

National Shellfisheries Association Quarterly Newsletter



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2017 (4)

President's Message



Greetings from Maine. I hope that you all have had a productive end-of-the-year fall. Those of you that have been affected by this year's devastating hurricane season, our thoughts are with you. As cliché as it sounds, this year truly has flown by and it is hard to believe that the

holiday season is already upon us. I, for one, am looking forward to some much needed down time with family, friends, and of course good food. I feel lucky to be in one of the best spots for local fresh seafood and I will surely be taking advantage of it this holiday season. Thanks to those of you who make this possible.

The 110th annual meeting in Seattle, WA is just around the corner, March 18th-22nd. With over 25 dedicated sessions we are expecting to have a very exciting and informative meeting. The meeting is at the Renaissance Hotel in downtown Seattle, a great location with easy access to much of what the city has to offer, including the world famous Pike Place Fish Market. Be sure to make your reservations early by using the link on the NSA website. The planning for the second annual Scallop Gallop is also underway so be sure to start training. For more details and to sign up contact Lewis Deaton. As a reminder, early-bird registration ends January 8th. As always we will be having our 'not to be missed' Student Endowment Fund Auction on Tuesday evening. We are always on the hunt for great auction items, if you have anything that you think might fetch a pretty penny to support the students, please bring it along.

Two last reminders before I have to go; renew your NSA membership for 2018 so you can continue to receive the *Journal* and the *QNL* and be on the lookout for elections ballots in the mail. They should be arriving in early January. Please remember to vote for the new NSA officers.

As always thank you for being members, without you we would not have the successful association that we do.

Happy Holidays!

Steven Allen, President

**HAVE YOU RENEWED YOUR
NSA DUES FOR 2018?**

**If not, this is your last issue of the
Newsletter, so head on over to**

www.shellfish.org

**Ballots are on their way.
Watch your mailbox!**



In this issue:

• ***In Memoriam:***

George Carey Matthiessen

• ***Book Review: Biology of Oysters***

• ***Seattle Meeting Update***

• ***2016 Student Awardees***

• ***NSA Strategic Plan Update***

2016 George R. Abbe Student Research Grant Update

**Awardee: Joseph Caracappa
Rutgers University**

“Maternal and Salinity Effects on Blue Crab (Callinectes sapidus) Larval Morphology”



Life as a larva is very uncertain, especially for the blue crab (*Callinectes sapidus*). Larvae must avoid predators, find food, and grow, all while having to return to an estuary to metamorphose and settle, so it is surprising that larvae *do* complete their journey every year. Female blue crabs release their eggs near the mouths of estuaries, leaving the larvae to develop in the surface waters of the coastal

ocean. The coastal ocean is a dynamic environment with large changes in temperature, salinity, winds, and currents over the year. While we're gaining a better understanding on how physical processes might be influencing transport, it is still unknown how biological processes might influence larval dispersal. For my PhD, I am interested in determining the factors that influence blue crab larval morphology, as well as how morphology might influence their dispersal.

The morphological structures of crab zoea can have a direct influence on their survival as larvae. Carapace spines deter predators and help stabilize and orient the larvae. The size and shape of the maxillipeds, which are tipped with long setae, determine the ability to produce swimming and feeding currents. The overall size and shape of a zoea can influence who its predators are as well as the physics of moving through water at such a small size.

During the summer of 2016, I performed experiments focusing on two potential sources of morphological variability. First, I was interested in whether culturing larvae in different salinities would impact morphological development, and secondly, whether there was any maternal influence on larval morphology. To do this, gravid adult female blue crabs were collected from Delaware Bay and allowed to spawn naturally in individual enclosures. Upon spawning, larvae were collected and placed into static bucket cultures of two salinities (28 and 33), representing high and low coastal surface salinities. Larval cultures received $\frac{3}{4}$ water changes every two days and were fed on a diet of rotifers, *Artemia*, and copepods. Every three days, 10-20 larvae were sampled and preserved for morphological

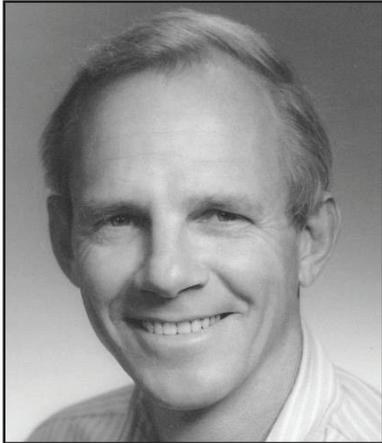
measurements. These samples were later photographed under a microscope under two perpendicular perspectives. Then using ImageJ, a variety of morphometrics were measured.

In 2016, two broods were cultured in both salinities and reared for the entirety of their development. Salinity did have an impact on their morphology. Larvae cultured in lower salinity had significantly larger carapaces and longer maxillipeds than those in higher salinity. Based on my measurements and the swimming velocity for larvae of this age, I estimated the drag forces acting on these zoea while swimming. Whereas longer maxillipeds should result in a greater swimming ability, the modeled drag force acting on them is much higher. Thus there appears to be a tradeoff between the two treatments. In low salinity, larvae are larger, can produce stronger swimming and feeding currents, but need to work harder to overcome drag forces. Blue crab larvae may respond to low salinity as an estuarine signal to accelerate growth in order to reach settlement size before being swept past potential settling habitat.

