Women of the Water

Research. Community. Collaboration. Celebration.

June 14th - 15th, 2022

Sarasota, Florida

Women and gender minorities make aquaculture happen.

Developing innovative research, managing environmental resources, and cultivating commodities - the legacy of women and gender minorities in aquaculture is undeniable. So it only makes sense to hold a conference specifically for the industry's movers and shakers!

Over the course of two days, we will explore the values of research, community, collaboration, and celebration while bringing together the current and future generations of stakeholders in aquaculture. This conference will provide attendees with networks of opportunity and support, will showcase the diversity of options in aquaculture, and will aim to uplift underrepresented voices in the industry.

As critical parts of the aquaculture workforce, we are dedicated to equipping attendees at all experience levels with practical professional development. Please join us as we honor, embrace, and discuss the amazing work done by Women of the Water.

Conference Organizers

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Tuesday, June 14th, Mote Main Campus		
Time	**Activity**	**Location**
8:00 AM	**Check-In** *(Optional presenter load in)*	**New Pass Room**
8:30 AM	**Welcome and Opening Remarks**	
9:00 AM	**Keynote Speaker - Angela TenBroeck**	
9:30 AM	**Oral Presentations**	
10:00 AM		
10:30 AM	**Mid-Morning Break** *(Coffee and snacks provided)*	
11:00 AM	**Oral Presentations**	
11:30 AM		
12:00 PM	**Lunch** *(Provided for registered attendees)*	
12:30 PM		
1:00 PM	**Snapshot Talks**	
1:30 PM		
Break/Transition into round table breakout groups		
2:00 PM	**Round Table # 1** *What challenges do women and gender minorities face in the industry?*	**New Pass Room**
2:30 PM		
3:00 PM	**Mid-Afternoon Break** *(Coffee and snacks provided)*	**New Pass Room**
3:30 PM	**Workshop Block A** *(3:30-4:15)*	**New Pass Room and Classrooms**
4:00 PM		
4:30 PM	**Workshop Block B** *(4:30-5:15)*	
5:15 PM		
Break/Transition for film screening		
5:30 PM	**Film Screening**	**New Pass Room**
6:00-8:30 PM	**Networking Reception** *(Networking and Photo & Film Contest Voting)*	**Mote Aquarium Courtyard**

Wednesday, June 15th, Mote Aquaculture Park		
Time	**Activity**	**Location**
8:00 AM	**Check-In**	**MAP Conference Room**
8:30 AM	**Opening Remarks**	
9:00 AM	**Round Table # 2** *How can we manage misinformation about aquaculture?*	
9:30 AM		
10:00 AM	**Mid-Morning Break** *(Coffee and snacks provided)*	
10:30-11:30 AM	**Tour of Mote Facilities**	
12:00 PM	**Lunch** *(Provided for registered attendees)*	**MAP Conference Room**
12:30 PM		
1:00 PM	**Poster Presentations, Additional Discussion & Networking**	
1:30 PM		
2:00 PM		
Break/Transition into round table breakout groups		
2:45 PM	**Round Table # 3** *What does the future of aquaculture look like? How can we make it more inclusive?*	
3:00 PM		
3:30 PM		
4:00 PM	**Closing Remarks and Awards**	
4:30 PM		

KEYNOTE SPEAKER
Angela TenBroeck

Named the 2021 Woman of the Year in Agriculture, Angela TenBroeck and her family have been hydroponic farmers in North Florida since the 1970s. Over the years, she has worn many hats: farmer, educator, entrepreneur, and mayor of Marineland, Florida. Throughout her career, she has been dedicated to innovation and community advocacy, as well as committed to helping Floridians most affected by food insecurity. A kingpin in the aquaponics and hydroponics community, Angela helped launch Traders Hill Farm in 2012 -the first commercial aquaponics farm to receive a SQF Certification for Safe Quality Food; Aqua Hortus - a consulting company that educates and helps farmers across the globe develop and implement aquaponics systems; and the Center for Sustainable Agricultural Excellence and Conservation (CSAEC) - a nonprofit network of farmers working to develop and share best practices for more sustainable agriculture and increased access to fresh produce in underserved communities. She currently serves as the CEO for her current hydroponic/aquaculture venture, Worldwide Aquaponics.

We are thrilled to have Angela share her experiences in the industry with our attendees!

Women of the Water Event Code of Conduct

The Steering Committee for *Women of the Water* is committed to providing safe and welcoming environments for all who participate in conference events and activities. **We will not tolerate any form of harassment, bullying, or discrimination**.

As this conference focuses on the lived experiences and perceptions of women and gender minorities, uncomfortable topics and differing viewpoints are likely to be discussed. Therefore, it is of utmost importance to embrace the conference culture of collaboration, compassion, and active listening. Together, we can ensure that the conference supports free expression and exchange of ideas in an environment that is positive and productive for all.

Purpose and Scope

The *Women of the Water* Steering Committee has established this Event Code of Conduct (the "Code") to serve as a guideline for the conduct of anyone attending or participating in the conference, as well as the consequences for unacceptable behavior. We expect everyone to follow this Code so that all participants can enjoy the event responsibly and with respect for the rights of others. Failure to abide by this Code is subject to corrective action and sanctions, including but not limited to refused admission, ejection from the conference without refund, and/or other penalties consistent with this Code. The Code applies to all attendees, media representatives, speakers, exhibitors, sponsors, staff, contractors, volunteers, award recipients, organizers, and other guests (collectively referred to as "Participants") who attend or participate in the conference. By attending the *Women of the Water* Conference, you agree to abide by this Event Code of Conduct.

Expected Behavior

The following behaviors are expected of all conference Participants:

- Treating all participants with respect, dignity, and consideration, in the spirit of valuing a diversity of views and opinions;
- Behaving in a courteous and professional manner;
- Welcoming all voices and perspectives;
- Listening and learning with respect, empathy, and curiosity;
- Refraining from demeaning, discriminatory, or harassing behavior and speech;
- Reporting suspected inappropriate behavior directed at yourself or others to a member of the event Steering Committee;
- Respecting the rules, policies, and property of event facilities and vendors; and
- Complying with the directions of meeting organizers, and all applicable laws and regulations.

