Grun, T ***;** Kowalewski, M; University of Florida

Distribution and diversity of sediment-dwelling echinoids of the central Florida Keys

Sediment-dwelling echinoids (clypeasteroids and spatangoids) are important ecosystem engineers found in many soft-bottom habitats around the Florida Keys. Over the last 50 years, many studies have documented their spatial distribution and diversity in various areas of the Florida Keys. This study focuses on the central part of the Florida Keys, an area that has been subject to diverse human impacts that can undermine the ecosystem's composition and health, including sediment-dwelling echinoids. To assess the current state of echinoid populations, 27 sites located along the central part of the Florida Keys have been surveyed by SCUBA (2020-2021) for the presence of live specimens and dead skeletal remains of clypeasteroid and spatangoid echinoids. 17 sites were inhabited by six species of sediment-dwelling echinoids. Up to five species co-occurred at single sites with most sites harboring only one or two species. At all sites, a single species was dominant in terms of relative abundance. A comparison of live and dead echinoids indicates that dead tests are typically much rarer than live specimens. However, the spatial distribution and abundance of dead remains tracks live occurrences: when dead remains are found, live specimens are always observed. A comparison suggests that the faunal composition of surveyed echinoid assemblages has not changed notably over the past 50 years.

Padilla, P.*; Herrel, A; Denoël, M.; University of Liege, Belgium

Warmer is better for an overlooked invasive frog species

Global warming and temperature variation caused by anthropogenic mediated climate change are impacting organisms world-wide. Despite the fact that the strongest species declines have been observed in amphibians, some introduced exotic amphibians have been able to quickly adapt to new environmental conditions. Because the interaction between the effects of these invaders and climate change could lead to unprecedented loss to native populations, gathering knowledge on how these invaders might benefit from warmer temperatures is needed to assess future threats.

We here investigate if an overlooked invasive frog species, marsh frogs (Pelophylax ridibundus), will benefit from warmer temperature in its invasive range (Southern France). To do so we evaluated multiple physiological traits to temperature and determined the thermal preference, optimum, and limits of this species in relation to the temperature observed in their invasive range.

Results show that marsh frogs have a broad thermal tolerance with thermal preference and optima of performance at temperature higher than the current average temperature in their habitat.

Warmer climate may have already favoured the invasion of marsh frogs and, given the current predictions, will undoubtedly continue to do so.

Abstract - ID: 198

Grun, T***;** Portell, R; Kowalewski, M; University of Florida, Florida Museum of Natural History, University of Florida

Discovering Fossils within Florida's Remarkable Springs and Sinkholes

Northern Florida is famous for its extensive and complex aquifer system with many springs and water-filled sinkholes. Today, these water bodies serve as popular playgrounds for swimmers, snorkelers, free and SCUBA divers. However, only a few of the countless visitors realize that those springs and sinkholes provide a window into the distant past when Florida was the seafloor of an ancient sea. Remains of animals that dwelled in that aquatic setting can still be found preserved as fossils embedded in rock or as loose shells that fell to the bottom after the rock encasing them dissolved away. Some of those fossils are so well preserved that they can be mistaken for Recent specimens.

The Fossil-Trails Project team of paleontologists aims to bring to the public the ancient natural history of Florida seas recorded in the rocks of springs and sinkholes. Our scientific divers are currently developing the project by surveying springs and water-filled sinkholes in northern Florida. Suitable in-place fossils are being photographed, identified, and labeled. Permanent posters are being developed and will then be installed to provide information about regional geological processes and display images of identified fossils with a description of the environment in which they once lived. Additionally, a website is being developed with more comprehensive information about specific sites, including their geological setting and the fossils that can be found there.

Abstract - ID: 199

Author(s): Tobias Grun ***;** University of Florida

Session Type: Contributed Talk Presentations

Select the best divisional affiliation for this abstract: DIZ - Invertebrate Zoology

Select Topic: DIZ - Invertebrate Zoology: evolutionary ecology

Title: Who did this? Chances and limitations of predator recognition in irregular echinoid populations

Abstract:

Burrowing echinoids are important contributors to the health and function of soft-bottom ecosystems. These echinoids introduce oxygen-rich water to lower sediment layers, control sediment grain size, and remove detritus from their habitats. Many marine organisms rely on these echinoids as a food source. Fish, crabs, snails, and sea stars are common predators. During an attack, predators typically leave traces back in the echinoids' skeletons that can allow the identification of the aggressors. Here, the recognition potential and limitations of predation traces found in these ecologically important echinoids is analyzed. Data indicate that five categories of traces can be identified: (1) well recognizable traces with the potential to identify predators on family-level, (2) traces with the potential to identify predators on class-level, (3) traces with the potential to identify as predator traces, (4) cryptic predation without traces on the skeleton, and (5) unidentifiable traces. Special consideration is given to drillholes produced by cassid gastropods (category 1). Those predators are hard to find in the habitats as they hide burrowed in the sediment or blend well between boulders. Given the composition of their shells, these predators are rare in the fossil record. However, drill holes that cassids leave in their preys' skeletons relate to the snails' body size. This allows the interpretation of some parameters of the predator populations.

Are you a student?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No

Abstract - ID: 214

Author(s):	Matt Steffenson ***;** St. Edward's University Samantha Mathieu, St. Edward's University Elizabeth Fotinos, St. Edward's University
Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DEDE - Ecoimmunology and Disease Ecology
Select Topic: DEDE - Ecoimmunology	immune-based trade-offs

and Disease Ecology:

Title: The effect of hive foundation on the immunological response of Italian honeybees (Apis mellifera)

Abstract:

Bee husbandry is an integral element in agriculture and natural ecosystems through pollination services that improve crop yields and support plant reproduction. Colony collapse disorder (CCD) is a phenomenon where honeybee colonies suddenly and rapidly lose worker bees leading to collapse of the colonies, which can have a dramatic indirect impact on agricultural production. While the exact causes of CCD are unknown, many scientists agree that it is mostly likely caused in part by environmental pathogens. This study aims to understand how colony energy expenditure can affect honeybee's ability to fight off pathogenic threats. We maintained two colonies; one with frames that had a plastic foundation to help honeybees build up honeycomb, and one with frames that had no foundation. Because wax is energetically costly to produce, we predicted that bees from the no-foundation colony would be more energetically stressed, and thus less able to immunologically respond to pathogens. Honeybees were collected from both foundation and no foundation hives and fed them either a plain nectar solution (control) or a solution of lipopolysaccharides to mimic a pathogenic threat. We then extracted hemolymph at three different time points to assess the effect of time on immunological functioning as well. With data collection ongoing, we predict that bees from colonies with no foundation will have lower immunological activity than those from colonies with a frame foundation.

Are you a student?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: Yes

Sign up to be a session chair: No

Presentation Video: https://xcdzoom.s3.amazonaws.com/t2UoqYCjeElJYOU.mp4_new.mp4

Abstract - ID: 253

Author(s): Christy Wayne ***;** Lousiana State University
Karen Maruska, Louisiana State University

Session Type: Contributed Poster Presentations

Select the best divisional affiliation for this abstract:	Outreach, Education, and Policy
Select Topic: Outreach, Education, and Policy:	science communication
Title:	"Fin-Tastic Fish Science": Using a comic book to disseminate and enhance science literacy

Abstract:

Hi everyone! My name is Burt. I'm a cichlid fish from the Maruska lab at LSU. Did you know that education outreach and public engagement helps scientists expand the reach of their work and make it more relevant to society? Those fancy papers scientists write are highly stylized, difficult to read even among experts, and intimidating for the public. That's why I am starring in a comic book! "*Fin-Tastic Fish Science"*, is based on published literature from our lab and explains the basics of fish neuroscience. The goal of this comic is to change public perception of their own abilities to understand scientific literature while also educating them about how science is relevant to their lives. To test whether this comic could influence understanding and perception of science, a study using pre- and post-surveys was conducted in undergraduate non-science majors. Students were given identical content in different formats: 1) scientific journal article, 2) 'news-type' summary, 3) Fin-Tastic comic book, or 4) nothing (control). What's exciting is that individuals who read the comic book or journal article learned and remembered more about the material than the other groups. Students who read the comic also improved their attitudes and were more willing to engage with science in the future! To improve scientific literacy, presenting research content in more accessible formats like comics may be a valuable approach.

In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_253_0112110456.12.23 RW.pdf

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Abstract - ID: 256

Author(s): Christy Wayne ***;** Lousiana State University
Karen Maruska, Louisiana State University

Session Type: Contributed Poster Presentations

Select the best divisional affiliation for this abstract: DNNSB - Neurobiology, Neuroethology, and Sensory Biology

Select Topic: DNNSB - Neurobiology, Neuroethology, and Sensory Biology: genetics of behavior

Title: Transcriptome profiles associated with repeated social defeat in a cichlid fish

Abstract:

In response to social defeat stress, many animals perform proactive or reactive coping behaviors, which are often associated with distinct neural profiles. However, we know little about complete transcriptome profiles in different brain nuclei and how differences in neurochemical signaling contributes to susceptible (avoidance behaviors) and resilient (more proactive behaviors) phenotypes, particularly in non-mammalian taxa. While specific candidate genes are implicated in social defeat behavioral phenotypes in fishes, most studies are conducted on whole brains. Thus, more fine-scale neuroanatomical analyses across integrated brain nuclei are necessary to better understand molecular mechanisms of social defeat. After repeated defeat, males of the cichlid fish *Astatotilapia burtoni*, can be reliably classified into either resilient or susceptible phenotypes, similar to other vertebrates. We used TagSeq, a 3'-transcriptome sequencing method appropriate for differential gene analysis, to test the hypothesis that transcriptomic profiles in microdissected candidate brain regions differ between males that experience repeated social defeat compared to those that do not (controls), and between males showing resilient and susceptible phenotypes. We identified many up and downregulated genes in susceptible compared to resilient individuals in key regions of the social decision-making network. This work reveals molecular correlates of social defeat phenotypes and can be used to help identify predictors of stress coping. Further, it provides important comparative information towards better understanding aspects of social stress responses that may be evolutionarily conserved.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting and/or SICB+: SICB+ only

Primarily No

Undergraduate Institution:	
Sign up to be a session chair:	No
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_256_0112112303.12.22 RW.pdf

Abstract - ID: 270

Author(s):	Amanda Hewes ***;** University of Washington, Seattle William Buttemer, University of Wollongong Maude Baldwin, Max Planck Institute for Ornithology Alejandro Rico-Guevara, University of Washington, Seattle

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DVM - Vertebrate Morphology
Select Topic: DVM - Vertebrate Morphology:	evolution of form and function
Title:	How do honeyeaters drink nectar?