To determine whether individual broods showed any maternal influence, I compared the morphologies of larvae from six broods upon spawning. Only two of the seventeen metrics measured did not have significant differences between broods. Interestingly, there was no consistency in which broods were morphologically similar to each other, with broods being similar to each other in regards to one metric and different in regards to another. Morphology was also highly variable within a brood, yet inconsistently variable between broods. For some metrics, larvae within a brood may be spread across a wide range of values for one metric but be tightly clustered for another. In short, potential patterns in morphology within and between broods are complex and not clear yet. Next, I examined whether any maternal characteristics (maternal carapace width and egg mass size) I measured correlated with larval morphology. Surprisingly, there was only one significant correlation between larval and maternal carapace width, though this may not be of any biological significance. At this point it appears as though there are significant maternal effects, where individual broods are morphologically distinct from one another. This means that future experiments with blue crab larvae either focusing on morphology or functionality derived from morphology should control for maternal effects. Though I was unable to identify the cause of these differences yet, it may be caused by genetics, maternal nutrition, or environmental conditions prior to egg development. This also suggests that not every mother's offspring will be equally equipped to survive as larvae. Small differences in rates of predation, feeding/swimming ability, and growth may have the potential to favor the offspring of crabs with some yet unknown characteristics. My work in 2016 answered some questions, but has definitely brought about new ones, and I'm looking forward to seeing how my continuing experiments in 2017 will resolve them.



George Carey Matthiessen Aug. 15, 1928 - May 15, 2017



George Carey Matthiessen, shellfish biologist and pioneer in shellfish aquaculture died May 15, 2017 at his home in Chester, CT. Carey was born on August 15, 1928 on Fishers Island, N.Y., the son of Erard A. and Elizabeth Carey Matthiessen.

Carey was awarded the David H. Wallace Award in 1994 by the National Shellfisheries Association for his long service to the shellfish industry beginning in the 1960's. Carey's activities associated with the development and management of shellfisheries in New England, his pioneering work in developing practical hatchery techniques for rearing commercial quantities of oyster seed, and long-term service to the industry will be long remembered by older NSA membership. Matthiessen began his long career advocating for the conservation and beneficial utilization of marine resources soon after receiving his Ph.D. in Marine Biology from Harvard in 1959. His thesis focused on the ecology of soft shell clams. He entered the work force soon thereafter, working first as Assistant Director of the Massachusetts Division of Marine Fisheries, and later establishing the Marine Research Foundation (MRF) on Martha's Vineyard in 1962. The MRF was a non-profit organization dedicated to the propagation and development of shellfish aquaculture on the Vineyard, utilizing south side salt ponds for cultivating seed oysters. Carey directed the activities of

the MRF until the late 1960's prior to establishing a marine consulting firm, Marine Research, Inc. (MRI) in response to the growing opportunities associated with ecological assessment work associated with electric utilities utilizing seawater for cooling and their effects on marine biota associated with warm water pumped into estuaries.

Carey resigned from MRI to focus his energy on developing a seed oyster production farm on a salt pond on the east end of Fishers Island, NY, starting Ocean Pond Corporation in 1978. There, his pioneering and deceptively simple approaches to rearing oyster larvae and seed took root and provided seed oysters for growers in southern New England. He worked tirelessly with researchers, including Susan Ford and Hal Haskins to bring in oyster brood stocks selectively bred for resistance to MSX, soon after MSX was discovered in southern New England.

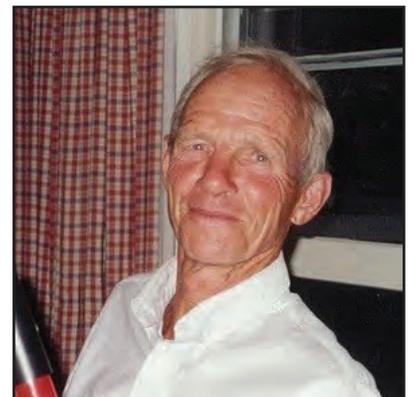
Carey was intrigued by the potential to utilize the high nutrient seawater trapped by the thermocline in Ocean Pond to fertilize the surface waters during the summer months and stimulate primary production to provide more microalgae to feed seed oysters growing in tray culture on the pond's surface. He was also very interested in evaluating both selective breeding combined with triploidy in *C. virginica*, publishing results in the 1990's on the performance of triploid *C. virginica* in the face of MSX infections on Cape Cod.

Noting the decline in habitats suitable for raising shellfish on Long Island Sound, Carey later served as Director of the Sounds Conservancy and as a visiting Professor at the University of Connecticut, Groton during the 1980's. Together with his wife of 65 years, Cis, they traveled widely and often for the purpose of research on oysters. His long experience developing aquaculture techniques in New England combined with observations made all over the world, culminated in the publication of his book "Oyster Culture" published in 1991. He was also active in the conservation movement and served for years on the board of the Quebec-Labrador Foundation, publishing for them in 2005: Forage Fish - a booklet dedicated to increasing public awareness of the importance of forage fish to our marine ecosystems and the damage done to them by industrial fisheries.

