

## **0251 AES Behavior & Ecology, 552 AB, Friday 9 July 2010**

Jeff Kneebone<sup>1</sup>, Gregory Skomal<sup>2</sup>, John Chisholm<sup>2</sup>

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### **Spatial and Temporal Habitat Use and Movement Patterns of Neonatal and Juvenile Sand Tiger Sharks, *Carcharias taurus*, in a Massachusetts Estuary**

In recent years, an increasing number of neonate and juvenile sand tiger sharks (*Carcharias taurus*) have been incidentally taken by fishermen in Plymouth, Kingston, Duxbury (PKD) Bay, a 10,200 acre tidal estuary located on the south shore of Massachusetts. There are indications that the strong seasonal presence (late spring to early fall) of sand tigers in this area is a relatively new phenomenon as local fishermen claim that they had never seen this species in large numbers until recently. We utilized passive acoustic telemetry to monitor seasonal residency, habitat use, site fidelity, and fine scale movements of 35 sand tigers (79 - 120 cm fork length; age 0 - 1) in PKD Bay. Sharks were tracked within PKD Bay for periods of 5 - 88 days during September - October, 2008 and June - October, 2009. All movement data are currently being analyzed to quantify spatial and temporal habitat use, however, preliminary analyses suggest that sharks display a high degree of site fidelity to several areas of PKD Bay. Outside PKD Bay, we documented broader regional movements throughout New England. Collectively, these data demonstrate that both PKD Bay and New England coastal waters serve as nursery and essential fish habitat (EFH) for neonatal and juvenile sand tiger sharks.

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## **0175 AES GRUBER AWARD, 551 AB, Friday 9 July 2010**

Danielle Knip<sup>1</sup>, Michelle Heupel<sup>2</sup>, Colin Simpfendorfer<sup>1</sup>, James Moloney<sup>2</sup>, Andrew Tobin<sup>1</sup>

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### **Site Fidelity and Habitat Use of Spottail Sharks (*Carcharhinus sorrah*) in a Tropical Nearshore Environment**

Tropical nearshore environments contain regions of high productivity and often provide key habitat for many shark populations. This project examines the presence and movements of shark species in a nearshore region to define their use of space and dependence on coastal habitats. An array of fifty-six acoustic receivers deployed in

Cleveland Bay, north Queensland was used to monitor sharks within a tropical nearshore environment. Thirty spottail sharks (*Carcharhinus sorrah*) fitted with acoustic transmitters were monitored in 2009 and 2010. Spottail sharks displayed long-term use of this nearshore environment with some individuals continually present for more than 100 days. Individuals that remained within Cleveland Bay showed high levels of site fidelity to specific regions and consistent patterns were found in their use of space. Location of home ranges and distribution of spottail sharks within Cleveland Bay revealed segregation among individuals with some differences in behaviour between sexes. Spottail sharks are an important component of the commercial fishery in Queensland. Long-term presence and consistent use of nearshore regions suggests that Marine Protected Areas employed in these areas may provide some shelter from exploitation for spottail sharks. This research gives new insight into habitat use of spottail sharks and provides advice for potential management of these populations.

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## **0198 Fish Genetics & Biogeography, 556 AB, Friday 9 July 2010**

Jason Knouft<sup>1</sup>, Lawrence Page<sup>2</sup>

<sup>1</sup>*Saint Louis University, St. Louis, Missouri, United States*, <sup>2</sup>*Florida Museum of Natural History, Gainesville, Florida, United States*

### **Assessing the Relationships Between Climate, Landscape, and Species Richness in North American Freshwater Fishes**

Variation in species richness across broad geographic areas has been attributed to both historical effects (i.e., evolutionary history) and contemporary climate and landscape factors. We examined the relationship between contemporary climate and landscape variables and species richness among all species of North American freshwater fishes as well as within the seven most diverse families (Catostomidae, Centrarchidae, Cottidae, Cyprinidae, Ictaluridae, Percidae, and Salmonidae). Results indicate that contemporary climate, elevation, and variation in elevation are significant predictors of species richness to varying degrees in the total species data set as well as within families. However, total stream length and the diversity of stream order segments within a region do not explain significant components of the variation in species richness in any group. Results will be discussed in the context of predicted changes in climate as well as the regional conservation of freshwater taxa.

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## 0227 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Brooks Kohli, Matthew White

*Ohio University, Athens, OH, United States*

### **Lack of Differentiation Suggests a Recent Range-wide Expansion of Muskellunge (*Esox masquinongy*)**

The muskellunge (*Esox masquinongy*) is an important recreational species found in the Mississippi, Great Lakes, and Hudson drainages. Three subspecies have been recognized, Ohio, Great lakes, and Northern, corresponding to differences in color pattern. Although these are no longer considered valid, genetic differences have been observed among Ohio River, Great Lakes, and Upper Mississippi River populations. Considerable stocking has occurred from a number of local broodstock sources. We conducted a phylogeographic study of muskellunge from samples throughout its range. A preliminary analysis of 450bp of the mitochondrial control region has identified little variation. Two haplotypes are widely distributed; several rare haplotypes have local distributions. The three subspecies designations are not supported nor are the allozyme based clusters. Although stocking from multiple hatchery strains could result in some regional homogeneity, it would not explain the range-wide pattern observed. Our data suggest that the current muskellunge distribution reflects a recent expansion from a single refugium. The paucity of mtDNA sequence variation also suggests a bottleneck.

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## 0133 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Matthew Kolmann<sup>1</sup>, Daniel Huber<sup>2</sup>, Mason Dean<sup>3</sup>, R. Dean Grubbs<sup>4</sup>

*<sup>1</sup>Florida State University, Tallahassee, FL, United States, <sup>2</sup>University of Tampa, Tampa, FL, United States, <sup>3</sup>University of California Irvine, Irvine, CA, United States, <sup>4</sup>Florida State University Coastal and Marine Laboratory, St. Teresa, FL, United States*

### **Ecomorphological Consequences of the Feeding Mechanism in the Cownose Ray**

Controversy has arisen over the implication of the cownose ray, *Rhinoptera bonasus*, in hindering commercial shellfish recovery projects. Because of support for shellfish projects, a fishery was started for *R. bonasus* under the guise of predator control. Questions about the necessity of such a fishery were not adequately resolved and other investigations into the matter have been contradictory. Bite-force calculation will allow this researcher to accurately reconstruct the capabilities of this animal as a durophagous predator. Preliminary examination of the feeding mechanism in *R. bonasus* has discovered formidable jaw musculature, but one possibly limited by gape size. Investigations into gape limitation, meaning the ability of the ray to manipulate, crush,

and then engulf bivalve prey items will allow researchers to accurately diagnose whether the cownose is capable of consuming commercial bivalve species. An ontogenetic series of representative bivalve prey (oysters, scallops, and quahogs) will be obtained for use in determining the forces necessary to cause shell failure in each species. Forces at which the bivalve shells exhibited catastrophic failure will be compared to measured and theoretical bite force data gathered from the cownose rays. If cownose rays are not capable of consuming bivalves, this could potentially indicate that once a bivalve has reached a certain adult size, it is functionally beyond the predator's ability to ingest. A directed fishery for *Rhinoptera* could then be diverting resources from identifying and addressing real threats to bivalve abundances and endangering another species concurrently.

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**0688 Fish Ecology, Morphology & Physiology, 556 AB, Saturday 10 July 2010**

Peter Konstantinidis

*The Natural History Museum, London, United Kingdom*

### **Osteology of the Ragfish, *Icosteus aenigmaticus* (Lockington)**

The ragfish was first described by Lockington in 1880 as a possible member of the Blenniidae. It is now placed, as the sole member, in its own family, Icosteidae. The species occurs only in the North Pacific Ocean from California to Japan, where adults inhabit the bathypelagic zone while juveniles are frequently caught near the surface. There is a great difference in shape and anatomy between juveniles and adults, which can reach a maximum length of up to two meters. The species is characterized by more than 60 vertebrae, the lack of dorsal-, anal-, and pelvic-fin spines, prickles on all fin rays, the absence of the pelvic fin in adults, more than 17 principal caudal fin rays and scales which are only present along the lateral line. Anatomical characters are scarce and peculiar and have led to various speculations of the systematic position of *Icosteus* ranging from a 'prepercomorph' position to a close relationship to members of the Stromateoidei. The latter hypothetical relationship finds additional support through larval characters and molecular data. Here, I will present a detailed anatomical analysis of the skeleton of larval and juvenile *Icosteus* in order to shed some light on its phylogenetic relationship.

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**0233 Poster Session II, Exhibit Hall D, Saturday 10 July 2010; ASIH STORER HERPETOLOGY AWARD**

Chelsa Korfel

*The Ohio State University, Ohio/Midwest, United States*

**Altitudinal Distribution of the Amphibian Fungus, *Batrachochytrium dendrobatidis*, in the Ecuadorian Andes**

Chytridiomycosis, the amphibian disease associated with the pathogen *Batrachochytrium dendrobatidis* (*Bd*), continues to persist in amphibian populations throughout the world. Ongoing research is critical for understanding the dynamics of the disease and the continuing impacts on amphibian populations. Amphibian populations in the highlands of Ecuador have experienced dramatic declines and extirpations as a result of *Bd* infections, and research on the persistence and dynamics of enzootic *Bd* at these localities is essential to understand the full impact of this pathogen. *Gastrotheca pseustes*, an Andean species found in Ecuador and IUCN endangered (likely due to impacts of *Bd*) persists in reduced populations over a broad altitudinal and geographical gradient. In this study skin swabs were taken from tadpoles of this species at five sites (Jerez 2000m; Monay 2500m; Mazan 3000m; Chusalongo 3500m; and Tres Cruces 4000m) ranging in altitude from 2000-4100 m in Cajas National Park. Amphibian mouthparts were swabbed 10 times each with a different swab from each individual. Tadpoles were collected from several different pools at each site. Swabs were analyzed by PCR methods to detect the presence of *Bd* genetic material and to estimate the level of infection. Results of the altitudinal distribution of *Bd* in *G. pseustes* will be reported.

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**0238 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Amy Koske<sup>1</sup>, Michelle Staudinger<sup>2</sup>, Francis Juanes<sup>1</sup>

<sup>1</sup>*University of Massachusetts, Amherst, MA, United States*, <sup>2</sup>*University of North Carolina, Wilmington, NC, United States*

**Foraging Habits of Large Pelagic Predators in the Northwest Atlantic**

The New England coastal shelf is a historic seasonal feeding ground for pelagic predators such as sharks and tunas, although their diets are still poorly known. Over recent decades, dolphinfish (*Coryphaena hippurus*) have increased exponentially in this area. This increase suggests that dolphinfish may be expanding their distribution pole ward, and have the potential to compete for regional prey resources. The aim of this study is to conduct a mass-based quantification of the food habits of large pelagic predators in the northwest Atlantic and to estimate potential overlap among species, particularly dolphinfish. We have collected stomachs of albacore tuna (*Thunnus*

*alalunga*), yellowfin tuna (*Thunnus albacares*), shortfin mako shark (*Isurus oxyrinchus*), thresher shark (*Alopias vulpinus*) and dolphinfish at recreational fishing tournaments from New Jersey to Massachusetts during the summers of 2007-2009. Initial analyses of stomach contents have determined that yellowfin consumed cephalopods (37%), fish (38%) and crustaceans (22%) in nearly equal amounts, albacore consumed a majority of crustaceans (38%) and cephalopods (42%), mako and thresher diets were composed primarily of bluefish (>60%), and dolphinfish diets concentrated primarily on squid (69%). Bluefish, shortfin squid and larval hermit crab appear to be the greatest potential sources of shark and tuna competition with dolphinfish in this region. Further results will detail predator feeding habits and provide an analysis of dietary overlap. Length data will be used to determine trophic niche breadths. This project will provide useful information on trophic ecology of these species in the northwest Atlantic necessary for informed management and regulation.

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## **0597 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Adrienne Kovach, Kimberly Babbitt, Jennifer Walsh, Charlotte Gabrielsen

*University of New Hampshire, Durham, New Hampshire, United States*

### **Effects of Suburbanization on Genetic Structure and Connectivity of Vernal Pool-breeding Amphibians**

Vernal pool-breeding amphibians are particularly vulnerable to the effects of habitat fragmentation and land use change, as they require both suitable wetland and forested upland habitat during their complex life cycles. Land use changes associated with suburbanization, including increases in the transportation infrastructure, may negatively impact both wetland and upland habitat quality, thereby impeding critical metapopulation processes, such as dispersal and recolonization of populations. We use a landscape genetic approach to identify the effects of environmental (water quality) and landscape (forest connectivity and road density) features on the genetic structure of the spotted salamander (*Ambystoma maculatum*) and wood frog (*Lithobates sylvaticus*). We conduct a comparative analysis of spotted salamanders and wood frogs from 44 ponds in 3 developed landscapes and 2 forested landscapes. Within each landscape, we estimated inter-pond connectivity using  $F_{ST}$  as a measure of gene flow for ponds separated by distances of 100 m – 5 km. We also used Bayesian clustering methods to identify genetically similar ponds and to estimate inter-pond migration rates in relation to landscape features and water quality variables. For spotted salamanders, we identified genetic barriers associated with Class 1, 2, 3 and residential roads and power line corridors in the developed landscapes and with elevation in the forested landscapes. We report preliminary results for wood frogs and discuss implications in light of differences in mobility of the two species. Our results suggest that suburbanization decreases the genetic connectivity of vernal pool-breeding amphibians and may negatively impact metapopulation dynamics over the long-term.

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**0598 Acoustics Symposium I, Ballroom D, Saturday 10 July 2010**

Kathryn Kovitvongsa, Phillip Lobel

*Boston University, Boston, MA, United States*

**Toadfish Boatwhistle Call Diversity and the Error Associated with Different Acoustic Recording Methods**

Toadfish (family Batrachoididae) are known as soniferous fishes due to their conspicuous boatwhistle courtship calls. However, only 5 out of 78 species' calls have been described in the literature. We add two more acoustic descriptions from two toadfishes on coral reefs in Belize (*Sanopus astrifer* and *Batrachoides gilberti*) and compare these to the well-known temperate species *Opsanus tau*. The Belizean species are the first recorded from tropical coral reefs. Both Belizean toadfishes were distinct from *O. tau* by producing multiple pulses per call as opposed to a single pulse call. The field study was conducted using both a hydrophone and the internal microphone of a point-and-shoot digital camera in an underwater housing. This led us to quantitatively compare recording modalities to determine if the inexpensive digital cameras in housings could record underwater sound accurately. Digital cameras were compared to a hydrophone system using simultaneous recordings during controlled playback of synthetic sounds. This determined accuracy for recording frequency, amplitude and temporal characteristics. Results indicated that digital cameras can be used for recording loud sounds known to be within the camera's frequency range, and for gross description of temporal patterning. However, due to temporal error introduced by the digital camera fish recordings cannot be precisely analyzed for pulse and interval durations which are necessary for interspecific comparisons. It was determined that a quality hydrophone is still the best tool for accurate underwater recordings and is necessary for comprehensive scientific description of sounds.

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**0759 Acoustics Symposium I, Ballroom D, Saturday 10 July 2010**

Cecilia Krahforst, Joseph Luczkovich, Mark Sprague, Charles Singhas, J.P. Walsh

*East Carolina University, Greenville, NC, United States*

**Can the Fundamental Frequency of an Atlantic Croaker's Sound be Used to Determine Length or Sex in the Field?**

Both sexes of Atlantic croaker (*Micropogonias undulatus*) have the ability to produce sounds beginning within the first year of life. Research has indicated that there is sexual dimorphism of gonads and sonic muscles, which indicates that there may be variants within acoustic structure. We recorded Atlantic croaker vocalizations of individuals

ranging from 40-250 mm TL in the laboratory to determine if sex and length varied with the fundamental frequency. Digital audio recorders were deployed at two sites in Pamlico Sound from June to November 2008, recording 10s audio files at 15 minute intervals. The fish community was sampled once a month at each site using trawls to compare with the passive acoustic recordings. Atlantic croaker were transported in a live well to an aquarium holding facility where they acclimated for a minimum of 24 hrs prior to acoustic recordings. Analyses revealed an inverse linear relationship between total length (TL, mm) and fundamental frequency ( $F_0$ , Hz), where  $TL=305.32-0.27(F_0)$  ( $r^2=0.84$ ). There was no significant difference in fundamental frequency between the sexes. The linear regression equation was then used to estimate total length from the fundamental frequency of in-situ observations and compared to Atlantic croaker collected in the trawl. There was a significant difference between the mean lengths of Atlantic croaker in the trawl and mean lengths estimated from fundamental frequency ( $p<0.0001$ ). We conclude the trawl is size-selective and underestimates the average length of fish. Therefore, the passive acoustic approach may provide an accurate size estimate for Atlantic croaker populations.

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## **0179 Herp Conservation II, Ballroom B, Sunday 11 July 2010**

Kerry Kriger

*SAVE THE FROGS!, Santa Cruz, CA, United States*

### **SAVE THE FROGS! - Translating Science into Action**

SAVE THE FROGS! is America's first and only public charity dedicated exclusively to amphibian conservation. Our mission is to protect amphibian populations and to promote a society that respects and appreciates nature and wildlife. Founded in May 2008, we have several active educational programs, including (1) teaching a free laboratory course on chytrid detection techniques to Latin American batrachologists; (2) coordinating the annual Save The Frogs Day events; (3) providing free educational materials and laboratory protocols to teachers and scientists via [www.savethefrogs.com](http://www.savethefrogs.com) and [www.salvemossapos.com](http://www.salvemossapos.com); (4) giving presentations on amphibian extinctions in multiple languages to schools, universities, zoos, museums, businesses, and community groups; (5) creating public service announcements that have been posted in Washington, D.C., San Francisco and in five major U.S. airports; (6) providing an annual \$500 travel grant for a student to present at this conference. SAVE THE FROGS! also has active advocacy campaigns, such as working with restaurants to discontinue frog leg sales, and campaigning for the removal of invasive trout from critical Yellow-Legged Frog habitat. We accomplished all of the above on less than \$50,000. As funds permit, we will purchase land, lobby for mandatory disease testing on imported amphibians and for laws limiting the use of harmful pesticides, provide full Ph.D. scholarships, and an array of other urgently needed conservation actions. Our vision is a world in which not a single amphibian species is threatened with extinction. With your advice, your involvement and your financial support, we are 100% positive we can SAVE THE FROGS!

## 0219 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Kerry M. Kriger<sup>1</sup>, Andrew J. Crawford<sup>2</sup>, Alain Dubois<sup>3</sup>

<sup>1</sup>SAVE THE FROGS!, Santa Cruz, CA, United States, <sup>2</sup>Universidad de los Andes, Bogota, Colombia, <sup>3</sup>Alytes, Paris, France

### **Batrachology: The Study of Amphibians**

**Batrachology** is the study of amphibians. Most people use the term "herpetology", but this term signifies the study of amphibians *and* reptiles, two groups with extremely different evolutionary and life histories. Evolutionary biologists all agree that taxonomy should reflect natural groups (i.e. monophyletic clades), and thus the current polyphyletic concept of herpetology is incorrect and should be refined. Extant amphibians are monophyletic and form the sister group to all other tetrapods. As such, we request you sign the Batrachology Petition at [www.savethefrogs.com/batrachology](http://www.savethefrogs.com/batrachology), and phase out future usage of the prefix "herpeto" when you are not referring to reptiles. With support from the batrachological community, this change in terminology can be implemented with as much ease and rapidity as have any of the changes in species names that have taken place in recent years.

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## 0666 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Andrea Kroetz, Sean Powers

University of South Alabama/Dauphin Island Sea Lab, Dauphin Island, AL, United States

### **Functional Responses in Bonnethead (*Sphyrna tiburo*) and Atlantic Sharpnose (*Rhizoprionodon terraenovae*) Sharks to Varying Prey Densities**

Several studies indicate that elasmobranchs are integral predators in marine ecosystems. However, there has been little investigation into how these fishes respond to changes in prey densities (i.e. functional response). As traditional management plans of elasmobranchs rely on detailed dietary information, a better understanding of functional responses is essential to future ecosystem management plans of these fishes. Bonnethead (*Sphyrna tiburo*) and Atlantic sharpnose (*Rhizoprionodon terraenovae*) sharks are small coastal shark species abundant in the northern Gulf of Mexico. Bonnetheads show specialized feeding on macroinvertebrates (e.g. blue crab) and exhibit schooling behavior, while Atlantic sharpnose sharks are piscivorous and generally more solitary foragers. This study will investigate the functional responses of individual *S. tiburo* and *R. terraenovae* to varying densities of their natural prey, blue crab (*Callinectes sapidus*) and Atlantic croaker (*Micropogonias undulates*), respectively. Results will be analyzed to determine if there is a difference in functional responses between species with different

prey specializations as well as varying aggregation behaviors. To investigate the effect of group size on these responses (i.e. numerical response), trials will be conducted with varying levels of individuals. These examinations will provide novel insight into the dynamics of predator-prey interactions involving elasmobranch predators, and thus further our understanding of the dynamical nature of top-down control in coastal marine ecosystems.

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## **0057 Fish Systematics II, Ballroom D, Monday 12 July 2010**

Kristen Kuhn, Thomas Near

*Yale University, New Haven, CT, United States*

### **Waiting for Resolution: An Example of Species Tree Inference in the Antarctic Fish Species Flock *Trematomus***

The biota of Antarctica is amazingly rich and highly endemic. Notothenioid fishes are a clade of acanthomorph teleost fishes containing approximately 129 species. The phylogenetics of notothenioid fishes has been extensively investigated through analyses of morphological characters, DNA sequences from mitochondrial genes, and single copy nuclear genes. These phylogenetics analyses have produced reasonably similar phylogenetic trees of notothenioids, however a number of phylogenetic questions remain. The nototheniid clade *Trematomus* is an example of a group where phylogenetic relationships remain unresolved. Here we revisit the phylogenetic relationships of *Trematomus* using both increased taxon sampling and an expanded data set which includes DNA sequences from two mitochondrial genes (ND2 and 16S rRNA) and ten single-copy nuclear genes to investigate strategies of species tree inference. The Bayesian phylogeny resulting from the analysis of the combined mitochondrial and nuclear gene datasets was well resolved. It contained more nodes supported with significant Bayesian posteriors than either the mitochondrial or nuclear gene phylogenies alone; demonstrating that the addition of nuclear gene sequence data to mitochondrial data can enhance phylogenetic resolution and node support.

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## 0352 Fish Systematics & Morphology, Ballroom D, Friday 9 July 2010

Hyuck Joon Kwun, Jin Koo Kim

*Pukyong National University, Busan, Korea, Republic of*

### **One Undescribed Species of the Genus *Eulophias* (Perciformes: Stichaeidae) from Korea**

Five specimens (70.7-160.7 mm SL) of *Eulophias* sp. were collected from the southern sea of Korea. Genus *Eulophias* belongs to the family Stichaeidae and distribute in Northwest Pacific. Only two species, *Eulophias tanneri* (type locality: Suruga gulf, Japan) and *Eulophias owashii* (Owashi off, Japan) have been recognized in the world, but no species have been recorded in Korea. *Eulophias* species are poorly-known and rare to date. *Eulophias* sp. has eel-like body shape, 19-23 dark blotches on body side and many dorsal fin spines and anal fin rays. Head of the largest specimen is rounded and its snout is blunt, but that of the other specimens are slightly pointed. Caudal fin rays are blended with posterior region of dorsal and anal fin rays. Pelvic fin is absent. Our specimens are similar to *Eulophias tanneri* and *Eulophias owashii* in having elongated body and dark blotches on body side. But *Eulophias* sp. is easily distinguished from *Eulophias tanneri* by the number of anal fin rays (102-104 in *Eulophias* sp. vs. 75 in *Eulophias tanneri*) and caudal fin rays (9-11 vs. 7). Our specimens are most similar to *Eulophias owashii*, but differed in the number of anal fin rays (102-104 in *Eulophias* sp. vs. 95 in *Eulophias owashii*) and pectoral fin length in head length (2.5-2.8 times vs. 3.6 times). More comparative specimens are needed for clarifying the taxonomic position of *Eulophias* sp. collected from Korea by means of morphology and genetics.

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## 0573 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Peter Kyne, Joanna Stead, Jaime Leung, Mike Bennett

*The University of Queensland, Brisbane, Queensland, Australia*

### **Where You Are is What You Eat: Large-scale Spatial Variation in the Diet of a Demersal Elasmobranch Predator**

Studies examining the stomach contents of elasmobranchs, and fishes in general, often provide a snapshot of diet in time and space. Temporal and spatial characteristics of sampled populations can influence dietary composition, as can sex and ontogeny, among other factors. The diet of a demersal predator, the eastern shovelnose ray *Aptychotrema rostrata* (Shaw, 1794) was examined and compared between three distinct geographic environments off southern Queensland, Australia, representing a range of bathymetric zones: (1) shallow estuarine waters of a large embayment (Moreton Bay; 3-8 m depth); (2) inshore coastal continental shelf waters (Wide Bay-Burnett region; 15-33 m); and, (3) offshore continental shelf waters (offshore of Moreton Bay; 41-102 m). There

were no differences in the diet between sexes within each sample, however, ontogenetic changes in diet were evident. The overall diet of this common predator differed between estuarine, coastal and offshore environments. Diet within the estuarine environment was dominated by decapod crustaceans, with teleost fishes of minor importance. Diet within the coastal environment was also dominated by decapod crustaceans, but teleost fishes were considerably more important. In the offshore environment, teleost fishes were the dominant prey category. The eastern shovelnose ray consumes a diversity of benthic prey, but its diet varies spatially, highlighting not only the generalist nature of the feeding ecology of the species, but also that elasmobranch dietary studies need to consider the spatial context of their results.

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## **0094 Acoustics Symposium I, Ballroom D, Saturday 10 July 2010**

Friedrich Ladich

*University of Vienna, Vienna, Austria*

### **Ontogenetic Development of Acoustic Communication in Fishes**

Investigating the potential ability of juvenile fishes to communicate acoustically requires considering the development of vocalization and hearing. The ontogeny of both processes was examined in three non-related species, namely the croaking gourami *Trichopsis vittata* (Osphronemidae), the squeaker catfish *Synodontis schoutedeni* (Mochokidae) and the Lusitanian toadfish *Halobatrachus didactylus* (Batrachoididae). Juveniles of all three species vocalized during agonistic behaviour and showed similar changes in sound characteristics despite possessing different sonic mechanisms. Dominant frequencies decreased, whereas sound pressure levels, pulse periods and sound duration (except in the toadfish) increased with growth. Generally, hearing sensitivities improved during development, but differences were observed between species. Croaking gouramis responded to sounds up to 5kHz in all stages. Auditory sensitivity increased in the high frequency range and the best hearing frequency shifted from 2.5 to 1.5kHz. In the squeaker catfish, hearing abilities increased up to 2kHz but showed a decrease at 5 and 6kHz. The Lusitanian toadfish showed the smallest changes of all three species. The best hearing sensitivity was found at 50Hz in all stages and hearing improved only at 100Hz, 800Hz and 1kHz. A comparison between audiograms and sound spectra within same-sized fish of the respective species revealed that the main energies of sounds were concentrated within the most sensitive frequencies. The comparison also showed that early-stage gourami and toadfish probably cannot detect conspecific sounds due to low sound levels and high hearing thresholds. Only the catfish is able to communicate acoustically at all stages of development due to its Weberian apparatus.

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**0803 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Lisa Cordes Landry, Kyle Piller

*Southeastern Louisiana University, Hammond, LA, United States*

**Swimming to the Beat of a Different Drumm: Stock Structure of Red Drum (*Sciaenops ocellatus*) in Louisiana**

Previous large scale population genetic studies of Red Drum, *Sciaenops ocellatus* (Sciaenidae), in the Gulf of Mexico found significant differentiation among populations across the northern Gulf of Mexico. We conducted a microgeographic study of genetic variation of Red Drum to specifically investigate genetic variation in Louisiana's waters. We examined genetic variation for 321 Red Drum individuals for 16 microsatellite loci using seven a priori delimited management zones. Multiple population genetic analyses reveal significant genetic differentiation between Lake Pontchartrain Basin populations (East of the Mississippi River), and all six management zones to the west. This result is interesting, especially considering previous molecular studies for other marine species have proposed that the Mississippi River outflow presents a barrier to gene flow in the Gulf of Mexico. Little variation was seen among all other populations (West of the Mississippi River) suggesting ongoing gene flow among these western populations.

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**0042 Roads Symposium I, Ballroom B, Saturday 10 July 2010**

Tom Langen

*Clarkson University, Potsdam, NY, United States*

**Predictive Models of Reptile and Amphibian Road Mortality Hotspots or Connectivity Blockages in Extensive Road Networks**

Road-kill and connectivity blockages caused by roads and road traffic can result in population declines of amphibians and reptiles. To implement an effective plan to reduce road-kill and restore connectivity at blockages, the entire regional road network should be assessed. The time and expense to adequately survey an extensive road network may be prohibitive to agencies, however, so there is a need for accurate and efficient models to prospectively identify the most promising locations for monitoring and mitigation. I review three general modeling methods to predict road-kill hotspots and connectivity blockages for amphibians and reptiles, and propose a procedure to create and validate predictive models that uses publically-available GIS data. I also explain some of the informational and logistical challenges to developing models that are useful for management agencies. I argue that predictive hotspot models are tools that are essential for effective and economical whole road-network survey and mitigation, and for planning new road routes that avoid areas of high road-kill risk or critical corridors for habitat and population connectivity. While such models have

already proven useful for mammals, they may be especially effective for reptiles and amphibians, which typically have road-kill hotspots or connectivity blockages that are short in length but severe in effect.

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**0046 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Alicia LaPorte, Dana Bethea

*NOAA Fisheries SEFSC Panama City Laboratory, Panama City, FL, United States*

**Preliminary Analysis of the Diet of the Sandbar Shark, *Carcharhinus plumbeus*, from the South Atlantic and Gulf of Mexico, USA**

The diet of the sandbar shark, *Carcharhinus plumbeus*, was examined from stomachs collected in the US south Atlantic Ocean and Gulf of Mexico on NOAA Fisheries observer-covered bottom longline fishing vessels from 2008-2009. We examined historical changes in diet and tested for differences in diet between water basins. Additionally, bait type, hook and haul information were used to eliminate the bias of bait in diet calculations. Preliminary analysis shows teleosts (mostly species associated with hard bottom) and cephalopods (mostly octopi) to be the two most important prey categories in the diet.

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**0667 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Joanna Larson

*Harvard University, Cambridge, MA, United States*

**Eyelid Ossifications in *Aubria masako***

Amphibians are generally known for their reduced level of ossification in comparison to other tetrapods and fossil representatives. Some species like *Pyxicephalus*, *Lepidobatrachus* and *Ceratophrys* however, show signs of hyperossification, particularly in the skull. Cranial co-ossification also appears in several species of casque-headed tree frogs that use their heads to plug holes into which they climb for protection and some species of *Brachycephalus* are remarkable for the development of an ossified dorsal shield. Caecilians display interesting patterns of ossification among amphibians with their heavily ossified skulls and dermal scales, which are probably an adaptation to their fossorial lifestyle. I here report on a specimen of *Aubria masako*, a frog from central Africa, with numerous ossicles embedded in the eyelids. Additional specimens of *A. masako* and *A. subsigillata*, the other species within the genus, were x-rayed to determine whether similar ossicles were present. No other examples of this feature were found, although the number of available specimens is limited due to the rarity of these frogs.

This species is semi-fossorial and it is speculated that these ossicles may provide protection to the eyes as individuals burrow into the soil.

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## **0056 Karel Liem Symposium, Ballroom D, Thursday 8 July 2010**

George Lauder

*Harvard University, Cambridge, MA, United States*

### **Fish Biomechanics from Karel Liem to the Present**

One of the key contributions of Karel F. Liem to the field of functional morphology came at a time when the European "holistic" view of morphology dominated the field. Karel, in a series of highly influential papers, emphasized the importance of experimental manipulation as a tool for understanding the relationship between form and function. In his remarkable 1970 paper on nandid feeding mechanisms, Karel used a variety of surgical modifications of the feeding apparatus coupled with high-speed movies to demonstrate experimentally the function of mechanical linkage systems in the head. This experimental approach caused some consternation among European colleagues whose holistic view of morphology did not allow for experimental manipulations as a means of testing functional hypotheses, but the passage of time has shown the great value inherent in Karel's experimental methodology. One modern manifestation of the experimental and manipulative approach to functional morphology pioneered by Karel is the development of simple robotic devices that allow us to modify and manipulate models of fish components to test hypotheses about the function of fish morphology. I will give some examples from our recent work on robotic pectoral and caudal fins and a robotic flapping foil model of swimming fish to illustrate how robotic tools are allowing new questions to be addressed in fish functional morphology. I am thankful that Karel was able to see in recent years the current wide adoption of his approach and the newest expressions of the experimental methods that he initiated in the early 1970s.

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**0399 SSAR SEIBERT CONSERVATION AWARD, 555 AB, Friday 9 July 2010**

Jolene Laverty, Jacqueline Litzgus

*Laurentian University, Sudbury, Ontario, Canada*

**Impact of Water-based Recreation on the Spatial Ecology of Stinkpot Turtles (*Sternotherus odoratus*) in an Ontario Park**

Land-based recreation can have a negative impact on turtles, but little is known about the impacts of water-based recreation on turtles. Provincial parks are considered protected areas for species at risk, but parks also provide areas for recreational activities for people, and studies are needed to determine if human presence is impacting resident species at risk. The purpose of our project was to determine if water-based recreation is having an effect on the health and spatial ecology of Stinkpot Turtle (*Sternotherus odoratus*) populations in The Massasauga Provincial Park (The MPP). We predicted if human recreation was negatively affecting turtles, then 1) injuries and mortality would be higher in impacted than in non-impacted sites, and 2) home range sizes and movements would be greater in impacted sites as turtles try to avoid people. Data were collected from three replicates of each site treatment: impacted bays and non-impacted bays. Thirty-two females were radio tracked during the 2009 field season and locations recorded; ArcGIS was used to examine movements and estimate home range sizes. Incidences of injuries and adult mortality were higher at impacted sites. Although not statistically significant, the home range sizes and movements were greater in impacted than in non-impacted sites. In mid-summer, when human presence at the park was greatest, turtles had significantly larger home ranges in impacted compared to non-impacted sites. Our findings indicate that water-based recreation could be negatively impacting Stinkpot turtles in The MPP, but further study with larger sample sizes are needed to make conclusive statements.

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**0112 SSAR SEIBERT SYSTEMATICS & EVOLUTION/SSAR SEIBERT PHYSIOLOGY, 555 AB, Friday 9 July 2010**

Lucinda Lawson

*University of Chicago, Chicago, IL, United States*

**Historical Biogeography, Divergence Times, and Diversification Patterns in the *Hyperolius spinigularis* Complex: A Molecular, Morphological, and Spatial Investigation into Evolutionary History in East Africa**

New species diverge and diversify as a function of intrinsic and extrinsic forces, and identifying these processes is imperative for understanding speciation. The highly-fragmented *Hyperolius spinigularis* species-complex of three closely related and poorly

resolved species (*H. spinigularis*, *H. tanneri*, *H. minutissimus*) is an excellent system to study patterns and processes of diversification due to the discrete and compact nature of their geographic distribution (endemic to the fragmented highlands of East Africa) and the fact that divergences in this group are minor yet stable, and thus the signal of selection can still be detected. In this study, I use multiple independent datasets to discern the evolutionary history of this group and to identify the processes that create and maintain lineage independence in spite of potential gene-flow and/or competition between adjacent populations. By combining a multi-locus molecular dataset with spatial information, environmental niche modeling, paleoclimate reconstructions, and morphological analyses, I determine the historical and contemporary processes underlying the diversification and maintenance of genetic and ecological diversity in this group. Species tree estimations support monophyly for each of the described taxa, and spatial reconstructions of ancestral distributions appear driven by vicariance, long distance dispersal, and local extinction. Species are significantly different in their environmental niche requirements, but not in morphology. The combined results of spatial, genetic, morphological, and environmental analyses imply that allopatric mechanisms including adaptation to divergent habitat requirements and competitive exclusion have created at least part of the diversity in this sky-island system.

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**0743 SSAR SEIBERT CONSERVATION AWARD, 555 AB, Friday 9 July 2010**

Daniel Leavitt

*Texas A&M University, College Station, TX, United States*

### ***Sceloporus arenicolus*, an Endemic Lizard in an Endangered Ecosystem**

Factors known to influence the persistence in anthropogenically fragmented habitats include connectivity between habitat patches, patch size, and frequency of disturbance. We are studying how these factors associated with oil and gas development may affect the Dunes Sagebrush Lizard (*Sceloporus arenicolus*) and six other lizard species in the Mescalero-Monahans Shinnery-Sands Ecosystem of New Mexico and Texas. Our Before-After-Control-Intervention study design consists of replicated mark-recapture studies on 27 trapping grids in fragmented, non-fragmented, and to-be fragmented landscapes. The first year of sampling produced 1,781 captures in 12, 150 trap days. The Dunes Sagebrush Lizard was notably absent from many fragmented sites. Additionally we are finding evidence of differences in lizard community structure, species diversity, and demographics between fragmented and non-fragmented sites.

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**0436 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Alexander Lebron<sup>1</sup>, Karen Warkentin<sup>2</sup>

<sup>1</sup>Cornell University, Ithaca, NY/14850, United States, <sup>2</sup>Boston University, Boston, MA/02215, United States

**Induction, Acclimation, and Behavioral Phenotypes: Predator Cues Change Flight Initiation Distance in Hatchling Red-eyed Treefrogs**

Behavioral responses to predators can be important for tadpole survival. Terrestrial embryos of red-eyed treefrogs, *Agalychis callidryas*, hatch prematurely to escape from egg predators. They enter the water less developed than full-term hatchlings, less behaviorally responsive, and more vulnerable to aquatic predators. Development in the water, however, is faster than in the egg, which might reduce the cost of hatching early, particularly if larvae can use cues from aquatic predators to improve their defenses. We measured flight initiation distance (FID) of *A. callidryas* larvae in response to an approaching model predator to assay antipredator behavior. We assessed effects of hatching age and brief acclimation or longer induction with predator cues on FID. Tadpoles were tested at six days, when spontaneous hatching peaks. We compared responses to cues from odonate, belostomatid, and poeciliid predators. Two days induction by belostomatid and odonate cues increased FID, while fish induction decreased FID, compared with predator-free controls. This suggests that *A. callidryas* tadpoles have predator-specific responses consistent with differences in predator foraging behavior. Newly hatched six-day-old tadpoles had FID similar to predator-naïve early-hatched tadpoles. Moreover, two days after early hatching a 30-min acclimation with odonate cues increased FID, but newly hatched tadpoles showed no such change. If enhanced sensitivity to predator cues confers a survival advantage, accelerated development in the water may give surviving early-hatched animals an advantage over late-hatching members of their age cohort, once all eggs have hatched. This could reduce the overall mortality cost of premature hatching.

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## 0222 Fish Systematics & Morphology, Ballroom D, Friday 9 July 2010

Mao-Ying Lee<sup>1</sup>, Thomas A. Munroe<sup>2</sup>, Kwang-Tsao Shao<sup>1</sup>

<sup>1</sup>Laboratory of Fish Ecology and Evolution, Biodiversity Research Center, Academia Sinica, Nankang, Taipei, Taiwan, <sup>2</sup>National Systematics Laboratory, NMFS/NOAA, Smithsonian Institution,, Washington, DC, United States

### **Evaluating the Taxonomic Status of Tonguefishes Tentatively Identified as *Symphurus microrhynchus*: Comparisons of Morphological and Molecular Data between Populations Collected off Taiwan and Vietnam**

*Symphurus microrhynchus* (Weber), a small-sized tonguefish species (ca. 100 mm), is characterized by 12 caudal-fin rays, low meristic features, and a blind-side pigmentation pattern of small, pepper-dot melanophores. This species, known from relatively few specimens collected from marine waters usually shallower than 100 m, has been reported from widespread localities ranging from off East Africa, to Viet Nam, and the Indo-Australian archipelago. Recently, other specimens tentatively identified as this species have been collected off Japan, Taiwan and the Philippines. Based on morphological features, specimens identified as *S. microrhynchus* share overall similarities in meristic features, but detailed comparisons of specimens from different areas reveal minor differences in their meristic, morphometric and coloration features. It is difficult to determine whether these differences reflect the presence of a species complex, or are population level differences of a widespread species occurring throughout the entire region. During a recent (2009) expedition, 42 tonguefish specimens tentatively identified as *S. microrhynchus* were collected and preserved in alcohol from Nha Trang fish port, Vietnam. Comparisons of morphological characters between specimens of Vietnam and Taiwan reveal that they share similar meristic and morphometric characters, but specimens from Vietnamese are absent pepper-dot melanophores (present at Taiwanese specimens). We using DNA barcoding to understand better of relationships between populations from Vietnam and Taiwan. Also, molecular data will assist in determining the informative value of morphological and coloration characters presently for identifying these fishes, and help resolve questions about the taxonomic status of populations presently identified as *S. microrhynchus* in the future.

