National Shellfisheries Association
Quarterly Newsletter
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President's Message

Greetings colleagues. I assume that you all have submitted your abstracts for the annual NSA meeting coming up this Spring. I am looking forward to interacting with you and the World Aquaculture Society crowd. A couple of months ago, I found myself on an initial visit to Oregon. We spent a week hiking through forests of Sitka spruce and hiking through sand dunes. As a Gulf/Atlantic coast person, these dunes were very impressive (as were the tsunami warning signs along the road). We then moved on to Crater Lake National Park. Our drive to our lodgings went through mile after mile of recently burned forest, complete with smoke enough to reduce visibility and make for itchy throats. One more unwelcome example of climate change. Fortunately, it rained that night, clearing the air. At the rim of Crater Lake we got caught in a hailstorm. Next stops were Mt. Hood and the Columbia River gorge. An unexpected highlight of the trip was a look-see at the Bonneville Dam and adjacent fish hatchery. We saw various species of salmon and sturgeon making their way up the Columbia River *en route* to spawning grounds further inland. Biodiversity note: Atlantic salmon don't die after spawning as do their Pacific relatives. One is reminded of the crucial role of both natural fishery stocks and aquaculture of marine and freshwater species in providing protein to us humans. To celebrate the local culture, I had a delicious smoked salmon p'boy for lunch. During our sojourn on the coast, I noticed that the local fare included razor clams and Dungeness crabs, but our schedule prevented us from availing ourselves of these invertebrates. I confess that I have never eaten a razor clam, but some research turned up that they are regularly consumed here and in Europe. Are there any species that are farmed? If so, how? Are they eaten raw? Can they go in a seafood gumbo? I will get answers to all of my questions about this by finding the right people at the NSA meeting and talking to them. The meeting is a smorgasbord of information and expertise available to anyone. The WAS sessions broaden the scope of this trove of intelligence and networking opportunities, and I recommend a tour of the commercial expo—it is mind boggling to see how rapidly the technology of aquaculture is advancing. See you in San Diego.

Lewis Deaton, *President*

See you in San Diego!

Early-bird registration deadline:
January 21, 2022

https://www.was.org/Meeting/code/AQ2022

In this issue:

The Native Olympia Oyster Collaborative (NOOC): Conserving native oysters throughout their range

The Olympia oyster (*Ostrea lurida*) is a species native to the west coast of North America and occurs from Baja California to British Columbia. Like other oysters, "Olys" are ecosystem engineers creating habitat for many other estuarine species and serving as the foundation of those systems. Olympia oysters were harvested by Indigenous people for millennia, and were once abundant enough to support a robust fishery on the West Coast. The first shellfish farms in the Pacific Northwest cultured "Olys". Overharvesting during the Gold Rush era, however, coupled with subsequent alteration of estuarine habitats, drove abundances of wild populations to the point of functional extinction in some estuaries.

The Native Olympia Oyster Collaborative (NOOC) was formed in 2018 by scientists, restoration practitioners, shellfish growers, Indigenous communities, and state and federal agencies to conserve and rebuild populations of native oysters to maintain their legacy for future generations. The NOOC was created by and for these collaborators to advance restoration and conservation goals for the native oyster through community engagement, restoration and species recovery efforts, aquaculture, and scientific research. The NOOC grew out of early efforts by Kay McGraw, Natalie Cosentino-Manning, and Betsy Peabody to organize Olympia oyster practitioners, which included dedicated sessions at NSA conferences and a special volume of the *Journal of Shellfish Research*.

Coastwide distribution of oysters. Map is color-coded to indicate whether one, the other, both or neither species were documented as present. Note: in some cases records overlay each other; check https://arcg.is/LmLD1 for an interactive map of these data (modified from Kornbluth et al. 2021, Fig 3)

In the first project at the NOOC, data were compiled from all current and historical restoration efforts for the Olympia oyster throughout its range. Data for the 35 projects – which began in 1997 in Puget Sound - are highlighted on the NOOC website via an interactive Story Map. The synthesis showed that most projects increased or supported native oyster populations, and enhanced public awareness of Olympia oysters through community engagement. Restoration projects are, however, unevenly distributed, driven by local goals, and implemented with differing, and sometimes contrasting, approaches. This underscores the need for regional strategic planning and decision support tools to evaluate restoration project design and methods, including the selection of substrates and the targeted use of aquaculture. Though rare, it was found that larger projects were more cost-effective, and that monitoring over broader temporal and spatial scales is needed to characterize long-term effects of restoration on oyster populations and the services they provide more completely. Thus, future investments in larger projects and longer-term monitoring is recommended.

