

Big Bay skink (*Oligosoma* sp.): taxonomy, distribution and habitat requirements

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Abstract

Suitable habitat between Kaipō River mouth and Awarua point was surveyed for skinks. Three populations were found at four sites. Results from genetic work show all Big Bay skinks collected belong to a new species within the *Oligosoma nigriplantare polychroma* complex (C. Miller pers. comm.). Skinks were common in suitable habitat, and all habitat that appeared suitable was occupied. The exotic weed *Ulex europaeus* (gorse) encroaching on to stable cobble fields is likely to be the most immediate threat to Big Bay skinks, and gorse control should continue in order to keep cobble habitat clear.

1. Background

Prior to this survey, two specimens of *Oligosoma* had been collected from Awarua point, Big Bay (West Coast Conservancy).

Specimens of *Oligosoma* observed (some of which were collected) prior to the present survey were:

Date	observer
15-1-86	3 unidentified skinks observed at Awarua Point, Big Bay [G. Loh]
21-9-92	5 unidentified skinks observed at Awarua Point, Big Bay [I. Southey]

Based on allozyme work (carried out by Rod Hitchmough, Victoria University, Wellington) they were thought to belong to a unique species related most closely to *Oligosoma notosaurus*, but less closely related to *O. notosaurus* than *Oligosoma maccanni* is related to *Oligosoma inconspicuum*. The latter two species are widespread throughout the South Island (Rod Hitchmough pers. comm.).

The West Coast Conservancy of the Department of Conservation (DoC) has contracted two workers to conduct a survey for skinks along the entire coastal region of Westland. Ron Van Mierlo and Peter Van Klink began a 6 month contract in October 1997, but will not survey areas south of Barn Bay, 10-15 km North of Awarua Point.

From preliminary results, there seem to be two main groups of West Coast skinks - *Oligosoma nigriplantare polychroma* complex (including the Big Bay species, and *O. n. polychroma* proper), and also an *O. infrapunctatum* complex (Open Bay Island skink, Chesterfield skink, and *O. infrapunctatum* proper). There will almost certainly be three West Coast endemics described from Charlie Daugherty's laboratory (Victoria University, Wellington) in the near future (Geoff Patterson pers. comm., February 1998).

To determine the presence of species within the assumed species complex, an allozymal examination of specimens is required. Morphological traits are more variable and therefore less reliable predictors of a specimen's true identity. Following allozymal work, morphological traits can be examined for specimens identified as the same species, and consistencies can be noted. Morphological traits deemed diagnostic can then be used to identify cryptic species in the field.

Within a given species, variation exists between individuals, in both genetic makeup and morphology. Genetic tests must be run on as many individuals as possible to ensure the degree of within-species variation is identified to enable the identification of new, cryptic species, which differ markedly from the average variation found within a species.

In order to accurately identify threats to any given species within a complex, the distribution limits of each species must be determined. Should a species be limited in distribution, display very specific habitat requirements, or be found in areas undergoing massive change or habitat degradation, management would be deemed more urgent than for a species with a wider distribution and more generalised habitat requirements.

Thus, the objectives of the survey undertaken here are:

1. To collect specimens of *Oligosoma* to determine the taxonomy of skinks present in the Big Bay region (Martins Bay through to Big Bay), and compare them with other specimens collected by West Coast Conservancy.
2. To determine the local distribution of skinks in the search area.
3. To make a preliminary assessment of the habitat requirements of *Oligosoma* present in the survey area, and assess potential threats to populations in the Big Bay/Martins Bay region.

2. Survey

The survey team was Mandy Tocher, Science & Research Unit, DOC; Carol West, DOC, Southland Conservancy; David McFarlane, volunteer (Dunedin); Simon Morris, volunteer (Christchurch)

2.1 AREA SURVEYED

The focus of the survey¹ was the area bounded by Martins Bay in the South and Big Bay in the North (Figure 1). Martins Bay was surveyed from the Kaipō River Mouth to the Martins Bay Hut. The survey party then flew to Big Bay and surveyed Big Bay from Penguin Rock in the south to 250 m north of Awarua Point. Thus, the area between Martins Bay Hut and Penguin Rock was not surveyed.

