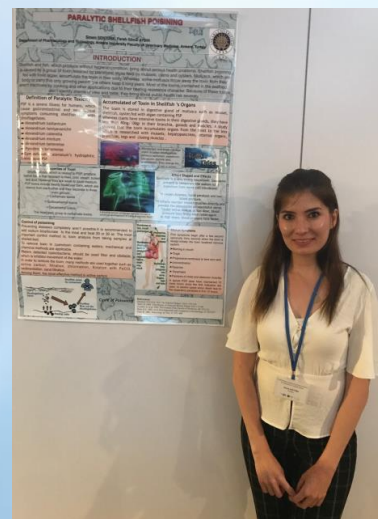


The



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Sinem Senturk by her poster presentation at the WAVMA Conference in Romania. See other lecturers and abstracts of presentations on pages 18-39.

Volume 11, Number 3
Third Quarter, 2017



WHO ARE WE**MISSION**

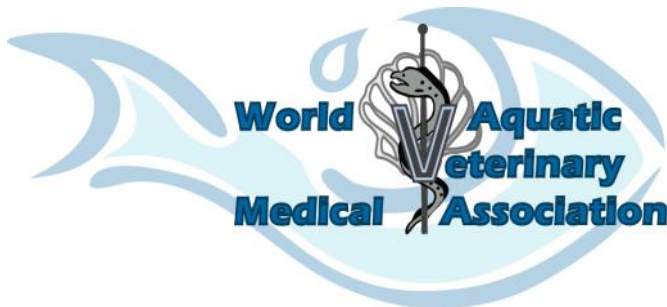
The Mission of the World Aquatic Veterinary Medical Association is to serve the discipline of aquatic veterinary medicine in enhancing aquatic animal health and welfare, public health, and seafood safety in support of the veterinary profession, aquatic animal owners and industries, and other stakeholders.

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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ISSN 2329-5562

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Editor’s Note

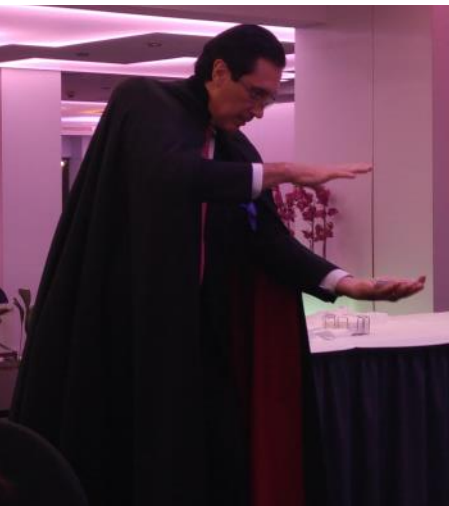
Since this year’s WAVMA Annual General Meeting was expanded into a full 3-day conference (our second stand alone WAVMA Conference, the first one being in Greece in 2010) and was held on September 12-14, 2017, the third quarter issue of *The Aquatic Veterinarian* (normally published in September) was delayed so we could include information from that event. In this issue are the abstracts from the conference lectures, as well as photographs from the Annual General Meeting (WAVMA’s annual business meeting for all members to attend) and sights around Romania.

Our 2017 President, Laura Urdes from Bucharest, Romania, picked a beautiful hotel in a lovely area of the country to host our conference and AGM. The weather was perfect that time of the year, and all the food was delicious! The event was very successful with many attendees from all over Europe and other parts of the world.

I was fortunate enough to be able to travel to Romania to attend the WAVMA Conference and had a wonderful trip. The people in Romania are splendid, and the traveling within the country was easy, affordable, and the scenery and architecture are beautiful. I visited several castles and fortresses (Medieval history is one of my passions), including several locations that were associated with the Wallachian Prince, Vlad Tepes, Son of Dracul, or also known as Dracula. I had lunch in the building where he was purportedly born!

Interestingly enough, we had a special guest at our banquet at the Annual General Meeting, the famous (infamous?) Count Draquaculture. He was able to provide an interesting evening to all who attended, despite the garlic...

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



A rare appearance by Count Draquaculture occurred at the Annual General Meeting in Transylvania, Romania. September 13, 2017.

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



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

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

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

Cover Photo:

Sinem Senturk by her poster presentation at the WAVMA Conference in Romania.

See other lecturers and abstracts of presentations on pages 18-39.

(Photo by Nick Saint-Erne)

The Aquatic Veterinarian

The Quarterly Magazine of the World Aquatic Veterinary Medical Association

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

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Free 1/8 page (business card size) advertisement

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

President's Report

I would like to start by warmly congratulating the recently elected Executive Board 2018, composed by:

- Dr. Devon Dublin (Japan/Guyana) - President-Elect;
- Dr. Stephen Reichley (USA) – Secretary;
- Dr. Nick Saint-Erne (USA) – Treasurer;
- Dr. Trista Becker (USA) - Director-at-Large;
- Dr. Jena Questen (USA) - Director-at-Large;
- Dr. Howie Wong (Hong Kong/China) - Director-at-Large.

They will serve starting January 1, 2018 under Dr. David Scarfe (USA) – President, and me, as Immediate Past President.

The most important actions and events of this summer are summarized below.

The number of certified aquatic veterinarians is continually increasing worldwide, indicating that the CertAqV Program is being successfully implemented and that this project is meeting the desire of veterinary practitioners to achieve the title certifying their expertise in the field of aquatic veterinary medicine. To manage the flow of KSE records submitted by the mentors, and to allow for a more predictable timeline of the evaluation results, the **CertAqV records submitted by the mentors are now evaluated on a quarterly basis** at scheduled meetings in March, June, September and December.

We are very pleased that our membership is getting stronger, with members renewing and many new vet and vet student members joining in. With this continual increase in membership, it is expected that WAVMA projects should continue diversifying and multiplying, so as the workload of the Committees, Working Groups and the Executive Board would only get heavier. Therefore, the Executive Board has been considering recently the possibility of opening a new (paid) Board position, as an Executive Assistant, to help with the workload. Related details will be published *via* our usual communication channels as the proposition materializes.

In an effort to open education and training to vets and vet students all around the globe, including for those in developing countries, the WebCEPD program is now allowing members from developing countries identified by WCEA to access select WAVMA webinars for free. Please see the WebCEPD page on WAVMA.org.

Other important achievements during this summer were approval of the refined WAVMA by-laws on July 31, 2017, *and the translation of the WAVMA Brochure* into French, German, Italian, Spanish and Romanian languages.

Fundraising for the **2018 John L. Pitts Aquatic Veterinary Education Awards Program** has started, and we have high hopes to have available for the next year increased funds to support many more students in pursuing their education and training in aquatic veterinary medicine. Please consider making a donation to the program, even small amounts will go a long way!

This summer, we fervently prepared for and participated in a number of meetings of high importance to WAVMA as a whole. To name just a few: the 3rd World Veterinary Congress and General Assembly, Korea (August 2017), 2017 WAVMA Conference & Annual General Meeting, Romania (September 2017) and WSAVA Congress and General Assembly, Denmark (September 2017). The plan for next year's events and meetings that WAVMA will participate in/organize has been recently discussed, also acknowledging the need for sponsorship outreach. Anyone with knowledge of businesses or organizations that may be interested in sponsoring some of our activities for 2018, please contact me by email.

With my best wishes,

Laura Urdes, PhD DVM PgDip CertAqV
WAVMA President 2017
Bucharest, ROMANIA
president@wavma.org



Secretary's Report

Dear WAVMA members,

I wish to begin by thanking everyone for participating in the election of the 2018 office bearers. I wish the elected officers [President-Elect Dr. Devon Dublin (Japan/Guyana); Secretary: Dr. Stephen Reichley (USA); Treasurer: Dr. Nick Saint-Erne (USA); Directors-at-Large: Dr. Trista Becker (USA), Dr. Jena Questen (USA), and Dr. Howie Wong (Hong Kong/China)] a successful year ahead. I am particularly happy to see new members coming forward to serve and certainly encourage more members to keep doing so.

Over the last quarter, WAVMA's 2017 Conference and Annual General Meeting under the theme "Current Concepts in Aquaculture and Ornamental Fish Practice", was held in Târgu Mureș, România. This event provided a framework for discussion and reflection on the role of veterinarians in continuing to foster the sustainable development of worldwide aquaculture and ornamental fish industries, with a special focus on development and options in the Eastern Europe region. I wish to thank the members who attended the event. In addition to that conference, WAVMA members participated in the 2017 WSAVA congress held in Copenhagen, Denmark and gave lectures in aquatic medicine. Several initiatives were started which would give WAVMA more visibility in the WSAVA organization in our quest to support the veterinary community as it relates to aquatic veterinary medicine.

WAVMA continued to offer services and benefits to its members and beyond through the WAVMA Certified Aquatic Veterinarian program, where more persons are successfully being accredited, further contributing to the pool of CertAqVs that remain available to function as mentors and support the organization in various capacities. WAVMA has continued to faithfully execute and facilitate on-line *e-Learning* programs and courses to advance the knowledge and skills of its members especially through webinars.

The Communications Committee, Meetings Committee, Membership Committee, Credentialing Committee and Student's Committee collectively assist in the smooth functioning of this organization under the guidance of the Executive Board. I thank all members that contribute by sitting on one of these committees. Your work is remarkable and valuable to our noble cause. If you would like to join any of these committees, please contact me or the President.

As we continue to the end of the year, I wish to reiterate my appeal to members to publish in *The Aquatic Veterinarian* journal, which is a great avenue to let others know what you have been doing and the interesting cases that you may have worked on. Guidelines for writing articles are found in this issue, and all contribu-

tions are welcome (don't worry if English is not your first language as we can help edit the articles to be clear).

In the next quarter, I will offer a secretarial review of the year under the presidency of Dr. Laura Urdes with whom I had the pleasure of working closely with as secretary.

Devon Dublin, PhD, DMVZ, MSc. CertAqV
WAVMA Secretary
Project Coordinator
Global Environment Facility - Satoyama Project
Conservation International Japan
201 Leoplace FONTEINE
37-14 Hatsunegaoka
Hodogaya-ku,
Yokohama, Kanagawa
240-0016
Japan
Secretary@wavma.org



Treasurer’s Report

We have closed the third quarter of 2017 with a continued strong membership and treasury. As of September 30, there are 383 members that either renewed or joined for the first time in this calendar year, in addition to the Fish Veterinary Society in the UK joining WAVMA as an Allied Veterinary Organization. Our Certified Aquatic Veterinarian Program is thriving with 19 new applicants since January 1 pursuing certification and recognition of their proficiency, knowledge and skills.

WAVMA sponsored a conference in Romania this year in conjunction with our Annual General Meeting. Lectures on a variety of topics were delivered by a number of highly respected leaders in the aquatic veterinary community as part of our commitment to providing quality education. This year our support to veterinary students pursuing aquatic study and research was again extended through contribution to the Pitts Educational Awards, of which there were 8 deserving recipients.

WAVMA strives to promote comradery, professional support and information sharing through our members email listserv, *The Aquatic Veterinarian* magazine, and live webinars on topics ranging from managing the business side of aquatic veterinary practice to the most current and up-to-date information on physiology, medicine and surgery.

Our Executive Board and committee members volunteer their time and go the extra mile to ensure that you get the most value for your annual dues. As we are now into October, the early renewal period for the January – December 2018 membership cycle has started. I hope you continue to support and be a part of this wonderful organization which makes every effort to support you as a valued colleague.

With kindest regards,

Sharon Tiberio,
DVM, CertAqV
WAVMA Treasurer
My Fish Vet, Inc.
Dallas, Texas, USA
Treasurer@wavma.org;
srtiberio@att.net



2017 Budget

01/01/17 Balance: \$25905.38		9/30/2017 Balance: \$34700.50	
SUMMARY	ACTUAL	BUDGETED	
Total income	33,646.65	32,300.00	
Total expenses	26,845.46	36,080.00	
Income less expenses:	6,801.19	-3,780.00	
INCOME DETAILS	ACTUAL	BUDGETED	
<i>Memberships:</i>			
Veterinarian	13,100.00	13,000.00	
New Graduate	850.00	500.00	
Vet Student	5,725.00	5,000.00	
Vet Tech/Nurse	100.00	100.00	
Affiliate (Non-vet)	400.00	200.00	
Allied Veterinary Organization	500.00	0.00	
Library	0.00	200.00	
CertAqV Applications	4,750.00	5,000.00	
CertAqV Renewals	0.00	0.00	
Advertising Income	400.00	0.00	
Webinar Income	545.25	800.00	
WebShop Income	0.00	0.00	
<i>Pitts Award Donations:</i>			
Corporate/Organization	500.00	500.00	
Individual	2,250.00	2,000.00	
WAVMA Conference Income:	0.00	4,000.00	
IAVBC	3,256.07		
Romania	1,270.33		
St. Kitts	0.00		
Conference Website Income:	0.00	1,000.00	
IAVBC	0.00		
Romania	0.00		
St. Kitts	0.00		
Total Income:	33,646.65	32,300.00	

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>.

PRIVILEGES & BENEFITS OF WAVMA MEMBERSHIP

Aquatic Veterinary e-Learning

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



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

WAVMA Committees

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

Budget and Finance Committee

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

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

Chair: Sharon Tiberio, 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: Devon Dublin, DevDub@yahoo.com

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: Tim Miller-Morgan tim.miller-morgan@oregonstate.edu

Meetings Committee

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

Chair: Julius Tepper, cypcarpio@aol.com

Membership Committee

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

Student Committee

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

Chair: TBD

Credentialing Committee

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

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

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

- Register for the Program (application at <https://www.wavma.org/CertAqV-Pgm>).
- Identify a mentor to assist the registrant through the Program. The potential mentors would be available WAVMA Certified Aquatic Veterinarians.
- Provide the mentor with written evidence of satisfactory completion of each of the core Knowledge, Skills and Experience (KSE) subject areas.
- Be adjudicated by the Credentialing Committee for recognition of completion of all KSE requirements after the mentor has approved the documentation.
- Have the CertAqV certification approved by the WAVMA Executive Board.

The WAVMA Certified Aquatic Veterinarian (CertAqV) program has now certified 62 aquatic veterinarians from 20 countries. Congratulations on our newest Certified Aquatic Veterinarians:

David Marancik
Christine Parker-Graham
Sarah Wahlstrom
Irene Yen

There are an additional 50 other WAVMA members currently in the process of being certified. For more information, see the WAVMA website:

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

Tim Miller-Morgan, DVM, CertAqV
2017 Credentialing Committee Chair

Certified Aquatic Veterinarians

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

Fellows Advisory Council

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

Our WAVMA Distinguished Fellows are:

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

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

Executive Board Responsibilities

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

WAVMA Shop

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



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

WAVMA VETERINARY SCHOOL CHAPTERS

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

Auburn University, [College of Veterinary Medicine](#) (established 2013)

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

Mississippi State University, [College of Veterinary Medicine](#) (estd 2014)

2016 Officers - Elizabeth Works (President), Taylor James (Vice-President), David Mills (Treasurer), Madeleine Hendrix (Secretary); **Faculty Advisor** - Dr. Wes Baumgartner; **Chapter Contact** - [click here](#).

Murdoch University, [School of Veterinary & Life Sciences](#) (estd 2014)

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

Ross University, [School of Veterinary Medicine](#) (established 2015)

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

Oregon State University, [College of Veterinary Medicine](#), USA (estd 2017)

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

Tuskegee University, [School of Veterinary Medicine](#) (established 2012)

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

University of Florida, [College of Veterinary Medicine](#) (established 2013)

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

John L. Pitts Education Awards Program

We are inviting colleagues to collaborate with us in advancing the vision of the John L. Pitts Aquatic Veterinary Education Awards Program and impacting the future of aquatic animal health. The Program is global in its perspective, offering veterinary students and recent graduates financial assistance to pursue their interest in aquatic veterinary medicine. To date, the Program has supported 73 veterinary students and recent graduates from 37 colleges and universities across 4 continents.

Will you help us increase available funds for the 2018 awards cycle? **100% of every donation, regardless of the size, goes directly to supporting the future of aquatic animal health.**

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Kind Regards,

Stephen Reichley, DVM, PhD, CertAqV
Chair
John L. Pitts Aquatic Veterinary Education Awards Program
stephen.reichley@gmail.com

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WAVMA is on Facebook!



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

Search for WAVMA at www.facebook.com.

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

**DO YOU HAVE A STORY TO TELL ABOUT
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Send your article (<1,000 words) with pictures to
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Did you know?

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

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

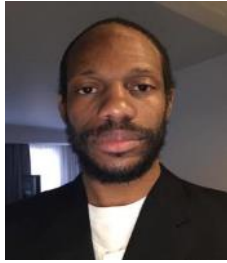
In addition, if you have a video that you would like to make available to other WAVMA members, kindly contact
WebAdmin@wavma.org.

WAVMA Annual Elections Results

Congratulations to the following WAMVA Members who will serve as the 2018 Executive Board, along with Past-President Laura Urdes and 2018 President David Scarfe:

President-Elect: Devon R. Dublin

(Japan/Guyana) – Doctor in Veterinary Medicine and Zootechnics (summa cum laude), Agrarian University of Havana, Cuba (2007); Masters in Marine Life Sciences, Hokkaido University, Japan (2012); PhD in Environmental Science Development at the Hokkaido University, Japan (2015); CertAqV (2013).