Everyone who knew Carey knew of his humble, easy going demeanor, clever wit, and infectious smile. Many describe him as the nicest person they've ever known. Stimulated by both the natural beauty of Ocean Pond and his intellectual curiosity, Carey worked tirelessly, well into his 70s, to refine his oyster seed production techniques. During this time, he also served as mentor, imparting his wisdom, passion for the marine environment, expertise, friendship and love of striped bass fishing to a cadre of active oyster aquaculturists today – a list that includes, Joth Davis, Steve Malinowski, Bob Rheault, Seth Garfield and others who cut their teeth at Ocean Pond on Fishers Island. Today, Steve continues the tradition of utilizing the pond for seed oyster cultivation.

G. Carey Matthiessen left an indelible mark on the development of shellfish aquaculture, through his unique capacity to combine a deep love of the marine world that valued stewardship above all with the practical development and utilization of marine resources for the betterment of people. He was a pioneer in aquaculture recognizing decades ago that humanity would need to look to farming the sea to satisfy the growing demand for seafood. His recognition in 1994 by the NSA as a David H. Wallace Award recipient is a tribute to that legacy.

Joth Davis
Steve Malinowski



2016 Michael Castagna Student Research Grant Update

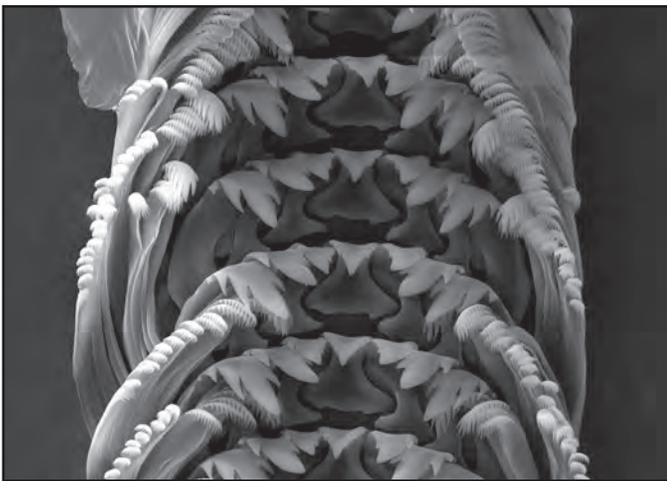
Awardee: Lillian Kuehl
Western Washington University

*“The effect of diet on *Haliotis kamtschatkana* (pinto abalone) post-larval survival, growth, and radular morphology”*

The pinto abalone (Pacific northwest abalone), *Haliotis kamtschatkana* (pinto abalone) is in decline. This species is culturally important to both indigenous people and those descended from immigrants. Recreational and commercial overfishing have wreaked havoc on this broadcast spawner that aggregates during reproductive events, making them easy picking for divers. Remaining wild populations are too low for successful reproduction, so current recovery strategy relies upon the hatchery-based production of juveniles for out-planting. Thus, efficient production and out-planting of juvenile *H. kamtschatkana* are critical to restoring this iconic species.

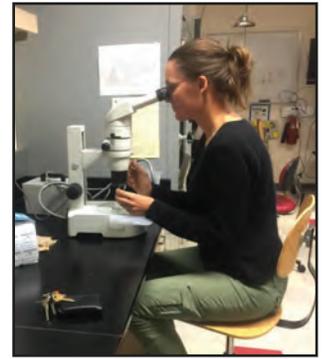
My research addresses a current need for improved post-larval survival in hatcheries by examining the effect of diet on survival and growth of newly metamorphosed post-larval abalone. My research also considers how morphology of the radula—the strip of teeth that snails use to rasp food from the substratum—relates to optimal diets.

The time period of one to three months after metamorphosis is critical to successful abalone production because the post-larvae have just begun eating and often suffer high mortalities from rapid morphological changes. At this life stage, they consume only microalgae, specifically benthic diatoms, and other small organic particles. The angle and shape of the radula changes as



abalone develop, leading to a progression of bio-available food. To date, extensive research on other commercial abalone species has been completed, but in *H. kamtschatkana* optimal diets to support survival and growth have not yet been investigated. Unlike other species, *H. kamtschatkana* post-larval radulae have also never been examined by scanning electron microscopy. Diatom diet properties that affect post-larvae are variable and include attachment strength to substrate, biochemical composition, strength of the silica cell wall (frustule), size and shape.

Competent *H. kamtschatkana* larvae were settled in 6-well plates with 7 different diets (18 wells per diet, randomized complete blocks), including a starvation control, and reared for two months. Diatoms were chosen from a range of genera, sizes, shapes, and reported mucus quantities, and that were used in previous feeding studies on other abalone species. These included *Achnanthes brevipes*, *Amphiprora paludosa*, *Amphora salina*, *Cylindrotheca closterium*, *Navicula incerta*, and *Nitzschia laevis*. Stocking density was low enough to prevent a crowding effect, and no treatments were over-grazed.



Water changes were conducted three times per week, monitored diatom growth, and removed any wells with contaminants. Diatom survival was counted at days 20, 26, 38, 49, and 61. Diatom size was measured at days 7, 20, 42, and 61, using a dissecting scope equipped with a camera, and then shell size was measured in the photographs with ImageJ software. One block of post-larvae was sampled and frozen every other week for radula dissection. Diatom diet had a clear effect on post-larval survival and growth. Survival of post-larvae in the starvation treatment was very low, as expected, but surprisingly survival in post-larvae fed *A. brevipes* was equally low. They were observed wandering across the diatom film without attempting to graze on it. *A. salina* yielded the highest survival, followed by *N. incerta* (46% and 38%, respectively, at day 61). Post-larvae fed *C. closterium* grew notably faster than those fed other diets, and post-larvae fed *N. laevis* grew notably slower. A linear mixed model (Fixed effects: treatment and age. Random effect: well, with random intercept and slope) was created to plot growth curves of post-larvae fed each diatom species. Starvation and *A. brevipes* treatments from the growth model were omitted due to zero survival to day 61.

