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Bird fauna of Motu Kaikoura, New Zealand

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Abstract An annotated checklist of the birds of Motu Kaikoura (Selwyn Island) in the Hauraki Gulf, New Zealand, is provided from surveys carried out between Dec 2006 and Jun 2008, supplemented by other recent observations. Thirty-seven species were recorded, including 25 species of land or wetland birds, and 12 species of seabirds and shorebirds. A total of 26 species were indigenous and 11 species were exotic. Motu Kaikoura was gazetted as a scenic reserve in 2004, with ecological restoration a key aim of its management. The 564 ha island has low vegetation diversity, reflecting a long history of anthropogenic degradation. Fallow deer (*Dama dama*), rats (*Rattus* spp.), mice (*Mus musculus*) and feral cats (*Felis catus*) were present on the island. Eradication of invasive mammals has been a management priority, with the bird surveys representing baseline data against which the progress of ecological restoration can be measured.

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INTRODUCTION

Motu Kaikoura or Selwyn I is located on the western side of Aotea (Great Barrier I) in the Hauraki Gulf, New Zealand, forming Fitzroy Harbour on its eastern side (Fig. 1). The island is 564 ha in area (Taylor 1989), and of andesitic volcanic origin (Armitage 2001). The highest point of the island is 205 m, with a deeply dissected terrain including coastal cliffs and inland bluffs. Streams within the catchments tend to be seasonal, with much runoff through groundwater. There is one permanent pond (*c.*500 m^2) that is a remnant of farming.

Motu Kaikoura was gazetted as a Scenic Reserve in 2004, with management vested with the Motu Kaikoura Trust. The Trust's goals include restoration of the island's environment, and an early priority was rodent and feral cat eradication. Bird surveys were carried out to establish the baseline status of biodiversity on the island and to inform management decisions during ecological restoration. Here we present a checklist that represents the 1st comprehensive avifauna survey for Motu Kaikoura. Published checklists of the birds of Aotea I and surrounding islands refer to Motu Kaikoura briefly or not at all (Bell & Braithwaite 1964; Ogle 1981; Phillips 2007).

The island has a long history of degradation from human habitation, starting with Polynesian colonisation of Aotea 600-650 years ago (Horrocks *et al*. 1999; Armitage 2001). Archaeological evidence suggests that most larger islands of the Hauraki Gulf were extensively modified prior to European settlement (Hayward 1986). Motu Kaikoura and Aotea have extensive archaeological sites indicating habitation by Maori (Dodd & Tanner 2006; Armitage 2001), and habitat modification would have been associated with this period.

Since 1854, Motu Kaikoura has had 20 European owners, with farming established in 1859. Management of the island included periodic burning, the last major fire being *c.*1980 (Cameron

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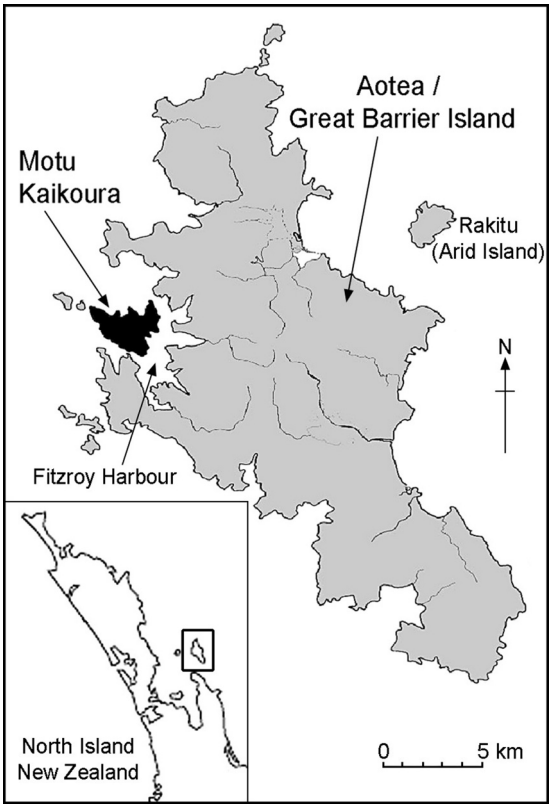

Fig. 1. Location of Motu Kaikoura.

