

2013 Biotropica Award for Excellence in Tropical Biology and Conservation

Chris J. Kettle

THE ASSOCIATION FOR TROPICAL BIOLOGY AND CONSERVATION and the Editors of *Biotropica* proudly announce the winner of the 2013 *Biotropica* Award for Excellence in Tropical Biology and Conservation, presented to the author of a paper published in *Biotropica* during 2012. We recognize an outstanding contribution based on original research conducted in tropical regions. Criteria include clarity of presentation, strong basis in natural history, well-planned experimental and/or sampling design, and novel insights gained into critical processes that influence the structure and functioning of tropical biological systems.

The 2013 Award is presented to Jordan Karubian, Renata Durães, Jenny L. Storey and Thomas B. Smith for their paper entitled ‘*Mating Behavior Drives Seed Dispersal by the Long-wattled Umbrellabird Cephalopterus penduliger*’ published in *Biotropica* 44(5): 689–698.

Seed dispersal is a critical process shaping many terrestrial ecosystems. Seed dispersal by animals (zoochory) has long attracted the attention of tropical biologists, not least because of the preponderance of tree species in moist tropical forests producing fleshy fruit for animal dispersal. The fascinating mutualisms which have evolved between plants and their animal dispersers, and the potential for disruption of these mutualisms—particularly by habitat fragmentation and other human disturbances—present both a fascinating and highly applied field of research. Zoochory is a driving force in forest tree community structure, forest recovery following disturbance, and management of tropical forests. Despite this importance, few studies have effectively evaluated seed dispersal with adequate consideration of both the behavior of the animal dispersal agent and implication for plant species recruitment.

Karubian and colleagues address this issue by a very well-conceived study applying novel field techniques (GIS and radio telemetry), traditional ecological approaches (gut retention time), and a solid foundation in natural history to investigate the importance of disperser behavior for seed dispersal in a biodiversity hotspot – the Chocó rain forests of Northwest Ecuador and West Colombia. Their considerable body of ecological data enabled them to demonstrate the importance of mating behavior (lekking) in shaping seed dispersal and its potential importance for forest community structure.

Karubian *et al.* focus on the charismatic and endemic Long-wattled Umbrellabird, which is one of the few large avian frugivores in the Chocó. Their study reveals that territorial male Umbrellabirds, which congregate in leks, spend a considerable proportion of their time defending small display areas. In contrast, females are solitary and only visit the leks to mate. Using

detailed movement and home range data from individual birds and corresponding gut retention times for seeds from different tree species, Karubian *et al.* elegantly reveal spatially explicit probabilities of seed dispersal—differences in behaviour between males, females, and non-territorial ‘floater’ males have important implications for seed dispersal. Furthermore, the inclusion of an empirical validation of dispersal patterns by spatial analyses of the density of seed, seedlings, and adults of five forest tree species shows how behavior drives the high density of seedlings around leks. This excellent contribution advances our mechanistic understanding of how bird behavior can be important in shaping seed dispersal patterns. It also paves the way for novel studies to explore long-standing questions of tree species coexistence, such as the Janzen-Connell hypothesis. In combination with earlier molecular analysis of one of the five focal tree species (the palm *Oenocarpus batana*), Karubian *et al.*, highlight the value of combining multiple empirical approaches in a single study to unravel this cryptic yet critical ecological process.

Chris J. Kettle

Tropical biologists often tell their students that ‘the research question must determine the study species to be investigated, not *vice-versa*’. If so, then I went about researching the Long-wattled Umbrellabird all wrong. Umbrellabirds are lek-breeding species, and males have developed extraordinary ornaments, presumably to assist with mate attraction. My first encounter with this species, on a misty morning in northwest Ecuador’s Chocó rain forest, left me with my mouth agape. After a long, muddy hike through predawn darkness, I found myself staring at a male extending and retracting its outsized crest and wattle while producing a series of low booming calls. That was when my decision to study Umbrellabirds crystalized, and it came from the heart. The fact that the Long-wattled Umbrellabird was an endangered species, with little known of its basic biology, was further inducement to dive in. The research questions only came later... blame it on that exuberant wattle.

