

NOTORNIS

is the journal of the Ornithological Society of New Zealand (Inc.)

Editor B. D. Heather,
10 Jocelyn Crescent,
SILVERSTREAM

VOLUME 40

PART 2

JUNE 1993

THE FIORDLAND CRESTED PENGUIN SURVEY, STAGE III: BREAKSEA ISLAND, CHALKY AND PRESERVATION INLETS

By IAN G. McLEAN, BELINDA J.S. STUDHOLME
and RODNEY B. RUSS

ABSTRACT

From 13 to 21 August 1992, we surveyed Breaksea and adjacent islands, Chalky and Preservation Inlets, and some of the coastline north of Chalky Inlet, for Fiordland Crested Penguins. Minimum total counts were 215 nests and 425 birds on Breaksea and adjacent islands, and 59 nests and 108 birds in Chalky and Preservation Inlets. Most nests on Breaksea and adjacent islands were under vegetation. Further south, nests were both in caves and under vegetation. Many apparently suitable caves did not contain penguins. The total absence of penguins from the outer coast reinforces our belief that we are finding most of the colonies in the survey area.

INTRODUCTION

The Fiordland Crested Penguin (*Eudyptes pachyrhynchus*) survey is an ongoing attempt to provide a baseline for future counts of the species, to provide an index of abundance, and to develop methods for rapid censusing of breeding Fiordland Crested Penguins (henceforth penguins). Previously, we surveyed the central portion of the species' range, from Milford to Dusky Sounds (McLean & Russ 1991, Russ *et al.* 1992). However, weather prevented landings on Breaksea and adjacent islands in 1991.

In 1992 we surveyed Chalky and Preservation Inlets, at the southern end of Fiordland (Figure 1). However, reports received from government personnel (R. Taylor, B. Thomas, A. Cox & P. McClelland; referred to below as Taylor *et al.*) suggested that good numbers of penguins were present on Breaksea Island. The size and terrain of the island are such that a rapid survey was not possible, and in 1992 a party was landed on Breaksea Island for five days. We also surveyed the adjacent islands using our standard techniques (McLean & Russ 1991, and below). To date, we have surveyed only small portions of mainland coastline. At the end of the boat cruise in



FIGURE 1 — Survey area for the 1992 survey of Fiordland Crested Penguins

1992, a party spent three days onshore surveying about 20 km of mainland coastline north of Chalky Inlet, from Cape Providence to West Cape. Although we have previously seen little evidence of penguins along the mainland coastline, they are known to be there north of Milford Sound, and some indication of abundance along the more southern exposed coast is essential.

Fiordland Crested Penguins nest in caves, under rocky overhangs, in burrows or large dugouts under trees, and in the open under dense vegetation. Most nests are within 30 m of the shore. Colonies range from isolated nests up to about 20 nests within 1-2 m of each other. These penguins are not highly vocal, but some calling is usually heard from larger colonies at any time and we are confident that we locate any larger colonies that are approached within hearing range. Surveys are conducted in mid-August because most penguins are incubating at that time, and our primary aim is to count nests.

METHODS

The survey is financed by means of fee-paying tourists. Surveys are conducted in three ways with decreasing likelihood of detecting penguins. First and most effective, small groups of tourists are put ashore on small islands with an experienced guide. They form a line from the coast inland for 20 to 30 m, and then move alongshore searching for burrows, caves, large dugouts under trees or banks, and tracks leading inland from the shore. Their role is to locate penguins; only the group leader counts penguins and nests. Usually the group leader is one of the scientific leaders, but some tourists have been on several surveys and were sometimes given this task in 1992.

Second, the coastline is surveyed a few metres offshore from a small boat. People are put ashore to spot-check likely locations such as low flat areas or caves, or where runways leading into bush are seen. This technique results in virtually all caves being located, but is less likely to detect penguins nesting in burrows or under vegetation. Larger colonies usually have obvious runways into the forest, but some isolated nests are presumably missed.

Third, the coastline is scanned from the mother-ship (*Affinity* in 1992) as it steams from one location to another. Time does not usually allow landings if likely locations are seen, but they are noted for future reference.

