



The



quatic

eterinarian

Volume 15, Number 1
First Quarter, 2021



WHO ARE WE

MISSION

The Mission of the World Aquatic Veterinary Medical Association is to serve the discipline of aquatic veterinary medicine in enhancing aquatic animal health and welfare, public health, and seafood safety in support of the veterinary profession, aquatic animal owners and industries, and other stakeholders.

OBJECTIVES

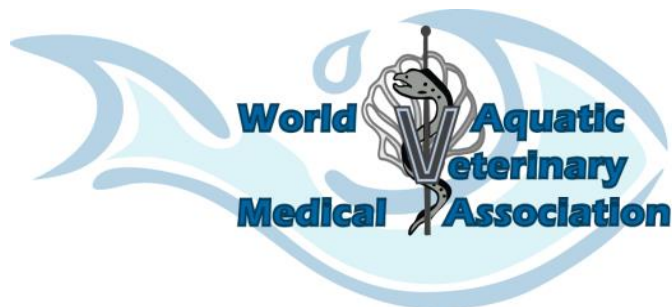
- A. To serve aquatic veterinary medicine practitioners by developing programs to support and promote our members, and the aquatic species and industries that they serve;
- B. To be an advocate for, develop guidance on, and promote the advancement of aquatic animal medicine within the veterinary profession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

The ideas presented in this publication express the views and opinions of the authors, may not reflect the view of WAVMA, and should not be implied as WAVMA recommendations or endorsements unless explicitly stated.

Information related to the practice of veterinary medicine should only be used within an established valid Veterinarian-Patient-Client Relationship.

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Cover Photo:

Erica Chang, UC Davis School of Veterinary Medicine DVM Candidate Class of 2022 assisting with the necropsy of a 9 ft, 340 lb white shark (*Carcharodon carcharias*).

See article on pages 14-15.



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>

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>.

Editor’s Note

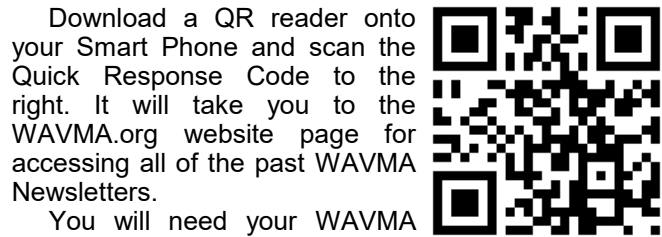
Welcome 2021! I think it is safe to say we have all had enough of 2020...

This year promises to be a good one. COVID-19 Vaccinations have begun and hopefully we will be able to get vaccinated and return to normal soon this year. This will allow us to get together as colleagues in person this year at veterinary meetings, as well at social events. There are several conferences that will still be held online early this year (See CEPD listings on pages 31-35), but some later in the year are planning to meet in person, including the AquaVet classes at Roger Williams University in June, where I will be going to lecture. This will be my first in-person lecture presented since 2019, as they were all canceled in 2020.

Many of the John Pitts Aquatic Education Awards are given to students who attend the AquaVet program, sponsored by Cornell University. Last year, the program was canceled for the first time in its 44 year history. Still, some of the award recipients were able to go out and do an externship. See the student reports by Laura Krogman (page 16) and our cover story by Erica Chang (pages 14-15) to read what they were up to last year. Erica had the opportunity to work with sharks, and her story inspired me to make this issue of *The Aquatic Veterinarian* focus on sharks, with related articles scattered throughout the issue. Hope you enjoy them.

Dum-dum dum-dum dum-dum da-da-da!

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>.



The Aquatic Veterinarian

**The Quarterly Magazine of the
World Aquatic Veterinary Medical Association**

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WAVMA Members

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

President's Report

WAVMA Members,

First and foremost, I hope you, your family, and friends are doing well. As the global pandemic continues, I recently read an article with some health experts beginning to feel cautiously optimistic the worst is behind. Yet there is still a long way to go. The pandemic has been disruptive in practically all facets of life. I hope you have been minimally impacted and share optimism about the future.

Thanks to each of you for your continued membership in WAVMA. Our members have been working hard since 2006 to serve the aquatic veterinary medicine community. You are what make this organization possible and successful. Thank you for all you do.

I am humbled to serve as President of this organization and have made improving the value of membership my focus during the brief time in this office. I am fortunate to be surrounded by Executive Board members who share this vision and are working hard to make it a reality. We recently rolled out a new website; it received a much-needed facelift that many have commented positively on. In addition to the mobile friendliness of the site, it also provides the platform for more robust services and programs. We now have a [Find A Fish Vet Directory](#) where the public can search for aquatic veterinarians and our [Member Directory](#) was also enhanced. I am happy to report plans are continuing nicely for Phase 2 of the website which will bring enhancements to other programs and will help reduce the administrative burden of WAVMA's programs, which are run by volunteers.

Despite the pandemic, there are many things going on for WAVMA. This is the second year for our Directors-at-Large to represent specific geographic regions of the world. Several have already begun to hold regional and local meetings to raise awareness of WAVMA and highlight our many programs. Our Treasurer, Dr. Wes Baumgartner, worked hard to present a balanced budget for 2021 which has been approved by the Executive Board and supports our vision to add the necessary infrastructure to increase member benefits.

As I recently announced, the Executive Board has approved a change to our [WebCEPD Program](#) allowing WebCEPD recording access and CEPD certificate earning as a FREE benefit for WAVMA members. This will help our members get the necessary CE and help us continue our pursuit of lifelong learning. It is great to see the WebCEPD program continue to expand. We have held several excellent WebCEPDs this year and many more are scheduled. If you have not visited the WebCEPD page on the website lately, go check it out at www.wavma.org/WebCEPD. We have over 45 hours of CE content available and much more to come.



President
Dr. Stephen Reichley
(USA)

We will also be hosting our third annual KoiPrax event this spring. KoiPrax is the annual meeting of the Koi Practitioners Working Group with great presentations on all koi-related topics. You can learn more and register for KoiPrax3 at

www.wavma.org/koiprax3. Be sure to check out videos from past KoiPrax meetings on the WAVMA Video Library at www.wavma.org/video-library.

As Dr. Julius Tepper, WAVMA Meeting Committee Chair, recently announced we have made tentative plans to join the European Aquaculture Society this year to hold the WAVMA Annual General Meeting at AE2021 ([Aquaculture Europe 2021](#)). We are excited at the possibility to finally meet in-person again and to do such in such a beautiful part of the world. Please let Dr. Tepper know if you will be attending the meeting, we will have WAVMA members there as speakers and look forward to a great AGM.

Thanks again for your membership in WAVMA. We are One Profession, One Discipline, One Voice – Cohesive and Inclusive. Please reach out to me at President@wavma.org if you have any suggestions on how we can add value to your WAVMA membership, improve our many services and programs, or just to check in. I wish you and your family continued health in 2021.

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

2021 WAVMA Executive Board



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Dr. Stephen Reichley
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(Chile)



Representing Asia-Pacific
Dr. Stephen Pyecroft
(Australia)



Representing Europe
Dr. Matt Metselaar
(UK)

Secretary's Report

Congratulations to the 2021 WAVAMA Executive Board, as pictured above. President Stephen Reichley has many years of experience on the WAVMA Executive Board as the former Secretary, and last year's President Jena Questen will continue on the board to assist him this year. Our Directors are now associated with different regions of the globe. They are tasked to promote WAVMA in their respective geographical areas, and report back to the Executive Board items of concern from their region and for WAVMA to help them promote Aquatic Veterinary Medicine around the globe. Please contact your specific Director to find out more information about WAVMA activities in your area.

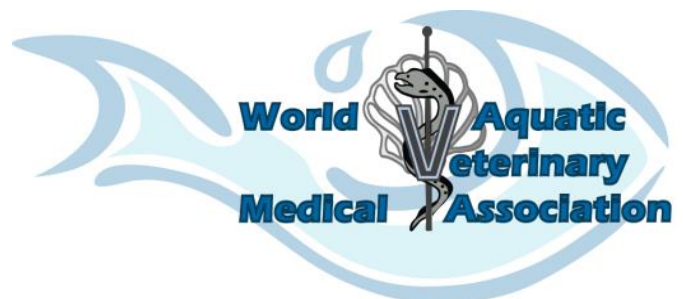
The year 2020 was challenging, but WAVMA has been forging ahead and doing great things. 2021 promises to be better and we have great programs planned for our members. Most importantly, we are planning our 2021 WAVMA conference and Annual General Meeting to be held in conjunction with the European Aquaculture Society convention in Madeira, Portugal in October 2021. Watch for more information, and plan on attending this premier conference in a unique environment. See the European Aquaculture

Society Website for more information about the conference: <https://www.aquaeas.eu/>

If you have any questions or would like to become more involved in WAVMA activities, please contact me, or any of the Officers, Directors or Committee Chairs. See the list of Committee Chairs on page 8.

Thank you for your membership in WAVMA and for your participation in the WAVMA activities. Hoping to see you—in person—again this year. It's full steam ahead and look forward to seeing you in Funchal in October!

Morag Clinton
WAVMA Secretary
Secretary@wavma.org



Treasurer’s Report

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

New Members—First Quarter 2021

Veterinarians

| | |
|-------------------------|---------------|
| Adhemir Valera | Peru |
| Alberto Manchego | Peru |
| Bill McGehee | United States |
| Carlos Zuluaga | Colombia |
| Carol Tobias | United States |
| Daniel Savson | United States |
| Emma Liechty | United States |
| Farah Arnowitz | United States |
| Galaxia Cortés Hinojosa | Chile |
| Hasmin Chogsayan | Philippines |
| Jaime Nalezny | United States |
| JingLu Teh | Australia |
| Karlee Hirakis | Australia |
| Lana Krol | United States |
| Markos Kolygas | Greece |
| Markus Schrittwieserm | Singapore |
| Nicole Seda Boone | United States |
| Patricio Peña Rehbein | Chile |
| Thay Somony | Cambodia |

Veterinarian—New Graduate

| | |
|-------------------|-------------|
| Heejun Ko | South Korea |
| Joao Osorio | Portugal |
| Larry Kwame Tay | Ghana |
| Stella Albarenque | Italy |

Vet Student Members (enrolled in Vet Curriculum)

| | |
|------------------------|------------------------------|
| Aduku Gloria Naome | Uganda |
| Alaina Kruszewski | United States |
| Alyssa Pellin | Canada |
| Andrea Day | St. Kitts and Nevis |
| Anne Goodall | United States |
| Ariana Manikas | United States |
| Brenda Gomes k j | Student Member India |
| Brianna Saylor | St. Kitts and Nevis |
| Caroline Terry | United States |
| Cheyenne Merrick | Student Member United States |
| Chloe Baker | United States |
| Christina Negretti | United States |
| Christopher Versch | Student Member United States |
| Cristi Cain | St. Kitts and Nevis |
| Danny Raya Pantoja | United States |
| Darron Ho | Australia |
| Eda Ozdemir | United States |
| Elisabetta Parravicini | Member Italy |
| Elkie Hector | United Kingdom |
| Hailey Penticoff | United States |
| Jacob Veilleux | United States |
| Jade Maestas | Australia |
| Jasmine Worthy | United States |
| Jeherul Islam | India |
| Jes Damitan | Philippines |
| Julia Gabilondo | United States |
| Julia Lee | St. Kitts and Nevis |
| Karissa Leifker | St. Kitts and Nevis |
| Kayla Brandt | United States |

Vet Student Members—continued

| | |
|-------------------------|---------------------|
| Kelly Mahoney | United States |
| Kendra David | United States |
| Kimberly Guzmán | United States |
| Kimberly Louise Tam | United Kingdom |
| Kirstin Shade | United States |
| Luke VanBlois | United States |
| Marielle Yuret | Puerto Rico |
| Marta Baquero | Spain |
| Mary-Grace Trogdon | United States |
| Mevlüdiye Arat | Turkey |
| Michelle Marinich | United States |
| Mika Maenhout | United Kingdom |
| Mudasir Hakim | India |
| Muhammad Tariq | India |
| Nicholas Prather | United States |
| Nisa Elif Eker | Turkey |
| Oliver Nourse | United Kingdom |
| Rachel Angles | United States |
| Rasika Balasuriya | Sri Lanka |
| Robert Hutto | United States |
| Rose Reynolds | United States |
| Roxane Aflalo | United States |
| Samuel Ajulo | Nigeria |
| Santiago Beach | United Kingdom |
| Sarah Allred | United States |
| Savannah Porter | United States |
| Shangeerthana Kalimuthu | Sri Lanka |
| Sharon Brown | United Kingdom |
| Sieara Claytor | Australia |
| Sydney Johnson | United States |
| Tessa Peerbolte | United States |
| Tori Matta | United States |
| Victoria Kobbevik | Norway |
| Victoria Park | United States |
| Whitney Driscoll | St. Kitts and Nevis |
| Zoey Lex | United States |

Affiliate Members (Non-veterinarian)

| | |
|-------------|---------------|
| Andra Kurtz | United States |
|-------------|---------------|

Welcome to WAVMA!

