

Florida United Malacologists



February 15, 2020

José H. Leal, Organizer



BAILEY-MATTHEWS

**NATIONAL SHELL MUSEUM**

Program and Abstracts

## WELCOME TO FUM!

On behalf of the Bailey-Matthews National Shell Museum, I welcome you to the eleventh meeting of Florida United Malacologists, FUM 2020. Everyone is welcome to present their malacological findings at FUM! We encourage you to ask questions, discuss data, compare notes on methods and problems, and be inspired by your fellow malacologists and enthusiasts. The Museum is entering a new phase. Its soon-to-open Living Gallery will display iconic species of mollusks, with the main objective of motivating the audience to appreciate our animals and to engage in environmental conservation in order to protect them. FUM's mission and scope fits right in with this renovated aspect of the Museum. Enjoy the party!



Dorrie Hipschman  
Executive Director  
Bailey-Matthews National Shell Museum

## ENJOY FUM 2020!

Dear FUM 2020 Participants,

Thanks for your support of FUM 2020. The stage is set, let's have fun! Each one of you brings a unique contribution, either as presenters or enthusiastic members of the audience. I want to thank Chief of Museum Operations Colleen Donnelly, and Environmental Educator Melissa Dill for their assistance with event logistics. Museum Store Manager Gretchen Falk kindly "deaccessioned" and donated the collapsible water bottles included in the registration package.

Remember that your questions to speakers and mutual communications during the event play a big role in what makes FUM so distinctive and rewarding to all. Some of the presenters are students who may be offering a talk for the first time; reach out to them with questions, suggestions, and, most of all, encouragement. And, more than anything, revel in the presentations, discussions, and camaraderie at FUM 2020!



José H. Leal, Ph.D.  
Science Director & Curator  
Bailey-Matthews National Shell Museum

**FLORIDA UNITED MALACOLOGISTS 2020**  
**FEBRUARY 15, 2020**  
**PROGRAM**

**9:00 José H. Leal, BMNSM**  
OPENING REMARKS AND ANNOUNCEMENTS

**SESSION 1**

**9:15 Rebecca A. Mensch**  
*BEYOND SHELLS: YOUR MUSEUM COMES ALIVE*

**9:35 Carly Hulse**  
ENRICHMENT: HOW TO KEEP CEPHALOPODS OCTOPIED

**9:55 Thomas Annesley**  
CONE SNAILS: CREATIVE, SWEET KILLERS THAT ARE FASTER THAN A SPEEDING BULLET

**10:15 David J. Karlen, Thomas L. Dix, Barbara K. Goetting, Anthony Chacour, Sara E. Markham, Kevin W. Campbell, Joette M. Jernigan, Kirsti Martinez**  
TWENTY-FIVE YEAR TRENDS IN THE SOFT SEDIMENT MOLLUSCAN COMMUNITIES OF TAMPA BAY

**10:35 Break – 10 minutes**

**SESSION 2**

**10:45 Don Swenson**  
TWENTY YEARS OF COLLECTING IN JUPITER ISLAND, FLORIDA

**11:05 Phyllis Sharp, Paula E. Cushing**  
IMAGING MICROMOLLUSKS AT THE DENVER MUSEUM OF NATURE & SCIENCE

**11:25 José H. Leal, James F. Kelly, Patricia A. Starkey**  
FORWARD TO THE BASICS: THE BAILEY-MATTHEWS NATIONAL SHELL MUSEUM DIGITAL IMAGING PROJECT

**11:45 Group Photo**  
LOCATION TO BE ANNOUNCED AT THE EVENT

**12:05 LUNCH**  
Lunch provided at the Museum: your choice of regular or vegetarian sandwiches, plus assorted chips, soft drinks, water