When found, penguins are not disturbed, especially if Weka (*Gallirallus australis*) are known to be present. Contents of nests are determined only if birds back off or flush. Everyone is instructed to approach no closer than 5 m from penguins nesting in the open, and to back off immediately if a penguin leaves a nest or appears agitated. Preventing disturbance is given a higher priority than accurate counting, although we obtain the best counts possible at the time. If time allows, an observer can get an accurate count by sitting quietly near a colony for about an hour watching and listening, and some of the counts on Breaksea I. were made in this way. Penguins in burrows may be approached more closely because they are less likely to flush, and their nests are protected from Weka by the burrow even if they do flush. Burrows and caves usually have to be approached closely for nests to be seen at all.

A "nest" is counted if (1) a single bird is sitting prone on a nest (if an incubating bird is erect an egg is usually visible); (2) two birds are standing together at a nest site (we assume them to be a breeding pair that has not yet laid); (3) one or two eggs are seen in an obvious nest with a bird nearby (this is rare as the few birds that flush do not usually do so until after we have seen them). Eggs are noted as being clean (freshly laid) or dirty, and large (the second egg laid, indicating that the clutch has been completed) or small. Nest sites that are not currently active are not counted. Counts of birds are provided, but do not give an accurate indication of nesting density. (The breeding system was described by Warham 1974.)

RESULTS

General

Totals of 274 nests and 538 penguins were counted in 1992. Of these, 215 nests and 425 penguins were counted on Breaksea and adjacent islands. Birds were seen at two locations previously surveyed but at which we had not seen penguins: four birds were seen in the water in the Acheron Passage (between Dusky and Breaksea Sounds), and one (non-breeding) bird was found on Crayfish Island, Pickersgill Harbour, Dusky Sound. The other 59 nests and 108 birds were counted in Chalky and Preservation Inlets.

In Chalky and Preservation Inlets, penguins were found in caves and in burrows or dugouts. Only one colony was nesting under vegetation in the open. A large number of caves did not contain penguins. Our observations suggest that penguins prefer wet caves with small narrow entrances rather than caves that are large, well ventilated and dry.

In the summaries below, eggs should be regarded as dirty unless otherwise indicated.

Breaksea Island, 13-18 August

A large, triangular, heavily forested island, steep sided but with scattered boulder beaches suitable for penguin landings on the east- and south-facing coasts, and with cliffs on the northwest coast. Survey essentially complete (one small bay on the eastern side not visited, and some nests not counted because access to them was prevented by other nests); 185 nests and 357 birds counted. Estimated to be up to 250 nests. Breeding well under way because many birds were incubating two dirty eggs and some nests contained one large egg. Nests up to 120 m from shore, with almost all nests in the open under dense canopies of fuchsia (*Fuchsia excorticata*), stinging nettle (*Urtica ferox*), treefern (*Dixonia* sp.), kiekie (*Freycinetia banksii*), supplejack (*Ripogonum scandens*), and five finger (*Pseudopanax* sp.). Some small caves and rocky overhangs were available but were not generally used. Penguin tracks tended to follow watercourses and some nests were on steep slopes.

The island has three main ridges (southeast, northeast, southwest) determining exposure of the penguin colonies. Penguin colonies are identified by capital letters (Figure 2).

Northeast ridge: Three colonies. (A) 15 nests, 29 birds; 6x2 eggs, 4x1 egg; one nest with one clean egg; (B) 2 nests, 7 birds; 1x1 egg; (C) 13 nests, 30 birds; 3x2 eggs each with one clean egg, 1x1 egg. Colonies A and B could be called one colony because they were separated only by a small stream.