Abstract:

Acquiring food is key for organismal survival and reproductive success. Nectarivorous birds subsist on a food that is difficult to acquire, as it often occurs in minute volumes within floral corollas. It has long been assumed that avian nectarivores fill their tongues via capillary action while feeding from flowers, but recent work has shown that this is untrue for hummingbirds. It has not been empirically investigated, however, whether capillary action is the actual mechanism at work during nectar uptake in other avian nectarivores. This research aims to 1) describe the general mechanics of honeyeater feeding and 2) to characterize the mechanism of nectar uptake in the honeyeater tongue. Honeyeaters are the dominant group of nectarivorous birds in Australia, and one of the largest groups of avian nectarivores globally. Using kinematic analysis of high-speed video, we characterized the movement of the tongue and bill tips throughout the feeding cycle and quantified metrics such as lick frequency, duration, and tongue velocity for five honeyeater species (*Phylidonyris novaehollandiae, Acanthagenys rufogularis, Ptilotula penicillata, Certhionyx variegatus, Manorina flavigula*). We combined this kinematic information with measures of changes in tongue thickness during feeding to

elucidate the mechanism used by honeyeaters to fill the tongue with nectar.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/KRTmk9SPuiNbTUQ.mp4_new.mp4

Abstract - ID: 314

Author(s):	Laura Segura Hernández ***;** University of Nebraska-Lincoln Eileen Hebets, University of Nebraska-Lincoln
Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DIZ - Invertebrate Zoology
Select Topic: DIZ - Invertebrate Zoology:	global change
Title:	Effects of Microclimate Change Across Life Stages of the Pseudoscorpion Dactylochelifer silvestris

Abstract:

Most of our understanding of current and future climate change comes from measurements and modeling projections across large temporal (e.g. annually) and spatial (e.g. regional) scales. Much less is known about changes over small temporal (e.g. daily) and spatial (e.g. beneath a plant) scales. Daily changes in fluctuating temperature at a small scale, however, are likely to be extremely important for small ectotherms, which comprise the vast majority of Earth's biodiversity. Additionally, taxon-specific studies of the impacts of climate change on animals

predominantly focus on a single life stage, overlooking the possibility that temperature-related survival changes throughout development. Many small ectotherms live in secluded spaces (e.g. in soil), and it is poorly understood how (i) climate change may alter the abiotic microhabitat conditions, and (ii) future microhabitat conditions can influence survival across life stages. Here, we evaluated the effects of microclimate changes on the survival and behavior of *Dactylochelifer silvestris* (Pseudoscorpiones: Cheliferidae). We first recorded daily summer microhabitat temperatures and used them to calculate future temperature predictions. In the laboratory, we then assessed the life-stage specific survival of pseudoscorpions under (a) current and (b) future temperature conditions. Then we tested how different temperatures influenced their dispersal behavior. We found that future microclimate influences survival on all life stages of *D. silvestris*, with younger nymphs having enhanced risk of dying, and females being most resilient.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	Yes
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/oTaYPu4sqwKKuQX.mp4_new.mp4

Abstract - ID: 372

Author(s):	Amanda Palecek-McClung ***;** Clemson University Heiko Schoenfuss, St. Cloud State University Richard Blob, Clemson University

Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DVM - Vertebrate Morphology
Select Topic:	adaptation and ecomorphology

DVM - Vertebrate Morphology:

Are you associated with one of SICB's affiliated societies? Please indicate below:: AMS - American Microscopical Society

Title: Sticky and slimy: The influence of mucus production on adhesion in goby fishes

Abstract:

Gobies possess a sucker which is capable of adhering to substrates and even used to climb waterfalls. Species vary in their adhesive and climbing abilities, leading to elevation-dependent stratification among stream dwelling taxa where poor climbers generate lower suction forces and thus are found at lower stream elevations compared to better climbers. Adhesion in these fishes may be dependent on several factors, including sucker tissue morphology, the neuromuscular outputs of the sucker, behavior of the fish, and the substrate that the fish is adhering to. Here, we used histological analyses to investigate whether epidermal mucus may contribute to adhesion in these fishes. We compared concentrations of goblet cells across species and regions of the body as a metric reflecting mucus production. In all tested goby species, goblet cells are found in higher concentrations in the epidermis around the suction disc than in other areas of the body, such as the caudal peduncle. Greater numbers of goblet cells were also found surrounding the suction discs of better-climbing species, compared to nonclimbing species. These results suggest that elevated mucus production may play a role in improved adhesion of gobies, either as a sticky surfactant capable of bonding to a substrate, or as a way to improve seal formation between the suction disc and substrate, thereby preventing disruption of the pressure differential between the chamber enclosed by the sucker and the surrounding environment.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation Poster: https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_372_0113110832.pdf

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Abstract - ID: 419

Author(s): Gregory Violet **(Presenter)**
Armita Manafzadeh, Yale University
Stephen Gatesy, Brown University

Session Type: Contributed Poster Presentations

Select the best divisional affiliation for this abstract: DVM - Vertebrate Morphology

Select Topic: locomotion: wings, legs, and fins

DVM - Vertebrate Morphology:

Title: Knee Long-Axis Rotation in the Common Loon, Gavia immer

Abstract:

The Common Loon (*Gavia immer*) is a primarily North American bird that uses its muscular legs to dive and maneuver underwater. Unlike the free distal limbs of most other foot-propelled aquatic species, in loons the crus is relatively fixed to their elongate body wall. Researchers have offered conflicting hypotheses about loon hindlimb mobility, so it remains unclear how the major hindlimb joints work together to create forces for aquatic propulsion. Using marker-based X-ray Reconstruction of Moving Morphology (XROMM), we quantified hip, knee, and ankle joint rotational mobility in an intact loon cadaver. We found that the highly abducted hip displays little mobility overall, and that the ankle moves primarily in flexion-extension. Contrary to the predictions of some anatomical studies, the knee is highly mobile in long-axis rotation. Our analyses demonstrate that the tibiotarsus is able to long-axis rotate over 75º with respect to the femur, and the fibula long-axis rotates over 65º relative to the tibiotarsus. Similarly high levels of knee long-axis rotation have previously been measured in the ground-dwelling Helmeted Guineafowl, suggesting that mobility in this degree of freedom may be widespread among birds. In the loon, crural long-axis rotation may play an important role in lift-based force generation. Studying hindlimb mobility in a broader variety of birds will elucidate the evolution of hindlimb-propelled diving as well as other adaptive locomotor behaviors.

Are you a student?: Yes

Do you want to compete for No

the Best Student Presentation competition?:	
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/W3T56TO1qfWGjFR.mp4_new.mp4
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_419_0112023159.pdf

Abstract - ID: 462

Author(s):	Carlos Ruiz ***;** University of Washington Jamie Theobald, Florida International University

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DNNSB - Neurobiology, Neuroethology, and Sensory Biology
Select Topic: DNNSB - Neurobiology, Neuroethology, and Sensory Biology:	sensory biology
Title:	Habitat structure and natural history shape stabilizing responses in three species of fruit flies

Abstract:

Flies respond to perturbations with fast, accurate corrections. To evaluate visual information quickly, flies have evolved optimizations, such as parallel processing by separate visual regions. *Drosophila melanogaster*, respond strongly to dorsal rotational flow, and ventral translational flow. They are sensitive to both parallax and density of ventrally moving elements, but these vary dramatically

between habitats, but it is unknown if these responses are matched to the structure of their native environment. To address this, we compared dorsal and ventral optic flow responses in three species: *Drosophila melanogaster*, a cosmopolitan fly native to habitats with dense vegetation, *Zaprionus indianus*, which flies under fig trees that potentially induce heavy dorsal optic flow, and *Drosophila mojavensis*, which flies in arid regions which may generate mostly ventral optic flow. We found modulation of stabilizing responses to ventral element density in all three, but the range of responsiveness in *D. mojavensis* is narrower. To dorsal sideslip, *Z. indianus* responds more strongly, and to a broader range of densities than *D. melanogaster*, while in *D. mojavensis* responses appear inhibited shortly after being elicited. Our findings suggest dorsoventral differentiation and response tune to the general structure of a visual environment, with potential specializations for flying beneath overhead structures or in barren environments. Subtle response modifications to in-flight visual patterns could allow fly species to navigate disparate habitats, opening a door to diversification.

Are you a student?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No

Abstract - ID: 513

Author(s):	Danielle Ingle ***;** Texas A&M University at Galveston Eliza Perez, Texas A&M University at Galveston Christopher Marshall, Texas A&M University

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	biomaterials, structure, and mechanics
Title:	Feeding without teeth: Rhamphotheca material properties from two species of durophagous sea turtles

Abstract:

The feeding apparatus of sea turtles is comprised of cornified keratinous rhamphothecae

overlaying a bony rostrum. Although keratin is less stiff than the enamel of toothed animals, certain species of sea turtles are capable of withstanding large forces when feeding on hard prey (e.g. bivalves, molluscs, and crabs). We aimed to quantify the mineral density and material properties of rhamphothecae from two durophagous species: loggerhead (*Caretta caretta*) and Kemp's ridley (*Lepidochelys kempii*) sea turtles. Since loggerheads produce the largest bite forces, we predicted that keratin from their rhamphothecae would have a greater mineral density and be stiffer and tougher compared to Kemp's ridley turtles. Rhamphothecae mineral density ranged between 0 - 0.069 g cm^{-3}; loggerheads had significantly greater mineral density compared to Kemp's ridleys, where several specimens had no mineral detected. Despite the greater mineral density in loggerheads, we found no significant difference in Young's modulus or yield strength between these species. In addition to mineral density, our findings suggest that other material components, such as sulfur, may be influencing the material properties of keratin from sea turtle rhamphothecae.

Are you a student?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/Q4iZfMNJjXSx08o.mp4_new.mp4

Abstract - ID: 538

Author(s):	Haoyuan Xu ***;** Beihang University Jiale Zhi Shuyong Zhao Lei Li, Beihang University Fuqiang Yang, Beihang University Li Wen, Beihang University

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative	bioinspired engineering and biomimetics

Biomechanics:

Title: Modeling, Analysis and Robotic Experiments of the Locomotion of Larval Net-Winged Midges

Abstract:

The suckers of Net-winged midge larvae can resist the high shear force induced by fast flow and can even crawl on slippery underwater surfaces with several locomotion patterns. The rapid and reversible suckers endow this remarkable capability on their abdomen. In this study, we design a biomimetic sucker to explore this mechanism with parametric modeling and finite element analysis. From FEA results, we infer that the angle of the midge sucker in nature allows the midge suckers to achieve firm adhesion while expending relatively less energy. Also, we define the locomotion of the sucker in four states: adhesion, detaching, sliding, and attaching. The kinetic modeling of the sliding state shows that the friction state switches to hydrodynamic lubrication when the V-notch of the sucker opens and liquid floods into the contact area. Thus the relative friction coefficient decreases and the sucker can slide rapidly. To test this hypothesis, we combined a biomimetic sucker with a soft linear actuator to form a crawling-adhesion motion unit and tested its motion characteristics on different surfaces.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation Video: https://xcdzoom.s3.amazonaws.com/0olfXlhinkn8nxp.mp4_new.mp4

Abstract - ID: 539

Author(s): Lei Li ***;** Beihang University
Wenbo Liu, Beihang University
Hongru Cai, Beihang University
Peiyu Hu, Beihang University
Zimo Li, Queen's University

Jihui Guo, Beihang University
Wenzhuo Gao, Beihang University
Youning Duo, Beihang University
Jiaxi Xing, Beihang University
Fuqiang Yang, Beihang University
Bocheng Tian, Beihang University
Li Wen, Beihang University

Session Type: Contributed Talk Presentations

Select the best divisional affiliation for this abstract: DCB - Comparative Biomechanics

Select Topic: DCB - Comparative Biomechanics: bioinspired engineering and biomimetics

Title: Remora-inspired sensing adhesive disc for an intelligent hitchhiking robot

Abstract:

Remora suckerfish (*Echeneis naucrates*) can attach to various marine hosts using its adhesive disc pad. Hitchhike to the fast-moving hosts is challenging because it requires not only the structural features of the disc to form adhesion but also the ability to sense attachment/detachment. Inspired by the anatomical structure of the mechanoreceptors of the remora disc, we developed a remora-inspired adhesive disc pad with two flexible multi-layered tactile sensors embedded in the soft lip. We investigated the prototype's sensing performance for different attachment areas with varied preloading forces, surfaces, and environments. The results show that the sensors can distinguish the attachment and detachment states and measure the attachment area of the biomimetic disc both in the air and underwater. We equipped the disc prototype on an aerial-aquatic fully autonomous drone with an onboard depth camera for visual sensory. The results show that the robot can detect the adhesive surface by vision, automatically generate a movement path, cross the air-water boundary, attach to the surface by the disc's sensory feedback, and maintain attachment for a period. Our study may shed light on future autonomous robots with the capabilities of intelligent navigation, host identification and perception, adhesion, and operation in complex aerial-aquatic environments.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation Video: https://xcdzoom.s3.amazonaws.com/r8jZHk9Zn37x723.mp4_new.mp4

Abstract - ID: 540

Author(s): Yongqi Shi
Wenguang Sun
Gang Wang **(Presenter)**
Jiongjie Fang
Yunfeng Ya
Shuhan Liu
Zhibin Hu
Li Wen, Beihang University

Session Type: Contributed Talk Presentations

Title: Fish finlet inspired flexible electronic skin for underwater robotic proprioception and sensing

Abstract:

Fish fins can perceive the surrounding environment and its movement, which is vital in high-speed and high-maneuverable swimmers. Based on the perception mechanism of the tuna finlet, we developed a modular bionic flexible finlet-sensing system. The finlet-sensing system mainly consists of two components, the sensing part, whose structure is inspired by the finlet, and the signal processing circuit, both manufactured by liquid metal printing and laser processing technology. The signal processing circuit can process data from environmental perception, signal processing, and data transmission. These two parts were fabricated simultaneously on the plane state and then folded to form a three-dimensional configuration. Experimental results showed that finlet could perceive the tail-beat amplitude up to 90 degrees and frequency up to 2Hz. Moreover, we found that the finlet was passive waving which has a phase difference as functions of the tail-beat. Additionally, experiments demonstrated the ability to use finlet as feedback to control robotic tuna swimming and respond to external stimuli mimicking evading movement. We envision that this bionic flexible finlet-sensing system can provide a valuable perception scheme for future underwater autonomous vehicles.