2007). Fallow deer (*Dama dama*) were introduced in the 1930's, and pigs (*Sus scrofa*) and goats (*Capra hircus*) in the 1980's. Goats were removed from the island in 1993 (Cameron 2007) and, at the time of the bird surveys, few pigs remained (Will Scarlet, *pers. comm*.). Fallow deer remained as an unmanaged herd since the cessation of farming in the 1990's. The deer reached peak numbers of *c*.360 in the 1970's, and have been culled biannually since 2005. At the time of the bird surveys, a small number persisted on the island.

The vegetation of the island is highly modified, reflecting environmental disturbance, and only in locations inaccessible to deer is there extensive indigenous vegetation (Cameron 2007). Much of the island is now covered by a relatively low, but dense, canopy of kanuka (*Kunzea ericoides*), and manuka (*Leptospermum scoparium*) (Fig. 2a), with emergent pines (*Pinus radiata* and *P. pinaster*) dominating the southeastern slopes. Pockets of coastal broadleaf vegetation occurs in the lower reaches of the larger catchments, and includes old growth puriri (*Vitex lucens*), taraire (*Beilschmiedia tarairi*) and kohekohe (*Dysoxylum spectabile*). In all areas, the understory is sparse and limited to species unpalatable to fallow deer (Fig. 2b). An airfield on an eastern ridge of the island offers *c*.3 ha of grassland that is mowed on a regular basis. During the bird surveys, ship rat (*Rattus rattus*), house mouse (*Mus musculus*) and feral cat (*Felis catus*) were present on the island. Mustelids, Norway rat (*R. norvegicus*), hedgehog (*Erinaceus europaeus*) and possum (*Trichosurus vulpecula*) have never been introduced to Aotea nor its surrounding islands (Cameron *et al*. 1997; Armitage 2001).

METHODS

The island was surveyed formally over 3-day periods in Dec 2006, Dec 2007 and Jun 2008. The species present on the island were recorded during visits to different areas of the island. This coverage was generally restricted to the areas serviced by tracks, but the low canopy in other parts of the island offered sufficient visibility from elevated positions to include a wider area in the survey. Identification of vocalisations was used to include species heard but not seen. The survey encompassed each of the habitat types present on the island: ridge, valley, coast, pine dominant, kanuka/manuka dominant, and grassland/farm remnant. Observations were also made at night and during a circumnavigation of the island by boat to survey areas otherwise difficult to assess, and to identify species using the waters around the island. Observations made by Pierce (2006) and Cameron (2007) during visits to the island have been incorporated into the species list, along with observations by the island's resident caretaker, Will Scarlett.

Quantitative data for forest birds was gathered during 'slow-walk' transects (Handford 2002) in 3 locations selected to represent the main habitat types: coast, pine dominant, kanuka/manuka dominant. Each transect was counted at least 3 times each day of recording. For consistency, these counts were undertaken 2 to 4 hours after dawn during fine weather. We were assisted by 8 different field assistants, with a minimum of 2 people participating in each transect count. As these were fixed-width transects 100 m x 20 m (n=51), an average density was then calculated to indicate abundance (Manuwal & Carey 1991).

ANNOTATED CHECKLIST OF BIRDS OF MOTU KAIKOURA

Bird species recorded on and around Motu Kaikoura are listed below (nomenclature and order follows the Ornithological Society of New Zealand (1990) and Holdaway *et al*. (2001).

