

# National Shellfisheries Association Quarterly Newsletter



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## President's Message



I invite you to delve deep into this edition of our *Quarterly Newsletter*, which is full of useful information. Many thanks to the *QNL* Team, Editor, Steve Allen and Associate Editor, Noreen Blaschik Favreau, and our contributors for providing articles, insights, and updates for all members.

In light of current trends emphasizing the integration of scientific research with sustainable practices, the connections created among National Shellfisheries Association members provide invaluable opportunities to advance knowledge and enhance sustainability of marine ecosystems. It is imperative that we continue to bring young scientists into our field, fostering the next generation of researchers who will carry forward our mission. The NSA offers several research grant awards that provide \$1,250 each to support student research. See page 6 and 'The Recruits' column for more details.

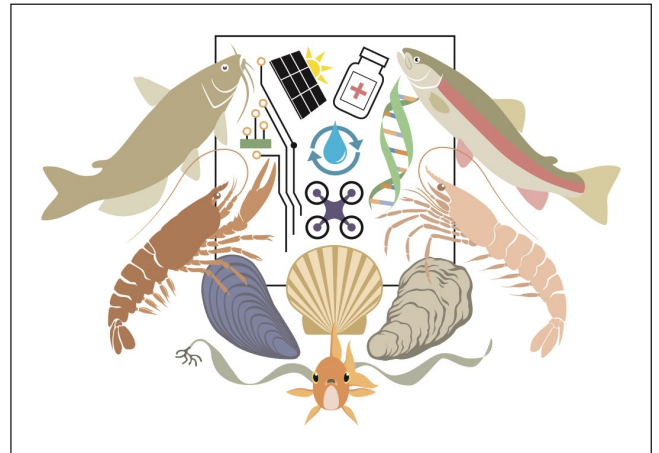
We must also take a moment to honor legendary researchers like Clyde L. MacKenzie, Jr. (page 3) who dedicated his career to marine fisheries. His work laid a sturdy foundation for many researchers, propelling us toward new discoveries.

Be sure to share what you are learning as you continue your work this fall. Send your papers for publication in the *Journal of Shellfish Research*.

Make plans to attend Aquaculture 2025 in New Orleans next March and submit your abstracts. As the fall gets underway, let us continue to collaborate with each other to conduct robust research and advocate for continued investment in the marine sciences. Thank you for your continued dedication to shellfish research and management.

Yours in service,  
**Aswani K. Volety, President**  
UNCW Chancellor

## AQUACULTURE 2025



**New Orleans, Louisiana**  
**March 6-10, 2025**

**Abstract Deadline:**  
**September 30, 2024**

<https://www.was.org/meeting/code/AQ2025>

### In this issue:

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# 2023 Michael Castagna Student Research Grant Update

**Awardee: Lexi Mitchell**  
**College of Charleston**

*“Understanding reproductive development in female white shrimp, *Penaeus setiferus*, in support of sustainable fisheries management”*

One of the tools the South Carolina Department of Natural Resources (SCDNR) uses for the sustainable management of the white shrimp fishery is the opening and closing of State waters to commercial trawling. White shrimp begin spawning offshore in the spring of each year when water temperatures begin to warm along the southeastern U.S. coast, and the decision to open the shrimp season relies on estimates of female spawning activity. These estimates help determine when a sufficient portion of the population has spawned to support the next crop of shrimp. The SCDNR research staff collect data on white shrimp reproduction based on macroscopic observations of ovarian development such as ovary color and ovary size. These macroscopic assessments, however, have many limitations. One shortfall is that the post-spawn stage is difficult to distinguish from the early developing stage because of similarities in size and color of the ovary, thus generating doubts in the reliability of observations of spawning activity. With management of the commercial fishery relying on accurate assessments of female reproductive development, higher resolution is needed to provide more detailed biological data in support of a well-informed decision-making process.

For my Master’s thesis project, female white shrimp *Penaeus setiferus* reproductive development and spawning activity were characterized as observed both macroscopically and microscopically. Microscopic assessments through histology provide a more comprehensive understanding of reproductive development than macroscopic assessments alone and have been used extensively for management of commercially important fish species. The determination of spawning status is especially important for fisheries management and is made possible through the detection of atretic oocytes, or oocytes that were not ovulated and have begun degenerating. By conducting these high-resolution microscopic assessments in coastal South Carolina, it was possible to describe the timing of development and spawning within a single spring spawning season in great detail. Then, using the results of microscopic observations of spawning activity, the accuracy of macroscopic observations of spawning activity was evaluated by comparing microscopic indicators of spawning with macroscopic indicators of spawning. This comparison will help to inform the development of improved methodologies for observations of female white shrimp reproductive development and spawning activity to inform management of the commercial fishery.

During the 2022 spring spawning season, 520 female white shrimp were collected, and ovarian development was evaluated both macroscopically and microscopically for each individual. Macroscopic ovarian development stages, stages 1-5, were collected using existing methods based on observations of ovarian tissue size and color. Tissue samples were then processed through standard histological procedures, and slides were read to determine microscopically observed ovarian development stage based on oocyte characteristics such as oocyte type and prevalence. In-depth examination of oocyte

characteristics allowed for the development of a standardized template for differentiation of development stages, as well as differentiation of two different atresia types: non-spawning atresia (*i.e.*, resorption of vitellogenic yolk granular oocytes without cortical rods), and post-spawn atresia (*i.e.*, atresia of oocytes with cortical rods). As batch spawners, both the early-development stage and post-spawn stage are characterized by a dominance of pre-vitellogenic oocytes within the ovary, making the presence of atretic cortical rod oocytes in the post-spawn stage the distinguishing metric between these two stages. The total number of individuals that were macroscopically characterized as post-spawn was 88 whereas the total number of individuals that were microscopically characterized as post-spawn was only 59, indicating that macroscopic assessments likely overestimated spawning activity due to an inability to distinguish post-spawn individuals. On a weekly basis, the percent agreement between macroscopic and microscopic observations of post-spawn

