

adult male plumage. Shortly afterwards he was seen with a mate who began building a nest. She was banded on 4 September. The pair unsuccessfully attempted to nest four times between August 1989 and April 1990, on each occasion losing their nest in high winds, and were still present in June 1990. This is the first known nesting attempt by any land bird on Booby Island.

It is usually assumed that island colonists are juveniles and that the process of colonisation is essentially random (O'Connor 1986). There has been considerable debate about the frequency with which new potential colonists reach islands and the role of stochastic events in the composition of island avifaunas (e.g. Diamond 1975; Simberloff 1978). The observations reported here suggest that colonisation may not always be a random process. That the eventual colonist had not only visited Booby Island a year earlier but, at that time, stayed longer than any other sunbird, suggests the first visit may have been a reconnaissance for possible breeding sites. Further, the apparent brevity of the period between his return and the start of breeding suggests he found his mate during his absence.

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Increased Mortality of Birds on an Elevated Section of Highway in Northern Tasmania

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Numerous studies have documented mortality of fauna on roads both overseas (McClure 1951; Hodson 1966; Bellis & Graves 1971) and in Australia (Vestjens 1973; Disney & Fullagar 1978; Coulson 1982; Brown *et al.* 1986). However, there is little information on the influence of highway design on road kills and this is mainly discussed in terms of ways to keep animals off roads, e.g. use of fencing or underpasses. This paper reports the comparative mortality rates of fauna on an elevated and on a standard section of highway in northern Tasmania.

Methods

A new section of highway bypassing the town of Deloraine in northern Tasmania was opened to traffic on 8 June 1990. This bypass runs through pastoral country with only one small section of open woodland to one side of the road. For 2.8 km the road is elevated (maximum height 8.5 m) above the level of the surrounding farmland.

A railway line, a river with a contiguous road and a large culvert pipe carrying a creek pass under this elevated section of highway. Guard rails run along both

Table 1 Animals found killed on sections of highway near Deloraine, Tasmania on 13 September 1990.

Species	Bypass			Adjoining highway (5.4 km)
	Elevated (2.8 km)	Non-elevated (2.6 km)	Total (5.4 km)	
MAMMALS				
Brushtail Possum <i>Trichosurus vulpecula</i>	1	1	2	4
Ringtail Possum <i>Pseudocheirus peregrinus</i>	1		1	3
Wombat <i>Vombatus ursinus</i>	1		1	
Platypus <i>Ornithorhynchus anatinus</i>	1		1	
Tasmanian Devil <i>Sarcophilus harrisii</i>				1
Brown Bandicoot <i>Isodon obesulus</i>				1
Rabbit <i>Oryctolagus cuniculus</i>	1	1	2	
Cat <i>Felis catus</i>	1		1	
Black Rat <i>Rattus rattus</i>	1		1	
Totals	7	2	9	9
BIRDS				
Tasmanian Native Hen <i>Gallinula mortierii</i>	11		11	1
Brown Falcon <i>Falco berigora</i>	2		2	
Southern Boobook <i>Ninox novaeseelandiae</i>	1		1	
Totals	14	0	14	1

sides of the elevated highway. Part of the remaining 2.6 km section of the new bypass has a cutting several metres high on one side. The 5.4 km of highway to the west of the new bypass (an equivalent distance to the length of the new bypass) runs through similar country to that of the bypass but contains several more houses and woodlots. The speed with which vehicles travel may influence mortality rates of fauna on roads. However, it is unlikely that vehicle speed is higher on the elevated section of highway as at the elevated end of the bypass a ninety degree turn needs to be taken to get on or off this new section of road.

A survey of the road kills present on the bypass and the equivalent length of highway was conducted on 13 September 1990. Any mammal remains unable to be identified visually were identified from hair samples using the key given in Taylor (1985).

Results and discussion

Road kills found during the survey are given in Table 1. Mortality rates on the non-elevated section were not higher than on highway to the west, so that there is no evidence that mortality of fauna on the bypass was

greater due to its recent construction. The numbers of mammals found did not differ on the bypass and the adjoining highway, although species composition differed somewhat. The greater numbers of possums on the adjoining highway can probably be explained by the greater prevalence of patches of forest. The Platypus *Ornithorhynchus anatinus* was found on the road above where the creek flowed through a culvert pipe. It is interesting that this animal chose to leave the creek and climb the embankment rather than go through the pipe. Around two-thirds of the volume of the pipe was filled with water and hence the Platypus could have swum through. This may be a general phenomenon as all eight Platypus found killed on roads by N.J.M. elsewhere in Tasmania were either above cement culverts or at obstructions in creeks. It is also worth noting that the presence of two underpasses did not lead to any reduction in the mortality rate of terrestrial animals. However, Hunt *et al.* (1987) note that underpasses may need to be well vegetated before they will be used.

The numbers of dead birds found on the non-elevated section of bypass and on the adjoining highway were low. However, significantly more corpses were found on the elevated section ($\chi^2_1 = 35$, $P < 0.001$), most of which were Tasmanian Native Hens *Gallinula mortierii*, a flightless grazer. The lush pasture in the surrounding area provides a rich source of food. It appears that climbing up to the road from below, with low rails alongside the road, makes the animals more susceptible to being run over when crossing the road. This is probably related to poor visibility. Until they are actually on the road the native hens would not be able to see oncoming cars.

It appears likely that certain birds of prey may also be more susceptible to being killed on the elevated section of highway. Three individuals were found here whereas none were found on the other sections surveyed. M. Holdsworth (pers. comm.) also reports seeing Brown Falcons *Falco berigora* killed on this same section of highway. Surveys of road kills undertaken over many years by N.J.M. indicate an expected mortality of one per 1000 km for both Southern Boobook *Ninox novaeseelandia* and Brown Falcon, and five per 1000 km for all birds of prey for highways in northern Tasmania at the time of year at which this survey was undertaken.

These rates are over 200 times lower than that obtained on the elevated bypass. Elevation of the roadway increased the chance that birds of prey would encounter the road as they hunted over surrounding farmland. On non-elevated sections of highway the birds would normally fly across the road at a height where they would not encounter cars. Mortality of the birds of prey on the elevated section could be avoided by planting tall shrubs or trees along the edge of the roadway. This would force them to fly across the road at a height above the cars.

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