COOK'S PETREL *Pterodroma cookii*

One or 2 birds recorded on summer visits calling in flight above the accommodation after nightfall. While there is no evidence of this species nesting on Motu Kaikoura at present, the island is on the flight-

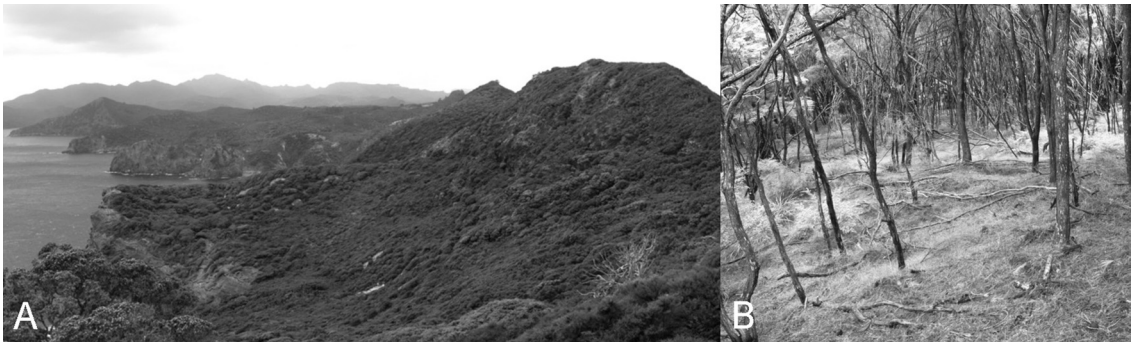

Fig. 2. A, Northern coast of Motu Kaikoura looking east towards Aotea (visible in distance); **B,** kanuka/manuka vegetation showing the result of overgrazing of understory by fallow deer. Photos: M. Galbraith.

path between the principal breeding site, Hauturu (Little Barrier I), and feeding areas off the east coast of the North I (Rayner 2008), and close to a small population extant on Hirakimata (Mt Hobson) on Aotea (Ogle 1981; B. Bell, *pers. comm*.). Although the birds were not sighted, it is likely that the flight path of at least some birds was in the vicinity of a ridge-line where telephone towers are sited. With a wind power generator recently installed on this ridge, it raises concern for the potential impact on these petrels given their threatened status (Hitchmough *et al*. 2005; Pierce 2006).

BLUE PENGUIN *Eudyptula minor*
Observed as individuals or groups of up to 3 birds entering southern Fitzroy Harbour through Man-o-War Passage at dusk. Also heard calling from the island's shoreline. Nesting on Motu Kaikoura has been confirmed (W. Scarlett, *pers. comm*.).

AUSTRALASIAN GANNET *Morus serrator*
Observed daily as individuals or large feeding flocks (50+) within Fitzroy Harbour. There is a substantial gannet breeding colony on Mahuki I, 5.5 km south of Motu Kaikoura (Wodzicki *et al*. 1984).

PIED SHAG *Phalacrocorax varius*
Observed feeding around Fitzroy Harbour, and in flight to and from a breeding colony on the southern coast of Motu Kaikoura. When visited in Jun 2008, this colony was active, with 9 nesting platforms in pohutukawa (*Metrosideros excelsa*), 8 of which were occupied by well-developed juveniles.

LITTLE SHAG *Phalacrocorax melanoleucos*
One seen drying wings on the southern Motu Kaikoura coast.

WHITE-FACED HERON *Ardea novaehollandiae*
Single birds observed on the southern Motu Kaikoura coast on several visits.

REEF HERON *Egretta sacra*
One seen regularly on the island's jetty.

BROWN TEAL *Anas aucklandica*
Aotea is the national stronghold for this threatened species (O'Connor *et al*. 2007). Although the majority of the population is found in the Whangapoua catchment on the eastern coast of Aotea, small numbers inhabit the inner bays and coves in Fitzroy Harbour. A pair of brown teal were observed swimming past the southern side of Motu Kaikoura. Cameron (2007) also recorded a pair on the pond adjacent to the farm remnant.

AUSTRALASIAN HARRIER *Circus approximans*
Solitary individuals observed on all visits, flying over the canopies of all habitat types. Lack of habitat for breeding suggests this species is an occasional visitor from Aotea.

BROWN QUAIL *Synoicus ypsilophorus*
One observed in scrub adjacent to the open farm remnant.

RING-NECKED PHEASANT *Phasianus colchicus*
One heard in scrub adjacent to the open farm remnant.

