

# National Shellfisheries Association Quarterly Newsletter



Est. 1908

2016 (2)

## President's Message



I hope you are having an enjoyable and productive Summer season (winter in the Southern hemisphere!) – I certainly am, but I'm also dismayed that there are only 4 weeks until the start of Fall semester at my university. Where does the time go?? The past few months

have been busy and productive ones for NSA with a lot of behind-the-scenes activity. Sandy Shumway and colleagues have been working diligently to put together the program for our next annual meeting to be held March 26-30, 2017 in Knoxville, TN. LeRoy Creswell and Noreen Blaschik continue their efforts to produce excellent and informative issues of the *Quarterly Newsletter*. Chris Davis and John Scarpa continue to manage the Association web presence and financial services, respectively. Sandy Shumway continues to work her magic producing the award-winning *Journal of Shellfish Research*, and Linda Kallansrude keeps the membership database up-to-date, answers a steady stream of queries, and sends out the JSR invoices and then chases payment – a lot of behind-the-scenes effort that keeps NSA going. Why am I calling out these particular efforts? Simple answer: NSA is a year-round operation with a six-figure operating budget. Since we meet just once per year it is easy to forget that many, many efforts continue throughout the year. Interested in helping? Send me an e-mail (Karolyn.Hansen@udayton.edu) or better yet, call or text me: 937-901-0593. Yes, I really just put my cell number on the front page of the *QNL*. Wink, wink...use it!

It is always a pleasure to recognize the efforts of our student members – and we have plenty to recognize in this issue. Two students were selected for the 2016 Nelson Award for Outstanding Oral Presentation at the annual meeting in Las Vegas: Evan Durland and Melissa Pierce. DJ Kleppel's poster was selected for the 2016 Gunter Poster Award. Maria Rosa and Katherine Silliman report on their research that is funded by the Carriker Student Research Grant. We have three (3!) Student Research Grants that each provide US\$1250 for research efforts – the Melbourne Carriker Award, the Michael Castagna Award, and the George Abbe Award. But you have to apply to be selected and awarded the funds – please note that the deadline is November 1 annually, so start putting your applications together now.

The EXCOM is focusing on three core efforts this year: membership, improved member services, and revision of our Strategic Plan. As a way to kick-start our membership campaign we

are sponsoring a membership contest: recruit 10 new members and receive a free registration for the Knoxville meeting. What a great deal! The improved member services effort is focusing on developing a streamlined web interface, hassle-free membership renewal, and hassle-free abstract submission and meeting registration. Our Strategic Plan is being reviewed by a core group of Past-Presidents under the outstanding leadership of Lou D'Abramo, who was President of NSA when the first Strategic Plan was published in 2009. We'll have more info on these efforts in upcoming issues of the *QNL*.

So yes, the third quarter of 2016 has been a productive one for NSA. The fourth quarter promises to be just as busy with annual meeting activities (abstract submission, meeting registration, student travel award applications), nominations for the Honored Life Member, Bourne-Chew, and Wallace Awards, and submission of Student Research Award applications. *Busy* is good, *productive* is sublime.

**Karolyn Hansen, President**

## NEW MEMBER CAMPAIGN IS UNDERWAY

You can earn a free registration for the Knoxville meeting by recruiting 10 new members to the NSA. It's easy, just takes a little initiative and power of persuasion. We all work with colleagues who are not members of the NSA - convince them to join! Be sure that your students are all members. If you are willing to take promotional materials to other conferences, we can provide you with advertising material, membership brochures, back issues of the Newsletter and *JSR*. They can be shipped for you, nothing to carry. As you recruit, be sure to notify Linda Kallansrude so that she can keep track of who gets credit for the new members. (And Sandy has agreed to keep recruiting, but not to participate in the contest).

