

The



quatic

eterinarian



*Testing for Escherichia coli
bacteria in food fish.
See Research Report on pages 30-31
Photo credit: Shiva Prasad Bhusal*

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WHO ARE WE

MISSION

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.

OBJECTIVES

- A. To serve aquatic veterinary medicine practitioners by developing programs to support and promote our members, and the aquatic species and industries that they serve;
- B. To be an advocate for, develop guidance on, and promote the advancement of aquatic animal medicine within the veterinary profession and with associated industries, governments, non-governmental entities and members of the public;
- C. To develop and implement aquatic veterinary education programs, certifications and publications, including a credentialing process to recognize day-one competency in aquatic animal medicine;
- D. To foster and strengthen greater interactions among: aquatic veterinarians, related disciplines, veterinary allied and supportive groups and industries, governments and animal owners.

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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WAVMA News	
Editorials	4
Advertising Rates	4
Executive Board Reports	5
Committee Reports.....	8
Privileges & Benefits of WAVMA Membership	8
WAVMA Committees	8
WAVMA Veterinary School Chapters	10
WAVMA Student Chapter Reports	16
Author's Instructions	13
Colleague's Connection	
Meet Dr. Laura Urdes	14
John L. Pitts Veterinary Education Awards Program	
2018 Award Announcements	15
Sarah McConnachie	18
Courtney Wright (WDFW)	20
Courtney Wright (IDFG)	22
Aquarium Reports	
New England Aquarium — Boston, Massachusetts, USA	23
Centerfold	
Anemones at the New England Aquarium.....	24
Literature Reviews	
Book Review: <i>Diseases of Coral</i>	26
Grand Round Cases	
Suggestions for Fish Diagnostic Labs in USA	28
Bacterial Transport Media	29
Research Report	
Prevalence and Antibigram of <i>E. coli</i> in Fish Meat from Fish Shops of Chitwan, Nepal	30
News and Views	
Genetic Clues Reveal Origins of Killer Fungus Behind the 'Amphibian Plague'	32
Some Endangered Frogs may be Leaping Back from Extinction	33
Fish Vet Claims Breakthrough in Discovering Alabama Rot Cause	34
Pain Study in Reptiles	34
Legislation and Regulations	
New York State Eliminating Commercial Harvest of Diamondback Terrapins	35
Charges Filed in Turtle Poaching Case	35
Australia's Response to Importing Exotic Cajun Dwarf Crayfish and Disease Concerns	36
Is the release of the koi herpesvirus (Cyprinid Herpesvirus-3) in Australia necessary?	38
Aquatic Veterinary CE & PD	
Meetings of Interest to Aquatic Veterinarians	40
Sponsors	44

Editor’s Note

This year, once again I had the great opportunity to lecture at the AQUAVET® program at Roger Williams University in Rhode Island, USA. On my way there, I stopped at the New England Aquarium, in Boston, Massachusetts and met the students on their daytrip to the aquarium. It is always great to be able to visit public aquariums, and I try to stop by as many as possible in my frequent travels. See the article in this issue about visiting this aquarium on pages 23-25.

Several of the AQUAVET students received funding for the course through the John L. Pitts Aquatic Veterinary Education Awards Program, and the winners of this year’s awards are announced in this issue on page 15. On pages 18-22, are reports from the activities of two of last year’s Veterinary Education award winners. In the past and future issues of *The Aquatic Veterinarian* we will publish the reports of the students about their internships or other projects completed with the John L. Pitts Aquatic Veterinary Education Awards Program funding. Reading these will be a great way for other veterinary students to see the opportunities available to them in Aquatic Veterinary Medicine education.

We always welcome clinical case reports or research projects from members to publish in our journal, and in this issue, on pages 30-31, we have an original research paper by Shiva Prasad Bhusal (pictured on the cover), who used funding from the John L. Pitts Aquatic Veterinary Education Awards Program to study *E.coli* bacteria in food fish found in local fish markets.

And on page 14 we have a nice interview with our Past-President, Laura Urdes, by our President-Elect Devon Dublin, about women in Aquatic Veterinary Medicine. We always seem to get interesting articles and information provided for each issue, but I encourage all our members to send more information in for future issues of *The Aquatic Veterinarian!*

Nick Saint-Erne, DVM, CertAqV
Executive Editor
TAVeditor@wavma.org



A cuddly cuttlefish at the New England Aquarium (photo 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 issues of *The Aquatic Veterinarian*.

The latest editions are available for download at <https://www.wavma.org/TAV-Current-Issues>.

Past years’ editions are available for download at <https://www.wavma.org/TAV-Archives>.

Cover Photo:

Testing for Escherichia coli bacteria in food fish. See Research Report on pages 30-31. Photo credit: Shiva Prasad Bhusal

The Aquatic Veterinarian

The Quarterly Magazine of the World Aquatic Veterinary Medical Association

Consider promoting your products, services or programs to aquatic veterinarians, veterinary students, nurses & paraveterinary professionals throughout the world

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President's Report
Moving Forward in 2018

Thank goodness the icy chills of a Northern hemisphere winter are behind us. While those of us who are in private practice have geared up to the summer needs of our clients, those in the Southern hemisphere are adjusting to what they anticipate is needed in winter. But this also makes me ponder how best WAVMA can support the diverse needs of members in more than 70 countries – not an easy task.

The WAVMA Executive Board is still deliberating the best options for a 5-year strategic plan that would be a 'road map' to ensure we meet the needs of members. We are also planning to send out surveys to current members, and those that have not renewed in 2018, to discover what programs are most important, and where we should invest our limited funds. However, there are a number of activities that have been shown to be clear priorities for our members – perhaps the most important is the need for information on what knowledge, skills and experience a veterinarian needs to practice aquatic veterinary medicine.

The information shared, and questions asked and answered through the Members-L discussion listserv, about aquatic animal diseases and how to best deal with them, are becoming more refined and detailed. It turns out to be a great source of information that practitioners can immediately use in practice. In addition, information shared at sessions that WAVMA organized, and booths at international conferences have helped, particularly those at the World Veterinary Association, the World Small Animal Veterinary Association, the International Student Veterinary Association, and a number of other conferences in different countries.

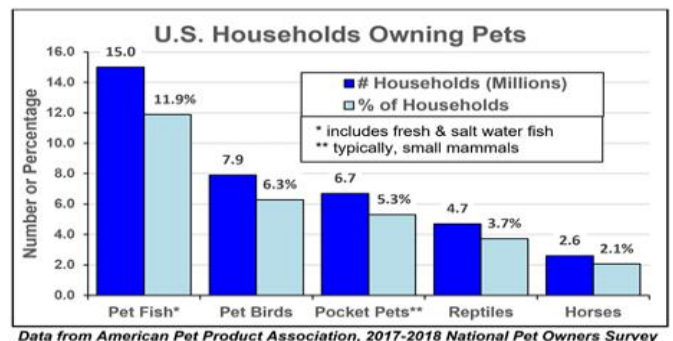


Unquestionably, these have made a large number of people understand what's involved with aquatic veterinary medicine, and eager to join WAVMA. But equally important, the rest of the veterinary profession are realizing that aquatic veterinary medicine is a *bona fide* and distinct discipline – and, as we've said for many years, is the fastest growing discipline within the profession.

For many years aquatic animals were thought of, and lumped into "exotics." Everyone understands that most people when they keep pets own a lot of fish, but each only keep a few cats or dogs as pets. As expected, a new APPA survey showed the numbers had increased in 2017 in the U.S.: 140 million fish; 88.3 million cats; 74.8 million dogs. But in analyzing the data carefully, more impressive, what I discovered is that more households owned fish, compared to all other "exotic" pets – a truly untapped market for veterinarians who offer aquatic veterinary services to fish owners.



WAVMA Members at the booth promoting Aquatic Veterinary Medicine at the 2017 AVMA Convention.



The WAVMA “Certified Aquatic Veterinarian” (CertAqV) Program has successfully advanced those wanting to be recognized as having core (or Day-1) competency in aquatic veterinary medicine. While the Program provides guidance for what core knowledge, skills and experience (KSEs) a practicing veterinarian needs, it also allows those who have demonstrated they have the KSEs in 9 areas to use the CertAqV honorific. Since the program was started in 2013, 62 veterinarians have been certified and another 48 are in the process of documenting their KSEs. What is perhaps more important, several veterinary schools, and organizations that influence what is covered in veterinary curricula, in Africa, Asia, N. America and Europe, are looking at the 9 KSE subject identified by WAVMA CertAqV Program to figure out if their curricula meet the needs of those wanting an aquatic veterinary career. This clearly indicates that we are on the right track. In fact, a small group of WAVMA members have embarked on a multi-year project to verify these 9 areas meet the needs of any practicing aquatic veterinarian, and hope to survey as many veterinary schools in each continent as possible, to discover which schools actually provide aquatic veterinary courses.

To help the effort of educating those interested in aquatic veterinary medicine, and to expand WAVMA’s reach into Latin American countries, the November 2018 WAVMA Conference on the Caribbean island of St. Kitts, with 30+ hours of RACE-approved CE lectures, poster sessions, wet labs and a biosecurity workshop (and lot of social and family activities), promises to be a real winner.

We are particularly excited as Dr. Árni Matthias Mathiesen, a veterinarian and the Assistant Director-General of FAO, who oversees the FAO Fisheries and Aquaculture Programs, has accepted our invitation to be a keynote speaker. Abstracts are coming in dealing with environmental veterinary medicine, veterinary education, clinical medicine, case reports, and emerging disease (including Tilapia Lake Virus that is now impacting a number of countries).

To encourage more presentations at the Conference, until the program is full, we will give speakers who submit abstracts for oral presentations, discounted registration. We strongly encourage everyone to register on-line as soon as possible for the conference and book discounted rooms at the St. Kitts Marriott Resort, Conference Center and Casino, as wet labs and the workshop are filling fast. Full details are available at <http://2018-Conference.wavma.org>. Individuals wanting to receive Conference e-mail updates, can subscribe at:

<http://tinyurl.com/2018WAVMA-Conf-Updates>.

David Scarfe PhD, DVM, MRSSAf, CertAqV
President 2018
President@wavma.org

Secretary's Report

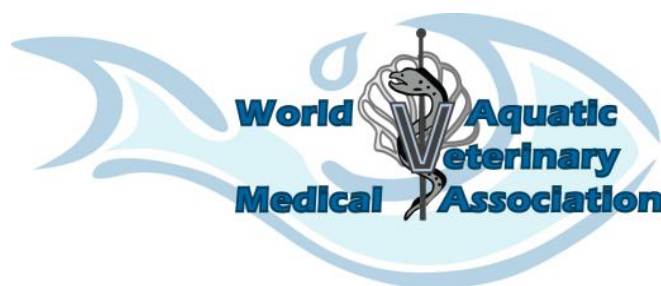
2018 continues to be another great year for WAVMA. The Executive Board continues discussions on strategic planning with a focus on improving WAVMA’s presence in the global veterinary profession, bringing increased value to our members, and maintaining our strong financial position.

Plans continue for the 3rd WAVMA Conference and Biosecurity Workshop, along with Ross University School of Veterinary Medicine and the International Aquatic Veterinary Biosecurity Consortium in St. Kitts in November. The 2018 WAVMA Annual General Meeting will be held at this event. We are looking forward to seeing WAVMA members at the meeting.

I encourage members to start to think about elections for 2019. In order to continue to grow and incorporate new ideas, we need active and engaged members to participate in the leadership of the organization. Regardless of your participation level in WAVMA to date, please consider submitting a nomination for an Officer or Director position.

I also encourage everyone to consider joining a WAVMA committee; it’s a great way to become involved in WAVMA and help the organization better support aquatic veterinarians around the world. If you have an interest in joining any committee, don’t hesitate to reach out to me or any other WAVMA Executive Board, we’d love to have you on a committee!

Stephen Reichley, DVM, PhD, CertAqV
WAVMA Secretary
Secretary@wavma.org



**Discover core knowledge, skills & experience
needed to become a WAVMA Certified Aquatic
Veterinarian (CertAqV)**

Did you know that WAVMA’s **CertAqV Program** offers members the opportunity to become recognized and certified as having competency in 9 core areas deemed necessary to practice aquatic veterinary medicine? Find out more information online at: <http://www.wavma.org/CertAqV-Pgm>.

Treasurer’s Report

This year is likely to set a record for WAVMA membership! Currently we have 390 members, and we still will have our WAVMA booth set up at good number of veterinary meetings, where we usually attract many new members. For the different categories of membership, the numbers so far are as follows:

Veterinarian Members -	192
Full Member (New Grad:1st yr) -	24
Vet Graduate Student, Intern or Residents -	30
Vet Student Member (enrolled in Vet Curriculum) -	137
Vet Tech/Nurse Member -	3
Affiliate Member (Non-Veterinarian) -	4

We have members from 37 countries around the world, from countries that begin with every letter except for DLMOQVWXYZ! So, if you know any aquatic veterinarians in Denmark, Liberia, Malaysia, etc., get them to join WAVMA!

Nick Saint-Erne, DVM CertAqV
WAVMA Treasurer
Treasurer@WAVMA.org



New Members—2nd Quarter 2018

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

Veterinarian Members

Pamela Yochem	United States
Bram Meersman	Netherlands
Serena Brenner	United States
Jan Raines	United States
Nelly Isyagi	Kenya
Atisara Ranglichol	Thailand
Nimrod (Rod) Arad	United States

New Graduate Veterinarian Members

Lauren Grotton	United States
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Vet Graduate Student, Intern or Resident

Vet Student Members

Sarah Lietzke	United States
Jayne Ellis	United States
Victoria Nelson	United States
Jacklin Pletcher	St Kitts and Nevis
Ashley Bisson	St Kitts and Nevis
Julie Fithian	St Kitts and Nevis
Alayna DeMarco	St Kitts and Nevis
Allison More	United States
Hadiyah Edwards	St Kitts and Nevis
Adam Pfefferle	St Kitts and Nevis
Kayla Johnson	St Kitts and Nevis
Cheyenne Lasky	St Kitts and Nevis
Mary Offutt	United Kingdom
Evangelia Makrygiannis	Grenada
Jennifer Mathe	United States
Alyssa Blew	United States
Bryce Talsma	United States

Vet Tech/Nurse Member

Edythe (Edi) Sonntag	United States
Misaw Kasye	

QUICK LINKS TO WAVMA PROGRAMS & SERVICES:

(Press control then click on item using computer mouse)

- [Online Member Directory](#)
- [Certified Aquatic Veterinarian Program \(CertAqV\)](#)
- [WebCEPD](#)
- [The Aquatic Veterinarian](#)
- [Aquatic Veterinary Jobs Listing](#)
- [WAVMA Student Chapters](#)
- [Veterinary Student Externship Listing](#)
- [John L. Pitts Aquatic Veterinary Education Awards Program](#)

PRIVILEGES & BENEFITS OF WAVMA MEMBERSHIP

Aquatic Veterinary e-Learning

Supporting WAVMA's WebCEPD, PubCEPD
 CertAqV & Clinical Cases Programs.



- Enjoy on-line *e-Learning* programs & courses to advance your knowledge & skills
- Get continuing education credit through *WebCEPD, PubCEPD & Clinical Corner*
- Discover core knowledge, skills & experience needed to become a WAVMA Certified Aquatic Veterinarian (*CertAqV*)
- Receive *discounted* subscriptions to publications & meetings
- Utilize *WAVMA's picture & video libraries* for your own presentations
- Join *listservs* to discuss clinical cases & other issues
- Mentor & be mentored to expand your and other's aquatic veterinary skills
- Publish your articles in WAVMA's quarterly journal: *The Aquatic Veterinarian*
- Find world-wide externships, internships, residencies & jobs in all aquatic vet areas
- Access *Member Directories* & have your Clinic/Hospital listed on-line
- Benefit from *Educational grants* for vet students & new veterinary graduates
- Form & participate in *veterinary school chapters* throughout the world
- Participate in veterinarian and client surveys
- Help build additional member programs by serving as an Officer, Director or Committee Member

WAVMA Committees

As a member-driven organization, WAVMA relies on volunteers to help implement programs useful for all members. Any WAVMA member can volunteer on a Committee to help shape the direction of the Association, meet new colleagues, forge valuable and lasting relationships, and help address key issues affecting aquatic veterinary medicine today. To find out more about serving on a Committee, please contact the Committee Chair or the WAVMA Parliamentarian.