BANDED RAIL *Rallus philippensis*
Banded rail are widespread and conspicuous on Aotea (Armitage 2001). On Motu Kaikoura, they were observed away from cover although remaining wary. At least 3 individuals were seen and heard frequently around the accommodation on Motu Kaikoura, and the sighting of chicks in a neighbouring bay confirmed breeding.

VARIABLE OYSTERCATCHER *Haematopus unicolor*
One pair seen and heard regularly around the bays of the south-eastern coast, another pair was observed on a sandy beach on the northern side of the island. This species was also observed flying the short distance between the southern coast of Motu Kaikoura and Aotea.

SPUR-WINGED PLOVER *Vanellus miles*
One pair observed regularly on the airfield, the

principal habitat on the island available to this species. Observed flying between Motu Kaikoura and Aotea.

BLACK-BACKED GULL *Larus dominicanus*
Recorded daily in flight within Fitzroy Harbour. Individuals also observed roosting on coastal promontories scattered around both Motu Kaikoura and Aotea.

RED-BILLED GULL *Larus novaehollandiae*
Recorded daily in flight within Fitzroy Harbour. Individuals also observed roosting on coastal promontories scattered around both Motu Kaikoura and Aotea.

CASPIAN TERN *Sterna caspia*
Observed as solitary individuals feeding in Fitzroy Harbour; 1 pair known to nest on a rock outcrop within Fitzroy Harbour (W. Scarlett, *pers. comm*.).

WHITE-FRONTED TERN *Sterna striata*
Observed feeding frequently in small flocks (up to 20) throughout Fitzroy Harbour.

NEW ZEALAND PIGEON *Hemiphaga novaeseelandiae*
One or 2 recorded in the lower reaches of each of 3 southern coastal valleys containing suitable fruit resources such as puriri, taraire and kohekohe; transect density 0.5 birds ha^{-1}. Observed flying between Motu Kaikoura and Aotea.

NORTH ISLAND KAKA *Nestor meridionalis*
Aotea has a large conspicuous kaka population (Armitage 2001). This is also the case on Motu Kaikoura, with flocks of 6-8 seen from the accommodation site. Their distribution on Motu Kaikoura appears to be associated with the presence of pines. Kaka were observed feeding on green pine cones, and there were numerous kaka-damaged cones on the ground. Observed flying between Motu Kaikoura and Aotea.

SHINING CUCKOO *Chrysococcyx lucidus*
Observed throughout the island during summer surveys; transect density 0.3 birds ha^{-1}.

MOREPORK *Ninox novaeseelandiae*
Heard calling throughout the island in all surveys, with 1 or 2 birds recorded nightly adjacent to the accommodation site.

KINGFISHER *Todiramphus sanctus*
Common on the island during the summer (transect density 5.5 birds ha^{-1}), but scarce in the winter survey (absent from transects). This population pattern reflects the observed abundance of cicadas (Hemiptera: Cicadidae) and stick insects (Phasmatodea) during the summer months. Nest holes in clay banks confirm breeding on the island. The abundance of kingfisher on Aotea was also reported in early surveys (Ogle 1981).

WELCOME SWALLOW *Hirundo tahitica neoxena*
Established throughout the island, observed feeding above the vegetation canopy.

DUNNOCK *Prunella modularis*
One recorded in scrub adjacent to the open farm remnant.

BLACKBIRD *Turdus merula*
Small number observed in the open farm remnant and open understory of the pine vegetation; transect density 1.0 birds ha$^{-1.}$

SONG THRUSH *Turdus philomelos*
One recorded in the open farm remnant.

GREY WARBLER *Gerygone igata*
Common and widely distributed throughout the island; transect density 5.7 birds ha^{-1}.

NORTH ISLAND FANTAIL *Rhipidura fuliginosa*
Common and widely distributed throughout the island; transect density 5.0 birds ha^{-1}.

SILVEREYE *Zosterops lateralis*
Common and widely distributed throughout the island; transect density 4.2 birds ha^{-1}. No evidence of the winter flocks normally associated with this species (Higgins *et al*. 2006).

