



Schedule for SyngBio 2017

Sunday	May 14, 2017
4-9 pm 7-9pm Grand Salon	Meeting Registration , On Campus, Outside Grand Salon in Plant Lobby (Building #51 on map) Meet and Greet , On Campus, Grand Salon of Plant Hall
Monday	May 15, 2017
7:30-8:30 am 1st Floor Vaughn	Breakfast , Ultimate Dining in Vaughn (#44 on map)
8:00-9am President's Conference Room 9th Floor Vaughn	Continuation of On-Campus Meeting Registration , 9 th Floor of Vaughn Center
8:45am Crescent Club 9th Floor Vaughn	Welcome and Announcements
9:00-9:45 Crescent Club 9th Floor Vaughn	Sexual Selection and Mating Systems <u>Keynote: Kenyon Mobley (Switzerland)</u> Sexual selection and the evolution of female ornamentation in pipefishes
9:45-10:45am Crescent Club 9th Floor Vaughn	Sexual Selection and Mating Systems (Moderator: Amanda Vincent) Caitlin Leslie (USA) : The mating system of the blue-striped pipefish, utilizing both behavioral and genetic methods * Masahito Tsuboi (Norway) : Brain size evolution in Syngnathidae: the role of sexual selection and feeding ecology Nuno Monteiro (Portugal) : Brood reduction, embryo homogenization and the “women in red” effect: new perspectives in pipefish male pregnancy Charlotta Kvarnemo (Sweden) : Costs and benefits to male pipefish caring for broods of different sizes
10:45-11:15am	Coffee Break in Trustees' Board Room
11:15-12:30 Crescent Club 9th Floor Vaughn	Genomics (Moderator: Adam Jones) Clay Small (USA) : The Gulf pipefish reference genome facilitates genetic study of derived morphologies and an evolutionary novelty Geng Qin (China) : GPER (G protein-coupled estrogen receptor 1) is involved in brood pouch cell proliferation of seahorse Adam Jones (USA) : The estrogen connection in syngnathid sexual selection Qiang Lin (China) : Seahorse genome and morphological events in evolution



	Allison Fuiten (USA): Key losses in Hox Coding and Regulatory Elements in the Gulf Pipefish *
12:30-2pm 1st Floor Vaughn	Lunch on campus, Ultimate Dining in Vaughn (#44 on map)
2:00-2:45pm Crescent Club 9th Floor Vaughn	Syngnathid Communication and Human Impacts on Behavior <u>Keynote: Adam Lim (Malaysia)</u> Acoustic Signatures and Sound Producing Mechanisms in Syngnathid Fishes
2:45-3:15pm Crescent Club 9th Floor Vaughn	Syngnathid Communication and Human Impacts on Behavior (Moderator: Gunilla Rosenqvist) Tacyana Oliveira (Brazil): Assessing wild seahorse sounds in Brazil Jorge Palma (Portugal): The effect of anthropogenic noise as a source of acoustic stress in wild populations of <i>Hippocampus guttulatus</i>
3:15-3:45pm 9th Floor Vaughn	Coffee Break in Trustees' Board Room
3:45-5:00pm Crescent Club 9th Floor Vaughn	Gunilla Rosenqvist (Norway): Sex in murky waters: algal induced turbidity increases sexual selection in pipefish Maarten De Brauwer (Australia): Behavioural and physiological impacts of flash photography on seahorses * Louw Claassens (South Africa): An unexpected Atlantis: using artificial structures in the conservation of an endangered seahorse species * Maite Mascaro (Mexico): Thermal preference, energy balance and growth in <i>Hippocampus erectus</i> (Perry, 1810): the effect of gradually increasing temperature during exposure Mari Kawaguchi (Japan): Morphological observations on the formation of brood pouch of pot-bellied seahorse <i>Hippocampus abdominalis</i>
5:00-7:00pm	Busses depart for The Florida Aquarium from the front of the Vaughn Center (Building 23) starting at 5:15 (second bus at 5:30), and participants should get dinner in the area of the Aquarium prior to the evening event. Announcements regarding available restaurants will be made earlier in the day.
7:00-9:00pm Florida Aquarium	Evening Event – Florida Aquarium, Scientific Storytelling Drinks and Nibbles will be available Keynote: Richard Smith (UK): Seahorses and Beyond British marine biologist Dr. Richard Smith travels the world's oceans photographing and studying the tiny and under-appreciated species that make our seas such a treasure trove of biodiversity. His talk will take you on a journey through the fascinating group that comprises the pipefishes and seahorses, including many rarely seen and photographed animals. Richard will share stories of his adventures searching for these animals and



	investigates their biological quirks that capture our imaginations. In addition, others of us will tell tales of our experiences with these mythical animals and the sometimes perilous conditions in which we work. This event is made possible thanks to the support of the Herbert W. Hoover Foundation, supporters of seahorse and marine conservation in Florida's Biscayne National Park. Please join us for an evening featuring these unusual fish!
Tuesday	May 16, 2017
7:30-8:30 1st Floor Vaughn	Breakfast , Ultimate Dining in Vaughn (#44 on map)
8:30-9:15am Crescent Club 9th Floor Vaughn	Syngnathid Reproductive Physiology, Feeding patterns, and Natural Population Dynamics <u>Keynote: Atsushi Sogabe (Japan)</u> Ovarian structure and mode of egg production as a phylogenetic constraint on mating patterns in Syngnathids
9:15-10:00am Crescent Club 9th Floor Vaughn	Syngnathid Reproductive Physiology, Feeding patterns, and Natural Population Dynamics (Moderator: Heather Masonjones) Alana Boyles (USA): Seasonal Changes in the Reproductive Biology of a Tampa Bay (FL) Population of the Dwarf Seahorse, <i>Hippocampus zosterae</i> * J Pedro Andrade (Portugal): Spatial and temporal variation in the abundance of two sympatric seahorse species (<i>Hippocampus guttulatus</i> and <i>Hippocampus hippocampus</i>) Nicole Dunham(USA): Distribution and Abundance of <i>Hippocampus erectus</i> and <i>Hippocampus zosterae</i> in Florida Estuaries
10:00-10:30am 9th Floor Vaughn	Coffee Break in Trustees' Conference Room
10:30-12:30 Crescent Club 9th Floor Vaughn	(Moderator: J Pedro Andrade) David Harasti (Australia): The Ups and Downs of the White's Seahorse <i>Hippocampus whitei</i> in Australia. Clayton Manning (Canada): Medium and small-scale habitat associations of White's seahorse (<i>Hippocampus whitei</i>) in New South Wales, Australia, with a focus on predators and prey * Heather Masonjones (USA): Population dynamics and habitat preferences of the lined seahorse (<i>Hippocampus erectus</i>) inhabiting a Bahamian saltwater lake Katie-Lynn Roberts (Bahamas): Plankton Dynamics of a Species-Poor Bahamian Saltwater Lake: Which Prey Do Lined Seahorses (<i>Hippocampus erectus</i>) Prefer? * Nuno Simoes (Mexico): Amphipods as feed for seahorse aquaculture Emilie Stump (Canada): Occurrence and habitat selection in syngnathid fishes in Biscayne National Park, Florida * Lindsay Aylesworth (Canada): Approaches to locating cryptic and data-poor marine fishes for conservation *



	Julia Lawson (Canada): Low bycatch rates add up to big numbers for a genus of small fishes
12:30-2pm 1st Floor Vaughn	Lunch on campus, Ultimate Dining in Vaughn (#44 on map)
1:00-2:00pm Crescent Club 9th Floor Vaughn	Nanette O’Hara, Tampa Bay Estuary Program: Tampa Bay - Twenty-five years in 25 minutes, the story of the restoration of the Tampa Bay Estuary
2-3:45 pm Crescent Club 9th Floor Vaughn	Population Genomics and Phylogenetics (Moderator: Emily Rose) Healy Hamilton (USA): The evolutionary diversity of syngnathid fishes Sarah Flanagan (USA): Population genomics reveals multiple drivers of population differentiation in a sex-role-reversed pipefish Emily Rose (USA): A DNA-based assessment of the phylogenetic position of a morphologically distinct, anchialine-lake-restricted seahorse Nuno Monteiro (Portugal): A female lek mating system in the worm pipefish (<i>Nerophis lumbriciformis</i>) Josefin Stiller (USA): A phylogenomic analysis of Syngnathidae based on high-throughput sequencing of more than 1000 genetic regions * Nancy Pham Ho (USA): Population genetics of the lined seahorse, <i>Hippocampus erectus</i>
3:45-4pm	Pop-up session: Share current research with colleagues (Moderator: Amanda Vincent)
4:00-4:30pm	Coffee Break in Trustees’ Board Room
4:30-5:30 Crescent Club 9th Floor Vaughn	Lightning talks: (10 minutes each= 3-5 min talk and 5-7 min questions) (Moderator: Ingrid Ahnesjö) Ingrid Ahnesjö (Sweden): Are “sex-roles” in pipefishes and seahorses exceptional? Graham Short (USA): A new pygmy pipehorse, <i>Idiotropiscis aotearoa</i> (Teleostei: Syngnathidae), from New Zealand Lindsay Aylesworth (Canada): Generating spatial data for marine conservation and management & Effects of indiscriminate fisheries on small data-poor species * Shawn Garner (USA): Leafy Seadragon Courting based on Moon Phases Louw Claassens (South Africa): Big brother is watching: gaining insights into seahorse behaviour using GoPro cameras * Miguel Correia (Portugal): Is filament clipping an effective tool for tissue sampling in <i>Hippocampus guttulatus</i> Cuvier?
5:30-7:30	Participants have dinner on their own in Tampa
7:30-9:00pm Trustees’ Board Room	Memorial for members of Syngnathid fish community lost since last meeting



9th Floor Vaughn	<p><u>Poster session</u></p> <p>Ingrid Ahnesjö (Sweden): Trophic specialization in a broadly-distributed nearshore pipefish species</p> <p>Laura Bellato (Italy): Mapping critical habitat for <i>Hippocampus zosterae</i>*</p> <p>Elizabeth Brown (USA): Identification and Comparison of Vibrio Species within Captive and Wild Caught <i>Syngnathus scovelli</i>*</p> <p>Mercedes Bruce (USA)/Guadalupe Sepulveda-Rodriguez (Mexico): The effects of 17α-ethinyl-estradiol (EE2) on sexually selected banding patterns of the sexually dimorphic Gulf pipefish, <i>Syngnathus scovelli</i> *</p> <p>Emily Craft (USA): A baseline examination of habitat preference of the Gulf pipefish (<i>Syngnathus scovelli</i>) *</p> <p>Jessica Elson (USA): Effects of abiotic environmental factors on reproduction in the Sweetings Pond Seahorse, <i>Hippocampus erectus</i>*</p> <p>Megan Hill (USA): Male Mate Choice in <i>Hippocampus zosterae</i>*</p> <p>Diego Luzzatto (Argentina): Trade of seahorses in Argentina & The presence of the Patagonian seahorse <i>Hippocampus patagonicus</i> in Monte Hermoso, southwestern Buenos Aires Province, Argentina</p> <p>Ally Marter (USA)/Joshua Smith (Bermuda): Use of mark-recapture techniques to quantify the population size of <i>Hippocampus erectus</i> in a closed system*</p> <p>Maite Mascaro (Mexico): Characterization of the respiratory metabolism of juvenile <i>Hippocampus erectus</i> (Perry, 1810) near the limit of thermal tolerance: the effect of magnitude and velocity of temperature change</p> <p>Maryam Norouzibakhsh (Iran): Studying the genetic diversity of pipefish population in Caspian Sea using nuclear genome*</p> <p>Marina Quiñe (France): <i>Hippocampus ingens</i>' conservation and fishermen ecological knowledge in Peru. Ethnobiology's role in endangered marine species studies *</p> <p>Breeann Roberts (USA): Lined Seahorse (<i>Hippocampus erectus</i>) Habitat Preferences in a Bahamian Saltwater Lake *</p> <p>Nuno Simoes (Mexico): Current and future distribution of <i>Hippocampus erectus</i> in the climate change scenario: a modelling approach.</p> <p>Nuno Simoes (Mexico): Color manipulation on the lined seahorse <i>Hippocampus erectus</i> (Perry, 1810)</p> <p>Julia Skowronski (USA): Reproductive success of male <i>Syngnathus scovelli</i> pipefish across seasons *</p> <p>Josefin Stiller (USA): Phylogeography of leafy and common seadragons inferred from genome-wide data *</p> <p>Rachel Thomas (USA): The Use of Microsatellites to Detect Molecular Diversity in an Isolated Bahamian Seahorse Population*</p>
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	<p>Angelica Vega Ramirez (USA): Comparison of Methodology for Measuring Female Ornaments of Gulf Pipefish (<i>Sygnathus scovelli</i>)*</p> <p>Brooke Weinstein (USA): Pair-bonding changes sexually dimorphic gene expression in bluestripe pipefish (<i>Doryrhamphus excisus</i>) brains*</p>
Wednesday	May 17, 2017
6:30-7:00am 1st Floor Vaughn	Breakfast , McKay Community Room (#20 on map) for BioBlitz and Birding field trips ONLY
7:30-8:30 1st Floor Vaughn	Breakfast , Ultimate Dining (#44 on map) in Vaughn for non-field trip participants and Mote and Florida Aquarium field trips
Early am-mid day	<p>Excursions in Tampa Area. For folks not going on scheduled excursions, morning free as an option to explore downtown Tampa. All transportation for field trips will leave from the front of the Vaughn Center (Building 23)</p> <ol style="list-style-type: none"> 1) Mote Marine Laboratory trip to observe shark facilities (Led by Amanda Hodo and Brian Siegel; Pick up boxed lunches from local team leader, Alana Boyles; depart 8:45am) 2) Field Trip to Florida Aquarium (Led by Shawn Garner and Amy Slagoski) (Pick up boxed lunches from local team leaders, Katie-Lynn Roberts and Emily Williams; depart 8:00am) 3) Birding trip to local hotspot for both resident and migrant birds (Led by Dr. M. McRae) (Breakfast and pick up boxed lunches in McKay Community Room 6:30-7:00; depart 7am) 4) Bio Blitz: Marine lab visit with trip to field site to seine in seagrass beds for seahorses and pipefish (Led by Drs. H. Masonjones, E. Rose, B. Froeschke, R. Waggett) (Breakfast and pick up boxed lunches in McKay Community Room 6:30-7:00, depart 7:00am) <p>Other possibilities (see potential excursions list on SyngBio website)</p>
2:00-5pm Various Rooms Cass Science Building	<p>Technical sessions</p> <p><u>Captive Husbandry & Aquaculture Techniques - Cass Building 186 (Building 31)</u> Leaders: Paula Carlson, Shawn Garner, Amy Slagoski</p> <p><u>Field Methods & Syngnathid Marking Techniques- Cass Building 184 (31)</u> Leaders: David Harasti, Nuno Monteiro</p> <p><u>IUCN Red Listing Workshop - Cass Building 187 (Building 31)</u> Leader: Riley Pollom</p> <p><u>Modern Molecular Methods - Cass Building 185 (Building 31)</u> Leaders: Adam Jones, Ingrid Ahnejo</p>
5:00-6:30pm Cass Science Building	iSeahorse training (L. Aylesworth) <u>Cass Building 187 (Building 31)</u>



Evening	Free for participants. Participants have dinner on their own in Tampa
Thursday	May 18, 2017
7:30-8:30 1st Floor Vaughn	Breakfast , Ultimate Dining (#44 on map)
8:30-9:15am Crescent Club 9th Floor Vaughn	Syngnathid Husbandry and Aquaculture Keynote: Paula Carlson (USA) Syngnathids in Public Aquaria – Husbandry Perspectives and Conservation Opportunities
9:15-10:15am Crescent Club 9th Floor Vaughn	Syngnathid Husbandry and Aquaculture (Moderator: Healy Hamilton) Steven Yong (USA): Using Association of Zoos and Aquariums (AZA) Species Survival Plan® (SSP) Programs as Resources for Conservation and Research Catherine Rousseau (Canada): Visible Elastomer Implant (VIE) use for medical management in syngnathids at the Aquarium du Québec Jorge Palma (Portugal): Climate induced temperature effects on growth performance and fecundity of <i>Hippocampus guttulatus</i> Diego Luzzatto (Argentina): New opportunities for conservation and aquaculture using “rafting seahorses”
10:15-11:00am	Coffee Break in Trustees’ Board Room
11:00-12:00 Crescent Club 9th Floor Vaughn	Seadragons (Moderator: Leslee Matsushige) Leslee Matsushige (USA): Seadragons in Public Aquariums Kristen Aanerud-Smith (USA): Techniques in SeaDragon handling Laurel Johnson (USA): How to Train Your Dragon, Operant Conditioning of the Weedy Seadragon, <i>Phyllopteryx taeniolatus</i> Erika Moss (USA): Closed System Production of <i>Americamysis bahia</i>
12:00-1:30pm 1st Floor Vaughn	Lunch on campus, Ultimate Dining (# 44 on map)
12:00-1:30pm President’s Conference Room 9th Floor Vaughn	Seahorse Identification Workshop (Riley Pollom) during lunch in President’s Conference Room on 9 th Floor of Vaughn Center.
1:30-2:15pm	Syngnathid Conservation



