

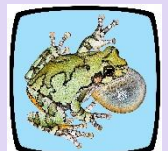
# Abstracts Chambers-Geheber



The Joint Meeting of  
ASIH SSAR HL AES  
**Ichthyologists & Herpetologists**

**Austin 2017**

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## **0594 Herp Systematics II, Sabine, Sunday 16 July 2017**

E. Anne Chambers<sup>1</sup>, Harry W. Greene<sup>2</sup>, David M. Hillis<sup>1</sup>

<sup>1</sup>University of Texas at Austin, Austin, Texas, USA, <sup>2</sup>Cornell University, Ithaca, New York, USA

### **Species Delimitation in Geographically Variable Taxa: A Re-examination of the American Milksnakes (*Lampropeltis triangulum* complex)**

Many recent taxonomic revisions have relied heavily on genetic data, often analyzed largely or exclusively using coalescent model-based methods. The assumptions and limitations of these methods are well known, but they are often not taken into account. We describe a protocol for species delimitation in parapatrically-distributed species that incorporates evidence from multiple sources. We test this protocol in a historically problematic species complex, the American milksnakes (*Lampropeltis triangulum* complex), using available genetic, morphological, behavioral, and biogeographic data. We demonstrate how limitations in sampling and analyses can lead to over-splitting of geographically variable species and to an underestimation of gene flow. We recommend a reduction in the number of recognized species, and note that subspecies designations are useful for distinguishing geographic variation within species. We recommend that coalescent-based species delimitation studies incorporate thorough analyses at contact zones between putative species, and evaluate and synthesize all available evidence before making taxonomic revisions.

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## **0004 LFC Phenotypic Variation II, San Marcos, Thursday 13 July 2017**

R Christopher Chambers

NOAA / Northeast Fisheries Science Center, Highlands NJ, USA

### **Thermal Reaction Norms of Early Life Stages of Mid-Atlantic Estuarine Fishes**

Species from coastal and estuarine habitats are likely adapted to extreme seasonal or even daily temperature variations and perhaps have sufficient plasticity to tolerate the higher, more variable temperatures as the climate warms. Although rate processes of ectotherms are expected to increase with temperature, the scope and shape of various biological responses to a wide range of temperatures are poorly known but may vary among species, populations, and spawning habitat. We examined the plasticity of responses in key early life-stage (ELS) features in multiple coastal and estuarine species of the Mid Atlantic Bight including flatfish, silverside, killifish, tomcod, and sturgeons in an attempt to find generalities. Responses include survival to hatch, thermal tolerance range, embryonic period duration (EPD), developmental rate (DR, a derivative of EPD), size and condition at hatching, and persistence of yolk-sac larvae. In general, all species examined were eurythermal with tolerances ranging from 13 °C in winter-spawning taxa (winter flounder, Atlantic tomcod) to over 22 °C in summer-spawning ones (Atlantic silverside, mummichog). Empirically derived thermal tolerances extended beyond temperatures likely to be encountered currently in nature or those projected by climate-change models. EPD ranged five to nearly ten-fold within taxa. DR was typically

a linear or slightly convex function of temperature except at thermal extremes, supporting the use of constant water temperature at habitat average and associated DR to predict hatching in a variable thermal regime. Size at hatching typically decreased with increasing temperature which may be a critically important, sub-lethal response to ocean warming.

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#### **0434 AES Genetics, Systematics, & Biogeography, Pecos, Sunday 16 July 2017**

Alayne Chappell<sup>1</sup>, Dovi Kacev<sup>2</sup>, Andrew Nosal<sup>1</sup>, Kevin Feldheim<sup>3</sup>, Daniel Cartamil<sup>1</sup>

<sup>1</sup>Scripps Institution of Oceanography, La Jolla, California, USA, <sup>2</sup>NOAA SWFSC, La Jolla, California, USA, <sup>3</sup>Field Museum, Chicago, Illinois, USA

#### **Population Structure and Genetic Diversity in Southern California Thresher Sharks (*Alopias vulpinus*)**

In both the US and Mexico, the Common Thresher shark (*Alopias vulpinus*) is targeted in commercial and recreational fisheries, and considered one of the most important commercially-caught sharks in both areas. Exploitation peaked during the 1980s and 90s but has since waned. Common Thresher sharks found in the Eastern Pacific along the US and Mexico coasts are thought to comprise one homogenous population spanning from British Columbia, Canada to Baja California (BC), Mexico. Despite being historically overfished, a recent stock assessment found that overfishing is not currently occurring in California waters. However, catch data from the same population in Mexico is difficult to obtain and actual catch is not fully incorporated into the assessment. Genetic relatedness analyses can provide further insight into the health and demographic history of this population. Genetic data were collected from 551 adult and juvenile Common Thresher sharks off the coast of California and BC, from 11 different years from 1997 to 2012. All individuals were genotyped at 11 independent microsatellite loci for analyses. The results of this study have implications for bilateral management of Common Thresher sharks between the US and Mexico with particular consideration for sensitive nursery areas spanning both jurisdictions.

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#### **0892 Snake Biology I, Brazos, Sunday 16 July 2017**

Matt Charnock

N/A, Austin, Texas, USA

#### **A Window into the Limbless Giants of Papua Island (New Guinea)**

The island of New Guinea (Papua Island) is one of the most biodiverse slices of terra firma left on our ever-shrinking planet. Beyond the birds of paradise and tree kangaroos, in the upper-story and atop the leaf litter below live giants. Large, limbless, and enigmatic – the three giant pythons of Papua Island. The scrub python complex (*Morelia*

*amethystina*, *Morelia* sp.), Boelen's pythons (*Morelia boeleni*), and papuan pythons (*Liasis papuana*) have largely alluded both the academic and hobby circles for decades; Boelen's pythons and scrub pythons collected from Papua New Guinea and Irian Jaya, however, have seen spikes in commercial popularity in the past two-decades. (Papuan pythons were heavily imported into the United States in the mid-70's in a failed attempt to cement them as a hobby staple.) Interestingly enough, there's the equivalent of mitochondrial bread crumbs we're now just finding that are giving us a view into a wider window into these snakes. Subspeciation is likely occurring in all three species given described phonetic differences regarding populations separated topographical ebbs and flows, examples of ophiophagy between scrub and papuan pythons, and metabolic abnormalities seen in Boelen's and Oksibil scrub pythons living in high elevations. Like other endemic species to Papua Island, human greed is taking a demoralizing toll on wild populations. But, knowledge is a power and currency all to itself; visibility and comprehension is key to sustainable change. And to peer through a window is the first step into changing and comprehending a world not your own.

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### **0203 Fish Ecology II, San Antonio, Sunday 16 July 2017**

Paul Chittaro<sup>1</sup>, Rich Zabel<sup>2</sup>, Chris Grandin<sup>4</sup>, Dayv Lowry<sup>3</sup>

<sup>1</sup>*Ocean Associates contractor at NWFSC, Seattle, WA, USA*, <sup>2</sup>*NWFSC, NOAA, Seattle, WA, USA*, <sup>3</sup>*WDFW, Seattle, WA, USA*, <sup>4</sup>*DFO, Nanaimo, Canada*

### **Investigating Declines in Body Size of Salish Sea Pacific Hake Following Fishery Closure**

Fishing restrictions and closures may provide a necessary window of time for recovery, but they do not ensure that the population will rebound. For example, the population of Pacific hake (*Merluccius productus*) in inland waters of Puget Sound, Washington, USA, has failed to recover despite the closure of the commercial fishery in 1991. We reconstructed size-at-age of Pacific hake from Puget Sound and nearby Georgia Strait populations and found that individuals grew similarly in the first year of life. However, fish collected from the degraded Puget Sound population grew 2 to 3 times less during the second, third, and fourth summers relative to those from Georgia Strait. Also, Pacific hake from Puget Sound that hatched before the fishery closure grew, on average, 33% and 42% more during their second and third summers, respectively, than those that hatched after the closure. To investigate this decline in size-at-age of Puget Sound hake and explain variability in size-at-age of hake collected from Puget Sound and Georgia Strait we used a generalized linear modeling approach that included data of competitive and predatory pressure as well as the environmental conditions experienced by the fish.

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### **0660 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Olivia Clark<sup>1</sup>, Juan Diego Daza<sup>2</sup>, Aaron Bauer<sup>3</sup>, Ian Brennan<sup>4</sup>, Mark Hutchinson<sup>5</sup>

<sup>1</sup>Sam Houston State University, Huntsville, Texas, USA, <sup>2</sup>Villanova University, Villanova, Pennsylvania, USA, <sup>3</sup>The Australian National University, Canberra, New South Wales, Australia, <sup>4</sup>South Australian Museum, Adelaide, South Australia, Australia, <sup>5</sup>University of Adelaide, Adelaide, South Australia, Australia

### **Distinct patterns of skull morphology among Australian legless lizards (*Aprasia*: Pygopodidae)**

*Aprasia* is a genus of miniaturized pygopods from Australia that indisputably exhibit the most extreme skull morphologies for any known gecko. Some of the autapomorphies of this group include several convergent characters with scolecophidian snakes such as the outer shell bone arrangement in the snout, extreme reduction of teeth, lateral closure of the braincase, and a lower jaw that is shorter than the cranium. The genus today includes 14 species of fossorial or semifossorial lizards, but only three of them have been studied osteologically. Using XRCT scans of 27 specimens, we found that the skulls show two alternative construction patterns. When these patterns were mapped into concatenated tree of mtDNA and nDNA, we found two distinctly different patterns: 1) A basal pattern where the braincase is supported by the pterygoid bones via the epipterygoid (as in the vast majority of squamates) and 2) a derived pattern where the braincase contacts the frontal bone via a hypertrophied parabasisphenoid rostrum, with no support of the pterygoids due to a reduction of the epityergoids. This second pattern is present today exclusively in Western Australia, while the basal patterns are found throughout the country. It has also been suggested that perhaps the *Aprasia* lizards from Western Australia will consist of all “long-nosed” specimens, which are possibly going to be considered the more fossorial species. Their counterparts found throughout the rest of the Australian continent are known to have a more basic, round-nosed morphology.

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### **0508 Reptile Behavior, Sabine, Friday 14 July 2017**

Rulon Clark<sup>1</sup>, Malachi Whitford<sup>1</sup>, Grace Freymiller<sup>1</sup>, Tim Higham<sup>2</sup>

<sup>1</sup>San Diego State University, San Diego, CA, USA, <sup>2</sup>University of California Riverside, Riverside, CA, USA

### **Leaps and Bounds: High Speed Predator-Prey Interactions Between Sidewinder Rattlesnakes and Desert Kangaroo Rats**

Viperids recorded under laboratory conditions can reach exceptional levels of performance when striking at prey. However it is generally not known how this performance may translate to predatory success under natural conditions, when attempting to kill prey that may have coevolved with snakes to avoid strikes. Kangaroo rats, which are largely sympatric with rattlesnakes throughout the arid regions of North America, can use their disproportionately large hind legs to create a powerful, extremely rapid jump accompanied by acrobatic twists and kicks that allow them to avoid envenomation. We used high speed cameras to record 32 predatory strikes from free-

ranging sidewinder rattlesnakes (*Crotalus cerastes*) attempting to envenomate desert kangaroo rats (*Dipodomys deserti*). We quantified the speed, acceleration, timing, and trajectory of movements of both rattlesnakes and kangaroo rats, along with a series of environmental variables, to determine how ecological factors and physical performance interact to determine the outcome of high-speed predatory attacks by rattlesnakes striking from ambush.

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## **0796 Fish Conservation II, San Antonio, Sunday 16 July 2017**

Scott Clark<sup>1</sup>, Scott Durst<sup>2</sup>, Nathan Franssen<sup>2</sup>

<sup>1</sup>University of New Mexico, Albuquerque, NM, USA, <sup>2</sup>U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, NM, USA

### **Age-specific survivorship of Colorado Pikeminnow (*Ptychocheilus lucius*) in the San Juan River**

Programs developed to re-establish extirpated or augment declining populations have become a common conservation action to manage imperiled fishes in the United States. While these programs may lessen the threat of local extirpation or extinction, augmented individuals may exhibit differential biological responses to local environmental conditions compared to wild conspecifics. The federally endangered Colorado Pikeminnow (*Ptychocheilus lucius*) is a large-bodied, piscivorous cyprinid historically known from only the Colorado River basin of western North America. While wild and self-sustaining populations remain in portions of the basin, Colorado Pikeminnow were considered nearly extirpated from the San Juan River (NM & UT) by the late 1990s. Annual stocking efforts (primarily age-0 fish) have increased the numbers of juvenile Colorado Pikeminnow in the San Juan River over the past decade, however individuals are rarely encountered three years after stocking. Consequently, we assessed the effects of first-encounter size, body condition, location (river kilometer), and age on the survival and recapture probabilities of Colorado Pikeminnow between 2004 and 2016. Our results indicate that survivorship was variable across years and generally increased with initial encounter size. Juvenile survival was low but increased once individuals reached approximately 350 mm, suggesting a potential bottleneck that may impact wild recruitment in the San Juan River. Detection probabilities were higher in the lower reaches of the river and were positively related to body condition and age. Our results corroborate field observations of low juvenile survival and highlight the need for further studies investigating putative causes contributing to the apparent recruitment bottleneck.

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## **0682 Fish Conservation I, San Antonio, Sunday 16 July 2017**

Scott Clark<sup>2</sup>, Jake Schaefer<sup>1</sup>, Brian Kreiser<sup>1</sup>

<sup>1</sup>University of Southern Mississippi, Hattiesburg, MS, USA, <sup>2</sup>University of New Mexico, Albuquerque, NM, USA

### **Persistence and stability of Pearl Darter (*Percina aurora*) populations**

The Pearl darter (*Percina aurora*) is one of the most imperiled species in the Gulf Coastal Plains. It is historically known from only the Pearl and Pascagoula River systems of Mississippi and Louisiana. However, it appears that populations remain only in the Pascagoula River drainage, likely extirpated from the Pearl River drainage (last specimen taken in 1973) after installation of flow control structures. Proposal for listing was initiated in 1999 with a recent recommendation for Threatened status. Throughout 2013-2016 we surveyed sites within the Pascagoula River and its major tributaries (Chickasawhay and Leaf Rivers) to assess long-term patterns of population persistence in reference to surveys conducted over a decade ago. While yearly variation in abundance (CPUE) was observed, frequency of occurrence remained stable throughout the surveyed years indicating persistence and stability in the Pascagoula populations. Among the sampled rivers, CPUE and occurrence rates were highest in the Chickasawhay and Pascagoula Rivers, Furthermore, Pearl darter presence during coarse spatial sampling in other tributaries within this drainage (Okatoma and Black Creeks, Bouie River) have indicated available habitat remains and populations still persist in these relatively under-sampled major tributaries.

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### **0399 Lightning Talks II, Glass Oaks, Friday 14 July 2017**

Natalie Claunch, Christina Romagosa

*University of Florida, Gainesville, Florida, USA*

### **Do reptilian invaders shed armor to conquer new lands?**

A suit of armor protects against unseen attacks, but weighs heavy. A shield is carried to protect against specific, anticipated attacks, and is more versatile. The immune system can be roughly seen as both armor and shield against pathogens, and just as warriors vary in their selection of armor and shields, vertebrates vary in immune investment. When a species is displaced into a new environment, it will encounter many new pathogens (including parasites), however, the innate immune armor may be too heavy to advance in battle; species may mount inappropriate inflammatory responses to innocuous substances at a cost to reproduction and dispersal. For invasive vertebrates, it may be beneficial to shed much of the inflammatory armor against non-specific pathogens to invest in reproduction, yet still carry an acquired immunity shield to deflect known pathogens from previous exposures. While suppressing inflammation leaves an invader vulnerable to sustained parasite and pathogen infection, it may award the invader with the ability to reproduce before succumbing to infection. Patterns of inflammation-suppression have been observed among nonnative species at the invading range-edge(s), but comparisons to their populations in the native range are lacking. Additionally, glucocorticoid hormones, known immunosuppressants, may mediate

invasive phenotypes. This project aims to assess inflammatory responses and glucocorticoid hormone patterns across 20 nonnative reptile species in their nonnative and native range(s) to understand whether native-range plasticity can predict potential invasive phenotypes. To amass range-pair comparisons, I aim to collaborate with researchers working in the native range of focal species.

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### **0768 General Herpetology, Sabine, Sunday 16 July 2017**

Jarad Cochran<sup>1</sup>, Naya Eady<sup>1</sup>, David Haskins<sup>1</sup>, Melissa Pilgrim<sup>2</sup>, Tracey Tuberville<sup>1</sup>

<sup>1</sup>*Savannah River Ecology Lab, University of Georgia, Athens, Georgia, USA*, <sup>2</sup>*University of South Carolina Upstate, Spartanburg, South Carolina, USA*

#### **Influence of Coal Combustion Residues on Metabolic Rates and Immune Responses in Eastern Mud Turtles (*Kinosternon subrubrum*)**

Coal combustion is a major energy source in the US. Coal combustion residues (CCRs), the waste product of coal combustion, contains potentially toxic trace elements that can negatively impact animal physiology (e.g., lower immune responses, and/or alter metabolic rates). Before 1980, the US primarily disposed of CCRs in aquatic settling basins known as constructed wetlands. Many animals use constructed wetlands as habitat and can be exposed to CCRs, potentially affecting their physiology. To investigate the effects of CCRs on Eastern Mud Turtles (*Kinosternon subrubrum*), we sampled 30 turtles exposed to CCRs and 17 unexposed turtles captured in 2015-2016 from the Savannah River Site (Aiken, SC, US). For captured turtles, we (1) quantified accumulation of CCRs in claw and blood samples (2) evaluated CCRs effects on metabolic rates via flow through respirometry, (3) used bacterial killing assays to assess influences of CCRs on immune responses, and (4) compared differences in hemogregarine parasite loads. Claw arsenic, selenium, and strontium levels were significantly higher in turtles from contaminated sites. Blood selenium and strontium levels were significantly higher in turtles from contaminated sites. CCR-exposed turtles had significantly lower metabolic rates than reference turtles at 35 oC. Average bacterial killing efficiency for both groups was greater than 98%. Average parasite loads did not significantly differ between CCR-exposed and reference turtles ( $0.03461 \pm 0.02$  and  $0.06153 \pm 0.03$ , respectively). Our results show that turtles accumulate CCRs from the environment, and accumulation of CCRs is associated with changes in turtle physiological functions when additional stressors are present.

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### **0485 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Adam Cohen<sup>1</sup>, Dean Hendrickson<sup>1</sup>, Tomislav Urban<sup>2</sup>, David Walling<sup>2</sup>, John Gentle<sup>2</sup>, Gary Garrett<sup>1</sup>, Melissa Casarez<sup>1</sup>, F. Douglas Martin<sup>1</sup>



<sup>1</sup>University of Texas, Integrative Biology, Austin, Texas, USA, <sup>2</sup>University of Texas, Texas Advanced Computing Center, Austin, Texas, USA

### **Update on the Fishes of Texas Project**

The Fishes of Texas project ([www.fishesoftexas.org](http://www.fishesoftexas.org)), originating in 2006, remains the most reliable (quality controlled) and data rich site for acquiring occurrence data for Texas fishes, holding over 124,000 records from 42 institutions. Among many discoveries, the project is responsible for detecting at least 3 freshwater species not previously known from Texas. We continue making improvements, but substantial updates so far have been onerous for our developers for various reasons. A recent major update reduces coding redundancies, points the website to a new massively restructured and more fully normalized PostgreSQL database (was MySQL), and places the code in a versioning environment. These changes have little immediate effect on user experience, but will greatly accelerate development. PostgreSQL allows for complex spatial queries and users will be able to quickly map occurrence data alongside many more political/environmental layers than currently possible. While our database/web designers have been implementing these changes and fixing bugs etc., we've been preparing resources for them to integrate into the website. Some highlights to expect: (1) new updates to the state Species of Greatest Concern list; (2) expert opinion-determined nativity spatial layers for all freshwater fishes displaying in our new mapping system; (3) dynamic statistical summaries; (4) new data types from the literature (>14500 records), citizen science (>4500), anglers (>32000), and agency databases (>800000); (5) new museum records, many derived from our gap sampling (17000, 4 museums); (6) more specimen examinations (>400) and photographs (1000); (7) document archive with smart text search tools (currently in beta testing using TPWD fisheries reports). So be patient and keep your eyes open for updates.

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### **0302 Herp Reproduction & Life History I, Pecos, Thursday 13 July 2017**

Kristina Cohen, Karen Warkentin

*Boston University, Boston, MA, USA*

### **Different Hatching Mechanisms but Similar Escape-hatching Processes in Two Neotropical Treefrogs**

Environmentally cued hatching (ECH) is widespread in anurans. Across lineages that vary in reproductive mode, embryos adaptively alter hatching timing in response to threats and opportunities. Yet we know little about how frogs hatch and less about hatching regulation. Most frogs have hatching gland cells (HGCs) that gradually secrete a hatching enzyme that digests the vitelline membrane. We compared the hatching mechanisms of two Neotropical treefrogs with terrestrial eggs that both hatch early to escape threats. *Agalychnis callidryas* hatch rapidly to escape snakes, and have a derived hatching mechanism with 2 types of HGCs that retain enzyme and release it acutely. *Dendropsophus ebraccatus* hatch to escape dehydration and ant attacks, but their eggs expand gradually, indicating prolonged enzyme release. In addition, *D. ebraccatus*

acutely release enzyme to escape predator attacks. Thus, two anurans with different underlying hatching mechanisms employ the same mechanism of regulation to escape acute threats. Investigating how diverse anurans regulate hatching through convergent or homologous mechanisms will elucidate how ECH has evolved within this diverse group.

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**0158 HL/SSAR/ASIH Symposium - The Science, Management, and Policy of Amphibian Conservation: Extending the Legacy of Ray Semlitsch, Glass Oaks, Saturday 15 July 2017**

James Collins

*Arizona State University, Tempe, AZ, USA*

**Amphibians in the 21st Century: The Challenge of Integrating Discovery and Loss, Conservation and Husbandry**

Several paradoxes characterize modern amphibian biology. At a time when new species continue to be discovered, populations and species are going extinct as a result of land use change, infectious disease, invasive alien species, and certainly in the near future climate change. Understanding these causes and perhaps mitigating the losses will require research, which of course entails discovery even in a time of extinction. One solution to the anticipated loss of species, a solution provoked especially by emergence of infectious diseases, is moving amphibians from native habitats into conservation facilities. But this husbandry solution, at least for the foreseeable future, means species must remain in captivity unless there are major discoveries that alter this fate. There are arguments that revolutionary breakthroughs in gene editing and its application in a technology such as gene drives offer a powerful tool for sustaining biodiversity. These advances, however, raise complex questions about what counts as natural, and what are acceptable ways for applying new technologies to alter populations and communities to sustain species. I will discuss integrating the four themes of discovery, loss, conservation, and husbandry as an ongoing challenge confronting 21st century students of amphibian biology. Accepting this challenge is one way to envision adapting to the rapid pace of global change. It is a way that offers hope for conserving species, but it is a route that will require hard decisions relative to how intrusive we are willing to be in shaping Earth's biodiversity.

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**0292 LFC Multi-Stressor Effects, San Marcos, Friday 14 July 2017**

Louise Cominassi<sup>1</sup>, Marta Moyano<sup>1</sup>, Guy Claireaux<sup>2</sup>, Patrcik Quazuguel<sup>3</sup>, Sarah Howald<sup>4</sup>, Felix Christopher Mark<sup>4</sup>, José-luis Zambonino<sup>3</sup>, Myron Peck<sup>1</sup>

<sup>1</sup>Hamburg University (IHF), Hamburg, Germany, <sup>2</sup>UBO, Brest, France, <sup>3</sup>IFREMER, Brest, France, <sup>4</sup>AWI, Bremhaven, Germany

## Combined Effects of Ocean Acidification and Warming on the Swimming Capacity of European Sea Bass Larvae

Swimming ability is a key determinate of Darwinian fitness in fish as it influences a number of fundamental performance traits including the ability to acquire food and to avoid predators. Reductions in swimming ability, therefore, may have important population-level consequences. As an integrated measure of the functioning of a variety of interlinked physiological systems, swimming ability is also considered to be a good indicator of fish health. We examined the effects of ocean acidification and warming (OAW) on growth, development (*e.g.*, morphology, ossification) and critical swimming speed ( $U_{crit}$ ) of European sea bass (*Dicentrarchus labrax*) larvae. From an age of 2 days post hatch (dph) onward, larvae were exposed to a combination of three CO<sub>2</sub> levels (400, 800, 1200  $\mu$ atm; pH 8.1, 7.8, 7.6) and two temperatures (15, 20°C). Larval stage duration was 35% longer at 15°C (60 days) compared to 20°C (45 days). Thermal effects on growth and development were stronger than those of CO<sub>2</sub> levels, although the rate of ossification increased with increasing  $p$ CO<sub>2</sub>. Swimming ability increased rapidly with larval size, but inter-individual variability was large. For larvae reared at 20°C,  $U_{crit}$  reached a plateau around 13 mm in standard length, resulting in lower  $U_{crit}$  at metamorphosis (3.5 cm s<sup>-1</sup>) compared to 15°C-reared larvae (6.3 cm s<sup>-1</sup>). Overall, our data suggest that swimming ability during larval development in European seabass is impacted more by exposure to warm temperature and less by exposure to high CO<sub>2</sub> levels.

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### 0877 Texas and Mexican Blindcats/Desert Fishes, Sabine, Saturday 15 July 2017

Kevin W. Conway<sup>1</sup>, Megan Osborne<sup>2</sup>, Megan Bean<sup>3</sup>, David Portnoy<sup>4</sup>

<sup>1</sup>Texas A&M University, College Station, TX, USA, <sup>2</sup>University of New Mexico, Albuquerque, NM, USA, <sup>3</sup>Texas Parks & Wildlife Dept., San Marcos, TX, USA, <sup>4</sup>Texas A&M University Corpus Christi, Corpus Christi, TX, USA

### The plight of the Rio Grande Shiner, *Notropis jemezanus*, in the lower Rio Grande along the Texas/Mexico border

The Rio Grande Shiner (*Notropis jemezanus*) is endemic to the Rio Grande drainage of the southwestern United States and Mexico. It has been extirpated from the main stem of the Rio Grande in New Mexico and exhibits a fragmented range in the upper Pecos River in New Mexico and the main stem of the Rio Grande along the Texas/Mexico border. We provide an overview of US museum holdings for *N. jemezanus* and report on recent sampling efforts for this species along the main stem Rio Grande from the Big Bend region downstream to Laredo. Examination of museum voucher specimens indicates that records of *N. jemezanus* from the lower Pecos River and Devils River in Texas are based on mis-identifications of *Notropis megalops*. Recent field efforts by our group throughout the Rio Grande along the TX/Mexico border have produced only four individuals of *N. jemezanus*. The Rio Grande Shiner is now extremely rare and we

predict that the future of this species will be bleak without immediate conservation intervention.

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### **0390 Lightning Talks II, Glass Oaks, Friday 14 July 2017**

Pearce Cooper<sup>1</sup>, Dave Portnoy<sup>2</sup>, Sean Powers<sup>1</sup>

<sup>1</sup>University of South Alabama, Mobile, Alabama, USA, <sup>2</sup>Texas A and M University Corpus Christi, Corpus Christi, Texas, USA

#### **Preliminary Evidence of Genomic Population Structure and Selection in Sheepshead, *Archosargus probatocephalus*, in the Coastal Southeastern United States**

Sheepshead are euryhaline sparid fish that are recreationally and commercially exploited in the coastal Southeastern United States. Morphologically divergent groups of Sheepshead are described as subspecies. *Archosargus probatocephalus oviceps* is reported from the Florida panhandle to the Western Gulf of Campeche, Mexico, while *A.p. probatocephalus* is reported from Florida panhandle to Nova Scotia, Canada. These groups appear to show admixture in a region centered on Apalachee Bay, Florida. To resolve differences between the putative subspecies and better understand population structure in the Gulf of Mexico and U.S. South Atlantic, genomic variation is being characterized in 13 geographic samples spread from the Lower Laguna Madre, TX to the Lower Chesapeake Bay, VA. Double digest Restriction-site Associated DNA (ddRAD) sequencing is being used to assess the level of genomic variation across this range. We highlight the preliminary results of this study in terms of neutral population structure and trends observed with markers putatively under selection while making comparisons between our data and current data of other euryhaline fish species. The results of this study will increase the understanding of micro-evolutionary processes that may affect multiple fishes in this region and allow for more successful management of this important fishery species.

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### **0830 ASIH STOYE ECOLOGY & ETHOLOGY IV, Sabine, Friday 14 July 2017**

Christina Coppenrath, Jacob Lasala, Matia Gingras, Noi Meersohn, John Baldwin  
*Florida Atlantic University, Davie, FL, USA*

#### **Identifying Important Foraging Grounds for Florida's Nesting Leatherback Turtles (*Dermochelys coriacea*)**

The migratory behavior of North Atlantic leatherback turtles (*Dermochelys coriacea*) has been documented in the Wider Caribbean, but the migratory movements of leatherbacks nesting in South Florida are relatively understudied. Our knowledge of their migrations is currently limited to ten nesting females tracked from the east coast of Florida. Most of them moved north along the Gulf Stream or to the central North Atlantic, while one

travelled to the coast of Western Africa. The results of this study bring to light the need for larger sample sizes in order to identify and determine the relative importance of the different foraging areas for the leatherbacks nesting in South Florida. As Florida's nesting population has been experiencing increased nesting numbers (10-11% per year since 1979), it is important to know which geographic areas are providing the energy sources necessary for vitellogenesis, migration, and nesting. Here, we analyzed  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  stable isotopes in whole blood and skin samples from leatherbacks nesting in South Florida and compared those data from previous studies in the Atlantic in order to gain insight into their foraging ecology. In addition to the original three foraging grounds, two new ones were identified for the South Florida population using k-means cluster analysis. We also tested whether the observed isotopic signatures were correlated with mtDNA haplotypes to examine the relationship between migratory foraging behavior and ancestral nesting site fidelity. A better understanding of where active nesters are feeding will help identify areas that should be protected in the future.