TUI *Prosthemadera novaeseelandiae*
Noticeably few on Motu Kaikoura (transect density 0.6 birds ha^{-1}), although abundant on Aotea and local mainland (*pers. obs*.), and particularly scarce in winter. Observed flying between Motu Kaikoura and Aotea. Given the state of the vegetation on Motu Kaikoura, tui may move between food resources as they become available (Stewart 1980).

YELLOWHAMMER *Emberiza citrinella*
Individual birds recorded scattered throughout the island in low coastal and ridge scrub.

HOUSE SPARROW *Passer domesticus*
Two individuals recorded at the accommodation site.

CHAFFINCH *Fringilla coelebs*
Recorded in all habitats across the island, but particularly noticeable in the pine stands; transect density 5.6 birds ha^{-1}. Observed feeding stick insects to fledglings.

GOLDFINCH *Carduelis carduelis*
Recorded in flight above all habitats across the island; transect density 0.4 birds ha^{-1}.

INDIAN MYNA *Acridotheres tristis*
One pair recorded around the accommodation area, another pair on the airstrip. Not recorded in winter survey.

MAGPIE *Gymnorhina tibicen*
Up to 3 magpies were observed near the summit and airstrip. A resident pair may remain in the vicinity of the airstrip, but this pair is likely to exclude all other magpies as has happened on Tiritiri Matangi I over most of the restoration period (R. Walter, *pers. comm.*).

DISCUSSION

Species diversity

Thirty-seven bird species were confirmed as present on or immediately around Motu Kaikoura. Twenty-five are land or wetland birds and 12 are sea- or shorebirds. The species list was lower than expected given that Aotea (at its closest point only 120 m from Motu Kaikoura) has a species count of 62 (Ogle 1981). This difference likely reflects the degraded state of Motu Kaikoura's vegetation and the presence of mammalian predators. Few species were also reported for Rakitu (Arid) I, on the eastern side of Aotea, which is at a similar stage in the process of restoration from past farming activities (Bellingham *et al*. 1982).

The impact of fallow deer on New Zealand vegetation is well documented (Smale *et al*. 1995; Nugent 1990; Nugent *et al*. 2001; Husheer & Frampton 2005). Fallow deer prefer palatable species in the sub-canopy, which generally have small fleshy fruit that are included in the diet of many native forest birds (Clout & Hay 1989). Potential canopy species are also palatable to fallow deer, increasing the risk of canopy collapse as mature trees die. Husheer & Frampton (2005) conclude that a near-zero density of fallow deer is needed to assure subcanopy regeneration. With the eradication of deer on Motu Kaikoura, a flush of subcanopy and canopy plants is expected to result in an increase in both bird diversity and densities.

The presence of ship rats on Motu Kaikoura is likely to have had a negative impact on bird diversity and abundance (e.g. Brockie 1992; Innes 2001). The land-bird species that have persisted are generally those that rely on invertebrates as food, and with high productivity or behavioural traits that allow them to counter mammalian predators. The lack of ground-nesting species is also evident, the result of the former presence of cats (Gillies 2001). The eradication of introduced mammalian predators on islands has resulted in rapid recovery of bird populations (Graham & Veitch 2002). It is expected that the eradication of rats on Motu Kaikoura will result in the recovery of insectivorous bird species, but for species dependent on plant and fruit resources, the restoration of vegetation will also be needed for their recovery.

The dependence of many New Zealand plants on birds for pollination and the dispersal of seeds is well recognised (Anderson 2003a), with the kereru considered to be the sole remaining seed disperser of plants with large fruit (Clout & Hay 1989). The low number of kereru currently on Motu Kaikoura may be a significant limiting factor in its ecological restoration. Future management may need to take potential bird/plant relationships into account and encourage the early return of larger kereru populations to the island.