Wes Bumgartner
WAVMA Treasurer
Treasurer@WAVMA.org



*Photo of Great White Shark by Elias Levy
13 August 2014
Public Domain image from Wikipedia*

Join A WAVMA Committee

All of the great programs and features you get from WAVMA membership are provided by volunteers. We are always looking for more helpers, whether veterinarians, veterinary students or veterinary nurses, to join us on the committees. 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 12. Contact our Secretary or the committee chair for more information about the committee and the dates of the next meeting (also done via web conference). All are Welcome!

Join a WAVMA Committee today!

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 meeting by contacting the [WAVMA Secretary](#).

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

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 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!

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 Secretary.

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: Wes Baumgartner 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: Morag Clinton 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: Matthijs Metselaar

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 educational programs and services.

Chair: Bartolomeo Gorgoglione, BartGorg@msu.edu

Fellows Advisory Council

A Fellows' Work Plan for the year 2021 was discussed and agreed upon by the Fellows in January. Based on the work plan, we are currently implementing the following activities:

- Revision of the WAVMA by laws (by a Fellows sub-committee group),
- Preparing the evaluation round of the candidates applying to be Fellows under the 2021 (current) call,
- Finding ways to enhance communication within WAVMA,
- Attend the WAVMA Annual General Meeting 2021 in conjunction with the [Aquaculture Europe 2021](#), in Funchal, Madeira, Spain, 4 - 7 October.

Announcement on the Fellows Program and call for nominations

The WAVMA Fellows invite all members to nominate a colleague to be considered as a future WAVMA Fellow. Self-nominations will also be accepted. Nomination forms must be submitted at FellowsChair@wavma.org

There is still time to apply for the Distinguished Fellow honorary title!

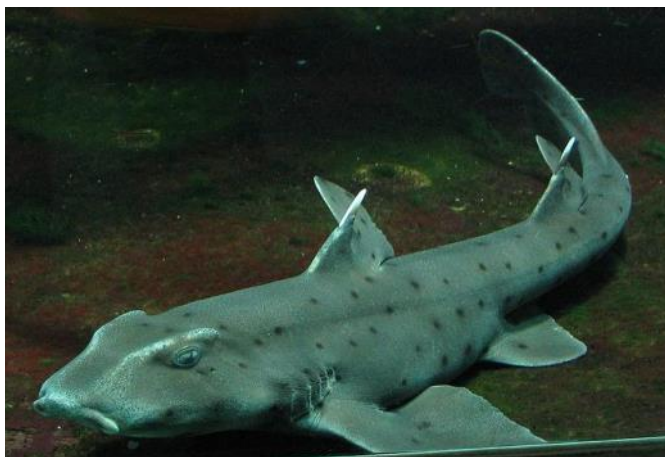
The call deadline is 30th of April 2021.

To read more about this call and how to apply, click here: <https://www.wavma.org/WAVMA-Fellows>

Best wishes and Happy Easter!

Laura Urdes, DVM PgDip PhD CertAqV
Fellows Advisory Council Chair
FellowsChair@wavma.org

Horn Shark (*Heterodontus francisci*)
Public Domain image from Wikipedia



Meetings Committee

The WSAVA conference, was held virtually on Monday, March 22, 2021 and featured talks by 4 WAVMA members. If you missed it, it can still be found at: <https://wsava2020.com/registration/>. All WAVMA members can register at the reduced member rate.

The Koi Practitioners Working Group is pleased to announce its third annual session (KoiPrax3), which will take place Sunday, April 18, 2021. This will be a virtual event, starting at 12 PM UTC. Check your local time zone for the start time in your area. KoiPrax 3: "Koi Ulcer Disease and Aeromonas species: Current Clinical Presentations, Diagnostic Resources and Treatments" This meeting will feature speakers that are at the forefront of research on bacterial diseases of koi.

Our honored keynote speaker will be **Verena Jung-Schroers**, a veterinarian specializing in fish diseases working at the Fish Disease Research Unit of the University of Veterinary Medicine in Hannover, Germany. She is the leader of the ECAAH (European College of Aquatic Animal Health) approved training centre of the Fish Disease Research Unit in Hannover. Verena Jung-Schroers is involved in many research projects of different topics, like microflora and bacteriology, welfare of aquatic animals, and fish and shrimp and virology.

Fees: WAVMA members, free of charge – registration required. Non-WAVMA members - \$100. For more information, please contact me at: dvm2468@gmail.com

The first announcement of a joint conference with the European Aquaculture Society, to take place October 4-7, 2021 in Funchal, Madeira, Portugal, will be the location of our AGM this year. Though plans are just starting to gel, we tentatively will have an excellent turn-out with many European members of WAVMA in attendance. If you would like to present a talk, WAVMA may have some support for your registration. Contact me immediately if you are interested.

Julius M. Tepper, DVM, CertAqV
Meetings Committee Chair
dvm2468@gmail.com





Certification Program

The WAVMA Aquatic Veterinarian Certification Program identifies the core competency or subject matter areas needed to practice aquatic veterinary medicine, and recognizes those veterinarians who have acquired the necessary knowledge, skills and experience (KSE) from a variety of sources, in the following 9 core subject matter areas:

1. Aquatic Environment and Life Support Systems
2. Taxonomy, Anatomy and Physiology
3. Husbandry and Industries
4. Pathobiology and Epidemiology of Aquatic Animal Diseases
5. Diagnostics and Treatment of Aquatic Animal Diseases
6. Clinical Veterinary Experience and Client Communications
7. Public Health, Zoonotics and Seafood Safety
8. Legislation, Regulations, and Policies
9. Principles of Aquatic Animal Welfare

For CertAqV Program Description [Click here](#) to download, or go to WAVMA.org/CertAqV-Pgm.

Individuals who desire to participate in the WAVMA CertAqV Credentialing Program will first need to register and pay the US\$250 administrative fee. When registering you will select a mentor to assist and guide you through the requirements. After you have registered, you will receive an e-mail on how to download a document to record where you have obtained sufficient KSEs (knowledge, skills and experience/education) in each of the 9 modules or subject areas. You have up to 2 years to complete these.

When your mentor is satisfied you have sufficient KSE credits, he/she will request the WAVMA Credentialing Committee to evaluate these. Once the Committee and the WAVMA Executive Board have evaluated these and are satisfied you meet all requirements, you will be notified and mailed a certificate suitable for framing and display.

There are an additional 81 members in the process of becoming Certified Aquatic Veterinarians. If you have questions about the Certification process, please send me an email.

Dr. Matthijs Metselaar DVM PhD CertAqV MRCVS
Credentialing Committee Chair
CertAqV-Admin@wavma.org

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>

Certified Aquatic Veterinarians

| | |
|------------------------|-------------------|
| Jessica Allen | USA |
| June Ang | Singapore |
| Nimrod Arad | USA |
| Farah Gonul Aydin | Turkey |
| Sarah Balik | USA |
| Madison Barnes | St. Kitts & Nevis |
| Christa Barrett | USA |
| Heather Barron | USA |
| Giana Bastos-Gomes | Hong Kong |
| Mariah Beck | USA |
| Jenice Bell | USA |
| Heather Bjornebo | USA |
| James Bogan | USA |
| Pierre-Marie Boitard | France |
| Serena Brenner | USA |
| Erika Brigante | St. Kitts & Nevis |
| Todd Cecil | USA |
| Bryony Chetwynd-Glover | UK |
| Dondrae Coble | USA |
| Michael Corcoran | USA |
| Emily Cornwell | USA |
| Rebecca Crawford | St. Kitts & Nevis |
| Rubén López Crespo | |
| Charles Cummings | USA |
| Nadav Davidovich | Israel |
| Darren Docherty | UK |
| Simon Doherty | UK |
| Devon Dublin | USA |
| Jacqueline Elliott | USA |
| Ashley Emanuele | USA |
| Azureen Erdman | USA |
| Antonella Fabrissin | Italy |
| Mohamed Faisal | USA |
| Erika First | USA |
| Ari Fustukjian | USA |
| Danielle Godard | |
| Christopher Good | USA |
| Bartolomeo Gorgoglione | USA |
| Krystan Grant | USA |
| Miguel Grilo | Portugal |
| Stephanie Grimmert | UK |
| Katharina Hagen-Frei | Switzerland |
| Katharine Haussman | USA |
| Orachun Hayakijkosol | Australia |
| Eileen Henderson | USA |
| Chelsea Hester | USA |
| Nora Hickey | USA |
| John Howe | USA |
| Kerryn Illes | New Zealand |
| Leslie Jarrell | USA |
| Jimmy Johnson | USA |
| Sharmie Johnson | USA |
| Kasper Jorgensen | Denmark |
| Brian Joseph | Canada |
| Parinda Kamchum | Thailand |
| Fritz Karbe | Germany |
| Sherri Kasper | USA |
| Elizabeth Kaufman | Israel |
| Denyse Khor | Singapore |
| Amy Kizer | USA |
| Jessica Koppien-Fox | USA |
| Jack Kottwitz | USA |
| Elizabeth Leuchte | UK |
| Jan Linkenhoker | USA |
| Eric Littman | USA |
| Richard Lloyd | UK |
| Richmond Loh | Australia |

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| Jordi Lopez Ramon | |
| Adolf Maas | USA |
| Raphael Malbrue | USA |
| David Marancik | Grenada |
| Victoria Maroun | St. Kitts & Nevis |
| Robert Martinez | USA |
| Alexandra Mason | USA |
| Colin McDermott | USA |
| Matthijs Metselaar | UK |
| Sonja Miles | UK |
| Tim Miller-Morgan | USA |
| Haitham Mohammed | Egypt |
| Alissa Mones | USA |
| Danny Morick | Israel |
| Lucie Nedved | |
| Ross Neethling | UK |
| Sally Nofs | USA |
| Massimo Oriuels | Italy |
| Dušan Palić | Germany |
| Brian Palmeiro | USA |
| Christine Parker-Graham | USA |
| Lily Parkinson | USA |
| Ayanna Phillips | Trinidad & Tobago |
| Jena Questen | USA |
| Eva Quijano Cardé | USA |
| Atisara Rangsichol | Thailand |
| Laura Rasche | |
| Zachary Ready | USA |
| Aimee Reed | USA |
| Stephen Reichley | USA |
| Nuno Ribeiro | Portugal |
| Julianne Richard | |
| Patinan Rookkachard | Thailand |
| Komsin Sahatrakul | Singapore |
| Nick Saint-Erne | USA |
| Jessie Sanders | USA |
| Sasha Saugh | South Africa |
| David Scarfe | USA |
| Khalid Shahin | UK |
| Galit Sharon | Israel |
| John Shelley | USA |
| Chris Shirkey | USA |
| Constance Silbernagel | USA |
| Melissa Singletary | USA |
| Esteban Soto | USA |
| Brandon Spolander | |
| Brittany Stevens | USA |
| Win Surachetpong | Thailand |
| Gillian Taylor | South Africa |
| Julius Tepper | USA |
| Sharon Tiberio | USA |
| Norrapat Towanabut | Thailand |
| Laura Urdes | Romania |
| Greta Van de Sompel | Belgium |
| Claudia Venegas | Chile |
| Zachary Waddington | Canada |
| Sarah Wahlstrom | USA |
| Chris Walster | UK |
| Scott Weber | USA |
| Marcus Webster | USA |
| Trista Welsh | USA |
| Michael Wenninger | USA |
| Peter Werkman* | Holland |
| David Wilbur | USA |
| Howard Wong | Hong Kong |
| Sarah Wright | USA |
| Taylor Yaw | USA |
| Irene Yen | St. Kitts & Nevis |

To initiate a new Student Chapter, download the [WAVMA Student Chapter Guidelines](#)

A Spanish version of the Student Chapter Guidelines can be [downloaded from the WAVMA website](#).

