

The



quatic

eterinarian



Dr. Sharmie Johnson tending penguins at the Wildlife World Zoo and Aquarium. See articles on pages 20-33.

Volume 13, Number 4
Fourth Quarter, 2019



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.

© 2019 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)
John Griffioen (USA)

WAVMA Executive Board

Devon Dublin (Japan) President@wavma.org
President

Jena Questen (USA) jena@drquesten.com
President-Elect

David Scarfe (USA) dscarfe@ameritech.net
Immediate Past President

Stephen Reichley (USA) Secretary@wavma.org
Secretary

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

Dr. Matthijs Metselaar (UK)
Dr. Christine Parker-Graham (USA)
Dr. Gillian Taylor (South Africa)
Directors-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
Dr David Scarfe (USA)	2018

Past Secretaries and Treasurers

Chris Walster, Secretary	2007-2013
Devon Dublin, Secretary	2014-2017
David Scarfe, Treasurer	2006-2007
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
Dr. Laura Urdes Assumes the Role of Chair of the WAVMA Fellows Program	10
WAVMA Endorses the Joint Position Statement on Regulatory Harmonization	11
Two New WAVMA Student Chapters Established in 2019	15
Author’s Instructions	13
Student Reports	
2019 John L. Pitts Aquatic Education Award Report: Holly Ward	14
2019 John L. Pitts Aquatic Education Award Report: Sarah Wright	15
Research Report: Dr. Sunita Shrestha	16
Colleague’s Connection	
Dr. Leighanne Hawkins	19
Dr. Sharmie Johnson	20
Centerfold	
The Wildlife World Zoo and Aquarium	22
Featured Aquarium	
The Wildlife World Zoo and Aquarium, Litchfield Park, Arizona	24
Clinical Case Reports	
Bacterial granulomas arising from a sialocele in a green anaconda (<i>Eunectes murinus</i>), By Dr. Sharmie Johnson	26
Medical and surgical management of a bite wound to the foot of an American alligator, By Dr. Sharmie Johnson	30
Grand Round Cases	
Zebrafish Opercula Defects	34
Fish Body Condition Scoring	35
Literature Review	
Aquatic Veterinary Abstracts: Zebrafish	36
Body Condition Scoring for Adult Zebrafish (<i>Danio rerio</i>)	36
Knockdown of prothymosin α leads to apoptosis and developmental defects in zebrafish embryos	36
Zebrafish Diseases: Mycobacteriosis	37
Aquatic Veterinary CE & PD	
Meetings of Interest to Aquatic Veterinarians	40
AQUAVET® 2020	41
Sponsors	
Iolight	38
FishVet Group	39
Zoo Med.....	46
2019 Index	42

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

Editor’s Note

Happy New Year 2020 to all WAVMA members! This year should be a great one, and we have lots of activities planned for our members. The meetings committee is planning for WAVMA to be represented at many veterinary conferences this year. The first activity will be at Aquaculture America in Hawaii this February (see information on page 18).

We also have the WAVMA election results for the 2020 Executive Board (see page 6). Congratulations to the new Officers and Directors. These people volunteer their time to help direct the future of this association, along with the work done by our committees. Please consider joining a committee (see list on page 8) to become more involved in WAVMA. We welcome everyone!

In this issue, we have three reports from students that were granted funds from the John L. Pitts Aquatic Education Awards (see pages 14-17). The awards committee will be accepting applications for the 2020 grants in early 2020, so watch the WAVMA Listserv and the next issue of *The Aquatic Veterinarian* for that information. We also welcome donations to this fund to help veterinary students interested in aquatic veterinary medicine learn more about our profession. You can get information and make a donation here: www.wavma.org/scholarships

Here in Phoenix, Arizona, we are lucky to have three public aquariums and two major zoos. In 2016 we featured the OdySea Aquarium in *The Aquatic Veterinarian* issue 10(4), pages 32-35. In this issue we feature one of the other aquariums in town that is also a zoo: Wildlife World Zoo and Aquarium (see pages 22-25). Meet Dr. Sharmie Johnson, one of their veterinarians in the Colleague’s Connection article on pages 20-21. Dr. Johnson is also working toward her Aquatic Veterinarian Certification (CertAqV) and has submitted case reports on two patients from the aquarium, an American Alligator and a green anaconda (pages 26-33). These case reports qualify for credits for her certification.

If you are interested in learning more about becoming a Certified Aquatic Veterinarian, please see page 9 in this issue, or go to the WAVMA website: <http://www.wavma.org/CertAqV-Pgm>.

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



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:

Dr. Sharmie Johnson tending penguins at the Wildlife World Zoo and Aquarium. See articles on pages 20-33.

Photo by Wildlife World’s photographer Lorenzo Fuentes

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 TAVeditor@wavma.org for information on advertising and payment options.

President's Report

Dear WAVMA members,

I have come to the end of my tenure as the 2019 WAVMA president. My ability to serve was because of the support obtained from the Executive Board, made up of individuals from Africa, Asia, Europe and the Americas. Their perspectives and contributions were key factors in achieving what was set out to be achieved in 2019. In addition, the Chairs of the WAVMA Committees were supportive of initiatives that were embarked on and I thank them.

As I indicated at the beginning of the year, my focus was on WAVMA as an organization with a view of strengthening its capacity to fulfil the mandate on which it was founded. One of the initiatives included the restructuring of the WAVMA committees, which saw the establishment of the Education and Student's committee that is synergistic in nature. This committee chaired by Dr. Bartolomeo Gorgoglione has done well and has seen the establishment of WAVMA Student Chapters at Colorado State University, College of Veterinary Medicine and Biomedical Sciences and at Cornell University, College of Veterinary Medicine during 2019.

The Membership Committee was restructured as well to ensure that a representative from each of the other committees comprises this committee. This was done to ensure that discussions taken there on matters that would affect members at large benefit from student, communication, fiduciary, credentialing and meetings perspectives. This committee has been finding its footing in 2019 and most of its work in this year will impact WAVMA in 2020. I thank Dr. Chris Walster who functioned as the chair for 2019.

We have also tried to improve our transparency, accountability and good governance within the organization, which includes the signing of the WAVMA Code of Ethics and Code of Conduct, along with the Conflict of Interest declarations. Dr. Laura Urdes, a past president of WAVMA, has assumed the role of Chair of the WAVMA Distinguished Fellows Program and will lead it into 2020. This committee is made up of eminent members of the WAVMA and will be instrumental in providing suggestions and recommendations for the improvement of the functioning and management of the association.

The year 2019 saw the number of WAVMA members becoming certified as Certified Aquatic Veterinarians rising to more than 100. This program of the Credentialing Committee, under the chairmanship of Dr. David Scarfe, continues to be one of the most popular member benefits. I am indeed grateful for the work of the certified members that also function on the committee to facilitate the certification process of the new applicants. I thank as well, those who have agreed to and have served as mentors for new applicants. Without their help, the program would not have had any good footing.

Dr. Julius Tepper continued to function as the chair of the Meetings Committee, which saw WAVMA participating in a number of events. Among the main activities were the hosting of the second Ornamental Fish Scientific session, KoiPrax2, on Monday, July 15, 2019 and the WAVMA sponsored Aquatic Medicine stream on July 16, 2019 at the World Small Animal Veterinary Association (WSAVA) 2019 conference in Toronto.

WAVMA continues its engagements and collaborations with organizations such as WSAVA and the World Veterinary Association (WVA). I continue to encourage you as WAVMA members to take advantage of the benefits that you are entitled to, such as reduced or waived registration fees. I currently sit as a member of the One Health Committee and the Therapeutics Guidance Group of WSAVA. Recently, Dr. Chris Walster submitted an expression of interest to serve as a member of the Animal Wellness and Welfare committee of WSAVA. Similarly, Dr. David Scarfe serves a member of the Veterinary Education Working Group of the WVA and is currently competing to be elected as Councilor representing International Discipline-centred Organisations. I encourage further engagements of WAVMA members outside of WAVMA, which would result in more visibility and consideration of matters related to aquatic veterinary medicine.

Finally, I congratulate all the candidates that participated in the WAVMA elections and thank those who exercised their right as WAMA members to vote in these elections. For the first time, the Directors-at-Large were elected to serve with a regional mandate and I look forward to seeing how it functions in 2020. I thank you all for your support during 2019 and I remain committed to continuing the work of WAVMA in 2020 as the Immediate Past President. I thank you, and wish you a wonderful New Year in 2020.

Devon Dublin PhD, DMVZ, MSc, CertAqV
 WAVMA President 2019
 102 Leopalace Grace Tsurugadai
 2-Chome-6-15 Tsurugadai,
 Kushiro-shi, Hokkaido
 085-0821 Japan
President@wavma.org



Secretary's Report

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

Directors-at-Large

			
Africa and the Middle-East Dr. Ajangale Isyagi (Uganda)	Americas Dr. Claudia Venegas (Chile)	Asia-Pacific Dr. Stephen Pycroft (Australia)	Europe Dr. Dusan Palic (Germany)

The elections of the 2020 Officers and Directors has been tabulated and above are the results. Congratulations to those who were elected, and thanks to all who participated in standing for election and to all members who cast their ballots. It is important for members to be involved in the running of WAVMA. If you are not ready to be an Officer or Director, at least join a committee (see page 8),

Have a wonderful 2020!

Stephen Reichley, DVM, PhD, CertAqV
WAVMA Secretary
Secretary@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!

**TO SUPPORT FUTURE STUDENT
SCHOLARSHIPS, PLEASE MAKE
A DONATION TODAY
TO THE SCHOLARSHIP FUND!**
[www.wavma.org/
SCHOLARSHIPS](http://www.wavma.org/scholarships)

Treasurer’s Report

2019 has been a very good year for WAVMA. Financially we have enough money to fund all of our activities for 2020, including setting up booths at multiple veterinary meetings, having our Annual General Meeting, and providing scholarships to the John L. Pitts Aquatic Veterinary Education Awards. We also set a record for WAVMA membership! Currently we have 571 members. We have members from 42 countries around the world. Looking forward to 2020!

Nick Saint-Erne, DVM CertAqV

WAVMA Treasurer
Treasurer@WAVMA.org

New Members—4th Quarter 2019

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

Veterinarians

Mary Krothapalli	USA
Courtenay Bombara	Australia
Craig Pelton	USA

Veterinarian—New Graduate

Melody Winterhalter	UK
---------------------	----

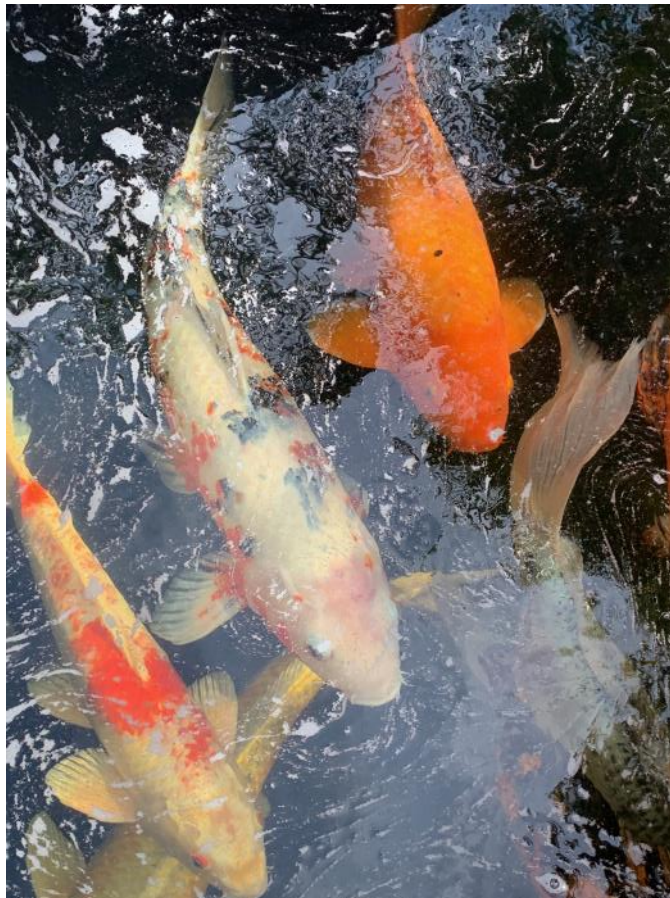
Vet Graduate Student, Intern or Resident Member

Aderonke Alamu	Nigeria
Jamie Gerlach	USA

Vet Student Member (enrolled in Vet Curriculum)

Melinda Gorges	United States
Grace White	United States
Karl Mitchell	Canada
Grant Waldrop	United States
Jessica Sprando	United States
Wiley Archibald	United States
Luke Pfund	United States
Ryan Patterson	United States
Alexis Zieve	Saint Kitts and Nevis
Marisa Brue	Saint Kitts and Nevis
Callie Migden	United States
Mariah Cotton	Saint Kitts and Nevis
Darbi Jones	United States
Lena de Jong	Canada
John Paul DeTrolio	United States
Meredith Cronin	Saint Kitts and Nevis
Jenifer Prine	Saint Kitts and Nevis
Kelsie Kittrell	United States
Grace Chetney	Saint Kitts and Nevis
Anna Card	Saint Kitts and Nevis
Shevon Meadows	United States
Felix Valles Feliciano	Puerto Rico

Welcome to WAVMA!



Koi in pond at the World Wildlife Zoo and Aquarium Litchfield Park, Arizona

Photo by Nick Saint-Erne

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>

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: David Scarfe, dscarfe@ameritech.net

Meetings Committee

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

Chair: Julius Tepper, cypcarpio@aol.com

Membership Committee

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

Education & Student Committee

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

Chair: Bartolomeo Gorgoglione, BartGorg@msu.edu

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 104 aquatic veterinarians from 32 countries. Congratulations to our newest Certified Aquatic Veterinarians:

Charles Cummings USA
 Katharina Hagen-Frei Switzerland
 Elizabeth Leuchte UK
 Zachary Waddington Canada

There are an additional 52 other WAVMA members currently in the process of being certified. For more information, see the WAVMA website:

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

David Scarfe, DVM, CertAqV
 2019 Credentialing Committee Chair
dscarfe@ameritech.net

Certified Aquatic Veterinarians

Jessica Allen	USA	Adolf Maas	USA
Farah Gonul Aydin	Turkey	Raphael Malbrue	USA
Madison Barnes	St. Kitts & Nevis	David Marancik	Grenada
Heather Barron	USA	Victoria Maroun	St. Kitts & Nevis
Giana Bastos-Gomes	Australia	Colin McDermott	USA
Jenice Bell	USA	Matthijs Metselaar	UK
Heather Bjernebo	USA	Tim Miller-Morgan	USA
James Bogan	USA	Haitham Mohammed	Egypt
Pierre-Marie Boitard	France	Alissa Mones	USA
Erika Brigante	St. Kitts & Nevis	Danny Morick	Israel
Todd Cecil	USA	Ross Neethling	UK
Bryony Chetwynd-Glover	UK	Sally Nofs	USA
Dondrae Coble	USA	Dušan Palić	Germany
Michael Corcoran	USA	Brian Palmeiro	USA
Emily Cornwell	USA	Christine Parker-Graham	USA
Rebecca Crawford	St. Kitts & Nevis	Lily Parkinson	USA
Charles Cummings	USA	Ayanna Phillips	Trinidad & Tobago
Nadav Davidovich	Israel	Jena Questen	USA
Darren Docherty	UK	Atisara Rangisichol	Thailand
Simon Doherty	UK	Aimee Reed	USA
Devon Dublin	Japan	Stephen Reichley	USA
Jacqueline Elliott	USA	Komsin Sahatrakul	Singapore
Ashley Emanuele	USA	Nick Saint-Erne	USA
Azureen Erdman	USA	Jessie Sanders	USA
Antonella Fabrissin	Italy	Sasha Saugh	South Africa
Mohamed Faisal	USA	David Scarfe	USA
Erika First	USA	Khalid Shahin	UK
Ari Fustukjian	USA	Galit Sharon	Israel
Christopher Good	USA	John Shelley	USA
Krystan Grant	USA	Chris Shirkey	USA
Miguel Grilo	Portugal	Constance Silbernagel	USA
Stephanie Grimmett	UK	Melissa Singletary	USA
Katharina Hagen-Frei	Switzerland	Esteban Soto	USA
Orachun Hayakijkosol	Australia	Brittany Stevens	USA
Nora Hickey	USA	Win Surachetpong	Thailand
John Howe	USA	Gillian Taylor	South Africa
Kerryn Illes	New Zealand	Julius Tepper	USA
Jimmy Johnson	USA	Sharon Tiberio	USA
Kasper Jorgensen	Denmark	Laura Urdes	Romania
Brian Joseph	Canada	Greta Van de Sompel	Belgium
Parinda Kamchum	Thailand	Claudia Venegas	Chile
Fritz Karbe	Germany	Zachary Waddington	Canada
Sherri Kasper	USA	Sarah Wahlstrom	USA
Elizabeth Kaufman	Israel	Chris Walster	UK
Amy Kizer	USA	Scott Weber	USA
Jessica Koppien-Fox	USA	Marcus Webster	USA
Jack Kottwitz	USA	Trista Welsh	USA
Elizabeth Leuchte	UK	Peter Werkman*	Holland
Jan Linkenhoker	USA	David Wilbur	USA
Eric Littman	USA	Howard Wong	Hong Kong
Richard Lloyd	UK	Taylor Yaw	USA
Richmond Loh	Australia	Irene Yen	St. Kitts & Nevis



Fellows Advisory Council

WAVMA has established a Distinguished Fellows 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 the Fellows to advise the Executive Board with guidance on WAVMA 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
- Dr Laura Urdes

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

As acting chair of the Fellows Committee, I would like to announce that **Dr. Laura Urdes** of Romania has been selected as our 2019 Distinguished Fellow inductee. Laura was president of WAVMA in 2017 and organized the fantastic WAVMA Conference and AGM in Romania during her tenure. She has been tirelessly working with WAVMA for many years, including as a member of the Executive Board, the Communications Committee and previously editing the WAVMA eNews emails. She is currently working with me as a co-editor of the text "Fundamentals of Aquatic Veterinary Medicine" to be published for the benefit of WAVMA. Please congratulate Laura Urdes as our newest Distinguished Fellow!