Perhaps not surprisingly, the first research question that popped to mind was how ornaments like the wattle and crest might affect female mate choice. As luck would have it, difficulties associated with observing behavior at the lek and finding nests rendered this approach intractable. Yet, from these preliminary efforts, a more viable research question began to emerge. As with all lekking species, male and female Umbrellabirds exhibited strikingly different mating behaviors. And because Umbrellabirds are among the largest avian frugivores in Chocó rain forest,

there was good reason to believe that they might play an ecologically important role in dispersing large-seeded fruits like palms. The more my colleagues and I thought about it, the more likely it seemed that this system might provide insights into how disperser behavior impacts patterns of seed movement and deposition. At last, we had arrived at our core research question: would sex-specific mating behaviors impact the seed dispersal services provided by males vs. female Umbrellabirds and, if so, how?

Renata Durães, Tom Smith, Jenny Storey and I addressed this question by combining radio tracking with gut retention trials to model where males and females deposit the seeds they ingest while foraging. We faced logistical challenges in capturing these canopy-dwelling birds, and in keeping up with radio-equipped individuals as we tracked their movements across our topographically endowed field site, Bilsa Biological Station. Long-time local resident researchers Jorge Olivo and Domingo Cabrera overcame these and other issues through clever placement of canopy mist nets and impressive feats of physical endurance. Our tracking efforts indicated that lekking males centered movements around leks, leaving display areas only to forage from surrounding trees, whereas solitary females moved more evenly across their home ranges. Combining these data with gut retention times, we calculated that males deposit over half the seeds they ingest in leks, whereas females deposit seeds more evenly across their home ranges. We then confirmed that densities of dispersed seeds and seedlings of focal tree species were substantially higher in the lek than in control areas outside the lek.

We hope this study emphasizes the fact that certain animal behaviors—in this case, mating behaviors associated with lekking—can generate predictable and ecologically meaningful patterns of seed dispersal. Illuminating this relationship between animal behavior, foraging ecology, and seed deposition improves our mechanistic understanding of how the seed dispersal patterns we observe in nature are generated. This is especially relevant for tropical systems, where most trees depend upon animals for dispersal of seeds and pollen, and may prove useful for the conservation of these critical ecological processes.

Our research is complemented by conservation initiatives carried out by local residents working under the auspices of Fundación para la Conservación de los Andes Tropicales (FCAT), an Ecuadorian non-governmental organization. The rallying point of FCAT's efforts is the Long-wattled Umbrellabird. FCAT's Environmental Ambassadors program provides full-time employment



From left to right: Jordan Karubian, Jorge Olivo, Monica Gonzalez, and Domingo Cabrera at an Environmental Fair hosted by FCAT, to recognize and celebrate local community conservation of the Long-wattled Umbrellabird.

as field biologists and advocates for conservation for local residents such as Domingo Cabrera and Jorge Olivo. Environmental Ambassadors co-author scientific articles, present their work to local communities and at international scientific conferences, and go on to obtain university degrees or jobs with the Ministry of the Environment. FCAT's education program, directed by Monica Gonzalez, provides a complementary and integrated series of targeted environmental and ecological modules to schoolteachers, children, and adults. This program has reached 12–15 local communities in each of the past 8 yr. For more on our research and conservation efforts, please visit: karubian.tulane.edu.

Today, there is no lack of questions, hypotheses, and predictions driving our research on Long-wattled Umbrellabirds. Nonetheless, I often find myself out on the muddy trail before dawn, just to experience the thrill of seeing a fantastic Umbrellabird displaying in its native habitat. Of course, I am not the only one in whom this species inspires a sense of wonder. As the core FCAT's environmental initiatives in the region, the Long-wattled Umbrellabird is helping to motivate local residents to respect, research, and conserve Umbrellabirds, their threatened Chocó forests, and the ecological processes to which they contribute.

Jordan Karubian