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## **0504 Amphibian Conservation I, Wedgewood, Sunday 16 July 2017**

Sarah Corey-Rivas

*New Mexico Highlands University, Las Vegas, NM, USA*

### **Population-Level Variation in Southern Rocky Mountain Boreal Toad Susceptibility to *Batrachochytrium dendrobatidis***

Response to emerging disease can be difficult to predict from host population to population even within the same species. In the last few decades, the global panzootic lineage of the fungal pathogen, *Batrachochytrium dendrobatidis* (*Bd*), has threatened the survival of many amphibian species. Studies of the pathology, immunology and transcriptomics of host susceptibility to *Bd* infection demonstrate a remarkable range of host responses across different species. The boreal toad, *Anaxyrus boreas*, is susceptible to *Bd* infection and many populations have declined after the arrival of *Bd*. However, *Bd*-positive boreal toads persist in some populations within the Southern Rocky Mountain lineage. In this study, I collected eggs from sibling clutches of wild boreal toads from a purportedly *Bd*-tolerant Utah population of boreal toads and eggs from a known *Bd*-susceptible Colorado population. I conducted a *Bd* challenge trial with lab-reared toads using a global panzootic *Bd* isolate originating from boreal toads of Colorado. The purportedly *Bd*-tolerant Utah toads exhibited mild clinical presentation of infection while carrying a range of *Bd* loads. Over the 34 day infection period, trends in *Bd* infection load, body condition, and clinical presentation of infection indicate that population-level genetic differences likely are responsible for variation in *Bd*-tolerance. Management of *Bd*-threatened boreal toad populations may consider underlying genetic variation as a major contributing factor to *Bd* susceptibility, in addition to local ecological factors. Strategies to increase immunogenetic diversity and gene flow will provide significant conservation payoffs especially for geographically isolated populations.

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**0849 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Erin Cork, John Maerz, Jeffrey Hepinstall-Cymerman

*Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Georgia, USA*

**Investigating Habitat Associations of the Gopher Frog, *Lithobates capito*, in South Georgia**

The gopher frog, a species of concern in Georgia, has suffered population declines corresponding with the loss and alteration of southeastern longleaf pine ecosystems. Identifying habitat associations and remaining suitable habitat for the gopher frog are essential first steps for implementing effective conservation management to sustain the species. This study will investigate gopher frog site occupancy throughout the Alapaha River Wildlife Management Area (ARWMA) using automated recording devices, dipnetting surveys, and egg mass surveys. We predict wetland characteristics such as hydroperiod, canopy cover, presence of fish, and proximity to other wetlands will be significant variables for predicting site occupancy by gopher frogs. Our objectives are 1) to identify site- and landscape-level habitat characteristics of known localities harboring viable gopher frog populations throughout Georgia; 2) to assess site and landscape characteristics of occupied sites within ARWMA; 3) to create wetland inventories for amphibian species at ARWMA; 4) to develop a habitat suitability model for gopher frogs that identifies networks of suitable wetlands and terrestrial habitat throughout ARWMA; and 5) to develop a management plan for the Georgia Department of Natural Resources with the objective to improve breeding wetlands and upland habitats likely to be used by gopher frogs and to increase connectivity between these habitats. By evaluating habitat characteristics of localities where gopher frogs are detected, we can develop a more localized habitat modeling approach that can direct agencies towards focusing resources (prescribed burns, thinning, planting, surveying) on areas most likely to promote persistence of gopher frog populations within managed landscapes.

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**0336 HL GRADUATE RESEARCH AWARD, Pecos, Friday 14 July 2017**

Decio Correa, Mathew Leibold

*The University of Texas, Austin, TX, USA*

**Unraveling the Role of Evolutionary History on Skin and Gut Microbial Communities of Anuran Amphibians**

Host-associated bacterial communities (microbiomes) are thought to provide numerous benefits to their host. Amphibians have symbiotic skin microbiome that harbors a broad range of bacteria, including some capable of combating the frog-killing fungus *Batrachochytrium dendrobatidis*. Likewise, the amphibian gut microbiome can be very important for nutrient acquisition. We investigated how the evolutionary history relates

to the composition of the skin and gut microbiome of anuran amphibians. We hypothesized that 1) the similarity of the skin microbiomes across anurans correlated with their phylogenetic relatedness since the chemical composition of anuran skin can be evolutionarily conserved and it might thus affect the microbiome; and that 2) similarity in anuran gut microbiomes would not be correlated with phylogenetic relatedness because of the generalist diet of most species. We sampled 27 anuran species from six families and found that, as hypothesized, the evolutionary relationship between anurans explained more than 80% of the variation of their skin microbiome but less than 15% the variation in gut microbiomes. Evolutionarily conserved microbiomes have been observed in other animals, but it is often likely due to the vertical or horizontal transmission of the microbiome, an unlikely case in anurans. Our results provide another mechanism for the conserved pattern: environmental filtering by some attribute + phylogenetic conservation of that attribute. These results can help the planning of current conservation and management strategies aiming at manipulating amphibian skin microbiome to prevent or eliminate diseases that are driving amphibians extinct worldwide.

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**0344 SSAR VICTOR HUTCHISON STUDENT POSTER AWARD: ECOLOGY, NATURAL HISTORY, DISTRIBUTION, & BEHAVIOR; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Decio Correa<sup>1</sup>, Denise Rossa-Feres<sup>2</sup>, Ricardo Sawaya<sup>3</sup>

<sup>1</sup>*The University of Texas, Austin, TX, USA*, <sup>2</sup>*Universidade Estadual Paulista, São José do Rio Preto, SP, Brazil*, <sup>3</sup>*Universidade Federal de São Paulo, Diadema, SP, Brazil*

**Metacommunity Structure of Tadpoles and Adult Anurans: Integrating Traits, Space, Environment, and Evolutionary History**

Larval and adult stages of complex life cycle organisms usually live in different environments, being subject to distinct environmental and evolutionary agents. Therefore, to fully comprehend the community assembly of those organisms it is critical to evaluate both life stages together. We sampled a metacommunity of tadpoles and adult anurans in Southeast Brazil to investigate how characteristics of water bodies affect the phenotypic and phylogenetic diversity of anurans. Additionally, we evaluated evidence for environmental filtering acting on community assembly based on association among phenotypic traits, phylogeny, space, and environmental variables. Water body characteristics related to calling site acted as environmental filters for adult anurans. However, there was no evidence for filtering influencing the tadpole communities, even though they were associated with ponds that favor their development, such as temporary ponds with open canopy cover. The adult traits considered were phylogenetically conserved, with most diversity concentrated in a few nodes on the phylogeny. On the other hand, phenotypic diversity of tadpoles was widespread throughout the phylogeny. Since adults are affected by environmental filters, i.e., phenotypically similar anurans occur in similar environments, and tadpoles do not, we hypothesize that the higher phenotypic diversity of tadpoles, when

compared to the adults, could be related to resource exploration in environments with unpredictable interactions. Moreover, the community assembly of anurans is likely determined by an interplay between environmental filters for adults and water bodies favorable to tadpole development and survival.

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**0825 ASIH STOYE GENERAL ICHTHYOLOGY III, Trinity, Friday 14 July 2017**

Joel Corush, Evin Carter, Benjamin Fitzpatrick

*University of Tennessee, Knoxville, TN, USA*

**Effects of Diadromous Life Histories on Genetic Diversity and Population Structure in Fishes**

Phylogenetic comparative methods have shown that diadromous fishes, or those with an obligate scheduled movement between marine and freshwater, have a high rate of diversification compared to completely marine and freshwater taxa. A high propensity for speciation leads to the prediction that diadromous species will often have disjunct populations with restricted gene flow and a strong pattern of isolation by distance. We reviewed the literature to find datasets with which to test this prediction. We compared genetic diversity (allelic richness and heterozygosity) between species as well as genetic distance vs. geographic distance between populations within each species for species representing marine, freshwater, and all forms of diadromy (anadromous, catadromous and amphidromous). Our results indicate that not all forms of diadromy follow the same patterns of population subdivision. Amphidromous species tend to be more similar to freshwater taxa, which have high levels of isolation by distance. Anadromous and catadromous taxa which closely resemble marine taxa, have a smaller increase in genetic difference with increased geographic distance. These results illustrate how variation in life history might increase or decrease diversification via effects on geographic structuring of populations.

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**0620 Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Tiago Costa<sup>1</sup>, Sergio Lima<sup>1</sup>, Liana Mendes<sup>1</sup>, Antonio Sole-Cava<sup>2</sup>, Waldir Berbel-Filho<sup>1</sup>, Flavia Petean<sup>1</sup>

<sup>1</sup>*Universidade Federal do Rio Grande do Norte, Natal, RN, Brazil*, <sup>2</sup>*Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil*

**Population Structure of the Brazilian Large-eyed Stingray *Dasyatis marianae* Gomes, Rosa & Gadig, 2000 (Myliobatiformes, Dasyatidae) in the Tropical Southwestern Atlantic**

In general, elasmobranchs are K strategists and their dispersion is mainly a result of the movement of adults. However, other specific features, such as preference for habitat and



spatial fidelity, may interfere with gene flow and population connectivity, in addition to the actual mobility. *Dasyatis marianae* is endemic to northeastern Brazil, and it is a small-medium size stingray that inhabits coastal areas associated with reefs. Through a phylogeographic approach, we evaluate the population structure, genetic diversity, and gene flow of *D. marianae* using mitochondrial (CYTB) and nuclear (RAG1) DNA sequences. We sampled 109 individuals in six locations along the geographical distribution of this species. The results show that most haplotypes are unique to particular localities and the analysis of peer-to-peer fixation index,  $F_{ST}$ , was significant in most comparisons (60%). All results highlighted the SAL location. Through incorporating geographic information to multilocus molecular analysis, we identified two genetically different groups (BIT+CAI+MAR+PON+ABR/SAL) with a  $F_{ST}$  value of 0.68594 ( $p < 0.0001$ ) between them. *Dasyatis marianae* presented an unusual population structure for elasmobranchs, with strong genetic structuring between nearby locations (SAL and ABR) without an apparent gene flow barrier, while more remote locations are connected. This pattern suggests an ecological isolation in IBE, not by mobility or distance. Apparently, the different characteristics of watersheds influence the distribution and gene flow of this coastal species, favoring the occupation of areas further north of its geographical distribution and greater genetic diversity in these areas.

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### **0858 AES Life History, Pecos, Sunday 16 July 2017**

Charles F. Cotton<sup>1</sup>, R. Dean Grubbs<sup>1</sup>, Bryan Keller<sup>1</sup>, Austin Heil<sup>1</sup>, Alyssa Mathers<sup>2</sup>, Shannon Rolfe<sup>3</sup>

<sup>1</sup>Florida State University Coastal and Marine Lab, St. Teresa, FL, USA, <sup>2</sup>NOAA Fisheries Southeast Fisheries Science Center, Panama City Laboratory, Panama City, FL, USA, <sup>3</sup>University of Central Florida, Orlando, FL, USA

### **Comparing life histories of sympatric deep-water dogfishes (*Squalus cubensis* and *S. cf. mitsukurii*) from the northern Gulf of Mexico**

Over half of all extant shark species reside in the deep ocean (> 200 m), yet very little information exists on the life histories of these species. In conjunction with a project to examine the ecological effects of the 2010 Deepwater Horizon oil spill, dogfishes were collected near Desoto Canyon in the northern Gulf of Mexico using demersal longlines in depths ranging from approximately 200-600m. Samples and data from 243 Cuban dogfish (*Squalus cubensis*, SCUB) and 323 undescribed dogfish (*S. cf. mitsukurii*, SMIT) were collected to describe the reproductive biology and mode of embryonic development, and determine growth model parameters for these species. Maximum lengths (SCUB male (M) = 46 cm TL, female (F) = 58 cm TL; SMIT M = 65 cm TL, F = 82 cm TL) and length-based maturity ogives ( $TL_{50\% \text{ maturity}}$ ) varied considerably between these species (SCUB M = 38.7 cm, F = 48.1 cm; SMIT M = 54.4 cm, F = 66.2 cm). Both species were found to have concurrent ovarian cycles and seasonal measurements of embryonic size distributions suggest annual, synchronous mating for SCUB and aseasonal mating for SMIT. Fecundity ranged from 1-4 pups (mean = 2.5) for SCUB and 5-10 pups (mean = 7.1) for SMIT. Age was determined by counting growth bands

deposited on the enamel caps of both dorsal finspines. Growth model parameters were estimated using multiple length-at-age models, with results suggesting relatively fast growth and less "conservative" life histories compared with other deep-water elasmobranchs.

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**0112 SSAR VICTOR HUTCHISON STUDENT POSTER AWARD:  
PHYSIOLOGY & MORPHOLOGY; Poster Session I, Rio Grande Exhibit Hall,  
Friday 14 July 2017**

Erin Crandall, Christopher Rowe

*University of Maryland Center for Environmental Science, Chesapeake Biological  
Laboratory, Solomons, MD, USA*

**Metabolic Response of Larval *Lithobates sphenoccephalus* and *Hyla chrysoscelis*  
to Increased Temperatures**

Metabolic rate (MR) increases with temperature in ectotherms within an organism's critical thermal range. With global temperatures rising, it is important to evaluate whether the thermal metabolic responses (TMR) of individuals could lead to effects on higher levels of organization. My research focuses on larval amphibians because the biotic and abiotic conditions larvae experience in breeding pools can influence recruitment and have population-level effects. Temporary breeding pools are often resource-limited, leading to severe inter- and intra-specific competition. Increased temperatures (and thus MR) will elevate per capita resource requirements, potentially exacerbating the competitive interactions. Furthermore, if the TMR is species-specific, the unique effect of temperature on MR of each species could alter the competitive hierarchy. In southern Maryland, Cope's Grey Tree frogs ("GTF" - *Hyla chrysoscelis*) and Southern Leopard Frogs ("SLF" - *Lithobates sphenoccephalus*) are often sympatric in breeding sites where they compete for limited resources. My research evaluates the species-specific TMR of larvae of these species during acute exposure to a range in temperatures. I am also investigating whether chronic acclimation to elevated temperatures alters the acute TMR. The acute TMR differed between the species such that the Q10 (relative change in MR over a 10 C interval) was significantly higher for SLF than for GTF. Thus as temperature increases, resource requirements increase more for SLF than for GTF, potentially affecting the competitive interaction. The chronic acclimation study is underway; I expect that acclimation will shift the TMR somewhat, but that the pattern of thermal sensitivity will follow the acute exposure.

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**0070 Reptile Conservation, Trinity, Sunday 16 July 2017**

Brian Crawford<sup>1</sup>, Clint Moore<sup>3</sup>, John Maerz<sup>2</sup>, D. Todd Jones-Farrand<sup>4</sup>, Mike Harris<sup>5</sup>

<sup>1</sup>Georgia Cooperative Fish & Wildlife Research Unit, Warnell School of Forestry & Natural Resources, University of Georgia, Athens, GA, USA, <sup>2</sup>Warnell School of Forestry & Natural Resources, University of Georgia, Athens, GA, USA, <sup>3</sup>U.S. Geological Survey, Georgia Cooperative Fish & Wildlife Research Unit, Warnell School of Forestry & Natural Resources, University of Georgia, Athens, GA, USA, <sup>4</sup>Gulf Coastal Plains & Ozarks Landscape Conservation Cooperative, Columbia, MO, USA, <sup>5</sup>U.S. Fish & Wildlife Service, Region 4, Atlanta, GA, USA

## **Range-wide Status Modeling to Accelerate Conservation of At-Risk Species in the Longleaf System**

The U.S. Fish & Wildlife Service is commissioned with reviewing the status of more than 300 wildlife species in the Southeast for potential listing under the Endangered Species Act. The longleaf pine (*Pinus palustris*) ecological system supports many priority at-risk species designated for review, including five species of herpetofauna: the gopher tortoise (*Gopherus polyphemus*), gopher frog (*Lithobates capito*), striped newt (*Notophthalmus perstriatus*), southern hognose snake (*Heterodon simus*), and Florida pine snake (*Pituophis melanoleucus mugitus*). With federal, state, and other partners, we are assessing the statuses of these five at-risk species to inform where and how to invest in conservation resources. This work addresses three objectives: 1) synthesize species data and expert knowledge from previous research, monitoring, and management efforts, 2) develop comprehensive, range-wide models of current species distribution and persistence, and 3) predict distribution and persistence in the next 100 years under scenarios incorporating potential threats and management activities. We discuss the challenges and provisional results associated with developing Bayesian species distribution and persistence models, incorporating expert opinion to mitigate data limitations and reduce uncertainty, and facilitating partner buy-in across federal, state, academic, and non-academic partners. Research products will identify priority areas based on species metrics, enable regional partners to implement effective conservation strategies, and inform listing decisions of the U.S. Fish & Wildlife Service.

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### **0554 AES GRUBER AWARD IV, Wedgewood, Friday 14 July 2017**

Dan Crear<sup>1</sup>, Rich Brill<sup>2</sup>, Peter Bushnell<sup>3</sup>, Kevin Weng<sup>1</sup>

<sup>1</sup>Virginia Institute of Marine Science, Gloucester Point, VA, USA, <sup>2</sup>National Marine Fisheries Service, NOAA, Gloucester Point, VA, USA, <sup>3</sup>Indiana University South Bend, South Bend, IN, USA

### **The Impact of Climate Change on the Physiology of Sandbar Sharks, *Carcharhinus plumbeus***

As a result of climate change, warm hypoxic waters have become more prevalent in coastal estuaries, where many species refuge from predation during growth and development. Newborn and juvenile life stages of sandbar sharks, *Carcharhinus plumbeus*, use these inshore habitats as nurseries during the summer. As the conditions

of these habitats warm and become more hypoxic, it is unclear if sandbar shark distribution will shift as a result. To predict these shifts, it is important to understand the environmental thresholds of sandbar shark. Conditions that cause a lower aerobic scope (difference between maximum and minimum metabolic rates) and higher critical oxygen saturation ( $S_{crit}$ , O<sub>2</sub> saturation in which minimum metabolic rate can no longer be sustained) suggest that the habitat quality is degraded. Therefore, the objectives of this study are to determine the aerobic scope and  $S_{crit}$  of sandbar sharks under future ocean conditions. The aerobic scope and  $S_{crit}$  were measured at multiple temperatures of individuals caught in an estuary along the eastern shore of Virginia. To date, the mean aerobic scope values at 24, 28, and 32°C for five sharks were  $84 \pm 6$ ,  $110 \pm 25$ , and  $119 \pm 27$  mg O<sub>2</sub> kg<sup>-1</sup> h<sup>-1</sup>, respectively. At the same three temperatures, mean  $S_{crit}$  was  $60 \pm 3$ ,  $60 \pm 9$ ,  $67 \pm 7$ % O<sub>2</sub> saturation, respectively. Despite the high variability in the preliminary data, it appears that aerobic scope still increases up to 32°C, but that at this warm temperature, sandbar sharks are less tolerant to hypoxic waters compared to a bottom-dwelling clearnose skates.

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### **0598 AES Morphology, Pecos, Sunday 16 July 2017**

Stephanie Crofts, Brooke Flammang

*New Jersey Institute of Technology, Newark, NJ, USA*

#### **Flexibility and Morphology of Shark Tails**

An increase in stiffness coupled with the evolution of a lunate tail morphology are associated with increased swimming efficiency in actinopterygian fishes, sharks, and even extinct marine reptiles. In bony fishes, the lunate tail is symmetrical and formed by strong, rigid fin rays. In sharks, the lunate tail is slightly asymmetrical: the vertebral column runs through the dorsal lobe and the ventral lobe is formed by connective tissue and ceratotrichia. Extinct marine reptiles, ichthyosaurs, mosasaurs, and thalattosuchian crocodylomorphs, had inverted but similar tails. Sharks can actively stiffen their tails during swimming, but species with lunate tails have stiffer tails than those with more asymmetric tails. Our goal for this study is to understand how skeletal and soft tissues affect tail stiffness in both lobes, and how this varies between species. To do this we measured passive flexibility of 12 shark species, then dissected select representative archetypes from functional groups to compare morphology and estimate flexural stiffness. We found that tail flexibility varies between species, as do skeletal and soft tissue morphologies. Moreover we found that dorsal lobes are more passively flexible than the unsupported ventral lobes.

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### **0786 Fish Reproduction & Development, San Antonio, Saturday 15 July 2017**

Karen Crow

*San Francisco State University, San Francisco, CA, USA*

**There may be more to the Hox Code than you thought. The “Distal Phase” HoxA/D expression pattern is an ancient module that is deployed in a variety of novel features in fishes.**

Fins and limbs are homologous structures patterned by a shared genetic repertoire of HoxA/D expression, or “the Hox limb building toolkit”. A unique inversion of the HoxD expression pattern is associated with the most well characterized example of a novel fin/limb modification to date—the tetrapod autopod, where an inverted collinear HoxD expression pattern specifies digit identity and the origin of the thumb. This pattern also occurs in paddlefish pectoral fins and catshark paired fins, indicating that it arose in the common ancestor of jawed vertebrates. This pattern is called ‘distal phase’ (DP) expression because it occurs in distal structures and is regulated independently. We argue that it may be deployed in a modular fashion, suggesting a greater role in the evolution of morphological diversity in vertebrates than previously recognized. We demonstrated the first evidence for HoxD DP expression in a body plan feature beyond fins and limbs— **the paddlefish barbel**, and the first evidence for HoxA DP expression in the developing **hindgut and vent of ray-finned fishes**, suggesting that the limb-building program may have an expanded repertoire. Interestingly, HoxA DP expression is predicted by similar conformational properties between the HoxA/D cis-regulatory landscapes in zebrafish and mice, but has not been reported in vertebrate paired appendages. However, we found evidence suggesting that HoxA DP expression occurs in **claspers** of male cartilaginous fishes. Taken together, these data support the modularity of DP Hox expression pattern, and a greater role for the Hox code in evolution of novel body plan features.

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**0493 Lightning Talks II, Glass Oaks, Friday 14 July 2017**

Jenna Crowe-Riddell<sup>1</sup>, Coleman Sheehy III<sup>2</sup>, Harvey Lillywhite<sup>2</sup>, Kate Sanders<sup>1</sup>

<sup>1</sup>University of Adelaide, South Australia, Australia, <sup>2</sup>University of Florida, Gainesville, Florida, USA

**Understanding the Population Structure in the Widest-Ranging Squamate Reptile**

The yellow-bellied sea snake (*Hydrophis platurus*) is the only truly pelagic species that traverses the Indian and Pacific oceans. Despite this extensive distribution, very little is known about the interconnectivity between populations. Using a custom gene capture array we will sequence *H. platurus* tissues from museum and field collections in order to 1) resolve the population structure at a global scale, across oceans connecting Central America, Australia, Asia and Africa, and 2) reconstruct past demographic changes at a finer scale in two apparently separated populations of *H. platurus* in Costa Rica. To achieve these ambitious aims we are engaging collaborations with museum curators and field biologists who might contribute tissues.

**0400 ASIH STORER HERPETOLOGY; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Hayley Crowell, Emily Taylor

*California Polytechnic State University, San Luis Obispo, CA, USA*

**Comparative Thermal Ecology of Coastal and Inland Populations of Southern Pacific Rattlesnakes (*Crotalus helleri*)**

Understanding the effects of changing temperature regimes on a species is crucial if land managers and researchers are to make informed decisions about how to mitigate the predicted loss of diversity as a result of anthropogenic climate change. Field active body temperature data can be used to estimate metabolic rates using equations established in laboratory studies. The goal of this analysis is to use historical body temperature data from four distinct populations of *Crotalus helleri* from central California (two inland and two coastal) to compare body temperatures, estimated metabolic rates and annual energy budgets across varying habitat types. Snake body temperature data were collected via internal implantation of ThermoChron iButton temperature loggers from 2006 to 2016. Snakes at inland sites experience higher body temperatures and therefore greater energy expenditure than coastal populations. Operative temperature models will be used in combination with predicted increases in ambient temperature to extrapolate probable changes in body temperatures, activity times, and energy budgets at each site by 2100.

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**0001 HL/SSAR/ASIH Symposium - The Science, Management, and Policy of Amphibian Conservation: Extending the Legacy of Ray Semlitsch, Glass Oaks, Saturday 15 July 2017**

Martha Crump

*Utah State University, Logan, UT, USA*

**Life Histories and Conservation of Anurans in the New World Tropics**

The New World Tropics are home to well over 2000 species of anurans. The area has experienced widespread anuran population declines, caused primarily by the chytrid fungus *Batrachochytrium dendrobatidis* and habitat destruction, modification, and fragmentation. Fewer long-term field studies have been carried out on New World tropical anurans as compared to their temperate counterparts; for this reason we know much less about their population sizes and dynamics. Many anurans in the New World Tropics are terrestrial or arboreal and have specialized modes of reproduction that allow for independence of aquatic environments. Many other life history aspects, such as clutch size, number of clutches/year, and length of breeding season, differ between the faunas of the two regions. Most sampling techniques for surveying anuran populations have been developed in North America or Europe, where most species congregate at aquatic breeding sites and have a complex life cycle. We need to develop appropriate field survey methods for carrying out long-term population studies of species with

terrestrial and other specialized modes of reproduction. Life histories must be considered in shaping conservation priorities of anurans in the tropics.

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**0053 Amphibian Biology, Ecology, & Conservation, Sabine, Sunday 16 July 2017**

Paul Crump, Jeff Houlahan

*University of New Brunswick-Saint John, Saint John, New Brunswick, Canada*

**Using Out-of-Sample Predictions to Evaluate Performance of Automated Acoustic-Abundance Models**

Statistical models created using hard-won ecological data on reptiles and amphibians are often insufficiently validated. Many projects treat the reporting of p-values or AIC scores as the final step in the process of model validation, but because of 1) sampling error, 2) measurement error, and 3) spatial and temporal variation in the process of interest, it is generally unknown how robust these inferences are. To investigate this, we assessed the transferability in time and space of acoustic-abundance models. We developed an automated call recognizer from recordings of the wood frog (*Lithobates sylvaticus*) in New Brunswick, Canada using the bioacoustics software Song Scope. We used the recognizer to examine the relationship between wood frog egg mass abundance and acoustic activity at 43 sites in New Brunswick and 7 sites in eastern North America in 2015 and 2016. The models were parameterized using data from New Brunswick in 2015 or 2016 and used to make predictions in the other year in New Brunswick or the other sites in eastern North America. We used the root-mean-squared-error to assess model performance and found no agreement between what AIC determined was the best model and the model that gave the most accurate predictions to new data. This indicates the model selection approach could not identify the best predictive model and that without making predictions to new data not used to build the model, it was impossible to assess our understanding of the process.

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**0016 Herp Biogeography & Phylogeography II, Sabine, Sunday 16 July 2017**

Daniel Cueva, Jesus Rivas, Sarah Corey-Rivas

*New Mexico Highlands University, Las Vegas, NM, USA*

**Assessing the Species Status & Distribution of *Eunectes beniensis* Utilizing a Molecular Comparative Approach**

*Eunectes beniensis* (Dirksen, 2002) is a poorly studied and recently described anaconda species native to the Beni province, Bolivia. Originally thought to be a hybrid between *E. murinus* and *E. notaeus* due to range overlap between the species in the Beni province, Dirksen & Bohme (2005) disputed this notion and described it as a new species of anaconda utilizing solely morphological characteristics and scale counts from five

individuals (four males and one female). Due to difficulty in acquiring samples and exporting tissue from South America, no one has validated this assumption using molecular techniques. I propose to sequence several nuclear and mitochondrial markers, and compare sequences of *E. murinus*, *E. notaeus*, & *E. beniensis* in order to create a phylogenetic analysis of the *Eunectes* genus and reevaluate *E. beniensis* species status. Phylogenetic analysis will be conducted using a maximum likelihood analysis in order to determine the relationship amongst species within the *Eunectes* group. We hypothesize that *E. beniensis* represents a population of anacondas residing within a hybridization zone, and does not merit valid species designation.

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### **0327 Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Joshua Cullen<sup>1</sup>, Christopher Marshall<sup>2</sup>

<sup>1</sup>Texas A&M University, College Station, TX, USA, <sup>2</sup>Texas A&M University at Galveston, Galveston, TX, USA

#### **Morphological Changes in Shark Teeth May Facilitate Ontogenetic Dietary Shifts**

Form and function of the feeding apparatus are typically closely integrated since certain arrangements of the jaws, adducting musculature, and dentition are often closely tied to feeding behavior and dietary preferences. While jaw-closing biomechanics have been highly studied in a variety of fishes (including elasmobranchs), less work has been conducted on dentition. Sharks are known to undergo dietary shifts over their ontogeny, with some species exhibiting significant positive allometry of the feeding apparatus. It is currently unclear, however, whether there are any concurrent changes in tooth morphology of sharks. This study evaluated changes in tooth morphology at six locations along the jaw margin (anterior, middle, and posterior locations of upper and lower jaws) over the full ontogeny of bull (*Carcharhinus leucas*), blacktip (*Carcharhinus limbatus*), and bonnethead sharks (*Sphyrna tiburo*). Elliptical Fourier analysis was used to capture the outline of each tooth while maintaining a 99.9% likeness to the original outline. Outlines were then evaluated by principal components analysis (PCA) for each species at each of the six tooth locations. PC scores for each tooth location of each species were used in a multivariate analysis of variance (MANOVA) to investigate changes in tooth morphology over ontogeny. From this analysis, it appears that changes in morphology occur in all three species at multiple locations along the jaw margin. Locations of significant changes in tooth shape occurred at different locations for each species, but exhibited some overlap. Differences in tooth morphology likely facilitate the processing of prey with different material properties.

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### **0212 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Paul Cupp, Jr.