It is interesting that the diets that led to highest survival did not lead to highest growth. Small post-larvae may ingest *C. closterium* inefficiently, but once they grow above a critical size they can process the food in high quantities. Conversely, *A. salina* and *N. incerta* may be highly accessible to very small post-larvae but inadequate to meet their nutritional needs to create biomass quickly. Carbon to nitrogen ratios are one common proxy of nutritional quality; it was found that *A. salina* and *N. incerta* had the highest C:N ratio (24 and 30, respectively) of the diatoms, and *C. closterium* had among the lowest (C:N = 10). This result is surprising because post-larvae grew so well on *C. closterium*. Further investigation of diatom characteristics using scanning electron microscopy is needed to see more factors at play, such as frustule thickness and shape.

A bleach solution and Pasteur pipet were used to extract intact radulae from thawed post-larvae. The radulae were quadruple-rinsed with deionized water before being mounted on carbon tape and sputter coated with gold-palladium. Outlines of the teeth were traced using ImageJ, and the R software package “momocs” will be used to perform geometric morphometric analysis to compare tooth shape trends between diets and over time. Any visible patterns between diets in the outlines traced have not yet been discerned, as there is high variability between individuals, both between and within treatments. As post-larvae grow, there is a clear progression in number of teeth, and in tooth size.



SEATTLE IS JUST AROUND THE CORNER!

Plans are progressing for the 110th Annual Meeting in Seattle, WA from March 18-22, 2018. Opening speakers include Peter Beninger (Université de Nantes), Donal Manahan (University of Southern California), Gary Wikfors (NOAA/NMFS), and Suzanne Williams (Natural History Museum, London). The program includes several sessions new to NSA and is packed with interesting and timely papers. There will be two hands-on workshops, one organized by Sarah Kingston, Maureen Krause, and Steve Roberts on introductory genomics and the other by Bruce Koike who will instruct participants in the art of *Gyotaku* printing. Space will be limited so sign up early. Ed Catapane has again agreed to organize the undergraduate symposium, and there will be a special session on microalgae in honor of the late Robert R.L. Guillard organized by Steve Morton and Gary Wikfors. The deadline for abstract submissions is now past, but there is always room for more posters should you be making last-minute plans to attend. Contact the conference manager to make arrangements, watch the web page for meeting updates.

Seattle is always a popular destination and in addition to the usual NSA activities – opening reception, student breakfast, auction, scallop gallop, and business luncheon – an added treat this year is another Ken Chew Chinese Dinner. Seasoned NSA members already know about this special evening, but for the newcomers, it is not to be missed! Not only is it a great dinner at a traditional Chinese restaurant, it's an opportunity to spend some time with your friends and get to know an icon of the shellfish community a little better. Advisors, please consider buying a few extra tickets to be sure the students can experience this unique opportunity. Tickets will be available until Monday, March 19th, and can be purchased when registering online or at the meeting.

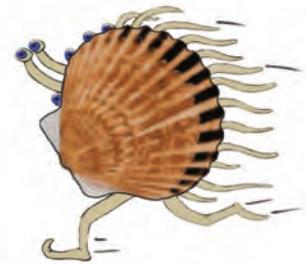
The 2nd Annual Scallop Gallop is scheduled for Wednesday afternoon and Lou Deaton has assured us that they will try to avoid as many hills as possible. This was very popular in Knoxville and looks to become a new tradition at the meetings. We'll be judging socks, and walkers are welcome. Sign up at

the conference. The students have plans for another oyster crawl and say they will welcome non-student participants.

There is something for everyone, see you in Seattle.

Sandy Shumway

The Scallop Gallop NSA 5K in Seattle



Contact Lewis Deaton:
led9784@louisiana.edu

SAVE THE DATE



Aquaculture 2019
March 6th-10th
New Orleans, Louisiana, USA

Recruits' Corner

Fellow Recruits,



The next annual meeting is almost here! Take a moment to visit the NSA website (www.shellfish.org) and see some of the highlights of this meeting, including the special sessions that are being planned. As you all know, student volunteers are a big part of the meeting's success, and we will be counting on your help to make this meeting happen. Remember, **EARLY REGISTRATION FOR STUDENTS ENDS FEBRUARY 23RD**, but there is no reason to wait until the last minute.

The annual meeting is a fantastic opportunity for students to expand professional networks, as researchers travel from around the country (nay, world) to attend. Attending will give you the chance to meet potential collaborators, present your work, get a quick "download" on shellfish research nationwide, and it's fun! There are many student-specific activities planned for the meeting including the student breakfast, the Oyster-Crawl through downtown Seattle, and a panel for students entitled "How I Got My Job." Other activities include the 2nd annual Scallop Gallop, the Auction, an icebreaker social to kick the meeting, poster sessions, happy hours, the annual business luncheon, and the closing reception. A special treat this year will be another not-to-be missed Ken Chew Chinese Dinner. Tickets for this event can be reserved with your reservation. Networking during the meeting is very important for students and every effort should be made to attend the social events as well as the technical sessions throughout the day.

