593

DO COMPARATIVE AND SELECTION STUDIES GIVE THE SAME ANSWERS? EVOLUTION OF WATER BALANCE IN *DROSOPHILA*.

A.G. Gibbs. Univ. of California, Irvine.

Laboratory selection has become an increasingly popular approach to study the evolution of physiological systems. These studies usually use model organisms, so their general relevance to physiological adaptation in nature is unclear. We developed a complete water budget for several desert and mesic species of Drosophila, and compared the results to earlier studies using D. melanogaster selected in the lab for resistance to desiccation. Both desert and desiccation-selected Drosophila lost water less rapidly than mesic species or unselected control flies. In contrast to lab selection results, desert Drosophila were more tolerant of dehydration stress than mesic species. All species contained similar amounts of water for their size, whereas selected flies had much higher water contents than controls. Behavioral and respiratory patterns which may affect desiccation resistance also differed among natural and lab flies. Thedifferent results of these studies suggest several testable hypotheses regarding selective forces in the field. Although comparative studies and laboratory selection can yield different results, they provide complementary insight into adaptive evolution. Supported by NSF grant IBN-9317471.

594

NATURAL SELECTION ABOVE 8,000-M: PATTERNS OF SUCCESS AND DEATH OF HIMALAYAN MOUNTAIN CLIMBERS.

R. B. Huey, Univ. Washington, Seattle. hueyrb@u.washington.edu.

Each year hundreds of mountain climbers travel to the Himalayas and spend several months trying to climb the highest mountains in the world. Most of these climbers fail to reach to summit, and some die. Sometimes many die. Despite the appalling 'cost:benefit' ratios associated with high-altitude climbing, increasing numbers of climbers are attracted to the highest peaks. Potentially a statistical analysis of patterns of death and success may provide useful insights to the climbing community. I will examine data for climbers on Mt. Everest and on K2, the two highest peaks. Specifically, I will examine whether the probability of death increases with altitude (on both mountains) and whether the cause of death changes with altitude. I will also determine whether the size of the climbing team influences the probability of success and that of death.

595

USE OF 'PLANKTON MIMICS' TO EXPLORE THE ROLE OF VERTICAL MIGRATION IN DINOFLAGELLATE BLOOM DYNAMICS.

T.G. Wolcott*, D.L. Wolcott and D. Kamykowski. NC State Univ., Raleigh.

Plants commonly face spatial separation between their sources of energy (light) and essential chemical building blocks (nutrients). In terrestrial environments, macrophytes tap both resources simultaneously by physically bridging the gap, pushing roots down into the soil while elevating leaves into the light. In aquatic systems, unicellular planktonic plants cannot optimize intake of both energy and nutrients by being two places at once. Mobile species, however, can partition their time between well-lit surface waters and deeper layers from which nutrients have not been depleted. We show how laboratory models of diel vertical migration by red-tide dinoflagellates (*Gymnodinium breve*) can be tested in nature by using "plankton mimics" (autonomous vertically-mobile Lagrangian drifters). These instruments are programmed to migrate according to paradigms controlled by either light alone, or by physiology (photosynthate and nutrient pools calculated from in-situ light levels and nutrient distributions encountered by migrating 'plankton mimics'). Results can shed light on how migration behaviors affect energetics, growth rate and transport by currents, and hence on how they influence formation and dissipation of blooms.

596

MEASURING ALLOCATION OF NECTAR NUTRIENTS TO REPRODUCTION IN A HAWKMOTH: A NOVEL METHOD USING STABLE CARBON ISOTOPES.

D.M. O'Brien*, D.P. Schrag, and C. Martinez del Rio. Princeton Univ., NJ; Harvard Univ., Cambridge, MA; Univ. of Arizona, Tucson. dmobrien@princeton.edu

Nectar feeding is important to female fecundity in many species of Lepidoptera. We use natural variation in plant 13C to measure the direct allocation of nectar nutrients into eggs. Females were assigned to artificial nectar diets: 30% sucrose solution derived from either C4 or C3 plants, and distinct from larval hostplant in 13C content. Eggs laid over the lifetime of females were analyzed for 13C content with mass spectroscopy, and incorporation of adult dietary carbon was characterized with great accuracy. We propose a simple two compartment physiological model to describe the dynamics of nectar incorporation: one compartment mixes with diet; the other compartment retains an exclusively larval isotopic signature. Nectar carbon is rapidly incorporated into eggs, comprising over half of total egg carbon at equilibrium. This pattern is discussed in light of whole animal energy and protein budgets. This research demonstrates a novel quantitative method for tracing allocation to reproduction from different life stages, with broad applicability to studies of allocation in insects.

Downloaded from http://icb.oxfordjournals.org/ at Harvard University on November 30, 2011