Eastern Kentucky University, Richmond, KY, USA

## **Polyandry and Polygyny in Green Salamanders, *Aneides aeneus***

Formation of male-female pairs leading to courtship and mating in *Aneides aeneus* may occur during spring and/or fall. Pairs occur in specific rock crevices or sometimes in adjacent crevices for periods of days or weeks. Pairing increases chances of courtship and mating, and allows for mate guarding thus reducing chances for polyandry and polygyny. But, not all *A. aeneus* pair for an extended time. Spontaneous pairing and mating may occur in rock crevices or on the surface. I released a gravid female into a rock crevice with a resident male, and mating ensued and was completed with spermatophore deposition and pickup within two hrs. Also, six instances of courtship and mating using unfamiliar males and gravid females were recorded on videos in the lab, and completed within 1-4 hrs. In addition, in five instances, single males were observed close to 2-3 breeding crevices, each containing a female with eggs, indicating that these males mated with multiple females. Females with eggs tend to aggressively reject unfamiliar or nonpaternal males from nest sites. Further, one specific male was monitored and located in the same position near 2-3 nest sites over seven years indicating that he is the paternal male. These observations indicate that some males may mate with more than one female and females more than one male during a breeding season. These behaviors are adaptive in that males may produce more young in a breeding season, while females that mate with unfamiliar males will produce young with greater genetic variation.

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## **0488 Lightning Talks II, Glass Oaks, Friday 14 July 2017**

Tobey Curtis<sup>1</sup>, Matthew Ajemian<sup>2</sup>, Christopher Fischer<sup>3</sup>, Michael McCallister<sup>2</sup>, Gregory Metzger<sup>4</sup>, Jessica Quinlan<sup>5</sup>, Leann Winn<sup>6</sup>

<sup>1</sup>National Marine Fisheries Service, Gloucester, MA, USA, <sup>2</sup>Florida Atlantic University's Harbor Branch Oceanographic Institute, Fort Pierce, FL, USA, <sup>3</sup>OCEARCH, Park City, UT, USA, <sup>4</sup>Southampton High School, Southampton, NY, USA, <sup>5</sup>South Fork Natural History Museum, Bridgehampton, NY, USA, <sup>6</sup>New Jersey Institute of Technology, Newark, NJ, USA

## **First Observations of the Movements of Young-of-the-Year White Sharks (*Carcharodon carcharias*) in the Northwest Atlantic Ocean**

In recent years, white sharks (*Carcharodon carcharias*) have become more accessible to researchers off the northeastern U.S. as coastal feeding aggregation sites have re-emerged and the overall population has increased. However, there has been very limited research focused on young-of-the-year (YOY) sharks relative to older age classes. Previous research indicated that the New York Bight is a region that has historically supported comparatively high concentrations of YOY and juvenile white sharks. In August 2015 and 2016, we deployed satellite tags on 10 YOY white sharks (119-145 cm fork length) caught on hook and line off Long Island, New York. The track data received to date indicate that these sharks remain mostly resident in New York

Bight coastal waters through summer, supporting the notion that the region is a nursery area. Southward movements along the coast were observed during the fall, with potential evidence of overwintering habitat off the Outer Banks of North Carolina. These movement patterns are likely influenced by temperature (16-23 °C) and depth (<100 m) preferences, as well as prey (teleost and invertebrate) distribution and availability. YOY white sharks in this heavily-populated region are susceptible to anthropogenic impacts from recreational and commercial fishing, energy development, and coastal habitat degradation. As juvenile survival rates are important for long-term sustainability, further research is necessary to better quantify the potential impacts of these activities on the northwest Atlantic white shark population.

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**0396 ASIH STORER ICHTHYOLOGY; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Paul D'Ortona, Grace Kocubinski, Rebecca Daub, Scott McRobert

*Saint Joseph's University, Philadelphia, Pennsylvania, USA*

**The Effect of Gender on Shoaling Behavior in Guppies (*Poecilia reticulata*)**

Shoaling behavior is thought to provide numerous benefits to individual fish, including reduction in the risk of predation (by blending into a group of phenotypically similar individuals), and increasing the opportunity to find mating partners. However, in highly dimorphic fish, like guppies, a trade-off exists with respect to shoaling. Males, with brightly colored tails, might be expected to shoal with other males to gain predation-related benefits, but may be expected to shoal with females to find mates. And the reverse situation is true for females. We examined the effect of gender on the shoaling behavior of captive adult male and female guppies by observing time spent swimming near same-sex and opposite-sex shoals, in dichotomous choice tanks. In the first set of tests, males spent significantly more time swimming near a shoal of males, or a shoal of females, vs. an empty chamber. However, when given a choice between same-sex and opposite-sex shoals, males showed no preference. This may indicate a balance between the predation-risk, and mating benefits of shoaling. We will also present tests (in progress) on the female choices.

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**0793 ASIH STOYE GENETICS, DEVELOPMENT, & MORPHOLOGY II, Trinity, Friday 14 July 2017**

Kristen A. Dahl<sup>1</sup>, William F. Patterson, III<sup>1</sup>, David S. Portnoy<sup>2</sup>, J. Derek Hogan<sup>2</sup>, Alison Robertson<sup>3</sup>, Alice Ortmann<sup>4</sup>

<sup>1</sup>*University of Florida, Gainesville, FL, USA*, <sup>2</sup>*Texas A&M University-Corpus Christi, Corpus Christi, TX, USA*, <sup>3</sup>*University of South Alabama, Dauphin Island, AL, USA*, <sup>4</sup>*Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada*

## DNA Barcoding and Microsatellite Genotyping Confirm Cannibalism in Northern Gulf of Mexico Invasive Lionfish, *Pterois volitans*

Invasive Red Lionfish (*Pterois volitans*) have become well-established within reef ecosystems across the western Atlantic where they pose substantial threats to native fish communities as generalist mesopredators. Species-specific identification of prey, which is necessary to elucidate invasive predator-prey interactions, is challenging with traditional visual identification given prey are often highly digested. In this study, we applied mitochondrial DNA barcoding to identify visually unidentifiable fish prey (n = 696) sampled from lionfish stomachs from the northern Gulf of Mexico. Barcoding nearly doubled the number of identifiable fish prey, leading to the highest prey diversity reported to date for invasive lionfish. Barcoding also identified potential cannibalism on juvenile lionfish, with the highest incidence corresponding to high adult lionfish densities. To test whether these samples constituted cannibalism, we performed genotyping of consumer and prey pairs (n = 80) across four nuclear DNA microsatellite loci. We confirmed 30.2% of prey samples as being cannibalized lionfish. This estimate should be considered conservative given rigorous assignment criteria, low allelic diversity in western Atlantic lionfish populations, and the greater difficulty in amplifying nuclear microsatellites versus mitochondrial barcodes from partially digested prey samples. These results indicate density-dependent cannibalism in invasive lionfish. Furthermore, our results have important implications for other DNA barcoding diet studies in which potential cannibalism is observed.

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**0413 Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Mindy Dang, Kevin W. Conway

Texas A&M University, College Station, TX, USA

### **An undescribed species of *Parachiloganis* (Siluriformes; Sisoridae) from Nepal**

The sisorid catfish *Parachiloganis hodgarti* (Hora, 1923) is found in high altitude rivers and streams across the Himalayan region, including Bhutan, Nepal and India. The distribution of this species is highly fragmented with disjunct populations in central and eastern Nepal (type locality), northern India (Assam, Sikkim, West Bengal) and throughout Bhutan. A recent investigation of Bhutanese material of *P. hodgarti* concluded that multiple undescribed species are confused under the name *P. hodgarti* and it is likely that a similar situation exists in India and Nepal. We investigate material of *P. hodgarti* from eastern Nepal (type locality) and central Nepal to assess whether material from these different areas belongs to the same species. We document differences in standard counts and measurements, features of color pattern, and osteology between individuals of *P. hodgarti* from eastern Nepal (including material from the type locality) and central Nepal. We conclude that material of *P. hodgarti* from central Nepal represents an undescribed species.

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**0111 Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Gonzalo Daudén Bengoa, Laura del Pilar Echeverri García, Sylvia Patricia Adelheid Jiménez Rosenberg, Sharon Zinah Herzka Llona

*Centre of Scientific Investigation and Superior Studies of Ensenada (CICESE), Ensenada, Baja California, Mexico*

**Larval Fish Assemblages of Myctophidae Family Linked to Oceanographic Conditions in the Deepwater Region of the Southern Gulf of Mexico**

Understanding the relationship between oceanographic processes and mesopelagic larval fish assemblages populations is challenging due to small larval size, limited development and the complexity of the physical and biological processes involved. Myctophids are one of the mesopelagic fish families with higher biomass and broader world-wide distribution, and they play an important role in the trophic structure of oceanic communities. However, studies focusing on the larval ecology of this family are scarce at a global level. The main goal of this study is to understand the relationship between oceanographic conditions and the larval fish assemblages of the Myctophidae family in the deep-water region (> 1000 m) of the southern Gulf of Mexico (19°N a 25°N). During August-September 2015, 56 plankton samples were collected with oblique tows in the first 200 meters of the water column with a 333 µm mesh bongo net. On average, 30.75% of the standardized abundance of fish larvae was comprised of myctophids. Furthermore, an increasing larval abundance pattern was observed from the continental shelf boundary toward the deep-water areas. Through multivariate analyses (MANOVA, PCA and Cluster) we will establish the relationship between larval fish assemblages and specific oceanographic conditions, and evaluate whether larval fish assemblages feature a higher degree of similarity in regions with similar oceanographic conditions. Studying myctophid larval assemblages relative to oceanographic conditions will provide us detailed information about spawning areas and biogeographical patterns of pelagic fishes in the southern Gulf of Mexico region.

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**0340 Amphibian Biology, Ecology, & Conservation, Sabine, Sunday 16 July 2017**

Jon Davenport, Alex Riley, Peter Constantides

*Southeast Missouri State University, Cape Girardeau, MO, USA*

**Plants Versus Salamanders: The Effects of Competition on Spotted Salamander and Bladderwort Life History**

The coexistence of organisms in nature is more likely when phenotypic similarities of individuals are reduced. Despite the lack of similarity, distantly related taxa will compete intensely for shared resources. No larger difference between organisms that share a common prey could exist than between carnivorous plants and animals.

However, few studies have considered inter-Kingdom competition among carnivorous plants and animals. In order to evaluate interactions between a carnivorous plant (greater bladderwort, *Utricularia vulgaris*) and a vertebrate (larval spotted salamanders, *Ambystoma maculatum*), we conducted a mesocosm experiment. We deployed two levels of spotted salamander density and the presence/absence of bladderwort. We measured salamander survival and growth along with bladderwort growth and flowering time. Mean spotted salamander survival and size at metamorphosis was not affected by the presence of bladderwort. However, mean time to metamorphosis was significantly increased in the presence of bladderwort. Mean bladderwort flowering time was delayed with an increase in spotted salamander density, but growth was not affected. Our data suggests that competitive interactions between carnivorous plants and larval spotted salamanders affect some key life history traits (time to metamorphosis and flowering date), but not others (growth or survival). Therefore, these interactions may be context dependent on resource availability with indirect costs survival or future fitness. Overall, our work illustrates that aquatic carnivorous plants may have unexpected impacts on other species in wetland food webs.

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**0155 ASIH STOYE PHYSIOLOGY & PHYSIOLOGICAL ECOLOGY II, San Antonio, Thursday 13 July 2017**

Drew Davis, Jacob Kerby

*University of South Dakota, Vermillion, SD, USA*

**Physiological Stress and Pathogen Infection in Larval Salamanders from Wetlands Influenced by Agriculture**

Declines in amphibians are a global problem with complex local factors. While many factors contribute to these declines, much attention has been focused on the role of environmental contaminants and pathogens. Throughout eastern South Dakota, the use of tile drainage in agricultural fields has contributed to habitat degradation for many amphibian species, often through the increase in environmental contaminants in affected wetlands. These contaminants may represent additional stressors to amphibians, and prolonged exposure may affect immune function and influence pathogen dynamics. As part of a two-year study, we visited four wetlands (two reference, two tile drain) to measure water quality and both ranavirus infection and water-borne corticosterone (CORT) levels in larval Western Tiger Salamanders (*Ambystoma mavortium*). Although ranavirus infection prevalence among sites and between years was similar, we found that environmental contaminants were significantly greater and salamanders had significantly higher ranavirus infection loads at tile drain wetlands. Additionally, we found that water-borne CORT was greater from individuals at tile drain wetlands and that water-borne CORT is positively correlated with ranavirus infection load. While the causal relationships between environmental contaminants, ranavirus infection, and CORT are difficult to determine, chronically elevated CORT can be immunosuppressive and may result in high infection loads. This study adds to existing data describing the negative effects of agricultural tile drainage on wetland habitat quality and may suggest that additional stressors may trigger mass-mortality events in this system.

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**0549 SSAR VICTOR HUTCHISON STUDENT POSTER AWARD:  
PHYSIOLOGY & MORPHOLOGY; Poster Session I, Rio Grande Exhibit Hall,  
Friday 14 July 2017**

Drew Davis<sup>1</sup>, Travis LaDuc<sup>2</sup>, Gregory Pauly<sup>3</sup>

<sup>1</sup>University of South Dakota, Vermillion, SD, USA, <sup>2</sup>Biodiversity Collections, University of Texas at Austin, Austin, TX, USA, <sup>3</sup>Natural History Museum of Los Angeles County, Los Angeles, CA, USA

**Morphological Variation Between Two Widely Distributed Populations of  
*Plethodon albagula* (Caudata: Plethodontidae)**

The Western Slimy Salamander (*Plethodon albagula*) is a species of lungless plethodontid salamander with two broadly separated ranges: one is in the Edwards Plateau of Central Texas and the second is in the Interior Highlands of Arkansas, Missouri, and Oklahoma. Recent studies have demonstrated that Central Texas *P. albagula* includes multiple mtDNA clades, many of which are also morphologically distinct from one another. Given this unexpected diversity within the Edwards Plateau, even greater differences between the Edwards Plateau and Interior Highlands populations seem probable. We examined 12 morphological characters, including both body shape and size characters, in 343 adult *P. albagula* from across both geographic ranges. Principal component analysis and discriminant function analysis suggest that there are strong morphological differences between these two populations, with both males and females from the Interior Highlands being larger in body size and shape characters than Edwards Plateau individuals. These results suggest that there are indeed morphological differences between these disjunct populations and additional molecular information is needed to detect potential cryptic species.

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**0378 Lightning Talks II, Glass Oaks, Friday 14 July 2017**

Jonathan Davis<sup>1</sup>, Philip Matich<sup>2</sup>, Carey Gelpi<sup>1</sup>

<sup>1</sup>Texas Parks and Wildlife Dept., Port Arthur, Texas, USA, <sup>2</sup>Sam Houston State University, Huntsville, Texas, USA

**Co-occurrence or Coexistence of two Estuarine Predators in Texas: Bull Sharks and Alligator Gars**

The coexistence of species through their partitioning of preferred habitat and resources provide the structure for ecological communities. Bull Sharks (*Carcharhinus leucas*) and Alligator Gars (*Atractosteus spatula*) are two of the most abundant large-bodied predators found in Texas estuaries, especially in Sabine Lake. Texas Parks and Wildlife Department gillnet data from 1986-2016 were utilized to assess the spatial overlap of Bull Sharks and Alligator Gars. From 30 years of sampling, 9960 Alligator Gars and 633

Bull Sharks were collected in Sabine Lake. Among the Bull Sharks collected, 580 (~92%) co-occurred with Alligator Gar throughout the entire ecosystem. To better understand the breadth and overlap of the ecological niches of these species the diets of both predators will be analyzed and compared. Specimens from routine gillnet sampling will be utilized and given the high spatial overlap between these predators and high levels of productivity within Sabine Lake, trophic overlap is predicted. Initial observations suggest that Gafftopsail Catfish (*Bagre marinus*) are highly correlated with Bull Sharks occurrence, and we hypothesize that Gafftopsail Catfish abundances influence top predator distributions as a primary prey resource, and may be a link between Bull Shark and Alligator Gar coexistence.

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### 0138 AES GRUBER AWARD III, Wedgewood, Friday 14 July 2017

Matthew Davis<sup>1</sup>, Pablo Suárez-Moo<sup>2</sup>, Toby Daly-Engel<sup>1</sup>

<sup>1</sup>University of West Florida, Pensacola, FL, USA, <sup>2</sup>Center for Research and Advanced Studies of the National Polytechnic Institute, Mexico City, Federal District, Mexico

#### **Population Structure and Phylogenetics of Atlantic and Caribbean Sharpnose Sharks (Genus: *Rhizoprionodon*)**

Members of the genus *Rhizoprionodon* are small coastal requiem sharks that occur in high abundance throughout the coastal waters of the world. The Atlantic sharpnose shark *Rhizoprionodon terraenovae* is found throughout the Western Atlantic and Gulf of Mexico where it is often exploited by artisanal fisheries, though is considered of least concern to overfishing. Existing research has shown that the larger elasmobranch species display high vagility, or long range movements, whereas smaller sharks occupy small home ranges, with significant genetic heterogeneity between regions. Despite this trend, previous research on *R. terraenovae* has not supported significant genetic heterogeneity between regions on a large scale. We assessed the genetic population structure of *R. terraenovae* throughout its range using a highly polymorphic gene, the mitochondrial control region (CR), coupled with intensive sampling to determine if barriers to gene flow exist within this species' range. Our results indicate weak but significant population structure exists between the Gulf of Mexico and Atlantic Ocean, but found no evidence of genetic structure within basins. In the process of assessing *R. terraenovae* phylogeography, several samples from South Carolina, Virginia, and northern Florida were identified as the Caribbean sharpnose shark *Rhizoprionodon porosus*. *R. terraenovae* and *R. porosus* share a similar appearance, though their home ranges are non-overlapping north of the Bahamas. We sequenced the nuclear ribosomal Internal transcribed spacer-2 (ITS2) gene to verify the species identification of these specimens, qualify the observed range expansion, and assess the possibility of hybridization.

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### 0828 Herp Ecology II, Pecos, Friday 14 July 2017

Graham Dawson, Stephen Mackessy

*University of Northern Colorado, Greeley, CO, USA*

### **Fourteen-year Demographic Analysis of *Crotalus viridis viridis* Hibernacula in Northern Colorado**

Long-term mark-recapture studies are essential for understanding the ecology of long-lived species, but relatively few have been conducted on snakes. The Prairie Rattlesnake (*Crotalus viridis viridis*), an iconic species of the eastern plains, is a long-lived and important component of the Colorado shortgrass-steppe ecosystem that hibernates in large numbers at stable refugia. For 14 years, two hibernacula in Weld County, Colorado have been part of a mark-recapture study. The current study analyzes demographic characteristics of this population, including sex ratios, body mass and size, growth rates, size distribution, venom yield, capture rate, population size and den site fidelity. In addition, the effects of temperature and precipitation on growth rate were also explored. Overall 1786 unique individuals have been captured, and 1003 have been captured more than once. The adult sex ratio (F:M) is 0.78:1; males are generally larger than females and produce more venom. Individual snout-vent lengths ranged from 155 to 1160 mm, and the longest recapture interval was 9 years. Neonates experience rapid initial growth, which then slows as they age. This population exhibits high levels of den site fidelity, with snakes returning to the site of their original capture over 99% of the time. Demographic studies such as this can be invaluable for future animal conservation of snake species. These populations receive passive protection from the landowner, and all evidence suggests that this population is currently stable, but changes in land use and/or climate could adversely affect density and abundance, both locally and throughout their range.

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### **0509 Herp Morphology & Development, Brazos, Saturday 15 July 2017**

Juan D. Daza<sup>1</sup>, Aaron M. Bauer<sup>2</sup>, J. Salvador Arias<sup>3</sup>, Edward L. Stanley<sup>4</sup>, David A. Grimaldi<sup>5</sup>

<sup>1</sup>*Sam Houston State University, Huntsville, Texas, USA*, <sup>2</sup>*Villanova University, Villanova, Pennsylvania, USA*, <sup>3</sup>*UEL, CONICET-Fundación Miguel Lillo, San Miguel de Tucumán, Tucumán, Argentina*, <sup>4</sup>*Florida Museum of Natural History, Gainesville, Florida, USA*, <sup>5</sup>*American Museum of Natural History, New York, New York, USA*

### **At the root of the Gekkota clade, who is the oldest?**

A Mid-Cretaceous gecko skeleton (J CZ Bu1802, 99 mya) trapped in Burmite is the oldest non-ambiguous gekkotan. The fossil includes the axial skeleton, including the entire skull, 26 presacral vertebrae, sacrum, 5 caudal vertebrae, some ribs, the left pelvis and portions of the proximal parts of the limbs. Some apomorphic features distinguish J CZ Bu1802 from other gekkotans include two bones in the posterodorsal corner of the orbit (postorbital and postfrontal), and an anteromedial process of the pterygoid that excludes the entire medial border of the palatine from the pyriform recess. This fossil is a



hatchling based on its size (22.5 mm SVL), and has features that are only seen in embryonic and hatchling gekkotans, such as unfused subolfactory processes of the frontal, a large parietal fontanel, and a parabasisphenoid-basioccipital (basicranial) fenestra. We test the phylogenetic position using morphology (632 characters) and a concatenated analysis with molecules (15,100 BP). We also added three other Cretaceous forms (*Gobekko*, *Hoburogekko*, *Norellius*). We scored the specimen for 58.8% of the morphological characters and ran multiple analysis using parsimony and implied weighting (k values from 20 to 200, increasing 10 points each time). We recovered the nodes Gekkota and (*Gobekko*, *Hoburogekko*, JCZ Bu1802) in all analyses and the subsequent nodes (*Eichstaettisaurus* + *Ardeosaurus*) and *Norellius* in 95% (morphology) and 85% (concatenated) of analyses. We conclude that *Gobekko*, *Hoburogekko* and JCZ Bu1802 seem to represent an early radiation of gekkonomorphs predating the origin of Gekkota and that *Norellius* documents the early appearance of gekkotan features among squamates.

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## **0571 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Helena de Souza Brasil Barreto, Kathleen Cole, Jessica Maxfield

*University of Hawaii at Manoa, Honolulu, HI, USA*

### **Patterns of Oogonia and Spermatogonia Distribution in the Ovary of the Hawaiian Endemic Goby, *Eviota epiphanes***

Teleost fishes exhibit a dynamic range of sex determining systems and reproductive strategies. This diversity has been extensively explored in the literature, however, the vast majority of studies have focused on gonochoristic fishes (i.e. those with separate sexes). The precise mechanisms for sexual differentiation and maintenance remains poorly understood in hermaphroditic species. The aim of this research project is to identify the distributional pattern of gonial cells (i.e. oogonia and spermatogonia) in the non-partitioned ovary of the Hawaiian endemic hermaphroditic goby, *Eviota epiphanes*. In order to accomplish this goal, we propose to use immunohistochemical (IHC) techniques to identify proliferating cells expressing the *vasa* gene. This highly conserved gene is directly implicated in sexual determination and differentiation in many vertebrate taxa. Previous studies have shown that the *vasa* gene is expressed in the cytoplasm of both gonial cells and primordial germ cells (PGCs). We hypothesize that the number of appropriate gonial cells may increase through cell division during transition of sexual function. Alternatively, gonial cells may re-differentiate (i.e. oogonia become spermatogonia and spermatogonia become oogonia), and/or PGCs may be maintained in the ovary of adult hermaphroditic fishes and undergo differentiation during sexual transition. The results of this study will provide us with a clear/better understanding of how sexual differentiation, specifically the generation of new and different gametes, is regulated in hermaphroditic fishes.

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## **0746 SSAR SEIBERT ECOLOGY III, Glass Oaks, Friday 14 July 2017**

Samantha Dean<sup>1</sup>, James Gibbs<sup>1</sup>, Brian Underwood<sup>2</sup>

<sup>1</sup>State University of New York, Syracuse, NY, USA, <sup>2</sup>USGS Patuxent Wildlife Research Center, Laurel, MD, USA

### **Influence of Habitat Edges and Recreational Trails on the Distribution and Abundance of Amphibians in an Urban Protected Area**

Recreational trails fragment habitat within protected areas set aside for amphibian conservation, potentially generating "edge effects" or changes in population and community structure at the boundary between two habitats. Little attention has been paid to the effects of trail edges on amphibians, which hinders conservation planning for protected areas. Amphibian populations and habitat covariates were compared among five disturbance types (0, 15, and 50 m from trail, habitat edge, edge + trail) and a control in a protected natural area at the Home of Franklin D. Roosevelt National Historic Site (Hyde Park, New York). Habitat edges exert a much stronger negative influence than trail edges, yet trail effects do occur and extend up to 50 m from trails, and are primarily driven by reduction in leaf litter and coarse woody debris whereas habitat edge effects are likely driven by changes in microclimate. Effects of recreational trails and habitat edges on amphibians is additive. Given effects of trails on amphibians, protected area managers should seek to limit unauthorized trails and trail entrances/exits, as well as consider amphibian impacts in future trail design and planning.

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## **0515 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Alison Deary, Annette Dougherty, Steve Porter, Janet Duffy-Anderson

NOAA/AFSC, Seattle, WA, USA

### **Development and phenotypic variation in first feeding larvae of sablefish (*Anoplopoma fimbria*)**

In the Gulf of Alaska, sablefish (*Anoplopoma fimbria*) support a lucrative fishery with an ex-vessel value over \$90 million, but their numbers have been declining even though the fishery is regulated. Numbers of age-0 juveniles during the first summer have been related to year class strength, but it is hypothesized that recruitment is determined earlier, during the larval/early juvenile stages. *Anoplopoma fimbria* is unique relative to many other fishes that spawn in deep water because their larvae and juveniles are neustonic. The protracted neustonic stages increase the exposure of individuals to biological and environmental stressors (e.g., prey availability, avian and fish predators, wind stress, light intensity, and variability in sea surface temperature and salinity) that reduce survival. We were particularly interested in examining factors related to feeding success in early stage *A. fimbria* so we examined laboratory reared individuals at the Alaska Fisheries Science Center to describe the pattern and timing of ossification in

feeding and swimming structures. Due to the presence of a large yolk sac, we hypothesize that the skeletal elements required for swimming will ossify before feeding elements, but variability will exist in the onset of ossification among individuals. The data presented here are the first examination of the skeletal development of *A. fimbria* during the transition to first feeding, which improves our understanding of the mechanisms and ecological trade-offs that reduce mortality in individuals.

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**0772 Fish Ecology I, San Antonio, Sunday 16 July 2017**

Raelynn Deaton Haynes, Kelly McNab, Caitlyn Higgins, Briana Sebastian, David Johnson

*St. Edwards University, Austin, Texas, USA*

**Seagrass-Associated Fish Biodiversity in Texas Coastal Ecosystems**

Seagrasses provide many ecosystem services and home to a plethora of aquatic organisms. As diversity begins to decline, these vulnerable ecosystems are becoming seriously threatened. Since Texas relies heavily on the coast for resources and industry and its coastline is an attractive destination for recreational activities, there is a great amount of stress on these seagrasses, as well as the aquatic organisms that depend on their existence. Thus, we quantified fish, seagrass and adjacent terrestrial plant biodiversity along a 9km stretch of seagrass bed in Redfish Bay, Texas, an area susceptible to anthropogenic disturbance. We also quantified potential anthropogenic stressors to determine what factors predict biodiversity differences in seagrass habitats. We expected that species richness and abundance will vary among test sites, with more biodiversity identified in sites less accessible to humans. Results thus far do not support our predictions. Biodiversity of fishes and seagrasses was measured, anthropogenic impacts, such as boats and fishermen, were quantified, and water quality was assessed. Results suggest significant differences in seagrass biodiversity at one specific site, but no differences in fish biodiversity. To date, no “disturbance” measure quantified predicted biodiversity of seagrasses or fishes. Seagrasses are rapidly declining at a global scale, and, therefore an increased demand for scientific research on seagrass preservation is necessary, particularly in Texas where little is known about fish biodiversity in relation to seagrass habitats.

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**0748 SSAR SEIBERT SYSTEMATICS & EVOLUTION, Brazos, Friday 14 July 2017**

Jonathan DeBoer, Aaron Bauer

*Villanova University, Villanova, PA, USA*

**Non-adaptive Radiations in New Caledonian Geckos**

The southwestern Pacific island of New Caledonia has one of the most highly endemic herpetofaunas in the world, including eight endemic genera of geckos and sixteen endemic genera of skinks. Representatives of different genera are typically morphologically and ecologically distinct from one another, but congeneric taxa may be very similar in both regards. Members of the diplodactylid genus *Bavayia* exhibit this pattern. Currently 12 species of *Bavayia* are described, but genetic data have revealed an even greater diversity of cryptic taxa (30 putative species), some of which are virtually indistinguishable from one another. It is presumed that such instances represent cases of “non-adaptive radiation,” in which cladogenesis occurs through allopatric isolation, but species retain plesiomorphic ecological preferences. To evaluate this hypothesis, I generated predictive niche models using a Geographic Information Systems (GIS) approach to test for spatial niche similarity in described and putative species of *Bavayia*.

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## **0274 AES GRUBER AWARD IV, Wedgewood, Friday 14 July 2017**

Simon Dedman<sup>1</sup>, Rick Officer<sup>1</sup>, Deirdre Brophy<sup>1</sup>, Maurice Clarke<sup>2</sup>, Dave Reid<sup>2</sup>

<sup>1</sup>*Galway-Mayo Institute of Technology, Galway, Ireland*, <sup>2</sup>*Marine Institute, Oranmore, Ireland*

### **Mapping Elasmobranchs with Gbm.auto - a Decision Support Tool automating Boosted Regression Tree modelling of data-poor species abundance using environmental and human inputs, mapping essential habitats, and designing MSY-based MPAs considering stakeholder priorities**

The gbm.auto R package suite automates and greatly simplifies delta log-normal Boosted Regression Tree spatial modelling, removing the high technical barrier that prevents many potential users from reaping the benefits of this powerful statistical modelling technique. The package and its documentation allow users with very little experience of R to generate maps of predicted abundance, representativeness maps for those abundance maps, bar plots of the relative influence of explanatory variables, dot and line plots of the relationships between explanatory variables and response variables, databases of the processed model objects, and a report explaining all the steps taken within the model. This process can be used to map essential habitats such as nursery grounds and spawning areas, to produce areas of key conservation importance for multiple species. Escapement biomass - the percentage of the stock which must be retained each year to conserve it - is then combined with the predicted abundance maps to create a Decision Support Tool that generates location and size options for MPAs to protect the target stocks, based on stakeholder priorities, especially the minimisation of fishing effort displacement. In bridging the gap between advanced statistical mathematics and conservation science/management/policy, these tools can allow improved spatial abundance predictions, and therefore better management and better conservation. Here we demonstrate how the package can be obtained and used for your project, with examples of the outputs it produces.