The NSA Recruits play a vital role in the success of the annual meeting. We are involved with meeting registration on-site as well as A/V for the sessions. Additionally, we are responsible for running the sales booth throughout the meeting. All proceeds from the sales booth go to the Student Endowment Fund, so it is very important the booth is staffed during the entire meeting. Those who receive travel awards are obliged to help, and we will be putting out a call for volunteers for all of these duties in January. We don't expect to be let down by this batch of Recruits!



Feel free to email Erin (erin_roberts@my.uri.edu) or Laura (lhs3@uw.edu) with any ideas or concerns. Also, if you have travel questions ask Laura since she lives in Seattle. If you haven't already, be sure to "Like" the National Shellfisheries Association on Facebook to get regular updates, and look for a meeting hashtag.

Have a great rest of your 2017, we'll be in touch!

Laura & Erin

NSA Pacific Coast Section News *Greetings from the Pacific Coast!*

As always, it has been a busy time for the shellfish community. Many thanks to Brett Dumbauld, NSA Member-At-Large (and former NSA-PCS chair) for doing an excellent job keeping you up-to-date on PCS activities in Knoxville. Here are a few highlights since our last update in November.

NOAA Fisheries hosted a workshop in April to bring together representatives from regulatory agencies, tribes, the shellfish industry, and the scientific community, to increase understanding about eelgrass and shellfish aquaculture in Washington, determine where and why inconsistencies in eelgrass management related to shellfish aquaculture exist, and develop a path forward for addressing inconsistencies in the state. Over 70 people attended the workshop, including more than 20 researchers. A summary report of the workshop will be released in September.

In June, the University of Washington and the Pacific Shellfish Institute were awarded funding through the 2017 Saltonstall-Kennedy Grant competition. Three of the projects funded (totaling nearly \$3M) are focused on Pacific Coast shellfish research.

The Oregon State Legislature provided Oregon State University researchers with support for continued monitoring and research of ocean acidification (OA) conditions at the Whiskey Creek Hatchery, as well as support for the Molluscan Broodstock Program that will focus on selecting oyster stocks that are resistant to the effects of OA.

The Washington State Legislature approved \$448,000 to help support the Kenneth K. Chew Center for Shellfish Research and Restoration operated by Puget Sound Restoration Fund (PSRF) at NOAA Fisheries Manchester Lab. PSRF cultures oyster, abalone, kelp, and other species at the Center to support restoration, mitigation, and research.

The team leading efforts to restore Pacific Northwest abalone populations had its most productive winter field season in 2017. Recovery of the northern, or Pinto abalone, is monitored by the Washington Department of Fish and Wildlife along with PSRF. A re-survey of ten sites conducted in January in the San Juan Islands was used as an index of the wild population status. Sadly, only 12 individuals remained on the ten sites with no signs of recruits; however, the team found vibrant populations of adult abalone in reproductive densities when surveying experimental plots seeded with hatchery-reared juvenile abalone.

As a reminder, the NSA-PCS Twitter feed (@nsapcsand) and Facebook page are your best resources for news and information about the PCS and our events and annual meetings. Please join our community online.

Laura Hoberecht
NSA-PCS Chair



Strategic Planning for the Future of the NSA

A strategic plan is a working document that details actions designed to achieve desired goals. The Strategic Plan of the National Shellfisheries Association is the source of direction for NSA to meet the challenges of the future in concert with the NSA stated mission. The Strategic Plan is the vehicle whereby the value, relevancy, and unique merits of NSA can be sustained.

To remain a relevant document, the NSA Strategic Plan must be periodically revisited and reframed as deemed by change, and input from the membership is essential in this process.

Accordingly, a few months ago, a survey was sent to both current and former members of NSA. The questions in the survey were designed to learn about demographics of membership as well as to identify strengths, weaknesses, opportunities and threats (a SWOT analysis).

The level of participation of the membership in responding to the survey was impressive. The responses were collated, and using the “old” strategic plan as a template, a revision was developed based on comments from, and discussion among, the *ad hoc* Strategic Plan Committee. The revised Strategic Plan is based on:

- Preservation of those actions that continue to hold merit in sustaining the mission of the NSA.
- Elimination of proposed actions that either have been achieved or fell short of implementation due to lack of interest, logistics, or perceived financial risks.
- Addition of new actions to provide direction for NSA whereby the value of NSA relative to members and its mission is enhanced.

Through collective review of the responses, it was apparent that NSA is characterized by three pillars of pride which are:

- The *Journal of Shellfish Research* as a strong and highly reputable publication for the dispersal of knowledge and progress in both basic and applied shellfisheries science.
- The robust sense of belonging and comfort derived from a prevailing atmosphere of acceptance, comradery, and networking among NSA members.
- An enviable dedication to the participation of students through awards and recognitions, and providing career development opportunities and training for future employment.

The success of the NSA through its Strategic Plan must exceed the participation of the membership in the survey to keep NSA relevant and vibrant. To maintain the quality of services to members and the implementation of continued and new actions, volunteer service that includes an array of leadership activities is essential to make the strategic plan truly a working document to thereby realize the mission of NSA. The survival of NSA, with all its gloried history, lies in the enthusiastic engagement of its members—volunteer!