PROGRAMS AVAILABLE TO STUDENT CHAPTERS:

- Assistance in organizing and promoting Chapter programs and activities.
- Access to recorded webinars and live web-based presentations from experts around the world.
- Low annual WAVMA Student Membership (\$25) - 50% Chapter member's dues may be available to support Chapter-organized activities.
- Reduced rate (50% off) WAVMA Full Membership the year after graduation.
- John L. Pitts Aquatic Veterinary Education Awards Program
- Access to WAVMA member-only programs.
- Aquatic veterinary externship and job listings.
- WAVMA promotional flyers, brochures and other materials for distribution to other students.
- Free or discounted registration for WAVMA meetings, conferences or educational webinars.
- Participation in the WAVMA Certified Aquatic Veterinarian (CertAqV) Credentialing Program.
- Access to WAVMA e-mail listservs, including Members-L, and Student-L.

A list of all current WAVMA Student Chapters is available on the website:

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

Consider joining the [WAVMA Chapter Facebook Group](#) to find out what's happening in other Chapters.

Education & Student Committee

The WAVMA Education and Students Committee met virtually for the first time in 2021 on 23rd January to define subcommittees and their priority tasks. ESC subcommittees were re-composed by allocating all available contributors. Dr. Claudia Venegas, Chile is currently leading the ESC WebCEPD subcommittee, working to hold one WebCEPD webinar each month. Dr. Farah Gonul Aydin, Turkey is leading the ESC Student Chapter Support subcommittee, working on updating the information of WAVMA Student Chapters on the website, to update any ESC-related flyer and to support the ESC Chair with the evaluation of documents submitted for the establishment of new Student Chapters. Eva Marie Quijano Cardé is leading the ESC Students and Resources subcommittee, aiming to organize two Student Panel initiatives in 2021.

New WAVMA Student Chapters are expected to be established in several universities around the world. A new WAVMA Student Chapter has been established at the Royal Veterinary College in London, UK, while work is in still progress at Michigan State University, USA, at Ankara University, Turkey, and at Makerere University, Uganda. We hope to receive further applications from veterinary students in other universities, thus we made available detailed information through the WAVMA website in multiple languages.

After the success of the first student panel, "A Sea of Student Opportunities in Aquatic Animal Medicine" in November 2020, which connected WAVMA students to foster networking and discussion about externships and other learning opportunities, we are planning looking for new panelists. Please contact the ESC Students and Resources subcommittee (Emq8@cornell.edu) if you are willing to contribute, sharing your experience will be extremely helpful to stimulate other students during this difficult time to get an experience with aquatic animals. We are also working to provide students with a variety of opportunities for externship and other experiences, thus we look for suggestions to keep update the student resources and opportunities webpage.

There are many great opportunities listed, but the goal is to have a comprehensive list of educational opportunities. If you have any suggestions for worldwide educational opportunities, including externships, internships, residencies, training visits, etc, please contact us.



Risk of SARS-CoV-2 transmission from aquatic animals to human: What is known so far?

Win Surachetpong
(DVM, PhD, DTBVP, CertAqV)
Associate Professor

Department of Veterinary Microbiology and Immunology
Faculty of Veterinary Medicine, Kasetsart University



With the continuation of the pandemic situation, the ESC Chair and the WebCEPD subcommittee have been extremely successful in scheduling high quality contributions from an array of international speakers. We are grateful to all speakers for their contribution, managing to engage a considerable number of attendees during each event. The first webinar of 2021 was given by Prof. Win Surachetpong from Thailand on 27th January. It focused on the analysis of the possibility of SARS-CoV-2 transmission from aquatic animals or aquatic animal products to human and gathered an audience of 120 live attendees and up to 190 registered.

On 24th February, Prof. Paola Barato gave a webinar focused on diseases with economic and public health impact on the tilapia industry. Also allowing for the achievement of 1 Continuing Education credit, this event was attended by 70 people, with 131 registered. On 30th March, we hosted the second event organized in collaboration with European Association of Fish Pathologists (EAFP), thus it was jointly moderated by Dr. Gorgoglione and by the EAFP General Secretary, Dr. Snjezana Zrnčić. This event was delivered using a new format, including a lecture on zebrafish as a model for fish disease followed by a practical laboratory demonstration on CRISPR/Cas gene editing. The 2h-contribution was kindly provided by Prof. Louise von Gersdorff Jørgensen and Dr. Moonika Haahr Marana from the University of Copenhagen, Denmark revealing

to be very successful, indeed it attracted 413 registrations and 238 live attendees. The latest WebCEPD webinar was kindly provided by Dr. Johanna Baily, from the University of Stirling, Scotland, an outstanding 1.5 h lecture focused on pinnipeds' anatomy, diseases, and emerging threats. Baily's webinar was moderated by Dr. Gorgoglione and Dr. Venegas and attracted an astonishing audience, attended live by 457 people out of the 742 registered, becoming the most successful event ever held by WAVMA.

We continue to work on the organization of further WebCEPD events. The next, focusing on Aquaculture activities in the Indian Ocean is scheduled on 18th May and will be given by Dr. Marc Le Groumellec from Madagascar. So far, all webinar contributors received a 1-year complementary WAVMA membership, but we are currently implementing the allocation of a monetary honorarium to them, with specific amounts variable on webinars' length and complexity. Other upcoming WebCEPD events are already planned, including on 25th June by Dr. Prakan Chiarahkhongman from Thailand on practices in shrimp diseases, and on July 15th by Dr. Fernando Mardones from Chile on aquatic disease surveillance towards One Health. All previous Webinars are available on our website, free to all WAVMA members for both re-watching them and for obtaining CE credits after completing the knowledge and skills assessment. We invite all WAVMA members to participate to WebCEPD events, and to contact if wishing to contribute to upcoming events by delivering a webinar reaching colleagues from all around the world.

Finally, we would like to invite more WAVMA members to actively join our vibrant committee. ESC will continue to work intensively to increase educational opportunities offered or facilitated through WAVMA to the aquatic veterinarians and pathologists around the world, but we do need the support of further contributors to improve our organization capacities. If you are interested in joining the committee, please email Dr. Gorgoglione (bartgorg@msu.edu) or Dr. Jones (drjones01@vt.edu).

We hope to see you at our next ESC meeting on 30th May!

Dr. Darbi Jones, Vice Chair of ESC
 Dr. Bartolomeo Gorgoglione,
 Chair of Education & Student Committee
BartGorg@msu.edu

Pitts Aquatic Education Award Recipient Report
Erica Chang

UC Davis School of Veterinary Medicine
 DVM Candidate Class of 2022
ekcchang@ucdavis.edu

I joined the World Aquatic Veterinary Medical Association (WAVMA) when I was an undergraduate, hoping to one day become a colleague. Now, as a third year student at the University of California Davis (UCD) School of Veterinary Medicine, and a grateful recipient of the John L. Pitts Aquatic Education Award, I feel like a true part of the larger community of aquatic animal veterinarians and researchers.

I used scholarship funds to support ongoing pathology research on wild shark stranding in California, and to continue my study of normal elasmobranch biology. Under the tutelage of Dr. Mark Okihiro, a senior fish pathologist at the California Department of Fish and Wildlife, we have been investigating the causes of disease and mortality in shark strandings, while simultaneously building up a much-needed database of basic shark and ray anatomy and pathology for a variety of California elasmobranch species.

My first case was a broadnose sevengill shark (*Notorynchus cepedianus*) that stranded on Pismo State Beach (Central CA) in the spring of 2019. When another sevengill stranded in Southern CA in December with nearly identical signalment and pathology, we began an in-depth investigation. What initially appeared as two simple cases of bacterial infection, with esophageal abscessation has evolved into apparent systemic envenomation by scorpionfish (*Scorpaena guttata*). I have been hard at work reading histopathology slides from these two cases, analyzing proteomics data, and poring over our gross findings and current literature to try to piece the puzzle together. Despite the frequency of shark strandings, the lack of knowledge about shark pathology, and the importance of sharks for our marine ecosystems, funding for this



work is nonexistent. The scholarship funds enabled us to process dozens of histopathology slides, run proteomics for these cases, and travel to these cases (it's a bit difficult to transport a 106 kg shark around the state). I'm currently writing the manuscript for the sevengill shark cases.

Although the COVID-19 pandemic has limited the sharks that we can respond to, I've been able to conduct seven necropsies, and assist with two others, at five locations in CA: two at Shark Lab (Dr. Chris Lowe's Lab) at California State University Long Beach, four in Davis, one field necropsy in San Onofre, one in Vista, and one at the Marine Wildlife Veterinary Care and Research Center in Santa Cruz. In addition to the two sevengill sharks, necropsies were performed on: three juvenile salmon sharks (*Lamna ditropis*), two common thresher sharks (*Alopias vulpinus*), a leopard shark (*Triakis semifasciata*), and one 9 ft, 340 lb white shark (*Carcharodon carcharias*).

From these sharks, we've gleaned crucial data about causes of strandings and mortality in sharks, documented unique and specialized anatomic structures of selected sharks species (e.g., endolymphatic ducts in white sharks, 340+ vertebrae in a thresher spine, orbital optic pedicle), and have shared samples (e.g., muscle, liver, skin, fin clips, stomach contents, and inner ear otoconia) with researchers across the state.

One particular bacterial species, *Carnobacterium maltaromaticum*, continues to be a large culprit in many cases of meningoencephalitis and otitis interna, leading to stranding. *Carnobacterium maltaromaticum* was isolated in all three salmon sharks I necropsied, and in one of two thresher sharks that stranded in 2019. However, we've also identified numerous cases

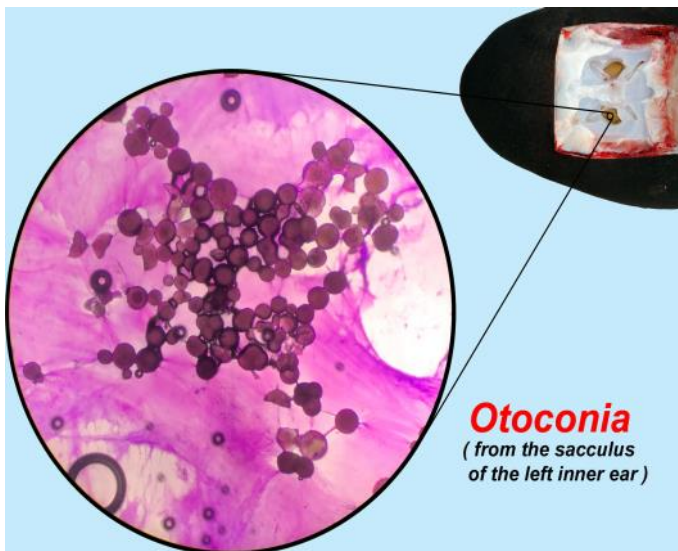




of trauma—gunshot wounds, boat strikes, and hook/fishing wounds—that have killed sharks. In the past, this pathology work by Dr. Okihiro has led to a successful conviction for illegal white shark capture and killing. Although most shark stranding cases don't have this sensational outcome, we're slowly filling in the large gaps of knowledge about these animals in hopes of better understanding and protecting them.