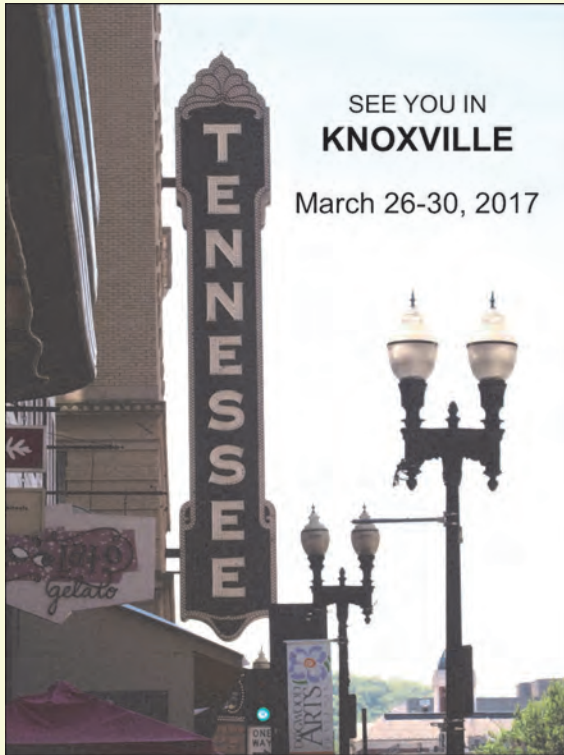
### *In this issue:*

- *Knoxville update*
- *2015 Melbourne Carriker Student Research Grant Updates*
- *2016 Nelson and Gunter Awardees*

# NSA is going to Knoxville, TN in 2017

— Mark your calendars —

Plans are underway for the 2017 annual conference in Knoxville, Tennessee  
**March 26 - 30, 2017**



Knoxville is a great location, easy access by plane or car, and the hotel and staff are fantastic. It's located a short walk away from downtown Knoxville and Market Square - lots of pubs and restaurants. For those who don't feel like walking, there's a trolley that runs from the hotel every 15 minutes during the day. The link for reservations is live on the NSA Web page, make your reservations early. A limited number of government-rate rooms are available on a first-come-first served basis.

Special sessions are already planned on physiology; emerging contaminants; larval shells; disease; modelling; food security, nutrition and aquaculture; apple snails; genetics; materials science; mussels, and Down on the Farm. A list of sessions and organizers is posted on the website. There will be plenty of space for contributed papers and there is still time to get on board to organize a special session. The meeting will feature all of the regular activities including the President's Reception, student breakfast, SEF Auction, business luncheon, and poster sessions (with happy hours). This is your meeting. If there are topics you would like to see included, or if you are willing to organize a session, get in touch with Sandy Shumway.

It's also worth considering a few extra days to explore the local history, the Knoxville Botanical Garden, the zoo, or take a drive to Asheville and the Great Smoky Mountains, or even Dollywood.

All signs are pointing to an exciting meeting in a new location - we are hoping to see record attendance!

*Sandy Shumway, NSA Conference Manager*

**ABSTRACT DEADLINE:  
DECEMBER 1, 2016**

**WANT A FREE REGISTRATION?**

Recruit 10 new members for NSA and it's yours. As you recruit, be sure to notify Linda Kallansrude ([lindajk@optonline.net](mailto:lindajk@optonline.net)) so she can give you credit.

Watch the web page for registration to open.



# 2015 Melbourne Carriker Student Research Grant Update

**Awardee: Katherine Silliman**  
University of Chicago

*“Population genomics and phylogeography of the Olympia oyster (*Ostrea lurida*)”*

Understanding the adaptive and demographic processes that drive population structure is crucial for predicting how species will respond to rapid global environmental change. The Olympia oyster (*Ostrea lurida*) is patchily distributed from California to the central coast of Canada, extending over strong environmental clines and mosaics that are typically considered necessary for local adaptation to occur; however, before testing hypotheses of adaptation, the underlying demographic population structure must be described.



By looking at the spatial distribution of genetic variation, one can determine the degree and scale over which populations are on evolutionary independent trajectories. This pattern could be consistent with a null model of no significant population structure, a continuous isolation-by-distance (IBD) model where the closer populations are spatially the more genetically similar they are, or instead show regional blocks of genetic similarity that correspond to physical barriers. I hypothesized that, by using thousands of genetic markers derived from a high-throughput sequencing approach, evidence of regional population structure and IBD will be observed across the range of the species.

During the summer of 2014, I and collaborators collected adductor tissue samples from ~25 individuals at each of 20 sites from Klaskino Inlet, Vancouver Island (50° 17' 55") to San Diego Bay, CA (32° 36' 9"). DNA from these samples was used to construct Genotype-by-Sequencing libraries (GBS). GBS is a reduced-representation genome sequencing technique, where a restriction enzyme digests genomic DNA and unique "barcodes" are ligated to the fragments for identification after multiplexed sequencing. The Carriker Grant was instrumental to the completion of my project, as it helped fund one of my early sequencing runs and provided me with preliminary data to use in a subsequent successful grant application for a NSF Doctoral Dissertation Improvement Grant.