Budget and Finance Committee

This Committee develops and regularly revises the Association's annual budget and assists the Treasurer, as necessary, in developing the Association's annual financial reports and tax materials.

This Committee shall consist of the Treasurer (Chair); the President-Elect; and one other member of the Executive Board who will volunteer to serve a one-year renewable term.

Chair: Nick Saint-Erne, Treasurer@wavma.org

Communications Committee

This Committee manages the communications among members and others involved with aquatic veterinary medicine. It oversees the listservs, membership lists, publication of WAVMA's quarterly journal *The Aquatic Veterinarian*, e-News, Facebook, Twitter, LinkedIn and other social media accounts.

Chair: Stephen Reichley, Secretary@wavma.org

Credentialing Committee

This Committee oversees and administers the Cert-AqV Program for credentialing aquatic veterinary practitioners, and evaluates aquatic veterinary educational programs useful to members.

Chair: Jena Questen, fish@drquesten.com

Meetings Committee

This Committee oversees and coordinates logistics for WAVMA-organized or sponsored aquatic veterinary educational meetings, including the Annual General Meeting.

Chair: Julius Tepper, cypcarpio@aol.com

Membership Committee

This Committee oversees membership issues to optimally serve individual members and the organization. Chris Walster, chris.walster@onlinevets.co.uk

Student Committee

This Committee facilitates networking between student members and helps development of student programs and services.

Chair: Emily Munday, emily.munday@gmail.com

Credentialing Committee

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:

- Register for the Program (application at <https://www.wavma.org/CertAqV-Pgm>).
- Identify a mentor to assist the registrant through the Program. The potential mentors would be 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.
- Be adjudicated by the Credentialing Committee for recognition of completion of all KSE requirements after the mentor has approved the documentation.
- Have the CertAqV certification approved by the WAVMA Executive Board.

The WAVMA Certified Aquatic Veterinarian (CertAqV) program has now certified 71 aquatic veterinarians from 27 countries. Congratulations on our newest Certified Aquatic Veterinarians:

Dr Miguel Grilo
Dr Sherri Kasper

There are an additional 55 other WAVMA members currently in the process of being certified. For more information, see the WAVMA website:

<http://www.wavma.org/CertAqV-Pgm>.

Jena Questen, DVM, CertAqV
2018 Credentialing Committee Chair

Certified Aquatic Veterinarians

Giana Bastos-Gomes	Australia
Heather Bjornebo	USA
James Bogan	USA
Pierre-Marie Boitard	France
Todd Cecil	USA
Michael Corcoran	USA
Emily Cornwell	USA
Darren Docherty	UK
Simon Doherty	UK
Devon Dublin	Japan
Ashley Emanuele	USA
Mohamed Faisal	USA
Ari Fustukjian	USA
Christopher Good	USA
Krystan Grant	USA
Stephanie Grimmett	UK
Orachun Hayakijkosol	Australia
Kerryn Illes	New Zealand
Jimmy Johnson	USA
Colin Johnston	New Zealand
Kasper Jorgensen	Denmark
Brian Joseph	Canada
Parinda Kamchum	Thailand
Elizabeth Kaufman	Israel
Amy Kizer	USA
Jack Kottwitz	USA
Eric Littman	USA
Richard Lloyd	UK
Richmond Loh	Australia
Adolf Maas	USA
David Marancik	Grenada
Colin McDermott	USA
Matthijs Metselaar	UK
Tim Miller-Morgan	USA
Haitham Mohammed	Egypt
Alissa Mones	USA
Danny Morick	Israel
Ross Neethling	UK
Dušan Palić	Germany
Brian Palmeiro	USA
Christine Parker-Graham	USA
David Pasnik	USA
Ayanna Phillips	Trinidad & Tobago
Jena Questen	USA
Aimee Reed	USA
Stephen Reichley	USA
Komsin Sahatrakul	Singapore
Nick Saint-Erne	USA
Jessie Sanders	USA
David Scarfe	USA
Khalid Shahin	UK
Galit Sharon	Israel
John Shelley	USA
Melissa Singletary	USA
Esteban Soto	USA
Win Surachetpong	Thailand
Gillian Taylor	South Africa
Julius Tepper	USA
Sharon Tiberio	USA
Laura Urdes	Romania
Greta Van de Sompel	Belgium
Sarah Wahlstrom	USA
Chris Walster	UK
Scott Weber	USA
Trista Welsh	USA
Peter Werkman	Holland
Howard Wong	Hong Kong
Taylor Yaw	USA
Irene Yen	St. Kitts & Nevis

Fellows Advisory Council

WAVMA has established a fellowship program to recognize those world-renowned veterinarians who have advanced aquatic veterinary medicine as a discipline and devoted their time and efforts to serve WAVMA's mission. The Fellows Advisory Council allows Fellows to advise the Executive Board with guidance on their initiatives, and mentor applicants for Aquatic Veterinarian Certification (CertAqV).

Our WAVMA Distinguished Fellows are:

Dr Peter L. Merrill
Dr Ronald J. Roberts
Dr A. David Scarfe
Dr Julius M. Tepper
Dr Christopher I. Walster
Dr Dusan Palic
Dr Grace Karreman
Dr Marian McLoughlin
Dr Mohamed Faisal
Dr Nick Saint-Erne

See: <http://www.wavma.org/wavma-fellows>.

Executive Board Responsibilities

The Executive Board has the responsibility for charting the course of WAVMA, fiduciary oversight of all issues, and, with input of committees, provides the oversight and approval for all WAVMA programs and services that fulfill the Mission and Objectives of the organization. The Board generally meets once a month through teleconferences, to discuss and approve WAVMA programs, services, and policies that drive the organization and issues that affect aquatic veterinary medicine. Members may submit items for discussion at the next Executive Board by contacting the [WAVMA Secretary](#).

WAVMA Shop

A number of WAVMA branded items
(including shirts, mugs, caps) are available
at the WAVMA Store. Get yours today!



Go to: <http://www.wavma.org/Shop>

WAVMA VETERINARY SCHOOL CHAPTERS

<https://www.wavma.org/WAVMA-Student-Chapters>

Auburn University, [College of Veterinary Medicine](#) (established 2013)
2016 Officers - Kate Butzen (President), Patricia Debow (Vice President), Erika Gibson (Treasurer), Lindsay Lawreck (Secretary); **Faculty Advisors** - Drs. Ray Wilhite & Jack Kottwitz; **Chapter Contact** - [click here](#).

Mississippi State University, [College of Veterinary Medicine](#) (estd 2014)
2016 Officers - Elizabeth Works (President), Taylor James (Vice-President), David Mills (Treasurer), Madeleine Hendrix (Secretary); **Faculty Advisor** - Dr. Wes Baumgartner; **Chapter Contact** - [click here](#).

Murdoch University, [School of Veterinary & Life Sciences](#) (estd 2014)
2016 Officers - Ming Jun Lim (President), Cheryl Tan (Vice President), Chermaine Lim (Treasurer), Jia Wen Lim (Secretary); **Faculty Advisors** - Drs. Lian Yeap & Richmond Loh; **Chapter Contact** - [click here](#).

Ross University, [School of Veterinary Medicine](#) (established 2015)
2016-2017 Officers - Larissa Menke (President), Erika Brigante (Vice President), Jean Fournier (Secretary), Robin Sayres (Treasurer), Michelle Sparks (Wetlab Coordinator), Mandy Murti (Fundraising Chair); **Faculty Advisors** - Drs. Don Bergfelt & Mark Freeman; **Chapter Contact** - [click here](#).

Oregon State University, [College of Veterinary Medicine](#), USA (estd 2017)
2017 Officers - Katharine Onofryton (President), Holly Arnold (Vice-President), Linda Yang (Secretary), Katie Royer (Treasurer), Courtney Pace (lab coordinator); **Faculty Advisor** - Dr. Tim Miller-Morgan; **Chapter Contact** - [click here](#).

Tuskegee University, [School of Veterinary Medicine](#) (established 2012)
2016 Officers - Jacqueline Elliott (President), Jennifer Algarin (Vice Prs), Jennifer Algarin (Secy), Aaron Judson (Treas.), Ayxa Rosado (Historian), TBD (Fundraising Chair); **Faculty Advisor** - Dr. Kenneth Newkirk; **Chapter Contact** - [click here](#). View the Chapter's [Facebook](#) page.

University of Florida, [College of Veterinary Medicine](#) (established 2013)
2016 Officers - Haley Violetta (President), Riley Shugg (Vice President), Kaylee Brown (Treasurer), Megan Joyce (Secretary); **Faculty Advisor** - Dr. Tom Waltzek; **Chapter Contact** - [click here](#).

University of Georgia, [College of Veterinary Medicine](#) (established 2015)
2016 Officers - Kristina Pascutti / Laura Burns (Co-Presidents), Sara Collins (Vice-President), Jaclyn Levin (Treasurer); **Faculty Advisor**, Dr. Alvin Camus; **Chapter Contact** - [click here](#).

University of Minnesota, [College of Veterinary Medicine](#) (established 2016)
2016 Officers - Sarah Knowles (Chair), Angela Jackson (Secretary); **Faculty Advisor** - Dr. Amy Kizer; **Chapter Contact** - [click here](#).

University of Pretoria, Onderstepoort [Faculty of Veterinary Science](#), South Africa (established 2017). **2017 Officers** - Varushka Naidoo (Chair), Aminah Vahed (Dpty Ch), Joanel Van Zyl (Secretary), Jodi Botha (Treas), George Woodley (Social Media), Robynne Britz & Vianca Naidu (Funding); **Faculty Advisor** - Dr. Jan Myburg; **Chapter Contact** - [click here](#).

University of Sydney, [Faculty of Veterinary Science](#) (established 2014)
2016 Officers - Ellen Rasidi (President), Arthur Chau (Secretary), Dr. Paul Hick (Treasurer); **Faculty Advisor** - Dr. Paul Hick; **Chapter Contact** - [click here](#).

University of Tennessee, [College of Veterinary Medicine](#) (estd 2012)
2012/13 Officers - Wesley Siniard & Grace Normann (Co-Presidents), Krista Lipe (Vice President), Carrie Dobby (Secretary), Samantha Schraith (Treasurer), Bree Dell (Wetlab Coordinator); **Faculty Advisors** - Dr. Michael Jones & Dr. Debra Miller; **Chapter Contact** - [click here](#). View the Chapter's [Facebook](#) page or [website](#).

University of Wisconsin-Madison, [School of Veterinary Medicine](#) (established 2014) **2016 Officers** - Katherine Hausmann (President), Nikki Wuestenhagen (Vice President), Geoffrey Gieni (Secretary), Jenna Newman (Treasurer), Jenna Epstein (Activities Coordinator); **Faculty Advisor** - Dr. Mike Collins; **Chapter Contact** - [click here](#).

Western University of Health Sciences, [College of Veterinary Medicine](#) (established 2014). **2016 Officers** - Andrew Switaj (President), Alexis Wohl (Vice President), David Abolnik (Secretary), Hali Jungers (Treasurer); **Faculty Advisor** - Dr. Suzana Tkalcic; **Chapter Contact** - [click here](#). View the Chapter's [Facebook](#) page.

Click here to get [WAVMA Student Chapter Guidelines](#) .

WAVMA Elections

It's not too soon to think about standing for election for a 2019 officer or director on the WAVMA Executive Board. The positions of President-Elect, Secretary, Treasurer, and three directors are up for election each year. We rely on our veterinarian members to run for positions on the Executive Board to help keep the organization moving forward. The Executive Board meets monthly via Skype and we have had board members from all around the world. It doesn't matter where you live—only that you are willing to help out!

All of the great programs and features you get from WAVMA membership are provided by volunteers. We are always looking for more helpers, whether veterinary students or graduate veterinarians, to join us on the committees as well. If you are not interested in running for office, but would like to provide your input and guide the future of WAVMA, join one of our committees (no previous experience necessary!). See a list of our committees on page 8. Contact our Secretary or the committee chair for more information about the committee and the dates of the next meeting (also done via Skype). All are Welcome!

Join a WAVMA Committee today!

**TO SUPPORT FUTURE STUDENT
 SCHOLARSHIPS, PLEASE MAKE
 A DONATION TODAY
 TO THE SCHOLARSHIP FUND!**

[www.wavma.org/
 SCHOLARSHIPS.](http://www.wavma.org/scholarships)

Aquatic Veterinary e-Learning
 Supporting WAVMA's WebCEPD, PubCEPD,
 CertAqV & Clinical Cases Programs



WAVMA is on Facebook!



“Like” WAVMA's Facebook Page and join the WAVMA Facebook group to keep up-to-date with WAVMA activities and aquatic veterinary medicine topics from around the world.

Search for WAVMA at www.facebook.com.

www.facebook.com/WAVMA

The Aquatic Veterinarian is meant to be read as a 2-page spread (like a paper magazine!). To view it this way on your computer, open the pdf document using Adobe Acrobat or Adobe Reader, then go to the menu bar at the top of the computer screen and click on View, then Page Display, then Two Page View. That will allow you to scroll through the issue seeing the cover page by itself first, followed by two pages side by side for the rest of the issue. Doing this, you will be able to see the Centerfold picture in all its ginormous glory!

**DO YOU HAVE A STORY TO TELL ABOUT
 HOW YOU BECAME
 INVOLVED WITH AQUATIC
 VETERINARY MEDICINE?**

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

Did you know?

WAVMA maintains an aquatic vet video library. Currently the videos cover a wide range of topics, including surgical procedures, diagnostic methods and guidance on how to be an aquatic veterinarian.

The videos can be accessed at:
<http://www.wavma.org/WAVMAs-Aquatic-Vet-Video-Library>

In addition, if you have a video that you would like to make available to other WAVMA members, kindly contact
WebAdmin@wavma.org.

Meetings Committee

The Meetings Committee has been hard at work preparing for our exciting conference schedule. We will have a booth at some of the meetings above and can always use people to help man our WAVMA booth for short periods.

The following are veterinary meetings that WAVMA is attending or sponsoring for the second half of 2018:

- 2018 AVMA Convention – Denver, CO (July 13-17)
- 2018 IVSA Conference – Krakow, Poland (July 16-28)
- 2018 ISAAH – Prince Edward Island, Canada (September 2-6)
- 2018 WSAVA – Singapore (25-28 September, 2018)
- 2018 WAVMA/RUSVM/IAVBC Conference – St. Kitts (November 2018)

I would like to spotlight this last meeting as our highly anticipated stand-alone meeting and Annual General Meeting. We are looking forward to seeing you on this lovely Caribbean island during the cold dreary November days. What a great place for CE and family fun!!!

Newly added to this conference will be a program of great interest to all pet fish practitioners.

KoiPrax 1

1st Annual Koi Practitioners Working Group Sat. Nov. 10, 2018

The first annual meeting of the Koi Practitioners Working Group (KoiPrax1) will take place in conjunction with the WAVMA St. Kitts Conference on Nov. 10, 2018. The mission of KoiPrax will be to serve the discipline of koi health, welfare and medicine. The objective will be to meet annually to discuss and catalog the collective knowledge about this veterinary specialty. We welcome the input and participation of all aquatic veterinarians interested in this subject. We also invite those in the hobby and industry to help us identify issues of interest and concern pertaining to koi keeping.

Experienced koi practitioners featured for our roundtable discussions will be:

Julius M. Tepper, DVM, CertAqV - Long Island, NY, USA

Richmond Loh, BVMS, MPh, MANZCVS, CertAqV - Perth, Australia

Tim Miller-Morgan, DVM, CertAqV - Oregon State U., Oregon, USA

Jessie Sanders, DVM, CertAqV - California, USA

The program will start with introductions, the structure and format for these talks, and tentative issues to be discussed. The afternoon will be devoted to discussing current issues and finish with a Q and A session.

This daylong meeting will be free to all WAVMA members. Non-members fee is \$100. Space will be limited, so please register with J. Tepper email:

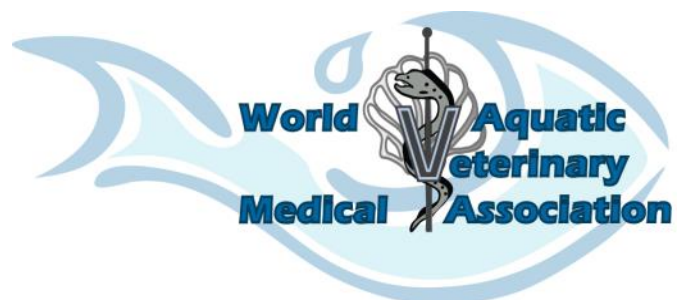
cypcarpio@aol.com

We are currently calling upon all those members who are interested in presenting either a live presentation or poster presentation to submit a CV and abstract as soon as possible. Information for presenters and attendees can be found at the conference website.