Investigative necropsies on stranded sharks are especially instructive in that they require an array of diagnostic skills, covering a wide spectrum of veterinary fields, to come up with the correct diagnoses. Thorough shark necropsies can take 2 or 3 days and involve a working knowledge of anatomy--which is quite different from mammalian, avian, and even teleost fish anatomy--as well as skills with dissection, sterile technique, microbiology, cytology, histology, parasitology, pathology, and molecular biology. Developing my necropsy skills with elasmobranchs has also improved my pathology and diagnostic skills when working with teleosts through the Aquatic Animal Health Laboratory at UC Davis. Although there are very different challenges when performing a necropsy on a 150+ kg white shark compared with a 2 g tiger barb, the problem-solving aspects, application of veterinary school knowledge, and necropsy finesse remain the same.

Working with Dr. Okihiro on shark pathology cases has been the highlight of my veterinary school career and I look forward to it continuing for many years. Because of this work, I am committed to pursuing a veterinary pathology residency, as well as a Ph.D. in aquatic animal medicine, with the eventual goal of working in government, or with an NGO, on some aspect of shark pathology research. I am forever grateful to WAVMA and the John L. Pitts Aquatic Education Award for making this work possible.



Aquatic Vet Med Externship Summary

By Laura Krogman, MS,

DVM Candidate, Class of 2020

WSU College of Veterinary Medicine

laura.krogman@wsu.edu

As a 4th-year Washington State veterinary student pursuing a career in aquaculture, I applied to the John Pitts scholarship to help fund my 6-week veterinary externship at the University of Florida's Tropical Aquaculture Lab (UF TAL). The UF TAL provides diagnostic health information to fish producers, wholesalers, retailers, and other agencies. My background prior to this experience was in salmonid aquaculture, so having the chance to learn about warmwater fish species was not only exciting but also important in helping me become more well-rounded as an aspiring fish vet.

During my first week, my learning goals revolved around understanding water quality as it related to fish health. I didn't have much experience with water chemistry analysis and interpretation or basic concepts like the nitrogen cycle in aquatic systems before arriving in Florida, so gaining hands-on experience with this foundational part of aquaculture and fish health was especially valuable for me. The focus of my second week was on-site tours of fish farms throughout the region. I had the opportunity to meet three different producers and wholesalers. I learned about different fish culture styles, challenges faced by the industry, and specific health requirements of various species. During my third week, bacteriology was a primary focus. I refined my existing bacteriology skills while learning about real-time techniques for identifying bacteria.

Over the course of my first three weeks on-site, I also completed "fish health workups" on nine unique fish cases. Fish health workups include water chemistry testing, parasitology, bacteriology, histology, and virology. In addition to handling the samples, I was also responsible for developing treatment and management plans for each case. The feedback I received during case discussions was invaluable and a true testament to how much the program coordinators care about their students' learning.

Due to the COVID-19 pandemic, my on-site training in Florida was cut short. I returned home to Washington 3 weeks earlier than I had anticipated, but the fish health learning didn't stop when I left the lab. I continued my own independent learning of fish health and aquaculture practices as well as continued discussing fish health with my UF TAL mentors via ZOOM meetings. I was able to work-up practice cases, test my knowledge of various common parasitic, bacterial, and viral diseases, and continue to learn about the Florida aquaculture industry.

I am so grateful for this experience as it was directly in line with my career goal of working as a fish vet in aquaculture. Thank you again to the scholarship committee for helping me further my education in fish health!

New WAVMA Student Chapter

Royal Veterinary College, University of London

This Student Chapter was formed with the goal to bring awareness to aquatic medicine to veterinary students at the Royal Veterinary College (RVC). We want to establish communication between students with a common interest and make resources and further knowledge more accessible. By doing this, we hope to make it easier for future veterinarians from the RVC with a genuine interest in a career in aquatic medicine to find the necessary contacts and resources to pursue it.

With help from WAVMA's amazing resources we are planning to open up "the world of aquatic medicine" to RVC students by organizing online lectures and discussions, wet labs, necropsies and field trips. We want to bring the aquatic veterinary community at the RVC together and offer more than what the vet school has to offer.

We are excited to be a part of WAVMA and are very thankful for this opportunity! Thank you!

Linnea-Serine Aune Görnerup
 Secretary—WAVMA Student Chapter
 Royal Veterinary College (RVC) in London.

Photo: from left to right
Kimberly Louise Qing Yee Tam (Vice President)
Mika Arnold Mauenhout (Treasurer)
Alex Joseph Hall (President)
Ragnhild Linnea-Serine Aune Görnerup (Secretary)



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 and Views

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

Legislative & Regulatory Issues

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

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

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

Jobs, Internships, Externships or Residencies

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

Advertising

See advertising rates on page 4.

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

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

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

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

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



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**Sharks at the OdySea Aquarium
Scottsdale, Arizona**

Photo by Nick Saint-Erne, DVM





WAVMA Member from Trinidad & Tobago Receives Prestigious Award

Meet **Dr. Ayanna Phillips Savage**
 University of the West Indies,
 St. Augustine, Trinidad & Tobago

“This award is undoubtedly a tremendous honor for which I am immensely grateful. It is the result of years of dedicated, unwavering hard work in a still little-recognized field in our region.” This is how Dr. Ayanna Phillips Savage describes being named a recipient of an

Anthony N Sabga Caribbean Excellence Award for Science and Technology.

Dr. Ayanna Phillips Savage is a Lecturer in Marine Mammal Medicine / Aquatic Animal Health and the Coordinator of the Aquatic Animal Health Unit and the Aquatic Animal Health Diagnostic Laboratory at the School of Veterinary Medicine at the St. Augustine Campus of The University of the West Indies. She is the first and only Certified Aquatic Veterinarian in Trinidad and Tobago.

Dr. Savage recalls when she was in her senior year of Veterinary School at UWI, St. Augustine and presented her aquatic animal-based research project. Despite being the top scoring project of that year, this was met with some skepticism as the field of Aquatic Animal Medicine was not yet recognized across the Caribbean. Today, Aquatic Animal Medicine is well recognized globally, having been introduced to the curricula of several of the top veterinary programmes in North America and Europe. Her role as the Coordinator of, and Lecturer at the Aquatic Animal Health Unit at UWI St. Augustine, having also designed and established the Unit, is testament to how far the field has developed.

The Aquatic Animal Medicine Unit seeks to sensitize and educate the Caribbean region about the importance of the health, management and conservation of aquatic ecosystems, and the impact of aquatic ecosystem health on human health – the One Health concept. Dr. Savage described some of her current work as being focused on identifying, documenting and educating on diseases of economic and public health significance in aquatic species across Trinidad and Tobago and the wider Caribbean region.



At the Aquatic Animal Health Laboratory, studies are ongoing on the diseases of marine and freshwater fish and shellfish as well as the diseases of sea turtles and marine mammals and the potential impact of these on public health. Her dedication continues with her work in the rehabilitation of endangered and protected sea turtles.

Dr. Savage is responsible for the work of the Trinidad and Tobago Marine Mammal Stranding Network, a network of 100+ volunteers from many varying professional spheres who work together to respond to marine mammal stranding when they occur in Trinidad and Tobago.

Dr. Savage intends to continue promoting and advocating for the inclusion of aquatic animal health regulatory guidelines in the business of aquaculture in Trinidad and Tobago; studying aquatic diseases that have economic and/or public health implications in an attempt to safeguard the livelihoods of those who interact with the aquatic ecosystems; and championing the cause of Caribbean aquatic ecosystem conservation so that our protected and

endangered aquatic wildlife are preserved for generations to come.

Dr. Karla Georges, Director of the School of Veterinary Medicine, sees this Caribbean award as recognition of the wealth of talent at the School, as well as the relevance and impactful output of the work that they produce. “Our School, though very small, is making a giant contribution to the region, and this recognition by our Caribbean peers is an immense booster for the morale of the School, staff and students, faculty and the UWI family”

The **Anthony N Sabga Caribbean Excellence Awards** is the only programme in the Caribbean that seeks out and rewards outstanding nominees in Arts & Letters, Public & Civic Contributions, Science & Technology, and Entrepreneurship. It has been in existence since 2005 and has named, inclusive of the current inductees, 49 Laureates from throughout the region.

A Short History of Aquaculture Innovation

By Jude Isabella & Shannon Hunt

For over a century, aquaculturists have tinkered with every part of aquatic animals' lives, from genetics to diet to where they grow best. In fact, humans have manipulated marine and freshwater habitats for millennia. Early Indigenous peoples around the world showed ingenuity and an acute awareness of how ecosystems worked as they found ways to encourage more bountiful harvests of all kinds of aquatic life. But we've taken a sharp turn away from the simple elegance of a clam garden or a fish trap and veered toward industrial mechanisms for domesticating aquatic species.

Farming fish and shellfish dates to ancient China, Egypt, and Rome, but the pace of innovation—especially when it comes to raising marine species—accelerated in the last century with modern technologies. Today, the Food and Agriculture Organization of the United Nations (FAO) says aquaculture is growing faster than other major food-production sectors.

Innovations come through many avenues—scientific research, novel materials (what a difference plastics made), and float and net technologies. Notably, the salmon farming industry has led many breakthroughs, evidence that when there's money to be made by creating and marketing a high-end product, investments in technology tend to follow.

Here's a brief overview of the research and technologies that have made today's food revolution blue.

1883

The 1883 International Fisheries Exhibition, which ran from May through October in London, England, featured all things related to fishing and fishermen, and also highlighted a growing interest in culturing species including salmon, trout, and oysters. The event was hugely popular—with 25,000 people passing through the turnstiles on one May day alone. While most visitors were likely happy to simply enjoy the aquariums, military bands, and fish dinners, those interested in learning about the weightier goals of the exhibition could peruse the almost 400-page official catalog. One section stated that the object of modern pisciculture was, in part, to restore already depopulated waters. The writer expressed hope that information collected and distributed through the exhibition would serve to “make an acre of water more valuable than an acre of land.” Exhibition prizes were available in a number of categories related to fish culture, such as the best description of fishpond construction and

management. A Scottish landowner was among the attendees who presented research, explaining that pure water and rat-proof drains were necessities for success. Fish culture, he said, not only involved the artificial propagation of fish, but also producing their food and getting them to market, “just as much as the culture of corn is understood to mean not merely the sowing, but every step from the preparation of the seed bed to the marketing of the harvest.”

1899

In Western countries, a growing concern that fish stocks were declining led to the establishment of marine laboratories and fish hatcheries. The Swedish government invited delegates from a handful of countries to attend a scientific conference dedicated to ocean research and how it related to the fishing industry. This and subsequent conferences, including one in Kristiania (now Oslo), Norway, resulted in the participating countries founding the International Council for the Exploration of the Sea. Delegates planned both hydrographical and biological studies, which included keeping records of salinity, currents, and temperature, as well as investigating the life histories of economically important fish. These internationally coordinated efforts boded well for the advancement of oceanographic research, but with fish hatcheries dogged by difficulties—including those associated with running mechanical water systems and a failure to understand the feeding requirements of fish larvae—this enthusiasm did not translate into much momentum in the field of aquaculture.

1924

Tilapia was first cultivated in ponds in Kenya. Nicknamed “the aquatic chicken”—because, like the popular fowl, it's an economical source of mass-produced, mild-flavored animal protein—tilapia is disease-resistant, grows quickly, and tolerates poor water quality, making it a popular choice for both subsistence and commercial production in many countries. The challenge: this fish breeds early and often, which leads to overcrowding, competition for food, and stunted growth. By the 1970s, researchers had devised a solution: sex reversal technology, which produced all-male populations through hormone manipulation. (Males were preferred because they grow faster.) This advancement was one of several that facilitated the growth of the tilapia industry. According to FAO, in 2017, tilapia was the most popular aquaculture species group in 127 countries. And Nile tilapia was ninth on the global list of top aquaculture species based on production quantity (measured by live weight)—not bad for a chicken.

1927

In Japan, Hidemi Seno and Juzo Hori published a paper describing their new method for growing oysters by attaching them to ropes and hanging them vertically from a floating raft. The innovative method replaced a 300-year-old tradition of driving bamboo sticks or tree branches into the ground in shallow water to provide a surface on which free-swimming oyster larvae could settle. Vertical suspension allowed oysters to take in more food and grow faster, as they could feed even when the tide was out. Oysters grown above the seafloor were also safer from predators and produced higher-quality meat. People were quick to adopt this new method, and the production of cultured edible oysters in Japan tripled in about 10 years. By 1958, it was reported that over 90 percent of the oysters produced in Japan were grown using the hanging method.