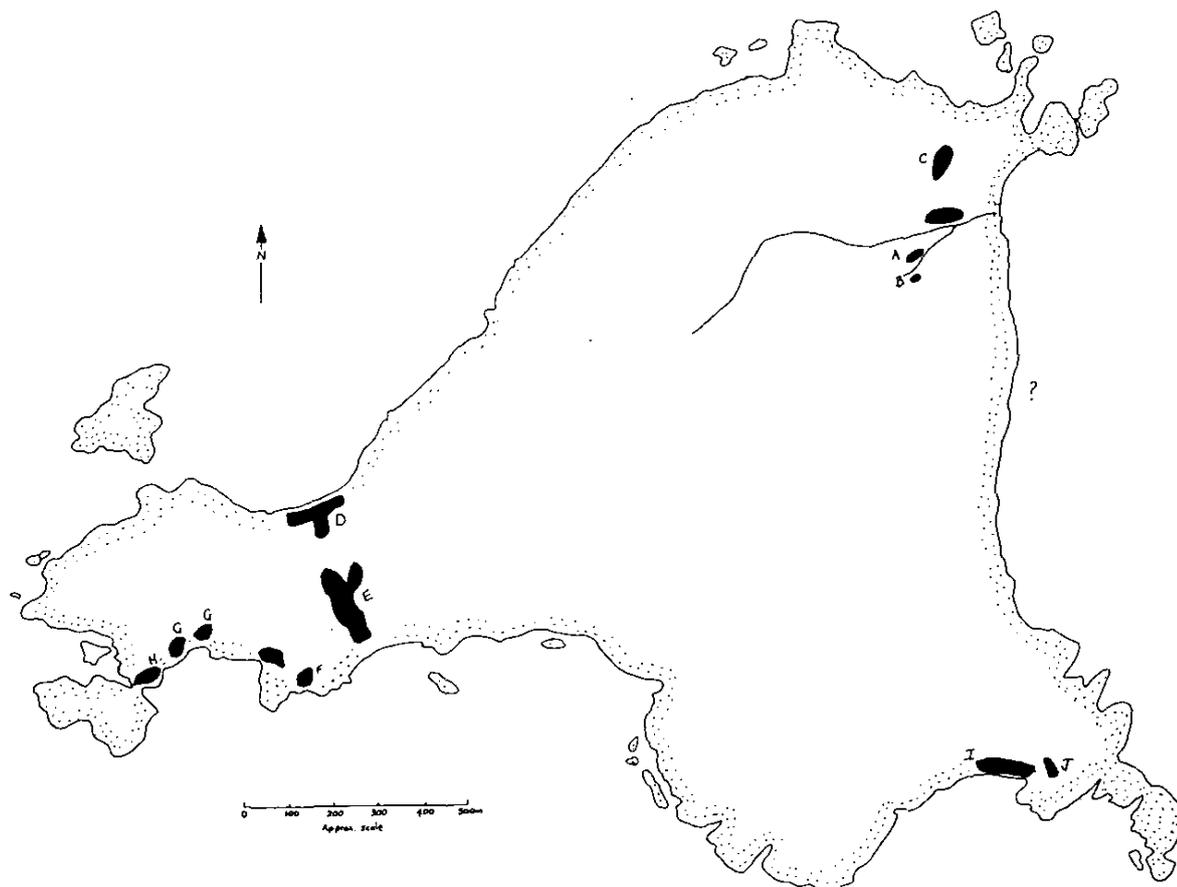


FIGURE 2 — Breaksea Island, showing the locations of penguin colonies counted by us, and previously recorded by government personnel R. Taylor, B. Thomas, A. Cox, and P. McClelland. Letters refer to counts provided in the text; unlabelled colonies were recorded by Taylor *et al.* but not by us; “?” indicates the bay that was not surveyed.

Southwest ridge: This ridge descends to a saddle, and colonies were found on both sides of the saddle (north and south). North side of saddle: (D) first nests 100 m above the beach; incomplete survey due to terrain and penguin nests; 23 nests, 50 birds; 6x2 eggs, 5x1 egg with one clean, 1 empty nest. Survey stopped 40 m above the beach. South side of saddle: (E) complete survey with nests between 90 and 50 m from the beach; 40 nests, 41 birds; 19x2 eggs, 4x1 egg.

The end of the southwest ridge, southern side: 3 colonies. (F) between 30 and 50 m from the beach, complete survey; 29 nests, 62 birds; 6x2 eggs, 2x1 egg. (G) on a small saddle up to 70 m from the sea divided by a rock fall that presumably destroyed earlier breeding sites, complete survey; 21 nests, 36 birds; 4x2 eggs, 1x1 + eggs, 1 abandoned nest with 2 eggs. (H) up to 50 m from the sea, complete survey; 19 nests, 37 birds; 2x2 eggs, 1x1 + egg with the egg seen being clean.

Southeast ridge: This ridge descends to a small south facing bay; one colony was found in the bay and a second slightly further east 60 m up a stream. (I) in the bay, complete survey; 14 nests, 51 birds; 3x2 eggs, 5x1 egg. (J) by the stream, complete survey; 9 nests, 14 birds; 3x2 eggs, 1x1

egg; access to this colony appeared to be through a surge pool that was filled only at high tide.