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation Video: https://xcdzoom.s3.amazonaws.com/FWRCjRWidyLACz4.mp4_new.mp4

Abstract - ID: 571

Author(s): Rick Hochberg ***;** University of Massachusetts Lowell
Thiago Araújo, University of Massachusetts Lowell
Elizabeth Walsh, University of Texas El Paso
Jonathan Mohl, University of Texas El Paso
Robert Wallace, Ripon College

Session Type: Contributed Poster Presentations

Select the best divisional affiliation for this abstract: DIZ - Invertebrate Zoology

Select Topic: evolutionary morphology and physiology

DIZ - Invertebrate Zoology:

Are you associated with one of SICB's affiliated societies? Please indicate below:: AMS - American Microscopical Society

Title: Social parasitism and cryptic aggressive mimicry in a rotifer?

Abstract:

Parasitism in Syndermata is mostly restricted to acanthocephalans, with occurrence in rotifers present in few species. One species, *Acyclus inquietus*, lives within colonies of *Sinantherina*, a colonial sessile rotifer. For *A. inquietus,* this relationship appears to be obligatory, but its nature is not well known. Female *A. inquietus* live permanently within the host colony, feeding on colony embryos and juveniles, thereby using the host as habitat and food. Because some species of *Sinantherina* are unpalatable to various predators, *A. inquietus* and her offspring may also receive protection. When her eggs hatch, larvae of *A. inquietus* leave the colony and eventually settle in a new *Sinantherina* colony. Colony individuals show no behavioral changes as *Acyclus* larvae invade. We hypothesize that this lack of recognition might be related to a form of cryptic aggressive mimicry. To study this, we used scanning and transmission electron microscopy to explore the integument of both the parasite and its hosts. We note that the integument of both rotifers is more similar to each other than they are to other related rotifers. We hypothesize that these similarities are a form of morphological camouflage that prevent host recognition, but we cannot rule out other forms of mimicry: e.g., chemical. We tentatively characterize the association between *A. inquietus* and *Sinantherina* as the first known cases of

social parasitism and cryptic aggressive mimicry in Rotifera.

Are you a student?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_571_0111062359.pdf

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Abstract - ID: 610

Author(s):	Matthew Lattanzio ***;** Christopher Newport University
Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DEE - Ecology & Evolution
Select Topic: DEE - Ecology & Evolution:	evolutionary ecology
Title:	Beyond thermoregulation: Habitat selection strongly impacts UV regulation in tree lizards

Abstract:

Over a century of ecophysiological studies on reptiles have perpetuated the assumption that basking and shuttling behaviors function solely for temperature regulation. However, these behaviors also modulate exposure to ultraviolet (UV) light essential for maintaining physiological homeostasis and ensuring proper growth and development. An alternative hypothesis is that lizards also actively regulate their UV exposure. In this scenario, microhabitat use should influence both temperature and UV regulation effectiveness, potentially in contrasting ways. I test this hypothesis on tree lizards (Urosaurus ornatus), employing a classic thermoregulatory framework with operative, preferred, and body exposure values of both UV and temperature. Despite operative UV models revealing daily exposure to UV often exceeding 10 (UV Index), tree lizards preferred values between ~0.5-2.9 UVI. Temperature preferences

and exposures matched prior studies; interestingly, operative temperature models revealed that lizards could attain preferred temperatures in the shade, especially lizards using living trees over dead snags. However, use of living trees conferred a much stronger UV advantage: UV regulatory effectiveness of lizards in trees was almost double that for lizards using snags. Overall, my findings confirm active UV regulation in tree lizards, and support that microhabitat selection has divergent impacts on the ability of a lizard to satisfy both UV and thermal demands. Addressing these considerations will be vital to improve our understanding of the evolution and diversity of photoregulation behavior in nature.

Are you a student?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	Yes
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/Xl3WaXmXrruBaed.mp4_new.mp4

Abstract - ID: 645

Author(s):	MD Rahman ***;** University of Texas Rio Grande Valley
Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DCPB - Comparative Physiology & Biochemistry
Select Topic: DCPB - Comparative Physiology & Biochemistry:	comparative biochemistry
Title:	Hypoxia Exposure Triggers Cellular Apoptosis, DNA breaks, and Epigenetic Signals in Red Snapper

Abstract:

Epigenetic modifications such as DNA methylation and histone acetylation impact developmental processes in vertebrates. However, little is known about the epigenetic modifications occurring in aquatic vertebrates during exposure to environmental hypoxia. In this

study, we investigated the changes in global DNA methylation and regulation of the related enzyme, DNA methyltransferase (DNMT), in hepatic tissues of red snapper after chronic exposure to hypoxia (dissolved oxygen 1.7 mg/L for 4 weeks). Chronic hypoxia exposure caused marked increases in the immunoreactive (IR) expression of ssDNA, dsDNA, and 8-hydroxy-2-deoxy guanosine (8-OHdG, a key marker of oxidative DNA damage) and decreases the mRNA levels of insulin-like growth factor (IGF-I and IGF-II) in hepatic tissues. The IR intensities of DNMT-1 and 5-methylcytosine (5-mC, a methylated form of DNA base cytosine) were markedly increased in hepatic tissues after hypoxia exposure. Collectively these results suggest that hypoxia leads to induction of DNA methylation through the related enzyme, DNMT, which might be involved in epigenetic modifications during exposure to environmental hypoxia in aquatic vertebrates.

Are you a student?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No

Abstract - ID: 648

Author(s):	MD Rahman ***;** University of Texas Rio Grande Valley
Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCPB - Comparative Physiology & Biochemistry
Select Topic: DCPB - Comparative Physiology & Biochemistry:	cell and molecular physiology
Title:	Physiological, Molecular & Biochemical Responses in Atlantic Croaker Exposed to Environmental Stress

Abstract:

Knowledge of the effects of environmental exposure to hypoxia on critical physiological functions is essential for accurate predictions of its chronic impacts on aquatic organisms. Marked disruption of

reproductive and endocrine functions was observed in Atlantic croaker collected from the hypoxic region in the northern Gulf of Mexico. Recent research has shown that growth and its physiological upregulation are also impaired in hypoxia-exposed marine fish. Expression of IGFBP, a growth inhibitory protein, and HIF-1alpha, an oxygen-sensitive transcription factor, were upregulated in croaker tissues collected from hypoxic environments. Preliminary field and laboratory studies indicate that hypoxia exposure also causes epigenetic modifications, including increases in global DNA methylation in croaker. Epigenetic modifications can be passed to offspring and persist in future generations no longer exposed to an environmental stressor. Collectively, the results indicate that environmental hypoxia exposure disrupts major physiological functions in marine teleost species critical for maintenance fish population.

Are you a student?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No

Abstract - ID: 651

Author(s):	Elizabeth Lange ***;** Duke Univeristy Shuxi Zeng Fernando Campos, University of Texas at San Antonio Fan Li Laurence Gesquiere Elizabeth Archie Susan Alberts
Session Type:	Symposia and complementary sessions
Is your Abstract an invited talk or would you like to be considered for a complementary session?:	Consider my abstract for complementary session
Are you submitting for a complementary talk or poster session?:	Complementary Talk Presentations
What symposium	7. Biology at birth: the role of infancy in providing the foundation for

is your abstract affiliated with?:	lifetime success
Title:	Early life environments have long-term effects on adult physiology and survival

Abstract:

Harsh early life environments are linked to a variety of negative outcomes in humans and non-human primates, including poor survival in adulthood. Understanding the pathways that drive the relationship between early life adversity and reduced survival is key both for understanding the evolutionary and biological underpinnings of this relationship, and for informing social policy. In this study, we leverage a long-term dataset of a wild animal model of aging, baboons of the Amboseli ecosystem in southern Kenya, to test hypotheses about how adult physiological phenotypes link early life adversity to adult survival. We find that for each additional source of early life adversity experienced by female baboons, the concentration of glucocorticoid metabolites in fecal samples (fGC) during adulthood increased by 12%, and adult lifespan decreased by 1.8 years. However, we find little evidence that adult fGC profiles mediate the effects of early life adversity and adult survival. Instead, we find independent effects of early life adversity and adult fGC concentrations on survival. The negative effects of maternal loss and low maternal social connectedness on survival are also buffered by a decrease in fGC concentrations. Our results show strong effects of early life environments on adult life and indicate that adult physiological processes can help mitigate the costs of negative early life environments.

In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/iHLHX9UwuHZTkCX.mp4_new.mp4

Abstract - ID: 686

Author(s):	Maria Gaughan ***;** Assumption University Nicolas Lessios, Assumption University
Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DNNSB - Neurobiology, Neuroethology, and Sensory Biology

Select Topic: aquatic sensory biology

DNNSB - Neurobiology, Neuroethology, and Sensory Biology:

Are you associated with one of SICB's affiliated societies? Please indicate below:: TCS - The Crustacean Society

Title: Broad and narrow spectrum phototactic responses of branchiopod crustaceans: red-tail fairy shrimp and tadpole shrimp

Abstract:

Fairy and tadpole shrimp have more spectral photoreceptor classes than expected given their reduced nervous systems for processing visual information. Both shrimp are branchiopods, a group of crustaceans that are often found in temporary pond habitats, and they are thought to use light cues for orienting behavior. Other organisms with many spectral photoreceptor classes, such as birds, butterflies, and fish, tend to have more complex sensory systems which process spectral information as color vision. It is possible that branchiopods have maintained multiple spectral photoreceptor classes for luminance vision in dim, spectrally variable habitats. We tested how fairy and tadpole shrimp respond behaviorally to broad and narrow spectrum light for phototactic behavior. These assays may indicate if color vision is being used. Fairy and tadpole shrimp behavioral responses were photonegative at higher intensities, such as those in late morning or early afternoon sunlight in a terrestrial habitat. Responses at intensities lower than starlight in a terrestrial habitat suggest tadpole shrimp are more sensitive to dim light than fairy shrimp, and neither shrimp uses color vision at these intensities. Male fairy shrimp become positively phototactic to broad spectrum light at low intensity. Broad and narrow spectrum behavioral results were similar, suggesting color vision is unlikely at low intensities. It remains to be seen whether responses at high intensities use color vision.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: Yes

Check if you would like to compete in one of these Best TCS – The Crustacean Society

Student Presentation competitions:	
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	Yes
Sign up to be a session chair:	No
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_686_0110022623.pdf

Abstract - ID: 714

Author(s):	Jiaqi Liu **(Presenter)** Feiyang Yuan Zhexin Xie Bohan Chen Zhongqiang Fu Lufeng Tian Sizhe Mao Li Wen, Beihang University