Crescent Club 9th Floor Vaughn	<u>Keynote: Sarah Foster (Canada)</u> Turning national commitments into conservation action for seahorses
2:15-4:00pm Crescent Club 9th Floor Vaughn	Syngnathid Conservation (Moderator: Nuno Monteiro) Riley Pollom (Canada): A Global Assessment of the Extinction Risk and Conservation Status of Syngnathiform Fishes Hongyue Qu (China): Seahorse resources and conservation in China Charity Mae Apale (Philippines): Citizen action is helping save Philippines seahorses and their seas Xiong Zhang (China): Using species distribution models and multiple sources of species data to inform seahorse conservation in China * Tanvi Vaidyanathan (India): Impacts of an Extraction and Trade Ban on Exploitation for India's Seahorses * Lily M. Stanton (Canada): Expanded Ranges and New Habitat for Seahorses (<i>Hippocampus</i> spp.): Early Lessons from a Nascent Marine Citizen Science Programme Amanda Vincent (Canada): Taking conservation action for seahorses (and pipefishes)
4:00-4:30	Coffee Break in Trustees' Board Room
4:30-5:30pm Crescent Club 9th Floor Vaughn	Final Panel discussion – The Future of Syngnathid Science Chairs: Conservation & Ecology (Amanda Vincent) Aquaculture & Husbandry (Paula Carlson) Evolution & Genomics (Adam Jones, Kenyon Mobley)
6:30-10pm Florida Aquarium	Symposium Dinner Banquet at Florida Aquarium Busses leave front of Vaughn Center starting 6pm
Friday	May 19, 2017
8-10am	Participant Check Out in McKay Common Room (Building 20) (Dorm Keys Must Be Returned to Emily Rose (347-524-2291) Before Leaving)
9am-5pm	Meeting of the IUCN SSC Seahorse Pipefish and Stickleback Specialist Group in Cass Building 184 (Building 31)
9am-3pm	Meeting to update the Syngnathid Husbandry Manual in Cass Building 187 (Building 31)

Abstracts listed in Alphabetical order by presenting author.



Techniques in Sea Dragon Handling

Kristen Aanerud-Smith

Presenting Author: Kristen Aanerud-Smith

SeaWorld Parks and Entertainment, Orlando, USA

Abstract: It can be an unnerving experience to handle seadragons in your collection for treatment or samples. I will go over different handling techniques for both Weedy and Leafy seadragons that can make it easier for both animal and aquarist. These techniques have been used successfully for assist or force feedings, diagnostics, administration of treatments, or any other procedure that involves catching up your dragons. I will discuss several cases where handling techniques played an important role in the husbandry of our collection.

Keywords: Ex situ and aquaculture, Husbandry



Are “sex-roles” in pipefishes and seahorses exceptional?

Ingrid Ahnesjö

Presenting Author: Ingrid Ahnesjö

Uppsala University, Uppsala, Sweden

Abstract: Our understanding of sexual selection and sex-biased sexual selection is crucially dependent on the diversity found among and within organisms. A common trend is to view male-biased sexual selection as a rule emanating from a common pattern of female care and male mating competition in many animals. The diversity found in pipefishes and seahorses in mating and care patterns, and sexual selection, go beyond such stereotypical views. By including the diversity in mating and care patterns in Syngnathid fishes we will improve our general understanding on how ecology influences the operation of sexual selection in many more animals. There is nothing exceptional about how sexual selection operates in pipefishes and seahorses and therefore we need to be inclusive of the enlightening diversities.

Keywords: Behavioural ecology, Ecology, Evolution



Trophic specialization in a broadly-distributed nearshore pipefish species

Wilson Anthony B1,2, Wegmann Alexandra2, Ahnesjö Ingrid3 and Gonçalves Jorge M4

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United States

2. Institute of Evolutionary Biology and Environmental Studies, University of Zurich, Winterthurerstrasse 190, 8057 Zurich, Switzerland.

3. Department of Ecology and Genetics/Animal Ecology, Uppsala University, Norbyvägen 18D,

Uppsala SE-75236, Sweden.

4. Centro de Ciencias do Mar (CCMAR), Coastal Fisheries Research Group, Universidade 15 do

Algarve, FCMA Campus de Gambelas, 8005-139 Faro, Portugal.

Presenting Author: Ingrid Ahnesjö

Abstract: Ecological specialization is an important engine of evolutionary change. The broad-nosed pipefish, *Syngnathus typhle*, is one of the most broadly distributed syngnathid species, and shows considerable intraspecific variation in trophic morphology. We quantified morphological variation within and across a genetically diverse sampling of pipefish populations using geometric morphometrics, and tested for evidence of trophic specialization by comparing individual-level dietary composition with the community of plankton available at each site. While the diets of juvenile pipefish are similar across sites, dietary composition shifts dramatically over the course of ontogeny, and adult populations have distinctive diets consistent with their divergent trophic morphology. Morphological differences found in wild animals are maintained under common garden conditions, indicating that trophic specialization in *S. typhle* is a heritable trait reflecting local adaptation to available resources.



Citizen action is helping save Philippines seahorses and their seas

CM APALE, HJ KOLDEWEY, ACJ VINCENT

Presenting Author: Charity Mae Apale

Abstract: Zoological Society of London-Philippines, Philippines and Project Seahorse, Vancouver, Canada iSeahorse is designed to put the power of marine conservation in the hands of local citizens throughout the world, wherever seahorses are found. The program provides a platform for individuals and groups to contribute information on seahorse sightings, and supports them in using the data they (and others) collect to advocate for conservation gains on behalf of seahorses and their marine environments. In order to kick-start iSeahorse, we secured funding to employ a national iSeahorse champion in the Philippines for two years. Her work enabled iSeahorse contributors to make measurable and important conservation gains for seahorses and their marine habitats. For example: 1) iSeahorse was the catalyst for the creation of a new marine sanctuary in Bohol where a local dive organization used iSeahorse data to petitioned for protection of valuable, yet threatened, seahorse habitat; 2) the Filipino government used data from iSeahorse to develop an action plan in support of sustainable seahorse fisheries and trades; and 3) there is now a larger and more engaged constituency supporting seahorse and marine conservation in the Philippines through iSeahorse collaboration with individuals, communities and institutions. That said, it has sometimes been difficult to engage fishers as contributors, because of legal issues, poor access to technology and the need to incentivize contributions. Nonetheless, thanks to iSeahorse, Filipino seahorses and seas are better protected.

Keywords: Conservation and management, Conservation and management, Conservation and management, Citizen science



Generating spatial data for marine conservation and management

Lindsay Aylesworth, Ratanawaree Phoonsawat, Pholphisin Wuvanachai, Amanda Vincent

Presenting Author: Lindsay Aylesworth

Department of Fisheries, Ministry of Agriculture and Cooperative, Bangkok, Thailand, Project Seahorse, Institute of Oceans & Fisheries, University of British Columbia

Abstract: Do fishers know best when it comes to identifying areas with rare and depleted fish species? The global conservation crisis demands that managers marshal all available datasets to inform conservation management plans for depleted species, yet the level of trust placed in local knowledge remains uncertain. This study compares four methods for inferring species distributions of an internationally traded, rare and depleted genus of marine fishes (*Hippocampus* spp.): the use of (i) fisher interviews; (ii) government research trawls, (iii) scientific diving surveys, and (iv) citizen science contributions. We analyzed these four datasets at the genus and individual species levels to evaluate our conclusions about seahorse spatial occurrence, diversity of species present and the cost effectiveness of sampling effort. We found that fisher knowledge provided more information on our data-poor fish genus at larger spatial scales, with less effort, and for a cheaper price than all other datasets. One drawback was that fishers were unable to provide data down to the species level. People embarking on conservation endeavors for data-poor species may wish to begin with fisher interviews and use these to inform the application of government research, scientific diving, or citizen science programs.

Keywords: Conservation and management, Ecology



Approaches to locating cryptic and data-poor marine fishes for conservation

Lindsay Aylesworth, Tse-Lynn Loh, Wansiri Rongrongmuang, Amanda Vincent

1. Project Seahorse, University of British Columbia, Vancouver, Canada
2. Daniel P. Haerther Center for Conservation and Research, John G. Shedd Aquarium, Chicago IL USA
3. Sarasin Divers, Phuket, Thailand
4. Project Seahorse, University of British Columbia, Vancouver, Canada

Presenting Author: Lindsay Aylesworth

Abstract: When seeking to conserve data-poor species, we need to decide how to allocate research effort, especially when threats are substantial and pressing. Our study provides guidance for sampling marine fishes that are particularly difficult to find – those species that are cryptic or rare and or where little information exists on local distribution (data-poor). We used our experience searching for seahorses (*Hippocampus* spp.) in Thailand to evaluate two search strategies for marine conservation: (1) determining relative abundance and (2) searching for presence / absence with detection probabilities. Our fieldwork indicated that using the presence / absence framework was more likely to lead to inferences that seahorses could be found in the site than when using the relative abundance framework. This realization would support a common-sense approach, where presence/absence with detection probabilities is centrally important to marine conservation planning for cryptic and or data-poor marine species.

Keywords: Conservation and management, Ecology, Sampling



Effects of indiscriminate fisheries on small data-poor species

Lindsay Aylesworth, Ratanawaree Phoonsawat, Amanda Vincent

Presenting Author: Lindsay Aylesworth

Department of Fisheries, Ministry of Agriculture and Cooperative, Bangkok,
Thailand, Project Seahorse, University of British Columbia, 2202 Main Mall,
Vancouver BC Canada V6T 1Z4

Abstract: As catches of economically valuable fishes decline, and demand continues to increase, commercial and small-scale fishers retain and sell more non-target marine fishes. Some of these catches are destined for international markets and subject to international trade regulations. Many of these species are considered “data-poor” in that we have limited data on their biology, ecology and exploitation, which poses a serious management challenge for sustainable fisheries and trade. Our research explores the relative pressure exerted by such indiscriminate fisheries on a data-poor marine fish genus – seahorses (*Hippocampus spp.*) – whose considerable international trade is regulated globally. Our focus is Thailand, a dominant fishing nation and the world’s largest exporter of seahorses (*Hippocampus spp.*), where we gathered data by interviewing commercial and small-scale fishers and through port sampling of landed catch. We estimate that annual catches were more than three times larger than previously documented, approximating 29 million individuals from all gears. Three fishing gears – two commercial (otter and pair trawl) and one small-scale (gillnet) - caught the most individuals. Results from port sampling and our vulnerability analysis confirmed that *H. kelloggi*, *H. kuda*, and *H. trimaculatus* were the three species (of seven found in Thai waters) most vulnerable to fishing pressure. Small-scale gillnets captured the majority of specimens under length at maturity, largely due to catches of juvenile *H. kuda* and *H. trimaculatus*. This research indicates a role for vulnerability analysis in initiating precautionary management plans while more extensive studies can be conducted. Our intention is to identify paths towards sustainable fisheries management when minimal data are available, which in the case of seahorses in Thailand, should focus on commercial trawling gears and small-scale gillnets.

Keywords: Conservation and management, Fisheries



Study of *Hippocampus zosterae* population distribution in Florida correlated with environmental factors

Laura Bellato, Heather Masonjones

The University of Tampa

401 West Kennedy Blvd, Tampa, FL, 33606

Presenting Author: Laura Bellato

These maps explore the distribution of *H. zosterae* populations across coastal Florida, with the purpose of identifying critical habitat regions and potential threats to their populations. In the past, this fish species has been identified as a conservation concern, due to habitat degradation caused by increasing human interference and aquarium trade practices. As a result, they are currently being considered for listing under the ESA in US waters (document currently being reviewed). The present work investigates their population distribution relative to seagrass cover, pH, and selected environmental contaminants (petroleum products, nutrient levels), using diagnostic mapping to identify specific regions of conservation concern for this species. We found a significant association between this species and both seagrass cover and higher pH levels (associated with marine systems), and have identified locations for special focus because of high seahorse populations but potential negative environmental impacts because of contaminants. Because of their susceptibility, regions for specific management of their populations must be identified to determine the best methods to use to conserve the species.

Keywords: dwarf seahorse, habitat distribution, potential threats, ecology and conservation



Seasonal Changes in the Reproductive Biology of a Tampa Bay (FL) Population of the Dwarf Seahorse, *Hippocampus zosterae*

Alana Hayashida-Boyles, Mackenzie Simmonds, Emily Rose, Heather Masonjones

Presenting Author: Alana Boyles

University of Tampa, Florida, USA

Abstract: Syngnathid fish are well known for their diverse mating systems and coastal distribution from temperate zones through the tropics. In the present study, we investigate factors associated with the reproductive ecology of the dwarf seahorse, *Hippocampus zosterae*. Fish were collected using push nets across three sites located roughly 100 meters apart in a Tampa Bay (FL, USA) seagrass bed. Upon collection, fish were marked and photographed for analysis of size, sex, and reproductive state. Sampling was conducted with 33 collections from each site during 2005-2007 and 25 from each site from 2008-2009. Analysis of body size, density, sex ratio, and gravid to non-gravid ratios across site and season was conducted to work to understand the population dynamics of *H. zosterae*. No significant difference was detected in body size between males and females, indicating no sexual dimorphism in this species. Animal density did not vary significantly with site and season, indicating there is little evidence of seasonal migration in this species, unlike that found for other species of syngnathids. *Hippocampus zosterae* density in Tampa Bay between 2005 and 2017 was shown to be stable with a mean seahorse density of 0.085114 (animals/m²) using a linear fit model ($r^2 = 0$). As expected, increased population densities were associated with a higher frequency of gravid males in the population. The ratio of gravid to non-gravid males was found to shift by season, but not by site, with breeding detected year-round in this population. Peak breeding (68% gravid males) observed in the summer in one of the three sites. Sex ratio shifted by site and with season, and overall a significantly female-biased sex ratio was detected. The combination of female-biased sex ratio with significantly more non-gravid males by season is unique to this species as many syngnathids are male-biased in their populations and have substantially higher pregnancy rates. This interesting reversal of patterns requires more research to understand this species as well as providing a more thorough basis upon which to build management programs around the Gulf of Mexico.

Keywords: Behavioral ecology, Ecology, Physiology



Behavioural and Physiological Impacts of Flash Photography on Seahorses

De Brauwer M, Shalders TC, Saunders BJ, Harvey ES, Collin SP, McIlwain JL

Presenting Author: Maarten De Brauwer

Curtin University, Perth, Australia and University of Western Australia, Perth, Australia

Abstract: Seahorses are iconic fishes, hugely popular with scuba divers. Digital cameras have made underwater photography an affordable hobby for millions of people. The slow movements of seahorses make them ideal subjects as they do not swim away while taking pictures. However, with millions of divers taking pictures of seahorses, populations could be significantly impacted by this seemingly harmless activity. At present only very limited research exists about the effects of underwater photography on seahorses. With growing number of underwater photographers and declining numbers of seahorses, it is crucial that the potential impacts are investigated. Our study consisted of field and aquarium experiments. In the field study 20 Seahorses (*Hippocampus spp.*) and 14 Ghostpipefish (*Solenostomus spp.*) were manipulated by a diver and exposed to flash photography. Our results show clearly that touching causes increased avoidance behaviour. The impacts of flash photography were difficult to separate from effects caused by diver presence alone. To discern between diver presence and flash effects, a lab experiment with 36 Western Australian seahorses (*Hippocampus subelongatus*) was conducted. Video analyses indicate clear flash avoidance and a 15% decrease in success when striking at prey. At present, we are examining the seahorse retinas for potential physiological damage caused by flashes. This study has important implications for the dive industry and facilitates development of best-practice guidelines when scuba diving with Syngnathids. Our results highlight the potential use of seahorses as a flagship species for correct dive practices.