Membership: 1) Guyana Veterinary Association. August 2007 to present.; 2) World Aquatic Veterinary Medical Association. January 2010 to present; 3) Fish Veterinary Society. January 2010 to present; 4) Japanese Society of Fisheries Science. June 2012 to present.

Secretary: Stephen Reichley (USA)

– PhD, Mississippi State University (2017), DVM, Ohio State University (2013)

Membership: WAVMA, AVMA, AAFV, AFS, OVMA, OAA.

Aquatic Veterinary Experience: I currently serve as Director of Fish Health for Clear Springs Foods, Inc., the largest producer of freshwater rainbow trout in the world. Previously, I served as Clinical Instructor in the Aquatic Teaching and Diagnostic Service at Mississippi State University College of Veterinary Medicine. I am a WAVMA Certified Aquatic Veterinarian.



Treasurer: Nicholas Saint-Erne

(USA) – DVM – Kansas State University 1984; CertAqV, 2013
Membership: WAVMA, AVMA, ARAV

Aquatic Veterinary Experience: I have been a fish keeper for over 50 years, plus have been working with fish as a veterinarian for 33 years, involved in the Ornamental Fish industry for the past 18 years, and I am a Charter Member of WAVMA.



Directors-at-Large:

Howard K.H. Wong

(Hong Kong/China) – MA (Cambridge), VetMB (Cambridge), MPVM (UC Davis), MSc (St. Andrews), CertAqV, MRCVS

Membership: WAVMA, AVMA, HKVA, WAS

Aquatic Veterinary Experience: MSc (Aquaculture), Aquaculture Education at CityUHK College of Veterinary Medicine and Life Sciences



Jena Questen

(USA) – DVM, Colorado State University (2001), CertAqV

Membership: WAVMA, AVMA, AAFV, AVSAB.

Aquatic Veterinary Experience: I have been in private aquatic animal practice since 2005. I served two terms on the AVMA aquatics committee. I have lectured several years in a row on aquatic animal medicine at the AVMA and other conferences. I was the only technical services veterinarian for the entire US for Novartis Aqua Health.



Trista Welsh-Becker

(USA) – BS, Humboldt State University; MS, University of Alaska Fairbanks; DVM, University of Georgia; CertAqV.

Membership: World Aquatic Veterinary Medical Association, American Fisheries Society Fish Health Section, American Veterinary Medical Association, Washington State Veterinary Medical Association, Idaho Veterinary Medical Association, Wildlife Disease Association.

Aquatic Veterinary Experience: I have worked with fish and wildlife in the natural resource field for nearly 15 years, with 9 years in fisheries, three years in aquatic medicine, and the last year spent in the Pacific Region Fish Health Program at the US Fish and Wildlife Service. I enjoy the challenge that working with fish brings, as it is one of the last frontiers in veterinary medicine. This continually expanding field always presents new challenges, and working for the USFWS allows me to give back to the public protecting and conserving America's fisheries.



Instructions for Authors and Contributors

While any information relevant to aquatic veterinary medicine might be published, we particularly invite contributions for the following regular columns in *THE AQUATIC VETERINARIAN*:

Colleague's Connection

An article explaining why and how a veterinarian became interested in aquatic veterinary medicine and what that veterinarian has done in their aquatic veterinary career.

Peer-Reviewed Articles

Original research or review of any aquatic veterinary topic. Articles will be reviewed by 3 veterinarians and comments and changes referred back to the author prior to publication. The text for an article begins with an introductory section and then is organized under the following headings:

- Materials and Methods
- Results
- Discussion (conclusions and clinical relevance)
- References (cited in the text by superscript numbers in order of citation).

Clinical Cases

Clear description of a distinct clinical case or situation and how it was resolved. These may be submitted for peer-review. Begin with the signalment (species, age, sex, body weight or length) of the animal or animals, followed by a chronologic description of pertinent aspects of the diagnostic examination, treatment, and outcome, and end with a brief discussion.

Book Reviews

Brief review of a published book, including an overview and critique of the contents and where to obtain the book.

Publication Abstracts

Abstracts of published veterinary and scientific journals with full citation/reference (authors, date, title, and journal volume and page numbers – ½-1 page).

News

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

Legislative & Regulatory Issues

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

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

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

Jobs, Internships, Externships or Residencies

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

Advertising

See advertising rates on page 4.

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

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

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

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

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



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WAVMA Annual General Meeting and Conference
Targu Mures, Romania

The trip from NY to London had been a breeze, but from London to Targu Mures, Romania was a bit more complicated than I anticipated. Crosswinds in London delayed our flight long enough that Terry and I missed our connecting flight and got to spend the day relaxing in the Lufthansa lounge in Munich. The next flight out would not be until 10:30 PM that night. That flight arrived in Cluj at 2 AM. After getting our rental car, we began our 2-hour drive to Targu Mures. Picture driving in the middle of the night through the heart of Transylvania. Not a soul in sight, very few street lights and all sorts of wildlife along the road. Several deer, two foxes, many dogs and cats and at one point under a street light, the biggest bat I ever saw in my life! You just can't make this stuff up.



After a few hours of sleep in our room at the Hotel Plaza, we met for breakfast and had a chance to renew old friendships with my WAVMA colleagues here for the conference.

A very enjoyable first day of lectures followed the opening ceremonies by President Laura Urdes. [See lecture abstracts on Pages 20-39]. Then it was time for food and relaxation.



Relaxing outside the hotel after the first day of lectures and appreciating the warmth of the weather and good friends.



The view up the block from the Hotel Plaza



A traditional Romanian dinner starts off with a toast of "palinca" from our 2017 Pres. Laura Urdes.



Welcome to Transylvania (photos by Julius Tepper)

After the second day of aquatic veterinary lectures, we had our WAVMA Annual General Meeting in the Hotel Plaza restaurant, where the management of the hotel created a wonderful menu of local foods for us to sample. During the dinner, we sampled some fine Romanian wines from the nearby Liliac winery.



President Laura Urdes translating the information about the Romanian wines that went with each course of our dinner at the Annual General Meeting's banquet.



Following dinner, I was pleased to present, along with our President, the 2017 Distinguished Fellows award to Dr. Nick Saint-Erne. Dr. Saint Erne has been a member of WAVMA since its first year, and is the Editor of our Journal, and this year's Past-President of WAVMA. Thank you for all you do for the association.

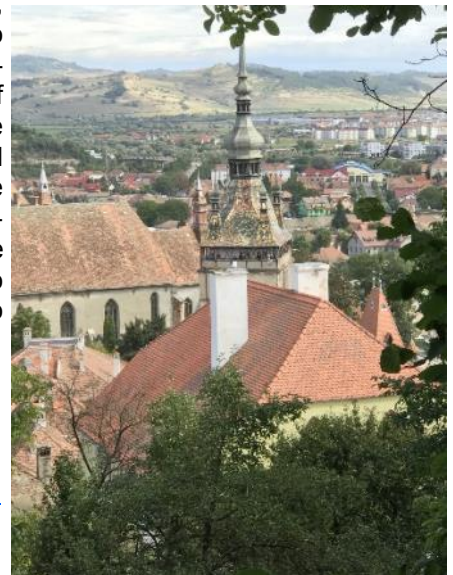
Our guest of honor for the evening was the most famous aquatic vet in Transylvania, Count Draquaculture. This vet uses his amazing magical abilities to treat his patients and entertain audiences!



On Thursday, the conference continued with the Ornamental Fish lectures, for a wonderful finish to three days of great education, good fun, food and friendship.

In addition to the wonderful WAVMA Conference, Terry and I had the opportunity to do some sightseeing around Romania,

including a visit to the nearby medieval town of Sighisoara, the birthplace of Vlad the Impaler, the basis of the Dracula legend. We look forward to our next visit to Romania.



Julius Tepper
Meetings
Committee Chair
cypcarpio@aol.com



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

Thorny-headed Worms (Acanthocephala) in Koi

Dear Colleagues

I've been sent the attached photos and drawings of what appears to be a thorny-headed worm of some sort. The ponds affected are outside, contain shubs, goldfish, and koi. A couple of shubs have died following mucoid enteritis according to the client and the "worms" have been seen since 2016.

I've never seen these worms in my part of the UK before and the other spanner in the works is that the client believes some were attached externally to the koi, which is impossible to my knowledge.



Left: Small fish with worm protruding from its right side.

Below: worm taken out of fish and drawing of the worm under magnification.



I'd be grateful if someone could confirm they are thorny-headed worms (I've no idea what else they could be from photos and drawings) and also what might be the best treatment. From what I can dig up on the internet it seems that control rather than eradication is the best that can be done and most anthelmintics are relatively useless against them.

Regards,

Chris Walster, BVMS M MPH CertAqV MRCVS
The Island Veterinary Associates
132 Lichfield Road
Stafford ST17 4LE UK
chris.walster@onlinevets.co.uk



Chris,

These appear to be Acanthocephalans. Several species are external parasites, can affect many fish species, and can become a severe problem. There are a number of products to treat individual fish and tanks/ponds.

Some possibly useful information:

<http://www.cabi.org/isc/datasheet/95446>,
<http://www.journalofzoology.com/volume2/v2i6/pdf/5.1.pdf>.

Regards,

A. David Scarfe PhD, DVM, MRSSAf, CertAqV
Aquatic Veterinary Associates International, LLC
365 Monarch Birch Ct., Bartlett, IL 60103, USA
+1 (847) 650-4628
dscarfe@ameritech.net or adscarfe@gmail.com

Hi Chris,

I agree with Dave, these certainly look like acanthocephalans, look for a typical gut, it should be absent. As far as I know, most adult stages are usually found in the intestine of the host, so I'm not sure about the ones on the external surfaces. They are not helminths as such, more closely related to rotifers, so not sure about treatments. There will be one or two intermediate hosts that might be targeted. Hope this helps,

Mark Freeman
RUSVM

Excerpts from "Phylum Acanthocephala" by Brent B. Nickol, in *Fish Diseases and Disorders, Vol. 1*; edited by P.T.K. Woo (CABI, 2nd edition, 2006):

"Acanthocephalans are endoparasitic worms comprising approximately 1100 species (Golvan, 1994), nearly one-half of which are found as adults in the intestine of fishes. Juvenile worms of many other species occur in the viscera, especially the mesentery and liver, of fishes that act as paratenic hosts."

"Most of the acanthocephalans of piscine hosts are found in the bony fishes (Teleostei). More species of Acanthocephala are found in the cypriniform families Cyprinidae and Catostomidae than in any other piscine family."

"Acanthocephalans are bilaterally symmetrical, dioecious, pseudocoelomate worms that lack an alimentary canal. They are characterized by a spined proboscis that is invaginable and retractable into a saccular proboscis receptacle. Body length of adults varies greatly among species, ranging from less than 2 mm to greater than 700 mm. Acanthocephalans of most species are about 10 mm long."

“Acanthocephalans attach to the intestine of definitive hosts by means of a spiny proboscis. Mucosal tissue is damaged at the attachment site, resulting in fibroplasia, which may extend through the submucosa and into the muscularis. Occasionally perforation of the gut wall occurs. The mucosal epithelium is frequently compressed or eroded along the trunk of the worm, and the tips of the villi may be absent. Destruction of intestinal villi and necrotic and degenerative changes in mucosal epithelium almost certainly reduce the absorptive efficiency of the fish intestine.”

“Acanthocephalans lack an alimentary tract and hence uptake of nutrients, derived both from leakage of host tissues and from dietary contents in the intestinal lumen of the host, is through the tegument. Hydrolytic enzyme activity at the tegumental surface probably assists in obtaining nutrients and in rapid penetration by the worm. Some acanthocephalans penetrate deeply and induce formation of a nodule, which extends into the coelom of the host. Such nodules are extensively vascularized. Increased leakage of proteins from the blood into the nodules ensures a steady supply of nutrients for the parasites.”

“The consequences of acanthocephalan-induced reductions in energy efficiency and altered metabolism of hosts are likely to be focused more sharply with increasing emphasis on aquaculture.”

Below excerpt is from *The Journal of Zoology Studies* 2015; 2(6): 32-37:

For successful prevention and elimination of *Acanthocephala* infections, it is extremely important to achieve early and correct diagnosis of the larval stages of the parasites for which fish constitute the final host. In case of valuable fishes or brood stock fishes, individual fish treatment is preferred.

Prevention involves proper hygiene to remove the infective host, regular checking of pond water to remove the crustaceans which serves as the intermediate host.

Injection of anthelmintic drugs like Fenbendazole or oral administration through feed of Bithionol, 2,2-thio bis (4, 6-dichlorophenol), at a dose of 0.2 g/kg fish, are recommended for controlling acanthocephalan infections in fishes (Hoffman GL. *Prevention and control of parasitic diseases of fishes*. First Internat. Symp. Ichthyoparasitol. Ceske Budejovice, Czechoslovakia. 1983; 38-39).

Feeds medicated with Di-N-butyl tin oxide are also potentially effective. The antidiarrhoeic drug Loperamide is recommended as the drug of choice for therapy of acanthocephalan infections in fish; 50 mg/kg were administered on 3 consecutive days. (Taraschewski H, Mehlhorn H, Raether W. *Loperamide, an efficacious drug against fish pathogenic acanthocephalans*. Parasitol Res. 1990; 76 (7): 619-23.).



Current Concepts in Aquaculture and Ornamental Fish Practice



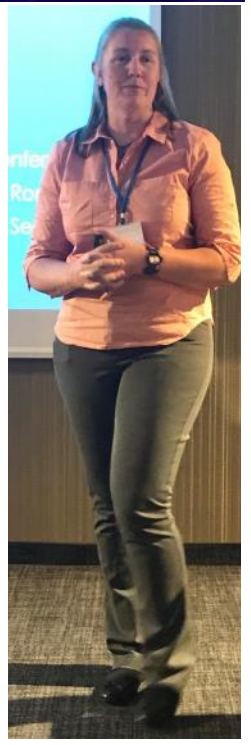
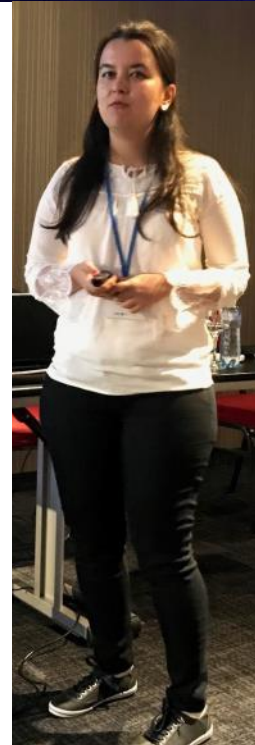
Please visit our website conferences.wavma.org/events/2017-tirgu-mures-romania-12-sep-2017 for program updates

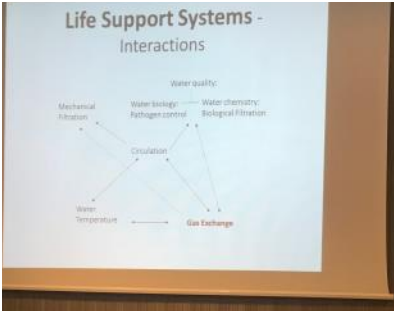
2 AQUATIC SESSIONS

TUE. - WED., SEPTEMBER 12 - 13
Current Concepts in
Aquaculture

THU., SEPTEMBER 14
Ornamental Fish
Practice

Each session will consist of plenary lectures and case report / research study communications.





PARALYTIC SHELLFISH POISONING

INTRODUCTION

Shellfish and fish, which produce without human intervention, group animal health products, and are consumed by humans. Paralytic shellfish poisoning (PSP) is a severe illness for humans, which can be fatal. PSP is caused by the consumption of shellfish containing PSP toxins. PSP is a neurotoxic condition caused by the consumption of shellfish containing PSP toxins. PSP is a neurotoxic condition caused by the consumption of shellfish containing PSP toxins.



Protozoa Parasites

Protozoa parasites feed on the epithelial cells of the fish, leading to staghorn-like lesions. Protozoa parasites feed on the epithelial cells of the fish, leading to staghorn-like lesions. Protozoa parasites feed on the epithelial cells of the fish, leading to staghorn-like lesions.

OCCURRENCE OF TWO PATHOGENIC BACTERIAL STRAINS - YERSINIA RUCKERI AND AEROMONAS SALMONICIDA IN A TROUT POPULATION- A CASE REPORT

Mihaela Costea¹, Laura Fartat¹, S. Miha¹, Florina Dumitrescu¹, Alina Popescu¹, Florica Bărbuțeanu¹, C. Lupescu¹

Introduction

Yersiniosis and Enteric Red Mouth (ERM) (salmonella yersiniosis) are diseases with epidemic evolution that causes high mortality in trout populations. The ecological agents of the two diseases - *Aeromonas salmonicida* and *Yersinia ruckeri* for enteric red mouth disease, are Gram negative bacteria, with different morphology and biochemical characteristics.

Materials and Methods

Following a disease outbreak in a trout population from a new farm, with water supply from spring water, two fish samples, consisted in 5 juvenile fish each, were taken for laboratory investigations. Besides anatomopathological investigations, besides gross pathology, histopathology, bacteriology, parasitology, and virology, were performed. Kidney was inoculated on TSA agar for bacteriological investigation and kidney, spleen and brain were collected, homogenized, centrifuged and inoculated on cell culture for virology investigation (1). Laboratory investigations were completed with laboratory tests of *Aeromonas salmonicida* subsp. salmonicida and *Yersinia ruckeri* strains, by inoculation on tryptic soy agar of mixed bacterial suspensions of different concentrations.