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	robotics
Title:	A Bending Propagation Model for Soft Continuum Robot Inspired by Octopus

Abstract:

The octopus commonly utilized a reaching motion to catch prey. The octopus arm bending starts from the arm's base and propagates along the arm toward the tip. To investigate this unique behavioral feature, we proposed a simple, reprogrammable, discrete kinematic model to describe the octopus arm's bending and propagation motion. First, we introduced the classical "rose line"

equation in polar coordinates to describe the kinematics of octopus bending propagation. In particular, the kinematics of the arm can be determined by three variables: the total length of the arm, the distance between the bending point and the arm's root, and the curvature of the bending wave. Considering that the biological octopus arm is composed of massive segments, we developed the robotic model's kinematic function in a discrete form. For simplification, we describe the posture of the soft robotic arm by N continuous arcs with constant curvature. We found an optimal arc length ratio fitting the discrete form of the kinematic function. Then we applied this model to a soft robotic octopus arm with a total length of 1.5m, equipped with a soft robotic tentacle gripper. Results show that the soft robotic arm could reach and grasp objects in air and water using bending propagation. During the process, no more than two actuators were activated simultaneously during the robotic arm's bending propagation, notably reducing the control complexity.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/HS6gVOMC1BH25QA.mp4_new.mp4

Abstract - ID: 724

Author(s):	Catherine Tylan ***;** Penn State Tracy Langkilde
Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCPB - Comparative Physiology & Biochemistry
Select Topic: DCPB -	metabolism

Comparative Physiology & Biochemistry:

Title: Effects of fire ant consumption and attack on energy absorption in the eastern fence lizard

Abstract:

The invasive red imported fire ant (*Solenopsis invicta*) is one of the most successful invasive species globally, having been found in North America, Australia, and Asia as well as its native South America. Much more territory worldwide is theorized to be hospitable to this ant, and it is likely to spread to additional areas. In our system, the invasive red imported fire ant is both a novel predator and novel prey item for the native eastern fence lizard (*Sceloporus undulatus*). From previous research in this system, we know that fire ants can affect the diet, immune function, behavior, and morphology of eastern fence lizards. In order to explore interactions between the two species as mutual predator and prey, we exposed lizards to fire ants through two different routes – either fed fire ants or stung by fire ants, with a third handling control group. We found that neither fire ant consumption nor attack altered energy intake or energy allocation to body mass. Resting metabolic rate trended higher in males stung by fire ants, but not females. Treatment altered the interaction between stress hormones and metabolism, with only lizards stung by fire ants showing a positive relationship between corticosterone and energy allocation to mass. We also assessed the effects of treatment on energy absorption from food, by measuring fecal calorie content and will report those data.

Are you a student?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation Video: https://xcdzoom.s3.amazonaws.com/A4PhdNDrEmgdAXL.mp4_new.mp4

Abstract - ID: 732

Author(s): Steven Jasinski ***;** Harrisburg University

Session Type: Contributed Talk Presentations

Select the best divisional affiliation for this DEE - Ecology & Evolution

abstract:

Select Topic: DEE - Ecology & Evolution: species and speciation

Title: Vicariance and biogeographic expansion of Chrysemys (Testudines: Emydidae) during the Neogene

Abstract:

Chrysemys, commonly known today as Painted Turtles, have the largest native biogeographic range of all North American turtles. The presence of a new species in the late Hemphillian-early Blancan North American Land Mammal Age (latest Miocene-early Pliocene) of Tennessee provides further data on the evolution of *Chrysemys*, deirochelyines, and emydids. The earliest species of deirochelyines, particularly *Chrysemys*, occur after the greenhouse conditions of the Eocene. The new species adds to a growing number of fossil species of emydids present during a time when global temperatures were changing, namely growing cooler after the Mid-Miocene Climatic Optimum. It is inferred cooler temperatures after these warmer conditions led to vicariance among these turtles. Vicariance aided their evolution by leading to times of high speciation as populations were separated and allowed to become isolated. Fossils of *Chrysemys* also hint at the biogeographic expansion of these turtles over the last approximately 15 million years. This is shown by more lateral expansions along longitudinal gradients and northern expansions along latitudinal gradients in times of warmer global temperatures and southern expansion along latitudinal gradients during cooler global temperatures. Fossil *Chrysemys* provides clues to how changing global temperatures may affect some turtle species moving forward. As speciation potentially slows during times of high global temperatures, it may take turtle biodiversity longer to recover from the dangerous conditions they are dealing with today.

Are you a student?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: Yes

Presentation Video: https://xcdzoom.s3.amazonaws.com/ablp9co9fHXG2Ez.mp4_new.mp4

Abstract - ID: 763

Author(s): Feiyang Yuan **(Presenter)**

Zhexin Xie
Jiaqi Liu
Lufeng Tian
Bohan Chen
Zhongqiang Fu
Sizhe Mao
Gang Wang
Li Wen, Beihang University

Session Type: Contributed Talk Presentations

Select the best divisional affiliation for this abstract: DCB - Comparative Biomechanics

Select Topic: DCB - Comparative Biomechanics: robotics

Title: A Bio-inspired Interactive Soft Machine Integrated with Embodied Highly Stretchable Electronics

Abstract:

The embodied neural network of the octopus arm, i.e., brachial ganglia and sucker ganglia, endowed the octopus with environmental awareness, decision-making, and extraordinary manipulation in complex environments. In this study, we imitate this unique octopus feature and implement a bio-inspired soft tentacle robot embodied with highly deformable sensors and control circuits. In particular, we integrate IC chips, electronic components, and flexible sensing (suction, bending, and temperature sensing) through printing and transferring liquid metal circuits onto the silicone rubber substrate. We show that the tentacle can perceive, process sensory information, endow grasping decisions, and alter control parameters. We also designed a liquid metal sensing circuit and embedded three vacuum suction cups for haptic feedback. This glove provides human subjects with suction sensations that were synchronized with the perception of the prototype suction cups. On this basis, we realize the interactive control of the prototype with one human finger. The results show that the robot system can complete the tasks of identifying and avoiding obstacles, detecting and closed-loop grasping objects in an unstructured environment. Through the suction haptic feedback, one can operate the bio-inspired prototype to search, grasp and fetch the target object without visual information. This paper provides a new method for soft robots that operate in unstructured environments and interact safely with humans.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting SICB+ only

and/or SICB+:	
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/Oi4RPY2Hf1ZtoGm.mp4_new.mp4

Abstract - ID: 770

Author(s):	Po-Lin Kuo ***;** National Tsing Hua University Patricia Yang, National Tsing Hua University

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	terrestrial locomotion
Title:	The Flapping Frequency of Dust Bathing in Avians

Abstract:

Birds remove excess lipids and ectoparasites from the plumage by dust bathing. While dust bathing, birds dig the ground with their legs, spread loose sand particles on their body, and shake the sand off with their wings. This behavior is common in avians, but the mechanism is unclear. In this study, we apply videography and a mathematical model to investigate the flapping frequency of dust bathing. The flapping frequency scales with body mass to the power of -0.13 (N = 32). An 88-kg ostrich flaps in dust ten times slower than a 0.02 kg hummingbird. The relationship between flapping frequency in dust and body mass is similar to the frequency when birds flap their wings in the air. We use a cantilever beam to model the wing. Larger birds have a higher moment of inertia and thus flap slower in the dust. This study may shed light on eco-friendly dry-cleaning technologies.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No

In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/L17bzNU4mVApG7A.mp4_new.mp4

Abstract - ID: 772

Author(s):	Guan Yu Chen ***;** National Tsing Hua University Patricia Yang, National Tsing Hua University

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	muscle and tendon morphology and mechanics
Title:	Mechanics of Take-off in Avians

Abstract:

During the process of avian take-off, birds extend their hindlimbs to exert sufficient force on ground for take-off. The duration of take-off in birds starts from reaching the lowest position to lifting off the ground. Previous studies reported that the process is related to the change of mechanical efficiency and pre-storage of elastic energy in hindlimb tendons, but the equation of motion is unclear. In this experimental and theoretical study, we collect the take-off high speed videos of 14 species. From a 19-g robin red breast to a 5-kg goose, the duration of take-off is around 100 milliseconds. We model avian take-off as a vibrational system, so the take-off time is the inverse of the natural frequency determined by the stiffness of the involved muscles. The stiffness has similar values across species, so the predicted take-off time is about the same. This study provides a more comprehensive understanding of avian mechanics and helps the development of bio-inspired jumping robots.

Are you a student?:	Yes
Do you want to compete for the	No

Best Student Presentation competition?:	
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/DzkdGpKo00S9zJI.mp4_new.mp4

Abstract - ID: 779

Author(s):	Hao-Ping Wang ***;** National Tsing Hua University Patricia Yang, National Tsing Hua University

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	aquatic locomotion
Title:	Surface tension barrier for juvenile flying fish

Abstract:

Juvenile flying fish fail to break the water surface due to the surface tension while it tries to leap out of water. The penetration process is highly correlated with the fish size, but the critical size of the fish is still unknown. In our experimental and theoretical study, we release buoyant spheres under the water surface to mimic juvenile flying fish. All spheres float to the water surface at high speed, but the penetrating process depends on the size of the sphere. The critical diameter of the sphere for breaking water surface is 5.2 mm. Spheres smaller than this diameter fail to penetrate the water surface. The phoenoma is the force balance between surface tension, gravity force, and buoyancy force. The predicted minimum diameter is around 2 mm, which is one-third of the experimental results. The inconsistency is possibly due to the surface properties of the sphere. Understanding the leaping process of juvenile flying fish probably shed light on the design of micro aero-hydro vehicles.

Keywords: flying fish, surface tension, biofluids

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/NSx9rIteNo8pJ8L.mp4_new.mp4

Abstract - ID: 798

Author(s):	Thiago Araújo ***;** University of Massachusetts Lowell Rick Hochberg, University of Massachusetts Lowell
Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DIZ - Invertebrate Zoology
Select Topic:	evolutionary morphology and physiology
DIZ - Invertebrate Zoology:	
Title:	Spines: Protection, Locomotion or both? Gastrotricha as a case study

Abstract:

Gastrotricha is an important group of microinvertebrates found in marine and freshwater environments. The most specious clade within the taxon is Order Chaetonotida, which comprises 520 species in 32 genera across seven families. Despite having similar body shapes, there is enormous variability in the structure of their cuticle (e.g., scaleless, scaled, spined,

spined scales), which has strong taxonomic value. These cuticular ornaments presumably provide a protective function, though adaptive significance of the individual types is unknown. Scales and spines are immobile in most species, but in two families, the Neogosseidae and Dasydytide, species can move their spines to engage in saltatorial locomotion. These spines are controlled by segmented lateral and oblique muscles that insert on the integument beneath the spines. The muscles antagonize each other, and their alternating contractions create a paddle-like movement. Curiously, an unrelated group within a different family, Chaetonotidae, can also move their spines in a similar fashion. However, these species cannot engage in saltation, nor do they rely on the same muscles for abduction and adduction as other species. Instead, their spines are supplied by small branches of the large longitudinal muscles. When these muscles contract, their spines flare outward, and seem to only function for protection. This study, we use CSLM and TEM to explore the muscles that control spine movement and place these observations in a phylogenetic context.