Keywords: Conservation and Management, Behavioural ecology



Identification of *Vibrio* Species within Gulf Pipefish (*Syngnathus scovelli*) from Tampa Bay, FL

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1Department of Biology, The University of Tampa

Presenting Author: Elizabeth Brown

Abstract: Marine pathogens are often the causative agent of disease in both marine species and humans. The gulf pipefish, *Syngnathus scovelli*, is a common species found up and down the gulf coast of Florida and is often studied for its sex reversal characteristics. The pipefish exhibit an outer mucosal layer that may protect against or carry certain pathogenic species including *Vibrio spp.* In this study, we examined the bacterial growth on pipefish that were isolated from the Tampa Bay as well as pipefish in captivity. Fish were swabbed and used to inoculate nutrient agar and Thiosulfate-citrate-bile salts-sucrose (TCBS) agar to examine total species and *Vibrio* species, respectively. Our results revealed that *Vibrio cholerae* was present on pipefish isolated from Tampa Bay. Although previous studies have identified other fish as reservoirs for *V.cholerae*, this is the first report that the gulf pipefish can harbor this important human pathogen.



The Effects of 17 α -ethynyl-estradiol (EE2) on Banding Patterns of the Sexually Dimorphic Gulf Pipefish, *Syngnathus scovelli*

M. Bruce, G SEPÚLVEDA RODRÍGUEZ, H. Masonjones, E. Rose, N. Ortega

Presenting Author: Mercedes Bruce

Department of Biology, The University of Tampa, Tampa, FL, USA

Abstract: The Gulf pipefish (*Syngnathus scovelli*), the most abundant pipefish found in Florida, exhibits sexual dimorphism (females have blue iridescent bands along the trunk of their bodies while males do not). The estrogenic compound 17 α -ethynyl-estradiol (EE2) is a common synthetic chemical used as an ovulation inhibitor for birth control. EE2 is released in water systems through human wastewater and could potentially harm aquatic life, such as the Gulf pipefish. For this experiment, five male pipefish and five female pipefish, housed independently, were exposed to two different concentrations of EE2 for three weeks (both levels at or below levels commonly seen in the environment). We observed whether banding patterns in the males would occur and to see if the higher concentrations of EE2 would increase the iridescence of the bands in females. After twenty-one days of data, the results showed that three out of the five males displayed banding patterns and the iridescence increased in all five females. These findings indicate that exposing Gulf pipefish to EE2 has a morphological effect on the organisms that could influence their behavior and mating strategies. The presence of blue bands in males could potentially be used as a bio-indicator for estrogen around wastewater outflows in the wild. Further research could determine if the appearance of blue bands in males has a physiological effect that could impair their mating methods.

Keywords: Conservation and management, Behavioral Ecology, *Syngnathus scovelli*



Syngnathids in Public Aquaria – Husbandry Perspectives and Conservation Opportunities

Paula Carlson

Presenting Author: Paula Carlson

The Dallas World Aquarium, Texas, USA

Abstract: For generations, Seahorses, Seadragons, Pipefish and their relatives have fascinated and inspired visitors to public aquaria and zoos. Millions of people visit these facilities each year. Their mythical appearance, and unusual reproductive behaviors make them some of the most popular species in aquarium collections. Once difficult to breed and rear in an aquarium, advances in their husbandry are helping to build sustainable, managed populations. Aquarium scientists and husbandry specialists are in a unique position to be able to study these fish in a controlled environment and this opportunity has contributed to increased knowledge about their biology, natural history, and breeding behaviors. Increased human impacts that have contributed to decreasing populations of Syngnathids in their natural environment, have made it critically important for scientists to work together to find solutions that will ensure the survival of these amazing animals. Public aquaria can be important partners in this effort with field researchers, aquaculture biologists and conservation agencies through collaboration and information sharing. As ambassadors for their fragile coastal ecosystems, Syngnathids themselves can play an equally important role in helping to engage the public in their conservation. These fantastical fishes tell a compelling story. One of the most important roles of public aquaria is to continue to share that story and inspire future generations to study them and conserve them.

Keywords: Ex situ and aquaculture, Conservation and management, Behavioural ecology, Public aquaria, husbandry



Is filament clipping an effective tool for tissue sampling in *Hippocampus guttulatus* Cuvier?

Miguel Correia, Ana Campoy, Jose Pedro Andrade

Presenting Author: Miguel Correia 1,2,3 - CCMAR,

University of the Algarve, Portugal

Abstract: Examining genetic diversity, population structure, and expansion has become an important part in the management plans of endangered populations. However, these studies rely on tissue samples collection for DNA analysis which may be problematic for endangered or threatened species. Partial fin-clipping has been employed for tissue collection purposes, due to the increased popularity of DNA- based analysis for ecological and fisheries studies, however, fin clipping can potentially affect swimming performance, predator avoidance and the ability to find and capture prey. This study aimed to test the effects of filament clipping on captive breed seahorses (*Hippocampus guttulatus*) as an alternative tool for tissue sample. Clipped filaments regrown on average 0.05 ± 0.02 mm/day for 3 months and no mortality or disease was observed during the experiment. Filaments provided enough tissue for DNA analysis purposes. This study provided valuable information regarding a new sampling technique that doesn't impair the seahorse locomotion. This methodology can be applied in population's genetic studies of other species that have skin filaments as a morphological trait.

Keywords: Ex situ and aquaculture, Physiology, Ecology



Spatial and temporal variation in the abundance of two sympatric seahorse species (*Hippocampus guttulatus* and *Hippocampus hippocampus*)

Miguel Correia, Heather Koldewey, Jose Pedro Andrade, Jorge Palma

Presenting Author: Miguel Correia

1,3,4 - CCMAR, University of the Algarve, Portugal 2 - Project seahorse, Zoological Society of London, UK

Abstract: Recent findings reported a significant decrease in abundance of two sympatric species (*Hippocampus guttulatus* and *H. hippocampus*) in the Ria Formosa lagoon (South Portugal) and no direct causes have been, so far, clearly identified. This study aimed to describe fluctuations in the local seahorse populations through monthly surveys over a course of a year, in order to identify some of the potential drivers behind the seasonal fluctuations. A total of six sites were chosen based on their habitat characteristics. The highest *H. guttulatus* abundances were recorded at sites with higher holdfast availability and depth ranging from 3 to 6 meters, while *H. hippocampus* were observed at highest numbers at sites with less holdfast availability and patchily distributed. In most sites, seahorse density decreased during the summer months (from May to August) and increased from August to December. Holdfast use changed across the sites surveyed, according to the respective habitat characteristics. This study identified environmental variables that influenced the abundance of seahorse population, i.e., holdfast availability, depth and temperature in the Ria Formosa lagoon, underlining the importance of monitoring populations over a course of no less than a year in order to avoid bias due to seasonal fluctuations.

Keywords: Conservation and management, Ecology, Behavioural ecology



An Unexpected Atlantis: Using Artificial Structures in the Conservation of an Endangered Seahorse Species

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Presenting Author: Louw Claassens

Rhodes University

Grahamstown,

South Africa

6140

Abstract: Anthropogenic development, especially the transformation of natural habitats into artificial, is of growing concern within estuaries and coastal areas worldwide. Many species are negatively affected as their natural habitats are destroyed or altered. Marine conservation actions usually focus on the protection of natural habitats e.g. Marine Protected Areas, but potential exists in the use of artificial habitats for species conservation. During the development of a residential marina estate in the Knysna Estuary, South Africa, Reno mattresses (horizontal wire cages filled with rocks) were used as a canal lining. Seasonal and monthly population assessments of the endangered Knysna seahorse, *Hippocampus capensis*, were conducted within the marina and the estuary over a two-year period. Consistently higher seahorse densities were found on the Reno mattresses compared to vegetation habitats and to historical data for the estuary. This result begged the question of whether the artificial habitat was chosen by the seahorse in preference to natural vegetation. An in-situ experiment in which adult *H. capensis* were given the choice between natural vegetation (*Zostera capensis*) and artificial (Reno mattress) habitat found that seahorses were significantly more likely to move away from *Z. capensis* onto the Reno mattresses or remain on the Reno mattresses. Adult *H. capensis* were found to prefer an artificial habitat to *Z. capensis* and we conclude that Reno mattresses provide an excellent habitat for this species. The results of this study suggest that similar artificial habitats should be examined when considering conservation models for other seahorse species.

Keywords: Conservation and management, Ecology, Behavioral ecology, Artificial habitat



Big Brother is Watching: Gaining Insights into Seahorse Behaviour using GoPro Cameras

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Abstract: Observation bias is an Achilles heel of behavioural research, particularly during underwater, in situ assessments. The advent of small, affordable underwater cameras presents an opportunity to overcome this specific obstacle, especially in relatively sedentary marine organisms such as seahorses. The efficacy of using cameras in seahorse behavioural research does, however, remain unexplored. GoPro cameras were used to study the behaviour of the Knysna seahorse (*Hippocampus capensis*) within a residential marina estate in South Africa. Four cameras were deployed over three time periods in summer (Oct–Dec 2015; Dec–Jan 2016; Jan–Mar 2016) throughout the day (morning, midday, afternoon) within artificial Reno mattress habitat (horizontal wire cages filled with rocks), to ascertain whether: I) cameras can be used to investigate seahorse behaviour, II) seahorse behaviour changes throughout the day, III) seahorse behaviour can be used to assess the impact of an external stressor (boat noise) on *H. capensis*. Thirty-six hours from a total of 161 hours (22.4 %) captured, contained footage of seahorses. Seahorses were significantly more visible during the morning and spent > 80 % of their time feeding. Courting behaviour, like morning greetings described for other seahorse species, were observed exclusively during the morning. Boat noise increased during the December holiday period and a significant decrease in seahorse visibility, time spent feeding, and courting events were noted during this time, which suggests that noise has an adverse impact on the behaviour of this species. This study proves the efficacy of using GoPro cameras in seahorse behavioural research.

Keywords: Behavioural ecology, Ecology, Conservation and management



A Baseline Examination of Habitat Preference of the Gulf Pipefish and the Implications of an Indicator Species

Emily Craft, Melisa Blasky, Dr. Heather D. Masonjones and Dr. Emily Rose

Department of Biology, The University of Tampa

Presenting Author: Emily Craft

Abstract: Due to the lack of research of habitat preference of gulf pipefish (*Syngnathus scovelli*), a laboratory study was conducted to determine if gulf pipefish spend a significant amount of time in a habitat composition. Changes in environmental conditions may increase the presence of submerged aquatic vegetation (SAV) in seagrass beds. Pipefish may reveal to be an indicator species to evaluate the health of seagrass beds in relation to SAV cover, as pipefish are often considered obligate seagrass species. Experimental set-up included a 50-gallon tank divided into four quadrants, presenting four different habitat options: bare crushed coral (control), seagrass only, mixed seagrass and macroalgae, and macroalgae only. Fish were observed for 3 replicates on their observation day; each trial consisted of an individual female, an individual male, and paired male and female; their time spent in each quadrant was recorded and scored as a percentage. Fish in this study preferred the mixed habitat most frequently. This preference could be indicative of an intermediate disturbance preference, indicating that a moderate amount of macroalgae cover is preferable for gulf pipefish, and may have positive impacts for the ecosystem; potentially providing insight into management practices when monitoring seagrass beds.



Distribution and Abundance of *Hippocampus erectus* and *Hippocampus zosterae* in Florida Estuaries

Nicole Dunham, Richard Matheson, Robert McMichael Jr.

Presenting Author: Nicole Dunham

Florida Fish and Wildlife Conservation Commission

In order to manage seahorse populations, we first need to understand their basic biology and habitat preferences. The purpose of this project was to determine spatial distribution, abundance, size at maturity, recruitment, and seasonality of *Hippocampus erectus* and *Hippocampus zosterae* in seven major estuarine systems in Florida. Specimens were collected throughout each estuary using 21.3 m seines and 6.1 m otter trawls. Seahorses collected in the study ranged from 20 to 168 mm TL for *H. erectus* and 16 to 47 mm TL for *H. zosterae*. The primary habitat for both species were beds of submerged aquatic vegetation (SAV). Spawning occurred year-round for both species, but seasonal spawning intensity varied by latitude, with an increase in larger mature specimens in the spring. *Hippocampus erectus* were found state wide and was most abundant in Charlotte Harbor and Tampa Bay. *Hippocampus zosterae* were more abundant in the more southern estuaries, perhaps in relation to temperature. This species was most abundant in Florida Bay and was not present in Northeast Florida. Even if temperature did not play a role in the difference in *H. zosterae* abundance in these two systems, our results would not be surprising because there was no SAV in Northeast Florida. Florida Bay had the densest SAV coverage among the seven areas sampled. Overall, both species demonstrated the most stable populations in semi-enclosed shallow estuaries with medium to dense seagrass coverage.

Keywords: Ecology, Conservation and management



Effects of abiotic environmental factors on reproduction in the lined seahorses, *Hippocampus erectus*, in Sweetings Pond, Eleuthera

Jessica Elson, Emily Rose, Heather Masonjones

The University of Tampa

Presenting Author: Jessica Elson

Sweetings Pond, on the island of Eleuthera, has a multitude of unique factors including an unusually large density of lined seahorses, *Hippocampus erectus*. With seahorses being a charismatic species with economic importance, it is crucial to understand how their environment affects their reproductive behaviors. The pond was divided into five microhabitats: Caves, Emma's, Quarry, Group, and Control. The sex ratios and abundance of pregnant males were analyzed along with the different abiotic factors across the five microhabitats within the pond. Results indicate that across the five microhabitats the Caves site ratio of males to females was significantly skewed towards males, with 78% of the seahorses found being male and furthermore 36% of the males were determined to be gravid males and 42% being nongravid males. After further investigation, it was discovered that the Caves site has the coolest average water temperature (27.4°C) and the highest abundance of food compared to the other four microhabitats, which may lead to this high abundance of gravid males. The variance between the summer and spring months in relation to gravid males revealed that the spring months had significantly more gravid males (72%) whereas the summer months only had 35% gravid males. This finding may be due to lower air temperatures and less rain fall that occurs during the spring months. The knowledge gained regarding the environmental effects on seahorse reproduction will lead to a future study to determine a possible preferred breeding ground. Hopefully the results gathered from the preferred breeding ground study will shed light onto the ideal conditions for *H. erectus* reproduction.

Keywords: Ecology, Reproduction, Conservation and Management



Population Genomics Reveals Multiple Drivers of Population Differentiation in a Sex-role-reversed Pipefish

Sarah Flanagan, Emily Rose, Adam Jones

Presenting Author: Sarah Flanagan

Author 1-National Institute for Mathematical and Biological Synthesis, Knoxville, Tennessee, USA

Author 2-University of Tampa, Florida, USA

Author 3-Texas A&M University, College Station, Texas, USA

Abstract: A major goal of molecular ecology is to identify the causes of genetic and phenotypic differentiation among populations. Population genomics is suitably poised to tackle these key questions by diagnosing the evolutionary mechanisms driving divergence in nature. Here, we set out to investigate the evolutionary processes underlying population differentiation in the Gulf pipefish, *Syngnathus scovelli*. We sampled approximately 50 fish from each of 12 populations distributed from the Gulf coast of Texas to the Atlantic coast of Florida and performed restriction-site-associated DNA sequencing to identify SNPs throughout the genome. After imposing quality and stringency filters, we selected a panel of 6348 SNPs present in all 12 populations, 1753 of which were not physically linked. We identified a genome-wide pattern of isolation by distance, in addition to a more substantial genetic break separating populations in the Gulf of Mexico from those in the Atlantic. We also used several divergence outlier approaches and tests for genotype–environment correlations to identify 400 SNPs putatively involved in local adaptation. Patterns of phenotypic differentiation and variation diverged from the overall genomic pattern, suggesting that selection, phenotypic plasticity or demographic factors may be shaping phenotypes in distinct populations. Overall, our results suggest that population divergence is driven by a variety of factors in *S. scovelli*, including neutral processes and selection on multiple traits.

