

THE FIORDLAND CRESTED PENGUIN SURVEY, STAGE I: DOUBTFUL TO MILFORD SOUNDS

By IAN G. McLEAN and RODNEY B. RUSS

ABSTRACT

From 13 to 17 August 1990, we surveyed from Doubtful to Milford Sounds, Fiordland, for Fiordland Crested Penguins. Minimum total estimates were 65 nests and 283 penguins. Proper counts were not made at a few sites and some small breeding groups were probably missed, but we are confident that all major breeding sites in the survey area were located. These penguins breed primarily in small isolated colonies on islands, or in small caves on the mainland coastline. The largest breeding site in the survey area was on the Shelter Islands, at the entrance to Doubtful Sound. Most nests were in dugouts under trees or on small ledges under rocky overhangs. A few penguins were breeding on islands up to 30 km from the open sea. We tentatively propose that there are less than 1000 nests for the species annually.

INTRODUCTION

The Fiordland Crested Penguin (*Eudyptes pachyrhynchus*) is one of the least studied of the world's 16 to 18 penguin species. The only intensive studies to date are those of Warham (1974) on general biology and recent studies at the Universities of Canterbury and Lincoln on breeding biology and brood reduction (Cassady St Clair 1990, McLean 1990, Phillipson 1991). All these studies were at the northern end of the species' range at Jackson Bay (Warham) or Taumaka Island (Open Bay Islands).

Almost nothing is known about the distribution of Fiordland Crested Penguins through Fiordland and western Stewart Island, which is the known breeding range (Bull *et al.* 1985). No estimates of numbers have been made, and the species may be as rare as the highly publicised Yellow-eyed Penguin (*Megadyptes antipodes*), commonly referred to as "the rarest penguin in the world". Fiordland Crested Penguins often breed in small colonies containing fewer than 10 pairs. Nests are placed under vegetation or in small caves or rocky overhangs within a short distance of the sea. These penguins have not been recorded in large colonies further inland, as is typical for the closely related Snares Crested Penguin (*E. robustus*; Warham 1975, pers. obs.). The largest breeding population known is on Taumaka I., where the number of nests was estimated to be 120-150 in September 1990 (McLean, unpubl. data).

From 13 to 17 August 1990, we ran the first stage of an intensive survey of Fiordland Crested Penguins (henceforth referred to as penguins) designed to run for 4 years. Using the RV *Acheron*, and with the support of fee-paying tourists, we surveyed the coastline between Doubtful and Milford Sounds, including all intervening sounds (Figure 1). We landed on virtually all islands in the survey area, checked some caves and rocky overhangs on the mainland, and surveyed some short sections of mainland coastline. Our objective was to locate breeding colonies of penguins and to make a preliminary count of the number of nests at each site. The survey was conducted when birds were on eggs, ensuring that breeding colonies would be easy to locate.