## 0006 Herp Systematics, 551 AB, Monday 12 July 2010

Edgar Lehr<sup>1</sup>, Alessandro Catenazzi<sup>1</sup>

<sup>1</sup>Illinois Wesleyan University, Bloomington/Illinois, United States, <sup>2</sup>University of California Berkeley, Berkeley/California, United States

### Species Diversity of *Bryophryne* (Anura: Strabomantidae) in Peru

Terrestrial-breeding frogs of the genus *Bryophryne* live at elevations of 2350–4000 m in cloud forests and puna habitats in southern Peru (Regions of Cusco and Puno). Since its description in 2008, five species have been described or assigned to this genus, which currently comprises six species. Previously, one of the defining characters for *Bryophryne* was the absence of a tympanum, which was considered a synapomorphy. However our recent herpetological surveys in southern Peru (Region of Cusco), led to the discovery of additional undescribed species, including the second species that has a tympanum and males that call during the day. One striking aspect of this genus is the level of endemism and high beta diversity across the eastern slopes of the Andes in southern Peru. Species of *Bryophryne* seem to be separated by a combination of habitat preferences and elevational distribution from their congeners. Morphological convergences between *Bryophryne* and *Phrynopus* are obvious. Species of both genera lack finger and toe disks with marginal grooves, and the majority of the species lack a tympanum. Both genera are restricted to Peru and are known from high elevation in the Andes. The deep valley of the Rio Apurimac presumably serves as a biogeographic border separating *Phrynopus* of northern and southern central Peru from *Bryophryne* and *Psychrophrynella* of southern Peru and Bolivia. We describe the distribution, taxonomy, and ecology of the species of *Bryophryne*.

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## 0173 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Lee Lemenager, Richard Tracy

University of Nevada, Reno, Nevada, United States

### Comparison of Water Potential in Two Anuran Species, *Lithobates catesbeiana* and *Xenopus laevis*

The water potentials of the seat patches of anuran amphibians (North American Bullfrog, *Lithobates catesbeiana*; and African claw frog, *Xenopus laevis*) were inferred from experiments of water exchange between frogs and environments in which the water potential was controlled. Water exchanges of frogs placed in different sucrose solutions were inferred from changes in body mass measured gravimetrically. Rates of water exchange by frogs were plotted against the osmotic potentials of the sucrose solutions with which the frogs exchanged water, and the x-intercept of this graph was taken to be

the water potential of the seat patch of the frogs (the point at which the water potential of the environment is equal to the water potential of the seat patch). Seat patch water potentials were different from the water potentials of blood implying that these frogs have some control of water uptake not seen in more terrestrial frogs.

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**0796 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Christine Lener, Theodora Pinou

*Western Connecticut State University, Danbury, Connecticut, United States*

**Sea Turtle Epibionts as Indicators of Migration Patterns**

Satellite transmitters are typically used to study sea turtle migration patterns. The cost of such technology often prevents local communities from understanding the behavior of turtles nesting on community beaches. This study examines sea turtle epibionts collected from nesting satellite tracked female sea turtles, and discusses the validity of epibionts as indicators of turtle movement. Species diversity analysis and canonical correspondance analysis provide insight to the relationship between turtle habitat and behavior, and demonstrate how traditional methods of comparative natural history can provide novel approaches towards conservation plans of endangered vertebrates.

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**0065 Herp Ecology & Systematics, Ballroom B., Thursday 8 July 2010; ASIH  
STOYE AWARD ECOLOGY & ETHOLOGY**

Danielle Leopold

*Stetson University, Deland, FL, United States*

**Foraging Success of *Nerodia fasciata* on Native and Exotic Fishes**

Introduced fish species are now a major component of aquatic communities in Florida, however few studies have addressed how these species will impact other trophic levels. I examined differences in prey handling by banded water snakes (*Nerodia fasciata*) when fed either an exotic armored catfish (*Hoplosternum littorale*) or a native catfish species (*Ictalurus punctatus*). *Nerodia fasciata* (n=10) from Florida were used in videotaped trials and were randomly given either a native or an exotic catfish that weighed approximately 10% of the snake's mass. Ten to fourteen days later the same snake was offered the other prey species. I measured attack latency, handling time, number of strikes, the number of times each snake released and recaptured the prey, and whether the fish was consumed. *Nerodia fasciata* can safely consume *H. littorale*, however only 40% were consumed, compared to 90% of the native catfish. Of the *H. littorale* that were attacked but not consumed, 75% died within 1-3 days. Both the mean number of unsuccessful strikes and the mean handling time were significantly higher in trials with

the exotic catfish. There was no significant difference in mean attack latency times between native and exotic species. Armored catfish have a number of physiological (air breathing) and anatomical (locking spines, armor) traits that make them a difficult prey item. However *N. fasciata* apparently perceive them as a suitable food item. Furthermore their predation attempts may result in mortality of the exotic prey.

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### **0787 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Eric Lewallen<sup>1</sup>, Robert Pitman<sup>2</sup>, Nathan Lovejoy<sup>1</sup>

<sup>1</sup>University of Toronto at Scarborough, Toronto, Ontario, Canada, <sup>2</sup>NOAA Southwest Fisheries Science Center, San Diego, California, United States

#### **The Relative Abundance and Distribution of Flyingfishes (Exocoetidae) in the Eastern Tropical Pacific**

Flyingfishes (Exocoetidae) play an important role in epipelagic ecosystems of the eastern tropical Pacific (ETP). Yet, detailed analyses on the relative abundance and distribution of these fishes have not been conducted. Flyingfishes were collected by dipnet in the ETP during research cruises (SWFSC) from 1986 – 2007. In total, 28,326 individuals from 13 species were obtained. Here, we quantify the relative abundance of each species and describe the distribution pattern of each species in the ETP. Relative abundance and distribution of each size class, temporal variation, and correlations between oceanographic processes were also investigated. Our results suggest that size classes are not distributed evenly across the ETP suggesting age-specific habitat preference for each species. The extremely large dataset available for this research provides a unique opportunity to understand the epipelagic ichthyofauna in the ETP. When coupled with available data on marine mammals, seabirds, plankton and oceanography, this study will improve understanding of trophic dynamics in epipelagic ecosystems.

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### **0187 Karel Liem Symposium II, Ballroom D, Friday 9 July 2010**

James Liao

University of Florida, Gainesville, FL, United States

#### **The Metabolic Cost of Trout Swimming in Vortical Flows**

The energetics of swimming in salmonids has held the interest of fisheries biologists, ecologists and physiologists for many decades. Despite the prevalence of turbulence in riverine environments, almost all fish respiration work has taken place in smooth flows. In light of the emerging importance of vorticity in understanding fish locomotion, we measured the metabolic costs of swimming in vortical flows and compared them with

swimming in smooth flows. We recorded the MO<sub>2</sub> for ten juvenile rainbow trout (*Oncorhynchus mykiss*, 15 cm ± 0.6, 51.3 g ± 2.4) using intermittent flow respirometry. We found that trout entraining behind 5 cm diameter cylinders in flows of 4.5 body lengths per second consumed 26.7% less oxygen than trout swimming in the free stream flow (300 mg/kg/hr vs. 220 mg/kg/hr). Preliminary results suggest that fish that Karman gait in the vortex street show similar oxygen consumption rates as fish that position themselves in the bow wake in front of the cylinder and well as entraining to the side of the cylinder.

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**0096 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Yi-fu Lin<sup>1</sup>, Di-Rong Chen<sup>1</sup>, Te-En Lin<sup>2</sup>, Sheng-Hai Wu<sup>1</sup>

<sup>1</sup>*Department of Life Sciences, National Chung-Hsing University, Taichung, Taiwan,*

<sup>2</sup>*Taiwan Endemic Species Research Institute, Nantou, Taiwan*

**Seasonal and Daily Activity of the Yellow-margined Box Turtle (*Cuora flavomarginata*) in Yunlin, Taiwan**

Information on activity patterns of wild animals is important to understand the processes of acquisition and allocation of resources as related to the physiological status of the animals and environmental conditions. The turtles we are studying are from two sources (turtles translocated a water reservoir construction site, and wild turtles in native habitats). We quantified seasonal activity pattern of turtles from recaptured individuals from September 2008 on. Turtles were active from April to November. Using motion/temperature-illuminance data loggers attached to turtle shells one week every month, we also recorded daily activity pattern and environment factors. Based on the data recorded on three turtles in seven occasions spanning three months (October 2009 to January 2010), we found that turtles were active between 06:00 and 18:00. They became inactive when temperature was below 20°C. Frequency of activity increased when the illuminance was above 10000 Lux.

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**0157 AES Feeding Symposium I, 552 AB, Saturday 10 July 2010**

Jason S. Link, Robert J. Gamble, William J. Overholtz, Michael J. Fogarty, Katherine Sosebee

*NOAA NMFS NEFSC, Woods Hole, MA, United States*

**What Would the Ocean Look Like without any Dogfish? Multimodel Inference from Simulations of the Northeast U.S. Large Marine Ecosystem**

Spiny dogfish are one of the more ecologically important fish species in the NEUS LME. As such, much speculation exists regarding the hypotheses that dogfish notably compete with or eat other species of commercial importance. Central to much of this speculation is that spiny dogfish are keeping other commercially important stocks at depressed levels, and for those other stocks of interest to recover, dogfish will need to be largely reduced in abundance, if not functionally removed from the ecosystem. To explore the range of possibilities associated with and implied by this set of speculations, we ran several simulations using a range of models. The results from our multimodel simulations generally concurred: after removing or reducing dogfish from the models, most groundfish stocks did not show the anticipated drastic increases. Key prey of dogfish, including small pelagic fishes and squids, varied in their response. Only one major prey of dogfish, ctenophores consistently tended to show a clear, positive response suspected to be due to a release from predation pressure. Collectively our multimodel inference demonstrates the need to consider indirect responses due to the highly interconnected food web of the NEUS LME and that a binary predator-prey response is unlikely in such an ecosystem. We conclude that the potential for unintended consequences remains quite high from such virtual experiments as in these simulations. We thus recommend that scenarios such as these be considered *in silico* as part of a management strategy evaluation before ever being considered for further application *in situ*.

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**0155 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Jason S. Link, Brian E. Smith, David McElroy, Richard S. McBride, John Hauser, Katherine Sosebee

*NOAA NMFS NEFSC, Woods Hole, MA, United States*

**The Trophic Role of Assorted Skate and Dogfish Species in the Northwest Atlantic Ecosystem**

The trophic role of individual elasmobranch species has been explored for the northwest Atlantic, but rarely for a collective group of species. Here we combine more than 35 years of data to compare the relative and cumulative role of seven species of skate and

two species of dogfish in this ecosystem. The elasmobranch species included were the barndoor (*Dipturus laevis*), winter (*Leucoraja ocellata*), clearnose (*Raja eglanteria*), rosette (*Leucoraja garmani*), little (*Leucoraja erinacea*), smooth (*Malacoraja senta*), and thorny (*Amblyraja radiata*) skates, plus the smooth (*Mustelus canis*) and spiny (*Squalus acanthias*) dogfishes. Most of these nine species could be characterized as either benthivorous, piscivorous or a combination thereof in nature. Some were, surprisingly, even major predators of gelatinous zooplankton. Major determinants of diet were noted and largely corresponded to changes in predator size, season, or era of the time series; spatial considerations were less prominent as a diet determinant. The total amount of consumption by these stocks was substantial, in many years averaging over a quarter of a million metric tons, largely driven by the more abundant spiny dogfish and winter skate. Currently, these elasmobranchs collectively represent some of the most prominent piscivores and benthivores in this ecosystem. The amount of energy cumulatively removed by these elasmobranchs is notably more than for the major groups of teleost species, implying the importance of tracking the trophodynamics of these species. As the fish community of this ecosystem remains dynamic, it is highly probable that any changes therein will nexus through these elasmobranch species.

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#### **0417 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Robert Literman, Jennifer Neuwald, Nicole Valenzuela

*Iowa State University, Ames, IA, United States*

#### **Differential Embryonic Mortality in Two Turtle Species with Different Sex Determination Pathways**

The adaptive value and maintenance of environmental sex determination (ESD) is an intriguing question in biology with molecular, ecological, and evolutionary implications. To understand why this trait remains present throughout evolutionary time, we must uncover the fitness benefits that developmental plasticity imparts to organisms which utilize it. In this study we tested the hypothesis that eggs of animals with ESD are more capable of surviving in a variable environment than species with genotypic sex determination (GSD). We used a controlled comparative experimental design to study the embryonic mortality of two turtle species, the painted turtle *Chrysemys picta* which has temperature-dependent sex determination (TSD), and the GSD spiny softshell turtle *Apalone spinifera*. Eggs of each species were incubated under identical conditions at multiple constant and fluctuating temperature profiles. Differences in embryonic mortality rates of the TSD and GSD species under constant and fluctuating thermal regimes are discussed along with the possible evolutionary implications.

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**0527 Fish Ecology, 555 AB, Sunday 11 July 2010**

Caitlyn Little, Devin Flawd, James Sulikowski

*The University of New England, Biddeford, ME, United States*

**Movement Patterns of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) in the Saco River, ME**

The Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*, is a large, anadromous fish that ranges along the eastern coast of North America from Labrador in Canada to Florida in the United States. Overfishing and habitat degradation during recent decades have severely depleted or extirpated several historic sturgeon populations. The decreasing population trends have prompted listing of the Atlantic sturgeon as a federal Species of Concern throughout its range in the United States. Over approximately the last 50 years, this species has been documented only in the Penobscot and Kennebec River complex in the state of Maine. Beginning in 2007 however, Atlantic sturgeon have been observed in the Saco River (the fourth largest river in Maine). In order to gain insight into the sudden appearance of this species in this river system, an acoustic array consisting of 10 VEMCO VR2W receivers was deployed in the spring of 2009. This array covers the area between the last dam seaward and the mouth of the river, a stretch of approximately six nautical miles. From May 2009 to November 2009, 34 sturgeon ranging from 94-188cm total length were captured using a 100m, 30cm stretched mesh gillnet. Total bottom soak time for this study was 12.45 hours. Acoustic transmitters were implanted in 21 captured specimens. Preliminary analysis of detections indicates that sturgeon may be displaying diurnal movement patterns within the river and that at least one of the tagged individuals has traveled the length of the lower portion of the river to the last seaward dam.

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**0612 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Jessie Livingston, Jim Gelsleichter

*Department of Biology, University of North Florida, Jacksonville, Florida, United States*

**Preliminary Observations on Relaxin Receptor-like Activity in Male Sharks and Rays**

The purpose of this study is to investigate potential roles for relaxin in regulating reproduction in male elasmobranchs. Relaxin is a 6kDa peptide hormone present in most vertebrate groups and is best known for its ability to stimulate remodeling of the female reproductive tract and birth canal during pregnancy and parturition. However, the function of this hormone in male vertebrates remains largely unclear. Prior research on the bonnethead shark, *Sphyrna tiburo*, has demonstrated that serum relaxin concentrations increase in this species during late spermatogenesis and the mating

period suggesting a role for relaxin in regulating processes such as spermiation, sperm transit through the male reproductive tract, and/or copulation. In this study, immunocytochemistry was used to detect relaxin receptor-like immunoreactivity in the reproductive tract of the male *S. tiburo* and a variety of other species including the Atlantic stingray *Dasyatis sabina* and the blacknose shark *Carcharhinus acronotus*. Preliminary results suggest that relaxin receptor-like activity is primarily localized to late stage and evacuated spermatocysts in the testis of male elasmobranchs, strongly supporting a role for this hormone in regulating some aspect of spermiation. Possible relationships between relaxin and cellular actions that would mediate sperm release, such as increased production of extracellular matrix-degrading enzymes, are considered. In addition, evidence of relaxin receptor-like immunoreactivity in other components of the reproductive tract, such as the epididymis and seminal vesicle, is presented.

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## **0542 Fish Genetics & Biogeography, 556 AB, Friday 9 July 2010**

Lisa Lobel<sup>1</sup>, Devin Drown<sup>3</sup>, Paul Barber<sup>2</sup>, Phillip Lobel<sup>1</sup>

<sup>1</sup>*Boston University, Boston, MA, United States*, <sup>2</sup>*UCLA, Los Angeles, CA, United States*, <sup>3</sup>*Washington State University, Pullman, WA, United States*

### **Determining Parentage of Damselfish Embryos Using Microsatellites Reveals Mate Selection Patterns**

We investigated the mating system of the damselfish, *Abudefduf sordidus*, (Johnston Atoll, Central Pacific Ocean) using genetic markers. Since spawning was rarely observed, microsatellite markers were developed to address several questions regarding both male and female mate selection and reproduction. Offspring from 343 clutches in 208 nests collected over seven consecutive nesting cycles (within one mating season) were genotyped using six polymorphic microsatellite loci. A nest contained one to five clutches of embryos, found in discrete patches, during a given cycle. Paternal genotypes were constructed by identifying common alleles from combined offspring genotypes. In 280 of 343 clutches the offspring had genotypes consistent with paternity by the attendant male. In the remaining 63 (18%) clutches, some offspring displayed genotypes inconsistent with the paternal male, suggesting reproductive parasitism by sneaker males. Males used the same nest site repeatedly and only in some cases used two nest sites. Maternal genotypes in clutches with a single sire (N = 280) were identified based upon the fact that only two maternal alleles were present after subtracting the paternal genotype. Of the females (N = 195) identified, 65% spawned once during the seven cycles, while the remaining females spawned two to six times during the same period. In contrast, males (N = 37) received between two and 19 clutches during the study. When spawning, a female deposited all of her eggs with one male in one clutch. These genetic data revealed previously unknown patterns of mating and mate selection.

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## **0469 Karel Liem Symposium II, Ballroom D, Friday 9 July 2010**

Phillip Lobel

*Boston University, Boston, MA, United States*

### **Searching for Evolutionary Novelties in Lac Tele, Congo: New Fishes and Giant Pythons**

A highlight of discussion in Karel Liem's lab during the latter 1970's was the topic of explosive radiations among fishes adapted to novel habitats. Liem's interest in adaptive radiations based on morphological diversification was a stimulating subject between him and his first graduate student clan (Lauder, Levine, Ono and me). Prof. Liem (and my fellow students) provided the intellectual stimulus for my conducting 3 expeditions (1986, 1988, 2003) into the deep jungles of Congo, Africa in search of new fishes. The hope was to find another species flock in an isolated lake, in northern Peoples Republic of Congo. It turned out that this remote lake (Lac Tele) was also the rumored home of a mysterious giant animal as yet unknown to science (aka Mokele mBembe). We found a suite of fishes restricted to this lake but more impressively; we found an abundance of giant pythons. The lake is oval shaped, about 5 by 6 km. The bottom is widely layered in decaying leaf litter. Maximum depths ranged 3 to 5 m. We collected about 36 species belonging to 14 families. Fishes included 1 lungfish, 8 mormyrids, 6 characins, several silurids, 5 killfish, 2 anabantids, 1 channid, and 4 cichlids. Several of these fishes are undescribed and appear to be found only in Lac Tele. We also recorded native names and associated local folklore for various fishes. A conceptual model for gigantism in Lac Tele pythons is proposed based on the fluctuating lake habitat, abundant prey and minimal threats.

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## **0489 Acoustics Symposium I, Ballroom D, Saturday 10 July 2010**

James Locascio, Ernst Peebles, David Mann

*College of Marine Science, St. Petersburg, Florida, United States*

### **Quantitative Measurements of Black Drum Sound Production and Spawning**

Long-term Acoustic Recording Systems (LARS) were used to document diel and seasonal patterns of sound production by spawning aggregations of black drum (*Pogonias cromis*) in estuarine canal systems of southwest Florida. Hydrophone array recordings were used to localize the position of calling black drum and estimate source levels. The temporal and quantitative relationship between egg production and sound production was examined from hourly collections of black drum eggs (1800 - 0400 hr) and simultaneous acoustic recordings made on two consecutive evenings, five times during the spawning season. Black drum sound production was strongly diel, beginning near dusk and lasting for several hours. Sound production occurred during

October through April and peaked in February-March, a pattern consistent with the documented spawning season of this species in the Gulf of Mexico. A total of 1,025 source level estimates were made from six different fish and averaged 165 dBRMS re: 1 $\mu$ Pa SPL (SD=1.0). Localization of consecutively produced calls by an individual indicated patterned swimming behavior. Acoustic communication range for black drum based on empirical data of source level, signal propagation, auditory sensitivity, and background levels was estimated at 33 - 108 m. Neither the timing nor quantity of sound production was correlated with egg production on a nightly basis. These results indicate that patterns in sound production are not useful for predicting patterns in egg production by black drum on a daily scale but do provide accurate characterization of spawning behavior on a seasonal basis.

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## **0140 Fish Conservation, Ballroom B, Friday 9 July 2010**

Ken Longenecker<sup>1</sup>, Ross Langston<sup>2</sup>

*<sup>1</sup>Bishop Museum, Honolulu, Hawaii, United States, <sup>2</sup>Windward Community College, Kaneohe, Hawaii, United States*

### **Size Structure of Reef-Fish Populations Exploited by a Papua New Guinea Subsistence Community**

As part of an effort to create a self-sustaining environmental conservation program at Kamiali, Papua New Guinea, we are generating baseline information on the marine portion of a 47,000-hectare wildlife management area. Here we use laser videogrammetry to describe the size structure of exploited reef-fish populations under traditional marine tenure. We generated size data for 17 species and found a typical individual in the exploited reef-fish community is 52% of its reported maximum length. In the subset of 10 species for which size at maturity is known, a typical individual is 99% of female reproductive size. Considering sex ratios (known for only four species) suggests an average 24% of a population is reproductively mature females. Residents of Kamiali routinely deny practicing conservation techniques, however several village characteristics are likely to promote sustainable fish populations. These include: exclusive harvesting rights, distance to commercial markets, and low-technology fishing methods. This information will be useful in guiding the village's future conservation efforts and to evaluate the effectiveness of those measures.

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**0721 NIA I, 556 AB, Saturday 10 July 2010; NIA BEST STUDENT PAPER AWARD**

Nicolas Longrie, Johann Delcourt, Pascal Poncin, Pierre Vandewalle, Eric Parmentier

*University of Liège, Liège, Belgium*

**Sound Production and Associated Behaviors in the Nile Tilapia, *Oreochromis niloticus* (Cichlidae)**

Several cichlid species, from both Africa and South America where the family has known a big development, have been shown to have the ability to produce sound (*Tramitichromis intermedius*, *Pseudotropheus* spp., *Cichlasoma centrarchus*, ... ). In the Nile Tilapia, *Oreochromis niloticus* (Linnaeus 1758), males are able to emit sound (pulse duration > 100 ms; frequency < 200Hz) in several behavioral contexts (territorial defence, courtship). Observations were made with the aim of determining the potential influence of the sex of an « intruder » on the territorial male's sound production, and to link the sound to specific behaviours within these contexts. Behaviours were studied in situations such as « Territorial Male - Male(s) », « TM - Female(s) ». *Oreochromis niloticus* females have also been studied, as they display strong territorial behaviors in certain contexts, during which sound production could occur (for example mouthbrooding).

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**0262 NIA I, 556 AB, Saturday 10 July 2010**

Hernan Lopez-Fernandez<sup>1</sup>

<sup>1</sup>Royal Ontario Museum, Toronto/Ontario, Canada, <sup>2</sup>University of Toronto, Toronto/Ontario, Canada

**Timing and Patterns of Divergence in Neotropical Cichlid Fishes**

Neotropical cichlids comprise more than 600 species with an enormous ecological, morphological and behavioral diversity. However, we know very little about the evolutionary processes responsible for the origin of the group. I use a molecular phylogeny of virtually all Neotropical cichlid lineages to estimate times of divergence and rates of diversification within the group. I combined data from recent fossil findings with dated geological events to estimate cichlid divergence times using Bayesian relaxed-clock methods. I use the resulting chronogram to test whether these patterns are compatible with processes of adaptive radiation. Neotropical cichlids appear to have originated in the Late Cretaceous between 90 and 130 Ma. The origin of the clades Geophagini, Cichlasomatini and Heroini corresponds with increased diversification rates about 100 Ma ago, supporting phylogenetic evidence that suggests they originated through ancient adaptive radiation. More recent episodes of accelerated diversification

may have occurred between the late Paleogene and early Miocene, especially during diversification of the mostly Central American amphiploids clade. From the Late Cretaceous through the Miocene, South and Central America were repeatedly affected by climate changes, sea-level variations and major geological disruptions. This generalized environmental instability likely drove cichlid diversification by repeatedly imposing novel ecological demands. Morphological and ecological specialization probably became widespread during these ancient periods of rapid diversification. As illustrated by cichlids, studying timing and patterns of divergence in different groups of Neotropical fishes should build an integrated understanding of the historical conditions under which the richest freshwater fish fauna on the planet evolved.

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## **0241 Fish Conservation, Ballroom B, Friday 9 July 2010**

Benjamin D. Lorson, Jonathan A. Freedman, Jay R. Stauffer, Jr.

*Pennsylvania State University, University Park, PA, United States*

### **Distribution of Allegheny River Fishes Using a New Sampling Technique**

Small benthic fishes have been under represented in historic sampling of medium to large rivers. Sampling techniques are the main reason for this as many of the historic sampling techniques do not target these fishes in deepwater habitats. The Allegheny River in northwest Pennsylvania contains many habitats that have not been able to be reached in historic sampling surveys. There are also many portions of this river that have never been sampled and much of the collection data are outdated. The electrified benthic trawl is a new sampling gear that allows the sampling of small benthic fishes in deepwater river habitats. A systematic sampling of the Allegheny River with an electrified benthic trawl allowed us to sample the diverse ichthyofauna inhabiting the mainstem of this river. We sampled 67 sites (286 trawls) and collected 10,333 fish representing 49 species. Benthic fishes (24 species) comprised 81.8% of the total catch and included 15 darter species (59.6% of the total catch). We collected eight species of special concern including four species of darters.

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## 0392 Herp Conservation II, Ballroom B, Sunday 11 July 2010

Robert Lovich<sup>1</sup>, Chris Petersen<sup>2</sup>, Priya Nanjappa<sup>3</sup>, Michael Lannoo<sup>4</sup>, Ernie Garcia<sup>5</sup>

<sup>1</sup>*Naval Facilities Engineering Command, Southwest, San Diego, CA, United States,*

<sup>2</sup>*Naval Facilities Engineering Command, Atlantic, Norfolk, VA, United States,*

<sup>3</sup>*Association of Fish & Wildlife Agencies, Washington, DC 20001, United States,*

<sup>4</sup>*Indiana University School of Medicine, Terre Haute, IN, United States,* <sup>5</sup>*Friends of PARC, Weaverville, CA, United States*

### **The DoD PARC Strategic Plan: Purpose, Strategies, and Implementation Opportunities**

The Department of Defense (DoD) lands contain the highest number of endangered species and habitats when compared to any federal landowner in the United States. Likewise, the herpetofaunal diversity and abundance on DoD lands is equally remarkable. While herpetofauna on military lands have been studied, managed, and conserved with robust funding and resources, studies have been accomplished without the benefit of overarching guidance. Given the diversity of both the herpetofauna and habitats across DoD landscapes, consistent approaches are important for management, conservation, monitoring, and research. The DoD has joined with Partners in Amphibian and Reptile Conservation (PARC) to develop a strategic plan for herpetofauna. The Plan will create a framework for the implementation of effective herpetofaunal research, management, monitoring, and conservation on DoD lands. The Plan will guide science-based management of herpetofauna and their habitats, set conservation priorities and objectives, and provide the needed tools for ongoing management, education, and outreach. Complementing the success of the DoD Partners in Flight (PIF) Strategic Plan, which has improved the status of avian communities on DoD lands, the proposed Plan will similarly benefit herpetofauna while providing opportunities for increased partnership with the greater herpetological community. Specifically, the Plan will offer guidance for incorporating herpetofauna habitat management and conservation efforts into installation Integrated Natural Resource Management Plans. In addition, the DoD PARC Strategic Plan will help DoD justify its unique role of stewarding natural resources in the United States, while benefiting the national defense mission requirements.

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## 0548 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Germán E. Lozano, Charles W. Olaya-Nieto

*Universidad de Córdoba, Lorica, Cordoba, Colombia*

### **Length-Weight Relationship of Common Snook (*Centropomus undecimalis*) in the Cispata Bay, Colombia**

The common snook (*Centropomus undecimalis*) is a very important species in the fishery in the Cispata Bay, Colombia. In order to estimate its length-weight relationship 247 samples was collected. The sizes ranged between 28.0 and 88.0 cm in total length (TL) and the total weight (TW) between 110.0 and 8000.0 gram (g). The length-weight relationship was estimated with the equation  $TW = a TL^b$ . The equations estimates were:  $TW = 0.002 TL^{3.43} (\pm 0.11)$ ,  $TW = 0.009 TL^{3.05} (\pm 0.17)$  and  $TW = 0.002 TL^{3.42} (\pm 0.16)$  with positive allometric growth coefficients, confidence intervals of 95% and high correlation coefficients ( $r$ ) with values of 0.95, 0.94 y 0.97 for males, females and combined sexes, respectively. In March and June the smallest and highest condition factor were observed, respectively, and this values corresponding to combined sexes; while that the annual mean condition factor is highest for females. The condition factor is related with spawning of common snook, between March and October.

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## 0778 Fish Systematics II, Ballroom D, Monday 12 July 2010

Ma. de Lourdes Lozano-Vilano<sup>1</sup>, Justin Bagley<sup>2</sup>

<sup>1</sup>*Universidad Autónoma de Nuevo León, San Nicolás de los Garza, Nuevo León, Mexico,*

<sup>2</sup>*Brigham Young University, Provo, UT, United States*

### **New Species of Poeciliid Fish from Northern Mexico, with Comments about its Genus**

It is reported a new species of poeciliid fish of genus *Heterandria*, was found in chanel from Allende, Coahuila, México. The new species is related with *Heterandria formosa*, that is not reported from México, is distributed in coast of North Carolina and Florida until Louisiana, USA, the new species and *Heterandria formosa* are similar in size, they are a pygmy species, are very small individuals, do not reach 3 cm, and some characteristics of coloration, like the bars in the body sides and the ocelo of the dorsal fin. They are different in dentition type, structure of the gonopodium, measurements and genetic studies. The same form *Heterandria formosa* y *H. sp.* are different of *Heterandria bimaculata* and *H. jonesii* of the South of México, in the size of body, gonopodium, and others morphological characteristics, as might be deemed to correspond to a new genus.

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## **0616 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Emmet Allen Luck, Rachel Goodman

*Hampden-Sydney College, Hampden-Sydney, VA, United States*

### **Examining Geographic Variation in Sexual Size Dimorphism in the Lizard, *Anolis carolinensis***

We examined whether populations of the lizard *Anolis carolinensis* vary in degree of sexual size dimorphism (SSD) across several populations in the southeastern United States. Many animals exhibit SSD that may be related to male competition, female fertility or young-carrying capacity, and differences in the ecology of the sexes. Lizards in the genus *Anolis* have served as a model species for understanding niche use, habitat partitioning, and convergent evolution of body size and form. Studies of *Anolis* species have indicated that males and females may occupy different niches that may contribute to SSD. Since temperature, precipitation, and habitat complexity vary over the range of *A. carolinensis*, we predicted that SSD may also vary among populations across the range. In 2006 and 2007, 627 lizards were collected from 19 populations across the southeastern United States. Mass, body and tail length measurements were taken on live specimens. All lizards were humanely euthanized and preserved in formalin. We measured maximum head width and maximum diameter of fore- and hind-limbs on preserved specimens using digital calipers. Lizards were x-rayed, and morphological measurements (length of head, spine, femur, tibia, and interlimb length) were taken from digital images of radiographs using ImageJ computer software. We combined measurements from live animals and preserved specimens to analyze how males and females differ in body size and shape, and how these relationships differ among populations. Degree of SSD was compared among populations along with climatic data, latitude, and longitude to examine any climatic or geographic trends in SSD.

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## **0596 Lundberg Symposium, Ballroom D, Sunday 11 July 2010**

Kyle Luckenbill

*Academy of Natural Sciences, Philadelphia, PA, United States*

### **Lundberg: A Retrospective Through Figures**

John Lundberg has made significant contributions to the advancement of the study of systematics over his long career. His list of publications speaks for itself and the figures from his work speak just as loudly. After working with John you soon realize that the only thing more satisfying to him than finding a new character or resolving a phylogenetic relationship is finding the most visually pleasing and informative way to present it. Over his career the art of creating figures has changed a great deal. He has gone from slides to digital photography, press-on letters to Adobe Illustrator, film

radiographs to digital radiographs and CT scans, printed media to web publications, and he has embraced every advancement. We will look at his work from his early days as a student to more recent work involving more advanced technology and new ways of presenting information visually.

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### **0539 Fish Behavior/Acoustics, 555 AB, Sunday 11 July 2010**

Joseph Luczkovich, Mark Sprague

*East Carolina University, Greenville, NC, United States*

#### **Sounds of Fishes: How Much Can Be Learned about the Behavior, Ecology, Evolution and Fisheries Management from Listening to Fishes?**

Fishes hear and produce a variety of sounds that allow them to interpret their environment as well as communicate with their conspecifics. Species-specific sounds are associated with predator avoidance, territory defense, reproduction, swimming, and feeding. Males make advertisement sounds to communicate their readiness to spawn, especially in the Families Sciaenidae, Gadidae, Holocentridae and Batrachoididae. Predator-prey interactions are acoustically mediated in some fishes. Playback studies with bottlenose dolphins (*Tursiops truncatus*) show that dolphins orient toward the sounds of fishes, and dolphin vocalizations cause silver perch (*Bairdiella chrysoura*, Sciaenidae), longspine squirrelfish (*Holocentrus rufus*, Holocentridae) and gulf toadfish (*Opsanus beta*, Batrachoididae) stop producing sounds. Sounds provide information on the behavior, species, sex, and size of the individual. Some female fishes may utilize sound to assess male fitness, suggesting sound characteristics (dominant frequency, pulse patterns, and loudness) are traits under selection pressure. Mate selection based on sounds and acoustic competition between males has been documented in the Batrachoididae. In sympatric species of the genus *Cynoscion* (Sciaenidae), the dominant frequency is a function of fish size, but the pulsing patterns produced by *C. regalis* are distinct from *C. nebulosus*, suggesting it could be an important cue for females during mate choice. There appears to be spatial and temporal differences in the calling sites for these sympatric congeners, thus supporting the hypothesis of acoustic competition. Because of these variations in sound characteristics, biologists can now identify spawning habitats, infer behavior patterns, and use the sounds of fishes as “natural acoustic tag” in fisheries management.

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## 0144 Acoustics Symposium III, Ballroom D, Sunday 11 July 2010

Marco Lugli

*University of Parma, Parma, Italy*

### **Ambient Noise and Shelter Acoustics Explain the Low-frequency Communication in Mediterranean Gobies**

Many soniferous teleosts using stones or other types of submerged objects for reproduction live in very shallow environments characterized by high background noise levels and short-range propagation of low frequencies. Yet, the use of low frequency sounds for communication is widespread among these fishes. This puzzling fact has remained unexplained for decades, with no convincing explanation being offered for the paradox. The present study examines the relationships between ambient noise spectrum, shelter resonance and main sound frequencies among nine species of Mediterranean gobies reproducing under stones and shells in very shallow freshwater (stream, vegetated spring), brackish (two lagoons) and marine (sandy/rocky sea shores) habitats. Ambient noise spectra of these habitats featured a low-frequency quiet window centered at 100 Hz (stream, sandy/rocky shore), or at 200 Hz (spring, brackish lagoon). The main frequencies of the species' sound matched the frequency band of the quiet window in the ambient noise typical of their own habitat. Natural shelters (flat stones, shells of several bivalve species) amplified the sound frequencies mainly in the range 100-150 Hz. Gain was higher for stones than for shells. The joint effect of hollow acoustics and the quiet window determined a remarkable increase of the S/N ratio at lower frequencies, thereby explaining the low frequency acoustic communication by these gobies.

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## 0633 Fish Evolution, 555 AB, Saturday 10 July 2010; ASIH STOYE AWARD GENERAL ICHTHYOLOGY

Daniel Lumbantobing<sup>1</sup>

<sup>1</sup>*The George Washington University, Washington, DC, United States*, <sup>2</sup>*Smithsonian Institution, Washington, DC, United States*

### **Recognition and Relationships of Areas of Endemism in South East Asia based on the *Rasbora sumatrana* Species Group (Teleostei; Cyprinidae)**

The *Rasbora sumatrana* species group is one of the most diverse and widespread yet problematic taxa in the freshwater genus *Rasbora*. Its species are superficially similar and therefore have been ignored taxonomically. In a phylogenetic analysis of the genus using morphological characters, the *R. sumatrana* species group is paraphyletic: some species are sister to the monophyletic *R. caudimaculata* species group; the two groups are now classified together. The *R. sumatrana* species group is a clade supported by three

synapomorphies: (1) triangular basicaudal blotch; (2) 25–26 pored lateral line scales; and (3) medial ramus of pelvic girdle without anterior process. Twenty-five species, including 9 undescribed, are recognized in the species group, herein further classified in 4 species complexes: (1) *R. caudimaculata* complex; (2) *R. elegans* complex; (3) *R. sumatrana* complex; and (4) *R. volzii* complex. New species and species complexes are identified using differences in body color patterns (black midlateral stripe, basicaudal blotch, and caudal pigmentation) and osteological characters (basihyal and urohyal shape). A cladogram of each complex is reconstructed using morphological characters. Within the *R. sumatrana* complex, all species are allopatric, and some are sympatric with species of the other complexes. Based on distribution of the four species complexes and of other *Rashora* species, 20 endemic areas are recognized in South East Asia. The relationships of the areas are inferred by generating areagrams of each complex and examining them for general patterns. These patterns are interpreted with respect to the geological and biological history of South East Asia.

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## **0521 Plenary, Ballroom A, Thursday 8 July 2010**

John Lundberg

*Academy of Natural Sciences, Philadelphia, PA, United States*

### **Authentic American Cryptoichthyology**

The nearly 1200 species of modern North American freshwater fishes are well delimited and properly named. Late Cretaceous and Cenozoic fossils add dozens more named and informative freshwater fishes to the emerging continental assemblage. Together, these are the known knowns. The North American ichthyofauna had complex phylogenetic, temporal and biogeographic origins, and its inventory is not done – there are unknown unknowns. Some gnarly fish problems have been recently cracked but we still confront long-standing puzzles: cryptically fuzzy species boundaries; unresolved rogue taxa within clades; endemic clades with uncertain but likely distant extralimital or deep phylogenetic reach. We commonly have new encounters with previously unseen fossil fishes and, uncommonly, someone finds a previously undetected living species. These are the better known and the lesser known unknowns. The discoveries and puzzles that ichthyologists love best are those with novel or unexpected or uncertain or unimagined results. Prominent and obscure real examples will illustrate the points, some with the generous assistance of a few good, intrepid ichthyological explorers and colleagues.

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## 0080 Lundberg Symposium, Ballroom D, Sunday 11 July 2010

Paula Mabee, Wasila Dahdul

*University of South Dakota, Vermillion, SD, United States*

### **New Tools for the Study of Development and Evolution of the Fish Skeleton**

Skeletal variation across fishes is widely recognized as resulting from evolutionary changes in underlying genetic and developmental factors. Although relatively little is known about these factors across fishes, a wealth of knowledge of genetics and development has been accumulated for the model organism zebrafish. Because developmental processes are highly conserved even across very distantly related organisms, this knowledge can potentially be leveraged for understanding the evolution of skeletal diversity. As a proof of concept, we extracted the comparative morphological data from ostariophysan fishes in concert with initiating an anatomy ontology for fishes, the Teleost Anatomy Ontology (TAO). TAO was built with community input and used for annotation of images and evolutionary phenotypes. In the Phenoscape Knowledgebase ([kb.phenoscape.org](http://kb.phenoscape.org)) the annotated evolutionary data are combined with similarly structured data from zebrafish genetics and mutant phenotypes (from [zfin.org](http://zfin.org)). Using the reasoning enabled by the underlying ontology-based structure, we inferred a set of candidate genes including *eda*, *edar*, and *brpf1* for morphological characteristics of catfishes (e.g. loss of scales and absence of basihyal element). Ongoing in situ hybridizations will determine whether the predicted tissue-specific expression patterns of these candidate loci in *Ictalurus punctatus* and other catfishes match those predicted from zebrafish. This in turn will test the broad-scale usefulness of the Phenoscape Knowledgebase for devo-evo predictions. The Phenoscape KB has facilities for browsing, sorting, and collating morphological systematic data that allows unprecedented access to a rich collection of data by developmental and evolutionary biologists.

