IH232: Island biogeography and the behaviour of the birds of the Wakatobi islands, Indonesia

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Island biogeography has been one of the primary driving forces behind the development of the theory of evolution. It was Charles Darwin who was struck by differences in bird populations on the Galapagos islands, and in recent years a great deal of research has been conducted on the finches of those islands. However, when Darwin returned from his travels, he spent a great many years considering and refining his ideas. He seemed reluctant to present them to the scientific community. It appears it was correspondence with Alfred Russell Wallace (working near to Sulawesi, in an area that now bears his name) that prompted Darwin to present his work to the Linnaean Society in London. Wallace had been fascinated by the small, but clear, differences he had seen between the island populations of Indonesia. Although the terms "island biogeography" and "allopatric speciation" were not coined until much later, it is clear that both Darwin and Wallace understood these concepts.

Indonesia is a perfect country for studying island biogeography, as it is comprised of somewhere in excess of 17,000 islands. Several new vertebrate species have been reported from Indonesia in recent years, and at least two new bird species from islands just off Sulawesi. Clearly the islands of Indonesia have yet to reveal all of their secrets. Indeed, work by Operation Wallacea teams has revealed new bird populations on Kabaena, the Wakatobi islands and mainland Sulawesi. An ongoing research partnership between Trinity College in Dublin and Haluoleo University in Kendari (SE Sulawesi) is continuing to make further discoveries. While the distance between the islands of Buton and Sulawesi is rather small, some species (e.g. white-eyes) show a remarkable reluctance to cross even the shortest oceanic barriers.

The aim of this project is to gather behavioural data on a number of avian populations, namely Lemon-bellied White-eyes, Olive-backed Sunbirds and Grey-sided Flowerpeckers, on the Wakatobi islands (also known as the Tukang Besi islands) which lie a significant distance off the coast of south-east Sulawesi. These remote islands are greatly understudied but in recent years a significant amount of genetic and morphometric data has been collected on the aforementioned species. These data suggest complex competitive interactions between the three species. There is clear evidence that some island populations have diverged, or are currently diverging, from their island neighbours. There is real potential for the description of numerous new species and/or subspecies among these populations. This project will gather data on the behaviour of these populations to help us understand how the populations are diverging and the causes of such divergence. These studies will allow us to gain a better understanding of evolutionary patterns and processes, using the archipelago as a living evolutionary laboratory.

The Wakatobi islands are remote and greatly understudied. Students will be travelling by boat to each of the main islands (Wangi-wangi, Kaledupa, Tomia and Binongko) and some of their smaller satellite islands. Transects will be established in selected habitat types on each island. Students will walk these transects every morning and evening while on each island. Data on species density, relative abundance, flocking and foraging behaviour, diet, habitat composition, habitat use, acoustics and competitive interactions with other species will be gathered while walking these transects. Notes will also be taken on local geography as features other than oceanic barriers can serve to isolate populations. These data will allow us to identify niches for each island population, the presence or absence of potential competitors and to determine the important competitive

interactions. Additional information on plumage, social behaviour and breeding will be collected where possible.

While the Lemon-bellied White-eye is a known generalist feeder, the Olive-backed Sunbird is a specialised nectar feeder (that may feed on invertebrates at times) and the Grey-sided Flowerpecker is a nectar "robber", as well as a known frugivore and insectivore. Therefore, taking this potential for competition into account, detailed descriptions will be taken of potential and actual nectar sources. A record of all bird species encountered will be maintained, to build up a more complete picture of the Wakatobi avifauna. As this area has been poorly studied, opportunities for new discoveries remain.

Suggested reading

Please read Newton (2003) OR Price (2008) and at least one other reference from each section

Island Biogeography and Avian Speciation

Newton, I. 2003. The Speciation and biogeography of birds. Academic Press, London.

OR

Price, T. 2008. Speciation in Birds. Roberts and Company Publishers, Colorado, USA.

Mayr, E. & Diamond, J. 2001. The birds of Northern Melanesia : speciation, ecology, & biogeography. Oxford University Press, Oxford.