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#### **0544 Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Breanna DeGroot<sup>1</sup>, Kim Bassos-Hull<sup>2</sup>, Michael McCallister<sup>1</sup>, Matthew Ajemian<sup>1</sup>

<sup>1</sup>Florida Atlantic University, Harbor Branch Oceanographic Institute, Fort Pierce, FL, USA, <sup>2</sup>Mote Marine Laboratory, Sarasota, FL, USA

#### **Movement and habitat use of Spotted Eagle Rays, *Aetobatus narinari*, throughout Florida**

Worldwide declines in elasmobranchs have been well documented and continue to remain a major concern for marine ecosystems. The spotted eagle ray (*Aetobatus narinari*), is protected in Florida waters yet harvested in neighboring areas of the Gulf and Caribbean including Mexico, Cuba, and Venezuela. Despite a hypothesized capacity to undertake large-scale migrations, the movement ecology of spotted eagle rays remains largely understudied. This limits our ability to assess population connectivity and the potential impact of these conflicting management approaches. The objective of our study is to examine habitat use and multi-scale movement patterns in two major lagoon systems of Florida (Sarasota Bay Complex and the Indian River Lagoon). To study these movements, we are utilizing multiple acoustic biotelemetry methods, including active tracking and passive monitoring in our locations of interest. Additionally, we are taking advantage of major collaborative acoustic networks (FACT and iTAG) to understand large-scale movement patterns along the Florida coastline and beyond. Preliminary data indicates that animals tagged off Sarasota in spring 2016 initially exhibited high fidelity, but have not returned to the region since September when a major red tide event encompassed the region. Individuals tagged in the Indian River Lagoon appear to exhibit similar fidelity, returning to the area after a short-term departure associated with Hurricane Matthew. Understanding how spotted eagle rays respond to major environmental events has conservation implications for this species and is pertinent to local bivalve fisheries that they may interact with.

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#### **0144 Herp Reproduction & Life History I, Pecos, Thursday 13 July 2017**

Jennifer Deitloff<sup>1</sup>, Erin Myers<sup>3</sup>, Stephen Spear<sup>4</sup>, Dirk Stevenson<sup>5</sup>, Craig Guyer<sup>2</sup>

<sup>1</sup>Lock Haven University, Lock Haven, PA, USA, <sup>2</sup>Auburn University, Auburn, AL, USA, <sup>3</sup>University of Houston, Houston, TX, USA, <sup>4</sup>The Wilds, Cumberland, OH, USA, <sup>5</sup>The Orianne Society, Tiger, GA, USA

#### **Multiple paternity and heritability of color in *Drymarchon couperi* (Eastern Indigo Snake)**

Multiple paternity is common in many vertebrates, including snakes, and understanding how frequently it occurs within a species is important for determining the role it might play in conserving that species. One such species, the Eastern Indigo Snake (*Drymarchon couperi*), is the subject of an ongoing captive-breeding program and repatriation project in the southeast United States. Many characteristics of the reproductive biology of this

species are poorly understood, including whether clutches are sired by more than one male, and which characteristics, if any, are selected in potential mates. One characteristic that might play a role in sexual selection is color, as several studies have described variation of color in this species. Our first objective was to determine if multiple paternity occurs in source and repatriated populations of *D. couperi*. Second, we examined whether color may play a role in sexual selection. Therefore, we also tested several hypotheses examining associations between color, heritability, and multiple paternity. We found that multiple paternity likely occurred in four of the 13 clutches (~31%). Furthermore, heritability of color was relatively high; but single-sired and multi-sired clutches were not different in color nor in the variability of color within a clutch. We conclude that management of *D. couperi* could benefit by exposing captive-bred females to multiple males within a mating. This will allow for use of stored sperm to inseminate eggs or for females to seek new mates among the repatriated population, thus increasing effective population size when the population is most vulnerable.

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### **0329 Lightning Talks II, Glass Oaks, Friday 14 July 2017**

Zackary Delisle, Johanna Delgado-Acevedo, Lani Lyman-Henley, Dean Ransom  
*Texas A&M University, Commerce, Texas, USA*

#### **Cottonmouth and Diamond-backed Water Snake Spatial Ecology within Constructed and Natural Wetlands**

Wetlands are critical habitats for a plethora of biodiversity, including mammals, fish, avifauna, and herpetofauna. In Texas, precolonial wetlands have declined by at least 52%. Because of this decline, wetland restoration and conservation efforts are of pivotal concern. Our preliminary research shows that cottonmouths (*Agkistrodon piscivorus leucostoma*) and diamond-backed water snakes (*Nerodia rhombifer*) are some of the most common serpents in Texas' Hunt County wetlands. Their abundance, omni-carnivorous diet, and role as prey suggest these serpents are important trophic links within wetland ecosystems. These commonalities are also evocative of broad interspecific competition. Our first objective is to quantify the microhabitat selection and home range sizes of each species, and certain subgroups (*e.g.* sex, gravid status), within constructed and natural wetlands. The study sites will be the constructed wetland owned by Texas A&M University-Commerce, and the natural wetland at Cooper Lake WMA, Cooper, TX. Home range comparisons could imply the suitability of constructed wetlands, and microhabitat comparisons may reveal how these two species partition their habitat. Our second objective is to quantify the herpetofauna community in these same wetlands. Communities will be evaluated using Shannon's Index, species richness, and equitability. Community comparisons may again help suggest the suitability of constructed wetlands for herpetofauna. Preliminary surveys showed that the constructed wetland's species equitability is continually increasing. Therefore, more surveying could show that as constructed wetlands age herpetofauna equitability may increase.

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**0211 ASIH STOYE GENERAL ICHTHYOLOGY III, Trinity, Friday 14 July 2017**

Naomi Delventhal<sup>1</sup>, Randall Mooi<sup>2</sup>

<sup>1</sup>University of Manitoba, Winnipeg, MB, Canada, <sup>2</sup>Manitoba Museum, Winnipeg, MB, Canada

**Intra-relationships of *Callogobius* (Teleostei:Gobiidae) - A Morphological Approach**

*Callogobius* Bleeker comprises more than 40 nominal species, and numerous undescribed species. The monophyly of *Callogobius* is supported by the shared presence of a unique arrangement of raised sensory papillae rows. McKinney's (1980) unpublished Master's thesis recognized two species groups using osteology and external morphology - a stout-bodied (*maculipinnis*) and a slender-bodied (*hasseltii*) group. Our study sampled a larger number of characters in the external anatomy (fin shape, scale distribution and morphology, sensory pores and papillae patterns, urogenital papilla morphology, color pattern) and osteology (including characters in the suspensorium, gill arches, cranium, axial skeleton and paired fins). We identify three monophyletic species groups, two containing stout-bodied species (*maculipinnis*, and *sclateri* groups) and one containing species that have an elongate caudal fin and often slender body (*hasseltii* group).

Members of these groups are distinguished from each other both by external anatomy and osteology; however the composition of our *maculipinnis* and *hasseltii* groups, as well as our interpretation of some characters, differ from McKinney's work. Several remaining species of *Callogobius* do not fit clearly into these monophyletic groupings; we temporarily place them in an undefined and likely nonmonophyletic assemblage, the *tutuila* group. Preliminary molecular phylogenetic analysis supports the monophyly of our *maculipinnis*, *sclateri* and *hasseltii* groups but the *tutuila* group remains unresolved. We confirm that morphological variation (including that in some seemingly superficial characters) contains meaningful phylogenetic signal and should not be dismissed as a data source even in large, unwieldy genera.

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**0812 LFC Physiological Performance III, San Marcos, Sunday 16 July 2017**

Nancy Denslow<sup>1</sup>, Erchao Li<sup>2</sup>, Derek Bolser<sup>1</sup>, Kevin Kroll<sup>1</sup>, David Dreier<sup>1</sup>, Erica Brockmeier<sup>3</sup>, Francesco Falciani<sup>3</sup>

<sup>1</sup>University of Florida, Gainesville, FL, USA, <sup>2</sup>East China Normal University, Shanghai, China, <sup>3</sup>University of Liverpool, Liverpool, UK

**Exposure of Fathead Minnows (*Pimephales promelas*) to Narcotic Chemicals Alters Energy Metabolism and Growth**

Chemicals that cause acute toxicity to fish may do so by interfering with mitochondrial function. We have investigated chemicals classified as polar and nonpolar narcotics on

developing fathead minnow embryos. Chlorophenols and dinitrophenol, which are classified as polar narcotics, are commonly found in the environment from low ng/L concentrations up to mg/L and are released as degradation byproducts from chlorination of sewage and drinking water and from industrial sources. Phenols with increasing substitution on the phenol ring (phenol, 2,4-dinitrophenol, 2,4-dichlorophenol and pentachlorophenol) show adverse effects on developing fathead minnow embryos including on development, heartbeat, and mitochondrial function. The observed effects were dose dependent and more severe for the more highly substituted phenols. Basal mitochondrial respiration and ATP production were decreased in a dose-responsive manner for the chlorinated phenols, and this was linked to adverse effects in development and heart rate. There was growth retardation in embryos exposed to 2,4-dinitrophenol. Pentachlorophenol and 2,4 dinitrophenol are recognized uncouplers of mitochondrial oxidative phosphorylation. Changes in gene expression were also investigated, highlighting their molecular effects.

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### **0331 General Ichthyology II, Trinity, Sunday 16 July 2017**

John Denton<sup>1</sup>, John Maisey<sup>1</sup>, Mark Grace<sup>3</sup>, Michael Doosey<sup>2</sup>, Alan Pradel<sup>6</sup>, Henry Bart<sup>2</sup>, Gavin Naylor<sup>5</sup>, Paul Tafforeau<sup>4</sup>

<sup>1</sup>American Museum of Natural History, New York, NY, USA, <sup>2</sup>Tulane University, New Orleans, LA, USA, <sup>3</sup>NOAA/NMFS/SEFSC Mississippi Laboratories, Pascagoula, MS, USA, <sup>4</sup>European Synchrotron Radiation Facility, Grenoble, France, <sup>5</sup>College of Charleston, Charleston, SC, USA, <sup>6</sup>Muséum National d'Histoire Naturelle, Paris, France

### **Unusual Cranial Morphology of the Pocket Shark *Mollisquama* sp. (Squaliformes; Dalatiidae) Suggests Potentially Novel Feeding Mechanics**

The midwater dalatiid sharks consist of nine described species, in seven genera, and are notable for adaptations related to both bioluminescence emission and feeding. Among the best-known examples of dalatiid ecomorphology is the heterodonty of the cookiecutter sharks (*Isistius* sp.), which exhibit a 'cartridge' of enlarged teeth in tooth rows along the Meckel's cartilage. These teeth are used for extracting characteristic tissue plugs from prey animals and are notorious for their diagnostic wound. Here, we examine the cranial morphology of a related and unknown species, the pocket shark (*Mollisquama* sp.), using propagation phase-contrast X-ray synchrotron microtomography. The pocket shark exhibits a heterodont dentition similar to that of the cookiecutter shark. However, the unusual, bulbous rostral profile of the pocket shark is explained by a massively enlarged suborbitalis muscle that extends ventrally to form an enlarged vertical wall of tissue anterodorsal to the palatoquadrate. This muscle is nearly the size of the Meckel's cartilage and is far larger than in the cookiecutter shark. The suborbitalis infiltrates a novel subethmoid fontanelle, not seen in the cookiecutter, that may serve as a reinforcing structure for muscle action. The *Mollisquama* labial cartilages each exhibit a plate-like morphology, and the configuration of the upper and lower



labials together is planar, not angular. This cranial configuration suggests the pocket shark may exhibit a novel slicing mechanism for feeding.

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### **0096 Amphibian Conservation II, Wedgewood, Sunday 16 July 2017**

Anne Devan-Song, Justine M. Fox, Haley A. Moniz, Nancy E. Karraker

*University of Rhode Island, Rhode Island, USA*

#### **Can Upland Clustering of Eastern Spadefoot Toads (*Scaphiopus holbrookii*) Predict Breeding Pool Locations?**

Breeding pools of the explosive breeder *Scaphiopus holbrookii* are highly ephemeral and often difficult to locate. There is no established method used to find them and researchers rely on prior knowledge of locations or by detection on breeding nights when males are calling, which range from zero to a few nights a year. It is likely that many breeding pools remain undetected, which can interfere with protection of breeding habitats. In a study conducted in Yorktown VA, we observed upland clustering of larger, sexually mature *S. holbrookii* near known breeding pools. We hypothesized that larger toads cluster near breeding pools outside of breeding periods, and that these clusters can be used to predict locations of dried-up breeding pools. In 2016, we surveyed forest adjacent to 10 km of roads for *S. holbrookii* on non-breeding nights and obtained GPS location and snout-vent length for >1000 toads. We interpolated average toad length within 14 m<sup>2</sup> pixels across a 35 m buffer around surveyed roads and determined the relationship between average toad length and distance to nearest known breeding pool. Clusters of large adults and small juveniles were more likely to be found within 100 m of breeding pools than medium-sized toads, while the vast majority of medium-sized toads were found 100 to 1200 m away from breeding pools. Upland clustering of both large adult and small juvenile *S. holbrookii* may be useful in predicting locations of ephemeral breeding pools, which has important implications for monitoring and conserving populations of this species.

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### **0623 Herp Biogeography & Phylogeography I, Brazos, Sunday 16 July 2017**

Tom Devitt<sup>2</sup>, David Cannatella<sup>1</sup>, David Hillis<sup>1</sup>

<sup>1</sup>*University of Texas, Austin, TX, USA*, <sup>2</sup>*City of Austin, Austin, TX, USA*

#### **Species Formation in *Eurycea* Salamanders of the Edwards-Trinity Aquifer System, West-Central Texas**

The karstic Edwards-Trinity Aquifer system of west-central Texas is one of the most species-rich groundwater ecosystems in the world, represented by dozens of endemic groundwater-obligate species with narrow, naturally fragmented distributions. Here, we examine how geomorphological and hydrogeological processes have driven population divergence and speciation in a radiation of plethodontid salamanders (genus *Eurycea*)

endemic to the Edwards-Trinity system. Species in this clade show convergence among subterranean populations alongside morphological conservatism of surface-dwelling forms with cryptic species boundaries. Coalescent analysis of genome-wide genetic data show complex patterns of isolation and reconnection driven by surface and subsurface hydrology, resulting in both adaptive and non-adaptive population divergence and speciation. Our results uncover new cryptic species and refine the boundaries of named species, several of which have been classified as threatened or endangered with extinction under the Endangered Species Act due to groundwater abstraction. Regional climate and hydrologic models that predict increased air temperature and decreased springflow forecast the Edwards-Trinity salamanders and codistributed groundwater-obligate species in the region to be highly vulnerable to extinction.

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**0563 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Wendy Diaz, Kevin W. Conway

*Texas A&M University, College Station, TX, USA*

**An Investigation of Substrate Scraping Behavior in Three Species of Sicydiine Gobies Inhabiting Freshwater Streams on Dominica, West Indies**

Gobies of the genus *Sicydium* are freshwater fishes present throughout the western Central Atlantic and eastern Central Pacific. They feed by scraping algae from hard surfaces in fast flowing rivers and streams and have highly modified teeth used for scraping. An investigation and analyses was conducted specifically on the frequency of substrate scraping during feeding in three different species of *Sicydium* found on Dominica (*S. buscki*, *S. plumieri* and *S. punctatum*). A total of 20 video recordings of scraping events were obtained using a waterproof digital camera and analyzed using appropriate software. Forty individual sicydiine gobies were documented: *S. punctatum* (n=14), *S. plumieri* (n=5), *S. buscki* (n=18). The total length range for *S. punctatum* was 22.0-71.2 mm, 32.3-117.0 mm for *S. plumieri*, and 34.0-82.0 mm for *S. buscki*. The head length range for *S. punctatum* was 3.9-13.5 mm, 8.0-25.3 mm for *S. plumieri*, and 6.8-18.1 mm for *S. buscki*. The range of scrapes per second for *S. punctatum* was 8-11, 2-6 for *S. plumieri*, and 3.5-6.5 for *S. buscki*. *Sicydium punctatum* had an average of 9.6 scrapes per second. *Sicydium plumieri* had an average of 3.9 scrapes per second. *Sicydium buscki* had an average of 4.8 scrapes per second. Results show that there are significant differences in the frequency of scraping in the different species of *Sicydium*. Thus, individuals can be identified as one of the three species documented based on their scraping frequencies.

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**0452 LFC Multi-Stressor Effects, San Marcos, Friday 14 July 2017**

Carlos Diaz-Gil<sup>1</sup>, Adam Gouraguine<sup>2</sup>, Miquel Palmer<sup>1</sup>, Ignacio A. Catalán<sup>1</sup>

<sup>1</sup>*Instituto Mediterráneo de Estudios Avanzados (IMEDEA), Esporles, Illes Balears, Spain,* <sup>2</sup>*University of Essex, School of Biological Sciences, Coral Reef Research Unit, Colchester, UK*

## **New metrics for measuring behavioural response to chemical cues: application to two juvenile temperate species**

Research into fish orientation through discrimination between chemical cues is extensive in both, larvae and adults. However, whether olfactory mechanisms are critical in habitat selection and avoidance of detrimental conditions in juveniles within the marine environment remains under-researched. Using a choice flume, we investigated the chemically mediated behaviour choices, to distinct chemical cues of juveniles of two common temperate species. A common issue in flume experiments is the apparent absence of response evidenced in terms of the amount of time spent in each water type and therefore results are considered non-significant and usually not published. We went a step further to discover that the response triggered by the detection of a particular cue could be observed through the difference in mean and variance of speed of individual movements, which had not been considered before in flume experiments. Consequently, we propose a novel protocol using a Bayesian approach to measure the time spent within in each water mass, as well as the mean and variance of speed of the fish movements within the flume as behavioural descriptors. We present the results of this analytical methodology for two case studies mentioned before describing how the juveniles of these two fish species indeed reacted both to natural and anthropogenic chemical cues, despite not spending a significantly larger amount of time in any water type. We argue that these analyses might be a useful complementary tool for future studies of behavioural responses of fish, as well as for re-analysis of previous video-based data.

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### **0140 ASIH STOYE ECOLOGY & ETHOLOGY IV, Sabine, Friday 14 July 2017**

Amanda DiBella, Scott L. Parker

*Coastal Carolina University, Conway, SC, USA*

#### **Dietary Composition and Prey Selectivity of the Diamondback Terrapin (*Malaclemys terrapin*) in North Inlet, SC**

Diamondback terrapins (*Malaclemys terrapin*) are physiologically and ecologically specialized turtles endemic to estuaries of the Gulf and eastern coasts of the U.S. Diamondback terrapins may play an important role in maintaining salt marsh biodiversity and ecosystem function through the consumption of herbivorous periwinkle snails (*Littorina littorea*) and crabs (*Uca pugnator*, *Sesarma reticulatum*). However, relatively little is known about terrapin feeding ecology and predator-prey relationships. The purpose of this study was twofold: The first objective was to determine whether terrapins preferentially select periwinkle snails over other available prey items in the field. Our second objective was to determine whether prey selection under laboratory conditions, when terrapins are given a choice of prey items, parallels

that observed in the field. Analysis of prey abundance in fecal samples indicates that terrapins show a preference for periwinkle snails (92%) compared to other available prey such as crabs (5%) or fish (<1%). In contrast, in laboratory feeding trials, terrapins showed a preference for fiddler and marsh crabs (80%), with periwinkles being the least preferred prey (0% consumed). Frequent predation attempts on fish (*Fundulus heteroclitus*) were also made. Preference for crabs and fish in the laboratory may be due to increased nutritional benefit of these prey species compared to the less digestible, but more easily accessible periwinkles. Our results indicate that prey selection by terrapins in the field may be constrained by a tradeoff between availability of periwinkles, an abundant prey item with relatively low digestibility, compared to less available but more digestible crabs and fish.

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### **0216 AES GRUBER AWARD III, Wedgewood, Friday 14 July 2017**

Pavel Dimens<sup>2</sup>, David Portnoy<sup>0</sup>

<sup>1</sup>Texas A&M University - Corpus Christi, Corpus Christi, TX, USA, <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS, USA

#### **Population structure of a migratory small coastal shark, *Carcharhinus acronotus*, across cryptic barriers to gene flow**

Patterns of population structure in the blacknose shark (*Carcharhinus acronotus*) were assessed using 2,178 nuclear encoded single nucleotide polymorphism loci scored for 249 individual sharks sampled from the U.S. South Atlantic (Atlantic), eastern and western Gulf of Mexico (Gulf). Results concurred with findings from a previous study that utilized microsatellites and mtDNA, supporting divergence between the Gulf and Atlantic and weak structure between the eastern and western Gulf. Individuals from the Florida Keys, an area which could potentially be a seasonal mixing zone for Atlantic and eastern Gulf populations, largely assigned to the eastern Gulf population. Of 79 Keys individuals analyzed, 50 were assigned to the Gulf, and four to the Atlantic with greater than 80% membership probability. Seven potential Gulf migrants were identified in the Atlantic and three potential Atlantic migrants were identified in the Gulf using the whole data set. When a reduced data set consisting only of markers that were significantly divergent between the eastern Gulf and Atlantic was used for assignment only five migrants were detected (four in the Atlantic and one in the Gulf). The results indicate that the Straits of Florida do not act as a hard barrier preventing movement between the western Atlantic and eastern Gulf. Despite the number of migrants detected exceeding that which is theoretically required to cause gene pools to homogenize, the western Atlantic and Gulf remain distinct; this suggests differences in potential and realized dispersal over generational scales.

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### **0490 ASIH STOYE GENERAL ICHTHYOLOGY II, Trinity, Thursday 13 July 2017**

Kyle Dineen, Brook Fluker

*Arkansas State University, Jonesboro, AR, USA*

**Genetic Structure and Diversity of Disjunct Populations of Rainbow Darters (*Etheostoma caeruleum*) and Southern Redbelly Dace (*Chrosomus erythrogaster*) Throughout the Mississippi Corridor**

Conservation studies of North America's freshwater fish fauna frequently focus on recently fragmented species or species with naturally small ranges. Our grasp of how recent, natural isolation affects the migration and genetic diversity of common and widespread freshwater fishes is limited. *Etheostoma caeruleum* and *Chrosomus erythrogaster* are widespread, abundant, and have overlapping distributions with comparable patterns of naturally disjunct populations on their range margins. Both species have potentially isolated populations in tributaries on Crowley's Ridge, Arkansas and the Bluff Hills, Mississippi. These regions are recent geological formations that would have been colonized by these species within the last 10,000 years making these species excellent subjects for studying the impacts of recent, natural genetic isolation. In this study, we analyze microsatellite DNA loci from both species to evaluate genetic diversity and connectivity among populations on Crowley's Ridge, the Bluff Hills, and larger core populations. Using DNA sequence data, we also test hypotheses about the pattern and timing of colonization of Crowley's Ridge and the Bluff Hills. The results of this study will provide useful information about the biogeographic history and conservation status of these potentially disjunct populations of *E. caeruleum* and *C. erythrogaster*.

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**0097 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017;  
HL/SSAR/ASIH SYMPOSIUM - THE SCIENCE, MANAGEMENT, AND  
POLICY OF AMPHIBIAN CONSERVATION: EXTENDING THE LEGACY  
OF RAY SEMLITSCH**

Chris Distel

*Schreiner University, Kerroville, TX, USA*

**Exotic armored catfish may reduce survival and growth of native amphibians**

Invasive species threaten biodiversity worldwide. Armored catfish, which are benthic grazers, have been introduced globally and damage ecosystems in numerous ways. However, their competitive interactions with native benthic grazers have not been tested. This study tested for the effects of an invasive armored catfish (*Hypostomus plecostomus*) on performance in native Rio Grande leopard frog (*Rana berlandieri*) tadpoles. Aquarium tests showed that armored catfish can negatively affect native amphibian survival and growth even when food is abundant. However, mesocosm tests showed no effects of competition. While the mechanisms of effect remain unclear this is the first study to demonstrate exotic armored catfish as a potential threat to native amphibians, which are declining globally.

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## 0427 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017

Blake Dixon, James Watling

*John Carroll University, Ohio, USA*

### **Thermal tolerances of Red-backed salamanders, *Plethodon cinereus*, with differing temperature exposure histories**

Twenty-first century climate change is predicted to push many ectothermic vertebrates to and past their critical thermal maxima ( $CT_{max}$ ), resulting in negative fitness and local extinctions. These predictions have fueled interest in using  $CT_{max}$  to understand which organisms and habitats face the greatest threats from increasing temperatures. However, few studies of ectothermic vertebrates have considered how an individual's  $CT_{max}$  can change depending on the thermal environment it is acclimated to, and the rate of temperature increase it experiences during  $CT_{max}$  trials. This experiment tested the  $CT_{max}$  of *Plethodon cinereus* acclimated to 20°C or 15°C, and described how thermal tolerance shifted using different rates of temperature increase (1°C/min or 0.5°C/min) during trials. Preliminary results suggest that animals acclimated to 20°C and those experiencing faster thermal ramping had the highest  $CT_{max}$ , indicating at least some potential for acclimation to reduce negative impacts of climate change on vulnerable ectotherm populations.

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## 0151 Lightning Talks II, Glass Oaks, Friday 14 July 2017

Tiffany Doan

*New College of Florida, Sarasota, FL, USA*

### **Can Exotic Reptile Invasion Be Facilitated by Disease?**

The state of Florida has become a haven for invasive reptile species, with exotics making up over 40% of its current reptile fauna. Invasive species have often displaced the native species, causing reductions in their populations. In some cases, invasive species are superior competitors with a higher tolerance for urbanized habitats. One particular example of this phenomenon is the abundant invasive *Anolis sagrei* and the now uncommon native *A. carolinensis*. One facet of the invasion of *A. sagrei* that has not received attention is susceptibility to disease. A recent study examined the relative infection rates of the malaria parasite *Plasmodium floridense* in Central Florida where *A. sagrei* is dominant but *A. carolinensis* still persists in some habitats. In that study, we found that *A. carolinensis* were infected at over twice the rate of *A. sagrei*. Because we also found that leukocytes were elevated in infected lizards, *Plasmodium* infection may harm the fitness of these species, though few studies have examined what effects malaria has on lizard health. Reduced infection by blood parasites may be one of the many factors allowing *A. sagrei* to successfully invade Florida and to become the superior competitor throughout its introduced range. Although few studies have

examined the effects of parasitic infection on native versus invasive species, infection status could be a new piece to the puzzle of what determines invasion success. Knowledge of the interactions of infection, invasion, and competitive ability will be valuable for combatting the damage that invasive species may wreak on ecosystems.

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**0448 Fish Behavior, San Antonio, Saturday 15 July 2017**

Terry J. Donaldson

*University of Guam Marine Laboratory, Mangilao, Guam, USA*

**Mating Systems of *Hemigymnus melapterus* and *Cheilio inermis* (Labridae) on a Spawning Aggregation Site: Weird!**

Species of fishes reproducing on resident spawning aggregation sites use different mating systems, and there is intraspecific variation in their use. A number of species utilize a lek-like system in which males secure and defend temporary territories for the purpose of attracting females. They defend these territories against rival males, often vigorously, and in some cases territorial males will also engage in streaking or sneaking while attempting to mate with a rival male's females. The territories they hold may be favorable if found in a location that is attractive to females. Attraction isn't everything, however. Some males forego establishing mating territories and instead mimic females in coloration, body size and even behavior, and reproduce using multiple episodes of group spawning. The relatively large tropical wrasse *Hemigymnus melapterus* engages in lek-like behavior but may be reduced to pair-spawning if site densities are low. In contrast, *Cheilio inermis* engages in group spawning but occasionally larger, single males also pair-spawn if site densities are low. Site density of either species on the site at any given time is a common factor for both species. What is not clear is the role of timing, given that moon phase, tidal state and time of day do not appear to influence local population densities at the site let alone the reproductive behavior observed there.

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**0240 SSAR SEIBERT SYSTEMATICS & EVOLUTION, Brazos, Friday 14 July 2017**

Caroline Dong<sup>1</sup>, Claire McLean<sup>1</sup>, Adnan Moussalli<sup>2</sup>, Devi Stuart-Fox<sup>1</sup>

<sup>1</sup>*The University of Melbourne, Melbourne, Victoria, Australia*, <sup>2</sup>*Museum Victoria, Melbourne, Victoria, Australia*

**Asymmetrical Introgression of Throat Coloration Across a Contact Zone of Australian Agamids**

Natural contact zones between lineages in the early stages of speciation offer a unique opportunity to directly measure the progress of speciation. Furthermore, speciation is facilitated when traits under divergent selection are linked to reproductive isolation, such as coloration. The Australian tawny dragon lizard, *Ctenophorus decresii*, is a

compelling study system of incipient speciation with a candidate reproductive isolating trait. The species comprises two genetically and phenotypically distinct lineages that are geographically structured into a 'northern' and 'southern' lineage, and interact in a narrow contact zone. The lineages exhibit striking differences in male throat coloration. An examination of genetic and phenotypic data from across the contact zone reveals strong patterns of asymmetrical introgression. We characterized hybrid throat coloration using segmentation analysis and reflectance spectrophotometry and found evidence that selection favors the northern phenotype in the contact zone. However, analysis of transcriptome sequences reveals that hybrid individuals are genetically more similar to the southern lineage. Further investigation into the complex contact zone dynamics between these two divergent lineages will contribute to our understanding of the role of coloration in speciation.

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**0187 Plenary, Thursday 13 July 2017**

Maureen Donnelly

*Florida International University, Miami, FL, USA*

**ASIH has been Very, Very, Good to Me: How Service to the ASIH Enhanced my Academic Career**

I began my career in herpetology as a member of all three societies, but started doing "heavy lifting" while I was a postdoctoral fellow. That involvement in society business helped me make connections that advanced my career, and those connections help advance the careers of my students, and now my academic grand-students. Service to a professional society can not only help a scientist advance their career, but it can pave the way for friendships that enhance academic life.