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## 0150 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Laura Macesic<sup>1</sup>, Erin Blevins<sup>2</sup>, Dana Mulvaney<sup>1</sup>

<sup>1</sup>*Florida Atlantic University, Boca Raton, Florida, United States*, <sup>2</sup>*Harvard University, Cambridge, Massachusetts, United States*

### **Pectoral and Pelvic Fin Coupling During Augmented Punting in the Freshwater Stingray, *Potamotrygon hystrix***

Punting, a form of aquatic locomotion performed by stingrays and hippos alike, involves depressing paired limbs into the substrate, then pushing off and gliding until the next limb depression cycle. In batoids (skates and rays), punting is performed either entirely with the pelvic fins (true punting), or in concert with the pectoral fins,

(augmented punting), as is seen in the freshwater stingray, *Potomotrygon hystrix*. We used high-speed video to quantify the motor patterns of the pectoral and pelvic fins during punting to test whether the fins acted synchronously to generate a uniform thrust vector. We filmed ventrally to quantify pelvic fin punting cycles and laterally to quantify the maximum and minimum amplitude of each pectoral undulation (i.e. crest and trough of each wave). We found that the start and end of each pelvic cycle coupled with both the maximum and minimum amplitude of a single pectoral undulation within individuals ( $n=4$ ;  $p<0.05$ ,  $p<0.01$ , respectively). Moreover, the minimum amplitude, likely the thrust generating portion of the wave, coincided with the end of the pelvic fin thrust for all rays ( $p<0.01$ ). This may be an efficient thrust generator, as pectoral undulation could add to the thrust generated by the pelvic fins. Timing of maximum pectoral fin amplitude was not consistent among the rays ( $p=0.64$ ). Pectoral fin undulation frequency during punting (mean= $2.25\text{Hz}\pm 0.56\text{SD}$ ) was similar to previously published values during swimming for the blue-spot stingray (mean= $2.32\text{Hz}\pm 0.42\text{SD}$ ), which suggests that the pectoral fin motor pattern may be fixed regardless of the type of locomotion being performed.

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## 0710 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Suzanne Macey<sup>1</sup>, Andrew Myers<sup>2</sup>, J. Alan Clark<sup>1</sup>

<sup>1</sup>Fordham University, Bronx, NY, United States, <sup>2</sup>SUNY ESF, Syracuse, NY, United States

### Hot Spots: Nest-site Selection in Bog Turtles (*Glyptemys muhlenbergii*) and the Implications for Management

The bog turtle (*Glyptemys muhlenbergii*) is a federally-threatened species, primarily because the early successional wet-meadow/fen habitat bog turtles require is increasingly rare. However, little is known about bog turtle nesting habitat requirements and preferences. Understanding nesting microhabitat conditions is important because such conditions may not only determine the survival of turtle embryos, but may also determine the sex of individuals if bog turtles have temperature-dependant sex determination. I will examine the hypotheses that (1) female bog turtles preferentially nest in areas with reduced woody and invasive vegetative cover and height; (2) selected sites are warmer than random points within nesting range; and (3) warmer nests have a higher hatching success rate. An understanding of the relationship between vegetative cover, nest temperature, and nest success will provide insight into understanding maternal nest-site selection in the bog turtle as well as relevant data for improving the preservation and management of nesting habitat.

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**0334 AES GRUBER AWARD, 551 AB, Friday 9 July 2010**

Anabela Maia, Cheryl Wilga

*University of Rhode Island, Kingston, RI, United States*

### **Comparative Anatomy of Bamboo Shark and Spiny Dogfish Dorsal Fins**

The dorsal fin anatomy of benthic white-spotted bamboo sharks *Chiloscyllium plagiosum* and benthopelagic spiny dogfish *Squalus acanthias* reflects their swimming habits. Differences are apparent in external and internal anatomy. Bamboo sharks have a larger second dorsal fin area and proportionally more muscle extending into both dorsal fins than spiny dogfish. Skeletal elements are composed of a variable number of basals and radials that are almost indistinguishable and lack a clear arrangement in spiny dogfish. In contrast, bamboo sharks have a single row of multiple plate-like elongated basals followed by a row of shorter radials that fans out into the fin web. Between each basal and radial lays a cartilaginous pad, indicating a movable joint. Bamboo fin muscle bundles are discrete and correspond with the radials. Spiny dogfish fin muscles have a more compact structure and lack discrete bundles. Dorsal fin complexity in spiny dogfish is increased by the presence of an anterior spine. The spines are wrapped in thick collagen fibers pointing posteriorly, which insert into the skin near the middle portion of the fin base. Similar bundles of collagen fibers run in the opposite orientation from the middle to the end of the fin base. The collagen fibers appear to make the fin more rigid but also create bending planes in the middle of the fin. Dorsal fin bending in dogfish may play a role in stabilizing forces, while the complex structure of bamboo shark fins imparts greater mobility to redirect thrust forces, as corroborated by kinematic analyses.

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**0145 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Maria Claudia Malabarba<sup>1</sup>, Luiz R. Malabarba<sup>2</sup>, Cecília del Papa<sup>3</sup>

<sup>1</sup>*Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS, Brazil*, <sup>2</sup>*Departamento de Zoologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil*, <sup>3</sup>*CONICET, Universidad Nacional de Salta, Buenos Aires, Argentina*

### **A New Species of *Gymnogeophagus* (Perciformes: Cichlidae), from the Eocene Lumbreira Formation in Argentina**

A new cichlid referable to the extant genus *Gymnogeophagus* is described from the Eocene Lumbreira Formation of the Salta Group, northwestern Argentina. The fossil species of *Gymnogeophagus* presents the synapomorphies that support the genus: absence of supraneurals and a presence of a forward spine in the first dorsal pterygiophore. We

further tested its relationships using a matrix of 136 morphological characters for geophagines, of whose only 48 characters (35.3%) were observable in the fossil, and found this cichlid in a clade containing the other two *Gymnogeophagus* species included in the analysis. Two additional characters used herein (the number of vertebrae and the sexually dimorphic dorsal fin) places the fossil species as sister group to *G. gymnogenys* clade, that contains all mouth breeder species of the genus. The existence of an early to middle Eocene aged species presenting the synapomorphies and the appearance of a modern genus requires the acceptance of an extensive differentiation from the basal cichlid lineages. Extant *Gymnogeophagus* species are restricted to the La Plata drainage and a few coastal drainages of southern Brazil and Uruguay. The occurrence of an Eocene fossil in the geographical area corresponding to the present distribution of the genus suggests the patterns of distribution and endemism of the Neotropical fish fauna have a very old history in the continent.

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## **0058 Acoustics Symposium II, Ballroom D, Saturday 10 July 2010**

Stefano Malavasi<sup>1</sup>, Gianluca Polgar<sup>2</sup>, Giacomo Cipolato<sup>1</sup>, Vyton Georgalas<sup>1</sup>, Jennifer Clack<sup>3</sup>, Patrizia Torricelli<sup>1</sup>

<sup>1</sup>University Ca' Foscari- Dep. Environmental Sciences, Venice, Italy, <sup>2</sup>Univeristy La Sapienza- Dep. Animal and Human Biology, Rome, Italy, <sup>3</sup>University Museum of Zoology, Cambridge, United Kingdom

### **Sound Production in a Mudskipper (*Periophthalmodon septemradiatus*): Implications for the Study of Evolutionary Convergence Related to the Vertebrate Water-Land Transition**

Mudskippers are fishes (Teleostei: Gobiidae: Oxudercinae) which exhibit extreme adaptations to an amphibious lifestyle; nonetheless, previous observations failed to demonstrate the presence of acoustic communication. The use of appropriate laboratory conditions and equipment allowed to record agonistic sounds during dyadic male-male aggressive encounters in a mudskipper species (*Periophthalmodon septemradiatus*). Preliminary analyses revealed that sounds were emitted when out of water and mainly transmitted through the wet substrate. Calls were significantly associated with aggressive visual displays. Both sexes were soniferous, showing very similar call structure. Sounds were organised in complex bouts, mostly composed of different combinations of pulsatile units and tonal segments, whose acoustical properties were assessed and analysed. Pulsatile units were broad band, low frequency (below 100 Hz) and highly damped oscillations well below 300 ms in duration; while tonal segments were continuous sine waves, showing a mean fundamental frequency around 160 Hz and mean duration of about 400 ms. The analysis of intraspecific variability revealed that most acoustical properties were highly dynamic, due to the high level of within individual variability, with the exception of the fundamental frequency of tonal segments, that could contain and convey some degree of individual information. These results both showed how exposed wet substrates and physical interfaces facilitated

acoustical communication during the mudskippers' transition from water to land; and offered new insights for the study of analogous transitions of the ancestors of all terrestrial vertebrates.

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**0425 AES Feeding Symposium II, 552 AB, Saturday 10 July 2010**

Aleksandra Maljkovic, Isabelle Côté

*Simon Fraser University, Burnaby, BC, Canada*

**Trophic Niche Width Collapse in a Reef-Associated Shark: The Double Whammy Effect of Fisheries on Shark Prey Populations**

Fishing, as a pervasive agent of change in marine ecosystems, is thought to alter the trophic relationships of species in defined food webs, although evidence supporting this is generally weak. As large-bodied predators at or near to the top of food webs, sharks are likely to incorporate matter from a wide variety of trophic networks, and the isotopic signatures of their tissues may therefore serve as indicators of trophic restructuring over gradients of environmental or anthropogenic change. We used stable isotope analysis of muscle tissue to define the trophic niche widths of Caribbean reef sharks (*Carcharhinus perezii*) in  $\delta^{13}\text{C}$ - $\delta^{15}\text{N}$  niche space. Reef sharks, as well as species representing model trophic guilds, were sampled at six sites over a gradient of fishing pressure in the Bahamas. We show that the trophic niche width of reef sharks inhabiting heavily fished sites has collapsed by >70% relative to sharks inhabiting lightly fished reefs. This pattern of change is due not only to the removal of high trophic level fisheries targets, but also to the collapse of the trophic niches of sympatric species in fished systems. Our results corroborate the suggestion that fisheries indirectly impact populations of non-target species, and highlight the need for holistic ecosystem-based management strategies to conserve marine resources.

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**0468 Acoustics Symposium I, Ballroom D, Saturday 10 July 2010**

Lisa Mangiamele, Sabrina Burmeister

*University of North Carolina, Chapel Hill, NC, United States*

**Neural Mechanisms of Female Preferences for Complex Advertisement Calls in Túngara Frogs (*Physalaemus pustulosus*)**

Females exhibit behavioral preferences for mating with males of their own species, and they often prefer conspecific males displaying elaborate sexual signals to males with simpler signals. Directional female behavioral preferences may be influenced by neural preferences, wherein elaborate signals are more attractive because they stimulate female

sensory systems more than simpler signals. To test this hypothesis, we studied how male acoustic signals of varying complexity and attractiveness are represented in the female túngara frog brain. Túngara frog males produce a “whine” advertisement call to attract females to mate, and they can increase the complexity of their whine by adding 1 – 6 broad spectrum call components known as “chucks.” Females strongly prefer whines with chucks to the simpler whine. We exposed female túngara frogs to one of three acoustic stimuli: no sound, whine, and whine + 3 chucks. We measured the expression of the neural activity-dependent gene, *egr-1*, in the ascending auditory pathway and several forebrain auditory targets. Our data show that the magnitude of the neural response to all conspecific calls, regardless of their complexity, is similar, suggesting that the female brain does not have a neural preference for elaborate male signals. However, when we used a habituation paradigm to ask whether the auditory system distinguishes complex from simple calls, we found that the two were indeed perceived as different. Although our results fail to show neural selectivity for female-preferred signals, this work represents an important contribution towards understanding the neural mechanisms underlying call discrimination.

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#### **0459 Fish Behavior/Acoustics, 555 AB, Sunday 11 July 2010**

David Mann<sup>1</sup>, Phillip Lobel<sup>2</sup>, Andrew Solow<sup>1</sup>

<sup>1</sup>University of South Florida, St. Petersburg, FL, United States, <sup>2</sup>Boston University, Boston, MA, United States, <sup>3</sup>Woods Hole Oceanographic Institution, Woods Hole, MA, United States

#### **Local Spawning Synchrony in the Soniferous Damselfish, *Dascyllus albisella***

Damselfishes show a broad spectrum of reproductive synchrony, but it has been difficult to quantify since they reproduce continuously, as opposed to seasonally. A measure of synchrony was developed based on a correlation between spawning time series and used in randomization test to test for within-site reproductive synchrony of the damselfish, *Dascyllus albisella*, at Johnston Atoll, Central Pacific Ocean. Reproductive synchronization was localized to groups of fish on the order of 10-20 m. Reproduction was not synchronized at larger scales where groups were not contiguous. Estimates of acoustic communication distance, which suggests that communication range is limited by background noise, are consistent with these ranges of reproductive synchronization.

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0799 SSAR SEIBERT SYSTEMATICS & EVOLUTION/SSAR SEIBERT  
PHYSIOLOGY, 555 AB, Friday 9 July 2010

Angela Marion, Dean Leavitt, Tod Reeder

*San Diego State University, San Diego, CA, United States*

### **Phylogenetic Relationships Among the Alligator Lizards (Anguinae: Gerrhonotinae): A Multi-locus DNA Sequence Approach**

The phylogenetic relationships among the alligator lizards of the anguid subfamily Gerrhonotinae have been addressed by morphology, allozymes, and mitochondrial DNA sequence data with discordant results. Using multi-locus nuclear DNA sequence data and coalescent approaches to species-tree building, we are investigating the evolutionary relationships among gerrhonotine lizards. Specifically, we evaluate whether phylogenetic analyses of these new nuDNA data (3 loci) are consistent with our unpublished mtDNA that suggest *Abronia* and *Mesaspis*, sister genera in previous published hypotheses, are in fact non-monophyletic with respect to one another. Analyses of the individual nuDNA loci and mtDNA each support the monophyly of *Elgaria*, *Gerrhonotus*, and *Barisia*, as well as a clade containing *Abronia* and *Mesaspis* (but neither is monophyletic). Also, the mtDNA strongly supports *Coloptychon* as the sister taxon of *Gerrhonotus*. The interrelationships among these clades in the separate nuDNA analyses are weak and incongruent. Combined analysis of the nuDNA and mtDNA strongly support the interrelationships among the gerrhonotine genera: (*Elgaria* ((*Coloptychon*+*Gerrhonotus*) (*Barisia* ("Abronia"/"Mesaspis")))). The non-monophyly of *Abronia* is surprising given the many apomorphic features members possess, many of which are associated with its arboreal ecology. Also, these new molecular data seem to provide strong support for *Elgaria* being the sister taxon of all remaining gerrhonotines instead of *Coloptychon*, as suggested by previous morphological studies.

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**0723 AES Stress Symposium I, 551 AB, Sunday 11 July 2010; AES GRUBER AWARD**

Heather Marshall<sup>1</sup>, Lyndsay Field<sup>1</sup>, Achankeng Afiadata<sup>1</sup>, Chugey Sepulveda<sup>2</sup>, Greg Skomal<sup>3</sup>, Diego Bernal<sup>1</sup>

<sup>1</sup>*University of Massachusetts Dartmouth, Dartmouth, MA, United States*, <sup>2</sup>*Pflegler Institute of Environmental Research, Oceanside, CA, United States*, <sup>3</sup>*Massachusetts Division of Marine Fisheries, Martha's Vineyard, MA, United States*

**Molecular and Biochemical Stress-response in the Blood of Longline Captured Pelagic Sharks**

Assessments of worldwide longline fisheries reveal that sharks constitute a large portion of bycatch for this gear type. A combination of recently enacted fishing regulations along and the low economic value of these catches, results in a large percentage of incidentally captured sharks being released. To date, little information exists on the rates of post-release survival for many shark species, and thus the full impact of longline fisheries on shark populations cannot be fully estimated. Recent studies have addressed the possibility of using biochemical profiles of secondary haematological stress parameters to predict post-release survivorship, yet little is known about interspecific differences in these indicators. This study sought to compare electrolytes (Na<sup>+</sup>, Cl<sup>-</sup>, Mg<sup>2+</sup>, Ca<sup>2+</sup>, and K<sup>+</sup>), metabolites (glucose and lactate), hematocrit, and heat shock protein 70 (HSP70) parameters between eight species of longline captured sharks (n = 151). Statistical comparison of parameters was conducted according to species, family, and ecological classification. Data reveal species-specific parameter differences in response to longline capture, as well as differences by family (i.e., Lamnidae versus Carcharhinidae) and ecological (i.e., oceanic versus coastal) classification. Results suggest that differences in locomotive and respiratory adaptations between study species bring about differences in stress-response by these sharks to longline capture. This study is the first to report a haematological secondary stress response assessment for such a large number of pelagic shark species, and lays the groundwork for developing species-specific indices for predicting post-release survivorship of longline caught sharks.

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## 0141 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Jennifer Martin, Eric Hilton

*Virginia Institute of Marine Science, Gloucester Point, VA, United States*

### **Distribution of Taeniosomous Lampridiformes in Australian and New Zealand Waters**

The families Stylephoridae, Lophotidae, Radiicephalidae, Trachipteridae and Regalecidae form the taeniosomous Lampridiformes, a putatively monophyletic group characterized in part by having extremely elongate bodies. These are rare, mesopelagic fishes that occur in all oceans. Observations of museum specimens, supplemented by museum records for certain taxa (e.g., Stylephoridae), were used to determine the distributions of the taeniosomes in Australian and New Zealand waters. Adult holdings were originally collected as beach wash-ups and from fishery-dependent and independent surveys. Specimens were identified to the lowest taxonomic level (typically species-level, except for within *Trachipterus*). Larval and juvenile identification, however, was particularly problematic and misidentifications in museum collections were common. In several collections, flatfish larvae from family Bothidae were misidentified as *Trachipterus* spp., and in one instance a juvenile *Radiicephalus* was misidentified as Lophotidae. Therefore, larval and juvenile distributions are based on original observations of specimens. Interestingly, the trachipterid genus *Zu* was discovered as larvae in collections from the Coral Sea near the Great Barrier Reef. Near-shore larval distribution of these typically open-water fishes is discussed. Collectively, nine genera from all five taeniosome families are distributed throughout Australian and New Zealand waters. These specimens include a new geographic record for the previously misidentified specimen of *Radiicephalus* from New Zealand. Improper identifications of specimens are likely to mislead biodiversity and biogeographic assessments for these rare fishes.

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## 0373 Acoustics Symposium II, Ballroom D, Saturday 10 July 2010

Karen Maruska<sup>1</sup>, Timothy Tricas<sup>2</sup>

<sup>1</sup>*Stanford University, Stanford, CA, United States*, <sup>2</sup>*University of Hawaii at Manoa, Honolulu, HI, United States*

### **Acoustic Communication in the Hawaiian Sergeant Damselfish**

Acoustic communication is important for social behaviors in many fishes, but studies that consider its role from both sender and receiver perspectives within a single species are limited. Here we used an integrative approach to examine behavioral contexts of sound production, hearing ability, and the effects of neuromodulators on auditory

perception in the Hawaiian sergeant damselfish *Abudefduf abdominalis*. Behavioral observations and sound recordings in the wild show that the Hawaiian sergeant produces low frequency, low intensity sounds during territorial and reproductive behaviors, which are used for close-range communication. Auditory evoked potentials and single-neuron recordings in the hindbrain and midbrain show that hearing ability closely matches the intensity, temporal, and spectral characteristics of their natural sounds. However, auditory neurons in the brain were more sensitive to playbacks of complex natural sounds than to tone bursts of a single frequency, highlighting the importance of using biologically relevant natural stimuli to test hearing abilities in fishes. Midbrain neurons were also more sensitive to playbacks of complex natural sounds compared to hindbrain neurons, which implicates the midbrain as an important feature-detecting center. The neuromodulator gonadotropin-releasing hormone (GnRH) was also abundant in the midbrain auditory torus semicircularis, and exogenous GnRH application to this region caused primarily inhibitory effects on auditory-evoked spike rates, which may function to fine-tune context dependent auditory processing. These data demonstrate how examination of sound production, hearing ability, and internal cues that influence acoustic communication can provide important information on how fishes use sound to communicate in their natural environment.

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**0159 Herp Physiology, 556 AB, Monday 12 July 2010**

Glenn Marvin

*University of North Alabama, Florence, AL, United States*

### **Recovery of Swimming Performance after Tail Loss Varies with Body Size in a Desmognathine Salamander**

Few studies have examined the locomotor cost of tail autotomy in salamanders. I examined whether the recovery of swimming performance after tail loss varies with body size in the Black-bellied Salamander (*Desmognathus quadramaculatus*). Maximal swimming performance (burst speed: mean = 0.83 m/s prior to tail loss) was significantly reduced after tail autotomy. With the loss of about 65% of tail length, burst speed declined about 50%. Thus, tail loss was costly for this primarily aquatic species in terms of a reduction in maximal locomotor performance. I measured the recovery of burst speed for individuals of different body size (42-106 mm SVL) as they regenerated their tails. After the regeneration of 50% of the tail length that was lost, post-autotomy speeds were not significantly different from pre-autotomy speeds. The time required for this amount of tail length regeneration (about 63-124 days) increased significantly with body size. Thus, the locomotor cost of tail loss may be greater for larger individuals. This may be related to a greater propensity for biting prior to tail autotomy (and a longer time required for autotomy) in larger individuals.

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## 0025 Headstarting Turtle Symposium I, Ballroom B, Monday 12 July 2010

Simone Masin, Gentile Francesco Ficetola, Luciana Bottoni

*Università degli Studi Milano Bicocca Dipartimento di Scienze Ambientali, Milano, Italy*

### **Head-starting European Pond Turtle (*Emys orbicularis*) for Reintroduction: Patterns of Growth Rate**

Some study suggests that, in a controlled environment, newborn European Pond turtles show a different growth pattern from those of other emidyd turtles. Mitrus and Zemanek (1999) suggest that newborns *E. orbicularis* feed and grow very little immediately after hatch and their growth rate accelerate only after the fourth month. Head-starting is often used to increase the survival in species of conservation concern in reintroduction and management projects. A limited growth rate might have important consequences on the usefulness of head-starting for conservation projects. In our study, we head-started a group of 12 *Emys orbicularis galloitalica* hatchlings from captive reproductions for 8 months in a controlled environment. Newborns were tagged with microchips and kept in an aqua-terrarium equipped with UV-b light tubes. Water temperature was kept at 25 C° and a basking site at 30C° was provided; hatchlings were first fed small fresh items, then shifted to larger preys (small fishes, earthworms, crickets, mealworms). Chopped vegetal matter was added to the diet of the animals after the first month of life. The animals were measured and weighed weekly. The growth patterns of the group we studied showed no slowness in the first three months of life, all hatchlings accepted readily small food items. Hatchlings were subsequently released in a reintroduction project. The survival rate of released individuals was 67% after 2 years. Our results suggest that a short period of head-starting can be a successful approach in *E. orbicularis*, enhancing growth rate and survival.

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## 0537 Fish Community Ecology, 555 AB, Monday 12 July 2010

Heather D. Masonjones<sup>1</sup>, Emily Rose<sup>2</sup>

<sup>1</sup>University of Tampa, Tampa, FL, United States, <sup>2</sup>Texas A & M University, College Station, TX, United States

### **Population Estimates and Movement Trends of Syngnathid Fishes in a Tampa, FL Seagrass Community**

Due to their tendency towards low mobility and high site fidelity, syngnathid fishes (pipefishes/seahorses) potentially make excellent candidates for population estimates through mark-recapture techniques. This 13-month study (August-August, 2008-09) was designed to compare two methods of estimation, the Lincoln-Peterson and Schnabel

techniques, measuring short term changes in population size. Both assume closed populations, which based on their biology, should be a reasonable assumption for syngnathids. However, to verify closed populations, movement patterns between three sites (roughly 200m apart) within the larger site located in a small bay off the South Tampa peninsula were investigated. On each census date, fish were collected by pushnet from a 150m<sup>2</sup> area of seagrass from each of the three sites. Each was marked with latex dye under the skin, photographed for body size and reproductive condition estimation, and returned the same day. Using both estimation methods, population sizes varied widely between sites and over time, indicating that the population is not as stable as assumed based on their biology. In addition, 19% of recaptured animals moved between sites, indicating that each site does not in fact comprise a closed population. This varied between pipefish and seahorses, however, with seahorses displaying complete site fidelity and pipefish moving frequently between sites. Pipefish movement between sites was consistent across the year, indicating that migration between sites does not appear to be a seasonal event. These results suggest that methods of population estimation for pipefish, at least, should be based on open, and not closed, populations.

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#### **0464 General Ichthyology, Ballroom B, Friday 9 July 2010**

Ivan Mateo<sup>1</sup>, Edward Durbin<sup>2</sup>, Richard Appeldoorn<sup>3</sup>, Aaron Adams<sup>4</sup>, Francis Juanes<sup>1</sup>

<sup>1</sup>*University Rhode Island, Kingston, RI, United States*, <sup>2</sup>*Graduate School Oceanography, Narragansett, RI, United States*, <sup>3</sup>*University Puerto Rico, Mayaguez, PR, Puerto Rico*, <sup>4</sup>*Mote Marine Lab, Pine Island, FL, United States*, <sup>5</sup>*University Massachusetts-Amherst, Amherst, MA, United States*

#### **Assessing the Role of Mangroves as Nurseries for French Grunt and Schoolmaster through Otolith Elemental Fingerprints**

Juvenile French grunt and schoolmaster were captured in mangrove and seagrass stations in St. Croix and Puerto Rico in 2006 and 2007 to determine if fish juvenile areas can be discriminated by otolith chemistry. Concentrations of 13 elements were determined in 0-group fish otoliths using (LA-ICPMS). ( $\delta^{18}\text{O}$ ) and ( $\delta^{13}\text{C}$ ) stable isotopes in otoliths were also analyzed. Multi-elemental signatures for both species differed significantly (MANOVA  $p < 0.001$ ) among mangrove and seagrass stations within both Islands. Furthermore, concentrations of six elements (Sr, Ba, Cu, Mg, Co, Na) and ( $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$ ) for both species within each year differed significantly among mangrove and seagrass stations within Islands (ANOVA  $p < 0.001$ ). Classification success for French grunt and schoolmaster juvenile stations within St. Croix across years ranged from 87-92% and from 76-77%, respectively, whereas in Puerto Rico, for French grunts and schoolmaster for the two years ranged from 80-84% and 84-87%, respectively. Classification success between mangrove and seagrass habitats (stations combined) in Puerto Rico for French grunt ranged from 84-91%, and for schoolmaster ranged from 94-99%. In St. Croix, classification success for French grunt was 95-96%, and for

schoolmaster was 86-89%. The percentage of the French grunt subadults collected from fore-reef stations in St Croix, identified as having resided as juveniles in mangrove habitats in 2006 and 2007, was 40% and 68 % while for Puerto Rico, it was 70% and 74%. By contrast for schoolmaster almost 100% of all fish in both islands resided as juveniles in mangrove habitats across years.

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## **0748 Fish Community Ecology, 555 AB, Monday 12 July 2010**

Richard Matheson, Theodore Switzer, Robert McMichael, Keith Fischer

*Florida Fish and Wildlife Research Institute, St. Petersburg, FL, United States*

### **Zoogeographic and Bathymetric Gradients in Demersal Fish Community Structure on the West Florida Shelf**

The continental shelf off the west coast of the Florida peninsula, the West Florida Shelf, supports a diverse ichthyofauna which, in turn, supports some of the most valuable fisheries in the United States. Despite these facts, the zoogeography and ecology of this fauna have received relatively little attention from researchers. We add to the knowledge of this fauna by analyzing data from trawl samples collected during 2008 and 2009. Our survey was funded by the Southeast Area Monitoring and Assessment Program and was conducted in depths ranging from 9 to 110 m from just north of Cape Romano, latitude 26° N, to Mobile Bay, approximately 30°N and 88°W. Preliminary sampling was conducted in 2008, and a full annual survey was conducted in 2009. The latter survey consisted of summer and fall cruises, and each cruise made approximately 40 trawl sets in each of three sampling zones, for a total of approximately 120 sets per season. We use multivariate community analyses to explore zoogeographic and bathymetric community structure among these samples and relate these patterns to other parameters (e.g., temperature and salinity) collected with each trawl sample. Finally, we discuss the distribution and abundance of some of the prominent members of this fauna, including numerical dominants, such as *Lagodon rhomboides* and *Syacium papillosum*, and economically valuable species such as various sciaenids, lutjanids, and serranids.

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0345 AES Ecology, 551 AB, Thursday 8 July 2010

Philip Matich, Michael Heithaus, Craig Layman

*Florida International University, Miami, FL, United States*

### **Contrasting Patterns of Individual Specialization and Trophic Coupling in Two Marine Apex Predators**

Top predators are often assumed to be dietary generalists and, by feeding on prey from multiple basal nutrient sources, serve to couple distinct food web modules. Yet, there is increasing evidence that individual dietary specialization may be critical to trophic dynamics of predator populations. Individual specialization is well-documented in teleosts, birds, and mammals, but little is known about dietary specialization in highly mobile top predator taxa in marine habitats. Using stable isotope analysis of body tissues with different turnover rates, the dietary patterns of bull sharks (*Carcharhinus leucas*) and tiger sharks (*Galeocerdo cuvier*) were investigated to assess dietary specialization. Tiger sharks were largely dietary generalists, but the bull shark population was characterized by a wide trophic niche with many specialized individuals. These differences in individual dietary specialization suggest that marine apex predators may fill very different functional roles in coupling or compartmentalizing distinct food webs depending on ecosystem context, and resource availability, competition, and the spatial patterns of food webs appear to be important factors driving trends in individual dietary specialization. Our study suggests that individual specialization may be an important feature of trophic dynamics of non-mammalian marine top predators and should be explicitly considered in studies of marine communities.

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0207 NIA II, 551 AB, Monday 12 July 2010

Emmanuel Maxime

*University of Louisiana at Lafayette, Lafayette, LA, United States*

### **Phylogenetic Position of *Gymnotus inaequilabiatus* (Valenciennes, 1847) Using Osteological Data from Computed Tomography**

*Gymnotus inaequilabiatus* from the Rio Paraná of Argentina and Brazil is the largest bodied species of the genus growing to one meter. This nominal species has been regarded as a member of the *G. carapo* species group but the phylogenetic position and even the limits of the species remain poorly known. Here I report osteological data from the CT scans of the c. 200 year-old holotype analyzed using Mimics software package to delineate the 3D configuration of bony elements in the oral jaws, neurocranium, suspensorium, and branchial basket. Each bone was manually isolated by delimiting their boundaries using slices recalculated in all three planes: sagittal, coronal, and axial,

from an original dataset composed of n=1,107 (65  $\mu$ m) sections. These data were examined in a phylogenetic context and used, in addition with other characters of the external morphology, to hypothesize the putative position of the species within the genus. *Gymnotus inaequilabiatus* is concluded to be more closely related to *G. tigre* than to *G. carapo*, based on osteological characters. This interpretation is also supported by characters more readily observed of the external phenotype (pigmentation, laterosensory canals), and conventional radiography (vertebral counts). These results support the conclusion that the assemblage of *Gymnotus* species in the Paraná basin is not monophyletic.

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**0510 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Amy Maynard, Jocelyne Dolce, Cheryl Wilga

*University of Rhode Island, Kingston, RI, United States*

**Biomechanics of Ventilation in Smoothhounds, *Mustelus canis*, and Spinydogfish, *Squalus acanthias***

Gill slit length, inter-gill slit spacing, and the number of gill slits over the pectoral fin differ among shark species. The goal of this study was to determine whether the morphological difference in the length of the fifth gill slit between dusky smoothhounds (shorter) and spiny dogfish (longer) is associated with a functional difference in ventilation at rest and swimming. The kinematics of the branchial arches and gill slits and associated pressure was quantified using sonomicrometry crystals and pressure transducers. During resting ventilation, smoothhounds move the gill arches at greater peak distances and have longer cycle durations than dogfish during resting and swimming. Smoothhounds open the fifth gill slit before the others and also close the gill slits earlier when resting compared to dogfish. Smoothhounds, however, open the slits later and for a longer duration during swimming than resting. Smoothhounds generate less suction pressure during resting than dogfish, while the opposite occurs for swimming. Smoothhounds open the fifth gill slit before the others, thus they appear to use the fifth gill slit as an exit valve to prevent pooling of water in the pharynx in swimming as well as resting. The longer duration of gill slit opening and lower subambient pressures when swimming compared to resting indicates that smoothhounds use ram assisted suction ventilation during swimming. Dogfish appear to modulate kinematics to achieve similar pressures at rest and during swimming.

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## **0449 Fish Systematics II, Ballroom D, Monday 12 July 2010**

Mauricio De la Maza-Benignos<sup>1</sup>, Ma de Lourdes Lozano-Vilano<sup>2</sup>

<sup>1</sup>WWF-Chihuahuan Desert Program, Chihuahua, Chihuahua, Mexico, <sup>2</sup>FCB, UANL, San Nicolas de los Garza, Nuevo León, Mexico

### **A Systematic Revision of the *Herichthys* Genus, with One New Genus and Three New Species Endemic to the Panuco-Tamesí River Basin, Mexico**

The authors describe a new genus along with three new species of cichlids based on chromatic, morphometric and meristic characters: one from the Rio El Salto in San Luis Potosi, Mexico characterized by the dorsal fin is set back with respect to the snout tip; one from Rio Tamasopo in San Luis Potosi, characterized by a very long caudal peduncle and a shallow body; and the last one from Laguna Azteca, Hidalgo, Mexico characterized by very small eyes, and dorsal, pectoral and ventral fins set forward with respect to the snout tip, and a short lower jaw. A re-description of *Herichthys pantostictus* (Taylor and Miller, 1983) and *H. labridens* (Pellegrin, 1903), a review of *H. bartoni* (Bean 1892) and *H. steindachneri* (Jordan y Snyder, 1900) and a zoogeographic dispersal and evolutionary theory for the subgenus are also presented.

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## **0447 Fish Conservation, Ballroom B, Friday 9 July 2010**

Mauricio De la Maza-Benignos<sup>1</sup>, Lilia Vela-Valladares<sup>3</sup>, Ma. de Lourdes Lozano-Vilano<sup>2</sup>, Ma. Elena García-Ramírez<sup>2</sup>, Jürgen Hoth Von Der Maden<sup>1</sup>, José Alfredo Rodríguez-Pineda<sup>1</sup>

<sup>1</sup>WWF-Chihuahuan Desert Program, Chihuahua, Chihuahua, Mexico, <sup>2</sup>UANL, San Nicolas de los Garza, Nuevo Leon, Mexico, <sup>3</sup>Amigos del Pandeño, A.C., Julimes, Chihuahua, Mexico

### **A Holistic Approach to Freshwater Ecosystems Conservation: The *Cyprinodon julimes* Case Study**

"Pandeño-de-los-Pando" is home to the endemic Julimes pupfish (*Cyprinodon julimes*) considered to be among the vertebrates that live at the highest temperatures on the planet. This spring is about 200 m<sup>2</sup> in size and located in the Conchos River Basin, Chihuahua, Mexico. It is among several springs impacted by increasing pumping that depletes the local groundwater supply. In the context of a full scale IRBM-Program, the initiative to conserve a viable pupfish population, developed into a demonstration project which considers socioeconomic, biologic, taxonomic, ecologic, behavioral, hydrologic, legal and administrative framework leading to a holistic understanding of a system within an initiative that proves that conservation is compatible with and beneficial to economic and social development of a region. The objectives were to secure

a viable population of the endangered pupfish, develop legal and administrative framework authorizing environmental flows, and establish the spring and surroundings as protected area. Studies to understand the relation between habitat utilization and physicochemical variables determining the needs of the fish; the hydrology of the system; as well as to support water rights acquisition were conducted. It was determined that temperature drives tempo-spatial displacements of the fish. That 70-80 L/sec in water rights ultimately needed to be secured. In 2009 50 L/sec. were secured on a voluntary basis. The "Pandeño" is an example of social-bio-hydraulic/hydrologic-adaptive-management-initiative involving simple research and calculations that yielded large benefits in terms of conservation and decreased groundwater pumping. In sum a framework that functionally combines conservation together with social and economic imperatives.

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### **0186 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Michael McCallister, Ryan Ford, Christina Walker, Yaira Aponte-Osborne, Jim Gelsleichter

*University of North Florida, Jacksonville, FL, United States*

### **Use of Two Northeast Florida Estuaries as Shark Nursery Habitat: Preliminary Data from a Longline Survey**

The use of nearshore and estuarine waters as Essential Fish Habitat is well documented throughout the literature. EFH plays a crucial role in the life-history of the species that utilize a given area. For many elasmobranch species these locations include nearshore and estuarine waters that serve as nursery habitat where sharks are born and/or juveniles spend the early part of their life. Examination of the literature shows the presence of shark nurseries in most major estuaries along the Atlantic and Gulf Coasts of the United States, however, there is a noticeable gap in data from the Northeast region of Florida. To identify and characterize shark nursery habitat in estuarine waters of Northeast Florida, a long term longline survey was initiated in May of 2009. A total of 96 longlines were set in Nassau and Cumberland Sounds from June 2009 - November 2009 and 199 elasmobranchs were caught. A total of 12 different elasmobranch species were collected, including 8 species of shark, 3 species of ray, and 1 species of skate. Preliminary data show that these two estuaries are utilized by multiple species of elasmobranchs. This is an ongoing survey and future work will be done to identify specific species that use these waters as a nursery, the spatial boundaries of the nursery, temporal variation in habitat use, and the influence of prey abundance and predation risk on specific habitat use within these estuaries.

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**0586 AES Ecology, 551 AB, Thursday 8 July 2010**

Heather McCann<sup>1</sup>, Nigel Hussey<sup>1</sup>, Aaron Fisk<sup>1</sup>, Sabine Wintner<sup>2</sup>, Jeremy Cliff<sup>2</sup>, Sheldon Dudley<sup>2</sup>, Brian Fryer<sup>1</sup>

<sup>1</sup>Great Lakes Institute of Environmental Research, University of Windsor, Windsor, Ontario, Canada, <sup>2</sup>KwaZulu-Natal Sharks Board, Umhlanga Rocks, South Africa, <sup>3</sup>Biomedical Resource Unit, University of KwaZulu-Natal, Durban, South Africa

### **Microchemistry of White Shark (*Carcharodon carcharias*) Vertebrae: A Potential Tool to Examine Life-History Strategies?**

The microchemistry of biomineralized structures, such as fish otoliths, is becoming an important tool to elucidate life-history characteristics of marine animals over ontogeny. The corpus calcareum of shark vertebrae grows incrementally preserving a seasonal microchemistry signal (summer / winter) over the lifetime of the animal, similar to fish otoliths. The microchemistry of white shark (*Carcharodon carcharias*) vertebrae may provide an additional ecological tool to aid in understanding individual life history patterns. I present baseline elemental concentration profiles for several sharks of varying age, size and sex sampled from beach protection nets in KwaZulu-Natal, South Africa. The potential of laser ablation inductively coupled mass spectrometry (LA-ICP-MS) to analyze vertebrae microchemistry is assessed. A suite of elements (ranging in concentration from a few ppb to 1000s of ppm) were quantified using LA-ICP-MS in continuous transects along the corpus calcareum. Barium levels varied across growth bands suggesting ontogenetic movement between nutrient rich upwelling areas and non-nutrient rich areas. A number of non-essential elements (e.g., uranium, lead) also varied across growth bands and may provide insights into ontogenetic migration and depth profiles of individual sharks. A number of essential elements (zinc, copper...) of the embryonic component of the vertebrae were enriched compared to after birth and increased with age to levels approaching those in the embryonic sections. These preliminary results show that a range of elements have suitable detection limits to aid in determining life-history patterns.