### SESSION 3

**1:15** Michael Middlebrooks, Nicholas Curtis, Sidney Pierce

THE DIET OF THE SOLAR-POWERED SEA SLUG *ELYSIA CRISPATA* VARIES THROUGHOUT THE CARIBBEAN

**1:35** Anton E. Oleinik, Alexander B. Modys

SHALLOW WATER MOLLUSCAN BIODIVERSITY OFF POMPAÑO BEACH, BROWARD COUNTY, FLORIDA

**1:55** M.G. Harasewych, M. Sei, J. E. Uribe

MITOGENOMES OF CERIONIDAE: INSIGHTS INTO EVOLUTIONARY HISTORY, BIOGEOGRAPHY, AND AGE OF ISLAND FAUNAS

**2:15** Stephen P. Geiger, Erica Levine

PRELIMINARY ESTIMATE OF SIZE AT MATURITY AND SPAWNING SEASONALITY IN BANDED TULIPS (*CINCTURA LILIUM*) AND LIGHTING WHELKS (*SINISTROFULGUR SINISTRUM*)

**2:35** **Break 2 (10 minutes)**

### SESSION 4

**2:45** **Jaime Rogers**

LASER INDUCED BREAKDOWN SPECTROSCOPY AND SHELLS: NEW APPROACHES IN AGING MOLLUSKS

**3:05** Morgan Tomlin, Ryan M. Harke, Nicole Seiden, Stephen H. Hesterberg, Jaime Rogers, Kaydee J. West, Gregory S. Herbert, Stephen P. Geiger

AGING FLORIDA'S HORSE CONCH (*TRIPLOFUSUS GIGANTEUS*) USING ISOTOPE SCLEROCHRONOLOGY, LASER-INDUCED BREAKDOWN SPECTROSCOPY (LIBS), AND MORPHOLOGY

**3:25** Harry G. Lee, Roger W. Portell, Richard L. Edwards

ONTOGENY AND PHYLOGENY: PROTOCONCHS PLAY A PART IN PLACEMENT

**3:45** **Gregory S. Herbert**

INVESTIGATING NATIVE GASTROPOD PREDATORS' ABILITY TO RESIST INVASIVE BARNACLE PREY—A CASE STUDY FROM PATAGONIA

**4:05** **CONCLUSION, CLOSING REMARKS**

**5:30** **DINNER at George & Wendy's. Prior reservation required. Address and location map at the end of this booklet. (Attendees will be responsible for their dinner expenses.)**

## **Abstracts FUM 2020**

(In talks with more than one author, the names of the presenters are underlined.)

## **CONE SNAILS: CREATIVE, SWEET KILLERS THAT ARE FASTER THAN A SPEEDING BULLET**

**Thomas Annesley**

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Cone Snails are known to use a modified radula to inject a lethal toxin (venom) into their prey. But these snails are far more skilled in their methods of prey and defense than just injection of a single chemical, as occurs for snakes, scorpions and lizards. Cone snails can selectively use different mixtures of toxins depending on the circumstances: predation, protection or competition. Some cone snails also known as "sweet killers". And, recent research shows that these slow-moving mollusks are indeed faster than a speeding bullet.

## **PRELIMINARY ESTIMATE OF SIZE AT MATURITY AND SPAWNING SEASONALITY IN BANDED TULIPS (*CINCTURA LILIUM*) AND LIGHTNING WHELKS (*SINISTROFULGUR SINISTRUM*)**

**Stephen P. Geiger, Erica Levine**

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Banded tulips and lightning whelks are two of the more common large gastropods found in estuaries on the Gulf coast of Florida but their life histories are poorly described. Histological analysis of samples of each species collected in Tampa Bay will be used to describe reproductive seasonality, minimum size at sexual maturity and gender ratios. Both species appear to mature between 30–50 mm total length and appear to be ripe or spawning in late winter. Both species regress in in summer such that determining gender using histology is difficult. For lightning whelk, regrowth of new gametes appears to begin in the fall. For banded tulip, there appears to be a high mortality beginning at a size of around 60 mm, suggesting possible semelparity, or at least a limited number of spawns. In lightning whelks, no large males have been observed. This study is ongoing.

