

A census of reef herons (*Ardea sacra*) in the Marlborough Sounds

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Abstract A total of 57 reef herons (*Ardea sacra*) were counted during a survey of the entire 1,500 km coastline of the Marlborough Sounds in spring 2006. Most birds were encountered in the outer part of the sounds rather than the more developed inner sounds. The total New Zealand population is estimated at 300-500 birds. Both the Marlborough Sounds and national population appears to have been stable for the past 40 years. With a small but stable population the reef heron's threat classification in New Zealand should be changed from Nationally Vulnerable to Naturally Uncommon. The species is secure overseas with New Zealand being the southernmost limit for the species.

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INTRODUCTION

The reef heron (*Ardea sacra*) is found in Eastern Asia (from Japan and South Korea to Bangladesh), Australasia, New Zealand and eastward to Southeast Polynesia (Marquesas, Tuamotu and Austral Is). In New Zealand they are widespread in the North, South and Stewart Is, with stragglers recorded at the Kermadec, Chatham and Auckland Is. Reef herons are usually solitary, preferring both rocky shores and mangrove-filled estuaries (Edgar 1978; Marchant & Higgins 1990; Heather & Robertson 1996).

In New Zealand, reef herons are solitary nesters, occupying sites hidden in caves, crevices, rock piles, rock ledges or in low vegetation on cliff faces. Laying is from Sep to Dec, and incubation lasts 25-28 days with chicks fledging when 5-6 weeks old (Edgar 1978; Marchant & Higgins 1990; Heather & Robertson 1996).

Reef herons are considered widespread and are commonly seen in New Zealand, although more so in the North I and throughout the Marlborough Sounds (Edgar 1978; Marchant & Higgins 1990; Heather & Robertson 1996; Robertson *et al.* 2007). Presently, the reef heron has a threat classification of Nationally Vulnerable (Miskelly *et al.* 2008). Following a survey of the entire coastline of the Marlborough Sounds during Sep-Dec 2006, this paper presents the distribution and numbers of reef herons in the Marlborough Sounds, with an estimate of the national population, and review of the threat classification for this species.

