

The



quatic

eterinarian



Herd of Sea Dragons at the S.E.A. Aquarium in Singapore. See article on pages 26-29.

Volume 12, Number 4
Fourth Quarter, 2018



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.

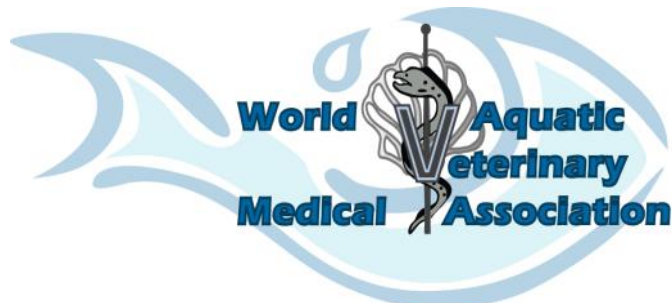
OBJECTIVES

- 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.

© 2018 World Aquatic Veterinary Medical Association



ISSN 2329-5562

Editorial Staff

Nick Saint-Erne (USA) TAVeditor@wavma.org
Executive Editor

Communications Committee:
Stephen Reichley (USA) - Chair
Andrei Bordeianu (France)
Chris Walster (UK)
David Scarfe (USA)
Devon Dublin (Japan)
Richmond Loh (Australia)

WAVMA Executive Board

David Scarfe (USA) President@wavma.org
President

Devon Dublin (Japan) devdub@yahoo.com
President-Elect

Laura Urdes (Romania) laurau_2005@yahoo.com
Immediate Past President

Stephen Reichley (USA) Secretary@wavma.org
Secretary

Nick Saint-Erne (USA) Treasurer@wavma.org
Treasurer

Howard Wong (Hong Kong) hkh Wong@cityu.edu.hk
Director-at-Large

Jena Questen (USA) jena@drquesten.com
Director-at-Large

Trista Welsh (USA) trista.welsh@gmail.com
Director-at-Large

Non-voting Advisors:
Julius Tepper (USA) cypcarpio@aol.com
Fellowship Advisory Council

Past Presidents

| | |
|------------------------------------|------|
| Dr Peter L. Merrill (USA) | 2007 |
| Dr Ron Roberts (UK) | 2008 |
| Dr Hugh Mitchell (USA) | 2009 |
| Dr Fotini Athanassopoulou (Greece) | 2010 |
| Dr Julius Tepper (USA) | 2011 |
| Dr Dusan Palic (Germany) | 2012 |
| Dr Mohamed Faisal (USA) | 2013 |
| Dr Richmond Loh (Australia) | 2014 |
| Dr Chris Walster (UK) | 2015 |
| Dr Nick Saint-Erne (USA) | 2016 |
| Dr Laura Urdes (Romania) | 2017 |

Past Secretaries and Treasurers

| | |
|----------------------------|-----------|
| Chris Walster, Secretary | 2007-2013 |
| Devon Dublin, Secretary | 2014-2017 |
| Dusan Palic, Treasurer | 2007-2010 |
| Nick Saint-Erne, Treasurer | 2011-2014 |
| Sharon Tiberio, Treasurer | 2015-2017 |

| | |
|--|--------------------|
| 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 Conference and Annual General Meeting Report..... | 12 |
| Author's Instructions | 19 |
| Colleague's Connection | |
| The Life of an Aquaculture Veterinarian: Mykolas Kamaitis..... | 16 |
| John L. Pitts Veterinary Education Awards Program Reports | |
| Erika Brigante | 20 |
| Emily S. Munday | 22 |
| Katherine Weber | 23 |
| Patrawin Wanakumjorn | 24 |
| Literature Review | |
| Aquatic Veterinary Abstracts: Salmonids | 25 |
| Selective precipitation reaction: a novel diagnostic test for tissue pathology in Atlantic Salmon infected with salmonid alphavirus | 25 |
| Physiological and behavioural evaluation of common anaesthesia practices in the rainbow trout . | 25 |
| The efficacy of three types of analgesic drugs in reducing pain in the rainbow trout | 25 |
| Centerfold | |
| Moray Eels at the S.E.A. Aquarium—Singapore | 26 |
| Featured Aquarium: S.E.A. Aquarium—Singapore | |
| 28 | |
| Conference Reports | |
| WAVMA Wetlab Workshop at WSAVA Was Wonderful | 30 |
| AVMA Humane Endings Symposium | 32 |
| Grand Round Cases | |
| Euthanasia of fish eggs, amphibian eggs and tadpoles | 34 |
| Euthanasia for crayfish | 34 |
| Methods of Euthanasia in Fish | 35 |
| Research Reports | |
| Detection of Ostreid Herpesvirus 1 microvariant DNA in aquatic invertebrate species, sediment and other samples collected from the Georges River estuary, NSW, Australia | 36 |
| Scientists get new tool to track new pathogen killing frogs | 38 |
| News and Views | |
| Salmon Farming in Chile at a Glance | 40 |
| After spending days aground in Sitka, a sea lion returns to the water—with help from humans . | 42 |
| Experts to start capturing rare vaquita porpoises in Mexico | 42 |
| Firing a dart into a wild, sick orca 'a little bit different,' says sharp-shooting veterinarian | 43 |
| Aquatic Veterinary CE & PD | |
| The Health and Welfare of Atlantic Salmon | 45 |
| Meetings of Interest to Aquatic Veterinarians | 46 |
| Sponsors | |
| ioLight | 39 |
| FishVet Group | 45 |
| ZOO MED | 52 |
| Index for <i>The Aquatic Veterinarian</i> Volume 12—2018 | 48 |

Page numbers are hyperlinked to articles. If you are reading a digital copy of this, Control click on page number to go to that page.

Editor’s Note

As the year 2018 comes to an end, looking back on it, we have had a very good year in the World Aquatic Veterinary Medical Association. You will see in the Executive Reports (pages 5-7) and Committee Reports (pages 9-15) a summary of many of the year’s activities, most important of which is the Annual General Meeting and Conference held in St. Kitts in November (see report on pages 12-15).

As usual, the Executive Board and Committees slowly but surely advanced aquatic veterinary medicine as an active, important and growing discipline in veterinary field. More and more veterinary students are being exposed to this field at their veterinary colleges or through externships, as reported in the student reports (see pages 20-24). More veterinarians in aquatic medicine are getting recognition by their peers for their important work in the animal health and food industries (see Colleague’s Connection on pages 16-18). And more veterinarians are getting their Certification as an aquatic veterinarian to indicate to their clients and peers their knowledge in this field (see page 9). It is a great year to be an aquatic veterinarian, and it will even be better in 2019!

This particular issue has some information and abstracts about salmon and trout aquaculture (pages 16-18, 20-21, 23, 25, 40-41, 45), and a few news articles about marine mammals (pages 24, 42-43). It also has a review of the AVMA Humane Endings Symposium (pages 32-33). I didn’t get the information about koi from the Koi Prax 1 meeting at the St. Kitts conference to dedicate this issue to koi fish, but I hope to make that the topic of a future issue, including the latest information on Hikui disease of koi. Please send me any case reports or other information you have about koi diseases so we can make a dedicated issue on that topic.

Any news items, meeting notifications or other items of interest for our members can be emailed to me at the address below.

Wishing all vets a Happy New Year everywhere!

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

Dr. Temple Grandin and Nick Saint-Erne at the AVMA Humane Endings Symposium, November 3, 2018. See article on pages 32-33



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:
Sea Dragons at the S.E.A. Aquarium in Singapore.
See article on pages 26-29.
Photograph by Nick Saint-Erne



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

Advertising Rates (per issue)

| | Commercial | Non-Profit |
|--|------------|------------|
| Full page (~7" x 9") | \$100 | \$50 |
| 1/2 page (~7" x 4.5") or 1 column (3.5" x 9") | \$60 | \$30 |
| 1/4 page (~3.5 x 4.5") | \$30 | \$15 |

WAVMA Members

Free 1/8 page (business card size) advertisement
Contact TAEditor@wavma.org for information on advertising and payment options.

President's Report

The founders came together to form WAVMA some 13 years ago, with the aim of creating a global organization to serve the interests of aquatic veterinarians and the veterinary profession; and ensure that this discipline grows to meet the needs of producers, industries and other stakeholders. Over the years, WAVMA has proved itself to be a global leader in aquatic veterinary medicine, with membership and alliances spanning more than 85 countries.

Without a doubt, individuals are increasingly looking to WAVMA as a source of leadership in aquatic veterinary medicine, which is exemplified by the continued interest in membership and WAVMA programs. Over the years, quite a number of individuals have contributed to bringing the organization to where it is today. The task at hand is to build on the gains of the past decade and shape the direction for 2020 and beyond. Against this background, 2019 is pivotal to build on what the Executive Board and our committees have previously developed.

As President, my focus for the year is on the strengthening and streamlining of WAVMA programs and the internal procedures and policies of the organization. This is important since it is essential that WAVMA engages the public and other organizations from the position of transparency, competency and credibility. The 2019 Executive Board will benefit from a mix of persons with lots of years in the WAVMA leadership and persons being on the board for the first time, thus providing both experience and fresh ideas.

Current members should not only expect a continuity of programs being offered but an improvement in the efficiency and effectiveness in which these are delivered. This requires, however, the cooperation of everyone. Feedback in the form of recommendations, complaints and participation in surveys when launched is needed to better meet the needs of our members. On the other hand, the work of WAVMA so far has, unfortunately, been dependent on a handful of individuals. It is time for all of the WAVMA members to be a bit more involved in the affairs of the association. I will do all I can to bring the affairs of the administration of the organization closer to all the members.

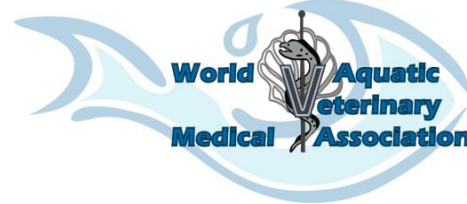
To the new and aspiring members, I recognize that there are other associations around the world that supports aquatic veterinary medicine, therefore, your interest in WAVMA and its programs is welcomed, encouraging, and not taken for granted. As a member, please take full advantage of the opportunities that you are afforded and get involved. As is evidenced by the Listserv, WAVMA members are quite supportive, so please reach out.

I do look forward to a great year ahead as my team and I serves you and the interests of WAVMA.

Devon Dublin, PhD, MSc. DMVZ, CertAqV
WAVMA President 2019
President@wavma.org



2019 WAVMA President Devon Dublin with 2018 President David Scarfe at the WSAVA Conference in Singapore, September 25, 2018.



WAVMA ELECTIONS:
Congratulations to the following Officers and Directors who will be the 2019 WAVMA Executive Board

2019 WAVMA Executive Board

- President:** Dr. [Devon Dublin](#) (Guyana/Japan)
- Past-President:** Dr. [David Scarfe](#) (USA)
- President-Elect:** Dr. [Jena Questen](#) (USA)
- Secretary:** Dr. [Stephen Reichley](#) (USA)
- Treasurer:** Dr. [Nick Saint-Erne](#) (USA)
- Directors-at-Large:** Dr. [Matthijs Metselaar](#) (UK), Dr. [Christine Parker-Graham](#) (USA), Dr. [Gillian Taylor](#) (South Africa)

2019 WAVMA Executive Board



President Dr. Devon Dublin (Guyana/Japan) **President-Elect** Dr. Jena Questen (USA) **Past-President** Dr. David Scarfe (USA) **Secretary** Dr. Stephen Reichley (USA) **Treasurer** Dr. Nick Saint-Erne (USA)

Directors-at-Large



Dr. [Matthijs Metselaar](#) (UK) Dr. [Christine Parker-Graham](#) (USA) Dr. [Gillian Taylor](#) (South Africa)

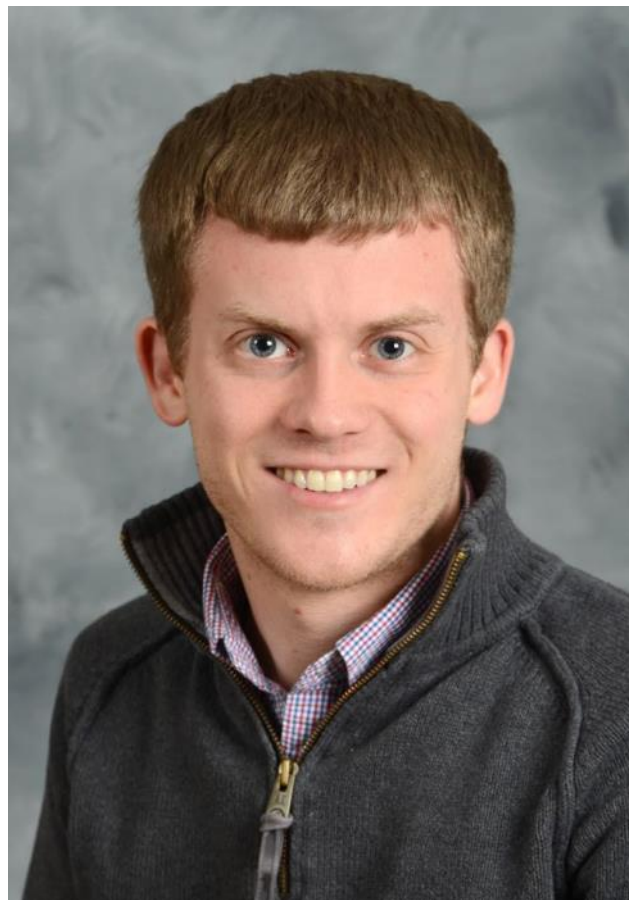
Secretary's Report

As we end another year, it is a natural time for reflection on the accomplishments during 2018. This year brought our first renewals for the CertAqV program; our Credentialing Committee continues to do a great job administering this important WAVMA initiative. Our Student Committee continues to remain engaged and we have added several new WAVMA Student Chapters at veterinary schools. In addition, the John L. Pitts Aquatic Veterinary Education Awards Program continues to provide invaluable support to veterinary students and recently graduated veterinarians from around the globe. This year, the Program welcomed a new partner, the Fish Veterinary Society. The new partnership will help the Program continue to expand its impact. I encourage all WAVMA members to consider supporting the future of our profession by making a donation, in any amount, by visiting www.wavma.org/scholarships.

The WAVMA Meetings Committee was very active this year. The 3rd WAVMA Conference and Biosecurity Workshop, hosted by WAVMA along with Ross University School of Veterinary Medicine and the International Aquatic Veterinary Biosecurity Consortium saw over 50 attendees. WAVMA was also involved in providing continuing education sessions at several conferences and workshops throughout the year. A big thanks to Dr. Julius Tepper, chair of the Meetings Committee, for his continued leadership and efforts. Also, great thanks to all of the members of the WAVMA Communications Committee. I have the distinct pleasure of working alongside some of the most engaged members who put forth tremendous efforts to ensure excellent communication within WAVMA and with our global audience.

WAVMA continues to publish *The Aquatic Veterinarian* on a quarterly basis. This publication, under the direction of Executive Editor Dr. Nick Saint-Erne, provides great value to our members on all aspects of aquatic veterinary medicine and generates advertising income for WAVMA. We also publish the WAVMA e-News, under the direction of e-News editor Miguel Grilo and Devon Dublin, while maintaining our website and social media presence.

Congratulations to the 2019 WAVMA Executive Board members; I am looking forward to working with you as we continue to strengthen WAVMA and its val-



ue to our members. I encourage all WAVMA members to consider joining a WAVMA committee. Commitments on a committee are minimal, yet are a great way to impact the organization and meet colleagues from around the world.