Results

From a pathological point of view in both samples were observed a powerful serosanguineous exudate in the gill, eyes, integument, mouth, muscles and viscera associated with darkening of the skin, emphysematous abdominal swelling, pale gills, tetraemphysematous and congestion of gill (Picture no. 1 and 2).

Microscopy examination was negative for protozoans and monogeneans. Bacteria in squash smear and positive for *Yersinia ruckeri* and *Aeromonas salmonicida* in Gram stained smears from gill, spleen, and integument in both samples (Picture no. 3 to 6).

The virology investigation by virus isolation in cell culture was negative for ISNV, IBNV and IPNV in both samples. The bacteriological investigation has revealed, in each sample, the both enteric redmouth disease and furunculosis agents. The morphology and biochemical characteristics are shown in picture no. 7, 8 and Table no. 1 & 2.

Sensitivity test to the antimicrobials substances shows inhibition of bacteria growth by Furazolidone both for *Yersinia ruckeri* and *Aeromonas salmonicida* respectively. Instead, Chloramphenicol has inhibited the growth only for *Yersinia ruckeri* and Erythromycin has inhibited the growth of *Aeromonas salmonicida* respectively.

Discussion

The general pattern of anatomopathological changes in trout population indicated, at first sight, a presumptive diagnosis for enteric red mouth disease, but bacteriological investigation reveals two pathogenic bacteria.

Coincidence in the same fish population of two bacterial pathogenic strains like *Aeromonas salmonicida* and *Yersinia ruckeri* it may imply that the infections occurred in the same time or in a close period of time. The intervention of the owner about water supply, rearing condition and moving of biologic material shows that fish were bought from two different rearing facilities and released in the ponds farm.

Coincidence of fish infected with *Aeromonas salmonicida* and *Yersinia ruckeri* arises the question of which strain is stronger and inhibits the growth of the other. In vitro study performed in the Institute for Diagnosis and Animal Health, by inoculation on bacteriological media of mixed saline solutions of the two strains at different McFarland concentration showed that *Yersinia ruckeri* is growing faster than *Aeromonas salmonicida* salmonicida, even in very low concentration and it is not inhibited by the furunculosis agents (Picture 9 to 11). A few colonies of *Aeromonas salmonicida* inoculated onto agar plate were displayed when was used an equal McFarland concentration of the two pathogenic bacteria in the same saline solution, so *Yersinia ruckeri* may inhibit, in vivo, the growth of *Aeromonas salmonicida* respectively, if the numerical report between the two bacteria is

Conclusions

The case described is the first co-occurrence of *Aeromonas salmonicida* and *Yersinia ruckeri* in a trout population in Romania, but the causality was demonstrated to be the introduction of fish from two separately rearing facilities infected with bacterial pathogenic agents.

References

1. Dăbulețiu Paul & Costea Mihaela (2014) - Boli peștiilor de acvacultură, metode de diagnostic, tratament și prevenție, Editura Ceres, București (pg. 121-138, 227-263)
2. Munteanu Gabriela & Bogdan Dumitru (2003) - Tratat de ihtiopatologie, Editura Excelsior, Timișoara (pg. 148-156, 179-184)

Table 1

Tests from APV 2015 test	<i>Aeromonas salmonicida</i> strain 162	<i>Yersinia ruckeri</i> strain 162
ONPG	+	+
API	+	+
LDH	+	+
COI	+	+
MOR	+	+
TSI	+	+
MSU	+	+
UP	+	+
SEP	+	+
MAA	+	+
ACO	+	+
DOB	+	+
SEA	+	+
AMP	+	+
URE	+	+
HEA	+	+
CH	+	+

Table 2

Tests from APV 2015 test	<i>Yersinia ruckeri</i> strain 162	<i>Aeromonas salmonicida</i> strain 162
API	+	+
LDH	+	+
COI	+	+
MOR	+	+
TSI	+	+
MSU	+	+
UP	+	+
SEP	+	+
MAA	+	+
ACO	+	+
DOB	+	+
SEA	+	+
AMP	+	+
URE	+	+
HEA	+	+
CH	+	+

Techniques for Diagnosis and Animal Health, Bucharest, Romania

DIAGNOSIS PALPATION

The fish should be anesthetized, e.g. with benzocaine (chlorbutol).

The presence of fluid or nodules inside the abdomen can be detected sometimes in vivo.

sometimes a clear or yellowish fluid can be pressed out.



CURRENT CONCEPTS IN AQUACULTURE September 12-14, 2017

Keynote Speakers:

Julie M. Cavin has spent the last seven and a half years at the New England Aquarium in Boston, MA, USA, initially as a Veterinary Fellow and then as Associate Veterinarian. Along with two other full time veterinarians, she is responsible for the health and well-being of a unique collection of animals including Northern fur seals, over 90 penguins of three different species, giant octopuses, and a multitude of fishes (boney and cartilaginous) from around the world. She also supervises multiple veterinary students each year.



Prior to her current position, Dr Cavin earned a bachelor's degree and a Certificate in Living Marine Resource Ecology at Florida State University and a veterinary degree from North Carolina State University. She then completed a two year internship at the Georgia Aquarium in Atlanta, GA, USA before moving to New England Aquarium. She has participated and led numerous unique procedures on aquatic animals during the nearly 10 years as a veterinarian and several years prior working with fisheries research and in rescue and rehabilitation clinics. Her research interests include improved anesthetic techniques for elasmobranchs, improving nutrition for aquarium animals of all taxa, and increasing the available baseline hematologic parameters for all aquatic animals.

FISH ARE ANIMALS TOO: THE ADVENTURES OF AN AQUATIC ANIMAL VETERINARIAN

Julie Cavin

*New England Aquarium, Animal Health Department,
Boston, Massachusetts, USA;
email: fishdoc07@gmail.com*

Whenever I tell people that I am a fish vet, they look very excited and very confused at the same time. "Oh wow!" they say. "What does that mean?" This lecture will discuss some of the unique challenges that come with fish medicine as well as highlight the exciting and often innovative aspects of working with animals that live in a completely different world than we are used to. By the end, hopefully the audience will feel more comfortable that they too can learn to care for aquatic pets.



Hamish Rodger graduated from the University of Glasgow Veterinary School, Scotland in 1984 and has worked as an aquatic animal veterinarian for over 30 years. He has a Masters in Aquatic Veterinary Medicine from the Institute of Aquaculture, University of Stirling, Scotland where he also completed his PhD in 1997. He was founder and principal of the veterinary aquatic animal practice Vet - Aqua International, now merged into Fish Vet Group (FVG) of which he is Global Managing Director, www.fishvetgroup.co. FVG is the world's largest aquatic animal veterinary, diagnostic and consultancy company and is part of Benchmark Holdings, www.benchmarkplc.co. He is a founding Diplomat for the European College of Aquatic Animal Health and current research interests and projects include investigations into the causes and control of gill disease in marine farmed salmon, amoebic gill disease, alternate methods for the control of sea lice and effects of climate change on aquaculture.



SALMON, TILAPIA AND SHRIMP AQUACULTURE HEALTH PRIORITIES AND INDUSTRY APPROACHES TO CONTROL

Hamish D. Rodger

*Fish Vet Group, Oranmore Business Park, Oranmore,
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In the global aquaculture industry three of the most significant species, in terms of value, are the salmon (*Salmo salar* and *Oncorhynchus* spp.), the tilapia (*Oreochromis* spp.) and the shrimp (*Penaeus vannamei*) sectors. Disease is the major challenge for each sector and the most significant condition and how the industry is aiming to reduce the impact of each is considered and presented.

The most significant health challenge for the global salmon industry is the marine ectoparasite known as sea lice (*Caligus* spp. & *Lepeophtheirus salmonis*). These parasites cause poor growth, increase susceptibility to other diseases, cause direct mortality and result in multi-million dollar costs for the industry. Parasite resistance has developed to several classes of medicines available to treat the parasites and in the absence of new compounds being available and no effective vaccines the industry is utilising cleaner fish species (*Labridae* sp. and *Cyclopterus lumpus*) (both wild and farmed), engineering solutions (such as physical barriers, deep water pens, elevated water temperature baths, lasers), genetics, nutritional supplements and changed management practices.

Katinka de Balogh is a veterinarian specializing in tropical diseases and veterinary public health. She has held positions as lecturer at the veterinary faculties in Zambia, Mozambique and the Netherlands. She has worked at the World Health Organization in Geneva from 1988-1990 in the Veterinary Public Health Unit. Since 2002 she has been working for the Food and Agriculture Organization of the United Nations (FAO) at its Headquarters in Rome, Italy. Since January 2016 she has taken up the position of Senior Animal Health and Production Officer at the FAO Regional Office for Asia and the Pacific based in Bangkok, Thailand where she is also the focal point for antimicrobial resistance and One Health for FAO in the region.



Flavius Prelipcean is an official veterinarian working within the Animal Health Directorate of The National Sanitary Veterinary and Food Safety Authority, in Romania. He graduated as a DVM at ASVMU-Bucharest (2005) and Biologist at University of Bucharest (2008), he also specialised in Animal Welfare during his early years as official veterinarian, he is now the official responsible person at central level regarding aquatic animals health.

FRAMEWORK ON AQUACULTURE – PAST AND PRESENT APPROACHES

Flavius Prelipcean

National Sanitary Veterinary and Food Safety Authority, General Sanitary Veterinary and Food Safety Directorate, Animal Health Directorate; email: prelipcean.flavius@ansvsa.ro



The aquaculture business has developed a lot lately, not only regarding the best practices but also when it comes to trade. The aquatic animals market has opened up quite fast and trade within EU needs to be closely kept under control to assure the animal health status and the food safety afterwards. To be able to cover this fast business development, a more adequate legal framework has to be put in place to meet the market demands. The pillar of this new ongoing framework is the new Animal Health Law.

The presentation will focus on the present EU veterinary legal requirements on aquaculture (Dir. 2006/88/ EC), such as animal health status, certification, biosecurity, stock movements and trade patterns, fish mortality and impact on certification. The future framework (Reg. 2016/429/CE) and the new ongoing animal health law approach, supplementary rules, disease categorisation and other actual elements will also be considered.

Mihaela Costea graduated from the University Ovidius, Constanta in 1995. She completed her PhD at the University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary Medicine in 2005. She has worked for over 20 years in the Aquatic Animal Health Department, Institute for Diagnosis and Animal Health, during which she has implemented diagnostic methods for the aquatic animal diseases. Currently, she is the coordinator of the Romanian National Reference Laboratory for fish and mollusc diseases and from this position cooperate with international and national institutes for implementation and harmonization of diagnostic methods of aquatic animal diseases in the Romanian Sanitary -Veterinary Laboratory network.



THE EUROPEAN VETERINARY LEGAL IMPORTANCE OF THE LABORATORY DIAGNOSIS IN AQUATIC ANIMAL HEALTH

Mihaela Costea*, Florina Dumitrescu, Constantin Lupescu, Florica Bărbuceanu

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The need to establish the diagnosis in a short time in order to limit the fish losses and also maintaining of healthy populations of aquatic animals, has determined the implementation in the diagnostic laboratories of quick tests such as: ELISA, immunofluorescence and molecular biology assay along with histology methods and pathogen isolation tests for aquatic animal diseases.

In order to establish precise and reproducible diagnosis, the laboratories for official control use detailed procedures validated in accordance with relevant standards. Thereby, these laboratories play a key role in the prevention and control of diseases of aquatic animals, providing both quality diagnostic laboratory services as well as cooperation with authorities and institutions in the field.

The lecture highlights the baseline documents for laboratory work, the investigations implemented within the Institute for Diagnosis and Animal Health, National Reference Laboratory for Fish Diseases and the importance of laboratory diagnosis in the struggle to prevent and control aquatic animal diseases.

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

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

TAVeditor@wavma.org.

Laura Urdes is the 2017 President of the World Aquatic Veterinary Medical Association (WAVMA), and editor of the monthly WAVMA e-News. She works as an Assistant Professor at the University of Agricultural Sciences and Veterinary Medicine of Bucharest, Romania.



Dr. Urdes has a PhD and BSc in Veterinary Medicine, is a WAVMA Certified Aquatic Veterinarian (CertAqV), and has a Postgraduate Diploma in Livestock Health and Production from the Royal Veterinary College, University of London. She has over 17 years of teaching, mentorship and research experience in life sciences, as well as expertise in research design, management, grant application and coordination of scientific projects. Dr Urdes was the project coordinator of the *SheepRep* project (FP7-PEOPLE-2011-IRSES) involving seven organisations in Europe (Romania, Italy), North America (Canada) and North Africa (Egypt). Since December 2016 she is a National Contact Point (NCP) for Marie S. Curie Actions (EC-REA-MSCA) in Romania.

Dr Urdes has been a member/chair of international committees and panels in E.U. and abroad, on themes related to Aquaculture and Aquatic Veterinary Medicine, advocating for the role of the veterinary profession in ensuring aquatic animal and public health and welfare.

IMPROVING THE ACCURACY IN THE IDENTIFICATION OF LARVAL EUSTRONGYLIDES SPP (PH: NEMATODA, CL: ADENOPHOREA)

Laura Urdes*, Cristiana Diaconescu

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Larval infestations with *Eustrongylides spp* have been reported in marine, brackish and freshwater fish species, worldwide. Fish eustrongylidosis is caused by the larvae of a nematode of the Order Dioctophymatida. Although a total of 19 *Eustrongylides* species have been described based on the morphology of the adult and larval stages, three species are commonly being referred to into literature: *E. tubifex*, *E. ignotus* and *E. excisus*. It is generally accepted however, that these nematodes have a complex life cycle, requiring a definitive host (wading birds) and intermediate hosts, *i.e.*, oligochaetes or annelid worms (for earlier larval stages (L) – to ensure development from L1 to L2, or only for L2) and finfish (either for both L3 and L4, or just for L4). *E. ignotus* may be able to complete its life

cycle without a tubifex worm, whereas some fish species may act as definitive hosts of the nematode (Ibiwoye et al, 2004). Amphibians (frogs), reptiles (alligators, caimans, grass and dice snakes) and humans are occasional hosts of the nematode. Most of the studies would recognize the larvae to the genus level, as there are no sufficient discriminant morphological characteristics to identify them to species level. Consequently, misidentifications and erroneous taxonomy and case reportings have occurred in past studies.

Only a few molecular studies have been conducted on dioctophymatides including *Eustrongylides* spp. A recent molecular phylogeny trial conducted in China reported the existence of three different clades of *Eustrongylides* larvae (intra- and interspecific evolutionary variations) where clade 2 and 3 represented the same species, whereas clade 1 was a different cryptic species. Each of the three clades had different host specificity and, seemingly, dissimilar life cycles. Hence, the identification of *Eustrongylides* spp larvae to the species level is clearly required to be able to monitor and control the disease in fish populations.



Grant Vandenberg has a background in agriculture and aquaculture. He was educated at University of Guelph, receiving his B.Sc. in animal science and his M.Sc. in fish physiology and aquaculture. Following his M.Sc.

degree, he gained academic experience in the US, followed by work in the private sector with the biotechnology company AquaPharm Corp, where he was involved in the development of several new product concepts related to the controlled delivery of pharmaceuticals to fish. In 1996, he moved to Quebec to pursue his Ph.D. studies at Laval University in the area of polymer encapsulation strategies and fish nutrition after which time he developed the Oralject system and co-founded *PerOs Systems Technologies* Inc. to commercialize the technology, and for which he remains Chief Scientific Officer, Director, and Chair for the Scientific Advisory Board.

In 2003, Dr. Vandenberg was awarded an NSERC Industrial Chair for Sustainable Aquaculture Development in the *Dep des sciences animales* at the Université Laval where his research pursuits involve nutritional approaches to minimise the environmental impact of fish production, as well as technological developments related to animal physiology, production and health.

Dr Vandenberg is a founding member and President of the *Interprovincial Partnership for Sustainable Freshwater Aquaculture Development, Veridis*

Aquatic Technologies, and the NGO *Fish for Africa* as well as its sister organisation *Fish for Africa Fund*. He is also Vice-President of the NGO *Eco-7* an NGO working on International Development in Tanzania.

IDENTIFICATION OF ANTI-SAPROLEGNIA PARASITICA COMPOUNDS FROM PSEUDOMONADS

Grant Vandenberg^{1*}, V. Domingue Gauthier², A. Faille³, É. Déziel², and P. Belhumeur²

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²Université de Montréal, Département de microbiologie et immunologie, CP 6128, succ. Centre-Ville, Montréal QC H3T 1J4; ³Centre INRS-Institut Armand-Frappier, 531 boulevard des Prairies, Laval QC, H7V 1B7

Disease is the single largest cause of economic losses in aquaculture, and fungal infections are second only to bacterial diseases in economic importance. Fifty percent per year losses due to fungal infections have been reported in a number of species including salmonids (*Oncorhynchus* sp., *Salmo* sp.) which are particularly susceptible to *Saprolegnia* sp. The ability to effectively treat fungal infections has become increasingly difficult with restrictions on the use of the most effective fungicide available, malachite green due to concerns regarding its carcinogenicity.