2.2 SURVEY LOG

Saturday 24-1-98

Entire team surveyed south end of Martins Bay. We left camp at 14:00. The weather was very hot and humid (25 °C). Returned to camp 18:00.

Sunday 25-1-98

Entire team surveyed north end of Martins Bay, towards the spit from 9:30 to 13:00. The weather began with low cloud clearing to sunny patches. It became overcast again by 12:00, but remained very hot and humid (>25°C).

Monday 26-1-98.

Entire team surveyed from Martins Bay to Kaipō River mouth, and back again. SM and DM set off in the morning, whilst MDT and CW joined them in the afternoon. In the morning the weather was overcast, and although the temperature and humidity increased by lunchtime, it continued to remain overcast. We all returned to camp by 19:00.

Wednesday 27-1-98

Preliminary survey of back dune at Big Bay. We arrived at Big Bay about 17:00. We had a chance to question some locals (Graeme and Anne Mitchell and Dale Hunter) about likely spots to encounter skinks. At approximately 19:30 MDT and DM set out for a cursory look around the back dunes of Big Bay, including stable cobble fields. The weather was overcast but warm during our early evening search. Seven pitfall traps were placed around the sites where skinks were found. We returned to camp by night (approximately 22:00).

Thursday 28-1-98

Survey of south end of Big Bay to Penguin Rock (from DOC Hut). At 10:00 the temperature was 20 °C. The day was mostly overcast, with occasional sunny patches. The team split up at the McKenzie River. CW and SM went up the river whilst MDT and DM crossed the river and continued to Penguin Rock. The latter party arrived at the mouth site during an extensive sunny patch (24°C) and returned to the hut around 18:30.

¹ After examining records of skinks collected at Big Bay in the Amphibian and Reptile Distribution Scheme database, MDT was misled into believing that the entire search area was within Southland Conservancy. However, the boundary for Southland Conservancy expires at the Awarua River. Thus the survey bridges two Conservancies: Southland to the South of Awarua River and West Coast to the North, including Awarua Point.

Friday 29-1-98

Survey north Big Bay to Awarua Point and back again. MDT and DM set off 8:00 for Awarua Point. Again, the day was warm and humid, with long periods of intense sun. We returned from the point around 18:00.

2.3 SURVEY TECHNIQUES AND PROTOCOL

Because of the extensive nature of the beach habitat, searching consisted of walking all over the back dunes and through the vegetation encroaching on to and directly adjacent to the dunes searching for lizards. Searches concentrated in and around beaches, up to and including the high tide mark. In some instances coastal herb fields, coastal bush and scrub were searched. The search party spread out to cover as much ground as possible. All types of likely habitat were surveyed: drift piles, coastal scrub patches, stands of exotic grasses, coastal herbfields, stable cobble, non-stable cobble, riparian habitat. Logs, rocks and other debris were lifted in search of lizards sheltering beneath. During patches of sun, searchers scanned ahead in search of basking lizards or lizards running for cover. In more sheltered sites, we listened for the distinct rustling noise of a retreating lizard (especially in *Phormium tenax* habitat which overhung the dunes). All manner of debris was lifted: rocks, drift logs, driftwood, fence posts and metal signs, concrete pieces, and miscellaneous litter that had been washed up on to the beach.

Pitfall traps were used to survey for skinks on just two occasions. We placed 10 pitfalls into a stand of exotic grass on Martins Bay, an area judged suitable for skinks but difficult to survey in the absence of sun. Also, we placed 7 pitfall traps in and around driftwood known to harbour skinks at Big Bay, a site where we had having trouble catching skinks. Traps were sunken so that their lip was level with the ground, and were baited with canned sardines (for 1 night) then canned pear.

Lizards were caught by hand before they escaped into the complexity of their rock home. Captured lizards were weighed (30 g Pesola spring balance), measured (snout-vent length and vent-tail length), sexed if possible, and searched for distinguishing marks and scars. Photos were taken of all lizards collected. Lesser quality photos (the camera used in the field was malfunctioning) were taken for all lizards released following measurement. A reference collection of photographs/slides has been lodged with the Southland Conservancy, DOC (see Table 1).