Julius M. Tepper, DVM, CertAqV
 WAVMA Distinguished Fellow
 World Aquatic Veterinary Medical Association

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](#).

Dr. Laura Urdes assumes the role of Chair of the WAVMA Fellows Program

Dr. Laura Urdes became the newest WAVMA Distinguished Fellow in 2019, joining the distinguished rank of past honorees, all of whom have made important contributions to the field of Aquatic Veterinary Medicine and to WAVMA. Laura has been a WAVMA member for eight years, serving initially for two years as Chair of the Communications Committee, then as a Director-at-large and ultimately becoming the 2017 WAVMA President.

Laura works as an Assistant Professor at the University of Agricultural Sciences and Veterinary Medicine of Bucharest and holds a PhD and a BSc in Veterinary Medicine. She is a WAVMA Certified Aquatic Veterinarian (CertAqV) and has a Postgraduate Diploma in Livestock Health and Production from the RVC, University of London. More information on WAVMA Fellows is available at :

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



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!

Education & Student Committee

The next virtual meeting of the WAVMA Education and Students committee (WAVMA-ESC) will be held on 18th January 2020 at 14:00 h (UTC). This will be our first meeting in 2020, thus we are seeking for an active participation from either former ESC members and any other WAVMA member wishing to be involved from now on.

Once again, we would like to remind to all former ESC members to confirm your willingness to keep contributing to ESC activities in 2020. After this meeting the new list of ESC contributors will be formulated according to the availability confirmation received. Unresponsive members will be removed from the list of ESC contributors.

It is very important, especially for the former subcommittee leaders to join this meeting and provide updates on work recently carried out. New subcommittee leaders for 2020 will be decided during this meeting.

As in our previous meetings we will use GoToMeeting again. Here is how to join:

<https://global.gotomeeting.com/join/456325541>

You can also dial in using your phone with Access Code: 456-325-541

Australia: +61 2 9087 3604

Germany: +49 692 5736 7317

United Kingdom: +44 330 221 0088

United States: +1 646 749 3129

New to GoToMeeting? Get the app now and be ready when your first meeting starts:

<https://global.gotomeeting.com/install/456325541>

Bartolomeo Gorgoglione, Chair

BartGorg@msu.edu

WAVMA VETERINARY SCHOOL CHAPTERS

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

There are 18 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](#).

**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.

WAVMA Endorses the Joint Position Statement on Regulatory Harmonization

Restricted access to veterinary medicines because of regulatory issues in regions of the world including Eastern Europe, Africa and Asia, is a long-standing problem and limits the efforts of many veterinarians to provide optimal care to their patients. The mission of the Therapeutic Guidance Group (TGG) of the World Small Animal Veterinary Association (WSAVA) is to ensure best practices for the selection and use of medicines including their quality, availability and responsible use.

Dr. Devon Dublin, President of WAVMA, currently sits on this committee. The Therapeutic Guidelines Group is campaigning to raise awareness of the problems around regulation and to call on governments and regulatory bodies to act. More information on the TGG can be found at <https://www.wsava.org/Committees/Therapeutics-Guidelines-Group>.



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.

WAVMA Committees

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

Join a WAVMA Committee today!



TO SUPPORT FUTURE STUDENT SCHOLARSHIPS, PLEASE MAKE A DONATION TODAY TO THE SCHOLARSHIP FUND!
[WWW.WAVMA.ORG/SCHOLARSHIPS.](http://www.wavma.org/scholarships)

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



WAVMA is on Facebook!



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

Search for WAVMA at www.facebook.com.

www.facebook.com/WAVMA

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

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

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

Did you know?

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

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

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

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.

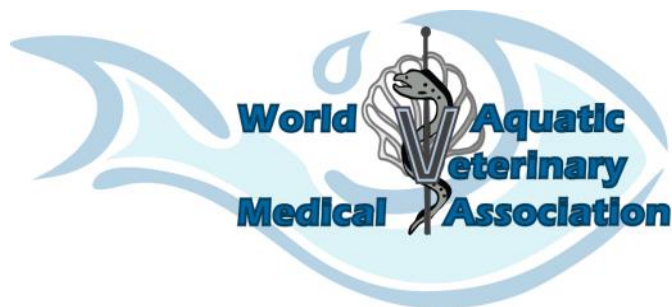
Please send articles, clinical reports, or news items to the editor by the following submission dates:

- 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.



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 Journal](#)
- [Aquatic Veterinary Jobs Listing](#)
- [WAVMA Student Chapters](#)
- [Veterinary Student Externship Listing](#)
- [John L. Pitts Aquatic Veterinary Education Awards Program](#)

John L. Pitts Aquatic Education Award Report
By Holly Ward

University of Cambridge – Class of 2021

Back home in the UK, aquatic veterinarians (and even public aquaria in general) are few and far between and there are no clinical externship opportunities for interested veterinary students. Therefore, prior to this summer, my aquatic veterinary experience was limited to a husbandry placement at a large UK aquarium and observing a vet visit there, and a third-year dissertation on the topic of the embryonic development of bone and cartilage in fish. I realised that if I was serious about this career path then I would need to travel further afield to get the experience I needed. So, this past summer, I completed an incredible three-week Veterinary Externship at the Vancouver Aquarium in BC, Canada, home to over 50,000 animals.

I was a little nervous about my lack of previous experience but needn't have worried as I soon found the veterinary staff to be keen for students to learn and more than willing to teach. Externs are responsible for assisting veterinary staff and writing clinical notes during daily rounds and treatments, performing necropsies, assisting with laboratory work, preparing any medications required and assisting with diagnostic and surgical procedures. My clinical pathology skills were definitely tested as externs are responsible for interpreting lab results and discussing our thoughts with the vet. A particular highlight for me was spending one day a week at the aquarium's Marine Mammal Rescue Center where I was able to get involved in the rehabilitation of rescued harbour seal pups and assist with their feeding, medical treatments and surgical procedures in the afternoons. In my free time, I was able to explore beautiful British Columbia, including a whale watching trip where I was lucky enough to see four humpback whales.

On their final day, externs are responsible for presenting a literature review to veterinary staff on a topic relevant to their externship. I found it incredibly hard to choose after seeing such a huge variety of species and cases, but eventually settled on Diagnostic Imaging in Cetaceans, an interest I developed after chatting to one of the vets about ultrasound skills. I was very nervous about presenting this topic to such experienced clinicians but actually found the presentation very relaxed with lots of encouraging questions and feedback throughout.

I am so grateful to have had the opportunity to complete this externship, as I learned so much and had the chance to develop so many practical skills not taught in vet school. What surprised me most was how much I personally grew in confidence over the three weeks – veterinary staff encouraged me to develop my own assessment and treatment plan for the cases I saw and then gave me useful feedback on my thoughts. I really felt my knowledge and skills develop massively throughout my placement.

Finally, I would like to thank the John L Pitts Awards Program for making such an amazing insight into what a career as an aquatic veterinarian involves possible for me. It was great to talk to staff about their route into the profession and made what originally seemed like an unrealistic career aspiration seem possible. Massive thanks also go to all the dedicated and knowledgeable veterinary staff at the Vancouver Aquarium for sharing their skills and experience with me, particularly Dr Hannah Drumm for all her time and patience. I can't think of any other office where visits from sea lions were an almost daily occurrence!



The entrance to the Vancouver Aquarium



Flippery kisses on my last day!

Exploring beautiful Stanley Park, where the Vancouver Aquarium is located



John L. Pitts Aquatic Education Award Report
By Sarah Wright

University of Illinois - Class of 2020

I had the honor of using the financial support that the John L. Pitts Aquatic Education Award provided to present my clownfish hematology and biochemistry research at the 2019 International Association for Aquatic Animal Medicine Conference in Durban, South Africa and to participate in a Veterinary Preceptorship at the John G. Shedd Aquarium.

The first experience that I participated in was presenting my research at the 2019 International Association for Aquatic Animal Medicine (IAAAM) Conference. With the support of the IAAAM Medway Scholarship, I had collected blood from 63 clownfish in the summer of 2018 and reported reference intervals for several hematology and biochemistry panel analytes in two aquacultured clownfish species, *Amphiprion frenatus* and *Amphiprion polymnus*. I then traveled to South Africa in May 2019 and presented the findings of my project at the 2019 IAAAM Conference. This experience was invaluable because it allowed me to network with professionals in aquatic animal medicine and practice my presentation skills.

I also used the funds that this Award provided to participate in a Veterinary Preceptorship at the John G. Shedd Aquarium in Chicago, Illinois. As a Veterinary Preceptor, I gained exposure to the veterinary management of a large collection of fishes, marine mammals, amphibians, reptiles, birds, terrestrial mammals, and invertebrates. I also prepared and reviewed mock cases with clinicians and participated in weekly Journal Club and Advanced Topics with the Illinois Zoological and Aquatic Animal Residency Program. One of the aspects of my Preceptorship that I enjoyed the most was starting a prospective research project that investigated the safety of alternative parasiticides in teleost fish.

I would like to thank the John L. Pitts Aquatic Veterinary Education Award selection committee and the World Aquatic Veterinary Medical Association for giving me the financial support to participate in opportunities that will well-equip me to make meaningful, forward contributions to the field of aquatic veterinary medicine. I have grown as an aquatic animal clinician and a researcher through these experiences, and I know that these experiences will help me to succeed in pursuing my career goals of becoming a Diplomate of the American College of Zoological Medicine and practicing veterinary medicine at a large public aquarium.

**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.

Two new WAVMA student chapters established in 2019

The Education and Student's committee has done well and has seen the establishment of two new student chapters at Colorado State University College of Veterinary Medicine and the Biomedical Sciences, and at Cornell University College of Veterinary Medicine during 2019. More information on student chapters is available at <https://www.wavma.org/WAVMA-Student-Chapters>.

The ESC acted through a Core Committee and with five Sub-Committees. In 2019 the ESC sub-committees were: WebCEPD, Leader: Rafael Malbrue (USA); Resources Improvement, Leader: Brandon Spolander (South Africa); Student Support, Leader: Eva Marie Quijano Cardé (USA); Student Chapters Support, Leader: Kathryn Ziegner (USA); Communication Support, Leader: Jaclyn Wilson (USA). New contributors for 2020 are welcomed, please contact me.

Bartolomeo Gorgoglione, DVM, MSc, PhD
 Chair of WAVMA Education and Students Committee
 Michigan State University (USA)
BartGorg@msu.edu

Dominik von La Roche (Germany)
 Vice-Chair



**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>.

RESEARCH REPORT**Prevalence of *Clostridium perfringens* in retail fish meat in Chitwan, Nepal****Dr. Sunita Shrestha**

M. V. Sc Student,
Agriculture and Forestry University (AFU),
Chitwan, Nepal

Introduction

Clostridium perfringens is an anaerobic Gram-positive bacterium that is found in many environmental sources as well as in the intestines of humans and animals. *C. perfringens* is commonly found on raw meat. *Clostridium perfringens* is one of the most common causes of foodborne illness, according to the US CDC (www.cdc.gov/foodsafety/foodborne-germs.html).

A research project was carried out from Oct 2018 to Feb 2019 to find out the prevalence of *C. perfringens* in retail fish meat of Chitwan district of Nepal. The fish meat samples were collected from different food fish shops of Chitwan district of Nepal. The laboratory works were carried out at Department of Microbiology and Parasitology of Agriculture and Forestry University (AFU), Chitwan, Nepal.

Methods and Methodology

A total of 93 fish meat samples were collected from 31 fish shops (18 fixed shops and 13 street shops) for isolation of *Clostridium perfringens*. Dressed fish meat samples were collected in plastic zip lock bags. Three meat samples (from 3 different fish) were taken from each fish shop and transported to the Department of Microbiology and Parasitology of AFU, in thermocool box with ice and subjected to further processing without storage.

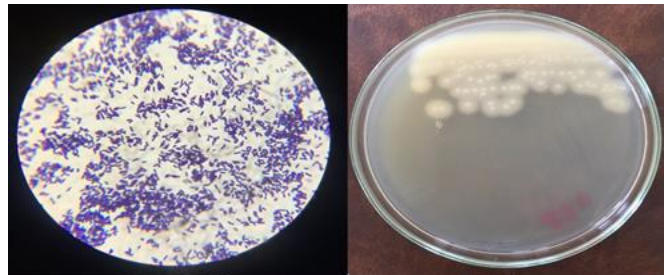
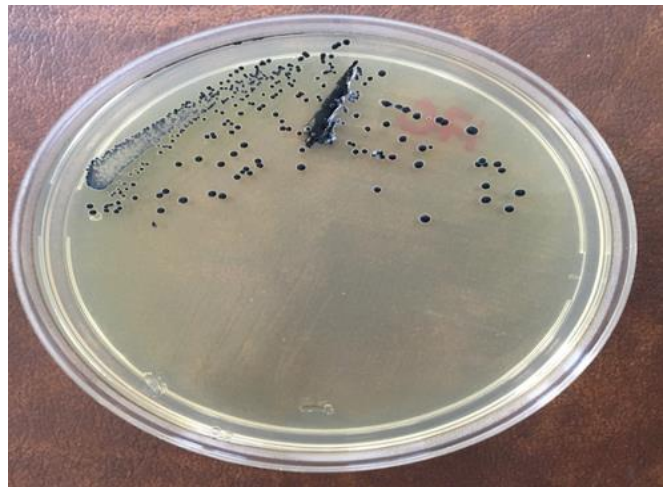
The isolation protocol included: 1) Selective enrichment in Robertson's cooked meat (RCM) broth, 2) Isolation in Tryptose Sulfite Cycloserine (TSC) agar and 3) Biochemical confirmation by Gram's Staining, Motility Test, Lecithinase and Lipase Test in Egg Yolk Agar, Haemolytic property in Blood Agar, Carbohydrate Fermentation Test (Glucose, Lactose, Sucrose, Maltose) Indole Test, Oxidase Test and Catalase tests). The anaerobic environment for enrichment, isolation and biochemical tests of *C. perfringens* was created in anaerobic gas jar with anaerobic gas packs. A questionnaire survey was also done to assess the knowledge among butchers on meat borne diseases and *Clostridium perfringens* and safety measures and waste management adopted by the butchers.