As of April 2016, I have sequenced 270 samples across 7 Illumina HiSeq lanes, including technical replicates and 15 samples of the southern species *Ostrea conchaphila* provided by Doug Eernisse at California State University - Fullerton. In a preliminary analysis of 1983 polymorphic markers sequenced in 200 individuals, a Mantel test using *Fst* and water distance rejected the hypothesis of pure isolation by distance. Using a new method to visualize spatial population structure called EEMS (Estimated Effective Migration Surfaces), I have identified two areas where genetic similarity decays very quickly with distance- indicating potential barriers to gene flow. One phylogeographic divide is found between Puget Sound, WA and Willapa Bay, WA and the other is at San Francisco Bay, CA. Although this method cannot distinguish between different scenarios that could produce the observed spatial structure, it supports the rejection of both a continuous IBD model and the null model of no significant genetic structure.

With the last of my GBS samples sequenced and the completion of an *O. lurida* genome funded by the Steven Roberts lab (UWashington) in the spring of 2016, I will assemble a larger dataset of confidently genotyped genetic markers for analysis. These data will also be used to identify genomic regions potentially involved in local adaptation. This characterization of the demographic and adaptive genetic population structure in the Olympia oyster will be the first chapter of my doctoral dissertation. For subsequent chapters, I am conducting common garden experiments at the K. K. Chew Center for Shellfish Research and Restoration in Washington to test for local adaptation across a range of spatial scales. This summer I will be comparing resilience to ocean acidification conditions in larvae of broodstock from San Francisco Bay, CA, Coos Bay, OR, and Ladysmith Harbor, BC, so stay tuned!

## SAVE THE DATE



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## ***Nominations Sought Honored Life Member, David H. Wallace, and Bourne-Chew Awards***

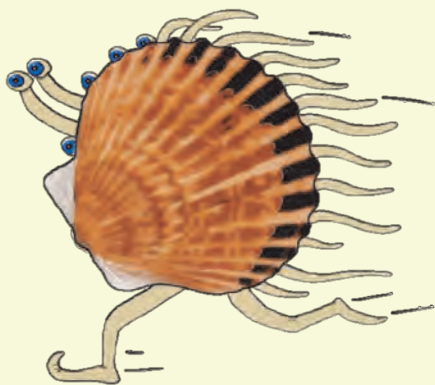
The National Shellfisheries Association offers three major awards. The Honored Life Member Award is given to individuals who, by their exemplary service to the Association or to the profession, deserve recognition. The David H. Wallace Award is given to individuals whose activities in shellfisheries, aquaculture and conservation have promoted understanding, knowledge, and cooperation among industry members, the academic community, and government, as exemplified by Mr. David H. Wallace during his lifetime. The Bourne-Chew Award is in recognition of an individual whose actions demonstrate the principles in shellfisheries aquaculture, education, outreach, and extension exemplified by Drs. Neil Bourne and Ken Chew during their lifetime in mentoring, teaching, researching, and promoting understanding and knowledge among industry members, the academic community, and government. Recipients of these awards receive a plaque and lifetime membership in the Association.

Nominations for these awards should be carefully considered by those making the nomination. The awards are intended for truly deserving individuals, are prestigious to the individual receiving the award, and important to NSA and our long history. Initial nominations are reviewed prior to forwarding to a Committee of Past-Presidents for consideration. Nominations may then be forwarded to the NSA Executive Committee for final consideration. For more information on these awards, visit the NSA website ([www.shellfish.org](http://www.shellfish.org)).

***Nominations of individuals for these awards should be forwarded to Chris Davis, Chair of the NSA Awards Committee by **November 1, 2016.*****

## **The Scallop Gallop**

**NSA 5K in Knoxville  
Watch for details**



## **Student Research Grant Application Deadline: *November 1<sup>st</sup>***

It may seem as though the deadline for applications for three student research grants offered by the National Shellfisheries Association is a long way off, but it will approach before you know it! The Melbourne R. Carriker Student Research Grant supports promising basic research in the area of shellfish, while the Michael Castagna Student Grant for Applied Research supports applied areas of research in shellfish and aquaculture. The George R. Abbe student grant supports research specific to crustacean biology and fisheries management. All of these competitive grants help cover the costs of conducting research in an era of dwindling financial resources. Students are strongly encouraged to apply for these awards. The process is relatively painless and the potential rewards are great! Students may apply for all the awards, but must submit separate applications that highlight appropriate aspects of their research for each. An applicant must be a NSA student member in good standing at the time of application and currently enrolled as a M.S. or Ph.D. student in a recognized, degree-granting institution. Students may not apply for an award they have received previously. The deadline for applications is **November 1<sup>st</sup>, 2016.**