On a closing note, WAVMA continues its efforts to support the global aquatic veterinary community with many successes in 2018 and great plans for 2019. Thanks to David Scarfe for serving as our 2018 President. I wish all our members a very happy holiday season and all the best in 2019.

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



Treasurer’s Report

2018 was a great year for WAVMA. For the third time we organized an Aquatic Veterinary Medicine Conference, which had over 50 veterinarians and veterinary students in attendance. We held our Annual General Meeting at that Conference in St. Kitts (see pages 12-15 for the report). While WAVMA did not generate a profit from the conference, it upheld our Mission and Objectives (see page 2 of this issue for that information) for promoting Aquatic Veterinary Medicine and we had many new student members join from the conference.

WAVMA donates from our dues revenue \$3000 annually to the John L. Pitts Veterinary Education Awards Program, which helps veterinary students learn more about aquatic medicine (see student reports on pages 20-24). In 2018, nine students received the Education Awards. If every veterinarian member would donate even a small sum to the scholarship fund, we could possibly double the number of awards given in 2019! Please make a small donation here:

WWW.WAVMA.ORG/SCHOLARSHIPS

Scroll down to the bottom of the page and hit donate.

Don’t forget to renew your WAVMA membership dues while you are on the website, as they are paid by calendar year, so are due January 1 of each year. As a bonus to our members, those who join in the 4th quarter of the year will get the next full year membership included with that paid membership. Pay your dues here: <https://www.wavma.org/membership-renewal>.

Finally, we are looking for someone to act as Assistant Treasurer to help manage the WAVMA accounts and potentially take over the Treasurer role in the future. If you are interested in learning what this entails, please email me for more details. Proficiency with Excel and Quickbooks is helpful but not necessary. Thanks for your support!

Nick Saint-Erne, DVM CertAqV

WAVMA Treasurer
Treasurer@WAVMA.org



Having dinner with Dr. Nantarika Chansue and her veterinary team in Bangkok, Thailand, October 4, 2018.

New Members—4th Quarter 2018

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

Veterinarian Members

| | |
|-------------------|---------------|
| Michelle Rivard | United States |
| April Geer | United States |
| Solomon Deguzman | United States |
| Matthew Leong | Australia |
| Tomislav Saric | Croatia |
| Thanida Haetrakul | Thailand |
| Nadav Davidovich | Israel |

New Graduate Veterinarian Members

| | |
|---------------|-------------|
| Lesly Cabrias | Puerto Rico |
|---------------|-------------|

Vet Graduate Student, Intern or Resident

| | |
|-----------------|-------------|
| Suong Nguyen | New Zealand |
| Julian Vaillard | Mexico |

Vet Student Members

| | |
|------------------------|-----------------------|
| Daniela Monje | United States |
| Danielle Merritt | United States |
| Alexis Kessler | United States |
| Elizabeth St. Germaine | United Kingdom |
| Leanna Boyd | United States |
| David Krucik | United States |
| Daniel Paushter | United States |
| Allison Murawski | United States |
| Corinne Weston | United States |
| Mark Bilger | United States |
| Charlene Morotti | United States |
| Grace Kallenberg | United States |
| Mary Swiger | United States |
| Elin Crockett | United States |
| Danielle Pacura | Saint Kitts and Nevis |
| Abigail Ayre | Saint Kitts and Nevis |
| Lisa Phelps | United States |
| Chaunte Lewis | United States |
| Carly Levinstein | Saint Kitts and Nevis |
| Abigail Carr | Saint Kitts and Nevis |
| Leah Arth | United Kingdom |
| Jennifer Krupa | United States |
| Jordan Whitaker | Saint Kitts and Nevis |
| Frédérique Labranche | Saint Kitts and Nevis |
| Brooke DeJohn | Saint Kitts and Nevis |
| Olivia Allen | Saint Kitts and Nevis |
| Alexis DeMong | Canada |
| Naomi Ogasawara | United States |
| Michael Palillo | United States |
| Rachael Adams | United States |
| Taylor Fiorini | United States |
| Adam Feinzig | United States |

Vet Tech/Nurse Member

| | |
|--------------|---------------|
| Crystal Sims | United States |
|--------------|---------------|

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/Education 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 81 aquatic veterinarians from 23 countries. Congratulations on our newest Certified Aquatic Veterinarians:

- Dr Madison Barnes**
- Dr Erika Brigante**
- Dr Jacqueline Elliott**
- Dr Fritz Karbe**
- Dr Claudia Venegas**

There are an additional 47 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
fish@drquesten.com

Certified Aquatic Veterinarians

| | |
|-------------------------|-------------------|
| Giana Bastos-Gomes | Australia |
| Heather Bjornebo | USA |
| James Bogan | USA |
| Pierre-Marie Boitard | France |
| Madison Barnes | St. Kitts & Nevis |
| Erika Brigante | St. Kitts & Nevis |
| Todd Cecil | USA |
| Michael Corcoran | USA |
| Emily Cornwell | USA |
| Rebecca Crawford | Australia |
| Darren Docherty | UK |
| Simon Doherty | UK |
| Devon Dublin | Japan |
| Jacqueline Elliott | USA |
| Ashley Emanuele | USA |
| Azureen Erdman | USA |
| Mohamed Faisal | USA |
| Ari Fustukjian | USA |
| Christopher Good | USA |
| Krystan Grant | USA |
| Miguel Grilo | Portugal |
| Stephanie Grimmett | UK |
| Orachun Hayakijkosol | Australia |
| John Howe | USA |
| Kerryn Illes | New Zealand |
| Jimmy Johnson | USA |
| Colin Johnston | New Zealand |
| Kasper Jorgensen | Denmark |
| Brian Joseph | Canada |
| Fritz Karbe | Germany |
| Sherrri Kasper | USA |
| 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 |
| Haiatham 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 |
| Constance Silvernagle | 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 |
| Claudia Venegas | Chile |
| Sarah Wahlstrom | USA |
| Chris Walster | UK |
| Scott Weber | USA |
| Marcus Webster | 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
 Dr. Richmond Loh

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](#).

Student Committee

The committee plans to talk with the WAVMA website manager (IT person) about adding externship listings to the website and adding some fields to the submission form. There are already externship entries on the WAVMA website, but they need to be edited and updated. The entries should be divided into "externships", "internships", "fellowships" using a drop down menu (like the video page). These could potentially be broken up by externship type (e.g., aquaculture, aquariums) depending on the difficulty of doing so. When clicking a link, it can open a new page/pop-up window so the person looking doesn't lose their place on the list. When the list is active, share on the WAVMA list-serve, Facebook, etc to make sure people know about it (including non-members).

The committee also wants to start a Journal Club via the student member listserv (Students-L). There are currently about 80 subscribers. Some might have graduated or just subscribe even if they aren't a student. A Journal Club might help get students talking more. We can pick out an article to read each month and discuss by email on the listserv. Can ask the Members-L for article recommendations. Can also tell the Members-L to sign up for the Student-L if they want to participate. This will allow for inclusion of newer grads or anyone who would be interested.

Use the Student-L to communicate with other students about informal events / meet-ups / room sharing for veterinary conferences, to help facilitate activities for students.

Now, students can use the member directory to search for potential mentors in their area / by geographic region. Include the mentors program in the PSA/email about opportunities to vet students to spread word about the program. In future, when we email/blast about WAVMA student opportunities, include the mentoring program information.

WAVMA VETERINARY SCHOOL CHAPTERS

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

There are 16 WAVMA Student Chapters in veterinary schools around the world. If you are a veterinary student, please join your school's WAVMA chapter, or start one if your veterinary school does not have one yet! Find out more about the veterinary school chapters on the WAVMA website, where you can download the WAVMA Student Chapter Guidelines to help create or run your own school's chapter.

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

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>

The John L. Pitts Aquatic Veterinary Education Awards Program

This Program offers financial support to veterinary students or recent graduates of recognized veterinary schools, allowing recipients to explore a career in aquatic veterinary medicine through a variety of aquatic veterinary educational activities. Awards are intended to assist veterinary students and veterinarians, who have graduated in the past 24 months, to become involved in aquatic veterinary medicine. Awards (generally \$250-\$1,000) may be used towards offsetting personal costs associated with aquatic veterinary conferences, symposia, continuing education and professional development, aquatic veterinary externships, or equipment and supplies needed for aquatic veterinary research projects not funded by other sources.

During the 2018 award cycle, 9 students and recent graduates were awarded funds to increase their knowledge of, and experience in, aquatic veterinary medicine. To date, the Program has supported 82 veterinary students and recent graduates from 42 colleges and universities across 4 continents. **This year, the Program was excited to have the Fish Veterinary Society join us as a partner!** We are excited for this new partnership as we continue to expand our impact on veterinary students and veterinarians from around the world.

We are inviting colleagues to collaborate with us in advancing the vision of the John L. Pitts Aquatic Veterinary Education Awards Program and impacting the future of aquatic animal health. The Program is global in its perspective, offering veterinary students and recent graduates financial assistance to pursue their interest in aquatic veterinary medicine.

Will you help us increase available funds for the 2019 awards cycle? **100% of every donation, regardless of the size, goes directly to supporting the future of aquatic animal health.** You can make donations and find additional information online at www.wavma.org/scholarships.

Stephen Reichley, DVM, PhD, CertAqV
Chair, John L. Pitts Aquatic Veterinary Education Awards Program
PittsEduAwards-Admin@wavma.org



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

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

**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>.

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.

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!

Meetings Committee Report
2018 Conference and AGM
St. Kitts, BWI
By **Julius Tepper**

The finalization of over a year's worth of planning and preparation came to fruition this past November with the gathering of new friends and reunion with old ones on the beautiful Caribbean island of St. Kitts. Our meeting and AGM was the continuation of a weeklong conference of the BWI Veterinary Association. The conference hotel, the Marriott St. Kitts was situated in a cove on the Atlantic side of the island.



We convened on Thursday, November, 8, 2018 for a spectacular catamaran cruise. The first stop was for snorkeling in crystal clear blue waters. Drinks and lunch were served on board as we continued to the sister island of Nevis. That evening was devoted to registration check-in and the poster set-up. Later that evening, we all had a chance to get together at the Meet and Greet icebreaker social gathering.

Friday morning was the official start of the conference, with the opening welcome delivered by Dean Sean Callanan of the Ross University veterinary school.



This was followed by our two keynote speakers, Arni Mathiesen of FAO, One Health, Environmental Stewardship and Veterinary Medicine...

... and Richmond Loh, who talked about being a field and laboratory aquatic veterinarian.



Following the opening keynote talks, the rest of the morning and afternoon saw two concurrent sessions featuring a variety of talks on aquaculture, ornamental fish, marine mammals and turtles in one room, while talks devoted to meeting aquatic veterinary educational needs occurred in the other.

But our day was not over after the talks concluded, as we were all invited by the WAVMA student chapter at Ross University to pizza and wine and an informal Q and A session. Most of the questions were aimed at clarifying the requirements for the completion of the CertAqV certification process. It was gratifying to see so many vet students interested in being certified as an Aquatic Veterinarian.



The second conference day was devoted to a program named *Koi Prax 1*, the first annual meeting of the Koi Practitioners Working Group. This is a project I have been working on for some time, in the hope of advancing our knowledge and understanding of this single species, so important to the daily workload of pet fish practitioners. Starting with an introduction of the speakers and the proposed method for archiving the data, we moved on to the reports from around the world.



Dr. Loh covered Australia, Dr. Sanders Western U.S., I covered the Eastern U.S. and Dr. Miller-Morgan covered Europe and Asia. This was an opportunity to describe regional morbidity and significant events pertaining to koi health. The hope is yearly reports will provide insight to changes occurring in each region, as well as help to track disease progression.



Talks that followed included: Feed, Feeding Behavior & Body Condition of Koi, Hikkui Disease Diagnosis & Treatment, Koi Sleepy Disease / Carp Edema Virus Disease, Koi Ulcer Disease - Advances in Koi Ulcer Treatment, Koi Herpes Virus, Ocular Neoplasm in Koi and a session that gave a unique perspective on koi practice by allowing all four speakers to describe some of their best practical practice tips.

The session ended with a roundtable discussion of several clinical conditions, providing an opportunity for the attendees to both ask questions and comment in this discussion. Interest was high for the continuation with Koi Prax 2 for next year.

The 2018 WAVMA Annual General Meeting and Banquet was held at the hotel that Saturday evening. The prizes for best student posters were awarded by 2018 WAVMA President, Dr. David Scarfe.



It was also an opportunity to announce the winner of the 2018 WAVMA Distinguished Fellow, Dr. Richmond Loh.



On Sunday morning were held the two wetlabs. The Finfish Clinical Exam, Anesthesia, Euthanasia and Necropsy wetlab was done at the vet school. Dr. Jessie Sanders and Dr. Richmond Loh conducted the Finfish wetlab.



The Dolphin Clinical Exam was held at Dolphin Discovery.



**The Life of an Aquaculture Veterinarian:
 Mykolas Kamaitis, BSc, DVM**

If the question is what is British Columbia's number one agricultural export, the answer might surprise you: it's salmon. Given that, it is no surprise that aquaculture, the production of aquatic or marine organisms, continues to grow at an exponential rate in order to meet global seafood demands. In British Columbia, Canada, the primary fish species being cultured is Atlantic salmon (*Salmo salar*). Aquaculture employs thousands of people in BC, many of whom live in small coastal communities on Vancouver Island and the Central Coast. Fish production occurs in sea cages as well as land-based facilities that are primarily used for early rearing. As in all livestock production, animal health and welfare are key components to a successful and sustainable aquaculture industry and provide an important role for veterinarians to play.

The lifecycle of a typical farmed Atlantic salmon is two-and-a-half to three years from egg to plate. This includes one year in fresh water and one-and-a-half to two years in salt water. Broodstock, or those mature fish used to produce eggs for the next generation of fish, live one more year at sea before they are spawned. The first year of life is spent in a hatchery, where eggs are fertilized, incubated, and hatched. The newly hatched fish, called alevin or sac-fry, develop into parr, receive a number of vaccinations against various bacterial and viral pathogens, and are then transported to net pens out in the ocean as they develop into smolts. While hatcheries allow producers the ability to regulate rearing and water quality parameters, particularly in recirculating aquaculture systems, little can be done to control or regulate environmental factors and water quality at sea. However, various tools and technology have helped fish producers mitigate the potentially devastating impacts of poor environmental conditions; air diffusers and oxygenation systems have helped manage challenges such as low dissolved oxygen levels or harmful plankton blooms that may occur at certain times of the year.



duced with a little over 1 kg of feed). Salmon are fed specialized pelleted diets at different sizes and life stages; in addition to marine fish oil and protein, feeds are being developed to incorporate an increasingly higher proportion of land-based ingredients, including plant-based products as well as by-products of other livestock industries such as feather meal. Salmon feed also includes the carotenoids astaxanthin and canthaxanthin which, in addition to adding nutritional value to the feed, also give salmon flesh its distinctive pink colour.

As an aquaculture veterinarian working in the BC salmon industry, I am responsible for the health and well-being of millions of farmed fish, from egg to harvest. I also have the responsibility to minimize any risk to wild fish populations and the ecosystem as a whole. My job includes on-site fish health visits as well as analyzing fish health and production data. I need to apply the

principles of biosecurity, preventative health management, production data analysis, and client relationships to promote the health and welfare of our patients. I also ensure our customers receive a healthy, nutritious, and safe product, and help drive continual improvement in all aspects of production and processing. The Association of Aquaculture Veterinarians of BC (AAVBC) includes around twenty veterinarians involved in the BC aquaculture industry, including both the private and public sectors. This association meets and corresponds to discuss current fish health and veterinary issues, and to respond to questions, comments, and concerns from the industry, regulators, and the public.