Photos on the right from top to bottom:

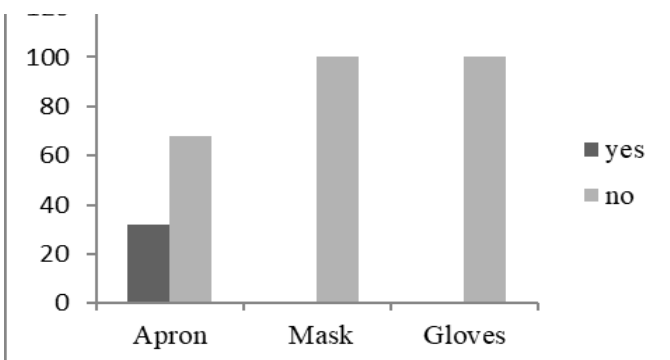
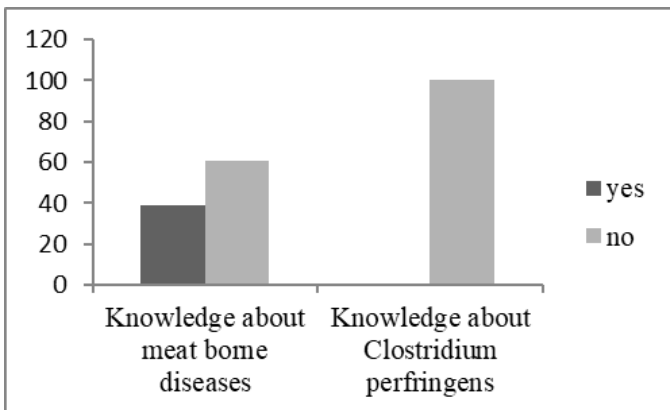
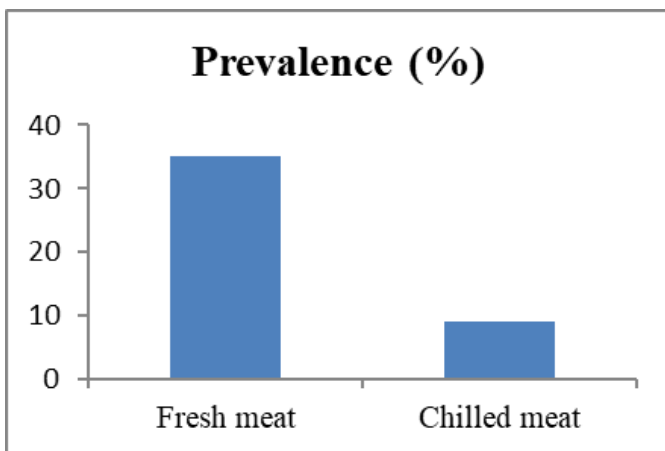
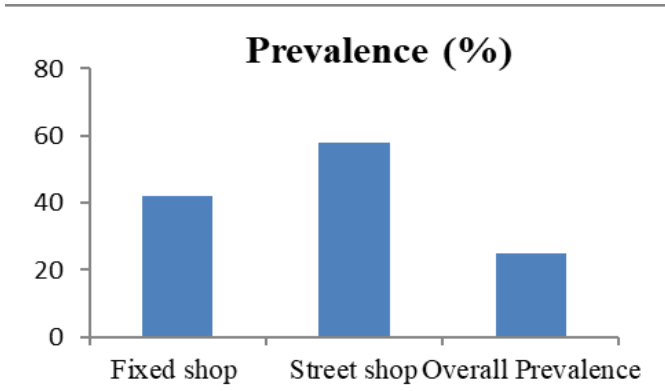
Preparation of RCM broth for enrichment

Black colonies of Clostridium perfringens in TSC agar

Biochemical tests of Clostridium perfringens



Prevalence of *Clostridium perfringens* in fish meat



Results

Out of 93 samples, 24 were found to be contaminated with *Clostridium perfringens*, therefore the prevalence of *Clostridium perfringens* in fish meat was 25.8%. The prevalence in fixed shop was 41.7% and in street shop was 58.3%. The prevalence was 35.0% in fresh meat and 9.1% in chilled meat. Out of 31 butchers, only 38.7% (12) knew about meat borne diseases and none of them knew about *Clostridium perfringens*. Among them, only 32.3% (10) butchers were using apron but none of them used masks and gloves while handling fish. The nuisance of flies was present in 45.1% (14) of the shops and the contamination of meat with intestinal contents was present in all shops. The waste products from the fish preparation were fed to Magur catfish (*Clarias batrachus*) in all shops.

Conclusion

The prevalence of *Clostridium perfringens* was found to be high in fish meat sold in Chitwan, Nepal. The contamination of meat by *C. perfringens* can be reduced by chilling of meat and avoiding the contamination of meat with intestinal contents. It is also necessary to make butchers aware of the meat borne diseases and using proper hygienic practices during handling of meat.

Funding

The World Aquatic Veterinary Medical Association (WAVMA) has financially supported this research through a John L. Pitts Aquatic Veterinary Education Award Grant in 2018.

Acknowledgement

I am highly grateful to Prof. Dr. Hom Bahadur Basnet, Asst. Prof. Kamala Gharti, Asso. Prof. Dr. Rebanta Kumar Bhattarai, Dr. Sirjan Bastola and Dr. Sabina Mishra for continuous guidance to complete this research successfully. I would also like to thank Ms. Sujata Regmi, Mr. Shiva Prasad Bhusal and Ms. Sabita Mishra for kind help and co-operation during the research period.

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!

Aquatic Veterinary Medicine Program



**Hawaii Conference Center
Honolulu, Hawaii, USA
February 9-12, 2020**



This program has been approved for 5.0 hours of veterinary continuing education credit in jurisdictions which recognize AAVSB-RACE approval.

Tuesday February 11, 2020 – Location: TBD		
Aquatic Veterinary Medicine General		
Moderator: Scarfe		
10:30	Roy Yanong*	How to Work with Veterinarians: A Not-so-Secret Secret to Enhancing Aquaculture's Bottom Line
10:45	Okey Iron*	Efficacy of <i>Ocimum gratissimum</i> (sent leaf) powder as an Anesthetic & its Effect on the Hematology of <i>Clarias gariepinus</i> Juveniles
11:00	Stanley Smith*	Programs at the U.S. Food & Drug Administration to Monitor the Usage of Pesticides & Toxic Elements in Aquaculture Products
11:15	Timothy Kniffen*	Increasing Challenge of Parasitic Freshwater Copepods, Control Options & Integrated Pest Management Program Development
11:30		
11:45	Timothy Kniffen* & Jackie Zimmerman	AQUA CARE 385®: An Approach to Teaching & Advancing Fish Care & Welfare
12:00		
12:15	Myron Kebus*	Fish disease risk assessments and regulations
Aquatic Veterinary Education		
Moderator: Sanders		
12:30 - 1:30 LUNCH		
1:30	A. David Scarfe*	New Developments in Programs for Day-1 and Advanced Training & Education in Aquatic Veterinary Medicine
1:45		
2:00	Jessica Koppien-Fox*	Finding Your Fins! Training Opportunities in Aquatic Animal Medicine
2:15	Warren Hess*	The Practice of Aquatic Veterinary Medicine in the United States Exclusive Economic Zone
2:30		
2:45	Kathleen Hartman*	Commercial Aquaculture Health Program Standards (CAHPS) Program: Implementation Update
National Veterinary Accreditation Program		
Moderator: Sanders		
3:00 – 3:30 Break		
3:30	Alicia Marston*	National Veterinary Accreditation Program Module 13: Aquatic Animal Health Regulations and Health Certification
3:45		
4:00		
4:15	Kathleen Hartman*	National Veterinary Accreditation Program Module 14: Evaluation of Aquatic Animals for Detection of Reportable Diseases and Pathogens
4:30		
4:45		

WAVMA Veterinarian Honored with the 2019 Atlantic Canada Aquaculture Award

St. Andrews-by-the-Sea, New Brunswick, Canada
 October 24, 2018

The Atlantic Canada Fish Farmers' Association (ACFFA) is pleased to award Dr. Leighanne Hawkins of Cooke Aquaculture as the recipient of the 2019 Atlantic Canada Aquaculture Award in recognition of her long-time contributions to the advancement of fish health in our region's salmon aquaculture sector.

"Dr Leighanne Hawkins is one of the most clinically experienced veterinarians in salmon aquaculture. She skillfully manages through the complex unknowns often encountered when dealing with fish health challenges experienced in aquaculture, and she does it with confidence and undiminished passion," said Tom Taylor, Chair of the Atlantic Canada Fish Farmers Association (ACFFA). "She is an indomitable force in this industry. Her colleagues respect her abilities, her farm clients value her advice, and her industry admires her ongoing significant contributions."

Dr. Hawkins became interested in veterinary medicine at an early age, and the aquatic focus came naturally as her father and uncle were early salmon farmers in New Brunswick. She graduated with her Doctor of Veterinary Medicine from the Atlantic Veterinary College, UPEI, in 1994. Since that time, she has dedicated her skills exclusively to fish veterinary medicine in Atlantic Canada working initially as the Provincial Veterinarian in Newfoundland and then moving into that same position in New Brunswick in 1998. She then moved to the private sector to work with finfish aquaculture and worked for Maritime Veterinary Services as a practicing veterinarian, before starting in 2005 as the Fish Health Manager for Cooke Aquaculture Inc.

"Her 25-year career in Atlantic Canada has witnessed many novel fish health events for the region," said Taylor. "Her calm and steady hand and application of the art of veterinary medicine has been invaluable to the Atlantic Canadian industry. She continues to apply this effective approach in her guidance of the industry through other health issues."

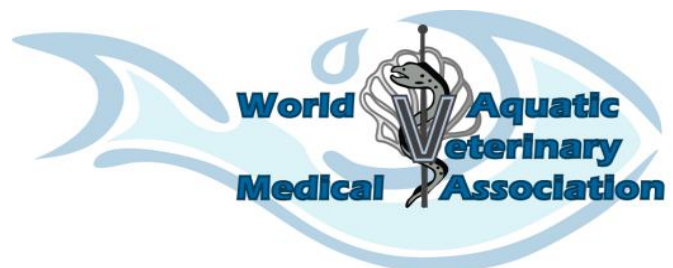
"I started loving fish farming because of my dad and my uncle, and I still love fish farming," said Dr. Hawkins. "Thank you to Cooke Aquaculture for believing in the East coast of Canada when no one else believed in the East coast. At a time when so many people and groups seem to be against aquaculture, it's great to look out and see so many people who believe in fish farming and are dedicated to its sustainability."

Atlantic Canada Fish Farmers Association (ACFFA) established the Atlantic Canada Aquaculture Award in 2017. The award honours an industry professional who has dedicated 25 years or more in the areas of science, environment and technology in support of the sustainable development of salmon aquaculture in Atlantic Canada. ACFFA is an industry-funded association working on behalf of Atlantic Canada's salmon farming industry in addition to a wide range of service and supply companies and organizations. Salmon farming employs over 3500 people in our region and has a value of over \$400 million to provincial economies.

For more information, please contact:
 Susan Farquharson,
 Executive Director
 Ph: 506-755-3526
 Email: info@atlanticfishfarmers.com



For more information, please contact:
 Susan Farquharson,
 Executive Director
 Ph: 506-755-3526
 Email: info@atlanticfishfarmers.com



My Story...

By Sharmie Johnson, DVM
 Wildlife World Zoo and Aquarium
 Litchfield Park, Arizona USA

I'm sitting at my desk reflecting over the last 30 years of my career, and the amazing adventure that led me to this day, and the even more amazing people that helped get me here.

I grew up about as far away from water as one can get. I hail from Yuma, Arizona, which is located in the Sonoran Desert in the southwest corner of the Arizona. I was blessed, at least, in living near the Colorado River, which provided a lot of boating and swimming activities, which most likely started my love for the water and its creatures. My family also traveled annually to the Salton Sea when it was in better spirits than it is now. I couldn't get enough of the fish and birds, driftwood, and weathered colored glass -- the things that give personality to a place. There is nothing like the breeze and the feel of the sun when you are near water. I was hooked.

The real addiction started when we traveled to San Diego for a summer vacation. I was somewhere in the neighborhood of six years old. We stayed at Solana Beach with some friends. At the time there were campsites along the

beach, and I would head out every morning combing the beach for sea stars, shells, broken crab shells and of course kelp. I spotted my first shark from atop my little raft. I know now that it was a baby sand shark. That started the whole, "I love sharks" thing! It was four years later on another vacation that I went to Sea World and Scripps's Institute of Oceanography.

From that time forward I was determined to be a marine biologist and work with dolphins. Somewhere in my senior year of high school, I became concerned that I wouldn't be able to make a living as a marine biologist, and decided that I could combine 2 loves—taking care of animals, and the marine world. Now veterinary school was in my sights. I don't need to tell anyone reading this about the grueling negotiation through undergrad and then veterinary school. Eight years between the two degrees! Backing up a little, I spent two years at a community college in Yuma before venturing to Tucson to the University of Arizona. I graduated with a bachelor's degree in general biology with a minor in physics. While in Tucson, I was able to

get a job volunteering at Valley Animal Hospital. It was (and still is) a small animal/exotics practice that just so happened to provide veterinary service for the Reid Park Zoo.

My mentor, the late Dr. Tom (Doc) Miller, one of the practice owners, took me under his wing. I am so privileged to have known him. I can never repay his memory for all that I learned from him. When I got into vet school, I was so excited that I could purchase Harrison's Avian Clinical Medicine book. It was Doc's bible. I could now be just like Doc. The best \$80.00 that I have ever spent!

I then attended veterinary school at Colorado State University. There weren't many opportunities for any aquatic veterinary training. I tried to get preceptorships/internships at aquariums and marine parks, but no one was buying. One wonderful veterinarian, Dr. Jessica Porter, had mercy on me. She was the veterinarian for

Wolf Hollow Wildlife Center on San Juan Island, WA. There I was able to participate in the daily care of many of the region's wildlife. It was there that I was able to care for abandoned harbor seals. I loved it. I couldn't get enough of the injections, tube feeding, support swimming, and all that goes along with the cleaning of everything seal.

No other opportunity for aquatic work presented itself so I became discouraged, and gave up on the whole notion, and

decided to focus my attention on being the best veterinarian that I could be for whatever furred, feathered, or scaled patient walked through the door. I saw everything! I managed to get in on the ground floor of the pot-bellied pig craze. My ears will never be the same!

I worked two years in a practice in Mesa, AZ, then transferred to Arrow Animal Hospital in Glendale, AZ. I was there for nine years. I cared for dogs and cats, and all manner of exotic creatures. I had a freshwater angel fish that came in because it was stuck in a hole in some lava rock. I sacrificed the rock, and both fish and owner were happy. First fish-paying client. I also provided veterinary care for Adobe Wildlife Rehabilitation Center, which is operated by the Arizona Game & Fish Department. It was during my years there that I rekindled my friendship with Dr. Brian Joseph. He was at the Point Defiance Zoo in Washington State. I owe him a debt of gratitude. He encouraged me to take my present job at Wildlife World Zoo & Aquarium, and has provided countless insights on several of our medical cases.



At the zoo, I share responsibilities with the best co-partner ever—Dr. Bradley (Scott) Houser. We provide care for approximately 7,000 animals comprising approximately 650 species. The zoo has traditional terrestrial animals, of course, but it also has anacondas, Florida water snakes, small-clawed otters, many species of water turtles, amphibians, waterfowl, penguins, and crocodilians. The aquarium currently is divided into 4 separate buildings, each housing traditional and unique species. Sea turtles, California sea lions, fresh, brackish and marine fish are all represented. Dr. Martin Haulena provides consulting services for the sea lion department, and I pick his brain a lot on the fish side as well. I never imagined being in his company.