## **MITOGENOMES OF CERIONIDAE: INSIGHTS INTO EVOLUTIONARY HISTORY, BIOGEOGRAPHY, AND AGE OF ISLAND FAUNAS**

**M.G. Harasewych, M. Sei, J. E. Uribe**

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Land snails of the family Cerionidae are a well-studied group best known for the extreme diversity of shell morphology that has given rise to over 600 taxon names. Many of these taxa are known to interbreed ("hybridize") when they come into contact, usually producing narrow "hybrid zones". In the present study we report on relationships of and within the family based on analyses of seven complete mitochondrial genomes as well as complete nuclear 18S genes produced using next generation DNA sequencing. Taxa include: *Microceramus pontificus* (Gould, 1848) (Urocoptidae - outgroup); and six members of the Cerionidae: *Mexistrophia reticulata* Thompson, 2011; *Cerion uva* (Linnaeus, 1758); *Cerion tridentatum costellata* Pilsbry, 1946; *Cerion watlingense* Dall, 1905; *Cerion coloni* Bartsch, 1924 and *Cerion incanum* Leidy, 1851, that span the geographic range of the family in the Recent fauna. We use the results of these analyses to evaluate prior phylogenetic and biogeographic hypotheses, including the ages of the cerionid faunas of the various islands of the western Atlantic.

## INVESTIGATING NATIVE GASTROPOD PREDATORS' ABILITY TO RESIST INVASIVE BARNACLE PREY—A CASE STUDY FROM PATAGONIA

**Gregory S. Herbert**

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The acorn barnacle *Balanus glandula* is native to rocky shores of the northeast Pacific. Humans, however, introduced this species around the world, where its populations have exploded and now threaten native mollusks and other fauna. In this study, our research team investigated whether the native predatory gastropod *Trophon geversianus* (Muricidae) is likely to contain further spread of *B. glandula* in Patagonia. Field observations and stable isotope dietary reconstructions show that *B. glandula* is not immune to attacks from *T. geversianus* but is selected at low rates (4% of diet) relative to native mussel prey. By killing and consuming potential competitors of *B. glandula*, *T. geversianus* is indirectly facilitating the latest wave of this barnacle invasion.

## **ENRICHMENT: HOW TO KEEP CEPHALOPODS OCTOPIED**

**Carly Hulse**

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In effort to increase the quality of life and health of the animals here at the Bailey-Matthews National Shell Museum, a structured enrichment plan is necessary. Enrichment is essential to the overall welfare and care of the animals. The primary goal of the enrichment program, is to provide our animals with the chance to demonstrate species appropriate behaviors, offer mental stimulation, allow them to explore and interact with their environment, as well as decrease the likelihood of undesired behaviors. Also, enrichment increases the animal's visibility to the public, thus providing an educational experience for the guests. This presentation will discuss the importance of enrichment to animal husbandry, and how it can be engaging for both the cephalopod and the guests.

## **TWENTY-FIVE YEAR TRENDS IN THE SOFT SEDIMENT MOLLUSCAN COMMUNITIES OF TAMPA BAY**

**David J. Karlen, Thomas L. Dix, Barbara K. Goetting, Anthony Chacour, Sara E. Markham, Kevin W. Campbell, Julie Christian, Joette M. Jernigan, Kirsti Martinez**

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Molluscan species data were compiled from the Environmental Protection Commission of Hillsborough County's benthic monitoring database. The database comprised 1,791 sediment grab samples collected over a 25-year period (1993–2017) as part of the Tampa Bay Estuary Program's Bay-wide Benthic Monitoring Program. A total of 1,180 benthic macrofaunal taxa were identified with the mollusks being represented by 361 taxa or approximately 30.6% of the total taxa. Mollusks ranked as the second most species-rich and second most abundant phylum behind the annelids. The mollusk species were represented by 214 gastropods, 134 bivalves, 6 chitons, 6 scaphopods and a single aplacophoran. The bivalve *Mysella planulata* was the most abundant mollusk in Tampa Bay, accounting for 16% of the molluscan abundance and was present in 41% of the samples followed by the gastropod *Caecum strigosum* which accounted for 10% of the molluscan abundance and was present in 17% of the samples. This presentation will examine the distribution and 25-year population trends of some of the dominant soft sediment molluscan species in Tampa Bay as well as for the overall molluscan community. Increases in species richness and abundance were observed over the 25-year monitoring period and reflect improvements in Tampa Bay's water quality.