Lizards were collected and placed in cloth bags and later transferred to plastic vivaria (25x15x3 cm) containing moistened tissue paper (no more than 3 lizards per container). On return to Dunedin, photographs were taken by Marcus Simons, DOC Otago Conservancy, and specimens were sent to Charlie Daugherty at Victoria University, Wellington. A single voucher specimen will be kept and lodged in the Wellington Museum. The other lizards will be sacrificed in order to carry out genetic examination.

3. Results

3.1 DISTRIBUTION AND ABUNDANCE

Three populations² of skinks at 4 sites were located during this survey. Populations contained good numbers of skinks (estimated at 30-50 individuals per population).

No skinks were found at Martins Bay (Martins Bay Hut to Kaipō River mouth). In accordance with our findings, the locals we spoke to could not recall ever seeing skinks in the vicinity. The search area contained a number of sites that looked, at least superficially, to contain reasonable habitat. However, beneath the rocks and wood we lifted, conditions appeared far too damp. Also, the habitat looked as though it could be periodically disturbed by flooding and high tide reaches, i.e., not stable enough to support skink populations.

At Big Bay, locals had noticed skinks in the past. Anne and Graeme Mitchell's daughter caught many skinks from the area as a child. Both Dale Hunter and Graeme Mitchell pointed to a site down the beach (south) from the DOC but where they remembered seeing skinks. We searched this area and found an extensive population of skinks throughout a large area (2 x 0.8 km) of stable, lichen-encrusted cobble. The first 1 km of this habitat (*Site 1*; see Figure 1 and site description below) contained extensive uninterrupted cobble. Within the second kilometre stretch, towards the mouth of the McKenzie River, the cobble habitat became fragmented by large patches of dune, but skinks were found throughout, where the cobble persisted (*Site 2*, Figure 1). Three skinks were located in 0.7 person hours of searching at Site 1, and 2 skinks were found in 3 person hours at Site 2.

A second population was found on the south side of the McKenzie River, near the mouth, in the same type of cobble (*Site 3*; Figure 1). MDT and DM arrived at this site during a patch of sun to find 10-15 basking skinks in an area of 10x10 m. No skinks were seen on the beach/in drift piles further around the coast towards Penguin Rock. Dale Hunter did tell us that he had skinks 'at his place', but we were unsure whether it was the mouth site he was referring to or a location further around the coast. Regardless, no skinks were found past the mouth, and no patches of the stable cobble habitat were located.

From the Big Bay Hut to Awarua Point, habitat appeared much too damp due to the adjacent wetlands draining directly on to the beach. Only at Awarua Point did habitat again become more suitable, and a good population of skinks was found. The point itself is 'peninsula-like' and, as such, does not have direct drainage from the nearby wetlands. Skinks were only found on the peninsula area of the point itself (*Site 4*; Figure 1). During approximately 0.5 person hours, 10-15 skinks were observed (during a patch of sun). We searched a little further north (< 1 km), but no other likely skink habitat was located.

² A population is defined here as a reasonably isolated group of individuals separated from the nearest group by what appeared to be inappropriate habitat.

3.2 SITE DESCRIPTIONS

Site 1. Mid Big Bay An extensive tract of lichen-encrusted cobble characterised this site (Figure 2). The presence of the lichen indicates a stable habitat (Carol West pers. comm.). Large pieces of driftwood were lying on top of the cobble, and it was under driftwood that skinks were found. Skinks were also observed basking at the margins of prostrate *Coprosma propinqua*. Also present at the site were wind-shorn *C. acerosa*, *Muehlenbeckia axillaris*, and a scattering of herbs such as *Centella uniflora*, and *Prunella vulgaris*.

During the first few hundred metres of this site, the cobble field was nested in-between an extensive wetland drainage channel to the east, and dunes towards the sea (west). The cobble was raised above the wetland water table, and seemed unlikely to be inundated at any time.

Site 2. 2/3rds Big Bay. Situated 1 km south of site 1, this site also contained stable, lichen-encrusted cobble. However, the cobble was less extensive and was patchy. Cobble rested within a mosaic of sand, sand dunes, and herbaceous fields towards the back of the beach. Gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) were present throughout this site, as well as numerous wind-shorn shrubs (*Coprosma propinqua*, *C. acerosa*, *Muehlenbeckia axillaris*), and as at Site 1, a scattering of exotic herbs such as *Centella uniflora* and *Prunella vulgaris*.