Dr. Nick Saint-Erne asked that I mention some of the more interesting cases that I have worked on. Speaking of him, how fantastic is it that he lives close to the zoo, and also provides consulting services! He is a koi-vet rock star. We currently are attempting the identification of a possible virus causing neoplasia in our koi pond.

With a collection this size, there have been so many cases, but two stand out. One was an albino alligator named Fluffy. She was beloved by the entire staff, and departed this world due to neoplasia. I cannot express enough gratitude to Drs. Doug Mader and Freeland Dunker for all the support that they gave to us during her care. The other case was a black-tip reef shark named Lucy. Lucy was a dystocia. I performed a cesarean section on her and then a salpingo-oophorectomy. I never would have guessed that a sur-



*Photos by Wildlife World's photographer
Lorenzo Fuentes*

gery like this was possible until Dr. Brian Joseph gave me the “Go get ‘em” talk, and I did it. She did great for 6 weeks, and the day we were planning on transferring her back to her exhibit, she dehiscd at the mid-aspect of her laparotomy site and was euthanized due to secondary septicemia from coelomitis.

In closing, my advice to newcomers is that even though some cases don't work out as we envisioned, it is the journey, and all that we learn from these wonderful animals in order to help the next one, that is important. We don't ever give up, and we support one another and work as a team. If you feel stranded in small animal medicine, remember how much you can learn from those animals. Everything can be extrapolated. It leads to experience and exactness. Join as many aquatic oriented groups as you can, such as WAVMA, Fish Vets, and IAAAM, to name a few. Be patient and diligent, and do the best job possible with each and every case until that angelfish that is stuck in the rock shows up.

I am also indebted to Mickey Ollson, Director of Wildlife World Zoo and his wife Connie, and their family for having the confidence in me to care for their collection. I have completed year 20 at the zoo and aquarium. I can't believe that it has gone by so fast. I do believe what people say: “if you love your job, you never spend a day working!” I hope that none of you ever spend a day working. It is a big, bright world, full of aquatic animals that need our help and the people who care about them.
 “Go get ‘em!”

Sharmie Johnson, D.V.M.
 Chief Veterinarian
 Wildlife World Zoo & Aquarium
 16501 W. Northern Avenue
 Litchfield Park, AZ 85340
vetdept@wildlifeworld.com
 623-935-9453-zoo
 623-297-9871-cell





*Predators at the Wildlife World Aquarium
Photo by Nick Saint-Erne*

Wildlife World Zoo and Aquarium

16501 W. Northern Avenue
Litchfield Park, AZ 85340
<https://wildlifeworld.com/>

Discover the wonders of life in the water with our four-building aquarium, filled with thousands of fish, amphibians, invertebrates, and reptiles. Our aquarium's South Pacific Reef tunnel tank also features the longest acrylic tunnel in Arizona. Get as close and personal with the world's water life as possible without getting wet by visiting The Wildlife World Aquarium!

Diversity of Life in Water

Our first building exemplifies the diversity of life in the world's water ways and oceans with fish, amphibians, and reptiles from the Caribbean, South Pacific, Amazon, and many more distant and exotic locales.

River Monsters

The world's internal waterways are full of fascinating, beautiful, and sometimes terrifying water life. Get up close and personal with some real-life river monsters at our engaging and educational River Monsters exhibit, where you and your loved ones can enjoy the exotic thrills of these captivating creatures.

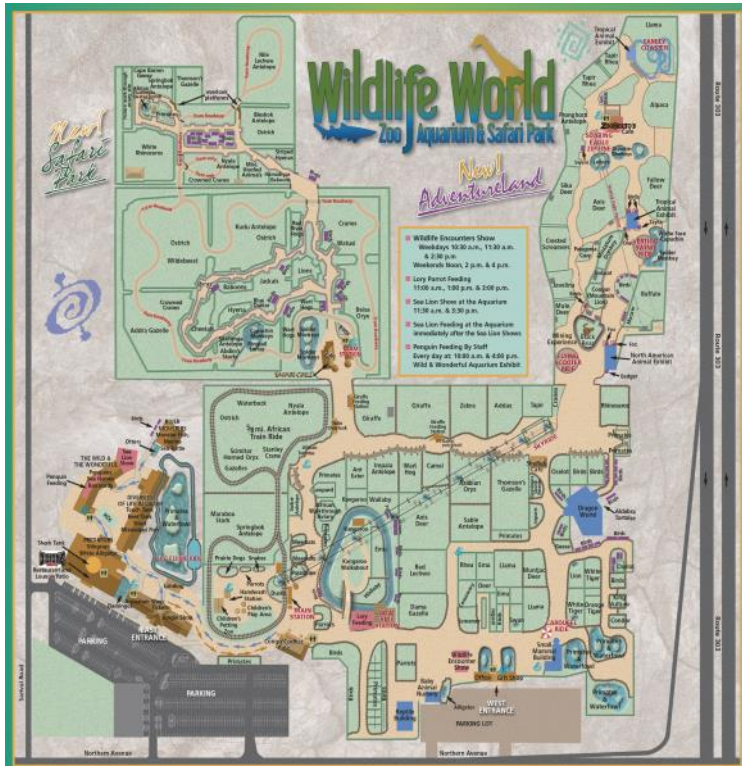
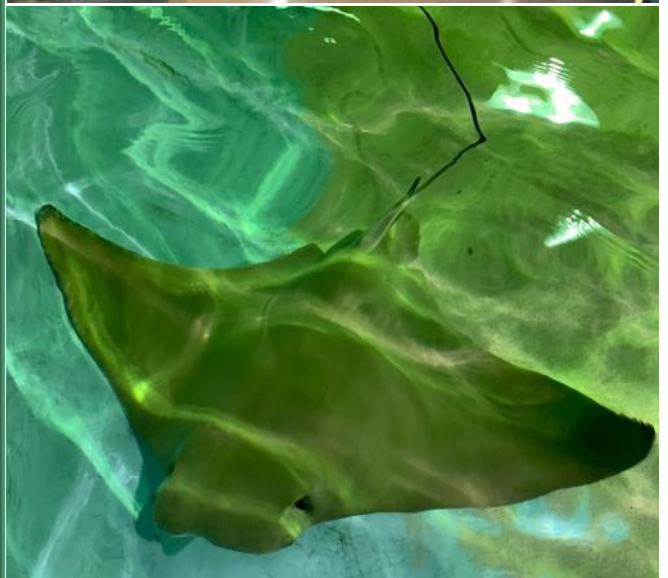
The Wild & The Wonderful

The exhibits in this building will open your eyes to the diversity and uniqueness found below the surface. If you enjoy strange, exotic creatures, you'll definitely like the outlandish inhabitants in this enthralling exhibit.



Predators

Some of the world's most graceful, majestic, and downright terrifying predators live and hunt in the water, and you can see them up close (and safely) at The Wildlife World Aquarium. Our Predators exhibit features such activities as the Stingray Touch Tank and Crocodile Monitor Tunnel, as well as an ultra-rare albino alligator!





Wildlife World Zoo, Aquarium & Safari Park is excited to announce the birth of the first female sea lion pup at Shipwreck Cove! The newborn's animal care team named the baby Makara, which means "little sea creature" in Hindi. With her mom by her side, Makara is quite the adventurer and is exploring everything in her new world.

Like all marine mammals, sea lions are protected by the landmark legislation known as the Marine Mammal Protection Act ("MMPA"), first passed in 1972. The MMPA makes it illegal to hunt or harass any marine mammal species found in U.S. waters. Sea Lions, like many marine animals, face an uncertain future due to ocean pollution, dwindling fish stock, and competition with human activities.

Wildlife World's expert sea lion care team is committed to providing the best care to their animals and engaging, informative, and fun educational experiences for visitors of all ages at Shipwreck Cove! In addition, guests can feed the sea lions and participate in photo opportunities after their scheduled feeding times. With an outdoor exhibit pool, public seating, and a viewing area for the sea lions, guests can come out and see Makara explore her new surroundings on land and in the water!

With more than 650 species & 7000 animals on display, there are always new arrivals at Wildlife World! Other babies on display include a baby jaguar, colobus monkey, baboon & several hoofed animal species, including a giraffe & wildebeests and other youngsters throughout the 100-acre park.

As a USDA licensed, private institution, accredited by the Zoological Association of America (ZAA) and the Alliance of Marine Mammal Parks & Aquariums (AMMPA), Wildlife World Zoo, Aquarium & Safari Park receives zero taxpayer funding. No tax dollars have ever been spent to build or operate Wildlife World in its 35-year history.

Wildlife World Zoo, Aquarium & Safari Park is located at 16501 W. Northern Avenue, Litchfield Park, AZ. Open seven days a week, 365 days a year, including all holidays. Zoo exhibits are open from 9:00 a.m. to 6:00 p.m. (last zoo admission is at 5:00 p.m.) Aquarium exhibits are open from 9:00 a.m. to 7:00 p.m. Admission includes access to the Zoo, Aquarium and Safari Park.

Find out more about what you can do to help support sea lion conservation efforts:

Alliance of Marine Mammal Parks & Aquariums:

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

International Marine Animal Trainers' Association:

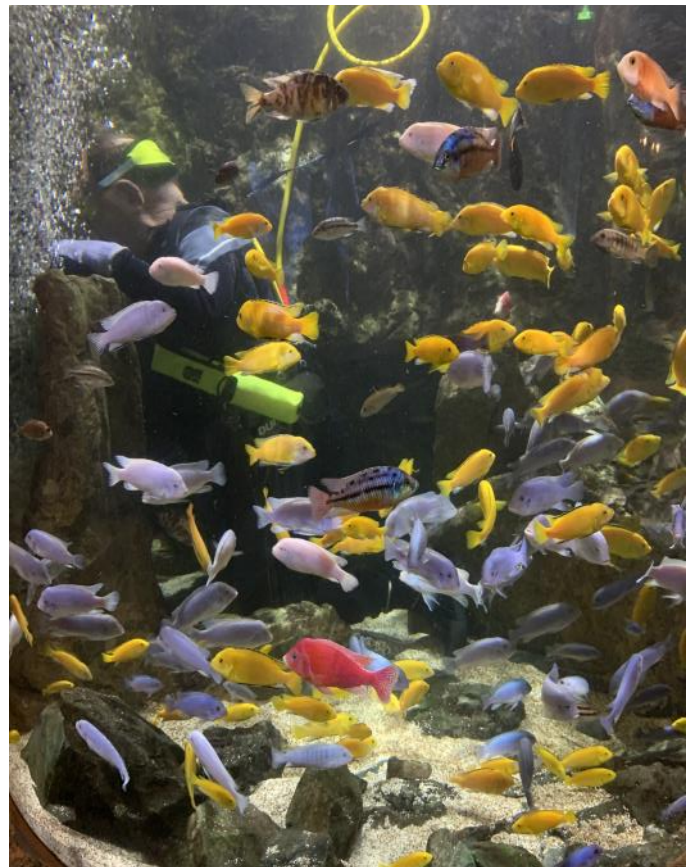
<https://www.imata.org/>

National Marine Mammal Foundation:

<https://www.nmmf.org>

*Sea Lion Photo by Wildlife World's photographer
Lorenzo Fuentes*

*Previous page photos and below by Nick Saint-Erne.
Diver cleaning African Cichlid aquarium*



Bacterial granulomas arising from a sialocele in a green anaconda (*Eunectes murinus*)

By Dr. Sharmie Johnson

Abstract

A female green anaconda (*Eunectes murinus*) presented for submandibular swelling that was diagnosed as a sialocele by cytology. The lesion was removed surgically and consisted of 4 separate masses that were diagnosed by histopathology as bacterial granulomas. Culture of the granulomas revealed *Bacteroides* spp., *Actinomyces* spp., and *Corynebacterium*. These are commensal bacteria of the oral cavity of snakes and can become pathogenic under certain conditions.

Key Words: green anaconda, bacterial granuloma, sialocele, *Bacteroides*, anaerobic bacteria

Introduction

Bacterial abscesses and granulomas are common in snakes. They occur as a result of some inciting damage to a tissue or by hematogenous spread. Over 50% of the bacteria isolated from the gastrointestinal tract of snakes are anaerobes, with *Bacteroides* spp. being the most common isolate. *Bacteroides* is a commensal bacterium that can become pathogenic under favorable circumstances. In the case presented, *Bacteroides*, *Actinomyces* and *Corynebacterium* were isolated from granulomas that formed secondarily to sialoceles within the submandibular space in a green anaconda housed at the zoo. Sialoceles have been reported by veterinarians and are believed to be caused by trauma to the oral cavity. This is the first published case in a green anaconda.

Case Presentation

A 17-year-old, female, green anaconda (*Eunectes murinus*) presented for a submandibular swelling of 1-week duration. A slight swelling was detected several years prior, but was considered insignificant following examination, with no change in status. The snake measured 11 feet 1 inch (335.28 cm) from snout to vent and is housed with a male yellow anaconda (*Eunectes notaeus*) in the Tropics building at Wildlife World Zoo & Aquarium. The exhibit is glass on 2 sides, has ground coconut shell substrate, a large branch, a pond, and sky lights. At presentation the snake weighed 39 lbs (17.7 kg), had a BCS of 3/5 and appeared to be in good condition with the exclusion of the mass below the jaw. The zoo staff reported that her appetite was normal, and eagerly fed on 2 thawed large rats every 14 days. Her diet was alternated with small, thawed rabbits.^a

Physical examination was normal. Her resting heart and respiratory rates were 36 BPM and 5 BPM, respectively. She was alert and passive for the examination. A rubber spatula was used to facilitate the oral examination. A soft mass (0.5cm x 0.25 cm) was readily visible in the right submandibular area, but only visi-

ble on the external surface. Palpation did not elicit a withdrawal response, indicating that it probably was not uncomfortable for the animal. The internal oral examination was normal. Her mucous membranes were a light pink color, CRT was 2 seconds, and the mucosal was shiny. The tracheal hilus and nares were free of any exudates.

A differential diagnosis was made of an abscess, granuloma (fungal, bacterial, mycobacterial or parasitic), salivary duct obstruction (sialocele), or neoplasia. A diagnostic plan was initiated. Radiographs revealed a soft tissue mass, primarily located on the right aspect of the submandibular space. There were punctate areas of calcification within a dense soft tissue structure. There was also some calcification visible on the opposite side. There appeared to be no boney involvement.

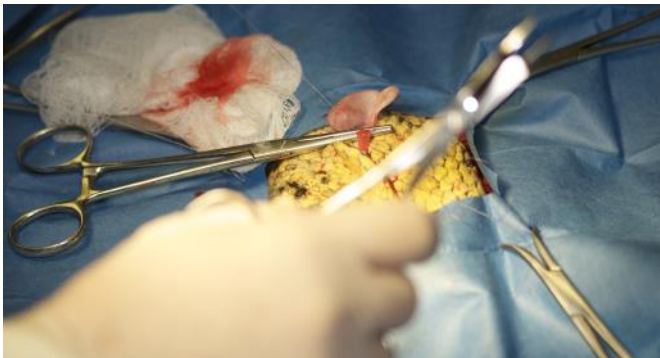
A fine needle aspirate was performed at the caudal aspect of the mass. A serous appearing fluid was retrieved. An in-house cytology with Diff Quik stain showed only amorphous debris that stained a lavender color. Slides of the aspirate were submitted to an outside laboratory.^b The cytological diagnosis was mild inflammation and acellular matrix with crystal material, most consistent with a sialocele. To complete the minimum data base, a fecal direct smear and zinc floatation were performed, which were negative.^c Blood was also obtained from the ventral abdominal vein for routine CBC and biochemistry analysis.^c All parameters were normal excluding an elevation in creatine phosphokinase (CPK) and a depression in glucose. The snake struggled some during restraint for venipuncture which was most likely the cause for the elevation in CPK. The blood was not separated in a timely manner, which was the most reasonable explanation for the low glucose value. Blood work was repeated again and all values were normal.

A tentative diagnosis of a sialocele was made. Plans were initiated for anesthesia and surgical exploration of the submandibular region. The snake was induced via intramuscular injection of ketamine 70 mg and midazolam 12.5 mg in the upper 1/3 of the body in the epaxial region. A 3.0 mm endotracheal tube was placed, and sevoflurane was administered and maintained between 3-4% with oxygen levels at 2-3 L/min. Bupivacaine^d 17 mg was divided and administered at the caudal aspect of both commissures of the mandible. The anesthetic plane was evaluated using ECG, ET_{CO}₂, and esophageal temperature.