Keywords: Genomics, Evolution, Population genomics



Key Losses in Hox Coding and Regulatory Elements in the Gulf Pipefish

AM Fuiten, S Bassham, CM Small, WA Cresko

Presenting Author: Allison Fuiten

Institute of Ecology and Evolution, Department of Biology, University of Oregon, USA

Abstract: The elongated skull and axial skeleton are key evolutionary novelties of the syngnathid body plan, but their genetic basis remains unclear. Hox genes are organized into conserved clusters in the genome and play a role in axial and craniofacial bone development. Changes in Hox gene expression and cluster content are suggested to underlie macro-evolutionary modifications of the body plan. We hypothesized that changes in Hox cluster content in terms of genes, microRNAs, and regulatory elements have contributed to the evolution of the elongated syngnathid body plan. To test this hypothesis, we sequenced, annotated and confirmed the orthology of 49 Hox cluster genes and seven Hox cluster microRNAs in the fully assembled Gulf pipefish genome. Additionally, we searched for cis-regulatory elements co-localized near Hox genes. Our results indicate that Gulf pipefish have a few key losses in genes and regulatory elements that are potentially related to the derived axial and craniofacial traits found in the pipefish lineage. The Hox 7 genes, which have been hypothesized to be associated with rib loss, have been lost in pipefish and appear to have deteriorated independently in the pufferfish. We found a unique loss of the *eve1*, a *hox-ba* cluster gene expressed during teleost tooth development. We identified a convergent loss of the *mir-196b* microRNA in the *hox-ba* cluster, which is known to affect the number of vertebrae that develop in teleost fish. We conclude that a subset of pipefish Hox genes may be associated with body plan diversification via differential regulation and gene loss.

Keywords: Evolution, Genomics



Syngnathid Aquarium and/or Exhibit design and Maintenance

Shawn Garner

Presenting Author: Shawn Garner

Florida Aquarium, Tampa, USA

Technical Workshop for May 17, 2017. Topics will include rearing, holding tank and exhibit/life support system design. Examples from public aquaria, research facilities will be included. Participants not submitting abstracts for formal presentations are encouraged to email or bring digital images on a flash drive of their tanks or exhibits to share during the group discussion. I will mostly talk about fry tank design and modifications of exhibits to capture fry.

Keywords: Conservation and management, Behavioural ecology, Behavioural ecology, Exhibit Design



Feeding and Nutrition

Shawn Garner

Presenting Author: Shawn Garner

Florida Aquarium, Tampa, USA

Technical Workshop on May 17, 2017 Topics will include live food culture techniques such as those used in the culture of brine shrimp, mysid shrimp, and copepods. Other related topics will include food transitions for fry and nutritional supplementation. I will mainly talk about live to frozen food transitions and the supplementation of vitamins to our foods.

Keywords: Conservation and management, Behavioral ecology, Behavioral ecology, Feeding and Nutrition



Leafy Seadragon Courting based on Moon Phases

Shawn Garner, Emily Greene

Presenting Author: Shawn Garner

Florida Aquarium

This study provides an in depth look at the behavior of a mated leafy seadragon pair in managed care during the October to March breeding season. Daily time-lapse videos will be taken and analyzed to plot behavior as a function of the phases of the moon. The behaviors examined are position in the water column, time spent together and apart, number of known mating “interactions” witnessed, and the receptiveness of the male (as quantified by the redness of the tail in color and percentage of the tail that is red). On October 16, 2016, the leafy seadragon female dropped approximately 20 eggs onto the bottom of the tank. Due to the successful development of eggs we will be adding a temperature manipulation component to the study. Temperature manipulation, steadily decreasing the temperature throughout the month then rapidly increasing right before the full moon, will be used to prompt the male to receive the eggs. This research will be used to create a baseline of knowledge about leafy seadragon breeding habits in managed care facilities.

Keywords: Behavioral ecology, Conservation and management, Behavioral ecology



The Evolutionary Diversity of Syngnathid Fishes

H Hamilton, N Saarman, GA Short, WB Simison

Presenting Author: Healy Hamilton

Author 1) NatureServe, Arlington, Virginia USA; Author 2) Yale University, New Haven, Connecticut USA, Authors 3 & 4) California Academy of Sciences, San Francisco, California USA

Abstract: Although syngnathid fishes have long been fascinating for their many unusual traits, such as male brooding, derived body plans, and extraordinary cypsis, their evolutionary relationships remain poorly known. A lack of taxon sampling, few diagnostic morphological characters, and limited molecular data have provided an incomplete picture of patterns of syngnathid diversification. Based on extensive field collecting and expanded genetic sampling, we present a phylogenetic hypothesis focused at the generic level for 91 syngnathid species representing 48 of the 57 recognized genera, including many genera never previously investigated using phylogenetic analysis. We synthesize evidence from eight nuclear and mitochondrial markers, 17 morphological characters, and biogeographic distributions to present an integrative hypothesis of syngnathid evolution. The results confirm the deep phylogenetic split between lineages with trunk- or tail-brood pouch placement, define well-supported and sometimes novel clades, and suggest multiple pathways to characters such as prehensile tails, complex skin filaments, and fully enclosed male brood pouches. We propose a revision of Syngnathidae classification into only two subfamilies: the Nerophinae and the Syngnathinae. For multiple genera, taxonomic revision is required to reflect deep evolutionary splits in nominal lineages from the Atlantic versus the Indo-Pacific. Our results suggest the highly cryptic, miniaturized pygmy pipe horses evolved independently in the Atlantic and Pacific oceans, and neither lineage represents an evolutionary pathway between pipefish and seahorses. Contrary to previous studies, we find the seahorse genus *Hippocampus* originated in the IndoPacific and is most closely related to a strikingly diverse clade that includes both the elongate *Trachyrhamphus* and the highly ornate *Haliichthys*.

Keywords: Evolution, Phylogenetics, Ecology, Biogeography



The Ups and Downs of the White's Seahorse *Hippocampus whitei* in Australia.

David Harasti

Presenting Author: David Harasti

Fisheries NSW, Australia

Abstract: The White's seahorse *Hippocampus whitei* is a species endemic to estuary systems along the east coast of Australia and is currently considered to be at threat from anthropogenic impacts. There are two known estuaries in New South Wales, Australia, where the species is known to be abundant (Port Stephens and Sydney Harbour); however, both localities have recently experienced population declines. Over the past decade, over 1,000 individuals have been tagged across both locations using Visible Implant Fluorescent Elastomer, allowing individuals to be identified on a long-term basis. Using mark-resight analysis of tagged individuals, this has provided annual population estimates using open and closed population models in Program Mark. This study details how populations of *Hippocampus whitei* have changed over the past decade, and assesses how changes to the preferred habitats of *Hippocampus whitei* can be detrimental to the species. The results from this study are contributing towards the future management of *Hippocampus whitei* and being used to support the listing of the species as 'threatened' under State and Commonwealth legislation and inclusion on the IUCN Redlist.

Keywords: Conservation and management, Behavioral ecology



Male Mate Choice in *Hippocampus zosterae*

Megan N. Hill*1, Arianna N. Nixon*1 and Dr. Heather D. Masonjones1

1Department of Biology, The University of Tampa

Presenting Author: Heather Masonjones

Abstract: *Hippocampus zosterae* is one of many species in the order Syngnathiformes considered monogamous due to the formation of male and female pair bonds. The mechanisms for mate selection are not well understood, but this study tests to see if male mate choice is dictated by size. Each male was partitioned from two females by a clear porous divider and the females were separated from each other by an opaque divider. The male and female groupings were based on weight, having the smaller female's weight and the larger female's weight equidistant from the male's weight. The activity of the seahorses for the first three hours after dawn were recorded for eight consecutive days to observe courtship behavior. By testing the male location over the first two days, we analyzed their initial female choice independently from the female responses to the male. Over the first two days, males significantly picked the large female over the small female without the influence of time. The data indicates male mate choice is influenced by size, but continuing studies are needed to indicate if other factors, such as female coloration, influence pair bonding.



Nutritional Analysis of Frozen and Live Commonly Fed to Sea Dragons

Lisa Hoopes, Leslee Matsuhige

Presenting Author: Lisa Hoopes

1 Georgia Aquarium, Atlanta, GA, USA; 2 Birch Aquarium at Scripps Institution of Oceanography, La Jolla, CA, USA.

Proper nutrition is considered the cornerstone of good health and studies with fish have shown that diets lacking in essential nutrients can negatively affect growth, energy production, reproduction, stress levels, wound healing, immune function, and susceptibility to disease causing agents. Sea dragons and other Syngnathids are popular display animals in zoos and aquaria, yet information on nutritional requirements for these species is largely lacking. A variety of frozen and live food items (including live mysid shrimp from Florida, California, and Australia) were analyzed for proximate composition, trace minerals, vitamins, and fatty acids to identify the composition of diets fed to sea dragons with the intent to identify possible nutrient deficiencies. Nutritional data will be presented comparing frozen and live foods and comparing live mysids collected from different geographical regions. A typical sea dragon diet will be compared to known teleost nutrient requirements to identify nutrient deficiencies and areas for continued study.

Keywords: Physiology, Conservation and management, Nutrition



Thermal Response of Behavior and Gene Expression of Heat Shock Proteins in the Lined Seahorse, *Hippocampus erectus*.

Johnson CA, Geng Q, Lin Q, Tan S, Yanhong Z, Bo Z

Presenting Author: Cara Johnson

Florida Institute of Technology, Melbourne, USA and Key Laboratory of Tropical Marine Bio-resources and Ecology, South China Sea Institute of Oceanology, Chinese Academy of Science, Guangzhou

Abstract: Many factors restrict the responses of dispersal-limited species, such as syngnathids, to the unpredictable effects of global climate change. With sea surface temperatures expected to rise +2C in the next 85 years, seahorses will experience varying degrees of acute and chronic heat stress. Three-hundred captive-bred lined seahorses (*Hippocampus erectus*) were exposed to various non-lethal temperatures for different durations to assess how these animals will respond on a molecular and physiological level to heat stress events. Expression of the genes coding for heat shock protein (HSPs) 60 and 70 were quantified to represent the molecular stress response of seahorses exposed to 22C, 26C, 30C, and 32C for acute (2, 6, and 10 hours) and chronic periods (4 weeks) of time. Respiratory rates, measured as breaths per minute, were recorded daily to show the physiological response of seahorses to increased temperature. The relative expression of hsp60 and hsp70 increased dramatically in seahorses exposed to higher temperatures for shorter durations, although decreasing levels of these HSP genes in the highest temperature regimes indicate there may be a maximum threshold for the expression of the protein-repair mechanisms. Respiratory rates also increased with exposure to higher temperature. Seahorses are often used as indicator species of the health of an ecosystem, and the information gained from this research will better direct the use of syngnathids as a representative focal species for dispersal-limited populations of fish.

Keywords: Conservation and Management, Physiology, Ecology, Molecular Ecology



How To Train Your Dragon, Operant Conditioning of the Weedy Seadragon, *Phyllopteryx taeniolatus*

Laurel Johnson

Presenting Author: Laurel Johnson

Newport Aquarium, Kentucky, USA

July 2015, Newport Aquarium acquired 0.0.20 juvenile Weedy Seadragons, *Phyllopteryx taeniolatus*, F1 generation from a wild-collected gravid male. Following a one month acclimation period, a discriminative stimulus (visual target) was introduced along with live mysid feeds. Initially, the target was presented concurrently with positive reinforcement feeds, and progressed to target presentation prior to the addition of food. To date, not only does this large group of Seadragons exhibit targeting behavior in the absence of food, but can also be lead to different positions within the exhibit by the movement of the target. The use of operant conditioning in this species has implications in feeding/live food dispersal, exhibit maintenance and diving, veterinary examinations, and animal transfers.

Keywords: Ex situ and aquaculture, Behavioral ecology, Behavioral ecology



The Estrogen Connection in Syngnathid Sexual Selection

Adam Jones AG, Andrew Anderson A

Presenting Author: Adam Jones

Texas A&M University, College Station, USA

Abstract: Sexual selection acts more strongly on females than on males in many syngnathid taxa. Consequently, females evolve secondary sexual traits, and, at least in Gulf pipefish, these traits are regulated by estrogen. Estrogens bind to two estrogen receptors, ER-alpha and ER-beta. These receptors, in turn, bind to DNA to regulate transcription. Here, we use comparative data from next-generation sequencing to test the hypothesis that sexual selection has affected the evolution of estrogen receptors and their binding sites in syngnathid lineages. Our results show that perfect estrogen receptor binding sites are surprisingly rare in the Gulf pipefish genome, calling for an approach in which partial sites are weighted by their expected binding affinity to identify regions with high potential to bind estrogen receptors. Empirical data regarding differential expression because of estrogen exposure show that some, but not all, differentially expressed loci seem to reside in genomic regions with enhanced estrogen receptor binding. Additional analyses show that the genomic response to sexual selection is probably complex and subtle, so a variety of approaches will be necessary to ascertain how sexual selection affects genomes.

Keywords: Genomics, Evolution, Behavioral ecology, Awesome



Morphological observations on the formation of brood pouch of pot-bellied seahorse *Hippocampus abdominalis*

Mari Kawaguchi, Ryohei Okubo, Akari Harad, Kazuki Miyasaka, Junya Hiroi,
Shigeki Yasumasu

Presenting Author: Mari Kawaguchi

Sophia University, Tokyo, Japan

Abstract: Seahorses have one of the most unique reproductive strategies. Male, not female, carries and cares embryos in a brood pouch formed on the ventral surface of the tail. Lumen of the brood pouch is surrounded by loose connective tissue called “pseudoplacenta” and dermis. How the brood pouch is formed during the development from juvenile to adult is not sufficiently understood. We tried to make brood pouch-forming processes of seahorse clearer by morphological analyses. First, we characterized pseudoplacenta and dermis of mature male seahorse by several staining methods. Pseudoplacenta was mainly composed of reticular fibers, while dermis was mainly composed of collagenous fibers. Observation of various juvenile seahorses showed that formation of brood pouch was initiated from linear projections of epithelia on both ventro-lateral sides of the body. The projections elongated toward the ventral midline, fused together and finally formed a baggy structure composed of a single dermis layer with neither smooth muscle nor pseudoplacenta, and then, pseudoplacenta having two layers of dermis and smooth muscle was formed. Thus, the fully developed brood pouch was established. Finally, we analyzed the localization and gene expression of C-type lectins (haCTL1 and haCTL2). haCTL1 was localized in both outer and luminal epithelia of brood pouch throughout the developmental stages, while haCTL2, which was not detected in early stage of development, became specifically localized in the luminal epithelium as development proceeded. Thus, the luminal epithelium is drastically and specifically changed so as to carry the embryos during the development of brood pouch.

Keywords: Evolution



Costs and Benefits to Male Pipefish Caring for Broods of Different Sizes

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Abstracts: Trade-offs between brood size and offspring size, offspring survival, parental condition or parental survival are classic assumptions in life history biology. A reduction in brood size may lessen these costs of care, but offspring mortality can also result in an energetic gain, if parents are able to utilize the nutrients from the demised young. Males of the broad-nosed pipefish (*Syngnathus typhle*) care for the offspring by brooding embryos in a brood pouch. Brooding males can absorb nutrients that emanate from embryos, and there is often a reduction in offspring number over the brooding period. In this study, using two experimentally determined brood sizes (partially and fully filled brood pouches), we found that full broods resulted in larger number of developing offspring, despite significantly higher absolute and relative embryo mortality, compared to partial broods. Male survival was also affected by brood size, with males caring for full broods having poorer survival, an effect that together with the reduced embryo survival was found to negate the benefit of large broods. We found that embryo mortality was lower when the brooding males were in good initial condition, that embryos in broods with low embryo mortality weighed more, and surprisingly, that males in higher initial condition had embryos of lower weight. Brood size, however, did not affect embryo weight. Male final condition, but not initial condition, correlated with higher male survival. Taken together, our results show costs and benefits of caring for large brood sizes, where the numerical benefits come with costs in terms of both embryo survival and survival of the brooding father, effects that are often mediated via male condition.

Keywords: Behavioral ecology, Ecology, Evolution



The effect of decreased salinity on diversity, density and maturity of seahorses in Wonnapha Beach, Chonburi Province (East coast of Gulf of Thailand)

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Environmental changes affected marine life including seahorse. This study investigated the influences of decreased salinity on species diversity, maturity, and abundance of seahorses in Wonnapha Beach, Chonburi Province, Thailand. The data was collected monthly during May 2011- May 2012 by scuba diving along four 50 meter-line transects. The salinity was monitored. Three seahorse species were found in the study sites. *Hippocampus kuda* were observed every month except September to December; *H. trimaculatus* were found during March to May 2012. However, *H. spinosissimus* existed only in May 2011. The number of mature seahorses was higher than that of immature ones during May to August 2011 and February 2012 whereas the number of immature seahorses was higher during March to May 2012. About the same number of mature and immature *H. kuda* were found whereas mostly immature *H. trimaculatus* and only mature *H. spinosissimus* were identified. The seahorse density during May to August 2011 ranged from 0.09 to 0.47 seahorses.m⁻². The density declined as the salinity decreased from 32 ppt to 4 ppt from June to September 2011 (rainy season) after which no seahorse was found for 4 months (September to December 2011). But the density gradually increased to 0.88 seahorses.m⁻² in May 2012. In conclusion, the decreased salinity lowered the seahorse density and affected species diversity and maturity of seahorses.