1933

Alvin Seale, superintendent of the Steinhart Aquarium in San Francisco, California discovered that the brine shrimp *Artemia* made an excellent food source for fish larvae. Young marine fish at the aquarium typically ate live food such as plankton, which was not easy to mass produce. Seale noticed that the fish thrived when fed tiny crustaceans harvested from nearby salt ponds. *Artemia*—a hybrid of which was later sold as the novelty instant pets called Sea-Monkeys—soon became a dietary staple for the aquarium's animals. But they were hard to source in the winter, so Seale visited the salt ponds to gather sand-grain-sized *Artemia* eggs and started experimenting. When conditions such as temperature or salinity levels are unfavorable, females encyst their eggs, which can stay dormant until conditions improve. Seale wrote that these cysts could remain viable almost indefinitely and concluded that it was possible to have a good supply of live food by simply triggering the eggs to hatch when needed. Dried and canned, this food was available year-round, it was easy to store and prepare, and it had a long shelf life. *Artemia* remains an important food source for the larval stages of commercially farmed marine fish and shellfish.

1950

By the 1950s, a sea change was underway as plastics revolutionized the design and manufacture of many items in the aquaculture industry. Salt water is bad news for aquaculture operations—it corrodes pipes and valves, leaching heavy metals into the water, which can poison fish, and makes the upkeep of mechanical systems expensive and time-consuming. While the

first fully synthetic plastic was developed in 1907, it wasn't until after the Second World War that the large-scale manufacturing of plastics really took off. In their 1963 paper about rearing bivalve mollusks, Victor Loosanoff and Harry Davis of the Milford Laboratory in Connecticut noted finding an increasing use for plastic pumps and pipes, although they said that plastics could be contaminated by chemicals, including insecticides. Possible disadvantages aside, the development of aquaculture has been dependent on the use of plastic. Today, plastics are found in many items, including fish cages, pond linings, and seafood packaging.

1954

Researchers at the Oregon Fish Commission and what is now Oregon State University developed a fish food in a moist, soft pellet form as a replacement for the more traditional diet of dry grains and meat. The pellet formula varied over the years. In 1956, frozen tuna viscera, herring meal, cottonseed oil meal, corn oil, folic acid, and niacin were among the ingredients. Antibiotics and additional vitamins could also be added to the pellets. At a conference in 1960, Wallace F. Hublou of the fish commission said that the pellets had been fed to steelhead and several species of salmon. After almost two years of production use, the pellets were living up to expectations—not surprising as the cost to produce a kilogram of fish was 41 percent less than in 1958 before pellet feeding. Cost was not the only advantage: Hublou reported that pellets took up less storage space, eliminated the need for food preparation in the hatchery, and caused less water pollution than traditional feed, which also cut labor requirements as less pond cleaning was necessary. While formulations continue to evolve, pelleted feeds remain an aquaculture staple.

1958

Japanese scientist Motosaku Fujinaga, who had first artificially spawned and hatched kuruma shrimp in a tank in 1933, continued to build on his success by producing 10 kilograms of shrimp big enough to be marketable. The quantity may have been modest, but the exhaustive research they represented was impressive. By 1967, Fujinaga was able to produce 1.5 million fry in a 10-by-10-meter concrete tank, and he reported that there were 11 kuruma shrimp culturing sites in Japan producing 200 tonnes of shrimp annually. At a scientific conference in Mexico, he explained that the scale of operations had been greatly increased and the cost of production lowered by using large outdoor tanks filled with seawater. His techniques, including the use of the brine shrimp *Artemia* as a food source, gave rise to the modern shrimp farming industry. Fujinaga, often called the father of

shrimp farming, believed the shrimp cultivation industry could contribute to solving what he called the growing problem of protein shortages.

1959

Norwegian brothers Karstein and Olav Vik built floating wooden cages with suspended nets to hold their Atlantic salmon and moved toward establishing ocean-based fish farming. The Viks had started their experimentation with freshwater trout a few years earlier, trying to see if the fish could acclimate to life in salt water, a habitat that was thought to speed up growth and reduce the risk of disease. They proved it was possible and then began experimenting with Atlantic salmon, an anadromous species that migrates between fresh water and sea water. By manipulating salinity levels and using their open-ocean floating cages, they were able to raise salmon from eggs to adults completely in captivity. The US patent for their method of breeding fish—which they claimed could almost double the fish growth rate—was granted in 1968. As Norway's wild fish stocks starting collapsing in the 1960s, the country eagerly embraced the possibilities of this new industry, and today Norway is the world's largest producer of farmed Atlantic salmon.

1963

Victor Loosanoff and his colleagues at the Milford Laboratory developed techniques for making bivalves spawn almost year-round, allowing researchers in seasonal climates to experiment with rearing shellfish outside the short periods of natural propagation. They stimulated the normal development of bivalve gonads and induced spawning by taking mollusks from outside where water temperatures might be near freezing, putting them into warmer water, and then gradually increasing the temperature. With their conditioning and rearing methods, the scientists successfully cultured about 20 species of bivalves at the Milford lab. Loosanoff published hundreds of articles, got credit for helping save the ailing North American shellfish industry, became known as the father of US shellfish hatcheries, and had a research vessel named in his honor. The techniques Loosanoff and his colleagues developed became known as the Milford method and are still used in shellfish aquaculture today.

1970

Off the island of Hitra in Norway, brothers Ove and Sivert Grøntvedt put 20,000 Atlantic salmon smolts into large floating octagonal cages they had designed and built. Inexpensive, strong, and simple to assemble, the cages made it easier to feed the salmon and created a barrier against predators. The brothers' venture was regarded as

the world's first successful salmon farm. Their cage design combined with government support and Norway's nature—a long coastline, protected waters, stable water temperatures—nurtured the Norwegian aquaculture industry. Norway exported 886 tonnes of salmon in 1971; in 2018, the country produced over 1.3 million tonnes of salmon. According to the Norwegian Seafood Council, 14 million meals of Norwegian salmon are eaten daily worldwide.

1971

Norwegian scientist Trygve Gjedrem believed the basic elements of breeding theory were the same for fish and shellfish as for farm animals. After researching topics such as sheep-fleece weight and wool quality traits, he turned his attention to salmon, helping develop the world's first family-based breeding program for fish. The program was designed to produce high-quality, fast-growing Atlantic salmon with high disease resistance. The breeding program contributed to the success of Norway's salmon aquaculture industry: by 2010, an estimated 97 percent of the world production of Atlantic salmon was based on genetically improved stock. Gjedrem later contributed to the Genetic Improvement of Farmed Tilapias project, which was initiated in the Philippines and developed faster-growing stocks of Nile tilapia for small-scale farmers and commercial operators alike.

1980s

Denmark was one of the first countries to use recirculating aquaculture system (RAS) technology for commercial European eel aquaculture. Recirculating systems are now used to produce both freshwater and saltwater species, including rainbow trout, whiteleg shrimp, and turbot. With RAS, species are raised on land in a contained facility that recirculates and filters water so it can be reused. While high start-up and operational costs and the need for highly skilled staff have hampered widespread adoption of the technology, advantages include eliminating the possibility of farmed stock escaping into the wild and the ability to keep external conditions such as water temperature stable, which results in steady growth.

The Monterey Bay Aquarium Seafood Watch's "best choices" list includes several species farmed in recirculating tanks, a farming method that it says can minimize disease and the discharge of pollutants with wastewater treatment. Charoen Pokphand Foods of Thailand aims to produce all its whiteleg shrimp with indoor RAS by 2023. Other RAS ventures currently planned include a US \$500-million Atlantic salmon farm in Maine that's expected to produce about 30,000 tonnes of fish annually and a \$152-million Atlantic salmon farm

in Japan that will produce 10,000 tonnes of fish annually.

1999

At an experimental fish farm in France, researchers employed acoustic telemetry technology to measure fish swimming behavior. They fitted rainbow trout with miniature ultrasonic transmitters, and used hydrophones and specially developed software to show that monitoring fish activity was feasible in high-density culture conditions. Today, as aquaculture operations seek to feed and care for ever-increasing numbers of fish—a single Norwegian sea cage can hold up to 200,000 farmed salmon—the traditional methods of measuring parameters such as size by eye or by hand can be time-consuming and inaccurate. In addition to acoustic telemetry, methods for monitoring fish now include sonar and computer-vision technology, in which video from submerged cameras and computer-vision algorithms are used to gauge variables such as fish size and sea-lice infestation.

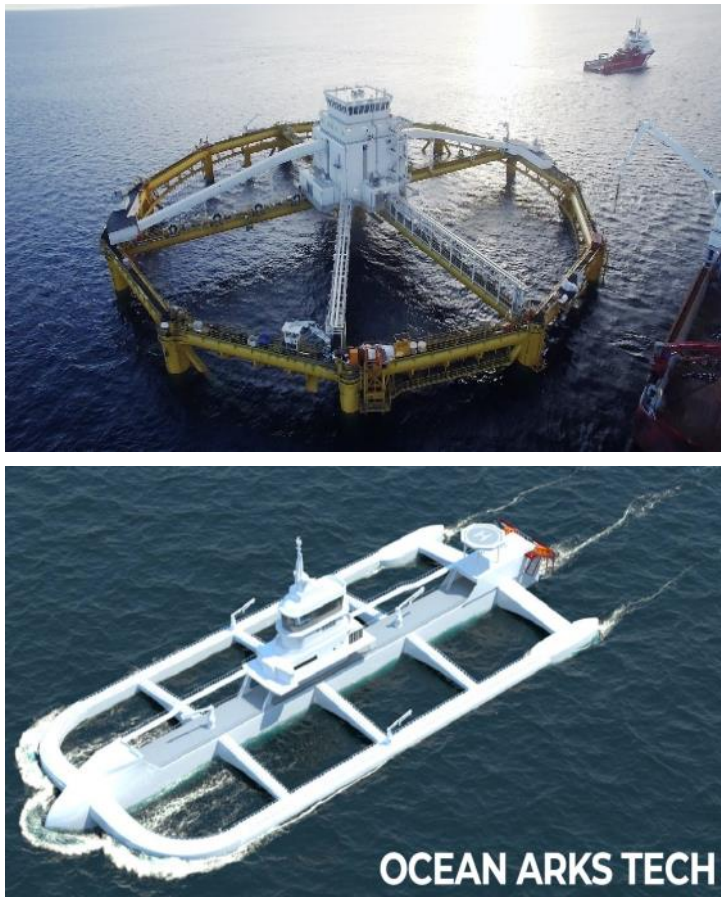
2018

With companies increasingly recognizing the potential of offshore aquaculture, the Chilean venture Ocean Arks Tech obtained a patent for a self-propelled fish farm—basically a 170-meter vessel that can produce 3,900 tonnes of commercial fish species such as salmon, tuna, and amberjack. Billed as “aquaculture without borders,” this floating farming vessel will operate in the open ocean where it can seek optimal water conditions for fish production and avoid algal blooms and areas of low oxygen and acidity. While it’s possible that this idea for autonomous ocean aquaculture ends up dead in the water—at the time of writing, the company’s Twitter account had 22 followers—others have already set sail for the high seas: in 2017, Norwegian company SalMar

began operating Ocean Farm 1, which it called the world’s first offshore fish farm. The pilot facility—68 meters high and 110 meters wide—was fitted with 20,000 sensors for monitoring and feeding up to 1.5 million Atlantic salmon. Meanwhile, in the Yellow Sea, China’s first deep-sea fish farm got underway in 2018. Located about 240 kilometers offshore, the 35-meter-tall structure can submerge as deep as 50 meters to reach the best water temperature for keeping the farm’s 300,000 salmon alive. A 2019 report by the Nature Conservancy and Encourage Capital, written in an effort to spark greater investment in sustainable aquaculture, identified **offshore finfish aquaculture** as one of three systems with the greatest potential for financial returns and improved environmental sustainability.