A midline incision was made using a size 10 surgical blade, extending 2 cm from the mandibular commissure rostrally, exposing 3 masses beneath the subcutaneous tissue but ventral to the muscles. Two masses were located to the right of midline. The masses measured 3 x 3 cm, and 4 x 2 cm. The mass located to the left side measured 1 x 0.5 cm. The masses were soft, light brown in color, and were removed by blunt dissection. Occasional small blood vessels were encountered and ligated with 4-0 Monocryl.^e



Closure commenced following flushing of the site with warmed physiologic saline. The subcutaneous tissue was closed in a simple continuous pattern using 4-0 Monocryl. The skin was closed with 4-0 Monocryl in a subcuticular pattern. A horizontal mattress pattern was then used externally with 4-0 Ethilon.^f Suture removal was planned for 3 weeks post-op. Plasmalyte A^g was administered intra-op via the ventral abdominal vein. Carprofen^h 17 mg, ceftazidimeⁱ 340 mg, flumazenil^l 0.15 mg were all administered post-op.

Esophageal pre-surgical temp was 82.1°F (27.8°C). Post-surgical esophageal temp was 83.3°F (28.5°C). Total anesthesia time was 52 minutes. Total surgery time was 30 min. The snake was extubated 36 min following discontinuation of gas anesthesia in a 90°F heated room. She was placed in a vision cage for the next 3 weeks until suture removal. She was then returned to her exhibit.



The masses were submitted to the laboratory and were identified as chronic bacterial granulomas. Culture results were positive for anaerobic bacteria (*Bacteroides spp.*- 4+) and aerobic bacteria (*Actinomyces spp.*- 4+, pathogenic, and *Corynebacterium spp.*- 2+, considered non-pathogenic). The snake was placed on a 2- week course of Taziceff 340mg x 72 hr IM.



Discussion and Conclusions

This case presented to the veterinary department 6 years ago. There has been no recurrence of the disease since surgery. Bacterial granulomas are common in reptiles as are abscesses. Abscesses in reptiles present as hard, caseated, "cheese-like" masses that are generally encapsulated and have a lamellar appearance on cut-surface. They are comprised of heterophils primarily. The heterophils lack the oxidative response seen in neutrophils, their mammalian counterparts, resulting in a firm mass instead of a liquified one.⁴ Swelling may be the only presenting sign in reptiles. Typically, there is no heat, pain, fever or malaise associated with them like there is in a mammalian patient. Blood work is normal in most circumstances, however the white blood cell count may be reduced, verses a leukocytosis in normal reptile patients.¹ The hallmark of granulomas is the presence of large numbers of macrophages instead of heterophils. Aggregation of macrophages result in the formation of multinucleated giant cells. The epithelial description of the macrophages seen in granulomas refer to the confor-

mational change of the nuclei from small and round to large and elongated and the cytoplasm stains a pinkish color instead of a basophilic one. These changes are believed to be related to the activation of the tissue macrophage by the particular inciting antigen.²⁻⁸ The difference between granulomas and other types of inflammation are related to the resistance of the offending antigen to "first-responder" inflammatory cells such as neutrophils (heterophils) and eosinophils. Granulomas form when the body is not able to clear the infection, and walls it off instead.^{2,3,4,5,6,7} Granulomas are frequently observed in fungal and mycobacterial infections. A fungal culture was not submitted, but no fungal agents were observed on the biopsy. An acid-fast stain was also negative.

An abscess or granuloma should be sampled from the periphery of the lesion. This will insure the highest yield of bacteria for aerobic and anaerobic culture and sensitivity, since the center primarily only contains necrotic material.¹ Radiographs, ultrasound and advanced imagery can be used to help diagnosis these conditions and rule out other causes while providing information regarding the extent of the lesion and its involvement with adjacent tissues. Complete surgical excision of the mass and capsule are imperative as antibiotics will not penetrate the core and reoccurrence is possible with incomplete excision. Antibiotics should be continued for a minimum of 14 days.⁸

The anaerobic bacteria isolated in this case are common bacteria found within the intestinal tract of many species. They are opportunistic bacteria in lesions involving the integumentary, hepatic, gastrointestinal, respiratory, and central nervous systems.^{2,3} The *Bacteroides spp.* cultured from the anaconda is a gram - negative, obligate anaerobic bacteria. It is commonly found in the intestinal tract of organisms that consume primarily protein and fat in the diet.⁹ It is commonly involved in wound colonization of humans following snake bite injuries. *Actinomyces* is in the *Acinetobacter* class of bacteria. It is gram- positive and facultatively anaerobic. Both bacteria, as well as *Corynebacteria* are the most common bacteria isolated from the oral cavity of snakes based on current research.^{1,11} In one report, greater than 50% of the bacteria isolated from the oral cavity of snakes were anaerobes and *Bacteroides* was the most common.¹ *Bacteroides* is frequently implicated as a causative agent of hepatic abscesses and foot rot in cattle and cholangitis/ cholangiohepatitis syndrome in felids. They can cause pleuropneumonia in horses, omphalitis in neonatal foals, periodontal disease in cats and dogs, and stomatitis and pneumonia in snakes.^{1,12-17}

The pathologist stated that sialoceles (salivary mucoceles or salivary gland cysts) are not commonly reported in snakes in the literature, however several veterinarians have reported clinical experiences with them on the Veterinary Information Network (VIN). Speculation is that they are caused by either trauma from rubbing on enclosures, feeding too large of prey, upper

Microbiology: Aerobic & Anaerobic Cultures

12/19/13 (Order Received)
12/27/13 2:49 PM (Last Updated)
Source: SALIVARY GLAND

Direct Gram Stain
3+ GRAM POSITIVE RODS
2+ GRAM NEGATIVE RODS

Anaerobic Culture Results:
Bacteroides species - 4+
Penicillin Susceptible Strain
Antimicrobial of choice: Penicillin, Ampicillin or Clavamox (1st), Clindamycin, Metronidazole, or Chloramphenicol (2nd).

Aerobic Culture Results:
Actinomyces species - 4+
Successful treatment requires prolonged antibiotic administration. Antimicrobials of choice: Penicillin (high doses), Erythromycin, Clindamycin, Ampicillin and Chloramphenicol.

-
Corynebacterium species - 2+
(Diphtheroids) Not considered pathogenic.
Normal inhabitant of the skin.

-
Non-enteric gram-negative rod (unable to speciate) - 3+
Salmonella Screen: No Salmonella isolated.

respiratory infection or stomatitis.^{1,18} Treatment ranged from either long- term antibiotics, repeated drainage, or attempts at surgical removal. The anaconda in this case was never observed to rub her face or head on any part of the enclosure. She has never had a respiratory infection or stomatitis. It is possible that the other anaconda could have struck at her during feeding. The two snakes are fed separately because of this. It is also a possibility that the oral mucosa was scratched or perforated by a nail, tooth or sharp bone from the thawed prey that was offered.

A sialocele is a potential problem in any species that possess salivary glands, and snakes are no exception. Sialoceles have been observed in humans, dogs, and occasionally in cats. They consist of a soft, subcutaneous, fluid-filled mass that is located in the submandibular or cervical regions. They are generally non-painful and filled with saliva. They can be associated with damage to the salivary ducts or glands, themselves.¹⁹ Causes in dogs have been associated with trauma, sialolithiasis, foreign bodies, inflammation and neoplasia. Neoplasia is a common occurrence in cats that are affected by them.²⁰ Hydration of the oral cavity in squamates is accomplished in part due to the presence of an epithelial layer that is rich in goblet cells. There are numerous mucous glands and 5 types of salivary glands, which are labial, lingual, sublingual,

palatine, and dental. These glands all help to lubricate prey²¹ The sublingual gland is suspected to have been involved in the present case, but any one of the glands could have been affected.

The author believes that an initiating trauma brought about the formation of a sialocele, that was eventually colonized by commensal bacteria. Surgical excision was complete, without perforation of the granulomas. Antibiotics were only continued for a short time because of exposure of the tissues to the environment. Treatment and eradication of commensals was deemed impossible, therefore no attempt was made once culture results were ascertained.

This case illustrates a successful surgical outcome for the removal of bacterial granulomas that were secondary to a sialocele in a green anaconda.

Footnotes

^a Layne Labs-4303 Huasna Rd., Arroyo Grande, CA 93420

^b Zoo/Exotic Pathology Service- 6020 Rutland Dr. #14, Carmichael, CA 95608

^c IDEXX Laboratories-11034 N. 23rd Dr #100, Phoenix, AZ 85029

^d Marcaine- Pfizer Inc. 10555 Science Center Dr., San Diego, CA 92121

^e Monocryl 4-0-Ethicon, Inc.-P.O. Box 151 Somerville, NJ 08876

^f Ethilon 4-0- Ethicon, Inc.-P.O. Box 151 Somerville, NJ 08876

^g Baxter International, Inc.- Baxter Pkwy, West Deerfield Township, IL 60015

^h Rimadyl @Injectable Zoetis Inc.-16420 Via Esprillo, San Diego CA 92127

ⁱ Tazicef- Pfizer Inc.- 235 E. 42nd St., NY, NY 10017

^j Sandoz-100 College Rd. W., Princeton, NJ 08540

References

- Mader D, Specific diseases and clinical conditions, *Reptile Medicine and Surgery*, 2nd ed., Section VII, Chapter 42 (Abscesses), Saunders, 2006, pp. 715-719.
- Mukhopadhyay S, Farvar CF, Vaszar LT, et al, Causes of pulmonary granulomas: a retrospective study of 500 cases from seven countries, 2012, *J of Clin Path* 65(1); pp. 51-57.doi: 10.1136/jclinpath-2011-200336.
- Woodard BH, Rosenberg SI, Farnham R, et al, Incidence and nature of primary granulomatous inflammation in surgically removed material, *Am J of Surg Path*, 1982, 6(2): pp. 119-129. Doi: 10.1097/0000478-198203000-00004.
- Hunter DC, Logie JR, Suture granuloma, *Brit J of Surg*, 1988, 75(11): pp. 1149-1150. Doi: 10.1002/bjs.1800751151140.
- Chen KT, Kostich ND, Rosai J, Peritoneal foreign body granulomas to keratin in uterine adenocarcinoma, 1987, *Archives of Path and Lab Med*, 102 (4): pp174-177.
- Adams Do, the granulomatous inflammatory response, *Am J of Path* (1976), 84(1): 164-191.
- Travers P, Walport M, *Janeway's Immunobiology*, 2008, Garland Science. P. 372.
- Murray M, Pneumonia and lower respiratory tract disease, *Reptile Medicine and Surgery*, 2nd ed., Section VII, Chapter 65, pp. 865-877.
- Wu GD, Chen J, Hoffman C, et al. Linking long-term dietary patterns with gut microbial enterotypes, *Science* 334 (6052): 105-8.
- Holt JG, ed. (1994) *Bergey's Manual of Determinative Bacteriology* (9th ed.) Williams & Wilkens. ISBN 0-683-00603-7.
- Sajesh Puthenpurackal Krishnankutty, Megha Muralleedhasan, Next-generation sequencing analysis reveals high bacterial diversity in wild venomous and non-venomous snakes from India, *J Venom Anim Toxin Incl Trop Dis*. 2018; 24:41. Doi:10.1186/s40409-018-0181-8.
- Hepatic disease in large animals, *The Merck Veterinary Manual*, 11 ed., 2016, p. 352.
- Systemic pharmacotherapeutics of the integumentary system, *The Merck Veterinary Manual*, 11 ed., 2016, P. 2571.
- Hepatic disease in small animals, *The Merck Veterinary Manual*, 11 ed. Merck & Co., Inc, 2016, p. 481.
- Respiratory diseases of horses, *The Merck Veterinary Manual*, 11 ed., Merck & Co., Inc., 2016, p. 1449.
- Management of the neonate, *The Merck Veterinary Manual*, 11 ed., Merck & Co., Inc., 2016, p. 2092.
- Dentistry, *The Merck Veterinary Manual*, 11 ed., Merck & Co., Inc., 2016, p. 178.
- Veterinary Information Network (VIN)®, www.vin.com, 12/01/2019.
- Araujo MR, Centurion BS, Albuquerque DF, et al, Management of a parotid sialocele in a young patient: Case report and literature review, 2010, *J Applied Oral Sci: Revista FOB*. 18(4): pp 432-436.
- Welsh EM, Surgical conditions of the salivary glands, *Brit Small Animal Vet Congress* 2008.
- Diaz-Figuero O, Mitchell M, Gastrointestinal anatomy and physiology, *Reptile Medicine and Surgery*, 2nd ed., Saunders, 2006, Section III, Chapter 12, pp. 145-146.

**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>.

Medical and surgical management of a bite wound to the foot of an American alligator
By Dr. Sharmie Johnson

Abstract

Aggression in animals is most commonly the result of competition, either for territory, breeding, food, or water. It can be of an active nature where physical altercations lead to trauma or death, or passive, leading to chronic stress and secondary disease. Whatever the cause, under most circumstances the affected animals need to be separated from the aggressive ones.

This case illustrates the severity of an injury to the rear foot of an American alligator (*Alligator mississippiensis*) resulting from an altercation with a conspecific with which it had been raised for several years. The alligator presented with a fracture and avascular necrosis of the 4th digit, combined with severe soft tissue injury to the dorso-lateral aspect of the associated metatarsal region. Surgical debridement and closure of the wound was accomplished following induction with Alfaxalone and with maintenance on gas anesthesia.

Key Words: American alligator, amputation, aggression, competition, Alfaxalone

Introduction

Aggression by most definitions is the unprovoked attack on another for the purpose of dominance resulting in physical or psychological consequences.¹ Aggression in animals is most commonly the result of competition, either for territory, breeding, food, or water. It can be of an active nature where physical alterations lead to trauma or death, or passive, leading to chronic stress and secondary disease. Whatever the cause, under most circumstances the affected animals need to be separated from the aggressive ones if changes in management do not affect a favorable outcome for those that are bullied. The following case describes the medical and surgical management of a severe bite wound incurred in a American alligator (*Alligator mississippiensis*) caused by a dominant conspecific.

Case Presentation

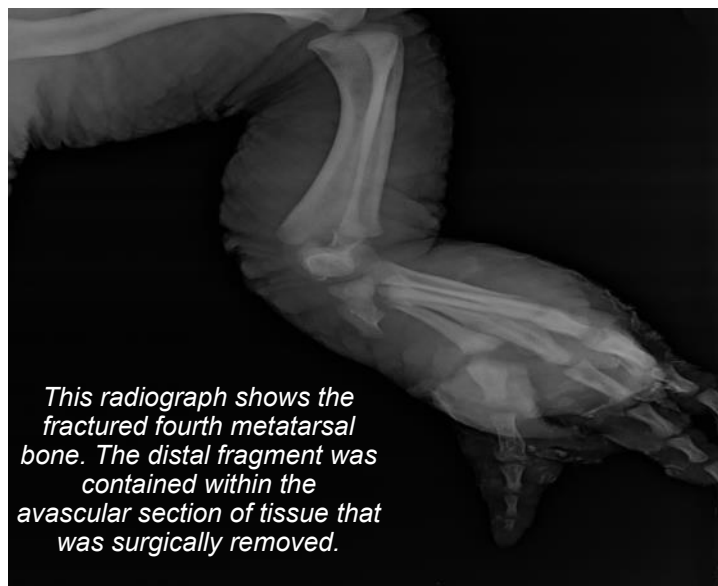
A 10-year-old, male American alligator presented for acute trauma to the right rear foot. The alligator was

housed in a spacious, outdoor exhibit with a large pond, which it shared with 3 other male alligators of equal age and size. The animals were fed two extra-large rats^a once weekly from February through November. The animals fast in the winter due to cooler weather. No aggression had been noted by the staff preceding this event, and the animal was observed to be normal at close-down the previous day.