Larger aquaculture companies in BC employ veterinarians to manage the health of their fish on a full-time basis, while smaller operations hire veterinarians when development of resistance to this product with the use of alternative treatments, the most common of which are hydrogen peroxide baths; others include freshwater baths, as well as new mechanical removal technology such as the Hydrolicer, which uses high pressure jets to remove sea lice. Bath treatments are generally performed with a well-boat (a vessel with a well for storage and transport of live fish), but can also be performed in



a tarpaulin; fish are pumped onto the boat or into the tarpaulin, treated for a set period of time, then returned to their pen. Bioassays are routinely performed on sea lice pre- and post-treatment to assess the level of sensitivity to different treatments.

Wild salmon, which are often covered in sea lice upon their return from the open ocean, are a blessing in disguise for sea lice management. Although on-farm sea lice numbers tend to spike when wild salmon return, passing sea lice to our farmed salmon, this also introduces to the population naïve sea lice which have never undergone any treatment, therefore propagating their genetics and helping keep the sea lice on our farms sensitive to the treatments we use.

For the most part, antibiotic use on BC fish farms is minimal. The vast majority of treatments are for tenacibaculosis (also known as mouth rot, bacterial stomatitis, or yellow mouth), a disease affecting smolts under 400 grams in size and occurring in the first few months post-saltwater entry. There is an active effort to develop a vaccine against this bacterial disease, which has already been successfully developed for some other species of fish in other parts of the world.

Other diseases and fish health issues sometimes encountered include Progressive Gill Damage and Amoebic Gill Disease, as well as some bacterial diseases such as Winter Ulcers (caused by the bacteria *Moritella viscosa*), Bacterial Kidney Disease (BKD), Salmonid Rickettsial Septicemia, and Furunculosis. Most of these diseases occur sporadically in a few fish here and there. In cases when there is a more serious fish health concern at the population level, fish may be treated if deemed appropriate, or may be harvested out or culled depending on the life stage and extent of disease. Broodstock are screened for BKD, as well as a number of other pathogens including notifiable viral pathogens such as Infectious Hematopoietic Necrosis,

Infectious Salmon Anemia (never identified in BC) and Viral Hemorrhagic Septicemia. The eggs of any broodstock which tests positive are discarded to limit any chance of vertical transmission of pathogens.

R&D is another important component of what aquaculture veterinarians do. Although R&D is an important part of all veterinary medicine, the overall lack of information and understanding regarding fish health when compared to other livestock species makes it all the more important in our line of work. We often collaborate with various researchers and academic institutions to improve our understanding of fish health and welfare, health management strategies and technologies including vaccine development, and environmental impacts, as well as other relevant areas.

As in any area of veterinary medicine, being an aquaculture veterinarian comes with its challenges. There are always new or changing fish health issues which we have to address and deal with. It's important for us to stay current and engage in new R&D to try to better understand these issues.

The aquaculture and fish health community is quite tight-knit, and members from BC, Canada, and around the world often correspond and collaborate; often the problem you're facing has been encountered by someone elsewhere. The aquaculture industry does an excellent job of capturing fish health and production data, which can be analysed to identify patterns or clues as to what the source of a given challenge may be. Another challenge we face is communicating the science and facts of our industry. There is a great deal of public interest in the aquaculture and fisheries sciences, particularly in the interactions between wild and farmed salmon. We have a responsibility to be transparent about our operations, and we take that very seriously.

The aquaculture industry is constantly advancing and evolving. Improved farming technology, such as





remote feeding systems, underwater cameras, and mortality removal systems have helped us better manage the health, welfare, and productivity of our fish. The reality is that there is an increasing demand for healthy and nutritious sources of food. The BC salmon industry and the veterinarians who care for the fish we grow are a vital part of ensuring that people of BC and the world are able to eat healthy nutritious food to nourish our bodies.

Mykolas Kamaitis, BSc, DVM, graduated from OVC in 2016, having completed his BSc in Biomedical Sciences in 2011 at the University of Guelph. He is the veterinarian for Marine Harvest and president of the Association of Aquaculture Veterinarians of BC.

This article originally appeared in *West Coast Veterinarian*, the quarterly magazine of the CVMA-Society of BC Veterinarians, and is reprinted here with permission.



TO SUPPORT FUTURE STUDENT SCHOLARSHIPS, PLEASE MAKE A DONATION TODAY TO THE SCHOLARSHIP FUND!
www.wavma.org/scholarships

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.

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!

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 length).

News

Brief synopsis or information about aquatic veteri-

nary 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.

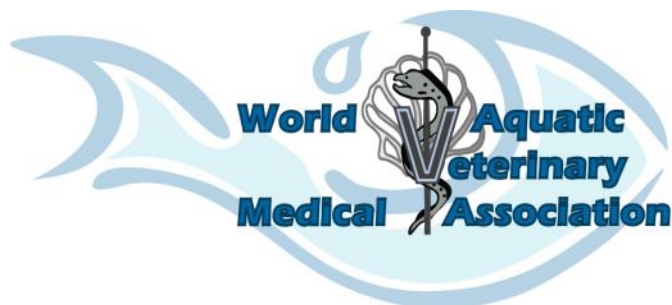
Please send articles, clinical reports, or news items to the editor by the following submission dates:

- 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.



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



2018 Pitts Education Award Recipient Report
Erika Brigante
 Ross University, St Kitts and Nevis

At the end of my fourth year as a Ross University veterinary student, I completed one of my last externships and rotations with the Washington Department of Fish and Wildlife, WA Public Utility District Association, and the Northwest Indian Fisheries Commission in September 2018. Before this four week-long externship I knew very little about salmon and salmon aquaculture, so I learned something new every day.

Each week, I worked in a different region of Washington with a different fish vet; this exposed me to different types of hatcheries as well as different methodologies of the vets. Each vet spends a lot of time working on spawning and disease prevention, diagnosis, and treatment. I got to perform some of the spawning activities such as properly holding the adult fish for euthanasia, which is done by a swift, hard blow to the head. I learned how important it is to have experienced members leading this part of spawning because it results in the quickest deaths that minimizes struggling and suffering of the fish and maximizes efficiency.

During spawning, I also sampled various organs for disease testing and disease prevention, and I got to strip the male's milt to then mix it with the eggs. Being able to not only observe, but to partake in these activities hands-on helped me understand the process and further develop my skill set.

I learned about some of the major diseases of importance including bacterial coldwater disease, bacterial kidney disease (BKD), bacterial gill disease, Saprolegniasis, infectious hematopoietic necrosis virus (IHNV), *Flavobacterium columnare*, and

Trout Necropsy



Stacks for Eggs

Aeromonas salmonicida. Surveillance testing and appropriate biosecurity are important ways BKD and IHNV are managed. I observed this by assisting with biosecurity audits and by collecting samples for the tests. I helped run some of the samples, and I got to work up a few different disease cases. I necropsied sturgeon as well as different salmon and trout species which was fun to compare the anatomy and helpful for me in refining my knowledge of normal versus diseased.

During the last week of the externship, I volunteered along with one of the vets for a few days at an environmental outreach program called Kids in the Creek. We got local high schoolers excited about fish health, and I taught them a lot of what I had just learned, which helped me remember, too. It also brought on new questions and points of discussion, it improved my communication skills, plus it was a lot of fun!





I enjoyed how this externship was in different locations because the various habitats and wildlife were astounding. Even though the externship was for a short time, I got to know some really amazing fish vets and aquaculturists that work in the salmon industry, develop professional relationships, and receive valuable career advice. The experience taught me so much from salmon aquaculture to biosecurity to how I still have a lot to learn! It also confirmed that I am certain I want to specifically work with fish. This externship invaluablely helped me prepare for my future career, and I am so thankful that it was made possible due to the John L. Pitts Aquatic Veterinary Education Awards Program!

Finally, I was able to take some interesting photos during my externship, some of which I have included for this article.

Saprolegniasis of a Salmon, above, and microscopic image of Saprolegnia fungus to the right



Salmon Mortality a Few Days Before Spawning, right bottom photo on previous page and below.



Sturgeon Necropsy



2018 Pitts Education Award Recipient Report

Emily S. Munday, M.S.

DVM Candidate (Class of 2020)
President and Founder, WSU CVM Aquatic Club
Washington State University Research Scholar

I am very grateful to have received the Pitts Aquatic Veterinary Education Award, and would like to express my sincere thanks. These funds helped me to attend the International Symposium on Aquatic Animal Health at Prince Edward Island, Canada. During this conference, I met other veterinary students, graduate students studying aquatic animal health, aquatic veterinarians and paraprofessionals. I watched many fascinating lectures, participated in a pre-conference workshop, and gave an oral presentation about my own research. My favorite part of the conference was meeting new people, and reconnecting with colleagues.

Attending ISAAH further empowered me to continue pursuing a career in aquatic veterinary medicine. Meeting other students who share my interests is always exciting, and reminds me why I love this field. It was helpful to exchange different aquatic veterinary medicine opportunities with each other, as well discuss ways to increase student involvement in WAVMA.

The first day, I attended a workshop on *Evaluation of accuracy of diagnostic tests for aquatic animal diseases: (Tips, tricks and traps)* presented by Dr. Ian Gardner. We delved into how diagnostic tests for infectious diseases are validated, and what the best practices are for development and validation of these tests. When I am running these tests in the future, I will be able to more critically evaluate their usefulness and applicability, and better interpret results given how a test was developed versus how it is applied for diagnostics in the field. In addition, it was beneficial for me to hear about new tests that might be more widely available when I am out in practice, such as a high throughput qPCR microchip! We also discussed risks associated with sensitivity and specificity, and the consequences of being wrong when it comes to declaring an animal's disease status as positive or negative.

The rest of the week was a whirlwind of inspiring and fascinating lectures, and mingling with fellow aquatic veterinary students and veterinarians over some incredible Prince Edward Island seafood. Some of my favorite session that I attended were the WAVMA and AAFV session, as well as a contentious session on PRV. I learned more about current approaches to disease diagnostics and control in salmonid culture, and challenges of treating salmon for sea lice in ocean net pens; fish stunning and slaughter techniques; educational opportunities in aquatic veterinary medicine; practical applications and frequently asked questions pertaining to VFDs; and



diseases that affect ornamental fish. I was impressed and inspired by Dr. Jessie Sanders who spoke about her all-fish practice, and how she approaches cases. Having not had much experience with zebrafish, I also attended talks about their common diseases and biosecurity. In a fungal pathogen session, I was surprised to learn that *Saprolegnia* can be considered a primary pathogen of fish – I will take it a bit more seriously when I encounter it in the future! One of my favorite

talks discussed the applications of biochemistry panels in aquaculture, which inspires me because I am always trying to apply the concepts I am learning in school to aquatic veterinary medicine.

In addition to attending talks and meeting with colleagues I already knew, I pushed myself out of my comfort zone and scheduled a “partnering session” with an aquatic veterinarian I had never met. We ended up having a great discussion, and I hope to shadow him during my fourth year.

There are so many other wonderful talks that I did not mention here, and I feel lucky have been able to attend this amazing conference. Attending ISAAH helped me make connections with colleagues that I look forward to maintaining. In addition, this experience helped direct me to things I want and need to learn more about to be a successful aquatic veterinarian.

Thank you very much for the opportunity to learn more about aquatic veterinary medicine, and meet colleagues from around the world.



2018 Pitts Education Award Recipient Report

Katherine Weber
 University of Wisconsin-Madison

This past summer, I completed an externship with the Idaho Fish & Game Department, in which I worked with the state fish veterinarian and the fish pathologists. We conducted disease surveillance tactics during spawning season to maintain biosecurity and prevent the spread of disease throughout the wild populations of chinook and kokanee salmon. Kidney samples were taken from every single fish to screen for bacterial kidney disease, which is vertically transmitted intra-ovum and therefore eggs from positive animals must be culled. We also took kidney and spleen samples as well as ovarian fluids from a representative population of fish for virology screening. Lastly, head wedges were harvested as part of a monitoring program for whirling disease.

While spawning disease surveillance comprised the bulk of my experience with the Idaho Fish & Game, I was able to travel throughout most of the state and view the beautiful scenery. Fortunately for the hatchery managers, there were limited opportunities for diagnostic hatchery visits. The management program within the state has evolved to a progressive system with impressive biosecurity protocols and consistent monitoring from the veterinarian and pathologists with the Fish & Game. I learned a lot about not only the day-to-day activities of the staff, but also the effort it takes to slowly advance a fisheries program with research and adequate communication. It was a great experience and one I will not forget!



WSAVA/CVMA 2019
 16 - 19 July 2019 | Toronto, Canada

Season's Greetings

The WSAVA/CVMA 2019 organizing committee would like to wish you, your families, and your pets a very happy and joyous holiday season. We look forward to a spectacular new year and hope to see you in Toronto!

[Register today](#) and you will save \$260.

2018 Pitts Education Award Recipient Report

Patrawin Wanakumjorn
Kasetsart University, Thailand

First, I would like to thank the 2018 John L. Pitts Aquatic Veterinary Education Awards Program that provided financial support for vet students and new vet graduates. It's my pleasure to be chosen as one of the recipients in 2018.

This award helped me to fund a three-week externship program at Ocean Park, Hong Kong. There are various types of animals at Ocean Park, such as sharks, goldfishes, grass turtles, birds, dolphins, sea lions, and other mammals, so I learned many things from these diverse cases.

Each day I followed the vets to see animals, how they diagnosed, treated, and followed-up on cases. It was my first time to learn how to work with trained marine mammals. Many procedures can be used very well with them; for example, I learned about checking the reproductive system of female dolphins by using ultrasound weekly, taking radiographs to help fill the teeth of a dolphin.



One of the most interesting cases is a zebra shark that had a congenital cataract. The vet team decided to surgically remove it. After the surgery, everything seemed to work well. But many weeks later, it was infected by an unknown source, so I saw many treatments and applications that can be used in fish.



For marine mammals, one of the most important diseases in dolphins is Melioidosis. On the second week, there was one case of a dolphin that got clinical signs very likely to be this disease, so the vet decided to empirically give him antibiotics. Luckily it was not Melioidosis, but I still gained many things by asking the vets and reviewing the cases in the past.



Besides medicine, I learned how to do basic necropsy methods in fishes. Like other animals, first we have to collect history or information about corpses, and it must be kept correctly, to avoid autolysis and any other misleading post mortem change. Then we have to look for external abnormalities before incision to see internal organs. In fishes, skin and gill scraping are basic samples that have to be collected every time. If there is abscess, bacterial culture should be performed. After that, the sample will be sent to the laboratory.

I am much honored to be part of this award. This experience means a lot to me. After finishing these three weeks, I felt more confident. It has awakened my passion to pursue my study in marine mammals and aquatic medicine after my graduation. I really appreciate this opportunity from 2018 John L. Pitts Aquatic Veterinary Education Awards Program and Ocean Park, Hong Kong.



Aquatic Veterinary Abstracts: Salmonids

Compiled by David Scarfe

Selective precipitation reaction: a novel diagnostic test for tissue pathology in Atlantic salmon, *Salmo salar*, infected with salmonid alphavirus (SAV3)

Braceland M, J Tinsley, D Cockerill, R Bickerdike, MF McLoughlin & PD Eckersall (2016). *J. Fish Dis.* (open access publication available at: <http://onlinelibrary.wiley.com/doi/10.1111/jfd.12587/epdf>).