Prohibited Behavior

Violations of this Code include but are not limited to the following:

- Harassment, which is defined for purposes of this Code to include unwelcome or offensive verbal comments, visual displays, or physical contact directed at any

Participant, including conduct, comments, or images that a person would reasonably find offensive, demeaning, or hostile;

- Sexual harassment, which is defined for purposes of this Code to include unwelcome, unsolicited, and unreciprocated sexual advances, requests for sexual favors, and other physical conduct, comments, or gestures of a sexual nature that has or that might reasonably be expected or be perceived to offend, humiliate, or intimidate another person;
- Exhibiting behavior that is unruly or disruptive, or that endangers the health or safety of yourself or others;
- Discriminatory or defamatory conduct or language based on race, sex, sexual orientation, gender expression or identity, transgender status, age, national origin, disability, religion, marital status, veteran status, political affinity, or any other characteristic protected by law;
- Inappropriate use of nudity and/or sexual images;
- Deliberate intimidation, threatening, or stalking;
- Sustained disruption of portions of the event;
- Actual or threatened pushing, shoving, or use of any physical force whatsoever against any person;
- Possession of a weapon or use of any item in a way that may cause danger to others at an in-person Event;
- Destruction, theft, dismantlement, defacement, abuse, or intentional misuse of venue, property, equipment, signage, or supplies;
- Failure to comply with directions of Event leaders and organizers, venue personnel, or staff regarding Event operations or emergency response procedures;
- Retaliation against participants for reporting activity that they reasonably believed to be in violation of this Code; and
- Knowingly and falsely reporting violations of this Code in bad faith

Moreover, this Code is not intended to be all inclusive, and it is likely there will be conduct issues that it does not specifically address. In that event, as in all others, Participants are expected to follow the direction of Steering Committee and Event staff who will take appropriate action to ensure the safety, security, and well-being of Participants.

Reporting Unacceptable Behavior

If you believe you or someone else are being subjected to conduct that violates this Code or is otherwise inappropriate, or have any other concerns, please alert a member of the event Steering Committee who will work to resolve the situation.

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Approved 25 May 2022

ORAL PRESENTATIONS

9:30 AM **Cultivating the Queen in the Next Generation of Aquaculture Leaders**
Megan Davis, Ph.D.*

The queen conch, *Aliger gigas*, is the most important molluscan fishery in the Caribbean and is in a state of steady decline due to overfishing and habitat degradation across its geographic range. The heritage of conch is deeply rooted in the island nations.

Florida Atlantic University Harbor Branch Oceanographic Institute's Queen Conch Lab, led by Megan Davis, Ph.D., is comprised of a dedicated group of conservationists and aquaculturists with a mission to grow the queen conch for the sake of the species, ecosystem, and people who depend on the fisheries. Dr. Davis brings over 40 years of practical knowledge to growing queen conch and has an attainable vision of a queen conch farm in every Caribbean nation. The work towards this vision begins at the hatchery with community members of island nations showing interest in restoring their own resource.

A partnership aquaculture project in Puerto Rico, funded by NOAA Fisheries, USDA ARS and Puerto Rico Sea Grant, has been established by FAU Harbor Branch, Conservación ConCiencia and Naguabo Fishing Association. This community-based pilot-scale aquaculture facility produces conch to assist with restoration of the species. The aquaculture staff are Puerto Rican native and the majority are females. These early career aquaculturists are encouraged to ask questions and make decisions, all with the goal of building their confidence within the new frontier of conch aquaculture.

Dr. Davis has mentored many women throughout her career and encourages all of us to to be bold and move past comfort zones to develop new proficiencies.

9:42 AM **Maternal Diet Influence on Egg Quality and Production in California Yellowtail, *Seriola dorsalis***
Li Sun Chin*^, Kevin Stuart, Mark Drawbridge, David Bradshaw, Paul Wills and Sahar Mejri

An optimal broodstock diet contains essential nutrients that are required for successful reproduction and healthy offspring production. Currently, a cut-bait diet is commonly used by the industry to feed broodstock. However, a formulated pellet commercial diet would be a more affordable, sustainable and nutritionally consistent alternative. The aim of this study is to use alternating diets of sardine-squid and commercially available pelleted feed to determine the amount of time needed for broodstock to incorporate nutrients, especially essential lipids, from their diet into their eggs. California yellowtail, *Seriola dorsalis*, broodstock were fed two alternating diets: Vitalis Prima pellets (World Feeds Ltd, UK) and sardine-squid. Each diet was switched after every 6 weeks within the spawning season lasting for a total of 24

weeks and 47 spawns. Egg samples along with biometric data from each spawn were collected. They will then be processed for proximate analysis, essential fatty acid content, and amino acid composition. This data will be used to compare the varying nutritional incorporation happening at each diet switch. This study aims to provide a greater understanding and insight into nutritional assimilation on a temporal scale between the maternal parent and offspring. Our findings will contribute towards the development of a more cost-effective and reliable broodstock diet for farmers and reduce the industry's reliance on cut bait diet, which will improve the economic viability of the California Yellowtail as a staple aquaculture species.

9:54 AM **Garage-A-Culture: Small-Scale Ornamental Aquaculture**

Michelle L. "Mick" Walsh* and Travis G. Knorr

Ornamental aquaculture has many advantages compared to seafood aquaculture; perhaps the biggest is the value per size or weight. While rarely sold by the pound, ornamental products yield a high value when compared to seafood products. This small product size opens the (garage) door to operations working in small spaces. With less area required for production, garages, green houses, and even spare bedrooms can be appropriate for ornamental aquaculture systems. Here we will discuss advantages and strategies to maximize production in small spaces and species that have a relatively high return on invested time, money, and space of an operation.