While pines are often perceived to have a negative impact on indigenous vegetation, and consequently on indigenous fauna, this is not always the case, and special consideration needs to be given to the management of pines on the island. Pine ecosystems can be rich in invertebrates (Clout & Gaze 1984), and observations during the summer surveys indicated that phasmids (stick insects) were abundant in both pine and native vegetation. The role of pine cones as a food source for kaka means that their removal needs to be paralleled with the provision of an alternative indigenous food (e.g. kauri, *Agathis australis*). Clearly, this transformation will be a long-term process. In the interim, it is important that management actions recognise that pines do not necessarily exclude native biota, and that an understory of native plants can develop under a pine canopy.

Species gaps

Although there is no intention to augment the bird fauna through translocations in the short term, additional species might be expected to colonise the island unassisted. Native species recorded from Aotea and Rakitu (Ogle 1981; Bellingham *et al*. 1982; Armitage 2001; Phillips 2007) may be expected to occur on, or around, Motu Kaikoura given the proximity of the 2 islands and improving habitat quality. These species include black shag (*Phalacrocorax carbo*), grey duck (*Anas supercilosa*), pukeko (*Porphyrio porphyrio*), red-crowned parakeet (*Cyanoramphus novaezelandiae*), New Zealand pipit (*Anthus novaeseelandiae*), North I tomtit (*Petroica macrocephala*), North I robin (*Petroica australis*), and bellbird (*Anthornis melanura*).

Recent records of birds flying significant distances within the Hauraki Gulf and establishing new populations suggest a similar process may occur on Motu Kaikoura. For example, red-crowned parakeet are regular visitors to Te Whara (Bream Head) from offshore islands such as the Hen and Chickens (Pearce *et al*. 2001), a minimum distance of 10 km, and the species is a well known coloniser of distant islands (Boon *et al*. 2001); North I tomtit have colonised Rangitoto I 25-40 km from their nearest potential source (Anderson 2003b), and 1 individual is known to have returned to its former territory in the Hunua Ranges after translocation to Tiritiri Matangi I, a distance of 56 km (Parker *et al*. 2004).

Bellbirds have similarly colonised Tawharanui Regional Park from Hauturu (Lee 2005), a distance of 23 km. This suggests that Hauturu (Little Barrier I), 17 km west of Motu Kaikoura, is also a potential source of colonists.

A population of North I robin has been re-established on Aotea through translocation to Glenfern Sanctuary close to the north-eastern point of Motu Kaikoura. This robin population is a potential source for Motu Kaikoura since there is contiguous vegetation between the sanctuary and the Aotea coast, and the distance between the 2 islands at this point varies only from 340-650 m. Monitoring of robin translocations has shown that the species readily disperses from natal territories (Lovegrove *et al.* 2002) and will cross stretches of open water in this range (Oppel & Beaven 2002).

Finally, although the recovery of many land birds depends on the vegetation condition, some seabirds may be restored independent of the vegetation (Taylor 2000). This has potential for boosting seabird populations in the Hauraki Gulf and changing the productivity and successional trajectory through the contribution of nutrients (Markwell 1999). A number of petrel species already breed on Aotea and the smaller islands west of Motu Kaikoura. These include black petrel (*Procellaria parkinsoni*), Cook's petrel, grey-faced petrel (*Pterodroma macroptera*), diving petrel (*Pelecanoides urinatrix*) and fluttering shearwater (*Puffinus gavia*) (Armitage 2001; Halema Jamieson, *pers. comm*.). Observations suggest that some of these petrels are attracted to the sound of generators on Aotea (B. Bell, *pers. comm*.) and Raoul I (S. Ishmar, *pers. comm*.). Diesel generators are present at the lodge and 2 telecommunication sites on Motu Kaikoura, and their regular running may attract petrel colonists.

The survey reported here provides a picture of the avifaua of Motu Kaikoura at the start of the restoration process. It is expected that bird diversity and density will increase over time and with management actions to achieve ecological restoration goals. The eradication of introduced mammals in Aug 2008 should result in enhanced habitat and food resources for existing bird species, and increase the potential for colonisation by other species. On-going monitoring of birds will help track biodiversity trends and inform management decisions on the island's restoration.

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