Abstract

While investigating biomarkers for infection with salmonid alphavirus (SAV), the cause of pancreas disease (PD), a selective precipitation reaction (SPR) has been discovered in serum which could be an on-farm qualitative test and an in-laboratory quantitative assay for health assessments in aquaculture.

Mixing serum from Atlantic salmon, *Salmo salar*, with SAV infection with a sodium acetate buffer caused a visible precipitation which does not occur with serum from healthy salmon. Proteomic examination of the precipitate has revealed that the components are a mix of muscle proteins, for example enolase and aldolase, along with serum protein such as serotransferrin and complement C9. The assay has been optimized for molarity, pH, temperature and wavelength so that the precipitation can be measured as the change in optical density at 340 nm (D340).

Application of the SPR assay to serum samples from a cohabitation trial of SAV infection in salmon showed that the D340 in infected fish rose from undetectable to a maximum at 6 weeks post-infection correlating with histopathological score of pancreas, heart and muscle damage. This test may have a valuable role to play in the diagnostic evaluation of stock health in salmon.

Physiological and behavioural evaluation of common anaesthesia practices in the rainbow trout.

Poundera KC, JL Mitchell, JS Thomson, TG Pottinger & LU Sneddon (2018). *Appl. Anim. Behav. Sci.*, 199:94:102.

Abstract

Anaesthetic drugs are commonly administered to fish in aquaculture, research and veterinary contexts. Anaesthesia causes temporary absence of consciousness and may reduce the stress and/or pain associated with handling and certain invasive procedures. The rainbow trout (*Oncorhynchus mykiss*) is a widely-used model species with relevance to both aquaculture and natural ecosystems.

This study sought to establish the relative acute impact of commonly used anaesthetics on rainbow trout when used for anaesthesia or euthanasia by exploring their effects on aversion behaviour and stress physiology. Five widely used anaesthetics were investigated at

two concentrations reflective of common laboratory practices: MS-222, benzocaine, 2-phenoxyethanol, etomidate and eugenol. The anaesthetics were administered via immersion and fish were: 1) euthanised with anaesthetic; or 2) allowed to recover from deep plane anaesthesia; or 3) subjected to a conditioned place avoidance paradigm. Behaviour, opercular beat rate and plasma cortisol concentrations and cortisol release rates to water were quantified to investigate the effects of the five drugs.

Based upon longer induction to deep plane anaesthesia, and increased plasma cortisol levels post-anaesthesia the widely-used and recommended anaesthetic MS-222 may be relatively stressful for rainbow trout. Whereas 2-phenoxyethanol, due to a combination of quicker induction, reduced aversive behavioural response during anaesthesia and lower post-anaesthesia plasma cortisol levels may be a more advisable alternative.

It is crucial for the welfare of fish that the use of anaesthetics is as humane as possible and thus these findings have important implications for the welfare and husbandry of captive rainbow trout.

The efficacy of three types of analgesic drugs in reducing pain in the rainbow trout

Mettam JJ, LJ Oulton, CR McCrohan, LU Sneddon (2011). *Appl. Anim. Behav. Sci.*, 133 (3-4):265– 274.

Abstract

Recent research has shown the possibility of pain perception in fish; therefore, the use of analgesia or “painkillers” should be considered for invasive procedures. However, there is relatively little information on the effectiveness of analgesic drugs nor on the appropriate dose for fish. This study assessed the efficacy of three types of drug: an opioid, buprenorphine, a non-steroidal anti-inflammatory drug (NSAID), carprofen and a local anaesthetic, lidocaine.

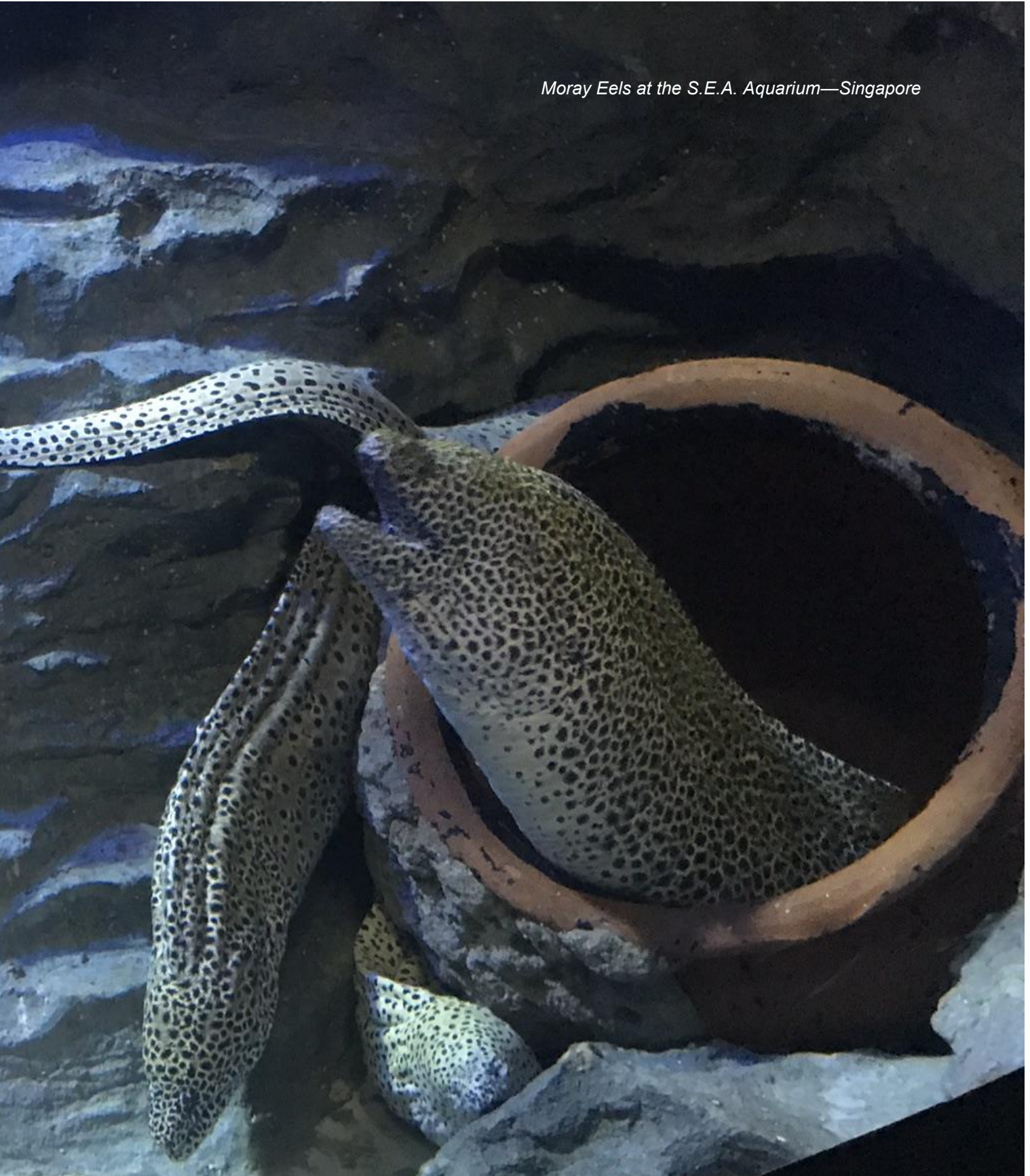
Each drug was tested at three doses on rainbow trout that were noxiously stimulated and the most effective dose was also given to fish experiencing no pain to investigate side-effects. Ventilation rate and time to resume feeding were used as pain indicators, together with the amount of activity and plasma cortisol concentrations to gauge any detrimental side effects.

Buprenorphine at all three doses had limited impact on the fish’s response to a painful stimulus. Carprofen ameliorated effects of noxious stimulation on time to resume feeding but activity was reduced more than by noxious treatment alone. Lidocaine reduced all of the pain indicators measured with the lowest, most effective dose being 1 mg per fish. None of the analgesics led to raised plasma cortisol compared to control groups.

Results of the study indicated Lidocaine was the best analgesic for use in rainbow trout.



Moray Eels at the S.E.A. Aquarium—Singapore



S.E.A. Aquarium—Singapore

While some of the WAVMA officers were attending the WSAVA Conference in Singapore in September 2018, Komsin Sahatrakul, DVM, CertAqV, a veterinarian in the Animal Health Department of S.E.A. Aquarium, offered to give us a behind the scenes tour. The Aquarium is part of the Resorts World Sentosa facility, and we gladly hopped in a cab from the Marina Bay Sands conference hotel to the aquarium on Thursday morning.

The S.E.A. (South East Asia) Aquarium is home to diverse species of marine animals across different habitats where you feel as though you're walking right through the oceans of the world as you gaze at more than 100,000 marine animals of over 800 species. The S.E.A. Aquarium journey takes you through 49 habitats in the 10 zones, which feature the Open Ocean, Red Sea, East Africa, and the South China Sea, to name a few, all of them are home to exotic species that are taken care of exquisitely in these replicas of their natural habitats.

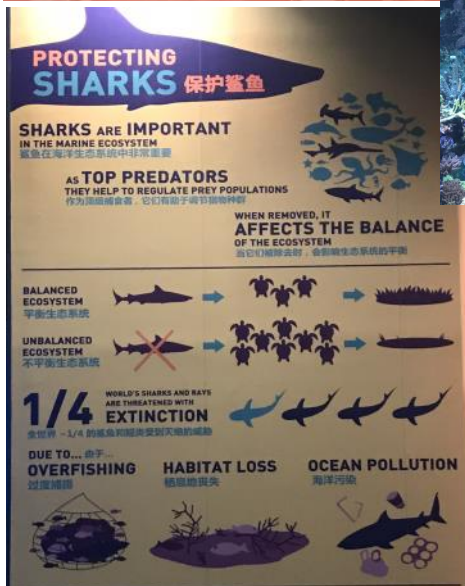
The aquarium's centerpiece display is the Open Ocean Habitat, featuring a viewing panel measuring 36 meters in width and 8.3 meters in height – a spectacular window into a serene blue world teeming with marine animals including manta rays and giant groupers as well as schools of many species of fish, truly replicating what the deep ocean looks like. In fact, since the Open Ocean Habitat is a registered diving site, you'll even be able to see divers swimming around and interacting with the marine life.

Devon Dublin, Komsin Sahatrakul, David Scarfe, Julius Tepper and Terry Tepper at the Open Ocean Habitat.

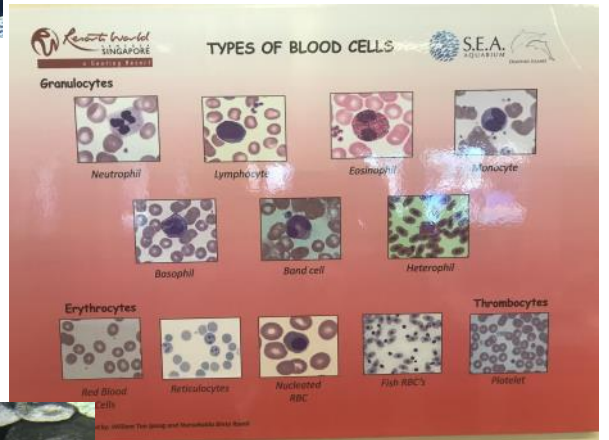


The Aquarium has an impressive collection of moray eels. See pages 26-27 in this issue and Case Report in TAV 10(4) pages 40-43.





Some of the displays and signage, along with the inhabitants of the S.E.A. Aquarium – Singapore, seen by Devon Dublin, Julius Tepper, David Scarfe, our guide Komsin Sahatrakul, and Nick Saint-Erne, in the above right photograph.



Resorts World at Sentosa Pte. Ltd.
8 Sentosa Gateway, Resorts World Sentosa,
Singapore 098269
<https://www.rwsentosa.com/en/attractions/sea-aquarium/explore>



**WAVMA Wetlab Workshop at WSAVA
 Was Wonderful**
 By Nick Saint-Erne

As part of the 43rd World Small Animal Veterinary Association Congress in Singapore, WAVMA sponsored an Aquatic Medicine Wetlab on Monday, September 24, prior to the start of the congress programs. Drs. Richmond Loh, Julius Tepper and Nick Saint-Erne presented the daylong wetlab, held at the Temasek Polytechnic School, through the courtesy of Dr. Diana Chan, Head of the Centre for Aquaculture and Veterinary Science at the school.

Following the wetlab, Dr. Chan provided us with a tour of the Aquaculture facility at the school, with its advanced holding tanks and filtration systems manufactured by Apollo Aquaculture Group, based in Singapore. The wetlab was very successful with lots of great interaction between the teachers and participants.

We also presented two days of lectures at the general sessions of the WSAVA Congress on Tuesday and Friday.

*Below:
 Dr. Nick Saint-Erne explaining water quality
 parameters to the wetlab participants.*



The program started with check-in at 9:00 and lectures beginning at 10:00 and the lab continuing until 16:00. Over 20 veterinarians and college students attended the wetlab. The wetlab provided lectures introducing each topic, then a demonstration of the technique, followed by participants doing the procedure themselves on koi fish from the centre's Aquaculture facility.

The topics covered were:

Water Quality Testing - Nick Saint-Erne
 Aquatic Systems and Filtration - Julius Tepper
 Fish Anesthesia - Nick Saint-Erne
 Fin, Gill and Skin Mucous Biopsies - Richmond Loh
 Blood Sampling Techniques - Julius Tepper
 Necropsy and Sample Collection - Richmond Loh
 Question and Answer Session—All

Wetlab participants testing water quality.





Wetlab session photos

Clockwise starting from top left:

*Lin Mingfa (Apollo Aquarium Group),
Nick Saint-Erne, Julius Tepper,
and Richmond Loh.*

*Richmond Loh describing how to make
a wet mount from biopsy samples.*

*Julius Tepper demonstrating blood
sampling techniques. Richmond Loh
looking on*

*Diana Chan discussing the Aquacul-
ture Centre's fish systems with
Richmond Loh.*

*Necropsy samples removed from
an euthanized koi.*



AVMA Humane Endings Symposium
By Nick Saint-Erne

Following the success of the 2014 symposium, the American Veterinary Medical Association held a second Humane Endings Symposium in Rosemont, Illinois on November 2-4, 2018. The Welcome speech was presented by the AVMA President-elect, Dr. John Howe, (photo to right) who is a WAVMA member and was recently Certified as an Aquatic Veterinarian through our certification program (see page 9). In addition to Dr. Howe, aquatic veterinary medicine was represented by lectures given by Stephen Smith, Craig Harms, and Nick Saint-Erne (shown in photograph below in that order).



In the scientific literature, there are several variations describing sequential stages of anesthesia in fishes but all have significant similarities (McFarland, 1959; L. Brown, 1993 Stoskopf 1993; Ross 1999, 2001; Saint-Erne 2017). Although in theory these stages appear to be straightforward, in practice because of differences between fish species with regard to size, morphology, physiology and behaviors, inter- and even intra-stage differences can sometimes be a challenge to distinguish or assess. However, with euthanasia, because the desired endpoint is death, the ultimate measure of a successful death is non-survival after a given time frame.