Are you a student?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	Yes
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_798_0113092521.pdf

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Abstract - ID: 811

Author(s):	Dennis Wang Lu ***;** National Tsing Hua University Patricia Yang, National Tsing Hua University
Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	terrestrial locomotion

Title: Pectinate Claws in Avians

Abstract:

Birds eliminate ectoparasites in feathers mostly by preening, but preening does not reach birds' heads. Specific bird species grow claws with several indentations forming teeths, combined called a pectinate claw. Previous studies hypothesized that these species use pectinate claws to remove ectoparasites for the head area, but the mechanics of removal and other functions of the pectinate claws are yet unknown. In this combined experimental and theoretical study, we apply species measurement and video-recordings to unravel the function of this structure. We examined the claws of 18 bird species from Yellow Bitterns to Gray Herons, spanning 15-fold in body weight as well as the video recordings on birds scratching. The average distance between each tooth, teeth height, and scratching period remain relatively constant across species. We hypothesize that pectinate claws are the optimal design for ectoparasite removal as well as feather maintenance. We hope this study may help develop new bio-inspired dry cleaning technologies.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/wL0oS4RTyshFTXU.mp4_new.mp4

Abstract - ID: 899

Author(s):	Kinsey Brock ***;** University of California - Berkeley

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DAB - Animal Behavior
Select Topic: DAB	social behavior

- Animal Behavior:

Select Topic: character development and evolution

DPCB - Phylogenetics and Comparative Biology:

Title: Color morph predicts social behavior and contest outcome in a polymorphic lizard

Abstract:

Space is a limited resource that many animals need to perform basic functions such as feeding and reproducing. Competition over access to space can induce a variety of behaviours that may result in differential access to crucial resources related to survival and fitness. The Aegean wall lizard, *Podarcis erhardii*, is a color polymorphic lizard that inhabits dry stone walls where they access food, safely thermoregulate, shelter from predators, and interact with other lizards. Many colour-polymorphic species have morphs with distinct behavioural strategies, which may play a role in morph evolution and maintenance. To compare morph competitive ability and characterize morph differences in social behaviours, I used laboratory contest experiments over a limited heated space on a stone wall in a neutral arena. Experiments revealed that color morph, not size, predicted intermorph contest outcomes. White and yellow morphs were associated with winning and the orange morph was associated with losing contests. Male color morphs exhibited different levels of aggressive, boldness, chemical signalling, and visual signalling behaviors depending on which morph they were in contest with. Considering these results, social behavioral variation among *P. erhardii* color morphs may promote morph maintenance.

Are you a student?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Abstract - ID: 923

Author(s): Matheo López Pachón ***;** Universitat Rovira i Virgili
Jorge Esteve, Universidad Complutense de Madrid, España-Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de CC. Geológicas,

Session Type: Contributed Poster Presentations

Select the best divisional affiliation for this abstract: DCB - Comparative Biomechanics

Select Topic: DAB - Animal Behavior: evolution of behavior

Select Topic: DCB - Comparative Biomechanics: modeling and computational approaches

Select Topic: DEE - Ecology & Evolution: evolutionary paleobiology

Title: Why enroll in the Middle of the Ordovician sea?: The case of the pelagic trilobite Microparia

Abstract:

Trilobites have occupied most ecological niches since the Cambrian, including benthic and pelagic environments. But, they did not reach their maximum expansion in pelagic environments until the Ordovician. We focus our work on a hydrodynamic trilobite from the Ordovician of Bohemia, the cycloplegic *Microparia*. Compared to the nectobenthic trilobite *Hypodicranotus*, which has a secondary coiling reason, it retained the ability to encapsulate its body perfectly.

We examined whether and how enrollment represented an advantage in this trilobite. Numerical simulations based on computational fluid dynamics (CFD) were implemented to help us explore the hydrodynamic behavior of *Microparia*. The results show very low drag coefficients when the models are stretched, suggesting that this trilobite was a strong swimmer. With the *Microparia* coiled, the drag coefficients are even lower as the shape becomes markedly oval, which is very efficient in reducing drag.

On the other hand, the lift is almost zero. Therefore, the water currents do not push *Microparia* towards the sea surface or the sea floor. These results show high stability in the horizontal plane and suggest that *Microparia* could be almost stable in the water column when rolled up, which is a hydrodynamic advantage. For this reason, this shows morphological indications that the coil was not only used for protection from predators.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person SICB+ only

meeting and/or SICB+:	
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/bJVr5s1bVGNoetC.mp4_new.mp4
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_923_0114112158.pdf

Abstract - ID: 973

Author(s):	Nathalie Alomar **(Presenter)** Eric Riddell, Iowa State University Martha Muñoz, Yale University

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DEE - Ecology & Evolution
Select Topic: DEE - Ecology & Evolution:	evolutionary morphology and physiology
Title:	Comparing Physiological Traits of Lungless Terrestrial Salamanders

Abstract:

Woodland salamanders (genus: *Plethodon*) reside in the North American Appalachian Mountains: the global hotspot for salamander biodiversity. The slimy salamander (*P. glutinosus* complex) and the red-backed salamander (*P. cinereus* complex), like other woodland salamanders, are a 'non-adaptive radiation' characterized by little ecomorphological differentiation. Yet, these lineages are also characterized by rapid diversification rates, urging a deeper exploration of other potential dimensions of ecological diversity, like physiology. For example, those found in moister and warmer microhabitats could be physiology adapted to those environments (higher water loss rates, higher metabolic rates). We tested this hypothesis by collecting 14 species of *glutinosus* salamanders and 6 species of *cinereus* salamanders along with their microhabitat data across the Appalachian Mountains. We collected each species' water loss rates across different temperatures and water vapor pressures as well as metabolic rates, critical thermal maximum, minimum, and thermal preference. The results allow for a

comparison of hydric, thermal and metabolic physiology between two clades in the *Plethodon* genus. It also allows for an inference of the environmental variables that correlate with physiological diversity.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No

Abstract - ID: 983

Author(s):	Alexandra Vetrova ***;** N.K. Koltsov Institute of Developmental Biology (IDB), RAS, Russia, Moscow Daria Kupaeva, N.K. Koltsov Institute of Developmental Biology (IDB), RAS, Russia, Moscow Nikoloz Tsikolia, Institute of Anatomy and Embryology, University Medical Center Göttingen Stanislav Kremnyov, Department of Embryology, Faculty of Biology, Lomonosov Moscow State University,

Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DEDB - Evolutionary Developmental Biology
Select Topic: DEDB - Evolutionary Developmental Biology:	evolution of developmental mechanisms
Title:	Brachyury genes in Hydrozoa: duplications, divergence, and neofunctionalization

Abstract:

Brachyury gene is a founding member of the T-box transcription factor family. Though Brachyury is an established mesodermal marker gene, its homologs were also discovered in diploblasts, such as cnidarians. A single copy of the Brachyury gene is present in genomes of anthozoans, but hydrozoans *Hydra* and *C. hemisphaerica* have at least two copies. It is unclear if gene duplication occurred in the common hydrozoan ancestor or if there were several independent lineage-specific events.

Using phylogenetic analysis, we reconstructed the Brachyury evolution within cnidarians. Duplication events occurred in the common ancestor of Meduzozoa and once more in the hydrozoan lineage. Thus, there are three Brachyury genes in hydrozoans, though several species, such as *Hydra*, have lost one of the copies. We examined the expression of three Brachyury paralogs of the hydrozoan *Dynamena pumila* during normal development and in the colony. *In situ* hybridization revealed DpBra1 and DpBra2 expression in oral tissues of *D. pumila* and DpBra3 expression in neural cells of a larva.

Brachyury is a direct target gene of the cWnt pathway. We tested if all three Brachyury paralogs are regulated by cWnt. Pharmacological modulations of cWnt demonstrate that DpBra3 is differently regulated in comparison with DpBra1 and DpBra2. Taken together, our results suggest the neofunctionalization of the most recent Brachyury paralog in *D. pumila*.

RFBR, 20-04-00978a, supports the work.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_983_0116012030.pdf

Abstract - ID: 991

Author(s): Toriann Molis ***;** Texas State University
Utpal Smart
David Rodriguez, Texas State University

Session Type: Contributed Talk Presentations

Select the best divisional affiliation for this abstract: DEE - Ecology & Evolution

Select Topic: DEE - Ecology & Evolution: comparative genomics and proteomics

Title: Nanopore sequencing of the Cachabi robber frog (Pristimantis achatinus) mitochondrial genome

Abstract:

Measuring diversity can now be performed *in situ* with portable nanopore DNA sequencing technology. To facilitate this, universal PCR primers meant to target the 12S, 16S, and ND1 regions of the mitogenome have been designed to generate fragments of ~3400 base pairs (bp) when applied to many amphibians; however, in *Pristimantis achatinus,* they only generate fragments of ~900 bp. In amphibians with a typical mitochondrial gene arrangement, the forward primer anneals in the middle of the 12S region, while the reverse primer anneals just beyond ND1 on a methionine-tRNA. To investigate the cause of the decreased amplicon size, we performed a series of tests using nanopore sequencing, wherein we attempted to sequence the entire mitochondrial genome of *P. achatinus* through both enrichment and non-enrichment protocols. We found there are two other met-tRNAs in the mitogenome of *P. achatinus:* one just beyond a different placement of the 16S region and one at the start of the original placement of the D-loop. Though the reverse primer can anneal to these two locations, it preferentially targets the met-tRNA closest to the forward primer, resulting in far more of the smaller fragments than the much larger sequences the other two binding sites would typically produce.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate No

Institution:	
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/skEF1cj0gkJaauw.mp4_new.mp4

Abstract - ID: 999

Author(s):	Eliza Perez ***;** Texas A&M University at Galveston Danielle Ingle, Texas A&M University at Galveston Christopher Marshall, Texas A&M University

Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic:	biomaterials, structure, and mechanics
DCB - Comparative Biomechanics:	
Title:	Flexural Stiffness Analysis on the Costal Scutes of Sea Turtles

Abstract:

Keratinous scutes are a key feature of the carapace on cheloniid sea turtles, and function as the first line of defense against predators and the environment. This study analyzed, quantified, and compared intra- and interspecific differences in the flexural stiffness (FS) of costal scutes on Kemp's ridley (*Lepidochelys kempii*), loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) sea turtles. Nine samples were collected from necropsied specimens. Scute thicknesses were measured to observe variations that may result in an uneven bending surface. Two longitudinal samples were cut from each scute (80x20mm, 60x15mm, or 40x10mm) to test FS under ambient dry and rehydrated conditions. Samples set for rehydration were measured and weighed then submerged in filtered seawater for five days. All samples underwent a three-point bending test using an MTS Insight 5 with a 2.5 kN load cell and a Mark-10 bending apparatus. Data collected from stress-strain curves were used to calculate and compare FS. Means calculated in this study were 21.60 kPa ± 2.57 kPa for Kemp's, 8.59k Pa ± 7.89 kPa for loggerheads, and 13.24 kPa ± 18.64 kPa for greens. No significant difference regarding FS was found likely due to the small sample size. A more extensive set of data would provide better insight into the ontogenetic variation of FS both within and among our target species.