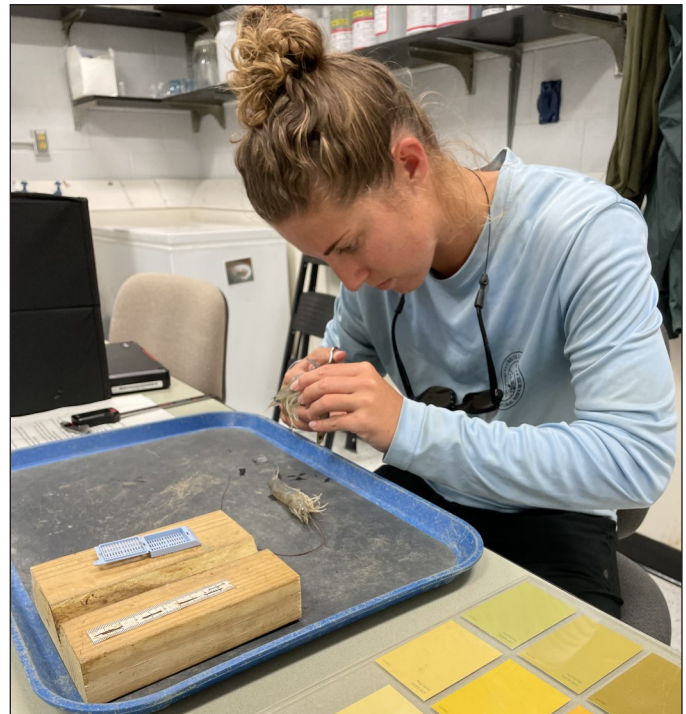


Photo credit: Lauren Faulk

individuals was less than 50% on average, indicating that further research is needed to explore alternative management approaches beyond macroscopic assessments.

Microscopic evaluation of shellfish reproduction is a rapidly evolving field of research, and the results of this study will allow for a detailed description of the female white shrimp reproductive development cycle and spawning phenology within a single season. Detailed descriptions of each microscopically observed development stage at the oocyte level and precise observations of post-spawn individuals provide a framework for standardized microscopic assessments moving forward that are applicable to populations within South Carolina and beyond, opening the door for similar studies to evaluate how reproductive phenology differs across a latitudinal gradient. I would like to thank the National Shellfisheries Association for their generous award and contribution to completion of my M.S. in Marine Biology at the College of Charleston, and all those whom I have collaborated with along the way.



## ***In Memoriam: Clyde MacKenzie, Jr.***

June 4, 1931 - April 29, 2024

Clyde MacKenzie, Jr. passed away peacefully on April 29, 2024, at the age of 92. He dedicated his life to public service, using science to improve sustainable fisheries and the lives of fishermen. His distinguished career as a fisheries biologist at NOAA Fisheries spanned a remarkable 66 years (<https://www.noaa.gov/heritage/stories/celebrating-half-century-of-service>).

Clyde was born on June 4<sup>th</sup>, 1931, on Martha's Vineyard, Massachusetts. He grew up in a commercial fishing community in Edgartown in the 1930s and 1940s. He enjoyed talking with local farmers and fishermen about how they cultivated crops and dealt with challenges. His desire to help the island's fishermen improve their economic condition inspired his career path, which focused on understanding the factors that limit shellfish abundance and sharing that knowledge with the industry. He worked his way through college by harvesting shellfish, earning his Bachelor's degree from the University of Massachusetts Amherst in 1955 and his Master's degree from the College of William and Mary in 1958. Clyde's research was particularly influenced by undergraduate coursework he took in wildlife management with Dr. Reuben Trippensee.

In 1958, he started working for what was then the Bureau of Commercial Fisheries, known today as the NOAA Fisheries Milford Laboratory in Connecticut. He was hired by the laboratory's founding director, Dr. Victor Loosanoff. He worked there for 14 years, studying the productivity of wild oyster beds and developing methods to control shellfish predators including sea stars and oyster drills. He carefully observed and documented marine ecosystems as a scientific scuba diver, often going out on oyster boats to document the condition of Connecticut's oyster beds. Clyde believed in improving shellfish habitat as the best way to enhance shellfisheries. He also recognized that field observations are critically important to science. Throughout his career he maintained close relationships with fishermen. His research benefited from frequent knowledge exchange between the scientific community and the fishing industry.



*NOAA Milford Lab divers (left to right): Clyde MacKenzie, Bill Gnewuch, and Paul Chanley on board the R/V Shang Wheeler in the 1960s. Credit: NOAA Fisheries Milford Lab Historical Photo Collection*



*Clyde Mackenzie of NOAA Fisheries (left) and Assistant Edgartown Shellfish Constables Warren Gaines (center) and Jason Mallory (right) during a check on the bay scallop populations on Martha's Vineyard, Massachusetts. Credit: Deborah M. Gaines.*

given to individuals whose activities in shellfisheries, aquaculture and conservation have promoted understanding, knowledge, and cooperation among industry members, the academic community, and government. Beyond being an accomplished scientist, Clyde was a devoted father and grandfather. He is predeceased by his wife, Nati Rivera MacKenzie, and survived by his daughter, Natalie MacKenzie and his two grandchildren: Emma Sheehan and Aidan Sheehan. Clyde's obituary from the Ashbury Park Press is available at: <https://www.app.com/obituaries/pnys0805864>.