Julius M. Tepper, DVM, CertAqV

Meetings Committee Chair

cypcarpio@aol.com



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.

Advertising

See advertising rates on page 4.

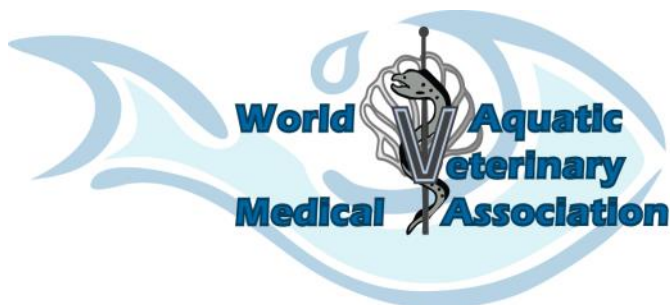
Please send articles, clinical reports, or news items to the editor by the following submission dates:

- 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.



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TAVeditor@wavma.org.

Meet Dr. Laura Urdes:

For the observance of **International Women's Day**, our President-Elect Dr. Devon Dublin (DD) conducted an interview with the WAVMA's Immediate Past-President Dr. Laura Urdes (LU).

DD: What is it like pursuing the career of Veterinarian as a woman?

LU: I decided to pursue this career mostly because, according to the tuition profile I had received in school, I was to be either a veterinarian or a physician. "Caring for people is easier, as they can speak to tell what is wrong with them", I had thought. Besides, I have always been fond of animals. So, I decided I will study to become a vet. My first year at the faculty was difficult, for many reasons. I believe one of them was because I had to get used to learning in a stricter and not always comfy environment, specific of most universities in my country in early 1990s, and very different from what I had expected as a high school student. But, in time, I learned to trust myself and my ability to improve, which brought about good grades, satisfaction and benefits, including grants, which I maintained until I graduated. My favorite courses were Obstetrics & Gynecology, and Medical Clinics. I had also a faculty mentor, Prof. Alin Birtoiu who, unfortunately and too early, passed away last year.

DD: Are there any specific challenges that female veterinarians face that do not affect male veterinarians?

LU: I believe there are such challenges in a woman vet's life. My personal perception is women are generally more sensitive than men, which may affect their

personal and professional sides of life. Veterinarian women tend to empathize with the suffering of their patients more than men do, stocking in their heart and mind the animal's pain and the feeling that they are sometimes helpless in the face of incurable diseases, having to euthanize their patients.



This may bring them close to depression and suicidal thoughts. This explains in my opinion why female veterinarians are more prone to suicide compared to male veterinarians. This is so sad...

A second challenge that vet women may face is the sacrifice they have to do to maintain the career – family balance. When I was a young, married practitioner, I remember I didn't have holidays or weekends to spend with my family. And, leaving the clinics for home, hours after closing time, was the usual practice.

DD: What are the characteristics of females that enhances their veterinary practice?

LU: There may be more than one. Generally, women are more organized, scrupulous, compassionate, dedicated, and have a complex mindset, rendering them better at clinical reasoning. Also, as I mentioned earlier, their native emotional openness may facilitate better communication with clients and the patient.

DD: What was it like being a female president of WAVMA?

LU: I don't know, I couldn't tell the difference. I just hope for the general WAVMA membership the year 2017 wasn't very different from other Presidency years. Apart from the responsibility and authority such a position brings about to one becoming a President, I couldn't tell it was any other difference.

DD: What advice would you give to young and aspiring female veterinarians?

LU: I know many people do not like being given advice, so I would rather, hopefully, inspire women who are considering becoming veterinarians. I often find myself thinking that we are living in an increasingly better world because women are now supported and encouraged to do their "magic touch" in all scientific fields. It is my belief that women can change the world to become a better, more caring one.

The John L. Pitts Aquatic Veterinary Education Awards Program

The John L. Pitts Aquatic Veterinary Education Awards Program is excited to announce recipients for the 2018 Award Cycle! The following individuals were selected to receive an award from a large pool of applications. Please join us in congratulating them on this prestigious recognition.

Erika Brigante;

Ross University, St. Kitts and Nevis

Alyssa Capuano;

University of California-Davis, United States

Nicole Himebaugh;

North Carolina State University, USA

Manuel Künzel;

[Ludwigs Maximilians Universität](#), Germany

Emily Munday;

Washington State University, United States

Sunita Shrestha;

Agriculture and Forestry University, Nepal

Patrawin Wanakumjorn;

[Kasetsart University](#), Thailand

Katherine Weber;

University of Wisconsin-Madison, USA

Joshua Zlotnick;

North Carolina State University, USA

Since its inception in 2010, the John L. Pitts Aquatic Veterinary Education Awards Program has awarded over \$50,000 to 82 veterinary students and recent graduates from 40 colleges and universities across 4 continents. These funds, which have come from a small number of individuals and organizations, allow recipients to explore a career in aquatic veterinary medicine through participation in externships at public, private, and academic institutions and attendance at conferences, workshops, and short courses all over the world.

The Program was started to honor the late John L. Pitts, DVM, who was passionate about student involvement in the profession and a global approach to aquatic veterinary medicine. His service to the profession began as a veterinary student in 1969 when he helped create a national chapter for the Student American Veterinary Medical Association. John also

helped in the formation of the National Association of State Aquaculture Coordinators, the Aquaculture and Seafood Advisory Committee of the AVMA (now called the Aquatic Veterinary Medicine Committee), and he worked tirelessly to shape and encourage the passage of the Minor Uses and Minor Species Act of 2004. To continue John's vision, a small all-volunteer committee comprised of individuals representing private practice, academia, past recipients, WAVMA student members, and the Pitts family work to administer this program.

For more information regarding the Program and to make a donation for future awards, please visit www.wavma.org/scholarships. Please help us support the next generation of aquatic veterinarians, donations of all amounts help tremendously.

Stephen Reichley, DVM, PhD, CertAqV

stephen.reichley@gmail.com

Chair,

John L. Pitts Aquatic Veterinary Education Awards Program



**TO SUPPORT FUTURE STUDENT
SCHOLARSHIPS, PLEASE MAKE
A DONATION TODAY
TO THE SCHOLARSHIP FUND!**

[WWW.WAVMA.ORG/
SCHOLARSHIPS.](http://www.wavma.org/scholarships)

Oregon State University
WAVMA Student Chapter Update
By Linda Yang (Secretary)

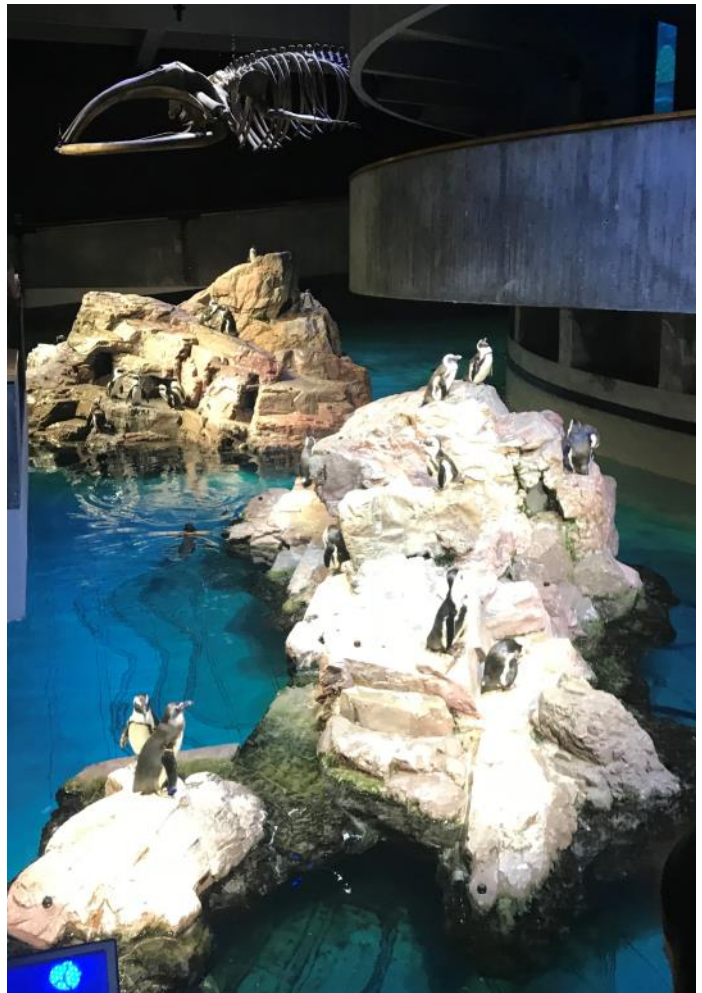
After a full year since the founding of our chapter, we have accomplished many activities and establishing local contacts to develop student's opportunities to experience aquatic medicine at Oregon State University Carlson College of Veterinary Medicine. We've worked with multiple student organizations like the Pathology Club and the Zoo, Wildlife, and Exotics Club for joint wet labs and lunch talks, and hosted an aquatic medicine night to explore cases. We ended the year by electing a new executive board for the next academic year.

The chapter hosted two lunch talks, one about summer opportunities to explore what students can look to gain experiences in aquatic medicine and zoo and wildlife medicine and the other with Dr. Nora Hickey on careers in aquatic medicine and being a veterinarian with the Northwest Indian Fisheries Commission. In our summer opportunities lunch talk, students who participated in shadowing fish hatchery veterinarians or completed workshops and externships during their summer. Opportunities that were brought up during the lunch talk was MarVet and SeaVet Programs, Wildlife Safari's Zoo and Wildlife Medicine Workshop, and the California Wildlife Center externship. Participants of these programs answered questions from club members and spoke about their experiences during their summer adventures. In our second lunch talk, Dr. Hickey emphasized the growing need for veterinarians in hatcheries, how to approach going into a career in aquatic medicine, and the importance of aquatic veterinarians in our profession. The chapter then hosted a meet and greet with Dr. Hickey that evening for students.

One of the Chapter's goals this year was to bring more hands-on experiences with fish medicine. With the Pathology Club, the chapter organized a fish necropsy demonstration with Dr. Christiane Lohr, one of our faculty pathologists. Students learned how to perform a skin scrape, gill biopsy, and fin clip on trout and observed wet mount slides under a light microscope. Students were also able to learn the importance of the "fish TPR" (skin scrape, gill biopsy, and fin clip) in working up aquatics cases with salmonids with Dr. Hickey during our evening rounds night. Dr. Lohr and Dr. Aimee Reed from ODFW also completed the evening with discussion of their own cases of mycobacterium in seahorses and clinical cases with koi respectively. We also had the opportunity to tour Dr. Carla Schubiger's shrimp and oyster laboratory on OSU campus and discuss her research on antimicrobial treatments and *Vibrio cholera* in oysters.

With the end of the academic year in May, the chapter elected a new executive board and thanked the current board for their hard work in the past year since the chapter was founded. Katharine Onofryton, will continue as an advisory role as president with the president-elect, Lesley Cohen. Laura Eldridge will be vice president with Corinne Weston as secretary, Elin Crockett as treasurer, and Robyn Cates as wet-lab coordinator. The now former executive board wishes them good luck to the coming year and will be excited to see what they will bring to the Oregon State University Chapter.

Below:
Penguins at the New England Aquarium
in Boston, Massachusetts,
under a whale skeleton
suspended from above.
(photo by Nick Saint-Erne)



Illinois WAVMA Student Chapter Activities

Sarah Wright, President

Illinois Student Chapter of the World Aquatic Veterinary Medical Association

I am writing with great enthusiasm for the success of the newly installed Illinois Student Chapter of the World Aquatic Veterinary Medical Association (ISCWAVMA). After only a few months of installation, ISCWAVMA has hosted two lectures and one wet lab. Additionally, we have twenty active Chapter members.

The first event that we held was a lecture from Dr. Matt O'Connor, Staff Veterinarian of the John G. Shedd Aquarium in Chicago, Illinois. Dr. O'Connor gave us an engaging lecture about aquarium cases that he's seen at Shedd. The lecture evoked our problem-solving skills as we applied what we had learned in the classroom to aquatic animal cases.

The second event that we held was a pinniped necropsy wet lab. This hands-on wet lab was coordinated and facilitated by our Chapter Advisor, Dr. Kathleen Colegrove of the Zoological Pathology Program. The lab took place at Brookfield Zoo in Brookfield, Illinois. We necropsied a juvenile free-ranging California sea lion, giving twelve of our members the opportunity to learn sea lion anatomy and pathology. We also had the opportunity to tour Brookfield Zoo's Animal Hospital afterwards with Dr. Karisa Tang. We hope to have more hands-on labs similar to this one in the future.



The last event that our Chapter held this school year was a lecture from Dr. Michael Kinsel of the Zoological Pathology Program. Dr. Kinsel gave us an interesting lecture on aquatic animal pathology cases. This lecture was a fantastic complement to the recent pinniped necropsy wet lab and it gave our members a comprehensive introduction to common pathologies of aquatic animals.

Overall, our Chapter has been thriving since its installation. As an Executive Board, we look forward to expanding on this initial success by providing more opportunities in aquatic veterinary medicine to our members next year.

Thank you for your continued support of our endeavors.



2017 Pitts Education Awards Program Report

Sarah McConnachie, 4th year veterinary student, Atlantic Veterinary College Marine Harvest Canada Veterinary Externship

I feel honoured to be a 2017 John L. Pitts Scholarship awardee. As a 4th year student at the Atlantic Veterinary College in Prince Edward Island, the award helped fund an externship across the country at Marine Harvest Canada (MHC) on Vancouver Island, British Columbia, where they farm Atlantic salmon. I am motivated to gain experience in aquaculture as our oceans cannot supply the increasing demand for healthy seafood. Furthermore, as a budding veterinarian, aquaculture is an especially exciting industry as it combines aspects of human health, environmental stewardship, nutrition, pharmacology, wild fish interactions, vaccines, and new/emerging pathogen research.

In October 2017, MHC's aquaculture veterinarians and experienced fish health staff graciously hosted me for three weeks. MHC is a vertically integrated company, meaning they oversee internal production of broodstock through to sales, and I was lucky to see aspects of fish health management at all steps. This type of management has been proven to optimize fish health and feed conversion (almost at 1:1 ratio) by mimicking the natural lifecycle of salmon while keeping tight control over fish health and growth parameters. I was also exposed to collaborations with regulatory groups to ensure proper protocols and auditing occurred. All diseases of concern are continually investigated by MHC fish health staff, and confirmed by 3rd party accredited laboratories. Below I have outlined some important activities I was involved with during my time at MHC.

FISH HEALTH INITIATIVES

Atlantic salmon are regularly and randomly screened by trained staff farmers for health status, including condition factor, gill quality, and external parasite loads. Weekly production reports outline mortality categorized by cause, growth, feed conversion, and environmental parameters, which allows for the identification of site-specific problems before they become an issue for fish health and welfare. Licensed veterinarians and government scientists visit all sites regularly for further in-depth fish health testing completed through 3rd party labs. Results of these assessments are publicly available through Canada's Department of Fisheries and Oceans (DFO), who oversee the management of aquaculture in British Columbia. Salmon are a vital commodity in British Columbia to a variety of stake-

holders, which has resulted in delicate political and social interactions. However, MHC highly values transparency and open communication regarding environmental issues, which has enabled them to meet and exceed all government environmental regulations, along with industry codes of practice.

Continual communication among MHC's fish health staff and farmers managing the fish allows them to solve fish health problems in real-time. In-house diagnostic capabilities allow for the identification of problems quickly so the correct management action can be taken before outbreaks occur. In addition, all fish are vaccinated against naturally occurring marine fish diseases. The company continually tests fish for naturally occurring viruses in the region and viruses of concern. These strategies have resulted in a decline of viral outbreak occurrences and antibiotic use in Canadian salmon over the last decade.