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**0379 Herp Morphology, 556 AB, Sunday 11 July 2010**

Jacob McCartney, Nathan Kley

*Stony Brook University, Stony Brook, NY, United States*

### **Morphometric Analysis of Intracolumnar Variation in Vertebral Morphology in Snakes**

Vertebral intracolumnar variability (i.e., the serial morphological variation observed along the entire length of the vertebral column) is an important but remarkably

understudied aspect of snake biology. Any attempted study of systematics or functional morphology that focuses on these bony elements is very difficult without a better understanding of the variation present both within and between species. In order to establish a basis for such studies, intracolumnar variation in a number of snakes was quantified through the use of osteometrics. The sample was carefully chosen to maximize phylogenetic and ecological differences between snakes, and 22 measurements were chosen to maximize repeatability while potentially providing useful information, particularly with respect to functional questions. The resulting data show considerable variation in several of the metrics throughout the vertebral column of individual snakes. This variation is remarkably conserved among terrestrial snakes. This implies either that terrestrial snakes in general have similar functional constraints, regardless of differences in ecology and behavior, or that snakes are constrained by phylogeny and/or development to particular morphologies. Despite this conservatism, examination of ratios, including some that have been used previously in the literature to distinguish snakes systematically or ecologically, reveals subtle differences. Ratios may in fact be useful for differentiating between multiple taxa within discrete fossil assemblages, with the caveat that some overlap may occur, particularly considering variation in the column.

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### **0317 AES Feeding Symposium II, 552 AB, Saturday 10 July 2010**

David McElroy<sup>1</sup>, Joe Bizzarro<sup>2</sup>, Nancy Kohler<sup>3</sup>

*<sup>1</sup>National Marine Fisheries Service, Woods Hole, MA, United States, <sup>2</sup>University of Washington, Seattle, WA, United States, <sup>3</sup>National Marine Fisheries Service, Narragansett, RI, United States*

#### **A Review of Selected Methods of Studying Food Habits and Trophic Ecology with Particular Reference to Elasmobranchs**

Diet and feeding ecology studies are fundamental to our knowledge of inter-specific relationships and patterns of abundance that govern marine ecosystems. Food habits data are also critical for understanding the life-history and habitat requirements of species. This information is particularly valuable for elasmobranchs as they typically feed at high trophic levels and are long-lived. As ecological-based approaches to resource management have gained acceptance; increased focus, new technologies, and different analytic methods have come to bear in feeding studies. We review data collection and analytical topics with a focus on ones that are debated and exhibit inconsistencies in their application. We offer recommendations on issues such as increasing taxonomic resolution and accounting for alterations due to sample preservation, limiting bias related to sampling gear and other factors, and analytical subjects including data transformations, appropriate grouping of data, sample size sufficiency, and scaling for size. Various indices for quantifying the diet, ecological metrics for comparisons, multivariate ordination, and methods of testing significance are compared using example data. Comparisons utilize published studies as well as dietary

data sets for species with both narrow and broad foraging patterns. It is suggested that dietary analysis should be made using number, mass, and occurrence data separately; as each metric provides a different type of information, some of which is lost when combined. Overall, data collection and analysis techniques selected in diet studies will often vary depending on the objectives of the authors, but some methods suggested herein can be utilized to create greater consistency among studies.

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**0268 Fish Ecology, Morphology & Physiology, 556 AB, Saturday 10 July 2010;  
ASIH STOYE AWARD ECOLOGY & ETHOLOGY**

Patrick McGrath

*Virginia Institute of Marine Science, Gloucester Point, VA, United States*

**The Diet of Longnose Gar, an Apex Predator in the Tidal Waters of Virginia, USA**

Chesapeake Bay is the largest estuary in the United States and comprises vast areas of polyhaline to freshwater, tidal fish habitat. These areas are nursery grounds that provide protection from large ocean predators while supporting an abundance of prey for estuarine dependent fishes. However, a few large piscivorous species, such as longnose gar (*Lepisosteus osseus*), are abundant in fresh and brackish nurseries and the impact of their predation is poorly understood. This study aimed to characterize the diet of longnose gar from tidal rivers in Virginia. The top five prey items were white perch, menhaden, *Fundulus* spp., Atlantic croaker, and spot. Percent weight and number indicated that both marine and anadromous fishes (%W = 59.4%, %N = 56.5%) and resident fishes (%W = 40.6%, %N = 43.5%) were equally important in the diet of longnose gar. The diet varied with the seasonal prey fish assemblages, longnose gar length, and salinity, reinforcing the categorization of the species as an opportunistic predator. The constant influx of anadromous or coastal spawning fishes appears to be an important prey source for longnose gar in the upper estuaries of Chesapeake Bay.

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**0276 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Allison McHale

*NOAA Fisheries Service, Gloucester, MA, United States*

**Tricky Business -- Managing Monkfish in the Face of Uncertainty**

How does one manage one of New England's most valuable fishery resources in light of little scientific information? It is a difficult job that the New England Fishery Management Council (NMFS) and NOAA's National Marine Fisheries Service (NMFS)

have been tackling for the last 10 years. An explanation of why monkfish is considered a data-poor species will be provided and how this has impacted the management of this species. In addition, a brief management history will be presented that focuses on management approaches taken by the NEFMC and NMFS to account for and address this uncertainty, including lessons learned options for future management. Time permitting, comparisons may be drawn with other data poor fish stocks in the Northeastern United States, such as the Northeast skate fishery.

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## **0511 Karel Liem Symposium II, Ballroom D, Friday 9 July 2010**

Kenneth McKaye<sup>1</sup>, Mary Shawa<sup>1</sup>, Troy Townsend<sup>1</sup>

<sup>1</sup>Malawi Office of President and Cabinet, Lilongwe, Malawi, <sup>2</sup>World Wide Fund for Nature, Helsinki, Finland, <sup>3</sup>HEEED Malawi, Monkey Bay, Malawi

### **Biological Control by Cichlid Fishes of Snail Vectors of the Human Disease Bilharzia: Conservation of Cichlids Might Reduce HIV/AIDS in Malawi**

Karel Liem once bantered “if cichlids reduced AIDS-- they would catch granting agencies and the world’s attention!” Work initially stimulated by Karel’s interest in the cichlid feeding biology has demonstrated that overfishing and deforestation in the Lake Malawi ecoregion is linked to an increase in the intermediate freshwater snail host for schistosomiasis, *Bulinus nyassanus* and, perhaps, HIV/AIDS along Lake Malawi shores. Various studies indicate that bilharzia infections increase the risk of infection with HIV. “Furthermore, they support the idea that control programs for schistosomiasis and perhaps other parasitic worm infections may also be useful in helping to reduce the spread of HIV/AIDS in developing countries where helminths are endemic.” (Chenine 2008). Research sponsored by Malawi’s Office of President and Cabinet has demonstrated that, until recently, cichlid predators of these snails have been decreasing in number due to over-fishing, while the vectors have increased. Also this work has demonstrated that the vector snails prefer fine substrate, which has increased-due to extensive deforestation over the past twenty years. Encouragingly, during the past two years, no-fishing zones have been established to reduce disease, and the villagers have been treated extensively with bilharzia drug, Praziquantel. Numbers of snail feeding fishes have increased, numbers of snail vectors have decreased dramatically, and the number of infected snails collected by the research team has dropped to zero. Increased awareness of the relationship between environmental degradation, cichlids and human diseases such as bilharzia and HIV/AIDS has resulted in increased conservation awareness and action by the Government of Malawi.

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**0296 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Jonathan McKenzie, Christopher Schieble, Martin O'Connell

*University of New Orleans, New Orleans, LA, United States*

**Habitat Use by Immature Lemon Sharks (*Negaprion brevirostris*) at the Chandeleur Islands, Louisiana**

We examined immature lemon shark (*Negaprion brevirostris*) habitat use at the Chandeleur Islands, Louisiana between May and August 2009. A total of 56 sharks were collected, tagged, and measured (28 males; 28 females, fork length range = 600 to 1770 mm). For each shark habitat and environmental variables were also recorded. Sharks were grouped into three size/age classes (neonates < 640 mm, YOY < 900 mm, and juveniles < 900 mm). There were no significant differences (ANOVA,  $p > 0.05$ ) between males and females for any environmental variables. There were also no significant differences ( $p > 0.05$ ) in substrate preference among the size classes. However there was a significant difference ( $p < 0.001$ ) among size classes in regard to depth. The smaller two size classes preferred shallower habitats than the largest size class. We attached SPOT 5 satellite tags to the dorsal fin of six juvenile *N. brevirostris* (4 males; 2 females; fork length range = 1100 - 1770 mm) in an effort to determine habitat preference on a larger scale. Data recovered from the tags indicated that these sharks stayed in the area throughout the summer, remaining near the islands and rarely moving to deeper offshore habitats. In the future, we will be calculating growth rate from recaptured lemon sharks with PIT tags and pursuing genetic analyses to determine the extent of polyandry and site fidelity in this nursery habitat.

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**0176 Fish Conservation, Ballroom B, Friday 9 July 2010; ASIH STOYE AWARD CONSERVATION**

Jennifer McKinney<sup>1</sup>

<sup>1</sup>*Gulf Coast Research Laboratory, Ocean Springs, MS, United States*, <sup>2</sup>*Department of Coastal Studies- University of Southern Mississippi, Hattiesburg, MS, United States*

**Predicting Whale Shark, *Rhincodon typus*, Distribution in the Northern Gulf of Mexico**

Whale sharks, *Rhincodon typus*, have a circumglobal distribution and are thought to be highly migratory. Due to their protected status, understanding critical habitat is essential for proper management. The goal of this study was to describe the probable distribution of whale sharks in the northern Gulf of Mexico using the Maximum Entropy (MaxEnt) modeling algorithm for species distribution. This study also aimed to determine inter-annual variability and compare the effects of aggregation presence on

the probability distribution. Models built on presence only localities (PRS) and weighted by aggregation size (WTD) were compared for the temporal period of June to September of 2008 and 2009. Input variables included: distance features and remotely sensed sea surface temperature, chlorophyll concentrations, sea surface height anomalies, and bathymetry. Cross-validation procedures were used to calculate the mean area under the receiver operating characteristic curve (AUC), a measure of model performance. Mean AUC values ranged from 0.828 - 0.984, indicating strong performance in all models, with significantly higher values for WTD ( $p < 0.001$ ). There were observable spatial variations in the predicted distributions amongst year and model type. Distance to continental shelf edge, petroleum platforms and the Mississippi Delta were the predominant contributors. This correlation may be due to the presence of a potential food source (upwelling along the shelf edge and high riverine output) for these foraging filter feeders or structural/landmark recognition (petroleum platforms and bathymetric features) for migrant animals. Knowing the critical habitat for these animals could aid in the development of effective protection strategies.

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## **0189 General Ichthyology, Ballroom B, Friday 9 July 2010**

Paul McLaughlin, Ken Oliveira

*University of Massachusetts-Dartmouth, Dartmouth, MA, United States*

### **The Effects of *Anguillicola crassus* Infection on Silver Phase Male American Eels (*Anguilla rostrata*)**

Originally endemic to the continent of Asia, the nematode *Anguillicola crassus* has become established in North America over the past two decades. Upon ingestion of an infected intermediate or paratenic host by the eel, the parasite burrows through the wall of the swim bladder eventually reaching the lumen where the parasite feeds on blood. Damage caused by the parasite's movement includes swelling, fibrosis, and in some cases loss of swim bladder function. The eel spends the first 6-20 years of life in a primarily benthic existence where the parasite's impact may not be noticed. Upon approaching maturity, the eel undergoes a metamorphosis to the silver stage and begins an extensive pelagic migration to the Sargasso Sea to spawn. It is at this time that the effects of the parasite may become a considerable detriment to migration. In this study, we examined the effects of *Anguillicola crassus* infection on the host eel's metabolism (Active & Resting), Cost of Transport, hematological parameters (RBC Count, hemoglobin concentration, hematocrit and ferritin concentration), and swim bladder characteristics (% body volume). Preliminary analysis thus far have only revealed significant reductions in hematocrit and increase in swim-bladder volume. The infection does not appear to be affecting other blood parameters or eel metabolism. Further review will determine if the parasite is affecting the eel's ability to make an extended migration at depth.

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## **0651 Fish Systematics I, Ballroom D, Monday 12 July 2010**

Caleb McMahan, Chris Boeckman, Chris Murray, Aaron Geheber, Kyle Piller

*Southeastern Louisiana University, Hammond, Louisiana, United States*

### **Systematics of Cichlid Fishes of the Genus *Vieja***

Numerous phylogenetic studies of New World cichlids have recovered the genus *Vieja* as a paraphyletic group. As a result, several taxonomic changes have been recommended for species within this genus based on only a handful of representative species. We conducted a comprehensive phylogenetic study of *Vieja* using complete taxon sampling of the genus, as well as the inclusion of other closely related species and genera. Our study included both mitochondrial (cyt b) and nuclear DNA (S7 intron-1) sequences and Bayesian and Maximum Parsimony analyses. The results are largely congruent with those of other studies and also failed to support the monophyly of *Vieja*. Inclusion of all of the taxa in the genus resulted in a more comprehensive representation of the evolutionary relationships among the fishes in this group. Furthermore, these results suggest that *Vieja* is in need of taxonomic revision. Additionally, data will be presented regarding our ongoing studies of morphological variation within select species groups within the genus.

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## **0484 Herp Conservation I, 556AB, Thursday 8 July 2010**

Taegan McMahan<sup>1</sup>, Neal Halstead<sup>1</sup>, Steve Johnson<sup>2</sup>, John Romansic<sup>1</sup>, Patrick Crumrine<sup>3</sup>, Raoul Boughton<sup>4</sup>, Lynn Martin<sup>1</sup>, Jason Rohr<sup>1</sup>

<sup>1</sup>*University of South Florida, Tampa, Florida, United States*, <sup>2</sup>*University of Florida, Wimauma, Florida, United States*, <sup>3</sup>*Rowan University, Glassboro, NJ, United States*, <sup>4</sup>*Archibald Biological Station, Florida, United States*

### **Chlorothalonil: An Immunomodulatory and Deadly Fungicide to Amphibians**

Agrochemicals have been implicated in amphibian declines, but most tested agrochemicals do not kill amphibians at concentrations found commonly in the environment. However, many of the ~100,000 registered chemicals have not been thoroughly tested on amphibians. One understudied pesticide is chlorothalonil, the most commonly used synthetic fungicide in the U.S. We reared *Rana sphenocephala* and *Osteopilus septentrionalis* in outdoor mesocosms for five weeks in the presence or absence of one and two times the expected environmental concentration (EEC; 164 µg/L) of chlorothalonil. The EEC was associated with 99.5% and 97.8% mortality of *R. sphenocephala* and *O. septentrionalis*, respectively, and 2x the EEC caused 100% mortality. We then conducted three static renewal, dose-response experiments on *O. septentrionalis*, *Hyla squirella*, *H. cinerea*, and *R. sphenocephala*. The EEC of chlorothalonil caused 100%

mortality of all species within 24 hours, half the EEC killed 100% of *R. sphenoccephala*, and the lowest concentration tested, 0.0164 µg/L, caused significant mortality. The dose-response was non-monotonic, with only low and high concentrations causing significant mortality, these concentrations were also associated with elevated Corticosterone. Additionally, chlorothalonil concentration was negatively associated with liver health and numbers of immune cells in the liver (<16.4 µg/L). Given that chlorothalonil: killed nearly every tadpole at the EEC, caused significant mortality four orders of magnitude below the EEC, induced immunosuppression at environmentally common concentrations, and has been regularly detected at or below the EEC where amphibian are going extinct, chlorothalonil exposure has the potential to directly and indirectly cause amphibian declines.

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**0432 AES Ecology, 551 AB, Thursday 8 July 2010**

Bailey McMeans<sup>1</sup>, Michael Art<sup>2</sup>, Aaron Fisk<sup>1</sup>

<sup>1</sup>University of Windsor, Windsor, Ontario, Canada, <sup>2</sup>Environment Canada, Burlington, Ontario, Canada

### **The Feeding Behavior of Greenland Sharks Based on Stable Isotope and Fatty Acid Analysis of Multiple Tissues**

The Greenland shark (*Somniosus microcephalus*) is one of only two sharks that inhabit seasonally ice-covered waters. However, few data exist regarding their feeding behavior and potential role in marine ecosystems. Greenland sharks consume a variety of prey taxa and likely have slow tissue turnover due to their large size and slow growth. Thus, investigating important energy sources and temporal patterns of feeding behavior in Greenland sharks using stomach contents and chemical tracers is potentially problematic. The objective of the present study was to analyze multiple Greenland shark tissues with different turnover times (i.e. muscle, liver, red blood cells, blood plasma) for stable nitrogen ( $\delta^{15}\text{N}$ ) and carbon ( $\delta^{13}\text{C}$ ) isotopes and fatty acids (FA) to investigate seasonal patterns in feeding behavior. Regarding  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ , no differences were observed in any tissue between open-water and ice-cover, indicating that neither trophic position nor carbon sources of Greenland sharks differed with season. Diet breadth, indicated by coefficients of variation, were also similar between seasons within each tissue, further supporting the lack of seasonal diet differences in Greenland sharks. Fatty acid profiles of Greenland sharks differed between tissues, but not between seasons. However, blood plasma FA profiles were similar to blubber FA profiles of ringed seals (*Pusa hispida*), indicating recent consumption of marine mammal by Greenland sharks. The use of multiple tissues in the present study was useful for indicating that Greenland sharks do not differentially feed between seasons and that marine mammals are likely an important energy source to Greenland sharks.

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**0433 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Bailey McMeans<sup>1</sup>, Jill Olin<sup>1</sup>, George Benz<sup>2</sup>

<sup>1</sup>University of Windsor, Windsor, Ontario, Canada, <sup>2</sup>Middle Tennessee State University, Murfreesboro, TN, United States

**Stable Isotope Comparisons Between Embryos and Mothers of a Placentotrophic Shark Species**

Fisheries management, conservation and ecological concerns have prompted considerable efforts to better understand the early life history of sharks. Stable nitrogen ( $\delta^{15}\text{N}$ ) and carbon ( $\delta^{13}\text{C}$ ) isotopes of Atlantic sharpnose shark, *Rhizoprionodon terraenovae*, embryos and mothers were analyzed. Embryos were generally enriched in  $^{15}\text{N}$  in all studied tissue relative to their mothers' tissue, with mean differences between mother and embryo  $\delta^{15}\text{N}$  (i.e.  $\Delta\delta^{15}\text{N}$ ) being 1.4‰ for muscle, 1.7‰ for liver and 1.1‰ for cartilage. Embryo muscle and liver were enriched in  $^{13}\text{C}$  (both  $\Delta\delta^{13}\text{C}$  means = 1.5‰) and embryo cartilage was depleted ( $\Delta\delta^{13}\text{C}$  mean = -1.0‰) relative to corresponding maternal tissues. While differences in  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  between mothers and their embryos were significant, muscle  $\delta^{15}\text{N}$  values indicated embryos to be within the range of values expected if they occupied a similar trophic position as their respective mothers. Positive linear relationships existed between embryo total length (TL) and  $\Delta\delta^{15}\text{N}$  for muscle and liver and embryo TL and  $\Delta\delta^{13}\text{C}$  for muscle, with those associations possibly resulting from physiological differences between smaller and larger embryos or differences associated with the known embryonic nutrition shift (yolk feeding to placental feeding) that occurs during the gestation of this placentatrophic species. Together these results suggest that at birth, the  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  values of *R. terraenovae* are likely higher than somewhat older neonates whose postpartum feeding habits have restructured their isotope profiles to reflect their postembryonic diet.

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**0454 SSAR SEIBERT ECOLOGY AWARD, 555 AB, Thursday 8 July 2010**

Tamara McPeck, Michelle Boone

Miami University, Oxford, OH, United States

**Effects of Pesticides and Competition on Spotted Salamander (*Ambystoma maculatum*) Metamorphosis and Overwinter Survival**

Pesticides are considered to be a risk to amphibians, but their impact on salamander species is poorly understood. Pools that spotted salamanders rely upon for reproduction are being threatened by contamination with common pesticides such as the herbicide atrazine and the insecticide carbaryl. This study aims to determine how metamorphosis in spotted salamanders is affected by exposure to pesticides at different levels of

competition. Additionally, I will investigate how alterations in metamorphosis due to pesticide exposure may alter growth and survival in the terrestrial environment. Salamander egg masses were collected in Oxford, Ohio. After hatching, larvae were reared in mesocosms until metamorphosis at a density of 10 or 30. I exposed larvae to pesticide concentrations that are considered to be sublethal to salamander larvae, represent realistic exposure concentrations in the environment, and can affect the aquatic food web. Salamanders' time to metamorphosis, SVL, and mass at metamorphosis were monitored; additionally, we monitored the phytoplankton and zooplankton communities. After metamorphosis, juveniles were reared in terrestrial enclosures until the following spring. Mass and SVL measurements of juveniles will be taken this spring. Current results from this experiment have shown that competition and both pesticides decreased mass at metamorphosis. Competition and the insecticide reduced SVL at metamorphosis and increased time to metamorphosis. Furthermore, I hypothesize that these impacts on metamorphosis will impact terrestrial growth and survival. Understanding how pesticides may affect amphibians in the larval and juvenile stages will help determine which amphibian life-stage is at greatest risk to contaminants.

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### **0354 AES Physiology & Reproduction, 552 AB, Thursday 8 July 2010**

Paola A. Mejia Falla<sup>1</sup>, Enric Cortés<sup>2</sup>, Fernando A. Zapata<sup>3</sup>, Andrés F. Navia<sup>4</sup>

<sup>1</sup>Fundación colombiana para la investigación y conservación de tiburones y rayas, SQUALUS, Cali, Valle del Cauca, Colombia, <sup>2</sup>NOAA-NMFS, Panama City, Florida, United States, <sup>3</sup>Grupo de Investigación en Ecología de Arrecifes Coralinos, Departamento de Biología, Universidad del Valle, Cali, Valle del Cauca, Colombia, <sup>4</sup>Grupo de Investigación en Ecología Animal, Departamento de Biología, Universidad del Valle, Cali, Valle del Cauca, Colombia

### **Reproductive Biology of the Round Stingray *Urotrygon rogersi* in the Pacific Coast of Colombia**

We studied reproductive aspects of 1158 individuals of the round stingray *Urotrygon rogersi*. Specimens were obtained from the artisanal shrimp fishery operating in the Colombian Pacific Coast between March 2006 and March 2009. Females reached greater maximum total length (TL) and weight (37.4 cm and 293 g) than males (32.5 cm and 160 g). Sex ratio of adult males vs. females was 1:1.4 and that of embryos, 1:1. Clasper length increased rapidly between 20.0 and 22.0 cm TL. The smallest mature male measured 20.2 cm TL and the largest immature individual 21.9 cm TL. First maturity was reached at 61.5% of maximum length (TL<sub>max</sub>), and TL<sub>50</sub> was estimated to be 26.2 cm. Uterus width increased between 22.0 and 23.0 cm TL. The smallest maturing individual measured 18.0 cm TL. The size at first maturity was 54.5% of TL<sub>max</sub> and TL<sub>50</sub> was estimated at 25.8 cm. Embryos were found in females > 20.4 cm TL and maximum fecundity was three embryos per female (mode=1). A statistically significant relationship between fecundity and maternal size was found. The high percentage of mature individuals in the area and the low number and presence of embryos of all sizes during all months suggest that: 1)

parturition in *U. rogersi* is not seasonal, but rather occurs throughout the year; 2) there is a trade-off between fecundity and length of reproductive cycle; and 3) the study sites are important nursery and reproductive areas for *Urotrygon rogersi*.

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#### **0403 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Waldiney Mello

*Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil*

#### **Preliminary Results on the Cranial Anatomy of Rare Hammerhead Sharks (Elasmobranchii: Sphyrnidae): How it Can Change the Relationships within the Family**

The hammerhead sharks are grouped in the family Sphyrnidae, which comprises 8 living nominal species: *Sphyrna lewini*, *S. tudes*, *S. tiburo*, *S. zygaena*, *S. mokarran*, *S. corona*, *S. media*, *S. couardi* and *Eusphyrna blochii*. This family is largely fished worldwide, however it is poorly known, having taxonomical and phylogenetical controversies. Besides the characteristic lateral expanded head, studies on the internal anatomy of this region have been neglected. Certain species, such as *S. media*, *S. couardi* and *E. blochii* are especially represented by few exemplars in scientific collections, when compared to the others. The difficulties in avoid damages in specimens seems to delayed and limited the studies on the internal anatomy of hammerhead sharks, even more on rare species. I have been solving this problem using more sensitive digital x-rays, and also mammography. The present work discusses the preliminary results on the cranial anatomy of the rare cited Sphyrnidae species in scientific collections, and shows how it can change what is poorly known about the interrelationships among hammerhead sharks. This involves to show some new cranial characters to be used, for the first time, in phylogenetical studies within the family Sphyrnidae. This would help to elucidate the controversial relationships among the hammerhead sharks, as well as to study new important cranial characters.

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#### **0575 AES Morphology, 552 AB, Sunday 11 July 2010**

Waldiney Mello

*Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil*

#### **Hammerhead Sharks (Elasmobranchii: Sphyrnidae) from the Indo-Pacific: More Species Than it Seems?**

Among sharks, the Carcharhiniformes comprises more than 55% of all living species. In this order, the family Sphyrnidae, which includes all the hammerhead sharks, is

characterized by the presence of a laterally expanded head forming the cephalofoil. Between all the 8 living species in this family, *Sphyrna lewini* is distinguished for its largest occurrence, which is cosmopolitan, and *Eusphyrna blochii* is recognized for being the only endemic species of Sphyrnidae. Both species occurs in the Indo-Pacific ocean, and their internal anatomy were studied especially concerning the head. Differences in the anatomy of the cephalofoil were found among exemplars of each studied species. I will discuss the preliminary results on the cranial anatomy in these two species, questioning if there are just different subpopulations of *S. lewini* and *E. blochii*, based on new cranial characters. This includes to show some peculiar characters between the subpopulations of *S. lewini* and *E. blochi* in the Indo-Pacific ocean. The preliminary results on the internal and external morphologies suggests, at least, 3 subpopulations of *S. lewini* and 2 of *E. blochii* in the Indo-Pacific. The Indic ocean is showed as a distinguished region to study morphological patterns that were never described in hammerheadsharks, suggesting two possibilities: different subpopulations or more species than was thought.

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**0701 HERPETOLOGISTS' LEAGUE GRADUATE STUDENT AWARD, 556  
AB, Friday 9 July 2010**

Sabine Melzer, Phil Bishop

*University of Otago, Dunedin, New Zealand*

**Skin Secretions of *Leiopelma pakeka* as a Potential Mechanism Against Rat Predation**

The secretion of defensive chemicals onto the skin is a widely used mechanism for predator defence in anurans. Secretions often consist of a potent mixture of bioactive peptides with cytotoxic or neurotoxic effects, which may aid in predator deterrence. In New Zealand, introduced rodents have been suggested as one of the main drivers for the historical declines and extinctions of endemic *Leiopelma* species. This study demonstrates that the skin secretions of *L. pakeka* can lyse rat erythrocytes successfully and were effective in deterring rats from ingesting secretion-covered food. When offered a choice, rats displayed a significant preference for food pellets coated with water over those covered in frog skin secretions. Direct oral exposure to the secretions has no significant effects on water or food intake of rats. In addition, video analysis showed that there was no significant difference in the proportions of time rats spent grooming, rising on the hind legs, motionless or investigating associated with exposure to the secretions. This study provides new insight into the defensive function of leiopelmatid skin secretions as a defence mechanism against predation. The functional significance of the often highly complex defensive strategies utilised by anurans are discussed with specific reference to the endemic New Zealand fauna.

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## 0703 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Sabine Melzer, Phil Bishop

*University of Otago, Dunedin, New Zealand*

### **Differential Polymorphism in Cutaneous Glands of Archaic *Leiopelma* species**

Endemic New Zealand frogs of the genus *Leiopelma* are from a basal lineage of extant anurans that release defensive secretions onto their skin when disturbed. Here, I characterize the gross anatomy and microscopic structure of the skin of *L. archeyi*, *L. hochstetteri* and *L. pakeka* using stereoscopic, light and transmission electron microscopy. The terrestrial *L. archeyi* and *L. pakeka* possess polymorphic granular glands, categorized as I and II, based on their frequency and morphological traits, whereas the semi-aquatic *L. hochstetteri* lacks type I glands. This is the first report of differential polymorphism in anurans of the same genus and could be interpreted as an adaptation to different physiological or ecological needs of these species. However, species within this ancient genus share similar general gland morphology with other anurans, namely, a secretory unit containing storage granules ensheathed by myoepithelial cells. Type I glands are ellipsoid, large and contain a homogeneous mass of electron-dense granules ( $1.8 \pm 0.08 \mu\text{m}$  in diameter). Type II glands are round and contain larger heterogeneous granules ( $4.06 \pm 0.16 \mu\text{m}$ ) of varying densities. Exposure to noradrenaline causes the contraction of myoepithelial cells, resulting in bulk discharge of type I glands through the epidermal duct onto the skin surface. Differential release of secretions from polymorphic glands may be indicative of their functional specialisation in antipredatory or regulative roles.

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## 0060 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Tricia Meredith<sup>1</sup>, Anne Hansen<sup>1</sup>

<sup>1</sup>*Florida Atlantic University, Boca Raton, FL, United States*, <sup>2</sup>*University of Colorado Denver, Anschutz Medical Campus, Aurora, CO, United States*

### **Olfactory Hemi-bulb Organization in the Elasmobranch Brain**

Olfactory cues are detected by olfactory receptor neurons (ORNs). The information is conveyed via the olfactory nerve to the olfactory bulb (OB), the first relay station in the brain. The axons of the ORNs make contact with mitral cells in glomeruli. In teleost fishes, both tracing and electro-physiological studies showed that the teleost OB is divided into separate functional zones that process different types of odorants with no suggestion of somatotopy. While the OB in teleosts has a round shape, the OB of elasmobranchs is a long structure that lies parallel to the olfactory lamellae. In some elasmobranchs, the OB is physically partitioned into "hemi-bulbs", either as two distinct hemi-bulbs or as a succession of connected swellings along the OB. The functional significance of these hemi-bulbs is not fully understood. The present study examined the

organization of the OBs in two elasmobranch species, the Atlantic stingray (*Dasyatis sabina*) and the bluntnose stingray (*D. say*) to test the hypothesis that axons projecting from the olfactory epithelium to the OB in elasmobranchs exhibit a somatotopic arrangement. We injected various fluorescent tracers into the OBs to retrogradely label ORNs in the epithelium; and into the olfactory epithelium to anterogradely label the OBs. Our results suggest that the distribution of glomeruli in the OB is different from that in teleosts and that glomeruli receive projections from three to four olfactory lamellae situated immediately adjacent to these glomeruli. This suggests a somatotopic arrangement of the elasmobranch OB, which may be unique among vertebrates.

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### **0390 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

George Meszaros<sup>1</sup>, Alison Yasick<sup>2</sup>, Michael Walton<sup>2</sup>

<sup>1</sup>John Carroll University, University Heights, Ohio, United States, <sup>2</sup>Cleveland State University, Cleveland, Ohio, United States

#### **The Effects of Embeddedness on Habitat Selection of Aquatic Macroinvertebrates and Plethodontid Salamanders**

The effects of urbanization are a major challenge for river systems in Northeast Ohio. An increase in impervious surface area adjacent to headwater streams alters the streamflow regime, which in turn alters channel morphology thereby increasing in-stream sedimentation. As a result the interstitial spaces between the rocks in the streambed become filled with sediment and thus embedded. These spaces represent important habitat for the Northern two-lined salamander *Eurycea bislineata* and aquatic macroinvertebrates. It is hypothesized that an increase in in-stream embeddedness will have a negative impact on both salamander and macroinvertebrate populations. In order to test this twenty replicates of two treatments, unembedded and partially embedded, were made and placed in pairs in selected riffle zones of Haskell Run, a first order stream in Peninsula, Ohio. Sampling was done weekly using a kick seine; organisms collected from each treatment were counted and identified to family. Using a two-tailed T-test, *Eurycea bislineata* showed a significant preference for the unembedded treatments (p-value=0.0003). Among families of macroinvertebrates, only the Baetidae elicited a significant preference for unembedded treatments (p-value=0.037). One explanation for this is that salamanders have greater mobility within a stream, which allowed them to be more selective in their choice of habitat as opposed to the macroinvertebrates. These results have important implications for the conservation of stream ecosystems. Salamanders, such as *E. bislineata*, are a vital part of these ecosystems, and new and greener methods of development must be explored and implemented in order to preserve them.

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**0456 Poster Session II, Exhibit Hall D, Saturday 10 July 2010; ASIH STORER  
HERPETOLOGY AWARD**

Lisa Regula Meyer

*Kent State University, Kent, Ohio, United States*

**The Impact of *Typha angustifolia* and *Phragmites australis* Invasions in  
Wetlands on Behavior of Larval and Adult *Rana clamitans***

Invasive plants often have chemical components to which many native amphibians are naïve, and change the structure of the entire habitat by rapidly establishing a dominance of a single species, thus reducing habitat complexity. Invasive plants threaten amphibians and other wetland organisms, more so than they threaten fully terrestrial organisms for a number of reasons. This study compares the behavior of *Rana clamitans* tadpoles in a swim T-maze when presented with the invasive plants *Typha angustifolia* or *Phragmites australis*, the native plant *Juncus effusus*, or no plant. Individuals were caught in ponds without the plants in question, and are assumed to be naïve to chemical cues from these plants. The ability to recognize and avoid unknown and possibly dangerous chemicals would be advantageous to larval amphibians, which are sensitive to numerous chemical and physical factors. The behavior of adults caught from similarly non-invaded ponds was also investigated using a 1-meter diameter arena with one third each *T. angustifolia*, *P. australis* and native plant mix. Samples of plant communities were obtained from the shores of previously studied wetlands, which have been used for three years of data collection on invasive plants. Differences in behavior based upon different plant communities may prove important for amphibians, especially if there is significant difference between invaded and non-invaded plant communities. Despite the preservation of total wetland area via no-net-loss policies, if the preserved wetlands are dominated by invasive plants, the net effect for amphibians may be negligible.

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**0160 Amphibian Ecology, 551 AB, Monday 12 July 2010**

Matt Michel

*Saint Louis University, St. Louis, MO, United States*

**Spatial Dependence of Phenotype-Environment Associations for Tadpoles in  
Natural Ponds**

Within natural habitats, phenotypes are shaped by many environmental factors. Consequently, environmental heterogeneity can promote phenotypic divergence. However, because environments exhibit heterogeneity at different spatial scales, phenotypic divergence should also exhibit such scale-dependence. Using hierarchical linear models, I determined how multiple environmental factors at two spatial scales

affected the morphology of wood frog (*Rana sylvatica*) tadpoles collected from natural ponds. Among ponds, predation risk and tadpole density were strong predictors of tadpole morphology, while within ponds, other environmental variables such as water depth and leaf litter were more important. Spatial analyses revealed that water depth and leaf litter, but not predation risk or tadpole density, exhibited heterogeneous spatial distributions within ponds, suggesting that spatial properties of environmental variables influence the scale at which they shape phenotypes. These results emphasize the importance of considering phenotype-environment associations across multiple spatial scales.

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## **0668 Headstarting Turtle Symposium II, Ballroom B, Monday 12 July 2010**

Kathy Michell

*New York Center for Turtle Rehabilitation and Conservation, Inc., Narrowsburg, NY, United States*

### **Use of Radio-telemetry and Recapture to Determine the Success of Head-started Wood Turtles in New York**

Three cohorts of head-started wood turtles (*Glyptemys insculpta*) hatched in 1994, 1998 and 1999 were radio-tracked for two years each. Six turtles were released as one year olds, four as two year olds, all with a minimum weight of 130g and equipped with an ATS (Advanced Telemetry Systems) 357 transmitter weighing 3.8-3.9g. To attain this pre-release weight without the shell abnormalities sometimes associated with rapid growth, the "Michell Method" was developed; maintaining the hatchlings on a moist peat moss substrate with incandescent lighting at a temperature of 22-26°C and feeding only softened Reptomin® to avoid food preferences. Reptomin® was found to be a balanced diet for the species. Juveniles were placed in a predator proof outdoor acclimation enclosure in the spring preceding their release. Three different release locations were used in the 1.5 km study stream at known wood turtle hibernacula. Regardless of release location, all 10 turtles migrated to a portion of the stream adjacent to a meadow dominated by goldenrod, fern, stinging nettle, alder, multiflora rose and winterberry prior to the end of their second year in the wild. During the two years each turtle was tracked survivorship was 100% (n=10) for both the one and two year old turtles. Spring emergence surveys are conducted in the meadow and recapture observations made of the head-started turtles which are now adult or nearly adult and are identified by individual notching.

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## 0083 Headstarting Turtle Symposium I, Ballroom B, Monday 12 July 2010

Slawomir Mitrus

*Opole University, Opole, Poland*

### **Body Size of Several Years Old European Pond turtles - Wild and Headstarted Ones**

In Poland headstarting programs of the European pond turtle *Emys orbicularis* are carried on since mid 80s 20st century. In 2006 I made an attempt to evaluate efficiency headstarting program in central Poland. I was capturing turtles during four field trips from May to August. Individual turtles were captured by dip netting, four to six consecutive days on each field trip. I captured e.g. 8 turtles hatched in 1999 (3 headstarted and 5 "wild" = not taken to artificial rearing) - in 2000 64 headstarted turtles were marked by marginal scute notching and released to natural habitats; additionally other 52 "wild" individuals hatched in the same season were marked. In 2006 the three headstarted turtles had mean straight carapace length (SCL) 139.07 mm (SD=6.38) and mean plastron length (PL) 126.48 mm (SD=3.11); the five "wild" ones SCL=146.38 mm (SD=4.07) and PL = 137.08 (SD=5.57) [Mann-Whitney U-test, for SCL: U=3, p=0.18; for PL U=0, p=0.025]. After hatching there were no differences in size of the turtles [for the five later headstarted SCL=27.10 (SD=0.70), PL=24.57 (SD=1.03), for "wild" ones SCL=26.28 (SD=1.12), PL=23.96 (SD=1.00) [U-test, for SCL: U=5, p=0.46; for PL U=6, p=0.65]. The probe is small, but this sound alarming that the "wild" turtles were bigger (PL) than "heasterted" ones. However, in Poland headstarting is considered well-tried technique, and headstarting programs are still carried on without probes to evaluate their efficiency.

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## 0034 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Masaki Miya<sup>1</sup>, Theodore W. Pietsch<sup>2</sup>, James W. Orr<sup>3</sup>, Takashi P. Satoh<sup>4</sup>, Hsuan-Ching Ho<sup>5</sup>, Rachel Arnold<sup>2</sup>, Andrew M. Shedlock<sup>6</sup>, Mitsuomi Shimazaki<sup>7</sup>, Mamoru Yabe<sup>7</sup>, Mutsumi Nishida<sup>4</sup>

<sup>1</sup>Natural History Museum and Institute, Chiba, Japan, <sup>2</sup>University of Washington, Seattle, United States, <sup>3</sup>National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, United States, <sup>4</sup>Ocean Research Institute, The University of Tokyo, Tokyo, Japan, <sup>5</sup>National Taiwan Ocean University, Keelung, Taiwan, <sup>6</sup>Museum of Comparative Zoology, Harvard University, Cambridge, United States, <sup>7</sup>Hokkaido University, Hakodate, Japan

### **Evolutionary History of Anglerfishes (Teleostei: Lophiiformes): A Mitogenomic Perspective**

The teleost order Lophiiformes comprise approximately 325 living species placed in 67 genera, 18 families, and five suborders. Although several attempts to establish phylogenetic relationships using morphology have been made, a detailed molecular approach has heretofore not been possible because of the lack of fresh material for DNA extraction. Also incompleteness of the fossil record across all of the Lophiiformes makes it difficult to interpret evolutionary history of these fishes. In this study we assembled whole mitochondrial genome (mitogenome) sequences from 39 lophiiforms representing all five suborders and 17 of the 18 families. Unambiguously aligned sequences of the 14,611 nucleotide positions from the total of 77 species were subjected to partitioned maximum likelihood analysis and all of the higher taxa (including the order itself) were confidently recovered as monophyletic with the exception of the Thaumacichthyidae (*Lasiognathus* was deeply nested within the Oneirodidae). The mitogenomic trees strongly support the most basal and an apical positions of the Lophioidei and a clade comprising Chaunacoidei + Ceratioidei, respectively, although alternative phylogenetic positions of the remaining two suborders (Antennarioidei and Ogcocephaloidei) with respect to the above two lineages are statistically indistinguishable. A relaxed molecular-clock Bayesian analysis of the divergence times suggests that all of the subordinal diversifications have occurred during the early to mid Cretaceous (100–130 Myr ago) and estimated per-net clade net diversification rates are highest for the deep-sea Ceratioidei that exhibit remarkable specialization in morphology and ecology including extreme sexual dimorphism and male sexual parasitism.