For more on Clyde's career:

- "In Our Own Words" (NOAA Fisheries 150<sup>th</sup> Anniversary): <https://www.fisheries.noaa.gov/new-england-mid-atlantic/about-us/science-center-our-own-words#james-j.-howard-sandy-hook-marine-sciences-laboratory>
- Voices of NOAA - Clyde's Interview: <https://voices.nmfs.noaa.gov/clyde-mackenzie>

***Kristen Jabanoski  
Lisa Milke  
NOAA Fisheries***

**AQUACULTURE '25** is just around the corner – March 6-10, 2025, in New Orleans, Louisiana (<https://www.was.org/Meeting/code/AQ2025>). This is a Triennial and a great opportunity to see all your NSA colleagues and engage with old and new friends from the World Aquaculture Society, the Fish Culture Section of the American Fisheries Association, and the National Aquaculture Association. Don't forget the spectacular Trade Show – a chance to see all the new technology and products and to talk with the representatives, so much better than web pages and email.



All of the regular NSA activities will be part of the conference including the **Auction**, so start clearing out those closets now for all that shellfish merchandise. Remember, all things 'fishy' are also welcome at this meeting. The **Business Luncheon** will be held on March 8<sup>th</sup>, and there will be numerous student-oriented activities and focused program content. **Abstract Deadline** is September 30, 2024 (<https://www.was.org/Meeting/Abstract/Submit/AQ2025>).

Remember when you **Register** (<https://www.was.org/Meeting/Registration/Submit/AQ2025>) to check off the box for 'NSA member' – this ensures our profits from the conference. Book your rooms early (<https://book.passkey.com/e/50777842>), and get ready for a memorable week in New Orleans.

*Laissez les bons temps rouler...* See you in New Orleans!  
**The Conference Management Team**

## RENEW YOUR DUES

Reminder emails will begin  
 October 1<sup>st</sup>

Recruit 5 new members and earn  
 a free 2024 membership

Questions, contact  
 Secretariat@shellfish.org



## *New Guide to Shellfish Aquaculture Permitting in Washington*

This guide is for those interested in learning about the aquaculture permitting processes for growing oysters, mussels, clams, geoduck, or other shellfish commercially in Washington State. Some steps may not apply to you based on the location of your farm, these steps will specify if you should skip them. Questions, contact: Teri King ([teri.king@noaa.gov](mailto:teri.king@noaa.gov)). Available now at: <https://www.fisheries.noaa.gov/west-coast/aquaculture/guide-shellfish-aquaculture-permits-washington>

## *Did you know?*

Articles published in the *JSR* from 2000–present are available at BioOne:

<https://bioone.org/journals/journal-of-shellfish-research>



All others are available at the Biodiversity Heritage Library:

<https://www.biodiversitylibrary.org/bibliography/2187>



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Facebook (@shellfisheries)  
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# ***eConch: Online Course to Learn About Growing Queen Conch for Conservation and Restoration in the Caribbean***

***By: Megan Davis & Becky Holt, Florida Atlantic University***



*The queen conch, Aliger gigas. Credit: Megan Davis*

The queen conch (*Aliger gigas*, formerly known as *Strombus gigas*) is a large marine snail with a beautiful pink shell and it is geographically found in Florida, The Bahamas, and the wider Caribbean. It is an important herbivore that is established across a range of habitats, especially seagrass beds, where its grazing promotes higher productivity. The queen conch is also valued for its nutritious, protein-rich meat. As a cultural icon, nutritional staple, and economic contributor to the livelihoods of countless communities, it is essential to the ecosystem and the people.

The queen conch is the most important molluscan fishery species in the Caribbean; however, intensive fishing practices, coastal habitat degradation from urbanization, and climate change have caused a significant decline in queen conch populations; a problem that has been escalating for decades. This resulted in NOAA Fisheries recently (Feb. 2024) listing the queen conch as ‘threatened’ under the Endangered Species Act. This decline impacts seagrass ecosystems and communities dependent on the queen conch for sustenance and revenue.

The Florida Atlantic University Queen Conch Lab (QCL) began a program in 2019 to address this dilemma. The vision of the QCL is for there to be a community-based queen conch farm in every Caribbean country, with a mission to grow the queen conch for the sake of the species, seagrass ecosystem, and the people who depend on the fishery. Over the past 5 years, this vision has taken root and QCL team members are now working with partnerships in 10 locations (e.g., Florida, Puerto Rico, The Bahamas, Jamaica, Curacao) with several more pending.

To train and share knowledge with community members on how to grow the queen conch, Megan Davis, Ph.D., FAU Research Professor and Director for the QCL, conceived an online course to encapsulate her 40+ years of experience growing queen conch at commercial, pilot, and experimental scales. The QCL and the FAU Center for Online and Continuing Education combined their expertise to develop a free online course for anyone seeking to learn about growing queen conch for conservation and restoration. *eConch* launched in June 2024 and the 7-module training course is easy to follow at the user's own pace. The modules include Introduction to Conch Aquaculture, Microalgae Culture, Collection and Hatching Egg Masses, Larval Rearing, Metamorphosis, Juvenile Culture, and Restoration Tips.



*Megan Davis, Ph.D., teaching about conch in The Bahamas. Credit: IsleLens - Tyrie Moss*



*Lachelle Russell, Aquaculture Technician at Blue Action Lab, learning how to grow conch in The Bahamas. Credit: Megan Davis*

The queen conch take 4-5 years to mature, at which time they can reproduce using internal fertilization. The female lays a sand covered egg mass that contains approximately 500,000 eggs. She lays about 10 of these each season during the warm summer months of the year (April to September). After 4 days of incubation, the eggs hatch at 9:00 PM and the microscopic veligers have a 3-week larval cycle. They feed on microalgae as larvae and at competency they require a metamorphic cue, which are the epiphytes on seagrass blades. This is a trophic cue and after settlement, the conch bury in the sediment for the first year to then emerge and continue to grow as juveniles until they reach adulthood.

