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Use of ultraviolet light to help age nightjars, owlet-nightjars, frogmouths and owls

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INTRODUCTION

Ultraviolet (UV) light is widely used by researchers to help determine feather generations of most North American owls. It was originally developed for use on Barn Owls *Tyto alba*; however, it is most extensively used on Northern Saw-whet Owls *Aegolius acadicus* due to the frequency at which this species is banded (Weidensaul 2011). Its use is possible because exposing feathers that contain porphyrin pigments to UV light results in them fluorescing a spectacular, hot pink colour (Gill 2007). The pigments degrade over time as feathers are exposed to sunlight, resulting in older feathers fluorescing less brightly than newly grown feathers (Gill 2007; Weidensaul 2011). Moult stages are identifiable under incandescent light by looking at the amount of wear and fading of the feathers, although this requires significant experience on the part of the bander. The use of UV light enables inexperienced banders to easily and accurately identify moult patterns. Although moult strategies differ between species, some are predictable. Therefore, by understanding moult patterns researchers are able to accurately age these kinds of birds (Rogers *et al.* 1986).

METHODS

The methods described by Weidensaul (2011) were used by the authors to demonstrate that the exposure of flight feathers to UV light is useful in determining feather generations not only in owls, but also in nightjars, owlet-nightjars and frogmouths. These birds were caught using hand nets and mist nets in 2014 and 2015 at Bold Park and Matuwa (Lorna Glen), Western Australia. Bold Park is one of the largest bushland remnants in Perth's urban region and Matuwa is an ex-pastoral lease on the southern edge of the Little Sandy Desert. Trapped birds were banded and examined under a handheld UV light. As the described fluorescence is not visible in daylight, a portable 1.5m^3 dark room was used to examine any birds that were captured at dawn. The single Christmas Island Hawk-Owl *Ninox natalis* examined was being held in captivity due to an old injury and used as an educational aid. It was examined at night in a laboratory with the lights off. The UV source used for all examinations was a General Electric 12 inch, battery-operated light, Model number 50975, with a longwave 365nm bulb. The wavelengths providing the best results are considered to be produced by longwave black UVA lights in the range 400-315nm (Weidensaul 2011). Exposure to the UV light, particularly of the eyes, should be kept to a minimum to avoid potential damage to both researchers and subjects.

RESULTS

All individuals listed in Table 1 exhibited differing degrees of fluorescence when examined under UV light, members of some species more markedly so than others. The newly grown feathers of the Tawny Frogmouth *Podargus strigoides*, with feather moult stages ranging from two to five (as described by de Rebeira 2006), were by far the most spectacular, with the ventral side fluorescing hot pink across the entire vane. This differed from the new feathers of Spotted Nightjars *Eurostopodus argus* and Australian Owlet-nightjars *Aegotheles cristatus*, which showed more fluorescence in the shaft of the feather than in the vane. In all species examined, the white parts of the feathers fluoresced more than the darker parts. The first-year birds that were examined first under incandescent light and aged using characteristics described by de Rebeira (2006), Higgins (1999) and Rogers *et al.* (1986), had a full set of hot pink primary feathers when examined under UV light. This would be expected if they had not yet started their post-juvenile moult. The remaining birds examined had a contrasting mix of new and old primaries that, whilst sometimes hard to distinguish under incandescent light, were easily recognised under the UV light.

Table 1

The number of birds examined under UV light.

Species	Number examined
Strigiformes	
Christmas Island Hawk Owl *Ninox natalis*	1
Southern Boobook *Ninox novaeseelandie*	13
Barn Owl *Tyto alba*	6
Caprimulgiformes	
Tawny Frogmouth *Podargus strigoides*	13
Spotted Nightjar *Eurostopodus argus*	20
Australian Owlet-nightjar *Aegotheles cristatus*	21
Total	74

Australian bird banders commonly age individuals of the species listed in Table 1 as 'unknown', 'first- year' or 'older-than-first year'. Aging is often based on information available in banding guides and aids, such as "markings on forehead obscure" in Australian Owlet-nightjars, "juvenile plumage duller and looser than adults" in Tawny Frogmouths and "slight variations in plumage" in Boobooks *Ninox novaeseelandie*, all of which can be subjective (Rogers *et al.* 1986; Higgins 1999; de Rebeira 2006). It is hoped that the methods described here will help banders to determine moult strategies and more accurately and consistently age owls, nightjars and frogmouths in Australia.

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