Recipients of Carriker, Castagna, and Abbe Awards are encouraged to present the results of their research at an annual meeting of the Association and are required to write a synopsis of their research for the *NSA Quarterly Newsletter*. These awards provide students with \$1,250. The funds are intended for the purchase of supplies and equipment essential to perform their research, and are not intended to enable purchase of general items, such as computers, or to fund travel expenses associated with attendance at professional meetings. The good news is that students can apply for travel support through the NSA Student Endowment Fund.

To apply for the Castagna, Carriker, or Abbe Awards, send the following as a single pdf file to Past President, Chris Davis ([cdavis@midcoast.com](mailto:cdavis@midcoast.com)):

- Cover sheet with the applicant's name, professional address, phone number, email address, thesis title, degree being sought (M.S. or Ph.D.), date they entered the graduate program, and anticipated graduation date.
- Project description - 2-page limit plus one page for figures (if needed). Note, any literature cited is not included in the 2-page limit.
- Budget (1 page) - Briefly itemize how the award will be spent (e.g., \$300 for micropipette supplies, \$200 for histology supplies, etc.).
- Resume (1 page) - List educational background, awards/honors, presentations at meetings, and any publications.
- Letter of endorsement (1 page) - The student's major advisor must provide a succinct letter of support commenting on the student's research and confirming that the funds are necessary.

Applicants will be notified of the status of their application by **January 15, 2017** and awards presented at the Annual **Business Luncheon in Knoxville, TN. Additional details are available online at [www.shellfish.org/grants.htm](http://www.shellfish.org/grants.htm).**

***Chris Davis, NSA Awards Committee***

# 2015 Melbourne Carriker Student Research Grant Update

**Awardee: Maria Rosa  
University of Connecticut**

*“Assessment of the presence of an active selection mechanism in the regulation of particle selection by suspension-feeding bivalve molluscs”*

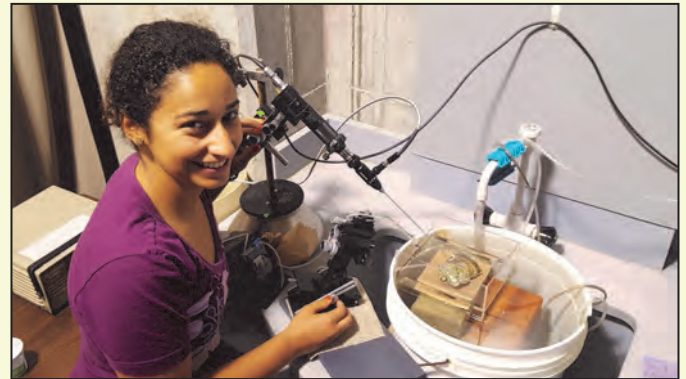
Suspension-feeding bivalve molluscs are some of the most important near-shore species, often dominating the macrobenthos and contributing significantly to the benthic food web structure. These contributions are affected by their ability to ingest particles selectively, rejecting some matter and depositing in the benthos as undigested material. This pre-ingestive sorting process has been extensively studied for the last 60+ years to determine what types of particles, including microalgae and detritus, these organisms select. My doctoral dissertation work has attempted, through various projects, to better understand the mechanisms of particle retention and selection in suspension-feeding bivalve molluscs.

The project supported by the Melbourne Carriker Research Award examined whether this selection mechanism is controlled actively. Active selection, if present, would depend on an immediate physiological response of feeding organs to stimuli (Ward & Shumway 2004). This project assessed experimentally the presence of active selection of particles by determining if soluble phytoplankton metabolites can elicit a chemosensory response by gill cilia. While the role of gill cilia in particle capture, transport, and sorting by bivalves, and its response to both environmental and chemical cues is well documented, thus far a mechanism for an active physiological response to different food types has not been identified. Active particle selection would likely be elicited by the frontal cilia due to their direct involvement in particle transport. This study tested the null hypothesis that there is no response by the frontal cilia of gill filaments to dissolved metabolites.