The setting for the course is the Naguabo Aquaculture Center in Puerto Rico, a partnership project between the QCL, Conservación ConCienca and Naguabo Fishing Association, and supported by NOAA Fisheries and the USDA ARS. The *eConch* curriculum is presented through high quality videos, narrated PowerPoints, and handouts, along with a discussion board and access to expert advice. The textbook for the course is the English or Spanish Queen Conch Aquaculture Manual that was published by the *Journal of Shellfish Research* (<https://doi.org/10.2983/035.039.0319>) and Food and Agriculture Organization, respectively. Upon completion of the online course, the students receive a certificate and an online badge they can share with their network.

For anyone interested in signing up for *eConch*, please contact Becky Holt, Assistant Director for the FAU Queen Conch Lab, [holtr@fau.edu](mailto:holtr@fau.edu). Find out more about the FAU Queen Conch Lab by connecting via LinkedIn, Instagram, or our website: <https://www.linkedin.com/company/queen-conch-lab>; <https://www.instagram.com/queenconchlab>; <https://www.queenconchlab.com>.

## ***NSA Student Presenters! The Big Easy (New Orleans, LA) is calling!***

***A call for action from the NSA Student Endowment  
Fund Committee***

*Aquaculture 2025* is fast approaching, and while these triennial meetings have a different feel in terms of size, flavor, and participation from multiple organizations, rest assured that the NSA will have a strong presence and the NSA Student Endowment Fund (SEF) Committee is as committed as ever to supporting great opportunities for graduate student members of the NSA that plan to present their original research at this fantastic meeting.

*When/where:* March 6-10, 2025 New Orleans, LA.  
Registration and abstract submission are open:  
<https://www.was.org/Meeting/Abstract/Submit/AQ2025>

### ***Student Travel Awards***

To assist with the costs of attending this meeting, the SEF provides a lottery-based system that offers waivers for either registration costs or accommodation costs. The deadline to apply for the lottery is **November 1, 2024** and the application can be downloaded at: [https://shellfish.memberclicks.net/assets/docs/2025sefapplication\\_word.pdf](https://shellfish.memberclicks.net/assets/docs/2025sefapplication_word.pdf).

### ***Student Presentation Awards***

At the annual meeting, the NSA will be adjudicating competitions for both the Thurlow C. Nelson (outstanding talk) and Gordon Gunter (outstanding poster) Presentation Awards. The winners of these awards receive membership for two years to the Association and a certificate of accomplishment. **Graduate** student members wishing to participate in these competitions should do the follow in order to be considered eligible for the Nelson and/or Gunter award(s):

- Submit their abstracts by the conference deadline of **September 30<sup>th</sup> 2024**.
- Indicate that they wish their presentation to be judged during the abstract submission process. [This question is part of the abstract submission through the WAS website.]

**NOTE: To be eligible for both of these opportunities you must pay your 2025 membership dues by **November 1, 2024!****

For more information about both of these opportunities, visit: <https://www.shellfish.org/sef-student-presentation-and-travel-awards>. If you have any questions, please don't hesitate to contact us.

### ***SEF Committee Co-Chairs***

***Peter Kingsley-Smith*** ([kingsleymithp@dnr.sc.gov](mailto:kingsleymithp@dnr.sc.gov))  
***Melissa Southworth*** ([melsouth@vims.edu](mailto:melsouth@vims.edu))

## **Award Nominations Deadline: November 1<sup>st</sup>**

### **Nominations for:**

- Honored Life Member Award
- David H. Wallace Award
- Neil Bourne - Ken Chew Award
- Paul Galtsoff Industry Award

### **Student Research Grant Awards:**

- Melbourne R. Carriker Award
- Michael Castagna Award
- George R. Abbe Award
- R. LeRoy Creswell Award
- Susan E. Ford Award

### **SEF Presentation/Travel Awards**

Send nominations to the  
Chair, Past-Presidents Committee:  
Lewis Deaton  
[lewis.deaton@lusfiber.net](mailto:lewis.deaton@lusfiber.net)

Visit [www.shellfish.org](http://www.shellfish.org) for specific  
award descriptions and instructions

Student Grant Award applications are  
available at: [www.shellfish.org](http://www.shellfish.org)





## Seen but not Cited...the Fate of Your Publication in the JSR

In today's world of publication metrics and the emphasis on personal statistics, the choice of which journal to target for your research becomes a numbers game, and the true focus of publication - sharing knowledge - is lost in the race. Much of what is published in all fields of science is cited only a few times or never cited at all. Some published papers do not become significant until years or even decades after they are published when new technologies and fields of interest emerge. While so many people are chasing the almighty Impact Factor, authors are most likely unaware of the number of people who download (and read?) their work, even though they do not cite it. Why do they not cite it? In most cases, because the reader was seeking information, not writing a paper of their own, and perhaps they do not publish at all as part of their efforts, e.g., educators, outreach specialists, individuals outside the specific field of study, and others.

A recent analysis from BioOne has elucidated some interesting numbers that are shared below. These are the most downloaded (>1000 times) papers from the *JSR* in just the 18 months between January 2023 and June 2024. Most interesting to note is the number of papers published over a decade ago that are still routinely being accessed.

Your work is seen! And, every download provides income to the NSA through BioOne. The *JSR* is a society journal and the continued success of the society and the *Journal* requires your support. Please consider sending your papers for publication and simultaneously support your career, the field of shellfish research, and the NSA coffers.