Are you a student?:	Yes

Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	Yes
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/u9mTIsQVmK0eHxN.mp4_new.mp4
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_999_0119011250.pdf

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Abstract - ID: 1000

Author(s):	Carolyn Pope ***;** Texas A&M University at Galveston Danielle Ingle, Texas A&M University at Galveston Christopher Marshall, Texas A&M University
Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	muscle and tendon morphology and mechanics
Select Topic: DVM - Vertebrate Morphology:	muscles and muscle action
Title:	Comparing Pectoral Muscle Tension in Sea Turtles Along the Upper Texas Coast
Abstract:	

Sea turtles are known for their characteristic undulatory motion that produces a propulsive motion with their forelimbs. The pectoralis major muscle is one of the primary muscles responsible for this movement. The objective of this study is to compare and analyze the morphology of pectoralis major muscle by calculating the maximum theoretical muscle tension for two Gulf of Mexico sea turtle species, green (*Chelonia mydas*) and Kemp's ridley (*Lepidochelys kempii*). Samples of pectoralis major were dissected from Code 1 stranded green and Kemp's ridley sea turtles during necropsy by the Gulf Center for Sea Turtle Research. The muscle was photographed in situ, removed, and weighed. Transverse cross-sections were cut from each muscle and cross-sectional areas were measured using ImageJ. Maximum theoretical muscle tension for each sample was calculated based on muscle density for vertebrates, muscle fiber length, and physiological cross-sectional area (PCSA) with the equations: PCSA = (muscle mass) x (cos?)/(FL) x (muscle density) and MTMT = (PCSA)(specific tension). The mean muscle tensions were 0.010 N ± 0.011 for greens and 0.041 ± 0.063 for Kemp's ridleys. All data were normalized for size. We found that Kemp's ridley turtles exhibited greater variability of muscle tension among individuals, and an overall higher MTMT compared to greens. This suggests behavioral performance differences between these two species that may influence their natural history.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/QHwGZa7LV69KEB1.mp4_new.mp4
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_1000_0119093437.pdf

Abstract - ID: 1077

Author(s): Joanna Reinhold, Virginia Polytechnic Institute and State University
Helen Oker
Karthikeyan Chandrasegaran, Virginia Polytechnic Institute and State University
Jose Crespo, Laboratorio de Entomología Experimental—Grupo de Ecología Térmica en Insectos (GETI),
Clément Vinauger, Department of Biochemistry - Virginia Tech
Chloe Lahondere ***;** Virginia Tech

Session Type: Contributed Talk Presentations

Select the best divisional affiliation for this abstract: DAB - Animal Behavior

Select Topic: DAB - Animal Behavior: sensory biology

Title: Species-Specificity in Thermopreference and CO2-Gated Heat-Seeking in Culex Mosquitoes

Abstract:

Combining thermopreference (T_p) and CO_2-gated heat-seeking assays, we studied the thermal preferendum and response to thermal cues in three *Culex* mosquito species exhibiting differences in native habitat and host preference (e.g., biting cold and/or warm-blooded animals). Results show that these species differ in both T_p and heat-seeking behavior. In particular, we found that *Culex territans*, which feed primarily on cold-blood hosts, did not respond to heat during heat-seeking assays, regardless of the CO_2 concentration, but exhibited an intermediate T_p during resting. In contrast, *Cx. quinquefasciatus*, which feeds on warm blooded hosts, sought the coolest locations on a thermal gradient and responded only moderately to thermal stimuli when paired with CO_2 at higher concentrations. The third species, *Cx. tarsalis*, which has been shown to feed on a wide range of hosts, responded to heat when paired with high CO_2 levels and exhibited a high T_p. This study provides the first insights into the role of heat and CO_2 in the host seeking behavior of three disease vectors in the *Culex* genus and highlights differences in preferred resting temperatures.

Are you a student?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/V9Wz7EO4d8DC4O4.mp4_new.mp4

Abstract - ID: 1101

Author(s):	AVIK BANERJEE ***;** Indian Institute of Science Maria Thaker, Indian Institute of Science Mihir Joshi, Indian Institute of Science Fahis K T

Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DAB - Animal Behavior
Select Topic:	foraging behavior
DAB - Animal Behavior:	
Title:	An integrative approach towards understanding differences in diet composition

Abstract:

Foraging is an indispensable task for all animals as it provides necessary energy required for all fitness-related activities. Dietary choices are influenced by a range of factors, including internal states (e.g., age, sex, physiological condition) and external states (e.g., habitat structure, food availability). However, studies investigating the effects of both internal and external factors on diet selection are lacking. Using the sexually dimorphic tropical lizard species, *Psammophilus dorsalis*, as our model system, we quantified the diet of male and female lizards (through gut flushing) to prey Order level, across seasons (i.e., pre-breeding vs. breeding season) and across sites that differed in level of urbanization. We found that both sexes were predominantly myrmecophagous but showed seasonal and site-specific intersexual differences in prey Order frequencies. We also determined diurnal and seasonal variation in corticosterone levels and essential energy metabolites, such as glucose and triglycerides from blood samples from these wild-caught animals. We found seasonal differences in corticosterone levels and site-specific differences in energy metabolites. This study provides novel insights and better understanding of the concurrent effects of physiological demands, sexual size dimorphism (internal factors) and levels of urbanization (external factors) on diet composition.

Are you a student?:	Yes
Do you want to compete for	Yes

the Best Student Presentation competition?:	
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/iVpDwrWMWotTlCy.mp4_new.mp4
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_1101_0120111856.pdf

Abstract - ID: 1104

Author(s):	Andrew McKamy ***;** Youngstown State University Melody Young, New York Institute of Technology College of Osteopathic Medicine Angela Mossor, Northeast Ohio Medical University Edwin Dickinson, New York Institute of Technology Michael Butcher, Youngstown State University Michael Granatosky, New York Institute of Technology College of Osteopathic Medicine

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DVM - Vertebrate Morphology
Select Topic: DCB - Comparative Biomechanics:	muscle and tendon morphology and mechanics
Select Topic: DVM - Vertebrate Morphology:	muscles and muscle action
Title:	Muscle activation patterns in the pelvic limb of three-toed sloths

(Xenarthra: Pilosa).

Abstract:

Tree sloths are obligate suspensory mammals which have evolved behavioral and anatomical modifications to support their arboreal lifestyles. The roles of specific muscle groups for suspensory mammals are suspected to differ from those of upright taxa. Specifically, the hindlimb musculature must support bodyweight and contribute to control of locomotion by applying large braking forces. These expectations were tested by sampling simultaneous limb loading data and EMG activations in brown-throated three-toed sloths (*Bradypus variegatus: N=5*) to identify hindlimb muscle function during suspensory walking. Measurements involving EMG onsets/offsets and burst intensity were determined for 10 muscles to complement forelimb musculature that has been previously analyzed. The hindlimb flexors are generally activated most intensely later in the stride to provide braking forces and vertical support. The hip flexors appear to act as the main braking muscles and are most likely to co-activate with the m. pectoralis superficialis. With the exception of m. vastus lateralis, which contributes to strut-like function of the hindlimb, the extensors show bi-phasic activations that are most intense earlier in the contact to extend the hip and ankle joints and later to control joint position against flexor activations. The limb adductors are activated most intensely to provide medial forces during contact and control of limb abduction/lateral rotation during swing phase. These muscle activation patterns match well with the limb loading patterns observed in *B. variegatus*.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	Yes
Sign up to be a session chair:	No

Abstract - ID: 1161

Author(s): Andrew McKamy ***;** Youngstown State University
Melody Young, New York Institute of Technology College of Osteopathic Medicine

Angela Mossor, Northeast Ohio Medical University
Edwin Dickinson, New York Institute of Technology
Michael Butcher, Youngstown State University
Michael Granatosky, New York Institute of Technology College of Osteopathic Medicine

Session Type: Contributed Talk Presentations

Select the best divisional affiliation for this abstract: DVM - Vertebrate Morphology

Select Topic: DVM - Vertebrate Morphology: locomotion: wings, legs, and fins

Title: Three toes and three modes: dynamics of terrestrial, suspensory, and vertical locomotion in sloths

Abstract:

Tree sloths exhibit numerous anatomical specializations towards suspensory habits that may limit the efficacy of other locomotor modes. Previous studies of positional behavior have noted a more varied locomotor repertoire in sloths than previously anticipated. Spatiotemporal gait characteristics and tri-axial kinetic data from the brown-throated three-toed sloth (Bradypus variegatus) were collected and analyzed across three locomotor modes: quadrupedal 'crawling' (QC), suspensory walking (SW), and vertical climbing (VC). Compared to QC and SW, B. variegatus adopted longer contact times and stride durations, as well as larger duty factors during VC. However, locomotor velocity was greatest during climbing driven by significant increases in stride length. Net fore-aft impulses were significantly greater during VC in both the fore- and hindlimbs than those measured during QC and SW. Functionally, during QC and VC, both limb pairs served propulsive roles, yet during suspensory locomotion, a differentiation between a propulsive forelimb and braking hindlimb was observed. Net mediolateral impulses were also significantly greater during VC than both modes of horizontal locomotion. In total, this study provides novel data on the diverse locomotor dynamics in a slow-moving arboreal tetrapod and posits new testable hypotheses about the neuroplasticity and ease of transitioning between locomotor behaviors. In addition, there were strikingly similar kinetic profiles of inverted quadrupedalism and terrestrial crawling compared to vertical climbing, suggesting shared mechanical demands between these mirrored locomotor modes.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting and/or SICB+: SICB+ only

Primarily Yes

Undergraduate Institution:

Sign up to be a session chair: No

Abstract - ID: 1221

Author(s): Nari Chang ***;** California State University Fresno
Maikou Xiong
Guadalupe Nambo
Jessica Reis, California State University Fresno
Ulrike Muller, California State University Fresno

Session Type: Contributed Poster Presentations

Select the best divisional affiliation for this abstract: DVM - Vertebrate Morphology

Select Topic: jaws and skulls

DVM - Vertebrate Morphology:

Title: Examining the functional morphology of the mammalian mandible using a biological collection

Abstract:

Carnivore jaws are designed for tearing and cutting tough flesh, whereas herbivore jaws are designed for chewing and grinding plants. Teeth reflect these dietary differences through variations in tooth placement, shape, and number. This project focuses on the functional morphology of mandibles, specifically the attachment points for the two main chewing muscles: the masseter and the temporalis. The distance between jaw hinge and muscle attachment point is a measure of bite force and can be expressed as mechanical advantage. We collected data on more than 60 species from the Fresno State Vertebrate Skeleton Collection, ranging in body size from shrew to elephant to study the effects of body size on mandibles' mechanical advantage. We found that in carnivores the temporalis has a larger mechanical advantage than the masseter. In contrast, herbivores' masseter muscles have a larger mechanical advantage than the temporalis. These differences reflect differences in diet as the temporalis is the main muscle for ripping while the masseter is the main muscle for crushing. Looking at the size effect, mechanical advantages do not change dramatically with size in carnivores, but they do in herbivores. Mandible morphology reflects the animal's foraging style and our analysis provides a quantitative method to determine foraging styles of mammals based on their skeletons, which may extrapolate to

extinct species.	
Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	Yes
Sign up to be a session chair:	No
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_1221_0120024804.pdf

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Abstract - ID: 1275

Author(s):	Daniel Stanton ***;** University of Florida Hannah Justin, Department of Biological Sciences University of North Carolina at Charlotte Adam Reitzel, UNC Charlotte
Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DPCB - Phylogenetics and Comparative Biology
Select Topic: DPCB - Phylogenetics and Comparative Biology:	comparative genomics and proteomics
Title:	A Comparative Analysis of Circadian Clocks and Clock-Regulated Mechanisms

in Animals

Abstract:

The circadian clock is essential in regulating cellular and physiological homeostasis. There has been an increase in circadian clock literature over the last decade with a heavy focus on aspects of circadian regulation in flies and mammals. While some studies have examined circadian clock components in other bilaterian phyla and phyla that diverged from the animal stem prior to the bilaterian ancestor, a synthesis of data across the animal kingdom remains incomplete. Here, we use bioinformatics to compile existing data to fill in knowledge gaps in our understanding of circadian clock evolution across the animal lineage. We detail multiple processes that interact with circadian clocks in animals, with a focus on redox homeostasis, cell cycle regulation, and metabolism. These mechanisms act as both outputs of the core clock mechanism and as inputs to allow for fine-tuned adjustments of the clock. This suggests that localized rhythms observed in these mechanisms may predate the evolution of a centrally regulated circadian clock mechanism. We performed bioinformatic analyses to examine the conserved nature of important proteins in each of these pathways throughout the animal lineage. We aim to disentangle the history of when these rhythmic processes may have been independently regulated before the core circadian clock mechanism evolved, likely at the base of the Bilateria. Future research testing these associations experimentally will strengthen our understanding of circadian clock evolution.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	Yes
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/4B1UNHtGA5ZFntR.mp4_new.mp4
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_1275_0114015828.pdf

Abstract - ID: 1343

Author(s): Anahita Sadrossadat ***;** University of California, Irvine
Oceanus Zhang, University of California, Irvine
Katrina Moore, University of California, Irvine
Craig McGowan, Keck School of Medicine of USC
Monica Daley

Session Type: Contributed Poster Presentations

Select the best divisional affiliation for this abstract: DCB - Comparative Biomechanics

Select Topic: movement, migration and dispersal

DAB - Animal Behavior:

Select Topic: terrestrial locomotion

DCB - Comparative Biomechanics:

Title: Is exploration correlated with body size in kangaroo rats exposed to a modified open field test?

