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ABSTRACTS

SICB 2024 Annual Meeting Abstracts

Taphonomic bias in the taxonomic identification of Lystrosaurus in the Karoo Basin, South Africa

Caroline Abbott

The Permo-Triassic Mass Extinction (PTME) occurred 251.9 Ma and was the worst biodiversity crisis in all Earth's history, and is well-preserved in the Karoo Basin, South Africa. Taxa like the genus Lystrosaurus, are useful for understanding the PTME for their large sample size and broad geographic distribution. Changes in Lystrosaurus' body size, histology, and ontogeny during the PTME are a compelling system for understanding life history shifts with climate change.

Historically, Lystrosaurus species were over-split, many of which were erected based on deformation style. Today, four species are recognized in the Karoo Basin: L. maccaigi, L. curvatus, L. declivis, and L. murrayi. While these species boundaries are more reliable, identifications still suffer from taphonomic biases. Given that Lystrosaurus is a crucial taxon for understanding the PTME, recognition of how taphonomy affects their identification is needed.

I surveyed cranial characters of 150 Lystrosaurus specimens in South African collections. Lystrosaurus exhibits varied brittle and plastic deformation modes. The two Permian species are distinct regardless of ontogeny, size, and deformation. The two Triassic species appear to be problematic, as their classic diagnostic features are subject to alteration based on taphonomic processes. These results highlight the necessity of ongoing revisions to taxonomy, ontogeny, and phylogeny of this taxon. Additional ordination analyses, cluster analyses, and phylogenetic analyses, are planned to provide additional insight into Lystrosaurus taxonomy and ontogeny.

Oceanography's Diversity Deficit: Identifying and Addressing the Challenges for Marginalized Groups

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Centuries of exclusion have resulted in a tangible diversity deficit, where the diversity of oceanographers does not represent the global diversity of people impacted by ocean processes. We present six challenges faced by oceanographers with one or more marginalized identities: 1) Historical practices of conquest, discrimination, and exclusion thwart attempts to address oceanography's modern diversity deficit; 2) Undervalued and uncompensated labor by minority oceanographers can perpetuate a lack of representation by leading to burnout and attrition; 3) Marginalized individuals are often forced to hide parts of their identities (languages, appearances, partners, behaviors) that deviate from outdated expectations of professionalism; 4) Oceanography requires trainees to navigate extensive logistical and financial hurdles; 5) Individuals from non-Western cultural and religious traditions often conceal their spiritual obligations in attempts to assimilate or avoid forgoing valuable research experiences; 6) Limited planning and transparency in oceanographic fieldwork can threaten the physical and mental safety of marginalized individuals. We highlight how holding multiple, intersecting identities can compound negative impacts on the well-being of marginalized oceanographers. Finally, we recommend solutions that individuals, mentors, professional societies, funding agencies, and institutions should undertake to move toward a more diverse oceanographic community.

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to thermal stress, although other steps in this cascade might plausibly explain the muted proteomic response to heat. Overall, our data offer further insight into the physiological underpinnings of stenothermy in Antarctic fishes.

Risk-taking behavior and defensive morphology of marine three-spined stickleback

Steven Downs, Stephanie Crofts, Kevin Neumann

Defensive morphology, such as spines or armor plates, is ubiquitous across multicellular life and can coevolve with a host of other traits, including modifications to risk-taking behavior, or metabolism, to form an Armor Syndrome. While armor syndromes have mainly been studied in plants and terrestrial mammals, the goal for this project is to expand this taxonomic coverage. Here we focus on armor syndrome traits in a marine population of Three-Spined Stickleback (G. aculeatus), as correlations between behavior and armor are well studied in freshwater populations. We collected fish from waters surrounding Friday Harbor, WA and measured 5 risk-taking behaviors: activity, inspection/time inspecting, orientation, and time sheltering. Following behavioral trials, we microCT scanned each fish. We used the Slicermorph module in Slicer3D and ImageJ to measure dorsal and pelvic spine morphology and lateral armor plate coverage and density using. To detect any correlation between our behavioral and morphological data, we ran linear regressions in R. We found no significant correlation between armor measurements and behaviors, but saw a significant negative correlation between both the 1st and 2nd dorsal spine aspect ratios and number of inspections, one of our inferred risky behaviors. Based on findings from freshwater G. acuaetus, we might expect to see greater variation between marine populations than observed here for both morphology and behavior.

Diverse Anatomical Peak Shifts Underlie Body Elongation in Zoarcoid Fishes

Summer Duba, David Collar

Evolutionary shifts towards elongate body shapes have occurred repeatedly in ray-finned fishes and led to a variety of eel-like forms across diverse lineages. However, whether elongation events have been shaped by similar evolutionary processes remains an open question. Transitions in body shape can occur through multiple combinations of vertebral and cranial skeleton changes, and overlap in anatomical evolution can shed light on commonalities in the circumstances underlying elongation. In our investigation of the suborder Zoarcoidei, we identified seven instances of body elongation that varied in their associated anatomical peak shifts. The most elongate species, Ptilichthys goodei (quillfish), experienced extensive head elongation and increases in precaudal and caudal vertebral numbers, but other body shape transitions involved only subsets of anatomical shifts. For example, increasing precaudal vertebrae numbers drove elongation in the Pholidae (gunnels), while increasing caudal vertebrae numbers were more salient in the Zoarcidae (eelpouts). These distinct anatomical shifts suggest elongate bodies evolved in association with different functional capacities that likely contributed to divergent habitat use patterns. For example, gunnels inhabit rocky, shallow intertidal zones, where additional precaudal vertebrae may confer advantages in respiratory function at low tide for temporary air breathing. Eelpouts, by contrast, have some of the deepest habitat ranges of the suborder, where greater numbers of caudal vertebrae may confer greater flexibility and swimming efficiency under high pressures and cold temperatures.

The impacts of climate change on secondary seed dispersal in dung beetles

Nathan Duerr, Kimberly Sheldon

Dung beetles, which move and bury the feces of vertebrates, are major drivers of ecosystem processes and provide crucial ecosystem services, including secondary seed dispersal. Dung beetles bury seed-containing dung in food caches or in brood balls used for breeding purposes, but little is known about how this behavior will be affected by climate change. We utilized field manipulations to investigate the effect of simulated climate change—including simultaneous increases in temperature mean and variance—on the seed dispersal behavior of two tunneling dung beetle species, Phanaeus vindex and Onthophagus taurus. We placed single adult females into either control or greenhouse treatments along with temperature loggers. We mixed glass beads of three sizes into cow dung to mimic seeds, provided beetles with the dung, and then allowed them to bury dung for either six or nine days. At the end of each trial, we recorded information on dung deposits, including the type (i.e., food cache or brood ball), number, size, burial depth, and the amount of each bead size found in the deposit. We found differences in burial depths of brood balls and food caches within species, as well as differences in the size and amount of beads buried between species. Exposure to higher temperatures resulted in brood balls being buried deeper across species, but did not change the burial depth of food caches.