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**0893 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

María A. Doria-González<sup>1</sup>, Andrea M. Espitia-Galvis<sup>1</sup>, Angel L. Martínez-González<sup>1</sup>, Glenys Tordecilla-Petro<sup>2</sup>, Charles W. Olaya-Nieto<sup>1</sup>, Fredys F. Segura-Guevara<sup>1</sup>

<sup>1</sup>*Fishery Biology Research Laboratory-FBRL, Department of Aquatic Sciences, University of Cordoba., Loricá, Córdoba, Colombia,* <sup>2</sup>*Institución Educativa Lácides C. Bersal. Alcaldía municipal., Loricá, Córdoba, Colombia*

**Reproductive Ecology of Bocachico *Prochilodus magdalenae* in the San Jorge River Basin, Colombia**

Reproductive ecology of Bocachico *Prochilodus magdalenae* in the San Jorge River basin, Colombia, was studied. Individuals with total length (TL) ranged between 19.9 and 42.7 cm and total weight (TW) ranged between 103.0 and 1105.0 grams were collected. The gonads were placed in Gilson solution, the Vazzoler scale was applied and sexual



proportion, maturity index, spawning season, length at first maturity, oocytes' diameter and fecundity were estimated. 210 females, 171 males and 15 undifferentiated were found, with sexual proportion female: male 1.2:1, differently than expected, and sexual dimorphism in size, since females reach larger sizes than males. Length at first maturity was estimated in 30.2 cm TL for both sexes, oocytes' diameter were 951 µm and average fecundity estimated was 109972 oocytes. The results achieved suggest that Bocachico is a fish whose spawning season extends from May to October, with annual spawning in the rainy season and synchronous gonadal development in two groups, large oocytes and high fecundity associated to the ovaries' weight.

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**0215 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017;  
HL/SSAR/ASIH SYMPOSIUM - THE SCIENCE, MANAGEMENT, AND  
POLICY OF AMPHIBIAN CONSERVATION: EXTENDING THE LEGACY  
OF RAY SEMLITSCH**

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**Amphibian Community Composition in Missouri Ponds**

We examined community composition of pond-breeding amphibians at over 200 ponds in Missouri between 2002 and 2012 using drift fence and dipnet and funnel trap data. We encountered a total of 20 pond-breeding amphibian species in the combined surveys. We also examined whether the presence of fish and Bullfrogs, *Rana (Lithobates) catesbeiana*, influenced observed patterns of diversity. Our results indicate that the presence of fish, Bullfrogs, and their interaction influenced the community composition of amphibians at these sites, but in opposite patterns. Fish presence was negatively associated overall with species diversity, while Bullfrogs often had a positive relationship with the total number of species, total caudate species, and total anuran species, and the presence of both fish and Bullfrogs was negatively associated with anuran species diversity. It is important to have baseline community species composition data from wide geographical ranges so spatiotemporal changes in community structure can be noted and assessed.

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**0732 LFC Contributed I, San Marcos, Friday 14 July 2017**

Denice Drass, Glenn Zapfe, David Hanisko, Pamela Bond

DOC/NOAA/NMFS, Pascagoula, MS, USA

## **Abundance and distribution of larval snapper assemblages (Lutjanidae) in the northern Gulf of Mexico from 1982-2014**

Several snapper species (*Lutjanus campechanus*, *Rhomboplites aurorubens*, *Ocyurus chrysurus*, *L. griseus*, *L. analis*, *L. vivanus*, *L. synagris* and *Etelis oculatus*) comprise commercially and recreationally important fisheries in the Gulf of Mexico (GOM). As federally managed species, life history components are used in creating stock assessment models. One component used in the assessment models is larval indices of abundance for *Lutjanus campechanus* and *Rhomboplites aurorubens* calculated from fishery-independent data collected during Southeast Area Monitoring and Assessment Program (SEAMAP) ichthyoplankton surveys. Lutjanidae larvae from SEAMAP surveys (1982-2014) in the GOM were inspected for this project. Larvae were examined under a stereomicroscope, identified, and body length was measured for each specimen. Abundances for *Lutjanus campechanus* and *Rhomboplites aurorubens* were calculated from bongo (# larvae under 10 m<sup>2</sup>) collections for Fall (August and September) throughout the time series. Maps for *Lutjanus campechanus* and *Rhomboplites aurorubens* were created to examine the geographical extent and change in larval distribution over the time series.

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### **0640 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Michael Dreslik<sup>1</sup>, Christopher Petersen<sup>2</sup>, Scott Goetz<sup>3</sup>, John Kleopfer<sup>4</sup>, Alan Savitzky<sup>5</sup>

<sup>1</sup>Illinois Natural History Survey, Champaign, Illinois, USA, <sup>2</sup>Naval Facilities Engineering Command Atlantic, Norfolk, Virginia, USA, <sup>3</sup>Auburn University, Auburn, Alabama, USA, <sup>4</sup>Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA, <sup>5</sup>Utah State University, Logan, Utah, USA

### **Spatial Ecology of the Timber Rattlesnake (*Crotalus horridus*) from the Mid-Atlantic Coastal Plain**

Studies of the spatial ecology of organisms provide insights into movement rates, area used, and habitat use. Spatial studies answer such conservation-related questions as how much and when an organism moves, how much area it requires, and what factors affect both movements and activity areas. Our study aimed to determine what factors affect movement patterns and activity area sizes of Timber Rattlesnakes (*Crotalus horridus*) in the mid-Atlantic using data collected over a 17 year-period, which afforded us the ability to examine the effects of individual and inter-annual variation. There have been few long-term studies of the spatial ecology of this species on the Coastal Plain. We used mixed-effects general linear regression, coupled with AIC methods, to determine which predictive models best explained the variation observed in movement and activity areas. For movement, we found that the daily and annual total distances moved by male snakes were approximately two times those of females and males moved greater distances from hibernacula than females. In most cases, half of the variation was explained by differences among individuals. Similarly, activity area sizes for males were

more than twice those of females, with the individual variation being a less important component. Our study suggests one aspect of snake size (mass) may play a role in the spatial ecology of this species. Importantly, we observed a positive relationship between increasing mass and size of activity areas in males, however, this trend was not seen in females.

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### **0648 Snake Biology I, Brazos, Sunday 16 July 2017**

Michael Dreslik<sup>1</sup>, Christopher Petersen<sup>2</sup>, Scott Goetz<sup>3</sup>, John Kleopfer<sup>4</sup>, Alan Savitzky<sup>5</sup>

<sup>1</sup>Illinois Natural History Survey, Champaign, Illinois, USA, <sup>2</sup>Naval Facilities Engineering Command Atlantic, Norfolk, Virginia, USA, <sup>3</sup>Auburn University, Auburn, Alabama, USA, <sup>4</sup>Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA, <sup>5</sup>Utah State University, Logan, Utah, USA

#### **Factors affecting the movements of Timber Rattlesnakes (*Crotalus horridus*) from the Mid-Atlantic Coastal Plain**

Factors governing why or how far an organism moves can reflect local conditions, such as weather and habitat structure, as well as intrinsic biological variables such as age, sex, and reproductive condition. These variables may act synergistically to influence the frequency and distance of movements. We sought to determine whether climatic, behavioral, and/or biological factors drive movements in a mid-Atlantic population of Timber Rattlesnakes (*Crotalus horridus*), using a 17-year radio-telemetric data set. We used mixed-effects binary logistic regression to determine the probability of movement, and general linear mixed-effects regression, coupled with an AIC approach, to determine the best predictive models for distance per movement. Our results indicate that movements are influenced by numerous climatic, behavioral, and biological variables. For example, as mean three-day maximum temperature increased, so did the probability of movement, but the greatest distances moved were at the lower (egress and ingress) and higher temperatures (main activity season). Additionally, the probability of movement was approximately the same throughout the year, whereas the greatest movement distances occurred during the summer months. As the number of days increased since last feeding, the probability of movement decreased, but the distances moved increased. Movements decreased before shedding and increased slightly after shedding. Together, our data suggest that numerous factors affect movements in *C. horridus*, notably the impact of weather patterns.

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### **0645 ASIH STORER ICHTHYOLOGY; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Kandria Driskill, Kyle Dineen, Brook Fluker  
Arkansas State University, Jonesboro, AR, USA

## **Body shape variation within and among lineages of the Rainbow Darter, *Etheostoma caeruleum***

The Rainbow Darter (*Etheostoma caeruleum*) is distributed widely throughout the eastern United States, with several disjunct populations in the lower Mississippi River drainage. An unpublished morphological study of *E. caeruleum* suggested several potentially distinct species in the White River drainage and in tributaries of the lower Mississippi River drainage. However, published phylogeographic studies are not concordant with morphological data. This study used geometric morphometrics to evaluate body shape differences of *E. caeruleum* across its range. Specifically, we asked whether differences in body shape corresponded to previously identified lineages or putative species based on meristic data. Preliminary results based on populations from loess habitats of Crowley's Ridge in Arkansas (St. Francis River drainage) and upland habitats of the Ozark Highlands (White River drainage) revealed some overlap in body shape between distinct lineages. However, disjunct populations from Crowley's Ridge were somewhat differentiated from other populations based on the distinction of the nuchal hump. Results from this study will provide valuable information about the distinctiveness of potentially unrecognized diversity within *E. caeruleum*.

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### **0848 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017; LFC BLAXTER BEST STUDENT POSTER**

Melissa Drown<sup>1</sup>, Delan J. Boyce<sup>2</sup>, Ehren A. Habeck<sup>2</sup>, Matthew Poach<sup>2</sup>, R. Christopher Chambers<sup>2</sup>

<sup>1</sup>University of Minnesota, Minneapolis MN, USA, <sup>2</sup>NOAA / Northeast Fisheries Science Center, Highlands NJ, USA

### **Plasticity of Responses to High CO<sub>2</sub> in Early Life Stages of Atlantic Silverside, *Menidia menidia***

Absorption of atmospheric CO<sub>2</sub>, elevated from hydrocarbon combustion, by ocean surface waters has led to an acidification of coastal and ocean water (OA). OA is expected to affect the future mineralogy and biota of these ecosystems in ways ranging from minimal and subtle to strong and pervasive. Marine scientists lack a predictive understanding of the patterns of responses and downstream consequences of these effects. To date, experimental CO<sub>2</sub> effects studies on early life stages of fishes and other marine fauna typically use a small number of elevated CO<sub>2</sub> environments into which experimental subjects are placed then evaluated for responses. While effective for determining whether CO<sub>2</sub> has an effect on the responses measured, little is revealed about the scope and shape of the biological responses. Here we describe a new experimental apparatus for achieving a large number of different CO<sub>2</sub> concentrations among experimental tanks, report its performance, and use a forage fish (Atlantic Silverside, *Menidia menidia*) to demonstrate the extent and shape of various early life-stage biological responses to a wide range of CO<sub>2</sub> concentrations. This high-frequency CO<sub>2</sub> system (HFCO<sub>2</sub>) uses gas diffusion across distance to generate up to 12 unique and

stable CO<sub>2</sub> concentrations. The HFCO<sub>2</sub> system can also be used to mimic high-frequency (e.g., daily) oscillations in CO<sub>2</sub> concentrations as would be expected in nearshore and estuarine environments in summer. Such knowledge of full phenotypic plasticity of fish to CO<sub>2</sub> is needed to establish a quantitative understanding of CO<sub>2</sub> effects on our living marine resources in future CO<sub>2</sub>-impacted environments.

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## **0121 AES Conservation & Management I, Pecos, Saturday 15 July 2017**

Marcus Drymon<sup>1</sup>, Steven Scyphers<sup>0</sup>

<sup>1</sup>*University of South Alabama, Mobile, AL, USA*, <sup>2</sup>*Northeastern University, Boston, MA, USA*

### **Attitudes and Perceptions Influence Recreational Angler Support for Shark Conservation and Fisheries Sustainability**

Despite the perilous status of many shark populations, rallying support for their conservation has been challenging, due in part to both long held negative perceptions and desire for shark fisheries. Recreational anglers are often advocates of conservation and can act as valuable partners with resource managers in developing fisheries management and conservation strategies. However, understanding their attitudes and perceptions, particularly towards resources status and management, is essential to developing successful management strategies and predicting outcomes. As a case study for assessing the complex challenges of sustainable shark fisheries, Florida recreational anglers were surveyed to understand how attitudes and perceptions influenced their willingness-to-donate for shark 1) conservation and protection or 2) fisheries sustainability. Overall, recreational angler willingness to donate was 25.5%, but attitudes and perceptions helped explain dramatic divides. For instance, willingness-to-donate was only 6% among the subset of anglers that perceived a growing large coastal shark population as a threat to recreational fishing opportunities. Highest support for shark conservation was shown by anglers who value seeing sharks in the wild (41.4%), and even more so among individuals who occasionally target sharks while fishing recreationally (65.8%). Pervasive among anglers unwilling to donate was a perception that shark populations were increasing, and thus not in need of further protection. These findings illustrate attitudes and perceptions that challenge shark conservation and fisheries management, as well as the critical importance of engaging anglers when developing strategies that rely on the recreational angling community for support.

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## **0913 LFC Physiological Performance I, San Marcos, Saturday 15 July 2017**

Benjamin Dubansky, Warren Burggren

*University of North Texas, Denton, Texas, USA*

### **Growth, Development, and the Measure of Cardiovascular Physiology in Embryonic and Larval Teleost Fish**

The use of developmental models in environmental science enhances understanding of the ecosystem response to stressors, and teleosts are often convenient subjects. In developing fish, cardiovascular structure and function are predictably and profoundly altered by both natural and anthropogenic stressors. As such, cardiovascular effects have become benchmarks in developmental teleost studies where observational and optical techniques enable rapid data collection. However, defects of the developing heart and vasculature can also be subtle, and are thought to result from a complex interaction of both environmental and heritable factors whereby developing organisms may be physiologically primed for increased plasticity and resilience, or sensitivity to stressors. Further, alteration in the timing of developmental processes may be reflective of an adaptive strategy. Complicating this, we note that development occurs across multiple trajectories and is neither linear nor saltatorial. In this vein, we illustrate here that synchronicity of growth and development can be variable, thus resulting in perceived alterations in cardiovascular physiology that are perhaps indirect effects, rather than direct effects of environmental stress. However, there is a poor understanding of the development of cardiovascular regulation in early life stage fish and much work is still needed that may be explanatory of effects seen in previous and ongoing work. Drawing upon a few examples and emerging model systems, we illustrate how growth, development, experimental timelines, and measurement can inform on and guide the acquisition of physiological data.

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## **0238 Turtle Conservation, Sabine, Saturday 15 July 2017**

Thomas Duchak, Russell Burke

*Hofstra University, Hempstead, New York, USA*

### **Habitat and Species-specific Factors could be causing Maternally-linked Hatching Failure in a Threatened Turtle Population**

We collected four years (2013-2016) of wood turtle nesting data at a site in northern New Jersey (NNJ) and found the overall hatch rates of this population to be unusually low ( $\approx 30\%$ ). Intra-individual hatch rates and comparisons between in-situ and artificial incubation revealed that many females consistently produced clutches with low ( $< 50\%$ ) hatch rates, regardless of incubation conditions. In contrast, the annual hatch rates of other females were either consistently high ( $> 50\%$ ) or highly variable, ranging from 0-100%. Thus, some females routinely made much larger contributions to the next generation than others. We obtained hatch rate data from a similar study in northern Virginia (NVA) and compared hatch rate repeatability between the NNJ and NVA populations to determine whether maternally-linked hatching failure (MLHF) is uncharacteristic of wood turtles. Additionally, we collected preliminary hatch rate data on NNJ painted and snapping turtles at the same site to determine if they also experience low hatch rates. Repeatability estimates revealed that maternal identity accounted for 58% of hatch rate variation in NNJ and only 5.6% in NVA. In 2016, the overall painted (58.82%;  $n = 5$ ) and snapping (76.28%;  $n = 7$ ) turtle hatch rates were not as low as the overall wood turtle hatch rate (31.71%;  $n = 16$ ); however, larger sample

sizes are needed for robust statistical comparisons. Our current results suggest that an unknown and, possibly, wood turtle-specific factor could be responsible for the elevated proportions of MLHF in NNJ. Inbreeding, deficient maternal diets, or environmental contamination are potential causes.

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### **0916 AES Morphology, Pecos, Sunday 16 July 2017**

Laurent Duchatelet<sup>1</sup>, Nicolas Pinte<sup>1</sup>, Taketeru Tomita<sup>2</sup>, Jérôme Mallefet<sup>1</sup>

<sup>1</sup>*Catholic University of Louvain, Louvain-la Neuve, Belgium*, <sup>2</sup>*Okinawa Churashima Foundation, Motobu, Okinawa, Japan*

#### **Species-specific dorsal luminous pattern in Etmopterids with an emphasis on the dorsal spine associated photophores**

In the darkness of the ocean an impressive number of taxa have evolved the capability to emit bioluminescence. Most mesopelagic organisms emit a ventral dim glow that matches with the environmental residual light in order to camouflage themselves (countershading hypothesis), as for Etmopteridae. Dorsal luminescence pattern, conversely, is rare within these deep-sea organisms. Nevertheless, new evidences show that *Etmopterus spinax*, *Etmopterus molleri* and *Etmopterus splendidus* have a luminescence pattern spread all over the dorsal surface of the body. When we visualize the dorsal luminescent pattern in these three lanternshark species, we were able to observe specific lines of luminous organs, called photophores, on the dorsal area as well as more light coming up from the spines boundary. This dorsal light seems to be conflicting with the ventral photophores counterilluminating camouflage role. Moreover, skin photophores surrounding the defensive dorsal spines show a precise pattern supporting an aposematism function for this bioluminescence. Highlighting the defensive spine with bioluminescence seems to deter predators after a first learning bite on an Etmopteridae species. Thanks to in vivo digital camera pictures, *in situ video recording*, morphological and histological analysis, we reconstruct these species dorsal light emission pattern, with an emphasis on the photogenic skin associated with the spine. Video footage analysis validated, for the first time, the defensive effect of the dorsal spines. Finally, we validate that Etmopterid, by opposition of Squalid and Heterodontid, do not have any spine-associated gland via CT scan analysis.

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### **0733 Texas and Mexican Blindcats/Desert Fishes, Sabine, Saturday 15 July 2017**

Laura E. Dugan<sup>1</sup>, Dean A. Hendrickson<sup>2</sup>, Antonio Hernández-Espriú<sup>3</sup>, Gary P. Garrett<sup>2</sup>, Adam E. Cohen<sup>2</sup>, Brad Wolaver<sup>4</sup>, Ryan Smith<sup>5</sup>

<sup>1</sup>*Texas Parks and Wildlife Department, Austin, TX, USA*, <sup>2</sup>*University of Texas, Integrative Biology, Austin, TX, USA*, <sup>3</sup>*Universidad Nacional Autónoma de México, México City, México, Mexico*, <sup>4</sup>*University of Texas, Bureau of Economic Geology, Austin, TX, USA*, <sup>5</sup>*The Nature Conservancy, San Antonio, TX, USA*

## **Conservation status assessment of the endangered Mexican blindcat, *Prietella phreatophila***

Discovery of the Mexican blindcat, *Prietella phreatophila*, in Texas in 2016 generated interest in the species, which had previously only been known from Mexico but is listed as a foreign endangered species in the US. Consequently, an effort was undertaken to conduct a conservation status assessment of the fish using standardized methods developed by NatureServe. These assessments aim to determine the extinction risk of species and produce conservation ranks, which can be used to inform listing statuses and policy decisions and to determine conservation priorities. The rank is determined by assessing factors in three main categories: rarity, threats, and trends. Here we used three rarity and one threat factor in the NatureServe rank calculator to determine the global conservation rank of *P. phreatophila*. Known occurrences were compiled, and the online tool GeoCAT (geospatial conservation assessment tool) was used to determine range extent and area of occupancy. Number of occurrences (e.g., populations) was estimated based on the spatial distribution of observations and their proximity to one another. Threat comprised scope, which was assessed in ArcGIS by intersecting the total area covered by a given threat with the known occurrence area of *P. phreatophila*, and severity, which was estimated based on expert opinion. The resulting conservation rank was G2 (globally imperiled; roughly equivalent to IUCN's Vulnerable rank); however, complete data were not available for any factor thus motivating the need for further study. When new data are available, the rank can be easily updated with this new information using the rank calculator.

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### **0394 AES Conservation & Management II, Pecos, Saturday 15 July 2017**

Nicholas Dulvy<sup>1</sup>, Colin Simpfendorfer<sup>0</sup>

<sup>1</sup>Simon Fraser University, Burnaby, Canada, <sup>2</sup>James Cook University, Townsville, Australia

#### **Bright spots of sustainable shark fishing**

Sustainability is not on the menu according to the movies 'Sharkwater' and 'Racing Extinction'. We evaluate the null hypothesis that there are no sustainable shark fisheries. Fisheries stock assessments were available for a total of 65 populations of 47 species. We estimate that ~9% of the global catch of sharks is biologically sustainable, taken from 39 populations of 33 species that exhibit a wide range of life histories. Stocks that met some or all of the sustainability criteria mostly occur in the waters of developed countries that have well-developed fisheries management systems. Sustainable shark fisheries yield about 4,406 t of dried fins, suggesting 8.7% of the global trade is from sustainable sources. Sustainable shark fishing is not only possible, transitioning toward sustainable fishing is a viable for a wide range of the world's shark and ray fisheries.

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## **0450 Lightning Talks I, Glass Oaks, Friday 14 July 2017**

Andrew Durso, Susannah French, Geoff Smith

*Utah State University, Logan, Utah, USA*

### **Stable Isotope Ecology of Urban and Rural Lizards in a Desert Landscape**

Urbanization modifies wildlife habitat and often has major impacts on animal ecology and physiology. Changes to feeding ecology and nutritional status resulting from urbanization have been documented, but studying the diet and nutrition of wild reptiles is challenging. Stable isotopes integrate dietary information over long periods of time and have the potential to provide ecologists with information about wildlife health and nutrition as well. We measured the stable isotope ratios of toe clips from 426 wild *Uta stansburiana* at three urban and three rural sites and compared them with stable isotope ratios of plants and ants from those same sites, as well as with data on other physiological indicators of nutritional status on a within-site basis. We found that, although substantial spatial variation in plant, ant, and lizard stable isotope signatures was present, the relative values of stable isotope ratios were more similar among rural sites than among urban sites. We also found support for relationships between  $\delta^{13}\text{C}$  and clutch size in urban areas, and between C:N and body condition, corticosterone reactivity, and immune function at some sites. We suggest that stoichiometric and isotopic ratios can provide important ecological information about the diet and nutritional status of wild reptiles.

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## **0185 Turtle Conservation, Sabine, Saturday 15 July 2017**

Kirsten Dutcher<sup>1</sup>, Amy Vandergast<sup>2</sup>, Ken Nussear<sup>1</sup>, Todd Esque<sup>3</sup>, Anna Mittelberg<sup>2</sup>, Jill Heaton<sup>1</sup>

<sup>1</sup>*University of Nevada, Reno, Reno, Nevada, USA*, <sup>2</sup>*USGS-Western Ecological Research Center, San Diego, California, USA*, <sup>3</sup>*USGS, Henderson, Nevada, USA*

### **A Recent History of Mojave Desert Tortoise (*Gopherus agassizii*) Genetic Connectivity in Relation to Utility-Scale Solar Development**

Large-scale development of utility solar facilities on public lands in the Mojave Desert has recently increased due to initiatives for renewable energy in the United States. This has decreased available habitat for the Mojave desert tortoise (*Gopherus agassizii*), which is a federally threatened species. Although faced with multiple threats to its persistence, major contributors include habitat loss and fragmentation. In 2015 we began studies of tortoises inhabiting six 1-km<sup>2</sup> plots bridging the California-Nevada border. The plots are located in habitat adjacent to solar facilities in designated connectivity corridors, relatively open habitat, and adjoining mountain passes in an effort to determine genetic connectivity in this rapidly changing landscape. Blood samples were collected and genotyped at 21 microsatellite loci. We find no evidence of inbreeding and heterozygosity conformed to Hardy-Weinberg expectations ( $F_{IS} = -0.023 \pm 0.004$ ,  $F_{IT} = 0.012 \pm 0.012$ ) and little genetic differentiation among plots ( $F_{ST} = 0.034 \pm 0.012$ ), which

falls within range-wide estimates ( $F_{ST} = 0.012 - 0.132$ ) for the species. Weak population substructure exists ( $k = 2$ ) with shared alleles from each cluster in all plots, indicating a near panmictic population. Full-pedigree likelihood analysis identified second order relatives distributed among plots. Our results indicate a recent history of genetic connectivity across the landscape and provide a reference point from which to compare current and future measures of connectivity required to understand the maintenance of current genetic population structure for Mojave desert tortoises.

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### **0518 AES Reproduction, Pecos, Sunday 16 July 2017**

Jessica Dutton<sup>1</sup>, Kaitlyn Gioia<sup>2</sup>, Nicholas Fisher<sup>3</sup>, Daniel Madigan<sup>4</sup>

<sup>1</sup>Texas State University, San Marcos, TX, USA, <sup>2</sup>Adelphi University, Garden City, NY, USA, <sup>3</sup>Stony Brook University, Stony Brook, NY, USA, <sup>4</sup>Harvard University, Cambridge, MA, USA

### **Mercury Bioaccumulation and Maternal Transfer in Spiny Dogfish (*Squalus acanthias*)**

Mercury (Hg) is a global pollutant that biomagnifies up marine food webs. The spiny dogfish (*Squalus acanthias*) is a small, commercially valuable shark species with an ovoviviparous reproductive strategy and a gestation period lasting approximately 24 months. Using a Direct Mercury Analyzer, this study 1) determined the concentration of Hg in muscle, liver, brain, heart, blood, and fins, in relation to body length, in 49 female spiny dogfish caught off Long Island, NY, and 2) investigated the maternal transfer of Hg from the female into the eggs, and then the transfer of Hg from the external yolk sacs into the muscle and liver of the developing embryos. The Hg concentration was highest in the heart (0.67 to 3.22  $\mu\text{g/g}$  dry weight), followed by the muscle, brain and blood, and lowest in the liver (0.02 to 0.26  $\mu\text{g/g}$ ) and fins (0.007 to 0.16  $\mu\text{g/g}$ ). There was a positive relationship between body length and Hg concentration in the muscle, liver, heart, brain and blood ( $p < 0.01$ ), and dorsal and caudal fins ( $p < 0.05$ ). Forty-nine females contained 200 eggs and 200 embryos (average = 4.1 eggs and 4.1 embryos per female), all of which accumulated Hg. There was no relationship between Hg concentration in the eggs and egg diameter, whereas Hg concentration in the embryos increased in the liver and decreased in the muscle with an increase in embryo body length ( $p < 0.01$ ). This study showed that maternal transfer should not be overlooked as a source of Hg in sharks.

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### **0353 Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Jessica Dutton<sup>1</sup>, Brian Jackson<sup>2</sup>, Diego Cardeñosa<sup>3</sup>, Andrew Fields<sup>3</sup>, Demian Chapman<sup>4</sup>

<sup>1</sup>Texas State University, San Marcos, TX, USA, <sup>2</sup>Dartmouth College, Hanover, NH, USA, <sup>3</sup>Stony Brook University, Stony Brook, NY, USA, <sup>4</sup>Florida International University, Miami, FL, USA

### **Trace Element Concentrations in Shark Fin Soup and Dried Shark Fins**

Prior studies have estimated that approximately 100 million sharks are killed each year for their meat and fins. Shark fins are used in shark fin soup and dietary supplements. This study investigated the concentration of eight essential trace elements (Co, Cr, Cu, Fe, Mn, Ni, Se, Zn) and five nonessential trace elements (Ag, As, Cd, Hg, Pb) in shark fin soup (n = 18) and dried shark fins (n = 17) purchased from Chinese restaurants and stores in New York and Texas using ICP-MS. Samples were also genetically identified to determine the species. Blue shark (*Prionace glauca*) was the predominant species identified in the soup (n = 7) and the dried fins were mainly scalloped hammerhead (*Sphyrna lewini*; n = 6) or a *Carcharhinus* sp. (n = 10). For the essential elements, Zn, Fe, and Mn was found at highest concentration (38.1, 28.3 and 15.1 µg/g dry weight, respectively) and for the nonessential elements, As was found at highest concentration (0.649 µg/g dry weight). The average concentration of Hg in the fins (0.066 µg/g dry weight) is significantly lower than concentrations reported in shark muscle and well below the FDA 1 µg/g wet weight guideline for human consumption. Fins extracted from the soup were also speciated for methylmercury; there was large intra- and interspecies variability in the data, e.g., between 10 and 100% of the total Hg concentration was methylmercury in blue shark. This study is the first in-depth investigation into the concentrations of trace elements in shark fins.

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### **0028 HL/SSAR/ASIH Symposium - The Science, Management, and Policy of Amphibian Conservation: Extending the Legacy of Ray Semlitsch, Glass Oaks, Saturday 15 July 2017**

Julia E. Earl

*Oklahoma State University, Stillwater, OK, USA*

### **Effects of Global Change on Amphibian Biomass Export from Ponds: a Meta-analysis of Mesocosm Studies**

Information on the role of amphibians in ecosystems is important for informing conservation, understanding what may happen if species decline, and supporting policy decisions. Some of these roles will likely be altered with increased global change, but it is unclear what these effects will be and which types of global change will have the largest impact. One role that pond-breeding amphibians play is transporting nutrients and energy from aquatic to terrestrial ecosystems as recently metamorphosed individuals. Mesocosm experiments have played a key role in helping scientists understand the effects of different types of global change on tadpoles and emerging metamorphs, and these results can be used to estimate effects on amphibian biomass export from ponds to the surrounding terrestrial ecosystem. I used this approach to estimate effect sizes for different types of global change on amphibian biomass export

and then performed a meta-analysis to compare the effects of different types of global change. Preliminary analyses have been completed for the following types of global change: land use change, climate change, contaminants, and emerging pathogens. I found that land use resulting in input of plant material to ponds increased amphibian biomass export. Increased canopy cover, shortened hydroperiods possible with climate change, and low pH all decreased amphibian biomass export, but decreases were most severe with high levels of heavy metal contamination. No effects were found for increased temperatures and emerging pathogens, but sample sizes were low. Future work will focus on adding studies on pesticides and invasive species to this analysis.