Abstract:

Variations in morphological, physiological traits, and environmental factors can all influence animal behavior. Individual variation and plasticity in behavior play key roles in enabling adaptation to changing conditions to allow animals to thrive in novel environments. Previous research indicated that consistent individual differences in behavioral response to novelty represent a continuum among traits, including aggressiveness, exploration, sociability, activity, and boldness, which are also correlated with each other. According to pace-of-life theory, faster and bolder individuals are likely to have higher reproductive success but shorter longevity, since their exploratory behavior enables resource acquisition but puts them in danger of predation. Here we investigate whether variation in body size correlates with exploration and suites of behavior expression in kangaroo rats. We hypothesize that larger kangaroo rats will act ‘bolder’ and more active compared to smaller individuals when exposed to novel conditions. We test this hypothesis by measuring behaviors in 9 kangaroo rats in a modified open field test for 15-minute trials. We measured exploration, locomotor behaviors and interactions with a novel object (mirror) throughout the trial. We predict that body size will be correlated with boldness, where boldness is indicated by high exploratory activity compared to ‘shyer’ individuals. We hope this research will link variation in animal behavior with distributional ecology to enhance wildlife management and conservation.

Are you a student?: Yes

Do you want to compete for the Best

Student Presentation competition?:	
Check if you would like to compete in one of these Best Student Presentation competitions:	TCS – The Crustacean Society,AMS – American Microscopical Society
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/tFxYSCytJPVsdic.mp4_new.mp4
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_1343_0119120800.pdf

Abstract - ID: 1356

Author(s):	Maria del Mar Moretta-Urdiales ***;** Texas State University David Rodriguez, Texas State University Juan Manuel Guayasamín Ernest, Universidad San Francisco de Quito Ryan Lynch, Third Millennium Alliance Shawn McCracken, Texas A&M University – Corpus Christi Francisco Velasquez, Universidad San Francisco de Quito Moises Tenorio, Third Millennium Alliance Rebecca Davis

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DEDE - Ecoimmunology and Disease Ecology
Select Topic:	host/pathogen population dynamics

DEDE - Ecoimmunology and Disease Ecology:

Title: Tropical epiphytes as reservoirs for the amphibian-killing fungus

Abstract:

Batrachochytrium dendrobatidis (Bd) has been identified as a major threat to amphibian diversity. Previous studies have shown Bd is found in 28% of amphibians in a coastal Chocó region of Ecuador, which is Ecuador's most threatened rainforest, with just 2% of its original forest cover remaining. However, the life cycle of Bd includes an aquatic, flagellated, and free-living zoospore stage critical in initiating infection in amphibians. Therefore, it is necessary to also investigate potential Bd aquatic reservoirs. This study aimed to determine the role of bromeliads (Family Bromeliaceae) as water reservoirs in the prevalence of Bd on the landscape independent of the host. Our study was also conducted in the coastal Chocó region. We collected water from 120 bromeliads, and using a portable laboratory, we extracted environmental DNA and conducted quantitative PCR in duplicates. Results were examined and interpreted as *positive* (presence of Bd) and *negative* (absence of Bd). Out of the 120 samples, 11.6% tested positive for Bd [95% CI (0.06 - 0.22)]. We found that Bd is present in isolated water repositories suggesting that bromeliads are potentially helping to maintain Bd on the landscape even during the dry season.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: Yes

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation Video: https://xcdzoom.s3.amazonaws.com/Od1Qbh5ju3WC8Y3.mp4_new.mp4

Abstract - ID: 1404

Author(s): Taylor Miller ***;** University of Georgia

Kristen Navara, University of Georgia

Session Type: Contributed Talk Presentations

Select the best divisional affiliation for this abstract: DCE - Comparative Endocrinology

Select Topic: DCE - Comparative Endocrinology: stress

Title: Investigating the effects of prenatal corticosterone on immunological development in a wild songbird

Abstract:

In breeding birds, stress that elevates circulating glucocorticoids often accumulates within eggs, which can program many aspects of offspring behavior, growth, and physiology. Glucocorticoids are also potent immunomodulators in adults and thus may influence immunological development in offspring. We designed a study to test the effects of yolk corticosterone, the principal glucocorticoid in birds, on immune function in wild Eastern bluebird (*Sialia sialis*) nestlings. We hypothesized that prenatal exposure to corticosterone will alter the development of innate immunity. We injected eggs with either an exogenous dose of corticosterone or control solution. We measured growth and various innate immune parameters of the resulting nestlings, including leukocyte profiles, phytohemagglutinin (PHA) induced swelling, bacteria killing ability, and nitric oxide production. Corticosterone-exposed nestlings had an attenuated inflammatory response compared to control nestlings. Additional results will be discussed.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation Video: https://xcdzoom.s3.amazonaws.com/ZUCqY03f3wtxEfD.mp4_new.mp4

Abstract - ID: 1432

Author(s): Jacob Youngblood ***;** Southern Oregon University
Michael Angilletta, Arizona State University
Johannes Overgaard, Aarhus University
Michael Ørsted, Aarhus University
John VandenBrooks, Arizona State University

Session Type: Contributed Poster Presentations

Select the best divisional affiliation for this abstract: DEE - Ecology & Evolution

Select Topic: global change

DEE - Ecology & Evolution:

Title: Dehydration worsens heat tolerance and predicted survival of locusts

Abstract:

By increasing the mean and variance of environmental temperatures, climate change has caused local extinctions and range shifts that are likely to intensify over time. Previously, biologists projected impacts of climate change from the acute heat tolerances of adult organisms; however, this approach ignores important factors, such as the cumulative damage from chronic heat exposure and the variation in heat tolerance among individuals in different physical conditions and at different life stages. To address these issues, we measured the effects of hydration state and life stage on the heat tolerance of an agricultural pest, the South American locust *(Schistocerca cancellata*). By measuring tolerance time at twelve stressful temperatures ranging from 46.5˚C to 52˚C, we estimated heat tolerance at multiple time scales ranging from five minutes to six hours. We then used these data to model the survival of locusts in microclimates of the past (1961-1990), present (1991-2020), and future (uniform warming of 3°C). We modeled the microclimates near La Rioja of Argentina (latitude: -29.32588, longitude: -65.94552, elevation: 275 m), where locust populations have persisted since the 1950s. Our experiment indicated that locusts succumbed to heat stress exponentially faster as temperature increased, but hydration state and life stage both altered this exponential relationship. Our model indicated that climate change has already amplified the risk of overheating, particularly if locusts cannot access shade or water.

Are you a student?: No

In person meeting and/or SICB+: SICB+ only

Primarily Yes

Undergraduate Institution:	
Sign up to be a session chair:	No
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_1432_0210104830.31_Ontogeny and dehydration differentially shape heat tolerance and predicted survival of an insect pest.pdf

Abstract - ID: 1479

Author(s):	Abigail Dennis ***;** North Dakota State University Rebecca Young Anuj Ghimire, North Dakota State University Angelo Anacleto Britt Heidinger, North Dakota State University

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DAB - Animal Behavior
Select Topic: DAB - Animal Behavior:	parental behavior
Title:	Effects of parental behavior and temperature on house sparrow (Passer domesticus) nestling traits

Abstract:

Developing birds are vulnerable to temperature conditions associated with climate change. Parents may have some ability to buffer these effects via incubation attentiveness and postnatal behaviors such as brooding and provisioning but are constrained by their own physiology and ecology. The relative contributions of ambient temperature and parental behavior across ontogeny in shaping growth trajectories and fitness consequences remain poorly understood. To address this gap in knowledge, we examined the effects of parental behavior (measured using video recordings) and naturally varying ambient temperature on growth, survival and telomere outcomes across development in house sparrow (*Passer domesticus*) nestlings, a species found throughout North America across a range of environments, with an enormous potential for developmental plasticity. We hypothesized that parents modify behavior in response to ambient temperature in order to modulate developmental environment and maximize fitness outcomes,

and parents who successfully maintain tight regulation of the developmental environment through increased attentiveness have the best nestling outcomes. Preliminary findings indicate that females but not males modify their behavior in response to temperature, ambient temperature during incubation predicts early developmental outcomes better than parental behavior does, and effects on body mass can carry over to later developmental stages. To expand upon this work, similar studies in other free-living avian populations could better our understanding of the fitness effects of increasingly warm and erratic global temperatures.

Are you a student?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/yFj2q5vfib59nhs.mp4_new.mp4

Abstract - ID: 1498

Author(s):	MD IMRAN NOOR ***;** University of Texas Rio Grande Valley MD Rahman, University of Texas Rio Grande Valley
Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCPB - Comparative Physiology & Biochemistry
Select Topic: DCPB - Comparative Physiology & Biochemistry:	comparative biochemistry
Title:	Roundup’s effect on Na+/K+ -ATPase, redox status, and cellular apoptosis
Abstract:	

Intense anthropogenic activities of industrialized nations significantly contribute to aquatic environment pollution. We examined Na^{+}/K^{+} -ATPase enzyme expression, oxidative stress biomarkers, and programmed cell death in the gills of goldfish (*Carassius auratus*, a model teleost species). This study focused on identifying the expression of different stress biomarkers

in response to varying dosages (low dose: 0.5 mg/L, high dose: 5 mg/L) of Roundup (a glyphosate-based herbicide) exposure. Histopathological analysis showed widespread tissue damage, including changes in interlamellar cell mass area, increased protruding lamellae length, and distance between the lamellae. Moreover, Immunoreactive optical density measurement from immunohistochemical assay provided insights into expressions of stress biomarkers. Gill tissues exhibited a significant (P <0.05, Tukey's test) attenuation in Na^+/K^+-ATPase (crucial sodium ion pump regulatory enzyme) expressions, upregulation in 2,4 dinitrophenol protein (DNP, a biomarker of reactive oxygen species) expression. Additionally, fish exposed to Roundup showed a significant (P<0.05) increase in apoptotic cells in gill tissues. Our results suggest that Roundup induces ion-pump imbalance, oxidative damage, and cell death in the gills of goldfish.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No

Abstract - ID: 1544

Author(s):	Hannah Culp **(Presenter)** Paloma Gonzalez-Bellido Jennifer Talley

Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DNNSB - Neurobiology, Neuroethology, and Sensory Biology
Select Topic: DNNSB - Neurobiology, Neuroethology	neuroethology

, and Sensory Biology:

Title: Extracellular Recording of Target Selective Descending Neurons of Robber Flies (Asilidae)

Abstract:

Robber flies are highly specialized visually guided aerial predators. Here we have investigated the target encoding properties of this invertebrate clade. In particular, we recorded from the Target Selective Descending Neurons (TSNDs) via extracellular recording. By analyzing how robber fly TSDNs' pass and process information about moving targets from the brain to the body, we aim to elucidate its fast and precise sensorimotor transformation. First, we studied the behavior of two genera of robber flies (*Diogmites sp.* and *Efferia sp.*), to elucidate what types of targets and/or prey they pursue. According to such findings, we then presented relevant visual stimuli while recording electrophysiological data. Studying the nervous system of biological agents, such as robber flies', is vital to the advancement of munitions technology; bioinspired technology has the potential to make technology simpler, more cost effective, powerful, and efficient.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation Poster: https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_1544_0108024522.pdf

Abstract - ID: 1559

Author(s): Stephen Kinsey ***;** University of North Carolina Wilmington
Sarah Fausett, University of North Carolina Wilmington
Emily Rhodes, University of North Carolina Wilmington
Shannon Parness, University of North Carolina Wilmington

Session Type: Contributed Talk Presentations

Select the best divisional affiliation for this abstract: DCPB - Comparative Physiology & Biochemistry

Select Topic: DCPB - Comparative Physiology & Biochemistry: energetics

Title: Thermal stress decreases aerobic scope in a nematode with compromised energy allocation strategies

Abstract:

Organisms often respond to environmental challenges by allocating more resources to tissue maintenance and less to growth and reproduction. It has been proposed that this strategy indicates that the stress is due at least in part to a disruption of energy homeostasis resulting from increased maintenance costs. In this view of energy stress, a consequence of elevated maintenance costs is a reduction in aerobic scope. We tested this hypothesis by measuring aerobic scope during thermal stress in the wild type N2 strain of the nematode worm, *Caenorhabditis elegans*, and in a *daf-18* mutant strain that has a lower thermal tolerance and is unable to reallocate energy in response to environmental stress. Thus, the comparison of the wild type and mutant strain offers an opportunity to ascertain the role of energy state in coping with thermal stress. Aerobic scope was measured during development at four life stages (L1, L2/L3, L4 and young adult) at 32 and 33 C, which is near the upper thermal limit but is non-lethal for both strains. Mass-specific metabolic rate scaled negatively with body volume over a 70-fold range in body size during growth and development. For most life stages at both temperatures, aerobic scope was lower in the *daf-18* mutants, consistent with the view that thermal stress compromises energy state by increasing maintenance costs.