Breaksea Sound, other outer islands, 14 August

After mooring at Harbour Island overnight, we steamed back to the outer islands and dropped parties on Entry, West Gilbert and Hawea Islands.

Entry I.: At confluence of Breaksea Sound and Acheron Passage. Complete survey of northwestern end. Nests distributed along a narrow gut and in adjacent forest with smaller guts providing access in some cases. Most nests under dense vegetation, including small patches of kiekie and some thick supplejack. One nest in a hollow log. Most of the rest of the island too steep for penguins, but a flat area at the southeastern end was not checked. Weka present. Totals 22 nests, 48 birds; 1 clutch of 2 eggs with 1 clean egg.

West Gilbert I.: A narrow, west-facing gut at the western end provided a possible landing and penguins were reported to be above the landing by Taylor *et al.* A steep sided island with thick kiekie and coastal scrub. Complete survey of western end. No penguins found.

Hawea I.: A moderately steep-sided island with a relatively flat area at the southern end; a small protected bay provided the main landing. Incomplete survey, southern end only (about one-third of the island surveyed). Nests under kiekie or logs; none in burrows. Distribution map from Taylor *et al.* suggested that most or all nests were found. Totals 8 nests, 20 birds; 7x2 eggs, including 2 with 1 clean egg.

Through the afternoon we steamed to Chalky Inlet.

Chalky Inlet, 15-16 August

Overnight on 14 and 15 August was spent in North Port, Great I., Chalky Inlet.

To visit the large number of islands in both Chalky and Preservation Inlets, the survey party was split into several groups. One party spent an entire day on Chalky I., a second group spent the day in a small boat, and the rest of the party were put ashore on the Small Craft Harbour Is and the Garden Is, with some doing a boat survey of the intervening mainland coastline.

Chalky I.: Sealers Bay, at the northeastern end of the island and about 2 km of the exposed southwestern coast were surveyed. About 500 seals were seen on the outer coast. One small cave was found with 3 nests and 6 penguins.

Passage Is: South (large) and North (small) checked by small boat. Caves on the exposed southern coast of South I. could not be checked due to weather, but one contained penguins in 1988 (RBR, unpubl.) although no birds were seen at the entrance in 1992. All other caves were checked. One cave on South I. contained 3 nests and 6 birds and a large number of unused nests and old eggs. One cave on North I., contained 3 nests and 6 birds.

On the south coast of North I. 12 nests and 25 birds (3x2 eggs) were found in the open under vegetation. Totals 18 nests, 37 birds. Breeding well under way.

Great and Little Is: The coasts of both were checked by small boat. No penguins or sign were found despite checks at a number of suitable sites.

Small Craft Harbour Is: Two moderate-sized and one small island at confluence of Chalky, Edwardson and Cunaris Sounds. The two larger islands are separated by a narrow channel. Mature forest eaten out by deer. A lot of Little Blue Penguin (*Eudyptula minor*) sign. Complete survey by land and boat. West island surveyed by land except for a small knob at the western end that was surveyed by small boat. The west-, south- and east-facing coasts of the larger east island were surveyed by land and the northern coast was surveyed by small boat. It was unlikely that any penguins were missed as there were no likely landings on the coasts surveyed by boat. The small island was surveyed by boat. Penguins were found at two locations, in a small cave and under vegetation. Those under vegetation were under logs or in holes within 10 m of the sea. In the cave were 2 nests and 5 birds (1x1 small clean egg). In burrows were 6 nests and 11 birds (1x1 clean egg). Early in breeding with some pairs not yet laying. Totals 8 nests, 16 birds. Spotted shags (*Stictocarbo punctatus*) and Little Shags (*Phalacrocorax melanoleucos*) were at a roost on the small island.

Eastern coast, Chalky Inlet: The eastern coastline was surveyed by small boat from a small inlet opposite the Small Craft Harbour Is to Stripe Head. Several caves were checked and there were many potential landing sites, but no penguins were found. A landing party checked the coast from the western entrance of South Port (opposite the Garden Is) south along the west-facing coast for several kilometres before being forced inland by the topography. The coast was also checked from *Affinity* and no likely penguin landing sites were seen. About 0.5 km of beach at Gulches Head, which separates Chalky and Preservation Inlets, was checked by a land party. Much deer sign. Penguins were found in two small caves on the mainland point immediately south of the Garden Is: 1 nest, 3 birds.