From a *Saprolegnia parasitica* infected pisciculture, we have isolated three *Pseudomonas fluorescens* bacterial strains able to inhibit the growth of this oomycete in vitro. While the identities of these secreted activities are being characterized, we have also identified an antifungal activity in the supernatant of *Pseudomonas aeruginosa* culture. This activity is linked to 4-hydroxy-2-heptylquinoline (HHQ), a quorum sensing molecule. It is noteworthy to mention that HHQ is not produced by *P. fluorescens*. We show that towards *S. parasitica*, HHQ has a fungistatic effect with a minimal inhibitory concentration (50%) of 6 ppm in vitro.

More work is indeed necessary but these results suggest that small bacterial metabolites could lead to the new therapeutic strategies for the industry.



Aurelia Totoiu has been working at the INCDM "Grigore Antipa" since 1993 and during this period she was a laboratory technician, research assistant and scientific researcher. The fields of her activity were aquaculture, microbiology, ichthyopathology, evaluation of fish species at the Black Sea, and fish stomach contents. Currently she is a PhD student at Galati University, studying for the thesis "Optimization of industrial fishing operations by analyzing the state of health of the main commercial fish species in the Romanian marine area."

INFLUENCE OF PARASITES ON THE HEALTH STATE OF FISH POPULATIONS INDUSTRIALLY FISHED AT THE ROMANIAN BLACK SEA COAST

Aurelia Totoiu^{1*}, Magda Nenciu¹, Cristian S. Danilov¹, Gheorghe Radu¹, Tania Zaharia¹, Neculai Patriche²

¹ National Institute for Marine Research and Development Grigore Antipa, 300 Mamaia Blvd., RO-900581, Constanta, Romania;

email: atotoiu@alpha.rmri.ro; ² Institute of Research and Development for Aquatic Ecology, Fishing and Aquaculture, Galati, Romania.

Parasites can act as severe pathogen agents causing mortality or increasing fish vulnerability to stress factors. Researches were made to identify the main fish species from the Romanian Black Sea area and to highlight the influence of parasites over the fish populations state.

For the identification of parasites that appear at marine fishes, the following species were analyzed: *Squalus acanthias* - dogfish, *Sprattus sprattus* - sprat, *Alosa tanaica* - Azov shad, *Engraulis encrasicolus* - anchovy, *Merlangus merlangus euxini* - whiting, *Trachurus mediterraneus ponticus* - horse mackerel, *Mullus barbatus ponticus* - red mullet, *Psetta maxima maeotica* - turbot, *Platichthys flesus luscus* - flounder

In the analyzed fishes, 19 species of parasites were identified: five species of ectoparasites and 14 of endoparasites. Nematoda worms *Contracaecum aduncum*, *Contracaecum* sp., *Porrocaecum* sp., had the highest occurrence at all analyzed fishes, affecting the abdominal cavity, being free or fixed on their organs, especially on liver. The grade of infestation recorded high values at *Sprattus sprattus*, *Alosa caspia nordmanni*, *Engraulis encrasicolus* (80-100% intensity and with 20-40 parasites/ host). The hosts react in different ways, presenting cellular reactions (hypertrophy, changes in white blood cells), tissular reactions (inflammation, proliferation, tumors), and



antibody, the parasites and their toxins causing this process.

Lethal effects can be determined statistically or by conducting an experiment, but the mortality observation is very difficult. Sub lethal effects include muscular disorders, hepatic dysfunctionalities, nutritional disturbances, heart diseases, changes in the nervous and reproductive system, weight loss and changes in the entire organism.

Parasites in fish are being utilized as biologic markers and as important indicators for fish circulation studies, migration and stock assessment, being at the same time one of the causes for fish population reduction. This presentation highlights the need for updated studies of parasites in fish populations.

Farah Gönül Aydın graduated from the Ankara University, Faculty of Veterinary Medicine, in 2010. Between 2007-2009 she was chosen for Erasmus Exchange Program as a student at Bologna University Faculty of Veterinary Medicine in Italy. After graduation, she enrolled in the PhD program at Ankara University, Institute of Health Science Dept. of Pharmacology and Toxicology. Since 2011, she has worked as a research assistant at the same department. She received her PhD in 2016. Also since 2012 she is a board member of Veterinary Pharmacology and Toxicology Association. In 2012-2013 she joined an Erasmus Intensive programme with the seven country participation. Her international experience include programs and consultancies in Italy, Hungary and Germany. She has many publications in national and international congresses. Also, her scientific publications are published in national and international journals. Her current research involves the study of the genetic determination of bacterial resistance in aquaculture, alternative drug regiments and their impacts on ecology, PK/PD modelling for aquatic drugs and set new methods around the Aegean Sea.



She is a member of International Veterinary Students Association Ankara (2004-2010), Turkish Pharmacology Ass. Member (2015), WAVMA Member (2016), CLSI Member (2016), Turkish Ecology Conservation Ass. Member (2017).

IDENTIFICATION OF *VIBRIO SPP.* FROM MARINE FISH IN AEGEAN SEA

Farah Gönül Aydın*, **Emine Baydan**

Ankara University Faculty of Veterinary Medicine, Department of Pharmacology and Toxicology, Ankara; email: farahgonul.aydin@gmail.com

Fish is an important source of food in human health, due to its rich content in polyunsaturated fatty acids.

Turkey stands as the third country among Mediterranean region in the production of seabass and seabream. The most important loss in aquaculture is the economical due to diseases. Detection of pathogen from carrier fish is essential for the effective fish disease control. Traditionally the diagnosis of the disease is carried out by agar cultivation and then phenotypic examination. Yet, some of the bacteria couldn't be differentiated from phenotypically similar bacteria of the same genera. Molecular techniques are faster and more sensitive than culture methods. Hence, disease outbreak could be prevented. Traditional methods can be time-consuming. The molecular approach allows to overcome the disadvantages of culture methods. Antibiotic treatment can be reduced so antibiotic resistant bacteria may be eliminated. In this study we try to show differences between two methods and to determine appropriate drug regiments.

Samples of sea bass and seabream cultured fishes and wild fishes are collected for the isolation and identification of *Vibrio anguillarum* and *V. alginolyticus* in Aegean region. Pure isolates, were identified by biochemically according to the Bergey's Manual Bacteriology. For molecular identification specific primers and a PCR assay were designed to detect pathogens. Identification of the bacteria were using classical methods; respectively *V. anguillarum* and *V. alginolyticus* was isolated from 14 cage, 12 wild fishes; 35 cage, 23 wild fishes. According to specific identification respectively *V. anguillarum* and *V. alginolyticus* identified from 12 cage, 5 wild fishes 29 cage and 19 wild fishes.

The results of this study have confirmed the utility of molecular tools for routine identification of pathogens and rapid characterization of bacteria. And preventing excessive drug using that cause antibiotic resistance and its negative effects on marine environment.



Vasile Vulpe became involved in the year 1991 with fish diseases. He currently teaches the Ichthyopathology course at the Faculty of Zootechny of Iasi, Romania. He was the director of 4 national research projects whose central theme revolved around

the diagnosis of pathological occurrences in fish, as well as their impact on the commercial quality of the food resulting from these pathologies. He has published over 70 scientific papers in the field and four monographs.

PATHOLOGICAL CONDITIONS DIAGNOSED IN FISH POPULATIONS FROM SOME FARMS IN IASI COUNTY, ROMANIA

Vasile Vulpe

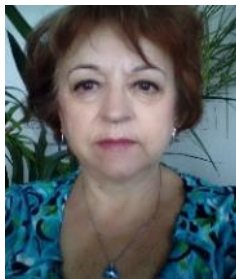
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The fish populations from the Iasi district (Romania) are multicultural, in that they are composed of indigenous carp, various species of Chinese carp, and crucian. The pathological examination starts off with obtaining several epidemiological data such as those pertaining to the technical information of the piscicultural basin, water sources, technological data regarding the feeding process, the population formula, the age category of the fish, and others. The direct examination of the fish begins on the field and should even involve the analysis of their moves while they're being targeted and caught. The inspection, palpation and special methods can then on be performed, and the latter comprise a necropsy, a bacteriological, parasitic, and hematological examination.

From a pathological standpoint, the monitoring process that the authors of the paper have performed throughout several years has led to the creation of an epidemiological sketch of various pathologic statuses in fish that are cultured on these farms.

Tania Zaharia is a Fishery Engineer. She graduated from "Dunarea de Jos" University, Galati, Institute for Alimentary Chemistry and Fishery Technique (1977), with a PhD in 2002 in Industrial Engineering.

Present position: senior scientist, scientific director, president of scientific council, National Institute for Marine Research and Development "Grigore Antipa" Constanta, Romania; Involved in 69 R&D projects, coordinator of 30 projects (national and international); Author and co-author of 234 scientific papers; Study director and lecturer of the Training Center for Environmental Profession of Balkan Environmental Association (B.EN.A.); National Representative of Romania in CIESM - Mediterranean Science Commission; Evaluator for national research programs and Fishing Operational Programme; Editor-in-chief and member in the editorial team of "Cercetari Marine/Recherches Marines", NIMRD journal; Reviewer of journal "Fresenius Environmental Bulletin" (Parlar Scientific Publications) (Germany). "Journal of Environmental Protection and Ecology" (Greece), "Turkish Journal of Fisheries and Aquatic Sciences (Turkey); Member of International Editorial Committee of Journal of Environmental Pro-



tection and Ecology (Greece); Program Committee Membership: Program Committee of 18 conferences, workshops and symposiums organized by NIMRD and B.EN.A.; Invited lecturer – "Ovidius" University Constanta, Romania.

DISEASES AS LIMITATIVE FACTOR OF VALUABLE FISH SPECIES FROM THE ROMANIAN LITTORAL

**Tania Zaharia*, Aurelia Totoiu, Victor Nita,
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The study of diseases affecting fish bred in captivity or captured from their natural environment on the Romanian littoral was carried out between 1994-2016, with the aim of emphasizing their importance as limitative factors in the preservation and protection of these valuable species. It is estimated that this is a more limitative factor for the farmed turbot, during its early growth, strongly connected with the quality of the water. Although aquaculture in Romania is represented almost exclusively by fresh water aquaculture, there are perspectives for developing marine farms for the rearing of significant species, such as: turbot *Psetta maxima maeotica* and sturgeons: *Huso huso* (beluga) and *Acipenser gueldenstaedti* (Russian sturgeon). The study was carried out on animals reared in fresh and marine water (for sturgeons) and on individuals collected from their natural environment or reared under experimental conditions (for turbot).

The biologic material was represented by beluga, Russian sturgeon and turbot individuals, captured from their natural environment or reared in captivity (in fresh and marine water for sturgeons). The diagnosis was made by associating the clinical and the microbiological examinations. Bacteria were isolated from the internal organs of the affected fish. To establish an effective treatment antibiogrammes were performed separately for each species of bacteria identified and for the total isolated bacterial flora. For parasitic diseases, the collection of parasites was made when controlling the exterior of the fish and during its dissection, using specific methods.

Diseases identified in turbot were: bacterial diseases, parasitic diseases, neoplasm-skin fibroma and diseases identified at hatched eggs and turbot larvae from experimental farming. Diseases identified in sturgeons were: hemorrhagic bacterial septicemia, vibriosis (caused by bacteria belonging to the *Vibrio* genus), bacterial gill disease (caused by bacterial germs of the *Cytophaga* genus), and lipid liver degeneration caused by the consumption of rancid fodder.

Pinar Arslan is a PhD student at the Department of Biology at Ankara University and also has completed her master's degree in this department. She completed her undergraduate study at Department of Biology Education at Gazi University. Her master thesis is about growth biology of *Pseudorasbora parva* from Mogan Lake, Ankara, Turkey. Her research interests lie in the area of freshwater fish ecology, fish biology, fish systematics, population dynamics, ecotoxicology, endocrine disruptors, primary cell culture from fish and molluscs, cell line from fish and cancer cell lines. She has been supported by TUBITAK, within 2211 - National PhD Fellowship Programme since October 1, 2015.



EFFECTS OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) ON PRIMARY CULTURES OF CARP AND TENCH FISH

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Ayhan Filazi²

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Polycyclic aromatic hydrocarbons (PAHs) are listed among common environment contaminants in ecosystem. They are released to the environment through natural and anthropogenic sources. In aquatic ecosystem, PAHs can be stored in sediment due to low aqueous solubility and strong hydrophobic features. Aquatic organisms such as fish can absorb them via their body surface, gills, digestive system through contaminated sediment and foods.

The aim of this study was to evaluate the cytotoxic effects of three PAHs [benzo(k)fluoranthene (BkF), benzo(a)pyrene (BaP), indeno(1,2,3-cd)pyrene (IND)] on primary cell cultures from *Tinca tinca* (tench fish) and *Cyprinus carpio* (carp).

Primary cells of gonads, muscle, gill and liver tissues were cultured from carp and tench fish collected from Lake Mogan, Ankara, Turkey. Half dilutions of three PAHs between 0,097-200 µg/L were applied on the primary cell cultures for 24 hours and cytotoxicity were evaluated using mitochondrial viability endpoint using MTT assay.

For tench fish primary cell cultures, highest cytotoxic activity was observed for IND with IC₅₀ value of 0,62 ppb and 0,50 ppb in gill and gonad cells, respec-

tively. For primary carp cell cultures, highest cytotoxic activity was observed for BkF with IC₅₀ value of 1,20 ppb in gonad cell culture. For BaP, the least cytotoxic activity was found for primary carp hepatocyte culture with IC₅₀ of 84,21 ppb.

The cytotoxic effects of three PAHs were evaluated on different fish species using primary cell cultures. Lowest cytotoxic activities were found for primary hepatocyte cultures probably due to the rapid transformation and low bioaccumulation of PAHs; where a longer exposure period is required. BkF was found toxic for fish cell culture because of bioaccumulation characteristic on fish. This study indicate that fish primary cell cultures represent valuable investigative model for the assessment of screening environmental contaminants.



David Scarfe is President-Elect of the World Aquatic Veterinary Medical Association (WAVMA) and an Executive Board member of WAVMA. He has recently returned to private veterinary practice to revitalizing Aquatic Veterinary Associates International

(AVAI), LLC, and coordinate a team of veterinarians who provide services to aquaculture producers and industries in several countries. Over the past 40+ years he has been a University Professor, has owned and operated multi-veterinarian private practices, and has overseen aquatic veterinary issues for the American Veterinary Medical Association, and has consulted with numerous veterinary organizations and governmental agencies in several countries, on veterinary education, legislative and regulatory animal health issues.

In addition to providing aquatic veterinary services to clients and industries, he currently assists several organizations and veterinary schools refine and implement aquatic veterinary academic and continuing education programs to ensure a global well-trained aquatic veterinary global workforce. He also serves as the Associate Director of the International Aquatic Veterinary Biosecurity Consortium, with the Secretariat located within the Centre of Excellence for Aquatic Veterinary Education & Biosecurity at Tierärztliche Fakultät, Ludwig Maximilians University in Munich, Germany, which develop and runs aquatic veterinary biosecurity training programs to assist governmental agencies, aquaculture producers and industries, and private practitioners prevent, control and eradicate infectious diseases.

GLOBAL EDUCATIONAL EFFORTS TO ENSURE AN ADEQUATE WORKFORCE TO PROVIDE AQUATIC VETERINARY SERVICES

A. David Scarfe

Aquatic Veterinary Associates International LLC, International Aquatic Veterinary Biosecurity Consortium (IAVBC) & USDA-APHIS Veterinary Services (NAHERC). 365 Monarch Birch Ct. Bartlett, IL 60103. dscarfe@ameritech.net

With increasing impacts of diseases on aquaculture production in all countries, the need for a well-trained aquatic veterinary workforce has become a global imperative. However, numerous educational efforts are underway ensure that sufficient numbers are available to support aquaculture industries and producers, governmental agencies that support or regulate aquaculture, and a myriad of supporting industries that provide therapeutic products, laboratory diagnostic services, and a number services to prevent, control or eradicate diseases. Without this infrastructure, sustainable and economically viable aquaculture will simply not thrive.

In an effort to provide direction to countries on determining the needs, deficiencies, and a pathway to ensure countries have a well-trained veterinary workforce, the World Organization for Animal Health (OIE) has developed a process evaluate and assist building capacity (including education) to ensure a country's veterinary services comply with OIE standards. Similarly, several international organizations (e.g. the World Veterinary Association, the Federation of Veterinarians of Europe, North American Veterinary Medical Educational Consortium) are making strides to ensure veterinary education across the world is standardized, and meets contemporary societal needs.

While some organizations address aquatic veterinary education needs, that of the World Aquatic Veterinary Medical Association (WAVMA) stands out. In order to identify the core knowledge, skills and experience (KSEs) needed for those making up an aquatic veterinary workforce, and recognize those with sufficient KSE obtained through a variety of educational opportunities, WAVMA has developed an Aquatic Veterinary Certification (CertAqV) Program. This program specifically identifies 9 core subject-matter areas, that are directly relevant to providing aquatic veterinary services to aquaculture producers. These cover clinical and non-clinical subjects specifically focused on aquatic health issues, including: anatomy and physiology; environmental factors; aquaculture industry structure and function; pathobiology and epidemiology or important diseases; clinical and laboratory diagnostics; the availability and appropriate use of therapeutic and biologic agents; public health, zoonotic diseases and seafood safety; international and national legislation, regulations and standards: and, principles of welfare

and humane treatment of aquatic animals.