2020

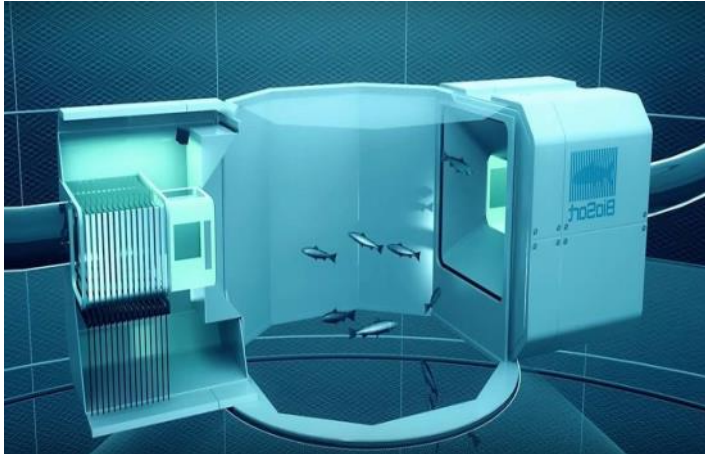
Cermaq, a Norway-based fish farming giant, planned to launch its \$63.7-million iFarm project with the goal of monitoring not just an entire cage of salmon, but each individual fish. Cermaq says iFarm sensors recognize individual salmon based on their dot pattern, which makes it possible to keep track of the number of fish, fish size, number of sea lice, and possible signs of disease. Meanwhile, Norway Royal Salmon, Microsoft, and technology company ABB piloted an artificial intelligence system to monitor salmon in offshore sea cages. The companies claim remote monitoring will mean workers are safer because they won’t be out on the open water as often, and that there will be an environmental advantage as fewer boat trips out to the sea cages to manually check the salmon will reduce carbon dioxide emissions.



Ocean Farm 1 and Ocean Arks offshore fish farm systems in development by Norwegian salmon farming companies.

Images courtesy of SalMar & Ocean Arks.

In a 2018 article in *Biosystems Engineering*, researchers said that because variables like fish numbers and fish size affect key decisions—for example, how much food and medicine is needed—being



Cermaq's iFarm Sensor.

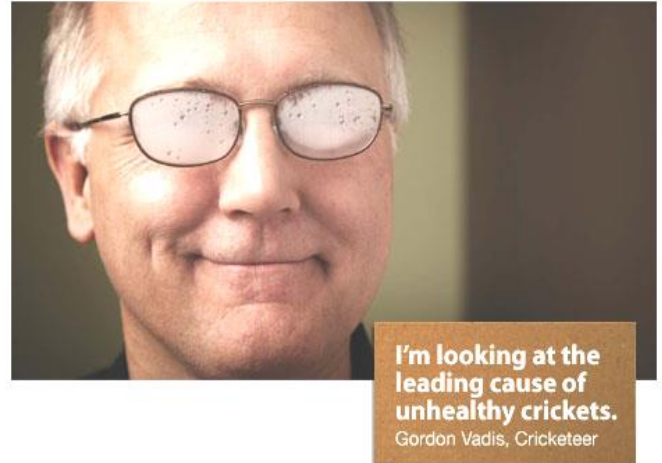
Image courtesy of Cermaq.

able to predict and quantify those variables has become "a holy grail in the salmon farming industry." With operations aiming to produce ever-greater quantities while grappling with challenges such as securing adequate and ecologically sustainable feeds and competing for space with other industries, the authors say that future fish farming methods will need to be smarter. In other words, more outside-the-sea-cage thinking will be required to move the industry forward into its next era.

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This article is also available and a podcast is available from:

<https://www.hakaimagazine.com/features/a-short-history-of-aquaculture-innovation/>



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[WAVMA Members-L@wavma.org](mailto:WAVMA_Members-L@wavma.org)
Sick Shark at Aquarium

Hi all!

I hope this finds you well. I could really use some advice on a shark in a small local aquarium. We have a black tipped reef shark that suddenly began swimming in just a little more of a lethargic manner, and wobbling just a bit side to side. Otherwise, the animal looks pristine, is eating and defecating normally, the water quality is good, and the rest of the animals in the tank (2 eels and a few other sharks) are perfectly fine.

I am considering things in this order:

- 1) having them put fiber in the squid daily for a few days to help expel any possible FB thrown in by a guest
- 2) Next would be capture and give a vitamin B complex injection
- 3) If no response, next consider a Florfenicol injection and possibly more q 3-5 days based on response
- 4) I considered advising treating with praziquantel; however, I understand that there may be a risk with creating resistance so want to hold off unless more sure this is monogeneans causing the issue
- 5) Finally, capture for a full exam, bloodwork, gill cytology, and to pass a stomach tube and go from there based on results.

I suspect this could be neurological or congenital. If the former, then maybe a course of prednisone? If the latter of course there is nothing to do.

Thanks so much in advance for any help/advice.

I would appreciate any quick ideas as they really don't want to delay and risk losing the animal. I appreciate you all, take care!

Jena Questen, DVM
fish@drquesten.com

Hi Jena

Could be many things. Handling black tip RS is not without some risk – the perennial issue of monitoring and hoping for the best or to intervene, with the associated risk of a poor outcome that the handling contributed to. Not sure of the size of the animal and whether there is the ability to place it off display.

We have used injectable alfaxalone in this species with quite good results – gives 5 to 10 minutes sedation, just enough for exam, gill clip, blood sampling etc. Recovery much quicker than with the baths when we have used them.

Injectable B-complex vitamins would always be first choice and then monitor for a day or so. Do they supplement with any vitamins? If not, thiamine deficiency and real possibility.

Regards,
 Dr. Rob Jones
www.theaquariumvet.com

Hi Jena,

I have seen this presentation in several different shark species. Ultimately, we almost never find the cause. Sometimes it can be due to over exertion leading to a myopathy or lactic acidosis. How old is this shark?

Things to consider are meningitis, hypoglycemia, secondary sepsis, nutritional deficiencies. Are you sure this shark is defecating normally? I've seen sharks that have prolapsed their spiral valve and have it bitten off, swim like this afterward.

If I were to handle this shark, I would want to get diagnostics and provide treatments all in one go. I would not want to plan to do things stepwise. If smaller, like Rob suggested, you could give alfaxalone IM to sedate and reduce handling stress. I really like propofol IV if your handling is going to be longer than 10 minutes. Otherwise, TI may be fine with a power-head RAM ventilator and O₂. I would get blood (CBC, chemistry, protein electrophoresis, +/- acute phase proteins), ultrasound and maybe radiographs.

As for treatment, I would treat for the treatable. I would give a long-acting antibiotic such as Excede. I also like to combo that with amikacin. I would give dexamethasone SP, or if you have hoarded any, Solu-Delta. Finally, I would give Vitamin E/Se, Vitamin B and Vitamin C complex. I can provide doses if you need any of them.

Best of luck,

Michael Hyatt, DVM, DACZM
 Wildlife Conservation Society
 New York Aquarium
 Brooklyn, NY



The blacktip reef shark (*Carcharhinus melanopterus*) is a species of requiem shark, in the family Carcharhinidae, which can be easily identified by the prominent black tips on its fins (especially on the first dorsal fin and its caudal fin).

Photo from <http://www.whatsthatfish.com/profile/fishx6>
 - <http://www.whatsthatfish.com/image/view/6882>,
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<https://commons.wikimedia.org/w/index.php?curid=10235586>

Shark Transportation

Hi everyone,

I wonder if someone has experience with transfer of large sand tiger sharks. I soon will have to transfer several of them (above 150 kg each) from their tank to another one, because maintenance operations are planned on the old one.

I only have experience with capture and anaesthesia on this species, but not on transportation. Given the heavy weight and to prevent the fish from crushing itself if we take it out of the water on a stretcher, the only option I see is to carry it within a transportation tank full of water, but it is an expensive and complex solution in our case (we need a large crane). Does any of you have some experience in that matter, or ideas to share?

Many thanks for your help

Pierre-Marie BOITARD
 Vétérinaire, CertAqV
pm.boitard@reseaucristal.fr

Hi Pierre-Marie

We gave recently shifted 6x > 200-kilogram mature adult sand tiger sharks on road trips, with some over 1000 kilometres travel distance – with 100% success. We used Phenoxyethanol at 0.15 ml/L and up to 0.20 ml/L as needed with great success getting them in an out of the transport container. Non-sedated for the road trip. All never left the water and it was a large logistical operation.

We swam the sharks into a smaller pool or in one case (large lemon sharks) a tarpaulin and sedated them that way. Takes ten to twenty minutes for sedation. Have now done this for about 6 or 7 species of large elasmobranchs of between 100 and 300 kilograms in BW with no issues at all. I have not used it more concentrated into the mouth.

Be VERY careful shifting mature females. I once was involved in a weighing exercise of a mature F sand tiger shark and in the process of lifting her out of the water there was a jolting movement (not huge) and in the process the ovarian artery tore, and she died in less than 24 hours – one of those scars you carry for life. So definitely sedate (phenoxy worked very well for us and is cheap) and lots of Dissolved Oxygen (up to 180%) and then in tightly restrained stretcher with NO sudden movement and be VERY careful going up and down stairs.

Used cranes and a forklift for the sand tigers as we were lifting almost 3000 litres of water / shark. All were given Nufloor LA, Dexapent and Vitamin C injections as soon as sedated and able to be handled in preparation for the transport. None were put into TI at any stage.

We did i-Stats before the transport as soon as sedated (before moving to the truck) and again at the other end when sedated and before lifting out of the truck. Blood values were all excellent and no change

after 15 to 16 hours in transport container. All recovered very quickly and ate within 24 hours.

Regards,

Dr Rob Jones
 The Aquarium Vet
www.theaquariumvet.com

Outstanding work, Rob. I have been advocating using vibration isolation materials under transport containers and by all pumps for elasmobranch transports. I think we can reduce the transport stress associated with all forms of transport.

Brian E. Joseph DVM CertAqV
brian.e.joseph6.mil@mail.mil

I have moved a 12-footer numerous times from tank to tank. We used a stretcher with aluminum poles and manpower, we have gone up steps and in elevators. If moving a long distance, then a tube-like shark box is used super oxygenated to calm the shark with a pump to ram ventilate. Would be glad to discuss at any time.

We did not sedate the sharks at all but if you need to, I would use the phenoxy. Ours did very well with hyperoxygenation. We carried them dorsally recumbency with a couple of extra people on the mid-section. We herded them into the stretcher using portable shields once we had them in the shallow med pools.

Michael D. Stafford DVM
 Fair Grove Veterinary Service
Fgvs@aol.com



The sand tiger shark (*Carcharias taurus*), also called the grey nurse shark, spotted ragged-tooth shark or blue-nurse sand tiger, is a species that inhabits subtropical and temperate waters worldwide.

Photo of sand tiger shark at the Newport, Kentucky Aquarium by Jeff Kubina from Columbia, Maryland. From Wikimedia Commons, the free media repository, Public Domain.

**Book Review: Part 1 -
Fowler's Zoo and Wild Animal Medicine; 9 volumes
Reviewed by Nick Saint-Erne**

When I graduated from Kansas State University veterinary school in 1984 and entered into small animal and exotic pet medicine, I was armed with two tomes that guided my endeavors for many years as my main reference sources: *Diseases of Exotic Animals* by Joel Wallach and William Boever (Saunders 1983) and *Zoo and Wild Animal Medicine* by Murray Fowler (Saunders 1978). These books, along with my veterinary text books and hundreds of aquarium fish books by TFH Publications, helped me with my exotic and aquatic clients. Now, there are myriad veterinary books about aquatic and exotic species, much to our delight and edification, though at a high cost to our pocketbooks. In this series of articles I will present and review the portions of each of the nine volumes of *Zoo and Wild Animal Medicine* addressing aquatic veterinary medicine specifically. From this, the reader may decide if they would benefit from acquiring any of the editions of this massive series that they currently do not own.