Summerland Ocean Life is an S-Corp created in 2019. The operation focuses on simple aquaculture techniques that require little effort and high-value products. The use of technology to monitor and control the aquatic habitats is utilized to minimize required efforts and allow for autonomous operation. The site of the operation in the Florida Keys and takes advantage of the South Florida aquarium trade, networking with local collectors and regional wholesalers. Of the species cultured, a particularly ecologically important species, the blue neon goby, *Elacantinus oceanops*, remains a high priority as abundance within the coral reef ecosystem has been shown to be related to increased biodiversity. Additionally, the Banggai cardinalfish, *Pterapogon kauderni*, has been greatly impacted by over-harvesting and has been placed on the IUCN Red List of threatened species. Aquaculture these species is an important alternative to wild collection.

10:06 AM **The effect of photoperiod on swim bladder inflation in hatchery-reared Common Snook (*Centropomus undecimalis*)**

Tristan Shonat*^, Nicole Rhody, Joshua Patterson, and Roy Yanong

Common snook (*Centropomus undecimalis*) are critical to Florida Gulf Coast environments and the angling industry. Since 1997, Mote Marine Laboratory has partnered with Florida Fish and Wildlife Conservation Commission to develop methods for producing hatchery-reared snook at Mote Aquaculture Park (MAP) to stock into Sarasota Bay. One widely identified snook hatchery problem is improper swim bladder (SB) inflation, which results in elevated rates of spinal deformities and

reduced growth and survival. The most up-to-date rearing protocols for snook at MAP require the use of 24-hour light conditions until 17 days post-hatching (DPH) to overcome bottlenecks encountered in early development by maximizing feeding. However, as transient physostomes, snook may require a period of darkness to trigger larvae to gulp air at the water surface and inflate their SB during a finite inflation window (3-7 DPH). To ensure that the 24-hour light regime used is not negatively impacting SB inflation, a study was conducted at MAP using 12 x 100 L tanks in three identical, upwelling, recirculating systems, and utilizing 2 photoperiod regimes (24-hour and 18-hour light). Larvae were stocked at 0 DPH, and fifty fish from each tank were sampled on 3, 5, 7, and 10 DPH and observed under light microscopy for the presence of an inflated SB. Fifteen of the fifty larvae sampled from each tank were photographed for later analysis. Initial SB inflation occurred by 3 DPH for both treatments, however, SB inflation rates, total length, and survival were greater in larvae reared under 24-hour light.

10:18 AM **Advancing marine fin fish aquaculture: an international journey from academia to business owner**

Nicole Kirchhoff*

Women and minorities are increasingly represented within fisheries, aquaculture, and aquatic conservation fields, yet both face unique challenges personally and professionally resulting in decreased representation at the top. This presentation will be a journey of the past 17 years working immersed in commercial non-ornamental marine aquaculture and obtaining a PhD in Aquatic Animal Health; from Atlantic halibut in Maine, to Bluefin tuna in Australia, then back to a menagerie of warm water marine food and baitfish in Florida. I hope to highlight how I have used the strength and power of being a woman to springboard my career as both a researcher and a business owner, how we can continue to level the playing field through minor reforms and awareness, and how as a tribe we minorities can, and will, bring our field to new heights.

11:00 AM **The Story and Significance of Women in the Development of a Clam Farming Industry in Cedar Key**

Leslie Sturmer*, Rose Cantwell, and Sue Colson

Located on a small island in the Gulf of Mexico, Cedar Key is a working waterfront community, rich in small-town flavor with fewer than 800 residents. For most of the 20th century, Cedar Key remained a sleepy, ramshackle fishing village. However, during the 1990s closures of oyster harvesting grounds and state-imposed ban on gillnets affected the livelihoods of its fishing families. A transition to shellfish aquaculture as an alternative employment opportunity was facilitated through job retraining programs in the same decade. These programs were spearheaded by local women who actively sought the federal funding and provided community leadership. As clam farming took off, the promise of prosperity created a new excitement and common bond as women played a critical role in its expansion through technical

support, business development, and industry organization. Today, clam farming adds an estimated $34 million a year into the area's economy and supports over 500 jobs. With a sense of purpose and cohesion, women continue to work together to promote their livelihoods through federal, state, and local partnerships with agencies, legislators, and associations. Women instrumental in the creation and sustainability of the clam farming industry in Cedar Key are featured in this presentation.

11:12 AM **Developing Methods for Rapid and Early Bacterial Disease Detection in Florida Pompano (*Trachinotus carolinus*) Aquaculture**

Carlie S. Perricone,*^ David J. Bradshaw II, Laura E. King, Nicole Kirchhoff, Elizabeth Allmon, Marisol Sepulveda, Sahar Mejri, Martin S. Riche, Paul S. Wills

Bacterial disease outbreaks pose a significant threat to marine warm water finfish aquaculture. Intensive rearing conditions and environmental stressors such as high densities of fish, fluctuations in water temperature, and suboptimal salinities can create a chronically stressful environment. Fish exhibit suppressed immunocompetence when stressed and become susceptible to infection by ubiquitous opportunistic pathogens including Vibrio species. The etiological agent of classical vibriosis, *V. anguillarum*, impacts many marine and estuarine water fish, and can cause high mortality rates and economic loss at commercial aquaculture farms. The Florida pompano (*Trachinotus carolinus)* is a popular sportfish that inhabits marine and estuarine waters along the Atlantic Coast and Gulf of Mexico. This species has been targeted in the U.S. for land-based recirculating aquaculture due to its impressive market value and tolerance to low salinity environments. Our study investigates stress-mediated Vibrio growth in Florida pompano and aims to develop noninvasive molecular methods that can be used in a farm setting to detect *V. anguillarum* in tank system water, as well as identify deleterious changes in the total bacterial composition of the water in response to stressful rearing conditions. We will incorporate Oxford Nanopore minION sequencing technology to screen for *V. anguillarum* and conduct metagenomics for microbiome surveillance. Our overall goal is to develop rapid and early disease diagnostic tools that can be easily accessible to producers and used by veterinarians to assess fish health at commercial aquaculture farms.