Keywords: Ecology, Gulf of Thailand



Low bycatch rates add up to big numbers for a genus of small fishes

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Nonselective fishing gear extracts a great many small marine species, with limited documentation or assessment of their impacts. Among those species, seahorses (genus *Hippocampus*) are unusual as this genus has been the focus of scientific surveys and of international trade regulation. Our review of published and unpublished data sources analyzed data on seahorse bycatch for five gear type categories and 22 countries. The median catch-per-unit effort of seahorse bycatch across all five gear types was 0.96 seahorses vessel-1 day-1.

Nonetheless, fleet sizes were so large that annual catches were estimated at approximately 37 million seahorses across our sampled countries. Fisher interviews suggested that seahorse catches were declining (although information on changes in effort over time were not available). Furthermore, international export data did not capture the magnitude of seahorses in bycatch. Our work emphasizes the importance of evaluating bycatch, even for taxa where reported daily catch rates are low.

Keywords: Conservation and management, Conservation and management, Conservation and management, Incidental Catch



The Mating System of the Blue-striped Pipefish, Utilizing Both Behavioral and Genetic Methods

Caitlin Leslie, Emily Rose, Adam Jones

Presenting Author: Caitlin Leslie

Caitlin Leslie - UNIVERSITY OF TEXAS AT AUSTIN, USA

Emily Rose - University of Tampa, Florida, USA

Adam Jones - Texas A&M University, College Station, USA

Abstract: To date, little is known about the blue-striped pipefish, *Doryrhamphus excisus*. This reef-dwelling species of pipefish has been assumed to be monogamous due to their monomorphic coloring across sexes and the consistency at which they are found in pairs in the wild. However, no experimental studies of the *D. excisus* mating system have been published. We set out to study the social system of the blue-striped pipefish using both behavioral and genetic methods. We quantified variation in aggression by performing one-on-one aggression trials with inter- and intrasexual pairs. Overall, while very little aggression was observed in the intersexual trials, we found that intrasexual pairs demonstrated higher levels of aggression via a flicking behavior. We then used RNA-seq to compare gene expression levels in the brains of males and females, both pair bonded and non-pair bonded. Some of the genes of interest included arginine vasotocin (AVT) and isotocin, which have previously been shown to affect pair bonding and paternal care in other fish species. Overall, we found strong signatures of sexually dimorphic gene expression patterns in the blue-striped pipefish brains (141 genes), regardless of their mating status. There were 84 genes that showed statistically significant differences in gene expression levels across the paired and non-paired fish. Future work will investigate gene expression patterns in the brains of several additional syngnathid fish species to identify differentially expressed genes across varied mating systems.

Keywords: Behavioral ecology, Genomics



Seahorse genome and its unique male pregnancy and pelvic fin loss

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Abstract: Seahorse *Hippocampus*, belongs to the family Syngnathidae, has a complex array of morphological innovations and reproductive behaviors. Seahorse is regarded as a model fish in this family because of its well-evolutionary body plan and male pregnancy, moreover, some characteristics, such as toothless tubular mouth, and absence of caudal and pelvic fins. We report the genome sequence of a tiger tail seahorse, *Hippocampus comes*, which was done using the Illumina HiSeq 2000 platform, and the filtered reads were assembled using SOAPdenovo to yield a 501.6 Mb assembly (N50 contig size and N50 scaffold size of 34.7 kb and 1.8 Mb; 23,458 genes in the genome were predicted). Comparative genomic analysis finds higher protein evolutionary rates in the *H. comes* compared to other teleost fish. We find *Patristacin* gene has six gene duplications during the brood pouch development and male pregnancy. This is an interesting instance of a gene family (C6AST subfamily) that has undergone expansion independently in different teleost lineages and shows new expression patterns and functions associated with similar evolutionary innovations. The *H. comes* genome also shows loss of enamel matrix protein-coding P/Q-rich SCPP genes, which might have led to the loss of mineralized teeth, as well as a master control limb development gene, *tbx4*. Knockout of *tbx4* in zebrafish recapitulated the 'pelvic fin-loss' phenotype of seahorses, linking genotype to phenotype. This finding shows the *tbx4* plays a major role in the pelvic fin formation in teleost fishes. This work has been accepted as an article research in Nature recently.

Keywords: Genomics



Acoustic Signatures and Sound Producing Mechanisms in Syngnathid Fishes

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Presenting Author: Adam Chee Ooi Lim

Abstract: Syngnathid fishes are known to produce acoustic signals in various behavioral contexts. While there are very few bioacoustic studies on seahorses, pipefishes have received even less attention. Such studies are sporadic, and there are no comparative studies within the family. This study reveals that the feeding click of syngnathids is composed of multiple acoustic components whereas the distress growl of the seahorse is of a solitary low-frequency component. The acoustic parameters (frequency and duration) of syngnathid feeding click and seahorse distress growl were found to be species-specific signatures. The feeding click sound is produced by two dorsal cranial bones (posteriorly, the supraoccipital bone and coronet) which is consistent throughout the Hippocampus genus whereas pipefishes depict varied sound producing mechanisms. In the pipefish and pipehorse, these mechanisms consist of either three cranial bones (posteriorly, the supraoccipital, 1st postcranial plate and 2nd postcranial plate) or two bones (posteriorly, the supraoccipital and 2nd postcranial plate) in the absence of the 1st postcranial plate or presence of a vestigial 1st postcranial plate. The click sound components of the seahorse can be traced to the sliding movement and forceful knock between the supraorbital bone and coronet bone (=1st postcranial plate). In *Doryichthyes* pipefishes, the click sound components are generated when the supraoccipital slides backwards, striking and pushing the 1st postcranial plate against (and striking) the 2nd postcranial plate, whereas in *Syngnathoides* pipefish, the supraoccipital rubs against the 2nd postcranial plate. The growl is accompanied by intense vibration at the cheek indicating another sound producing mechanism involving possibly the pectoral girdle. The cranial morphology and kinesis of the examined syngnathids produced acoustic signals consistent with the bone strike that produce sharp energy spikes, or stridulation between bones that produce repeated or multimodal sinusoidal waveforms. It is hypothesized here that the extant syngnathid species either retain the ancestral three-bone mechanism or possess a derived or modified form of this model. The production of species-specific acoustic parameters in seahorses is attributed to the individual shapes and size of the coronet bone despite a common modified two-bone mechanism throughout the Hippocampus genus. The different mechanisms in pipefishes (i.e. either three or two participating bones) promote variability in signal acoustic shape and parameters. The variation in cranial bone morphology, cranial kinesis and acoustic signatures among syngnathid fishes reflects the adaptive evolution within the Syngnathidae.



New opportunities for conservation and aquaculture using “rafting seahorses”

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IIMyC - CONICET - Mar del Plata, Argentina

Abstract: Rafting has been proposed as a dispersive mechanism for some species of seahorses. Juveniles of *Hippocampus patagonicus* have been reported in high numbers doing rafting in the sea surface. In this study, 102 juvenile’s seahorses were captured at the beginning (early; n=50) and at the end (late; n=52) of the reproductive season (summer) while they were rafting. We divided each group (early and late) in two groups and cultured them in two recirculation systems. One of the systems was set at 20°C (warm) while, in the other, the temperature varied down to 12°C (cold). We recorded the number of individual deaths at the time of occurrence. The highest number of deaths was recorded during the coldest period of the year in the “cold” system. It accounted for 22% of the “early” and 71% of the “late” seahorses. No seahorses were found dead in the “warm” system. The results suggested that low temperatures could be lethal to most of the juveniles born at the end of the reproductive season. In the wild, most of them would have probably died. In future studies, rafting seahorses could be used as a genetic diverse bloodstock to plan a sustainable aquaculture project. We recommend the use of “late seahorses” in conservation projects particularly those focused to reintroduce the species in the wild.

Keywords: Ex situ and aquaculture, Conservation and management, Physiology



Trade of seahorses in Argentina

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Abstract: Seahorses (genus *Hippocampus*) are commercialized for purposes generally excluding food. They are traded dried, for traditional medicines, tonic foods and as souvenirs; and live, as ornamental fishes. This study describes and analyzes the trade of seahorses in Argentina with a emphasis on the native species *Hippocampus patagonicus*. We assessed seahorses for marine curios and/or souvenir shops and handcraft fairs at eleven beach locations; for ornamental fishes at eight marine aquaria and for traditional medicines in the biggest Chinatown. The trade involved five exotic species (*Hippocampus kuda*, *Hippocampus ingens*, *Hippocampus reidi*, *Hippocampus spinosissimus*, and *Hippocampus barbouri*) as well as the endemic *H. patagonicus*. The sale of marine curios recoded the largest volumes of seahorses. This trade was widespread and presented two different patterns along Argentine coastal towns and cities. *Hippocampus patagonicus* was the only species found in Río Negro Province. However, exotic species led the market in Buenos Aires Province. We could not verify neither the trade of seahorses for human consumption, medical and religious uses, nor the presence of products made of seahorses in the Chinatown. Exotic species were more frequent than *H. patagonicus* in the trade of ornamental fishes. This trade was limited and sporadic. The rate of the trade of *H. patagonicus* in Argentina seemed to be small compared to other regions where this species is commercialized. However, it could be an issue of concern for local populations.

Keywords: Conservation and management, Behavioral ecology, Behavioral ecology



The presence of the Patagonian seahorse *Hippocampus patagonicus* in Monte Hermoso, southwestern Buenos Aires Province, Argentina

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IIMyC - CONICET, Mar del Plata, Argentina

Abstract: Seahorses are often difficult to detect in their natural habitats due to their effective camouflage. They can remain virtually immobile for a long time and change colour. In addition, they can present a patchy distribution and occur at low densities, which further complicates their localization in poorly explored areas. The Patagonian seahorse *Hippocampus patagonicus* occurs in the Southwest Atlantic Ocean from southern Brazil to northern Patagonia, Argentina. In Argentina, there are currently only two populations described, one in San Antonio Bay, the type locality of the species, and the other in Mar del Plata dock. Although sporadic records have been reported in the area between these two populations, no other population has been detected so far. Data gathered at interviews with local artisanal fishermen and seahorses collected by them were analyzed to determine the presence of *H. patagonicus* in the coastal area of Monte Hermoso (38° 59' 33" S- 61° 15' 55" W), southwestern Buenos Aires Province, Argentina. The record of the species over the years, the high catches reported and the characteristics of the individuals sampled confirmed the presence of a third population of *H. patagonicus* in Monte Hermoso.

Keywords: Phylogeography, Behavioral ecology, Behavioral ecology



Medium and small-scale habitat associations of White's seahorse (*Hippocampus whitei*) in New South Wales, Australia, with a focus on predators and prey

Clayton Manning, Sarah Foster, Amanda Vincent

Presenting Author: Clayton Manning

Project Seahorse, British Columbia, Canada and University of British Columbia, British Columbia, Canada

Knowing where to find seahorses would really help us study and conserve them. We here quantify habitat characteristics that may affect where seahorses live, with a focus on predation and food. We investigated their habitats at both a medium and small scale. Along a 4-km stretch of marine estuary in Port Stephens, New South Wales, Australia, we compared the abundance and size distribution of White's seahorse (*Hippocampus whitei*) among seven Posidonia- dominated seagrass beds. Within these seagrasses, seahorse abundance was not correlated with differences in habitat characteristics among sites. One site, however, had a notably higher population and provided a case study for seahorse microhabitat associations. An availability-use resource selection model found that at a small-scale (80x30 m), seahorses are more likely to occur in microhabitats with higher seagrass density, more available prey types, and a greater distance from potential predator refuges. We then used geostatistical modelling to compare microhabitat association by seahorse size, sex, and reproductive status. Pinpointing how different elements of habitat correlate with seahorse populations at differing scales will better equip conservationists to inform management decisions.

Keywords: Conservation and management, Behavioral ecology, Ecology



Use of traditional mark recapture and facial markings to track population of *H. erectus* seahorses in a saltwater Bahamian lake

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Presenting author: Alexandra Marter

Anchialine ponds are habitats frequently associated with unique biota that differs dramatically from nearby coastal systems. Sweetings pond (91 hectares) on the island of Eleuthera (The Bahamas) is such a system, containing an unusual population of the lined seahorse (*Hippocampus erectus*). In this study, researchers worked to assess the seahorse population size of the lake and track movement patterns, using both traditional mark-recapture techniques (Curtis, 2006) and facial recognition techniques (Correia et al. 2014). Animals were collected on 30 X 2 meter benthic transects arranged in 5 zones around the lake (35, repeated twice per year; March 2014, July 2014, August 2015, March 2016), photographed in situ, and replaced on their holdfasts. In addition, during Spring 2016, 202 seahorses were marked at one site (Quarry) in the pond with elastomer (NMT) following the protocol from Curtis (2006) and tracked through the spring and summer of 2016. All seahorse photographs (N=1861) were analyzed using the Interactive Individual Identification System (I³S; <http://www.reijns.com/i3s/>). Analysis is ongoing to determine how well facial patterning works for individual identification of *H. erectus* seahorses in this population by comparing physically marked animals to repeat collections of those same animals using I³S. A total of 553 seahorses were observed at the Quarry site in 2016, 202 of them were marked, and of those marked, 57 were re-sighted during surveys. Using closed population estimation techniques, it was determined there were 873+/-150 animals in that region of the pond. Facial analysis is ongoing and expected to be complete by September 2017. Compared to research focused on other global seahorse species, Sweetings Pond animals have a higher habitat density and are shaped differently than other *H. erectus*, indicating a population that may be a discrete management unit compared to other *H. erectus*. Given the CITES Appendix II listing of all seahorses and their decreasing numbers worldwide due to overfishing and habitat loss, this population represents a valuable biological resource for Bahamians and one that should be protected.

Keywords: population biology, mark-recapture, anchialine lake, *Hippocampus erectus*, facial recognition



Characterization of the respiratory metabolism of juvenile *Hippocampus erectus* (Perry, 1810) near the limit of thermal tolerance: the effect of magnitude and velocity of temperature change.

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Presenting Author: Maite Mascaro

Abstract: The zone of thermal tolerance (ZTT) is the temperature range in which metabolic activity supplies enough energy to fully satisfy the physiological demands of an individual. Beyond its limits, energy investment becomes less efficient until the basic physiological needs cannot be met and life terminates. We examined oxygen consumption (VO₂) and five metabolites in newborn (20 days) and juvenile (1 year) *Hippocampus erectus* before, during and after they were exposed to an abrupt (10 minutes) or gradual thermal change (12 hours). Temperature was increased from 26°C to either 30°C (within the ZTT), 33°C (beyond the ZTT) or was kept constant at 26°C (control). Immediately after an abrupt exposure to 30°C, VO₂ increased 0.4 and 1.27 times in newborn and juvenile seahorses, respectively, but returned to normal levels after 5 hours even when temperature was kept high. By contrast, a sudden exposure to 33°C increased and maintained VO₂ in extremely high values (10.1 and 2.6 times, for newborn and juvenile seahorses, respectively). When exposed to gradual thermal change, VO₂ increased less and gradually (0.97 and 0.7 times at 30 and 33°C, respectively), and juvenile *H. erectus* returned to levels near those registered at 26°C. Total proteins and glucose in juvenile seahorses increased markedly, whilst acylglycerides and cholesterol decreased immediately after both abrupt and sudden exposure to 30 and 33°C. Lactate, however, increased in all but those individuals exposed abruptly to 30°C. Results suggest an immediate compensatory response to thermal increments when the final temperature lies within the ZTT.

Keywords: Physiology, Thermal Biology



Population dynamics of the lined seahorse (*Hippocampus erectus*) inhabiting a Bahamian saltwater lake

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Presenting Author: Heather Masonjones

University of Tampa, Tampa, Florida, Cape Eleuthera Institute, Eleuthera, Bahamas

Abstract: Anchialine ponds are habitats frequently associated with unique biota that differs dramatically from nearby coastal systems. Sweetings pond (91 hectares) on the island of Eleuthera (The Bahamas) is such a system, containing an unusual population of the lined seahorse (*Hippocampus erectus*). In this study, we investigated the distribution of seahorses by size and sex across habitat types, relative to habitat availability. Thirty-five 30 X 1 meter benthic transects were established around the pond margin and assessed three times over a two-year timespan (2014-2016). At each sampling event, photos (50 X 50 cm) were taken at each meter (30 total/transect) to characterize benthic cover. Seahorses were mapped along each transect, recording their holdfast type and photographed for morphological analysis. Across the lake, seahorses were seen at more than double the density in the north end (0.22 animals/m²) compared to the south (0.09 animals/m²), with no differences in distribution by gender. Adults were sighted more commonly than juveniles, but results may reflect the cryptic nature of these fish more than lack in abundance of this life stage. Animals were associated with every habitat type, with seahorse association reflecting habitat frequency. Compared to research focused on other seahorse species globally, Sweetings Pond animals have a higher habitat density, no holdfast preference, and are shaped differently than other *H. erectus*, indicating a population that is a discrete management unit compared to another *H. erectus*. Given the CITES Appendix II listing of all seahorses and their decreasing numbers worldwide due to overfishing and habitat loss, this population represents a valuable biological resource for Bahamians and one that should be protected.

