

# Diet of 25 sympatric raptors at Kapalga, Northern Territory, Australia 1979–89, with data on prey availability

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This study describes prey availability and the diet of 25 sympatric diurnal and nocturnal raptors over 11 years 1979–89 in tropical Australia, at Kapalga in Kakadu National Park. Rainfall is seasonal: most falls from January to early March, resulting in pronounced annual wet and dry seasons. The major habitats include tidal rivers, seasonally inundated floodplains, upland open forests and woodlands, seasonal and permanent streams, and billabongs. About 365 vertebrate species have been recorded at Kapalga including Magpie Geese *Anseranas semipalmata* and many other waterfowl, Dusky Rats *Rattus colletti* and other small mammals, aquatic reptiles, frogs and invertebrates on the floodplains of the two tidal rivers. Sixteen raptor species were recorded breeding at Kapalga and another ten species were recorded breeding elsewhere in the Top End of the Northern Territory. Whistling Kites *Haliastur sphenurus*, the most numerous raptor at Kapalga, mostly breed on the edge of the floodplains, with nest densities up to seven nests per square kilometre. Magpie Geese were a major prey for many raptors, and adult populations up to 70 000 were available annually, as well as eggs (up to ¼ million) and flightless young during their late wet-early dry season breeding period. Dusky Rats were also a major prey species and their populations fluctuated between highs (up to ½ million) and lows on a 2-year cycle. Other prey including small mammals, snakes, frogs and insects greatly increased in numbers in response to increased dry-season vegetation on the floodplains after Swamp Buffalo *Bubalus bubalis* were removed about midway through this 11-year study. Raptor dietary records were based mainly on pellets and prey remains collected at roosts, nests and feeding sites; and also on observations of prey hunted and captured by adult raptors. In total, prey identified comprised at least 49 bird species, 18 mammals, nine reptiles, eight fish, seven invertebrates and one frog. For the ten well-studied raptor species ( $\geq 20$  diet samples), the major prey types of the Whistling Kite, Black Kite *Milvus migrans* and Black Falcon *Falco subniger* were mammals and birds; mammals and invertebrates for the Barking Owl *Ninox connivens*; mammals for the Rufous Owl *Ninox rufa*, Eastern Barn Owl *Tyto javanica* and Eastern Grass Owl *T. longimembris*; birds for the Red Goshawk *Erythrotriorchis radiatus*; and reptiles for the White-bellied Sea-Eagle *Haliaeetus leucogaster* and Brown Falcon *Falco berigora*. These diets were generally similar to those reported for these species elsewhere in Australia, although the Black Falcon took more rats than birds at Kapalga, and the Barn Owl and Grass Owl had a narrower food niche (rats only) than elsewhere.

## Breeding ecology of Welcome Swallows *Hirundo neoxena* in the Yarra Valley, Victoria: the nestling stage

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Breeding ecology studies encompassing multiple seasons, sites and breeding attempts help in determining which aspects of a species' breeding ecology are widespread, which vary temporally and spatially, and the reasons for such variation. The nestling stage of Welcome Swallows *Hirundo neoxena* breeding in eleven sites less than or equal to 12 kilometres apart in the Yarra Valley, southern Victoria was studied over three successive seasons. The seasonal timing of the nestling stage (late Sept. –early Jan.), degree of hatching synchrony (53%) and the length of the nestling period (20–24 days) were similar to findings of other Welcome Swallow studies in SE Australia and suggested that these features may be genetically regulated. In contrast, values for features likely to be more proximally influenced by environmental variation were more at variance with values reported in some other investigations, e.g. absolute hatching success (68%), fledging success and, to some extent, the causes of nestling mortality. There was some variation among years in the seasonal timing of hatching, and among years and colonies in the causes of nestling losses. The role of predation in nestling mortality was equivocal; there was little direct evidence for it, but it may have contributed to the high frequency of nestling disappearance.

## **The utility of closed aluminium and butt-ended stainless steel leg bands for Australian Pelicans *Pelecanus conspicillatus***

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Leg bands are one of the oldest and most widespread of methods used to mark individual birds for study, but different kinds of bands may influence results obtained. We compared recoveries from closed aluminium and butt-ended stainless steel leg bands deployed on Australian Pelicans *Pelecanus conspicillatus* between 1968 and 2004. All 64 recoveries from the 2123 closed aluminium bands deployed exhibited wear, whereas none of the 162 recoveries from the 12 427 butt-ended stainless steel bands deployed were worn. Closed aluminium bands resulted in 2.3 times as many recoveries overall, but half the recoveries within one year of deployment compared to butt-ended stainless steel bands. Only butt-ended stainless steel bands were recorded as “band only found”, suggesting they became dislodged from pelicans. This was confirmed with pelicans that were simultaneously marked with leg bands and patagial tags. Together these data show that butt-ended stainless steel bands, while offering greater durability, result in less useful data than closed aluminium bands. A leg band that combines the durability of stainless steel bands and reliability of closed aluminium bands would provide a better proposition for the future studies of Australian Pelicans.