11:24 AM **Changes in Gut Microbial Ecosystem of Florida Pompano (*Trachinotus carolinus*) Fed Hempseed Protein Meal Replacement diets**

Omolola Betiku*, Zynia Alvarez, Marty Riche, Sahar Mejri, Brandon McHenry, Paul S. Wills, and Johnny Grace

The gut ecosystem plays a critical role in nutrient digestion, and the type of diet is a modulating factor that influences the composition of the gut microbiota. The recent legislation on hemp farming in Florida provides an avenue for the future availability of various hemp products that could serve as potential feed ingredients to replace

the conventional marine ingredients for the aquaculture industry. However, there is a dearth of information on hemp products in aquaculture nutrition, particularly on the changes in the gut microbiota of Florida Pompano (*Trachinotus carolinus*) when fed hemp protein meal. In this study, we determine the growth characteristics of Pompano when fish meal is replaced with hemp protein meal (HPM) and how this alters the gut compositions of pompano. Seven experimental diets were manufactured: a fish meal-based diet as the control and the remaining diets containing graded levels of HPM supplemented with or without taurine. Diets were randomly assigned to tanks, and Florida Pompano with an average weight of 4. 89 ± 0.28 were fed the diets three times daily for 12 weeks. Feed intake, mortality, and growth of fish were monitored. Post-feeding, tissue samples, and lumina samples were collected for histological and 16S rRNA analyses, respectively. Our results showed that the HPM had no adverse effect on Florida Pompano; survival and feed intake were not affected. However, the growth of pompano was significantly affected by replacing fishmeal with HPM (P= 0.0049). Results on histopathology and 16S rRNA analyses are ongoing and will be presented.

11:36 AM **From Guts to Glory: Black grouper aquaculture at the College of the Florida Keys**

Caeley V. Flowers*^ and Patrick H. Rice

To combat the intense fishing pressure on an essential Florida Keys apex predator species, we are investigating the spawning and rearing of black grouper, *Mycteroperca bonaci*, through in-vitro fertilization to develop a one-of-a-kind Florida Keys stock enhancement initiative. Working with local commercial fishers in the Florida Keys during their fish cleaning process, we will harvest male black grouper gonads as our gamete source and will be cryogenically preserved until spawning season for our female broodstock. During the initial stages of this work, 10 female black grouper have been housed in 3,200 liter tanks at the College of the Florida Keys both in outdoor flow-through systems as well as indoor recirculating systems. The biggest challenges have been in deterring aggression with other females and with supply issues that have ultimately delayed our progress with research. The next steps are to proceed with spawning simulation for the female broodstock to promote egg development with the next spawning season.

11:48 AM **The Importance of Staying Connected in the Aquaculture Industry**

Amy Stone*

While it is natural to be focused on your career, it is also important to stay connected to the news within our industry. Whether that means maintaining a membership in national organizations, state organizations or even species-specific organizations, it is critical to understand how upcoming legislation or regulations will affect your facility. In the last few years, several situations have arisen which individuals may or may not be privy to without these avenues of information. Not knowing or understanding these situations could translate into loss of funding, loss of income and in the worst case, a facility closure. This presentation will review a few situations and explain how they can affect everyone.

WORKSHOPS

There will be two blocks of afternoon workshops on the first day of the conference. Attendees can select from the following five workshops for each block:

Personalities in the Workplace

Blair Morrison (she/her)
Science Policy Fellow
FDACS Division of Aquaculture
National Academies of Science, Engineering and Medicine – Gulf Research Program

Communication and collaboration are a must in science- and in life! This interactive workshop will allow attendees to learn more about their thinking styles and how to work with others most effectively, all through the lens of the Myers-Briggs (MBTI) personality test. Join us as we discuss common experiences that exist among the personality types and how targeted communication strategies can lead to better outcomes for all members of a team. **Please come prepared with your MBTI results (a QR code to a free version of the test is in your welcome packet).**

Occupational Health and Safety

Dr. Boyi Hu
Assistant Professor
Herbert Wertheim College of Engineering- Industrial & Systems Engineering
University of Florida

One of the main occupational health issues in the aquaculture industry is chronic back pain (LBP). Aquaculture workers, compared to other industries such as manufacturing or construction, work in a unique setting with both heavy loads and repetitive lifting tasks. As many of the tasks in aquaculture require lifting heavy nets, boxes, and baskets under challenging conditions, prevention or management of LBP is particularly important for women and minorities who may be at greater risk. In our presentation, we will introduce some of the ergonomic concepts important for women and minorities working in aquaculture. Using the NIOSH lifting equation, we will illustrate how small alterations in lifting can decrease the overall repetitive loads on the body. Participants in this workshop can identify options that are feasible for their work settings and tasks. We will also briefly discuss some of our future work in this field and potential outcomes.

BMPs and Leasing Process

Sarah Grosmaire
Environmental Specialist II
Division of Aquaculture
Florida Department of Agriculture and Consumer Services

Katie Davis
Environmental Specialist II
Division of Aquaculture
Florida Department of Agriculture and Consumer Services

Florida has some of the largest diversity and quantity of aquaculture farms in the United States: from microscopic phytoplankton to massive alligators, from *Gambusia* for mosquito control to sturgeon harvested for caviar. Join us as we talk about the process of how to apply to have an upland farm, the wide variety of species available for cultivation, and the requirements for each type of farm to meet FDACS Best Management Practices. Moving from upland farms to operations on submerged lands, learn about the process of acquiring a lease from application to execution of the lease, and everything in between. Dive into how FDACS staff assess newly proposed lease areas!

Water Quality 101

Erin Dier
Environmental Specialist I
Division of Aquaculture - Shellfish Harvesting Area Classification Program
Florida Department of Agriculture and Consumer Services

Nicolette Mariano
CEO/Aquaculture Biologist
Treasure Coast Shellfish, LLC

Come learn about why routine water quality monitoring is critical for aquaculture! Participants will learn about water quality parameters, methods for sampling, and water quality policies - all culminating in a hands-on water sample evaluation activity.