Lastly, MHC is involved in both internal and external research initiatives. One exciting aspect of fish health in aquaculture is the constant change and advancement of practices. Some health issues are easily resolvable (e.g., viruses covered by effective vaccines), while others require constant investigation (e.g., sea lice). Investment in research allows for the improvement of current fish health practices

GILL HEALTH

Fish are unlucky in that their breathing tissue is on the outside of their bodies rather than safely tucked within their bodies like mammalian lungs. They are exposed to the water around them and are especially prone to changes in water quality, presence of algae, zooplankton, and jellyfish blooms. MHC tracks gill health over time using scoring charts that all fish health staff and farmers are trained to use to make sure fish are able to withstand upcoming environmental stressors and help fish farmers account for decreased breathing capabilities (e.g., decrease handling, increasing oxygen saturation).

SEA LICE

During the fall, adult wild salmon may pass lice to farm-raised salmon. Once a farm is exposed it may become a reservoir of lice. Judicious management by MHC and DFO ensure farmed fish do not become a source of infection during springtime outmigration of juvenile wild salmonids. Sea lice counts conducted by farmers are audited by fish health staff, which is in turn audited by DFO personnel to ensure counts match. All sea lice levels are publicly posted by both MHC and DFO. Area numbers need to remain below certain targets or else action must be taken to reduce them. Mitigation measures include timed harvesting, medical treatments (e.g., in-feed anti-parasitocides), and non-medical treatments such as freshwater baths.



Sarah with an Atlantic salmon during a routine health check

MHC advocates for using a variety of treatments to conserve use of medications as resistance is common. Avoiding overtreatment keeps susceptible populations within the farm (parasite refugia) with little resistance development. I was also able to actively participate in the use of live-lice bioassays designed to test local population susceptibility to medicated feeds.

FISH HEALTH INVOLVEMENT THROUGHOUT THE PRODUCTION CYCLE

Veterinarians at MHC are involved with managing fish health at all steps of the production cycle. There is also a staff veterinarian who specializes in fish nutrition to help guide farmers through feeding programs and regimes.

Hatcheries: MHC has invested in state of the art, large-scale recirculation hatchery systems to make sure fish are given the best opportunity to thrive from egg incubation to smoltification. Regular disease monitoring starts with broodstock to ensure clinically relevant pathogens do not vertically transfer to the next generation. Biosecurity practices, influenced by veterinarian recommendations, are well communicated to all staff and visitors to make sure fish are not exposed to any pathogens during the hatchery period.

Seawater: Fish are rigorously tested prior to seawater transfer to ensure they are ready for the change and are disease-free. Low-stress handling is maintained throughout transfer to ensure fish do not experience any significant health events following transfer. Fish health staff is familiar with site equipment to help farmers problem solve issues that may arise. They are also involved with site selection and determining proper following procedures. They understand the im-

portance of various environmental parameters that make a site suitable to support fish from smoltification to harvest at six kilograms, while maintaining optimum feed conversion, fish health, and environmental sustainability.

Harvest: Fish health staff work with farm managers to oversee harvest decisions and practices to ensure fish welfare is maintained, and by-catch is managed appropriately.

Broodstock: Fish health staff are involved in aiding farmers choose suitable breeding stock and keep them healthy through maturation and freshwater transitioning. Advice on housing temperatures, light duration, and health treatments help ensure fish are at optimal health to help influence the quality of the next generation.

Processing: Company owned processing plants serve to ultimately grade a whole premium product that is then sent to different markets, mainly in the USA, along with Canada and Asia. Fish health staff collaborate with Canada's Food Inspection Agency to ensure the fish remain safe for human consumption.

PERSONAL GROWTH

MHC also coordinated several activities that allowed me to further investigate a career in aquaculture. Along with a visit to a 3rd party laboratory, I was lucky that my visit coincided with the MHC Women in Aquaculture Conference. Its aim was to bring women together in an industry historically dominated by men and to discuss issues specific to women. Experienced farmers, site managers, and women in regulatory roles gave talks, each outlining their experiences, hurdles and suggestions on how to break barriers and maintain their relevance in the industry. MHC strives to be the best place for women to work in aquaculture, and I must say that I left impressed and inspired.

I was also afforded a visit to a well-established Chinook salmon farming operation to see the different challenges they face compared to Atlantic salmon aquaculture. I was able to explore why and how Atlantic salmon farming has been more successful, as Chinook experience profoundly different health issues that are often limiting to the industry. I was able to discover how this company was able to carve a niche out for themselves and do farming well at a smaller scale.

In summary, this externship brought together all my interests and experiences in water quality, environmental science, fish biology/health, and aquaculture management. Solving fish health problems requires knowledge and experience in all these topics and I was happy to finally apply my developing clinical reasoning skills to real life fish health issues. This experience was profoundly useful for my upcoming career in fish health, and I have MHC and the Pitts Scholarship to thank for that!

John L. Pitts Veterinary Education Awards

Courtney Wright

The Ohio State University—Class of 2019

Washington Department of Fish and Wildlife's (WDFW) externship program.

I am confident that most in the veterinary profession can relate to the notion that the journey into the field comes with sacrifices. For me, the theme since undergraduate school has been refraining from attending costly events so that I may have better exam scores, a good night's sleep and more money to pay for...well, everything. The generosity of the John L. Pitts Aquatic Veterinary Education Awards Program allowed me to travel across the country to partake in the Washington Department of Fish and Wildlife's (WDFW) externship program. For once, I did not need to make a sacrifice.

My passion for aquatic veterinary medicine has revealed itself to me slowly. As I drove from Ohio to Washington this past May, 2018 anxiety was a dear friend of mine. I was worried about knowing the bare minimum about fish health and being in Western USA for the first time. However, it was quickly apparent that my anxiousness was unwarranted. I was graciously hosted by different veterinarians set up through WDFW, whose openness and friendliness eased all my fears. In addition, I felt an immense sense of belonging with these veterinary professionals who echoed the feelings I have been having about pursuing an "alternative" veterinary career.

The externship began with a week spent at the Northwest Indian Fisheries Commission (NWIFC). Dr. Nora Hickey immersed me into fish health basics and provided excellent resources to me for a better understanding of fish terminology. I began to understand the intricacies of hatchery management, and the important role veterinarians have in serving as advocates for fish. Between monitoring formalin treatments, calculating water flow and turnover rates and discussing facility design with engineers, I quickly learned that the veterinary practice of fish health requires having knowledge far beyond just fish.

Being the Spring, parasites began to emerge and affect the fish. Dr. Hickey and the staff of NWIFC constantly encouraged me to perform fish necropsies and prepare gill and skin samples for microscopic examination. During my time at NWIFC I was shown many Native American fish hatcheries and began to understand the importance these hatcheries have for human traditions, health and overall happiness.

My next week in the program transitioned to observing a fish pathologist employed by the state. Bryan Quinton and I drove over what felt like the entire west side of Washington, which fortunately allowed me to ask him many, many fish health questions. He intro-



Rocky Beach Dam's gorgeous fish ladder, located in Chelan County, WA.

duced me to a multitude of hatcheries that primarily raised a combination of coho, chinook, chum and trout. He stressed the importance of understanding a hatchery's history and working with the hatchery staff to come to reasonable decisions about facility management. By the end of my time with Bryan, he had me work up a fish health case and I felt a surge of confidence knowing I was able to provide a list of appropriate differentials.

The incredible view of the Leavenworth National fish hatchery.

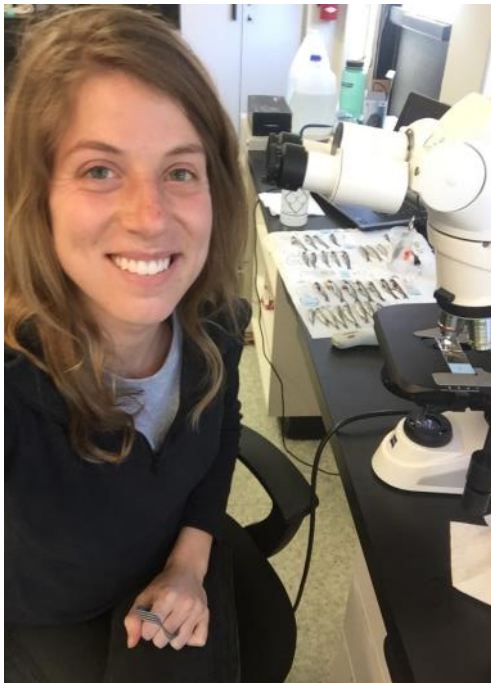




Learning proper fish feeding techniques at

Having gained perspectives from the veterinary and pathologist point of view, I eagerly drove to Eastern Washington to begin the next leg of my adventure. I must admit, driving in Washington was never cumbersome as every mile gives you a breathtaking view of mountain ranges, lakes and rivers. Thus, I began my week with Federal employee Dr. Trista Welsh-Becker. The hatchery Dr. Welsh-Becker is based out of is nestled

within the beautiful and unique Bavarian-style city of Leavenworth. Dr. Welsh-Becker continued to break down the “fish health language barrier” I had prior to my externship, and she encouraged me to keep practicing my fish necropsy skills. I was constantly impressed with Dr. Welsh-Becker’s attention to detail as she emphasized the value of having thorough records and consistent diagnostic criteria. In addition, I began to value the importance of interpersonal skills, as this often reflects how successful a veterinarian might be in history-taking and treatment implementation.



“Running the show” of fish diagnostic health evaluation at the Leavenworth National hatchery.



My first spawning experience! Spawning steelhead trout at a tribal fish hatchery.

The final week, as all good things tend to do, came too quickly. On day one Dr. Betsy Bamberger, a state veterinarian, and I were covered head to toe in protective clothing and mosquito spray, trekking at least half a mile to a fish trap to collect ovarian fluid, kidney and spleen samples. As the week slipped away, I ended my experience with a presentation over Bacterial Coldwater Disease. The environment the fish health professionals provided to me during my presentation was excellent, because it was formatted as an open discussion and allowed me to hear the opinions from many different perspectives.

As I reflect upon my externship, it was very useful to continuously observe different fish health professionals. It allowed me to integrate, change and apply different diagnostic techniques and critical thinking strategies into my own preferences and knowledge basis. I often joked that my family is thankful I have two years left of veterinary school, because I am not sure I would ever have wanted to leave Washington. Between the beautiful landscape and seamless way fish health medicine integrates my career goals and passions, I am thoroughly and utterly grateful for the opportunity to explore this field of veterinary medicine. I would like to thank not only those mentioned, but all other fish health professionals who took the time to teach me about this amazing field. As such, thank you again to the John L. Pitts program, which helped form an abstract career path of mine into a concrete passion.

John L. Pitts Veterinary Education Awards

Courtney Wright

The Ohio State University—Class of 2019

Growing up, my parents often struggled to make sure I had shoes on before I went outside for the day. I loved being outside, and every day provided a new adventure to be had. Though my shoe etiquette has solidified as I matured, my desire to be outside has not. This passion has been a crucial factor for me when I consider what I want my future as a veterinarian to look like. I often tell people that I am not sure what type of veterinarian I want to be, but I know what I do not want to be. Thanks to the generosity of the John L. Pitts Scholarship Program, I could further identify what my career goals are. This past summer, I traveled to Boise, Idaho to be a summer veterinary extern with Doug Munson at the Idaho Department of Fish & Game (IDFG).

Earlier in the summer, I had traveled for a similar externship position with the Washington Department of Fish and Wildlife (WDFW). During that externship, I was just happy to obtain any information I could about aquatic animal medicine. With IDFG, I continued my sponge-like behavior, but I wanted to challenge myself further: I wanted to start applying my comparative anatomy skills and contributing my own insights.

I arrived in Boise around 11pm at night, and a mere seven hours later I was riding up to the Pahsimeroi hatchery for a biosecurity audit. The externship continued like this: early morning rendezvous times to arrive at a facility to perform whichever task was needed. Sometimes, we did more biosecurity audits. Other times, we were taking biopsy samples for surveillance data or assisting in the spawning process. Despite having minimal to no experience, Doug and the hatchery staff were all incredibly helpful and patient as they taught me the nuances of examining a facility, taking samples, sorting males from females, humanely euthanizing fish and collecting eggs. Soon, I was either down in the raceway with the hatchery staff sorting fish or “running the show” to collect surveillance samples.

After about a week, the externship took an abrupt change of pace when I embarked on an eight-hour car ride with Doug to the annual Aquatic Animal Drug Approval Partnership Program in Bozeman, Montana. The conference was a whirlwind of talks and social events and I met a multitude of fish health professionals from all over the world. The trip ended with a decompression rafting trip down the Yosemite River, and I felt an immense sense of happiness despite being splashed by nearly everyone!



Left: I taught Doug how to string up a hammock! Tonight, we are sleeping under the stars the night before spawning at Sawtooth Hatchery.

Right: Checking the underside of a fish to determine its gender.



Left: Enlarged, granulomatous kidney of a salmon infected with Bacterial Kidney Disease.

The hours were long and the work was hard, but I reflect upon my externship and cannot believe I had the opportunity to do it. Between the room accommodations provided by Eagle Fish Health Lab, to camping outside in Idaho, to all the fish health professionals that mentored me, there simply are not words adequate to describe this experience.

Through my contacts with WDFW, I had begun to feel like shadowing Doug was a “rite of passage” for veterinarians interested in fish medicine. It did not take long for me to understand why: during the 6,000+ miles we rode together, I had ample opportunities to ask questions, test my knowledge and gain an insight into being a state employee. I know that this experience with IDFG will make me a better aquatic animal veterinarian, because having a good understanding of the process of raising and spawning fish will help me find better solutions to fish health problems.



Geared up to do my first sorting experience! Today we were going to sort chinook salmon at Sawtooth Hatchery.



Assisting Dr. Mark Drew, IDFG's wildlife veterinarian, in a necropsy of a moose head.

As most good things go, I could not have had this excellent experience without the help of others. I would like to thank the amazing fish health staff of IDFG and the John L. Pitts award for helping me further explore careers that fulfill a vital criterion for my quality of life as a veterinarian.

**AQUAVET Students at the New England Aquarium
By Nick Saint-Erne**



The New England Aquarium, in Boston, Massachusetts opened on June 20, 1969. The first time I visited the New England Aquarium was when I was an AQUAVET student myself, in the summer between my third and fourth years of veterinary school, in June of 1982.

On this recent visit on June 12, 2018, the students of AQUAVET and I were treated to a delightful behind-the-scenes tour of the facility by the aquarium veterinary staff, including Drs. Charles Innis, Mike Corcoran, Kathryn Tuxbury, and Senior Aquarist Scott Dowd (who coordinates Project Piaba in Brazil).

The Aquarium offers veterinary externships for 3rd and 4th year vet students. Students can apply by October 1 for the next 6-8 week sessions by contacting the Aquarium and submitting a veterinary student intern application:

<https://neaqinterns.applicantpro.com/jobs/713474.html>

E-mail: intern@neaq.org

Call: 617-973-5235

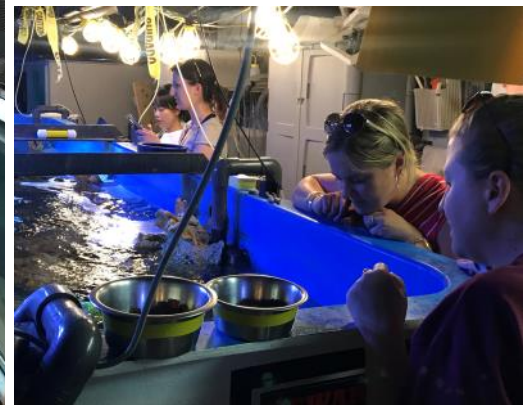


Above: 'Andre,' the estuarine stonefish.

Below: display tank with Sea of Cortez creatures.



(Photos at aquarium by Nick Saint-Erne)



*Above left: Dr. Mike Corcoran explains the workings of the Aquarium to the students.
Above: Students looking into the exhibits from the back room during the behind-the-scenes tour.
Below: display of Pacific Reef creatures.*







*Anemones at the New England Aquarium
Photo by Nick Saint-Erne*

Book Review

Diseases of Coral

Cheryl M. Woodley, Craig A. Downs, Andrew W. Bruckner, James W. Porter and Sylvia B. Galloway (editors).

John Wiley & Sons Inc., Hoboken, New Jersey, USA.
2016, 600 pp. ISBN: 978-0-8138-2411-6.
US \$249.95 hardback; \$199.99 e-Book.