The alligator was found on morning rounds to have a severe injury to the right rear foot. The animal was manually restrained while the foot was examined. The lateral aspect of the metatarsal region and 4th digit were severely mangled, cold to the touch, and dark in color. The animal failed to react to tactile pressure in

these regions when palpated, and no blood came from sites that were probed with a 20 g needle. A diagnosis of avascular necrosis to the right rear digit #4 and ventro-lateral aspect of the metatarsal region was made. The remainder of

the examination was normal, and a plan was formalized to care for the wound. One of the alligators housed with this animal was noted to be overtly aggressive at the time of this animal's examination. It appeared to take ownership of the pond. It was determined that this alligator was most likely the individual that caused the wound in the conspecific.



This radiograph shows the fractured fourth metatarsal bone. The distal fragment was contained within the avascular section of tissue that was surgically removed.



The alligator's snout was secured with duct tape and the head was covered with a towel for safety and to reduce stress. It was then transported to the medical building for wound treatment and radiographs. The animal was re-examined, weighed (51 lb/23.18 kg) and had a BCS of 3-4/5. The wound was flushed with chlorhexidine and gently debrided. An oxidizing disinfectant hydrogel^b was applied topically and enrofloxacin^c 230 mg was administered IM. The alligator was placed in a warm suite in the medical building (85°F/29.4°C) and misted with warm water. Surgery was scheduled for the following day.

The next morning the alligator was induced with Alfaxalone^d 110 mg IP. It was intubated and placed on isoflurane^e 2% and oxygen 2 L/min. Butorphanol^f 11 mg IM was administered, pre-operatively, followed by bupivacaine^g 11.5 mg in a ring block surrounding the proximal right metatarsal/tarsal joint. Physiologic saline 0.9% (250 ml) was given IP. Amputation of the avascular portion of the 4th digit and 4th metatarsal bone of



the right rear foot was performed. The ventral aspect of both those regions still maintained vascularity and was salvaged. This tissue was then used as a flap to close the wound over the 3rd digit/metatarsal region using 3-0 Monocryl^h in an interrupted pattern. The ends were trimmed short to allow for absorption without the need for suture removal. Silver sulfadiazine cr me, USP 1%ⁱ was applied to the wound. The foot was sprayed with a pet safe insecticide^j to deter flies/maggots. Baytril (115 mg IM) injection was repeated. Cefovecin^k (408 mg IM), carprofen^l (50 mg IM), and famotidine^m (10 mg IM) were administered.

The alligator was returned to the medical suite and maintained at its preferred optimal temperature zone (POTZ). It was sprayed twice daily with water followed by a final spray of propylene glycol/water (1 ml per 30 ml of water in a 60 ml catheter-tipped syringe for remote delivery) to prevent drying of the skin. The animal was prescribed Baytril 136 mg po x q72hr for 3 treatments and carprofenⁿ 25mg po x q72hr for 3 treat-



ments. Vetericyn was applied topically to the surgery site daily. Adam's spray was used prn. Food was offered daily but refused. The alligator was already in a self-induced fast prior to the incident due to the cooler weather. Because of this, no oral medications were consumed. The wounds appeared to be healing at a rapid rate just with the topical therapy.

The wound was completely healed 4 weeks later. The alligator was moved back to a segregated area within its' regular enclosure following a slow acclimation to the outside temperature.

Discussion and Conclusions

Aggression in animals is typically related to competition for resources such as territory, breeding, and food. When animals are confined in an artificial environment with limited space in comparison to a natural environment, the outcome from competition can be exaggerated and lead to trauma, death or secondary disease from chronic stress.²

When aggression is encountered within a group of animals, medical management can be employed to decrease this behavior through castration or ovariectomy, hormonal treatment with progestins or gonadotropin-releasing hormone agonists (GnRH), sedatives or anti-anxiety medications.

Environmental management is the first step. Separation of the affected animals ensures complete safety for the aggressor and the subordinate individual(s). If the animals must remain in the same environment, there are several measures that improve safety. The enclosure can be divided, enlarged, and visual barriers can be enhanced. Multiple feeding, watering, nesting, and basking stations can be provided. Separation during feeding and reduction in number of animals can be helpful. When anticipating the potential for aggression in the species maintained, same sex groups sometimes offset natural behaviors.³

Crocodylians in confinement, such as that seen in breeding farms and zoological parks, frequently experience trauma to digits or limbs. This is also observed in wild animals.⁴ They are an offensive aggressive apex predator, particularly when feeding, and a defensive aggressor during nesting and rearing of offspring. This inherent behavior is what ensures survival in the natural environment and can be impossible to change in the artificial one.

This case illustrates a common occurrence amongst aggressive animals. Oftentimes, if the animals have been raised together and are the same sex, they can cohabitate without incident. However, it is not unusual for animals to develop acquired aggression with sexual maturity and the need to establish social dominance. This is most likely the cause with this case. Establishment of territory with regards to the pond was apparent with the aggressor in this particular social group. Every effort is made to ensure the safety of the animals while attempting to create a pleasing display for the public. When one animal is determined to be dominant, the

social structure reconfigures, and oftentimes a subordinate animal(s) need to be removed and relocated.

Crocodylians have a tremendous capacity for healing of the most severe of injuries. The injury that this animal sustained was not mortal, and it went on to have normal ambulation.

Animals that reside in groups need to be monitored for aggressive behaviors towards others, whether physical or emotional. Adjustments need to be made when these situations arise for the well-being of the animals.

Footnotes

^a Layne Labs-4303 Huasna Rd, Arroyo Grande, CA 93420

^b Vetericyn + Plus Wound & Skin Care Hydrogel- Inno-vacyn, Inc-3546 Riverside Ave., Rialyo, CA 92377

^c Baytril® 100 Bayer HealthCare LLC Animal Health Division, Shawnee, KS 66201

^d Alfaxan-Jurox -85 Gardiner St., Rutherford NSW 2320, Australia

^e Isothesia™ Henry Schein 4401 E. Baseline Rd., Suite 103, Phoenix, AZ 85042

^f Torbugesic®-SA-Zoetis 16420 Via Esprillo, San Diego, CA 92127

^g Marcaine -Pfizer Inc. 10555 Science Center Dr., San Diego, CA 92121

^h Monocryl 3-0-Ethicon Inc- P.O. Box 151 Somerville, NJ 08876

ⁱ Ascend Laboratories Inc. -339 Jefferson Rd, Suite 101, Parisippany, NJ 07054

^j Adam's Plus flea & Tick Pet Spray-Adam's 301 W. Osborn, Phoenix, AZ 85013

^k Convenia®-Zoetis 16420 Via Esprillo, San Diego, CA 92127

^l Rimadyl® Injectable-Zoetis 16420 Via Esprillo, San Diego, CA 92127

^m Teva- Carlsbad Technology 5928 Farnsworth Ct, Carlsbad, CA 92008

ⁿ Rimadyl® Tablets- Zoetis 16420 Via Esprillo, San Diego, CA 92127

References

1. Merriam-Webster Britannica Digital Learning Unabridged, Merriam-Webster, Inc., Springfield., MA 01102
2. Penfold LM, Patton ML, Jöchle W: Contraceptive agents in aggression control. In Asa CS, Porton IJ: *Wildlife Contraception Issues, Methods, and Applications*, Baltimore, Maryland, 2005, The Johns Hopkins University Press, pp 184-194.
3. Environmental diseases and traumatic injuries, Reptiles, *The Merck Veterinary Manual*, ed. 11, Kenilworth, NJ, 2016, Merck & Co Inc., p 1999.
4. Nevarez J: Crocodylian differential diagnosis. In Mader DR: *Reptile Medicine and Surgery*, ed. 2, St. Louis, Missouri, 2006, Saunders, pp 705-714.



*Photos
Above:
Right rear
foot
before
and after
surgery.*

*Left:
Amputated
toe of the
fourth digit.*

*Right:
One week
post-surgery*

*Photos by
Wildlife
World's
photographer
Lorenzo
Fuentes*



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

Zebrafish Opercula Defects

Have any of you ever encountered what looks like opercular defects in zebrafish?

Most of the early juvenile stages within this population look phenotypically normal, but as they mature, evidence of absent or shortened opercula appears. Physiologically, they seem fine - swimming and feeding normally. I'm thinking this is most likely a genetic defect but am interested to know if any of you have encountered anything similar, and if there are other Differential Diagnoses I need to consider.

This population is housed within a Tecniplast Zebtec laboratory unit, where water quality is carefully controlled through self-cleaning/ RO and closely monitored. Fish are fed a strict protocol of ZM feed and artemia. So, I think nutritional deficits or water contaminants (heavy metals) are unlikely. We are running histopathology sections on the fish as well.

I'm attaching a blurred (sorry) photo but it gives you an idea...



On a side note, many of these adult fish show kyphosis, scoliosis deformities or small heads relative to their bodies as well. Quite an interesting looking population...

Kind regards,
Gillian Taylor

African Aquatic Veterinary Services

Consider Vitamin C deficiency in the diet. Try supplementing the food with Vitamin C and see if the next batch of babies have normal opercula.

Also, using Reverse Osmosis (RO) water may be taking too many minerals out of the water and they may have a calcium or phosphorus deficiency, which can lead to poor bone development. Check your water alkalinity and hardness, and specifically your calcium level.

Nick Saint-Erne, DVM CertAqV
nsainterne@gmail.com

Hi all,

We see opercula abnormalities occasionally in our colonies. I agree with you, I think is genetic. Also agree with you - I don't see any health issues with abnormal or missing opercula. I sent some in for histopathology but don't recall finding any issues. We feed our fish Gemma feed (size appropriate to life stage) and artemia, and rotifers for the babies.

For the kyphosis and scoliosis in adults, I'd suspect *Pseudoloma neurophilia*. These fish are usually 9 months+ dpf. Usually we cull and euthanize these fish because they shed spores and if they die and the other fish eat them, that's another mode of infection.

Dr. Katy Murray at Zebrafish International Resource Center (ZIRC) in Oregon, USA had a good paper on this several years ago. It was in *Comparative Medicine* journal, "Transmission, Diagnosis and Recommendations for Control of *Pseudoloma neurophilia* infections in Laboratory Zebrafish Facilities", 2011, Aug, 61(4): 322- 329.

There is a colony at University of Oregon that is *Pseudoloma*-free by PCR testing that sells stock. I would like some but need to have a totally clean rack first! I think many institutions have some level of *Pseudoloma* infestation.

Transmission is from ingestion of spores from dead infected fish and also vertical in the eggs, and from breeding. I send these fish for histopathology to ZIRC pathologists to confirm and to look for *Mycobacterium* or anything else. IDEXX BioResearch has some good PCR panels.

Best,

Leslie Jarrell, DVM, DACLAM

lesliejarrell428@gmail.com

Hi Gillian,

I can imagine the variety of causatives for your problem is broad. You could try to breed those "defect" fish and see if it occurs in the next generation under perfect environmental conditions (without using any substances against fungus during the "egg stage"), together with a diet having added minerals and vitamins (like the other persons advised you, Vitamin C), and in a lower stocking rate (or higher water change rate).

During the time I was "breeding" fish (koi and cichlids) those were the factors that played a role, next to the genetic background, when I had "deformed" fish. And I had problems in raising fish in RO water using not enough added minerals, with pH fluctuations.

I wish you success!

Manuel Künzel

WAVMA Student Member,
 Munich, Germany

Hi everyone,

Thank you so much for the input on the zebrafish!
The plot thickens...

We've done routine histopathology on some fish and found a granulomatous peritonitis and *Mycobacterium*, which really complicates the whole issue. And possibly explains the spinal pathology and low grade mortalities.

This population is used for larval stage (day 5-6 post hatching) pharmaceutical testing. Would the presence of *Mycobacteria* in the system render these experiments invalid? (I understand vertical transmission is possible, so I guess disinfection of ova wouldn't be enough to rule out infection in ova already, and compromised behaviour/ development?)

I'm thinking we need to depopulate and disinfect and start over. Would be interested to hear your thoughts?

Kind regards,

Gillian Taylor

African Aquatic Veterinary Services

Dear Gillian,

Depending on country regulations, depopulation after confirmation of *Mycobacterium* by PCR testing may be mandatory. Regardless of the regulations, it is also best practice to depopulate and disinfect and start the colony over from Specific Pathogen Free (SPF) embryos. Most wild/ornamental colonies would carry pathogens.

But, it will be rather difficult to completely clean-up as the bacteria will use every microscopic crack as sanctuary. It may require multiple disinfections with different chemicals. I would start with Vircon aquatic. Of course, eliminate anything that is disposable from the system (e.g., bioballs, filter media, aerator hoses, nets, etc). Disassemble all valves and joints and place them in Vircon. It is a tedious task.

If you can, test a couple batches of embryos with PCR. If negative the risk for experiments may be low
Good luck!

Dusan Palic

d.palic@lmu.de

Germany

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



Fish Body Condition Scoring

Dear colleagues,

I would like to have suggestions on body condition scoring systems for fishes. Particularly interested in applying them to live small cyprinid species in field conditions. A great bonus would be computer software or measures that could be applied to pictures.

Thank you in advance for all the feedback.

Best regards,

Miguel Grilo

Microbiology and Immunology Lab

Faculty of Veterinary Medicine

University of Lisbon

Spain

There are several published ways to score fish body condition. Possibly the most useful one, that can be adapted to most finfish body types/shapes, is Clark, T.S., et al. (2018). Body Condition Scoring for Adult Zebrafish. *J. Amer. Assoc. Lab. Anim. Sci.*, 57(6):698–702.

The full paper is downloadable from:

<http://tinyurl.com/rr9x48b>, or

<https://www.ingentaconnect.com/content/aalas/jaalas/2018/00000057/00000006/art00006#>

A. David Scarfe PhD, DVM, MRSSAf, CertAqV

Aquatic Veterinary Associates International

365 Monarch Birch Ct., Bartlett, IL 60103, USA

+1 (847) 650-4628

dscarfe@ameritech.net or adscarfe@gmail.com

Adult Zebrafish BCS		
	Lateral View	Dorsal View
<p>BCS 1:</p> <ul style="list-style-type: none"> • Head larger than body (big head) • Lateral- concave ventral surface between head and abdomen (narrow abdomen) • Dorsal- body is more narrow than head and linear • Fish is thin (emaciated) 		
<p>BCS 2:</p> <ul style="list-style-type: none"> • Head and body equal size • Lateral- flat ventral surface between head and abdomen • Dorsal- head and width of abdomen are equal • Fish is underconditioned 		
<p>BCS 3:</p> <ul style="list-style-type: none"> • Body larger than head • Lateral- slight convex ventral surface • Dorsal- head is slight smaller to a fusiform body • Fish is well-conditioned 		
<p>BCS 4:</p> <ul style="list-style-type: none"> • Body significantly larger than head • Lateral- body moderately convex ventral surface • Lateral- Symmetrical ventral surface • Dorsal- head visually smaller to a moderately distended abdomen • Fish is over-conditioned 		
<p>BCS 5:</p> <ul style="list-style-type: none"> • Body significantly larger than head • Lateral- body significantly convex ventral surface • Lateral- Symmetrical or asymmetrical ventral surface • Dorsal- head visually smaller to a significantly distended abdomen • Fish is obese (large) 		

Aquatic Veterinary Abstracts: Zebrafish
Compiled by David Scarfe

Body Condition Scoring for Adult Zebrafish (*Danio rerio*).

Clark TS, Pandolfo LM, Marshall CM, Mitra AK, Schech JM.

J Am Assoc Lab Anim Sci. 2018 Oct 25.

doi: 10.30802/AALAS-JAALAS-18-000045.

Abstract

Body condition scoring (BCS) is a simple, rapid, noninvasive tool used to assess body condition in animals. In this study, we developed and validated a diagram-based BCS for adult zebrafish (*Danio rerio*), a popular research model. After receiving 20 min of hands-on training regarding the scoring system, 5 people each rated 95 adult zebrafish. The fish then were euthanized and measured to establish body condition indices (BMI and the Fulton K factor). Both condition indices were highly correlated with fish width. Using correlation data and observed trends in fish width, we established expected BCS definitions. We validated the BCS definitions in 2 ways.