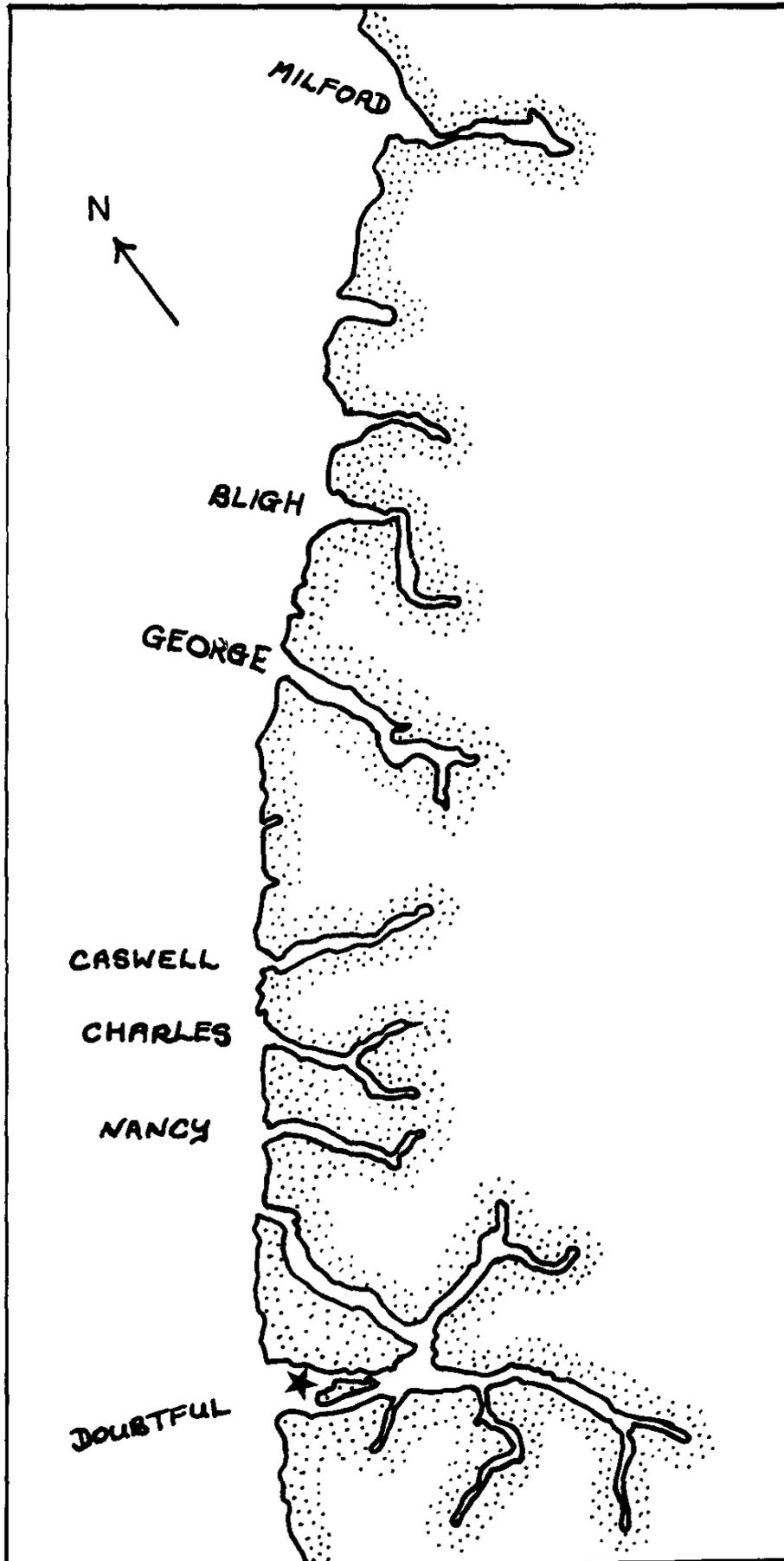


FIGURE 1 — Route taken by *Acheron* during the survey of Fiordland Crested Penguins from Doubtful to Milford Sounds, August 1990. Shelter Is indicated by a star.

METHODS

Preliminary information about the distribution of breeding penguins in the survey area was obtained by searching Department of Conservation (DoC) records in Te Anau. During the survey we checked all sites recorded in the DoC records as having penguins, and numerous other locations.

To check an island 2 - 4 people walked the perimeter searching for penguin sign (walkways into bush, feathers from the moult), listening for penguin calls, and checking rocky overhangs and dugouts under trees and shrubs. They used torches to scan larger caves and dugouts. Once located, penguins were not disturbed, but nest contents were recorded if the birds ran off or exposed the eggs. General descriptions of nest sites were recorded. Counts in most areas where penguins were found were made systematically, but rapidly, and a few well-hidden nests were presumably missed. We spent between 30 and 90 minutes on each island. Only spot checks at likely locations were made on large islands, but small islands were usually checked completely.

For each location visited we give a short description, how fully it was surveyed, and a summary of the penguins seen. The stated number of nests was estimated from the number of pairs (whether or not on eggs) plus the number of solitary birds on nests, and so should be treated as a minimum count. We could not be sure whether single birds were associated with nests if they were not incubating. However, pairs not already on eggs are likely to represent a nest where laying has not begun. Some birds were heard but not seen and we could not determine their breeding status. Incubating birds are obvious whether or not they are with a partner or eggs can be seen. Clutch sizes are only for those nests where the eggs were exposed. Comments about breeding are based on clutch size, presence of both birds (only likely early in incubation), and estimates of egg size if only one egg was present. One small egg indicates that the clutch is not yet complete; one large egg indicates that incubation is well underway.

Weka (*Gallirallus australis*) take penguin eggs and chicks on Taumaka I., and their presence is reported if they were seen. We were particularly cautious about disturbing penguins off nests if Weka were present.