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## 0172 Herp Morphology, 556 AB, Sunday 11 July 2010

Shabnam Mohammadi, Alan Savitzky, Krista McCoy

*Old Dominion University, Norfolk, VA, United States*

### **A Comparison of Adrenal Glands in Toad Eating and Non-toad Eating Snakes**

Toads are chemically defended by bufadienolides, a class of cardiotoxic steroids lethal to most predators, including many snakes. Bufadienolides bind to Na<sup>+</sup>K<sup>+</sup>-ATPase, inhibiting their ability to transport ions. In cardiocytes, this inhibition causes arrhythmia and severely increased contraction strength, which, if prolonged, leads to death. However, several snakes are resistant to bufadienolides and consume toads with no ill effects. Adrenal glands produce hormones that are important for the maintenance of Na<sup>+</sup>K<sup>+</sup>-ATPase, and therefore play an important role in countering the negative effects of bufadienolides. Indeed, the toad-eating specialist *Heterodon platirhinos* has been known to possess enlarged, and sexually dimorphic, adrenal glands. We hypothesize that toad-eating snakes have modified adrenal glands that play a role in the snakes' resistance to bufadienolides and that sexual dimorphism in adrenal gland size is a general characteristic of bufophagous snakes. We use phylogenetically independent samples to investigate adrenal morphology in bufophagous and non-bufophagous. We compare adrenal size, corrected for body size, among species. We find that the allometric relationship between adrenal mass and body size is significantly different in bufophagous and non-bufophagous snakes across phylogenetically independent lineages. We also compare the tissue ratios in the adrenal glands histologically, we are currently analyzing this data.

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## 0308 Acoustics Symposium II, Ballroom D, Saturday 10 July 2010

Hin-Kiu Mok<sup>1</sup>, Kai-Yun Tsai<sup>1</sup>, Pai-Ho Chiu<sup>1</sup>, Eric Parmentier<sup>2</sup>, Michael Fine<sup>3</sup>

<sup>1</sup>National Sun Yat-sen University, Kaohsiung, Taiwan, <sup>2</sup>University of Liege, Liege, Belgium, <sup>3</sup>Virginia Commonwealth Univ., Richmond, VA, United States

### **Convergent Evolution for Sound Production with a Putative Slow Muscle in a Perciform Fish *Glaucosoma buergeri* (Glaucosomatidae)**

Little is known about evolution of swimbladder sound production in fishes. Until recently all examples were presumed to utilize fast muscles that drive the swimbladder to produce sound as a forced but rapidly-damping response; a muscle contraction rate of 200 times/s will generate a sound with a fundamental frequency of 200 Hz. Recently, slow muscles have been demonstrated in a carapid fish, and they likely occur in many ophidiiform fishes. These muscles slowly extend the anterior swimbladder by stretching a swimbladder fenestra until the bladder snaps back exciting sound production. Sound pulses but not sound frequency is related to muscle contraction rate. Here we describe

sounds produced by a similar but phylogenetically-unrelated mechanism in a perciform fish. A pair of extrinsic sonic muscles originates on the pterotic bones and inserts on the anterodorsal swimbladder just forward of a stretchable swimbladder fenestra. A fan-shaped tendon, from the 9<sup>th</sup> vertebra that attaches to the bladder just forward of the fenestra, will be stretched along with the bladder by muscle contraction. Strain energy stored in the tendon will cause the anterior bladder to recoil upon muscle relaxation. Sound pulses consist of two parts: a short low-amplitude one followed by a longer-duration higher amplitude part that decays exponentially. We suggest that the first part of the call is caused by sonic muscle contraction (cocking) and the second (release) is forced by strain energy in the stretched tendon, which would also drive the exponentially-decaying sound pulse.

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### **0063 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Carmen G. Montana<sup>1</sup>, Craig A. Layman<sup>1</sup>, Kirk O. Winemiller<sup>1</sup>

<sup>1</sup>Texas A&M University, Department of Wildlife and Fisheries Sciences, College Station/Texas, United States, <sup>2</sup>Florida International University. Department of Biological Sciences, Miami/Florida, United States

### **Seasonality and Gape Width Structures Predator-prey Interactions in Neotropical Piscivores**

Multiple factors influence dietary choices of Neotropical piscivores. We examined how seasonal prey abundance and gape limitations may provide ultimate constraints on preferred prey. We examined diets of four large piscivorous species (*Cichla temensis*, *C. orinocensis*, *Boulengerella cuvieri* and *B. lucius*) from the Cinaruco, La Guardia, and Ventuari rivers in Venezuela throughout the wet-dry season hydrological cycle across multiple years. The four piscivores consumed a phylogenetically and morphologically diverse group of fishes, reflecting the overall diversity of fish species in these rivers (>300 species). At the start of the falling water period, all four piscivores consumed large prey, especially the abundant, migratory, benthivorous fishes of the genus *Semaprochilodus*. *Cichla* tended to eat large prey, about 50% of their body length; whereas *Boulengerella* exploited smaller prey (~ 20% body length). Prey/predator body size ratios were relatively low (0.11 - 0.20), and decreased as water level dropped during the annual flood cycle. Prey availability likely drives this seasonal decline in ratios.

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## 0709 Fish Ecology, Morphology & Physiology, 556 AB, Saturday 10 July 2010

Eric Montie<sup>1</sup>, Maria Wilson<sup>2</sup>, Kenneth Mann<sup>3</sup>, David Mann<sup>1</sup>

<sup>1</sup>College of Marine Science, University of South Florida, St. Petersburg, FL, United States, <sup>2</sup>Department of Biological Sciences, Aarhus University, Aarhus C, Denmark, <sup>3</sup>Department of Orthopedic Surgery, Upstate Medical University, Syracuse, New York, United States

### **Micro Computed Tomography and Three Dimensional Reconstructions of the Acousticolateralis System in the Gulf Menhaden, an Ultrasound-detecting Clupeid**

The mechanism of ultrasound detection in Alosinae has puzzled scientists over the last 15 years, but the acousticolateralis system has been thought to function in detecting these sounds. We used volume reconstructions derived from micro-computed tomography (CT) images to compare the head anatomy of a clupeid that can detect ultrasound, the Gulf menhaden (*Brevoortia patronus*), and a species that cannot, the scaled sardine (*Harengula jaguana*). One Gulf menhaden and one scaled sardine were scanned in air using a micro Computed Tomography (micro-CT) scanner. Isotropic voxel reconstructions were obtained for the scaled sardine (20 micron) and menhaden (16 micron). Segmentation and three-dimensional (3D) reconstructions of micro-CT images were performed using AMIRA. The imaging data indicated a more elaborate channeling of the lateral line system overlying the bullae in the Gulf menhaden. Comparison of 3D reconstructions of scaled sardine and gulf menhaden showed obvious anatomical differences. These distinctions included the shape of the two bullae, the orientation of the bulla and utricle, and the positioning of the bulla and lateral recess relative to the body surface. In the gulf menhaden, the rostral body of each bulla was positioned ventral to the utricle, rather than the anterior positioning observed in the scaled sardine. Furthermore, in the gulf menhaden, the distances of the bulla and lateral recess to the body surface were much shorter than the distances in the scaled sardine. These anatomical differences may play a role in allowing gulf menhaden to detect ultrasound.

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## **0672 Acoustics Symposium II, Ballroom D, Saturday 10 July 2010**

Misty Montie<sup>1</sup>, Christopher Koenig<sup>2</sup>, Felicia Coleman<sup>2</sup>, David Mann<sup>1</sup>

<sup>1</sup>*College of Marine Science, University of South Florida, Saint Petersburg, FL, United States*, <sup>2</sup>*Coastal and Marine Laboratory, Florida State University, Saint Teresa Beach, FL, United States*

### **In Situ Sound Production of Red Grouper (*Epinephelus morio*) on the West Florida Shelf**

Red grouper (*Epinephelus morio*) are long-lived, commercially important, soniferous fish belonging to the family Epinephelidae. Found throughout the western North Atlantic and Gulf of Mexico, they are protogynous hermaphrodites, and peak spawning occurs from March through May. Unlike many grouper species, red grouper do not form large spawning aggregations; rather, they form small polygynous groups, and remain in relatively close proximity to rocky depressions excavated in the sandy bottom by males. While extensive life-history information exists, largely from fishery catches, little is known about sound production or behavior of red grouper in their natural environment. Passive acoustic recordings combined with simultaneous digital video recordings were used to investigate sonic activity and behavior of red grouper on two marine reserves on the West Florida Shelf. Red grouper were found to produce a unique series of low-frequency (180 Hz peak) pulses, consisting of 1-4 brief (0.15s) broadband pulses and a 0.5-2s down-swept "buzz"; occasionally these were followed by a rapid series of 10-50 broadband pulses. Sound production was observed throughout the day and night, but most occurred between sunrise and sunset, with a noticeable increase during late afternoon. Behaviors associated with sound production included territorial displays and courtship interactions, indicating that sound production is likely related to spawning activity, and passive acoustic monitoring could be an effective tool for red grouper management and conservation efforts.

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## **0040 Roads Symposium I, Ballroom B, Saturday 10 July 2010**

Kevin Moody<sup>1</sup>, Dennis Durbin<sup>2</sup>, Steve Earsom<sup>2</sup>

<sup>1</sup>*FHWA, Atlanta, GA, United States*, <sup>2</sup>*FHWA, Washington DC, United States*

### **Green and Gray Infrastructure: Communications that Make a Difference**

The Federal Highway Administration (FHWA) has some direct influence, and much indirect influence, on interactions between surface transportation infrastructure and natural and human environments. The FHWA funds, authorizes, and permits certain highway projects; identifies and deploys technologies that enhance highway system reliability and safety, and influences institutional research and development of best

practices and design criteria. And yet the FHWA finds itself in a constant struggle to ensure that it integrates myriad societal values, such as sustainable populations of wildlife and ecosystems, into its' practices and programs. In recent years, the FHWA led multi-stakeholder efforts to institutionalize the integration of multiple values into planning, design, and decision-making. These include the "Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects," a primer on collaborative problem solving written by and for diverse audiences interested in addressing environmental concerns associated with infrastructure and other governmental actions; and, "Literature Synthesis of the Effects of Roads and Vehicles on Amphibians and Reptiles" by Andrews et al. 2006, which facilitates the transfer of ecological impact information into transportation planning, design, and decision-making. The FHWA recognizes the substantial need for a guide or "cookbook" that describes what local environmental information is most useful and relevant for transportation decision-making, when and to whom to communicate it, and how the information should be framed for effective and efficient application. This paper coaches subject-matter experts so they can effectively and efficiently communicate the information perceived as most useful and relevant to transportation and decision makers and decision support staff.

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### **0588 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Brad Moon, Paul Hampton

*University of Louisiana at Lafayette, Lafayette, LA, United States*

#### **Respiratory Water Loss During Rattling in Rattlesnakes**

Rattling is energetically demanding for rattlesnakes. The snakes increase their ventilation rates to support the energetic demand of rattling. Hence, respiratory water lost is probably increased during rattling compared to resting. This respiratory water loss could be important in desert species such as the western diamond-backed rattlesnake, *Crotalus atrox*. However, respiratory water loss during rattling has not yet been measured. In this study, we use a mass flow meter to measure air flow rates and a water vapor analyzer to measure respiratory water loss at rest and during 15-min bouts of rattling in western diamond-backed rattlesnakes. To determine rates of water loss, we measured air flow rates and excurrent water vapor density, and subtracted the water vapor density of the incurrent air. During the rattling bouts, the snakes appeared to reach steady levels respiratory water loss. Resting incurs low levels of respiratory water loss, averaging approximately 0.25 mg/g snake/hr, and that rattling incurs about two to five times more water loss. Coupled with infrequent and brief use of rattling, these relatively low levels of water loss probably do not cause any significant dehydration in the snakes.

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**0126 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Clinton Moran, Lara Ferry-Graham

*Moss Landing Marine Laboratories, Moss Landing, CA, United States*

**Jaw Kinematics During Scraping in *Girella nigricans* (Kyphosidae)**

Marine herbivory is common in fishes that inhabit tropical waters but is rare at temperate latitudes. Despite the abundance of herbivorous diet items at temperate latitudes, only a few families of fish are able to utilize this food source. Herbivorous foods are considered low quality diet items as they are chemically defended, securely attached, and poorly digested. A novel jaw joint called the intramandibular jaw joint has independently arisen in several lineages and is thought to assist in procurement of such diet items by creating a large, flat tooth bearing surface. We are investigating the kinematics of several features integral to herbivorous feeding, including the intramandibular joint, in *Girella nigricans* (Kyphosidae). High speed video of *G. nigricans* was recorded at 250 frames/sec while the fish scraped a gelatin block. Mean kinematic profiles we created for cranial elevation, lower jaw depression, opercular flexion, premaxillary rotation, and flexion of the intramandibular joint. Linear excursion of the premaxilla and gape distance were also recorded. Angular excursion of the premaxilla, lower jaw and cranium along with gape distance appeared to all reach a maximum in synchrony, around 0.1 seconds. Unlike suction feeding fish, there appeared to be little linear excursion of the premaxilla. Bending at the intramandibular joint was noted when biting at the food source and served to enlarge the gape. We have yet to determine if this bending is actively controlled by the fish or is a passive response to the substrate to which the herbivorous diet item is attached.

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**0237 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Cristiano Moreira

*Universidade Federal de São Paulo, Diadema, SP, Brazil*

**What a Great Nose You Have: Sexual Dimorphism of Olfactory Structures in Hypoptopomatine Fishes (Siluriformes, Loricariidae)**

The catfish family Loricariidae is one of the largest freshwater fish families, and as expected presents a vast array of morphological and behavioral diversification. The presence of secondary sexual dimorphic structures in loricariids is well documented and include modifications such as the elongation of fins in males (e.g. *Chaetostoma jegui*), different arrangements and shapes of odontodes in males (e.g. *Hemipsilichthys*), fleshy snout tentacles in the species of the genus *Ancistrus*, and development of the lower lip in a few genera of the subfamily Loricariinae. Examination of the olfactory structures of

males and females of several species of the loricariid subfamily Hypoptopomatinae revealed a surprising sexual dimorphism unknown for freshwater fishes. Males of this subfamily, with a few exceptions, have the olfactory organs larger and deeper than of the females. Lamellae of males' olfactory rosettes are longer and more numerous than that of females. The dorsal margin of the lamellae in males has a distinct knob on its median region, while in females the dorsal margin is straight. The olfactory-related areas of the brain are also sexually dimorphic, with the olfactory bulbs larger and deeper in males than in females. The function of these modifications in males is unknown, however, it possibly plays an important role in mate finding/selection.

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## **0236 Fish Ecology, Morphology & Physiology, 556 AB, Saturday 10 July 2010**

Cristiano Moreira<sup>1</sup>, Richard Vari<sup>2</sup>

<sup>1</sup>*Universidade Federal de São Paulo, Diadema, SP, Brazil*, <sup>2</sup>*National Museum of Natural History - Smithsonian Institution, Washington, DC, United States*

### **Cephalic Laterosensory System of Hatchetfishes (Characiformes: Gasteropelecidae)**

The species of the genera *Carnegiella*, *Gasteropelecus*, and *Thorachocharax* are among the most peculiar fishes within the order Characiformes with highly developed coracoids and associated expanded musculature. Although a few studies have documented their capacity to accurately detect and locate potential prey items on the water surface, no study to date attempted to identify the morphological modifications associated with this ability. In the present study we describe modifications of the laterosensory system on the head of the species of this family. The frontal has two longitudinal crests that create two elongate skin-covered depressions on each side of the head. The medial chamber extends along the entire frontal and a portion of the parietal, while the lateral chamber is shorter and located dorsal to the orbit. These chambers are connected by a foramen through the longitudinal crest separating them, but are isolated from all other laterosensory canals with the exception anteriorly of nasal canal. The two chambers are apparently homologous with the supraorbital canal of other characiforms. Associated with these expanded chambers are two large perpendicular neuromasts in the median chamber and one in the lateral chamber. It appears that these modifications serve as tympana enabling gasteroplecids to rapidly pinpoint the location of potential prey items.

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## **0203 AES Conservation & Management, 552 AB, Friday 9 July 2010**

Alexia Morgan<sup>1</sup>, Mike Allen<sup>1</sup>, Enric Cortés<sup>2</sup>, Colin Simpfendorfer<sup>3</sup>, George Burgess<sup>1</sup>

<sup>1</sup>University of Florida, Gainesville, FL, United States, <sup>2</sup>NOAA/NMFS, Panama City, FL, United States, <sup>3</sup>James Cook University, Townsville, Queensland, Australia

### **Population Assessment of the Dusky Shark in the Western North Atlantic Ocean Using an Age-structured Model**

An age-structured model was used to assess the effects of fishing on population trends for the dusky shark (*Carcharhinus obscurus*) off the east coast of the USA. This model included age-specific vulnerability to fishing, maturity and growth schedules, and a Beverton and Holt stock recruit equation. Results of the base case-scenarios, and sensitivity analyses indicated that the population of dusky sharks in the western North Atlantic Ocean is between 9 and 50% of virgin biomass in 2006. Model results showed that the impacts of fishing already imposed on the dusky shark combined with the continued bycatch of this species, will be difficult to overcome even with the implementation of time/area closures, gear modifications and/or catch and discards being reduced for another 20 years. Recent publications have shown that the Maximum Sustainable Yield (MSY) for dusky sharks may be well above 50% of the virgin biomass, suggesting this species is currently overfished even in the most optimistic scenarios, and will require long-term targets for recovery to sustainable levels.

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## **0462 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Amanda Moss, David Rostal

Georgia Southern University, Statesboro, GA, United States

### **Use of Ultrasound, X-ray, and Oxytocin to Determine Reproductive State of Female *Trachemys s. scripta* not Collected at the Nesting Site**

Traditionally, projects involving use of oxytocin in female turtles have utilized time consuming and labor intensive capture methods such as drift fencing with pit-fall or bucket traps. Palpation has been used as a method for detection of calcified eggs, though it lends no information on existence of follicles or less calcified eggs. Here, we set out to determine if x-ray and ultrasound could aid in determining reproductive state of females not captured at or near the nesting site. Ninety female *Trachemys s. scripta* were collected from two sites in southeastern Georgia from February to August 2009 through dip-netting and hoop-trapping. Females were ultrasounded to observe follicle and/or egg presence. State of reproductive development was designated in four categories: (1) no follicular or egg development, (2) follicles present, (3) eggs and follicles

present, (4) only eggs present. Females categorized as either 3 or 4 were brought to the lab for x-ray. Only category 4 females (N=20) were injected with oxytocin (20IU/kg). Ultrasound proved effective in identifying ovarian follicles and all stages of egg development. X-ray was effective in identifying eggs in 71% of females observed as gravid using ultrasound. Oxytocin was effective in less than 50% of females known to have oviductal eggs based on ultrasound. Ultrasound and x-ray combined can provide more accurate reproductive data without the need for oxytocin or trapping at the nesting site. Females caught away from the nesting site may not be physiologically ready to nest and therefore may not be responsive to oxytocin.

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**0461 SSAR SEIBERT SYSTEMATICS & EVOLUTION/SSAR SEIBERT  
PHYSIOLOGY, 555 AB, Friday 9 July 2010**

Amanda Moss<sup>1</sup>, David Rostal<sup>1</sup>, Thane Wibbels<sup>2</sup>

<sup>1</sup>Georgia Southern University, Statesboro, GA, United States, <sup>2</sup>University of Alabama Birmingham, Birmingham, AL, United States

**Annual Reproductive Cycles of Male and Female Yellow-bellied Sliders  
(*Trachemys s. scripta*) from Two Populations in Georgia Exposed to Different  
Water Temperature Regimes**

In recent decades, hormone levels have been measured in a wide range of reptilian species including turtles. Seasonal fluctuations in reproductive hormones (such as testosterone and estradiol) provide insight to how species have adapted to variable environmental factors. In this study, we set out to (1) determine the annual hormonal cycles of male and female *Trachemys s. scripta* and (2) examine effects of water temperature on reproductive cycles in this species. Turtles from two sample sites in southeastern Georgia were examined: George L. Smith (GLS) and Magnolia Springs (MS) state parks. The water temperature at GLS (consisting of a large, man-made pond with slow moving currents regulated by a dam) is influenced mainly by ambient temperatures with large fluctuations in summer and winter temperatures. The water temperature at MS (which consists of a spring fed pond flowing into a slow moving stream) remains relatively constant year round due to spring water effluent. Turtles were captured either by hoop-trapping (primarily at GLS) or dip-netting (primarily at MS) from January 2009 through February 2010. Hormone levels were measured through radioimmunoassay. In females, follicle and egg development was observed through use of ultrasound and x-ray. Males exhibited biphasic peaks of testosterone at both sample sites while females exhibited distinct differences in timing of follicle development, egg production, and hormone peaks at each site. Examination of the effects of water temperature on reproductive cycles in this species can lead to a better understanding of how environmental conditions influence reproduction in turtles.

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## 0481 Amphibian Ecology 551 AB, Monday 12 July 2010

Cy Mott<sup>1</sup>, Cy Mott<sup>2</sup>, Michael Steffen<sup>3</sup>, Michael Steffen<sup>4</sup>

<sup>1</sup>Cooperative Wildlife Research Lab, Southern Illinois University, Carbondale, Illinois, United States, <sup>2</sup>Watershed Studies Institute and Department of Biological Sciences, Murray State University, Murray, Kentucky, United States, <sup>3</sup>Department of Biology, Southern Illinois University, Carbondale, Illinois, United States, <sup>4</sup>Department of Biological Sciences, University of Tulsa, Tulsa, Oklahoma, United States

### **Ecological Consequences of Nonlethal Injury for a Larval Amphibian Intraguild Predator**

The consumption of potential competitors, or intraguild predation (IGP), is widespread among larval amphibians and contributes to local extirpation, morphological differentiation, and behavioral divergence among sympatric congeners. Theoretical and empirical treatments of IGP, however, commonly regard the phenomenon as an "all-or-nothing" event in which individuals either successfully consume or do not attempt to consume competitors. These approaches do not acknowledge the frequency and ecological impact of unsuccessful predation attempts resulting in nonlethal injuries, despite the potential reduction in competitive ability that injuries may impose. In assessing the consequences of injuries inflicted among intraguild competitors, we first recorded in situ injury prevalence among *Ambystoma opacum*, *A. tigrinum*, and *A. maculatum* through larval ontogeny. Using a combination of laboratory and field methods, we also evaluated the influence of conspecific injuries among top predators (*A. opacum*) by observing patterns of microhabitat selection, size, behavior, and diet among injured and uninjured individuals. During pairwise laboratory observations of agonistic behavior, larvae wounded during previous contests were less aggressive and more likely to be targeted by healthy larvae in subsequent encounters. In natural pond communities, injury frequency and severity increased steadily through ontogeny. Injured larvae were typically smaller in size and occupied benthic and riparian microhabitats, while larger, uninjured individuals inhabited zones at the pond surface and in the water column. Dietary analyses are currently ongoing. Our results to date indicate that nonlethal injury among intraguild competitors results in considerable behavioral and morphological consequences that may compromise an individual's competitive ability.

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## 0479 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Cy Mott, Howard Whiteman

*Watershed Studies Institute and Department of Biological Sciences, Murray State University, Murray, Kentucky, United States*

### **Facultative Paedomorphosis and Kin Aggression in a Larval Salamander**

Kin selection in larval amphibians typically occurs as reduced aggression among related individuals, and such relationships are hypothesized to increase inclusive fitness by facilitating relatives' survival to metamorphosis. However, some salamander species exhibit facultative paedomorphosis, a strategy in which larvae may either metamorphose into terrestrial adults or remain in ponds as branchiate, reproductively mature adults. Under such circumstances, reduced aggression toward kin by larvae that become paedomorphic may ultimately confer ecological costs rather than benefits. By reducing aggression towards kin, paedomorphic larvae may facilitate persistence of lifelong competitors if kin also become paedomorphs and shared resources are limiting. Whether larvae reduce aggression towards relatives may therefore depend on individual developmental trajectories, with future metamorphs being less aggressive toward kin than future paedomorphs. To determine how kin aggression varies among larvae with divergent developmental strategies, we are observing agonistic interactions among related and unrelated *Ambystoma talpoideum* throughout ontogeny in laboratory populations. We are also recording frequency of injury, growth, survival, and microhabitat selection among kin:kin and kin:non-kin treatments to determine how these aspects of larval ecology are impacted by relatedness and aggression. By repeatedly examining aggression through ontogeny among larvae developing into metamorphic or paedomorphic adults, we will evaluate if kin aggression is influenced by the costs and benefits associated with alternate developmental pathways.

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## 0097 Lundberg Symposium, Ballroom D, Sunday 11 July 2010

Philip Motta

*University of South Florida, Tampa, Florida, United States*

### **Simplicity and Conservation of the Selachian Feeding Bauplan**

The selachian feeding bauplan demonstrates a remarkable conservation of form throughout phylogeny, and when compared to that of bony fishes, is notable in its mechanical and constructional simplicity. Various lineages of selachians have, through subtle changes in motor patterns and muscular insertions, effected novel feeding mechanisms. Similarly, relatively minor changes in cranial morphology result in some of the most successful suction-feeding fishes. Filter-feeding, albeit relatively rare compared to bony fishes, is only noteworthy in its structural modifications in the whale shark.

Durophagy is most pronounced by modification of the dentition and simple changes in lever arms as well as muscle size and motor patterns. Dental replacement patterns and tooth biomechanics reveal apparently over-engineered morphology with respect to cutting ability, and polyphyodonty within the sharks might primarily serve to keep sharp teeth in the functional position. Relatively high bite force in some sharks appears to contradict the studies on tooth biomechanics, and high bite force may indicate differential selection throughout ontogeny. A growing body of data, indicate that sharks and rays have maintained a structurally simple yet effective feeding mechanism, with relatively minor evolutionary changes resulting in diversification of their feeding biology. This diversification, although not rivaling the bony fishes, has in part resulted in the success of this group.

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**0745 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Peter Muelleman, Chad Montgomery

*Truman State University, Kirksville, MO, United States*

**Trailing of Maternal Chemical Cues by Neonate Timber Rattlesnakes, *Crotalus horridus***

Chemical cues are important aspects in the life history of many animals. Snakes utilize chemical cues for foraging, post-venomation tracking and reproduction. Recent studies have indicated that some snakes, namely temperate pit-vipers, engage in more social behaviors than previously thought, mostly mediated by chemical cues. The goals of this study were to determine if neonate timber rattlesnakes preferentially use the chemical trail of their own mother to locate a suitable hibernaculum as opposed to the trails of other conspecifics with the use of radiotelemetry. We also looked at the status, demographics and size of the study population in northern Missouri. Over the course of two study seasons 43 individuals were marked. Two neonates were tracked from time of birth to the ingress of the hibernaculum and were documented to use the same hibernaculum as their mother.

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## 0450 Herp Ecology & Behavior, 555 AB, Saturday 10 July 2010

Kerry Muldoon

*Hofstra University, Hempstead, NY, United States*

### **Post-emergence Movement and Survivorship of Diamondback Terrapin (*Malaclemys terrapin*) Hatchlings at Jamaica Bay Wildlife Refuge, New York**

As with most turtle species, diamondback terrapin hatchling life history is poorly known and only a few short term studies and anecdotal notes exist regarding hatchling movements, salinity tolerance, microhabitat use and overwintering locations. I investigated terrapin hatchling movements after emergence, identified environmental factors associated with hatchling movements, and measured hatchling survivorship. I installed 11 drift fences and associated pitfall traps in six locations at Jamaica Bay Wildlife Refuge, New York, in fall 2006, spring 2007, fall 2007, and spring 2008. I checked traps daily during activity seasons, measured, marked, and photographed each hatchling. I captured 324 live hatchlings, 95 of these were recaptured at least once, and I found 42 dead hatchlings. More than 80% of dead hatchlings were found on nights with less than 50% lunar illumination. Over 50% of fall hatchlings were moving away from the water, at least 18 hatchlings overwintered terrestrially outside of the nest, and 62% decreased in size overwintering. The length of time between fall capture and spring recapture ranged from 183 - 276 days. Over 50% of spring hatchlings moved towards water. I found a weak but significant relationship between the number of hatchlings captured and higher air temperatures, but no relationship between hatchling movement and wind and precipitation. Future work will include management plans that identify and protect terrestrial overwintering habitat.

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## 0018 Herp Ecology & Systematics, Ballroom B, Thursday 8 July 2010

Erin Muths<sup>1</sup>, Rick Scherer<sup>2</sup>, Brad Lambert<sup>3</sup>

<sup>1</sup>U.S.G.S., Fort Collins, CO, United States, <sup>2</sup>Colorado State University, Fort Collins, CO, United States, <sup>3</sup>Colorado Natural Heritage Program, Fort Collins, CO, United States

### **Evidence for Skipped Breeding Opportunities in Female Toads and Unbiased Survival Estimates**

Estimates of demographic parameters for females, in many organisms, are sparse. This is particularly worrisome as more and more species are faced with high extinction probabilities and conservation increasingly depends on actions dictated by complex predictive models that require accurate estimates of demographic parameters for each sex and species. Our study assesses demographic parameters, specifically temporary

emigration and survival, for females, a class that has been difficult to investigate historically because of lack of data. Amphibians provide a particularly good example because there is global concern about amphibian decline yet most demographic parameter estimates are based on data from males, which we show can lead to erroneous conclusions. Using multi-state open robust design model on 10 years of capture-recapture data from boreal toads (*Bufo boreas*) we provide evidence for the occurrence of skipped breeding opportunities (i.e., temporary emigration) in females. We show that the transition from breeder to non-breeder is obligate and the probability of a non-breeder remaining a non-breeder is 64%, thus temporary emigration is first-order Markovian, where breeding probability is dependent on the previous year's activity. With temporary emigration accounted for, we estimated between-year female survival at 87%.

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## **0010 Headstarting Turtle Symposium II, Ballroom B, Monday 12 July 2010**

Kenneth Nagy<sup>1</sup>, Scott Hillard<sup>1</sup>, Brian Henen<sup>2</sup>, Michael Tuma<sup>3</sup>, David Morafka<sup>4</sup>

<sup>1</sup>University of California, Los Angeles, California, United States, <sup>2</sup>Marine Corps Air Ground Combat Center, Twentynine Palms, California, United States, <sup>3</sup>SWCA Environmental Consultants, South Pasadena, California, United States, <sup>4</sup>Deceased, San Francisco, California, United States

### **Desert Tortoise Head-starting Research in California**

Populations of the Threatened Desert Tortoise (*Gopherus agassizii*) continue to decline in the western Mojave Desert despite years of federal and state protection. Recruitment of young apparently is near zero, likely due to heavy predation pressure. We are studying ways to increase recruitment by protecting nests, eggs, hatchlings and young juveniles inside large, natural habitat, predator-resistant hatchery/nurseries on three military bases. Local wild females are placed temporarily inside enclosures to lay eggs. Improvements in handling gravid females and in protecting nests from rodents and ants have increased nesting/laying success and hatching success. Controlled irrigation experiments that mimic rainfall in a "good" year have increased juvenile survivorship and have enhanced juvenile growth rates. The increased availability of green wildflower foods and drinking opportunities resulting from one to three small, carefully-timed irrigation events allowed juveniles to grow two to three times faster than control tortoises receiving only natural rainfall. Several release experiments have revealed that survivorship of the smaller and younger juveniles was low, predation being the major cause of death. These experiments suggest that juveniles larger than about 110 mm MCL (midline carapace length) have much higher survivorship after release. This size could be reached in as little as six to eight years in irrigated enclosures. Efforts to evaluate possible vertical transmission of diseases (mother to egg, especially Mycoplasma-caused Upper Respiratory Tract Disease) have been unsuccessful due to scarcity of sick wild females locally. We are monitoring survivorship, and eventually reproduction, in released juveniles at one site.

## 0428 Roads Symposium II, Ballroom B, Saturday 10 July 2010

Priya Nanjappa<sup>1</sup>, Ron Sutherland<sup>2</sup>, Margaret Trani Griep<sup>3</sup>, Kyle Barrett<sup>4</sup>

<sup>1</sup>*Association of Fish and Wildlife Agencies, Washington, DC, United States*, <sup>2</sup>*Duke University, Durham, NC, United States*, <sup>3</sup>*U.S. Forest Service, Tallahassee, FL, United States*, <sup>4</sup>*University of Georgia, Athens, GA, United States*

### **Moving Targets: Linking Priority Conservation Area Schemes and Climate Assessments for Proactive Planning and Integrated Ecosystem Connectivity**

Most biologists agree that the largest challenges for wildlife conservation worldwide are habitat loss and fragmentation, yet it is clear that development and urbanization are unlikely to slow in the near term. As a result, many efforts have been initiated to identify priority conservation areas, ranging from taxon-specific schemes such as Audubon's Important Bird Areas (IBAs), to landscape-scale programs such as The Nature Conservancy's Ecoregional Assessments (ERAs) and the Department of the Interior's new Landscape Conservation Cooperatives (LCCs). Such efforts can focus habitat protection and restoration resources, and assist development and transportation professionals in proactive planning endeavors. Continued expansion of human populations coupled with climate change has caused conservation practitioners and transportation planners alike to consider options for maintaining long-term connectivity as current corridors (both wildlife and human) are modified. Partners in Amphibian and Reptile Conservation (PARC) has recently initiated efforts to enhance ecosystem connectivity, including 1) developing criteria to identify priority conservation areas, and 2) deriving climate vulnerability models for select herpetofauna. Although amphibians and reptiles are the target species, their diverse ecologies allow them to serve as proxies for high biodiversity areas or co-occurring taxa. Resulting Geographic Information Systems (GIS) layers will be used to overlay with other existing priority conservation areas data, road development plans, local human population growth projections, and climate vulnerability models to anticipate demands for transportation projects and to map focal areas for maximizing connectivity and minimizing conflict. These tools provide cost-saving incentives for proactive planning by reducing unexpected biological assessments or mitigation.

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**0566 AES Stress Symposium I, 551 AB, Sunday 11 July 2010**

Lisa Naples<sup>1</sup>, Natalie Mylniczenko<sup>2</sup>, Trevor Zachariah<sup>3</sup>, Forrest Young<sup>4</sup>

*<sup>1</sup>John G Shedd Aquarium, Chicago, Illinois, United States, <sup>2</sup>Disney's Animal Kingdom, Orlando, Florida, United States, <sup>3</sup>Chicago Zoological and Aquatic Animal Residency, Chicago Illinois, United States, <sup>4</sup>Dynasty Marine Associates, Marathon, Florida, United States*

**The Influence of Venipuncture Site on Secondary Blood Physiological Values During Elasmobranch Health and Stress Investigations**

It is important when evaluating hematologic parameters and establishing reference values to recognize any differences in regards to the collection site. Following the evaluation and comparison of hematocrit values from two venipuncture sites in captive and wild sharks, the current study was developed. As significant changes in the acid-base balance of elasmobranchs can occur during handling or transportation, blood gas assessment within minutes of collection is essential to provide information regarding immediate physiological stressors. This information can be applied to stress assessment and the limitation of morbidity and mortality during capture situations. The current study was developed to 1) evaluate baseline blood gas values of a captive population of elasmobranchs ranging from benthic to pelagic species, 2) to evaluate the use of a portable clinical analyzer boat-side during elasmobranch capture, and 3) to compare two commonly used blood collection sites in an effort to determine differences between the two. Pelagic, intermediate and benthic elasmobranchs at the John G Shedd Aquarium were immobilized for health screens. In addition, wild pelagic elasmobranch species were hook and line caught in the coastal waters of Florida several miles within the Keys during normal collecting trips for Dynasty Marine Associates. Wild caught animals were immediately brought boat-side, netted and manually restrained. Blood was obtained from the ventral tail artery and within 30 seconds from the dorsal sinus. Samples were immediately processed with the I-STAT (Heska, Fort Collins, CO 80525) portable clinical analyzer to run standard blood gas panels. Statistical comparisons were made for collection site, gender, and captivity status.

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## 0072 AES Feeding Symposium II, 552 AB, Saturday 10 July 2010

Andrés Felipe Navia<sup>1</sup>, Enric Cortés<sup>2</sup>, Paola Andrea Mejía-Falla<sup>3</sup>

<sup>1</sup>Fundación Colombiana para la Investigación y Conservación de Tiburones y Rayas, SQUALUS, Cali, Valle del Cauca, Colombia, <sup>2</sup>NOAA-NMFS, Panama City, FL, United States, <sup>3</sup>Grupo de Investigación en Ecología Animal, Departamento de Biología, Universidad del Valle, Cali, Valle del Cauca, Colombia

### **Topological Analysis of the Ecological Importance of Elasmobranch Fishes: The Gulf of Tortugas Food Web, Colombian Pacific Ocean, as a Case Study**

We built a trophic network based on a matrix of interspecific trophic relationships to assess the role of elasmobranch fishes in shaping community structure of the Gulf of Tortugas in the Colombian Pacific Ocean. We analyzed diet similarities to define trophic components (nodes)-rather than taxonomical groups-in the network. We evaluated the ecological function of species through topological analysis of their structural importance in trophic networks by applying one local and several mesoscale network indices and assessed the role of elasmobranchs in the set of keystone species for system stability using the "key player" problem approach. We found that elasmobranchs do not play an important ecological role in propagating direct or indirect effects through the system owing to the low and intermediate values of the node degree, centrality and topological importance indices. Only one elasmobranch node (*Mustelus* spp. and *Dasyatis* spp.) was included in the keystone species complex identified, contributing only 5% of the spread of effects in the network. Results from our study suggest that elasmobranchs at intermediate trophic levels-commonly referred to as "mesopredators"-are not so important in complex coastal ecosystems because their removal does not result in drastic changes in the structure of the trophic network.

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## 0391 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Farzaneh Nazari-Serengeh

Payame Noor University of Lorestan, 68158-348, Khorramabad, Lorestan, Iran, Islamic Republic of

### **Influences of Climate Gradient to Geographic Variation on Spermatogenesis Timing of *Cyrtopodion scabrum***

Spermatogenesis is a complicated process that different and various factors influence and control it. Based on climatic condition we collected many male specimens of *Cyrtopodion scabrum* in three latitudes (during biological activity) that different in climate condition. Removed testis and for histological survey H & E technique were used. Our results show three phase of spermatogenesis (Active, Transitional and Silent) during

biological activity those differences in three latitudes. In three latitudes spermatogenesis timing of three phases are different, and timing of activity spermatogenesis in low elevation population started earlier than higher population.

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#### **0401 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Farzaneh Nazari-Serengeh

*Payame Noor University of Lorestan, 68158-348 Khorramabad, Lorestan, Iran, Islamic Republic of*

#### **Sexual Dimorphism in the *Cyrtopodion scabrum* (Reptilia: Gekkonidae)**

I collected 33 specimens of *Cyrtopodion scabrum* (F= 15; M=18) from western Iran, Khorramabad City, Lorestan Provinces. For sexual dimorphism I work on 11 characters. For analysis of my data t-test and PCA were used. In first, all male have femoral pores and this factor is main factor for dimorphism between male and female of *C. scabrum*. Moreover, one of interesting point in results presented here is that the male specimens in all characters (excepted ear diameter) show lower values when compared to females. In some important characters such as interlimb space, the males significantly are longer than females. Sexual selection as well fecundity selection strongly occurred for male specimens. In this case, interlimbs space significantly selected for male specimens. In general, male specimens of *C. scabrum* have larger body and head size than their female counterparts.