**Sandra Shumway**  
Editor

### Articles downloaded > 1000 times from the *Journal of Shellfish Research* (Jan 2023 - June 2024)

Rank	Article	Downloads	DOI
1	Zavell, M.D., Lindhal, O., Filgueira, R., and Shumway, S.E. 2023. An estimate of carbon storage capabilities from wild and cultured shellfish in the Northwest Atlantic and their potential inclusion in a carbon economy. <i>Journal of Shellfish Research</i> , 42(2): 325-342.	7304	<a href="https://doi.org/10.2983/035.042.0214">10.2983/035.042.0214</a>
2	Goelz, T., Vogt, B., and Hartley, T. 2020. Alternative substrates used for oyster reef restoration: a review. <i>Journal of Shellfish Research</i> , 39(1): 1-12.	4227	<a href="https://doi.org/10.2983/035.039.0101">10.2983/035.039.0101</a>
3	Epifanio, C.E. 2019. Early life history of the blue crab <i>Callinectes sapidus</i> : a review. <i>Journal of Shellfish Research</i> , 38(1): 1-22.	3326	<a href="https://doi.org/10.2983/035.038.0101">10.2983/035.038.0101</a>
4	Parker, M. and Bricker, S. 2020. Sustainable oyster aquaculture, water quality improvement, and ecosystem service value potential in Maryland Chesapeake Bay. <i>Journal of Shellfish Research</i> , 39(2): 269-281.	3165	<a href="https://doi.org/10.2983/035.039.0208">10.2983/035.039.0208</a>
5	Baden, S., Hernroth, B., and Lindhal, O. 2021. Declining populations of <i>Mytilus</i> spp. in North Atlantic coastal waters - a Swedish perspective. <i>Journal of Shellfish Research</i> , 40(2): 269-296.	3098	<a href="https://doi.org/10.2983/035.040.0207">10.2983/035.040.0207</a>
6	Bert, T.M., Crawford, C., and Shea, C. 2021. Young-of-the-year stone crab (Genus <i>Menippe</i> ) recruitment in the Gulf of Mexico off Florida: key shallow-water hotspots. <i>Journal of Shellfish Research</i> , 40(2): 339-398.	2987	<a href="https://doi.org/10.2983/035.040.0211">10.2983/035.040.0211</a>
7	Davis, M. and Cassar, V. 2020. Queen conch aquaculture: hatchery and nursery phases. <i>Journal of Shellfish Research</i> , 39(3): 731-810.	2787	<a href="https://doi.org/10.2983/035.039.0319">10.2983/035.039.0319</a>
8	Waldbusser, G.G., Steenson, R.A., and Green, M.A. 2011. Oyster shell dissolution rates in estuarine waters: effects of pH and shell legacy. <i>Journal of Shellfish Research</i> , 30(3): 659-669.	2538	<a href="https://doi.org/10.2983/035.030.0308">10.2983/035.030.0308</a>
9	Lodeiros, C., Valentich-Scott, P., Chavez-Villalba, J., Mazon-Suastegui, J.M.M., and Grijalva-Chon, J.M. 2020. Tropical and subtropical Ostreidae of the American Pacific: taxonomy, biology, ecology, and genetics. <i>Journal of Shellfish Research</i> , 39(2): 181-206.	1754	<a href="https://doi.org/10.2983/035.039.0202">10.2983/035.039.0202</a>
10	Cameron, L.P., Reymond, C.E., Muller-Lundin, F., Westfield, I., Grabowski, J.H., Westphal, H., and Ries, J.B. 2019. Effects of temperature and ocean acidification on the extrapallial fluid pH, calcification rate, and condition factor of the king scallop <i>Pecten maximus</i> . <i>Journal of Shellfish Research</i> , 38(3): 763-777.	1606	<a href="https://doi.org/10.2983/035.038.0327">10.2983/035.038.0327</a>
11	Tremblay, I., Samson-Do, M., and Guderley, H.E. 2015. When behavior and mechanics meet: scallop swimming capacities and their hinge ligament. <i>Journal of Shellfish Research</i> , 34(2): 203-212.	1593	<a href="https://doi.org/10.2983/035.034.0201">10.2983/035.034.0201</a>
12	Karim, M., Zhao, W., Rowley, D., Nelson, D., and Gomez-Chiarri, M. 2013. Probiotic strains for shellfish aquaculture: protection of eastern oyster, <i>Crassostrea virginica</i> , larvae and juveniles against bacterial challenge. <i>Journal of Shellfish Research</i> , 32(2): 401-408.	1583	<a href="https://doi.org/10.2983/035.032.0220">10.2983/035.032.0220</a>
13	Peralez-Raya, C., Almansa, E., Bartolome, A., Felipe, B.C., Iglesias, J., Sanchez, F.J., Carrasco, J.F., and Rodriguez, C. 2014. Age validation in <i>Octopus vulgaris</i> beaks across the full ontogenetic range: beaks as recorders of life events in octopuses. <i>Journal of Shellfish Research</i> , 33(2): 481-493.	1555	<a href="https://doi.org/10.2983/035.033.0217">10.2983/035.033.0217</a>
14	Clare, X.S., Kui, L., and Hofmann, G.E. 2022. Larval thermal tolerance of Kelleys' whelk ( <i>Kelletia kelletii</i> ) as a window into the resilience of a wild shellfishery to marine heatwaves. <i>Journal of Shellfish Research</i> , 41(2): 283-290.	1517	<a href="https://doi.org/10.2983/035.041.0214">10.2983/035.041.0214</a>
15	Fales, R.J., Boardman, F.C., and Ruesink, J.L. 2020. Reciprocal interactions between bivalve molluscs and seagrass: a review and meta-analysis. <i>Journal of Shellfish Research</i> , 39(3): 547-562.	1493	<a href="https://doi.org/10.2983/035.039.0305">10.2983/035.039.0305</a>
16	Dupont, S., Hall, E., Calosi, P., and Lundve, B. 2014. First evidence of altered sensory quality in a shellfish exposed to decreased pH relevant to ocean acidification. <i>Journal of Shellfish Research</i> , 33(3): 857-861.	1488	<a href="https://doi.org/10.2983/035.033.0320">10.2983/035.033.0320</a>
17	Lodeiros, C., Soria, G., Valentich-Scott, P., Munguia-Vega, A., Cabrera, J.S., Cudney-Bueno, R., Loor, A., Marquez, A., and Sonnenholzner, S. 2016. Spondylids of Eastern Pacific Ocean. <i>Journal of Shellfish Research</i> , 35(2): 279-293.	1313	<a href="https://doi.org/10.2983/035.035.0203">10.2983/035.035.0203</a>
18	Gray, M.G., Chaparro, O., Huebert, K.B., O'Neill, S.P., Couture, T., Moreira, A., and Brady, D.C. 2019. Life history traits conferring larval resistance against ocean acidification: the case of brooding oysters of the Genus <i>Ostrea</i> . <i>Journal of Shellfish Research</i> , 38(3): 751-761.	1083	<a href="https://doi.org/10.2983/035.038.0326">10.2983/035.038.0326</a>
19	Konzewitsch, N. and Evans, S.N. 2020. Examining the movement of the common spider conch <i>Lambis lambis</i> in shallow water of a northeastern Indian Ocean atoll using passive acoustic tracking. <i>Journal of Shellfish Research</i> , 39(2): 389-397.	1080	<a href="https://doi.org/10.2983/035.039.0221">10.2983/035.039.0221</a>
20	Clements, J.C. and Comeau, L.A. 2019. Behavioral defenses of shellfish prey under ocean acidification. <i>Journal of Shellfish Research</i> , 38(3): 725-742.	1072	<a href="https://doi.org/10.2983/035.038.0324">10.2983/035.038.0324</a>