Diversity, Equity, and Inclusion in Aquaculture

Nathan Bruemmer, Esq. (he/him)
LGBTQ+ Consumer Advocate
Office of the Commissioner
Florida Department of Agriculture and Consumer Services

Dr. Marcy Cockrell (she/her)
Biological Administrator
Division of Aquaculture
Florida Department of Agriculture and Consumer Services

Join a scientist and an advocate for an engaging "fireside chat" style session on the current state of diversity, equity, inclusion, and accessibility (DEIA) within aquaculture. Session attendees will play an active role in the session with a hands-on activity, will engage in the conversation, and will be provided with tangible takeaways and resources.

POSTER PRESENTATIONS

1 **Exploring Florida pompano (*Trachinotus carolinus*) larvae tolerance to low salinity: Effects on fatty acid profiles**

Victoria Uribe*, MSc, David J Bradshaw II, PhD, Laura E King, MSc, Gonzalo Illian, PhD, Carlie S Perricone, MSc, Ellizabeth Allmon, PhD, Marisol Sepulveda, PhD, Marty Riche, PhD, Paul S Wills, PhD, Sahar Mejri, PhD.

As commercial aquaculture efforts grow in the state of Florida, the Florida Pompano (*Trachinotus carolinus*) has been identified as a potential species for culture. Though Florida pompano culture has been successful through the broodstock stage, the limits of salinity tolerance for Florida pompano have not been explored in depth. It is known that extreme salinities can have effects on early development and may affect nutritional (lipid) profiles related to genetic expression. To test the limits of *T. carolinus* salinity tolerance, pompano larvae were raised in three different salinities (10, 20, and 30 ppt) in partnership with local aquaculture farms in Vero Beach and Stuart, Florida. Larvae were sampled every 3 days after hatching up to 24 days post-hatch and evaluated for lipid content and gene expression. The expression of genes related to long-chain polyunsaturated fatty acid (LC-PUFA) synthesis coincided with LC-PUFA content in samples over time and did not differ between salinity treatments. Larvae also did not show any physiological difference between salinity treatments. This suggests that it is feasible to raise larval pompano up to 24 days post-hatch in salinities as low as 10 ppt. However, to determine the long-term feasibility of rearing Florida pompano at low salinities, studies must be conducted up to the broodstock stage. This study shows promise for Florida as a commercial aquaculture species and may help inform culture techniques as the industry evolves.

2 **Nutrient Mitigation Policies: Aquaculture for the Future of Florida Waterways**

Blair H. Morrison*, Marcy Cockrell, Charlie Culpepper III, and Portia Sapp

Nutrient loading along the Gulf of Mexico has long been understood as a threat to ecosystems and coastal economies. Excess nutrients can enter aquatic systems through wastewater discharge, septic systems, agricultural runoff, and industrial effluent; once in the environment, they can lead to eutrophication, harmful algal blooms, fish kills, and hypoxic zones. Within the state of Florida, 86% of watersheds contain imperiled waterbodies due to nutrient overload. Various methods have been proposed to mitigate nutrient loading in coastal waters, but it is clear an integrative watershed-level approach will be needed to address this issue. Among others, nutrient credit trading has been proposed as an option to offset nutrient loads entering important estuarine habitats. In particular, credits generated through shellfish and algae aquaculture may be a promising new avenue for offsetting nutrient inputs into Florida waterways. This poster will summarize existing nutrient mitigation frameworks within the state of Florida, highlight benefits and downfalls of various nutrient offset plans, and will provide insights into potential future policy directions in an aquaculture context. By bringing together stakeholders in agriculture, industry, conservation, and policy, we can create an adaptive program to help alleviate nutrient loading in Florida waterways and the eastern Gulf of Mexico.

3 **CFK'S Southernmost Coral Restoration Club**
Kimberly Furtado * and Nicole Sinnott

The Southernmost Coral Restoration Club, a Student Activities club at the College of the Florida Keys, is dedicated to the conservation and restoration of the coral reefs that comprise the Florida Reef Tract as well as educating the public and CFK student body about the myriad of threats to our coral reef ecosystems. The club began in Fall 2019 and is built upon partnerships fostered between the College and local coral restoration organizations such as Mote Marine Laboratory's International Center for Coral Reef Research & Restoration and Coral Restoration Foundation. The club is mainly comprised of students and campus community members associated with the College's Marine Science and Technology Division, many of whom have been trained as Professional Research Divers and American Academy of Underwater Scientists (AAUS). Our mission is to support coral restoration in the Florida Keys including both underwater and land-based activities for divers and non-divers. The College has the advantage of owning its own Corinthian Catamaran vessel, the FKCC II, which is used to transport divers out to coral sites. Club members have assisted in both cleaning coral trees at the nurseries as well as active out-planting.

4 **Building capacity to scale up crab mariculture in support of coral reef restoration in the Florida Keys National Marine Sanctuary**
Piper Flowers* and Dr. Jason Spadaro

Mission: Iconic Reefs is a long-term project to help successfully restore seven of Florida's iconic coral reefs. While the project primarily focuses on direct out-planting of stony coral species, phases also include re-establishing grazing functions throughout the Florida reefs by adding native species that eat algae that overgrow reefs, such as the Caribbean king crab *Mithrax spinosissimus.* With Stony Coral Tissue Loss Disease devastating the coral species on the coral reefs, herbivore species move to other locations in search of food and shelter. Algae abundance increases and with-it the suffocation of surviving coral and other sessile species. To combat the algae abundance, *M. spinosissimus* is a viable herbivorous prospect as it exhibits several optimal characteristics including short larval duration, rapid growth, a relatively high grazing rate, and an algal-based diet. This research has three objectives: (1) develop a scalable crab mariculture system for brood-stock and larval rearing, (2) identify environmental factors that influence the productivity of the *M. spinosissimus*, and (3) determine and demonstrate the effects of cultured *M. spinosissimus* on coral reef community structures through means of out-planting successful juveniles and monitoring the progress in algal abundance in the surrounding area. Additional laboratory experiments will identify limiting factors within productivity, survival, and overall fitness of the crabs throughout different ontogenetic stages.