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#### **0681 Fish Systematics I, Ballroom D, Monday 12 July 2010**

Thomas Near<sup>1</sup>, Matthew Niemiller<sup>1</sup>

<sup>1</sup>*Yale University, New Haven, CT, United States*, <sup>2</sup>*University of Tennessee, Knoxville, TN, United States*

#### **Phylogenetics and Diversification of Amblyopsid Cavefishes (Teleostei: Percopsiformes)**

The North American endemic Amblyopsidae contain species that utilize troglodytic habitats, as well as a surface dwelling species and a facultative troglodyte. Previous hypotheses have proposed a sequence of specialization to cave habitats that follows from a surface dwelling ancestor to troglodyte species that are found only in underground aquatic habitats, with the facultative troglodyte condition representing an intermediate stage to remarkable adaptations associated with cave-dwelling troglodytic species. Phylogenetic relationships and patterns of character evolution in traits associated with troglodytic species were explored using a time-calibrated species tree

inferred from a DNA sequence dataset sampled from nine nuclear genes. Divergence times were estimated using ages implied in the fossil record of Percopsiformes. Analysis of character evolution on the phylogeny supports a hypothesis of multiple transitions to troglodytic habitats in Amblyopsidae.

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## **0285 Headstarting Turtle Symposium I, Ballroom B, Monday 12 July 2010**

Ana Cecilia Negrete<sup>1</sup>, Rodolfo Raigoza<sup>1</sup>, Alejandro Areanas<sup>2</sup>

<sup>1</sup>Xcaret Park, Quintana Roo, Mexico, <sup>2</sup>Flora Fauna y Cultura de México A.C., Quintana Roo, Mexico

### **Green Sea Turtle (*Chelonia mydas*) Headstarting Program at Xcaret Park Quintana Roo, Mexico**

Xcaret Park is located in Quintana Roo State, 60km south Cancun City. The green sea turtle (*Chelonia mydas*) head starting program has been developed since 1993 with the main purpose of arousing awareness and educating our visitors about this species. Annually, around 200 hundred hatchlings born on X'cachel Beach are kept in captivity and at the end of this period those juveniles are released during a ceremony with a strong educational backup. Since 1993 the program had released 2143 juveniles with the participation of 8000 children and the attendance of 45000 tourists. The hatchlings are kept in four concrete made pools and 24 hours sea water flow. During this period, the turtles are fed with fresh and processed food and get day physical exams in order to diminish disease occurrence. Once a week they get measured and weighed to record growth rates. Since 1998, 36 reports have been received of head started juveniles of this program from Akumal bay, Campeche State, Cuba, Barbados, Bahamas and Florida and we have recorded 17 sightings of nesting females of both, living tag and head starting program after 11 years of extensive follow up. One of those seventeen sea turtles was confirmed to be a head started animal. Besides this, the program has allowed us to develop husbandry techniques in captivity where behavior, immunology and diagnostic techniques for *Fibropapiloma* and ulcerative dermatitis (SCUD) have been studied.

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### **0372 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Jessica Nelson

*National Aquarium Institute, Baltimore, MD, United States*

#### **Trends in Reproduction of Dendrobatid Frogs at the National Aquarium**

In light of the global amphibian crisis, we need to be aware of factors that might affect the many in- and ex-situ amphibian breeding and reintroduction projects. Understanding the captive care and survivability of egg clutches and tadpoles is important for maximizing these conservation efforts. Detailed reproductive records of the amphibian collection in the Rain Forest exhibit at the National Aquarium, Baltimore have been kept since August 2006. Trends in clutch size, fertility, and survival, and tadpole survival are evaluated among species and breeding groups. Trends in the occurrence of spindly leg are of special interest as it is still unknown what causes this malformation in tadpoles and it is a persistent issue in captive collections.

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### **0303 Herp Conservation III, Ballroom B, Sunday 11 July 2010**

Lorin Neuman-Lee, Karen Gaines, Stephen Mullin

*Eastern Illinois University, Charleston, IL, United States*

#### **Estradiol Levels in Watersnakes (Colubridae: *Nerodia*) During Gestation as a Function of Exposure to Ingested Atrazine**

Low levels of the pesticide atrazine have recently been linked to feminization in amphibians when exposed during development. One proposed mechanism that explains this effect is the induction of the enzyme aromatase, which elevates estradiol levels. We tested this hypothesis using Northern Watersnakes, *Nerodia sipedon*, which are suitable models for examining the effects of atrazine on viviparous organisms that are naturally exposed to this contaminant through ingestion of their main food source, fish. For the duration of their gestation, we exposed gravid female snakes to one of four treatment doses of atrazine through food ingestion. We collected blood samples from each subject on a weekly basis. We isolated estradiol from each blood sample using solid phase extraction, and we analyzed estradiol concentrations using a magnetic particle enzyme-linked immunosorbant assay. We discuss our results with an emphasis on the long-term effects on female fitness and, in particular, offspring viability. Our research can lead to an improved understanding of how estradiol levels are affected throughout pregnancy when atrazine exposure occurs through regular dietary intake.

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**0789 Fish Systematics & Morphology, Ballroom D, Friday 9 July 2010; ASIH  
STOYE AWARD GENERAL ICHTHYOLOGY**

Heather Neun

*Saint Louis University, Saint Louis, Missouri, United States*

**Morphological Variation in the Yaqui Sucker, *Catostomus bernardini*, (Family  
Catostomidae)**

Remote and often inaccessible areas present the opportunity for discovery of patterns of geographic variation in species and prospective new species. The Yaqui Sucker, *Catostomus bernardini*, occur naturally in some of the most remote areas of North America in rivers and streams of the Sierra Madre Occidental. In this investigation geographic variation was examined across river drainages for *C. bernardini* (5 drainages) from northwestern Mexico for body, head, lip, and fin shape using a morphometric approach. A series of 44 truss landmark measurements were completed for 251 *C. bernardini* from throughout their ranges. Scale and fin ray counts were documented as well. All individuals were sexed to account for potential sexual dimorphism and eliminate this variance from shape variation. Shape differences and variation was examined using sheared Principle Components Analysis (PCA). As demonstrated in many previous studies sheared PCA eliminates size from axes beyond the first to better estimate shape variation in and across populations. Results of these analyses will be discussed.

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**0451 AES Feeding Symposium I, 552 AB, Saturday 10 July 2010**

Steven Newman<sup>1</sup>, Richard Handy<sup>1</sup>, Samuel Gruber<sup>2</sup>

<sup>1</sup>*University of Plymouth, Plymouth, United Kingdom*, <sup>2</sup>*University of Miami, Florida, United States*

**Inter-annual Variation in Lemon Shark Feeding Ecology at Bimini Bahamas**

Stomach contents of juvenile, nursery bound lemon sharks, *Negaprion brevirostris*, were sampled concurrently with prey communities over three consecutive years in a highly enclosed nursery (North Sound) with limited to low immigration and emigration rates. Stomach contents were collected from 240 of 432 lemon sharks captured (56 %), and diet described from 420 items. Yellowfin mojarra, *Gerres cinereus*, were the main prey, although they were less important in the diet of lemon sharks in 2001 (58 %IRI - Index of Relative Importance, 69 %IRI 2000, 78 %IRI 2002). This reflected lower abundance and biomass of mojarra in the environment. Dietary composition differed significantly with year (Chi<sup>2</sup> P < 0.05, using pooled categories) with variability due to an increase in the consumption of a wider range of prey in 2001. In 2001 lemon sharks also exhibited

increased diet breadth and reduced dietary overlap with other years, and consumed on average smaller teleost prey although this was not significant (Kruskal-Wallis  $P = 0.07$ ). Prey preference estimates using residual Chi-square and %IRI revealed lemon sharks predominantly fed opportunistically, with some species-specific preferences. Inter-annual variation in lemon shark dietary composition in the North Sound appears to reflect prey communities. Therefore, recent development near this nursery may pose a threat, with anthropogenic impacts on fish communities likely to affect lemon shark diet, and ultimately growth and survival.

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## **0293 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Kirsten Nicholson, [John Phillips](#)

*Central Michigan University, Mt. Pleasant, MI, United States*

### **Evolution and Biogeography of the Anoles of Gorgona Island, Colombia**

Gorgona Island is an island located 50 km off the Pacific coast of Colombia and is home to five species of anoles: *A. chocorum*, *A. biporcatus*, *A. gorgonae*, *A. medemi*, *A. princeps*. Few studies have been conducted on these species, and none have conducted molecular analyses to investigate their phylogenetic relationships to mainland anoles. Two of these species are endemic to the island (*A. gorgonae* and *A. medemi*), while the other three are present on the mainland in purportedly identical form. We collected samples from all species to investigate their phylogenetic placement among anoles, as well as to examine their biogeographic relationships. Our single *A. chocorum* sample could not be amplified, but the other four species were supported phylogenetically as predicted from the literature: *A. biporcatus* was sister to other mainland *A. biporcatus*; *A. gorgonae* was nested within the punctatus clade of Dactyloid anoles, *A. medemi* was mostly closely related to *A. fuscoauratus*, and *A. princeps* was nested within the latifrons clade of Dactyloid anoles. Rigorous node dating analyses are in progress but are made difficult by the lack of sound geologic reference data or fossils of non-extant species. However, examination of branch lengths as a proxy for relative dates suggests that *A. gorgonae* colonized the island well before the other species, although it remains unclear if all species colonized the island before or after separation from the mainland. We expect to have relative dates for the relevant nodes by meeting time.

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## 0154 Herp Ecology & Systematics, Ballroom B, Thursday 8 July 2010

John Niedzwiecki, Elizabeth Schriener

*Belmont University, Nashville, TN, United States*

### **The Effect of Predation Threat on Asymmetric Intraspecific Competition in the Streamside Salamander, *Ambystoma barbouri***

Predation can play an important role in lessening the effects competition. *Ambystoma barbouri* experience intense intraspecific competition. In other ambystomatids, size plays an important role in intraspecific competition, leading to asymmetric competition, and presumably increased variation in time to metamorphosis. In this experiment, we asked if asymmetric competition occurs in *A. barbouri*, whether that competition is through interference or scramble, and whether the presence of a predator could reduce the asymmetry of this completion. We raised *A. barbouri* larvae in 3 treatment groups: isolated, grouped fed-separately, and grouped fed-together, both in the presence and absences of predator chemical cues. After measuring the growth rate of the larvae over two weeks, we saw significant differences in the differences in coefficient of variation among the treatments, indicating the presence of asymmetric competition, and possible roles for both scramble and interference competition. Predation seemed to dampen asymmetry in grouped larvae, though possibly acting differently on each type of completion.

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## 0518 Karel Liem Symposium II, Ballroom D, Friday 9 July 2010

Stephen Norton

*Centralia College, Centralia, WA, United States*

### **Ontogenetic Changes in Diet and Prey Handling by Two Snail-Punching Cottid Fishes**

Unlike the crushing jaws of many other molluscivorous fishes, *Asemichthys taylori* and *Radulinus boleoides* (Scorpaeniformes: Cottidae) have evolved a minimalist strategy to circumvent the defenses of gastropods and bivalves. Teeth on the vomer punch a hole into the shell; this provides access by digestive enzymes. However, not all mollusks are punched. Some, such as limpets and scallops, are digested without punching. Approximately 30% of operculate gastropods are unpunched; half of these emerge from the feces alive. I will present an analysis of ontogenetic changes in prey selection (type and size) and prey handling (punched vs. unpunched, alive vs. dead) for these two predators. Individuals were collected bimonthly from two sites in the San Juan Islands, WA by hand net while scuba diving. Each fish was held in an individual container for 48 hours and their feces collected; after 48 hours, fish were returned to the field. Prey remains in feces were identified to taxonomic groups. Hard-shelled prey (gastropods,

bivalves, hermit crabs) were measured and examined for evidence of punching and for survival. Both cottids demonstrated ontogenetic changes in diet; bivalves and gastropods were a consistent diet element. Quantile regression analyses indicate that the minimum size of gastropod prey was constant as predator size increased. The maximum shell size increased as predator size increased, except for *Alvania* spp., the most common gastropod genus. Unpunched gastropods were slightly smaller than were punched individuals. Therefore, unpunched prey do not appear to be too tough, but must represent errors during prey processing.

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## **0750 AES GRUBER AWARD, 551 AB, Friday 9 July 2010**

Andrew Nosal<sup>1</sup>, Nicholas Wegner<sup>1</sup>, Daniel Cartamil<sup>1</sup>, Edward Kisfaludy<sup>1</sup>, Mark Royer<sup>2</sup>, Marcus Taylor<sup>3</sup>, Jeffrey Graham<sup>1</sup>

<sup>1</sup>*Scripps Institution of Oceanography, La Jolla, California, United States*, <sup>2</sup>*University of North Carolina - Wilmington, Wilmington, North Carolina, United States*, <sup>3</sup>*University of Hawai'i - Hilo, Hilo, Hawai'i, United States*

### **Movement Patterns of Leopard Sharks (*Triakis semifasciata*) along the Open Coast of San Diego County, California**

Each year, hundreds of leopard sharks (*Triakis semifasciata*) aggregate in shallow waters at the head of La Jolla Submarine Canyon at the southern end of La Jolla Shores Beach. Despite growing public interest and the thriving eco-tourism industry surrounding "Leopard Shark City," the ecological significance of this phenomenon and its underlying mechanisms remain poorly understood. Work to date indicates these sharks are mostly pregnant females, with no males and very few juveniles observed. The males aggregate 12 km north in deeper waters off Del Mar, CA, just inshore of a small kelp forest. In July 2009, 12 females (in La Jolla) and 10 males (in Del Mar) were surgically implanted with coded acoustic transmitters and monitored by a coastal receiver array spanning from Del Mar, CA to the USA-Mexico border. Both sexes exhibit strong fidelity to their respective capture sites, often dispersing at night. Active tracking shows females travel up to 1.5 km offshore at night and make sustained dives to >50 m. Some nights when aggregating females did not disperse coincided with California grunion runs. In early autumn, half of the passively tracked females departed northward along the coast, surpassing the northernmost receiver in Del Mar. One shark was captured 70 km north off San Clemente Pier. The remaining sharks departed southward around Thanksgiving, following a string of leopard shark killings by a bull California sea lion. A portion of these sharks is expected to return in 2010. Males continue to be detected intermittently in the Del Mar vicinity.

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## **0728 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Justin Nowakowski<sup>1</sup>, Natalie Hyslop<sup>2</sup>, James Watling<sup>3</sup>, Maureen Donnelly<sup>1</sup>

<sup>1</sup>*Florida International University, Miami, FL, United States*, <sup>2</sup>*University of Florida, Gainesville, FL, United States*, <sup>3</sup>*Washington University in St. Louis, St. Louis, MO, United States*

### **Influence of Matrix Type on Aquatic Vertebrate Communities in Cypress Domes**

Many community models now explicitly consider spatial structure. Among these spatially complex models are metacommunity models that consider patterns and processes occurring at the local-community and regional (or metacommunity) scales. We conducted a study of assemblages of aquatic vertebrates in a network of cypress domes surrounded by two dominant matrix types in Big Cypress National Preserve. This landscape represents a natural experiment that allowed us to examine community patterns in light of metacommunity predictions and the degree to which observed patterns differed by matrix type. The two matrix types, pine rockland and cypress prairie, differ in hydroperiod and therefore in connectivity for aquatic organisms. These hydrologically imposed differences in dispersal opportunity allowed for investigation of the effects of decreased connectivity on local community similarity. Observed patterns of local community composition differed significantly between matrix types as did the relative strength of spatial and environmental variables in explaining beta-diversity.

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## **0235 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Ann O'Connell<sup>1</sup>, Martin O'Connell<sup>2</sup>, Chris Schieble<sup>3</sup>

<sup>1</sup>*University of New Orleans, New Orleans, LA, United States*, <sup>2</sup>*University of New Orleans, New Orleans, LA, United States*, <sup>3</sup>*University of New Orleans, New Orleans, LA, United States*

### **Lake Pontchartrain Fish Assemblages Four Years after Hurricanes Katrina and Rita**

In 2006, we assessed the impacts on fishes of the 2005 hurricanes and the pumping of New Orleans floodwaters into Lake Pontchartrain. At the time there were concerns that floodwaters contained damaging amounts of toxins. Our short-term results suggested no change in near shore fish assemblages (beach seine collections) but a slight decline in the diversity of benthic fishes (trawl collections). To assess possible long-term changes, we compared monthly collections taken prior to the hurricanes (2000-2003, 2005) with collections taken after (2006-2009). Benthic fish assemblages exhibited the most post-hurricane changes with significant (ANOSIM, two-way crossed,  $p < 0.05$ )

pre/post assemblage changes occurring in five of twelve months examined: March, April, June, July, and August. Global R values for these differences, though, were all markedly low ( $R < 0.221$ ) suggesting that pre/post assemblage changes were not especially drastic. In all five months, bay anchovies (*Anchoa mitchilli*) and Atlantic croaker (*Micropogonias undulatus*) were more numerous after the hurricanes, while fewer Gulf menhaden (*Brevoortia patronus*) were collected in post-hurricane trawls. Pre/post beach seine and gillnet collections only yielded one month each of significant differences, again with relatively low global R values: November beach seines (ANOSIM, two-way crossed,  $R = 0.319$ ,  $p < 0.01$ ), April gillnets (ANOSIM, two-way crossed,  $R = 0.275$ ,  $p < 0.01$ ). These results suggest that four years after the hurricanes, Lake Pontchartrain fish assemblages have mostly recovered. While the two most common species (*A. mitchilli* and *M. undulatus*) actually increased, concerns exist about possible declines in *B. patronus* populations.

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## **0295 Fish Community Ecology, 555 AB, Monday 12 July 2010**

Martin O'Connell, O. Thomas Lorenz

*University of New Orleans, New Orleans, LA, United States*

### **A Second Cichlid Species in Louisiana: The Cusp of Invasional Meltdown?**

Invasional meltdown occurs when the presence of one invading species facilitates subsequent invasions by other species. As an established non-native species destabilizes a native ecosystem, the disruption facilitates the success of other non-native invaders. The non-native Rio Grande cichlid (*Herichthys cyanoguttatus*) has been established in the canals of the Greater New Orleans Metropolitan Area (GNOMA) for over a quarter century and continues to expand. For example, since the 2005 hurricanes *H. cyanoguttatus* has expanded its range south across the Mississippi River. While we have documented its deleterious effect on native fishes in the GNOMA, *H. cyanoguttatus* may now also be acting as the initiator of invasional meltdown by facilitating another, more dangerous species to become established. In December 2008, specimens of an unknown tilapia hybrid (*Oreochromis* sp.) were collected near Port Sulphur approximately 75 km southeast of New Orleans. Because of the damage escaped tilapia have caused to native fishes worldwide, the Louisiana Department of Wildlife and Fisheries responded rapidly to this discovery with an eradication effort. In the subsequent collection of rotenoned specimens, tilapia dominated both biomass and numbers of fishes in freshwater habitats around Port Sulphur. Along with the tilapia, numerous specimens of *H. cyanoguttatus* were also collected even though Port Sulphur is 60 km southeast of the previously known southern extent of this species. Efforts are being made to better understand how these two non-native cichlid species may be influencing each other's establishment and further dispersal.

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**0684 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Cynthia O'Rourke, Tamra Mendelson

*University of Maryland in Baltimore County (UMBC), Baltimore, Maryland, United States*

**Mating Environment Changes over the Course of the Nuptial Season in the Fantail Darter, *Etheostoma flabellare***

The mating environment is sometimes compared to an economic market, in which the costs and benefits of mating vary across a lifetime. Accumulating empirical evidence indicates that animals may alter their mating behavior to reflect their own histories and this changing environment. We sought here to investigate whether such an environment may exist for *Etheostoma flabellare*, a fish species with a promiscuous mating system and male parental care. In this study, fish were collected at three points during the nuptial season from a single stream (Meadow Branch - Carroll County, Maryland.) Dissections revealed a steadily declining adult sex ratio, from 1:1 (female:male) early in the season to 2:1 late in the season. Though scarcer late in the season, males were on average significantly larger late in the season, while the same was not true of females. Mean egg mass peaked mid-season, but was most reliably predictable by body mass early in the season. The slope of the relationship between body mass and egg mass also changed over the course of the season; an increase in female body size predicted the greatest increase in egg mass at mid-season. All of these results reflect a variable mating environment that, if replicated across the range of dispersal, may select for adaptively flexible mating behavior in the fantail darter.

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**0687 HERPETOLOGISTS' LEAGUE GRADUATE STUDENT AWARD, 556 AB, Friday 9 July 2010**

Michel Ohmer<sup>1</sup>, Sarah Herbert<sup>1</sup>, Richard Speare<sup>2</sup>, Phil Bishop<sup>1</sup>

<sup>1</sup>*University of Otago, Dunedin, Otago, New Zealand*, <sup>2</sup>*James Cook University, Townsville, Australia*

**Chytridiomycosis in Threatened New Zealand Frogs (*Leiopelma* spp.): Susceptibility and Implications for Management**

The spread of chytridiomycosis, an emerging infectious disease caused by the fungal pathogen *Batrachochytrium dendrobatidis* (*Bd*), is one of many threats facing amphibians worldwide. In New Zealand, both threatened native (*Leiopelma* spp.) and widespread introduced (*Litoria* spp.) anuran species have been found infected with *Bd*. In addition, rapid and progressive declines in conjunction with *Bd* detection in wild populations of one native species indicate this pathogen may be a threatening process. In order to

comprehend the impacts of *Bd* on New Zealand's native anuran fauna, we assessed the susceptibility of two native species, *Le. pakeka* and *Le. hochstetteri*, to chytridiomycosis. *Bd*-naïve individuals were exposed to a virulent New Zealand-isolate of *Bd*, and their infection status monitored using quantitative real-time PCR. Both species demonstrated low susceptibility and all individuals cleared *Bd* infection (*Le. hochstetteri* by week 11, *Le. pakeka* by week 15). While both species became infected, zoospore load was so low that *Bd* was not detected consistently each week. Furthermore, no frogs demonstrated clinical signs of chytridiomycosis. *Le. archeyi* similarly demonstrated low susceptibility in a previous study, indicating a genus-wide trend. Our findings suggest that the risk of *Bd* for Leiopelmatids in captive populations is low. However, care needs to be taken when extrapolating the results obtained in the laboratory to wild populations because both biotic and abiotic factors can affect morbidity and mortality due to *Bd*. Thus, rigorous field trials are the next step along the pathway to reintroducing protected populations of *Leiopelma* into areas containing *Bd*-infected *Litoria* populations.

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## **0568 Fish Life History, 551 AB, Friday 9 July 2010**

Charles W. Olaya-Nieto<sup>1</sup>, Fredys F. Segura-Guevara<sup>1</sup>, Glenys Tordecilla-Petro<sup>1</sup>

<sup>1</sup>Universidad de Córdoba, Lórica, Córdoba, Colombia, <sup>2</sup>Institución Educativa Román Chica Olaya, Lórica, Córdoba, Colombia

### **Reproductive Biology of *Dorada Brycon sinuensis* in the Sinu River Basin, Colombia**

The Dorada (*Brycon sinuensis* Dahl, 1955) is a reophilic and endemic fish that occurs in the Sinu river basin, and one of the species most affected by the construction of Urra's dam, due to the interruption of their migration toward maturation and spawning areas upstream water of Urra's dam. In order to study its reproductive biology, individuals with total length (TL) ranged between 18.5 y 67.0 cm and total weight (TW) ranged between 68.0 y 6448.0 g were collected. The gonads were placed in Gilson solution, the Vazzoler scale was applicated and sexual proportion, maturity index, the length at first maturity, oocytes's diameter, spawning season and fecundity were estimated. The sexual proportion female: male was 1.9:1, length at first maturity was estimated in 51.1, 42.0 y 43.8 cm TL for females, males and combined sexes, respectively, oocytes's diameter were 1247 ±176 μ and fecundity was estimated in 314340 ±174554 oocytes. Spawning season of Dorada is extended from February to December as a possible response to the construction of the Urra's hydroelectric, meaning that the species has adapted to the new hydrological conditions in the Sinu river basin since 2000, when the Urra's hydroelectric began to generate electricity.

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## 0369 AES Ecology, 551 AB, Thursday 8 July 2010

Jill Olin<sup>1</sup>, Nigel Hussey<sup>2</sup>, Michelle Heupel<sup>3</sup>, Colin Simpfendorfer<sup>3</sup>, Gregg Poulakis<sup>4</sup>, Aaron Fisk<sup>1</sup>

<sup>1</sup>GLIER, University of Windsor, Windsor, ON, Canada, <sup>2</sup>School of Oceans Sciences, College of Natural Sciences, Bangor University, Menai Bridge, Anglesey, United Kingdom, <sup>3</sup>School of Earth and Environmental Sciences, James Cook University, Townsville, QLD, Australia, <sup>4</sup>Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Port Charlotte, FL, United States

### **Maternal Investment Confounds Stable Isotope Interpretation in Young Individuals**

Ontogenetic shifts in diet are common and are often assessed using stable isotopes of carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ). However, when considering neonate individuals, interpretation of stable isotope composition is confounded as viviparous species are born isotopically enriched compared to their mothers. To address this, values of  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  were measured in the liver and muscle of neonate and young-of-the-year bull (*Carcharhinus leucas*) and Atlantic sharpnose (*Rhizoprionodon terraenovae*) sharks and related to age using umbilical scar stage, a unique characteristic among fishes. Values of  $\delta^{13}\text{C}$  in tissues of both species, and  $\delta^{15}\text{N}$  in muscle of Atlantic sharpnose, declined with age, exceeding the enrichment documented between embryos and their mothers. Decline in stable isotopes was: more evident in Atlantic sharpnose compared to bull sharks, delayed to late scar stages in bull sharks, and greater in liver compared with muscle; highlighting that species-specific life history and tissue characteristics significantly influence maternal isotopic loss. Consideration of maternal investment is necessary in any study using stable isotopes of young individuals, as there is great potential to overestimate trophic position and incorrectly assign carbon source.

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## 0066 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Cristina Oliveira<sup>1</sup>, Luiz Malabarba<sup>2</sup>, John Burns<sup>3</sup>, Irani Quagio-Grassiotto<sup>4</sup>

<sup>1</sup>Universidade Estadual de Santa Cruz, Ilhéus, Bahia, Brazil, <sup>2</sup>Universidade Federal do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil, <sup>3</sup>George Washington University, Washington DC, United States, <sup>4</sup>Universidade Estadual Paulista-Júlio de Mesquita Filho, Botucatu, São Paulo, Brazil

### **Phylogeny of the Inseminating Compsurins Based on Sperm Ultrastructure (Teleostei: Characidae: Cheirodontinae)**

Spermatozoa of Characiformes display great variability in their anatomy and organelle shape and location. Sperm ultrastructure of inseminating species is notably more diverse

than that of externally fertilized taxa. Sperm ultrastructure is described in seven inseminating cheirodontines of the tribe Compsurini (*Acinocheirodon melanogramma*, *Compsura heterura*, *Macropsobrycon uruguayanae*, *Kolpotocheirodon theloura*, "Odontostilbe" *dialeptura*, "Odontostilbe" *mitoptera* and *Saccoderma hastatus*), and four externally fertilized species, three belonging to the tribe Cheirodontini (*Cheirodon interruptus*, *Serrapinnus calliurus*, and *Serrapinnus heterodon*) and one incertae sedis species in Cheirodontinae (*Odontostilbe pequirá*). Testes were prepared for both scanning and transmission electronic microscopy using standard techniques. A data matrix was constructed using 12 characters from sperm ultrastructure. Hypotheses of character evolution in sperm morphology are discussed based on the resulting phylogeny. Aquasperm of the externally fertilized species show vesicles in the midpiece that are clearly distinct from those of other characiforms. Although the introsperm of *Kolpotocheirodon* resemble aquasperm, they are nonetheless differentiated from the aquasperm of the externally fertilized species. The introsperm of the remaining inseminating species showed several changes mostly related to sperm elongation. A single hypothesis of relationships was obtained for the inseminating species, demonstrating that analyses based on sperm ultrastructural characters further contribute to the recognition of the Compsurini as monophyletic, as well as allowing hypotheses on the relationships among the included taxa.

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### **0224 Acoustics Symposium III, Ballroom D, Sunday 11 July 2010**

Tacyana P. R. Oliveira<sup>1</sup>, Friedrich Ladich<sup>1</sup>, Daniel Abed-Navandi<sup>1</sup>

<sup>1</sup>Universidade Federal da Paraíba, João Pessoa, Brazil, <sup>2</sup>University of Vienna, Vienna, Austria, <sup>3</sup>Aqua-Terra Zoo Vienna, Vienna, Austria

### **Sound Production, Hearing Abilities and Acoustic Communication in the Longsnout Seahorse *Hippocampus reidi***

Seahorses produce sounds in different behavioural contexts, but information on the sound characteristics and hearing ability of this fish group is scarce. This study assessed the acoustic behaviour of *Hippocampus reidi* by analysing sound production in four different contexts (acclimation, feeding, handling, courtship) and by determining hearing sensitivity with the auditory evoked potential recording technique. Seahorses produced two distinct sounds: short clicks during feeding and courtship, and continuous growling sounds in distress situations when the animals were handheld. Main energies of clicks were concentrated at 530Hz (feeding), whereas main energy of growls were at 115Hz. Auditory sensitivity was between 50Hz and 1500Hz based on the sound pressure level and particle acceleration level. We also determined thresholds to conspecific sounds. Baseline thresholds measured under quiet laboratory conditions showed best hearing sensitivity at 50Hz (mean hearing threshold: 92dB re 1 $\mu$ Pa and 55dB re 1 $\mu$ m/s<sup>2</sup>). Ambient noise recorded in the Barra de Mamanguape estuary (NE Brazil) did not affect hearing sensitivity. Comparisons between sound spectra and auditory thresholds revealed that main energies of growling sounds (but not of clicks)

were correlated to the maximum auditory sensitivity of *H. reidi* and that acoustic communication is not masked by ambient noise in the field.

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#### **0804 Fish Behavior/Acoustics, 555 AB, Sunday 11 July 2010**

Steven Oliver

*Worcester State College, Worcester, MA, United States*

#### **Direct Mate Choice for Simultaneous Acoustic and Visual Courtship Displays in a Pomacentrid Fish, *Dascyllus albisella***

Acoustic signals are well established as key components of mate selection in terrestrial species, but not in aquatic species. It has long been known that damselfish (Pomacentridae) use a combined visual and acoustic display in their courtship, but the role (if any) of the acoustic component in mate-choice has not been quantitatively defined. The aim of this study was to determine, for *Dascyllus albisella*, which male traits, if any, were correlated with mating success of males and if the acoustic component of the signal advertised the quality of the displaying male. Observations made over ten reproductive cycles showed that female mate choices were not random and that male mating success was correlated with courtship rate (a visual and acoustic cue), male size, and the number of neighboring females, but not with male morphological traits, territory quality, or acoustic call structure. Our results suggest that females choose mates based on a condition-dependent trait (courtship rate) that advertises quality of paternal care, which supports good parent models of sexual selection, thereby demonstrating the importance of the combined acoustic/visual display for sexual selection in fishes.

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#### **0201 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Christina Olson, Karen H. Beard

*Utah State University, Logan, UT, United States*

#### **Diet of the Cuban Greenhouse Frog in Hawaii**

This research is motivated by the recent introduction of the Cuban terrestrial greenhouse frog, *Eleutherodactylus planirostris*, to Hawaii. Studies from other invaded habitats suggest that *E. planirostris* may consume and potentially reduce Hawaiian endemic invertebrates. To examine its potential impacts on endemic invertebrates, we conducted a stomach content analysis of 427 frogs from 10 study sites on the Island of Hawaii. At each site, we also collected invertebrates with three different sampling schemes: leaf litter collection, sticky traps, and foliage vacuuming, to determine if its diet is representative of the available resources in the environment. Dominant prey items

consisted of Hymenoptera: Formicidae (32.4%), Acari (19.2%), and Collembola (17.4%). Non-native invertebrate orders comprised 43.2% of their diet (Amphipoda, Isopoda, and Hymenoptera: Formicidae). The invertebrate orders containing endemic species most threatened by the invasion include Acari (mites), Aranae (spiders), Collembola (springtails), and Psocoptera (booklice), which each comprised greater than 2% of their diet. *Eleutherodactylus planirostris* consumed proportionally more Aranae, Chilopoda, Hemiptera: Heteroptera, and Hymenoptera: Formicidae than was available in the environment and consumed proportionally less Acari, Diptera, Hymenoptera, and Thysanoptera. Mean prey items consumed per frog was 17.6, and a maximum number of items consumed by one individual was 134 items. This indicates that *E. planirostris*, in high densities, may reduce native Hawaiian invertebrates in invaded habitats.

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### **0321 General Ichthyology, Ballroom B, Friday 9 July 2010**

James Orr, Amelia Whitcomb, Duane Stevenson, David Somerton

*Alaska Fisheries Science Center, RACE Division, Seattle, WA, United States*

#### **An Intimate Affair: Reproductive Parasitism of Snailfishes on Golden King Crabs**

Liparid snailfishes of the genus *Careproctus* have long been known to lay eggs within the carapace of lithodid king crabs. We used molecular techniques in an attempt to identify the species of snailfishes involved in this mode of reproduction in the Aleutian Islands of Alaska. Tissue samples from four genera and 11 species of snailfishes commonly found in the eastern Aleutian Islands were sequenced to serve as references. All were readily identified by unique COI sequences. One hundred tightly agglutinated clusters of eggs were extracted from crabs caught in the eastern Aleutian Islands during golden king crab (*Lithodes aequispinus*) processing operations in Dutch Harbor, Alaska. DNA sequences were obtained for 10-15 eggs from each of nine clusters containing eyed embryos, and were matched with sequences generated from adult reference specimens. Eggs of three species of snailfishes (*Careproctus rastrinus*, *C. colletti*, and *C. furcellus*) were identified among clusters. Several of the egg clusters contained multiple species of *Careproctus*, and eggs of all three species were found within one cluster. These results indicate that multiple individuals, and in fact multiple species, of snailfishes may deposit eggs simultaneously in the carapace of a single crab.

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## **0629 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Guillermo Orti

*George Washington University, Washington, DC, United States*

### **DeepFin Research Coordination Network and the Tree of Life of all “Fishes”**

As the funding for this research coordination network enters its last year, a summary of the accomplishments and the future directions of this effort are presented. An additional round of the Student Exchange Program is being advertised for the Fall semester of 2010. Online resources for ongoing and future projects in fish systematics are emphasized. A major effort to make fish phylogenies readily available for researchers and the public is underway using the web portal at [www.deepfin.org](http://www.deepfin.org).

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## **0805 Karel Liem Symposium II, Ballroom D, Friday 9 July 2010**

Jan W. M. Osse, J. G. M. Van den Boogaart

*Wageningen University and Research Centre, Wageningen, Netherlands*

### **Structure and Function of the Larval Finfold**

Larvae of air-breathing fishes use countercurrent flow in hypoxic environments located in a capillary network just below the skin surface on the yolk and fins. Other proposed functions of the larval median finfold are mixing perivitelline fluid in embryos, providing space for the fin rays to develop, or contributing to undulatory swimming – these functions may change during ontogeny. The finfold is generally resorbed in larvae <10 mm long. This raises the question of the adaptive significance of this complex structure, taking into account that, in most cases, resources for growth in early larvae are limited. Structure and function of the larval finfold were studied on laboratory-reared carp and zebrafish larvae using standard light- and electron microscopy, and Nomarski differential interference optics to measure the actinotrichia, the supporting rods of the finfold. The construction of the finfold causes it to camber during lateral bending of the larval body during swimming. Deformation of the finfold was observed during free swimming using high speed video and artificial bending of the larval body. Actinotrichia support and restrict camber, thus increasing stiffness of the finfold so that the mass of the accelerated water due to the force developed in the swimming muscles is increased, enabling fast escape and feeding movements. Changes in diameter of actinotrichia during larval growth in carp closely follow changes in swimming style. So, the seemingly weak structure of this finfold will contribute to larval survival. Experimental verification will be accomplished with mutant zebrafish larvae that lack a finfold.

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## 0070 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Clint Otto, Gary Roloff

*Department of Fisheries and Wildlife, East Lansing, MI, United States*

### **Do Repeated Cover Object Searches Cause Localized Extinction of Red-backed Salamanders?**

Natural cover object (NCO) searches are commonly used to collect population data on terrestrial salamanders, with study sites often visited multiple times in a field season. Researchers have noted that repeated NCO searches along transects may degrade salamander habitat, however, the extent to which this influences population vital rates has not been rigorously explored. We test the hypothesis that repeated NCO searches causes temporary extinction of red-backed salamanders, *Plethodon cinereus*, along surveyed transects within a single field season. We control for the effect of Julian date on salamander occurrence by comparing occupancy probabilities for transects that were repeatedly disturbed to undisturbed, adjacent transects sampled during the same time period. We construct a small set of occupancy models to investigate how micro-habitat quality is associated with initial site occupancy and extinction probabilities, after accounting for salamander imperfect detection. We utilize our results to determine the optimal number of times a site should be visited with the goal of maximizing detection probability while minimizing observer-induced extinction.

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## 0299 Poster Session II, Exhibit Hall D, Saturday 10 July 2010

Chouly Ou<sup>1</sup>, Carmen Montana<sup>1</sup>, Kirk Winemiller<sup>1</sup>, Solida Putrea<sup>2</sup>

<sup>1</sup>Texas A&M University, College Station, Texas, United States, <sup>2</sup>Inland Fisheries Research and Development Institute, Phnom Penh, Cambodia

### **Fish Diversity Survey in Northeastern Cambodia's Mekong and 3S Rivers**

The Mekong River is the largest in Southeast Asia and contains over 1,200 fish species, of which about 500 have been recorded from Cambodia. In Cambodia, the Mekong River delivers water to and receives water from the Tonle Sap, a huge, shallow lake that supports the most productive inland fishery in the world. The Mekong River and its major tributaries, the Sekong, Sesan and Srepok rivers in northeastern Cambodia, have been identified as critical areas for biodiversity conservation. A preliminary survey was conducted in January 2010 in this region to document fish diversity. Large fishes were purchased from sellers at landing sites, and small fishes were collected using seine nets, dip nets and cast nets. One hundred and forty seven species belonging to twenty seven families were identified from the survey. Cyprinidae was the most species-rich family, followed by Bagridae, Pangasiidae, Siluridae, Balitoridae, Cobitidae, Sisoridae, Channidae, Clariidae, Mastacembelidae, Osphronemidae, Ambassidae, Noptopteridae,

Soleidae, Tetraodontidae, Amblycipitidae, Anabantidae, Anguillidae, Ariidae, Belontiidae, Cynoglossidae, Datnioididae, Eleotridae, Hemiramphidae, Pristolepidae, Sciaenidae and Synbranchidae. At least five species of Balitoridae, four of Cobitidae and two of Cyprinidae (*Rasbora* spp.) appear to be undescribed. The Sesan River, which has a regulated hydrology due to the operation of dams in Vietnam, had the fewest species, and the mainstem Mekong yielded the most species. Further research will examine the relationships between hydrology, fish assemblage structure and food web ecology in these rivers.

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### **0671 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Patrick Owen, Ryan Smith

*The Ohio State University at Lima, Lima, OH, United States*

#### **Field Observations of Amplexus Calls in American Toads (*Bufo americanus*)**

The most common calls used by male American toads are advertisement calls. These indicate position to females and to rival males. A call of uncertain function, the “amplexus call”, has been previously documented from amplexed males. While the advertisement call of the American toad consists of a long musical trill, the amplexus call is a long series of low volume clicks. Given that the amplexus call has only been recorded from captive toads, it has been suggested that it is aberrant. We made field observations of American toad choruses at the Lippincott Bird Sanctuary in Lima, Ohio, USA during March and April of 2006 and 2007. Amplexus calls were recorded at low volume using a microphone held close to the toad, and they also were detected via a hydrophone suspended close to the toad under the water. Properties of the calls were similar to those previously reported from a laboratory environment. We observed males using amplexus calls in two different contexts. First, we recorded several instances of males in amplexus giving the call. Additionally, we recorded a number of unamplexed males giving the call. This suggests that “amplexus call” may not be the most appropriate name for this vocalization and that it may also function as a mating or aggressive signal. Our work confirms that this call is not an aberrant vocalization, and we are currently investigating its behavioral context.