MacArthur, R. H. and Wilson, E. O. 1967. The Theory of Island Biogeography. Princeton, N.J.: Princeton University Press.

Clegg SM, Degnan SM, Moritz C et al. (2002) Microevolution in island forms: the roles of drift and directional selection in morphological divergence of a passerine bird. Evolution, 56, 2090–2099.

Warren, B.H., Bermingham, E., Prys-Jones, R.P. and Thébaud, C. 2006. Immigration, species radiation and extinction in a highly diverse song-bird lineage: white-eyes on Indian Ocean islands. Molecular Ecology 15: 3769-3786.

Character Displacement

Brown, W., Wilson, E. 1956. Character Displacement. Systematic Zoology, 5: 49-64.
Schutler, D. 2000. Ecological character displacement in adaptive radiation. American Naturalist, 156; S4-S16.

Grant, P. and Grant, B. 2006. Evolution of character displacement in Darwin's finches. Science, 313; 224-226.

Adaptive Radiation

Moyle, R. G., Filardi, C. E., Smith, C. E. and Diamond, J. (2009) Explosive Pleistocene diversification and hemispheric expansion of a "great speciator". Proceedings of the National Academy of Sciences of the United States of America 106: 1863–1868.

Schluter, D. 2000.The ecology of adaptive radiation. Oxford University Press, Oxford, UK.

Sulawesi

Lee, T., Sodhi and Prawiradilaga, D. 2007. The importance of protected areas for the forest and endemic avifauna of Sulawesi (Indonesia).Ecological Applications, 17; 1727-1741.

Rasmussen, P.C., Wardill, J.C., Lambert F.R. and Riley, J. 2000. On the specific status of the Sangihe White-eye Zosterops nehrkorni, and the taxonomy of the Black-crowned White-eye Z. atrifrons complex. Forktail 16: 69-82.

Indrawan, M., Rasmussen, P.C. and Sunarto 2008. A New White-Eye (Zosterops) from the Togian Islands, Sulawesi, Indonesia. The Wilson Journal of Ornithology 120: 1-9

Robinson-Dean, J.C., Willmott, K.R., Catterall, M.J., Kelly, D.J., Whittington, A., Phalan, B., Marples, N.M. and Boeadi, D.R.S. 2002. A new subspecies of Red-backed Thrush Zoothera erythronota kabaena subsp. nov. (Muscicapidae: Turdidae) from Kabaena island, Indonesia. Forktail 18, 1-10.

Kelly, D.J., Marples, N.M. & Singer, H. A. 2010. A population of Lemon-bellied White-eye Zosterops chloris from the south-eastern peninsula of Sulawesi. Forktail 26: 138-139.

Kelly D.J. and Marples N.M. 2011. Notes on the distribution of the olive-backed sunbird (Cinnyris jugularis) in south-eastern Sulawesi, BirdingAsia 15:15-16.

Identification Guides

Coates, B. J. & Bishop, K. D. 1997. A Guide to the Birds of Wallacea: Sulawesi, The Moluccas and Lesser Sunda Islands, Indonesia; Dove Publications, Queensland, Aus.

Holmes, D. & Phillipps, K. 1996. The Birds of Sulawesi (Images of Asia). OUP South East Asia.

Behaviour and Field Techniques

Bibby, C.J. (2000). *Bird Census Techniques*. Academic Press, London. pp 65-90.
Borghesio, L. and Laiolo, P. (2004). Habitat use and feeding ecology of Kulal White-eye *Zosterops kulalensis*. *Bird Conservation International* 14: 11-24.
Sridhar, H., Beauchamp, G., Shanker, K. (2009). Why do birds participate in mixed-species foraging flocks? A large-scale synthesis. Animal Behaviour 78(2): 337-347.

Sutherland, W.J., Newton I. and Green, R.E. 2004. Bird ecology and conservation: handbook of techniques. Oxford University Press, Oxford.

Competition and release

Svanback, R. and Bolnick, D. 2007. Intraspecific competition drives increased resource use diversity within a natural population. Proceedings of the Royal Society B, 274; 839-844.

Keast, A. 1970. Adaptive evolution and shifts in niche occupation in island birds. Biotropica 2: 61-75.