First, we calculated the Pearson correlation coefficient between the average observed BCS and expected BCS; this statistic revealed very strong correlation between observed and expected BCS. In addition, we assessed the predictive power of BCS by using multinomial logistic regression and then applied the fitted model to evaluate the accuracy of the predictions (BCS compared with BMI, 85%; BCS compared with K factor, 61%).

Finally, to determine the robustness of BCS to variation among raters, we calculated the intraclass correlation coefficient and demonstrated high interrater reliability. In conclusion, adult zebrafish BCS can be used to quickly identify animals with different body condition indices (thin to obese). In addition, the diagram-based chart is easy to use and implement accurately, with minimal training.

PMID: 30360771 PMCID: PMC6241379 DOI: 10.30802/AALAS-JAALAS-18-000045

Knockdown of prothymosin α leads to apoptosis and developmental defects in zebrafish embryos

Authors: Emmanouilidou, Anastasia; Karetsoy, Zoe; Tzima, Eleni; Kobayashi, Takahiko; Papamarcaki, Thomas

Biochemistry and Cell Biology, Volume 91, Number 5, 01 2013, pp. 325-332

Publisher: Canadian Science Publishing

DOI: <https://doi.org/10.1139/bcb-2012-0103>

Abstract

Prothymosin alpha (ProT α) is an abundant nuclear protein involved in cellular processes intricately linked to development, such as cell proliferation and apoptosis. Although it is known that ProT α inhibits the formation of apoptosome and blocks caspase-3 activity, its mechanism of function in the apoptotic machinery is still under investigation. We have studied the cellular role of ProT α by knocking down its expression in HeLa cells with small hairpin RNA (shRNA) in the absence of apoptotic stimuli. Flow cytometric analysis showed that the live cell population was significantly decreased with a concomitant increase of the apoptotic populations.

To understand the physiological role of ProT α within the context of embryonic development, we knocked down the Ptmaab zebrafish ortholog using 2 specific morpholino oligonucleotides. Ptmaab morphants exhibited growth retardation, bended trunks, and curly tails. The frequency of occurrence of the phenotypic defects was increased in a morpholino dose-dependent manner. Co-injection of ptmaa mRNA with ptmaab morpholino partially rescued the morphological defects. Immunostaining with the anti-phospho-histone H3 (pH3) antibody suggested that the abnormalities of Ptmaab morphants could be due to defective cell proliferation that results in growth imbalances.

TUNEL fluorescent labelling and Acridine Orange staining of the morphants showed high rates of cell death in the head and tail regions. Concomitantly, the active form of caspase-3 was detected in Ptmaab morphants. Our data suggest a conserved anti-apoptotic role of ProT α between zebrafish and humans, and provide the first evidence that ProT α is important for early embryogenesis.

The Aquatic Veterinarian is meant to be read as a two-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 thorough the issue seeing the cover page by itself first, followed by two pages side by side for the rest of the issue. Doing this, you will be able to see the Centerfold picture in all its ginormous glory!

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

Send your article (<1,000 words) with pictures to:

TAVeditor@wavma.org.

Zebrafish Diseases

Created by Nathan Dunn,
last modified by Anne Eagle on Jan 17, 2018
(Source: J. Matthews from *Zebrafish Book* 5th Edition)
Additional information of the diseases that affect laboratory zebrafish can be found in the on-line manual, "Diseases of Zebrafish in Research Facilities."
Available at:
<http://zebrafish.org/zirc/health/diseaseManual.php>
Diagnostic services are provided by the Zebrafish International Resource Center (ZIRC):
<http://zebrafish.org/zirc/health/index.php>

Mycobacteriosis

Mycobacteriosis, often incorrectly called fish tuberculosis or fish TB, is a common disease of laboratory zebrafish as well as wild and captive fishes worldwide. Mycobacteria are nonmotile, weakly staining Gram-positive, pleomorphic rods that are acid-fast. Many species of atypical (non-tuberculosis) mycobacteria are found ubiquitously in water and biofilms. Multiple species of *Mycobacterium* have been identified as infectious to zebrafish including *M. marinum*, *M. fortuitum*, *M. chelonae*, *M. abscessus*, *M. haemophilum*, and *M. peregrinum/septicum*.

Clinically, mycobacteriosis can manifest in a wide variety of signs. These include lethargy, anorexia, skin inflammation and ulceration, fin loss, edema/dropsy, peritonitis, and granulomatous nodules in internal organs and muscle. Deformities may occur with muscle and skeletal involvement.

Diagnosis is based on clinical signs, characteristic granulomatous inflammation and the presence of acid-fast bacteria in tissue sections or smears. Culture of the microorganism is considered definitive but can be difficult due to slow growth and special media requirements. PCR tests for the identification of mycobacteria infecting fish have been described.

As with most bacterial pathogens of fish, mycobacteria infections in zebrafish are most often opportunistic in nature. Poor water quality, high stress or other type of husbandry failure will commonly precede outbreaks. The virulence of a particular species or strain of mycobacterium may also affect the severity of the disease. Mycobacteria infecting fish typically respond poorly to antimicrobial treatments. Control should be focused on the removal of infected fish, optimizing water quality and husbandry practices and the use of strict sanitation and quarantine procedures. In severe outbreaks with highly virulent strains of mycobacteria, control may require the eradication of infected stocks and subsequent disinfection of the system.

Mycobacterium Zoonotic Considerations

Fish-pathogenic mycobacteria can infect humans. The disease is commonly referred to as fish tank granuloma or swimming pool granuloma. Humans are typically infected by contamination of lacerated or abraded skin with aquarium water or fish contact. A

localized granulomatous nodule may form at the site of infection, most commonly on hands or fingers. The granulomas usually appear approximately 6-8 weeks after exposure to the organism. They initially appear as reddish bumps (papules) that slowly enlarge into purplish nodules and nonhealing ulcers.

The disease can be difficult to treat due to drug resistance. The infection can spread to nearby lymph nodes. A physician should be consulted if lesions are noted. Individuals who have an immune-compromised medical condition or are taking medications that impair immune function (steroids, immunosuppressive drugs, or chemotherapy) are at a greater risk for disseminated forms of the disease and should consult their physician. It is also possible for these species of mycobacteria to cause some degree of positive reaction to the tuberculin skin test. If you have any cuts or abrasions on your hands or arms, you should wear sturdy, impervious gloves and always wash hands and arms after handling fish and aquarium water.

Additional Reading

Kent, M.L., Whipps, C.M., Matthews, J.L., Florio, D., Watral, V., Bishop-Stewart, J.K., Poort, M., and Bermudez, L. (2004). Mycobacteriosis in zebrafish (*Danio rerio*) research facilities. *Comp. Biochem. Physiol. Part C, Toxicol. Pharmacol.* 138(3):383-390.

Astrosky, K. M., Schrenzel, M. D. Bullis, R. A., Smolowitz, R. M., and Fox, J. G. (2000). Diagnosis and management of atypical *Mycobacterium* spp. infections in established laboratory zebrafish (*Brachydanio rerio*) facilities. *Comp. Med.* 50, 666-672.

Schulze-Robbeke, R., Janning, B., and Fischeder, R. (1992). Occurrence of mycobacteria in biofilm samples. *Tubercle and Lung Disease* 73, 141-144.

Talaat, A.M., Reimschuessel, R., and Trucksis, M. (1997). Identification of mycobacteria infecting fish to the species level using polymerase chain reaction and restriction enzyme analysis. *Vet. Microbiol.* 58, 229-237.



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>


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

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.

For more information go to: <https://www.wavma.org/Aquatic-Veterinary-Educational-Meetings-Conferences-Symposia-Workshops>



FEB 9- 12, 2020

**World Aquaculture Society
 Aquaculture America 2020**

February 9-12, 2020,
 Honolulu, Hawaii

See: [World Aquaculture Society](http://www.worldaquaculturesociety.org)

45th Annual Eastern Fish Health Workshop

March 23-27, 2020

Clarion Hotel and Conference Center,
 Shepherdstown, West Virginia

Abstracts Due By: 15 February 2020

For more info: TheEFHW@gmail.com

Includes a Continuing Education Opportunity on Friday, March 27, 2020, "Complete Post-Mortem Examination" from assessing history, to necropsy methods, smears, imaging, and new technologies. Final CE credits are expected to be about 5 hours.

For more information, go to:

<https://eafp.org/events-and-meetings/>

**International Association for Aquatic Animal
 Medicine 51st Annual Meeting & Conference**

May 16-20, 2020

Tampa, Florida USA

This event will bring together nearly 350 members of the highly respected International Association for Aquatic Animal Medicine (IAAAM). Veterinarians, professors, directors, curators, researchers, and other animal health and husbandry professionals from around the world participate in these meetings. Over 50 different parks, zoos, aquariums, universities, and other related institutions throughout the United States and abroad will be represented.

Highlights of the conference will include thought-provoking plenary sessions, special scientific sessions and workshops, poster session and ample social and networking opportunities.

Go to website for more information: iaaam.org



**45TH WORLD SMALL ANIMAL
 VETERINARY ASSOCIATION
 CONGRESS AND
 26TH FECAVA
 EUROCONGRESS**
 23-26 September, 2020
 Warsaw, Poland

**WARSAW
 POLAND**



Future WSAVA Conferences

45th WSAVA World Congress

Dates: 23-26 September 2020

Warsaw, Poland

[Visit the website here](http://www.wsa2020.com)

46th WSAVA World Congress

Dates: 13-16 November 2021

Hyderabad, India

[Visit the website here](http://www.wsa2021.com)

47th WSAVA World Congress

Dates: 29-31 October 2022

Lima, Peru

See: [WSAVA](http://www.wsa2022.com)

**Regional Aquatics Workshop (RAW) and
 Aquatic Animal Life Support Operators (AALSO)
 Symposium joint conference**

March 28th–April 1st, 2020
 Springfield, Missouri, USA
<http://www.rawconference.org/index.html>
[Click here for conference website](#)

**The 51st annual International Association for
 Aquatic Animal Medicine conference**

May 16-20, 2020
 Tampa, Florida, USA
<https://www.iaaam.org/>
[Click here for conference website](#)

**American Veterinary Medical Association
 Conference**

July 31 - August 4, 2020
 San Diego, California, USA
 See: [AVMA](#)

2020 North Central Aquaculture Conference

Saturday - Sunday, Feb. 1-2, 2020
 Columbus, OHIO, USA

The Ohio Aquaculture Association (OAA) and the USDA North Central Regional Aquaculture Center (NCRAC) are pleased to announce registration is now open for the 2020 North Central Aquaculture Conference Columbus, OH.

The Conference theme is "Equipping Producers to Move Midwest Aquaculture Forward". The OAA hosted the inaugural North Central Aquaculture Conference in 2014 in Toledo OH and attendance was nearly 400 people. It is the hope of the OAA's Board that all of you reading this message will attend and make this conference even more successful than the one in Toledo. Please note that our Annual Ohio Aquaculture Conference is a part of this North Central Aquaculture Conference - the Annual Ohio Aquaculture Conference will return as a stand alone conference in 2021.

Registration: Registration cost is \$150 until January 21, 2020, \$250 from January 22-28, and \$300 at the door. Register early and save! Registration includes two continental breakfasts, breaks, Saturday lunch, and the Saturday evening Social and Banquet. You can register at <http://ohioaquaculture.org/events>.

Hotel Information: The Crowne Plaza Hotel - Columbus North is providing a large block of rooms at a discounted rate until January 8th, 2020. Book early! Hotel reservations can be made at 2020 NCRAC Annual Meeting or by calling the hotel directly at 614-885-1885. Make sure to mention booking code NC1 when registering for hotel rooms to receive the discounted rate.

Bill Lynch
 OAA President
 8120 Wesley Chapel Rd
 West Liberty, OH 43357
 614-595-9308

AQUAVET® 2020

A Program in Aquatic Veterinary Medicine
www.aquavet.info

AQUAVET® I and II will be presented at Roger Williams University in Bristol, Rhode Island. Bristol is a picture perfect New England town about 20 minutes from Newport, RI.

AQUAVET® I - An Introduction to Aquatic Veterinary Medicine: The course is designed for veterinary students and veterinarians who have an interest in applying their veterinary training to aquatic animals.

Duration: 4 weeks – May 24 to June 20, 2020

Fee: \$2,450 for full-time veterinary students, although a program benefactor will pay \$200 for each student, bringing the cost down to \$2,250. This includes tuition, room and most meals.

AQUAVET® II – Comparative Pathology of Aquatic Animals: The course is oriented toward the pathology of vertebrates and invertebrates commonly used as laboratory animals, encountered in display aquaria, and of importance to aquaculture enterprises.

Duration: 2 weeks – May 24 to June 6, 2020 –

Prerequisite: AQUAVET® I

Fee: \$1,475 for full-time veterinary students. This includes tuition, room and most meals.

AQUAVET® Summer Research Fellow (one offered). Fellows pay no tuition for the 8 weeks of the research program itself and will be reimbursed for room and board expenses. In addition, research student will receive a stipend of \$3,800 for the research period.

Duration: 8 weeks following AQUAVET® I

Prerequisite: AQUAVET® I

Venue: Laboratory at Cornell University, Ithaca, NY.

AQUAVET® III – Clinical Aspects of Captive Aquatic Animal Medicine: The course is designed for veterinary students and veterinarians who have specific interest in working in an aquarium or dolphinarium.

Duration: 5 weeks following AQUAVET® I - June 21st to July 26th 2020 - Prerequisite: AQUAVET® I

The course will be presented in three different venues. The first two weeks are focused on all of the animals found in a typical aquarium and will be held at the Georgia Aquarium in Atlanta, GA. The next week focuses on endoscopy and surgery of reptiles and fish taking place at the University of Georgia. The final two weeks take place at Dolphinaris in Cancún, México, where students focus on dolphin medicine, including learning to take and analyze samples and hands-on learning of dolphin ultrasound. Fee: \$3,800 for full-time veterinary students. This includes tuition, room and many meals. (Actual costs are much higher, but are covered by anonymous donors.)

Applications for admission are due by January 15, 2020. The application is available on our website. You will receive an e-mail acknowledging receipt of your completed application and supporting materials.