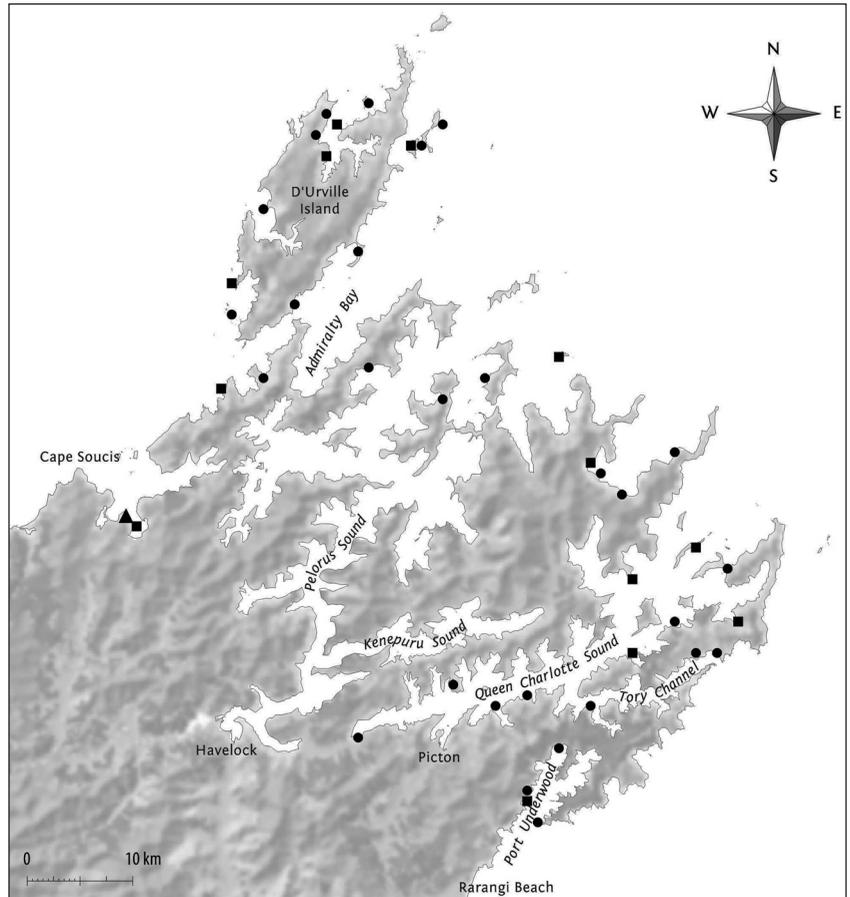
METHODS

Between 9 Sep and 16 Dec 2006, the entire coastline of the Marlborough Sounds was surveyed to conduct a census for a number of coastal bird species. The full extent of coastline from Rarangi Beach in the southeast to Cape Soucis in the west was included in the survey, a total length of 1,500 km (Fig. 1).

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Fig. 1. Location and numbers of reef heron sightings within the Marlborough Sounds in Sep to Dec 2006. Circles represent single birds, squares 2 birds, and triangles 3 birds.



The outer part of the Sounds were surveyed in Sep, Oct and Dec. During Nov, I concentrated survey effort on the inner part of the Sounds, an area of denser human population density and development compared to the outer Sounds.

Surveys were primarily carried out from a boat travelling at 5-8 knots and at a distance of 5-30 m (usually 5-10 m) from the shoreline depending on shore topography. As reef herons nest in concealed sites, this survey methodology made it impossible to find nest sites. Instead, all birds seen were counted. The boat stopped offshore when reef herons were seen and a count undertaken. The location of herons was noted with a hand-held GPS. The location of birds flushed by the boat was recorded from the point of take off, and these birds were carefully passed to avoid double counting.

For national population estimates, I used counts from this study and from Wellington Harbour (Robertson 1992) to calculate the average number of birds/km coastline. Using Robertson *et al.* (2007), the percentage of coastal atlas survey squares where reef herons were recorded. This was then divided

by the length of the New Zealand coastline, which provided a measure of the length of coastline where reef herons were present. A national population estimate was estimated by multiplying this figure by the average number of birds/km.

To compare regional differences in density, data from the 1999-2004 atlas survey was used (Robertson *et al.* 2007). For each 10 km grid square with reef heron present, the percentage of atlas field sheets with heron records was used as a measure of abundance. The more numerous reef herons were in an area is reflected by a higher percentage of sheets recording them. A Student t-test was used to test the significance of differences between areas.

RESULTS

Marlborough Sounds population

A total of 57 reef herons were recorded in the Marlborough Sounds, with most birds occurring in the outer part of the Sounds, especially around d'Urville Island (Fig. 1). No reef herons were observed in Nov when only the inner part of the

Table 1. Proportion of reef herons recorded as singles or in pairs/groups in the Marlborough Sounds during Sep – Dec 2006. Note: only the Inner Sounds were surveyed in Nov and no reef herons were observed.

	Sept	Oct	Nov	Dec
Singles	23	20	0	14
Pairs/groups	4 (15%)	11 (36%)	0	6 (30%)
Total	23	20	0	14

Sounds were surveyed, despite the continued presence of birds in the outer parts of the Sounds during this month.

Most (63%) birds were seen as single individuals, 32% were observed in pairs, and there was 1 sighting of a single group of 3 birds. A lower proportion of birds were recorded individually during Sep, than during Oct and Dec suggesting timing of the breeding season influenced sightings (Table 1).

National population estimate

The density of reef herons in the Marlborough Sounds was 3.8 birds/100 km, which is similar to the 5.3 birds/100 km recorded over 64 km of Wellington's coastline during Sep-Dec in 1986-88 (Robertson 1992). With these 2 areas being the only counts of reef heron covering large areas of coastline available at present, the pooled average is 4.6 birds/100 km.

During the 1999-2004 atlas period, reef herons were recorded from 294 gird squares, or 34.4% of the 855 squares that included some coastline (Robertson *et al.* 2007). New Zealand's coastline is 15,134 km in length, thus from the atlas data, reef herons occupied an estimated 5,145 km of coastline. Using the pooled density gives a national population estimate of 236 birds.

