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Single origin of a lake-wide pigmentation locus in the rock-dwelling cichlids of Lake Malawi.

The phenotypic diversity present in the cichlid fishes of Lake Malawi is amazingly rich given the relatively short history in which it has evolved. Perhaps the most varied set of phenotypes is found within pigmentation, with nuptial coloration at times defining, and possibly driving, species boundaries. Extremely similar pigmentation characters repeatedly appear across the Malawi cichlid flock, often in species separated by both geographic and phylogenetic distance. While such a pattern suggests repeated convergent evolution of pigmentation phenotypes, the same pattern could also arise as a result of the sorting of ancestral pigmentation genes, or the migration of pigmentation genes during rare interspecific hybridization events. Here we report the fine mapping of a genetic locus underlying the orange blotch pigmentation phenotype found in four distinct genera throughout Lake Malawi. Our results reveal a single haplotype, and thus a single origin, of the orange blotch locus, as well as some compelling candidates for the gene responsible for the phenotype. Additionally, the orange blotch locus accounts for a range of distinct blotched phenotypes. The single genetic origin of a phenotypic trait found throughout the lake has profound implications to understanding this particularly speciose vertebrate radiation, as well as to future utilization of the Lake Malawi cichlid flock as a model to understand gene function and the evolution of adaptive traits.

101.9 ROMERO, M. R.*; KELSTRUP, H. C. P.; STRATHMANN, R. R.; California State Univ., Los Angeles, University of Washington; MelissaRRR20@hotmail.com

High-speed video reveals capture of particles by direct interception by cilia during feeding of a gastropod veliger.

Ciliary feeding varies in arrangement of ciliary bands, mechanisms of capture, and concentration of food. Some larvae use opposed parallel bands of preoral (prototroch) and postoral (metatroch) cilia. Hypotheses for the mechanism of particle capture include filtration by adhesion to a cilium (direct interception), but unequivocal evidence for this mechanism has been lacking. High-speed video recordings of gastropod veliger larvae of *Lacuna vincta* indicated direct interception by prototrochal cilia. Adhesion between cilium and particle was seen when a prototrochal cilium tugged a diatom chain into the food groove while in contact with one part of the chain. In several recorded events, a prototrochal cilium overtook a particle during its effective stroke; then moved the particle inward with its recovery stroke and the particle subsequently moved to the food groove. Captures varied, however. In some cases the particle was intercepted multiple times in one capture event. In others several cilia passed a particle without interception. Particles occasionally remained in the area of recovery strokes, indicating retention without adhesion to a cilium. In three events, a particle lost from a prototrochal cilium was intercepted and moved into the food groove by metatrochal cilia. Particles as wide as or wider than the food groove were captured and transported but not ingested.

84.1 ROBERTS, S.P.*; VANCE, J.T.; WILLIAMS, J.B.; ELEKONICH, M.M.; Univ. of Nevada Las Vegas; stephen.roberts@unlv.edu

The effects of age and behavioral development on the flight performance of honey bees

A critical issue in life history theory is how behavior and age affect the lifetime kinetics of whole-organism performance. Studies of this issue should ideally separate the effects of age and behavior without ambiguity, focus on performance traits that are ecologically relevant, and utilize free-living models. In this study we compared the flight performance of honey bees (whose behavioral development and age can be assessed independently via simple manipulations of colony demographics) between distinct behavioral castes (in-hive nurse bees vs. out-of-hive foragers) and across lifespan. Variable-density gases and high-speed video were used to determine the maximum hovering flight capacity and wing kinematics of age-matched nurse bees and foragers sampled from a single-cohort colony over a period of 34 days. The transition from hive-work to foraging was accompanied by a 42% decrease in body mass and a proportional increase in flight capacity (defined as the minimum gas density allowing hovering flight). The lower flight capacity of hive-bees was primarily due to the fact that in air they were functioning at a near maximal wing angular velocity due to their high body masses. Foragers were lighter and when hovering in air they required a much lower wing angular velocity, which they were able to increase by 32% during maximal flight performance. Flight performance of hive-bees was independent of age, but in foragers the maximal wingbeat frequency and maximal wing angular velocity were lowest in precocious (7 to 14-day-old) foragers, highest in normal-aged (15 to 28-day-old) foragers and intermediate in foragers older than 29 days. This pattern coincides with age-dependent biochemical and metabolic properties of honey bee flight muscle.

83.3 ROOS, G.*; VAN WASSENBERGH, S.; LEYSEN, H.; HERREL, A.; ADRIAENS, D.; AERTS, P.; Univ. of Antwerp, Belgium, Univ. of Ghent, Belgium, Univ. of Harvard, Cambridge, Univ. of Ghent, Belgium; Gert.Roos@ua.ac.be

Ontogeny of feeding kinematics in the seahorse *Hippocampus reidi* from newly born to adult

One of the most important aspect of an animals life, adult or juvenile, is the ability to feed. Undoubtedly, the size and shape of an animals feeding apparatus will affect its working method and its constraints. In fish, larval morphology transforms into an adult-like body form during a period of metamorphosis. This causes changes in shape and size that inevitably have drastic functional consequences. To date, only a single study covered the entire range from the first-eating larval stage to reproductive adults when investigating scaling effects on feeding kinematics in zebrafish. The present study investigated the ontogeny of feeding kinematics in seahorses, which show a different feeding strategy (pivot feeding), a period of parental care inside the males brood pouch prior to first-feeding, and a strong allometric growth toward the adult stages. Five age categories were studied (1-3 days, 1 week, 2 weeks, 3 weeks and adults). The results show that, even in 1-day old individuals, the feeding apparatus already functions similarly compared to adults. However, the maximal movements during a feeding strike, their timings and velocities are subjected to profound ontogenetic effects.