The 2018 AVMA Euthanasia Guidelines Update for fish euthanasia using immersion in anesthetic solutions recommend that fish should be left in the anesthetic solution for a minimum of 30 minutes after cessation of opercular movement. Euthanasia by immersion techniques may be inadequate for some hypoxia-resistant fish species and a secondary adjunctive method is recommended to be used once the fish is completely anesthetized.

Later that afternoon, Stephen Smith discussed Depopulation of Fish. Depopulation is different from euthanasia (humane death) and is the rapid destruction of a population of animals in response to urgent circumstances, with as much consideration for the welfare of the animals as practicable.

Reasons for depopulation include: foreign animal disease control, stopping the spread of highly contagious diseases, ending suffering in severely ill animals, protecting public health from contaminated food supply, preventing zoonoses, and protecting the environment.



On Saturday afternoon, Nick Saint-Erne gave a presentation on Fish Pain, Sentience and Euthanasia. This covered some of the current research on fish pain sensations and sentience, then went into the approved methods of euthanasia for fish, as well as research being conducted using Metomidate for fish euthanasia. Some of the information from this talk is on page 35 in this issue. Below is a chart from the lecture describing the Stages of Anesthesia in Fish:



| <u>Stage</u> | <u>Plane</u> | <u>Description</u> | <u>Signs</u> |
|--------------|--------------|--------------------------|--|
| 0 | 0 | Normal | Swimming actively, equilibrium normal |
| I | 1 | Light sedation | Reduced motion, ventilation decreased |
| I | 2 | Deeper sedation | Motionless unless stimulated |
| II | 1 | Light anesthesia | Partial loss of equilibrium |
| II | 2 | Deep anesthesia | Total loss of equilibrium |
| III | 1 | Surgical anesthesia | Total loss of reactivity when stimulated |
| III | 2 | Deep surgical anesthesia | Decrease in respiratory and heart rates |
| IV | 1 | Medullary collapse | Cessation of respiratory movements |
| IV | 2 | Cardiac arrest | Death |

*Reprinted from:
Saint-Erne, Nick. 2017.
"Common Exotic Pets –
Tranquilization,
Anesthesia, Analgesia
and Euthanasia,"
Laboratory and Exotic
Animal Medicine Course;
Midwestern University
College of Veterinary
Medicine.*

The preferred methods of depopulating fish include using AVMA recommended euthanasia and slaughter methods, such as anesthetic immersion or injections, physical methods and electrocution that causes immediate unconsciousness and death. Other methods that can be used in certain circumstances include CO₂, including producing CO₂ in the water by adding dry ice, and hypothermal shock (in an ice slurry bath) for species that are not cold tolerant. It is not recommended to use toxic chemical or dewatering (removal of aquatic animals from the water resulting in suffocation) for depopulation.

Craig Harms gave an entertaining and informative talk on the dos and don'ts of euthanizing large marine mammals: specifically whales. A point that many would not consider is that there may not be enough volume of injectable euthanasia solution readily available for use with a stranded large whale! Other challenges in whale euthanasia include the public's expectations, the hazards of working with that large of an animal while in the surf, and calculating and obtaining the appropriate drug volume.

Many of the stranded marine mammals have some disease condition already, and death can occur within hours of stranding, but sometimes it is many days later. The options are to try to put it back in the water to save it (if it otherwise appears healthy), to put it out of its misery, which may entail use of firearms and explosives, or to let it die naturally. The use of euthanasia drugs can also present an environmental hazard if the corpse is allowed to return to the sea or decay on the beach.

Keep the whale alive and comfortable while awaiting rescue includes keeping the blow hole clear of sand and debris, protecting it from scavengers and the sun, preventing desiccation by keeping it wet and cool, and maintaining postural orientation. If it turns out that the animal is too debilitated to survive, or there is no viable means of rescue, then humane death using euthanasia methods is warranted.

The protocol for administering euthanasia drugs in a large whale is sequential doses of Midazolam, Acepromazine, Xylazine, all given intramuscularly to induce sedation, followed by intracardiac injection of potassium chloride (KCl) to stop the heart. The cost for just the drugs in the case of euthanizing a large whale can be over \$500.



2018 WAVMA President Dr. David Scarfe also attended the AVMA Humane Endings Symposium, here pictured with Nick Saint-Erne.

In addition to the highlighted speakers, there were many other lectures covering euthanasia, slaughter and depopulation methods of laboratory animals, food animals, pets and wildlife. Temple Grandin lectured on "Determining Insensibility at the Slaughter Plant," which included this topic:

Stages of Stunning (insensibility to pain)

- Normal
- Loss of balance
- Loss of posture
- Unconsciousness
- Brain Death

Prior to butchering of any animal there should be no corneal reflex present to ensure there is brain death.



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](#)

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

Euthanasia of fish eggs, amphibian eggs and tadpoles

Hi everyone,

I am currently putting together a new section of our organisation's euthanasia protocol, focusing on humane euthanasia methods for (embryonated) fish eggs, amphibian eggs and tadpoles. We previously haven't had a section for these creatures, but we'd like to be able to perform euthanasia as humanely for them as we do in our other species.

My experience in euthanising this group of animals is currently limited, so I would love to hear what others are currently doing these days, in terms of anaesthesia, euthanasia, and confirmation of death. Any protocol suggestions or general thoughts on the topic are welcome!

Histopathology-friendliness would be ideal, since disease monitoring is a strong focus (especially for our endangered frog breeding programs). However, welfare is our primary objective. Cost is not so important.

Thank you enormously in advance!
 Kind regards,

Chris Cheng BVSc, MAntSc, MVSc (Microbiology),
 MANZCVS (Medicine of Zoo Animals)
 Veterinarian—Healesville Sanctuary and Melbourne Zoo (Zoos Victoria)
 Melbourne, Victoria, Australia

Hi Chris,

We euthanize zebrafish embryos < 8 dpf (days post-fertilization) by rapid chilling in 4° C ice slurry for 20 minutes followed by bleach (6.15%) 1:5 solution. This is an AVMA approved method for tropical species. Instead of bleach as the secondary method which is necessary for embryos < 3 dpf, you could put them in a fixative after the ice bath. For *Xenopus* tadpoles, we use MS-222 1000 mg/L for 15 minutes. Here is a good resource:

<https://www.avma.org/KB/Policies/Documents/euthanasia.pdf>

Lisa Abbo
labbo@mbl.edu

Hi Lisa,

Thank you so much. That is very helpful. Can I ask if you have a preferred method of confirming death after euthanasia? I was thinking that we could place the specimens under a dissecting microscope to confirm that the heart has stopped (of those far enough developed to have a heart). We would be dealing with a relatively small number of animals in each case. Does that sound like a plausible method?

Kind regards,
Chris Cheng

Hi Chris,

I cannot say that I have looked at an embryo under the microscope after euthanasia, but the rationale behind the secondary method is to ensure death. In animals with visible opercula movement, we consider 10 minutes with no opercula movement confirmation, or 20 minutes if they are < 8 dpf. We then place animals into a freezer or fixative, so we don't have to worry that they will recover.

In general, for fish and amphibians, their hearts will beat for a long time after death and even after it has been removed from the body and is sitting isolated on the table, so the presence of a heartbeat in these species is not a reliable indicator of life.

Lisa Abbo
labbo@mbl.edu

Euthanasia method for crayfish

Hello,

I'm hoping someone can advise me on a humane killing method for signal crayfish research animals; consistent with the AVMA Guidelines policy recommending a 2-step method for aquatic invertebrates.

Christine MacWilliams DVM MSc
 Fish Health and Research Veterinarian
 Fisheries and Oceans Canada
 3190 Hammond Bay Road, Nanaimo, BC V9T 6N7
 Ph/fx: [250-729-8377](tel:250-729-8377) / [250-756-7053](tel:250-756-7053)
christine.macwilliams@dfo-mpo.gc.ca

Anesthesia with MS-222 or Aqui-S then pithing or freezing seems reasonable.

Aimee Reed DVM PhD CertAqV DACVM
 Senior Fish Pathologist,
 Oregon Department of Fish and Wildlife
 Fish Health Services
 Oregon State University
 Nash Hall 548
 Corvallis, OR 97331
 Office 541-737-1857
aimee.reed@oregonstate.edu
aimee.n.reed@state.or.us

I've found a dose for TMS (MS-222) of 1–4 g/L for immobilization, but I've got anecdotal reports from researchers that TMS doesn't work well, and magnesium chloride is also not recommended in crustaceans. There's an article that recommends clove oil or AQUI-S for immobilization prior to splitting, but our research facility prefers not to use clove oil due to OHS concerns (potential carcinogen) and AQUI-S is not approved/readily available in Canada.

Christine MacWilliams DVM MSc
christine.macwilliams@dfo-mpo.gc.ca

Dear all,

We will be conducting an eradication program in our river basins in Portugal for the crayfish, *Procambarus clarkii*, currently listed as an invasive species. The National Veterinary authority does not require specific methods for euthanasia for this animal species, but still we would like to do it in the most humane way possible for a field-based operation.

I would be very grateful regarding any input you can have on euthanasia on this type of species.

Best regards,

Miguel Grilo

Faculty of Veterinary Medicine
 University of Lisbon, Portugal
miguelgrilo@fmv.ulisboa.pt




For more information on euthanasia, please see the 2014 AVMA Animal Welfare Symposium Proceedings: <https://www.avma.org/Events/Symposiums/HumaneEndings/Pages/default.aspx#LabAquatic>

Recordings of the presentations are available to watch for free for members of the American Veterinary Medical Association. There are several videos related to aquatic animal euthanasia, including:

How to (more humanely) kill laboratory fish

Presented by Daniel Weary

<https://www.avma.org/Events/Symposiums/HumaneEndings/Pages/How-to-more-humanely-kill-laboratory-fish.aspx>

| | |
|--|---|
| <ul style="list-style-type: none"> • Tricaine mesylate/TMS/MS-222 – Widely used anaesthetic; CCAC states that TMS “causes no signs of stress” and is the recommended method for fish euthanasia • Metomidate /Aquacalm™ – Not as commonly used; literature indicates it is rapid-acting and highly effective • Clove oil – Not as commonly used; literature indicates it is rapid-acting and highly effective |    |
|--|---|

**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.

Methods of Euthanasia in Fish

By **Nick Saint-Erne**, DVM CertAqV

2018 AVMA Humane Endings Symposium Presentation

Immersion – Intentional overdose via immersion of fish in anesthetic solutions. Recommend using a minimum of 10 times the anesthetic dose when used for euthanasia. Fish should remain in the anesthetic solution for a minimum of 30 minutes after cessation of opercular movement. Adjunctive methods can be used to ensure death. There are currently no drugs approved by the FDA for euthanasia of fish in the U.S.

- Benzocaine
- Carbon dioxide
- Ethanol
- Eugenol, Isoeugenol
- Isoflurane, Sevoflurane
- Quinaldine
- Tricaine Methane Sulfonate
- 2-phenoxyethanol
- Lidocaine (zebrafish)

While Metomidate has been used for euthanasia of some finfish species, its listing in the Index of Legally Marketed Unapproved New Animal Drugs for Minor Species by the FDA (with a specified use for sedation and anesthesia) means that its extra-label use for euthanasia is currently prohibited for general use by veterinarians.

Injection – Injectable agents administered for euthanasia via intravenous, intracoelomic, intramuscular, and intracardiac routes. Dosages for all drugs are listed in the AVMA Guidelines.

<https://www.avma.org/KB/Policies/Documents/euthanasia.pdf>

- Pentobarbital
- Ketamine followed by a lethal dose of pentobarbital
- Ketamine:medetomidine followed by a lethal dose of pentobarbital
- Propofol followed by a lethal dose of pentobarbital

Physical Methods – Results in rapid loss of neuronal transmission

- Decapitation followed by pithing (2-step)
- Cervical transection followed by pithing (2-step)
- Blunt force trauma (cranial concussion) followed by pithing or exsanguination (2-step)
- Captive bolt to cerebrum and brainstem
- Maceration
- Rapid chilling – zebrafish and small tropical fish

Exsanguination, stunning, or pithing are not recommended as a sole means of euthanasia, but may be considered as adjuncts to other agents or methods.

Adjunctive Methods—Decapitation, pithing, freezing, and other physical or chemical methods for destroying brain function may be used as the second step of a 2-step procedure when fish have been rendered unconscious prior to their application by a first-step method.

Detection of Ostreid Herpesvirus 1 microvariant DNA in aquatic invertebrate species, sediment and other samples collected from the Georges River estuary, New South Wales, Australia

By Olivia Evans

Australian Government Department of Agriculture and Water Resources

(Adapted from *Animal Health Surveillance Quarterly* (Australia), 2018, 23(1): 14-16.)

Microvariant genotypes of Ostreid Herpesvirus 1 (OsHV-1) cause the disease Pacific oyster mortality syndrome (POMS). OsHV-1 was first detected in Australia in commercially cultivated triploid and wild diploid Pacific oysters (*Crassostrea gigas*) in Woolloomare Bay in the Georges River estuary, New South Wales, in November 2010. Both wild and cultivated populations experienced greater than 95% mortality. OsHV-1 related mass mortality was later confirmed in wild diploids in the Parramatta River, Sydney, in February 2011. In January 2013, OsHV-1 was detected in dead and diseased Pacific oysters in the Hawkesbury River estuary, approximately 40 km north of Sydney. Once major sites for the commercial production of Pacific oysters in New South Wales, farming has now ceased entirely in these affected estuaries due to the recurrent seasonal disease caused by OsHV-1.

In 2016, OsHV-1 was detected during an epizootic in south-east Tasmania, and most recently, it was detected in wild Pacific oysters in the Port River, South Australia.

OsHV-1 presents a serious threat to the Australian Pacific oyster industry. Larval oysters and oysters younger than 12 months are the most susceptible age classes in the production cycle; losses of 60 to 100% have been reported in Australia and Europe (where OsHV-1 has caused Pacific oyster mass mortalities since 2008). Of concern is the propensity for mortality due to OsHV-1 to recur annually in farmed Pacific oysters. However, the source of the virus in recurrent outbreaks remains unclear.

Evans et al. (2017) investigated the role that wild hosts in the Australian seashore population may play in the transmission of OsHV-1 by confirming the presence or absence of OsHV-1 in a range of opportunistically sampled aquatic invertebrate species inhabiting the Georges River estuary. Viral loads and prevalence of OsHV-1 were measured to identify which species may be of importance.

Before this study, interspecies transmission of OsHV-1 had not been investigated in Australian estuaries. Reference strain *Ostreid herpesvirus-1* (OsHV-1 ref) and related variants have been detected in several aquatic invertebrate species in Europe, Asia and the United States, suggesting that reservoir hosts of ostreid herpesviruses may exist and

that interspecies transmission may be possible. In Europe, OsHV-1 ref and another variant OsHV-1 var were detected in association with sporadic high mortalities in larval grooved shell clams (*Ruditapes decussatus*), larval Manila clams (*Venerupis philippinarum*) and larval French scallops (*Pecten maximus*). Indeed, naïve larval scallops and naïve larval oysters were infected with OsHV-1 var when exposed to a semi-purified tissue homogenate from larval scallops infected with OsHV-1 var; suggesting that both intra- and inter-species transmission of OsHV-1 may be possible. However, the role these species have in the transmission or persistence of OsHV-1 in the field is unknown.

In China, the closely related acute viral necrosis virus (AVNV) and OsHV-1-SB have been detected during mass mortalities of Zhikong scallops (*Chlamys farrerri*) and blood clams (*Scarpharca broughtonii*), respectively. OsHV-1 was also detected in adult Portuguese oysters (*C. angulata*) during mass mortalities in the Ria Formosa estuary in Portugal.