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**0167 Fish Ecology, 555 AB, Sunday 11 July 2010; ASIH STOYE AWARD  
ECOLOGY & ETHOLOGY**

Hannah Owens

*University of Kansas, Lawrence, Kansas, United States*

**Predicting the Distribution of the Coelacanths *Latimeria chalumnae* and  
*Latimeria menadoensis***

In 1998, a second species of coelacanth, *Latimeria menadoensis*, was discovered off the north coast of Sulawesi, Indonesia, expanding the known distribution of the genus from Madagascar and the east coast of Africa to encompass the Indian Ocean basin. This study seeks to generate hypotheses for additional sites in the Indian Ocean where coelacanths might be found using ecological niche modeling. Coelacanth specimen locality information was collected from museum records and submersible sightings. These data were then combined with environmental data from a variety of sources into a Geographic Information System and analyzed using both the Genetic Algorithm for Rule-set Production (GARP) and the maximum entropy algorithm Maxent. The resulting models were then used to generate maps of the occurrence likelihood of coelacanths throughout the Indian Ocean and potential habitat suitability for the genus worldwide. My findings suggest that the range of the coelacanths could extend beyond their currently described distribution, a hypothesis that merits further investigation.

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**0194 Fish Genetics & Biogeography, 556 AB, Friday 9 July 2010**

Lawrence Page<sup>1</sup>, Jason Knouff<sup>2</sup>

*<sup>1</sup>Florida Museum of Natural History, Gainesville, Florida, United States, <sup>2</sup>Saint Louis University, St. Louis, Missouri, United States*

**Geographic Variation in Species Richness of North American Freshwater  
Fishes**

Data on biological distributions are fundamental to protecting biodiversity, predicting impacts of climate change, and interpreting evolutionary and ecological patterns and processes. North America has the largest number of freshwater fish species of any temperate region in the world, and it is widely acknowledged that this diversity is highest in the southeastern United States. Most investigators have attributed this southeastern nucleus of species richness to a combination of high landscape heterogeneity, geological stability, and immense size of the Mississippi River basin. Given these seemingly robust explanations, it is surprising that over half (53%) of the North American freshwater fish families do not have their greatest species richness in the southeastern United States. We addressed several questions related to geographic

variation in species richness. Where precisely is the greatest number of species? Which families contribute, and in what proportion, to that richness? Are there major secondary hotspots? What are the conservation implications of the distribution of species richness? How has the recent surge of species descriptions of freshwater fishes affected our results?

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## **0501 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Erin (Misty) Paig-Tran<sup>1</sup>, James Strother<sup>2</sup>, Adam Summers<sup>1</sup>

<sup>1</sup>University of Washington, Seattle, WA, United States, <sup>2</sup>University of California at Irvine, Irvine, CA, United States

### **Go with the Flow: Estimation of Gill Raker Permeability in Suspension Feeding Elasmobranchs**

Cartilaginous filter feeders have four very different types of gill raker morphologies. Considering these morphological differences, one may also hypothesize that the movement of water through the buccal cavities and the mechanisms of particle sequestration would also be markedly different. Anatomical comparisons of the raker morphology and permeability measurements of the entire gill structures were performed on three intact, preserved neonatal *Rhincodon typus*, two *Mobula munkiana*, and one *Mobula japonica* using a gravimetric/monometer system pattached to a pump at a constant flow rate of 114 mL/sec. We calculated the extrinsic permeability of their buccal cavities using the equation:  $R = \Delta P/Q$ , where R was the resistance through the gill structure, P is the pressure estimated by measuring the change in water height of the manometer when the shark was attached to the manometer and Q is the constant flow rate of our pump. Results indicated that the three neonatal whale sharks and three mobula permeability measurements have very little extrinsic resistance through their buccal cavity (R ranged between 0.88 to 6.01 Pa/mL/s in *Rhincodon typus* and 0.89 to 6.78 Pa/mL/s for the two mobula species) when flow rate was constant. Although the pore size of the gill rakers are small in both neonatal whale sharks and mobulas (~1000 $\mu$ m), their gill rakers/filtering pads lay flush to the epibranchials instead of protruding into the buccal cavity at an angle that is perpendicular to water flow, which may account for the low measured resistances.

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## 0490 Fish Behavior/Acoustics, 555 AB, Sunday 11 July 2010

Erika Parker<sup>1</sup>, Boyd Kynard<sup>2</sup>

<sup>1</sup>US Geological Survey, Conte Anadromous Fish Research Center, Turners Falls, MA, United States, <sup>2</sup>BK-Riverfish, LLC, Amherst, MA, United States

### **Effect of Rearing Temperature on the Onset and Duration of Dispersal of Early Life Stages of Shortnose Sturgeon (*Acipenser brevirostrum* Lesueur 1818)**

The objective of this study was to determine the effect of three temperature regimes on the timing and pattern of downstream dispersal of shortnose sturgeon (*Acipenser brevirostrum*) larvae. Tests were conducted in artificial stream tanks with three replicates at each of three temperatures, 10°, 15°, and 20°C. Fish were introduced to experimental tanks immediately upon hatching, and their movements were monitored day and night with video cameras. Rearing fish at 10°C caused development to slow and delayed the onset of dispersal. Fish in the 10°C group had a single peak of dispersal lasting 8 days. Increasing the temperature (15 and 20°C) caused fish to begin dispersing at a younger age (in days after hatch), but also produced a dispersal with multiple peaks. Fish were all at or close to the beginning of the larval life stage (i.e. beginning exogenous feeding) and were all morphologically similar when they began dispersing, regardless of temperature. Fish in the 15 and 20°C treatments required a similar number of degree-days to become larvae, but fish in the 15°C group took more degree-days to begin dispersal than fish in the 20°C group. Fish in the 10°C group took many more degree-days both to become larvae and to initiate dispersal than fish in the other two groups. These results show development and dispersal of shortnose sturgeon early life stages can be influenced by river temperature, and anthropogenic impacts that alter river temperature regimes have the potential to affect sturgeon dispersal patterns.

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## 0297 Fish Behavior/Acoustics, 555 AB, Sunday 11 July 2010

Eric Parmentier<sup>1</sup>, David Mann<sup>2</sup>, Loïc Kéver<sup>1</sup>, Michael Fine<sup>3</sup>

<sup>1</sup>Université de Liège, Liège, Belgium, <sup>2</sup>University of South Florida, St Petersburg, FL, United States, <sup>3</sup>Virginia Commonwealth University, Richmond, VA, United States

### **Diversity in the Sound Production Mechanism in Ophidiiformes**

Cusk-eels *Ophidion rochei* and *Ophidion marginatum* inhabit sandy shallow bottoms in which they bury during the day. At dusk, they leave their shelter to chase and produce vocal choruses. Both species make sounds mainly at dusk. These sounds were recorded and first morphological studies were realised on the sound producing apparatus in both species to understand the mechanism. The sound producing apparatus presents in both species many particularities: antagonistic sonic muscles, pivoting first neural spine

(neural rocker), ribs forming osseous plates that cover the swimbladder, development of unusual hard pieces (rocker bone or cap) in front of the swimbladder that shows also at its caudal part an internal cone-like shape with elastic membranes at both extremities. However, the system of both species presents also huge morphological difference that could explain the differences in the recorded sounds. The sounds consist in trains of 6 to 40 pulses in both species, having a duration of ca. 13 ms in *O. marginatum* and 25 ms in *O. rochei*. These pulses are emitted at a frequency of 12 in *O. rochei* to 30 Hz in *O. marginatum* showing these pulses result from the contraction of slow muscles. It implies that, unlike most fishes having fast muscles, muscle contraction rate does not indicate the sound frequency. The main frequency is around 1,100 Hz in *O. marginatum* and between 200 and 400 Hz in *O. rochei*. This study proposes hypotheses dealing with the functional mechanism of these unusual sound producing mechanisms.

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## **0220 Acoustics Symposium III, Ballroom D, Sunday 11 July 2010**

Kirsten Parris

*The University of Melbourne, Parkville, VIC, Australia*

### **Acoustic Communication in Urban Noise: A Challenge for Frogs and Fishes**

Urban noise (such as road-traffic noise in terrestrial habitats and boat-traffic noise in aquatic habitats) hinders acoustic communication in a diversity of taxa including frogs and fishes, by reducing the distance over which their acoustic signals can be detected. Given the importance of these signals for mate attraction and territory defence, this acoustic interference may have wide-ranging consequences for individual fitness. I will present a mathematical model of the active space of frog calls in traffic noise, which demonstrates that frogs experience substantial acoustic interference in noisy cities. And despite having lower auditory thresholds, larger species with lower-frequency calls are expected to suffer the greatest reduction in communication distance. During a field study in Melbourne, Australia, I observed the southern brown tree frog *Litoria ewingii* to call at a higher frequency in traffic noise. However, the model indicates that this frequency shift would confer only a modest increase in active space. Furthermore, as females of certain frog species appear to prefer lower-frequency advertisement calls, this strategy may improve the audibility of calls but reduce attractiveness to potential mates. Calling more loudly would result in a larger increase in active space, but the high metabolic cost of this strategy could limit chorus tenure and ultimately reduce breeding success. I will compare this scenario to that of fishes communicating in freshwater and marine habitats with high volumes of boat traffic, and highlight the shared challenges of acoustic communication in a world increasingly dominated by anthropogenic noise.

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## 0531 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Kristene Parsons, Tracey Sutton, Jack Musick

*Virginia Institute of Marine Science, College of William & Mary, Gloucester Point, VA, United States*

### **Shark Assemblage Structure in the Chesapeake Bight**

The role and importance of the Chesapeake Bight region as essential fish habitat for several species of sharks is well represented in primary literature and US fisheries management plans. Diverse assemblages of shark taxa utilize the Chesapeake Bay and adjacent coasts at various stages throughout their lives. As top predators in most of the environments where they occur, sharks are key to maintaining healthy, diverse ecosystems. The estuarine waters of the Chesapeake Bay are exposed to extreme ranges in temperature and salinity, and consequently the environmental suitability of the Bay is spatially and temporally restricted to select taxa. By identifying shark assemblages in the Chesapeake Bight region we aim to: 1) provide spatial and temporal profiles of assemblage structures, 2) identify environmental factors that influence assemblage composition, and 3) provide a tool for measuring the effects of climate change on highly migratory species in the Mid-Atlantic. Shark assemblage structures were inferred from VIMS fishery-independent longline catch data. Fifteen species were represented in Bay and coastal waters between 1996 and 2009, dominated by sandbar (62%) Atlantic sharpnose (16%) and smooth dogfish (11%). Analyses revealed seasonal variations in Bay and coastal assemblage structures, and possible contributing factors as well as local impacts will be discussed. This information is essential for further investigations into climate change effects on shark migration phenology in the Chesapeake Bight, and is useful data for ecosystem-based approaches to marine resource management.

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## 0711 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Leilani Pasicolan, William Crampton

*UCF, Orlando, Florida, United States*

### **Morphological Adaptations to Hypoxia in the Electric Fish Genus *Brachyhypopomus***

Many tropical aquatic environments worldwide are characterized by intermittent or prolonged hypoxia (low dissolved oxygen). Nevertheless, many tropical freshwater fishes are able to inhabit these challenging environments via a range of morphological, physiological and behavioral adaptations. *Brachyhypopomus* is a diverse monophyletic genus of weakly electric fishes represented by 28 species distributed from Argentina to Costa Rica. 18 species occur exclusively in normoxic habitats, six species occur exclusively in seasonally hypoxic habitats (floodplains of large tropical rivers or

permanent swampy habitats), and four species occur in both seasonally hypoxic and normoxic environments. These habitat distributions offer the opportunity to explore both species- and population-level variation in adaptive responses to hypoxia. DO is known to be a good predictor of gill size in fishes, and preliminary studies show that species of *Brachyhypopomus* found in seasonally hypoxic habitats have larger gills than those found in normoxic habitats. Across all species in the genus (and among populations of the four eurytopic species), ANOVA was used to correlate total gill filament length (as a metric of gill size standardized for body size) with habitat (normoxic vs. seasonally hypoxic). In addition, Discriminant Function Analysis (DFA) using multiple gill metrics was utilized to compare species and populations in the context of habitat. Preliminary results indicate a strong correlation between gill size and oxygen-habitat among species, even when the effects of phylogenetic ancestry are taken into account using the comparative method. These results further support the hypothesis that large gill size is an adaptive response to seasonal hypoxia.

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### **0318 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Ketan Patel, George Harper, Patrick Huddleston, Lincoln Riley

*Hendrix College, Conway, Arkansas, United States*

### **Coral Snake Mimicry in the Southcentral US: Are Milksnakes really Mimics?**

Batesian mimicry, the resemblance of a harmless species (the mimic) to a distasteful or dangerous species (the model) that protects the mimic from predators, is an example of evolution by natural selection. A test of Batesian mimicry is whether predators avoid the mimic in areas where the model is present (sympatry), but do not avoid the mimic in areas where the model is absent (allopatry). We tested whether milksnakes (*Lampropeltis triangulum*) are mimics of the Texas coral snake (*Micrurus tener*). To do this, we constructed clay replicas that had: red, black and yellow bands similar to *L. triangulum amaura*, found in Arkansas, Louisiana and Texas, or brown similar to many snakes found in similar areas. We paired one banded replica and one brown replica (doublets). We placed ten doublets in a transect; ten transects in areas of sympatry (in Louisiana) and ten transects in areas of allopatry (western and northwestern Arkansas). Replicas were left in the field for four weeks to allow predators to attack them. Results show that predators in allopatry attacked the mimetic replicas at a rate of random expectation. In sympatry, there was a strong, but not statistically significant ( $P = 0.06$ ), trend to avoid the mimetic replicas. Our results in allopatry match our expectation, but the lack of significant avoidance in sympatry prevents us from declaring that *L. triangulum* is, in fact, a coral snake mimic. Additional studies are needed to establish whether *L. triangulum* in the south-central U.S. are mimics of *M. tener*.

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## 0516 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

James Paterson<sup>1</sup>, Brad Steinberg<sup>2</sup>, Jacqueline Litzgus<sup>1</sup>

<sup>1</sup>Laurentian University, Sudbury, Canada, <sup>2</sup>Algonquin Park, Whitney, Canada

### **Spatial Ecology and Habitat Selection in a Northern Population of Snapping Turtles (*Chelydra serpentina*)**

Central to our understanding of animal ecology is habitat use and resource selection. By comparing habitat use to habitat availability, preferences for specific habitats may become evident, and this information is important for creating management plans for species at risk. We examined habitat selection and spatial ecology in a northern population of Snapping Turtles (*Chelydra serpentina*) in Algonquin Provincial Park, Ontario. Snapping Turtles were recently listed as a Species of Special Concern in Canada, and data on their spatial ecology are needed to inform recovery planning. Radio telemetry was used to follow 11 turtles from May 2009 to present. Average daily distances travelled varied widely among individuals from 23-179 m/day (mean = 78, SE = 15), but were greater in females than in males. In addition, annual home ranges varied widely from 0.1-330 ha (mean = 60, SE = 30), although there was no difference between the sexes. Comparisons of habitat use and availability will be carried out using the distance-based method and ArcGIS software at two spatial scales: selection of a home range from the population range, and selection of habitat within the home range. Studying local populations of widely distributed generalist species allows recognition of important habitat characteristics preferred by these organisms, and allows comparisons of geographic differences among populations. Studies on habitat selection are important for identifying critical habitat for at-risk species, as well as for answering questions about life history evolution.

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## 0520 SSAR SEIBERT ECOLOGY AWARD, 555 AB, Thursday 8 July 2010

James Paterson<sup>1</sup>, Brad Steinberg<sup>2</sup>, Jacqueline Litzgus<sup>1</sup>

<sup>1</sup>Laurentian University, Sudbury, Canada, <sup>2</sup>Algonquin Park, Whitney, Canada

### **Comparisons of Hatchling Survivorship and Spatial Ecology between Two Sympatric Turtle Species**

Management plans should incorporate vital statistics and habitat requirements for all life stages. However, until recently, technological limitations and the cryptic nature of hatchling turtles have constrained our understanding of their ecology. We monitored the survivorship and movements of 21 hatchling Blanding's Turtles (*Emydoidea blandingii*) and 24 Wood Turtles (*Glyptemys insculpta*) during the fall of 2009 as part of a one-year telemetry study of hatchling turtles in Algonquin Provincial Park, Ontario. Turtles were captured as they emerged from nests in the fall, outfitted with radio-

transmitters, and tracked every 1-3 days from late August to 15 October 2009, at which time all turtles were at over wintering sites. The mortality rate was high in both species, with only 33% of Blanding's Turtles, and only 13% of Wood Turtles surviving the autumn. Predation was the primary source of mortality for both species. Wood Turtles moved directly to adjacent creek habitat, while Blanding's Turtles either moved to the nearest wetland or remained terrestrial. The differences in distances travelled may be related to the distance between nests and aquatic habitats, and decreasing ambient air temperatures in September. Blanding's Turtles that remained in upland habitat for overwintering (n = 4) were likely exposed to subfreezing temperatures. Differences in habitat use between adult and hatchling life stages have huge implications for management strategies for these at-risk species. Our data contribute to the understanding of the basic ecology of hatchling turtles in the wild, one of the previously missing links in the natural history of freshwater turtles.

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## **0589 Herp Conservation II, Ballroom B, Sunday 11 July 2010**

David Paulson, Paul Sievert

*University of Massachusetts: Department of Natural Resources Conservation, Amherst, MA, United States*

### **An Experimental Test of Tunnel Size and Position on Passage of Painted Turtles (*Chrysemys picta*)**

Roads are long linear features on the landscape that impact wildlife and their habitats. Among all forms of wildlife, turtles are one of the most negatively affected by roads. Wildlife biologists and civil engineers have developed and implemented design measures to mitigate the negative effects associated with roads. One common approach used to reduce road mortality and to facilitate movement of turtles is to construct a road passage structure. We examined the relative effectiveness of experimental passages for freshwater turtles. Structures were evaluated with respect to how their height, width, and position (at or below-grade), influenced the movements of painted turtles. A total of 190 turtles were exposed to the experiential trials and their behavior was characterized by 3 response variables (Total time to complete the trial, Total hesitations observed, and Success based on no hesitations and completion of the trial in less than 120 minutes). We concluded that painted turtles exposed to below-grade tunnels were less hesitant and traveled faster through them as the tunnel size increased from 0.6 m x 0.6 m to 1.2 m x 1.2 m. The 1.2 m x 1.2 m tunnel size overall proved to be the size with the fewest hesitations observed, fastest total times, and highest success rate.

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## 0092 Herp Systematics & Biogeography, 551 AB, Saturday 10 July 2010

Ryan Peek, Jennifer Dever

*University of San Francisco, San Francisco, CA, United States*

### **Landscape Genetics of Foothill Yellow-legged Frogs (*Rana boylei*) in Regulated and Unregulated Rivers: Assessing Connectivity and Genetic Fragmentation**

The stream breeding frog *Rana boylei*, is experiencing range wide population declines. Because this species inhabits rivers in the foothills of California, these frogs are directly and indirectly affected by anthropogenic impacts such as regulation, recreation, development, and agricultural activities. Such impacts can fragment the riverine landscape and reduce the connectivity within and among frog populations. We hypothesize that *R. boylei* populations in watersheds containing dams (regulated) will have lower genetic diversity and riverscape connectivity compared with watersheds without dams (unregulated). Six different rivers in the Sierra Nevada are being compared, pairing similar-sized regulated and unregulated rivers in adjacent watersheds. Genetic structure within and among regulated and unregulated watersheds will be characterized and compared using mitochondrial DNA (mtDNA) to estimate gene flow and random amplified polymorphic DNA (RAPD) to estimate genetic diversity. Three random primers from the Ready-to-Go RAPD Analysis Kit are being used to generate RAPD profiles. Additionally, a quantitative GIS-based analysis of site heterogeneity and riverscape connectivity will be conducted using landscape features and frog distribution patterns. Comparisons with data on gene flow and levels of genetic subdivision within and among frog populations will be discussed. Preliminary results indicate significant differences in population structure between regulated and unregulated streams.

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## 0584 Lundberg Symposium, Ballroom D, Sunday 11 July 2010

Mark Sabaj Pérez

*Academy of Natural Sciences, Philadelphia, PA, United States*

### **John Lundberg: The Man Behind the Whiskers**

Number of fishes named in honor of John Lundberg: 6. Chance that the patronym is a catfish: 2 in 3. Numbers of species, genera/subgenera, and families/subfamilies, respectively, of fishes described by Lundberg: 37, 12, 3. Chance that those taxa are extinct: 1 in 3. Chance that those taxa are in synonymy: 1 in 25. Number of publications authored/co-authored by Lundberg: 81. Number of different co-authors: 135. Number of "Calhamazon" Expeditions funded by NSF: 3. Number of "Calhamazon" trawls and

specimens collected, respectively: 1,826 and 100,168. Minimum number of km and cubic meters, respectively, of water trawled: 1,930 and 5,791,557. Number of masters, doctoral and postdoctoral students, respectively, advised by Lundberg: 3, 13, 3. Chances that those students have trawled with Lundberg: 1 in 2. Approximate age of fossil "titanoglanis", the world's largest known catfish that was discovered by Lundberg: 45,000,000. Factor by which this exceeds the number of years "titanoglanis" has remained an informal MS name: 3,461,538. Approximate number of New World freshwater catfishes: 2000. Number of New World freshwater catfishes with direct phylogenetic ties to African catfishes: 1. Factor by which this is exceeded by the number of engines and transmissions, respectively, that have been in the discoverer's 1991 Toyota pick-up: 2, 2.

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## **0168 AES Feeding Symposium II, 552 AB, Saturday 10 July 2010**

Derek Perry<sup>1</sup>, Greg Skomal<sup>1</sup>

<sup>1</sup>University of Massachusetts-Dartmouth School for Marine Science and Technology, New Bedford, MA, United States, <sup>2</sup>Massachusetts Division of Marine Fisheries, New Bedford, MA, United States

### **Feeding Ecology of Smooth Dogfish, *Mustelus canis*, in Buzzards Bay, Massachusetts**

Cape Cod, Massachusetts is generally regarded as a natural barrier to the northern range of smooth dogfish, *Mustelus canis*, although they have been observed farther north. This study was designed to characterize and quantify the food habits of smooth dogfish in the northern portion of its range where there is significant spatial overlap with relatively high densities of American lobster, *Homarus americanus*. According to the Lobster Stock Assessment Committee, the natural mortality of lobsters has increased for the Southern New England Stock. Smooth dogfish, coupled with other predators, may have led to the drastic decline in local abundance of lobster over the last decade in southern New England. Samples were collected from a longline survey and inshore trawl surveys. Analysis of 247 dogfish stomachs found the diet of the smooth dogfish consisted mostly of crustaceans. The most important prey species by percent mass were; Atlantic rock and Jonah crabs, *Cancer* spp (40%), lobster (16%), spider crabs, *Libinia* spp (14%) and mantis shrimp, *Squilla empusa* (9%). Analysis suggests that larger smooth dogfish may be a major predator of the American lobster, especially in the fall. Many of the lobsters found in the diet consisted of only claws and legs. These are appendages that the lobster is capable of autotomizing and later regenerating. Non-lethal predation may lessen the smooth dogfish's potential impact on lobster mortality.

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## 0183 Poster Session I, Exhibit Hall D, Friday 9 July 2010

Derek Perry, Greg Skomal

*University of Massachusetts-Dartmouth School for Marine Science and Technology,  
New Bedford, MA, United States*

### **Seasonal Variation in Smooth Dogfish, *Mustelus canis*, Catch and Diet from a Longline Survey in Buzzards Bay, Massachusetts**

This study was designed to characterize and quantify the feeding ecology of smooth dogfish in the northern portion of their range. The survey was conducted from May through October of 2008 in Buzzards Bay, Massachusetts. Longlines were set with 50 hooks and soaked for one hour. A total of twelve random stratified stations were sampled each month within three depth strata; 0-10 m, 11-20 m, and >21 m. A non-lethal stomach eversion technique was used to extract diet samples. Preliminary analysis of the 242 dogfish collected found CPUE was greatest in the earlier months of the survey largely due to the abundance of male smooth dogfish. The sex ratio was dominated by males in May and June and then shifted toward females in the summer months. A dramatic decrease in the number of males occurred in July which coincided with peak water temperatures within the bay during the same period. Most of the catch consisted of mature individuals, with 96% of males and 64% of females being above size at first maturity. The diet of the smooth dogfish consisted mostly of crustaceans. In the spring, crustaceans accounted for 71% of the diet by percent Geometric Index of Importance (%GII), 90% GII in the summer and 87% in the fall. Rock crab, *Cancer irroratus*, was the most important prey species in the spring (30% GII) and summer (31% GII) seasons. Lobster, *Homarus americanus*, was the most important prey species in the fall (21% GII).

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## 0569 Herp Physiology, 556 AB, Monday 12 July 2010

Charles Peterson

*Hofstra University, Hempstead, NY, United States*

### **Salinity Tolerance of Hatchling Diamondback Terrapins**

The diamondback terrapin (*Malaclemys terrapin*) is nearly unique among non-chelonioid chelonians in its exclusive use of estuarine and marine habitats. The physiological and behavioral characteristics underlying their unusual salt tolerance are incompletely understood. In particular, little is known of the ontogeny of salinity tolerance, but surface-area-to-volume relationships suggest that hatchling terrapins should be especially vulnerable to salt-loading, osmotic stress and dehydration. I report preliminary data from a comparative common-garden experiment intended to gauge the salinity tolerance of hatchling terrapins and identify putative adaptations. Identically-

incubated hatchlings of *Malaclemys* and two close freshwater-restricted relatives (*Graptemys geographica* and *Trachemys scripta*) were raised in water containing 0, 1, 9, 18, 27, and 36 (seawater) ppt ocean salt. Given a choice, naïve map turtles and sliders showed a clear preference for more dilute water, but terrapins did not. Terrapins enjoyed higher survivorship in saline water, but even so we were unable to successfully raise hatchling terrapins in even half-strength seawater (18ppt). Data will be also presented on captive growth rates of survivors over 17 months and resting metabolic rates (oxygen consumption, to assess potential metabolic costs of osmoregulation). Implications of the results for terrapin ecology will be discussed.

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## **0190 Acoustics Symposium II, Ballroom D, Saturday 10 July 2010**

Catherine Phillips<sup>1</sup>, Carol Johnston<sup>1</sup>

<sup>1</sup>U.S. Fish and Wildlife Service, San Marcos, Texas, United States, <sup>2</sup>Auburn University, Auburn, Alabama, United States

### **Sneaky Songs - Sound Production by *Cyprinella galactura* with Alternative Mating Strategies**

Acoustic signals were recorded during low level agonistic behavior (chases) associated with sneaking in three small male *Cyprinella galactura*. Sneaker males produced calls that consisted of three distinct call types with signal components similar to those dominant males produced during the same context. However, sneaker signals more closely resembled dominant male courtship signals in the important signal variable pulse rate. It is possible that sneaker male *C. galactura* are chasing females for courtship since they are not actively defending a territory.

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## **0209 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Josh Pierce<sup>1</sup>, Craig Rudolph<sup>1</sup>, Dan Saenz<sup>1</sup>, Robert Wagner<sup>2</sup>

<sup>1</sup>USDA Forest Service Southern Research Station, Nacogdoches, TX, United States, <sup>2</sup>Quantitative Ecological Services, Rosepine, LA, United States

### **A Reintroduction Experiment with the Louisiana Pine Snake (*Pituophis ruthveni*) in Bienville Parish, Louisiana**

Ongoing surveys suggest that the Louisiana Pine Snake (*Pituophis ruthveni*) is declining; and currently occupied habitat is limited to a few small, isolated blocks of degraded and fragmented habitat. Research suggests that the species requires frequently burned sites with a well developed herbaceous understory capable of supporting populations of its primary prey, Baird's Pocket Gopher (*Geomys breviceps*). Recent changes in management

practices on U. S. Forest Service lands have resulted in restoration of substantial blocks of suitable habitat, which are now available for reintroduction. A captive population consisting of 100+ individuals has been established from wild-caught snakes from Bienville Parish, LA. A reintroduction site has been located on the Catahoula District of the Kisatchie National Forest, which is thought to be unoccupied due to past fire suppression. We plan to breed captives and release 50% of available animals (~30-40) as neonates immediately following post-natal shed, while the remaining snakes will be head-started and released the following March. Snakes will be released at a density that crudely approximates the estimated recruitment density of a natural population. Automated pit tag readers and canine detection will be used to monitor the reintroduction site. Production of neonates and release of young will be repeated annually until a viable population is established or it is concluded that further releases are not likely to result in establishment of a population.

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## **0675 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Kyle Piller<sup>1</sup>, Devin Bloom<sup>1</sup>

<sup>1</sup>*Southeastern Louisiana University, Hammond, LA, United States*, <sup>2</sup>*University of Toronto, Scarborough, Ontario, Canada*

### **Diversification of New World Silversides (Atherinopsidae: Tribe Menidiini)**

The Tribe Menidiini consists of four genera of silverside fishes (*Chirostoma*, *Labidesthes*, *Poblana*, and *Menidia*) that are distributed throughout North America. *Chirostoma* is the most diverse genus in the Tribe consisting of approximately 23 species in Central Mexico. In addition to being the most speciose, *Chirostoma* is also the most morphologically diverse. The overall objective of this study was to investigate diversification within the Tribe Menidiini, specifically focusing on the diversity of *Chirostoma*. We built on our previous work by generating a multilocus phylogeny (mtDNA and nDNA) of Menidiini and then conducting multiple diversification analyses to investigate the patterns and processes of diversification. Results from the Bayesian phylogenetic analysis are largely congruent with our previous mitochondrial study. In addition, the diversification analyses suggest that there was a significant increase in diversification early in the history of the Menidiine clade and a more recent radiation event for the Central Mexican Lakes clade of *Chirostoma* (Lakes Chapala, Patzcuaro, and Zirahuén).

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**0109 Herp Physiology, 556 AB, Monday 12 July 2010; ASIH STOYE AWARD  
PHYSIOLOGY & PHYSIOLOGICAL ECOLOGY**

Nicholas Pollock

*California Polytechnic State University, San Luis Obsipo, CA, United States*

**Role of Host Preference and Testosterone in the Host-Parasite Relationship of the Western Fence Lizard (*Sceloporus occidentalis*) and Western Black-Legged Tick (*Ixodes pacificus*)**

In many species, males have higher ectoparasite loads than females. My study aim was to use Western fence lizards (*Sceloporus occidentalis*) and Western black-legged ticks (*Ixodes pacificus*) to test the hypothesis that ticks prefer male lizards over female lizards. I first aimed to determine if ticks prefer male over female lizards and thus, choose their host prior to attachment. I exposed male and female lizard pairs to 100 tick larvae, allowing the ticks to choose their hosts. The ticks were quantified as they fed to repletion and dropped off. No significant differences were observed in the number of ticks that attached to male and female lizards, which suggests that ticks do not exhibit preference for male hosts and there must be another explanation for higher ectoparasite loads in males. I then tested the hypothesis that higher circulating testosterone concentrations in male lizards cause them to have higher tick loads. To examine this hypothesis I implanted male lizards with either testosterone or blank implants in the field. The testosterone-treated males had significantly higher tick loads compared to the control males. I also conducted a host choice study in the lab between testosterone-treated and control males, and found that ticks do not exhibit a preference for testosterone-treated males. These results suggest that male lizards are infested more heavily than females, especially during times of the year when circulating testosterone concentrations are high, because testosterone alters their behaviors such that they are exposed to more ticks.

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**0049 AES Ecology, 551 AB, Thursday 8 July 2010**

Carlos Polo<sup>1</sup>, Felipe Galván<sup>2</sup>, Seth Newsome<sup>3</sup>, Angélica Barrera<sup>4</sup>

<sup>1</sup>Universidad Nacional Autónoma de México, Distrito Federal, Mexico, <sup>2</sup>Centro Interdisciplinario de Ciencias Marinas, La Paz, Baja California Sur, Mexico, <sup>3</sup>University of Wyoming, Laramie, Wyoming, United States, <sup>4</sup>Centro de Investigaciones Biológicas del Noroeste, La Paz, Baja California Sur, Mexico

**Examining Ontogenetic Trophic Shifts in *Alopias superciliosus* Via  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  Analysis of Muscle and Vertebrae**

The bigeye thresher shark *Alopias superciliosus* has a worldwide distribution in coastal and oceanic waters of tropical and subtropical seas, however, little is known about the ecology of this shark. Here we examine ontogenetic shifts in the diet of *A. superciliosus* via carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) stable isotope analysis of muscle and vertebrae. A total of 37 muscle and 37 vertebrae were analyzed. Mean ( $\pm$ SD)  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values in muscle were  $-15.2$  ( $\pm 0.2\text{‰}$ ) and  $14.5\text{‰}$  ( $\pm 0.2\text{‰}$ ) respectively; mean  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values in vertebrae were  $-16.7\text{‰}$  ( $\pm 0.6\text{‰}$ ) and  $+10.1\text{‰}$  ( $\pm 0.3\text{‰}$ ) respectively. We found no significant sex-related differences in mean C or N isotope values, but adult males had significantly higher muscle  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values than juveniles. This pattern suggests that adult males forage more often in coastal habitats and on higher trophic level prey than juveniles, whereas lower muscle  $\delta^{13}\text{C}$  values in juveniles indicate they migrate from coastal to oceanic waters. We found no significant ontogenetic related differences in  $\delta^{15}\text{N}$  for females, suggesting that they forage in similar habitats and on prey that occupies a similar trophic level throughout their life. Lastly, a comparison of tissue types from the same individual shows that  $\delta^{15}\text{N}$  values in muscle is on average  $4.4\text{‰}$  ( $\pm 0.1\text{‰}$ ) higher than vertebrae; muscle  $\delta^{13}\text{C}$  is also higher than vertebrae by  $1.5\text{‰}$  ( $\pm 0.2\text{‰}$ ). Tissue-specific differences in isotope values likely relate to differences in their amino acid composition and the observation that shark muscle contains a high concentration of  $^{15}\text{N}$ -depleted urea.

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**0395 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Marianne Porter, Joshua Sturm, John Long

Vassar College, Poughkeepsie, NY, United States

**Vertebral Column Strain of *Squalus acanthias***

Dynamically bending vertebral columns behave as springs, storing and returning elastic energy. In bony fishes, the structural source of the elastic energy is thought to be the intervertebral joints. Vertebrae are modeled as infinitely rigid spacers connecting the joints. However, by treating the vertebrae as elements with infinite stiffness, their possible contribution to the overall elastic behavior of the vertebral column is ignored.

We model the joints and vertebrae together as a series of Kelvin-Voigt viscoelastic elements. We measured axial strain of the joints and vertebrae during dynamic bending of an in vitro 10-vertebrae preparation to determine the relative mechanical contributions of each element to the behavior of the column. We tested vertebral columns from six *Squalus acanthias* using segments of ten centra. Dynamic testing frequencies ranged from 0.25 to 3.0 Hz at various curvatures. Displacement of the joint and centra were measured using sonomicrometry crystals placed bilaterally on the vertebral column at the cranial and caudal surfaces of the central joint and on the centra. During mechanical tests, vertebral column preparations were submerged in elasmobranch Ringers in an environmental chamber. We found differences in joint and centrum strain with varying curvatures and frequencies. Given the high level of centra strain, relative to that of joints in some cases, we speculate that as joints increase their stiffness, E (MPa), with increasing bending frequency, they approach the E of the centra and thus engage them as coupled springs. This work was supported by NSF DBI-0442269 and IOS-0922605.

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#### **0410 AES Behavior & Ecology, 551 AB, Saturday 10 July 2010**

Gregg Poulakis, Philip Stevens, Amy Timmers

*Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute, Charlotte Harbor Field Laboratory, Port Charlotte, FL, United States*

#### **Distribution and Habitat Use of Juvenile Smalltooth Sawfish, *Pristis pectinata*, in the Charlotte Harbor Estuarine System, Florida**

Although endangered smalltooth sawfish (*Pristis pectinata*) are known to use estuaries during their first 2-3 years, little is known about their life history and ecology while in their juvenile habitat. The purpose of this project was to monitor sawfish in the Charlotte Harbor estuarine system to characterize sawfish seasonality, recruitment, habitat use, and health. During the five year study, we captured sawfish in 1.4% of our random 183-m haul seines and in 14.6% of samples that were non-randomly set. Sawfish stretched total lengths ranged from 671 to 2,172 mm (n = 137; mean = 1,248 mm). Sawfish were captured in all months; most commonly between February and September. Captures of neonates with rostral sheaths allowed estimation of the size range at birth (690-807 mm) and confirms the protracted timing of parturition (November-July) inferred from length frequency data. Although extensive sampling occurred throughout the estuarine system, most sawfish were captured near the mouths of the three major rivers. Five specific locations ('hotspots') were identified as having higher catch rates. Logistic regression models identified various combinations of water depth, water temperature, dissolved oxygen, and salinity as influencing the probability of catching a sawfish. Electivity analysis showed that sawfish had an affinity for water < 1 m deep, water > 30°C, moderate to high dissolved oxygen levels (> 6 mg l<sup>-1</sup>), and salinities between 18 and 30 psu. Higher catch rates of larger sawfish (> 1 yr old) were associated with shoreline habitats with overhanging vegetation (e.g., red mangroves).

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**0411 AES Behavior & Ecology, 551 AB, Saturday 10 July 2010**

Gregg Poulakis, Philip Stevens, Amy Timmers, Christopher Stafford

*Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute,  
Charlotte Harbor Field Laboratory, Port Charlotte, FL, United States*

**Movements of Juvenile Smalltooth Sawfish, *Pristis pectinata*, in the Charlotte Harbor Estuarine System, Florida**

The movements of endangered juvenile (< 3 yr old) smalltooth sawfish (*Pristis pectinata*) were monitored during a drought between September 2007 and December 2009 using 33 acoustic listening stations in the tidal Caloosahatchee River, Florida. Movements of 23 sawfish were monitored along the main stem of the river and in 13 backwater habitats (natural mangrove-lined creeks, semi-natural creeks, seawall-lined canals). The daily activity space was 0.7 km, which is similar to other demersal ray species. There was no evidence that sawfish left the river and returned; they remained in the river under a wide range of environmental conditions. Three-fourths (74%) of the sawfish used backwater habitats. Generalized additive models and linear regression found that the distribution of sawfish was significantly related to 90-day lagged salinity; sawfish moved upriver with increasing salinity. When regressed separately for two size classes, the linear relationship between mean river position and salinity was stronger for < 1 yr old sawfish (60 day lag) than for larger sawfish (120 day lag). The lags apparent in the regressions could have occurred for at least three reasons: juvenile sawfish (1) may be more tolerant of changes in salinity than other elasmobranchs; (2) may have strong affinities for specific sites or areas of the river and remain there until conditions change enough for them to respond by relocating; (3) respond to indirect effects of salinity, such as the redistribution of prey populations that are known to exhibit similar distribution responses to lagged environmental changes.

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## **0199 Fish Community Ecology, 555 AB, Monday 12 July 2010**

Helen Poulos<sup>1</sup>, Barry Chernoff<sup>1</sup>, Pamela Fuller<sup>1</sup>, David Butman<sup>1</sup>

<sup>1</sup>Wesleyan University, Middletown, CT, United States, <sup>2</sup>USGS, Gainesville, FL, United States, <sup>3</sup>Yale School of Forestry and Environmental Studies, New Haven, CT, United States

### **Potential Habitat Modeling of Four Aquatic Invasive Fish (*Channa argus*, *Cyprinella lutrensis*, *Neogobius melanostoma*, and *Hypophthalmichthys molitrix*) in the Continental US**

Aquatic invasive species pose major ecological and economic threats to waterways worldwide through the displacement of native species and alteration of hydrologic cycles. Modeling the potential spread of alien aquatics through spatially explicit mapping is an increasingly important tool for risk analysis and rapid response. Habitat modeling provides the opportunity for identifying the key environmental variables influencing species distributions. We compared three presence-only modeling methods to predict the potential US distributions of *Channa argus*, *Cyprinella lutrensis*, *Neogobius melanostoma*, and *Hypophthalmichthys molitrix* using maximum entropy (Maxent), the genetic algorithm for rule set prediction (GARP), and support vector machines (SVM). We used inventory records from the USGS nonindigenous aquatic species database and a geographic information system of 70 raster climatic and environmental variables to produce spatially explicit maps for each species. Maxent and SVM produced higher accuracy predictions than GARP. Aquifer permeability, baseflow index, elevation, and mean annual precipitation were the key variables influencing fish distribution patterns. Results from this study provide insights into which locations and environmental conditions may promote the future spread of invasive fish in the US.

