

FEEDING ECOLOGY OF THE WEDGE-TAILED EAGLE *Aquila audax* IN NORTH-WEST QUEENSLAND: INTERACTIONS WITH LAMBS

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The diet of the Wedge-tailed Eagle *Aquila audax* was studied by analysis of pellets ($n = 145$) and prey remains from four sites in the north-west Queensland sheep rangelands, and one non-sheep site in north Queensland. Eagle behaviour around lambs was observed from a hide at sheep camps at three sites (total 216 h), and post-mortems were conducted on 29 dead lambs from three sites. In north-west Queensland the diet of breeding adult eagles, from remains ($n = 216$) at 12 nests, consisted of 53 percent mammals, 28 percent birds and 19 percent reptiles by number, and 89 percent mammals, 10 percent birds and 1 percent reptiles by biomass. Diet of breeding adults and non-breeding subadults combined, from pellets, consisted of 67 percent mammals, 25 percent birds and 8 percent reptiles by number, and 75 percent mammals, 24 percent birds and 1 percent reptiles by biomass. Eagles ate some lambs (17% by number and 15% biomass in remains, 33% and 21% in pellets); carrion could not be distinguished from live prey. The higher proportion of lamb in the pellet data may reflect a higher level of scavenging or predation on lambs by non-breeding immature eagles than by breeding adults. In north Queensland the eagles' diet at two nests consisted, by number, of 78 percent mammals and 22 percent birds in remains ($n = 21$) and 86 percent mammals and 14 percent birds in pellets; biomass contributions were 97–98 percent mammals and 2–3 percent birds. No attacks on lambs were observed; of 29 dead lambs, eagles killed one viable lamb (3%) and two lambs of unknown viability. The dietary data, together with differences between sites in eagle numbers, age classes, seasonal fluctuations and nesting activity, suggest the following interpretation: most of the few lamb deaths and injuries attributed to raptors were caused by non-breeding eagles, and that by their territorial defence adult eagles may exclude immatures and thus provide a measure of protection to lambing flocks.

INTRODUCTION

The diet and foraging of the Wedge-tailed Eagle *Aquila audax*, including the controversy over possible predation on lambs, have been investigated in many parts of southern Australia where introduced Rabbits *Oryctolagus cuniculus* provide a major food source for eagles (reviewed by Marchant and Higgins 1993 and Olsen 1995; also Olsen *et al.* 2006; Silva and Croft 2007; Collins and Croft 2007). However, there have been no detailed studies in northern Australian sheep lands where rabbits are absent and there may be increased potential for eagle predation on lambs. The only quantified study was in a national park, where lambs were not available within that study area (although feral Goats *Capra hircus* were); the eagles ate mostly small macropods and other mammals, including a few goats or kids (Sharp 1997). Otherwise, for northern Queensland there is an account of eagle predation on arboreal mammals in closed forest, i.e. non-sheep country (Burnett *et al.* 1996). Eagle diet on the subtropical east coast (a range of native mammals, birds and reptiles: Harder 2000), at sites where rabbits are scarce, suggests the likely prey profile farther north.

Raptor diets are commonly studied by examination of prey remains at nests, and by collection of regurgitated pellets at and away from nests (e.g. roosts). Both methods have potential biases, and the dietary profile can differ substantially in remains versus pellets for certain species eaten, especially large animals that may be fed on over several days, including sheep (e.g.

Leopold and Wolfe 1970; Brooker and Ridpath 1980; Sharp *et al.* 2002). For instance, sheep was more prevalent in Wedge-tailed Eagle pellets than in prey remains and vice versa for reptiles, but other prey types were more similarly apportioned between remains and pellets (Sharp *et al.* 2002).

Owing to concerns raised by graziers and the Queensland Department of Primary Industries, this project was established to investigate the diet of Wedge-tailed Eagles and their interactions with sheep in the rangelands of north-west Queensland, where there are no rabbits as alternative prey. The region is marginal for sheep production, with high mortality of lambs (D. Maxwell pers. comm.). The aims of the study were to quantify the eagles' diet, including the contribution of viable lambs, to describe the eagles' behaviour around lambs, and to assess the vulnerability of lambs to eagle predation. This study also sought to compare the eagles' diet in a region of north Queensland where lambs are not available and rabbits are scarce.

STUDY AREA AND METHODS

Study sites

The main study area was the sheep rangelands of north-west Queensland in the region bounded by Cloncurry, Hughenden and Boulia. Stations in the region are increasingly converting from sheep to cattle, leaving sheep runs increasingly isolated and surrounded by cattle runs. Eagle dietary samples, observations of eagle behaviour, interviews with graziers, or samples of dead lambs for post-mortem analysis were obtained