5 **Allelochemical control of freshwater harmful algal blooms**
Suzanne E. Tenison *^

Biological controls of freshwater harmful algal blooms have become presented as a potential form of water quality management. The production of allelopathic plant-based algaecides may produce an economical, sustainable, and biological control for maintaining water quality within closed aquatic systems.

6 **Effects of Environmental Manipulations on Survival, Growth, and Feeding Incidence in Larval Golden Domino Damselfish, *Dascyllus auripinnis***

Olivia I. Markham*^, Casey A. Murray, Sarah W. Hutchins, and Matthew A. DiMaggio

The golden domino damselfish (*Dascyllus auripinnis*) is currently being investigated for its commercial viability due to market demand and previous success with culturing other damselfish species. However, production techniques for successfully rearing this species are still in development. The survival and eventual commercialization of a species are contingent upon survival through numerous stages during the species' development. The "first feeding" period, where larvae transition from endogenous to exogenous feeding, can result in significant mortality due to starvation. Environmental conditions can also influence the identification of prey items, as well as the rate at which they are encountered, and can be species-specific. Slight changes in conditions such as algal and prey density can improve larval survivability and growth. To assess the effects of microalgal and prey densities on the viability of damselfish, these factors were evaluated at various densities at three days post-hatch (DPH): 150,000 - 600,000 cells mL-1 of the microalgae *Tisochrysis lutea* and feeding densities ranging from 2.5 - 10.0 nauplii/mL of the copepod *Parvocalanus crassirostris*. The greatest survival and growth in the larvae were observed at the algal density of 150,000 cells mL^{-1}, with no significant differences in feeding incidence among treatments. Survival and feeding incidence were not affected by prey density of *P. crassirostris*. These results contribute to the development of commercial production techniques for the golden domino damselfish and can provide important insights into larval feeding behavior.

7 **Slow your roll, improve your role: Suppressing copepods' escape responses to improve feeding success of larval fishes**

Sarah W. Hutchins*^, Casey A. Murray, Olivia I. Markham, Jessica L. Diemer, Brandon C. Ray, and Matthew A. DiMaggio

Successful larviculture of marine finfish often depends on providing small, nutritious live feeds, such as *Parvocalanus crassirostris* and *Oithona colcarva* copepod nauplii. Since copepod production is expensive and labor intensive, it is important to efficiently utilize these live feeds by maximizing fishes' capture and ingestion rates. However, copepods are highly evasive and can elude larval predation. Previous research identified environmental stressors that suppress naupliar escape responses. Additional experiments were conducted to determine if feeding slowed copepods to larvae results in improved feeding incidence, growth, and survival.

Tanks (15L) were each stocked with 750 Pacific blue tang *Paracanthurus hepatus* eggs. Each experiment evaluated three copepod feed treatments (n=6) on *P. hepatus* development over time. Escape responses of *P. crassirostris* were reduced in the first experiment using three exposure methods: cold water (1°C), high salinity (60g/L), or normal saltwater (control). The second experiment pre-treated *O. colcarva* by exposing them to warm water (40°C), high salinity (80g/L), and normal saltwater (control).

8 **The Women and Diverse Minorities of the Aquaculture Program at Kentucky State University**

Jasmine Iniguez*^ and Noel D. Novelo, Ph.D.

The aquaculture industry has traditionally been a male-dominated sector. Women and sexual, gender, ethnic, and racial minorities remain under-represented in the workforce. Women commonly have lower status jobs and pay inequality, and women farmers suffer from less access to finances and production inputs (land or ponds) because of discriminatory policies and gender roles, which has restrained their growth as farm owners, managers, and executives in large enterprises (Brugere and Williams, 2017). In 2018, women accounted for only 14% of the 59.5 million people engaged in primary sector of fisheries and aquaculture (FAO 2018). Women are often unrecognized and are assigned unstable roles or poorly paid or unpaid positions that require lower qualifications. Similarly, sexual minorities (for example, individuals who identify as gay, lesbian, or bisexual), gender minorities (individuals whose gender identity or expression is different from their sex assigned at birth), racial minorities, and ethnic minorities are under-represented in the fields of Aquaculture, Fisheries, and Natural Resource Sciences.

At Kentucky State University, women and a diverse group of minorities are part of the School of Aquaculture and Aquatic Sciences. Kentucky State University is Kentucky's oldest historically black land-grant university with a rich history, diverse campus community, and strong emphasis on academics and community service that prepares students towards success. Since the 1980's Aquaculture has made a significant impact at Kentucky State University. This impact has expanded throughout the local region, within the USA, and internationally due to the work, dedication, diligence, and passion of the students, faculty and staff in research, education, and extension on a wide variety of projects that address topics related to genetics, reproduction, physiology, nutrition, fish health, bio-floc, water quality, and aquaponics that are geared to make practical and progressive impacts on society. As aquaculture continues to grow, there is no doubt that women and diverse minority groups need to empower one another because with the right team, a fishbowl of opportunities and growth is possible.

