Testing Evolutionary Hypotheses in Relation to the Vanuatu White-eye (*Zosterops flavifrons*) - Preliminary Report

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Introduction

The Vanuatu White-eye (*Zosterops flavifrons*) is endemic to Vanuatu and is one of the most widespread and abundant birds within the region. Seven geographical subspecies of this bird, varying both in size and colour, have been identified in Vanuatu. The large number of island populations in Vanuatu makes this an ideal place to study the ultimate causes of population divergence.

Some of the questions this project hopes to address are:

1) Do the currently recognised island subspecies of *Z. flavifrons* constitute evolutionarily significant units (ESU's), or do they either over- or under-estimate the evolutionary distinctness of island populations? This question relates to recent studies, predominantly focusing on continental Eurasian and North American bird populations, which suggest that subspecies tend not to constitute ESU's. The extent of evolutionary distinctness of island populations may have consequences for their conservation status.
2) Can the phenotypic differences between the island populations be explained invoking only neutral mechanisms such as genetic drift?
3) If the differences in plumage between populations of the birds on different islands cannot be sufficiently explained by genetic drift, is there a correlation between the light environment encountered on the different islands and the plumage of the birds on these same islands?

Materials and Methods

A period of 3 months was spent collecting samples and data in the Vanuatu archipelago during the months of February, March, April and May. A total of 9 islands were visited in order to sample individuals of each of the seven recognised subspecies and to sample populations of two of the subspecies (*Z. f. efatensis* and *Z. f. perplexa*) from two separate island locations. The islands visited were Vanua Lava, Gaua, Santo, Malekula, Epi, Efate, Erromango, Tanna and Aneityum.

On each island birds were captured using either mist-nets or a basket trap. From each *Z. flavifrons* or *Z. lateralis* individual the following information was collected: Bill length (measured twice, once to the anterior and once to the posterior of the nostril), bill width (measured at the anterior of the nostril), bill depth (measured at the anterior of the nostril), head and bill length, tarsus length, tail length, caudal wing length, weight and the relative lengths of the first six primary feathers in relation to the longest one. A measurement of dorsal and ventral coloration was made using a digital camera. In order to correct for the ambient illumination a colour standard palate was included in all photographs. A blood sample was collected from each individual and stored in a buffer.

Information was collected on the light environments found on the different islands. This information was collected using a digital camera and standard colour palate. Attempts were made to collect digital photographs within scrub, secondary-forest and primary-forest habitats.

Results

At this stage no analysis has been conducted on the data or blood samples collected, however, a summary of the blood samples collected is provided in appendix 1. During this period of research the investigators kept incidental species lists for each islands, these are presented in appendix 2. This list is far from an exhaustive list of the bird species on each island and probably most closely approximates a survey of the most abundant birds on each island.

Comments on Conservation Issues Encountered in Vanuatu

The following is only a list of situations encountered in Vanuatu, discussed in this report in order to bring it to the attention of the Environment Unit.

Vanua Lava – In the Sola area 4 turtles were carried ashore having been shot with a spear-gun. This harvesting all took place in the space of one week.

Santo and **Malekula** – On both of these islands the Black-headed Manikin, an alien species, was abundant in disturbed habitats. This coincides with a lower abundance of the Vanuatu White-eye in the same habitats although it is unknown whether the Black-headed Manikin is the cause of this abundance-shift.

Tanna – The pressures on the bird populations due to hunting were particularly apparent on this densely populated island. In the period immediately following cyclone Ivy, *Zosterops* spp. were hunted for food at levels that may not be sustainable.

Aneityum – ABP professes no expertise in the study of invasive species but thought that the pine forests planted on the fragile red soils could potentially pose a large threat to the island's ecosystem were they to be invasive. During simple habitat censuses only the Cardinal Honeyeater was regularly found inhabiting the pine plantations.