Lou D'Abramo
Past-President



Past-President Lou D'Abramo led the review which included a survey of members in January 2017 and an open comment period at the 109th Annual Meeting held in Knoxville TN in March 2017. The review team included multiple Past-Presidents as well as then-EXCOM members Karolyn Hansen (now Past-President), Steve Allen (now President) and John Scarpa (now President-Elect). The response to our request for input on revision of the Strategic Plan was honest, timely, and enthusiastic - all characteristics of our diverse membership. NSA thanks Lou D'Abramo for his time commitment (during retirement no less) and tremendous diligence in undertaking and coordinating the review and revision of the Strategic Plan. Lou's leadership and corporate memory for this task were essential since he led the inaugural 2009 Strategic Plan effort during his term as NSA President.

Karolyn Hansen
Past-President

NSA Treasurer's Update

The most recent completed fiscal year for NSA was from October 1, 2015 through September 30, 2016. Revenues and expenses were \$261,322.55 and \$213,711.27, respectively, which resulted in a net gain of \$47,611.28. Total end of fiscal year assets were \$598,354.12, which includes \$134,349.45 in the Student Endowment Fund. The non-SEF assets are above the average annual expenses of approximately \$300,000, which the Executive Committee adopted to maintain fiscal security for the society. The Student Endowment Fund raised approximately \$3,000 at the 109th meeting of the society in Knoxville, TN. Thank you for supporting the NSA and SEF.



REMINDER - JOB ADVERTS

Did you know that NSA has a job board? If you have a job opening or an internship that would be of interest to our student members, send the job details, application instructions, and closing date to Noreen.blaschik@uconn.edu. It will be posted on the NSA website for 3 months unless otherwise indicated by the post. For more information, visit: <http://www.shellfish.org/jobs-internships>

The Commercial Fisheries Research Foundation: Engaging Fishermen in Research Since 2004

The Commercial Fisheries Research Foundation (CFRF) was started in 2004 by a group of fishermen to develop a means to address issues in the groundfish fishery, including ways to improve gear selectivity and reduce bycatch. The CFRF mission has since expanded to include all issues important to fisheries in the New England region. The primary focus of CFRF is to conduct collaborative research that strives for sustainable fisheries through the generation of better information and effective technologies to benefit the fishing community, consumers of seafood, and the public good.



Commercial fisherman, Michael Marchetti (*F/V Mister G*), and WHOI oceanographer, Glen Gawarkiewicz, PhD, use a wireless CTD and iPad to collect and review water column profiles for the CFRF Shelf Research Fleet.

Since its inception, the CFRF has focused on working collaboratively to build relationships and solve problems facing fisheries resources and fishing communities in New England. At its heart, the CFRF works to establish relationships among scientists, managers, and members of the fishing industry through collaborative research projects. The CFRF goal is to help the fisheries management decision-making process to move past contentious debates and towards use of research to better inform management decisions.

Over the past 10 years, the CFRF has worked with over 150 members of the commercial fishing industry, 100 researchers and students, and 25 fisheries managers to carry out research projects surrounding conservation gear engineering, bycatch reduction, lobster settlement and recruitment, spiny dogfish stock dynamics, discard mortality, fish habitat, shellfish larval dynamics, underutilized species processing, state fishery profiles, and supplementary trawl and trap surveys. Among its greatest achievements are the fisherman-based Research Fleets developed for lobster, Jonah crab, quahogs, and black sea bass, which involve over 40 fishermen in collecting data to inform the assessment and management of these valuable resource species. Currently, the CFRF has seven active initiatives:

Lobster and Jonah Crab Research Fleet:

Twenty fishermen from across New England collect biological and environmental data from commercial fishing gear using tablets and calipers. As of October 2017, Research Fleet has sampled > 103,000 lobsters and over 43,000 Jonah crabs. The data from this project are used in the American lobster stock assessment and the Jonah crab management plan. Collaborators include the Massachusetts Division of Marine Fisheries, Rhode Island Lobstermen's Association, and the Massachusetts Lobstermen's Association.

Shelf Research Fleet:

Ten fishermen collect oceanographic data from across the Southern New England continental shelf throughout the year using iPads and wireless conductivity, temperature, and depth instruments. As of October 2017, the Shelf Research Fleet has collected > 400 water column profiles from Southern New England. These data are used to track seasonal transitions and warm core ring activity across the continental shelf and explore

fisheries impacts. This work is being done in collaboration with the Woods Hole Oceanographic Institution.

Quahog Research Fleet:

Five commercial shellfishermen collect quahog and environmental data from bullrake pulls in Narragansett Bay throughout the year using tablets, sorting racks, and GPS units. As of October 2017, the Quahog Research Fleet has sampled >22,000 quahogs from > 300 locations throughout Narragansett Bay. These data are used to understand the spatial and seasonal dynamics of the quahog resource and will ultimately be applied in the quahog stock assessment. Collaborators include the Rhode Island Department of Environmental Management, Roger Williams University, and the Rhode Island Shellfishermen's Association.

Black Sea Bass Research Fleet:

Eight commercial fishermen from the trawl, gillnet, lobster, charter, commercial rod and reel, and fish pot fisheries collect biological black sea bass data from across Southern New England throughout the year using tablets and fish measuring boards. As of October 2017, the Black Sea Bass Research Fleet has sampled over 6,000 black sea bass at sea and has collected an additional 800 for laboratory analysis of sexual maturity, diet, and age. This project is in collaboration with the Rhode Island Department of Environmental Management.