The mainland coastline was continuously scanned for penguins or penguin sign (guano, small tracks into the bush) or likely nesting habitats (bush covered rocky platforms, caves) as we cruised by. However, time and sea conditions did not allow us to check all possible sites.

A record was kept of all birds and marine mammals seen during the cruise. Notes were made about forest birds on each island surveyed and at overnight anchorages.

RESULTS

General

A total of 65 nests and 183 penguins was counted during the survey. A proper count was not conducted on East Shelter I., Doubtful Sound, but our estimate of 100 birds should be added to this total to give 283 birds. Only 11 penguins were seen in the water; all were inside sounds or bays, usually near where, penguins were also seen on land. Not all penguins found

were breeding. Some sites had penguins but no nests; other sites had signs of moult but no penguins.

Most nests were in dugouts under tree roots (some dugouts going in 10-15 m and completely undermining the tree) or in small caves or rocky ledges with overhangs. In some cases it appeared that Fiordland Crested Penguins had excavated burrows previously developed by Blue Penguins (*Eudyptula minor*), but this was difficult to establish conclusively. Very few nests were found under vegetation such as kiekie (*Freycinetia banksii*) or other dense shrubbery, as is typical on Taumaka I. However, dense patches of kiekie were encountered on only two islands, of which one had nesting penguins.

The largest concentration of penguins found was on the Shelter Is at the entrance to Doubtful Sound, where 24 nests were counted on West I. Most other locations had fewer than 10 nests. No birds or sign was found at some sites where penguins were recorded "breeding" in DoC records; it is likely that some of these records were of moulting birds or young birds. Young Snares Crested Penguins are known to frequent breeding colonies, and even to interfere with breeders or show some breeding activities such as nest building and copulation (IGM, pers. obs.).

Doubtful Sound, 13-14 August

Rolla I.: A small island at the junction of Deep Cove and Hall Arm, 30 km from the open sea. Complete survey; 5 pairs and 5 solitary birds (15 total); 2 clutches of 1 egg; 1 abandoned egg. Breeding just begun.

Elizabeth I.: A long thin island in Malaspina Reach, mostly steep sided. North coast checked by dinghy; one landing at a platform tucked inside SW corner. Moulting sign and a few dugouts; no penguins.

Fergussion I.: A steep-sided dome in Malaspina Reach. Southern coast checked from the *Acheron*. No sign.

Seymour I.: A small island in Pendulo Reach at the SE corner of Secretary I., 14 km from the open sea. Complete survey; 8 pairs and 1 single on nests, 4 other singles (21 total); 4 clutches of 2 eggs. Early incubation. Weka present.

Bauza I.: A large steep-sided island plugging the entrance to Doubtful Sound. Moored overnight in The Gut in small bay at eastern end. No penguins heard at night. No sign.

Shelter Is: A group of two small islands and several stacks outside Bauza I. at the entrance to Doubtful Sound. Heavy coastal scrub with some large trees. Weka on both islands made surveys difficult. Complete survey of West I.; incomplete survey of East I.

West I.: 12 pairs and 12 singles on nests, 17 other singles (total 53); 3 clutches of 2 eggs, 3 of 1 egg; some empty nests with pairs. Early incubation. No count was made on East I., but 100 birds estimated by the group that landed; nests were found up to the top of the centre ridge (30 m); northern half only checked. A quick check was made on an islet between East and West Shelter Is; there were small patches of scrub on the islet; 5-6 birds were seen, 1 pair on 2 eggs.

Nancy Sound, 14 August

At the Entrance: A small cave just inside the entrance on the northern side; 3 single birds on 2 eggs each. A penguin was seen sitting at mouth of small cave just inside entrance on southern side (not checked, but fishers on RV *Seaway* said penguins often seen there).

Entrance I.: A granite slab washed clean on seaward side; penguin landing possible but difficult. A few possible sites under vegetation but no penguin or seal sign.

The boat did not go further into Nancy Sound.

Charles Sound, 14 August

Eleanor I.: At the confluence of the northern and southern arms, 8 km from the open sea. A very steep-sided granite slab. Perimeter of island checked by small boat; landing at small flat area at western tip, where 2 pairs and 3 singles were found (7 birds); no eggs seen but pairs were on nests. Breeding probably only just beginning. Walked over top of island but no other birds found. Much of perimeter too steep for walking or penguin landing. Fishing gear, mooring lines and a cleared helicopter landing area indicated much recent human activity.