Aquaculture techniques hold promise for supporting the recovery of Olympia oyster populations, particularly those that are facing extinction and are recruitment-limited. Aquaculture, however, carries risks not associated with other restoration techniques, and many of which are not well understood. The NOOC recently assembled a team of collaborators to assess the risks and rewards of using aquaculture as a conservation tool for Olympia oysters. We recommended the strategic use of aquaculture at ten priority estuaries (out of 66) where its use is critical to restoring oyster populations, and where the benefits clearly outweigh the risks. Conservation aquaculture in these estuaries - which can include commercial aquaculture that directly supports wild populations of the native species - presents a win-win scenario that supports severely declined populations, while also benefiting people, including local shellfish growers and Tribal communities.

During the pandemic, NOOC leaders collaborated with the Pew Charitable Trusts to collect over 2000 records of Olympia oysters throughout their entire range. The resulting data are publicly available via an interactive web-based map (https://arcg.is/LmLD1). The analysis revealed that *O. lurida* has decreased significantly in abundance over time, and that networks of interconnected sites are very small in Oregon, northern California, and Mexico. Natural biogenic beds on mudflats and sandflats are especially rare in the southern part of the range. We thus recommend restoring "Oly" abundance where it has declined, increasing networks where they are small, and increasing natural low profile beds on mudflats in the southern part of the range.

Looking forward, the NOOC will embark on projects that better identify the factors that limit Olympia oyster populations, and drive species recovery and restoration success. This includes conducting coordinated monitoring and experiments across the species range, especially where less is known, as in the Baja California. We will continue to strengthen partnerships with Tribes and First Nations to understand and support their goals for native oyster conservation and harvest. Our shellfish growers and scientists will collaborate to expand the use of hatchery-raised Olympia oysters in priority areas to augment recruitment-limited populations simultaneously, and support a resurgence in the market for "Olys".

Please join us at the "Olympia Oysters: Science, Culture, and Conservation" session at the Aquaculture 2022 Triennial meeting in San Diego to learn more. To send and receive periodic updates about the activities of the NOOC collaborators, please email olympiaoysters@gmail.com to be added to our list.

April Ridlon, University of California, Davis
Kerstin Wasson, University of California, Santa Cruz

Native Olympia Oyster Collaborative

Challenges and Solutions in Shellfish Aquaculture

The World Congress on Genetics Applied to Livestock Production (WCGALP), to be held in July 2022 in Rotterdam, the Netherlands, will organise a session to share methods and results entitled "Challenges and Solutions in Shellfish Aquaculture." Papers are welcome on how you are applying genetic tools and principles to develop solutions to challenges and seize emerging opportunities to advance shellfish aquaculture.

Abstract deadline: January 12, 2022

For more information or to submit your abstract https://wcgalp.com/call-for-papers

NEW PAID LIFE MEMBER OPTION

Thank you, Tom Soniat

Log-in to renew and update your membership status (www.shellfish.org), or contact the Secretariat with any questions (secretariat@shellfish.org)

10 Most Cited Papers from the Journal of Shellfish Research (2005-2021)

Most-referenced calculated by Altmetric which collects relevant mentions from social media sites, newspapers, policy documents, blogs, Wikipedia, and many other sources. Source: BioOne.

1. Mann, R., & Powell, E.N. 2007. Why oyster restoration goals in the Chesapeake Bay are not and probably cannot be achieved. *Journal of Shellfish Research*, 26(4): 905-917.
2. Karatayev, A.Y., Boltovskoy, D., Padilla, D.K., & Burlakova, L.E. 2007. The invasive bivalves *Dreissena polymorpha* and *Limnoperna fortunei:* parallels, contrasts, potential spread and invasion impacts. *Journal of Shellfish Research*, 26(1): 205-213.
3. Tolley, S.G., & Volety, A.K. 2005. The role of oysters in habitat use of oyster reefs by resident fishes and decapod crustaceans. *Journal of Shellfish Research*, 24(4): 1007-1012.
4. Taleb, H., Vale, P., Amanhir, R., Benhadouch, A., Sagou, R., & Chafik, A. 2006. First detection of Azaspiracids in mussels in Northwest Africa. *Journal of Shellfish Research*, 25(3): 1067-1070.
5. Watson, S.-A., Southgate, P.C., Tyler, P.A., & Peck, L.S. 2009. Early larval development of the Sydney rock oyster *Saccostrea glomerata* under near-future predictions of CO_2-driven ocean acidification. *Journal of Shellfish Research,* 28 (3): 431-437.
6. McKindsey, C.W., Landry, T., O'Beirn, F.X., & Davies, I.M. 2007. Bivalve aquaculture and exotic species: a review of ecological considerations and management issues. *Journal of Shellfish Research*, 26(2): 281-294.
7. Johnson, S.B., Warn, A., & Vrijenjoek, R.C. 2008. DNA barcoding of *Lepetodrilus* limpets reveals cryptic species. *Journal of Shellfish Research*, 27(1): 43-51.
8. Hedgecock, D., Gaffney, P.M., Goulletquer, P., Guo, X., Reece, K., & Warr, G.W. 2005. The case for sequencing the Pacific oyster genome. *Journal of Shellfish Research*, 24 (2): 429-441.
9. Waldbusser, G.G., Steenson, R.A., & Green, M.A. 2011. Oyster shell dissolution rates in estuarine waters: effects of pH and shell legacy. *Journal of Shellfish Research*, 30(3): 659-669.
10. Brumbaugh, R.D. & Coen, L.D. 2009. Contemporary approaches for small-scale oyster reef restoration to address substrate versus recruitment limitation: a review and comments relevant for the Olympia oyster, *Ostrea lurida* Carpenter, 1864. *Journal of Shellfish Research*, 28(1): 147-161.