Garden Is: Two low-lying islands, one small and one medium sized, the latter with several rocky bluffs. Small island surveyed on land on the eastern side, by boat on the western side. Complete check of the larger island by land. The smaller island had poor landings. The larger island had many potential landing sites and a series of large dry caves. Much Little Blue Penguin sign and one old egg of a Sooty Shearwater *Puffinus griseus*. No Fiordland Crested Penguins.

Preservation Inlet, 16-18 August

We steamed from North Port to Preservation Inlet, dropping off parties to do checks of the eastern coastline of Chalky Inlet (described above). Then the rest of the party headed for the Cording Is in Preservation Inlet. The nights of 16 and 17 August were spent in Isthmus Sound and at Cromarty, respectively.

Cording Is: A group of islands in the centre of Preservation Inlet just south of Isthmus Sound. Complete survey; smaller islands by land, the larger

southern island by small boat. Good landings, dense forest, and with caves on every island. Ideal habitat. A beach-cast Minke whale (*Balaenoptera acutorostrata*), 5m long, was lying in sheltered water on a small reef on the western side of the island group. No penguins.

Coal I.: A large island that is steep on the western side. Complete check of northern coast by land, and most of southeastern coast surveyed by small boat. Much evidence of old mine workings. Three New Zealand Falcons (*Falco novaeseelandiae*) were seen at Moonlight Point. One cave with penguins; very wet and with a small narrow entrance opening into an expansive cavern 30 m long: 17 nests, 23 adult penguins (3x2 eggs, 4 chicks aged 1-7 days).

Steep-to I.: A medium-sized island with numerous landings and small caves. Eastern coast and northern promontory surveyed by boat to half way along the northern coast. Coast not checked also had suitable habitat. Penguins found in small caves: 1 nest, 5 birds.

Round I.: A small island northeast of Steep-to I. Complete check by boat and several caves checked. Steep in most places. A small trail leading to a small cave seen on the northern side could not be checked. The landing was marginal for Fiordland Crested Penguins and was probably a Little Blue Penguin site.

Weka or Long I.: A long narrow island running north-south near Cromarty. Mostly steep sided, but many potential landing sites. The entire coast was checked by boat, but likely locations on the northern and western coasts were not checked. A long narrow cave on the eastern coast contained 2 penguins. All other birds were nesting in burrows and dugouts under tree roots along a 40 m stretch of coast, 10-20 m above the high tide mark: 11 nests, 18 penguins (1x1 egg).

One Tree I.: A small island on the western side of Preservation Inlet. Complete check. Heavily burrowed by little Blue Penguins and Mottled Petrels (*Pterodroma inexpectata*). No Fiordland Crested Penguins.

Dusky Sound and coast, Breaksea to Doubtful Sounds, 18-20 August

On 18 August, *Affinity* steamed north, dropping a party of three at Landing Bay, Chalky Inlet. We then steamed through a northerly gale with very large, short choppy seas, to Dusky Sound. Overnight at Cascade Cove.

Crayfish I.: A small island that protects Pickersgill Harbour. One penguin was calling from the shore on the southeastern tip. This bird disappeared into a long narrow cave when we approached. There was no calling from within the cave and a similar cave nearby was checked but no other penguins were found. This was probably a solitary bird (male?) and there did not appear to be any nests on the island.

Acheron Passage: Four penguins and one Common Dolphin (*Tursiops truncatus*) were swimming in the Passage. A group of three penguins porpoised in parallel with *Affinity* for 10 min (at 8 knots).

The storm on 18 August brought many seabirds close to land on 19 August and a minimum of 12 Light-mantled Sooty Albatrosses (*Phoebastria palpebrata*) followed *Affinity* up the coast to Doubtful Sound; one Fulmar

(*Fulmarus glacialisoides*) was seen. Overnight at Crooked Arm, Doubtful Sound. Two groups of Common Dolphins (4 and 7 + animals; the larger group included a calf) were in Crooked Arm on 20 August. No penguins were seen either along the coast or in Doubtful Sound.

Coast, Cape Providence to West Cape, 18-21 August

This coast consists of long sand or pebble beaches separated by small rock outcrops that often contain caves. Penguins could have landed almost anywhere. No penguins were found.