Fanny I. (South Arm): Complete survey; 12 pairs and 13 singles (total 37 birds), all around southern perimeter; 6 nests with 2 eggs, 1 with 1 egg. Incubation just begun. Weka present.

Catherine I. (South Arm): All except northeastern tip checked; 2 pairs and 1 single (total 5 birds); at least one nest.

Lloyd I.: At top of South Arm. Very low lying; no penguins.

Caswell Sound, 14-15 August

Moored overnight at top of sound. No penguins heard. One penguin in water about halfway along sound.

Styles I.: At entrance of sound. Full survey of eastern half; western half a high dome; perimeter of western half checked by boat but only one possible landing (poor). Scrubby vegetation around perimeter and a patch of mature beech/podocarp forest in centre of eastern half. Good landings and similar topography and vegetation to other islands on which penguins were found. One dugout found under tree roots, but no penguins or sign of recent use. A breeding location in DoC records.

No landings were attempted at Two Thumb and Looking Glass Bays, between Caswell and George Sounds. No penguins were seen in the water along this coast.

George Sound, 15-16 August

Overnight at head of eastern arm. We checked 2 km of coast near anchorage by small boat, but no penguins or sign were found. Three penguins were seen in the water towards the head of the sound. There are two unnamed islands at the head of the sound. One in the southwestern arm was small and steep sided, with rough subalpine vegetation; no penguins were found there.

The second unnamed island: This small island is just inside the eastern arm, 17 km from the open sea. It was densely forested with kiekie thick

in places. There were several good landings with the main penguin landing at the southern end. Northern tip of island not checked but steep sided and no landings seen from the sea. Penguins on both sides; 4 pairs, but only one of these was on an obvious nest; 3 singles on nests and 3 other singles (14 birds). Two clutches of 2 eggs and two of 1 egg. Probably early in incubation. Some fishing equipment on island.

Anchorage Cove: A small unnamed island protecting the south entrance to this cove on the eastern side of the sound is commonly used as a mooring site by fishers. Burrows (probably Blue Penguin) and dugouts were found, but no crested penguins or other sign. A penguin skeleton was found wrapped up in old netting. Three crested penguins were seen on the adjacent mainland coastline, including a pair on a rudimentary nest in a dugout (no eggs). This did not appear to be a breeding site.

Bligh Sound, 16-17 August

Several small caves on the northern side near the sound entrance were not checked. Seven penguins were seen in the water in the outer and middle reaches of the sound. The coast of the middle and upper reaches was checked for sign by small boat, and we surveyed a small promontory at Amazon Cove, but no penguins or sign was found. Overnight at head of Bligh; no penguins heard.

Sutherland Sound, 16 August

This sound is accessible only through a river channel that was unnavigable by small boat. No landings were made.

Coast, Bligh Sound to Milford Sound, 17 August

No penguins were seen on the open coast. One was seen in the water on the southern side of Poison Bay. The entire foreshore of Poison Bay was surveyed, including some small caves at the southern end. One penguin was found in the middle of the beach, about 200 m north of a small stream mouth. It was sheltering under coastal scrub in a site that was clearly used for moulting, and it was not on a nest. No other sign was found. A small island at the northern entrance of Poison Bay had enough vegetation to shelter penguins, and there were good landings, but we did not go ashore.

Anita Bay: Just inside the southern tip of the entrance to Milford Sound, this bay has good landings and several small ledges and caves. Penguins were found between the first and second of three boulder beaches, numbered from the seaward side. Five nests with 3 pairs and 2 singles (8 birds) were found. Three nests contained 2 eggs and 1 nest contained 1 egg. Incubation was well under way.

DISCUSSION

Fiordland Crested Penguins were widely distributed through the survey area, but in only one location (Shelter Is, Doubtful Sound) were they found in numbers that approached those known at Taumaka Island. Further surveys to the south of the survey area are needed before we will know if any other large concentrations exist, but it seems likely that, in general, these penguins occur in small numbers in discrete locations throughout their range.

Even on Taumaka and the Shelter Is, the birds nest in discrete groups rarely exceeding 10 nests. It would be valuable to learn more about genetic exchange between these small breeding groups.