Preliminary surveys evaluating available educational available, suggest that North America, Australia/New Zealand and Western Europe have sufficient opportunities to provide an adequate aquatic veterinary workforce, whereas other regions need improvement. However, with the assistance of the Council on International Veterinary Education, additional work that will continue through 2018, on evaluation aquatic veterinary education in Africa, Asia, Eastern Europe, South America, and the Middle East will help elucidate in all global regions.

IMPLEMENTING PRACTICAL AQUATIC VETERINARY BIOSECURITY APPROACHES TO MEET INTERNATIONAL (OIE) STANDARDS AND NATIONAL REGULATIONS

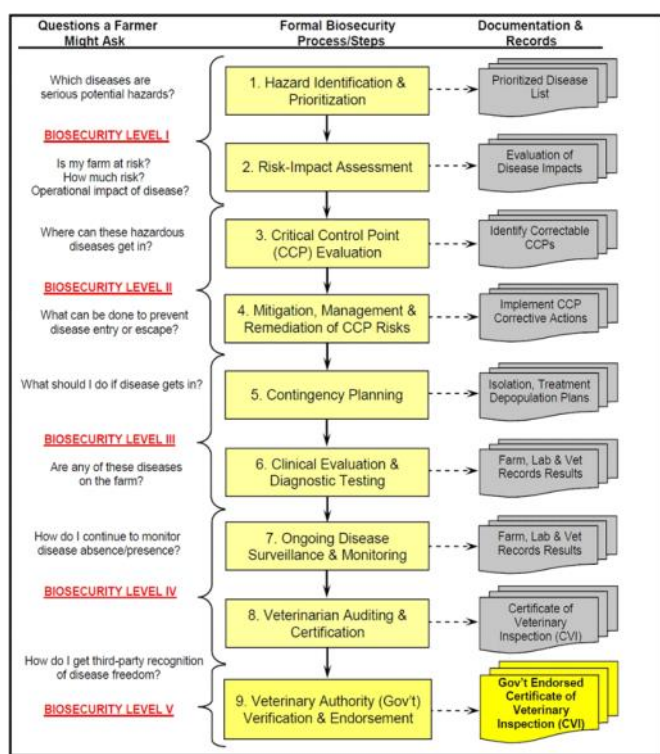
A. David Scarfe

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Facing progressively increasing risks and impacts of disease on aquaculture productions in all countries, over more than a decade at numerous conferences, symposia and workshops, a large number of individuals as part of the International Aquatic Veterinary Biosecurity Consortium (IAVBC) have discussed and debated what procedure that should be incorporated into biosecurity programs. A key feature has been determining which procedures will meet International Standards and National regulations. In balancing these requirements with practical approaches that aquaculture producers can implement, and are effective and useful for all stakeholders around the world (from producers to governmental regulators), the following were recognized as priorities for all biosecurity programs:

- be practical and economic;
- focus only on infectious and contagious diseases;
- include procedures that address disease prevention, control and eradication in
- definable epidemiological units;
- be based on well-established, sound scientific-justifiable veterinary procedures;
- incorporate internationally accepted standards in the OIE Code and Manual; and,
- involve public-private partnerships and collaboration between producers, aquatic veterinarians and paraveterinary professionals, and governmental regulators.

The IAVBC has tested the procedures shown in the associated figure below with stakeholders at several conferences and workshops in Norway, South Africa, Chile and elsewhere, that involve an integrated approach for developing, implementing, auditing and certifying effective aquaculture biosecurity programs. At the core of a biosecurity program is defining an epidemiologic unit (EpiUnit: a defined population of animals, separated to some degree from other populations, in which infectious and contagious diseases can be easily transmitted – e.g. a tank/pond, farm, state/province, zone, region or country) that would be appropriate for implementing, auditing and certifying an effective biosecurity program intended to prevent, control and possibly eradicate any infectious disease.



Călin-Decebal Cojocaru has been passionate about underwater world from his childhood when he discovered the beauties presented in J.I. Cousteau documentaries. After he graduated as DVM from the Faculty of Veterinary Medicine of Timisoara, in 1996, he worked in Food Safety and State Sanitary Veterinary Laboratory Timisoara. He is certified for veterinary medical practice (2000), aquatic pathology specialist and laboratory specialist (2003), obtaining the PhD in 2006 with the monographic thesis "Fish Parasites of Banat Region". In 2007 he was accepted as Postdoc at Institute of Aquaculture Torre de la Sal (Higher Spanish Council of Scientific



Research) - Fish Diseases Laboratory, Castellón, Spain where he studied treatment of some parasitic diseases using plants extracts. From 2007-2013 he was trained in Fish Diseases at the Institute for Diagnostic and Animal Health (Ro), Institute of Parasitology, Academy of Sciences of the Czech Republic, National Veterinary Institute, Oslo, Norway - O.I.E. Reference Laboratory for *Gyrodactylus salaris*, training for diagnostic of BKD, IHN and research in the field of sturgeon pathology, at Western Fisheries Research Center, Seattle, Washington, USA; O.I.E. Reference Laboratory for BKD and IHN, advanced training for diagnostic of KHV and KHVD, at Friedrich Loeffler Institut (Federal Research Institute for Animal Health) - Institute of Infectiology, German Reference Laboratory for Fish, Molluscs and Crustaceans Diseases, Greifswald - Insel Riems, Germany, course in aquatic biosecurity at EU Reference Laboratory for Fish Diseases Copenhagen, Denmark.

In 2009 was elected as Branch Officer of European Association of Fish Pathologists in Romania and Associated Editor Journal of Aquaculture & Marine Biology. In 2015 he obtained MASc: Design and technical - economic assessment of animal production (Design an integrated fish farm: fish, ducks and coypu) - University of Agricultural Sciences and Veterinary Medicine of Banat King Michael I of Romania, Timisoara, Faculty of Animal Husbandry and Biotechnologies.

He is Senior Principal Veterinary Officer, Aquatic Pathology Specialist, Head and founder of the Aquatic Pathology Laboratory Timisoara (National Sanitary Veterinary and Food Safety Authority, Romania). Major research are related to detection, epidemiology and control of fish diseases, fish parasites, food safety of fisheries. He is the main author of 35 scientific papers, has 4 quotation in books and attended many conferences in Romania and abroad.

CAPTURED AND AQUACULTURE FISH: WHAT SHOULD WE EAT?

**Călin-Decebal Cojocaru^{1*},
Clementina Luisa Cojocaru²**

¹National Sanitary Veterinary and Food Safety Authority, Aquatic Pathology Laboratory, Timisoara, Romania; email: c_cojocaru_d@yahoo.co;

²University of Agriculture and Veterinary Medicine of Banat "King Mihai I of Romania", Timisoara, Faculty of Animal Sciences and Biotechnology

This paper presents a cost-benefit analysis of captured and aquaculture fish designed to be placed on the market for human consumption. The benefits of eating captured fish are mainly related to flavour and health. The costs of placing on the market of captured fish are related to: protection of fish and environment,

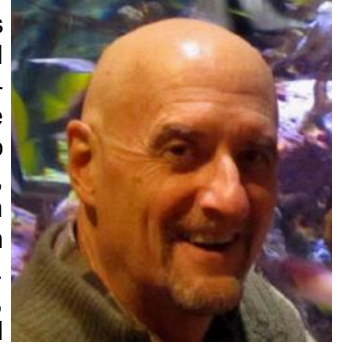
rational fishing, laboratory analysis of fish for food safety, removing from the market of parasitized or contaminated fish or fish parts, fish restocking.

The benefits of eating aquaculture fish are related to small costs with removing unsuitable fish (parasitized or contaminated) because of easier prevention and the possibility of placing live fish on the market. The costs are significant and sometimes difficult to be totally known, being related with fish growing, reproduction, prevention of fish diseases, treatments, biosecurity and food safety measures, laboratory diagnostic and, last but not least, the necessity of placing on the market of the fish with suitable weight at the right moment. At the same time, it is assumed that the flavour of aquaculture fish is not as intense as captured fish. In addition, the aquaculture fish can have unsuitable flavours caused by water actinomycetans in RCA, muddy taste of fish from some ponds, flavour of fish feed of some fish from intensive aquaculture (e.g., trout). Because the fish feed using wild fish and fisheries products as raw material, some contaminants (mainly heavy metals and pesticides) reach high concentration in fish meal, fish feed and finally fish meat. This can be reduced by removing the contaminants through fish feed production and short period of fish growing. In the wild, avoiding of contaminated waters and environment protection are the main tools to be used.

It is generally accepted the idea that natural water resources are subject of overfishing and it is not possible to sustain the increasing need of fisheries for the whole world human population. But many fisheries are removed daily from the market because of overproduction or oversupplying of the market to maintain a higher price or trying to obtain huge sales. In addition, the costs of aquaculture fish is higher than captured fish.

In our opinion, the main tools to have a sustainable natural water resources, including fish are fish restocking and the environmental protection. Is it easier to produce young fish for restocking the natural waters and protect the environment, then spending time with a long process of growing fish from eggs to the final marketable size of fish. In this period many things can happen: fish diseases, aquaculture maintenance of a fish farm, economic crises, lack of qualified personnel for fish farms. Humans can help fish in one of the most sensitive step of their life by restocking natural waters with young fish obtained from aquaculture (mainly RAS and intensive aquaculture), using artificial or controlled reproduction and protect the environment, leaving the nature to end the long process of fish growing from eggs to adults of marketable size.

Julius M. Tepper was born and raised in NYC and graduated from York College of CUNY in 1971. He then went to Europe to study veterinary medicine, graduating with honors from the University de Liege in Brussels, Belgium in 1976. Returning that year to NYC, he began practicing and held a special interest in birds and exotic animals. After many requests from clients, he opened the Long Island Fish Hospital in 1998 to care for the health of pet fish.



Dr Tepper served as Treasurer of the International Association for Aquatic Animal Medicine from 2006-2009, as an Officer on the Executive Board of the World Aquatic Veterinary Medical Association (WAVMA) since its formation in 2006 through 2012, and as President in 2011. He was honored by WAVMA in 2012 as one of five to be named as a Fellow. In 2013, he was certified by WAVMA as an aquatic veterinarian (CertAqV). He has been a member of the Association of Reptile and Amphibian Veterinarians, Association of Avian Veterinarians, the AVMA and state and local veterinary associations.

With a special interest in ponds, watergardens and koi, Dr Tepper developed a phytoremedial device for water quality improvement and received a U.S. patent for this invention. Known as "Pond'toons", these are currently in use in ponds, watergardens and in quarantine and treatment tanks for koi. Dr Tepper has authored many papers on fish health and pondkeeping.

AQUATIC HABITATS IN THE KOI HOBBY

Julius Tepper

*Long Island Fish Hospital,
New York, USA;
email: cypcarpio@aol.com*

Koi are a large species of ornamental fish typically maintained in outdoor ponds. The size and shape of these ponds, as well as the design and function of the life support systems vary greatly. As these aspects of the aquasystem can significantly affect the health of the koi, a review of some examples found in the hobby will be presented here. Energy metabolism and nutrient load will be considered. Koi pond design can be either shallow and dished or of deep design. Examples of different ponds with their corresponding design and function layout will be presented.

RECIRCULATING FILTER SYSTEMS IN THE ORNAMENTAL FISH HOBBY

Julius Tepper

Long Island Fish Hospital, New York, USA;

Koi, as well as smaller freshwater and saltwater species, are maintained in closed aquasystems that rely on recirculating filter systems to purify the water and aid in gas exchange. Some factors that help to determine the type of filter system are the type of fish, stocking density, feed rate, ease of maintenance and the budget of the owner. Some examples of systems are sedimentation units, internal and external box filters, prefilter solids separators and pressurized canisters.

NATURAL BACTERIAL CONTROL IN FRESHWATER AQUASYSTEMS

Julius Tepper

Long Island Fish Hospital, New York, USA;

The thorough understanding of the organisms present and the processes occurring in living aquasystems is essential to the care and treatment of pet fish. Water purification of pathogens from natural bodies of freshwater occurs primarily in wetlands. Four processes have been identified in achieving this end, being: aggregation (floc formation) and sedimentation; adsorption on suspended inorganic matter; competitive inhibition and ingestion by beneficial micro-organisms; and the presence of antibiotics and biocides produced by beneficial micro-organisms and plants. Despite the absence of inorganic matter, it is possible to identify and utilize both floc formation and sedimentation and competitive inhibition and ingestion in purifying artificial freshwater aquasystems. It is also likely that antibiotics and biocides produced by algae and higher plants may play a role in purifying artificial systems. This lecture will detail the organisms present and processes occurring in freshwater aquasystems and explain their roles in water quality maintenance.

GAS EXCHANGE IN FRESHWATER ORNAMENTAL AQUASYSTEMS

Julius Tepper

Long Island Fish Hospital, New York, USA;

Koi and smaller freshwater species, are maintained in closed aquasystems that require some form of active gas exchange. Some factors that help to determine the type of gas exchange system are the type of fish, stocking density, type of circulation and temperature control considerations. Some examples used are air diffusers, waterfalls and spillways, surface skimmers, fountains, venturis and pond deicers.

Timothy J. Miller-Morgan

is an aquatic veterinarian, educator and biologist. He directs the Aquatic Animal Health Program at Oregon State University (OSU), Corvallis, OR, USA. He has 30 years of experience in aquatic animal medicine, husbandry and education. He is based at the Hatfield Marine Science Center (HMSC), a major aquatic research institution associated with Oregon State University. He also serves as a clinical veterinarian for aquatic animals at Oregon State University, the adjacent Oregon Coast Aquarium and the Oregon Coast Community College, Aquarium Science teaching facility. Prior to attending veterinary college Tim worked as a wilderness guide, camp naturalist, backcountry health and safety instructor, wolf, grizzly bear and black bear keeper, and carried out research on beluga whales, Dungeness crabs, black abalone and rainbow trout. Prior to being hired to his current position he served as senior aquarist, curator and staff veterinarian for the Hatfield Marine Science Center Aquarium, Newport, OR, USA.

Tim holds two Bachelor of Science degrees. He earned a degree in Biology and a minor in chemistry from the University of Puget Sound in Tacoma, WA, and a degree in Wildlife Biology (cum laude) from Washington State University, Pullman, WA. He received his Doctor of Veterinary Medicine (DVM) from Washington State University College of Veterinary Medicine. He acquired additional clinical training in aquatic medicine at Clear Springs Trout Farms, Battelle Center for Marine Disease Control, the National Aquarium in Baltimore, and the Marine Biological Laboratory at Woods Hole. He has also completed additional graduate training in fish pathology, fish health management and medical informatics at Oregon State University and Oregon Health Sciences University. He is a Certified Aquatic Veterinarian by the World Aquatic Veterinary Medical Association, and a Professional Fellow of the Association of Zoos and Aquariums.

Tim is currently an assistant professor in the Department of Biomedical Sciences at OSU, College of Veterinary Medicine (CVM) and holds adjunct appointments with the School of Education and the Marine Resource Management Program in the College of Earth, Ocean and Atmospheric Sciences at OSU. He has developed and teaches courses, course sections and workshops at the CVM in fish medicine. He is also the co-creator of the Aquarium Science Program at Oregon Coast Community College in Newport where he currently teaches courses in aquatic animal health management. This successful and unique program



trains husbandry professionals for work in public aquaria, research laboratories, aquaculture facilities and the ornamental fish industry. Tim is also a member of the Executive Board of Ornamental Fish International. He is a founding member and past secretary of the American Association of Fish Veterinarians (AAFV) and a past member and vice-chair of the Aquatic Veterinary Medicine Committee, American Veterinary Medical Association (AVMA) and a founding member, former Director-at-Large and current chair of the credentialing committee for the World Aquatic Veterinary Medical Association (WAVMA). He is also a member of the World Aquaculture Society and the Executive Advisory Board of the Asia-Pacific Chapter of the World Aquaculture Society (APC-WAS).

Tim has consulted and taught extensively on fish and invertebrate health issues, primarily related to ornamental fish, throughout the United States and Indonesia, Japan, Norway, Israel, India, Australia, Brazil, Singapore and Malaysia. Some of his current work focuses on the development of best health practices for sustainable ornamental fisheries including the development of techniques to mitigate post shipment mortality among wild-caught marine and freshwater ornamental fish, characterization of pathogenic bacteria and antibiotic resistance associated with recently imported freshwater tropical fish, and the development of standardized health management protocols and training for aquarium fish facilities and research facilities utilizing fish and invertebrates for research and education. He has also developed a number of overseas 1- 10 week training opportunities for professionals and technical, undergraduate and graduate students in Japan, Israel, Australia, Brazil and Malaysia.

Tim has an ongoing interest in preserving the health of wild aquatic animal populations, their ecosystems and the viability of rural communities. In order to pursue these interests, he currently serves as the lead for animal welfare and an advisory board member of Project Piaba. He also serves on the Executive board of the Amazon River Dolphin Conservation Foundation. Tim serves on the steering committee for the International Union for the Conservation of Nature (IUCN), Freshwater Fish Special Group, Home Aquarium Sub-Group. The goals of these groups are to promote the sustainable use of aquatic animal resources, to conserve local ecosystems and promote viable socioeconomic development in rural areas of the world.