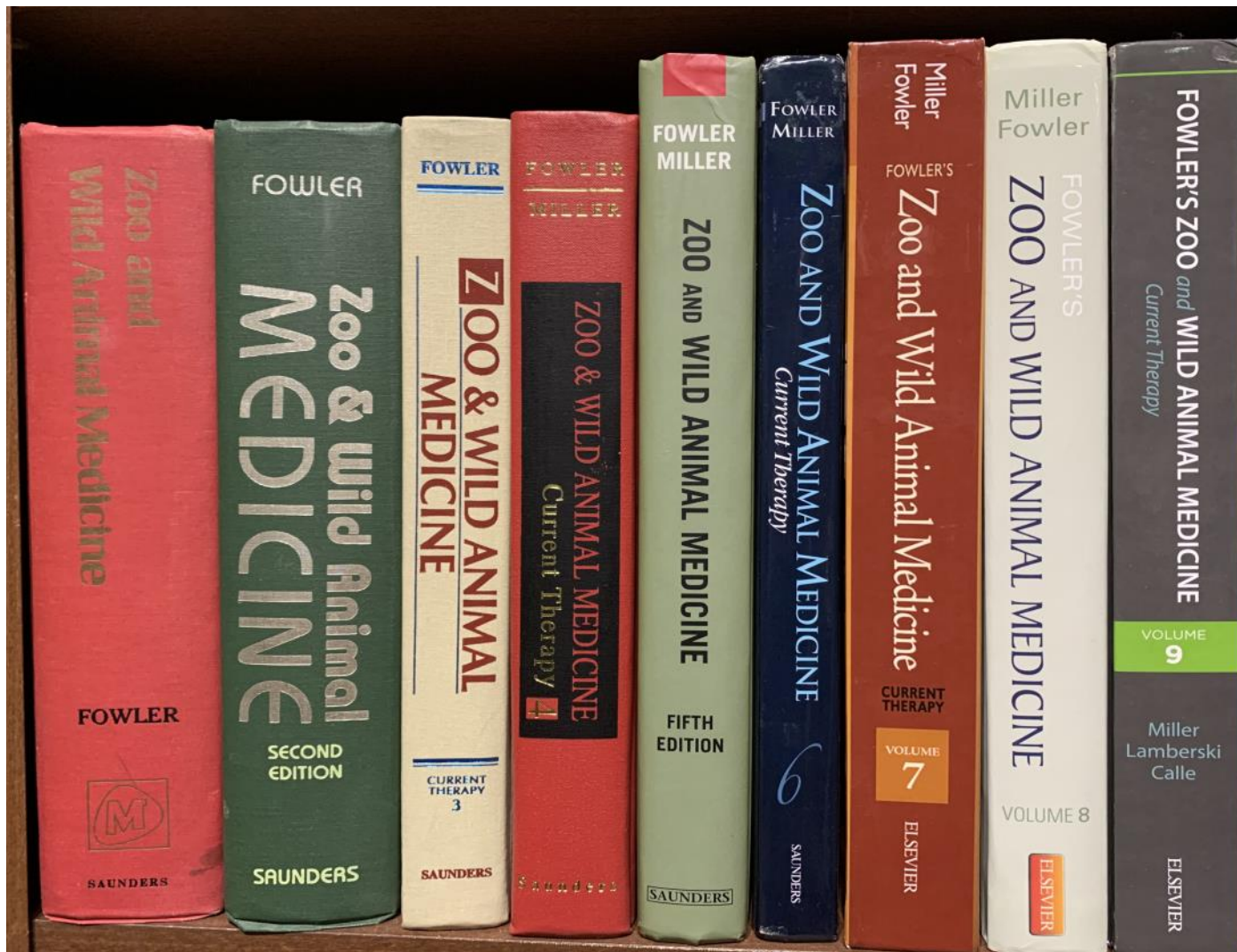
The original volume was edited by Professor Murray Fowler, DVM, of the University of California—Davis School of Veterinary Medicine, who compiled the chapters written by 75 contributors. The goal was to “provide zoo veterinarians with information enabling them to increase diagnostic, therapeutic and management skills.” Unfortunately, in the first book, “all groups of vertebrates, except fishes, are given at least superficial coverage. The reader is provided with a list of numerous publications on the diseases of fish.” In the index, the only reference to fish is “Fish, nutritive value of for marine mammals,” and the list of 30 References (found on pages 872-873). Many of the referred to books were published by *Tropical Fish Hobbyist* magazine (TFH Publications, Inc.).

Although lacking in information about fish, the first book has a wealth of knowledge on other aquatic species of animals: Part II Special Medicine: Amphibians and Reptiles (page 77) starts with *Chapter 8 Amphibians*, which was written by Robert Temple and Murray Fowler. It covers the anatomy and physiology, husbandry, feeding, restraint and handling of amphibians, then briefly covers preventive medicine, and common diseases. *Chapter 9 Reptiles* was edited by Thomas Burke and includes sections by multiple authors covering anatomy, physiology, husbandry, feeding and nutritional diseases, force-feeding, physical restraint, chemical restraint, infectious diseases, parasitic diseases, reproduction, and hematology (including the only colored plate in the whole book: photographs of reptile blood cells).

Part III Special Medicine: Birds (starting on page 151) has nine chapters that include all of the bird families, so readers interested in waterfowl will find information on biology, feeding and nutrition, restraint and handling, infectious diseases, parasitic diseases, non-infectious diseases, reproduction, and pathology of these species. Chapter 15 includes techniques of restraint and anesthesia, surgical techniques (including pinioning), and preventive medicine that can be used on birds. This part of the book makes a practical overview of avian medicine, including pet bird species.

Part IV Special Medicine Mammals (page 394) is divided into chapters that cover the orders of mammals. Of interest to aquatic veterinarians is *Chapter 25 Marine Mammals (Cetacea, Pinnipedia, and Sirenia)*, which is edited by Joseph Geraci. Following a plan presented in the other sections, this chapter includes identification, anatomy, physiology, husbandry, nutrition and nutritional disorders, capture, transportation, restraint, and marking, clinical techniques, infectious diseases, parasitology, noninfectious diseases, reproduction, and clinical pathology. There is a total of 66 pages in this chapter.





Considering this zoo animal book was written 43 years ago, it is still a great reference, even though many new drugs and techniques are available now that were not available when this was written. Which is the purpose of adding to the first edition by expanding it into multiple volumes!

The next volume to this set is actually a revised second edition of the first book, published eight years later. It has 86 contributing authors and was edited by Dr. Fowler. The first edition has 951 pages of text, and the second edition was expanded to 1127 pages. The introductory Part I General Information of both volumes deals with material common to all classes of animals, and has more chapters in the second edition, including behavior of captive animals, inhalation anesthesia, zoonoses, and poisoning in wild animals.

While the amphibian and marine mammal sections of the second edition are essentially the same as in the first edition, the reptile section was increased from 61 pages to 79, and the avian section was greatly expanded ; especially for aquatic birds and water fowl.

By comparison, the second edition is similar but slightly expanded from the first, with more updated information. If you were to get only one of these, the second edition would suffice. Yet, this edition still neglects fish, with no mention of them in the index.

A recent Amazon website search found the second edition of *Zoo and Wild Animal Medicine* for sale by multiple vendors for US\$ 40.00 and up. In the next issue of *The Aquatic Veterinarian* I will begin reviewing the next volumes in the series, which are actually not new editions, but supplemental information and they are labeled as the Current Therapy updates.

The third edition provides new information not included in the previous volumes, and, “the material printed in this third edition is not simply an update of the second edition and does not supplant it,” states Dr. Fowler in the Preface. This format is carried through future editions, so having access to either the first or second edition discussed here is very helpful; unless you want to learn about fish, which don’t appear until volume 4—but now I am getting into the contents of the next article!

Abstracts from Scientific Literature: Sharks**Largest global shark biomass found in the northern Galápagos Islands of Darwin and Wolf**

Pelayo Salinas-de-León, David Acuña-Marrero, Etienne Rastoin, Alan M. Friedlander, Mary Donovan, Enric Sala

Published May 10, 2016

PubMed [27190701](https://pubmed.ncbi.nlm.nih.gov/27190701/)

Abstract

Overfishing has dramatically depleted sharks and other large predatory fishes worldwide except for a few remote and/or well-protected areas. The islands of Darwin and Wolf in the far north of the Galapagos Marine Reserve (GMR) are known for their large shark abundance, making them a global scuba diving and conservation hotspot. Here we report quantitative estimates of fish abundance at Darwin and Wolf over two consecutive years using stereo-video surveys, which reveal the largest reef fish biomass ever reported (17.5 t ha⁻¹ on average), consisting largely of sharks. Despite this, the abundance of reef fishes around the GMR, such as groupers, has been severely reduced because of unsustainable fishing practices. Although Darwin and Wolf Islands are within the GMR, they were not fully protected from fishing until March 2016. Given the ecological value and the economic importance of Darwin and Wolf for the dive tourism industry, the current protection should ensure the long-term conservation of this hotspot of unique global value.

Ultrasonography as a Diagnostic Tool in Shark Species

Michael T. Walsh DVM, Frank S. Pipers DVM, PhD, Caroline A. Brendemuehl DVM, Frank L. Murru BS
Veterinary Radiology & Ultrasound, 34: 213-219
May 1993

<https://doi.org/10.1111/j.1740-8261.1993.tb02008.x>

Abstract

The use of sonography was evaluated in eleven sharks as a potential diagnostic and investigative tool. Individual sharks were anesthetized with MS-222 (Tricane Methane Sulphonate) and sonograms recorded from various planes using a 3 MHz linear array scanner. Sonographic images were compared with corresponding postmortem cross sections. Heart rate and rhythm were monitored with real time sonography in an attempt to gauge the depth of the anesthesia. Heart rates ranged from 12–46 bpm. Initial results of this study suggest that sonography may be a useful technique in shark species where the application of radiographic techniques is limited by the lack of adipose tissue and the need to maintain the animal in water.

Clinical and Cardiorespiratory Effects of Propofol in the Spotted Bamboo Shark (*Chylloscyllium plagiosum*)

S. M. Miller, M. A. Mitchell, J. J. Heatley, T. Wolf, F. Lapuz, M. Lafortune, J. A. Smith

Journal of Zoo and Wildlife Medicine Vol. 36, Issue 4
1 Dec 2005, pgs 673-676

Abstract

Sharks are important exhibit animals in aquariums and zoologic institutions worldwide. Although veterinarians are encountering these species more frequently in these institutions, our knowledge regarding safe restraint and anesthesia is limited. To date there have been only a few anecdotal reports or studies evaluating the effects of tricaine methane sulfonate (MS-222), ketamine hydrochloride, and tiletamine and zolazepam (Telazol) in sharks. The purpose of this study was to evaluate the clinical and cardiorespiratory effects of propofol in spotted bamboo sharks (*Chylloscyllium plagiosum*).

Nine wild-caught adult female spotted bamboo sharks (mean weight 2.4 kg ± SD 1.45 kg) were used in this study. Propofol (2.5 mg/kg) was administered over 30 sec via the caudal tail vein. Heart rate, respiratory rate, time to relaxation, escape response, loss of righting reflex, and response to noxious stimuli (fin pinch) were evaluated and recorded at baseline and 5, 10, 15, 30, 45, 60, and 75 min after propofol administration. A surgical plane of anesthesia was achieved when the shark lost its righting reflex, did not respond to noxious painful stimuli, and no longer resisted handling. The righting reflex was lost within 5 min of propofol administration, and a surgical plane of anesthesia was observed in all nine sharks. Heart rate (P = 0.5) and respiratory rate (P = 0.5) did not change significantly over time. The righting response returned within 60 min in 44% (4/9) of the sharks, 75 min in 22% (2/9) of the sharks, and over 200 min in 33% (3/9) of the sharks. All nine animals recovered uneventfully. Propofol provided a safe anesthetic event for spotted bamboo sharks.

Melanoma in the Skin of a Nurse Shark (*Ginglymostoma cirratum*)

Jennifer A. Waldoch, Sandy S. Burke, Jan C. Ramer, Michael M. Garner

Journal of Zoo and Wildlife Medicine 41(4), 729-731,
1 December 2010. <https://doi.org/10.1638/2010-0014.1>

Abstract

A female nurse shark, *Ginglymostoma cirratum*, estimated at 27 yr of age had a 5.5-yr history of a 6-cm black, raised nodular skin lesion located on the right side of the proximal tail. The lesion was diagnosed on biopsy as a slow-growing melanoma of the skin with no vascular invasion. The nurse shark was euthanized for systemic illness approximately 4.5 mo after diagnosis of the dermal melanoma. No evidence of metastasis was found on histopathologic evaluation of the skin and viscera.