Review by Michelle M. Dennis,
Center for Conservation Medicine and Ecosystem
Health, Ross University School of Veterinary Medicine,
PO Box 334, Basseterre, St. Kitts, West Indies
(MiDennis@rossvet.edu.kn)

Coral reefs are one of the most biodiverse ecosystems, supporting nearly a quarter of all marine life. They are highly productive natural food sources, sustain valuable recreational industries, and provide much-needed shoreline protection. Sadly, in recent decades, coral reefs have catastrophically declined around the world, and disease has been a major contributor. Yet, coral diseases are poorly described and their causes remain unknown for the most part. It follows that only a few text books have addressed coral disease, mainly comprising compilations on select topics or standalone chapters addressing major disease examples. Consequently, those interested in coral disease have eagerly awaited the publication of the first edition of *Diseases of Coral*.

This text is an extremely ambitious undertaking. The editors have effectively compiled subject matter written by more than 70 contributing authors and experts in the field, many of whom are well published in the literature or have previously authored other reference materials on the subject. *Diseases of Coral* successfully presents a distilled body of knowledge that brings attention to critical knowledge gaps. The text is distinguished by its sole focus on coral disease, the breadth of diseases reviewed, and its suitability to a wide readership of varying professional backgrounds. Additionally, it has a comprehensive approach to the discipline, including broader concepts and methods necessary to studying coral disease. It contains a large number of high-quality color illustrations. The number of field photos of corals showing macroscopic lesions is a highlight, and excellent color photomicrographs detail microscopic anatomy and pathology.

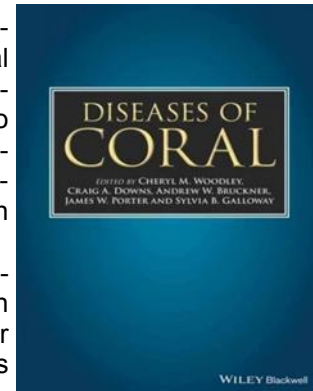
The book opens with “primer” chapters that cover basic topics essential to studying coral disease. Readers who are not especially well versed in animal disease investigation may particularly benefit from the chapters focusing on epidemiology, pathology, and etiology (including a comprehensive review on causal reasoning). Additionally, chapters focusing on coral

anatomy, reproduction, nutrition, immunology, and coral disease history may be especially advantageous to those already well experienced with disease investigation in animals other than corals.

The bulk of the text comprises expositions on specific coral diseases or syndromes. Some chapters focus on lesion type or pattern (e.g., “white syndromes,” bleaching, colored band diseases, skeletal growth anomalies), select etiologies (e.g., carallivory, vibriosis, serratiosis, cyanobacteriosis, Halofolliculina ciliates, and viruses), or specific disease entities (e.g., dark-spots disease, pink-line syndrome, white plague type II). Most of the diseases reviewed are specific to free-living hard corals. Additionally, sea fan aspergillois is addressed, and two chapters are dedicated to diseases of octocorals and deep-water corals, but no chapters are dedicated to aquarium corals.

The final chapters of the book explore novel methods relevant to coral disease investigation, including coral cell culture, coral tissue culture, coral regeneration assay, and pulse amplitude–modulated chlorophyll fluorometry, among other methods. It is hoped that adaptation of such techniques will help encourage innovation and advancement in coral disease research. These chapters will certainly be enlightening to the novice coral disease investigator and perhaps inspiring to experts in the field. However, chapters dedicated to fundamental methods relevant to coral disease investigation, such as assessing and monitoring coral diseases in the field, or special approaches to laboratory diagnosis in corals (e.g., histopathology or microbiology sampling and processing) are not included in *Diseases of Corals*. These are topics that a coral disease investigator should master to undertake effectively investigations emulating the standardized biomedical approach but will need to learn elsewhere.

My expectations for *Diseases of Coral* are probably biased by my familiarity with other “Diseases of ...” textbooks published by Wiley-Blackwell, which are commonplace among the reference collections of veterinary diagnosticians. A popular framework of such textbooks is to organize diseases according to etiology (such as bacterial, fungal, parasitic, nutritional, toxicological) and to section chapters by diagnosis and prevention and/or treatment. However, this traditional approach is challenging for coral diseases because many are of unknown cause or have not been described comprehensively. Like-wise, there is some inconsistency between chapter layouts and some redundancy of



material covered. Additionally, although each chapter effectively pulls together what is known on its subject, the case definitions for many diseases remain unclear. From a veterinary pathologist's perspective, I hoped for greater clarification on gross and micro-scopic pathology that would allow a specific disease to be diagnosed, especially because many coral diseases lack distinguishing characteristics and are named after rather non-specific visual appearances (e.g., "white band disease"). The shortage of these details is a reflection of our present knowledge of coral diseases, rather than an editorial oversight. Perhaps one day we will bridge the gaps in our understanding of coral diseases such that later editions of this text can provide more clarity here. In the meantime, *Diseases of Coral* has effectively teased apart a confusing mass of multidisciplinary literature in which a variety of names may be used to refer to the same disease, or in other instances, the same disease name has been used to refer to a variety of different diseases.

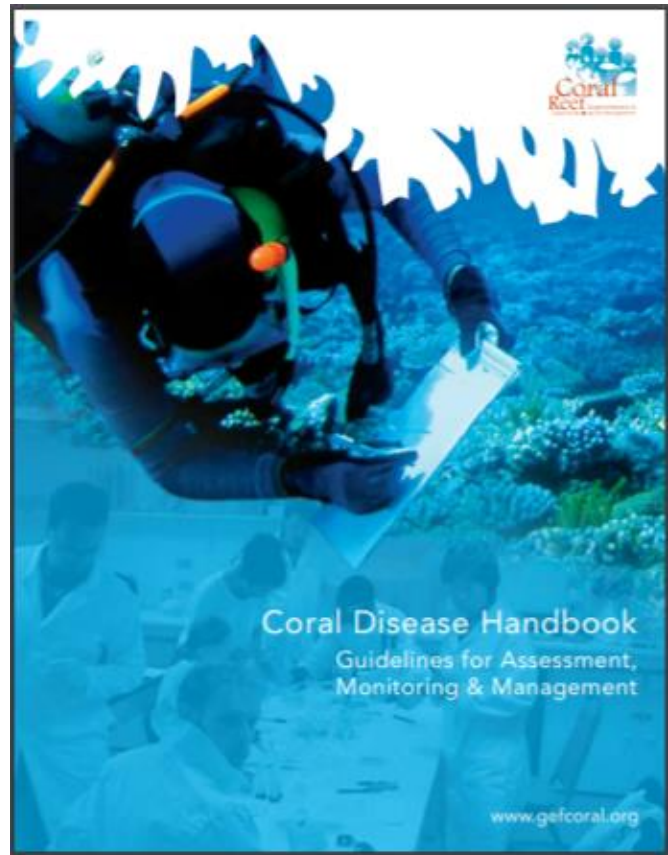
The editors must also be commended for catalyzing the process of developing a standardized vocabulary for coral diseases. The textbook's introduction wisely describes this as an essential step for scientific advancement of a new field. However, it is no small undertaking in a textbook involving so many contributing authors or in a subject area notorious for inconsistent use of language. The textbook's glossary, aimed at comprising a "full lexicon" of coral disease terminology, is all-inclusive and likely to be useful regardless of a reader's professional background. Readers can still expect some inevitable minor inconsistencies in vocabulary used among chapters; for example, some authors referring to "ectoderm" rather than "epidermis," "clinical (or gross) signs of disease" rather than "macroscopic lesions," or "epizootiology" rather than "epidemiology," despite a case made for universally using the term "epidemiology" in the epidemiology chapter.

While the field of coral pathology remains in its infancy, this textbook is a critical step forward, a milestone for the growth of our rudimentary collective understanding of coral diseases. *Diseases of Coral* is now an obvious first choice reference for getting quickly up to speed on most topics pertinent to diseases of free-living corals. The textbook succeeds in highlighting knowledge gaps and providing eager investigators with perspective and tools to get started. As a diagnostic pathologist with special interest in aquatic animals, I regard *Diseases of Coral* as a great accomplishment and an essential library reference for those investigating coral disease. I expect it will remain a foremost resource on coral disease, and I hope it continues to evolve as our knowledge of coral disease broadens in the decades to come.

Further recommended reading:

Carpenter KE, Abrar M, Aeby G, Aronson RB, Banks S, Bruckner A, Chiriboga A, Corte's J, Delbeek JC, Devantier L (2008). One-third of reef-building corals face elevated extinction risk from climate change and local impacts. *Science*, 321:560–563.

Work T, Meteyer C. (2014). To understand coral disease, look at coral cells. *Ecohealth*, 11:610–618.



Coral Disease Handbook (2008)

Download at:

<https://www.nwhc.usgs.gov/hfs/Globals/Products/Coral%20Disease%20Handbook.pdf>

The Aquatic Veterinarian is meant to be read as a 2-page spread (like a paper magazine!). To view it this way on your computer, open the pdf document using Adobe Acrobat or Adobe Reader, then go to the menu bar at the top of the computer screen and click on View, then Page Display, then Two Page View. That will allow you to scroll through the issue seeing the cover page by itself first, followed by two pages side by side for the rest of the issue. Doing this, you will be able to see the Centerfold picture in all its ginormous glory!

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

Suggestions for Fish Diagnostic Labs in USA

Good afternoon,

I have a client that has recently had a heavy loss of several mature koi. The koi all developed septic ulcers, but seemed to be parasite free. Of course, the owner had added a few pond comets about 3 months prior to the loss. I, unfortunately, only saw the last remaining koi which appears that it is not going to end up making it. Water quality was pristine and the owner would like to hopefully find a diagnosis. Which lab in the US is typically suggested for the work up?

Chad Harris, DVM

North Austin Animal Hospital
 5608 Burnet Road
 Austin, TX 78756
 512-459-7676
 Texas Veterinary Medical Foundation - President

Hi Chad,

What's the mortality rate? Speed of onset? Sounds like the comets could have brought a nasty bacterial disease, or perhaps have carried KHV? I'd take swab samples for bacteriology from ulcers and kidneys. For KHV, blood, gills, kidney and spleen sent on ice.

Is it practical to give them injectable antibiotics and then raise water temperature to 29.5-30.0 degrees Celsius?

Dr Richmond Loh

DipProjMgt, BSc, BVMS, MPhil (Pathology),
 MANZCVS (Aquatics & Pathobiology), CertAqV,
 NATA Signatory.
 Aquatic Veterinarian & Veterinary Pathologist.
 PERTH | MELBOURNE | SYDNEY | CANBERRA
 | TOWNSVILLE | SINGAPORE
 THE FISH VET
 Aquatic Veterinary Medical & Diagnostic Services.
 Web: <http://www.thefishvet.com.au>
 Ph: +61 421 822 383
 Mail: PO Box 5164, East Victoria Park, WA 6981, Australia.

Other WAVMA members suggested the following Fish Diagnostic Laboratories in the USA:

Dr. Peter Merrill

Director,
 Professional Services and Regulatory Affairs
 Kennebec River Biosciences
 Richmond, Maine 04357 USA
 207.841.7261 cell
<http://www.kennebecbio.com/diagnostic/>

Susan Fogelson

Chief Pathologist
 FISHHEAD LABS, LLC
 5658 SE Pine Ave, Stuart, FL 34997
 Veterinary Pathology Consulting (and more)
<http://www.fishheadlabs.com/>
 (813)-77FISHY

Dr. John Hawke

Department of Pathobiological Sciences Louisiana
 State University
 School of Veterinary Medicine
 Louisiana Animal Disease Diagnostic Laboratory
 River Road #1043
 Baton Rouge, LA 70803
<http://www.lsu.edu/vetmed/>

Eileen Henderson, MS, DVM

Veterinary Anatomic Pathology Resident
 Michigan State University
 Veterinary Diagnostic Laboratory
 4125 Beaumont Road,
 Lansing, MI 48910
healthyfish@cvm.msu.edu

Dr. Al Camus

camus@uga.edu
 University of Georgia Pathology Service
 Athens Veterinary Diagnostic Laboratory
 College of Veterinary Medicine
 The University of Georgia
 501 DW Brooks Dr.
 Athens, Georgia 30602
<http://www.vet.uga.edu/dlab/>

Washington State University

Aquatic Health Section
 Washington Animal Disease Diagnostic Laboratory
 155 N Bustad Hall
 Pullman, WA 99164-7034
 Email: waddl@vetmed.wsu.edu
 Phone: 509-335-9696
<https://waddl.vetmed.wsu.edu/labs-sections/aquatic-health>

**DO YOU HAVE A STORY TO TELL ABOUT
 HOW YOU BECAME INVOLVED WITH
 AQUATIC VETERINARY MEDICINE?**

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

Alex Primusprimu012@umn.edu

University of Minnesota
 College of Veterinary Medicine
 Aquaculture/Fisheries
 Veterinary Diagnostic Laboratory
 1333 Gortner Avenue

St. Paul, MN

55108-1098

vd1@umn.edu

612-625-8787 or 800-605-8787

Fax: 612-624-8707

<https://www.vd1.umn.edu/services-fees/aquaculturefisheries>

WAVMA does not endorse or recommend any specific diagnostic laboratory. The above listings are suggest by some WAVMA members as labs they use for fish pathology services.

Bacterial Transport Media

Hello, WAVMA members,

Does anyone have recommendations or opinions as to what transport medium they prefer for fish pathogens? Is Amies with charcoal a good overall choice? I am curious to know what others are using.

Thanks,

Sharon R. Tiberio, DVM, CertAqV

Certified Aquatic Veterinarian

954.552.4001

myfishvet.comDrSharon@myfishvet.com

Member,

American Association of Fish Veterinarians

Member/Past Treasurer,

World Aquatic Veterinary Medical Association



Amies with charcoal is my preference.

B. Denise Petty, DVM

North Florida Aquatic Veterinary Services

<http://nflaquavetsvc.com/home.html>**AMIES TRANSPORT MEDIUM WITH CHARCOAL**

This medium is used for collecting, transporting and preserving microbiological specimens. It is formulated to maintain the viability of microorganisms without significant increase in growth, being non-nutritive, phosphate-buffered and semi-solid.

The prerequisite of a transport medium is that it should be non-nutritive, semi-solid, and reductive and should be able to hamper self-destructive enzymatic reactions within the cells and in addition, must inhibit toxic oxidation reactions.

In 1967, C. R. Amies, medical microbiologist for the Ontario Public Health Laboratories (PHL) published his modification of Stuart's transport medium. Amies modified Stuart's transport medium by replacing glycerophosphate with an inorganic phosphate buffer and adding charcoal to the medium. This modified medium gave a higher percentage of positive results than the transport medium of Stuart. Amies solved the problem of charcoal removal from the swabs by incorporating charcoal into the formulation. Amies Transport Medium is recommended for throat, vaginal, and wound samples.

In the formulation, Charcoal neutralizes fatty acids that are toxic to microorganisms. The chloride salts supply essential electrolytes for transport and osmotic balance. Phosphates act as a buffer system. Sodium thioglycollate suppresses oxidative changes and provides a reduced environment.

Insert inoculated sterile swabs into the upper third of the transport medium within the transport container; break off the protruding portion of the swab stick and tightly screw shut. Send to laboratory within 24 hours for culture analysis. Specimens may be refrigerated until ready for shipment. The survival of bacteria in a transport medium depends on various factors such as bacteria type and concentration in the specimen, transport medium formulation, the temperature and duration of transport, and inoculation to appropriate culture media within 24 hours. Optimal growth and typical morphology can only be expected if direct inoculation and appropriate cultivation are followed.

References

1. Amies C.R., 1967, Can. J. Public Health, 58:296
2. Stuart R.D., 1946, J. Path. Bact., 58:343.
3. Stuart R.D., 1959, Pub. Hlth. Rep., 74:431



Prevalence and Antibiogram of *E. coli* in Fish Meat from Fish Shops of Chitwan, Nepal
By Shiva Prasad Bhusal

B.V.Sc. & A.H.-7th semester student
Agriculture and Forestry University (AFU),
Chitwan, Nepal

Introduction

A research project was carried out from Aug, 2017 to Feb, 2018 to find out the prevalence and antibiogram of *Escherichia coli* bacteria in fish meat from fish shops of Chitwan district of Nepal. The research involves both the field-based work (collection of fish meat samples) and laboratory based work (culture, biochemical tests and antibiogram).