For their study, Evans et al. (2017) opportunistically sampled a range of aquatic invertebrates, sediment and other samples from eight sites in the Georges River estuary (Figure 1 and Table 1) on six separate occasions from October 2012 to April 2013. Sites included a variety of habitats to ensure a diverse range of samples was collected: commercial oyster leases, natural oyster reefs, mangroves, sandy intertidal beaches and urban sites such as boat ramps and jetties. Samples were tested for OsHV-1 DNA using real-time quantitative PCR assay. The prevalence of OsHV-1 was calculated for each species, at each site and time of collection.

Figure 1: The location of the eight sampling sites within Woolloomare Bay and the Georges River estuary, New South Wales, Australia (star symbol indicates a sampling site)



| Species (or sample type) | OsHV-1 detected | Sites of detection | Highest viral load (DNA copies per mg tissue ± std dev) | Prevalence |
|--|-----------------|--|---|------------|
| Pacific oyster (<i>Crassostrea gigas</i>) | Yes | A, B, C, Gwawley Bay, Oyster Bay, Lime Kin | 6.74 x 10 ² ± 1.29 x 10 ⁰ | 0.03-0.68 |
| Sydney rock oyster (<i>Saccostrea glomerata</i>) | Yes | A, B, C, Gwawley Bay, Oyster Bay, Lime Kin | 6.8 x 10 ¹ | 0.06-0.43 |
| Sydney cockle (<i>Anadara trapezia</i>) | Yes | A | bloq ^a | 0.00-0.03 |
| Mussels (<i>Mytilus</i> spp.) | Yes | A | bloq ^a | n/a |
| Hair mussel (<i>Trichomya hirsuta</i>) | Yes | A | bloq ^a | 0.129 |
| Pipis (<i>Amesodesma</i> spp.) | No | Not detected | Not detected | - |
| Whelks (<i>Batillaria australis</i> / <i>Pyrazus ebeninus</i>) | Yes | A | bloq ^a | 0.021 |
| Gastropods (<i>Littorina</i> spp.) | No | Not detected | Not detected | - |
| Conch (Family Strombidae) | No | Not detected | Not detected | - |
| Barnacles (<i>Balanus</i> spp.) | Yes | A | bloq ^a | 0.02 |
| Crab (<i>Scylla</i> spp. / <i>Portunus</i> spp.) | No | Not detected | Not detected | - |
| Flat worm (<i>Pseudostylochus</i> spp.) | Yes | Not detected | Not detected | - |
| Brown macroalga (Class Phaeophyceae) | Yes | C | bloq ^a | n/a |
| Unidentified sediments | Yes | A | bloq ^a | n/a |
| Unidentified seabird excrement (urates and faeces) | No | Not detected | Not detected | - |

Table 1: (left) Results of real-time quantitative PCR analysis for the detection of OsHV-1 DNA in a range of aquatic invertebrates, brown macroalga and sediment samples collected in the Georges River estuary, New South Wales

Figure 2: (below) (a) Pacific oyster, (b) Sydney rock oyster, (c) Sydney cockle, (d) whelks, (e) gastropods

^a Samples positive for OsHV-1 DNA but with viral concentrations below the quantification limit of the qPCR assay (< 12 DNA copies per PCR reaction) were classified bloq.

OsHV-1 DNA was detected in samples of wild Pacific oyster, Sydney rock oyster, Sydney cockle, mussels (*Mytilus* spp. and *Trichomya hirsuta*), whelks and barnacles collected from several sites between October 2012 and April 2013. OsHV-1 DNA was also detected in a single brown macroalga sample and in two of 13 mangrove sediment samples collected in November and December 2012, respectively. OsHV-1 was not detected in any pipi, small gastropod, conch, flatworm, crab or bird excrement samples.

Viral quantities in non-ostreid species were consistently low, as was the prevalence of OsHV-1 DNA detection (Table 2). Viral concentrations were highest in wild Pacific oysters and Sydney rock oysters but varied according to the species, site and time of collection. The prevalence of detectable OsHV-1 DNA in these oysters reached approximately 68% and 43%, respectively, at least once during the study.

These two oyster species may be important to the transmission or persistence of OsHV-1 in OsHV-1 endemic estuaries. It is unclear whether OsHV-1 was actively replicating in the tissues of any species, as the low viral quantities meant that techniques such as in situ hybridization could not be used to localize the virus.

Seawater acts as a medium for the transmission of OsHV-1. Thus, it is possible that organisms and samples with low levels of detectable virus were contaminated by OsHV-1 that had been filtered or adsorbed from seawater.



Further structured longitudinal field studies in combination with laboratory-based infection trials are required to fully understand whether the species identified in this study are susceptible to OsHV-1, whether transmission between these species is possible and what role they may play in the transmission and persistence of OsHV-1 in endemically infected Australian estuaries.

Understanding which species may become infected with OsHV-1 will allow for thorough prevention and management strategies to be developed. These strategies, in combination with advances in oyster husbandry and genetics, may allow Australian farmers to continue Pacific oyster production in OsHV-1 endemic estuaries.

Reference

Evans O, Paul-Pont I & Whittington RJ 2017. Detection of Ostreid Herpesvirus 1 microvariant DNA in aquatic invertebrate species, sediment and other samples collected from the Georges River estuary, New South Wales, Australia, *Diseases of Aquatic Organisms* 122: 247–255.



*Emily Karwacki encounters a salamander during field work on testing for *Perkinsea*.
Credit: University of Central Florida.*

Scientists get new tool to track new pathogen killing frogs

August 14, 2018: University of Central Florida

An undergraduate researcher has developed a method to screen frogs for an infectious disease that has been linked to mass die-offs of frogs around the world. Thanks to her method, scientists will be able to track the disease and try to figure out why it is triggering the deaths.

Emily Karwacki, who recently earned her biology degree from the University of Central Florida, didn't set out to track the deadly pathogen *Perkinsea*, but after landing a research spot in Assistant Professor Anna Savage's lab, she was set with the task of trying to test for the disease. Frogs, which are indicators of environmental changes, have been dying off in mass quantities. They are also an important part of the food chain. Without frogs, many other species would die, Savage said. Scientists have narrowed down what's most affecting frogs to three pathogens, including *Perkinsea*.

"Not a lot of people have studied *Perkinsea* because it has only recently been identified," Karwacki said. "It's different from other diseases because of the way it attacks the host."

The pathogen enters the frog through the skin or may be ingested through its mouth. Scientists know it goes straight to the liver, embedding itself, before moving onto the rest of the tissue. It spreads and then the frog dies.

Karwacki, along with Savage and doctoral student Matt Atkinson, suspected that *Perkinsea* was killing frogs in Central Florida, but the researchers needed a way to test for it first. Karwacki was tasked with creating the molecular test. The method is called qPCR, but because *Perkinsea* was newly discovered, there wasn't enough genetic data to make a specific test. Karwacki had to create what's called a primer pair, and match it with a DNA sequence of *Perkinsea*, to get the qPCR test to work. Karwacki was the first to do this for *Perkinsea* and her work was recently published in the journal *Diseases of Aquatic Organisms*.

Using Karwacki's qPCR assay, the team of researchers found that 25 percent of the frogs they sampled tested positive for the pathogen. Karwacki's method will now allow researchers all over the world to test for the disease.

After graduating this summer, she is working on a new study, swabbing frog tissue samples at the Florida Museum of Natural History in Gainesville. She's swabbed more than 900 samples, and has found that *Perkinsea* dates back to 1922. This proves the disease has been in frog populations before, and scientists are trying to figure out why it's only now killing off large numbers of frogs.

Article provided by University of Central Florida.

Portable Digital Microscope



The only pocket-sized microscope that delivers
1 micron resolution (400x magnification)



The ioLight microscope displays laboratory quality images onto any smart phone, tablet or computer. Beautiful images can be viewed and shared instantly by the whole team. The microscope folds to fit a jacket pocket and can be used anywhere: on farms, in classrooms or even in the jungle.

- Laboratory quality images and video displayed on smart phone, tablet or computer
- 1 micron resolution for beautiful images of cells
- x200 magnification on an iPad - zoom to x400 or more
- Folds to fit your jacket pocket - take it anywhere
- Uses standard microscope slides and cover slips
- Top and bottom illumination to light any sample



ioLight

CONTACT

✉ info@iolight.co.uk

🌐 iolight.co.uk

Salmon Farming in Chile at a Glance

by **Claudia Venegas**

Scientific Coordinator/Station veterinarian VESO Chile

The geography in Chile provides opportunities for the production and exploitation of many natural resources. Historically the Chilean economy has been based in exports accounting for 35% of the gross domestic product and mining is undoubtedly the main export income in the country. The growth of earnings in fisheries and aquaculture sectors has been rapid since the early 1980s as Chile has exploited its comparative advantage in environmental endowment and low labor costs on the global market. The salmonid cultivation is restricted to regions with appropriate water temperature ranges in both fresh and seawater environments, sheltered waters and, most critically, excellent water quality. Thus, salmonid aquaculture has become an important activity and mainly developed in the southern regions of Chile. The Chilean salmon industry has shown a fast development over the last 30 years and today Chile is the largest producer of farmed rainbow trout and Coho salmon, and the second largest producer worldwide of Atlantic salmon.



The success of the salmon aquaculture in Chile has been the product of the appropriate assimilation of foreign technologies and development of local technological capabilities. Although national investors played a major role in the early development phases of the industry, the entry of large foreign companies in the last two decades has facilitated the introduction of technologies, increased production, vertical integration, merging and increasing the size of companies. This industry has also contributed to the general development of the economically depressed and rural regions in southern Chile.

Although the Chilean salmon aquaculture has performed an astonishing development over the last 30 years, there have been severe knowledge gaps before and during the devastating biosecurity crisis caused by the infectious salmon anaemia virus (ISAv) outbreaks that nearly led to a collapse of the industry. The ISAv crisis may not be exclusively related to the rapid



spread of a highly virulent pathogen. Prior to the ISAv outbreak, the industry struggled with serious Caligidosis (Sea lice, *Caligus rogercresseyi*) and Piscirickettsiosis outbreaks. Among diseases, Piscirickettsiosis, caused by the intracellular bacterium *Piscirickettsia salmonis*, has been present in the salmon farming sector since 1989, when first described. Since that time this pathogenic agent has been causing serious problems both directly through cumulative mortalities and through the use of antibiotics for treatments.

Huge efforts have been made by the Chilean salmon industry to reduce the use of antibiotics towards a more sustainable practice. The sanitary authority has also triggered a program with this focus leading to promote antibiotic free certification for sea sites where salmon are grown. This is a commitment of the industry and professionals who work in this area, with focus on the One Health concept in order to promote prudent and responsible use of antimicrobial agents to reduce antibiotic resistance with potential effect in the interface between animal-environment-human and emerging or re-emerging of pathogens. On this behalf, the regulatory authority has made funds available to perform local research to generate basic and applied knowledge to fight the main diseases struggling the sector – Piscirickettsiosis and Caligidosis, promoting interdisciplinary research and international collaboration to take informed and scientifically based decisions in terms of regulations.





After spending days aground in Sitka, a sea lion returns to the water – with help from humans

Author: **Michelle Theriault Boots**

Published September 3, 2018 [Alaska News](#)

An improvised rescue mission involving a front-end loader and tranquilizer darts returned a desperate and dehydrated sea lion that had spent four days meandering around Sitka to the ocean Monday.

"It's a good outcome," said Julie Speegle of the National Oceanic Atmospheric Administration. "He was last seen catching a fish."

The four-day misadventure appears to be a one of a kind event for a Steller sea lion in Alaska: Scientists say they don't know of any other similar instances of a sea lion hauling out in a populated area for days in Alaska.

First seen humping down a road near Sitka's hospital early Friday morning, the Steller sea lion had spent most of the past two days hiding in the woods. Scientists tried to encourage him to travel the quarter-mile to the ocean on his own, but those attempts failed. By Monday, things were getting desperate.

Sea lions can haul out on rookeries for days "with no problem" said Kim Raum-Suryan of NOAA's protected resources division. But the sea lion was stressed and had no access to water beyond mud puddles, she said.

Finally, the scientists decided that it would be safest to sedate the sea lion and put in place a rescue mission that involved marine mammal experts as well as volunteers from the Southeast Alaska Regional Health Consortium and other agencies.

Volunteers from SEARHC with a front-end loader pushed down trees in a stand of alder to clear a path to the sea lion. Then, at about 1 p.m. Monday, a NOAA veterinarian darted the sea lion, who was resting in the alders, Raum-Suryan said.

Once they were confident the more than 1,500 pound animal was asleep, the rescuers gently rolled the sleeping sea lion into the bucket of the front-end loader, and from there into the back of a flatbed truck. Rescuers drove the animal to Sitka's harbor.

Officials dotted the animal with pink paint on his head and used Clairol hair dye to mark a number on his side to allow for tracking after release, she said.

Experts to start capturing rare vaquita porpoises in Mexico

By Mark Stevenson | AP

The Americas—Washington Post

MEXICO CITY — U.S. Navy-trained dolphins and their handlers arrived in Mexico to participate in a last-ditch effort to catch, enclose and protect the few dozen remaining vaquita porpoises to save them from extinction. Mexican authorities and an international group of experts say they will set out on Oct. 12 in a fleet of small boats to find the critically endangered and elusive marine mammals with the assistance of the dolphins.

Mexican Environment Secretary Rafael Pacchiano said the U.S. government "has been a great ally in this process, in this unprecedented project."

Experts acknowledge the catch-and-enclose plan is risky; breeding in captivity has successfully saved species such as the red wolf and California condor, but the vaquita has only been scientifically described since the 1950s and has never been bred or even held in captivity.

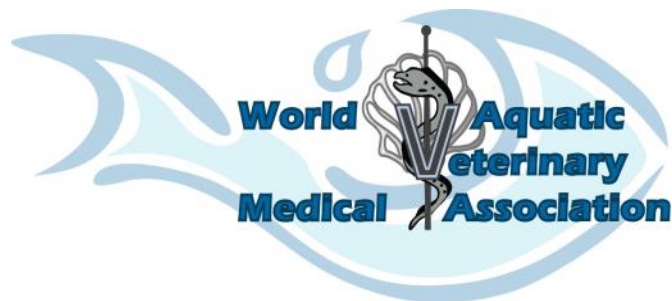
"The group of dolphins is trained to help us identify where the vaquitas are, so that once they are located, the group of scientists and veterinarians can capture them and take them to a sanctuary that is almost completely built," Pacchiano said. The sanctuary is expected to be some kind of floating pen or net enclosure in a protected bay.

"The idea is to keep these vaquitas we capture in a safe, restricted space so that we can look at how to reproduce them and eventually recover the population, and eventually release them," he said.

The dolphins will use their natural sonar to locate the extremely elusive vaquitas, then surface and advise their handlers, said Fallin. The dolphins have been trained by the Navy for tasks like locating sea mines.

Despite Mexico's campaign to help the species, which are the world's smallest and rarest type of porpoises, and live only in the Gulf of California, the number of remaining vaquitas is estimated to have dropped below 30. Vaquitas are often caught in nets illegally set to catch totoaba fish, whose bladder is prized in China. Mexico enacted a permanent ban on gillnet fishing in the northern Gulf of California earlier this year.