SUSTAINING ECOSYSTEMS, AQUARIUM FISHERIES AND COMMUNITIES - THE AQUATIC VETERINARIAN'S ESSENTIAL ROLE

Tim Miller-Morgan^{*1, 2, 3}, Christiana Lohr^{1, 2}, Aimee Reed^{1, 4}

¹*Aquatic Animal Health Program, Oregon Sea Grant, College of Veterinary Medicine, Oregon State University, Newport, Oregon; email: tim.miller-morgan@oregonstate.edu;* ²*Department of Biomedical Sciences, College of Veterinary Medicine, Oregon State University;* ³*Project Piaba Bio-Amazonia International, Weymouth, Massachusetts;* ⁴*Reed Aquatic Veterinary Services, Portland, Oregon*

Wild-caught aquarium fisheries are often demonized as an extractive fishery that is becoming non-essential due to the increasing capability to breed and rear these fish species in captivity. However, many of these fisheries are probably sustainable, provide important economic opportunities for the local communities and may be a principle driver for creating value for the local environment and thus an incentive to preserve local ecosystems.

Communities residing in regions of biological importance that have a consistent and long-term market demand for freshwater home aquarium fish have a strong economic incentive to maintain the most robust and productive environments. Commercially desirable aquarium fish represent a relatively easily attainable resource for rural people where alternative livelihoods are often unsustainable and environmentally destructive. A sustained economic benefit from the capture and export of home aquarium fish may provide effective incentives to fend off other industries and practices that degrade the environment upon which the fish depend, resulting in protection for not only the target species but the entire ecosystem. Further, many of these regions that contain or may contain marketable species are also home to other species that may be threatened according to IUCN Red List. Such areas in which there is a viable sustainable aquarium fishery may be in effect, *Protected Areas*, as a result of resident-based stewardship. In important instances in developing countries, the home aquarium trade has functioned as an effective instrument for poverty alleviation and social stability, the preservation of areas of biological importance, and critically endangered species, as well as contributions to global climate stability. Thus, community-based fisheries for the freshwater home aquarium trade are increasingly recognized as powerful potential drivers of environmental protection. Alarming, some of the fisheries that have been providing these environmental benefits for generations are threatened with collapse; not due to environmental constraints, but instead because of major changes in the global aquarium industry, including the growth of

aquaculture and concerns about wild harvests. These threats must be addressed to allow the continuation of sustainable wild-capture fisheries. In addition, new sustainable, community-based fisheries and supply chains could be established where possible to maximize social and environmental benefits and where environmental protectionism is urgently needed.

The International Union for the Conservation of Nature (IUCN) and its Freshwater Fish Specialist Group (FFSG) recognizes the potential value of these sustainable fisheries and in October of 2014 formally announced the formation of the Home Aquarium Fish Sub-Group (HAFSG). The FFSG has a strong interest in fostering projects that lead to the conservation of fish species related to the aquarium trade. They recognize that if developed and managed properly, sustainable aquarium fisheries can provide another useful approach to the conservation of freshwater fish species, habitat conservation and provide continued socio-economic benefits to the local communities. However, a fishery is not sustainable if the fish are injured and die of disease before they reach the end consumer. Poor health and quality of wild-caught aquarium fish is often one of the chief complaints mentioned by aquarium fish importers, retailers and hobbyists in importer countries. Aquatic veterinarians could easily diagnose, treat and provide management recommendations for many of the causes of poor fish health associated with aquarium fisheries. Unfortunately, they are rarely consulted and, in fact, conspicuously absent from many fishery conservation teams, programs and projects.

Aquatic veterinarians have a unique, multidisciplinary skill and knowledge set that can be applied to some of the problems that often plague sustainable or potentially sustainable aquarium fisheries. We will discuss some of the opportunities for aquatic veterinarians to become involved in sustainable aquarium fisheries and fisheries conservation teams as well as some of the ancillary skill sets that are useful when integrating oneself into such projects.

ENSURING HEALTH THROUGHOUT THE SUPPLY CHAIN: DEVELOPING A SUPPLY-CHAIN TRAINING PROGRAM FOR A WILD-CAUGHT AQUARIUM FISHERY IN BRAZIL – A CASE STUDY

Tim Miller-Morgan^{1,2,4}, Christiane Lohr^{1,2}, Sandra Jouglard¹, Scott Dowd^{3,4}, Camila Saraiva dos Anjos⁵

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email: tim.miller-morgan@oregonstate.edu;

²*Department of Biomedical Sciences, College of Veterinary Medicine, Oregon State University;*

³*New England Aquarium, Boston Massachusetts;*

⁴*Project Piaba Bio-Amazonia International, Weymouth, Massachusetts;* ⁵*National Institute for Amazonian Research (INPA), Manaus, Amazonas, Brazil*

The aquarium fishery is the principal subsistence activity for the riverine communities in the municipality of Barcelos (Amazonas state, Brazil). The trade in aquarium fish has at times, contributed at least 60% of the income revenues in the municipality. Fluctuations in fish production, market demand, export logistics; mortality rates and price are the main constraints on the fishers' subsistence. When fishers are asked what they would do if they could not sell fish, the most common answers are: timber harvest, cattle ranching, gold mining, or urban migration. Fortunately, the annually inundated, floodplain habitats of ornamental fishes have remained largely intact. Many forest fishes have a short life cycle (less than 2 years), and fish populations can be quickly replenished. Thus, it may be possible through proper management to protect the habitat from degradation, while maintaining adequate harvests for the local fishing communities.

For more than 25 years, Project Piaba has been researching the aquarium fishery of the Rio Negro. Very early on it was discovered that the capture of many of these species was not only sustainable, but it was the principal driver for creating value for the environment. Every year a small group of international fish health specialists, trade stakeholders, public aquarium biologists, and fish enthusiasts participate in an annual expedition to Barcelos and the fishing grounds. The outcomes of this program have led to a much better understanding of the role of this fishery and project members are helping the fishery adapt to changes in global markets. The industry and the business climate in which the fishery operates have changed significantly in recent years and this fishery is increasingly in competition from native Brazilian species being farm-raised in Asian countries. In the past, customers in the import countries have been willing to expend resources to acclimate, manage minor health issues and condition these wild-caught fish in preparation for sale to customer. Today customers expect a high quality and healthy wild-caught fish that requires little in the way of post-shipment health management and conditioning. In order to stay competitive one key area in which the Brazilian industry must focus is improved health management of these fish throughout the chain of custody, from collection to export.

Project Piaba partnered with the Aquatic Animal Health Program (AAHP) to initiate a project to identify the key factors impacting fish health throughout the chain-of-custody for the Rio Negro aquarium fishery. Key factors that appear to impact fish health and quali-

ty include: post-collection handling and transport, feed quality and feeding regimes, dramatic shifts in water quality, poor knowledge of disease identification and management and inadequate pre-export acclimation and conditioning. Utilizing this information the AAHP team developed a train-the-trainer program that would train and provide local biologists to act as trainers and consultants for the Rio Negro fishers, transit station managers and exporters as they worked to improve the health and quality of their collected fish. The trainers are fisheries biologists and aquaculture specialists selected based upon their relationships with the local communities and their knowledge of the fishery and local environment. Once trained these trainers began offering training and consultation to local fishers and facility managers throughout the supply chain addressing health management techniques that would lead to improved fish health and quality. We will discuss the development and implementation of this program and some of the early outcomes.



Nicholas Saint-Erne is Past President of the World Aquatic Veterinary Medical Association (WAVMA) and Executive Board member of WAVMA. Dr Nick has been keeping exotic pets since getting his first pet turtle in 1966, and setting up his first aquarium in 1968. His major field of study was Fisheries Biology for his Bachelor of Science degree. In 1984 he received his Doctor of Veterinary Medicine degree from Kansas State University. He practiced small animal and exotic pet medicine in Las Vegas, Nevada for 15 years (1984-1999). Since 1999, he has lived in Arizona where he is the Quality Assurance Veterinarian for PetSmart Inc., which is based in Phoenix. PetSmart is the largest North American pet and pet supply company, with \$8 Billion in annual sales. His current role is to supervise the care of the fish and reptiles sold at over 1500 PetSmart stores in the United States, Canada and Puerto Rico. This includes annual visits to pet breeder's facilities in the US and Canada, and supervising the health care of the tropical fish in 5 distribution facilities, each containing over 4000 fish tanks with state-of-the-art recirculating filtration systems. In 1982 Dr. Saint-Erne attended the "AquaVet" program on Aquatic Veterinary Medicine at the Marine Biological Laboratory in Woods Hole, Massachusetts. He wrote the book "Diseases of Koi" in 1994, and another fish medicine book "Advanced Koi Care" in 2002, now in its second edition. Since 1985 he has lectured to numerous fish and koi clubs around the U.S., and lectures on Aquatic Veterinary Medicine to veterinarians throughout the world.

COMMON PARASITES IN ORNAMENTAL FISH

Nick Saint-Erne

PetSmart, Inc,

Phoenix, Arizona, USA;

email: nsainterne@petsmart.com

Ornamental fish are often raised on fish farms where they receive limited treatment for parasitic diseases, especially those imported from many Asian countries. Some aquarium fish are also still collected from the wild, where they may have naturally occurring parasites. The fish often arrive to the fish retailer with external parasites and should be treated with appropriate medications to reduce parasites before being sold to customers.

Treat the fish using medicated dips or by adding medication into the aquarium water. Some medications can also be supplied in the food. Medicated food for treatment of intestinal parasite infestations should be fed for a minimum of 3 consecutive days. Repeated treatments may be necessary to effectively treat some parasites. The fish should be checked after treatment to ensure that the parasites have been completely cleared. Retreat as necessary prior to selling fish from the stores.

External protozoa are best treated using formalin or formalin/malachite green solution. Formalin effectively kills protozoan parasites on gills, skin, and fins. Formalin is not effective against internal infections of any type. Monogenean trematodes (gill and skin flukes) are treated with fenbendazole. Since fenbendazole powder is not water soluble, it must first be dissolved in a small volume of alcohol, and then added to the water. Digenean trematodes (encysted flukes) live in the intestines, gills, and muscles of the fish, which acts as the intermediate host. Oral fenbendazole can be used to treat the fish for Digenean flukes. Intestinal nematodes (*Camallanus*, *Capillaria*) can also be treated by feeding the fish a fenbendazole or mebendazole medicated fish food. External crustacean parasites (anchor worms, fish lice) can be treated by adding diflubenzuron to the tanks of affected fish.

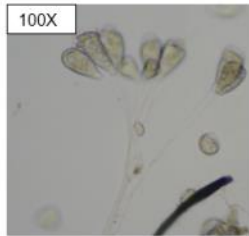
There are many types of parasites that affect fish: protozoa, digenean and monogenean trematodes (flatworms, flukes), intestinal nematodes, and external crustacean parasites. Appropriate diagnostic tests need to be conducted to determine the parasites that are present; often more than one type can be found on the fish. Each type of parasite needs a different medication to treat it effectively.

COMMON PARASITES IN ORNAMENTAL FISH
Nick Saint-Erne

Protozoa:



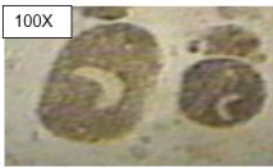
Vorticella



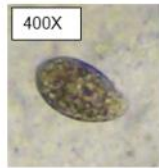
Epistylus



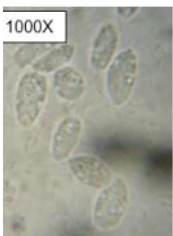
Chilodonella



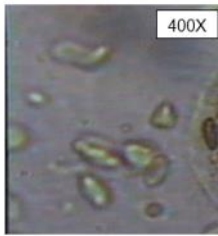
Ichthyophthirius multifiliis



Tetrahymena



Spiroplasma

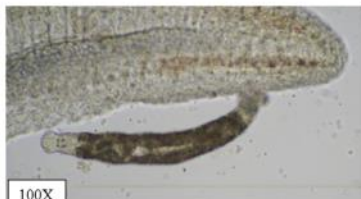


Ichthyobodo (Costia)

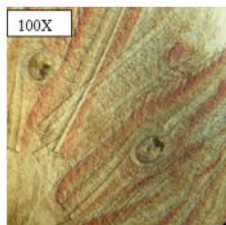


Trichodina

Trematodes:

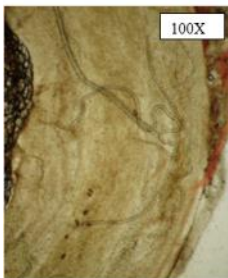


Monogenean fluke *Dactylogyrus* on gill filament



Digenean fluke in gill filaments

Nematode:



Capillaria worms in the intestines
Small brown ova also visible

Crustacea:



Argulus fish louse



Lernaean anchorworm

All microphotographs above by Nick Saint-Erne, DVM

THERAPEUTIC AGENTS FOR TREATING ORNAMENTAL FISH
Nick Saint-Erne

Ornamental fish keeping includes the housing of tropical freshwater and saltwater fish in aquariums, and coolwater fish species such as goldfish and koi, often in backyard ponds. Fish are the third most popular pet in the United States of America, according to the American Pet Products Association. The biennial APPA survey indicated that the number of households in the USA keeping the top three types of pets were 54.4 million dog owning households, 42.9 million cat owners, 12.3 million freshwater fish keepers plus 1.3 million saltwater fish keeping households in 2016. However, the total number of each of these pets in the households was 77.8 million dogs, 85.8 million cats, 95.5 million freshwater fish plus 9.5 million saltwater fish. This makes fish the most populous pet in the US!

Ornamental fish can succumb to a variety of viral, bacterial, fungal and parasitic diseases, as well as from poor water quality, toxins in the water, predation, interspecies aggression, and neoplastic, traumatic, and metabolic diseases. It is important to assess all factors and perform good diagnostic testing to ensure that the correct treatments are being given. Medications used for treating fish should be safe for the fish and other non-pathogenic organisms in the aquatic environment, and effective in decreasing or eliminating the cause of disease. Considerations for the economics of the medication are important also; for example, it is cheaper to treat fish in a smaller volume of water, such as a quarantine tank, than in a large body of water such as a koi pond.

Medications are administered to ornamental fish most commonly by adding them directly to the water. Medication can also be topically applied directly to the skin of the fish. Some medications can be incorporated into the food and given orally, or administered using a feeding tube placed through the mouth into the stomach or intestines. Larger sized fish can be injected with medications intramuscularly, intraperitoneally (intracoelomically in fish), and intravenously. Follow label directions on all medications and be sure of accurately measuring aquarium water volume to ensure the correct dose is administered.

When used appropriately after making an accurate diagnosis, medications can help to treat or cure diseases in fish, but must be used with care to ensure they are not underdosed to be ineffective in the treatment, or overdosed to potentially harm the fish. Water quality must also be taken into consideration when adding medications. A valid veterinarian-client-patient relationship is required for extra-label use of drugs in aquaculture, as well as for use of veterinary feed directive drugs.

Therapeutic Dosages for Commonly Used Drugs in Ornamental Fish

Nick Saint-Erne

PetSmart, Inc,

Phoenix, Arizona, USA;

email: nsainterne@petsmart.com

Amikacin – 5 mg/kg IM, IP every 3 days
 Aztreonam (Azactam) – 100 mg/kg IM, IP every 2-5 days
 Butorphanol – 0.1 mg/kg IM for pain control post-surgically
 Dexamethasone – 1-2 mg/kg IM, IP q12h
 Diflubenzuron (Dimilin) – 0.06 mg/L in water once weekly for 3 doses
 Enrofloxacin (Baytril) – 10-14 mg/kg IM, IP q48h, or PO q24h
 Epinephrine (1:1000) – 0.2-0.5 ml IM, IP, IC
 Fenbendazole (Panacur) – 50 mg/kg orally for 2 days, 2 mg/L water q7d x 3 doses
 Formalin (37% formaldehyde) – 25 mg/L (1 ml/10 gal) in water every other day
 Florfenicol (NuFlor; AquaFlor) – 30-50 mg/kg IM, IP, PO q24-72h
 Furosemide – 2-3 mg/kg IM, IP q12-72h
 Gentamicin – 3 mg/kg IM, once only due to kidney toxicity
 Hydrogen peroxide – 250-500 mg/L dip to prevent fungal growth on eggs
 Levamisole – 10 mg/L for bath; 50 mg/L for a 2h dip
 Metronidazole – 50 mg/L bath, added daily for 3-10 days, 10 mg/g of food daily for 5 days
 Oxytetracycline – 50-75 mg/kg BW, added to food daily for 10 days
 Praziquantel (Droncit) – 5-25 mg/kg IM, IP, PO, 10 mg/L for 6-24h bath
 Prednisolone – 1 mg/kg IM, IP
 Salt (sodium chloride) – 0.1-0.3% solution, for fresh-water fish species
 Sulfadimethoxine-orometoprim (Romet, Primor) – 50 mg/kg IM or added to food
 Tetracycline – 250 mg/100 g of food
 Trimethoprim sulfa – 30 mg/kg IM, IP, PO q24-48h
 Vitamin C – 3-5 mg/kg IM, PO q24h

Sandra Lechleiter was born in Kehl/Rhein, Germany. She studied Veterinary Medicine with the Ludwig-Maximilians-University in Munich, Germany, and did her Doctoral studies at the chair of Prof. E. Dahme, in the field of Neuropathology. She worked at the Veterinary Office Laboratory in Stuttgart, Baden-Württemberg, in Pathology of small animals, Parasitology and Fish Health Service. Main emphasis was on supporting fish farmers in regard to the prevention of fish diseases, diagnosis and therapy of fish health problems and monitoring of fish epidemics. Since 1997 she worked at the "Fachtierarzt für Fische", as specialized fish veterinarian with the authorization of education. Since July in 1998 she is a self-employed fish veterinarian in Stuttgart and in Neuenbürg, Baden-Württemberg.