## FORWARD TO THE BASICS: THE BAILEY-MATTHEWS NATIONAL SHELL MUSEUM DIGITAL IMAGING PROJECT

**José H. Leal, James F. Kelly, Patricia A. Starkey**

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The Bailey-Matthews National Shell Museum collection currently encompasses about 130,000 catalogued lots, consisting mostly of shells. To disseminate collection data and improve their accessibility to remote users, the Museum has embarked in an ambitious project that includes acquisition of images of selected collection specimens and related objects (e.g., original labels, notes). Key areas covered include types, the Redfern Collection, Southwest Florida (including local representations of difficult groups of micromollusks such as the gastropod family Tornidae), Florida in general, and parts of the eastern seaboard of the USA. Imaged material includes a few historical collections from Southwest Florida that provide important data for environmental studies, biodiversity analyses, and other types of research. To date, we have linked 1,604 composite images (for a total of 8,180 individual photos) to the BMSM Specify 7 (cloud version) catalogue, followed by ingestion into iDigBio<sup>1</sup> and other collection data aggregators<sup>2</sup>.

<sup>1</sup> <http://ipt.idigbio.org/resource?r=bmns-sm-shell>

<sup>1</sup> <https://www.idigbio.org/portal/recordsets/b40e13f7-a79a-4265-93d9-3b4878dfc988>

<sup>2</sup> <https://www.gbif.org/dataset/417f4d21-959b-4773-90a2-c38d1822d873>

## ONTOGENY AND PHYLOGENY: PROTOCONCHS PLAY A PART IN PLACEMENT

**Harry G. Lee, Roger W. Portell, Richard L. Edwards**

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Analysis of adult (teleoconch; tc) shell morphology is the default methodology in identification (taxonomic placement) of most molluscan taxa, but total reliance in that character set fails to allow for homoplasy (convergent evolution) and may thus belie true phylogeny in certain instances. By applying SEM imaging technology to selected species, principally in the Pinecrest beds (fossil) faunule, we are able to present examples, some novel, in which historical (even present-day) affinities were refuted by including protoconch (pc) morphology in the identification calculus. Such refinements apply to taxa ranging from the species to subclass rank. These demonstrations also inform the zoogeography, evolution, and life-history of many taxa.

## ***BEYOND SHELLS: YOUR MUSEUM COMES ALIVE***

**Rebecca A. Mensch**

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The Bailey-Matthews National Shell Museum staff has spent the last four years working to create a new living gallery by completely renovating the ground floor of the existing museum building. *Beyond Shells* includes 11 salt water aquaria featuring mollusks from around the world. Key educational topics include fundamental information on mollusk biology, importance of mollusks, mollusk diversity, and conservation. This presentation will include photographs and information about the new exhibit, as well as the work it takes behind the scenes to make it all possible.

## THE DIET OF THE SOLAR-POWERED SEA SLUG *ELYSIA CRISPATA* VARIES THROUGHOUT THE CARIBBEAN

**Michael Middlebrooks**

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**Nicholas Curtis**

Ave Maria University

**Sidney Pierce**

University of South Florida

Several species of sacoglossan sea slugs store chloroplasts taken from their algal food for photosynthesis within specialized cells in the digestive tubules of the slug. The diets of most sacoglossan species are highly specialized. *Elysia crispata*, however, is a large sacoglossan able to feed on multiple species of green siphonaceous algae. This slug can photosynthesize for up to three to months after feeding. In this study, we used DNA barcoding to identify algae consumed by *E. crispata* from five locations within the wider Caribbean and Florida. Results indicate that *E. crispata* has a broader diet than previously realized and several new species of algal food were identified for the slug, including some potentially invasive species. Although *E. crispata* is widespread throughout the Caribbean, it does not show a consistent dietary pattern across its range.

## SHALLOW WATER MOLLUSCAN BIODIVERSITY OFF POMPANO BEACH, BROWARD COUNTY, FLORIDA

**Anton E. Oleinik, Alexander B. Modys**

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Mollusk diversity patterns in shallow-water habitats off Broward County, were assessed by 49 SCUBA-based roving surveys along contrasting bottom-types at depths ranging between 2.5 and 8 m and within 600 m of the coastal zone. Surveys were conducted between 2011 and 2019. Bottom types vary from quartz and skeletal sand to rubble consisting of late Holocene (1800–3200 ybp) coral fragments, and Pleistocene bedrock, forming hardbottom flats, ledges, and drop-offs with significant vertical relief. Most of these bottom types are located within the nearshore ridge complex (NRC). Roving surveys yielded 119 species of marine gastropods belonging to 42 families. Differences in mollusk community structure between bottom types and survey season, based on the presence/absence data were analyzed using non-parametric (nMDS) ordination techniques. The analysis suggests minor but noticeable differences in species composition between bottom types, with no significant differences in mollusk occurrences detected between observation seasons.