Are you a student?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation https://xcdzoom.s3.amazonaws.com/DFKo0F75yvnKgE7.mp4_new.mp4

Video:

Abstract - ID: 1636

Author(s): Thomas Hahn ***;** University of California-Davis
Frederick Nelson, University of California, Davis
Jessica Schaefer
Heather Watts, Washington State University

Session Type: Contributed Poster Presentations

Select the best divisional affiliation for this abstract: DAB - Animal Behavior

Select Topic: movement, migration and dispersal

DAB - Animal Behavior:

Title: Timing mismatches versus carryover effects: Trade-offs for timing Life History Stages

Abstract:

Animals time Life History Stages (LHSs, e.g., breeding) using environmental cues. Some animals are highly temporally flexible, relying heavily on short-term predictive cues such as changes in temperature and food. Others are temporally relatively inflexible (seasonal), relying more heavily on long-term predictive cues such as photoperiod. A timely current question is: How do species on this flexibility continuum vary in how they will be affected by climate change? It would seem logical that more temporally flexible species would cope best with a changing environment where optimal LHS timing either changes (e.g., advances, such as earlier springs) or becomes more variable. Such species would be good at avoiding timing mismatches between their LHSs and the optimal conditions for successful expression of their different LHSs. However, temporal flexibility comes with potential costs in the form of carryover effects, where changing the timing (start or end time, and/or duration) of one LHS can have detrimental effects on the ability to successfully time or complete subsequent LHSs. Here we argue that variation in temporal flexibility creates a trade-off between ability to avoid timing mismatches versus avoid carryover effect. We present specific examples from well-studied systems such as white-crowned sparrows, and suggest this as one conceptual framework for thinking about how climate change is likely to affect species that vary in temporal flexibility of expression of LHSs.

Are you a student?: No

In person meeting SICB+ only

and/or SICB+:	
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Poster:	https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_1636_0123121213.pdf

Abstract - ID: 1662

Author(s):	Chelsea Skojec ***;** University of Florida Akito Kawahara, University of Florida

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DPCB - Phylogenetics and Comparative Biology
Select Topic:	molecular evolution
DPCB - Phylogenetics and Comparative Biology:	
Title:	Phylogeny and divergence time estimation of Automeris

Abstract:

Automeris moths are a genus of 145 species from the family Saturniidae distributed across the New World temperate zone and the Neotropics. Eyespots in *Automeris* function as the color component of an anti-predatory display called deimatism, the sudden reveal of a hidden coloration when approached by a predator. *Automeris* eyespots are hidden by the moth's cryptic forewings when at rest. When approached or disturbed by a potential predator, wing eyespots are quickly revealed. Though there has been research into the protective efficacy of deimatic displays, there has yet to be research demonstrating an evolutionary pathway for which it may have evolved. A phylogeny on *Automeris* and relatives is needed as a foundation to understand how eyespots and deimatic displays generally evolve. Although hemileucines have been included in recent large-scale phylogenies, a complete phylogeny of the 145 described species of *Automeris* has yet to be made. We sequenced 90 species of *Automeris* with an Anchored Hybrid Enrichment 571 loci probe kit and combined this backbone with existing barcode sequences to create the first complete phylogeny of *Automeris.* We used secondary calibrations

to date this tree. Together this dated tree will clarify the various evolutionary groups in *Automeris* and provide a framework for researching the evolution of deimatic displays within this genus.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No

Abstract - ID: 1700

Author(s):	Bohan Chen **(Presenter)** Feiyang Yuan Zhexin Xie Jiaqi Liu Zhongqiang Fu Sizhe Mao Lufeng Tian Zonghao Zuo, Beihang University Li Wen, Beihang University
Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	bioinspired engineering and biomimetics
Title:	Stereotypical Reaching Movements of Octopus Vulgaris Arm: Kinematics Analysis
Abstract:	

Octopus arms, as well as other muscle hydraulic, are characterized by a very large number of degrees of freedom and a rich repertoire of actions that can elongate, shorten, and bend in any direction and at any point along their length, posing a great challenge for any motor control system. The octopus simplifies movement control when capturing prey by using Stereotypical reaching movements that involve bending and elongation, and enables it to achieve precise grasping of targets in different situations. To explore this special octopus movement strategies, we use the trajectory tracking octopus reaching group (50), and in the total length of the arm, the rotation Angle, sweep area, speed, and the curvature of the flexural wave the five key parameters are normalized statistical analysis. The stereotypical reaching motion of octopus was divided into two motion strategies: reaching and sweeping. We applied this motion strategy to a multi-section continuum soft robot arms inspired by octopus. Results show that the tentacle gripper trajectory during reaching motion was more straightforward while that of sweeping motion was to achieve path maximization,which enables the soft arm to cope with more situations,and also provides a new control idea for multi-DOF continuum robot.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No
In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/streamed_0eo7p6ctf_seekable.webm

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Abstract - ID: 1712

Author(s):	Fatima Hidalgo ***;** University of California, Berkeley Robert Full, University of California, Berkeley Tatum Dwyer
Session Type:	Contributed Poster Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics

Select Topic: terrestrial locomotion

DCB - Comparative Biomechanics:

Title: Diversity of podomere lengths in cockroaches

Abstract:

Legs of arthropods show remarkable diversity in length, joint design, and function. We propose to create a structure-function design space for arthropod legs to reveal general design principles. We will quantify variation in leg podomere (segment) length, diameter, inertia, joint axis orientation, degrees of freedom, and range of motion, and evaluate the effect of input parameters on whole animal performance metrics by developing both mathematical and physical models. We began by choosing the Order Blattodea with its over 4,000 species. We measured podomere lengths of each leg of diverse cockroach species from a museum (Essig Museum at UC Berkeley) and specimens from colonies kept at UC Berkeley. Podomere lengths normalized by body length varied with species, podomere type (coxa, femur, tibia, tarsus), and leg position (front, middle, hind). Normalized hind leg tarsus varied the most, whereas hind leg coxa varied the least in the same set of species. Normalized podomere lengths correlated with behavior and habitat, where faster species occupying open habitats and deserts tended to have relatively longer podomeres. Burrowing species and those living in logs tended to have relatively shorter ones. We are using these data and other parameters to create a manipulator model to test future hypotheses of performance variables that include reachable space.

Are you a student?: Yes

Do you want to compete for the Best Student Presentation competition?: No

In person meeting and/or SICB+: SICB+ only

Primarily Undergraduate Institution: No

Sign up to be a session chair: No

Presentation Poster: https://s3.amazonaws.com/amz.xcdsystem.com/A9428521-B286-A9E9-B155928AD52CCA1D_abstract_File3040/PresentationPoster_1712_0120094023.pdf

Abstract - ID: 1727

Author(s):	Max Mikel-Stites ***;** Virginia Tech Anne Staples, Virginia Tech Nicole Abaid, Virginia Tech

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	modeling and computational approaches
Title:	Better hearing through mechanics: Modeling O. ochracea predator identification and host localization

Abstract:

The parasitoid fly, *Ormia ochracea*, has been the subject of numerous studies related to its extremely precisely tuned and amplified hearing abilities and has served as an inspiration for numerous bio-inspired research projects. *O. ochracea* is also one of the few organisms with simple analytic models for binaural hearing, making it ideal for theoretical exploration. However, few in-depth theoretical analyses have been conducted in the context of observed fly behaviors. To understand the role of biomechanics in both observed predator-avoidance and host-seeking behaviors, we analyzed the changes in response and precision of the mechanistic model for *O. ochracea* hearing due to variation in both the angle and frequency of incoming sound waves. We found evidence that the mechanical response of the coupled tympanal membranes enables specific host-seeking behaviors (e.g. the distinction between host-detecting lateralization and localization) observed in laboratory settings and gives the fly the ability to sort incoming sound signals into “bat” or “not-bat” categories. This sorting ability is present in the model in a frequency range consistent with insectivorous bat social calls, as well as in lower-frequency ultrasonic emissions. These results explain the mechanical mechanisms behind previously observed categorization behaviors and provide a window into naturally evolved mechanical approaches to sensory signal processing and interpretation, especially for organisms with limited neurological hardware.

Are you a student?:	Yes
Do you want to compete for the Best Student Presentation competition?:	No

In person meeting and/or SICB+:	SICB+ only
Primarily Undergraduate Institution:	No
Sign up to be a session chair:	No
Presentation Video:	https://xcdzoom.s3.amazonaws.com/WpWMEnxH55nGsvG.mp4_new.mp4

Abstract - ID: 1782

Author(s):	Jinguo Huang ***;** Beijing University of Posts and Telecommunications Tianmiao Wang, Beihang University Guixia Kang, Beijing University of Posts and Telecommunications

Session Type:	Contributed Talk Presentations
Select the best divisional affiliation for this abstract:	DCB - Comparative Biomechanics
Select Topic: DCB - Comparative Biomechanics:	aquatic locomotion
Title:	A Numerical Computational Framework for Hydrodynamics Analysis of Rigid-Flexible Cormorant Flippers

Abstract:

Natural waterfowl locomotion has inspired the design of aquatic robots with more physically swimming-enabling mechanisms and maneuverability. However, the fluid locomotion efficiencies of currently popular bio-robots fall well short of their biological origins. Cormorants can utilize the compliance/flexibility of their flippers and exploit hydrodynamics/biomechanics processes to dive underwater at speeds up to 15 m/s and depths greater than 10 m. Notably, the flipper's locomotion exhibits characteristics such as super-redundancy and large deformations, necessitating the representation of both the local deformations of the soft surfaces and the locomotion of the rigid skeletons. In current kinematics modeling and hydrodynamics analysis, no optimum and well-developed intrinsic equations can be identified for this typical rigid-flexible coupled system. We provide an iterative coupling framework for in-depth fluid-structure interaction (FSI) that can capture the viscoelastic and anisotropic deformation properties of soft bodies in low Reynolds number flow. Combined with the actively deforming skeleton-based skinning algorithm, our framework addresses the challenging issue of controlling a biorobotic flipper to synthesize realistic locomotion sequences. Combined with passive FSI numerical computations, we derive the hydrodynamical characteristics in the fluid. The results demonstrate that the flipper can morph rapidly and robustly under hydrodynamic loading, consistent with our former experimental findings and theoretical predictions. Consequently, a single flipper can create a fluid force of 5 N and complete the turning operation in 0.8 s.