Her work is focused on the support of ornamental fish trade, shops and private fish keepers in every aspect of fish husbandry, diagnosis and therapy of ornamental fish diseases. Patients are koi and other pond fishes (about 60%) and fresh water fishes living in aquaria (25%) and sea water fishes (5%). Her second focus is on writing articles, texts and books for hobbyists and professional fish keepers and giving lectures and webinars for this group of people as well as „vetinars“ for veterinarians interested in ornamental fish disease. Dr Lechleiter is a member of EAFF, WAVMA, DVG and ATF.

ABDOMINAL TUMORS IN ORNAMENTAL KOI CARP: DIAGNOSIS, TREATMENT AND PUTATIVE REASONS

Sandra Lechleiter^{1*}, Melanie Ehrenfried¹, Christine Lange¹, Heike Schmidt-Posthaus², Dieter Steinhagen³

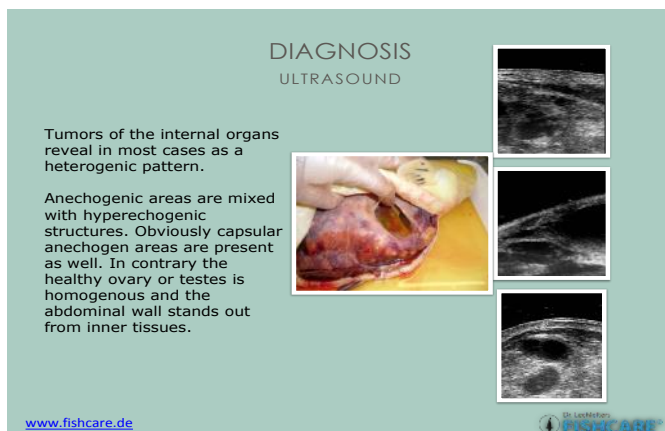
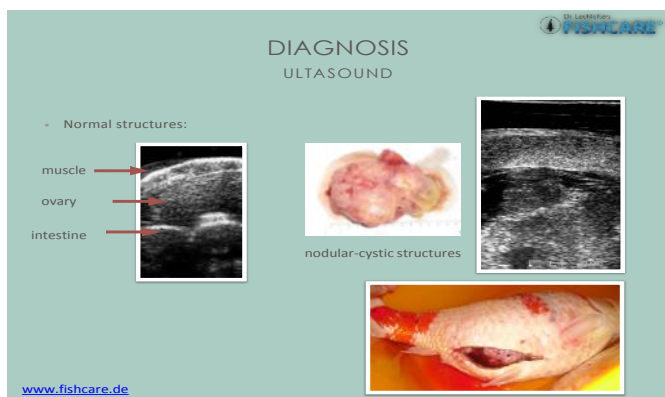
¹*Fachtierarztpraxis für Fische, Fuhrmannstraße 4, 75305 Neuenbürg, Germany; sandra-lechleiter@fishcare.de, www.fishcare.de;*

²*Vetsuisse Fakultät Bern, Zentrum für Fisch- und Wildtiermedizin, Länggassstraße 122, CH-3001 Bern, Switzerland;* ³*Stiftung Tierärztliche Hochschule Hannover, Institut für Parasitologie, Abteilung Fischkrankheiten und Fischhaltung, Bünteweg 17, 30559 Hannover, Germany*

Koi are about 70% of the patients in our practice specializing in fish diseases. The amount of cases with abdominal swelling, abdominal enlargement or "pregnant appearance" is rising since the 1990s. Most of these abdominal swellings are caused by neoplasms. We wanted to learn more about the types of abdominal tumors in koi, their appearance in ultra-



sound and in vivo and the type of tissue involved in the tumors. The sense of surgery and its possible success and prognosis will be discussed.



Melanie Ehrenfried collected in 2012-2013 a total of 26 Koi carp for her dissertation. These fishes were examined ultrasonographically before surgery or euthanasia. The putative neoplastic tissue was collected, fixed in formalin and sent to Heike Schmidt-Posthaus, Centre for Fish and Wildlife Health, Vetsuisse Bern for histological examination by a skilled fish histopathologist.

Most tumors in the 26 examined koi between 4 and 11 years of age were granulosa-cell tumors or fibroma (>80%), but gonadoblastoma, hepatocellular carcinoma and teratoma were present as well.

In the last three years, 25-30% of the koi survived surgery more than 2 years without showing signs of recidivism. Fibroma seem to have the best prognosis.

On the basis of this dissertation, which is not yet finished, our approach to abdominal tumors has changed. We now use ultrasound as a tool for diagnosis. The success of surgery is in fibroma much better than in polycystic tumors of the type of gonadoblastoma. The type and weight of the tumor masses play a significant role in respect to survive surgery. Early recognition and histopathologic diagnosis is therefore extremely important.

EGGBINDING IN ORNAMENTAL KOI CARP

Sandra Lechleiter*, Christine Lange

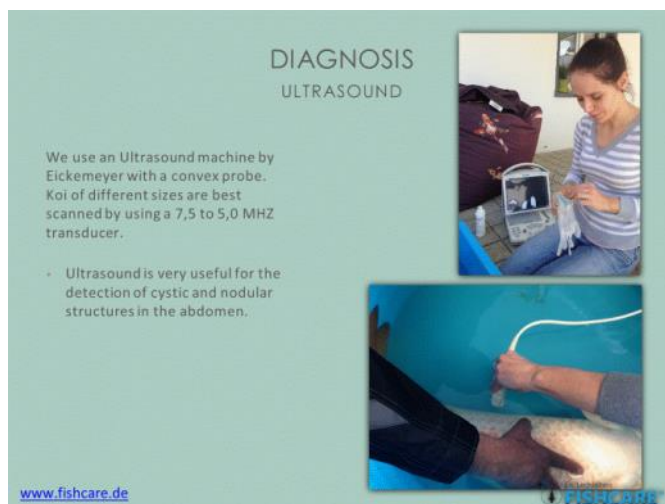
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email: sandra-lechleiter@fishcare.de

The term "egg binding" has its origin in avian and reptile medicine. It describes the inability of a female to pass eggs out of the reproductive tract. Koikeepers and other hobbyists use the term for any fish with enlarged abdomen. The reasons for these symptoms are numerous, ranging from abdominal tumors, adiposity to reproductive ovary and their disorders. In our presentation we want to show the most important causes for symptoms of "egg binding" in koi and the complex intercauses of environment, nutrition and temperature regime in the ponds. Further, developing a correct diagnosis and choice of a suitable treatment including hormonal injections are shown.

Our methods include clinical examination and comprehensive anamneses, palpation, aspiration of the ovary, and ultrasound.

Egg bound koi have in most of our cases a metabolic and/or conditional disorder. The temperature of the environment plays a central role for the ability to resorb eggs properly. Overfeeding and lack of oxygen in summertime is an important obstacle for resorption and proper function of the ovary. Hormonal therapy may be of help but deficiency in nutrition, environment and genetics should be taken into consideration. The koikeeper should be advised to avoid negative influences in respect to koi-health.



Abstracts of Poster Presentations

MOLECULAR CHARACTERIZATION OF NERVOUS NECROSIS VIRUS IN WILD MARINE FISH SPECIES FROM THE LEVANTINE BASIN OF THE EASTERN MEDITERRANEAN

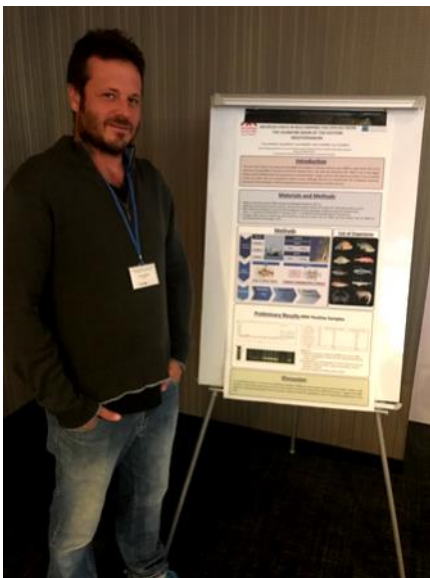
Danny Morick^{1*}, Ran Berzak¹, Yuval Maron², Aviad Scheinin¹, Dan Tchernov¹

¹Marine Biology Department, The Leon H. Charney School of Marine Sciences, The Morris Kahn Marine Research Center, University of Haifa; email: dannymorick@gmail.com;

²Koret School of Veterinary Medicine, The Hebrew University of Jerusalem

The aim of this study is to survey and investigate the presence of nervous necrosis virus (NNV) in wild marine fish and to determine the possibility of disease transmission between fish in the wild and mariculture fish. NNV is one of the biggest threats eastern Mediterranean Sea aquaculture is currently facing. A large number of fish species are known to be susceptible to the virus while other are considered as latent carriers. Although wild fish are economically and ecologically important, prevalence of this pathogen in wild fish populations around the Levant Sea is basically unknown. To close this knowledge gap, wild fish species were sampled from four areas along the Israeli Mediterranean coast. DNA was extracted from brain, liver and kidney tissue of each fish, following reverse transcription PCR and real time PCR for the detection of NNV. Specific primers for both RNA1 and RNA2 were used to characterize the specific NNV strains. The compiled data will be used to assess viral transmission between different fish populations.

Our preliminary results demonstrate that 12 out of 81(14.8%) tissue samples of different species were tested positive and then confirmed by sequencing. Positive results found in several fish species from different locations suggests that NNV might be a widespread pathogen that can become a threat to wild fish populations and to cultured fish populations in the area.



Poster titled 'NECROSIS VIRUS IN WILD MARINE FISH SPECIES FROM THE LEVANTINE BASIN OF THE EASTERN MEDITERRANEAN'. It includes sections for Introduction, Materials and Methods, Methods, List of Organisms, Preliminary Results-NNV Positive Samples, and Discussion. The poster features a flowchart of the methodology, a list of fish species, and gel electrophoresis images showing PCR results.

Poster titled 'PREY PREFERENCE OF THE LONG-SNOUDED SEAHORSE (Hippocampus guttulatus CUVIER, 1829) AT THE ROMANIAN BLACK SEA COAST'. It includes sections for Aims & Background, Results and Discussion, Experimental, and Conclusions. The poster contains several bar charts and graphs showing feeding rates and prey preferences of the seahorses.

PREY PREFERENCE OF THE LONG-SNOUDED SEAHORSE (*Hippocampus guttulatus* CUVIER, 1829) AT THE ROMANIAN BLACK SEA COAST

Magda Nenciu¹, Aurelia Totoiu¹, George Harcota¹, Elena Bisinicu¹, Tania Zaharia¹, Carmen Nicolae²

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The long-snouted seahorse (*Hippocampus guttulatus* Cuvier, 1829) is a representative species of the Romanian coast, due to its charismatic appearance and extraordinary biology. Although it is not a commercial fish in Romania, it is subjected to harvesting to be sold as curio or for the aquarium business.

In Romania, the first experiments conducted on the breeding and rearing in captivity of seahorses were carried out by the National Institute for Marine Research and Development (NIMRD) "Grigore Antipa" Constanta, in 2008 (Zaharia *et al.*, 2010). The results of the experiments conducted have shown that the breeding and subsequent rearing of these fish in captivity is feasible. However, the major drawback in rearing *H. guttulatus* was supplying the most appropriate diet for the fry, as many individuals died of starvation before reaching maturity due to the lack of a small-sized food alternative.

Under these circumstances, the current research was an attempt to determine which live diet is better accepted by seahorses in a controlled environment. Three experimental tanks were set in laboratory conditions, for a 10 day period. The different batches of seahorses collected from the natural environment were placed in the three tanks, after previous acclimation. Subsequently, one batch (Tank A) was fed exclusively with *Brachionus plicatilis*, one with *Artemia salina* (Tank B), and one with a 50%/50% combined mixture of the two invertebrates (Tank C). The results obtained indicated a linear length and weight increase of *H. guttulatus* in all three feeding regimes, the final length (+10 days) being higher than the +5 days length and initial length. From the ethologic point of view, differences in the behavior of *H. guttulatus* in the three tanks were observed.

Future research is required, focusing mainly on extending the experimental period (more than 30 days), separating males and females and diversifying the prey fed to seahorses. Other diets will also be tested in captive conditions, as studies have indicated that Amphipoda, Anomura, Decapoda and Mysidacea seem to be the dominant prey categories in the wild.

PARALYTIC SHELLFISH POISONING

Sinem Senturk*, Farah Gönül Aydin

Ankara University, Veterinary Faculty, Department of Pharmacology and Toxicology, Ankara, Turkey; email: sinemvett@gmail.com

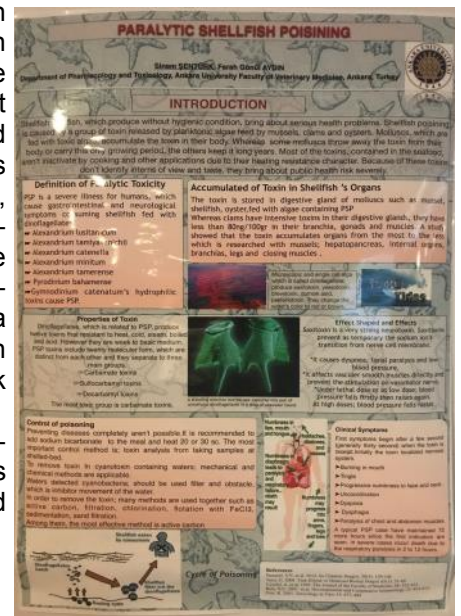
In recent years, the consumption of seafood has increased all over the world, especially in Turkey. Many aquaculture products from marine and freshwater are an excellent source of vitamins and minerals in that they have a high degree of digestion and are the source of unsaturated fatty acids. However, the presence of toxins in some of these products is an important problem in terms of consumption and economic reasons. The highest rate of death by consumption of shellfish is caused by paralytic poisoning.

The main aim of this review is the toxin, which has been in shellfish products, with which ways contaminates to people and what kind of effect on them. Also determined elimination methods and their application.

Water sources which contains cyanotoxin can be refined by using both mechanical and chemical methods. Filters and blocks are being used to prevent water movement. The methods such as using powdered or granulated active carbon, filtration, chlorination, flotation with FeCl₂, sedimentation, sand filtration, membrane filtration and others are being used together. In addition UV rays, titanium dioxide and hydrogen peroxide can be used. Between methods the use of active carbon and chlorination are the ones the most effective method. The effect of the toxins taken in the body in a very short period of time causes the toxication which results in death within 24 hours. Death occurs respiration paralysis.

Consumption of shellfish without considering hygiene conditions can cause poisoning and health

problems which can result in death. Because of toxins doesn't get degraded by processes such as heating, hygiene conditions should be considered before consuming a product. In high risk areas, risk assessment, tracing and control programs must be carried out.



COMPUTED TOMOGRAPHIC STUDY OF NORMAL STRUCTURE OF SWIM BLADDER AND PNEUMATIC DUCT IN COMMON CARP (*Cyprinus carpio*)
Omid Zehtabvar¹, Alireza Vajhi², Somaye Davudy Poor², Ala Enayati³, Amirparsa Azizi⁴, Fakhredin Borgheie⁴

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Common carp (*Cyprinus carpio*) is one of the most important species in aquaculture. So far, many studies have been conducted regarding different parts of the body of this fish.

One of the most important organs in fish is swim bladder and pneumatic duct. One of the best ways to evaluate the topography of air-filled organs is CT scan and a large variety of damages can be identified by using this technique.

In this study, five adult common carp were sent to the radiology department of the faculty of veterinary medicine, University of Tehran. After sedating, the fish were placed dorso-ventrally and all scans were obtained on a two detector scanner (Siemens Somatom Spirit), vertical to the longitudinal axes of the fishes. Suitable views were selected to reconstruct 3D, frontal and sagittal images.

Both swim bladder chambers, the isthmus between them and the pneumatic duct were distinguishable in images. Due to the high volume of gas in the swim bladder, lung pattern was used to reconstruct the images. Other patterns were used to take images, because soft tissues are not prominent in lung pattern method. Pneumatic duct connection with the swim bladder and esophagus were clearly distinguishable.

The Cyprinid swim bladder is divided into two chambers, a cranial chamber and a caudal chamber. Cranial chamber is elastic and can stretch, but the caudal chamber is inelastic. Pneumatic duct opens into the front of the caudal chamber. This organ is located in dorsocranial intracelomic space and has contact with most parts of the digestive system and urogenital system. The aim of this paper is to examine the characteristics of the normal condition of the swim bladder and pneumatic duct by CT scan.

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

More detailed information and applications for admission (due by January 15, 2018) are available on the web site www.aquavet.org.

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AQUATIC VETERINARY ABSTRACTS:**Aquatic Invasive Species: *Siganus***

Compiled by David Scarfe

Distribution patterns of the invasive herbivore *Siganus luridus* (Rüppell, 1829) and its relation to native benthic communities in the central Aegean Sea, Northeastern Mediterranean

By Sylvaine Giakoumi

Corresponding author; E-mail: sylvaine@aegean.gr

Marine Ecology; First published: 11 October 2013

DOI: 10.1111/maec.12059 [View/save citation](#)**Abstract**

The present study explores the distribution of the invasive herbivore fish *Siganus luridus* (Rüppell 1829) and its relationship to native herbivores and macroalgal assemblages in the shallow sublittoral of the Cyclades Archipelago, Aegean Sea, Greece. *In situ* underwater surveys of herbivore abundance (fishes and sea urchins) and algal coverage were carried out at 180 sampling sites in 18 islands. *Siganus luridus* accounted for 17% of the total herbivore abundance, with a decrease in relative abundance from the southeastern to the northwestern islands. In Santorini Island (in the southeast of the study area) *S. luridus* abundance accounted for 90% of the total herbivore fish abundance, while in Kea Island (at the northwestern limit of the study area), *S. luridus* was absent.