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## **0200 AES Feeding Symposium II, 552 AB, Saturday 10 July 2010**

Antonella Preti, Candan Soykan, Heidi Dewar, Suzanne Kohin

NOAA Fisheries, Southwest Fisheries Science Center, La Jolla, CA, United States

### **Comparative Feeding Ecology of Shortfin Mako, Blue and Common Thresher Sharks in the California Current, 2002-2008**

This study describes the feeding ecology of three pelagic shark species in the California Current. Contents of shortfin mako (*Isurus oxyrinchus*), blue (*Prionace glauca*) and common thresher (*Alopias vulpinus*) shark stomachs sampled from 2002-2008 were identified to the lowest taxonomic level and analyzed using univariate (Geometric Index of Importance [GII], Shannon and Simpson diversity, Sorensen, and Morisita-Horn overlap indices) and multivariate (regression trees, cluster, and discriminant analysis)

methods. Stomachs of 330 mako sharks ranging from 53 to 248 cm fork length (FL) were examined; 238 contained 43 prey taxa. Jumbo squid (*Dosidicus gigas*, GII=46.0) and Pacific saury (*Cololabis saira*, GII=25.5) were the most important prey. Stomachs of 158 blue sharks ranging from 76 to 248 cm FL were examined; 114 contained 38 prey taxa. Jumbo (GII=33.9) and *Gonatus* spp. squids (GII=33.6) were the most important prey. Of 225 thresher sharks sampled, ranging from 108 to 228 cm FL, 157 stomachs contained 18 prey taxa. Northern anchovy (*Engraulis mordax*, GII=68.4) and Pacific sardine (*Sardinops sagax*, GII=48.5) were the most important prey. Blue and mako shark diets were most similar, while dietary overlap was lowest between blue and thresher sharks. Inter-annual variation in diet was greatest for blue sharks. Overall, mako sharks have the most diverse diet feeding on a range of teleosts and cephalopods; blue sharks generally prefer cephalopods; threshers are more specialized feeding primarily on coastal pelagic teleosts. Despite similarities in life history characteristics and spatial and temporal overlap, diets of the three species are distinct.

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**0414 NIA II, 551AB, Monday 12 July 2010**

Francisco Provenzano

*Instituto de Zoología y Ecología Tropical, UCV, Caracas, Venezuela*

### **The Preopercular Laterosensory Canal in Loricariidae (Teleostei: Siluriformes)**

Schaefer (1988) performed an analysis of the homology and evolution of the bones of the opercular series between loricarioid catfishes. In that work he used the path and the pores of the branches of the laterosensory canal as a tool to establish the homology and nomenclature of bony elements. Since that time a remarkable number of new species of loricariids have been described. Also new information about the anatomy of the species of this family has been published. Finally, some hypotheses of phylogenetic relationships among species or genera of the family Loricariidae have been proposed. This work reviewed and analyzed specimens of species in the Loricariidae family that includes representatives of the subfamilies: Lithogeninae, Neoplecostominae, Hypoptopomatinae, Loricariinae, Hypostominae, Ancistrinae and Delturinae. The results indicate that path patterns and the pores of preopercular canal are similar and consistent with those presented by Schaefer (1988). Species in the subfamilies Loricariinae and Hypoptopomatinae shows the greatest variation in the path of preopercular canal and in the form of the bones that carry sections of this canal. A proposal about on the evolution of preopercular canal between loricariids shows concordance with the hypotheses of phylogenetic relationships for the subfamilies and "tribes" of the family Loricariidae.

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**0271 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Holly Puglis, Michelle Boone

*Miami University, Oxford, OH, United States*

**The Effects of Terrestrial Buffer Zones on Amphibians in Public Green Spaces**

A leading cause of amphibian declines is habitat degradation and destruction. Golf courses and other managed green spaces, could serve as refuge for amphibians and other wildlife if managed in ways consistent with natural habitat. Simple management techniques, such as leaving unmown buffer zone around ponds, may help mitigate the effects of habitat loss for some species. In a series of field studies, we explored the effects of grassy buffer zones on two species of larval amphibian and on the overwinter survival of one species. We reared cricket frog tadpoles through metamorphosis and green frog tadpoles through one summer in golf course ponds with and without grassy buffer zones to determine the effects of the buffer on survival, time to metamorphosis and size at metamorphosis (cricket frogs) and survival, developmental stage and mass at the end of the study (green frogs). In some golf courses, cricket frogs had greater survival and mass at metamorphosis when reared in ponds with buffer zones. Green frogs experienced lower survival but greater mass and developmental stage when reared in ponds with buffer zones on some golf courses. We also conducted a habitat choice study to determine if cricket frogs prefer unmown grassy habitat or mown grassy habitat. Cricket frogs preferred unmown habitat, but this result was marginally significant. Our results indicate that public green spaces can offer suitable habitat for some amphibians and also that terrestrial buffer zones may not need to surround the entire pond.

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**0381 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Jennifer Purrenhage, Kimberly Babbitt

*University of New Hampshire, Durham, NH, United States*

**Influences of Aquatic and Terrestrial Habitat and Adult Demographics on Juvenile Recruitment in Vernal Pool-Breeding Amphibians**

Vernal pool-breeding amphibians are particularly vulnerable to population decline and extinction because of the unpredictable nature of vernal pool hydroperiods, as well as the generally limited protection of vernal pools and adjacent upland habitat. The complex life histories of these species increase their vulnerability to habitat alteration and necessitate that conservation planning considers both their aquatic and terrestrial habitat requirements. One major threat to vernal pool-breeding amphibians is the encroachment of forestry practices (e.g., clearcutting) on vernal pools across the landscape. Forested terrestrial buffers surrounding pools may provide some protection

for vernal pool-dependent species; however, there are few studies to date testing the efficacy of forest buffers. From 2004 through 2009, we monitored populations of two important vernal pool-associated species - wood frogs (*Rana sylvaticus*) and spotted salamanders (*Ambystoma maculatum*) - at 11 vernal pools in central Maine, following a standard drift fence and pitfall trap protocol. Pools were assigned to one of three forested buffer treatments: 30-m buffer, 100-m buffer, and >1000-m buffer (reference) pools. Specifically, we explored population-level (sex ratio, population size, and juvenile recruitment) effects of forested buffer treatments over time, and we examined environmental (e.g., hydroperiod) and demographic (e.g., adult population size) factors potentially influencing juvenile recruitment of wood frogs and spotted salamanders. Here we present findings from our six-year study, including the relative influences of terrestrial forested buffer treatments, hydroperiod, and adult population demography on juvenile recruitment, and offer initial recommendations of conservation priorities for vernal pool-breeding amphibians.

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**0009 Herp Systematics & Biogeography, 551 AB, Saturday 10 July 2010**

Robert Pyron<sup>1</sup>, Frank Burbrink<sup>1</sup>

<sup>1</sup>*Stony Brook University, Stony Brook, NY, United States*, <sup>2</sup>*The College of Staten Island/CUNY, Staten Island, NY, United States*

### **Niche Evolution and Systematics of the Common Kingsnake (*Lampropeltis getula*)**

Based on a recent range-wide phylogeographic analysis, we evaluate patterns of niche evolution in geographic lineages of the *Lampropeltis getula* group. We find strong evidence for the influence of both niche conservatism and divergence driving lineage formation on relatively recent phylogenetic time scales. In light of this differentiation, we present a systematic revision, finding support for the recognition of five distinct species. We provide diagnoses based on mitochondrial DNA evidence, morphological variation, ecological niche modeling, and historical precedence. Each species bears the name of the nominate subspecies found primarily within the range of each phylogeographic lineage: the Eastern lineage (*Lampropeltis getula*, Eastern Kingsnake), the Mississippi lineage (*L. nigra*, Black Kingsnake), the Central lineage (*L. holbrooki*, Speckled Kingsnake), the Desert lineage (*L. splendida*, Desert Kingsnake), and the Western lineage (*L. californiae*, California Kingsnake). Interestingly, all of these taxa had previously been described or recognized as distinct species, in some cases for up to 101 years (e.g., *L. californiae*), before being demoted to subspecies. Increasingly detailed genetic information from phylogeographic analyses will likely continue to have a strong impact on traditional taxonomy for many groups.

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**0107 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Irani Quagio-Grassiotto<sup>1</sup>, MSc Clarianna Baicere-Silva<sup>2</sup>, Katiane Ferreira<sup>3</sup>, Naercio Menezes<sup>3</sup>, Ricardo Benine<sup>1</sup>, Luiz Malabarba<sup>4</sup>

<sup>1</sup>Universidade Estadual Paulista-UNESP, Botucatu, SP, Brazil, <sup>2</sup>Universidade de Campinas-UNICAMP, Campinas, SP, Brazil, <sup>3</sup>Museu de Zoologia da Universidade de São Paulo-MZUSP, São Paulo, SP, Brazil, <sup>4</sup>Universidade Federal do Rio Grande do Sul-UFRGS, Porto Alegre, RS, Brazil

**Spermatic Characteristics in Some Representatives of the Subfamily Stevardiinae (Teleostei: Characiformes) and Their Phylogenetic Implications**

The phylogenetic relationships among the members of the subfamily Stevardiinae (sensu Mirande, 2009) are primarily based on morphological characters and molecular data. Other characters, such as spermiogenesis and sperm structure can provide phylogenetic signals and are potentially useful for cladistic analysis. In order to know the spermatic characteristics of members of Clade A characids (sensu Malabarba & Weitzman, 2003), testes of the genera *Boehlkea*, *Bryconacidnus*, *Bryconamericus*, *Ceratobranchia*, *Caiapobrycon*, *Creagrutus*, *Cyanocharax*, *Hemibrycon*, *Hypobrycon*, *Knodus*, *Odontostoechus*, *Piabarchus*, *Piabina*, and *Rhinobrycon* were prepared and analyzed under Transmission Electron Microscopy. The specimens were collected or mainly obtained from zoological collections. In all species analyzed a variation of Type I spermiogenesis was obtained in which nuclear rotation is equal or minor than 10° resulting in a lateral position of the double nuclear fossa and flagellum. The sperm nuclei are slightly elongate toward the flagellar axis, the proximal centriole is partially inside the nuclear fossa and anterior and oblique to the distal, and the midpiece is short and strongly asymmetric. The fact that the species herein analyzed and others also belonging to Clade A, from which the spermatic characteristics are known, share the same characteristics strongly indicates that this clade is monophyletic. The great similarity of the sperm structure suggests that the 17 taxa included in Clade A are more related among themselves than with the other Stevardiinae, and constitutes a more basal subgroup within this subfamily.

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**0717 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Elizabeth Quimba, Dee Denver, Fredric Janzen

*Oregon State University, Corvallis, OR, United States*

**Molecular Phylogeography of the Western Hognose Snake (*Heterodon nasicus*)**

*Heterodon nasicus* (western hognose snake) is broadly distributed from southeastern Alberta, Canada to northern Mexico. The currently recognized subspecies (*H. n. nasicus*,

*H. n. kennerlyi*, and *H. n. gloydi*.) designation, based on morphological characters, has not been reassessed with modern molecular methods. The use of molecular tools will help to clarify the taxonomic status and population relationships of this broadly-distributed snake. Understanding evolutionary relationships among, and genetic variation within, *H. nasicus* populations will provide important conservation information, as this species is endangered or threatened in various parts of its range. This study will test for concordance in previous morphology based systematic assessments (Eckerman 1997; Chiszar et al 2003) against that of the proposed mitochondrial DNA sequence analysis. The secondary goal will be to assess how populations are genetically structured and to determine the regional historical forces responsible for the current distribution of the species. We anticipate that southern populations will be more genetically distinct than northern populations as a result of expansions northward into areas heavily impacted by the retreat of glaciers approximately 10,000 years ago. Furthermore, we predict *H. nasicus* dispersed northward and subsequently eastward, coinciding with the Holocene Climatic Optimum and the Xerothermic period of grassland invasion. If this pattern of dispersal is apparent, phylogenetic analyses will show eastern populations to be the most derived.

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### **0113 Headstarting Turtle Symposium I, Ballroom B, Monday 12 July 2010**

Abdul Rahim<sup>2</sup>, Ahmed Khan<sup>1</sup>

<sup>1</sup>Salahif, Muscat, Oman, <sup>2</sup>University of Karachi, Karachi, Pakistan

### **Conservation Status and Tagging Programs of Green Turtles on the Makran Coast at Daran Beach, Jiwani, Pakistan**

The population of sea turtles in Pakistan coast are decreasing year by year due to poaching, incidental catch by the fishing gears like illegal way of fishing (bottom Trawlers), non use of TED in fishing trawlers, degradation of feeding grounds and erosion of nesting beaches. The WWF-Pakistan Wetlands Program (PWP) started conservation and management activities of sea turtle around 2007 to 2010, trained the coastal community for flippers tagging of sea turtles at Daran Village, Jiwani. The tagging revealed the mystery of migrations and the location of foraging areas of sea turtles in Pakistani coast. Green turtle can nest at Daran beach but for feeding purposes it migrate to Oman, Iran and other neighboring countries. For the conservation of sea turtles, PWP is working with Daran Wetlands Village Conservation Community since 2007. The turtle nesting was recorded from 2007 to 2010 and total number of hatchlings which emerged was 8261, 16177 eggs were recorded and 2580 nests were protected. The site team mounted eight satellite transmitters and carried out a flipper tagging program on green turtles at Daran beach. Local community members have tagged more than fifty marine turtles. The Daran people got trained for protection of turtle nests in their natural condition by putting wire mesh enclosures around them and later release the hatchlings. Pakistan wetlands Program also introduced the

alternate energy model (Solar and Wind) for Daran community and running community primary school as community development initiatives.

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#### **0418 Poster Session II, Exhibit Hall D, Saturday 10 July 2010**

Shahriar Rahman<sup>1</sup>, Alexandra Kanonik<sup>2</sup>, Russell Burke<sup>2</sup>

<sup>1</sup>*Brooklyn College City University of New York, Brooklyn, New York, United States,*

<sup>2</sup>*Hofstra University, Hempstead, New York, United States*

#### **Evaluating Nest Protectors for Turtle Conservation: Unintended Consequences for the *Malaclemys terrapin* Hatchlings?**

Turtles are declining all over the world at alarming rates, and nest predation is one of the common threats to many species. Many conservationists depend on nest protectors/nest predator excluders to protect nests from predation. Various nest protector designs are used (e.g. wire mesh cages, plastic cages) and most of them are very successful against nest predators (e.g. raccoons, fox, crows, feral dogs). However, there are potentially negative impacts of nest protectors. Standard nest protectors may affect the incubation temperature of turtle eggs, which is potentially important because embryological development can be profoundly influenced by incubation temperature. Even a subtle change in incubation temperature caused by nest protectors can affect the sex ratio, growth, development, behavior and fitness of turtle hatchlings. In summer of 2009, I conducted an experiment at Jamaica Bay, New York, evaluating nest protectors of three different designs. I located 48 diamondback terrapin (*Malaclemys terrapin*) nests and reburied them in pairs. In each pair one nest was protected and other was left uncovered. Miniature temperature loggers were placed in all of the nests to record temperature for every hour June to August. Loggers were recovered in the fall and all the hatchlings were measured. Initial results indicate a significant difference in incubation temperature between the nests with metal box protectors and nest without protectors. The study will be continued in the summer of 2010 with larger sample.

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#### **0574 Karel Liem Symposium, Ballroom D, Thursday 8 July 2010**

Jason Ramsay, Cheryl Wilga

*University of Rhode Island, Kingston, RI, United States*

#### **Function of the Jaw Adductor Muscles During Suction and Biting in Bamboo Sharks**

The preorbitalis (PO) of orectolobiform sharks, such as white-spotted bamboo sharks *Chiloscyllium plagiosum*, interconnects the cranium and lower jaw and is thought to assist

the quadratomandibularis (QM) during jaw adduction by elevating the lower jaw during the compressive phase of feeding. However, the hyoidmandibular ligament in *C. plagiosum*, present in most Orectolobiformes, couples lower jaw and hyoid depression, yet constrains PO function. Elevation of the lower jaw also elevates the hyoid due to the ligament connection, and may result in backflow of water and prey in the buccal cavity during the compressive phase. Hyoid, upper and lower jaw kinematics, fascicle shortening and motor activity in the QM and PO and buccal pressure were recorded simultaneously during suction capture and processing bites. During suction capture, active PO shortening begins after jaw closure simultaneously with the onset of hyoid elevation. During biting, active QM and PO shortening begins at peak gape and coincides with jaw closure. Jaw closure during suction capture is entirely due to upper jaw protrusion actuated by the QM while the PO elevates the jaws and indirectly elevates the hyoid during the recovery phase as water is expelled through the gill slits. During a bite, the PO functions in jaw closure contributing to a more forceful bite. All orectolobiform species use suction to capture prey, yet not all feed on hard or tough prey, indicating that PO function in this group may have evolved in response to suction feeding, while modulation of PO function allowed a semi-durophagous lifestyle.

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#### **0707 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

Daniel Reeves, Rebeka Rand Merson

*Rhode Island College, Providence, RI, United States*

#### **Developmental Expression of AHR in the Little Skate**

An orphan receptor, the aryl hydrocarbon receptor (AHR) appears to play regulatory roles in numerous biological functions. Compelling evidence for roles of AHR in regulating cell differentiation and vascular architecture is demonstrated in mammals. We are developing approaches to use individual AHR genes of elasmobranchs to tease apart the numerous functions of the one mammalian AHR. To better understand the AHR's role in embryonic development, we are using the little skate (*Leucoraja erinacea*) model. Developmental expression of AHR was assessed using in situ hybridization with specific probes for AHR in whole skate embryos at several stages. Increasing our knowledge of the function of AHR in skates will further our ability to study the roles of the human AHR itself, and advance understanding of the role of AHR in development and teratogenesis. Supported by RI-INBRE grant P20RR-016457 from the National Institutes of Health National Center for Research Resources (NCRR), and a MDIBL New Investigator Award funded by ME-INBRE (P20RR-016463) and the NIEHS Center for Membrane Toxicity Studies (P30ES-00382820).

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## **0661 Lundberg Symposium, Ballroom D, Sunday 11 July 2010**

Peter Reinthal

*University of Arizona, Tucson, AZ, United States*

### **Integrating Ecological and Contaminant Studies Using Radiogenic and Stable Isotopes: Case Studies of Lead Contamination in Aravaipa Creek, Arizona and Paleocological Conditions in Lake Malawi, Africa**

John Lundberg was instrumental in stimulating new areas of ichthyology research by promoting the integration of various disciplines, especially systematics with ecological, developmental, functional and evolutionary studies as evident from the diverse array of studies presented in this symposium. Here we integrate fossil and isotopic analyses for forensic contaminant and palaeoecological studies. In fishes from Aravaipa Creek, high-precision isotopic analyses of lead ( $^{208}\text{Pb}$ ,  $^{207}\text{Pb}$ , and  $^{206}\text{Pb}$ ) are incorporated with ecological data to determine levels, sources and mechanisms of lead contamination in desert fishes and invertebrates and (2) stable isotopes of carbon ( $\delta^{13}\text{C}$  ‰) and nitrogen ( $\delta^{15}\text{N}$  ‰) to determine trophic interactions and mechanisms of bioaccumulation and paleoecological conditions. In some species, extremely high levels of lead contamination are determined and the source and transport mechanism of heavy metal accumulation are different than previously reported. In Cyprinididae and Cichlidae fossils taken from Lake Malawi sediment cores, stable isotopes of carbon ( $\delta^{13}\text{C}$  ‰) are used to determine fluctuations in pelagic and benthic conditions in the previous 100,000 years.

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## **0085 Lundberg Symposium, Ballroom D, Sunday 11 July 2010**

Roberto Reis<sup>1</sup>, Christian Cramer<sup>1</sup>, Edson Pereira<sup>1</sup>, Pablo Lehmann<sup>2</sup>

*<sup>1</sup>PUCRS, Porto Alegre/RS, Brazil, <sup>2</sup>Unisinos, São Leopoldo/RS, Brazil*

### **A Total Evidence Phylogeny of the Neoplecostomine and Hypoptopomatine Armored Catfishes**

The Neotropical loricariid catfishes have received a great deal of interest by systematists in the last two decades. In this study we combined a 303 character morphological data matrix of the Neoplecostominae with a 169 character morphological data matrix of the Hypoptopomatinae and a 2634 basepairs matrix (fragments of COI, RAG1, and RAG2) of both subfamilies. We included all described species of neoplecostomines, most species of hypoptopomatines, several loricariids from five other subfamilies, totaling 207 species and 53 loricariid genera, in addition to 10 loricarioid outgroup species, to obtain the largest catfish phylogeny produced so far, and the first total evidence hypothesis of the loricariids. Maximum parsimony analyses using "new technology" search strategies were used to seek a solution for the partial contradictory results of previous solely

morphological or molecular analyses. We found 150 maximally parsimonious trees (11,135 steps, CI=0.28) and used strict consensus to summarize our hypotheses and Bremer support as a branch support measure. Our results show the Delturinae as the sister-group of all other loricariids except of *Lithogenes*, Loricariinae and Hypostominae as successive sister-taxa of the Neoplecostominae plus Hypoptopomatinae, which were recovered as monophyletic sister taxa to each other. All previously described genera of the Neoplecostominae were recovered as monophyletic and an interesting biogeographic pattern was revealed for *Pareiorhaphis*. Concordant with previous molecular analyses but also quite surprising, the genus *Pseudotocinclus* was recovered among the Neoplecostominae. As expected, *Parotocinclus* was found to be highly polyphyletic and will have to be split in several monophyletic genera.

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### **0091 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Marcie K. Reiter, Carl D. Anthony, Cari-Ann M. Hickerson

*John Carroll University, University Heights, Ohio, United States*

#### **Differential Territorial Behavior Between the Color Morphs of *Plethodon cinereus***

The red-backed salamander, *Plethodon cinereus*, is a polymorphic species that has served as a model organism in behavioral and ecological studies. Recent work suggests that the two most abundant color morphs, the unstriped and striped, are diverging on certain niche dimensions. Although many studies indicate that red-backed salamanders are territorial, nothing is known about possible differences that may exist in territorial behavior between the two common color morphs. Here we used striped and unstriped *P. cinereus* to examine potential variation in territorial behavior in laboratory encounters. Residents of each morph were paired with the same color morph, a different color morph, and a control. We detected no difference in behavior between unstriped and striped salamanders. The behavior of residents and intruders was as expected in the context of territoriality theory. Residents spent significantly more time in aggressive behaviors and intruders spent more time in submissive behaviors. We also examined potential for differential homing behavior between the two morphs. We marked unstriped (n=50) and striped (n=49) salamanders and displaced them 5m from the naturally occurring cover object they were found under. Of the 99 salamanders originally displaced, eight (seven unstriped and one striped) were recaptured. Unstriped salamanders homed to covers object more frequently than striped salamanders. We also found that newly captured salamanders were notably smaller than the originally displaced individuals. Although there is some evidence that the two morphs differ in their diet, mate choice, and habitat preference, our data do not indicate differences in their territorial behavior.

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**0223 Herp Conservation I, 556 AB, Thursday 8 July 2010**

Rick Relyea

*University of Pittsburgh, Pittsburgh, PA, United States*

### **New Effects of Roundup® on Amphibians: Predation, Stratification, and Induction of Tadpole Morphology**

To understand the impacts of anthropogenic chemicals on natural communities, we often must base our predictions on short-term, single-species tests that are conducted as part of the regulation process. While a valuable first-step, these tests tell us little about the impacts of contaminants under more natural conditions including the presence of natural stressors. Among the many natural stressors, predator stress is a common one whose interactions with pesticides have only been examined under laboratory conditions. Using two mesocosm experiments, I examined how predation stress interacted with the effects of Roundup®, the most widely applied herbicide in the world. The first experiment (conducted with three spring-breeding species of anurans) crossed four concentrations of Roundup with the presence of no predators, caged adult newts, or caged dragonfly larvae. The herbicide had interactive effects on tadpole survival and growth. The cues from caged dragonflies induced adaptive morphological changes in the tadpoles. Surprisingly, the herbicide induced the same morphological changes in the tadpoles. The second experiment (conducted with three species of summer-breeding anurans) crossed four concentrations of Roundup with the presence of no predators, caged dragonfly larvae, or lethal dragonfly larvae. The herbicide and predator treatments again had interactive effects on tadpole survival and growth. Moreover, the morphology of the tadpoles was again induced similarly by caged dragonflies and the herbicide. Collectively, these results suggest that the effects of Roundup on larval amphibians can differ tremendously depending on community context. Moreover, for reasons that are unclear, the herbicide is able to induce anti-predator responses.

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**0719 AES Stress Symposium II, 551 AB, Sunday 11 July 2010**

Gillian M. C. Renshaw

*Hypoxia and Ischemia Research Unit, Griffith University, Queensland, Australia, Australia*

### **Assessing Oxidative Stress in Sharks and Rays**

Hypoxia and reoxygenation usually triggers an increase in the formation of reactive oxygen species (ROS) by mitochondria, which is greatest during the reoxygenation phase. While the mismatch between ROS production and antioxidant defence results in oxidative stress, the down stream effects of increased ROS production range from lipid

peroxidation to the initiation of cell death. The giant shovel nose ray (*Glaucostegus typus*) and the epaulette shark (*Hemiscyllium ocellatum*) can live in habitats characterised by intermittently variable oxygen levels yet their tolerance to hypoxia is markedly different, *Hemiscyllium ocellatum* can tolerate anoxia while *Glaucostegus typus* can not. The level of lipid peroxidation and the ratio of oxidised versus reduced glutathione was measured in both species after a single standardised exposure to 5% of normal saturation that represented a maximal challenge.

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#### **0442 Poster Session III, Exhibit Hall D, Sunday 11 July 2010**

Eric Reyier<sup>1</sup>, Debra Abercrombie<sup>2</sup>, Erick Ault<sup>3</sup>, George Burgess<sup>4</sup>, Demian Chapman<sup>2</sup>, Jynessa Dutka-Gianelli<sup>3</sup>, Bryan Franks<sup>5</sup>, Samuel Gruber<sup>5</sup>, Johanna Imhoff<sup>4</sup>, Zack Jud<sup>6</sup>, Steven Kessel<sup>5</sup>, Craig Layman<sup>6</sup>, Ron Taylor<sup>3</sup>, Jim Whittington<sup>3</sup>, Joy Young<sup>3</sup>

<sup>1</sup>Kennedy Space Center Ecological Program / IHA Environmental Services, Kennedy Space Center, Florida, United States, <sup>2</sup>Stony Brook University, Stony Brook, New York, United States, <sup>3</sup>Florida Fish & Wildlife Conservation Commission, Tequesta, Florida, United States, <sup>4</sup>Florida Program for Shark Research / University of Florida, Gainesville, Florida, United States, <sup>5</sup>Bimini Biological Field Station, Bimini, Bahamas, <sup>6</sup>Florida International University, North Miami, Florida, United States

#### **An Introduction to the Florida Atlantic Coast Telemetry (F.A.C.T.) Array**

Understanding how and why animals move through their environment is central to resolving their role within a given ecosystem and a necessary step for crafting sound management strategies for exploited and imperiled species. Continued advances in low cost, scalable autonomous acoustic telemetry systems have greatly enhanced the ability to study the movement patterns and habitat selection of aquatic animals over large geographic areas and multi-year time scales. One example of this is the Florida Atlantic Coast Telemetry (F.A.C.T.) Array, a collaborative partnership of the Florida Fish & Wildlife Conservation Commission, Bimini Biological Field Station and University of Miami, Florida Program for Shark Research, Kennedy Space Center Ecological Program, and Florida International University. Now spanning a 300 km stretch of the east Florida coast, the F.A.C.T. Array consists of 170 VEMCO VR2 and VR2W autonomous receivers deployed across a continuum of coastal habitats from freshwater rivers and open estuarine waters of the Indian River Lagoon system to adjacent offshore reefs and wrecks. The array has proven to be highly capable of evaluating site fidelity, habitat preferences, seasonal migration patterns, and reproductive strategies of over a dozen of Florida's most valuable freshwater and estuarine sportfish and large coastal sharks, insights which will help guide future management efforts. Of equal importance, the FACT Array has improved communication among marine research organizations along the Florida east coast, spurring new collaborative life history studies of fishes which otherwise would have been logistically and financially prohibitive.

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**0435 AES Behavior & Ecology, 552 AB, Friday 9 July 2010**

Eric Reyier<sup>1</sup>, Bryan Franks<sup>2</sup>, Demian Chapman<sup>3</sup>, Steven Kessel<sup>2</sup>, Samuel Gruber<sup>2</sup>

<sup>1</sup>*Kennedy Space Center Ecological Program / IHA Environmental Services, Kennedy Space Center, Florida, United States*, <sup>2</sup>*Bimini Biological Field Station, Bimini, Bahamas*, <sup>3</sup>*Stony Brook University, Stony Brook, New York, United States*

### **Site Fidelity and Seasonal Movement Patterns of Juvenile Lemon Sharks in an Open Ocean Nursery at Cape Canaveral, Florida**

For many coastal sharks, including the well studied lemon shark (*Negaprion brevirostris*), the geographic extent and temporal patterns of use in their winter nursery grounds remain poorly defined in most regions. Since 2003, we've documented large recurring winter aggregations of juvenile lemon sharks utilizing shallow surf zone habitats at Cape Canaveral, east-central Florida. To assess duration of residency within this open ocean nursery, as well as the timing of, and cues to, any coastal migrations, lemon sharks were implanted with acoustic transmitters in December 2008 (n = 9) and 2009 (n = 23). Fidelity to aggregation sites was monitored with up to 10 autonomous acoustic receivers while regional migrations were assessed via the Florida Atlantic Coast Telemetry (F.A.C.T.) Array, a network of 170 receivers spanning 300 km of the Florida east coast. Sharks released in December 2008 were regularly detected locally for up to 107 days. Five individuals were subsequently recorded on F.A.C.T. receivers 80 km north, confirming a northward spring migration as rapid as 18.1 km day<sup>-1</sup>. Behavior differed somewhat for 2009 releases with many sharks migrating south as far as West Palm Beach (190 km), apparently in response to a prolonged period of below average water temperature. Unexpectedly, 18 adult lemon sharks originally tagged from aggregations near Jupiter, Florida (175 km south) were also detected at Cape Canaveral in spring 2009 providing a putative connection between these two groups. Continued tracking over the coming year coupled with ongoing genetic analyses will further clarify the strength of this relationship.

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**0081 HERPETOLOGISTS' LEAGUE GRADUATE STUDENT AWARD, 556 AB, Friday 9 July 2010**

R. Graham Reynolds<sup>1</sup>, Glenn P. Gerber<sup>2</sup>

<sup>1</sup>University of Tennessee, Knoxville, TN, United States, <sup>2</sup>Zoological Society of San Diego, San Diego, CA, United States

**Ecology, Genetics, and Conservation of the Turks Island Boa (*Epicrates c. chrysogaster*)**

The genus *Epicrates* is composed of nine species of boid snakes in the West Indies. Little is known about the Turks Island Boa (*E. chrysogaster chrysogaster*) a subspecies of the Southern Bahamas Boa endemic to the Turks and Caicos Islands, for which no published ecological, genetic, or conservation studies exist. Here we report on the first multi-year ecological study of the Turks Island Boa, focusing on an important population located on the small island of Big Ambergris Cay. One hundred and seventy eight captures were made over three trips to the Turks and Caicos in 2007, 2008 and 2009. We report on basic natural history information including size, coloration, body temperature, abundance, diet, foraging, and diurnal refuge selection; as well as clarify the known distribution and conservation concerns of this species. We also investigated genetic variation across the Turks and Caicos Banks using a 617 bp fragment of the mitochondrial marker Cytochrome B gene. Bayesian inference and maximum likelihood resulted in single consensus trees with identical topologies. Shallow branch lengths indicate recent divergence in this species, contrary to studies of other Turks and Caicos herpetofauna. A long history of human habitation, greatly exacerbated by exponentially increasing development in the last several decades, may be threatening the remaining populations of these boas, and this study fills a significant gap in knowledge of the biology of this species.

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**0082 Poster Session I, Exhibit Hall D, Friday 9 July 2010**

R. Graham Reynolds<sup>1</sup>, Nell A. Koneczny<sup>2</sup>

<sup>1</sup>University of Tennessee, Knoxville, TN, United States, <sup>2</sup>Maryville High School, Maryville, TN, United States

**Molecular Divergence in Two Species of Dwarf Geckoes from the Turks and Caicos Islands**

The dwarf geckoes (*Sphaerodactylus*) of the West Indies have undergone a tremendous radiation comparable to that of the well-known *Anolis* lizards. We investigated the divergence between two species of dwarf geckoes, *S. underwoodi* and *S. caicosensis*, endemic to the Turks and Caicos banks (respectively) of the southern Bahamian

Archipelago using an 863 bp fragment of the mitochondrial marker ND2 gene. These banks have been isolated from each other since their emergence above the Bahamas Platform in the Pleistocene, though islands on each bank have been alternately connected and isolated with fluctuating sea levels. Pairwise distance analysis revealed 10.9% corrected sequence divergence between the two species, corresponding to an estimated divergence time of between 5.5 - 8.4 Ma. Bayesian inference and maximum likelihood resulted in single consensus trees with identical topologies. Contrary to expectation, *S. underwoodi* is a clade nested within *S. caicosensis*, and *S. caicosensis* shows as much divergence as might be expected between different species. AMOVA results agreed with the partitioning between banks, and revealed some divergence on each bank. Our results indicate a great deal of mitochondrial divergence among dwarf geckoes in the Turks and Caicos, and that the possibility exists that current nomenclature does not fully describe the relationships of these geckoes. We also find support for previous research, showing that divergence times between geographically proximate dwarf geckoes in both the Greater and Lesser Antilles greatly predate the formation of the islands that currently encompass their range.

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## **0664 Herp Morphology, 556 AB, Sunday 11 July 2010**

Justin Rheubert, David Sever

*Southeastern Louisiana University, Hammond, Louisiana, United States*

### **Reproductive Morphology of *Hemidactylus turcicus***

The reproductive system of the Mediterranean Gecko, *Hemidactylus turcicus*, from southeastern Louisiana was investigated to determine the ultrastructural characters of the testis, efferent ducts, and kidneys. The active reproductive system is from December through September. Mature spermatozoa are released into the lumen of the seminiferous tubules and travel through a single rete testis that is composed of a simple squamous epithelium with labyrinthine intercellular canaliculi. Data suggest that the rete testis is involved in the absorption of luminal fluid and break down of molecules. The rete testis diverges into three to four ductuli efferentes that consist of ciliated and non-ciliated cells. Widened intercellular canaliculi are found within the ductuli efferentes suggesting absorptive activities. However, the non-ciliated cells do contain secretory granules suggesting an absorptive and secretory function for the ductuli efferentes. All tubes making up the ductuli efferentes empty into the epididymis. The epididymis consists of a tall columnar epithelium consisting of principal cells and basal cells. Basal cells are rarely observed except in the spermatogenically inactive months. Dense amount of secretory granules are found within the epithelial cells, and the epididymis is the location where the sperm mass stains positively for proteins and carbohydrates. From Bowman's capsule the kidney has proximal and distal convoluted tubules and the collecting duct. The posterior portions of the collecting duct are the only region that participate in the renal sexual segment. The sexual segment consists of a columnar epithelium with numerous Golgi complexes and dense secretory granules.

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**0254 Fish Life History, 551 AB, Friday 9 July 2010**

Filipe Ribeiro<sup>1</sup>, Edward Hale<sup>2</sup>, Todd Clardy<sup>1</sup>, Alison Deary<sup>1</sup>, Eric J. Hilton<sup>1</sup>, Timothy E. Targett<sup>2</sup>, Jonh E. Olney<sup>1</sup>

<sup>1</sup>*Virginia Institute of Marine Sciences, Gloucester Pt, VA, United States*, <sup>2</sup>*University of Delaware, School of Marine Science and Policy, Lewes, DE, United States*

### **Patterns of Early Life Stage Fish Ingress into Chesapeake and Delaware Bay**

Many fishes, such as Atlantic Menhaden, Atlantic Croaker, Summer Flounder, and American Eel, are estuary-dependent, relying on species-specific transport mechanisms to reach nursery grounds in estuaries in the Mid-Atlantic Bight. These four species enter Chesapeake and Delaware Bay as larvae and early juveniles from fall to spring, through species-specific differences in spawning features (timing, location) and transport characteristics (swimming ability, body shape). We assessed differences in the timing and duration of ingress, patterns of density variation, and size distribution of these four species in both bays over three consecutive recruitment periods (Fall 2007 - Spring 2010). Early life history stage fishes were collected during weekly, night-time flood tides at shore-based stations in Chesapeake Bay (York River, VA) and Delaware Bay (Roosevelt Inlet, DE). All four species appeared earlier in the season and were observed later at Roosevelt Inlet compared to the York River, although considerable inter-annual variation was observed at both locations. Recruitment patterns of croaker, both fall- and winter-spawned cohorts of menhaden, and flounder showed differences in the strength of ingress and mean size between the sites over the three recruitment periods. Recruitment patterns for eel were more similar between the two bays, except for two large peaks (>50 individuals/1000m<sup>3</sup>) in recruitment at the York River during the 2007-2008 recruitment period. These patterns suggest species-specific and estuary-specific dynamics during the three recruitment seasons examined. We will discuss the ingress of these species and potential differences in their transport mechanisms through time based on these results.

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## 0242 Poster Session III, Exhibit Hall D, Sunday 11 July 2010

Filipe Ribeiro<sup>1</sup>, Tiago Navarro-Marques<sup>2</sup>, Maria Filomena Magalhaes<sup>2</sup>

<sup>1</sup>Virginia Institute of Marine Sciences, Gloucester Pt, VA, United States, <sup>2</sup>Universidade de Lisboa, Faculdade de Ciências, Centro de Biologia Ambiental, Lisboa, Portugal

### **Life-history Variability of a Non-native Cichlid in the Guadiana Drainage: Predicting Invasion Success in Mediterranean Streams**

Understanding the extent to which life-history traits are associated with fish invasions is a pressing ecological issue. The South American chameleon cichlid *Australoheros facetus* is becoming a successful non-native fish in Mediterranean streams in the Iberian Peninsula. In this study, we quantified seven life-history traits for three populations of the chameleon cichlid in the lower Guadiana Drainage exhibiting different degrees of success. Specifically, chameleon cichlid is rare in the Guadiana mainstream but increasingly abundant in the tributaries Vascão and Ardila rivers. Reproductive traits, such as size at maturity and duration of reproductive season, were similar among populations, but there was considerable variation in fish longevity, age, and growth. Fish aged 4+ occurred in the Guadiana mainstream, but longevity was only 3+ in the tributaries. Growth rates considerably differ between three populations, with Guadiana fish attaining maturity size faster than the fish present in the tributaries. Taken together, these results highlighted that adaptation to local conditions may indeed play a role in invasion success. However, the chameleon cichlid showed higher plasticity in growth than reproduction traits, contrary to what has been found in pumpkinseed sunfish (*Lepomis gibbosus*) a very successful invader in the Guadiana drainage. The extent to which this may contribute to explain the success of invasive vs. noninvasive introduced species in Mediterranean streams is discussed.

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## 0609 Acoustics Symposium III, Ballroom D, Sunday 11 July 2010

Aaron N. Rice, Peter J. Dugan, Janelle L. Morano, Christopher W. Clark

Cornell University, Ithaca, NY, United States

### **Acoustic Ecology of Black Drum (Sciaenidae: *Pogonias cromis*): Understanding Population-level Vocal Behavior and Responses to Anthropogenic Noise Using Automated Sound Detection**

Sciaenids (including drum, croakers, and weakfish) are among the best-studied groups of sonic fishes. As such, they offer the opportunity to serve as a model system for fish bioacoustics, furthering the discipline for how scientists understand the role of sounds in fish behavior and ecology. Black drum produce a highly stereotyped frequency-modulated harmonic call during courtship behaviors, which is easily detectable in

spectrographic analysis. We analyzed over 20,000 hours of archival recordings (recorded in winter 2006-2007) from 12 continuously recording hydrophone units deployed off coastal Georgia for the occurrence of black drum vocalizations. Black drum produced calls in varying abundance ranging from less than one per hour to enormous choruses with thousands of calls per hour. To quantify these large numbers of calls, we developed a multi-stage detection algorithm consisting of detection, feature extraction and classification by artificial neural network, which automatically discriminated between black drum calls (true positives) and noise signals (false positives). In Georgia waters, black drum choruses last upwards of 8-10 hours per day, and are one of the dominant features of the marine acoustic landscape. In the presence of increased noise from ship traffic, black drum appeared to decrease their calling rates, and then increase calling once the ship noise decreased. Combining black drum vocalizations with state-of-the art signal processing techniques (as currently used in whale passive acoustic monitoring) now allows for a more detailed understanding of fish bioacoustics across large temporal and spatial scales.

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