Keywords: Ecology, Behavioural ecology, Conservation and management



Seadragons in Public Aquariums

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Seadragons are a charismatic fish in public aquariums. They instill wonder and amazement to many visitors who go to aquariums around the world to view them. Seadragons serve as ambassadors, representing the diversity of life in our oceans. Husbandry of these fish has been complex at times and have challenged many. Due to their geographical isolation and strict protection in Southern Australia, these fish can be difficult to acquire. Many aquariums would like to successfully breed seadragons to continue exhibiting this fascinating fish. It has been a difficult task with only a few aquariums able to achieve this goal with weedy seadragons. Leafy seadragons have not been successfully bred in captivity yet. Public aquariums have decided to collaborate to achieve successful breeding of seadragons. Sharing information on exhibit design, nutrition, disease treatment, and ethology will hopefully improve the likelihood of breeding. Information exchange and collaborative research projects will be discussed.

Keywords: Ex situ and aquaculture, Public Aquarium Husbandry



Sexual selection and the evolution of female ornamentation in pipefishes

Kenyon Mobley

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Abstract: Sexual selection is a potent evolutionary force responsible for the evolution of extravagant behaviors and morphology seen in many species. Despite nearly 150 years since Darwin first proposed the theory of sexual selection, many aspects of this process are controversial and not well understood. For example, one unresolved facet of sexual selection concerns the link between individual preferences for sexually selected traits and the demonstration of selection on these traits in the wild. I will introduce the topic of sexual selection and how to measure it in wild populations of pipefishes. I will also discuss the evolution of female ornamentation in this group of fishes which shows a striking diversity rivaling those of traditional sex-role species.

Keywords: Behavioral ecology, Evolution, Ecology



Brood reduction, embryo homogenization and the “women in red” effect: new perspectives in pipefish male pregnancy

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University of Porto, Portugal; University Fernando Pessoa, Portugal; University of Uppsala, Sweden

Abstract: Life history theory predicts that investment in reproduction should mirror the expected fitness benefits. Thus, it seems reasonable to expect that both sexes should be capable of modulating investment in reproduction according to mate attractiveness, either prior or even after fertilization. Although several post-copulatory sexual selection mechanisms acting during embryonic development have already been described in viviparous species, these are currently restricted to female pregnancy. In the family Syngnathidae pregnancy occurs in the male, a fact that makes this fish group into a unique model to assess undescribed post-copulatory sexual selection mechanisms. Knowing that most pipefish males prefer larger partners, nourish the embryos during pregnancy and abort eggs from less preferred females (the latter in a predominantly polyandrous species), how would males optimize investment during pregnancy in polygynandrous species? We found that, in *Syngnathus abaster*, both brood size and embryo length variability are reduced from the beginning to the end of pregnancy. This strongly indicates an active role of the male in this process. Additionally, we show that an analogue of the “Bruce effect”, never described in non-mammals, also occurs in pregnant males. When presented with an unfamiliar “sexier” female (the “Women in red” effect), males produce less homogenous broods while giving birth to smaller than expected embryos.

Keywords: Behavioral ecology, Evolution, Ecology



A female lek mating system in the worm pipefish (*Nerophis lumbriciformis*)

Nuno Monteiro, Diana Carneiro, Nuno Queirós, Agostinho Antunes, Natividade Vieira, Adam Jones

Presenting Author: Nuno Monteiro

University of Porto, Portugal and University Fernando Pessoa and Texas A&M University, USA

Abstract: Lek mating systems, in which one sex gathers to display at a well-defined spatial location and the other arrives for the sole purpose of choosing a mate, remain an enduring puzzle for sexual selection theory. The most perplexing aspect of this mating system is embodied by the “paradox of the lek”: in the face of the strong directional selection imposed by mate choice, genetic variation among competing individuals should rapidly disappear, thus negating any benefit for the choosing sex. Here, we show that a marine pipefish, *Nerophis lumbriciformis*, has an extremely unusual mating system characterized by lekking females. Males, who provide all post-zygotic care to ventrally attached offspring, visit the lek and mate with the most attractive females. In this sex-role-reversed lek, the direct benefits to males are more obvious than in traditional systems as they receive fuller broods of larger eggs when mating with the most ornamented lekking females. Female display traits honestly reflect their reproductive potential, as ornaments are costly to maintain and expressed in a condition-dependent manner. Indirect selection on mating preferences is not necessary to explain the establishment and maintenance of the worm pipefish mating system, so the paradox of the lek appears not to apply to this species. Similar, but subtler, mechanisms could contribute to the maintenance of leks in species with “conventional” sex roles.

Keywords: Behavioral ecology, Evolution, Ecology



Closed System Production of *Americamysis bahia*

Mark Schick, Erika Moss

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Abstract: The mysid shrimp is the main food item for sea dragons in aquarium and zoos throughout the world. The propagation method developed at the John G. Shedd Aquarium eliminates the need for wild-caught animals and provides a constant supply of appropriate sized mysids for our sea dragon population. Several authors have previously presented methods for the captive propagation of mysids. By modifying techniques in feeding, juvenile collection and breeding times, Shedd Aquarium can produce enough *A. bahia* on site for our sea dragon feeding needs. In less than 100sqft of space we can produce between 8000-10,000 mysids every seven days that are in the four to five-week size class. If juvenile size classes are needed then production is approximately 30% higher for this same set-up. Total time dedicated to producing this population is approximately six to seven hours of staff time per week. Current protocols for the system call for three feedings each day with a mix of prepared diets and newly hatched artemia nauplii.

Keywords: Ex situ and aquaculture, Conservation and management, *Americamysis bahia*



Studying the genetic diversity of pipefish population in Caspian Sea using nuclear genome

Maryam Norouzibakhsh, Mohammadreza Shokri

Presenting Author: Maryam Norouzibakhsh

Shahid Beheshti University

Abstract: Recently study on mitochondrial genome of genus *Syngnathus* of pipefish in two lagoon regions and open sea in southern Caspian Sea has illustrated that there are significant morphological differences between two region population, despite that they reveal no differences genetically. In comparison with Mediterranean and black sea species, many genetic and morphologic differences have been detected. In terms of exploring this claim, we investigate the genetic diversity of these aquatic animals in the same areas using locus A1 of nuclear genome. Consequently, the results show that pipefish of these two regions were similar based on this locus and different with other available species in Europe. The only difference is in total body and snout length.

Keywords: Phylogenetics, Genomics, Behavioral ecology, nuclear genome, *syngnathus* genus, morphologic, locus A1



Morphological variation and genetic diversity of Caspian pipefish *Syngnathus caspius* (Pisces: Syngnathidae) across the southern Caspian Sea

Maryam Anami, Mohammad Reza Shokri, Hassan Rajabi-Maham

Presenting Author: Maryam Norouzibakhsh

Shahid Beheshti University, Tehran, Iran

Abstract: The morphological variation, genetic diversity, population differentiation and demographic history of pipefish *Syngnathus caspius* (Pisces: Syngnathidae) were investigated across the southern Caspian Sea. A total of 82 specimens were collected from two lagoons and two open sea sites. Using meristic and morphometric traits, the pipefish in two lagoons completely separated from each other and those in open sea sites. Whereas, the pipefish collected from open sea sites completely overlapped each other. Genetic diversity, population differentiation and demographic history were explored based on the mitochondrial DNA control region and nuclear genes. The result of maximum likelihood (ML) phylogeny analyses showed no separated clusters of *S. caspius* populations across the southern Caspian Sea. Using the sequencing data from this study coupled with those in NCBI, the phylogenetic ML tree displayed four separate clades including: (1) European group consisting of two species of *S. abaster* and *S. typhle*; (2) the southern Caspian Sea clade of *S. caspius*; (3) Italian mainland group of *S. abaster*; and (4) Tunisian group of *S. abaster*. While the southern Caspian Sea clade was minimally distinct from European group, these two clades were significantly separated from Italian mainland and Tunisian groups. This result suggests the occurrence of a species complex in the study area. A total of 19 haplotypes from 25 *S. caspius* individuals were obtained from four populations in the southern Caspian Sea. High mean haplotype diversity ($h = 0.96$) versus low nucleotide diversity ($Pi = 0.007$) was detected across these populations. The lack of separate clusters identified in the ML tree and geographical regions across the southern Caspian Sea was also indicated by AMOVA and pairwise F_{ST} estimates.

Keywords: Phylogenetics, Phylogeography, Conservation and management, *Syngnathus caspius*



Assessing wild seahorse sounds in Brazil

Tacyana Pereira Ribeiro Oliveira, Jessyca Souza Oliveira, Camilla Rayane Maranhão Batista, Ierece Maria Lucena Rosa, Antonio Silva Souto

Presenting Author: Tacyana Oliveira

Universidade Estadual da Paraíba, João Pessoa, Brazil; Universidade Federal da Paraíba, João Pessoa, Brazil; Universidade Federal de Pernambuco, Recife, Brazil.

Abstract: Seahorses are known to produce sounds in several behavioural contexts and, due to their singular morphology, life history and behaviour, may provide an opportunity to assess fish acoustic behaviour from a unique perspective. Here we provide the first assessment of sound production of wild populations of a seahorse species, the longsnout seahorse *Hippocampus reidi*. Data were gathered at three North-eastern Brazilian estuaries, through underwater observations and simultaneous audio-video recordings. We describe spectral and temporal characteristics and production rate of clicks - during feeding events and, for the first time, during an agonistic male-male encounter – and growling sounds, which were recorded when animals were handpicked and handheld. Size and sex differences in sound production were also evaluated.

Keywords: Behavioural ecology



Climate induced temperature effects on growth performance and fecundity of *Hippocampus guttulatus*

PALMA J, CORREIA MJ, ANDRADE JP

Presenting Author: Jorge PALMA

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Abstract: This experiment aimed to determine the temperature boundaries outside which seahorse growth and reproduction become sub-optimal. Temperature effects were tested in juvenile seahorses (0-56 days post-parturition (DPP)), and in adults prior and during breeding season (seven-month period). Four different temperatures (16, 20, 24 and 28°C) were tested. A second experiment determined the oxygen consumption (MO₂) and ammonia excretion (AE) (same age groups were tested). Significantly higher growth rates ($p < 0.05$) were observed in adult fish reared at 20 and 24°C compared to those reared at 16 and 28°C. Adult mortality was respectively, 0, 0, 6.2 and 62.5% at the four tested temperatures. Juvenile growth performance at 56 DPP was higher in fish raised at 20°C and 24°C, but significantly lower ($p < 0.05$) in fish raised at 16°C. Juvenile survival was respectively, 8, 62, 10 and 0% at the four tested temperatures. The respirometer results suggest an influence of temperature cycles in routine metabolism. It was observed that oxygen consumption increased with increasing temperature in both age classes. The results from this study highlight the fact that both juvenile and adult *H. guttulatus* have narrow thermal boundaries, outside which reproduction, growth and survival are seriously affected. Under a climate change scenario of extended heat exposure, the species seems unable to cope with the situation, resulting in their disappearance within a short period of time.

Keywords: Conservation and management, Ecology, Ex situ and aquaculture



The effect of anthropogenic noise as a source of acoustic stress in wild populations of *Hippocampus guttulatus* in the Ria Formosa lagoon, South Portugal

PALMA J, MAGALHÃES M, CORREIA M, ANDRADE JP

Presenting Author: Palma J

Centre of Marine Sciences, Portugal

Abstract: In this experiment, long snout seahorse, *Hippocampus guttulatus* specimens were exposed to potential acoustic stress factors to evaluate eventual physiological stress responses. Two different underwater noises with different sound intensities were tested: transient motor boat sound (63.4dB to 127.6dB) and constant sound produced by the motor boat anchored directly above the animals, up to 137.1 dB. A total of 60 fish (49 valid observations) were observed between 4 and 10 meters' depth throughout a three-minute period using a video camera and a hydrophone set. A significant increase ($p < 0.05$) in the respiratory rate was observed in 87.8% of the observed fish. Opercular movements per minute (OMPM) increased from $35,7 \pm 10$ (control sample) to $41,2 \pm 15,5$ in the first minute of observations, to $45,5 \pm 13,3$ in the second (both under transient sound) and to $49,7 \pm 12,5$ in the third (under constant sound exposure). Significant differences in means between the control fish and fish observed during the second ($p < 0.01$) and third minute of observation ($p < 0.0001$) were observed. Concordantly, a significant increase ($p < 0.05$) in the OMPM of fish observed in the 1st minute and the 3rd minute was noted. In addition to the OMPM increase, 30.6% of the animals abandoned the observation location to avoid the negative sound stimuli. Based on the obtained information, results showed a clear impact of underwater anthropogenic noise as a negative stress factor for the wild populations of *H. guttulatus* in the Ria Formosa lagoon.

Keywords: Conservation and management, Behavioral ecology



Studying the Lined Seahorse through Collaboration and Citizen Science

Nancy Kim Pham Ho, Adeljean L.F.C. Ho, Steven Yong, and Junda Lin

Nancy Kim Pham Ho – Coastal Biology Inc.

Adeljean L.F.C. Ho – Bethune-Cookman University

Steven Yong – California Academy of Science

Junda Lin – Florida Institute of Technology

Presenting Author: Nancy Kim Pham Ho

Abstract

To find a seahorse in the wild is as tough as finding a needle in a haystack. They are often found on accident by anglers or beach combers, hidden among drifting seaweed or latched onto crab traps. These serendipitous findings sparked the idea of having seahorses serve as advocates for our treasured lagoon. In 2013, under the guidance of the late Dr. Junda Lin, a project titled, “Studying seahorses through citizen sightings” was established. By collaborating with over 100 citizens, local schools, and three dozen public aquariums, over 400 wild seahorse sightings were sighted along the United States Atlantic and Gulf coasts. The sightings are paired with a nonlethal DNA sample of the seahorse to help us measure genetic diversity and connectivity in wild lined seahorse populations.

Keywords: citizen science, genetics



A Global Assessment of the Extinction Risk and Conservation Status of Syngnathiform Fishes

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Presenting Author: Riley Pollom

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We here report on the first comprehensive global assessment of the conservation status and level of extinction risk of the Syngnathiform fishes, which includes the seahorses, seadragons, pipefishes, and pipehorses (family Syngnathidae), trumpetfishes (Aulostomidae), cornetfishes (Fistulariidae), ghost pipefishes (Solenostomidae), and razorfishes (Centriscidae). We used the methods and tools of the IUCN Red List of Threatened Species, the most widely accepted and valued approach to conservation assessment. Project Seahorse recruited volunteers, graduate students, members of the IUCN SSC Seahorse, Pipefish and Stickleback Specialist Group, and other experts to collate known information about these 295 species and assess them using the IUCN Categories and Criteria. The majority of species are Least Concern (~60%), but many others are considered Data Deficient (~32%), and we lack sufficient information to properly assess them. There are 21 species (~7%) that are Near Threatened or Vulnerable, meaning that conservation actions are needed to conserve healthy populations of these species. In a few dire cases, we report on species that are Endangered or Critically Endangered and require urgent measures to avoid their extinction. We expand on opportunities and next steps in syngnathid conservation to move species away from data deficiency and threatened statuses.

Keywords: Conservation and management, Ecology



GPER (G protein-coupled estrogen receptor 1) is involved in brood pouch cell proliferation of seahorse

Geng Qin, Yanhong Zhang, Liangming Huang, Jianping Yin, Qiang Lin

Presenting Author: Geng Qin

Abstract: South China Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, China The brood pouch of seahorse is functionally equivalent to the amniote uterus. In the embryo-carrying stage, the inner epithelium and loose connective tissue layer is highly distended and rich in blood vessels. G protein-coupled estrogen receptor 1 (GPER) is widely distributed in tissues and high expressed in placenta. GPER combined with estrogen (E2) to transactivate the EGF receptor (EGFR), and induced the secretion of connective tissue growth factor (CTGF), and was involved in cell migration and proliferation, as well as vascularization. The seahorse GPER consisted of 1026 bp bases, encoding 341 amino acids, including a seven-transmembrane domain. The branch-site model test showed that seahorse GPER gene is under strong positive selection. One paralleled replacement from Serine to Cysteine at position 142 was identified in placental mammals and seahorse. Transcriptomic analysis revealed GPER was highly abundant in brood pouch compared to the other estrogen receptors, implying that GPER were the main receptor in responsible for estrogen effects. The expression of relevant downstream genes including CTGF and EGFR were also high, implying that GPER were probably relevant to cell growth and vascular proliferation in brood pouch. An intraperitoneal E2 injection test was finished to test estrogen effects mediated by GPER in brood pouch. The qPCR analysis showed that relative expression of GPER increased with serum E2 level, accompanied by an increase in CTGF and EGFR expression. In conclusion, our results suggest that GPER play an important role in promoting the brood pouch cell proliferation and vascularization.