9 **A glimpse into the larval development and digestive physiology of the freshwater ornamental Chinese algae eater (*Gyrinocheilus aymonieri*)**

Casey A. Murray*^, Olivia I. Markham, Nathan D. Evans, and Matthew A. DiMaggio

The Chinese algae eater (*Gyrinocheilus aymoneiri*) is a small fish native rivers of the Mekong Basin in Southeast Asia and is popular within the aquarium trade due to its ability to control algal growth in home aquariums. This species has been raised in aquaculture ponds however, with the short time frame to market size, ponds must be harvested and restocked frequently. Therefore, raising *G. aymoneiri* in recirculating aquaculture systems (RAS) would greatly reduce the amount of physical labor required. Significant challenges associated with larval survival of *G. aymoneiri* in RAS have been documented. Knowledge of the digestive tract development of this species is needed to understand the appropriate feeding and weaning schedule that best promotes survival and growth. 7800 newly hatched *G. aymoneiri* were distributed equally among three 10 L tanks and fed a microdiet (MD) twice daily to satiation from two to 30 DPH (days post hatch). Larvae were sampled at 17 timepoints throughout the trial, photographed, measured, and assessed for developmental

characteristics. Larvae were preserved for digestive enzyme analysis via standard microplate assays and histological processing. Lipase and trypsin activity was detectable at mouth opening and increased dramatically after 17 and 23 DPH, respectively. Pepsin activity was variable until its peak at 25 DPH. Developmental and digestive ontogeny data will provide insight into the digestive capacity of this species throughout the larval period. This information will aid in improving larval diet and culture conditions to optimize growth, survival, and production efficiency.

10 Environmental Hypoxia in the Indian River Lagoon (IRL) and its effects on native fish species during early development

Alessandra Jimenez Yap*^, Bing Ouyang, Paul S. Wills, and Sahar Mejri

The Indian River Lagoon (IRL) is one of the most species-diverse estuaries in North America. Unfortunately, the distribution and intensity of hypoxia (low dissolved oxygen, DO) is increasing, due to high nutrient run-off resulting in algal blooms, 'dead zones', etc. Effects of coastal hypoxia are well-studied in adult fish. However, knowledge gaps remain unsolved about early life stages, including potential consequences to the development, hatching success, or future recruitment of economically important native species. These include Florida pompano, red drum, common snook, gray snapper, and Atlantic croaker. To test the effects of severe hypoxia, fertilized eggs will be incubated in 10 (0.7 mg/L), 20 (1.4 mg/L), and 100% (~6.9 mg/L) DO saturation. Samples will be collected at 10, 20, 30, and 40 hours post-fertilization. Lipids will be extracted from each sample and separated into neutral (used for energetic purposes) and polar (used for membranous development) fatty acids (FAs). FAs profiles and quantities will inform us of the potential effects of severe hypoxia on energy demand and membrane remodeling. We hypothesize to see a decrease in hatch rate, survival, and overall development under severe hypoxia treatments (10 and 20% saturation). By investigating potential impacts of hypoxia on early larval stages, the IRL conservation and management strategies will be more well-informed and executed.

11 Assessment of The Florida East Coast Diamondback Terrapin as a Flagship Species and Estuarine Indicator in the Indian River Lagoon with Continuation of Acoustic Monitoring

Erin K. R. Dier*^, Jeffrey S. Herr, Penny McDonald, Traci Castellon, and Jon A. Moore

BACKGROUND

❖Flagship Species- chosen for their charisma, increase public awareness of conservation issues and rally support for the protection of that species' habitat. Protection of other species is accomplished through the umbrella effect of the flagship species

❖ Estuarine Indicator- should have some of the same habitat requirements as the species, communities, or ecosystems for which they indicate. By protecting indicator species, other species are also protected

❖ The diamondback terrapin (*Malaclemys terrapin; M. t.*) is the only exclusively brackish water turtle in North America

❖ The Florida east coast diamondback terrapin (*M. t. tequesta*) is one of seven subspecies. Five of the seven subspecies occur in Florida. Three of which, including *M. t. tequesta*, are endemic to the state

RATIONALE & IMPORTANCE

❖ Meets the criteria for selecting a flagship species

❖ The diamondback terrapin has characteristics that make it an excellent candidate as an estuarine indicator and has been recommended for this purpose by many investigators (Kannan et al. 1988a, 1999; Burger 2002; Blanvillain et al. 2007; Holliday et al. 2008; Arthur 2009; Green et al. 2010; Basile et al. 2011)

❖ Current population trend is decreasing.

❖ Threats include historical overexploitation, mid-century rapid habitat loss, mortality in crab traps and road crossing, loss of nesting habitat to development and sea level rise, and subsidized predators at nesting sites.

POTENTIAL RESEARCH

❖ Bioaccumulation of pesticides and herbicides (endocrine disruptors) in *M. t. tequesta* using plasma biomarkers. Concurrent with water quality testing of chemical parameters.

❖ Mangrove encroachment on nesting beaches also required by other species such as horseshoe crabs.

❖ Barnacle quantity on animals at different locations- correlative relationships exist between immune function and contaminant exposure

CONTINUATION OF ACOUSTIC MONITORING

❖ One more year of acoustic monitoring will take place to gather more habitat use and movement patterns at the Bee Gum Point Preserve site.

12 **Introducing LO-SPAT: A public-private partnership to better understand and apply knowledge on low salinity tolerance in oysters**

Ann Fairly Pandelides*, Beth Stauffer, Durga Poudel, Geoffrey Stewart, Natalia Sidorovskaia, Megan La Peyre, Louis Plough

The oyster industry of Louisiana supports one of the largest fisheries in the U.S. Gulf of Mexico, bringing economic value and crucial estuarine habitat to coastal communities. In recent years, oyster production has declined dramatically, primarily due to fluctuating salinity in oyster-producing areas caused by increased rainfall, flooding, and freshwater diversions. Freshwater intrusions are predicted to continue to affect water quality and oyster habitat. The LO-SPAT project is a state-funded effort to build and apply our understanding of oyster tolerance to low salinity. Goals include monitoring reefs at relevant spatial and temporal scales and with novel tools, applying the molecular underpinnings of tolerance to breeding of oysters, and engaging with oyster industry in understanding the role of these oysters in restoration and commercial sectors. By combining and leveraging expertise in coastal ecology, ocean observing, organismal and molecular biology, and shellfish production, researchers at UL Lafayette, LSU AgCenter, and University of Maryland, along with industry partners, seek to inform oyster management and commercial operations today while building knowledge to promote long-term oyster resource resilience in the face of continuing environmental changes.