## LASER INDUCED BREAKDOWN SPECTROSCOPY AND SHELLS: NEW APPROACHES IN AGING MOLLUSKS

**Jaime Rogers**

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The ability to age mollusks has many applications, including assessing the health of fisheries and monitoring restoration efforts, as well as estimating age and season of collection in archaeological contexts. In the case of bivalves, investigators typically cross-section the shell in half to view the growth lines. In many cases, however, it is unknown whether growth lines are formed annually, seasonally, or at more irregular intervals. Here, I introduce the method Laser Induced Breakdown Spectroscopy (LIBS), which scans the shell cross-section to analyze the shell chemistry at a high resolution (50  $\mu\text{m}$ ). The differences in shell chemistry can be related to the water temperature at the time of growth, and provide insights into the age and growth rate of the organism. LIBS is capable of producing 2D elemental maps for easy data visualization at a relatively fast scanning speed and low cost. This paper discusses recent applications of LIBS on mollusks, including preliminary results from oysters (*Crassostrea virginica*) collected from Tampa Bay, and future research directions.

## IMAGING MICROMOLLUSKS AT THE DENVER MUSEUM OF NATURE & SCIENCE

**Phyllis Sharp, Paula E. Cushing**

Marine Invertebrate Collections  
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The Denver Museum of Nature & Science (DMNS) Marine Invertebrate Collection holds approximately 44,000 lots. Cushing curates this collection with the assistance of over 15 volunteers. The collection is databased in *Arctos*<sup>1</sup>. All records and images automatically flow to online data consolidators including GBIF, iDigBio, and InvertEBase. *Arctos* enables geolocation and image uploads during data entry and provides a controlled taxonomy direct from WoRMS. We will give an overview of this online database and imaging system to familiarize you with features of the database that are helpful to the general public and researchers. With a bequest in 2018, we started an intern program to digitize our holdings. Finding fewer images of micromollusks available online, we decided to focus our light microscopy and SEM imaging program on shells less than 5 mm. Our fourth intern started in January and will bring our total images to over 1,000.

<sup>1</sup> <http://arctos.database.museum/>

<sup>1</sup> <https://arctosdb.org/>

## **TWENTY YEARS OF COLLECTING IN JUPITER ISLAND, FLORIDA**

**Don Swenson**

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Over the course of nearly 20 years I have managed to accumulate over 1600 shells worthy of notice while beachcombing. I plan to share photos of some the shells I am donating to the Bailey-Matthews National Shell Museum while I give a synopsis of my collecting experiences.

**AGING FLORIDA'S HORSE CONCH (*TRIPLOFUSUS GIGANTEUS*) USING ISOTOPE  
SCLEROCHRONOLOGY, LASER-INDUCED BREAKDOWN SPECTROSCOPY (LIBS), AND  
MORPHOLOGY**

**Morgan Tomlin**

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**Ryan M. Harke**

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**Nicole Seiden**

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**Jamie Rogers**

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**Kaydee J. West**

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**Stephen P. Geiger**

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The Horse Conch (*Triplofusus giganteus*) is heavily sought-after by collectors and harvested by commercial fisheries with little or no regulation and oversight and is, thus, at high risk of overexploitation. Management of Horse Conch populations should ideally consider how rapidly harvested individuals can be replaced by reproduction, a rate determined by life history traits (e.g., lifetime fecundity, age at reproductive maturation). In this presentation, we summarize oxygen isotope sclerochronology-based estimates of Horse Conch age and refine them with new data from Laser Induced Breakdown Spectroscopy (LIBS) and internal shell growth lines. Geochemistry-based age estimates are also used to test whether years of growth can be reliably and more rapidly assessed with morphology (e.g., growth lines on the operculum and growth breaks on the shell).

Location of 5:30 PM dinner venue:  
**George & Wendy's**  
**2499 Periwinkle Way, Sanibel, FL 33957**  
(on the corner of Tarpon Bay Rd., next to Bailey's General Store)  
**(239)395-1263**