The spatial variation of minimum sea surface temperature is possibly the reason for its distributional pattern. *Siganus luridus* abundance was found to be positively correlated to the native herbivore *Sparisoma cretense* (Linnaeus 1758). A significant negative relationship was found between the abundance of the invasive species and the sum of erect and canopy algae cover (Dictyotales and *Cystoseira* spp.), which are the main components of its diet in the region. On the other hand, its occurrence was particularly high in barren sites. The results arising from this study reinforce evidence from studies in the Eastern Mediterranean Basin that the expansion of the invasive species *S. luridus* may have profound impacts on native communities in the Mediterranean infralittoral zone.

<http://onlinelibrary.wiley.com/doi/10.1111/maec.12059/full>**A novel marine bioinvasion vector: Ichthyochory, live passage through fish**

By Tamar Guy-Haim, Corresponding author

E-mail address: tamar.guy-haim@ocean.org.il

Orit Hyams-Kaphzan, Erez Yeruham, Ahuva Almogi-Labin, and James T. Carlton

Marine Ecology; First published: 15 May 2017

DOI: 10.1002/lol2.10039 [View/save citation](#)**Abstract**

Many species of Indo-Pacific holobenthic foraminifera have been introduced and have successfully established sustainable populations in the Mediterranean Sea over the past few decades. However, known natural and anthropogenic vectors do not explain how these species were introduced long distances from their origin. We present evidence for a novel marine bioinvasion vector explaining this long-distance transport and introduction using both contemporary field and historical analyses.

In 2015–2016, we found living specimens of 29 foraminiferal species in the fecal pellets of two Red Sea herbivorous rabbitfish—*Siganus rivulatus* and *Siganus luridus* in the Mediterranean. In our historical analysis, we found 34 foraminiferal species in preserved Red Sea rabbitfish specimens, dating between 1967 and 1975. In addition, we found congruent propagation patterns of the non-indigenous rabbitfish and foraminifera, lagging 4–11 yrs between discoveries, respectively. Predation of marine benthos by non-indigenous fish, followed by incomplete digestion and defecation of viable individuals, comprise the main introduction vector of these organisms into novel environments.

<http://onlinelibrary.wiley.com/doi/10.1002/lol2.10039/abstract>**Diet Adaptations of Lessepsian Migrant Rabbitfishes, *Siganus luridus* and *S. rivulatus*, to the Algal Resources of the Mediterranean Coast of Israel**

By B. Lundberg, D. Golani

Marine Ecology; First published: March 1995

DOI: 10.1111/j.1439-0485.1995.tb00395.x

Abstract

The composition of the algal diet of *Siganus luridus* was compared with that of the algal vegetation found in fish habitats along the Mediterranean coast of Israel. North-south differences in the diet were found and reflected differences in the available algal resources as well as in algal species selected.



In the northern area, the diet and the algal selection differed considerably between *S. luridus* and a congeneric Lessepsian migrant siganid, *S. rivulatus*, whereas in the southern area the two species showed similarity in feeding.

The diet partitioning in the Northern Mediterranean resembles that found in the Gulf of Elat, where the realized diet may be related to strong competition between herbivores in combination with availability of numerous edible algal species. There, the two siganids showed different preferences. In the Northern Mediterranean, competition is probably lower, since there are fewer herbivorous fish species, while numerous good algal habitats (rocky areas) enable selection. By contrast, rocky algal habitats are scarce in the southern area; this implies that the total amount of algae available to choose from is smaller there.

The similar diets and preferences in the southern part of the Mediterranean indicate scarcity of preferred food species, as the fishes fed mainly on small filamentous species of the algal turf on the bottoms.

Summary

The algae and seagrasses in gut contents of two Lessepsian migrants were analysed: *Siganus rivulatus* and *S. luridus* from both Red Sea and eastern Mediterranean locations. The quantitative and qualitative composition of the diet was compared to that of the algal and seagrass vegetation in four regions: the southern and northern basins of the Gulf of Elat and the southern and northern area in the Mediterranean along Israel's coast.

In the original environment of the fish in the southern basin of the Gulf of Elat, a variety of large brown algae as well as fleshy and soft red algae, green and blue-green algae and seagrasses inhabited the coral reefs and adjoining areas, all of which were accessible to the fish. There, *S. luridus* mainly fed on and selected large brown algae, while *S. rivulatus* mainly fed on and selected fleshy and soft red algae. In the Mediterranean, horizontal platforms at about sea level are covered with algae. The small tidal range makes these sites mostly inaccessible to grazing fish. In the submerged habitats where the fish fed, calcareous red algae dominated. In the southern area both siganids fed on and selected small filamentous algae as found in the algal turf. In the northern area *S. luridus* fed on and selected large brown algae, *S. rivulatus* on *Ulva* and fleshy red algae. The algal partitioning in the Red Sea disappeared in the southern area of the Mediterranean as an adaptation to the environment. It developed in the northern area probably due to the prevalent rocky areas with their algal habitats.

<http://onlinelibrary.wiley.com/doi/10.1111/j.1439-0485.1995.tb00395.x/abstract>

Know Your Fishes

Dusky spinefoot *Siganus luridus* (Rüppell, 1829)



Classification

Actinopterygii (ray-finned fishes) > Perciformes (Perch-like) > Siganidae (Rabbitfishes)

Etymology: *Siganus*: Latin, *siganus* = a fish, rabbit fish; by the similarity of the nose.

Environment / Range

Marine; reef-associated; depth range 2-40 m.
Subtropical; 35°N - 35°S

Distribution

Western Indian Ocean: Persian Gulf; Red Sea and East Africa to islands in the western Indian Ocean. Immigrant to Mediterranean via the Suez Canal.

Length

Max length: 30.0 cm TL ; common length : 20.0 cm TL

Short description

Dorsal spines (total): 13-14; Dorsal soft rays (total): 10; Anal spines: 7; Anal soft rays: 9; Vertebrae: 13. Regional variation in color exists. Anterior spines of median fins slender and pungent, posterior spines stout, all venomous including that on the nape. Preopercular angle 87-97 degrees. Anterior nostril with a long, broad flap covering posterior nostril when depressed. Variable cheek scalation. Midline of thorax devoid of scales between the pelvic ridges.

Biology

Found in small schools in very shallow water close to the bottom. Prefer hard bottoms of compacted sand with rock or coral debris. Solitary adults and groups of 3 or 4 adults have also been observed. Feed on a wide range of benthic algae. May suddenly stop and erect its fins (dorsal, anal and pelvic) presenting an encircling array of spines to potential predators; these spines are venomous.

Life cycle

The larvae maintain themselves near the water surface. Feeding on phytoplankton and zooplankton begins 3 days after hatching.

<http://www.fishbase.org/summary/4613>

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MSc in AQUATIC PRODUCTION AND VETERINARY HEALTH

City University of Hong Kong's School of Veterinary Medicine working jointly with the Institute of Aquaculture, University of Stirling, Scotland, is introducing an **MSc course in AQUATIC PRODUCTION AND VETERINARY HEALTH** in **SEPTEMBER 2017**. A team of experienced staff of aquatic veterinary medicine and higher education from Hong Kong and Scotland has created this MSc programme.

The programme covers professional subject areas such as:

- Aquatic Animal Biology and Health
- Aquatic Animal Production Systems
- Bacterial, Viral, and Parasitic Diseases
- Aquatic Animal Reproduction and Genetics
- Aquatic Animals in the Environment
- Aquatic Animal Nutrition
- Epidemiology and Health Control
- System Pathology
- Immunology
- Ecotoxicology

Principles of the science of **AQUATIC PRODUCTION AND VETERINARY HEALTH** are central to this programme. Graduates will have a thorough understanding of aquatic animals' needs, the environment they live in, various production systems and the relevant disease conditions that can occur. Graduates will be able to plan and deliver the best possible health outcomes. **For more details, please visit www.cityu.edu.hk/svm/links/msapvh.asp.**



About the MSc Programme

Location	: Hong Kong
Duration	: 1 year
Mode of Teaching & Learning	: Full time, face-to-face & thesis research project
Start Date	: September 2017

School of Veterinary Medicine

Remarks: This is an exempted course under the Non-local Higher and Professional Education (Regulation) Ordinance of the HKSAR (Ref. No 452723). It is a matter of discretion for individual employers to recognise any qualification to which this course may lead.

Enquiry : svmenquiry@cityu.edu.hk
 Telephone : 852 3442 6361
 Fax : 852 3442 0589



Major shark die-off in San Francisco Bay

By **Paul Rogers**, Bay Area News Group
05/13/17, Excerpt

Scientists suspect leopard sharks that washed up on shore are being killed by a fatal brain infection linked to a fungus that may have been spread around by the huge amounts of rain California received this year. The historic storms also reduced the bay's salinity in ways that could have weakened the sharks, some researchers say.

The die-off has probably killed as many as 1,000 leopard sharks since early March, experts say, because the animals sink to the bottom of the bay when they die in the open water.

"They appear to be stranding themselves," said Joshua Porter, a marine biologist with the East Bay Regional Park District. "Park users have pushed them back in the water, but in reality they are going to die, or work their way back to the sand. When they beach themselves, there's no coming back."

Mark Okihiro, senior fish pathologist with the California Department of Fish and Wildlife, collected 26 dead leopard sharks two weeks ago near Foster City and Redwood Shores, found a fungus that appears to have invaded the sharks' bodies through their noses and ducts in their heads.

It's possible that the fungus bloomed during the drought as shallow sloughs, lagoons and channels stagnated, Okihiro said. All that new fresh water also could have disrupted the sharks' health on its own, said Jim Hobbs, a research scientist at UC Davis who has studied the bay's leopard sharks for the past seven years.

When leopard sharks get too much fresh water, their kidneys stop functioning, their immune systems fail and their breathing is limited, he said.

Normally the sharks would swim toward saltier water, Hobbs said. But this year's massive storms so dramatically changed the bay chemistry and created strong currents that many sharks may have become disoriented and trapped in the more toxic shallow waters, he said.

Cloern predicted the leopard shark population will recover fairly quickly. But others working on the issue say even if that occurs, the die-off raises big questions about whether bayfront communities should rescue sharks trapped behind tidal gates and the role human pollution is playing in contributing to the fungal blooms.

For full article, go to:

<http://www.santacruzsentinel.com/environment-and-nature/20170513/major-shark-die-off-in-san-francisco-bay>

Somewhere Beyond the Sea, Meet the Betta Fish of Boston College

by **Shannon Kelly**
January 29, 2017, Excerpt



Featured Image by Shannon Kelly / Heights Editor

Boston College's newest residents have arrived in the dorms, and though they're small, they are much more welcome than the occasional mouse. In keeping with BC's rules that no pets (besides service animals) are allowed to live with students except for tropical fish in tanks fewer than 20 gallons, students are making tiny additions to their on-campus families.

Take Horsey, for example. Despite its name, Horsey is a pink betta fish that lives in Fitzpatrick with Taylor Chodash, MCAS '20, and Meghan Boyer, LSOE '20.

"We got out of Michael's, and we see a Five Guys and a PetSmart, and me and Meghan looked at each other and just smiled," Chodash said.

On an impulse, the two walked into the store and examined the pets for sale. They walked out a few minutes later with a \$5 fish, a small tank, and pellets for food—roommate agreements be damned.

The roommates have attempted to introduce a Pavlovian response in Horsey by ringing a bell whenever they give him his pellets. While he doesn't comprehend their training methods, Horsey is better than man's best friend. In fact, he's better than any man at all.

The benefits of fish in dorms range from therapeutic responsibility to a certain "it factor" that draws people to a room.

Benjamin hopes to add more fish and acquire a bigger tank—still under the 20-gallon limit, of course.

"I think BC should be more pet-friendly overall," Benjamin said. "I'd like to see every room be given a pet fish."

For full article, go to:

<http://bcheights.com/2017/01/29/bc-betta-fish/>

Pelicans Continue to Die in St. Petersburg, Florida
By **Craig Pittman**

Tampa Bay Times Staff Writer
January 26, 2017, Excerpt

The latest report on pelicans found sick and dying around the city says dead birds continue to turn up but so far scientists still don't know what's killing them.

"To date we have confirmed reports of at least 70 dead or ill brown pelicans and at least one white pelican," said the report from the Florida Fish and Wildlife Research Institute in St. Petersburg.

Reports about the dead birds have been pouring in since Jan. 11. Most of the birds were found around Coffee Pot Bayou, Bayou Grande and the Riviera Bay development's lake, but the most recent one found was a decomposing brown pelican found by Albert Whitted Airport.

Low levels of toxins from an ongoing Red Tide algae bloom were detected in the bodies of some of the dead pelicans, "demonstrating some exposure," the report noted. "These results are inconclusive, neither confirming nor ruling out Red Tide as the cause of death."

Some bird advocates fear what's going on could be linked to St. Petersburg's recent sewage crisis, when the city release tens of millions of gallons of waste into Tampa Bay during last year's storms. So far, though, there is no evidence of a connection.

About 30 birds that were ill were treated by the Seaside Seabird Sanctuary, and the Owl's Nest Sanctuary. The birds were weak or even paralyzed, and some, as they recovered from those symptoms, displayed some disturbing new symptoms such as blinding cataracts.

Some of the symptoms the survivors displayed could match a diagnosis of poisoning by Red Tide, a toxic algae that has stunk up Florida's beaches with fishkills for centuries.

Small, scattered colonies of the microscopic algae *Karenia brevis* — named for retired St. Petersburg biologist Karen Steidinger, who spent decades studying it — live in the Gulf of Mexico all year long. Usually they cause no problems.

But every now and then, the algae population offshore explodes into something called a bloom in which the algae multiplies rapidly and spreads. The expanding bloom stains the water a rusty color that gives the creature its name.

For full article, go to:

<http://www.tampabay.com/news/environment/wildlife/pelicans-continue-to-get-sick-and-die-in-st-petersburg-but-why-is-a-still/2311003>

The fanged, faceless sea creature that washed ashore during Harvey has been identified
By **Lindsey Bever**

Washington Post, Speaking of Science
September 14, 2017, Excerpt



A sea creature identified as a possible a fangtooth snake-eel on a beach in Texas City, Tex. (Preeti Desai)

After high winds and heavy rains brought by Hurricane Harvey, a mysterious sea creature with fangs and no face washed up on the shoreline in southeastern Texas — giving the Internet a challenging task: to identify it.

Preeti Desai, social media manager at the National Audubon Society, posted pictures of the critter on Twitter, asking, "What the heck is this??"

Desai, who said she had accompanied conservationists assessing the damage from the storm, spotted the creature on a beach in Texas City, about 15 miles from Galveston. She said someone suggested that she contact Kenneth Tighe, a biologist with the Smithsonian National Museum of Natural History. Tighe, an eel expert, told Earth Touch News that the creature was most likely a fangtooth snake-eel, or *Aplatophis chauliodus*.

Fangtooth snake-eels live in burrows 100 to 300 feet down in waters stretching from the Gulf of Mexico to French Guiana, "with only snout and eyes exposed, darting out to feed on other fishes and crustaceans," according to FishBase.org, an online database for fish species.

Other possibilities? *Bathyrcongus vicinus* or *Xenomystax congroides*.

"All three of these species occur off Texas and have large fang-like teeth," Tighe told Earth Touch News. "Too bad you can't clearly see the tip of the tail. That would differentiate between the ophichthid and the congrid."

For full story, see:

https://www.washingtonpost.com/news/speaking-of-science/wp/2017/09/14/the-fanged-faceless-sea-creature-that-washed-ashore-during-harvey-has-been-identified/?utm_term=.341c8aa402f0&wpsrc=nl_sb_smartbrief



MEETINGS OF INTEREST TO AQUATIC VETERINARIANS

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

Aquaculture Europe 2017

October 17-20, 2017
Dubrovnik, Croatia

EAS and our Aquaculture Europe 2017 event will be held in Dubrovnik, Croatia from October 17-20, 2017. See the AE2017 brochure at:

http://www.easonline.org/images/stories/Meetings/AE2017/AE2017_flyer_web.pdf



In addition to the thematic sessions, AE2017 also includes parallel and poster sessions, on various topics, e.g. mollusc aquaculture, nutrition: novel feed ingredients, Phytoplankton and seaweed for food and feed, fish welfare, etc.

To find out more and register, please click :
<https://www.aquaeas.eu/>

Kind regards,
Alistair Lane - Executive Director,
European Aquaculture Society

AQUACULTURE AMERICA 2018

February 19-22, 2018
Las Vegas, Nevada, USA

This session is intended for Veterinary Continuing Education. Veterinarians attending will receive a veterinary CE certificate of participation. Of particular interest are presentations dealing with programs, services and tools that enhance aquatic veterinary practice, and fulfill aquaculture industry's and client's needs for increase production, profits and meeting regulatory requirements.

Submit an abstract on-line through WAS.org

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