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## **0788 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Laura Echeverri-García<sup>1</sup>, Sharon Herzka<sup>1</sup>, Patricia Jiménez-Rosenberg<sup>2</sup>, Paula Pérez-Brunius<sup>1</sup>, Vicente Ferreira-Bartrina<sup>1</sup>, Jesús Cano-Compairé<sup>1</sup>

<sup>1</sup>*Center for Scientific Research and Higher Education of Ensenada (CICESE), Ensenada, Baja California, Mexico,* <sup>2</sup>*Interdisciplinary Center of Marine Sciences (CICIMAR-IPN), La Paz, Mexico*

### **Influence of oceanographic processes in the spatial distribution of fish larvae in the deepwater region of the Gulf of Mexico**

The spatial distribution of ichthyoplankton is related to zones and seasons of spawning and to ocean circulation processes. These factors influence the ichthyoplankton assemblages, in which eggs and larvae from different zones converge. Upwelling filaments, frontal zones, currents and eddies are oceanographic processes that can influence larval transport, affecting the distribution, abundance and mortality of larvae. Few ichthyoplankton studies have been conducted in the deepwater region (depths >1000m) within Mexico's Exclusive Economic Zone (south of 25 °N). We are currently working on the characterization of larval fish assemblages in this region, obtaining information on taxonomic composition and abundances during different times of the year. This study presents data obtained during XIXIMI cruises carried out in November 2010, July 2011 and August-September 2015. Plankton samples were collected with bongo nets by oblique hauls; oceanographic data were obtained from CTD casts and satellite images (chl-a concentration and sea surface height anomalies). The abundance gradients of some families are analyzed. We evaluate the relationship between their distribution and mesoscale oceanographic processes, such as the confluence of coastal currents and upwelling events in the southeastern gulf, and anticyclonic and cyclonic eddies. The results show the occurrence of massive transport of coastal taxa from the continental shelf to the deepwater region, as well as the dominance of larvae of oceanic families in anticyclonic circulation structures and in the oligotrophic central Gulf of Mexico. These analyses highlight the importance of studying larval fish assemblages as indicators of oceanographic processes and transport patterns at regional scales.

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### **0347 Turtle Conservation, Sabine, Saturday 15 July 2017**

Tomo Eguchi<sup>1</sup>, Sam McClatchie<sup>1</sup>, Cara Wilson<sup>2</sup>, Scott Benson<sup>3</sup>, Jeffrey Seminoff<sup>1</sup>, Robin LeRoux<sup>1</sup>

<sup>1</sup>Southwest Fisheries Science Center, La Jolla, CA, USA, <sup>2</sup>Southwest Fisheries Science Center, Monterey, CA, USA, <sup>3</sup>Southwest Fisheries Science Center, Moss Landing, CA, USA

#### **Density, abundance, and distribution of loggerhead turtles off southern California during an extremely warm period**

North Pacific loggerhead turtles (*Caretta caretta*) nest on Japanese beaches and mature adults distribute in the western Pacific. Juveniles, however, disperse throughout the North Pacific, some reaching the west coast of the Baja California peninsula, Mexico, while others remain in the high seas of the central North Pacific. Occasional sightings, strandings, and fishery bycatch have indicated that loggerheads are present along the west coast of the US, where the majority of sightings occur off southern California. El Niño conditions brought warm waters along southern California in late 2014 through 2015 and aggregations of loggerheads were reported. An aerial survey was conducted during fall 2015 to determine density, abundance, and distribution of loggerheads off southern California. Approximately 5,000 km of track lines were surveyed during 11 days and more than 200 loggerheads were sighted. Using line-transect analysis, we estimated approximately 15,000 loggerheads at the sea surface (CV=21%). Accounting for those that were submerged and not available for detection, there were more than 70,000 loggerheads in the area. A similar survey during fall 2011 found no loggerheads. We speculate that the unusual warm waters created favorable conditions for loggerheads. Since 2003, management measures have been in place to reduce loggerhead interactions in the California-based drift gillnet (CADGN) fishery, which close the fishery from June to August when El Niño conditions are expected or present. The observed temporal and spatial distribution of loggerheads did not match with the current CADGN fishery management rules, indicating that the management rule may need to be reconsidered.

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### **0293 AES GRUBER AWARD IV, Wedgewood, Friday 14 July 2017**

Samantha Ehnert, Jim Gelsleichter

*University of North Florida, Jacksonville, FL, USA*

#### **Mercury Accumulation and Effects in the Brain of Atlantic Sharpnose Sharks (*Rhizoprionodon terraenovae*)**

Sharks often bioaccumulate mercury in their muscle to levels that threaten the health of human consumers. However, data is lacking on how mercury in the brain affects shark neurophysiology. Therefore, this study examined if shark brains accumulate significant levels of mercury, if mercury accumulation occurs in certain subcomponents of the brain, and if mercury accumulation is associated with effects on the shark central

nervous system, with special focus on the Atlantic sharpnose shark (*Rhizoprionodon terraenovae*). Sharks were collected throughout the U.S. Southeastern coast, along most of the shark's geographical range. Results indicate that there is an exponential relationship between muscle mercury and the length of the shark and between the muscle and brain mercury levels. However, brain mercury levels were significantly lower than muscle and did not exceed most known thresholds for neurological effects, suggesting limited potential for such responses. The lack of correlations between brain mercury concentrations and biomarker levels of mercury-induced neurological effects (markers of oxidative stress and cell damage) in shark cerebrospinal fluid support this premise. Higher mercury levels were measured in the forebrain of shark in comparison with the midbrain and hindbrain, but these levels were below threshold levels for effects. The percent methylmercury in the brain is lower than previous studies in the shark brain, suggesting mercury demethylation occurs in the shark brain. This extensive study is one of the first to demonstrate the correlation of mercury in the shark brain and muscle, as well as to identify significantly higher mercury levels in the forebrain.

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### **0380 LFC Multi-Stressor Effects, San Marcos, Friday 14 July 2017**

Werner Ekau<sup>1</sup>, Simon Geist<sup>2</sup>

<sup>1</sup>Leibniz Centre for Tropical Marine Research, Bremen, Germany, <sup>2</sup>Texas A&M University, Corpus Christi, Texas, USA

#### **Climate change impacting recruitment in upwelling areas: Can we save the small pelagics' stocks from extinction?**

The northern Benguela ecosystem (nBUS) has been facing increasing temperatures and decreasing dissolved oxygen (DO) levels over the last decades. This had implications for key processes and trophic interactions within the system including shifts in community ranges and trophic levels, changes in energy flows and migration patterns. A feedback into biogeochemical processes can be expected. As confirmed for other upwelling systems, oxygen is a major factor structuring and limiting the "living space" of pelagic organisms. Adaptations to oxygen deficits happen at the community level; species may either cope with lower oxygen levels and migrate into or through the oxygen minimum zone (OMZ) or leave/avoid the area/OMZ. Spatial and temporal distribution patterns of key species of zooplankton and fish larvae and their observed latitudinal shifts imply an overall change of biomass distribution and impact on the vertical (carbon) transport pattern. Changes in depth distribution of key taxa show their differences in hypoxia tolerance, hence different strategies to cope with the OMZ. Shrinkage of the oxygenated surface layer is constraining sensitive species and will lead to further adjustments of daily and/or seasonal vertical migrations. Simulated oxygen consumption rates and experimental data show mass specific rates between 10 and 50 ml O<sub>2</sub> g<sup>-1</sup> d<sup>-1</sup> imposing that elevated zooplankton densities contribute significantly to a further oxygen decline in the OMZ. Focussing on results from the Benguela Current Ecosystem the question is raised whether systems like the nBUS or Humboldt Current have the chance to flip back into "original" conditions under expected climate change forecasts.

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**0546 ASIH STORER ICHTHYOLOGY; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Diego Elias, Fernando Alda, Alexandria Adams, Prosanta Chakrabarty

*Louisiana State University, Baton Rouge, LA, USA*

**Comparative Phylogeography of the Green Swordtail (*Xiphophorus helleri*) and the Common Platy (*Xiphophorus maculatus*) across Middle America**

The genus *Xiphophorus* (subfamily: Poeciliinae) is distributed across Middle America and is comprised of 26 recognized species, that are divided into four groups according to their distribution: the northern swordtails and the northern platyfish which are distributed from Northern Mexico to the northern portion of the Trans-Mexican volcanic belt in Veracruz, Mexico, and the southern swordtails and the southern platyfish which are distributed from the Southern portion of the Trans-Mexican volcanic belt towards Northern Guatemala, Belize and the Caribbean slope of Guatemala and Honduras. The southern swordtails and southern platyfish are the most species rich, representing about 52% of the species diversity of the genus. Notably, both groups are composed of several geographically restricted species, and one single widespread species, *Xiphophorus helleri* (swordtails) and *X. maculatus* (platyfish), which overlap in their distribution. The objective of this work was to evaluate the genetic structure across the range of *X. helleri* and *X. maculatus* and to test if there is congruence among the phylogeographic patterns recovered for both species, using mitochondrial and nuclear markers. Our results shed light on the roles of previous hypothesized barriers (e.g., Isthmus of Tehuantepec) and of past climatic events shaping the genetic structure and demographic history of the widespread Common Platy (*X. maculatus*) and the green swordtail (*X. helleri*) in the geographically complex region of Middle America.

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**0537 ASIH STOYE GENERAL ICHTHYOLOGY I, Trinity, Thursday 13 July 2017**

Diego Elias<sup>1</sup>, Elyse Parker<sup>2</sup>, Caleb McMahan<sup>3</sup>, Christian Barrientos<sup>4</sup>, Kimberly Foster<sup>5</sup>, Kyle Piller<sup>2</sup>

<sup>1</sup>*Louisiana State University, Baton Rouge, LA, USA*, <sup>2</sup>*Southeastern Louisiana University, Hammond, LA, USA*, <sup>3</sup>*The Field Museum of Natural History, Chicago, IL, USA*, <sup>4</sup>*Wildlife Conservation Society, Bata, Equatorial Guinea*, <sup>5</sup>*Western Michigan University, Kalamazoo, MI, USA*

**Multi-locus phylogeny of *Pseudoxiphophorus* (Poeciliidae): Re-evaluation of relationships and geographic distribution**

The subfamily Poeciliinae (Poeciliidae: Cyprinodontiformes) represents one of the dominant groups of freshwater fishes in Middle America, including 276 viviparous species distributed from the southeastern United States to northeastern Argentina and

the Caribbean. Within this subfamily, the genus *Pseudoxiphophorus* is represented by nine species (*P. jonesii*, *P. tuxtlaensis*, *P. bimaculatus*, *P. cataractae*, *P. obliquus*, *P. diremptus*, *P. attenuatus*, *P. litoperas* and *P. anzuetoi*) distributed from northern Mexico to northern Nicaragua. A previous molecular phylogenetic study of the group suggests that the genus *Pseudoxiphophorus* harbors cryptic diversity, particularly in the most widespread species of the genus, *P. bimaculatus*, which is not recovered as monophyletic across its range of distribution. The objective of this study was to re-evaluate the phylogenetic relationships of the genus using a novel molecular dataset including both mitochondrial (one locus) and nuclear (six loci) markers. Our analysis recovered novel relationships among species of the genus and provides evidence to suggest that some species within *Pseudoxiphophorus* possess a more widespread distribution across Middle America than previously hypothesized. This work provides a robust historical framework that will allow an exhaustive examination of diagnostic morphological characters for the independent lineages recovered and will shed light on the evolutionary history of the genus *Pseudoxiphophorus* and the complex history of freshwater fishes of Middle America.

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#### **0191 AES Reproduction, Pecos, Sunday 16 July 2017**

Mariano Elisio<sup>1</sup>, Jorge, H. Colonello<sup>1</sup>, Cynthia, A. Awruch<sup>2</sup>, Gustavo, M. Somoza<sup>3</sup>, Gustavo, J. Macchi<sup>1</sup>

<sup>1</sup>Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP), Mar del Plata, Buenos Aires, Argentina, <sup>2</sup>Centro Nacional Patagónico (CENPAT), Puerto Madryn, Chubut, Argentina, <sup>3</sup>Instituto de Investigaciones Biotecnológicas - Instituto Tecnológico Chascomús (IIB-INTECH), Chascomús, Buenos Aires, Argentina

#### **Inter-annual Changes in the Narrownose Smooth-hound Shark (*Mustelus schmitti*) reproductive timing in Relation to Temperature Patterns in Coastal Waters of the South-western Atlantic Ocean (34-42 °S)**

As chondrichthyans have a relatively low reproductive potential, intensive protection of their reproductive events is critical for its sustainable management. This study assessed the inter-annual changes in reproductive events of a commercially important shark in southern Brazil, Uruguay and Argentina, *Mustelus schmitti*, in relation to environmental variability in two coastal areas of the south-western Atlantic Ocean (*El Rincón* and *Río de La Plata*). Data were collected from 612 sample sites during six spring surveys. The reproductive scenarios were defined by the presence of vitellogenic and ovulated females. Plasma sex steroids levels were assessed in females at similar reproductive stage captured at different temperatures to gather physiological evidences of reproductive thermal influences. Progression of reproduction (increase in proportion of ovulated females) showed significant inter-annual variability associated with bottom temperature conditions. Sites associated with reproductive aggregations (co-occurrence of ovulated and vitellogenic females) were significantly warmer than those where only vitellogenic females were found. Depth and salinity were not related with ovulation. The mean ovulation temperature estimated (temperature encompassing 50% of ovulated



females) was  $17.8 \pm 0.98$  °C. Change in sex steroid levels was consistent with the ovulation temperature. Inter-annual differences of more than one month were predicted in the reproductive timing of *M. schmitti* by using historical bottom temperature variability models together with the estimated ovulation temperature. In sum, this study showed significant inter-annual changes in *M. schmitti* reproductive timing in response to thermal variability. Thus, present results should be considered for management strategies seeking reproductive protection of this species.

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#### **0459 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Mariano Elisio<sup>1</sup>, Yan Zhang<sup>2</sup>, Leandro, A. Miranda<sup>3</sup>, Yoji Yamamoto<sup>2</sup>, Carlos, A. Strüssmann<sup>2</sup>

<sup>1</sup>Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP), Mar del Plata, Buenos Aires, Argentina, <sup>2</sup>Graduate School of Marine Science and Technology, Tokyo University of Marine Science and Technology, Tokyo, Japan, <sup>3</sup>Instituto de Investigaciones Biotecnológicas - Instituto Tecnológico Chascomús (IIB-INTECH), Chascomús, Buenos Aires, Argentina

#### **Potential Application of an *In Vitro* Gonadal Culture Assay to Determine Fish Reproductive Response to Environmental Temperature**

Temperature is a key environmental cue controlling gonadal development and spawning in fish. This control appears to be associated with the influence that this physical variable exerts on gonadal steroidogenesis. This study assessed if profiling of steroid synthesis on *in vitro* gonadal cultures at different temperatures accurately reflects the fish reproductive response to environmental temperature. The pejerrey *Odontesthes bonariensis* was selected as model because of its well characterized *in vivo* reproductive response to temperature changes. Ovarian *in vitro* cultures of three females were performed at 6 different temperatures between 12 and 27 °C, using Leivovitz L-15 medium containing 17-hydroxy-progesterone (100 ng/ml). Testosterone (T), estradiol (E<sub>2</sub>), and relative gene expression of gonadal aromatase (*cyp19a1a*) were measured after 12 hours culture. *Cyp19a1a* relative expression showed an almost linear decrease with temperature increase, while both T and E<sub>2</sub> levels in culture medium showed a Gaussian relationship with temperature. On average, the highest level of E<sub>2</sub> was obtained between 19 and 20 °C, while for T it was between 20.5 and 21.5 °C. The optimal temperature range estimated in this study for production of E<sub>2</sub> (hormone promoting ovarian development) coincided with the optimal temperature previously reported for ovarian maturation in this species (19-20 °C). The optimal temperature estimated for T production, which was approximately 1.5 °C higher than for E<sub>2</sub>, could indicate the best temperature for inducing spawning. In conclusion, this study provides promising evidences for the development of a relatively easy *in vitro* assay to determine fish reproductive response to environmental temperature.

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## 0061 ASIH STOYE ECOLOGY & ETHOLOGY I, Sabine, Thursday 13 July 2017

James Erdmann

*Southeastern Louisiana University, Hammond, Louisiana, USA*

### **This Little Piggy: Why do Amphibians Vibrate Their Feet While Hunting?**

Toe vibrations while foraging have been observed across nearly two-dozen amphibian taxa, in species exhibiting highly disparate ecology, geography, and evolutionary history. To date, no theory satisfactorily explains the general occurrence of these behaviors. I explore the theoretical views and empirical consequences of toe vibrating in amphibians using the Gulf Coast Toad (*Incilius nebulifer*; Girard, 1854) and their dominant diet item, woodlice (Isopoda, Oniscidea) as a study system. Using novel laboratory methods and application of a little-used statistic, I describe the correlates of toe vibrations, both in relation to the feeding and movement patterns between predator and prey. Overall, the presence of toe vibration is associated with increased feeding success in toads, but the conditions involved are inconsistent with current theory on the subject. Toe vibration as a biotremological adaptation remains equivocal pending further experimentation.

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## 0126 Fish Reproduction & Development, San Antonio, Saturday 15 July 2017

Brad Erisman<sup>1</sup>, Martha Romero<sup>1</sup>, Chris Biggs<sup>1</sup>, Erin Reed<sup>1</sup>, Derek Bolser<sup>1</sup>, Ka'ohinani Kawahigashi<sup>1</sup>, Tyler Loughran<sup>1</sup>, Will Heyman<sup>2</sup>

<sup>1</sup>University of Texas at Austin, Austin, TX, USA, <sup>2</sup>LGL Ecological Research Associates Inc., Bryan, TX, USA

### **Snowbirds and Sheepsheads: spatio-temporal interactions between spawning aggregations of *Archosargus probatocephalus* and recreational fishing activities in south Texas**

Sheepshead (*Archosargus probatocephalus*) is a valuable component of inshore recreational fisheries in the U.S. Gulf of Mexico, including Texas, where it ranks as seventh in total annual landings since 2010. However, there is a dearth of detailed information on the reproductive dynamics of Sheepshead and the importance of their spawning aggregations to fisheries production. From January through June of 2016 and 2017, we partnered with recreational fishermen from Port Aransas, TX to investigate temporal patterns of Sheepshead spawning and coincident fishing activities in the region. Visual and microscopic examinations of female gonads indicated that spawning occurred from late February through mid-April. Peak spawning occurred from late March through early April, and individual females were estimated to spawn every 3 to 4 days. Actively spawning females were collected on a daily basis throughout the spawning season, and we found no evidence of a lunar rhythm in spawning activity. The length and age frequency distributions of fish collected from the fishery were highly truncated such that

mean length was 37.8 cm FL and mean age was 4.7 years. The truncated distributions could be due to fishing pressure on spawning adults, since nearly 70% of the Sheepshead landed in Texas each year are caught during the spawning season. However, the collection of large spawning adults from offshore reefs and oil platforms also indicates the possibility of size-assortative mating. Future research will focus on assessments of fishing impacts on Sheepshead spawning and the long term productivity of the Sheepshead fishery in Texas.

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**0291 Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Janelle Espinoza, Jaime Alvarado-Bremer

*Texas A&M University at Galveston, Galveston, TX, USA*

**Population Structure of Gulf Killifish (*Fundulus grandis*) Along the Northern Gulf of Mexico Coast Using Mitochondrial DNA Sequencing**

Gulf killifish are among the most abundant nekton in *Spartina alterniflora* salt marsh habitat along the Gulf of Mexico coast, and are important prey items for shorebirds and many fish species. Their low dispersal potential and high site fidelity within the marsh make them an excellent indicator species for habitat health, and they have been used as such in studies on the impacts of recent oil spills in the Gulf. Despite their ecological importance, Gulf killifish are not considered a model species, and therefore little data exists regarding levels of genetic diversity and population connectivity. This study seeks to characterize genetic differentiation among Northern Gulf of Mexico populations using mitochondrial DNA sequence data. Specimens (n=176) were obtained from locations in Texas, Louisiana, and Mississippi. DNA was extracted, and segments of mitochondrial genes ND2, ND5, and the Control Region were PCR amplified and sequenced. The analysis of a total of 1,088 bp shows strong phylogeographic association with significant differences between locations. Accordingly, the null hypothesis of panmixia was rejected and confirmed with AMOVA ( $p < 0.05$ ). The data also shows the Atlantic sister-species, *Fundulus heteroclitus*, to be more closely related to populations from the Southern Texas coast than to populations from Louisiana and Mississippi, as hypothesized by the vicariant refugia hypothesis associated with the last glacial maxima. Future studies should focus on resolving this relationship by including samples from the Mexico coast and farther east along the U.S. coast.

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**0548 ASIH STOYE GENERAL ICHTHYOLOGY I, Trinity, Thursday 13 July 2017**

Kory Evans, Brian Schubert, James Albert

*University of Louisiana at Lafayette, Lafayette, LA, USA*

## **Developmental bias facilitates trophic diversification in Amazonian electric fishes**

The Neo-Darwinian view of adaptation by natural selection assumes that phenotypic variation is produced randomly with respect to function. However, developmental pathways are often buffered against the effects of mutations such that small changes in the timing of gene expression may generate non-random, functionally viable phenotypes. Phenotypes produced as a result of these developmental biases should exhibit a wide range of adaptability in order to persist at higher frequencies than alternative phenotypes. Here we explore the role of developmental biases in the production of ontogenetic variation and phylogenetic diversity in the neurocrania of Neotropical electric fishes (Gymnotiformes: Teleostei). We examine the role of developmental biases on the evolution of convergent phenotypes and use stable isotope analyses to examine the ecological and functional implications of convergent evolution via developmental biases in seven species of brachycephalic gymnotiform fishes. We find multiple trophic ecologies associated with very similar brachycephalic skull shapes and a diversity of lower jaw morphologies. These findings suggest that the brachycephalic skull is widely adaptable for a variety of trophic functions, due in part to the diverse array of lower jaw structures within which it can be adorned.

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**0650 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Elizabeth Everman, Luke Lockhart, Jacob Marlay, Daniel Bittel, Paul Klawinski

*William Jewell College, Liberty, Missouri, USA*

### **Seasonal and geographic variation in physiological and behavioral thermoregulation in *Hemidactylus turcicus***

The physiological and behavioral thermoregulation of ectothermic organisms is strongly influenced by environmental temperature, and previous research has shown that the ability to tolerate challenging temperatures is a function of both basal tolerance and the capacity for acclimation. The Mediterranean gecko (*Hemidactylus turcicus*) was introduced to Florida in 1910 and underwent subsequent range expansion, reaching Texas by 1950 and extending as far north as Kansas by 2006. *H. turcicus* populations in south Texas experience climate that is most similar to that of their native range, while northern *H. turcicus* populations experience climate with greater seasonal variability and frequency of cold temperatures. This suggests that northern invasive populations are at the edge of their thermal limits. We addressed the influence of climate and seasonal acclimation on physiological thermotolerance and behavioral thermoregulation in geckos collected in January from Galveston, TX and Oklahoma City, OK. Sprint speed of individuals collected from Texas and Oklahoma across horizontal and vertical surfaces at 10 degrees C indicates the critical thermal minimum (previously reported as 10 degrees C) is plastic and that cold tolerance of this species is dependent on seasonal thermal regime. The relatively recent establishment of *H. turcicus* across a variable climatic gradient makes this species ideal for understanding how physiological limits,

behavioral thermoregulation, and phenotypic plasticity contribute to the persistence of species in novel and thermally challenging environments.

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### **0758 Reptile Conservation, Trinity, Sunday 16 July 2017**

Cord Eversole<sup>1</sup>, Scott Henke<sup>1</sup>, Selma Glasscock<sup>2</sup>, Bart Ballard<sup>1</sup>, Randy Powell<sup>1</sup>, David Wester<sup>1</sup>

<sup>1</sup>Texas A&M University- Kingsville, Kingsville, Texas, USA, <sup>2</sup>Welder Wildlife Foundation, Sinton, Texas, USA

#### **A theoretical harvest model for American alligators (*Alligator mississippiensis*) in Texas**

The American alligator (*Alligator mississippiensis*) is a crocodylian species that was once listed as endangered in the United States but is now harvested both recreationally and commercially throughout its range in the southeastern United States. Harvest of alligators typically includes egg collection and hunting. However, the effects of harvest on alligator populations have received little to no scientific scrutiny. A theoretical simulation model was built to evaluate the impact of several harvest strategies on long-term (i.e., 100 years) alligator population trends. System dynamics software was used to develop the model and data for the model was acquired through literature and anecdotal information on alligator ecology. Results of model simulations showed that current harvest (50% egg harvest, 2% subadult harvest, 2% adult harvest) in Texas is sustainable, but alligator populations will stabilize at levels below population potential. The best harvest scenario for a sustainable harvest that maintains alligator populations at a relatively unchanging level is a 38% egg harvest, 2% subadult harvest, and 2% adult harvest. An elevated egg harvest (80%) can be sustained if no hunting harvest occurs. Contrarily, an increased hunting harvest (4% subadult, 4% adult) can be sustained with no egg harvest. This model verifies the function of current alligator harvest within populations and provides a tool for future use in determining the effect of changes in harvest or life history characteristics on alligator population dynamics.

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### **0767 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Cord Eversole<sup>1</sup>, Scott Henke<sup>1</sup>, Randy Powell<sup>1</sup>, Selma Glasscock<sup>2</sup>, Bart Ballard<sup>1</sup>, David Wester<sup>1</sup>

<sup>1</sup>Texas A&M University- Kingsville, Kingsville, Texas, USA, <sup>2</sup>Welder Wildlife Foundation, Sinton, Texas, USA

#### **The influence of nest patch on nest site selection and success of American alligators (*Alligator mississippiensis*)**

Selection of particular nest patches or sites results in nonrandom patterns of nest distribution and is said to be driven by natural selection. These nonrandom patterns

result from selection of habitat characteristics, such as patches in a habitat mosaic or specific microhabitats by nesting females. No studies to our knowledge have attempted to directly quantify or elaborate on this idea for American alligators (*Alligator mississippiensis*). In this study, we evaluated the influence of nest patch on nest site selection and preference of female American alligators in order to demonstrate the role of "nursery" habitat in alligator life history and ecology. We also examined the effect of nest patch and nest site characteristics on alligator nest success. Our data demonstrates that nest site selection of alligators is influenced by nest patch characteristics. It is probable that natural selection has selected for these behaviors associated with nest patch and site selection because they are directly related to increased nest success, due to a primarily lower probability of nest depredation, and an increased probability of hatchling survival. Patch characteristics of nursery habitats such as presence of islands, shallow water, and adequate vegetation coverage are what contributes to increased nest and hatchling survival and therefore selection by nesting female alligators. Conservation and management practices should consider this information when implementing management strategies.

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#### **0801 Fish Genetics, Trinity, Saturday 15 July 2017**

Ron Eytan<sup>1</sup>, Eva Paulus<sup>2</sup>, Max Weber<sup>1</sup>, Tracey Sutton<sup>3</sup>

<sup>1</sup>Texas A&M University at Galveston, Galveston, Texas, USA, <sup>2</sup>Barry University, Miami, Florida, USA, <sup>3</sup>Nova Southeastern University, Dania Beach, USA

#### **Once bitten, twice shy: a cryptic species of Sloane's Viperfish (*Chauliodus sloani*) discovered in the mesopelagic waters of the Gulf of Mexico**

The deep-oceanic Gulf of Mexico (GoM) is one of the highest diversity pelagic ecosystems in the world. While some species of deep-sea fishes appear to be exclusively found in the GoM, a large portion of the deep-sea fish fauna is represented by species found in other basins. However, genetic methods have begun to unravel some of this traditional taxonomy, and have revealed unanticipated diversity and endemism in the deep-pelagic of the GoM. This is in the form of cryptic, undescribed species. One example is *Chauliodus sloani* or Sloane's viperfish, a mesopelagic predatory fish found throughout the earth's deep-pelagic waters. Our genomic surveys of viperfish samples have revealed two deeply divergent viperfish lineages co-existing in the GoM, one apparently endemic to the GoM. These fishes live in sympatry, with no obvious ecological or morphological differences separating them. Nonetheless, they have not interbred for millions of years and species delimitation methods have identified them as two independently evolving lineages. Here we use comparative genomics to understand divergence, gene flow, and the historical demography of these two species, with the ultimate goal of elucidating speciation mechanisms.

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#### **0897 LFC Contributed III, San Marcos, Saturday 15 July 2017**

Marianne Falardeau<sup>1</sup>, Caroline Bouchard<sup>2</sup>, Dominique Robert<sup>3</sup>, Louis Fortier<sup>4</sup>

<sup>1</sup>McGill University, Montréal, QC, Canada, <sup>2</sup>Greenland Institute of Natural Resources, Nuuk, Greenland, <sup>3</sup>Université du Québec à Rimouski, Rimouski, QC, Canada,

<sup>4</sup>Université Laval, Québec, QC, Canada

## **Invasion of the Canadian Arctic Archipelago by Pacific Sand Lance Detected by an Ichthyoplankton Survey**

Northward invasions into rapidly warming Arctic marine ecosystems by southern species are occurring at a higher rate than the global average. In the Barents Sea, fish communities, once dominated by species endemic to the Arctic, are undergoing a "borealization" process as subarctic species rapidly expand their distribution northward, outcompeting Arctic fish assemblages. The same trend is observed in the Chukchi and Beaufort Seas, where North Pacific demersal and pelagic species are increasingly reported north of the Bering Strait, including commercially-important gadids and salmonids. Niche-based models run under climate change scenarios predict a drastic shift in the range of several Pacific species, which will eventually lead to an Atlantic-Pacific interchange. Among these range shifts, an expansion of Pacific sand lance (*Ammodytes hexapterus*) into the Northwest Passage and the Northwest Atlantic Ocean is projected by 2100. Relying on an annual ichthyoplankton survey in the Western Canadian Arctic, we report the occurrence and reproduction of Pacific sand lance for the first time in the Canadian Arctic Archipelago, a region far outside the species traditional range south of the Bering Strait. We observed an increasing density of larval Pacific sand lance with time over the 2011-2016 period, suggesting that environmental conditions are becoming increasingly favorable for the species to reproduce in the Central Canadian Arctic. Invasion of Arctic coastal ecosystems by sand lance could be facilitated by flexible habitat requirements, fast larval growth and the capacity of burying themselves into sediments to survive through harsh winter conditions.