Access these articles (as well as hundreds of other journals/resources) using your institution's BioOne subscription (see list of subscribing institutions).

Don't forget the Auction

Proceeds benefit the Student Endowment Fund

Bring your items to the meeting in San Diego, or send to Sandy Shumway before January 31, 2022

The *Journal of Shellfish Research* was awarded its 12th APEX Award for Publication Excellence!

WINNER

2021 APEX® AWARDS FOR PUBLICATION EXCELLENCE

Close Quarters: Ocean Zoning Pushes Fisheries to the Brink

Fishermen have long epitomized the image of hardy individuals, free to make their living at sea. But this freedom is facing increasing restrictions as U.S. oceans become the focus of multiple, sometimes incompatible uses, with fishermen too often pushed to the side. One major culprit is the misuse of the Antiquities Act to designate sprawling marine protected areas.

Since 1976, with the passage of the Magnuson-Stevens Act, the federal government has had exclusive jurisdiction over the 200-nautical-mile exclusive economic zone of the United States, covering approximately 4.42 million square miles. Magnuson codified international boundaries and established a structure for stewardship of marine resources, namely the regional fishery management councils. But managing fisheries is no longer simply about Magnuson's directives to "conserve and manage" a sustainable resource to serve the "social and economic needs of the States." It is about managing fisheries in a changing landscape of competition for ocean resources, where the environment is changing faster than in living history, and species footprints are on the move.

Part of this changing landscape is the creation of large, no-take marine protected areas (MPA), like the Northeast Canyons and Seamounts Monument off the coast of Cape Cod. Designated by President Obama using the Antiquities Act of 1906, the 4,913 square miles of the monument are now managed by multiple federal agencies under a bewildering patchwork of legislation, including Magnuson, the Endangered Species Act, the Marine Mammal Protection Act, the National Wildlife Refuge System Administration Act, the Refuge Recreation Act, Public Law 98-532, and Executive Order 6166. Then there is the National Marine Sanctuaries Act, through which the government can designate and protect marine areas of national significance. This plethora of confusing legislation lacks uniform definitions. It is not clear on how — or even if — MPA designations are required to be revisited, even when species move. In addition, it does not state who has precedent over whom in the management hierarchy.

The "space" for fisheries is shrinking. Commercial fishing won't be the largest economic player as development of the oceans continues, but it is historically an important part of the economic and social structure of coastal communities. Fisheries are based on moving species distributions that do not function well within fixed boundaries, like those being zoned for MPA and offshore wind.

As the complex ocean landscape changes, the way to achieve the best possible outcome for the ecosystem and all ocean users is through management processes, like the regional fishery management councils, that were designed to deal with their complexity. The councils must be allowed to continue managing a sustainable fishing industry that contributes to food security and supports coastal communities.

Abstracted from the National Fisherman*, September 23, 2021. This op-ed is based on the article Mann, R. 2021. An Ecosystem is Not a Monument, and Other Challenges to Fishing in the 21st Century, Journal of Shellfish Research, 40(2): 185-190.*

Recruits' Corner

Fellow Recruits,

Winter is here! We are preparing for the upcoming AQ 2022 and have a few updates for you.

The Triennial meeting this year is happening in sunny San Diego, California, February 28-March 4, 2022. To receive the student registration rate, remember to **register by February 15th**. Student presenters wishing to be considered for the Nelson and Gunter Awards must indicate they have an NSA affiliation during registration and will need to be active NSA members to be eligible.