Methods and Methodology

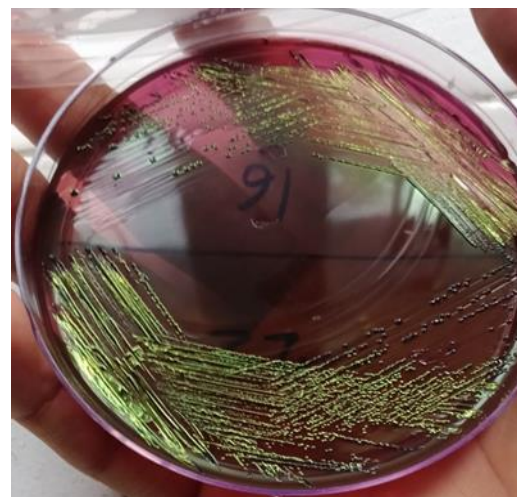
A total of 135 fish meat samples were collected from 45 fish shops (i.e., 3 samples from each shop), including 22 enclosed, fixed shops and 23 open air shops. The fish shops were selected randomly from different regions of Chitwan district so that the samples become representative of the district.

Each sample was collected inside a zipper plastic bag, then kept inside an icebox and transported to veterinary microbiology laboratory of Agriculture and Forestry University (AFU), Chitwan, Nepal. The samples were then processed according to ISO 657:2002 protocol. The protocol includes: Non-selective Pre-enrichment (Buffered peptone water), Selective enrichment (MacConkey agar), Isolation (Eosin Methylene Broth agar), Biochemical confirmation (Triple Sugar Iron agar, Indole Test, Methyl Red Test, Voges-Proskauer Test, Citrate Test, Gram's Staining, Oxidase Test and Catalase tests). The Antibiotic Sensitivity Pattern was undertaken by disc diffusion method following CLSI guidelines. The diagrams were constructed by using MS-Excel 2016.



Preparation of EMB Media for *E. coli* culture

Metallic sheen of *E. coli* in EMB agar



TSI and IMViC test for *E. coli*

Results

Total prevalence of *E. coli* in fish meat was 35.55% (48/135). Interestingly, fish meat from both closed and open shops have the same prevalence of 50% (24/48).

Among 12 antibiotics used in the study, the sensitivity tests are as follows:

- Colistin (100%),
- Amikacin(100%),
- Ampicillin/Sulbactam (97.91%),
- Ceftriaxone(95.83%),
- Chloramphenicol (93.75%),
- Levofloxacin (91.66%),
- Gentamicin (91.66%),
- Ciprofloxacin (91.66%),
- Tetracycline (83.33%),
- CotTrimoxazol (83.33%),
- Doxycycline(79.16%)
- Cefotaxime (77.09%).

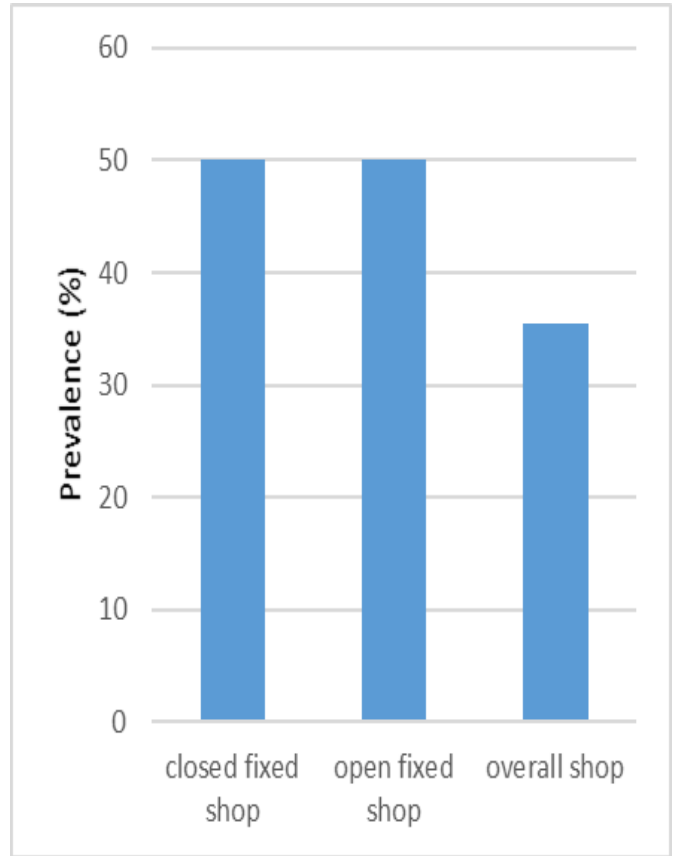
Similarly, resistance follows the order:
Tetracycline (16.67%)
Cot-Trimoxazole (16.67%)
Doxycycline (8.34%),
Ciprofloxacin (8.34%),
Gentamicin (8.34%),
Levofloxacin (8.34%),
Cefotaxime (6.25%),
Chloramphenicol (6.25%),
Ceftriaxone (4.09%)
Ampicillin/Sulbactam (2.045%).
Cefotaxime (16.66%) and Doxycycline (12.5%) have shown intermediate sensitivity.

Acknowledgement

I am highly grateful to Assoc. Prof. Narayan Prasad Pandit, Prof. Hom Badhadur Basnet, Assoc. Prof. Rebanta Kumar Bhattarai, Dr. Sirjan Bastola, Dr. Sabina Mishra and Dr. Sunita Shrestha for providing guidance to complete this research successfully. I would also like to thank Mr. Prakash Adhikari, Mr. Nabin Neupane, Mr. Khim Bdr. Ale, Mr. Bijay Poudel, Mr. Khil Rana Magar, Mr. Krishal Shrestha, Mr. Prem G.M., Mr. Samin Dahal and Mr. Sivendra Kushuwaha for kind help and co-operation during the research period.

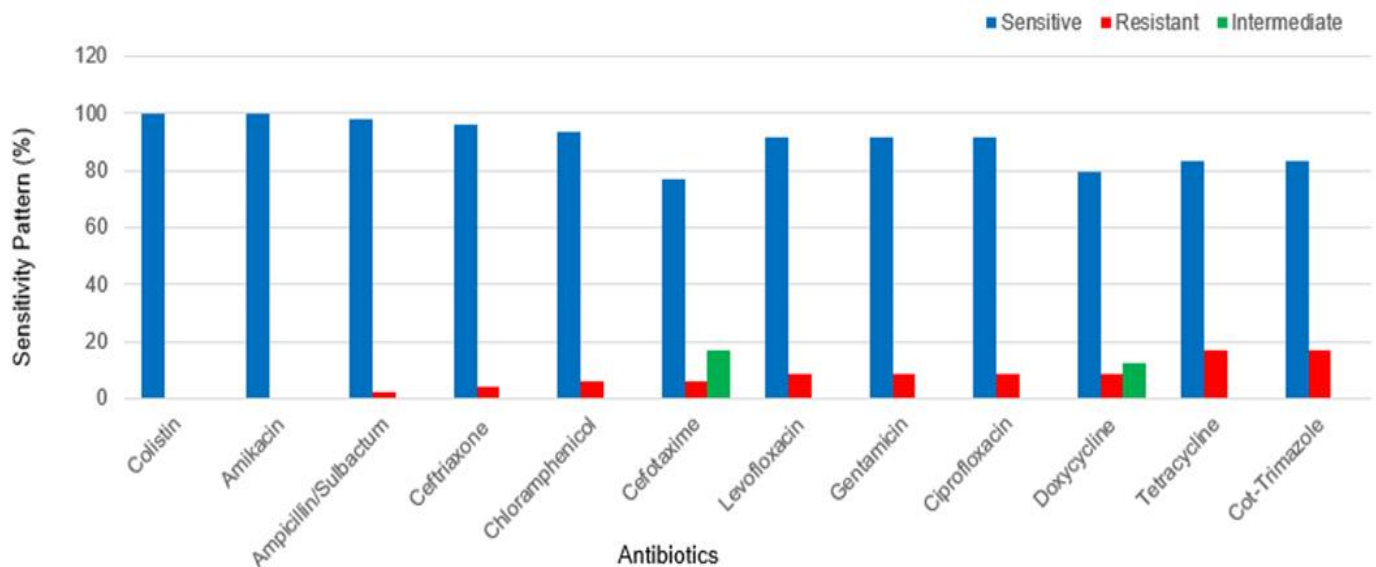
Funding

The World Aquatic Veterinary Medical Association (WAVMA) has financially supported this research through the John L. Pitts Aquatic Veterinary Education Award Grant 2017. I would like to heartily thank the organization for this support and encouragement in research.



Prevalence of *E. coli* in fish meat

Antibiotic Sensitivity Pattern of *E. coli* isolated from fish meat from fish shops of Chitwan, Nepal



Genetic clues reveal origins of killer fungus behind the 'amphibian plague'

May 10, 2018, Imperial College London



A captive Oriental fire-bellied toad (Bombina orientalis) imported into Europe from South Korea.

Credit: Frank Pasmans

A deadly fungus responsible for the devastation of amphibian populations around the world may have originated in East Asia, new research has found. *Batrachochytrium dendrobatidis* (Bd), known as chytrid fungus, has long been identified as a cause of the decline and extinction of species of frogs, toads, newts and other amphibians across several continents. Chytrid is distributed around the world but to date it has remained unclear where killer strains of the pathogen first emerged.

Now, new research published in the journal *Science* and led by researchers at Imperial College London alongside partners including ZSL (Zoological Society of London), suggests the killer fungus currently ravaging global amphibian populations originated in East Asia. The researchers highlight the need to tighten biosecurity across borders, including a potential ban on trade in amphibians as pets to ensure the survival of vulnerable species.

Dr. Simon O'Hanlon, from the Department of Infectious Disease Epidemiology at Imperial and first author of the paper, said: "Biologists have known since the 1990s that Bd was behind the decline of many amphibian species, but until now we haven't been able to identify exactly where it came from."

"In our paper, we solve this problem and show that the lineage which has caused such devastation can be traced back to East Asia."

Chytrid is passed from animal to animal and spreads rapidly in the wild, causing catastrophic mortality and declines in some species, while others are less affected. The fungus causes a disease called chytridiomycosis, which attacks the animal's skin, affecting their ability to regulate water and electrolyte levels and leading to heart failure.

In this latest study, an international team involving

38 institutions gathered samples of the pathogen from around the world. They sequenced the genomes of these samples, combining the data with genomes from previous Bd studies to make a collection of 234 samples. Researchers analysed the data, looking at differences between the genomes. From the samples, they identified four main genetic lineages of the fungus, three of which are distributed globally. A fourth lineage was found only in Korea, on frogs native to the region.

Cultures from this Korean lineage were found to contain much more genetic diversity than any other lineage. Deeper analysis of the Korean Bd showed no history of global outbreaks within their genomes suggesting the Korean chytrid strains were native to the region, and most closely resemble the ancestor of all modern Bd.

Using the genetic data, the team estimated when the killer strain of Bd currently plaguing amphibians diverged from its most recent common ancestor. Their findings support the idea that rather than dating back thousands of years, as previously thought, the range of the disease expanded greatly between 50 and 120 years ago, coinciding with the rapid global expansion of intercontinental trade. The team's finding Asian strains of Bd in pet Oriental fire-bellied toads strongly supported this idea.

According to the researchers, human movement of amphibians—such as through the pet trade—has directly contributed to spreading the pathogen around the world.

They add that the paper provides strong evidence for a ban on trade in amphibians from Asia, due to the high risk associated with exporting previously unknown strains of chytrid out of this region. The group also highlights the threat of another amphibian pathogen which has also emerged from Asia (*B. salamandrivorans* or BSal) affecting salamanders in Europe and whose spread is also linked with the global trade in pet amphibians from Asia. Professor Matthew Fisher, from the School of Public Health at Imperial, said: "Our research not only points to East Asia as ground zero for this deadly fungal pathogen, but suggests we have only uncovered the tip of the iceberg of chytrid diversity in Asia. Therefore, until the ongoing trade in infected amphibians is halted, we will continue to put our irreplaceable global amphibian biodiversity recklessly at risk."

From: S.J. O'Hanlon et al., "Recent Asian origin of chytrid fungi causing global amphibian declines," *Science* (2018).

science.sciencemag.org/cgi/doi

Read more at: <https://phys.org/news/2018-05-genetic-clues-reveal-killer-fungus.html#jCp>

Some endangered frogs may be leaping back from extinction

by [Joel Achenbach](#)
May 17, 2018

Variable harlequin frogs (*Atelopus varius*) and many other amphibians in the lush forests of Panama have been slammed by a globe-creeping fungus. The murderous pathogen attacks frogs, toads, salamanders and caecilians, and when it reached Panama early in this century the frogs vanished along streams where they had once been abundant. That's why the scientific community took notice this year when researchers announced that some of the vanished frogs were popping up again.

There's a simple explanation, potentially, for the apparent comeback: evolution. This might be natural selection working at lightning speed, an example of survival of the fittest frogs. No one expects natural selection to solve a problem as massive as the loss of biodiversity, but it might save some animals and plants here and there.

The rebound of the frogs was reported in March in the journal *Science* by two scientists, Jamie Voyles of the University of Nevada at Reno and Corinne Richards-Zawacki of the University of Pittsburgh, who had had worked in Panama in the early 2000s amid abundant frogs species, only to see the fungus arrive and essentially destroy the objects of their research. Research has concluded that the fungus originated in East Asia in the 1900s, and pointed to expanding global trade and the market in exotic pets as likely factors in the pandemic.

The researchers' initial assumption was that the fungus had grown less virulent. That's another feature of natural selection and disease: The most vicious pathogens in nature will often evolve into milder forms. That's a good strategy, because pathogens that don't exterminate their host species are able to live longer and spread more widely.

The researchers, however, ruled out that hypothesis. They took uninfected frogs raised in captivity and exposed them to the *Batrachochytrium dendrobatidis* (*Bd*) chytrid fungus obtained and frozen early in the century. They exposed other frogs to the more recently isolated fungus. Each batch of pathogens killed infected frogs at the same rate.

That put the focus on the frogs themselves. The frogs have a community of bacteria and fungi that live on their skin, and perhaps these microbes had found new ways to kill or compete with the deadly fungus. The frogs also secrete infection-fighting proteins, and that's where classic natural selection could be showing its hand: The frogs with the best immune systems might have survived while less-resistant frogs were culled from the population. Laboratory tests showed that frogs captured recently were more resistant to the fungus than frogs bred from populations captured before the fungus arrived in Panama.

A harlequin frog.
(Brian Gratwicke/
Smithsonian
Conservation Biology
Institute)



Voyles and Richards-Zawacki are the first to admit that they can't say how, exactly, resistance to the *Bd* fungus might be playing out at the level of the individual frog. And Voyles points out that the study is limited geographically and cannot be used to extrapolate a broad truth about a global problem.

Meanwhile there are other battle zones in the fight against pathogenic fungi. A chytrid fungus similar to *Bd* that kills salamanders has already swept through Europe and threatens to arrive in the United States, home to a huge salamander population. The U.S. Fish & Wildlife Service in 2016 banned the import or interstate trade of 201 species of salamanders, but experts have called for further restrictions on the global trade in exotic amphibians.

Efforts to fight the *Bd* fungus in the wild have had limited success. One of the few triumphs happened on Spain's Island of Majorca, but it was hardly an elegant process. Scientists retrieved tadpoles from ponds, drained the ponds, and treated the tadpoles with antifungals in the laboratory. When that wasn't sufficient to rid the island of *Bd*, they hit the ponds with powerful disinfectants.

That brute-force, chemically intensive effort can't work at the level of a forest. There doesn't seem to be a high-tech fix so far for the *Bd* pandemic, said Brian Gratwicke, a biologist at the Smithsonian Conservation Biology Institute. He said researchers have found ways to kill the fungus in test tubes using antifungal bacteria, but efforts to transfer such bacteria to the skin of frogs haven't been successful in the lab. He said that manipulating what lives on amphibians "is going to take a lot more understanding of skin microbial ecology."

Except from:

https://www.washingtonpost.com/news/science/wp/2018/05/17/some-endangered-frogs-may-be-jumping-back-from-extinction/?noredirect=on&utm_term=.40c472a23904&wpsrc=nl_sb_smartbrief

Fish Vet Claims Breakthrough in Discovering Alabama Rot Cause

Is there a link between Alabama Rot and bacteria found in fish?