Two additional factors need to be considered when estimating the national population of reef herons. Firstly, it is likely that proportionally more pairs were observed later in the breeding season and that some birds were missed in Sep (and thus population estimates were lower) whilst birds were incubating. Secondly, the atlas data suggests the stronghold for this species is in northern New Zealand, and thus extrapolating from counts in Marlborough and Wellington may under-estimate the national population size. The northern North I (above 40° S) has 71% of atlas records, with the average percentage of field sheets reporting reef heron being 25.7% per gird square. This is significantly more (t-test: $P = 0.00045$) than the 16.6% of sheets reporting reef heron in the lower North and South Is combined. Taking this into account, the national population is estimated at 300-500 birds.

Population trend

Edgar (1978) recorded 27 *ad hoc* sightings of reef heron from the Marlborough Sounds during the 1960's and 1970's. By using *ad hoc* sightings as opposed to a systematic survey, it is likely that many sections of coastline went unreported. The distribution of Edgar's (1978) sightings suggests that only ~50% of the Sounds were covered. However, in the areas with apparently good coverage, numbers have remained similar to that recorded during 2006: d'Urville Island (10 reported by Edgar 1978, 12 this study), Outer Pelorus Sound (5 *cf.* 5) and Queen Charlotte Sound/Tory Channel (10 *cf.* 8).

Nationally there was no significant difference in the distribution and abundance of reef heron records between the 2 atlas periods. During 1969-79, reef herons were recorded in 29.5% of coastal gird squares (270 of 913 squares), and then from 34.4% of squares during the 1999-2004 atlas survey (Bull *et al.* 1985, Robertson *et al.* 2007).

DISCUSSION

Within the Marlborough Sounds, reef herons showed a strong preference for the most isolated rocky coastlines. Although there appears to be considerable available rocky habitat in the inner part of the Sounds, reef herons were almost entirely absent from this area, as indicated by the lack of reef herons during my survey of the inner part of the Sounds during Nov. This suggests an inability to co-exist with coastal development, as it is this inner part of the Sounds that has the greatest number of homes and baches. Further sub-division and beachfront development could threaten the status of reef heron within the Marlborough Sounds.

Edgar (1978) suggested that the reef heron population had undergone a decline between 1900 and 1970. However, since this time it appears to have been stable for the past 40 years, with both the Marlborough Sounds and national populations showing little change.

Reef herons are considered to be most numerous in northern New Zealand, and this was confirmed by Robertson *et al.* (2007), where most records were from the northern North I, with a higher density of birds here than in the lower North I and South I. Reef herons usually feed solitarily (Marchant & Higgins 1990, Heather & Robertson 1996) and most birds in this study were recorded as singles, although the proportion changed as the breeding season progressed. The high occurrence of single birds probably reflects that during Sep some birds were missed whilst they were on nests. Pairs also appear to have large territories and may also occur separated from one another when feeding.

Seasonal changes in the behaviour of reef herons need to be considered when estimating the national

population. With few published coastal surveys, it is also difficult to compare the densities of reef herons found in this study with other regions, especially the northern North I. Nevertheless, given the constraints of the data, the national population of reef herons is estimated at 300-500 birds. Further coastal surveys in northern New Zealand are recommended to refine this estimate. Surveys should be carried out in Oct to Dec to reduce the chances of missing birds incubating on nests.

With a national population of 300-500 birds, reef herons are one of the least common shorebirds in the country. However, del Hoyo *et al.* (1992) list the species as not threatened, with reef herons being common or abundant in parts of their range. BirdLife International (2000) estimates the global population to be 100,000-1,000,000 birds. New Zealand is at the southern limit for this species, and the small population size and scarcity of records from the South I (Robertson *et al.* 2007) may reflect the largely tropical and sub-tropical distribution of this species.

At present, the reef heron has a threat classification of Nationally Vulnerable (Miskelly *et al.* 2008). However, it should be listed as Naturally Uncommon. This classification would reflect the small but stable population of the species in New Zealand, that it is secure overseas, and that New Zealand is the southernmost limit for the reef heron.

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