There will, of course, be several student events at the conference. The schedule is still in flux, but expect a student reception and awards ceremony the first night (with food and drink), followed by the annual auction. We are also organizing a student field trip, scavenger hunt, and a Student-Mentor Breakfast during the conference. Once the schedule of events is finalized, the list of student-run events will be sent out, plus other workshops and sessions that may be of particular interest to students. Stay tuned for more details.

In the coming months, we will be organizing volunteers for the NSA sales booth in San Diego. The booth supports the Student Endowment Fund, which provides travel awards for students. Please keep an eye out for the sign-up sheet.

Stay in the loop by following the Student Recruits website (https://www.shellfish.org/student-members), the Facebook page (https://www.facebook.com/groups/2216454881732029), and NSA Instagram (@nationalshellfisheries).

As always, email Hannah (hannah.i.collins@uconn.edu) or Alex (armarquardt@vims.edu) if you have any ideas, concerns, or questions.

Hannah and Alex

Ballots are on their way. Watch your mailbox!

Oyster Culture: The Newest Frontier in Agri-business

The USDA backs venture exploring year-round shellfish production using recirculating aquaculture system

Marine biologist Tap Pryor, one of the commissioners who founded NOAA, is pioneering a non-coastal system to grow eastern oysters year-round using recirculating aquaculture systems technology. Maine Shellfish Developers (MSD), founded in 2016 by Pryor and his son, moved to the new inland location in 2020 after a three-year "proof of concept" period at the Darling Marine Center, the University of Maine's research facility on the Damariscotta River. The U.S. Department of Agriculture (USDA) apparently agrees there is potential as the agency has supported exploration of this new frontier in agribusiness with two Small Business Innovation Research grants totaling $750,000. The Maine Technology Institute was also an early backer.

COO Chris Maloney stands among the four 3,400-gallon tanks with a projected annual harvest rate of one million Eastern oysters. Photo credit: Maine Shellfish Developers.

Housed in a 60-by-60-foot space within what Pryor calls the "Solar Arch Complex," the beta operation will utilize four circular tanks, filled with custom pie-shaped cages to take full advantage of the 3,400-gallon capacity of each. Pryor chose energy-efficient AST PolyGeyser Bead Filters to be part of each unit. The tank and filter together comprise "a basic feedlot," Pryor says. "We call four of these a Low Volume Model or LVM. Each LVM is rated to harvest about a million oysters annually. Five LVM will comprise one High Volume Model. The difference is that with a HVM, the cost per unit is halved, thanks to economies of scale." About one-third of the room will be devoted to tumbling, washing, weighing, sorting, and packing. Through automation, these operations can occur 24 hours a day and will also significantly cut labor costs, a burden for current-day ocean oyster farmers.

Mastering how to produce feed on an industrial scale has been a challenge. As hatchery operations know, production of microalgae is expensive: it requires human management, costly reactors or cylinders, and a variety of inputs. Pryor has conducted research using extracts of food waste from lobster processing, tofu factories, to even spent yeast from brewing Allagash beer as the medium to culture microalgae heterotrophically.

The success of this project could lead the way to opening up new shellfish aquaculture markets in non-coastal areas. It could also address social and environmental issues, ranging from NIMBY-ism to permitting complexity to the effects of ocean acidification on shellfish.

Abstracted from Aquaculture North America, March 12, 2021.

NSA Pacific Coast Section News

Greetings from the Pacific Coast!

There is a changing of the guard here at the Pacific Coast Section (PCS) as I step into my new position as PCS Chair. I'd like to extend a heartfelt thanks to P. Sean McDonald who has held this position for the past three years. During Sean's term, he took our annual meeting virtual and participated in successful fundraising efforts that have allowed PCS to fund student participation in annual meetings. Thankfully, Sean will be around for guidance, but I also have an excellent group of new officers with me who will make sure I succeed.

I want to emphasize the primary objectives and purposes of the PCS include encouraging and promoting shellfish research and student involvement. The 75th annual meeting of the National Shellfisheries Association Pacific Coast Section (NSA-PCS), was held September 20-22, 2021 in conjunction with the Pacific Coast Shellfish Growers Association (PCSGA). For the second year, the meeting was held virtually due to the pandemic. Although the online platform was set up, there were still challenges and additional planning by the organizing committee. The NSA-PCS would like to acknowledge the phenomenal efforts of Margaret Pilaro and Connie Smith of PCSGA for spearheading the planning and organization of this year's conference.