By Conor Gogarty

A vet believes she is close to discovering the cause of deadly canine disease Alabama Rot, or cutaneous and renal glomerular vasculopathy (CRGV). The disease was first seen in Alabama, USA in the 1980s. There have been several suspected cases of the illness — which causes death in nine out of every 10 dogs affected — in Gloucestershire, UK. There is currently no known cause for the disease, but a vet thinks she may have made a breakthrough in finding it.

Dr Fiona Macdonald, founder of Fish Treatment Ltd, develops and supplies professional medicines for fish keepers. She thinks she may have discovered a link between Alabama Rot and bacteria found in fish.

"The organism was *Aeromonas hydrophila*, which is a bacterium I know very well because it also affects fish and we have known about it for a long time. It infects the animal and causes toxins to enter the body, which can kill."

So far, Dr Macdonald has tested 27 dogs suffering from Alabama Rot symptoms with the help of funding from the New Forest Dog Owners' Group.

She said, "My theory is that the organism infects the dog's skin and then the toxins travel to the dog's kidneys, causing failure. It is a very toxigenic organism, and the toxin, Aerolysin, has been well-documented and the kidney failure is likely to be a result of the toxins rather than from direct infection by the organism itself. This could explain why the organism has never been isolated so far in affected dog's kidneys and why it has remained a mystery all this time."

Dr Macdonald admits she needs to test more dogs showing signs of Alabama Rot to attain more conclusive results. She has appealed to owners whose dogs may have suffered from Alabama Rot to get in touch to take part in tests. To join the trial, contact info@fish-treatment.co.uk.

Website: <https://www.fish-treatment.co.uk/>

For more information, please see:

<https://www.gloucestershirelive.co.uk/news/gloucester-news/vet-claims-breakthrough-bid-discover-1103720>

<http://www.dailymail.co.uk/news/article-5294619/Vet-claims-breakthrough-fight-against-Alabama-Rot.html>

<https://metro.co.uk/2018/01/20/breakthrough-identifying-cause-fleshing-eating-alabama-rot-deadly-dogs-7245310/>

https://en.wikipedia.org/wiki/Alabama_rot

Pain Study in Reptiles

Martyn Lewis, a veterinarian at the University of Edinburgh, is doing a study on this important topic and is looking for participants. For those interested in participating in a survey, there is a link at the end of the article.

Reptiles are increasingly popular as pets. Subsequently, there is an increasing requirement to optimize diagnosis and management of these patients using the best possible information, a process motivated both by increasing client expectation and profession advancement.

The appreciation of reptile pain in a clinical setting is nuanced due to their unique behavioral, physical and physiological adaptations. Sadly, this commonly results in a failure to identify painful reptiles and sub-optimal (or non-existent) analgesic provision, driven in part by the widely held assumption that reptiles are naturally stoical. This represents a significant failing in a profession where reducing pain and suffering is rightly considered primordial.

The causes of pain in reptiles are the same as in other animals, and the capacity for reptiles to sense and respond to painful stimuli is well documented. However, our approach to the use of analgesics in these species still lags far behind that of more traditional pets.

It is unclear whether this is through a lack of empathy and simple failure to identify a patient in pain, or whether it is due to technical concerns related to drug pharmacokinetics and dynamics, or safety and analgesic potency. A fundamental lack of research in this area is a key factor and needs addressing if we are to rectify this situation.

It is hoped that the survey you are about to participate in will help to increase professional awareness, stimulate relevant debate and identify areas for further research that are considered deficient.

Thank you for your time.

Martyn Lewis BSc (Hons) BVM&S MRCVS
Senior Clinical Scholar (herpetology)
The Royal (Dick) School of Veterinary Studies,
The University of Edinburgh

[Click here to take survey.](#)

<https://edinburgh.onlinesurveys.ac.uk/reptile-pain-and-analgesia-usa>

New York State Eliminating Commercial Harvest of Diamondback Terrapins

Press Release

The New York State Department of Environmental Conservation (DEC) and Commissioner Basil Seggos announced that the agency is adopting regulations to eliminate commercial



harvest of diamondback terrapins and add the species to the list of native turtles with no open season. The closure on harvest will go into effect beginning May 1, 2018.

"Diamondback terrapins depend upon a steady diet of mollusks and crustaceans, making them an excellent indicator for the health of New York's estuarine habitats," Commissioner Seggos said. "If diamondback terrapins are doing well in a bay, you know you have a healthy population of blue mussels, clams, and blue crabs, too. Closing the hunting season is an important step in the conservation of diamondback terrapin populations in New York."

Diamondback terrapins are a turtle species that live in brackish waters associated with the lower Hudson River, Long Island Sound, Peconic Bay, and the coastal embayments along the south shore of Long Island. The diamondback terrapin was identified as a Species of Greatest Conservation Need in the 2015 New York State Wildlife Action Plan due to documented threats from habitat loss, nest predation, and incidental capture. The turtles are sometimes accidentally trapped in crab pots and commercial fishing gear.

Populations of diamondback terrapins plummeted in the early 20th Century due to unregulated harvest for turtle soup. After a rebound throughout most of the last century, new declines in diamondback terrapin populations along the Atlantic Coast led to the closure of commercial harvest in all states in the terrapin's range with the exception of New York.

The current action closes commercial harvest of terrapins throughout their range. In addition to closing New York's open season, the diamondback terrapin has been added to the list of native turtles to protect all life stages of the species from being collected from the wild. DEC will continue to evaluate and pursue additional actions to improve the status of the diamondback terrapin populations in New York.

Information on the life history of the diamondback terrapin may be found by visiting:

<http://www.dec.ny.gov/animals/59652.html>.

The Regulatory Impact Statement for the revision to the regulation may be viewed at:

<http://www.dec.ny.gov/regulations/109828.html>.

Charges Filed in Turtle Poaching Case

PHILADELPHIA (AP) — A Pennsylvania man has been indicted on charges of trafficking more than 3,500 protected turtles. U.S. Attorney's Office for the Eastern District of Pennsylvania says David Sommers poached diamondback terrapins and their eggs from coastal marshes in New Jersey. The turtles are protected under New Jersey law and by an international treaty.

The U.S. Fish and Wildlife Service agents allegedly seized over 3,400 diamondback terrapin hatchlings from Sommers' Levittown, Pennsylvania, home in October, 2017. The indictment charges 62-year-old Sommers with smuggling turtles and submitting false records for a package shipped to Canada and four violations of the Lacey Act. The law bans trade in illegally obtained wildlife, fish and plants.



These Oct. 25, 2017, photos provided by the U.S. Fish and Wildlife Service show diamondback terrapin hatchlings in the agency's custody after they were seized, before the hatchlings were released into the protected turtles' native habitat at locations in New Jersey.



Australia's Response to Importing Exotic Cajun Dwarf Crayfish and Disease Concerns

Yuko Hood, BVSc. Principal Scientific/Policy Officer
 Department of Agriculture and Water Resources,
 Australian Government, Canberra, Australia

Public information and other intelligence was provided to the Department of the Environment and Energy, which began an investigation into the alleged illegal importation and sale of exotic freshwater crayfish in Australia. Members of the public informed the Australian Government Department of Agriculture and Water Resources and the Department of the Environment and Energy that presumed exotic species of miniature freshwater crayfish, including the dwarf Mexican crayfish (*Cambarellus* spp.), were available for sale online in the aquarium pet trade in Australia. The citizens, especially those involved in crayfish conservation and aquaculture industries, were concerned about non-indigenous crayfish species negatively impacting Australia's native crayfish populations. Of greatest concern was the potential for exotic crayfish to bring crayfish plague to Australia. Australia is free from crayfish plague as per the World Association for Animal Health Code (OIE, 2017).

In July 2017 the Department of the Environment and Energy investigators visited five premises in Newcastle, Sydney, Bathurst and Melbourne, and 45 crayfish were surrendered and tested for diseases exotic to Australia. This article summarizes the outcome of testing for crayfish plague in animals seized during an investigation.

The international aquarium pet and aquaculture trade in freshwater crayfish has led to the establishment of non-indigenous crayfish populations in many parts of the world. Some introduced crayfish have decimated native crayfish populations through invasion pressures and disease, in particular, crayfish plague and the North American freshwater crayfish can be subclinical carriers capable of transmitting the disease to naïve populations (Holdich et al., 2009). The first European introduction of crayfish plague, associated with American crayfish, occurred in Italy in 1860 Holdich & Reeve (1991). Since then, deliberate introductions of North American crayfish and fomites, such as traps, have spread crayfish plague throughout Europe and destroyed many native European crayfish populations.

Approximately 140 species of freshwater crayfish are endemic to Australia. Some Australian and closely related New Guinean freshwater crayfish species are highly susceptible to infection by crayfish plague under experimental or natural conditions (Unestam, 1976; Hsieh et al., 2016). Australia is the only continent where the native freshwater crayfish population is free of crayfish plague.

Crayfish plague is caused by a member of the water molds, *Aphanomyces astaci*. *A. astaci* is exotic to Australia, is included on our national list of reportable diseases of aquatic animals, and Australia has produced a disease control manual for crayfish plague as part of the Australian Aquatic Veterinary Emergency Plan (AQUAVETPLAN). Manuals developed by Australian aquatic animal health experts



Cajun Dwarf Crayfish (*Cambarellus shufeldtii*)

Photo: Shane Ahyong, Australian Museum Research Institute

with extensive stakeholder consultation and a formal endorsement process through government and relevant industry sectors. Manuals are prepared during 'peace time' so that the information is readily available in the event of an actual emergency.; (DAFF, 2005). The manual sets out the disease control principles for use in response to a suspected or confirmed incursion of crayfish plague in Australia.

The Department of Agriculture and Water Resources organized for the animals to be transferred to the CSIRO Australian Animal Health Laboratory for testing for crayfish plague to manage the potential biosecurity risk. Seven of the 45 animals were either dead or cannibalized when received by the laboratory and not suitable for testing. The two untested animals were sent, under biosecure conditions, to the Australian Museum for its collection where they were identified as Cajun dwarf crayfish, *Cambarellus shufeldtii* (Figure 3 and Figure 4). *C. shufeldtii* is a species native to North America.

The remaining surviving animals were tested for *A. astaci* using a real-time polymerase chain reaction (qPCR) test method recommended by the World Organization for Animal Health (OIE). All animals tested negative in the qPCR assay. The investigation could not determine that Cajun dwarf crayfish had been illegally imported by the five groups of people. Instead, Department of the Environment and Energy staff provided educational information and advice to the groups investigated, as well as to other ornamental crustacean enthusiasts. A social media post was disseminated for enthusiasts, which clarified restrictions about importation and possession of exotic species, including *C. shufeldtii*. The investigators were satisfied that prosecution was not warranted in this instance.

The Department of Agriculture and Water Resources takes seriously any breach of Australia's biosecurity and works with industry and the public to safeguard Australia from the introduction of new pests and disease from overseas. This case highlighted the difficulty of surveillance of hobbyists who like to collect new or rare specimens, and trade amongst themselves in an unregulated way. Education of hobbyists, as undertaken by the Department of the Environment and Energy in this case, is an important element of biosecurity defense.

Information gathered from concerned citizens, public online forums, social media and hobbyist chat groups is invaluable. The Department of Agriculture and Water Resources values the ongoing contribution made by industry and the general public through information that identifies potential non-compliance with biosecurity laws and requirements.

If you have information about the possible illegal import of live aquatic animals, such as Cajun Dwarf crayfish, or any other biosecurity breach, phone the Department of Agriculture and Water Resources Biosecurity Redline on 1800 803 006.

Acknowledgement

Adapted from a similar article published in *Animal Health Surveillance Quarterly Report*, 22, (4): 10-11, December 2017, Animal Health Australia. "Testing Exotic Cajun Dwarf Crayfish for Crayfish Plague in Australia."

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Is the release of the koi herpesvirus (Cyprinid Herpesvirus-3) in Australia necessary?

By Richmond Loh and Jelena Vukcevic

The Fish Vet

On 19 February 2018, we were invited, on behalf of the Australian Veterinary Association, to attend an ACT Key Stakeholder Workshop of the National Carp Control Plan (NCCP) on the proposed national release of the carp herpesvirus. Attendees included personnel from anglers' societies, local government, universities, parks and fisheries, RSPCA and animal welfare monitors. After attending this meeting, we found that many questions remained unanswered and our personal views on these are below.

Internationally, carp are the most widely cultured animal protein for human consumption in the world, with annual global production accounting for over 40% of the total aquaculture by tonnage. European carp (*Cyprinus carpio*) were introduced to Australia 180 years ago. A hardy strain of carp escaped from a fish farm and only in the last 60 years they have started to dominate south-eastern Australian aquatic ecosystems. Also known as the common carp and Japanese koi, *C. carpio* are present all over Australia except for the Northern Territory; they are prized by coarse fishing anglers and kept as pets in WA, NSW and ACT.

In the Murray Darling Basin (MDB), carp are abundant, and in some water bodies, they make up to 80% of the fish biomass. They have been blamed for muddying the waters and causing a decline in native fish populations. But are booming carp populations the cause, or effect, of poor conditions in the waters? As scientists, we know that correlation does not equal causation. Carp numbers are highest in places with high levels of environmental disturbance, such as conditions found in regulated rivers, and this coincides with the building of dams and weirs. Therefore, separating carp impacts from other sources of environmental damage can be difficult.

The main causes for reductions in native fish populations include loss of native habitat and food from projects that prohibit natural water flow and form barriers for migration, cold water pollution (when water is released from dams), which fails to provide cues for native fish to breed, silting from land runoff, agrichemical pollution and elevated salinity. In contrast, carp can tolerate extremes of temperature and water quality and are able to reproduce in dammed waters. The MDB Authority has recorded recovery of native fishes by 45% using water control, and predicts an additional 4% improvement with feral fish control, towards pre-European settlement times.(1)

The NCCP was given a budget of \$15M at the beginning of 2016 and tasked to research, plan, consult and assess risks in order to identify a smart, safe, ef-

fective and integrated suite of measures to control carp impacts. Several methods of carp control were evaluated, including fishing events, manipulation of water flows, poisons, use of Judas carp (radio-tracking carp to identify areas of high concentrations for schools), traps on weirs, son-less technology in which fish produce single-sex offspring, pheromones to attract carp to traps and commercial fishing. The NCCP identified the use of a biological control agent as the key method that can deliver outcomes quickly and within budget.

The NCCP proposes release of a relatively newly discovered cyprinid herpesvirus-3 (CyHV-3), which is commonly known as koi herpesvirus (KHV). It appears to be highly host-specific, contagious, and with high mortalities. It is highly dependent on host size/age range; the most susceptible age-class being under 1 year of age but > 20 mm in length. However, reports by the NCCP appeared to show conflicting results on carp or native fish mortalities. (2,3) More studies are needed to ensure our native fishes and commercially farmed fish industries will not be in jeopardy.

CyHV-3 is present in 33 countries and can have wide-ranging sociopolitical and economic effects, such that it is listed by the OIE (World Organisation for Animal Health). Australia's dedication to biosecurity and a ban on carp imports has prevented its entry into Australia and CyHV-3 remains a nationally reportable disease. So, while other countries are investing in measures to contain and limit the effects of the CyHV-3 virus, Australia is looking at the possibility of voluntary release of this virus. How would having an OIE-listed disease in our country affect the trade of freshwater fishes and potentially contaminated equipment?

The NCCP admit that CyHV-3 is not a silver bullet that will eradicate carp. CyHV-3 is expected to kill more than 70% of carp post-introduction, and in the ensuing 1–4 years, but the virus and carp will settle into a balance that allows both to survive. The high fecundity of carp would mean swift repopulation, possibly with genetically resistant individuals. So, it can be inferred that there would need to be subsequent releases of more virulent strains as feral fish develop immunity or the virus mutates.

Koi owners around Australia are understandably concerned that this virus will kill their pets. Under the current legislation, any property detected with CyHV-3 will require all fish on the premises to be destroyed and facilities disinfected. The NCCP dismisses the import or manufacture of a vaccine for the koi pet owners, stating that it will escape to the wild and hamper the efficacy of their CyHV-3 release program.