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## **0698 Lizard Conservation, Sabine, Saturday 15 July 2017**

Bryan Falk<sup>1</sup>, Emma Hanslowe<sup>1</sup>, Amy Yackel Adams<sup>2</sup>, Robert Reed<sup>2</sup>

<sup>1</sup>U.S. Geological Survey, Homestead, FL, USA, <sup>2</sup>U.S. Geological Survey, Fort Collins, CO, USA

## **Working Towards Improved Management of Invasive Black and White Tegus (*Salvator merianae*)**

Land managers need control and monitoring tools for populations of invasive species, but many of these tools are species-specific and undeveloped for newly established populations. Researchers developing these tools may have to build them in several steps over multiple years, and here we describe one year's progress in developing control and monitoring tools for invasive black and white tegus (*Salvator merianae*) in South Florida. Despite intensive trapping efforts by several agencies and private individuals over the last few years, the tegu population continues to expand, and it is unclear what control

methods and intensities are necessary for containment. In 2016 we conducted several experiments with the ultimate goal of facilitating containment of the tegu population, including: 1) a trap trial for juvenile lizards; 2) a bait trial; and 3) a radio-transmitter-attachment trial for growing, juvenile lizards. We discuss how these results will inform future research and control efforts and illustrate the effectiveness of a multi-year strategy in invasive-species research.

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**0562 ASIH STORER HERPETOLOGY; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Patricia Faulkner, David Hala, Lene Petersen

*Texas A&M University at Galveston, Galveston, Texas, USA*

**Physiological Effects of Salt Stress on Juvenile American Alligators (*Alligator mississippiensis*)**

Gulf of Mexico coastal habitats constitute vulnerable ecosystems susceptible to the impacts of storm surges which can cause saltwater intrusions into freshwater habitats. These intrusions can be both persistent (~1 year) and severe (~24 ‰) and have significant negative effects on freshwater organisms. The Gulf of Mexico region is habitat for American alligators (*Alligator mississippiensis*) which have a low tolerance to saline environments as they are unable to excrete high sodium (Na<sup>+</sup>) concentrations. Indeed, studies have shown high salinity to cause hyperosmotic stress (electrolyte imbalance) and mortalities of juvenile alligators. Changes in electrolyte balance stimulate the Renin-Angiotensin-Aldosterone System (RAAS) which is an endocrine system responsible for regulating blood pressure and cardiac function. Adverse effects of salt stress in juvenile alligators include high aldosterone and stress hormone levels (corticosterone, catecholamines). It is, however, unknown if saline environments affect cardiac function in alligators via RAAS stimulation. This project aims to determine the physiological effects of salinity stress on juvenile alligators. To this end, juvenile alligators were exposed to either 0 or 12 ‰ salinity for five weeks. Chronic effects of brackish water on cardiac physiology will be determined by assessing plasma electrolyte levels (Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup>), gene expression of cardiac RAAS hormone receptors (angiotensin II type 1, mineralocorticoid, glucocorticoid), plasma hormone levels (angiotensin II, aldosterone, and corticosterone), and in vivo cardiac performance using electrocardiography (ECG). This study will increase our understanding of alligator physiological responses to salt stress, and inform decision-makers regarding management of wild alligators.

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**0580 Fish Reproduction & Development, San Antonio, Saturday 15 July 2017**

Richard Feeney<sup>1</sup>, Milton Love<sup>2</sup>, Taylor Sakmar<sup>3</sup>, William Steinriede<sup>4</sup>, Kaia Joye Moyer<sup>3</sup>



<sup>1</sup>Natural History Museum of Los Angeles County, Los Angeles, CA, USA, <sup>2</sup>Marine Science Institute, University of California, Santa Barbara, CA, USA, <sup>3</sup>Catalina Island Marine Institute, Avalon, CA, USA, <sup>4</sup>Catalina Island Camps, Howlands Landing, CA, USA

### **Unusual occurrence of King-of-the-Salmon (*Trachipterus altivelis*) juveniles near Santa Catalina Island, California, during the winter of 2013**

Dozens of fragile King-of-the-Salmon juveniles appeared nearshore at Santa Catalina Island and were observed and photographed in situ at three separate localities during the winter and spring of 2013. Usually this species is confined to the mesopelagic zones off the coast. The oceanographic conditions of the Southern California Bight were not unusual except for strong winter upwelling. A northwestern gale came through a week before the first observed fish. Numerous other pelagic organisms such as ctenophores, pelagic mollusks, siphonophores, and a manefish, were also observed. The young King-of-the-Salmon juveniles (50-150 mm) display fantastic elongations of the dorsal, caudal and pectoral fin rays not seen in preserved specimens. The function of these elongations, and curious color changes, is not known. The elongations are mostly gone by 300 mm and in larger juveniles (500-600 mm) completely lost. Like many lampriforms they undulate their dorsal fin to move and position themselves, sometimes with a vertical posture with the pectoral and dorsal fins extended out. Mitochondrial DNA from a few specimens submitted to BOLD show high similarity to adult *Trachipterus altivelis* and *T. trachipterus*, supporting growing evidence that these two ribbonfish species are synonyms.

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### **0444 SSAR SEIBERT PHYSIOLOGY & MORPHOLOGY, Brazos, Friday 14 July 2017**

Logan Fehrenbach, Christopher R. Tracy

California State University - Fullerton, Fullerton, CA, USA

### **Physiological differences of two closely related skink species, *Plestiodon skiltonianus* and *Plestiodon gilberti*, that differ in habitat aridity**

*Plestiodon skiltonianus* and *Plestiodon gilberti* are two closely related skink species located in Western North and South America. *P. gilberti* is thought to have evolved a larger body size from *P. skiltonianus* to deal with heat flux across the skin as it moved into warmer and more water restricting habitats. *P. skiltonianus* is usually found in cooler and higher elevation habitats while *P. gilberti* can be found in warmer and lower elevation habitats. Both species can be found in areas of sympatry, however these areas are patchy and intermixed between areas of allopatry. This experiment was done to test inter/intraspecific physiological differences in sympatric and allopatric populations of both species. It was hypothesized that there would be significant physiological differences between all populations tested. To test physiological differences, burst sprint speed, critical maximum and minimum temperatures, and preferred temperature was taken. Respirometry analysis including oxygen consumption rates, carbon dioxide

production rates, and evaporative water loss rates were taken at a range of temperatures both species experience in the field. Preliminary results show interspecific differences in optimal temperature, preferred temperature, and critical maximum and minimum temperatures. These results suggest that *P. gilberti* moving into a more xeric habitat resulted in a physiological shift along with the change in body size. Also, each species retains a physiological plasticity when compared between sympatric and allopatric populations of the same species.

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### **0902 Herp Biogeography & Phylogeography I, Brazos, Sunday 16 July 2017**

Martin Femenías<sup>1</sup>, Luciano J. Avila<sup>2</sup>, Jack W. Sites, Jr.<sup>3</sup>, Mariana Morando<sup>2</sup>

<sup>1</sup>*Univ. Nacional Patagonico, Trelew, Chubut, Argentina*, <sup>2</sup>*Centro Nacional Patagonico, Puerto Madryn, Chubut, Argentina*, <sup>3</sup>*Brigham Young University, Provo, Utah, USA*

#### **The Leiosaurae “matuastos” lizard clade endemic to southern South America: phylogeography, species limits, biogeographic history and new candidate species**

The Leiosaurae is one of the most enigmatic lizard clades from the Southern Cone of South America. The species of this clade are poorly represented in herpetological collections and almost nothing is known of their natural history. These limitations make this clade one of the least known of the herpetofauna of South America. Although a recent molecular phylogeny with most of the 18 described species has been published, no within-species studies have been completed, and here we present a phylogeographic study of the four species of the genus *Diplolaemus*, as well as *Leiosaurus bellii* in a paleogeographic context. We implemented a species delimitation study on this clade, using a multilocus coalescent approach, and a sample of 342 individuals from 235 localities, the most extensive to date for this clade. We present molecular diversity indexes and infer historical demographic patterns based on the *cyt-b* gene, and we update the phylogeny of the group based on two mitochondrial and eight nuclear genes. We generate hypotheses for the historical biogeography and evolutionary history of this clade.

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### **0351 ASIH STORER ICHTHYOLOGY; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Steven Ferguson<sup>1</sup>, Shannon Smith<sup>2</sup>, Ronald Lowe<sup>1</sup>, Robert Colombo<sup>2</sup>, Devon Keeney<sup>1</sup>

<sup>1</sup>*Le Moyne College, Syracuse, NY, USA*, <sup>2</sup>*Eastern Illinois University, Charleston, IL, USA*

#### **Impact of Low-Head Dams on the Genetic Structure of Fish Populations in Two Illinois Rivers**

Low-head dams are prevalent throughout the United States and can influence the genetic structure of riverine fish populations in multiple ways. We used microsatellites to assess how two low-head dams affect genetic diversity and differentiation in longear sunfish (*Lepomis megalotis*), bluntnose minnow (*Pimephales notatus*), black redhorse (*Moxostoma duquesnei*), and golden redhorse (*Moxostoma erythrurum*) in two Illinois rivers. We also examined if hybridization is occurring between the two redhorse species throughout the study area. Initial results suggest the dams are not reducing genetic diversity along rivers, but are influencing genetic differentiation in at least one species, bluntnose minnow. Genetic differentiation is potentially the result of poor quality habitat created by a dam serving as a deterrent to fish movement. Hybridization is not common between the redhorse species analyzed in our study region. Our data reveal that even small dams can impact the genetic structure of fish populations and that the influence of dams depends on the focal species, river system, and the individual dam itself.

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### **0081 Lightning Talks I, Glass Oaks, Friday 14 July 2017**

Miranda Figueras<sup>1</sup>, Brian Bastarache<sup>2</sup>, Russell Burke<sup>1</sup>

<sup>1</sup>Hofstra University, Hempstead, New York, USA, <sup>2</sup>Bristol County Agricultural High School, Dighton, Massachusetts, USA

### **Water exchange relationships and overwintering behavior in hatchling turtles**

Neonate ectotherms face a wide range of environmental hazards because of the diverse habitats they inhabit and their small sizes. This is especially true amongst high latitude turtles which experience cold winter conditions after hatching; such hatchlings must balance challenges involving desiccation, freezing, and predation, among other threats. Four behavioral patterns are known; turtle hatchlings either overwinter in water (OIW), terrestrially overwinter shallowly in the nest and likely freeze (TIN), terrestrially overwinter deep in the nest and perhaps avoid freezing (TBN), or terrestrially overwinter outside the nest entirely and likely freeze (TON). Previous investigations found that TIN and TBN species were generally able to supercool and resist freezing at lower temperatures, as well as being better at resisting desiccation. We measured desiccation tolerance of three additional turtle species, two that use the TON strategy (Diamondback Terrapins, *Malaclemys terrapin*, and Common Box Turtles, *Terrapene carolina*) and Wood Turtles (*Glyptemys insculpta*), which are probably OIW strategists. As predicted, hatchlings of the two TON species had high desiccation resistance. In fact, Diamondback Terrapins had extraordinarily high desiccation resistance, which may be due not only to their habit of overwintering on land, but also their exposure to saline environments. As predicted, the OIW strategist had the lowest desiccation tolerance. We therefore found additional support for the hypothesis that desiccation tolerance is associated with overwintering strategies in hatchling turtles.

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## **0088 SSAR SEIBERT ECOLOGY II, Glass Oaks, Thursday 13 July 2017**

Miranda Figueras<sup>1</sup>, Kent Hatch<sup>2</sup>, Timothy Green<sup>3</sup>, Russell Burke<sup>1</sup>

<sup>1</sup>*Hofstra University, New York, USA*, <sup>2</sup>*LIU Post, New York, USA*, <sup>3</sup>*Brookhaven National Laboratory, New York, USA*

### **Consumption and Assimilation Patterns of the Eastern Box Turtle, Diet Generalists**

Eastern Box Turtles (*Terrapene carolina*, EBT) are generalist omnivores and important seed and fungal spore dispersers throughout the eastern United States. Studies have shown that EBT feed opportunistically on seasonally available fruit, plants, invertebrates, and occasionally carrion. We radio-located EBT in the Pine Barrens of Long Island, New York and collected fecal and blood samples. We identified prey items to the highest possible taxonomic level, and quantified seeds in the fecal samples. Plasma was analyzed for C and N isotopes ratios ( $\delta$  C and  $\delta$  N). We found highly seasonal patterns in fruit seed abundances in fecal samples correlating with availability. Vaccinium fruit were in 50% (June), 50% (July), and 20% (August) of samples, showing consumption of Vaccinium before they ripened and after they fell to the ground. Unidentifiable plant material was in 90-100% of samples in all periods. Coleopterans were in 70% (June), 85% (July), 80% (August), and 80% (October) of samples. Snails were in 10% of samples from June, August, and October, and 28% of July samples. Mushrooms were in 10% of June samples, 45% (July), 10% (August), and none in October. Surprisingly, stable isotope analysis indicated no significant differences in the  $\delta$  C and  $\delta$  N from EBT plasma sampled throughout their active season despite seasonal consumption patterns. Low plant digestibility reducing nutrient assimilation, diet items with similar  $\delta$  C and  $\delta$  N contributions, and a short study period may have affected EBT nutrient assimilation patterns.

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## **0091 Fish Biogeography & Morphology, Trinity, Saturday 15 July 2017**

Daniel E. Figueroa<sup>1</sup>, Mauro Belleggia<sup>2</sup>, Santiago Barbini<sup>1</sup>, David Sabadín<sup>1</sup>, Lorena Scenna<sup>1</sup>, Melisa Chierichetti<sup>1</sup>, Martin Roman<sup>1</sup>

<sup>1</sup>*Grupo de Ictiología, IIMyC-CONICET. UNMdP, Mar del Plata, Argentina*, <sup>2</sup>*Instituto Nacional de Investigación y Desarrollo Pesquero, Mar del Plata, Argentina*

### **The Young Argentine Sea, Its Ichthyofaunistic Colonization and Its Traumatic Evolution**

At the beginning of the Mesozoic Era (140Ma), the Argentine Sea did not exist, the Gondwana was probably a set of united plates with shallow water. In the middle of that Era (112Ma) the plates separate with each other allowing shallow marine intrusions, where an endemic fish fauna develops, as some coelacanths. At the end of the Mesozoic Era, in the Cretaceous period (66 Ma), the south Protoatlantic joins with the North Atlantic (Tethys Sea in part), and allows the fish fauna of Tethyan origin to colonize the south, reaching Antarctica. The opening of the Drake Passage in the Oligocene period

(33 Ma), in the Cenozoic Era, enables the cold waters of the Pacific Ocean to penetrate in the south Atlantic, causing drastic effects on the thermophilic fauna. Successive glaciations in the Quaternary Period (2 Ma-10,000A), allowed the polar front to advance several times to lower latitudes, leaving the Argentine Sea within it. This traumatic development in the constitution of the southwest Atlantic is reflected in the heterogeneous composition of the Argentine marine ichthyofauna, with cosmopolitan, Tethyan, Pacific, Antarctic, Gondwanic and own lineages.

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#### **0499 Herp Physiology, Brazos, Saturday 15 July 2017**

Michael Finkler, Jessica Filer

*Indiana University Kokomo, Kokomo, Indiana, USA*

#### **Physiological Consequences of Delayed Nest Emergence for Hatchling Snapping Turtles (*Chelydra serpentina*)**

Snapping Turtle (*Chelydra serpentina*) hatchlings typically emerge from their nests soon after hatching and overwinter in aquatic habitats. Overwintering in nests is rare, even in areas where freezing risks are low. Herein we explored how remaining an additional three weeks (Day 7 to Day 28 post-hatching) in a simulated nest environment influences body size, metabolic rate, and blood plasma chemistry (osmolality and urea concentration) compared to animals held in water for the same time interval. Both live mass and carapace lengths of hatchlings held in water increased during from Day 7 to Day 28 post-hatching, whereas neither measure changed in hatchlings held in moist sand. Metabolic rates of hatchlings held in water were lower than those of hatchlings held in sand. Plasma osmolality tended to increase in Day 28 hatchlings held in sand, and decrease in Day 28 hatchlings held in water, compared to Day 7 hatchlings. Plasma urea concentrations were higher in Day 28 hatchlings held in sand than in Day 7 hatchlings, but Day 28 hatchlings held in water had similar urea concentrations to those of Day 7 hatchlings. As mass did not change over 21 days in hatchlings held in sand, elevated concentrations of total plasma solutes may represent a response by the hatching to maintain fluid volume and blood pressure. Nevertheless, sustained continuous elevation of urea and other potential toxic substances in the blood, coupled with increased energetic expenditure may, in part, account for why Snapping Turtle hatchlings rarely overwinter in the nest.

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#### **0853 AES GRUBER AWARD III, Wedgewood, Friday 14 July 2017**

Cristín Keelin Fitzpatrick<sup>1</sup>, Kimberly Finnegan<sup>1</sup>, Andrea Bernard<sup>1</sup>, Filip Osaer<sup>2</sup>, Krupskaya Narváez<sup>2</sup>, Mahmood Shivji<sup>1</sup>

<sup>1</sup>*Save Our Seas Shark Research Center and Guy Harvey Research Institute, Nova Southeastern University, Dania Beach, FL, USA*, <sup>2</sup>*ElasmoCan, Asociación Canaria para*

*la Investigación y Conservación de los Elasmobranchios, Las Palmas, Gran Canaria, Spain*

### **Almost Angels? The Critically Endangered Angelshark (*Squatina squatina*) in its Last Refuge, the Canary Islands**

Once so abundant as to be called the 'common' angelshark, *Squatina squatina* has been extirpated from nearly the entirety of its historical range, from the eastern North Atlantic, to the Mediterranean (IUCN Red List Critically Endangered). The angelshark now seems to occur in any abundance only in the waters surrounding the Canary Islands. We present the first genetic assessment of the angelshark's population dynamics and diversity. Tissue samples were collected between 2007-2016 from three islands within the archipelago: Gran Canaria, Tenerife, and Lanzarote. To investigate the genetic population dynamics, a three part approach was adopted: (i) DNA sequencing four mitochondrial regions commonly used in vertebrate population analysis [control region, COI, ND4, and ND2] of 300 angelsharks, (ii) Whole mitochondrial genome sequencing of nine individuals to identify and examine the comparative sequence variability in other gene regions, and (iii) assessment of nuclear diversity with 40 species-specific microsatellites. Results reveal exceptionally low genetic diversity across all individual mitochondrial regions sequenced, with single haplotypes in each region found across nearly all individuals. Mitogenome analysis follows this trend with only 11 single nucleotide polymorphisms seen across all Canary Island individuals in a genome of 16,689 bp. Furthermore, screening of 40 microsatellite markers across 32 individuals has shown all but two loci to be monomorphic. Such low levels of genetic diversity may have implications for the evolutionary persistence of this species and ultimately underscore the angelsharks' highly vulnerable state.

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### **0346 ASIH STORER ICHTHYOLOGY; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Adania Flemming, Lawrence Page

*University of Florida, Florida Museum of Natural History, Gainesville, Florida, USA*

### **North versus South; a comparative life history study of the Swamp Darter, *Etheostoma fusiforme***

Do we expect the life histories of subspecies of fishes to differ from one another? The Swamp Darter, *Etheostoma fusiforme*, has had a complex taxonomic history, with two subspecies, based on morphological data, now recognized. The life history for the Swamp Darter is well documented for the northern subspecies, but little information exists for the southern subspecies despite the opportunity for differentiation. An ecological study of the southern population is essential for a comprehensive understanding of this taxonomically complex species. Over a period of 18 months, at Hatchet Creek in the Suwanee River drainage of Florida, an ecological and behavioral study of the Swamp Darter has revealed differences between the northern and southern populations in several life history characteristics. Our findings confirm that in the

southern population, the Swamp Darter can live for at least fifteen months, spawns from February to April, and consumes a variety of invertebrates not found in the diet of the northern population. By better characterizing the differences in life history between the northern and southern populations of *E. fusiforme*, we can better inform policy makers about strategies to protect or otherwise manage this species and the aquatic ecosystems it inhabits. Looking at why or when differences in life histories of subspecies arose may also help in our understanding of evolutionary processes.

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## **0552 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Cesar Flores-Coto, Faustino Zavala-Garcia

*Instituto de Ciencias del Mar y Limnologia, Cd. de Mexico, Mexico*

### **Fish larvae distribution in Campeche Bay, Mexico**

Composition and abundance of larval fishes in Campeche Bay was studied during two seasons, winter, 2013 (25 stations) and summer, 2014 (31 stations). Sampling was carried out with open-close nets, mouth 75 cm and 505  $\mu$ m mesh. The data of salinity and temperature although with small differences allowed distinguish three oceanic regions, that by its geographical position were call North (warm), East (middle) and West (cold). There were 237 taxa, belonging to 78 families, 171 species, 154 taxa occurred in winter and 171 in summer. The general composition in both seasons consisted by more than 65% for species whose adults are oceanic, many of which are considered meso and bathy-pelagic or demersal, the rest were species from neritic parent. The most abundant species in both seasons were oceanic: *Diogenichthys atlanticus*, *Notolichnus valdiviae*, *Bentosema suborbitale*, *Bregmaceros atlanticum*, *B. cantori*, *Gonostoma atlanticum*, *Sternoptyx diaphana* and the genus *Diaphus* y *Cyclothone*. The hydrodynamics of the Bay of Campeche fits well with the results, thus, the West region located where a cyclonic gyre takes place, is the region with lower temperatures and salinities by the upwelling, while the North region which was the higher temperature and salinity is formed in the area of influence of the most northern part of warm currents flowing over the Yucatan shelf. The distribution of oceanic taxa is not limited by the temperature and salinity differences of the three recognized regions, and those larvae of neritic origin have a distribution generated by the warm current of the Yucatan platform.

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## **0725 SSAR VICTOR HUTCHISON STUDENT POSTER AWARD: ECOLOGY, NATURAL HISTORY, DISTRIBUTION, & BEHAVIOR; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Brian Folt

*Auburn University, Auburn, Alabama, USA*

## **Knives for a Pro? Prepollical Spines of the Glassfrog *Teratohyla spinosa* as a Sexually Dimorphic Weapon**

Sexually dimorphic weapons are morphological traits used in combat between rival males for resources. In Neotropical forests, glassfrogs (Centrolenidae) occur along stream habitats, where males defend and advertise from territories which provide access to females and oviposition sites. While all centrolenid species possess an ossified prepollex, the prepollex is exposed to form a spine at the base of the thumb for one species, *Teratohyla spinosa*. This exposed prepollical spine has been suggested to play a role in male combat, but natural history of *T. spinosa* is undescribed. Here, I used mark-recapture methods and focal observations of *T. spinosa* from three populations at La Selva, Costa Rica, to better understand the species' life history and the function of prepollical spines. Mark-recapture models for two populations of males described similar apparent survival ( $0.43 \pm 0.12$  SE;  $0.42 \pm 0.09$ ) but varying population size (29 individuals, 27-37 CI; 49, 45-57). I observed male combat behavior where one male used a prepollical spine to jab his opponent; this male "won" the dispute and resumed advertising for females, while the loser vacated the site. Males exhibited scarring in populations, potentially as a consequence of male combat with spines; the proportion of scarred individuals increased with population density. These observations suggest that exposed prepollical spines of male *T. spinosa* are consistent with criteria for sexually dimorphic weaponry. Spine use in combat may influence fitness by inflicting wounds and reducing access to females, and male-male interactions appear to be density dependent.

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**0712 SSAR SEIBERT ECOLOGY I, Glass Oaks, Thursday 13 July 2017**

Brian Folt, Craig Guyer

*Auburn University, Auburn, Alabama, USA*

### **Effects of Invertebrate Predators on Vertebrate Prey are Strong but Inconsistent with the Mainland-island Model of Anole Population Regulation**

For the species-rich radiation of anoles, literature has supported a dichotomy between population regulation in Caribbean islands and Central-South America ecosystems, where island populations are regulated by competition for resources and mainland populations are regulated by predation. A recent experiment on island anoles supported predictions of the mainland-island model, but comparable tests are needed to reconcile the role of predation in mainland populations. Here, I used multi-species occupancy models to test the mainland-island model with a frog and anole assemblage in Costa Rica that is depredated by spiders (Ctenidae). I modeled the relative contribution of food, microhabitat, and predators toward frog (*Craugastor bransfordii*, *Oophaga pumilio*) and anole (*Norops humilis*) occupancy and detection to test the predictions that (1) occupancy is more strongly influenced by predators than resources (food, leaf-litter), and (2) detection decreases when predators are present. Frog occupancy was most strongly influenced by predators and secondarily by leaf litter; predator effects on frogs



increased as litter decreased. Anole occupancy was also influenced by leaf litter, but not by predators. Detection probability of all species was elevated when predators were present. Results described strong effects of predators on a prey vertebrate assemblage in a Central American forest. However, patterns of anole occupancy and detection were inconsistent with predictions of the mainland-island model, and oppose literature invoking predation as the dominant force shaping ecology and evolution of mainland anoles. A novel interaction between leaf litter and predation pressure of frogs has significant implications for models of patch dynamics and amphibian declines.

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## **0228 NIA BEST STUDENT PAPER, Brazos, Friday 14 July 2017**

João Pedro Fontenelle<sup>1</sup>, Fernando Marques<sup>2</sup>, Matthew Kolmann<sup>3</sup>, Nathan Lovejoy<sup>1</sup>

<sup>1</sup>University of Toronto Scarborough, Toronto, ON, Canada, <sup>2</sup>Universidade de São Paulo, São Paulo, SP, Brazil, <sup>3</sup>University of Washington, Friday Harbor, WA, USA

### **Molecular Phylogeny of the Neotropical Freshwater Stingrays (Chondrichthyes: Myliobatiformes: Potamotrygonidae), with Biogeographical Inferences**

Neotropical freshwater stingrays of the family Potamotrygonidae, which includes ~40 described species in 4 genera within Potamotrygoninae, form a very diverse and geographically widespread group, found in almost every major river basin in South America. This freshwater clade is sister to the marine Styracurinae, composed of two amphi-American species of *Styracura* – *S. pacifica* and *S. schmardae*. Diversity and biogeography of freshwater stingrays are still poorly understood and we address both population- and species-level relationships among potamotrygonid lineages using four molecular markers, both nuclear and mitochondrial, for over 350 terminal taxa. Our dataset includes almost all presently described species of this family and an unprecedented biogeographical representation. We time-calibrated our tree using well-documented vicariant events and fossil priors, informed by literature documenting the paleogeography of South America. The phylogeography of each genus and species were evaluated, to test whether observed patterns are congruent with other Neotropical freshwater fishes. The phylogeny corroborates the monophyly of the family and its two subfamilies. Within Potamotrygoninae, we provide molecular evidence for the paraphyletic status of *Potamotrygon*, which includes members of *Plesiotrygon*. This clade is sister to *Heliotrygon*+*Paratrygon*. Time estimates and paleogeographical events suggest the evolution of potamotrygonids is intimately correlated with geological processes of the continent, marine intrusions, river captures and changes in river drainage patterns. Finally, we discuss rates of diversification within freshwater lineages and possible events of hybridization and introgression, a phenomenon rarely observed in elasmobranchs, which might explain the lack of reciprocal monophyly for many nominal species of *Potamotrygon*.

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## 0570 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017

Clifford Fontenot, Jr<sup>1</sup>, John Pojman<sup>2</sup>

<sup>1</sup>*Southeastern Louisiana University, Hammond, LA, USA*, <sup>2</sup>*Louisiana State University, Baton Rouge, LA, USA*

### **Self and Conspecific Dermatophagy in the Aquatic Salamander *Amphiuma tridactylum***

Dermatophagy, the practice of eating shed skin, in amphibians and reptiles has been reported anecdotally in the literature, but the process and purpose remains poorly understood. We document a fortuitous observation of whole-skin shedding and conspecific dermatophagy in *Amphiuma tridactylum* (Three-toed Amphiuma), and report on 2 additional observations of self-dermatophagy. Shed skins are potential protein and nutrient sources, and we suggest that dermatophagy may be a much more common occurrence than originally thought.

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## 0690 Fish Biogeography & Morphology, Trinity, Saturday 15 July 2017

Kassandra Ford, James Albert

*University of Louisiana at Lafayette, Lafayette, LA, USA*

### **The long and short of it: Patterns of snout differentiation in four species of mormyrid electric fishes (Osteoglossiformes: Mormyridae)**

In the weakly electric group of fishes, Mormyridae, there is diversity in the head shape and snout length among the c. 221 species; however, the evolutionary and allometric patterns within this diversity are largely unstudied. Some species have elongate tubular snouts with a small terminal mouth used for benthic feeding, while others use brachycephalic snouts to feed throughout the pelagic zone. Previous work examined processes leading to snout differentiation in South American electric fishes (Gymnotiformes), but studies have yet to investigate head shape diversity in Mormyridae. This research analyzed patterns in snout elongation and head shape diversity in four mormyrid species using two-dimensional geometric morphometrics. Species included in this study have varying snout lengths, and include *Brienomyrus brachyistius* (n=30), *Marcusenius mento* (n=30), *Mormyrops anguilloides* (n=14), and *Mormyrus rume* (n=10). Homologous landmarks and intervallic semi-landmarks were placed to capture the head shape, angle of snout depression, and snout length of the specimens. Through the Geomorph program, Principal Component Analyses of statistically significant variables were generated to perform multivariate regressions between the three measurements of head shape diversity. Further, evolutionary allometry was analyzed to determine the covariation between shape and allometric patterns of growth among these species. These results showed significant covariation between head shape, snout length, and angle of snout depression among the adult males of the four mormyrid species. This preliminary study provides further opportunities to evaluate the underlying diversity of head shape among additional mormyrid species

and examine the covariation between snout elongation and ontogenetic patterns of diversification.