The conference saw over 200 people registered, of which approximately 30% were NSA members. The conference included more than 42 oral presentations across 10 sessions, and three workshops (Green Crab, *Polydora*, and Crabby Conversations: Crab Research Across the PNW) and three tradeshow spotlights.

This year's conference keynote was a panel discussion on Diversity, Equity, and Inclusion, to continue the conversation about systemic racism and inequities in our workplaces, schools, and labs. The panel included: Blair Paul, member of the Tlingit Tribe of Alaska and Skokomish Tribe shellfish biologist; Imani Black, a Chesapeake Bay shellfish farmer and founder of Minorities in Aquaculture; Michael Acquafredda, Program Specialist at NOAA Ocean Acidification Program; and Amelia-Juliette Demery, a PhD student from Cornell University and author of "*Safe Fieldwork Strategies for At-Risk Individuals, Their Supervisors and Institutions*". The seventh recipient of the *John Lentz Profiles in Innovation Speaker Series* was J. Evan Ward, from the University of Connecticut, for his talk titled "The Secret Life of Bivalves: Biological Processes Revealed Through Endoscopy". Dr. Ward's presentation took us for a ride inside an oyster with an endoscope to observe oysters moving microplastics through their gills. Exciting work.

The NSA-PCS provided funding to support the participation of 14 students at the conference. The 2021 NSA-PCS Best Student Presentation award went to Laura Spencer, University of Washington, for her presentation, "Transcriptional Response of Parental Low pH Exposure Across Populations and Generations of the Olympia Oyster (*Ostrea lurida*)." Marina Washburn, University of Alaska, received an honorable mention for her presentation titled, "Examining the Interaction of Shell Development Strategy and Ocean Acidification on Larval Pacific Razor Clams (*Siliqua patula*)." Support for students to attend the meeting was also generously provided by Arcadia Point Seafoods, Chuckanut Shellfish, Pacific Shellfish Institute, Rock Point Oyster Company LLC, SEAPA, HC Snail LLC, Jorstad Creek Oyster Co., and Drayton Harbor Oyster.

The NSA-PCS fundraising was again limited this year due the virtual meeting format, but PCS Member-at-Large Andrew Suhrbier organized an online auction that was extremely successful. The auction raised more than $2,900 which will help the PCS sponsor students at future meetings.

NSA-PCS held its annual business meeting during the 2021 conference. Elections were held and the new officers are Chair: Sandy Zeiner (Northwest Indian Fisheries Commission); Vice Chair: Jodie Toft (Puget Sound Restoration Fund); Secretary: Annie Raymond (Jamestown S'Klallam Tribe); Treasurer: Laura Butler (Washington Department of Agriculture); and Members-at-Large: (1) 2021-2024 Margaret Homerding (Nisqually Indian Tribe); (2) 2019-2022: Katie Houle (Pacific Shellfish Institute); and (3) 2021-2024: Matt Nelson (Swinomish Indian Tribal Community).

Plans are being made for the 76th Annual Shellfish Conference (NSA-PCS/PCSGA joint meeting) to be held September 19-22, 2022 (in-person) at the Wenatchee Convention Center, Wenatchee, WA. The call for presentations will open April 1, 2022. You can find more information at: https://pcsga.org/annual-conference or follow us on Twitter (@nsapcs) and Facebook.

Sandy Zeiner
Pacific Coast Section Chair

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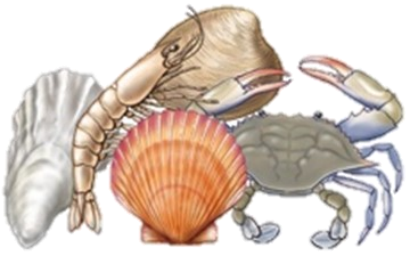

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RENEW YOUR DUES

Be sure to review your membership profile, contact secretariat @shellfish.org with questions

www.shellfish.org

Upcoming Events

Aquaculture 2022 (Triennial): Feb. 28-Mar. 4, 2022. San Diego, CA. For more information: www.was.org

23rd International Pectinid Workshop: Apr. 20-26, 2022. Douglas, Isle of Man. For more information: www.internationalpectinidworkshop.org

Aquaculture Canada/WAS North America 2022: Aug. 15-18, 2022. St. John's, Newfoundland, Canada. For more information: www.was.org

Aquaculture America 2023: Feb. 19-22, 2023. New Orleans, Louisiana. For more information: www.was.org

115th NSA Annual Meeting: Mar. 21-25, 2023. Baltimore, Maryland. For more information: 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, Steven Allen (sallen@bowdoin.edu).