## ***Tyrian Purple: The Lost Ancient Pigment that was More Valuable than Gold***



*Banded dye-murex*  
(*Hexaplex trunculus*)  
Credit: iNaturalist.org

Tyrian purple, otherwise known as shellfish purple, was the most expensive product in antiquity – worth more than three times its weight in gold, according to a Roman edict issued in 301 AD. This precious product forged empires, felled kings, and cemented the power of generations of global rulers. The Egyptian Queen Cleopatra was so obsessed with it, she even used it for the sails of her boat, while some Roman emperors decreed that anyone caught wearing it – other than them – would be sentenced to death.

No one living today knows how to make it. Tyrian purple was produced from the secretions of three species of sea snail, each of which made a different color: *Hexaplex trunculus* (bluish purple), *Bolinus brandaris* (reddish purple), and *Stramonita haemastoma* (red). Once snails were collected, the mucous gland was sliced out using a specialized knife, then collected into mortars for grinding. But this is the end of the certainty. Accounts of how colorless snail slime was transformed into the dye of legends are vague or contradictory. The most detailed record comes from Pliny, who explained the process in the 1<sup>st</sup> century AD: after isolating the mucous glands, they were salted and left to ferment for three days. Next came the cooking, which was done in tin or possibly lead pots on a "moderate" heat. This continued until the whole mixture had been boiled down to a fraction of its original volume. On the tenth day, the dye was tested by dipping in some fabric – if it emerged stained with the desired shade, it was ready.

Given that each snail only contained the tiniest amount of mucous, it could take 10,000 to make just a single gram of dye. In 2003, scientists stumbled upon a pile of sea snail shells at a site of the ancient port of Andriake in southern Turkey. In all, they estimated that this garbage heap, dating to the 6<sup>th</sup> century AD, contained around 300 cubic metres (10,594 cubic ft) of their remains – corresponding to up to 60 million individuals.

Scientists now know that the chemicals in Murex snail slime need to be exposed to visible light. Initially their secretions will turn yellow, then green, turquoise, blue and eventually a shade of purple, depending on the snail species. But this isn't instant Tyrian purple. The shade is actually made up of many different pigment molecules, all working together.

Mohammed Ghassen Noura, has been experimenting for 16 years, and has gradually discovered tricks that he suspects may have been used in antiquity – blending secretions from all three sea snail species mentioned in Pliny's account, adjusting the acidity of the mixture, alternating exposure to sunlight with darkness during preparation, and cooking his mixtures for different lengths of time.

But Tyrian purple is again under threat. Murex sea snails are under threat from pollution and climate change. *Stramonita haemastoma*, which lends the color a reddish tint, has already vanished from the eastern Mediterranean. So, whether or not Tyrian purple has finally been revived, one thing is certain: it could easily be lost all over again.