To examine the response of the frontal cilia to different cellular moieties, I developed a confocal microscopy method to study the ciliary activity of isolated gill sections from several species of bivalves. Preliminary studies using this method and isolated gill segments of the ark *Anadara ovalis* demonstrated a capacity for bidirectional transport of captured particles on the gill. Synthetic particles directly delivered to the gill were transported ventrally, indicating a bulk rejection of non-nutritious particles. Cells of *Tetraselmis chuii* (nutritious) directly delivered to the gill were transported dorsally, where particles are generally ingested. This transport was the same regardless of which particles were delivered to the gill first, suggesting either a chemical cue or that the physicochemical properties of the particles affect the direction of particle transport. These methods were further adapted for microscopic and endoscopic observations of particle capture and transport by *C. virginica* and *A. ponderosa*.

Endoscopic observations of particle movement demonstrate that transport by gill frontal cilia is within micrometers of the frontal surface (< 5  $\mu\text{m}$ ), so changes in beat angle or frequency would translate to changes in particle movement (Ward 1996). The rate and beat angle of frontal cilia of *C. virginica* and *A.*

*ponderosa* gills were examined to determine if such a response occurs and influences particle sorting. The gill was isolated and mounted on a Stovall flow cell<sup>®</sup> filled with isotonic, artificial seawater. Changes in beat and frequency of cilia were analyzed directly (frame by frame) under a compound microscope by tracking the movement of delivered microspheres to the gill before and after dissolved extracellular metabolites and cell extracts are introduced separately. The dissolved extracellular metabolites (exudates) of *T. chuii* were prepared by filtering suspensions through 0.8 $\mu\text{m}$  filters with gentle vacuum (Ward and Targett, 1989; Gainey and Shumway, 1991). Intracellular compounds were extracted by freezing and sonicating monocultures of phytoplankton cells. Additionally, two specific neoglycoproteins of interest (D-mannose and N-acetylglucosamine) were covalently coupled to carboxyl particles using a commercially available PolyLink Protein Coupling Kit (Polysciences, Inc.). These carbohydrates have been implicated in physicochemical signals affecting particle sorting in bivalves. The use of these complimentary methods (bulk metabolites vs. targeted sugars) allowed a more precise measure of the role of chemical cues in eliciting a potential active response in particle capture and transport. Experiments were repeated *in vivo* using endoscopic observations of the gill (Ward et al. 1993).



Results of the bulk metabolite experiments have shown that the addition of the exudates or extracts of *T. chuii* cells had no significant effect on particle transport. There were no differences in the number of particles moving dorsally or ventrally between the control assays and the experimental treatments. Further, no changes to particle transport were observed on the frontal surface of the gill, indicating that the metabolites did not affect ciliary movement. Results of the experiments with the targeted sugars demonstrated that particles coated with D-mannose were rejected (transported to the ventral margin), whereas particles coated with N-acetylglucosamine were generally ingested. Together, these findings further demonstrate that specific physico-chemical properties of particles, and not an active physiological response, mediate particle selection in bivalves. Namely, the interaction of the particle surface with the mucus constituents determined particle fate. A manuscript outlining these findings is currently being drafted for submission, stay tuned!

**(Editor's note: Congratulations to Maria who received an NSF Post-doctoral Fellowship to study at Stony Brook University beginning in September, 2016)**

## ***In Memoriam:*** **Junda Lin (1960 – 2016)**

It is with a heavy heart for many of us to hear that professor Junda Lin (PhD, University of North Carolina, Chapel Hill) passed away on March 2.

Professor Lin was a long-time member of the *Journal of Shellfish Research* Editorial Board, and was always very generous with his time and assisted many authors whose first language was not English. He was also an associate editor for the *Journal of World Aquaculture*. Junda was a



postdoctoral fellow at the Smithsonian Environmental Research Center and was a biostatistician for Texas Parks and Wildlife Department before joining in 1991 the faculty at Florida Institute of Technology in Melbourne, Florida, where he focused on aquaculture, biology, and conservation for marine ornamental species. Junda was a talented lecturer and a popular mentor to his legion of graduate students. For years we mentored graduate students conducting research on the reproductive biology and culture of marine ornamental shrimp and other crustaceans.

In every conversation he had there was a smile and laugh that was uniquely his. We will miss his friendship, camaraderie, and professionalism.

***LeRoy Creswell***

## **70<sup>th</sup> Annual Shellfish Conference** **October 10 – 14, 2016** **Chelan, WA**

Conference attendees include shellfish growers, suppliers, service providers, researchers, academicians, government agencies, environmental organizations, and students.