Keywords: Genomics, Evolution, Physiology, brood pouch, GPER (G protein-coupled estrogen receptor)



Seahorse Resources and Conservation in China

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Presenting Author: Hongyue Qu

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Abstract: At least 45 seahorse species have been described throughout the world so far, 17 species at present can be found along the China's coast, and most of them inhabiting the shallow seabed in southern China (below latitude 26°N). Three spotted seahorses *Hippocampus trimaculatus* distributes throughout all the China's coast and is the most abundant species, followed by *H. kuda*, *H. histrix* and *H. mohnikei*. These species have been the main sources for the Chinese traditional medicine for many decades. The seahorses are frequently taken in as trawl bycatch and vulnerable to destruction and degradation of the habitats, leading to dramatic decline of the wild seahorse resources. Seahorse aquaculture has been developed in China since 1970's to meet the demand of the heavy trade and reduce the pressure on the overexploitation of the wild populations. During the last decade, the seahorse production has increased dramatically although still cannot meet the market requirement. We carried out the researches on the aquaculture, biology and conservation of the seahorses from 2003, and mainly focused on the aquaculture bottlenecks: the reproductive efficiency of parent seahorses and survivorship of the juveniles. To increase the reproductive efficiency, we have evaluated the gonad development, mating behavior, and the quality of the adult body condition through physiological, behavioral and chemical studies. In recent years, we started to study the physiological studies to disclose the further information about the seahorse reproduction. At 2014, we finished the seahorse genome project, and lots of novel genes about the seahorses have been found and some new mechanisms on seahorse growth, pregnancy have been evaluated. Our goals are to find some new and novel information about the seahorses to effectively protect the seahorse resources.

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Keywords: Conservation and management, Ex situ and aquaculture, Behavioral ecology, Seahorse, abundance, reproduction, genome project



***Hippocampus ingens'* conservation and fishermen ecological knowledge in Peru.**

Ethnobiology's role in endangered marine species studies.

Quiñe, M. and Planes, S

Presenting Author: Marina Quiñe

Abstracts: When information gaps about marine endangered species are critical and to fill, them become a priority, to implement and develop a conservation program; traditional ecological knowledge of fishermen (TEKF) represent an extremely useful tool. Peru was one of the more important exporting countries of dry seahorses to the Traditional Medicine Asian market until 2004. Since August 2004, the catch and commercialization were banned by the Peruvian government, although the extraction and trade have continued illegally, until nowadays. For accomplishing with this assessment and to deal with information's lack, I worked directly with 15 fishermen communities in Northern offshore of Peru, all them related to seahorse fishing and trade. A total of 88 persons (fishermen principally) were interviewed over three years. Information related to spatial distribution, size population variability, reproductive biology, species association, fishing, commercialization and population shifts, were collected. The Fishermen knowledge about *H. ingens* has allowed me to: verify the accuracy of the information, compared with the ecological data collected; determining catching and trading points (commercial circuit); retracing chronologically, *H. ingens* situation's shift; and evaluating marine fishing practices, like Bycatch and their impact on *H. ingens* populations. The TEKF has constituted a priceless tool for the field study development and for rebuilding time changes series since the nineties. With the preliminary results of this assessment, the Peruvian government ratified the fishing and trade ban of *H. ingens*. In conclusion, the importance to involve fisheries communities in conservational studies was verified.

Keywords: Conservation and management, Ecology, Ethnobiology



Plankton Dynamics of a Species-Poor Bahamian Saltwater Lake: Which Prey Do Lined Seahorses (*Hippocampus erectus*) Prefer?

Katie-Lynn Roberts, Heather Masonjones, Rebecca Waggett, Elisabeth Pendergrass

Presenting Author: Katie-Lynn Roberts

University of Tampa, Florida, USA and Florida Aquarium, Tampa, USA

Abstract: Relatively little is known about the diet preferences of seahorses, except that they are ambush predators. Sweetings Pond, a tidal Salt Lake on the island of Eleuthera (The Bahamas) contains an unusual high-density population of lined seahorses (*Hippocampus erectus*). These anchialine ponds often have unique biota differing dramatically from nearby coastal ecosystems, even varying in planktonic composition. In this study, we investigated diet preference of lined seahorses by comparing available planktonic dietary components. Replicate 2-minute surface plankton and 2-minute tows above the seafloor were collected with a 150 μ m 0.5 m net at each end of the 1600 m long lake just after dawn and before dusk across October 2015. In addition, 12-hour light traps collected benthic organisms overnight at each sampling time point. A non-lethal gastric lavage technique was performed to assess seahorse diet breadth, anesthetizing animals with a 0.05% clove oil solution and flushing food items through their continuous gut with fresh water following the methods of Castro and colleagues (2008). Animal size, reproductive condition, and gender were assessed using photographs taken at each sampling event. Overall, the plankton community of the pond was dominated by calanoid copepods, with calanoids, harpacticoids, and cyclopoids observed in all tows, and amphipods, annelids, metazoans, echinoderm larvae and shrimp observed intermittently. Few differences were observed by either time of day or location of tow. Light traps were characterized by copepods and shrimp, with additional genera represented that were not observed in plankton tows. Seahorses across size and gender consumed predominantly copepods (females=50%, males=51%, gravid males=57% of diet), but other food types observed were small fish (otoliths), amphipods, mysids, and diatoms. Seahorse numbers globally are on the decline due to overfishing and habitat degradation, and thus, Sweetings Pond animals represent a unique opportunity to study a healthy, intact population to gain a deeper insight into seahorse food requirements on a larger scale.

Keywords: Behavioral ecology, Behavioral ecology, Behavioral ecology, Seahorses



A DNA-based assessment of the phylogenetic position of a morphologically distinct, anchialine-lake-restricted seahorse

Emily Rose, Heather Masonjones, Adam Jones

Presenting Author: Emily Rose

The University of Tampa, Florida, USA Texas A&M University, Texas, USA

Abstract: Isolated populations provide special opportunities to study local adaptation and incipient speciation. In some cases, however, morphological evolution can obscure the taxonomic status of even recently founded populations. Here, we use molecular markers to show that an anchialine-lake-restricted population of seahorses, originally identified as *Hippocampus reidi*, appears based on DNA data to be *H. erectus*. We collected seahorses from Sweetings Pond, on Eleuthera Island, Bahamas, during the summer of 2014. We measured morphological traits and sequenced two genes, cytochrome b and ribosomal protein S7, from seahorses in our sample. Based on morphology, Sweetings Pond seahorses could not be definitively assigned to either of the two species of seahorse, *H. reidi* and *H. erectus*, that occur in marine waters surrounding the Bahamas. However, our DNA-based phylogenetic analysis showed that the Sweetings Pond fish were firmly nested within the *H. erectus* clade. Thus, Sweetings Pond seahorses are an isolated population of *H. erectus*. Interestingly, the seahorses from Sweetings Pond differ morphologically from other marine populations of *H. erectus* in having a more even torso to tail length ratio. The substantial habitat differences between Sweetings Pond and the surrounding coastal habitat make Sweetings Pond seahorses particularly interesting from the perspectives of conservation, local adaptation and incipient speciation.

Keywords: Phylogenetics, Conservation and management, Ecology



Sex in murky waters: algal induced turbidity increases sexual selection in pipefish

JOSEFIN SUNDIN, TONJE ARONSEN, GUNILLA ROSENQVIST, ANDERS BERGLUND

Presenting Author: Gunilla Rosenqvist

Department of Ecology and Genetics/Animal Ecology, Uppsala University, Sweden

Abstract: Algal induced turbidity has been shown to alter several important aspects of reproduction and sexual selection. However, while turbidity has been shown to negatively affect reproduction and sexually selected traits in some species, it may instead enhance reproductive success in others, implying that the impact of eutrophication is far more complex than originally believed. In this study, we aimed to provide more insight into these inconsistent findings. We used molecular tools to investigate the impact of algal turbidity on reproductive success and sexual selection on males in controlled laboratory experiments, allowing mate choice, mating competition and mate encounter rates to affect reproduction. As our study species, we used the broad-nosed pipefish, *Syngnathus typhle*, a species practicing male pregnancy and where we have previously shown that male mate choice is impaired by turbidity. Contrary to our expectations, turbidity enhanced sexual selection on male size and mating success as well as reproductive success. Effects from mating competition and mate encounter rates may thus override effects from mate choice based on visual cues, producing an overall stronger sexual selection in turbid waters. Hence, seemingly inconsistent effects of turbidity on sexual selection may depend on which mechanisms of sexual selection that have been under study.

Keywords: Behavioral ecology, Evolution, Ecology, Climate change, Eutrophication



Visible Elastomer Implant (VIE) use for Medical Management in Syngnathids at the Aquarium du Québec

Catherine Rousseau CR

Presenting Author: Catherine Rousseau

Aquarium du Québec, Québec, Canada

Abstract: Managing and identifying an individual fish within a group is a well-known challenge in the aquarium industry. Our veterinary technician team were consistently in search of a solution for a high-quality and effective monitoring system that could work with several species within the collection without causing an unreasonable stress or harm to the individual. Challenges for physical and visual identifiers for syngnathids are even greater as they can change color with their environment, identifiers can be lost as they age or can cause injuries. In 2013, we identified a material that was used for visual identification in field research and tested and presented from one aquarium in the USA. We began testing the application of this silicone based material with our bony fishes, while developing a coding table for each species that identifies locations and color coding. In 2015, we were confident with the efficiency of this product so we extended this program to our syngnathids. The success with this group has greatly improved our ability to medically manage them. In this presentation, we will explore our experiences and uses with the product including preparation, application, anesthetics and handling techniques, color coding, monitoring and documentation.

Keywords: Conservation and management, Medical monitoring



Closed System Production of *Americamysis bahia*

Mark Schick

Presenting Author: Mark Schick

John. G. Shedd Aquarium, Chicago, Illinois, USA

Abstract: The mysid shrimp is the main food item for sea dragons in aquarium and zoos throughout the world. The propagation method developed at the John G. Shedd Aquarium eliminates the need for wild-caught animals and provides a constant supply of appropriate sized mysids for our sea dragon population. Several authors have previously presented methods for the captive propagation of mysids. By modifying techniques in feeding, juvenile collection and breeding times, Shedd Aquarium could produce enough *A. bahia* on site for our sea dragon feeding needs.

In less than 100sqft of space we can produce between 8000-10,000 mysids every seven days that are in the four to five-week size class. If juvenile size classes are needed then production is approximately 30% higher for this same set-up. Total time dedicated to producing this population is approximately six to seven hours of staff time per week. Current protocols for the system call for three feedings each day with a mix of prepared diets and newly hatched artemia nauplii.

Keywords: Ex situ and aquaculture, Conservation and management, *Americamysis bahia*



A new pygmy pipehorse, *Idiotropiscis aotearoa* (Teleostei: Syngnathidae), from New Zealand

Graham Short, Tom Trnski

Presenting Author: Graham Short

California Academy of Sciences, San Francisco, USA

Abstract: A new species of pygmy pipehorse, *Idiotropiscis aotearoa* sp. n. (Teleostei, Syngnathidae) is described based on a single adult male and a juvenile female specimen collected in northern New Zealand. *Idiotropiscis aotearoa* shares morphological synapomorphies with the other three described Australian species of *Idiotropiscis*, *I. australe* (Waite & Hale, 1921), *I. larsonae* (Dawson, 1984), and *I. lumnitzeri* (Kuitert, 2004), including a fully enclosed brood pouch, superior ridges discontinuous below the dorsal fin base, and a head angled ventrally 25° from the abdominal axis. *Idiotropiscis aotearoa* is distinguished from its congeners by possessing a strongly elevated and anteriorly protruding frontal ridge, an exceptionally pronounced pectoral fin base, and a unique combination of characters shared only with the seahorses; a distinct cup-like coronet and conspicuous head and body spination on the nape, snout, shoulder-ring, pectoral fin base, and superior trunk and tail ridges. Comparative examinations of diagnostic characters confirm it is similar in meristics to *I. australe* in having 12 trunk rings, 37 tail rings, 14 dorsal fin rays, and 14 pectoral fin rays. The unexpected discovery of a new and diminutive temperate species of pygmy pipehorse highlights the incompleteness of our current knowledge of syngnathid biodiversity in New Zealand.

Keywords: Evolution, Phylogenetics, Conservation and management, biodiversity



Color manipulation on the lined seahorse *Hippocampus erectus* (Perry, 1810)

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Presenting Author: Nuno Simoes

Abstract: Wild seahorse populations are threatened worldwide due to loss of habitat, direct fishing and bycatch to supply the demand for Traditional Chinese Medicine, the souvenir market and the live marine ornamentals industry. For the specific aquarium market, bright colored individuals attain higher prices. In the present study, we manipulated incident radiance (light spectrum) and reflected radiance (tank and fixation substrate color) and followed *Hippocampus erectus* juvenile changes in color along time. The reversibility to initial color potential and timing of such reversibility were also investigated and described. According to our results, PAR incident radiation (blues and greens) induces more color changes than longer wavelengths (reds). Reflected radiation induces more color changes than incident radiation. *Hippocampus erectus* changed from initial dark brown/black tones to lighter yellowish tones, clearly adapting to different light environments by changing color (showing yellow coloration with yellow substrates and black coloration with black substrates). This process last from a few to 12-14 days and nearly all treatment animals changed color, whilst control animals did not. Animals could reverse the lighter color back into dark brown/black tones in less than a week. Animals that were submitted to a previous color change treatment, changed more rapidly than animals that were submitted for the first time to a color change treatment. Our results contribute to the understanding of the qualitatively and quantitative response of two color change factors: incident radiation and reflected radiation. Such information can be used in seahorse culture protocols to obtain animals with color patterns that are most valuable in the aquarium market.



Current and future distribution of *Hippocampus erectus* in the climate change scenario: a modelling approach.

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Abstract: In the last decades, an enormous amount of studies was carried out on the potential effects of anthropogenic climate change (CC) on terrestrial biota. However, comparatively few studies have been focused on studying CC alterations on marine environments. The lined seahorse (*Hippocampus erectus*) is a species of ornamental importance that faces considerable threats within which one with a potential considerable impact is CC. We used a correlative niche modeling approach to evaluate potential effects of this phenomenon on *H. erectus* populations. Occurrences from its entire range were obtained from several databases (OBIS, GBIF, SNIB, scientific literature and regional collections) and a characterization of its environmental requirements (i.e. ecological niche) was made using Bio-ORACLE marine layers. Two algorithms (Maxent and NicheA) were employed to model its niche and estimate its current and future potential distribution under contrasting climate change scenarios. Finally, we evaluate and discuss potential distributional shifts for the next century.



Amphipods as feed for seahorse aquaculture.

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Abstract: The main bottlenecks in seahorse culture could be reduced to two: diseases and feeding of new-born and early juveniles. The present study concentrates on the second and resumes the results of PIECEMO laboratory during the last 5 years on the development of a cost-effective amphipod culture protocol as an alternative for a continuous supply of live-prey or complement-feeding to cultured seahorses. The model species used were *Hippocampus erectus* and the amphipods *Parhyale hawaiensis* and *Elasmopus pecteniscrus*. We present data on amphipod morphometry, nutritional value, sex-ratio, reproduction, population dynamics, potential feeds, and preliminary large scale culture systems. We also present data on seahorse feeding trials, both on the capture mechanics, prey selection, training to feed on frozen amphipods and growth rates when fed upon cultured amphipods. We finalize with a comparison on the pros and cons of large scale amphipod culture. Despite some drawbacks, our results demonstrate that amphipod production is a relatively novel solution to some of the problems faced by the seahorse ornamental culture industry.