Abstracted from: BBC, November 2023 <https://www.bbc.com/future/article/20231122-tyrian-purple-the-lost-ancient-pigment-that-was-more-valuable-than-gold>

***This is your Newsletter***  
***Your story should be here!***



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***The Journal of Shellfish Research***  
**was awarded its 16<sup>th</sup> APEX**  
**Award**





# ***Sudden Unusual Mortality Syndrome (SUMS) in Eastern Oysters***

**By: William C. Walton, Tal Ben-Horin, Jessica M. Small, Adriane K. Michaelis, Kimberly S. Reece, & Ryan B. Carnegie**

Initially, dubbed ‘triploid mortality’, as early significant reports were observed in the triploid crops, this phenomenon is now called ‘sudden unusual mortality syndrome’ or SUMS as it has also been observed in diploid crops. SUMS events in eastern oysters have been observed since at least 2012 occurring widely along the US Atlantic and Gulf coasts. These unpredicted spikes in mortality have threatened the financial survival of the affected farms. At the 2024 Oyster South Symposium, 62% of growers surveyed during a presentation on the mortality had experienced at least one SUMS event. At the 2024 North Carolina Aquaculture Development Conference, 89% of eighteen growers surveyed reported experiencing at least one SUMS event, 39% experiencing three or more such events. Not surprisingly, those surveyed at these presentations declared that SUMS is a ‘mission critical’ priority.



Oysters near market size. Credit: Bill Walton

What characterizes a SUMS event? 1) *Sudden*: Typically, these mortality events occur in the spring and/or summer of the crop’s second year, a time of elevated air and water temperatures and peaking oyster reproduction, with mortality occurring in a sudden, relatively short period (i.e., weeks). 2) *Unusual*: The observed mortality rates are unusually high and well beyond the expected, typical, low-level, chronic mortality that many farmers observe. These mortalities are also not readily explained by an obvious environmental challenge. Qualitatively, the observed mortality often leads to the affected grower reaching out for assistance to determine the cause. 3) *Syndrome*: Frustratingly, these mortalities are considered unexplained given the lack of relationship to the ‘usual suspects’, such as disease, extreme environmental conditions, culture methods, and so on.

The reports of mortality are usually from intensively cultured oysters, or those grown in containers, though there is some evidence that even extensively planted oysters may also be affected. There is no evidence that wild oysters experience this mortality, but the question remains as to whether they might exhibit the same syndrome if subjected to the potentially more stressful conditions associated with aquaculture. There appears to be no parasitic or other infectious agent associated, although work on “summer mortality” in other systems, for example, Pacific oyster culture in Europe and the Pacific Northwest, has revealed underlying bacterial etiologies that may be more widespread.

With support from the NOAA Fisheries Office of Aquaculture, a workshop convened at the VIMS campus in Gloucester Point, Virginia, from January 22-23, 2024 to characterize the state of the science behind the mortality syndrome, highlight urgent questions, and identify key priorities for future research that would illuminate the causes of mortality and possible strategies for mitigation. Twenty-eight workshop participants, selected based on prior research in SUMS and varying specializations, were from: Stony Brook University, University of Maryland Center for Environmental Science (UMCES), Virginia Institute of Marine Science (VIMS), North Carolina State University, University of Florida, Auburn University, Louisiana State University, and Texas A&M University Corpus Christi. Additional attendees represented the University of Washington, the Pacific Shellfish Institute, and NOAA Fisheries Office of Aquaculture. The workshop operated under six expressed objectives: 1) Define sudden unexplained spring/summer mortalities and differentiate them from other common mortality events; 2) Compile the best available data on a range of issues and describe the frequency and magnitude of the sudden mortality issue over the past decade; 3) Review past and ongoing studies of this problem; 4) Generate a list of current working hypotheses of potential causes of these mortalities; 5) By consensus, rank the above hypotheses by order of importance, likelihood, and testability to define three to five of the most promising research priorities; and 6) Build a collaborative approach to collecting preliminary data, testing these hypotheses with open communication among teams. The nine research priorities were identified and ranked: 1) Mechanistic understanding of mortality events, including energy budgets, pathobiology, etc.; 2) Preparing oysters to withstand stress in all phases, for example through hardening or priming against future challenges; 3) Breeding for increased, general resilience; 4) Understanding the frequency, extent and history of mortality events, including epidemiology and progression, monitoring and reporting; 5) Communicating risk factors and recommended management practices to industry; 6) Harmonizing data collection and information sharing among researchers and extension; 7) Understanding SUMS in wild populations, and adaptation to environmental stressors in natural populations; 8) Understanding relationships and interactions between restoration production and commercial aquaculture, and the potential role of seed limitation or reduced choice in SUMS and other mortality events; and 9) Measure reproductive investment in susceptible diploids.

The group has begun to collate data and perspectives on the extent and frequency of SUMS events, essentially building out from the VIMS database of industry reports of unusual mortality since 2012. Several efforts are underway to obtain external funding to support a regional effort with industry members to better quantify the spatial extent, timing and environmental factors associated with these mortality events. Furthermore, there are several efforts already underway including selective breeding and hardening of seed, as well as promotion of collaboration with colleagues on the US Pacific Coast. By working together with industry and collaborating across academic institutions, the hope is that the best and most up-to-date science can be brought to bear on this critical issue for the oyster aquaculture industry to allow shellfish growers to make informed decisions and maintain healthy oysters. For details on the 2024 SUMS workshop report: <https://indus.vims.edu/research/topics/docs/sums-workshop-report.pdf>. Questions, contact Bill Walton (Walton@vims.edu).

Abstracted from: *World Aquaculture Magazine*, vol. 55(2): 36-38.

## Recruits Corner

Fellow Recruits,

We hope that you are enjoying a productive summer research season! A few announcements and reminders as we head into the fall semester.

Aquaculture 2025 will be held from March 6-10<sup>th</sup> at the New Orleans Marriott in New Orleans, Louisiana. This is a Triennial meeting held in conjunction with the World Aquaculture Society (WAS), Fish Culture Section of AFS (AFS-FC), the National Aquaculture Association (NAA), and the NSA. The Triennial meeting is a great opportunity to network, share your work, and enjoy our yearly student activities, like our annual field trip, with graduate students from these organizations. Abstract submissions for the conference are due early this year so make sure to submit by **September 30<sup>th</sup>, 2024!** You can find information regarding abstract submission and registration on the World Aquaculture Society website: <https://www.was.org/Meeting/code/AQ2025>.