Southern New England Cooperative Ventless Trap Survey:

This project assesses the seasonal distribution, movement, and habitat use of lobsters and Jonah crabs in the Cox's Ledge Wind Energy Area, and will establish pre-construction baselines to enable assessment and mitigation of the impacts of offshore wind energy development in this area. SNECVTS is a collaborative project conducted in partnership with commercial lobstermen, who provide the platforms and background knowledge for the research, and the University of Rhode Island.

Economic Impact of Fisheries in Rhode Island:

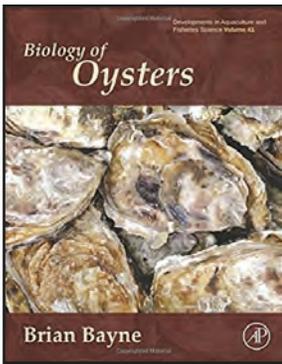
This project addresses the revenue and jobs associated with the Rhode Island fishing industry, raise awareness of the value of Rhode Island's natural resources, and identify opportunities for growth, and is being carried out in collaboration with the University of Rhode Island.

Improving Access to Local Seafood in the Ocean State:

This project seeks to increase the awareness and utilization of local seafood by Rhode Island restaurants, institutions, and consumers. Project components include: 1) RI Seafood Guide that details the fishery characteristics, ecology, seasonality, and culinary uses of RI seafood species and identifies seafood access points in RI (wholesale, retail, prepared), 2) Workshop to educate food professionals about the availability, sustainability, preparation, and procurement of local seafood, and 3) Research into the regulatory challenges facing the direct sale of seafood in RI. Collaborators include the Rhode Island Seafood Marketing Collaborative and Nick's on Broadway

For more information about the CFRF, please visit at www.cfrfoundation.org (and sign up for the CFRF mailing list), and follow us on Facebook and Twitter. You can also visit our booth at the 110th Annual NSA Meeting in Seattle.





BOOK REVIEW: Bayne, B. (Editor). 2017. *Biology of Oysters*. Developments of Aquaculture and Fisheries Science. Volume 41. Elsevier. Academic Press: 844 p.

Magnum Opus – a large and important work of art, music, or literature, especially one regarded as the most important work of an artist or writer.

It is stunning to read the level of intellectual depth, integration, and synthesis that Brian Bayne (yes, he is the sole author and wrote every word of this 844-page book!) has achieved in this impressive work. It is, truly, a *magnum opus*.

The comments in the Preface are striking, regarding the large and diverse literature now available on the biology of oysters. Certainly, it is a major challenge even for a group of chapter co-authors to summarize that large literature. Attempting (and succeeding) to do so as a single author is remarkable. The book has 10 major chapters, each of which provides details and perspectives that are very useful and important. And not just in Brian Bayne's specific areas of research expertise, but across many diverse topics including phylogeny, evolution, and reproduction (to name just a few).

For a large book of 844 pages, the format of the text and layout of figures and boxes make for a very readable and interesting book. Throughout the book, there are endless examples where complex scientific findings (with sometimes contradictory data) are presented so the reader is provided with a concise, elegant, and accurate synthesis. Brian Bayne certainly understands molluscs, as is vividly clear throughout his writings. He is just as comfortable writing about the modern era of genomics as he is about his own fields of research spanning the past 50 years. He has great writing skill in presenting the very fundamental concepts, then working back to the primary data to determine whether or not those data really answer the questions being asked. He is not afraid to discuss controversial topics, discrepancies and weaknesses in prior studies, and then present a balanced summary to describe the current level of understanding and the veracity of that understanding. We (as co-authors of this book review) have studied bivalve molluscs for decades. Yet, after reading the details in many of the chapters, we both came away with a new appreciation of not only what is currently known, but also what is not yet resolved and needs to be studied further.

This dense tome is a tour de force in shellfish biology. Importantly – no matter what the species of interest is among different readers – Brian Bayne's book goes well beyond a compilation of references on oysters. Highly detailed and thoughtful comparisons are made between species of oyster and other marine animals. Each chapter contains its own comprehensive reference list, which is a great service to the reader.

We believe this book is an instant classic. We recommend it highly to all marine scientists who have interests in the functional biology of marine animals. This book will be a source of information, education, and inspiration for decades to come. A book for the ages, indeed!

**Donal T. Manahan
Sandra E. Shumway**



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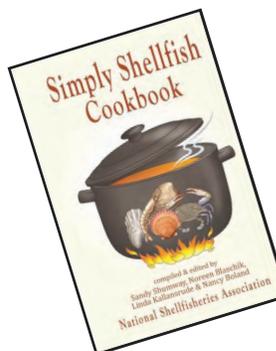
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The Last Surviving Sea Silk Seamstress

Byssus, or sea silk, is one of the most coveted materials in the world – but after more than 1,000 years in the same matrilineal family tree, this ancient thread may soon unravel.