Reproductive Success of Male *Syngnathus scovelli* Pipefish Across Seasons

Julia Skowronski*1, Dr. Heather Masonjones1 and Dr. Emily Rose1

Department of Biology, The University of Tampa

Presenting Author: Julia Skowronski

Abstract: The Gulf pipefish (*S. scovelli*) is a species residing in most of the Gulf of Mexico, including the Tampa Bay region. They breed year-round, except in the central gulf regions where their reproductive activity declines during winter. Addressing the reproductive status of males across seasons as well as detecting any patterns with partial pregnancy was the goal of this study. Male pipefish were collected from multiple populations in the Tampa Bay area during multiple seasons (2005-2010), where they were tagged with fluorescent dyes and photographed. The pictures were analyzed with the program Image J, where torso length (mm), pouch length (mm), pouch width (mm), pouch area (mm²), and the pouch reduction area (mm²) were measured. The number of embryos that males held, as well as the stage of pregnancy and if they were gravid, partially gravid, or not gravid at all were also recorded. During preliminary analysis, seasonal patterns were observed in both number of embryos and the amount of brood reduction. As a result, evidence suggests that sexual selection varies strongly with season in this species.



The Gulf Pipefish Reference Genome Facilitates Genetic Study of Derived Morphologies and an Evolutionary Novelty

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Abstract: Evolutionary origins of derived morphologies ultimately stem from changes in protein structure, gene regulation, and gene content. Quality reference genomes are powerful resources in any endeavor to understand how these molecular changes have influenced phenotypic evolution. We generated a chromosome-level reference genome for the Gulf pipefish, a well-studied species with many of the derived morphological features embodied by syngnathid fishes, including male pregnancy, a true evolutionary novelty. We documented genetic changes in the pipefish lineage, including gene loss, of conserved developmental genes such as *hox*, *dlx*, *tbx*, and *pitx* families, candidate mechanisms for the evolution of an elongated axis and the loss of ribs, pelvic fins and teeth. We identified marked transcriptional differences related to innate, but not adaptive immunity in pregnant versus non-pregnant brood pouch tissue. For the first time, we describe the genomic organization of rapidly diverging patristacins, duplicated metalloproteases which have evolved exceptional, pregnancy-specific expression patterns in the brood pouch. We also identified ultraconserved elements in the Gulf pipefish genome for phylogenomic analysis, confirming that the syngnathid lineage is an outgroup to the collection of percomorph fish commonly used as vertebrate models. Finally, comparisons of chromosome structure among percomorphs demonstrate a reduction in chromosome number via chromosomal fusions in the syngnathid lineage. These collected findings from the first syngnathid reference genome enable study of the genomic underpinnings of exceptional phenotypic diversity within Syngnathidae, demonstrating that de novo production of high quality and useful reference genomes is within reach of even small research groups.

Keywords: Genomics, Evolution, Ecology, Male Pregnancy



Ovarian structure and mode of egg production as a phylogenetic constraint on mating patterns in Syngnathids

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Abstract: Syngnathids are unique among teleost fish not only in their remarkable adaptations for paternal care, but also in their ovarian structures which consisted of a rolled sheet with stem cell compartments, called the germinal ridge, running along the entire length of the sheet. Distinct differences are seen in the ovarian structure and mode of egg production among promiscuous, monogamous and polyandrous species. *Promiscuous Syngnathus* pipefishes have a single germinal ridge and produce mature eggs asynchronously and continuously. On the other hand, monogamous (e.g., genus *Corythoichthys*) and polyandrous (e.g., genus *Nerophis*) species have two germinal ridges and produce mature eggs synchronously with a single or multiple ovulations, respectively. If ovarian structure is a prime determinant of the mode of egg production and mating pattern, we can expect clear phylogenetic patterns among them. I reconstructed the evolution of ovarian structures and mode of egg production to study evolutionary patterns of mating in syngnathids, and found that the ancestral syngnathids which have two germinal ridges and produce mature eggs synchronously with a single ovulation reproduce monogamously. Evolution of multiple from a single ovulation occurred in several branches independently, leading to polyandrous mating pattern. Furthermore, evolution of a single germinal ridge and asynchronous egg production was inferred to occur in common ancestor of *Syngnathus* pipefishes. I will also introduce a simulation-based study which shows that the direction and strength of sexual selection is partly explained by the interaction between the mode of egg production in female and egg brooding in male.



Expanded Ranges and New Habitat for Seahorses (*Hippocampus spp.*): Early Lessons from a Nascent Marine Citizen Science Programme

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Presenting Author: Lily M. Stanton

Abstract: iSeahorse is a citizen science conservation initiative designed to gather information on seahorse distribution and ecology and to promote species and marine conservation through engagement with the global public. Since its launch in 2013, iSeahorse has accumulated over 2000 individual seahorse observations, has documented 38 out of 41 species currently recognized, and has grown to over 450 users and counting. After over three full years of outreach and data collection through the program, we conducted a preliminary analysis to assess data quality and to explore new information about seahorse biology and citizen science in the marine realm. These analyses reveal different habitat types documented for certain species and sightings data has expanded the ranges of several species by hundreds, and in some cases thousands of kilometers. Data collected from iSeahorse provide much needed information for IUCN Red List assessments, and will help inform planning for species conservation. We are now engaging with the iSeahorse community to implement repetitive monitoring to determine population trends and threats. iSeahorse's goal is to empower contributing citizens to take action in response to changes they detect.



A phylogenomic analysis of Syngnathidae based on high-throughput sequencing of more than 1000 genetic regions

Josefin Stiller, Healy Hamilton, Sj Longo, Np Saarman, Graham Short, P Wainwright, WB Simison, GW Rouse

Presenting Author: Josefin Stiller

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Abstract: Syngnathidae are a charismatic group that is increasingly being studied for their intriguing reproductive mode and unique morphology. To give a perspective on the evolution of syngnathids, including biogeographic trends and evolution of morphological and life history characteristics, a well-resolved and taxonomically-broad phylogeny is needed. Previous studies were often limited in taxonomic breadth and had little resolution at deeper nodes due to the limited availability of genetic markers. These studies have found incongruence in phylogenetic signal from different types of markers and sampling schemes. The incongruence observed leave some important questions such as the phylogenetic placement of seahorses and the taxonomic relationships among congeneric species from the Atlantic and Indo-Pacific unresolved. The advent of high-throughput sequencing of numerous loci for phylogenetics will largely resolve the topology of deeper nodes, shifting the bottleneck to the acquisition of samples and towards bioinformatic analysis of the data. We have sourced >265 individuals, representing 177 species of pipefishes, pipehorses, seadragons and seahorses from museum collections, aquaria and personal field collections. We will generate genomic data for these samples using targeted capture of 1340 ultraconserved elements (UCEs). The resulting phylogenetic tree will be integrated with fossil and biogeographic information to date key nodes of the phylogeny. This taxonomically comprehensive genome-scale analysis and time- calibrated phylogeny will be an important resource for syngnathid biologists interested in studying the evolutionary history of this remarkable clade of fishes.

Keywords: Phylogenetics, Evolution, Genomics



Phylogeography of leafy and common seadragons based on over 1000 genetic markers

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Abstract: The southern coastline of Australia is home to a unique biota that has been exposed to complex changes throughout the glacial cycles. Glacial impacts on marine organisms of the region are less understood than in the northern hemisphere and detailed reconstructions of population histories were often hampered by the limited availability of genetic markers. Here, we investigate patterns of genetic structuring of two seadragon species that are sympatric in parts of Australia's temperate coast. Both leafy seadragons (*Phycodurus eques*) and common seadragons (*Phyllopteryx taeniolatus*) are known for their remarkable camouflage mimicking seagrass and kelp. We used range-wide sampling of both species and sequenced ~1000 Ultraconserved Elements (UCEs) for >300 individuals. The genetic data is integrated with information on life history and geology to elucidate the phylogeographic structure and demographic history of each species and compare patterns between them. Both seadragons showed strong geographic structuring, consistent with their low dispersal potential. Considerable differences in genetic diversity existed regionally, some of which bearing signatures of recent changes in population size. A genetic break between populations of common seadragons in the southeastern part of the range coincides with the historical location of a land bridge connecting Tasmania to mainland Australia. Reopening of the seaway ~14,000 years ago resulted in opportunities for secondary contact and we found low levels of gene flow across the phylogeographic barrier. Overall, the high-throughput data provide a detailed picture of histories of both species and point towards complex factors influencing marine organisms in southern Australia.

Keywords: Phylogeography, Genomics, Conservation and management



Occurrence and habitat selection in syngnathid fishes in Biscayne National Park, Florida

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Abstract: Occurrence and habitat selection were studied in syngnathid fishes in Biscayne National Park, Florida from May until September 2016. Repeat surveys (n=7) were conducted at each site to account for false absences due to the cryptic behavior and appearance of syngnathids. Habitat types were broadly separated into continuous seagrass beds, discontinuous seagrass beds, reefs, and hard-bottom habitats. Gulf Pipefish (*Syngnathus scovelli*), Dusky Pipefish (*S. floridae*), and the Dwarf Seahorse (*Hippocampus zosterae*) were most frequently observed syngnathids in Biscayne National Park. Syngnathids were most abundant in continuous seagrass beds composed of *Thalassia testudinum*, *Syringodium filiforme* and/or *Halodule wrightii*.

Keywords: Ecology, Conservation and management



The Use of Microsatellites to Detect Molecular Diversity in an Isolated Bahamian Seahorse Population

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Presenting Author: Rachel Thomas

Sweetings Pond (Eleuthera Island, Bahamas) is a saltwater lake with a large population of lined seahorses (*Hippocampus erectus*). The pond's unique biology stems from its low connectivity to the ocean, with evidence of reduced tidal flow through porous limestone rock. As a result, it is possible pond seahorses have been isolated from ocean populations, presenting the opportunity for speciation. Fin clip samples were obtained from animals from six locations in Sweetings Pond and the DNA was extracted. PCRs were conducted using microsatellite primers for four loci that were originally designed using DNA sequences from *Hippocampus zosterae* specimens. The PCR products were run on 2% agarose gels to confirm if the *H. zosterae* primers were successful in amplifying DNA from Bahamian *H. erectus* seahorses and to determine the percent heterozygosity for four *H. zosterae* microsatellite loci. Preliminary results show that three *H. zosterae* microsatellite primers successfully amplify *H. erectus* alleles and indicate that *H. erectus* have smaller allele sizes at these loci than *H. zosterae*. Final results from the project will include genotyping 24 seahorses from each of the six microhabitats within Sweetings Pond to compare with the genotypes from Bahamian *H. erectus* seahorses outside of the pond.



Brain Size Evolution in Syngnathidae: The Role of Sexual Selection and Feeding Ecology

M Tsuboi, Aco Lim, VC Chong, I Ahnesjo, N Kolm

Presenting Author: Masahito Tsuboi

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Abstract: Brain size varies greatly across vertebrates. Feeding ecology, life history and sexual selection have been proposed as key components in generating contemporary diversity in brain size. Analyses of brain size evolution have so far been limited to lineages where males predominantly compete for mating and females choose mates. This research bias has considerably compromised our understanding of brain size evolution with respect to the role of sexual selection. Here, we present the first original data set of brain sizes in pipefishes and seahorses (Syngnathidae) a group in which intense female mating competition occurs in many species. After controlling for the effect of shared ancestry and overall body size, brain size was positively correlated with relative snout length. Moreover, we found that females, on average, had 4.3% heavier brains than males and that polyandrous species demonstrated more pronounced (11.7%) female-biased brain size dimorphism. Our results suggest that adaptations for feeding on mobile prey items and sexual selection in females are two major factors in brain size evolution of pipefishes and seahorses. Most importantly, our study supports the idea that sexual selection plays a major role in brain size evolution, regardless of on which sex sexual selection acts stronger. Our study adds significant credibility to an old but highly controversial idea that brain size is a sexually selected trait.

Keywords: Evolution, Behavioral ecology, Phylogenetics, sexual selection, phylogenetic comparative method



Impacts of an Extraction and Trade Ban on Exploitation for India's Seahorses

Tanvi Vaidyanathan, Amanda Vincent

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Abstract: My research focuses on the impact of management measures for the conservation of seahorses and the livelihoods associated with the seahorse fisheries. I use the case study of seahorses in India, where in 2001, all Syngnathids were placed under the Wild Life Protection Act, preventing the catch and export of all species in this family. In 2002, all species of seahorses were listed in Appendix II of the Convention of International Trade of Endangered Species of Flora and Fauna (CITES), which regulates export of these fish to ensure that populations are not damaged by international trade. Fifteen years on, the trade of seahorses in India continues but has been driven underground. Little is known about the quantity, value or number of seahorses that are being caught and traded annually. Over two field seasons, through semi-structured interviews and port sampling, I conducted surveys along the entire Indian coast with multiple stakeholders and forest officials, to understand the changes and the current scenario. I also carried out in-depth interviews in Tamil Nadu, a state in Southeast India, a traditional hot-spot for both the directed and incidental seahorse fishery. My study found that landings of seahorses and trade continues illegally, particularly in Tamil Nadu, and that the price of seahorses has increased after the ban. My work is highly topical because CITES recently decided to ban exports from Guinea, Senegal and Vietnam because of their difficulties in implementing the Convention. We need to anticipate and address the likely effects of such bans.

Keywords: Conservation and management, Policy



Comparison of Digital and IDIA Methodology in Measuring Female Ornaments of Gulf Pipefish (*Syngnathus scovelli*)

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Presenting Author: Angelica M. Vega Ramirez

Abstract: This experiment conducts the comparison of an automated system that was programmed to measure iridescence of *S. scovelli* ornaments to the digital methods used by S. Flanagan and colleagues. In their study (2014), they measured ornament area, number, and body size. This process was done by measuring standard length (mm) from digital images of females using the software, ImageJ 1.60. From each digital image, they calculated the total number of bands and captured an outline of each band using tpsDig2. The band and outlines were then used to calculate band area (mm²) with a custom R script using package splancs. The system Iridescence Detection and Isolation Algorithm (IDIA) uses Access Microsoft to analyze female ornaments by toggling the image to best iridescence then placing the image in ImageJ and automatically calculating the band length count, band length sum (mm), band length sum 2 (mm), average length, and standard deviation. With the data, it can be concluded that the IDIA program is a successful and efficient method of measuring iridescence in female ornaments.

Keywords: Behavioral ecology, Ecology, Evolution, Sexual Selection



Using Association of Zoos and Aquariums (AZA) Species Survival Plan® (SSP) Programs as Resources for Conservation and Research

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Abstract: Seahorses are one of the most iconic and popular aquatic species in zoo and aquarium collections. The pot-bellied or big-belly seahorse, *Hippocampus abdominalis*, and the lined seahorse, *H. erectus* are the two most represented seahorse species in Association of Zoos & Aquariums (AZA) member institutions. AZA's Species Survival Plan® (SSP) Programs are one of the tools that help to maintain sustainable and genetically diverse captive populations, as well as advocate husbandry advancements and public education objectives. These programs can also serve to promote and facilitate research and conservation of wild animals. As the program leaders for these species, we will address the challenges and successes for each program, as well as discuss potential opportunities. Because we also represent these species outside of the zoo and aquarium community, we can be a resource to research, aquaculture, and other groups working with them. Developing networks for collaboration between in situ research and captive management is an important element in advancing our programs.

Keywords: Conservation and Management, Ex situ and Aquaculture, Aquarium



Using species distribution models and multiple sources of species data to inform seahorse conservation in China

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Abstract: I provide the first conservation study of seahorses in China, the world's largest consumer of dried seahorses and the country with the largest fleets of trawlers, (which catch many seahorses incidentally). I interviewed more than a thousand local fishers working on 554 fishing boats at 79 Chinese fishing ports to collect information on seahorse species, distribution, habitat, and abundance. I also collated seahorse data from local divers and peer-reviewed literature in China, and checked seahorse specimen information in local museums. I then built models to predict distributions of each seahorse species in China. My study indicated that at least five species are living in China and they were mainly found in the south of the country. Seahorses were mainly caught by trawl nets in the south, especially bottom trawls (targeting shrimps), and mainly found in teeth-bar rakes, stow nets, and crab traps in the north. Seahorse catch varied with years, seasons, and fishing zones. Fishers in some areas targeted seahorses with a harvest of up to thousands per boat per day. Reported habitats used by seahorses included seagrass beds, stones, sandy seafloors with sea fans, coral reefs and, macroalgae, and artificial structures. Three actions are needed to protect seahorse populations in China: 1) enhance management of existing marine protected areas that covers seahorse habitats, 2) set up new MPAs in areas where seahorse species richness or abundance is high; 3) regulate fishing activities and nets in fishing zones where seahorses are heavily caught.

Keywords: Conservation and management, Ecology