DISCUSSION

Except for the outer islands of Breaksea Sound, the results of stage III of the survey are consistent with patterns found in earlier years (McLean & Russ 1991, Russ *et al.* 1992). Many islands that appear to offer appropriate habitat contain no Fiordland Crested Penguins, and penguins are found unpredictably and in small groups. Most of the Breaksea colonies were known, but the maps given to us by Taylor *et al.* indicated a slightly different distribution of colonies than we located. No counts were made by Taylor *et al.*, and so we cannot tell whether the numbers that we found indicate an increase or decrease. Two colonies reported to be on Breaksea I. and one on west Gilbert I. had disappeared or moved. These missing colonies and the effect of the landslip through the middle of one colony suggest that colony location and size change over time, as has been found for *Eudyptes robustus* (Miskelly *et al.* 1986). Breaksea and adjacent islands, along with the Shelter Is and Open Bay I. to the north, are the largest breeding centres that we have located to date.

Currently, we know little about how much small and large breeding centres contribute to the future population structure of Fiordland Crested Penguins or what the disappearance and establishment rates of small colonies are. Despite the exciting number of birds in outer Breaksea Sound (which almost doubled the total count to date), the few nests and scattered breeding locations that we are finding remain of serious concern.

The oldest chick found in the cave on Coal I. on 17 August was about 7 days, indicating a laying date for the first egg of about 2 July. This is the earliest recorded breeding by Fiordland Crested Penguins to date, about a month earlier than peak laying on Open Bay I. (IGM & BJSS unpubl. data). In every survey we find penguins in pairs that have not yet laid. Thus, the start of laying in this species may be spread across a period of almost two months. Synchronisation of breeding in penguins is facilitated by proximity and social interactions (Waas 1988), and the apparent lack of synchronisation in Fiordland Crested Penguins may reflect the isolation of small colonies in this relatively asocial penguin.

The complete absence of penguins from about 20 km of coast north of Chalky Inlet reinforces our belief that we have found most of the penguin colonies in the survey area. Unfortunately, our lack of sightings of birds in the water outside the sounds cannot be used as an indication that penguins do not nest along the coast, because we rarely see birds in the water even inside the sounds. However, we have located several colonies by seeing birds

on the shoreline and we believe that if there were good numbers of penguins along the outer coast, we would see them on the beaches. It appears that, south of Milford Sound, Fiordland Crested Penguins are almost entirely restricted to islands.

ACKNOWLEDGEMENTS

We thank H. & B. Anderson, O. Ball, R. Cullen, M. Fitzpatrick, P. Lowen, N. O'Neill, J. Parry, G. Williams & N. Williams, D. Ruth for field assistance on Breaksea I., and the crew of *Affinity* for their support during the voyage. S. Russ provided essential administrative support and the Dept of Conservation allowed us to use the field hut on Breaksea I. R. Taylor provided details of penguin colonies on Breaksea I. recorded during the rat eradication program in the mid-1980s. Support for IGM and BJSS was provided by the New Zealand Lottery Board, the University of Canterbury, Southern Heritage Tours, Ace Computer Training and Camera House Ltd. Funding for RBR was provided by Southern Heritage Tours.

LITERATURE CITED

- McLEAN, I.G.; RUSS, R.B. 1991. The Fiordland Crested Penguin survey, stage I: Doubtful to Milford Sounds. *Notornis* 38: 183-190.
- MISKELLY, C.M.; TENNYSON, A.J.D.; LAMEY, T.C.; SAGAR, P.M.; KAMPERT, E.Z.; HARPER, G.A.; LAMEY, C.S. 1987. Snares Island Expedition 1986-87 Report. University of Canterbury.
- RUSS, R.B.; McLEAN, I.G.; STUDHOLME, B.J.S. 1992. The Fiordland Crested Penguin survey, stage II: Dusky and Breaksea Sounds. *Notornis* 39: 113-118.
- WAAS, J.R. 1988. Acoustic displays facilitate courtship in Little Blue Penguins, *Eudyptula minor*. *Animal Behaviour* 36: 366-371.
- WARHAM, J. 1974. The Fiordland Crested penguin *Eudyptes pachyrhynchus*. *Ibis* 116: 1-27.
- IAN G. McLEAN & BELINDA J.S. STUDHOLME, *Dept of Zoology, University of Canterbury, Christchurch;*
RODNEY B. RUSS, *Southern Heritage Tours, P.O. Box 22, Waikari*