Register at <http://pcsga.org/annual-conferences/>



## **2016 Thurlow C. Nelson and Gordon Gunter Student Presentation Awards**

More than 20 NSA student members presented their research at the Aquaculture 2016 meeting in Las Vegas and they all did a terrific job. We would like to thank them all for their hard work and recognize a few outstanding presentations. Congratulations to the award winners, who each receive a 2-year NSA membership and a certificate noting the achievement.

**The Thurlow C. Nelson Award** is given for an outstanding oral presentation of research that represents a distinctive and valuable contribution to shellfisheries science. The Award is named after the distinguished shellfish biologist who served as NSA President from 1931-1933 and contributed more than 125 papers, many relating to oyster biology. This year two students gave equally excellent presentations and were presented with a Nelson Award.



Evan Durland, Oregon State University, was recognized for his presentation: "Breeding Pacific oysters *Crassostrea gigas* for resilience to changing ocean conditions."



Melissa Pierce, University of Connecticut, presented her study entitled "Bivalves maintain a core gut micro biome: seasonal trends and species variation."



**The Gordon Gunter Award** is given for an outstanding poster presentation of research that represents a distinctive and valuable contribution to shellfisheries science. This award recognizes the important and essential role of poster presentations as a vehicle for research communication. This year a Gunter Award was presented to Donald Kleppel, University of Dayton, for his poster entitled "Distribution of L-DOPA-containing proteins involved in oyster shell formation."

We are very grateful to the NSA members who volunteered to serve as judges for the student presentations. It is only with your support and dedication that we run a successful presentation award competition each year. THANK YOU!

Finally, we would like to thank Stan Allen for his many years of service on the Student Endowment Fund Awards Committee. His strong commitment to supporting NSA student members was evident in his tireless efforts to recruit judges for the awards and in his fantastic, organized, and colorful judging spreadsheets. He elevated the tallying of scores and computing of results to a new level. Lisa and I will miss our third committee co-chair, but we look forward to working with Stan on other NSA projects in the future.

***Nature McGinn & Lisa Milke, Endowment/Student Awards Committee***

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## Upcoming Events

**70<sup>th</sup> Annual Shellfish Conference (PCSGA/NSA-PCS):** October 10-14, 2016. Chelan, Washington (USA). For more information, visit: <http://pcsga.org/annual-conferences/>

**16<sup>th</sup> International Conference on Shellfish Restoration:** November 16 –19, 2016. Charleston, South Carolina (USA). For more information, visit: <http://scseagrant.org>

**Northeast Aquaculture Conference & Exposition 2017:** January 11-13, 2017. Providence, Rhode Island (USA). For more information, visit: [www.northeastaquaculture.org](http://www.northeastaquaculture.org)

**109<sup>th</sup> NSA Annual Meeting:** March 26-30, 2017. Knoxville, Tennessee (USA). For more information, visit: [www.shellfish.org](http://www.shellfish.org)

**21<sup>st</sup> International Pectinid Workshop:** April 19-25, 2017. Portland, Maine (USA). More information available soon.

**110<sup>th</sup> NSA Annual Meeting:** March 18-22, 2018. Seattle, Washington (USA). For more information available soon, visit: [www.shellfish.org](http://www.shellfish.org)

If you would like to announce a meeting, conference, workshop, or publication that might be of interest to NSA members, please contact the *QNL* Editor, LeRoy Creswell ([creswell@ufl.edu](mailto:creswell@ufl.edu)).

For more information on these conferences:  
[www.was.org](http://www.was.org)

**Aquaculture Europe 2016:** Sept. 20-23. Edinburgh, Scotland

**LAQUA 16:** Nov.8 - Dec.1. Lima, Peru

**Aquaculture America 2017:** Feb. 12-22. San Antonio, Texas, USA

**World Aquaculture 2017:** Jun. 27-30. Cape Town, South Africa

**Asia Pacific Aquaculture 2017:** Aug. 26-29. Johor Bahru, Malaysia

**Aquaculture Europe 2017:** Oct. 16-20. Dubrovnik, Croatia

**Aquaculture America 2018:** Feb. 19-22. Las Vegas, Nevada, USA

**AQUA 2018:** Aug. 25-29. Montpellier, France

**Aquaculture 2019:** Mar. 6-10. New Orleans, Louisiana, USA

**Aquaculture 2022:** Feb. 27-Mar. 3. San Diego, California, USA

**Aquaculture America 2023:** Feb. 19-22. New Orleans, Louisiana, USA