Elsewhere, far off Mexico's western Pacific coast, the head of the country's nature reserves commission said Thursday that all fishing would be banned in territorial seas around the Revillagigedo Islands, located more than 400 miles (650 kilometers) from the coast. Commission head Alejandro Del Mazo Maza said the ban imposed on the 57,175 square-mile (148,087 square kilometer) reserve would create the largest unfished marine park in North America.



Firing a dart into a wild, sick orca ‘a little bit different,’ says sharp-shooting veterinarian

By **Lynda V. Mapes**

Seattle Times environment reporter

Updated September 6, 2018

Martin Haulena, head veterinarian at Vancouver Aquarium, fires a needle-tipped dart at ailing orca J50 on Monday, as seen from a frame from his GoPro footage of the encounter. (courtesy of Martin Haulena)



Ailing orca J50 isn't faring well, but an international group of scientists is working to save her, including sharp-shooting veterinarians. They've administered medicine to the whale over the past month.

Sighting down the barrel of his rifle, Martin Haulena took careful aim. It was a tricky shot, kneeling in the bow of a moving boat, in pursuit of a moving and fragile target: J50, a critically endangered southern-resident killer whale, swimming nestled among her family members Monday.

Dr. Haulena is part of a team of veterinarians, biologists and other experts trying an unprecedented intervention to save a wild young orca, feared to be near death. If his shot comes in too hard, he could embed the needle-tipped dart in her flesh, doing more harm than good. Shoot too soft, and the dart wouldn't fly true. Miss and he could hit her dorsal fin, where the medicine in the dart would hit a dead end.

He fired, letting loose the 30-centimeter-long dart, loaded with antibiotics, from the CO2-powered rifle, a DanInject, used by veterinarians all over the world for remotely injecting animals, from bears to white-tailed deer to giraffes. A sea-lion expert himself, Haulena has darted plenty of entangled sea lions, to anesthetize them so he can disentangle them from debris. But a wild, moving killer whale? That was a first.

His aim was true: With a thwack, the needle sailed from the rifle and stuck, right where he wanted. And while there was a bit of a blowout, with some of the medicine leaking, he got a good dose into the whale, who swam right on, seeming not even to notice, according to video of the intervention captured on Haulena's GoPro.

It was his only opportunity all day; Haulena, head veterinarian at the Vancouver Aquarium, had hoped to also get some dewormer into J50. But it was not to be. That will remain a priority this week, if conditions are right. Namely: The whale has to be at extremely close range — about 10 meters — and the water calm. Conditions were perfect Monday when he

made the shot, Haulena said. Yet still he had only one chance; not one other time all day was the position of the whales swimming in the wild and his ability to make the shot just right.

"Darting animals in the wild is something we do," he said. "Darting a moving whale that only has a bit of itself out of the water from a moving boat, that is definitely a little bit different. Like everything else, it is a matter of trying something and adjusting as you get used to it."

Haulena has already modified his technique from his first shot at J50 on Aug. 9, in which only about half the dose was administered because the needle came out. This time, under an amendment in permits from the National Oceanic and Atmospheric Administration and Canada's Department of Fisheries and Oceans, he used a dart with a collar to stick in better, and used slightly less velocity on the shot. Next time, he might try even less — but not so much as to let the shot wobble. "You still need a fair amount of pressure for it to fly straight, you don't want a dipping dart," he said.

Getting a close look at J50, Haulena said he only felt more worried about the young whale, who to him looked skinnier than ever. "I am not sure the antibiotics will help," Haulena said. "It is great she is still alive. That gives us hope. But she is in a state of body condition from which other whales have not returned."

Dr. Joe Gaydos, science director with the [SeaDoc Society](#), a nonprofit science and conservation group, is the veterinarian on rotation this week to help with J50. Getting the shot right if he gets a chance is just one of the things on his mind. "That is relatively simple compared with deciding whether to intervene, how much to intervene, managing expectations," Gaydos said.

Like many, Gaydos said he is amazed J50 is still alive — and over last weekend when she was temporarily not seen with her family, he feared the worst. "We were berating ourselves: We didn't do enough, we should have acted sooner. It was almost like Lazarus when she did show up, this is an animal that is easy to root for. She has a lot of heart."

Noting that J50 was once seen breaching, or leaping from the water, 40 times in a row, Giles said exuberance for life has always been J50's trademark. "If any animal could make it through with a little extra support it would be this animal," she said.

[@LyndaVMapes](#).

Lynda specializes in coverage of the environment, natural history, and Native American tribes.

For full article see:

<https://www.seattletimes.com/seattle-news/environment/firing-a-dart-into-a-wild-sick-orca-a-little-bit-different-sharp-shooting-veterinarian-says/>

Summer Courses in the Peruvian Amazon



Three Courses will be offered during summer 2019:

➤ **Fish Biology**

July 1 – July 10

Introduction to behavior, ecology, and taxonomy of fishes in the Peruvian Amazon

➤ **Fish Pathology**

July 15 – July 24

Identification of diseases and parasites of freshwater ornamental fishes

➤ **Limnology of Amazonia**

July 29 – August 7

Biological, chemical, and physical features of the waterways in the Peruvian Amazon

Courses will be taught in English and open to all students regardless of education level or age and will have both classroom and field components. Enrollment is limited to 12 students per course.

Students will have a chance to sample from three different river systems in the Iquitos region (Rio Amazon, Rio Itaya, and Rio Nanay).

COSTS:

| | |
|--------------|-----------|
| One Course | \$1795.00 |
| Two Courses | \$3500.00 |
| Three Course | \$5175.00 |

All inclusive: room (double occupancy with A/C, bathroom and internet), 3 prepared meals a day, boat fees, etc.

Not included: Airfare

All courses will be taught at the Amazon Research Station for Ornamental Fishes in Iquitos, Peru.

For more information contact amazonresearchstation@gmail.com or visit: www.amazonresearchcenter.org

NEW TRAINING COURSE LAUNCHING SEPTEMBER 2018

The Health and Welfare of Atlantic Salmon

Salmon farming is a multi-billion dollar global industry, making significant contributions to the economies of the world's major salmon producing countries. It is vital that fish farm operatives who are responsible for these fish are trained in all the main aspects of health and welfare, to ensure that their fish are free from disease and suffering, to enhance quality and productivity, and to comply with legislation.

The Knowledge Services Division of Benchmark Animal Health has worked closely with Fish Vet Group to produce an exciting and interactive online course covering the Health and Welfare of Atlantic Salmon.

The course includes

- Principles of fish welfare
- Feeds and feeding
- Transport
- The environment and fish welfare
- Health and veterinary health planning
- Management and husbandry practices
- Killing and flesh quality

Features and benefits

- Online course divided into bite-sized modules so you can study at your own pace
- Study on any device with internet access
- Interactive exercises and on-farm videos to create interest and test knowledge
- Questions after each module to test your understanding
- Course certificate available after successful completion of all the modules
- Optional practical sessions covering sea lice counting, gill scoring etc. to help reinforce your learning

Pricing and further details

Individual course access is £400 plus VAT.
Please contact us for prices of multiple course access.
marketing@5mpublishing.com
tel: +44(0) 1865 237733, thefishsite.com/learn



The Fish Site

Improve
International



FishVet Group



**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.



**INTERNATIONAL
SEA TURTLE
SYMPOSIUM, 2019**

Charleston, South Carolina, USA

International Sea Turtle Symposium

Charleston, South Carolina USA

February 2 - 8, 2019

International Sea Turtle Society

ISTS convenes the Symposium each year. Symposium goers have been able to promote their research network with others working in their field, and train future sea turtle biologists and conservationists. In the past decade, the Symposium focus has broadened to include social science, education, and grassroots conservation efforts. The Symposium also promotes conservation advocacy through developing Symposium Resolutions that describe the Society membership's ideas about emerging conservation themes. These resolutions are carefully and thoughtfully drafted, and then directed to national governments, international wildlife management organizations and other conservation entities around the world.

For more information, go to:

<https://internationalseaturtlesociety.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>.

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 transhippers. 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,
Aquarium Science Program, Oregon Coast Community College

Hatfield Marine Science Center
Oregon State University
2030 Marine Science Drive
Newport, OR 97365
(541) 867-0265 (office)

tim.miller-morgan@oregonstate.edu

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>

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, and 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>



35th WORLD VETERINARY ASSOCIATION CONGRESS
 San Jose, Costa Rica | April 27 - 30, 2019

Life connects all - Pura Vida



Get The Fuller Picture From WAVMA WebCEPD Online Webinars

WAVMA's WebCEPD Program - Webinars for Global Aquatic Veterinary Education

Given by leading experts, WAVMA's real-time and recorded WebCEPD webinars are intended as educational programs on key aquatic veterinary issues and techniques to hone the knowledge and skills of aquatic veterinary students and practitioners.

<https://www.wavma.org/WebCEPD>

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.

2019 AQUAVET® I & II & III Courses

The College of Veterinary Medicine at Cornell University is pleased to announce the 2019 AQUAVET® I, II & III course offerings. They are aquatic veterinary medicine education programs that currently consist of two courses that will be presented at Roger Williams University in Bristol, RI in June 2019 and one on aquarium medicine held in three venues.

AQUAVET® I: An Introduction to Aquatic Veterinary Medicine is a 4-week course (26 May - 22 June 2019) intended primarily for veterinary students.

AQUAVET® II: Comparative Pathology of Aquatic Animals is a 2-week course (26 May - 8 June 2019) that is oriented toward the pathology of diseases of aquatic invertebrates and fish that are used in biomedical research, encountered in display aquaria and are of importance in commercial aquaculture.

AQUAVET® Summer Research Fellow (one offered) is an 8 week research program, usually studying fish disease at a lab at Cornell University. There is no tuition and this student will receive a stipend of \$3,800 after completing the 8 weeks.

AQUAVET® III: Clinical Aspects of Captive Aquatic Animal Medicine is a 5 week course (following AQUAVET® I – 23 June to 28 July 2019) and is limited to a small number of students. The venues include GA Aquarium, U of GA and Dolphinaris, Cancún, México.



AQUAVET® III 2018 Concludes at Dolphinaris in Cozumel, México

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

More detailed information and applications for admission (due by January 15, 2019) are available on the web site www.aquavet.org.

**Compiled Table of Contents for
The Aquatic Veterinarian—Volume 12
[Key = Volume (Issue) Page Number]**

WAVMA News

Who We Are ... 12(1) 2; 12(2) 2; 12(3) 2; 12(4) 2
 Editorial Staff ... 12(1) 2; 12(2) 2; 12(3) 2; 12(4) 2
 WAVMA Executive Board ... 12(1) 2; 12(2) 2; 12(3) 2;
 12(4) 2
 Table of Contents ... 12(1) 3; 12(2) 3; 12(3) 3; 12(4) 3
 Editorials ... 12(1) 4; 12(2) 4; 12(3) 4; 12(4) 4
 Advertising Rates ... 12(1) 4; 12(2) 4; 12(3) 4; 12(4) 4
 Executive Board Reports ... 12(1) 5; 12(2) 5; 12(3) 5;
 12(4) 5
 President's Report ... 12(1) 5; 12(2) 5-6; 12(3) 5;
 12(4) 5
 Secretary's Report ... 12(1) 6; 12(2) 6; 12(3) 6; 12(4) 6
 Treasurer's Report ... 12(1) 7; 12(2) 7; 12(3) 6; 12(4) 7
 New Members ... 12(1) 7; 12(2) 7; 12(3) 7; 12(4) 7
 Committee Reports... 12(1) 8; 12(2) 8; 12(3) 8; 12(4) 8
 Privileges & Benefits of WAVMA Membership ... 12(1)
 8; 12(2) 8; 12(3) 8; 12(4) 8
 WAVMA Committees ... 12(1) 8; 12(2) 8; 12(3) 8;
 12(4) 8
 Credentialing Committee ... 12(1) 9; 12(2) 9; 12(3) 9;
 12(4) 9
 Certified Aquatic Veterinarians ... 12(1) 9; 12(2) 9;
 12(3) 9; 12(4) 9
 Meetings Committee ... 12(1) 12; 12(2) 12; 12(3) 12;
 12(4) 12-15
 Communications Committee ... 12(1) 12
 Fellows Advisory Council ... 12(1) 10; 12(2) 10; 12(3) 10;
 12(4) 10
 Executive Board Responsibilities ... 12(1) 10; 12(2) 10;
 12(3) 10; 12(4) 10
 Student Committee Reports ... 12(2) 16-17; 12(3) 10;
 12(4) 10
 WAVMA Veterinary School Chapters ... 12(1) 10; 12(2)
 10; 12(3) 10; 12(4) 10
 Pitts Aquatic Veterinary Education Award Program ...
 12(1) 11; 12(2) 15; 12(3) 13; 12(4) 11
 WAVMA Annual General Meeting and Conference ...
 12(4) 12-15
 WAVMA Elections ... 12(1) 6; 12(2) 11; 12(3) 11;
 12(4) 5
 WAS Aquaculture America Report ... 12(3) 13
 WAVMA Wetlab Workshop at WSAVA Was
 Wonderful ... 12(4) 30-31
 AVMA Humane Endings Symposium ... 12(4) 32-33

Author's Instructions ... 12(1) 13; 12(2) 13; 12(3) 14;
 12(4) 19

Advertisers

ZOO MED ... 12(1) 38; 12(2) 44; 12(3) 40; 12(4) 52
 Fish Vet Group ... 12(3) 37; 12(4) 45
 ioLight ... 12(3) 34; 12(4) 39

Colleague's Connection

Meet WAVMA Distinguished Fellow: Professor
 Ronald John Roberts ... 12(1) 14-15
 Meet Dr. Laura Urdes ... 12(2) 14
 Got a Sick Fish? Call West Seneca's Aquatic
 Veterinarian: Dr. Helen Sweeney... 12(3) 15
 The Life of an Aquaculture Veterinarian:
 Mykolas Kamaitis, BSc, DVM ... 12(4) 16-18

**John L. Pitts Veterinary Education Awards
Recipient Reports**

Nicole Nietlisbach ... 12(1) 16-19
 Sarah Wright ... 12(1) 19-20
 2018 Award Announcements ... 12(2) 15
 Sarah McConnachie ... 12(2) 18-19
 Courtney Wright (WDFW) ... 12(2) 20-21
 Courtney Wright (IDFG) ... 12(2) 22-23
 Manuel Kunzel ... 12(3) 18-19
 Nicole E. Himebaugh ... 12(3) 20
 Josh Zlotnick ... 12(3) 21
 Alyssa M. Capuano ... 12(3) 22
 Erika Brigante ... 12(4) 20-21
 Emily S. Munday ... 12(4) 22
 Katherine Weber ... 12(4) 23
 Patrawin Wanakumjorn ... 12(4) 24

Student Chapter Reports

Oregon State University, by Linda Yang ... 12(2) 16
 Illinois Student Chapter Activities, by Sarah
 Wright ... 12(2) 17
 IVSA Conference - Krakow, Poland ... 12(3) 16
 St. George University Student Chapter Update ...
 12(3) 16-17

Centerfold

Alligator Gar at the River Safari... 12(1) 22-23
 Anemones at the New England Aquarium...
 12(2) 24-25
 Seahorses at Arizona Aquariums ... 12(2) 24-25
 Moray Eels at the S.E.A. Aquarium - Singapore ...
 12(4) 26-27

Clinical Case Reports

Mouth brace to stabilise premaxillary bone fracture in
 a koi fish (*Cyprinus carpio*) ... 12(1) 27
 The role of general hardness, calcium and
 magnesium in ill-thrifty African cichlids ... 12(3)
 28-30