By Eliot Stein

Each spring, under the cover of darkness and guarded by members of the Italian Coast Guard, 62-year-old Chiara Vigo plunges headfirst into the crystalline sea off the tiny Sardinian island of Sant'Antioco. Using the moonlight to guide her, Vigo descends up to 15 m below the surface to reach a series of secluded underwater coves and grassy lagoons that the women in her family have kept secret for the past 24 generations. She then uses a tiny scalpel to carefully trim the razor-thin fibers growing from the tips of a highly endangered Mediterranean bivalve known as the noble pen shell, or *Pinna nobilis*. It takes about 100 dives to harvest 30 g of usable strands, which form when the mollusc's secreted saliva comes in contact with salt water and solidifies into keratin. Known as *byssus*, or sea silk, it's one of the rarest and most coveted materials in the world. Today, Vigo is believed to be the last person on Earth who still knows how to harvest, dye, and embroider sea silk into elaborate patterns that glisten like gold in the sunlight.



Sea silk comes from thin fibres growing from the tips of a highly endangered Mediterranean clam. Photo credit: Eliot Stein

Women in Mesopotamia used the exceptionally light fabric to embroider clothes for their kings some 5,000 years ago. It was harvested to make robes for King Solomon, bracelets for Nefertiti, and holy vestments for priests, popes, and pharaohs. It is referenced on the Rosetta Stone, mentioned 45 times in the Old Testament, and thought to be the material that God commanded Moses to drape on the altar in the Tabernacle. No-one is precisely sure how or why the women in Vigo's family started weaving byssus, but for more than 1,000 years, the intricate techniques, patterns, and dyeing formulas of sea silk have been passed down through this astonishing thread of women – each of whom has guarded the secrets tightly before teaching them to their daughters, nieces, or granddaughters. Vigo learned the ancient craft from her maternal grandmother. She remembers her grandmother paddling her into the ocean in a rowboat to teach her to dive when she was three years old. By age 12, she sat atop a pillow, weaving at the loom. Vigo is known as *su maistu* ('the master', in Sardo). There can only be one *maistu* at a time, and in order to become one, you must devote your life to learning the techniques from the existing master. Like the 23 women before her, Vigo has never made a penny from her work. She is bound by a sacred 'Sea Oath' that maintains that byssus should never be bought or sold.

In fact, despite weaving works for display in the Louvre, the British Museum, and the Vatican, Vigo doesn't have a single piece of byssus in her home. Instead, Vigo explained that the only way to receive byssus is as a gift. She's created pieces for Pope Benedict XVI and the Queen of Denmark, but more often than not she embroiders designs for newlywed couples, children celebrating a christening, and women who come to her in hopes of becoming pregnant. "Byssus doesn't belong to me, but to everyone," Vigo asserted. "Selling it would be like trying to profit from the sun or the tides." But that hasn't stopped people from trying. According to Małgorzata Biniecka, author of *The Masters of Byssus, Silk and Linen*, "a woman there forsake the Sea Oath and tried to establish a commercial byssus industry," Biniecka said. "A year later, it went bankrupt and she mysteriously died."



When held into the light, sea silk transforms from a brownish color into a golden hue. Photo credit: Eliot Stein.

It takes 15 straight days of extracting and dyeing raw byssus to create enough threads to weave just a few centimeters. Some pieces, like a 50x60 cm cloth of pure sea silk weighing just 2 g, take six years to stitch. Others, like the larger tapestries draped atop her loom depicting Biblical passages and pagan deities, take even longer. "There are 140 patterns in my family, eight of which will never be written and have been passed down orally from generation to generation," she said. But after more than 1,000 years in the same matrilineal family tree, this ancient thread may soon unravel. According to tradition, the heir to the byssus secrets is Vigo's youngest daughter, Maddalena. Like her own grandmother, Vigo began teaching her how to dive and embroider at an early age. But there's a problem: "My mother and I are very different," Maddalena said from her home in Dublin, Ireland, where she's been living for the past two years. "People have always told me that I'd be a fool to allow this art to die, but I'm desperately torn. My life is mine."

What's more, after creating the world's only museum dedicated to byssus in 2005, Vigo was notified last autumn that the government of Sant'Antioco had unexpectedly closed her free Museo del Bisso, citing that the building's electrical system wasn't up to code. "The 'electrical problem' was me!" Vigo snapped. "The municipality tried to force me to charge entrance fees and write down my patterns and secrets. But I will defend this sacred oath with my fingernails as long as I breathe!"

The news drew national attention, spurring an online petition that garnered nearly 20,000 signatures – including that of the President of Sardinia – to no avail. Recently, two young artists started a crowdfunding campaign to help Vigo rent the one-room studio where she now works. Ironically, it's the same room where Vigo's grandmother taught her how to spin sea silk 50 years ago. Unless they can raise €85,000 to purchase the rent-to-own property by November 2018, the town will evict her and the world will no longer be able to watch its last sea silk seamstress spin byssus into gold. "The secrets may die with me," she said, "but the silk of the sea will live on."

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Upcoming Events

38th Milford Aquaculture Seminar: January 8-10, 2018. Shelton, CT (USA). For more information: <https://www.nefsc.noaa.gov/nefsc/Milford/mas.html>

Florida United Malacologists 2018 (FUM 2018): January 27, 2018. Sanibel Island, Florida (USA). For more information: <http://www.shellmuseum.org/programs-events/event-calendar/florida-united-malacologists-2018>

110th NSA Annual Meeting: March 18-22, 2018. Seattle, Washington (USA). For more information: www.shellfish.org

10th International Abalone Society Symposium: May 8-12, 2018. Xiamen, China. For more information: <http://internationalabalonesociety.org>

For more information on these conferences:
www.was.org

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

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).