We are currently coordinating with student representatives from the WAS, AFS-FC, and NAA to plan several fantastic student-focused activities for Aquaculture 2025. We'll keep you up to date as planning continues - make sure to read any and all emails regarding conference activities in the coming months!

The NSA is accepting applications for the Student Endowment Fund Travel Award, which assists graduate student members with either registration costs or lodging costs. This is a lottery-based process. The deadline for applications is **November 1<sup>st</sup>** so apply now: [https://shellfish.memberclicks.net/assets/docs/2025sefapplication\\_word.pdf](https://shellfish.memberclicks.net/assets/docs/2025sefapplication_word.pdf).



**November 1<sup>st</sup>** is also the deadline for the NSA student grant applications: the George R. Abbe Grant, Melbourne R. Carriker Grant, Michael Castagna Grant, LeRoy Creswell Award, and the newly established Susan E. Ford Student Research Grant, which recognizes excellence in the areas of bivalve or crustacean mechanisms of defense against microbial and parasitic infection. Each of these research grants provide \$1,250 to support student research. For more information on the student grant awards and to apply, visit: <https://www.shellfish.org/grants-and-awards>. Application numbers have been low in recent years, so we highly encourage you to apply and take advantage of these grants.

**Please note - if you are not an NSA member or have not renewed your membership for the 2025 calendar year by November 1<sup>st</sup>, your application will not be considered!**

As always, stay on top of NSA news and announcements through the Student Recruits Facebook page (<https://www.facebook.com/groups/2216454881732029>), Instagram (@nationalshellfisheries), and now on LinkedIn ([www.linkedin.com/in/national-shellfisheries-association-5b9667300](http://www.linkedin.com/in/national-shellfisheries-association-5b9667300)).

Please feel free to contact us with ideas, questions, or concerns!

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## NSA Pacific Coast Section News

Summer is in full swing on the Pacific coast - sunny skies and low tides are keeping everyone busy. A quick reminder that the Pacific Coast Shellfish Growers Association (PCSGA) and National Shellfisheries Association-Pacific Coast Section (NSA-PCS) Annual Conference and Tradeshow is being held at the Lynnwood Event Center, Lynnwood, WA. The conference is scheduled for September 9-12, 2024. Register now: <https://pcsga.org/events/annual-shellfish-conference-tradeshow/>.



The agenda is full of great presentations in exciting sessions including Ocean Conditions and Climate, Pest Management, Broodstock Development, and Down on the Farm. There will also be workshops and panels, like What's Eating My Farm, Up in the Restaurant, and Advancements in Farming Methods. The keynote speaker is Loni Grinnell-Greninger, Council Vice Chair of the Jamestown S'Klallam Tribe. The lunch speaker is Tommy Gomes, an award-winning fishmonger from San Diego. And this year there is the first 2024 Legends in Shellfish speaker, Bryan Rackley who is an oyster bar manager and co-owner of Kimball House in Atlanta, GA. Some fun activities are also planned such as a golf scramble, pickleball tournament, student fundraising activity, silent auction, and the annual grand awards banquet.

The agenda, activities, tradeshow, and registration information are available at: <https://pcsga.org/events/annual-shellfish-conference-tradeshow/>. If you have any questions, please contact NSA-PCS Chair Sandy Zeiner ([szeiner@nwifc.org](mailto:szeiner@nwifc.org)). Students can direct their questions to Jodie Toft ([jodie@restorationfund.org](mailto:jodie@restorationfund.org)) and Laura Spencer ([lhs3@uw.edu](mailto:lhs3@uw.edu)).

The NSA-PCS Facebook page is your best resource for news and information about the Pacific Coast Section and our events and annual meetings (<https://www.facebook.com/pages/Pacific-Coast-Section-of-the-National-Shellfisheries-Association/1438569826443936>).

I look forward to seeing you in Lynnwood, WA.

**Sandy Zeiner**  
**Pacific Coast Section Chair**



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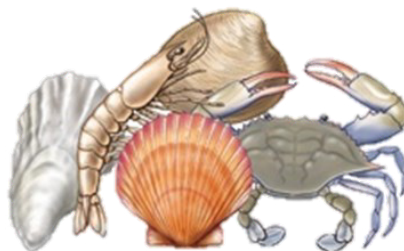
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## Upcoming Events

**78<sup>th</sup> Annual Shellfish Conference and Tradeshow (PCSGA/NSA-PCS joint meeting):** Sept. 10 - 12, 2024. Lynnwood, Washington, USA. For more information: <https://pcsga.org/events/annual-shellfish-conference-tradeshow/>

**International Conference on Shellfish Restoration 2024:** Sept. 15 - 18, 2024. Jekyll Island, Georgia, USA. For more information: <https://www.icsr2024.com/>

**5<sup>th</sup> International Symposium on the Advances in Marine Mussel Research:** Sept. 17 - 20, 2024. Sopot, Poland. For more information: <http://www.iopan.pl/ammr-2024/>

**Aquaculture 2025 (Triennial):** Mar. 6 - 10, 2025. New Orleans, Louisiana, USA. For more information: [www.was.org](http://www.was.org)

**118<sup>th</sup> NSA Annual Meeting:** Mar. 22 - 26, 2026. Portland, Oregon, USA. For more information: [www.shellfish.org](http://www.shellfish.org)

If you would like to announce a meeting, conference, workshop, or publication of interest to NSA members, please contact the *QNL* Editor, Steven Allen ([stevenmallen@gmail.com](mailto:stevenmallen@gmail.com)).