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The COVID-19 pandemic has changed many aspects of our lives, including how we communicate research. With the cancellation of in-person meetings, the AFS-FHS is offering an online fish health seminar series to showcase the work of students and early career professionals from across North America.


Indian Ocean Aquaculture - impacts of infectious diseases in its development



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EXOT212-0521: Fish Farm Veterinary Medicine

The lectures for this course will be presented in an audio format using a webinar platform.

Presenter: [Myron Kebus, MS, DVM](#)

Course Open: May 6-June 13, 2021

Real Time Sessions (RTS): Thursdays, May 13, 20, 27, and June 3, 2021; 8:00-9:00 pm ET (USA)

Total CE Credit: 4

RACE Category: 3 hours Medical, 1 hour Non-Medical (RACE 20-774527)

Course Information:

Fish farming has a long history, is very diverse and has been overlooked by veterinarians until relatively recently. It includes fish raised for food, stocking for angling opportunities, bait fish, and ornamental fish among other categories. There are very few opportunities to learn about fish veterinary medicine, especially fish farm veterinary medicine. Here is an opportunity. The principles in this course will be useful to any veterinarian who wants to provide fish veterinary service of any kind. The presenter was one of the first veterinarians to provide service to fish farms will share findings and experience from the past 30 years that will prepare participants to deliver fish veterinary services.

Level and Prerequisites: This **basic** VIN CE course is open for enrollment to veterinarians and veterinary technicians/technologists actively interested in fish farm medicine.

Course Agenda:**Week 1** (Real Time Session May 13, 2021): **Fish Farm Health Certificates**

Participants will learn the basics of issuing fish health certificates which is the primary revenue source for many veterinarians who provide service to fish farms. There are similarities, yet very important differences in issuing them compared to issuing health certificates for other animals. The techniques are similar to those that you would use to conduct pet fish diagnostics.

Week 2 (Real Time Session May 20, 2021): **Fish Farm Production Medicine Tools**

This is an area that the presenter has promoted with veterinarians and fish farmers. He will present examples on how veterinarians can conduct Modified Fish Health Assessment and other procedures that help fish farmers raise fish better. The principals apply to fish raised in large groups such as pet fish wholesalers and retailer, or research fish colonies

Week 3 (Real Time Session May 27, 2021): **Fish Farm Disease Cases**

The presenter will share many cases that include infectious, nutritional, and environmental disease cases from species including trout, yellow perch, walleye, tilapia and bait fish species. These cases will help the participant see how the topics discussed in the previous two weeks can be applied in their fish veterinary practice.

Week 4 (Real Time Session June 4, 2021): **Economics of Delivering Fish Farm Veterinary Services**

Economics determines whether fish farmers will continue to use your services and evaluating the costs and benefits of providing that service will determine whether fish practice is viable for you. This presentation has applications beyond fish farm medicine and is intended to address the questions private practitioners must consider in pet fish practice as well as all areas of private veterinary practice.

Successful completion (scoring 80% or better) on the end-of-course test is required to earn a certificate of completion for the course. To learn more about the requirements for earning a CE certificate, please refer to [Receiving Your CE Credit and Course Completion Certificate](#).

Tuition: Member \$92 (\$83 early bird special if enrolled by April 22, 2021)

Non-Member \$169 (\$152 early bird special if enrolled by April 22, 2021)

Enrollment qualifications:

VIN CE courses are open to VIN member and non-member veterinarians. Veterinarians enrolling in a VSPN CE course must be a VIN member. Veterinary support staff must be a VSPN member to enroll in a VSPN CE or a VIN CE course open to VSPN member enrollment.

For further assistance call 800-846-0028 ext. 797.

Katherine James, DVM, PhD, DACVIM (SAIM)
 VIN Education Director



**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.

Many Veterinary Conferences being held in 2021 have been canceled or postponed. Please check websites to ensure conferences are still being held before making travel plans.

Future WSAVA Conferences:

45th WSAVA World Congress [Virtual]

Dates: 21-24 March 2021

Held Virtually online

[Visit the website here](#)

46th WSAVA World Congress

Dates: 13-16 November 2021

Hyderabad, India

[Visit the website here](#)

47th WSAVA World Congress

Dates: 29-31 October 2022

Lima, Peru

See: [WSAVA](#)

The 2016 WAVMA Virtual Conference Presentations

The presentations (18 webinars) from the 2016 WAVMA Virtual Conference were recorded but due to various issues had never been placed on the WAVMA website to date. They will form part of over 140 webinar recordings which are available to members now that the new website is up and running.

CEPD credit was available if you watched the original webinars live and will be available when they go to watch them on the WAVMA website.

Chris Walster
Website Administrator



Call for Papers

A special Issue on *Viruses of Aquatic Animals*

Dr. James R. Winton of the United States Geological Service Western Fisheries Research Center has recently retired after a remarkable career in aquatic animals' health research and management that focused on fish viruses. We, his friends, colleagues, and collaborators are assembling a special issue on aquatic animal viruses and viral infections as a tribute to his outstanding career.

This special issue of the Aquatic Animals Section of *Animals* is expected to be completed by the end of 2021. *Animals* (ISSN 2076-2615) is an international peer-reviewed open access journal devoted entirely to animals, including zoology and veterinary sciences, published monthly online by MDPI.

The manuscripts are peer-reviewed, and a first decision provided to authors approximately 15 days after submission; with accepted paper posted online within a week with full-text archived in PubMed Central.

We would like to invite you to contribute to Winton's special issue by submitting a research paper, review article, or short communication that further our understanding of aquatic animals' viruses' pathogenicity, immunology, epidemiology, improved diagnostics, newly developed vaccines, taxonomy, and host susceptibility.

We are hoping that you will join our efforts in assembling an issue embodying emerging information in a field that Dr. Winton's led us through.

For further information please contact:

Professor Mohamed Faisal
Faisal@cvm.msu.edu

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SCHOLARSHIPS](http://WWW.WAVMA.ORG/SCHOLARSHIPS)

20th INTERNATIONAL CONFERENCE ON DISEASES OF FISH AND SHELLFISH
 Aberdeen, Scotland, UK
 29th August - 2nd September 2021

Depending on the status of the COVID-19 epidemiological situation for the appointed period, the 20th International Conference on Diseases of Fish and Shellfish (<https://www.delegate-reg.co.uk/eafp-2021/>) is currently planned to be held in-person at Aberdeen's newest events and exhibition space, TECA. Scientific and technical sessions consisting of poster presentations, invited talks, keynotes, oral presentations, workshops and an EAFP General Assembly will take place during the Conference. Planned social events such as, the Welcome Cocktail, Civic Reception and the traditional Conference Banquet, will be held in accordance with required epidemiological 'social distancing' measures in place.

In order to ensure that appropriate topics are covered, including emerging areas, we are very interested in hearing any suggestions for potential topics for scientific sessions and workshops at the conference. EAFP members and non-members are encouraged to submit proposals. More information will be available on the EAFP website and a 2nd announcement will provide more updates.

We look forward to seeing you at the 20th International Conference on Diseases of Fish and Shellfish organised by the EAFP. Feel free to contact our Meetings Secretary if you have any questions or need additional information, see below for contact information.

Ivona Mladineo,
 EAFP Meeting Secretary,
 e-mail: ivona.mladineo@paru.cas.cz
 or eafp@kc-jones.co.uk

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>.

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!

Aquaculture America 2021
 San Antonio, Texas
 August 11-14, 2021

Call for Speakers—Aquatic Veterinary Session

Abstracts for 15 or 30-minute oral presentations are invited, particularly presentations suitable for RACE-Approved Continuing Education for veterinarians, vet technicians/nurses and vet students dealing with clinical cases and programs, services and tools that enhance aquatic veterinary practice, and fulfill aquaculture industry and client's needs for increased production, profits and meeting regulatory requirements.

To ensure inclusion in this session,

Submit an abstract on-line through WAS.org (be sure to select **Aquatic Veterinary Medicine** as the Topic)

and

e-Mail the abstract to the Session Coordinator, David Scarfe (dscarfe@ameritech.net), indicating whether you prefer **15 or 30 minutes** for your presentation

****** Speakers submitting abstracts by June 1, 2021 will be entered into a random drawing for 1 of 5 complimentary full registrations for AA2021.

******* Speakers unable to travel because of COVID-19 may be given the option to submit a recorded presentation.

Aquaculture America 2021 and WAVMA are unable to subsidize registration fees, travel or hotel costs. All presenters are required to pay their own registration, accommodation and travel expenses. WAVMA members receive discount registration rates.

American Association of Fish Veterinarians

2021 Virtual Conference

[Call for Abstracts](#)

The AAFV Board and Conference Committee will once more be offering a two-day online conference. Sessions will be live on October 21 & 22, 2021. We are reaching out to both veterinarians and veterinary students to consider submitting abstracts for presentations.

In an effort to increase the diversity of talks that range the breadth of fish medicine, we are soliciting speakers from all clinically relevant topics to the fish veterinarian including, but not limited to: Clinical Pathology; Radiology; Surgery, Anesthesia & Analgesia; Diagnostics & Therapeutics; Economics; Ornamental/Pet Fish; Aquaculture; Public Aquaria; Unique Cases.

We welcome your submission for any of these focus areas, or any other topics you feel would be of great interest for fish veterinarians.

Please contact the Executive Secretary at: americanfishvets@gmail.com.

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. Currently, there are 44 recorded videos available to watch on the WAVMA.org website.

Earning CEPD Credit for Recorded Webinars

Recorded webinars can be viewed at no charge. However, to earn veterinary continuing education & professional development (CEPD) credit, you will need to complete a short knowledge & skills assessment (KSA) or quiz to ensure you have met the learning objectives. On successful completion you will receive a CEPD certificate (useful for re-licensure/registration to practice veterinary medicine, and credit towards becoming a WAVMA Certified Aquatic Veterinarian). Accessing the KSA and receiving a CEPD will cost US\$5.00 for WAVMA Student Members, \$15.00 for all other WAVMA Members, and \$25.00 for those who are not WAVMA members - click on "more info" for the recording and for KSA/CEPD information.

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

AFS-FHS Summer Seminar Series

The seminars are free and open to the public. The seminar calendar and Zoom access information is now available.

Important links:

[AFS-FHS Student Seminar Series Listserv](#)
[Seminar calendar and Zoom access information](#)

New this year!

- Five plenary presentations from world renowned fish health professionals
- Best student presentation awards
- Sponsorship opportunities to support future student travel awards

If you missed last year's series, the presentations have been archived here:

<http://z.umn.edu/fishhealthseminar>.

If you have any questions, please don't hesitate to contact us. We hope to see you this summer!

Matt Griffin (matt.griffin@msstate.edu)
 Megan Shavaliier (shavali1@msu.edu)
 Nick Phelps (phelp083@umn.edu)

Big Fish Seminars

The Big Fish Series are one-hour online seminars brought to you by the [Institute of Aquaculture](#), Stirling University. The purpose of this series is to highlight **Seafood's Roles in Sustainable Food Systems**. The seminars include a moderated panel discussion on topics relevant to aquaculture with the interactive engagement of a virtual audience.

[Alternative Seafood Products – A sustainable food future?](#)

Co-hosted with WorldFish 9th December 2020 (recorded).

[Impacts of Covid-19 on Seafood Value Chains](#)

Co-hosted with Johns Hopkins Center for a Livable Future 11th February (recorded).

[Is aquaculture breaking into the global food system?](#)

Co-hosted with [Center on Food Security and the Environment \(FSE\)](#), Stanford University 30th March (13:00-14:00 BST)

IAAAM 2021 Virtual Conference

May 23 – 26, 2021

Registration is still open, use this link to register:

<https://cvent.me/1wLd92>.

If you have registered for the conference, please check your email for instructions on accessing the virtual conference.

[IAAAM CONFERENCE PROGRAM](#)

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