Please visit our website at: www.aquavet.org

**Compiled Table of Contents for
The Aquatic Veterinarian—Volume 13
[Key = Volume (Issue) Page Number]**

WAVMA News

Who We Are ... 13(1) 2; 13(2) 2; 13(3) 2; 13(4) 2
 Editorial Staff ... 13(1) 2; 13(2) 2; 13(3) 2; 13(4) 2
 WAVMA Executive Board ... 13(1) 2; 13(2) 2; 13(3) 2;
 13(4) 2
 Table of Contents ... 13(1) 3; 13(2) 3; 13(3) 3; 13(4) 3
 Editorials ... 13(1) 4; 13(2) 4; 13(3) 4; 13(4) 4
 Advertising Rates ... 13(1) 4; 13(2) 4; 13(3) 4; 13(4) 4
 Executive Board Reports ... 13(1) 5-7; 13(2) 5-7; 13(3)
 5-7; 13(4) 5-7
 President's Report ... 13(1) 5; 13(2) 5; 13(3) 5; 13(4) 5
 Secretary's Report ... 13(1) 6; 13(2) 6; 13(3) 6; 13(4) 6
 Treasurer's Report ... 13(1) 7; 13(3) 7; 13(4) 7
 New Members ... 13(1) 7; 13(3) 7; 13(4) 7
 Committee Reports... 13(1) 8-13; 13(2) 8-16; 13(3) 8-
 12; 13(4) 8-13
 Dr. Laura Urdes assumes the role of Chair of the
 WAVMA Fellowship Program ... 13(4) 10
 WAVMA Endorses the Joint Position Statement on
 Regulatory Harmonization ... 13(4) 11
 Two New WAVMA Student Chapters Established in
 2019 ... 13(4) 15
 Privileges & Benefits of WAVMA Membership ... 13(1)
 8; 13(2) 8; 13(3) 8; 13(4) 8
 WAVMA Committees ... 13(1) 8; 13(2) 8; 13(3) 8; 13(4)
 8
 Credentialing Committee ... 13(1) 9; 13(2) 9; 13(3) 9;
 11(4) 9
 Certified Aquatic Veterinarians ... 13(1) 9; 13(2) 9; 13
 (3) 9; 13(4) 9
 Meetings Committee ... 13(1) 12; 13(2) 12; 13(3) 12
 Membership Committee ... 13(3) 12
 Education & Student Committee ... 13(1) 10; 13 (2) 10;
 13(3) 10; 13(4) 11
 Fellows Advisory Council ... 13(1) 10; 13(2) 10; 13(3)
 10; 13(4) 10
 Executive Board Responsibilities ... 13(1) 10; 13(2) 10;
 13(3) 10; 13(4) 12
 WAVMA Veterinary School Chapters ... 13(1) 10; 13(2)
 10; 13(3) 10; 13(4) 11
 Pitts Aquatic Veterinary Education Award Program ...
 13(1) 13; 13(2) 13; 13(3) 13;
 WAVMA Annual General Meeting ... 13(2) 7 and 16
 WAVMA Elections ... 13(2) 11; 13(3) 11; 13(3) 11; 13
 (4) 6
 WSAVA Congress 2019 Report ... 13(2) 13 and 16

Author's Instructions ... 13(1) 15; 13(2) 15; 13(3) 15;
 13(4) 13

Colleague's Connection

AVMA President John Howe to Focus on Member
 Needs, Veterinary Technicians and One Health ... 13
 (2) 17

An Interview with Dr. Ari Fustukjian ... 13(2) 18-23
 An Interview with Dr. Shane Boylan ... 13(3) 16-19
 WAVMA Veterinarian Honored with the 2019 Atlantic
 Canada Aquaculture Award: Dr. Leighanne Hawkins
 ... 13(4) 19
 My Story...By Sharmie Johnson, DVM ... 13(4) 20

John L. Pitts Aquatic Veterinary Education Awards Recipient Reports

2019 Award Announcements ... 13(2) 13
 Kathryn Ziegner ... 13(2) 24-25
 Bryony Chetwynd-Glover ... 13(3) 24-27
 Elizabeth St. Germaine ... 13(3) 28-29
 Holly Ward ... 13(4) 14
 Sarah Wright ... 13(4) 15
 Sunita Shrestha ... 13(4) 16-17

Student Chapter Reports

An Active Year for the Illinois Student Chapter, by
 Chelsea Clambrone ... 13(1) 14
 Fish Histology Seminar, Murdoch Student Chapter ...
 13(2) 14
 WAVMA Welcomes Our Newest Student Chapter: Col-
 orado State University, by Kathryn Ziegner ... 13(3) 14
 Two New WAVMA Student Chapters Established in
 2019 ... 13(4) 15

Centerfold

Dallas North Aquarium ... 13(1) 20-21
 Florida Aquarium ... 13(2) 20-21
 South Carolina Aquarium ... 13(3) 20-21
 Wildlife World Zoo and Aquarium ... 13(4) 22-23

Grand Round Cases

How to Euthanize Trout So They Can Still Be Fed to
 Other Animals ... 13(1) 22-23
 Clove Oil For Euthanasia ... 13(1) 23
 Generator Emissions and Fish Toxicity ... 13(2) 28-29
 Trichodina Treatments ... 13(3) 30-31
 Trichodina Protozoa ... 13(3) 31
 Zebrafish Opercula Defects ... 13(4) 34-35
 Fish Body Condition Scoring ... 13(4) 35

Clinical Case Reports

Some Cases of Swim Bladder Infections in Koi, by Tim
 Barbe ... 13(1) 24-27
 Bacterial granulomas arising from a sialoceles in a
 green anaconda (*Eunectes murinus*), By Dr. Sharmie
 Johnson ... 13(4) 26-29
 Medical and surgical management of a bite wound to
 the foot of an American alligator, By Dr. Sharmie John-
 son ... 13(4) 30-33

Research Reports

Anesthesia and Euthanasia in Ornamental Fish, by
 Nick Saint-Erne ... 13(1) 28-33
 Prevalence of *Clostridium perfringens* in retail fish
 meat in Chitwan, Nepal, By Dr. Sunita Shrestha ... 13
 (4) 16-17

Convention Report

IAAAM Meeting 2019, by Gillian Taylor ... 13(2) 26-27
WSAVA Congress 2019 Report ... 13(2) 13 and 16

Literature Review

Aquatic Veterinary Abstracts:

Swim Bladders ... 13(1) 16-17

The Volume of Air Within the Swim Bladder and Breathing Cavities of the Anabantoid Fish *Colisia lalia* ... 13(1) 16

The Volume and Rate of Volume Change of the Swimbladder of Goldfish ... 13(1) 16

Acoustic Observations of Gas Bubble Release by Pacific Herring (*Clupea harengus pallasii*) ... 13(1) 16

Physical Properties and Hydrostatic Function of the Swimbladder of Herring (*Clupea harengus*) ... 13(1) 17

In Situ Estimates of the Swimbladder Volume of Atlantic Herring (*Clupea harengus*) ... 13(1) 17

Viral Diseases ... 13(2) 30-31

Biocontrol in Australia: Can a Carp Herpesvirus (CyHV-3) Deliver Safe and Effective Ecological Restoration? ... 13(2) 30

Phylogenomic Characterization of Red Seabream Iridovirus from Florida Pompano Maricultured in the Caribbean Sea ... 13(2) 30

Carp Edema Virus / Koi Sleepy Disease: An Emerging Disease in Central-East Europe ... 13(2) 13

Detection of Spring Viremia of Carp Virus in Imported Amphibians Reveals an Unanticipated Foreign Animal Disease Threat ... 13(2) 31

Sea Turtles ... 13(3) 32-33

Blood analytes of oceanic-juvenile loggerhead sea turtles from Azorean waters: Reference intervals, size-relevant correlations and comparisons to neritic loggerheads from western Atlantic coastal waters ... 13(3) 32

Blood biochemistry and haematology of migrating loggerhead turtles in the Northwest Atlantic: Reference intervals and intra-population comparisons ... 13(3) 32

Physiological changes in post-hatchling green turtles following short-term fasting: implications for release protocols ... 13(3) 33

Zebrafish ... 13(4) 36-37

Body Condition Scoring for Adult Zebrafish (*Danio rerio*) ... 13(4) 35-36

Knockdown of prothymosin α leads to apoptosis and developmental defects in zebrafish embryos ... 13(4) 36

Zebrafish Diseases: Mycobacteriosis ... 13(4) 37

Book Review

Sea Turtle Health & Rehabilitation, reviewed by Thomas W. de Maar ... 13(3) 33

News and Views

Recent Asian Origin of Chytrid Fungi Causing Global Amphibian Declines ... 13(1) 34

Batrachochytrium salamandrivorans ... 13(1) 34

Will Trade Bans Stop Deadly Salamander Plague From Invading the US? ... 13(1) 34

Deadly Fungus Spread By Trade in Amphibians Could Wipe Out British Newts ... 13(1) 35

Vanishing in the Wild, These Salamanders Found Refuge in a Convent ... 13(1) 35

Online Aquatic Animal Welfare Training ... 13(2) 32

Some Endangered Frogs May Be Leaping Back from Extinction ... 13(2) 32

Fibromyxoma in a Flower Horn Cichlid ... 13(2) 33

Evicted Man Who Abandoned His Ailing Fish Was Charged with animal Cruelty ... 13(2) 33

Aquatic Veterinary Medicine ... 13(3) 34

Aquatic Veterinary Medicine Programs ... 13(3) 34

What Does an Aquatic Veterinarian Do? ... 13(3) 35

Aquatic Veterinary CE & PD

Meetings of Interest to Aquatic Veterinarians ... 13(1) 38-39; 13(2) 36-37; 13(3) 38-39; 13(4) 40-41

2020 AQUAVET® I & II & III ... 13(3) 39; 13(4) 41

The Health and Welfare of Atlantic Salmon ... 13(1) 37; 13(2) 35; 13(3) 37; 13(4) 39

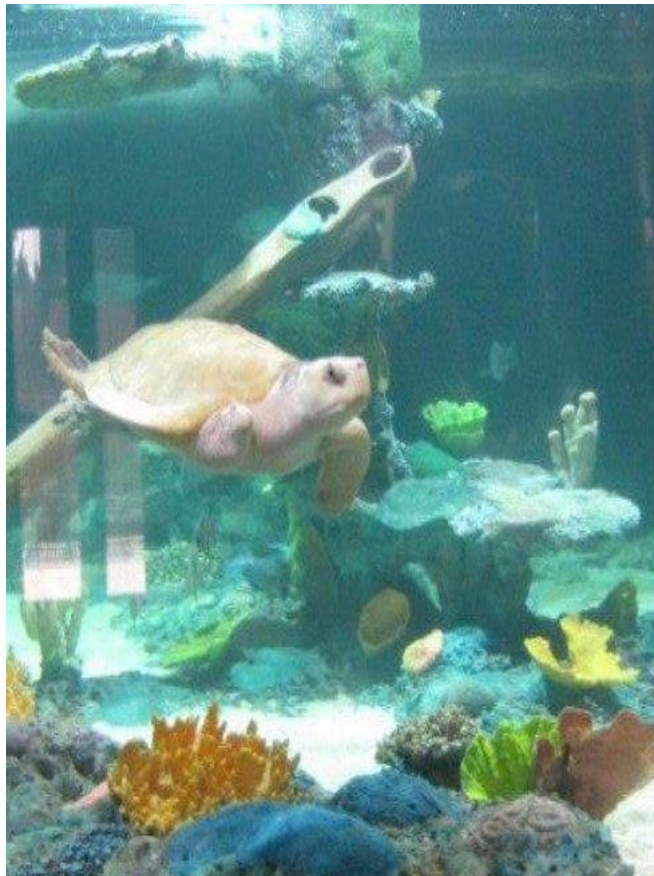
Sponsors

ioLight ... 13(1) 36; 13(2) 34; 13(3) 36; 13(4) 38

Fish Vet Group ... 13(1) 37; 13(2) 35; 13(3) 37; 13(4) 39

ZOO MED ... 13(1) 40; 13(2) 38; 13(3) 40; 13(4) 46

Index for 2019 Issues ... 13(4) 42-45



**Compiled Articles from
Aquatic Vet News and The Aquatic Veterinarian
[Key = Volume (Issue) Page Number]**

Featured Public Aquariums

Vancouver Aquarium, Canada - AVN 2(4): 21
 New York Aquarium, New York - TAV 7(1): 33
 Waikiki Aquarium, Hawaii - TAV 7(2): 12
 Melbourne Aquarium, Australia - TAV 8(1): 32
 Mote Marine Lab and Aquarium - TAV 8(4): 20-21
 The Georgia Aquarium, Atlanta, GA - TAV 9(1): 22-26
 The Shedd Aquarium, Chicago, Illinois - TAV 9(2): 29-30
 Monterey Bay Aquarium, California - TAV 9(3): 28-30
 OdySea Aquarium, Phoenix, Arizona - TAV 10(4): 32-35
 S.E.A. Aquarium, Singapore – TAV 10(4): 40-43; 12(4) 26-29
 National Aquarium, Baltimore, Maryland - 11(2) 17
 A Visit to River Safari—Singapore - 12(1) 20-21
 New England Aquarium — Boston, Massachusetts, USA - 12(2) 23
 Dallas North Aquarium, Dallas, Texas - 13(1) 18-21
 Florida Aquarium, Tampa, Florida—13(2) 20-23
 South Carolina Aquarium, Charleston, South Carolina—13(3) 20-23
 Wildlife World Zoo and Aquarium, Litchfield Park, Arizona— 13(4) 22-25

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, BWI—November 10, 2018; 12(4) 12-15
 Toronto, Canada—July 15, 2019; 13(2) 7 and 16

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

AVN = *Aquatic Vet News* (2007-2013)
 TAV = *The Aquatic Veterinarian* (2013-2017)
 SC = Student Committee Report
 Key = Volume(Issue): Page number
Listed in alphabetical order by last name

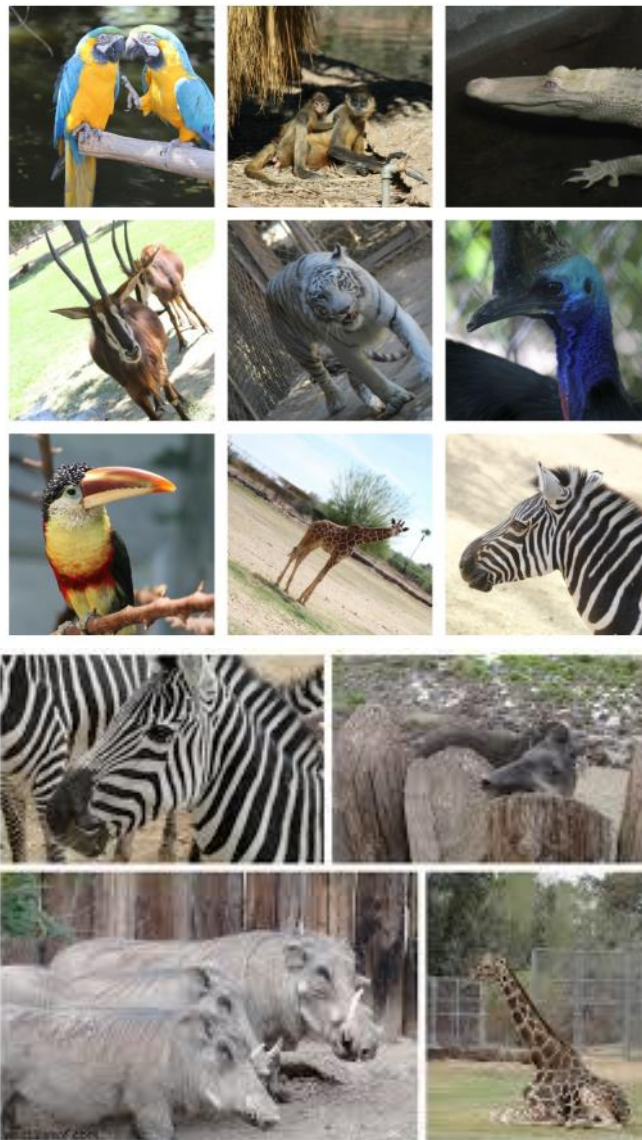
Kurt Arden – TAV 9(3): 20 SC
 Barry Baker – AVN 6(1): 6 SC
 Kendra Baker – TAV 9(2): 18 SC
 Meg Baker – TAV 10(1): 14 SC
 Elizabeth Bamberger – TAV 8(4): 19
 Wes Baumgartner – TAV 8(3): 17
 Brandon Boren – AVN 5(2): 6 SC
 Shane Boylan - TAV 13(3) 16-19
 Lydia Brown – TAV 8(2): 18; TAV 8(3): 18
 Alyssa M. Capuano - TAV 12(3) 22 SC
 Julie M. Cavin - TAV 11(1) 16
 Bryony Chetwynd-Glover –TAV 13(3) 24-27 SC
 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
 Ari Fustukjian — TAV 13(2) 18-23
 Ian Gardner – AVN 5(3): 13
 John Griffioen - 10(3): 15 SC
 Chad Harris – TAV 8(3): 18; TAV 9(4): 25
 Leighanne Hawkins - TAV 13(4) 19
 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; TAV 13(2) 17
 Sara Huckabone – TAV 8(2): 15 SC
 Sharmie Johnson– TAV 13(4) 20-21
 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

**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.

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
 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
 Elizabeth St. Germaine –TAV 13(3) 28-29 SC
 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
 Sunita Shrestha—TAV 13(4) 16 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
 Holly Ward— TAV 13(4) 14 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 (WDFW) - TAV 12(2) 20-21 SC
 Courtney Wright (IDFG) -TAV 12(2) 22-23 SC
 Sarah Wright—TAV 12(1) 19-20 SC; TAV 13(4) 15 SC
 Kathryn Ziegner—TAV 13(2) 24-25 SC
 Josh Zlotnick—TAV 12(3) 21 SC



Wildlife World
Zoo Aquarium & Safari Park

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.