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Appendix 1

Species	A	B	C	D	E	F	G	H	I
Vanuatu White-eye	26	26	7	13	9	46	17	40	23
Silvereye	3	20	34	19	9	25	14	12	-
Fantail Warbler					1				
Cardinal Honeyeater		2	1	2			2		4
Silver-Eared Honeyeater				1		1	1		
Vanuatu Mntn Honeyeater									2
Golden Whistler	1		7	7		1	5		
Vanuatu Flycatcher						1			
Scarlet Robin							1		1
Broad-Billed Flycatcher	1	2	3			1	1		
Long-Tailed Triller	1		1				1		
Island Thrush						3			
Spotted Fantail	1		2			6			
Grey Fantail			1				1		1

Blue-faced Parrotfinch						1			
Black-headed Mannikin									
White-collared Kingfisher	2	1	1	1		3	1		
Glossy Swiftlet						4			
Vanuatu Fruit Dove	2								
Red-Bellied Fruit Dove						1			
Green-winged Ground Dove	1		1	1		1			

Table 1. Summary of the number of blood samples taken from each species captured on each island. Key to locations: A = Vanua Lava, B = Gaua, C = Santo, D = Malekula, E = Epi, F = Efate, G = Erromango, H = Tanna, I = Aneityum. Blood samples can be provided for use in other studies on request.

Appendix 2

Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Eastern Reef Heron		*	*	*		*	*	*	*
White Faced Heron									*****
Black Naped Tern						*			*****
Sooty Tern						*			
Common White Tern						*			
Lesser Frigatebird	*					*			
Pacific Black Duck		*				*			

Grey Teal						*			
White-eyed Duck		*				*			
Austlasian Grebe						*			
Brown Goshawk						*	*	*	*
Swamp Harrier		*	*	*	*	*		*	
Peregrine Falcon				*		*			
Pacific Golden Plover		*	*	*		*		*	*
Ruddy Turnstone						*		*	*
Whimbrel								*	
Wandering Tattler								*	
Common Sandpiper						*			
Incubator Bird									
Red Jungle Fowl			*			*			
Buff -banded Rail	*	*		*	*	*		*	
Purple Swamphen						*			*
Red-bellied Fruit Dove	*		*	*		*	*	*	*
Vanuatu Fruit Dove	*			*		*	*	*	*

Pacific Imperial Pigeon	*	*	*			*	*	*	
White-throated pigeon		*	*				*	*	*
Rufous-brown Pheasant-Dove	*	*				*		*	
Green-winged Ground Dove	*	*	*	*	*	*	*	*	*
Rainbow Lorikeet	*	*	*	*	*	*	*	*	
Green Palm Lorikeet		*							
Glossy Swiftlet		*	*	*	*	*	*	*	*
White Chested Swiftlet			*						
Uniform Swiftlet		*	*	*	*	*			*
White-collared Kingfisher	*		*	*		*	*	*	*
Pacific Swallow		*		*	*	*	*		*
Golden Whistler	*	*	*	*		*	*		*
Melanesian Cuckoo-shrike				*					
Polynesian Triller				*		*			
Long-tailed Triller	*	*	*	*		*	*	*	*
Island Thrush									
Scarlet Robin		*					*	*	*

Southern Shrikebill		*							
Broad-billed Flycatcher	*	*	*	*	*	*	*	*	*
Vanuatu Flycatcher				*		*	*		
Grey Fantail		*	*	*	*	*	*	*	*
Spotted Fantail	*	*	*	*		*			
Fantail Warbler		*	*		*				
Vanuatu Mountain Honeyeater	*			*					
Silver-eared Honeyeater				*	*	*	*		
Cardinal Honeyeater	*	*	*	*	*	*	*	*	*
Vanuatu White-eye	*	*	*	*	*	*	*	*	*
Silvereye	*	*	*	*	*	*	*	*	
House Sparrow						*			
Common Waxbill						*			
Black-Headed Mannikin			*	*					
Blue-faced Parrotfinch						*			
Indian Mynah			*		*	*			
White-Breasted Wood Swallow		*	*	*		*			

Table 2. Summary of birds observed on each island. Key to locations: A = Vanua Lava, B = Gaua, C = Santo, D = Malekula, E = Epi, F = Efate, G = Erromango, H = Tanna, I = Aneityum.