The greatest concern among workshop attendees was the question of who would coordinate and fund the clean-up of fish kills post-CyHV-3 release. It is likely to cause on-going cyclical mass fish kills with population booms and busts far into the future. Clean-up is important because decaying masses of fish can lead to locally extensive environmental damage, and large areas of water are inaccessible for clean-up efforts.

This would lead to a marked decline in dissolved oxygen (blackwater events would kill aquatic animals and fish), the release of large amounts of nutrient into water (leading to bacterial and algal blooms that will exacerbate poor water quality conditions), and removal of a food resource being used by top-end predatory native animals such as cod, golden perch and piscivorous birds. The carcasses of fish and other animals can lead to massive aquatic and peri-aquatic death from subsequent botulism. Such events will also make water unfit for drinking and for watering livestock. There may be human health implications with secondary pathogen loads in live fish caught for consumption where dead carp are present.

The disease is highly dependent on water temperature and viral dose, and if CyHV-3 is released at a suboptimal period, it would not achieve its desired outcomes. The NCCP suggests that the optimal times for release is when water temperature is steady, between 18°C and 28°C. This would coincide with the spring breeding season, but also the time of greatest use of water bodies for boating, fishing and tourism. It would seem unlikely that viral release would be permitted during this optimal time. Given the cold-water pollution that inhibits cues for native fish to spawn, it is not clear if the waters of the Murray Darling Basin reach these temperatures for sustained periods.

After removal of carp, other alien species could take their place in their ecosystem, such as redfin perch, Gambusia and goldfish, which pose greater direct and indirect threats to native fishes through competition for food and predation. Additionally, redfin perch carry and can spread a more sinister EHN virus (ranavirus) which has a wide range of susceptible hosts (including rainbow trout), a factor that contributed to the listing of EHN by the OIE.(4) There are also animal welfare implications.

CyHV-3 has a temperature dependent incubation period of 7–21 days. Death results from inflammation and necrosis involving any of a number of organs including the brain, gills, skin, intestines, kidney, spleen and liver. The prolonged disease course means that fish become prone to secondary bacterial or parasitic infections prior to death. Diseased fish would present with lethargy, respiratory distress,



swim erratically and hang near the water surface. However, transmission trials by the NCCP showed low mortalities in carp (50%) and very high mortalities in non-target native and farmed fishes (up to 80–100%) (2,3) More studies are needed to ensure our native fishes and commercially farmed fish industries will not be jeopardised. There will be a stakeholder consultation period in September 2018. Australia's environment minister will make the final decision whether the plan goes ahead. The earliest slated release of the virus would be in 2019.

Disclaimer: The views and opinions expressed in this letter reflect those of the authors and do not necessarily reflect those of the AVA, the Australian Government or employer institutions.

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This letter to the editor appeared in the *Australian Veterinary Journal*, Volume 96, No 6, June 2018: Loh R, Vukcevic J. *Is the release of the koi herpesvirus (cyprinid herpesvirus 3) in Australia necessary?* Aust Vet J2018;96(6):N21–N22.

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World Aquatic Veterinary Medical Association

Program

Congress and Wetlab Early-bird Registration Ends June 25, 2018

PRE-CONGRESS AQUATIC MEDICINE WETLAB/WORKSHOP

Monday, 24 September, 10:00 Location: Temasek Polytechnic
Instructors: Dr. Richmond Loh, Dr. Julius Tepper & Dr. Nick Saint-Erne

Learning Objectives: This interactive wetlab will provide hands-on experiences for veterinarians, technicians, students and other support personnel involved in the care and handling of fish species, including a variety of handling, restraint, sample collection, and other techniques necessary for clinically evaluating the health of fish in practice. Restraint, medication administration, and other state-of-the-art techniques involving clinical procedures applicable to fish health and well-being will be demonstrated by instructors, then performed by participating veterinarians, veterinary technicians and veterinary students to help provide the clinical expertise and technical skills of the participant.

Transport from/to Marina Bay Sands & Temasek Polytechnic will be provided

CONGRESS INTERACTIVE LECTURES

ORNAMENTAL FISH & DISEASE		
Tuesday, September 25, 2018 Location: Marina Bay Sands Conference Centre, Auditorium 1		
Time	Speaker	Presentation
11:55-12:40	N. Saint-Erne	Supplies and Equipment to Practice Aquatic Veterinary Medicine
12:45-13:30	N. Saint-Erne	Water Quality Assessment in Aquatic Vet Medicine
14:30-15:15	J. Tepper	Clinical Aspects of Design and Function of Aquasystems
15:20-16:05	J. Tepper	Cutaneous Lesions in Koi
16:30-17:05	R. Loh	Anesthesia in Aquatic Vet Medicine
17:20-18:05	R. Loh	Therapeutics in Aquatic Vet Medicine
AQUATIC VETERINARY MEDICINE		
Friday, September 28, 2018 Location: Marina Bay Sands Conference Centre, Auditorium 5		
Time	Speaker	Presentation
08:30-09:15	A.D. Scarfe	International Efforts to Validate Day-1 Competency in Aquatic Veterinary Education

Because WAVMA is a WSAVA Association Member, to obtain the lowest registration WAVMA Members can register as a "WSAVA Member"

For more information about the WSAVA Congress, to Register, and for Hotel Reservations:

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April 18, 2018



*Pioneering New Approaches
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COURSE TOPICS

Fish Disease
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necropsy methods,
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Core Management
Zebrafish biology, breeding,
nutrition, water quality,
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biosecurity

**Health and Colony Management of
Laboratory Fish**

August 12-17, 2018

The MDI Biological Laboratory is pleased to present the short course Health and Colony Management of Laboratory Fish in our state-of-the-art training laboratory, the Maine Center for Biomedical Innovation.

This one-week short course is intended to help colony managers, researchers, and veterinarians monitor and maintain the health of a colony of aquatic organisms. The course consists of lectures, laboratory exercises with a high faculty to student ratio, and discussions. During the course, there are ample opportunities for students to discuss unusual and/or unsolved diagnostic case experiences from their home laboratories as problem-solving exercises.

This course is approved by the AAVSB RACE (American Association of Veterinary State Boards Registry of Approved Continuing Education) to offer a total of **35 CE** (Continuing Education) Credits to veterinarians and veterinary technicians.

More Information

Details on the course, as well as the online application, are available on the Health and Colony Management of Laboratory Fish course page. Principal investigators, technicians, core managers, students, postdocs, and veterinary professionals and trainees are encouraged to apply.

Inquiries

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**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.



3rd World Aquatic Veterinary Medical Association Conference, Annual General Meeting & Biosecurity Workshop

November 8-12, 2018
St. Kitts, USVI

The dates for the 2018 WAVMA Conference have been changed to November 8-12, 2018 to coincide with the West Indies Veterinary Conference. Consider attending or presenting at the 2018 WAVMA St. Kitts Conference (2018-Conference.wavma.org).

For more meetings, see information at: <https://www.wavma.org/Aquatic-Veterinary-Educational-Meetings-Conferences-Symposia-Workshops>

**Discover core knowledge, skills & experience
needed to become a WAVMA Certified Aquatic
Veterinarian (CertAqV)**

Did you know that WAVMA's **CertAqV Program** offers members the opportunity to become recognized and certified as having competency in 9 core areas deemed necessary to practice aquatic veterinary medicine? Find out more information online at: <http://www.wavma.org/CertAqV-Pgm>.

Project Piaba

Rio Negro, Amazonas, Brazil
January 19 to February 1, 2019.

We're working on the itinerary which you'll find here: <http://projectpiaba.org/what-we-do-2/expeditions/>

It is a fun trip and also a great way to learn about a segment of the aquarium fish industry, visit fishing villages and see an amazing amount of wildlife. I'll be on the trip again doing animal health assessments and training locals to serve as extension resources for the fishers and transshippers. We may have some veterinary students as well, since the trip is available as an externship.

Here's a video shot on the trip in 2014 that Oregon Sea Grant produced about the fishery on the Rio Negro and the travels of these fish to Oregon, https://www.youtube.com/watch?v=AqRmDFas_kg.

Here's some more information:

Costs: 2 weeks on the boat in Brazil approximately \$2,750, all included except alcohol or carbonated/bottled beverages and crew tip.

Brazilian tourist visa (\$100)

airfare \$1,200 - \$1,300 from most US cities

Any questions, feel free to send an email or call me or Scott Dowd:

Scott Dowd - sdowd@projectpiaba.org or (617) 973-5243.

Let us know if you are interested in joining the Expedition in January; a 50% deposit will hold a spot for you.

Hope to see you in Brazil.

Timothy J. Miller-Morgan, DVM, CertAqV
Aquatic Animal Health Program, Oregon Sea Grant,
College of Veterinary Medicine, Oregon State Univ.
Assistant Professor, Department of Biomedical Sciences,
College of Veterinary Medicine
Instructor, Aquatic Animal Health Management,
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Web sites:

<http://seagrant.oregonstate.edu>

<http://vetmed.oregonstate.edu/>

<http://www.oregoncoastcc.org/aquarium-science>

Blog: <http://blogs.oregonstate.edu/wetvet/>

Facebook: <https://www.facebook.com/aquaticanimalhealthprogram?ref=hl>

AVMA Convention

July 13-17, 2018
Denver, CO (USA)

67th Annual International Conference of the Wildlife Disease Association

August 5–10, 2018
St. Augustine, FL, USA
For more information:
<http://conference.ifas.ufl.edu/wda2018>

8th International Symposium on Aquatic Animal Health

September 2-6, 2018
Charlottetown, Prince Edward Island (Canada)

ExoticsCon 2018 - Association of Avian Veterinarians, Association of Exotic Mammal Veterinarians, Association of Reptilian and Amphibian Veterinarians Joint Conference

September 22–27, 2018
Atlanta, GA, USA
For more information: <http://www.exoticscon.org>

3rd World Aquatic Veterinary Medical Association Conference,

November 8-12, 2018
St. Kitts, USVI

ICARE 2019

April 28 – May 2, 2019
London, Great Britain.
For more information: <http://www.icare2019.eu>

ExoticsCon 2019 - Association of Avian Veterinarians, Association of Exotic Mammal Veterinarians, Association of Reptilian and Amphibian Veterinarians Joint Conference concurrent with AAZV

September 27–October 5, 2019
St. Louis, MO, USA

For more meetings, see information at: <https://www.wavma.org/Aquatic-Veterinary-Educational-Meetings-Conferences-Symposia-Workshops>

**DO YOU HAVE A STORY TO TELL ABOUT
HOW YOU BECAME
INVOLVED WITH AQUATIC
VETERINARY MEDICINE?**

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

43rd WSAVA Congress

September 25-28, 2018
Singapore

Plan ahead for World Congress 2018 in Singapore, the Tropical Garden City!

Our Congress will be held at our famous Marina Bay Sands, where you may lay down by the infinity pool after an eventful day of lectures. So, come on down and indulge yourself, because we all deserve it! Marina Bay Sands Hotel

10 Bayfront Avenue
Singapore 018956

Website: <http://www.marinabaysands.com/>

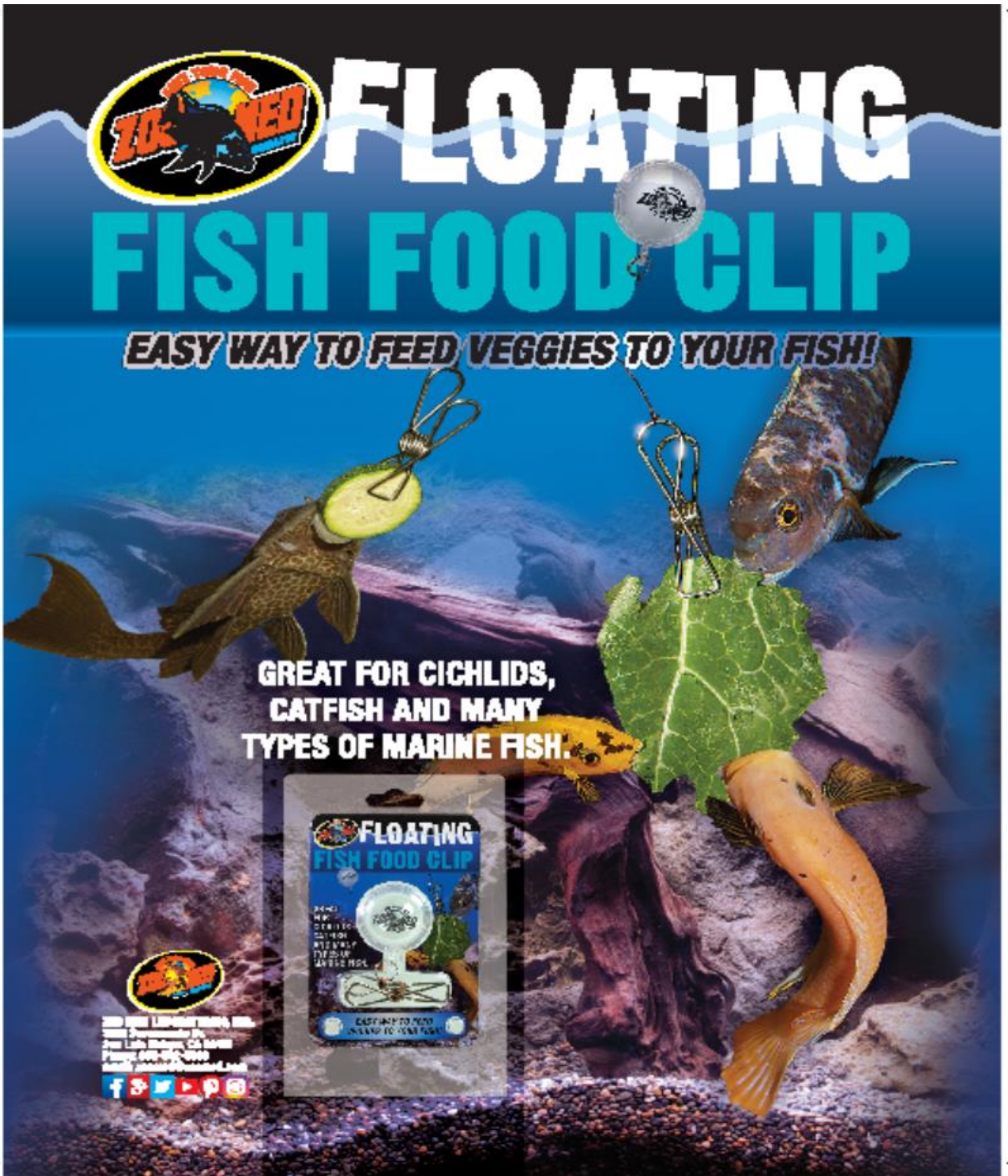
Conference Registration: <http://www.wsava2018.com/registration-hotels/registration#.WjrI87enEz0>

**Canadian Aquaculture Institute (UPEI), Aquatic Lab Animal Health, Husbandry and Medicine Workshops**

Atlantic Veterinary College,
University of Prince Edward Island Charlottetown,
Prince Edward Island, Canada

The Introductory workshop (*Health and Husbandry of Aquatic Laboratory Animals*) will be held on Monday May 14-Tuesday May 15, and the Advanced workshop (*Advanced Aquatic Animal Care and Husbandry*) on Wednesday May 16-Thursday, May 17, 2018. Participants can register for one or both of the workshops, which will include both lectures and hands-on laboratories.

For further information and registration, please see: <http://www.upei.ca/programsandcourses/canadian-aquaculture-institute>.



FLOATING FISH FOOD CLIP

EASY WAY TO FEED VEGGIES TO YOUR FISH!

GREAT FOR CICHLIDS, CATFISH AND MANY TYPES OF MARINE FISH.

THE WORLD AQUATIC VETERINARY MEDICAL ASSOCIATION

THE AQUATIC VETERINARIAN

WAVMA SPONSORS

Second Quarter 2018

Volume 12, Number 2

44

THE WORLD AQUATIC VETERINARY MEDICAL ASSOCIATION

The advertisement features a vibrant underwater scene with several fish. A large brown fish on the left has a green cucumber slice attached to its mouth with a silver metal clip. A blue fish on the right is eating a large green leaf held by another clip. A yellow fish is visible in the background. In the center, a product shot shows the 'Floating Fish Food Clip' in its retail packaging, which includes a white plastic clip and a small white ball. The background is a blue gradient with white wavy lines representing water. The text is bold and colorful, with the main title in white and blue. Social media icons for Facebook, YouTube, and Instagram are located in the bottom left corner.