13 **Simple adjustments in material handling during aquaculture production to reduce low back stress using ergonomic analysis**

Boyi Hu*, Kim Dunleavy, Mustafa Yerebakan, and Shuyan Xia

With worker shortages affecting almost every industry, maintaining worker health has become even more important. One of the main occupational health issues in the aquaculture industry is chronic back pain (LBP). In more severe cases, LBP can lead to loss of income, worker absences, and long-term disability. Aquaculture workers, compared to other industries such as manufacturing or construction, work in a unique setting with both heavy loads and repetitive lifting tasks. As many of the tasks in aquaculture require lifting heavy nets, boxes, and baskets under challenging conditions, prevention or management of LBP is particularly important for women and minorities who may be at greater risk.

There are options to reduce some of the loads on the lower back that are particularly important for individuals who are at a disadvantage for heavy lifting tasks. Small changes in the distances workers are lifting and changing the body position relative to the load can decrease overall loads on the body. In our presentation, we will introduce some of the ergonomic concepts important for women and minorities working in aquaculture. We will use the NIOSH lifting equation to illustrate how small changes can change the overall repetitive loads and the safe and unsafe values identified using evaluation tools. We will demonstrate how these tools are used in practical settings.

14 **Tropical Ornamental Aquaculture: Training For Careers In Production, Aquatic Animal Husbandry, And Public Aquariums**

Michelle L. “Mick” Walsh*

Tropical ornamental aquaculture is increasingly used for conservation efforts focused on coral reef species, restoration projects, and mitigating the pressures of wild collection. The College of the Florida Keys offers a Tropical Ornamental Mariculture Technician Certificate, which focuses on marine ornamental aquaculture because: (1) facility requirements are less than those for food fish, (2) aquaculture technology for several species are well developed and excellent for training, (3) the potential for undergraduate research to develop techniques for new species, (4) the ability to transfer technology to the overarching aquaculture industry, and ultimately (5) to reduce the demand for wild-caught species for the aquarium trade. The one-year certificate culminates with a 300-hour internship in situ at a local facility. Students gain hands-on husbandry skills incorporating biology, chemistry, physics and maths using the campus's indoor recirculating and outdoor flow-through systems.

The program feeds into a 2-year Associates degree in Marine Environmental Technology, where students’ technician-level skills are enhanced with courses such as Marine Data Collection, Basic Research Diving, and Basic Seamanship. With two additional years of training, students can progress into the Bachelor’s degree in Marine Resource Management, which is the culminating pathway to provide not only a strong academic foundation in the marine sciences, but also real-world, applied skills to make them marketable in the job-force when they graduate. Students who have completed the program have successfully landed jobs in the marine ornamental aquaculture, aquatic animal husbandry, and public aquarium fields.

15 **Following The Big Bend Shellfish Trail In Florida**

Natalie Simon*, Leslie Sturmer, and Savanna Barry

The rural communities along Florida's Big Bend coast have a long history of natural resource dependence. Oysters, crabs, shrimp, and fish have all crossed the docks of these working waterfronts at one time or another. To highlight the diverse shellfish resources the region supports, a tourism initiative, "Follow the Big Bend Shellfish Trail", was launched in 2017. In partnership with visitors' bureaus and chambers of commerce in four coastal counties and with support from The Conservation Fund, a map was developed identifying local businesses where visitors can buy, eat, and, sometimes, harvest local shellfish was developed. With National Maritime Heritage Program funding, the map was expanded in 2019 to an actual trail through the placement of educational kiosks in six communities. These kiosks serve as points of interest and convey cultural and historical information about the shellfish harvested and processed at each working waterfront location. Local governments are supportive and have invested in placement of additional signs. Further, the Trail is expanding to Wakulla County, where an oyster aquaculture industry is emerging alongside traditional stone and blue crab fisheries. An interactive website, www.floridashellfishtrail.org, provides information on kiosk locations, suggested road trips, infographics of each shellfish species, recreational and commercial harvesting, importance of water quality, recipes, and more. The Trail, the largest of its kind in the United States, has the potential of being a valuable public educational tool that will simultaneously enhance the authenticity and sustainability of the destinations as well as being economically beneficial for the working waterfront communities in the region.

Round Table 1:

What challenges do women and gender minorities face in the aquaculture industry?

What challenges have you faced in your journey as a stakeholder in aquaculture?

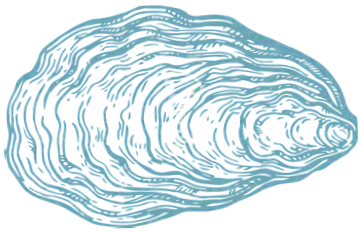
What aspects of the industry present the largest challenges?

How have you worked to overcome these issues?

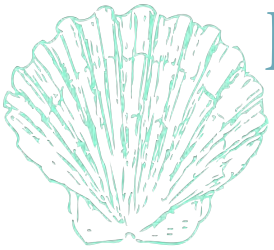
How can we address these issues as individuals?

How can we address these issues as a collective?

Summary of Important Points:

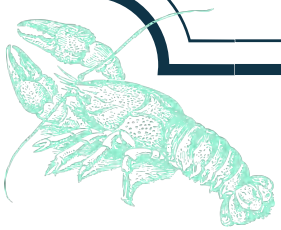


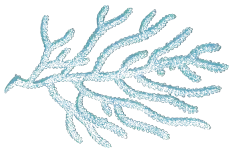
Round Table 2:



How do we combat misinformation about the aquaculture industry?

Have you experienced misinformation about aquaculture?





How can misinformation harm the industry?

Summary of Important Points:

How can we address misinformation as individuals?

How can we address misinformation as a collective?

What are examples of misinformation in your field?

Round Table 3:

What does the future of the aquaculture industry look like?

What do you think will be the biggest advances in the field over the next decade?

How do you view your role in the future of aquaculture?

How can we make the future of the industry more inclusive?

What kinds of collaborations should we foster moving forward?

Which stakeholders do we still need to bring to the table?

Summary of Important Points:

Notes

Notes