Book Reviews

*Fish Viruses and Bacteria: Pathobiology and
 Protection*, Woo and Cipriano ... 12(1) 25
Diseases of Coral ... 12(2) 26

Grand Round Cases

- Carbon Associated Head and Lateral Line Erosion...
12(1) 26
- Suggestions for Fish Diagnostic Labs in USA ...
12(2) 28
- Bacterial Transport Media ... 12(2) 29
- Treating Seahorses with Acetazolamide ... 12(3) 26
- Alkalinity and Hardness for Bass Production ...
12(3) 26
- Water Quality Requirements of the Striped Bass ...
12(3) 27
- Euthanasia of fish eggs, amphibian eggs and
tadpoles ... 12(4) 34
- Euthanasia for crayfish ... 12(4) 34
- Methods of Euthanasia in Fish ... 12(4) 35

Research Reports

- Prevalence and Antibigram of *E. coli* in Fish Meat
from Fish Shops of Chitwan, Nepal ... 12(2) 30-31
- Detection of Ostreid Herpesvirus 1 microvariant DNA
in aquatic invertebrate species, sediment and other
samples collected from the Georges River estuary,
NSW, Australia ... 12(4) 36
- Scientists get new tool to track new pathogen killing
frogs ... 12(4) 38

Literature Reviews

- Aquatic Veterinary Abstracts: Phytotherapy...12(1) 24
- Recovery of *Cyprinus carpio* (Ornamental Koi Carp)
Experimentally Infected with *Aeromonas*
hydrophila Through Phytotherapy...12(1) 24
- Influence of Tetra Smoke Tree (*Cotinus coggygia*)
Extract against *Vibrio anguillarum* Infection in Koi
Carp, *Cyprinus carpio* ...12(1) 24
- Traditional Indian herbal extracts used in vitro against
growth of the pathogenic bacteria – *Aeromonas*
hydrophila ... 12(1) 24
- Effects of Dietary Incorporation of Tetra Smoke Tree
(*Cotinus coggygia*) Extract on Immune Response
and Resistance to *Aeromonas hydrophila* in Koi
Carp (*Cyprinus carpio*) ...12(1) 24
- Aquatic Veterinary Abstracts: Stingrays...12(3) 23
- Comparison of hematology, plasma biochemistry, and
blood gas variables between 2 venipuncture sites
in southern stingrays ... 12(3) 23
- Plasma biochemistry reference values of wild-caught
southern stingrays ...12(3) 23
- Aquatic Veterinary Abstracts: Salmonids ...12(4) 25
- Selective precipitation reaction: a novel diagnostic test
for tissue pathology in Atlantic Salmon infected with
salmonid alphavirus (SAV3) . 12(4) 25
- Physiological and behavioural evaluation of common
anaesthesia practices in the rainbow trout ...
12(4) 25
- The efficacy of three types of analgesic drugs in
reducing pain in the rainbow trout ...12(4) 25

News and Views

- Antimicrobial Resistance Website ...12(1) 28
- Canada Suspends Import of Salamanders ...12(1) 28
- Read the *FrogLog* ...12(1) 29
- Scientists survey medicinal potential of endangered
frog family ...12(1) 29
- Cold waters killing more Florida manatees ...12(1) 30
- Incident Report - North Atlantic Right Whale Mortality
Event In the Gulf of St. Lawrence, 2017 ...12(1) 30
- Development of an opioid self-administration assay
to study drug seeking in zebrafish ...12(1) 31
- Antibiotic treatment of zebrafish Mycobacteriosis:
tolerance and efficacy of treatments with
tigecycline and clarithromycin... 12(1) 31
- Genetic Clues Reveal Origins of Killer Fungus
Behind the 'Amphibian Plague' ... 12(2) 32
- Some Endangered Frogs may be Leaping Back from
Extinction ... 12(2) 33
- Fish Vet Claims Breakthrough in Discovering
Alabama Rot Cause ... 12(2) 34
- Pain Study in Reptiles ... 12(2) 34
- Maintaining Healthy Oceans is Everyone's
Business...12(3) 30
- Aquarium de Paris offers haven for unwanted
goldfish ... 12(3) 31
- Bugs: They could be what's for dinner! ...12(3) 32
- Mixed Metazoan and Bacterial Infection of the Gas
Bladder of the Lined Seahorse ... 12(3) 32
- Leafy Seadragons Saved by Veterinarian's Simple
Prosthetic ... 12(3) 33
- The Leafy Seadragon, a Flagship Species with Low
But Structured Genetic Variability ... 12(3) 33
- Salmon Farming in Chile at a Glance ... 12(4) 40
- After spending days aground in Sitka, a sea lion
returns to the water—with help from humans ...
12(4) 42
- Experts to start capturing rare vaquita porpoises in
Mexico ... 12(4) 42
- Firing a dart into a wild, sick orca 'a little bit different,'
says sharp-shooting veterinarian ...12(4) 43

Legislative and Regulatory

- New York State Eliminating Commercial Harvest of
Diamondback Terrapins ...12(2) 35
- Charges Filed in Turtle Poaching Case ...12(2) 35
- Australia's Response to Importing Exotic Cajun
Dwarf Crayfish and Disease Concerns ...
12(2) 36-37
- Is the release of the koi herpesvirus (Cyprinid
Herpesvirus-3) in Australia necessary? ...
12(2) 38-39
- The Seahorse Trust ... 12(3) 34
- 'Endangered' seahorses could become extinct ...
12(3) 34

Aquatic Veterinary CE & PD

- Meetings of Interest to Aquatic Veterinarians ...12(1)
32-37; 12(2) 40-43; 12(3) 35-39; 12(4) 44-47
- Project Piaba...12(1) 32; 12(2) 42; 12(3) 38; 12(4) 46

2019 AQUAVET® I & II & III ... 12(3) 35; 12(4) 47
The Health and Welfare of Atlantic Salmon ... 12(3) 37;
12(4) 45

Index for 2018 Issues ... 12(4) 48-51

Featured Public Aquariums in all issues

AVN = *Aquatic Vet News* (2007-2012)
TAV = *The Aquatic Veterinarian* (2013-2018)
Vancouver Aquarium - AVN 2(4) 21
New York Aquarium - TAV 7(1) 33
Waikiki Aquarium - TAV 7(2) 12
Melbourne Aquarium - TAV 8(1) 32
Mote Marine Lab and Aquarium - TAV 8(4) 20-21
The Georgia Aquarium - TAV 9(1) 22-26
The Shedd Aquarium - TAV 9(2) 29-30
Monterey Bay Aquarium - TAV 9(3) 28-30
OdySea Aquarium - TAV 10(4) 32-35
S.E.A. Aquarium, Singapore – TAV 10(4) 43;
TAV 12(4) 26-29
National Aquarium, Baltimore, MD ... TAV 11(2) 17
A Visit to River Safari—Singapore ... TAV 12(1) 20-21
New England Aquarium — Boston, Massachusetts,
USA ... TAV 12(2) 23

WAVMA Annual General Meeting Reports

Washington, DC, USA - July 18, 2007; AVN 1(1) 1-2
Vancouver, BC, Canada - July 27, 2008; AVN 2(3) 1-6
Seattle, WA, USA - July 14, 2009; AVN 3(3) 6-7
Athens, Greece - July 14, 2010; AVN 4(3) 26-27
St. Louis, MO, USA - July 18, 2011;
San Diego, CA, USA - August 6, 2012; AVN 6(3) 5
Prague, Czech Republic - September 18, 2013; TAV 7
(3) 7, 10-11
Denver, CO, USA - July 24, 2014; TAV 8(3) 4-6
Istanbul, Turkey - September 15, 2015; TAV 9(4)
12-15
San Antonio, Texas USA – August 6, 2016; TAV 10(3)
12-13
Targu Mures, Romania—September 13, 2017; 11(3)
14-15
St. Kitts Annual General Meeting and Conference—
November 10, 2018; 12(4) 12-15

**Index to WAVMA Member Profiles in the
Colleagues' Connection and Student Reports**

AVN = *Aquatic Vet News* (2007-2012)
TAV = *The Aquatic Veterinarian* (2013-2018)
SC = Student/Scholarship Committee Report
Key = Volume(Issue): Page number
Listed in alphabetical order by last name

Kurt Arden – TAV 9(3): 20 SC
Barry Baker – AVN 6(1): 6 SC
Kendra Baker – TAV 9(2): 18 SC
Meg Baker – TAV 10(1): 14 SC
Elizabeth Bamberger – TAV 8(4): 19

Wes Baumgartner – TAV 8(3): 17
Brandon Boren – AVN 5(2): 6 SC
Erika Brigante—TAV 12(4) 20-21 SC
Lydia Brown – TAV 8(2): 18; TAV 8(3): 18
Alyssa M. Capuano - TAV 12(3) 22 SC
Julie M. Cavin - TAV 11(1) 16
Hui Nee Chin – TAV 8(4): 18 SC
Leigh Clayton - TAV 11(2) 16
Lori Corriveau – AVN 3(1): 7
Brett De Poister – AVN 6(3): 6 SC
Emily Denstedt – AVN 6(2): 6 SC
Jessica Dewar – TAV 8(2): 16 SC
Kyle Donnelly – TAV 7(3): 12 SC
Devon Dublin – AVN 4(2): 9; AVN 4(3): 11; TAV 8
(3): 16; TAV 11(3) 12
Mohamed Faisal – TAV 9(4): 24
Susan Fogelson – TAV 8(3): 14 SC
Ian Gardner – AVN 5(3): 13
John Griffioen - 10(3): 15 SC
Chad Harris – TAV 8(3): 18; TAV 9(4): 25
Ashley Heard-Ganir – TAV 9(4): 20 SC
Joe Gaydos – TAV 10(4): 21
Nora Hickey – TAV 8(1): 16-17 SC; TAV 9(4): 21 SC
Rob Hildreth – AVN 2(3): 29
Nicole E. Himebaugh ... TAV 12(3) 20 SC
Elizabeth Hodges – TAV 8(3): 14-15
John Howe – AVN 6(2): 10
Sara Huckabone – TAV 8(2): 15 SC
Colin Johnston – AVN 3(3): 11
Timothy Jones – AVN 5(1): 9 SC
Kirstin Kamps – AVN 4(4): 6, SC; AVN 5(1): 7 SC;
Myron Kebus – AVN 2(4): 14-15; TAV 7(4): 12-13
David Kestenman – AVN 5(1): 18-19
Sangwha Kim – TAV 10(2): 18 SC
Ashley Kirby – TAV 9(3): 18 SC
Sarah Knowles – TAV 9(3): 23 SC
Manuel Kunzel ... TAV 12(3) 18-19 SC
Austin Leedy – TAV 8(1): 10-12
Shelby L. Loos – TAV 9(4): 18-19 SC
Veronique LePage – AVN 5(1): 8 SC
Barbara Linnehan – TAV 8(4): 16 SC
Noelle Litra – TAV 9(2): 19 SC
Eric Littman – TAV 9(1): 16 SC
Richmond Loh – TAV 7(3): 14-17; TAV 10(2): 23-25
Doug Mader – TAV 10(3): 18-19
Sarah McConnachie - 12(2) 18-19 SC
Christina McKenzie - 10(3): 16-17 SC
Peter Merrill – AVN 5(2): 12-15; TAV 10(2): 19
Tim Miller-Morgan – AVN 2(3): 29; AVN 2(4): 13-14;
AVN 4(4): 11
Timothy Mullican – TAV 9(1): 22-26
Emily S. Munday—TAV 12(4) 22 SC
Jenny Munhofen – TAV 8(2): 14 SC
Michael Murray – TAV 9(3): 28-30
Ross Neethling – TAV 9(3): 21 SC
Nicole Nietlisbach ... TAV 12(1) 16-19 SC
Brian Palmeiro – AVN 3(2): 8
Samara Parker – AVN 5(3): 5 SC
Anna Penacchi – TAV 10(2): 17 SC

Kaylee Perry – TAV 9(3): 22 SC
 John Pitts – AVN 3(4): 1; AVN 4(1): 7; TAV 10(2): 13
 Caryn Poll – TAV 7(3): 9 CR
 Jena Questen – AVN 3(1): 1; TAV 8(1): 14-15; TAV 11(3) 12
 Stephen Reichley – AVN 6(3): 10; TAV 8(2): 12 SC; TAV 11(3) 12
 Julianne Richard – TAV 9(4): 22-23 SC
 Christine Richey – TAV 9(3): 22 SC
 Helen Roberts – AVN 2(4): 14; AVN 6(1): 10-11; TAV 12(3) 15
 Ronald Roberts – AVN 5(4): 12-13; TAV 12(1) 14-15
 Abe Robinson – TAV 8(4): 20-21
 Hamish Rodger – TAV 11(1) 16
 Jenna D. Roseman – TAV 9(2): 21 SC
 Nick Saint-Erne – TAV 7(1): 12-13; TAV 7(2): 12; TAV 8(3): 16; TAV 11(3) 12
 Jessie Sanders – TAV 10(1): 15-17
 Maya Sawyers – TAV 7(4): 11 SC
 A. David Scarfe – TAV 10(2): 20-22
 Karissa Sciacca – TAV 8(2): 16 SC
 Najim Sekh – TAV 9(2): 20 SC
 Wesley Siniard – TAV 8(3): 12 SC
 Justin Stillwell – TAV 9(1): 17 SC
 Megan Strobel – TAV 10(2): 16 SC
 Helen Roberts Sweeney - TAV 12(3) 15
 Julius Tepper – AVN 5(3): 12-13
 Sharon Tiberio – TAV 8(3): 17
 Laura-Daniela Urdes – TAV 7(4): 14-15; TAV 8(3): 18; TAV 12(2) 14
 Jonas Vaitkus – AVN 5(1): 10-11 SC
 Bill Van Bonn – TAV 9(2): 29
 Vasile Vulpe - TAV 11(4) 14-15
 Zac Waddington – TAV 8(4): 17 SC
 Chris Walster – TAV 7(2): 10-12
 Patrawin Wanakumjorn—TAV 12(4) 24 SC
 Katherine Weber—TAV 12(4) 23 SC
 Scott Weber – AVN 3(4): 9; AVN 6(4): 10-13;
 Tatiana Weisbrod - TAV 11(1) 14-15 SC
 Peter Werkman – TAV 9(3): 26-27; TAV 10(4): 20
 Sophie Whoriskey – AVN 5(4): 5 SC
 Jen Wilson-Cohen – TAV 8(3): 13 SC
 Hillary A. Wolfe – TAV 9(2): 18 SC
 Courtney Wright - TAV 12(2) 20-23 SC
 Sarah Wright - TAV 12(1) 19-20 SC
 Josh Zlotnick—TAV 12(3) 21 SC



*Photos on this page from exhibits at the
S.E.A. Aquarium—Singapore.*

*Top: Coral Reef
Bottom: South American freshwater cichlids.*

Photographs by Nick Saint-Erne

The Ultimate LED Light & Sound Experience

AQUAEFFECTS



*Available in 20", 24", 36" and 48" sizes, AquaEffects 24" Model 1 and Model 2 pictured above.

Customizable LED lighting with sound effects and true UVA? Oh yeah, let's go.

With Zoo Med's NEW AquaEffects LED aluminum aquarium fixtures, you can have it all. Zoo Med's Aquaeffects Model 1 and Model 2* have high output LEDs, adjustable color channels, synchronized natural sound effects and remote controls, taking your tropical and marine tanks to the next dimension.

To learn more about the ultimate LED light and sound experience, and other fine Zoo Med products, please visit our website.