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**0886 AES Conservation & Management II, Pecos, Saturday 15 July 2017**

Sonja Fordham

*Shark Advocates International, Washington, DC, USA*

**Wait, what? That's legal? An examination of under-appreciated inadequacies and imbalances in elasmobranch conservation policy**

Recent decades have brought great advances in shark and ray conservation around the world. Myriad U.S. domestic actions, listings under the Convention on International Trade in Endangered Species (CITES) and the Convention on Migratory Species (CMS), and Regional Fishery Management Organizations' (RFMOs) retention bans have been well-publicized. Nevertheless, significant gaps remain and often go unnoticed. For example, thirty giant devil rays were landed legally in Turkey this year despite protections agreed under CMS, CITES, the Barcelona Convention, and the Mediterranean RFMO. Implementation of CITES controls for commercially valuable elasmobranchs is highlighting countries' latitude for determining sustainability. Many CMS parties have yet to strictly protect Appendix I-listed sawfishes and mobulids as pledged. Greenland sharks' exceptional vulnerability has gained much attention, but commonly recommended protections are not feasible. There are still no international limits for the most valuable and vulnerable shark species taken in tuna fisheries (makos). In the US, retention of ~20 Atlantic shark species is prohibited, yet less fecund cownose rays are almost completely unregulated. While Congress debates a national shark fin ban, smoothhounds remains exempt from best practice finning bans and the legal "winging" of skates is commonplace. Fourteen years after smalltooth sawfish were listed under the Endangered Species Act, no areas have yet been closed to fishing to protect sawfish, and observer coverage in the fleet most lethal to sawfish is exceptionally low. Heralding conservation achievements is important, but recognizing and addressing policy shortcomings is critical to achieving effective, balanced conservation programs. Specific recommendations will be offered.

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**0740 NIA BEST STUDENT PAPER, Brazos, Friday 14 July 2017**

Kimberly Foster, Devin D. Bloom

*Western Michigan University, Kalamazoo, MI, USA*

**Molecular Phylogenetics and Diversification of South American Darters (Characiformes: Crenuchidae)**

Characiformes comprise >2,000 species that are largely pelagic, such as tetras and piranhas. The characiform family Crenuchidae, known as South American darters, is

intriguing because the 86 described species include a radiation of benthic and pelagic lineages. Previous morphology based phylogenetic studies of crenuchids indicate multiple transitions between pelagic and benthic habitats. Benthic crenuchids are more speciose (>70 species) and morphologically diverse than pelagic crenuchids, a pattern that suggests this clade may have undergone an adaptive radiation. Our study aims to determine evolutionary relationships, determine the number and frequency of benthic/pelagic habitat transitions and explore diversification patterns of crenuchids using molecular phylogenetics and comparative analyses. We generated a multi-locus phylogeny using Bayesian and maximum-likelihood inference. Preliminary results show widespread discordance with the current taxonomy of the group and instances of undescribed diversity. Using ancestral character reconstruction, we found crenuchids are ancestrally pelagic with multiple transitions into the benthos. These results provide the first comprehensive molecular phylogeny of Crenuchids and indicate a re-evaluation of current systematics of Crenuchidae is needed. Moreover, we suggest South American darters may have undergone an adaptive radiation facilitated by a transition to the benthos.

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## **0710 Lightning Talks II, Glass Oaks, Friday 14 July 2017**

Austin Francis

*Armstrong State University, Savannah, GA, USA*

### **Experimental Hydrodynamics of Hammerhead Shark Cephalofoils**

Hammerhead sharks (Family Sphyrnidae) are an unusual group of fishes that are characterized by a distinctive lateral expansion of the rostrum known as a cephalofoil. Among species of hammerhead sharks, there is considerable variation in the shape of the cephalofoil. To examine the hydrodynamics of different cephalofoil shapes, digital particle image velocimetry (DPIV) was used to visualize fluid flow around, and in the wake of, cephalofoils for three species of hammerhead shark (*Eusphyrna blochii*, *Sphyrna mokarran*, and *Sphyrna tudes*). In *E. blochii*, the cephalofoil is broad and wing shaped. In *S. mokarran*, the cephalofoil is nearly straight, while in *S. tudes* it is more angular with sagittal and parasagittal notches. Computed tomography (CT) scans of each species were used to 3D print scale models for testing. These models were fixed in a recirculating flow tank seeded with polyethylene microspheres. The microspheres were illuminated by a green (532 nm) laser sheet oriented in either a horizontal or vertical (parasagittal) plane. Models were tested at two velocities, 6.35 cm/s and 12.4 cm/s. Fluid flow was recorded by a high-speed video camera at 120 fps with video analyzed using PIVlab for cross-correlation analysis. The resulting velocity vectors; fluid vorticity and momentum; as well as lift and drag forces were compared among the different species. Different cephalofoil shapes were observed to exhibit differences in wake that may indicate differences in locomotor performance.

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### **0309 AES Ecology I, Glass Oaks, Sunday 16 July 2017**

Bryan Frazier<sup>1</sup>, William Driggers III<sup>2</sup>, Camilla McCandless<sup>3</sup>, Ashley Shaw<sup>1</sup>, Elizabeth Vinyard<sup>1</sup>

<sup>1</sup>South Carolina Department of Natural Resources, Charleston, SC, USA, <sup>2</sup>National Marine Fisheries Service, Pascagoula, MS, USA, <sup>3</sup>National Marine Fisheries Service, Narragansett, RI, USA

#### **On the importance of sampling gear: Relative abundance and habitat utilization of sharks in South Carolina revisited**

Scientists deploy sampling gear for a multitude of reasons, such as when collecting biological data for studies examining species abundance, length composition, life history, habitat preferences, and movement patterns. However, if careful consideration of sampling gear, including bias and selectivity, is not incorporated into survey design, an incomplete picture of community structure and species-specific distribution and length composition will likely emerge. Sampling for coastal sharks has been ongoing since 1994 in the nearshore and estuarine waters of South Carolina. Resulting data have been used to identify nursery areas, designate essential fish habitat, generate indices of abundance and determine seasonality and habitat utilization of coastal sharks in the region. In 2014, we introduced additional sampling gear to existing survey methods, yielding surprising new information about species composition and relative abundance of juvenile and large coastal sharks in the nursery areas and nearshore waters of South Carolina.

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### **0055 ASIH STOYE GENERAL HERPETOLOGY, San Antonio, Thursday 13 July 2017**

Connor French, Jason Brown

*Southern Illinois University, Carbondale, Illinois, USA*

#### **Climate Fluctuation as a Driver of Diversification in Peruvian Poison Frogs**

The Amazonian rainforest at the foothills of the Andes is one of the most diverse ecosystems in the world. Despite considerable research quantifying the biodiversity it contains, the key factors driving contemporary distribution patterns of its biota remain poorly understood. While these factors are certainly diverse and not limited to a single overarching mechanism, biogeography and climatic instability are widely considered to be fundamental in maintaining Amazonian rainforest biodiversity. To better understand the explicit role of these factors in the maintenance of biodiversity since the Pliocene, we assessed the phylogeographic history of a small clade of poison frogs (*Ameerega petersi* group). We constructed a phylogeny with divergence time estimates and measured key demographic parameters to quantify lineage diversification in this group. We integrated these metrics with species distribution models that utilize climate data spanning four million years ago to present day to evaluate the climatic conditions that gave rise to the *A. petersi* group's current distributions and relationships. We found that different stages

of their estimated dispersal patterns correlated with lineage divergence time estimates. We therefore conclude that historical climate fluctuations contributed significantly to the dispersal and diversification of this group of anurans.

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### **0697 AES Ecology III, Glass Oaks, Sunday 16 July 2017**

Michael Frisk<sup>1</sup>, Keith Dunton<sup>2</sup>, Chris Martinez<sup>3</sup>, Catherine Ziegler<sup>1</sup>, Josh Zacharias<sup>1</sup>

<sup>1</sup>*Stony Brook University, Stony Brook, New York, USA*, <sup>2</sup>*Monmouth University, West Long Branch, New Jersey, USA*, <sup>3</sup>*University of California, Davis, California, USA*

#### **Passive acoustic telemetry reveals seasonal long distance migrations in the winter skate (*Leucoraja ocellata*)**

The movement ecology of western Atlantic skates is poorly understood and existing information has been derived from short-term seasonal surveys and a limited number of traditional tagging studies. It has been hypothesized that large changes in the abundance of winter skate in the western Atlantic were the result of periodic migration events and not tied to a closed-population level response. However, no direct observations of winter skate movement have been published supporting long distance migration. We tracked the movements of 61 winter skates, *Leucoraja ocellata*, along coastal New York between 2012 and 2014 using passive acoustic telemetry. Individuals were monitored with the coastal New York receiver network from Montauk to the Hudson River, and the ACT Network receiver arrays provided extended coverage between Cape Hatteras and Massachusetts. Days at liberty averaged 138, and ranged from 3 to 490. Preliminary results indicated that some individuals performed considerable north-south migrations between coastal Massachusetts and North Carolina, with the total distance traveled ranging from 27 to 1376 km, and averaging 330 km. The daily rate of movement averaged 7 km per day; however, spring and fall movements were considerably higher, and often exceeded 20 km per day. These observations provide new insights into the seasonal movements of north Atlantic winter skates, which add complexity to our understanding of stock structure and broader management concerns. Importantly, the observations support the hypothesis that winter skate regularly undertake large coastal migrations.

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### **0642 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Shelby L. Frizzell<sup>1</sup>, Dalton B. Neuharth<sup>1</sup>, Connor Adams<sup>1</sup>, Timothy Johnson<sup>1</sup>, Wade A. Ryberg<sup>1</sup>, Toby J. Hibbitts<sup>2</sup>, Travis J. LaDuc<sup>3</sup>, Brad D. Wolaver<sup>4</sup>, Jon Paul Pierre<sup>4</sup>, Benjamin J. Labay<sup>5</sup>, C. Mike Duran<sup>6</sup>

<sup>1</sup>*Institute of Renewable Natural Resources, Texas A&M University, College Station, TX, 77843, USA*, <sup>2</sup>*Biodiversity Research and Teaching Collections, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77843, USA*,

<sup>3</sup>Biodiversity Collections and Department of Integrative Biology, The University of Texas at Austin, Austin, TX, 78758, USA, <sup>4</sup>Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin, Austin, TX, 78758, USA, <sup>5</sup>Siglo Group, Austin, TX, 78702, USA, <sup>6</sup>The Nature Conservancy, San Antonio, TX, 78215, USA

### **Comparative Analysis of Photo Identification for Mark-Recapture Data in the Spot Tailed Earless Lizard (*Holbrookia lacerata*)**

The Spot-tailed Earless Lizard (*Holbrookia lacerata*) was historically found in open grassland habitats across central and southern Texas and northern Mexico. Distribution surveys conducted in 2008-2009 found that this species was in only 5% of historic localities, motivating a petition to list *H. lacerata* in 2010. U.S. Fish and Wildlife Service (FWS) declared listing may be warranted in 2010 and requested data on current and future threats to *H. lacerata* populations and habitat. A collaborative research program was developed to characterize *H. lacerata* viability within the FWS's Species Status Assessment (SSA) framework. Surveys were conducted in different areas of historical and known habitat for estimation of population size using mark-recapture techniques. *Holbrookia lacerata* have unique blotches on their backs in different shapes and sizes that provide unique identifiers for individuals. Encounter histories were constructed from side-by-side comparisons of photos taken of individual lizards for each site. Upon review of the photos, no similarities were found between blotching patterns of any individuals indicating they were all unique. These results indicate that, while no recaptures were found, this method can still be used to distinguish between individuals for mark-recapture studies on this species.

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#### **0465 Fish Conservation II, San Antonio, Sunday 16 July 2017**

Bridgette Froeschke<sup>1</sup>, John Froeschke<sup>0</sup>

<sup>1</sup>The University of Tampa, Tampa, Florida, USA, <sup>2</sup>Gulf of Mexico Fishery Management Council, Tampa, Florida, USA

#### **Does Size Matter?**

Distribution and abundance of estuarine fishes are influenced by temporal, physical, and spatial variables. Spatially, the distance to the nearest inlet into the Gulf of Mexico has shown to be an important predictor variable for the occurrence of a variety of species (southern flounder, spotted seatrout, sheepshead etc.) in estuaries. Many estuarine species increase in abundance near inlets suggesting these areas are potential essential fish habitat. However, does size matter and if so what does that mean for secondary bays? This project examined the size distribution of multiple fish species (bonnethead, black drum, red drum, gulf flounder, sheepshead, gray snapper, striped mullet, pinfish, and Atlantic croaker), that range in a variety of life history traits in Tampa Bay in Tampa, Florida and Aransas-Bay Complex in Port Aransas, Texas. Overall, we found that size does matter and you can use size to follow movement and potentially identify breeding grounds.

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## **0002 LFC Nutrition, San Marcos, Friday 14 July 2017**

Lee A. Fuiman

*University of Texas Marine Science Institute, Port Aransas, TX, USA*

### **Nutritional Programming in Red Drum: The Ecological Context**

Nutritional or metabolic programming occurs when variations in nutrition during a specific developmental window result in long-term metabolic effects. Nutritional programming has been demonstrated in captive fishes under laboratory conditions, but could it be operating in nature and does it have important consequences? Fatty acid composition of red drum (*Sciaenops ocellatus*) eggs, especially docosahexaenoic acid (DHA), was experimentally manipulated by altering the proportions of natural products fed to adults. This produced variations in embryonic nutrition. Larvae reared from these eggs for 21 days under common garden conditions contained significantly different levels of DHA in their tissues, indicating changes in lipid metabolism associated with embryonic nutrition. Ecological performance of larvae (foraging and escape behavior) was significantly correlated with DHA content of larval tissues. Does egg fatty acid composition of eggs vary in nature? Red drum eggs were sampled at Port Aransas, Texas, for 8 years (2009-2016). There was significant interannual variation in fatty acid composition of those eggs, with a 71% increase in DHA from the lowest to highest annual mean. These findings demonstrate that variation in embryonic nutrition of red drum is a natural occurrence and that nutritional programming could have consequences for larval survival, thereby linking maternal diet to success of offspring.

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## **0116 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Yuki Fujinami, Ko Shiozaki, Hirotaka Ijima, Mikihiro Kai, Yasuko Semba

*National Research Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency, Shizuoka, Japan*

### **Movements of the Adult Female Blue shark (*Prionace glauca*) in the Northwestern Pacific**

Blue shark (*Prionace glauca*) is a highly migratory pelagic species with circum-global distribution in the tropical and temperate waters. Generally, knowledge of migration is important for the management and conservation of exploited species. However, there is little information about the movement patterns of blue shark in the North Pacific. We used pop-up satellite tags to explore the movement of blue sharks in the Northwestern Pacific. We released 19 sharks and obtained the datasets with deployment periods longer than one month (86-242 days) from five adult females. Four of five females were judged to be pregnant by visual inspection and palpation at time of release. All females were released at southern waters off Japan (17-29°N and 129-133°E) in October 2015. Pregnant females tended to travel in a northeastward direction from warmer to colder



water regions (experienced SST: 14.1-30.0 °C) from autumn to next spring. One female further travelled offshore along the Kuroshio-Oyashio transition zone from January to March, and moved in to the transition zone (around 35°N and 166°E) in April. The female showed unique movement such as vertical distribution in shallow water (< 200 m) for one week compared to the period before or after that and then returned in a southwest direction to the warmer region. Given that the location and date of this event was in the pupping ground and parturition period and that neonates were reported in the vicinity, it was suggested that migration of this adult female blue shark was related to parturition.

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### **0369 AES Trophic Ecology/Physiology, Wedgewood, Friday 14 July 2017**

Austin Gallagher<sup>1</sup>, Rachel Skubel<sup>2</sup>, Heidi Pethybridge<sup>3</sup>, Neil Hammerschlag<sup>4</sup>

<sup>1</sup>*Beneath the Waves, Miami, FL, USA*, <sup>2</sup>*Leonard and Jayne Abess Center for Ecosystem Science and Policy, University of Miami, Miami, FL, USA*, <sup>3</sup>*CSIRO Oceans and Atmosphere Research, Hobart, Australia*, <sup>4</sup>*Rosensteil School of Marine and Atmospheric Science, Miami, FL, USA*

#### **Measuring the Energetic and Nutritional Status of Large, Migratory Sharks: Implications for Studies on Movement, Diet, and Reproduction**

Evaluating how sharks metabolize energy is increasingly useful for conservation physiology, as it can provide information on their current nutritional condition. However, obtaining metabolic information from these species is inherently challenging owing to their relative rarity, cryptic nature and often wide-ranging underwater movements. Here, we investigate aspects of energy metabolism in four free-ranging shark species (n = 281; blacktip, bull, nurse, and tiger) by measuring three metabolic parameters [plasma triglycerides (TAG), free fatty acids (FFA) and cholesterol (CHOL)] via non-lethal biopsy sampling. Plasma TAG, FFA and total CHOL concentrations (in millimoles per litre) varied inter-specifically and with season, year, and shark length varied within a species. The TAG were highest in the plasma of less active species (nurse and tiger sharks), whereas FFA were highest among species with relatively high energetic demands (blacktip and bull sharks), and CHOL concentrations were highest in bull sharks. Although temporal patterns in all metabolites were varied among species, there appeared to be peaks in the spring and summer, with ratios of TAG/CHOL (a proxy for condition) in all species displaying a notable peak in summer. These results provide baseline information of energy metabolism in large sharks and are an important step in understanding how the metabolic parameters can be assessed through non-lethal sampling in the future. In particular, this study emphasizes the importance of accounting for intra-specific and temporal variability in sampling designs seeking to monitor the nutritional condition and metabolic responses of shark populations.

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### **0175 Fish Conservation II, San Antonio, Sunday 16 July 2017**

Grantly Galland<sup>1</sup>, Shana Miller<sup>2</sup>

<sup>1</sup>The Pew Charitable Trusts, Washington, DC, USA, <sup>2</sup>The Ocean Foundation, Washington, DC, USA

## **Harvest Strategies - the Next Phase of Fisheries Management for Tuna and Beyond**

In recent years, fisheries management has started to shift from a highly political process, where managers repeatedly negotiate quotas, to a system where harvest control rules are triggered at pre-determined reference points to meet pre-agreed management objectives (such as maintaining stability in catch from year to year). The combination of these tools, along with the models designed to test their effectiveness, is called a harvest strategy or a management procedure. Through an iterative process, managers and scientists work together to develop a harvest strategy for each fishery under their jurisdiction, including by incorporating the advice and feedback of stakeholders. This positive shift in management leads to more profitable fisheries, with more consistent catch and market value, while simultaneously protecting stocks from reaching unsustainable levels. Harvest strategies also take some of the politics out of fisheries management and reduce the likelihood of "horse trading" or other practices that may not be in line with the best available scientific information. Here, we detail the steps necessary to produce an effective harvest strategy and highlight case studies where this new management tool has been successful.

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**0532 LFC Physiological Performance I, San Marcos, Saturday 15 July 2017**

Fernando Galvez

Louisiana State University, Baton Rouge, Louisiana, USA

## **The Integrative Physiology and Comparative Genomics of Osmotic Diversification in *Fundulus* Species**

Killifish from the genus *Fundulus* are capable of much physiological plasticity to environmental salinity, however the extent of this plasticity varies amongst species. Although some *Fundulus* species are extremely euryhaline and can alter the phenotype of their ion-transporting epithelia to compensate for broad changes in environmental salinity, other species have narrow salinity tolerance ranges and are only capable of making limited physiological alterations. This presentation will describe results from a series of osmotic challenge experiments comparing species, and populations among species, to discover the integrated physiological and genomic basis of derived freshwater- and seawater-tolerance at micro- and macro-evolutionary scales. I will also briefly discuss comparative experiments among three sister species pairs of *Fundulus* to discover the genomic and physiological basis of repeated and parallel losses of hyper-osmotic tolerance. Finally, this presentation will investigate the ontogeny of osmoregulatory organs and the hyperosmotic tolerance limits of *Fundulus* larvae reared at different salinities ranging from fresh water to sea water. I will present how

differences in rearing salinity influences the ontogeny of osmoregulatory tissues in larvae and the expression of ion transport proteins in transporting epithelia, and how these effects influence hyperosmotic tolerance in the euryhaline killifish species, *Fundulus grandis*.

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**0535 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Tony Gamble

*Marquette University, Milwaukee, WI, USA*

**Sex chromosome evolution in House Geckos (*Hemidactylus*)**

Much of our knowledge about sex chromosome evolution comes from studying clades with ancient, relatively stable sex chromosome systems such as mammals, birds, and *Drosophila*. However, clades with multiple, independently derived sex chromosome systems can provide important insight into mechanisms that drive these transitions and illuminate the earliest steps in sex chromosome evolution [2]. Thus identifying transitions between sex chromosome systems in a phylogenetic context should be a high research priority. Squamates (lizards and snakes) have long been of interest for studying sex determination and sex chromosome evolution because they have a variety of sex-determining systems, including male (XY) and female (ZW) heterogamety, and temperature-dependent sex determination (TSD), with numerous transitions among them. Here, I identify the sex chromosome systems of five house gecko (*Hemidactylus*) species and identify a transition between male (XY) and female (ZW) heterogamety in the genus. These results illustrate that squamates, and geckos in particular, offer an excellent set of replicate evolutionary “experiments” to examine the origin and evolution of sex chromosomes. The RAD-seq method used here can significantly accelerate the pace of sex chromosome discovery, facilitating the study of sex chromosome origins and evolution.

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**0333 SSAR VICTOR HUTCHISON STUDENT POSTER AWARD: ECOLOGY, NATURAL HISTORY, DISTRIBUTION, & BEHAVIOR; Poster Session I, Rio Grande Exhibit Hall, Friday 14 July 2017**

Marissa Ganzfried<sup>1</sup>, Carl Anthony<sup>1</sup>, Cari-Ann Hickerson<sup>1</sup>, Jennifer Deitloff<sup>2</sup>

<sup>1</sup>*John Carroll University, University Heights, Ohio, USA*, <sup>2</sup>*Lock Haven University, Lock Haven, Pennsylvania, USA*

**Comparison of Cranial Morphology in a Color Polymorphic Salamander**

Differences in cranial morphology within and among species of plethodontid salamanders have been linked to variation in diet and behavior. A slower, stronger jaw (i.e. large squamosal:dentary ratio) has been related to consumption of small prey such as springtails. Elongation of the jaw, coupled with expansion of the posterior of both the

cranium and the jaw (defined as robustness) are positively associated with increased levels of aggression. We used a polymorphic species of salamander (*Plethodon cinereus*) that is known to vary in both diet and aggressive behavior to examine differences in head shape between striped and unstriped morphs. At one field site in Northeastern Ohio the striped morph is more aggressive, and maintains more consistent access to cover objects on the forest floor. As a result, the striped morph is found in prey rich territories containing an abundance of small prey. We hypothesized that striped salamanders would either exhibit cranial shape consistent with increased aggression, or morphology consistent with a diet of small prey items. We examined head shape differences between morphs (n=1146 specimens) from 9 polymorphic sites using geometric morphometrics. Differences in head shape were significant among localities, however, only one locality showed significant differences by morph. At this locality, the cranial morphology of striped morphs was significantly more robust which is consistent with elevated aggressive and territorial behavior by this morph. These results indicate that in at least one polymorphic population, differential selection on morphs may have resulted in distinct head shapes of striped and unstriped morphs.

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**0869 SSAR VICTOR HUTCHISON STUDENT POSTER AWARD:  
PHYSIOLOGY & MORPHOLOGY; Poster Session I, Rio Grande Exhibit Hall,  
Friday 14 July 2017**

Steven Gardner, Scott Goetz, Mary Mendonca

*Auburn University, Auburn, AL, USA*

**Assessing Immunocompetence in Anurans: Validation of a modified in Vitro Assay Measuring Innate and Cell-Mediated Responses**

Global amphibian declines and other conservation concerns relating to animal health have fueled an increase in the application of ecoimmunologically based investigations. As the field of ecoimmunology matures there is a growing need for assays providing more detailed immunological assessments of non-model organisms. Previous studies have addressed cell-mediated immunity, which could induce inflammation and be energetically demanding, in the form of T-cell proliferation, measuring radioactivity of incubated anuran cells exposed to radio-labeled thymidine, as well as measuring skin swelling after injection of PHA between toe webbing of toads. We are developing a modified in Vitro cytometric assay to measure anuran splenocyte proliferation, which involves culturing T cells stimulated with a mitogen, and measuring the total numbers of proliferated cells using flow cytometry. We have successfully distinguished living proliferated anuran T cells in culture using Alexa Fluor 647, a fluorescently labeled CD3+ antibody that has a high affinity and specificity for T cells, and with Ghost Dye Red 780, which has a strong affinity for amine groups, binding more strongly to dead cells, allowing for distinction between living and dead cells. In addition to cell mediated responses, we have also assessed innate immune responses by measuring nitric oxide production in splenocyte culture supernatants using Griess reagents. These assays are improvements over commonly used in vivo assays that provide limited information that

is highly variable, and will enable comparison of anuran cell mediated and innate immune responses among populations, allowing investigation into population declines.

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### **0837 LFC Physiological Performance III, San Marcos, Sunday 16 July 2017**

Monica Vanessa Garduño Paz

*Universidad Autonoma del Estado de Mexico, Toluca, Estado de Mexico, Mexico*

#### **Physiological and Morphological Phenotypic Plasticity of Larval Fish**

Phenotypic responses to environmental factors and mixed effects of these have driven species to increase their fitness. For more than thirty years the study of phenotypic plasticity has allowed researchers to understand deeply how organisms phenotypes are originated as interactions of ecology and genetics. Fish are known for their high phenotypic plasticity in several aspects and due to their great diversity lots of studies have been developed to elucidate the origin of this. The present study is an exhaustive review, about the role of phenotypic plasticity in morphological and physiological aspects throughout fishes, including freshwater, marine and brackish. Here we pretend to distinguish the effect of genetic variation from phenotypic plasticity and identify the factors that promote plasticity in fishes in their early lives and how they lead to changes in shape, growth and metabolism. We are eager to considerate experimental data as well as descriptive ones in order to compare methodologies to measure the plasticity and conclusions. Finally, elucidating the costs and limits of phenotypic plasticity in larval fish.

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### **0491 Texas and Mexican Blindcats/Desert Fishes, Sabine, Saturday 15 July 2017**

Gary Garrett<sup>1</sup>, Megan Bean<sup>2</sup>, Robert Edwards<sup>3</sup>, Dean Hendrickson<sup>1</sup>

<sup>1</sup>*University of Texas at Austin, Austin, TX, USA*, <sup>2</sup>*Texas Parks and Wildlife Department, Austin, TX, USA*, <sup>3</sup>*University of Texas Rio Grande Valley, Edinburg, TX, USA*

#### **Declines and losses of spring/ciénega ecosystems in the Chihuahuan Desert of Texas**

Desert ecosystems are particularly susceptible to anthropogenic influences. This is especially true for desert aquatic systems where limited water resources can be easily impaired by excessive water mining depleting the underlying aquifers. Although the aquatic environments and their associated native fishes are declining throughout the Chihuahuan Desert, we will focus on examples from the Big Bend region, the Balmorhea Springs Complex, the Pecos River region, and the Devils River region. Ongoing and impending land use and water consumption patterns suggest even further reductions in the near future. Even though numerous conservation activities are underway, archaic

Texas water laws must be revisited and reformulated if the desert aquatic systems are to be truly conserved for more than the immediate future.

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**0013 ASIH STOYE ECOLOGY & ETHOLOGY IV, Sabine, Friday 14 July 2017**

John Gatto, Joel Trexler

*Florida International University, North Miami, Florida, USA*

**Using Agent Based Modeling to Describe Dispersal Potential in the Florida Everglades**

Immigration into newly inundated habitats is well documented, but the mechanisms that influence a species' ability to recolonize successfully are poorly understood. Several studies have focused on the behavioral changes and directionality of fish movement caused by changing hydrology. Furthermore, a recent study investigating speed has attempted to explain recolonization patterns; however, speed alone does not describe this phenomenon. Agent Based Modeling (ABM) has become a popular method for modeling ecological processes by using computer simulated "agents". In this study, we used ABM to model species dispersal by combining directional field data with laboratory swimming speed estimates. Our simulations used six hypothetical species, each with increasing levels of directedness, to demonstrate how the combination of directionality and speed influences arrival time. Virtual fish were tasked with swimming for 12 hours to reach a refuge habitat located 1 km away. Six speeds were investigated and replicated 10 times for a total of 466,560 simulations. Arrival time and distance from habitat were collected at the end of each run, and we compared simulated results to those collected in the field. This study revealed that both speed and directedness are indicative of species which inhabits a recently disturbed habitat quickly. Fast, directed individuals are more likely to reach a habitat first compared to slow, undirected ones. Lacking just one of these characteristics can greatly inhibit a species' ability to disperse and recolonize a recently disturbed habitat. Furthermore, our simulated results generated information consistent with field data collected in a long term dataset.

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**0361 Poster Session II, Rio Grande Exhibit Hall, Saturday 15 July 2017**

Aaron Geheber<sup>1</sup>, McKenzie Russell<sup>1</sup>, Caleb McMahan<sup>2</sup>

<sup>1</sup>*University of Central Missouri, Warrensburg, MO, USA*, <sup>2</sup>*The Field Museum of Natural History, Chicago, IL, USA*

**Inferring Evolutionary Niche Conservatism in Neotropical Cichlid Assemblages using Functional Morphological Traits**

Systematic research focuses on evolutionary relationships among species groups based on morphological and molecular data; however, ecological relationships among closely related species are often overlooked. Assessment of species environmental function is a

basic goal in ecology, and recently, placing functionality in an evolutionary context has become an area of interest among ecologists attempting to understand the role that lineage plays in community dynamics. By examining how species traits have evolved, and are distributed within communities, we can better recognize how interspecific interactions have influenced present-day community composition (e.g., if co-occurring close relatives share similar traits, does this lead to competitive exclusion locally?). We examined functional traits, including body shape and trophic morphological features (representative of niche use), among co-occurring cichlids (Cichlidae) in the Usumacinta/Grijalva drainage in Mexico and Guatemala. This study system harbors > 20 species of cichlid, and many occur in sympatry at local scales where interactions are plausible. By incorporating functionally relevant traits with a molecular based phylogeny, we tested for evolutionary niche conservatism within cichlid assemblages. We found evidence of evolutionary niche conservatism in functionally relevant traits among the assemblage members. Furthermore, our findings suggest variable levels of conservatism among cichlid functional traits within the assemblage. Future applications of these findings for examining cichlid assembly processes will be discussed.