A surprising result from this survey was the large number of islands with breeding penguins near the heads of sounds. There is a slight suggestion in our observations that birds at the heads of sounds started breeding later than birds near the exposed coast, but more work on breeding patterns is needed. While breeding, Fiordland Crested Penguins obtain most of their food over the continental shelf (van Heezik 1989), suggesting that their food is close to coastal breeding sites. Birds breeding in the upper reaches of sounds presumably have a longer swim to reach food than those breeding on the coast.

Our survey of mainland locations was limited, but we saw little indirect evidence of mainland colonies as we cruised by. Penguins were not seen in coastal waters outside sounds and bays, despite excellent viewing conditions throughout the survey. Birds were seen in the water inside sounds, and it seems likely that we would have seen them outside the sounds if there were major breeding sites along the coast. Also, there were no records of such sites in DoC records. We consider it unlikely that we missed any major penguin breeding sites in the survey area, although we presumably missed some small groups in caves, or on the few islands that we did not check.

If we are right, most Fiordland Crested Penguin colonies in Fiordland are on small islands. These sites cannot have been selected because of Weka or introduced mammals, because all islands were within swimming range of these predators (except cats). The nest sites of the penguins (small caves, rocky ledges, dugouts under tree roots) are readily available on both islands and the mainland. Also, locations such as Styles I. looked suitable for penguin breeding, yet no birds were found. Further work on habitat requirements of nesting penguins is an important next step to understanding this little-known species.

Without any historical records we do not know if the small number of birds recorded here indicates cause for alarm. If generous estimates of 150 nests on Taumaka and 40 on East Shelter I. are added to the 65 reported here, the total of 255 nests is surprisingly small for all islands in the northern half of the breeding range for the species. We know of several sites with small numbers of nests on the mainland north of Milford Sound, but our observations suggest that there are few mainland nesting sites. We tentatively propose that the annual breeding total for the Fiordland Crested Penguin is well under 1000 nests.

ACKNOWLEDGEMENTS

We thank the crew of the *Acheron* for their cheerful support throughout the survey, and the fee-paying tourists who made the trip possible and assisted on penguin counts. Shirley Russ provided essential administrative support. The Department of Conservation (Te Anau) allowed access to their files. Financial support was provided for IGM by the New Zealand Lotteries Board and the University of Canterbury, and for RBR by Southern Heritage Tours.

LITERATURE CITED

- BULL, P.C.; GAZE, P.D.; ROBERTSON, C.J.R. 1985. The Atlas of Bird Distribution in New Zealand. Wellington: OSNZ.
- CASSADY ST CLAIR, C. 1990. Mechanisms of brood reduction in Fiordland Crested Penguins (*Eudyptes pachyrhynchus*). Unpubl. MSc thesis, University of Canterbury.
- McLEAN, I.G. 1990. Chick expulsion by a Fiordland Crested Penguin. *Notornis* 37: 181-182.
- PHILLIPSON, S.M. 1991. The brood reduction process in Fiordland Crested Penguins. Unpubl. MSc thesis, University of Lincoln.
- VAN HEEZIK, Y.M. 1989. Diet of the Fiordland Crested Penguin during the postguard phase of chick growth. *Notornis* 36: 151-156.
- WARHAM, J. 1974. The Fiordland Crested Penguin *Eudyptes pachyrhynchus*. *Ibis* 116: 1-27.
- WARHAM, J. 1975. The crested penguins. Pages 189-269 in *The Biology of Penguins* (Stonehouse, B., ed.). London: MacMillan.

IAN G. McLEAN, *Dept of Zoology, University of Canterbury, Christchurch;*
RODNEY B. RUSS, *Southern Heritage Tours, P.O. Box 22, Waikari*



SHORT NOTE

An early sighting of the Welcome Swallow

In view of the interest taken in the colonization of New Zealand by the Welcome Swallow it is worth making a belated recording of an early sighting which escaped registration at the time. In April 1953 I was with a party preparing the field trips for the Ecological Society's meeting in May. We were visiting Lake Ellesmere, near the outlet, when I saw a swallow and pointed it out to Professor Edward Percival. It was agreed that he should report the sighting to Dr Falla, but it appears this was not done. As swallows soon were seen regularly in this area, this early occurrence is of particular interest.

W.R. PHILIPSON, *Department of Plant & Microbial Sciences, University of Canterbury, Christchurch 1*