fauna that included *Trichosurus vulpecula, Petaurus australis* and *P. breviceps* as well as *Pseudocheirus peregrinus*. He stated, however, that *P. peregrinus* was the most abundant possum in his study area and suggested that the Owl was an opportunistic predator rather than highly selective, as other authors have stated. The selection of *P. peregrinus* and *S. volans* was unquestionable, however, at Girraween where both these species were present in a diverse fauna of possums, which also included the larger *T. vulpecula*, the smaller *P. breviceps* and the much smaller *Acrobates pygmaeus*.

The bulk of the data available on the diet of the Powerful Owl, including that provided by Seebeck (1976), supports the proposition that this Owl is a selective predator with a decided preference for the medium-sized possums *P. peregrinus* and *S. volans*, which it will take indiscriminately where both occur together.

Although this study provided no indication of the rate at which these possums are taken, this large Owl probably plays a significant part in the regulation of their populations in the area.

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COOPERATIVE BREEDING BY TREECREEPERS

Cooperative breeding has been reported in no fewer than sixteen families of Australian birds (Rowley 1976). In this paper I summarize evidence of co-operation in another family, the Australian Treecreepers (Climacteridae). The tendency for some species of *Climacteris* to occur in groups during the non-breeding season has been noted elsewhere (Reader's Digest 1976; Noske 1976). All species are sexually dimorphic (see Disney *et al.* 1974).

I studied colour-banded Brown Treecreepers *C. picumnus* at Swan Vale, thirty kilometres west of Glen Innes, NSW; Red-browed Treecreepers *C. erythrops* at Wollomombi Falls, forty kilometres east of Armidale, NSW; and White-throated Treecreepers *C. leucophaea* at both places. During the 1977–78 breeding season, six groups of Brown Treecreepers nested: two simple pairs, two trios and two quartets. Five nesting groups of Red-browed Treecreepers consisted of four trios and one quartet but there were no pairs. In both species, there was only one female in each group. Contrary to Reader's Digest (1976: 452), the female alone incubated in these and other species of *Climacteris* that I have observed. Every individual participated in feeding the young of its own group and each male fed the incubating bird. One Brown trio and two Red-browed trios successfully reared two broods but the offspring of the first brood did not help the adults at the second nest. In October 1978, I saw no fewer than six Brown Treecreepers (five males: one female) feeding at one nest. Of the four supernumerary males, two were a year old and the progeny of the primary (mated) male but the others were at least two years old. One of the last two simultaneously fed nestlings at another nest belonging to a different group, over one hundred metres away.

I have observed thirty nests of the White-throated Treecreeper and all have been attended by simple pairs. This is consistent with the strongly territorial social organization of this species, which is usually solitary during the non-breeding season (Noske 1976). I have also observed three nests each of the Rufous and White-browed Treecreepers *C. rufa* and *C. affinis* and one of the Black-tailed Treecreeper *C. melanura*. The three nests of Rufous Treecreepers, forty-six kilometres south-west of Iron Knob, SA, each contained young and were attended by trios, one of which had two females. Nests of White-browed Treecreepers in south-western Queensland were attended by simple pairs and during the non-breeding season I observed these birds singly or in pairs. The nest of the Black-tailed Treecreeper near Mount Isa, Qld, was attended by a simple pair. However, R. Orenstein (*in litt.*) has seen three

adults of this species feeding at a nest near Pine Creek, NT, and I noted two trios (two males: one female) near Mount Isa. Orenstein also observed a trio of *C. picumnus melanota* attending one nest at Mareeba, Qld.

I conclude that Brown, Rufous, Red-browed and Black-tailed Treecreepers are facultative cooperative breeders because I have observed three of these species also breeding in simple pairs. It is interesting that groups of these species typically contain more males than females. Skewed sex ratios may be characteristic of many Australian cooperative breeding passerines (Dow 1973) but few such species are sexually dimorphic. The White-throated Treecreeper probably never breeds cooperatively and this species differs from the above four in many other aspects of behaviour and morphology (unpubl. data). As the White-browed Treecreeper is closely related to the Red-browed (Keast 1957), it may also breed co-operatively.

A more detailed account of the social behaviour and breeding success of these birds will appear at a later date.

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SALINE COASTAL SWAMP IN NORTHERN TERRITORY AS A HABITAT FOR WATERBIRDS

Coastal building in recent geological time has been extensive and rapid in parts of the Northern Territory (Williams 1969). This has isolated sections of mangrove forest from the sea. This forest has then been ravaged by the monsoonal climate and succeeded by saline swamps and alluvial plains. The salinity in these areas seems to originate largely from the substratum, because any input from spring tides only affects their margins. Little study seems to have been made of this type of habitat but it probably has much in common with salt marshes of temperate climates.

The aim of this project was to study seasonal changes in numbers of waterbirds in one such area, Leanyer Swamp, five kilometres south-east of Darwin, also to compare the birds in this area with those in fresh-water and littoral habitats.

The Darwin region has a long cool dry season (May to September) and a hot humid wet season (December to March) when most of the annual rainfall (average 1,500 mm) is received. There are also transitional periods of high temperatures and humidity but comparatively little rain (October–November and April); McAlpine (1969) describes the climate in detail.

The census was carried out in the north-western corner of Leanyer Swamp between October 1970 and July 1971. The area consisted of bare clay pans dissected by beds of sedges, salt-tolerant grasses and other herbage (Story 1969). During September 1970, the swamp was completely dry; shallow flooding resulting from fresh-water drainage occurred in early October. This water became hypersaline as salt was deposited in the swamp. Salinity seemed to have been high enough to prevent germination of the sedges until after substantial inflows of fresh water in December 1970 and January 1971 (Fig. 1c). The sedges started to germinate in mid-January and by early March two thirds of the open water had been overgrown. Water-levels reached a maximum of about one metre in March but dropped steadily through April and May. The swamp was completely dry again by mid-July. After March, evaporation seemed to be the sole factor for reducing the level of the water. This caused the levels of salinity to rise and the sedges to die and mat down so that the habitat again became fairly open.

Observations were made along two transects about 100 metres wide and 400 metres apart. The census area covered about five hectares.

Richness of species (Fig. 1b) was calculated by totalling the number of species seen on each visit during a month and dividing by the number of visits. Weekly visits were made except from December to February when they were increased to twice a week at times. Sorensen's (1948) similarity quotient (QS) index was used to determine the relation between birds listed from Leanyer Swamp and Fogg Dam (freshwater) and the coast (Fig. 1a). The formula is $QS = [2W (a + b)] 1000$ where a = list of species from area A, b the list from area B and W those recorded from both areas. Each week censuses were carried out in the other two areas. The QS values were obtained by using the monthly list of species from each area. The areas were of unequal size; so there was a danger of bias with the use of the index (Southwood 1966). Leanyer Swamp was the smallest area. Because the index makes use only of lists of