Site 3. Mouth (Figure 3). Situated at the mouth of the McKenzie River 15-20 m from the high tide mark, skinks at this site are effectively cut off from the closest site (Site 2) by the McKenzie River. The site was small in total area (approximately 20x20 m). Dead and dying gorse encroached a long way on to the cobble at this site (recently sprayed by Southland Conservancy DOC). Again, the cobble was encrusted with lichen and appeared stable and dry. Driftwood was abundant here, scattered throughout the site. Many skinks were observed basking, but quickly took cover under the gorse, and became inaccessible for collection. Skinks were also observed in unstable cobble, and in drifts of shells. Vegetation at the site was similar to Site 1 and 2; however, *Phormium tenax*, and toe toe (*Cortaderia richardii*) were also present, and the legume *Lotus pedunculatus* was common.

Site 4. Awarua Point. This site was situated on a small peninsula and was therefore mostly surrounded by ocean, and fronted a large swamp area (Figure 4). Large driftwood piles had accumulated, and skinks were found in and around the wood, and also basking near the prostrate, wind-shorn *Coprosma propinqua* (the dominant shrub at this site). As for the previous three sites, herbs *Centella uniflora* and *Prunella vulgaris* were also present. Stable, lichen-encrusted cobble was extensive, but skinks were only found where the cobble had *Coprosma propinqua* or driftwood on top.

3.3 BIG BAY *OLIGOSOMA*

Although numerous skink specimens were observed during the course of this survey, only 15 were caught and measured (Table 1), and of these 11 were

collected and sent to Charlie Daugherty's laboratory. Live skinks are very dark in colour, with a distinctive ventral surface. The chin is grey, unusually without flecks, with a sharp cut-off to a golden bronze belly, and often bronze undersides of legs and feet (Figure 5). Tan coloured dorsal-lateral stripes are present, giving way ventrally to a wider chocolate band. A mottled panel completes the lateral profile and disappears underneath the animal. Some flecks from this last band may also appear on the chocolate band above it (Figure 6).

3.4 TAXONOMY OF BIG BAY *OLIGOSOMA*

Clare Miller, a student in Charlie Daugherty's laboratory, has run the allozyme gels on the specimens collected during this survey. Her results concur with those of Rod Hitchmough; the skinks from Big Bay are within the *Oligosoma nigriplantare polychroma* complex, and constitute a new species. All 11 specimens collected from the survey (Sites 1-4) are the same new species.

3.5 BEHAVIOUR OF BIG BAY *OLIGOSOMA*

The skinks had a distinctive, upright posture and were very alert, in captivity and in the field. Skinks mainly sheltered beneath shrubs which lay on top of cobble, and climbed out to bask on sun-drenched rocks (Figure 7). Basking skinks allowed us to get to within 2 m before they disappeared under a rock. At this point, it was virtually impossible to catch the skinks. They continued to move down and across the cobble field to emerge again a long way from where they submerged.

During handling the skinks easily became stressed (assumed a stiff and non-responsive posture). I have observed a similar behaviour in *O. maccanni* from Macraes Flat, Otago. Whilst photos were being taken, skinks frequently curled into a ball by wrapping their tail around themselves (Figure 8). This behaviour was often displayed by juveniles.

3.6 ECOLOGY\REPRODUCTION OF BIG BAY *OLIGOSOMA*

Most skinks captured, and a large number of individuals observed in the field, were females. Females may take greater risks basking when gravid, and this alone may explain the bias in female captures and sightings. Another possible explanation may be that males are much smaller as adults than females, and we mistook some males for juveniles. A less likely explanation, given that in New Zealand most skink populations have a reasonably even sex ratio, could be that the sex ratio is skewed towards more females.

Females that were captured were at varying stages of embryo development. Some had medium-sized embryos indicating that they give birth about March onwards. On average females had two embryos (range 1-3). One female gave birth to three juveniles on 3 March whilst being held in captivity.

Skinks displayed a high incidence of partial tail loss, and 3 of the 11 skinks collected had lost a toe, or had deformed toes. The cobble in which they were found appeared very stable, and it is likely that the tail and toe loss is due to intraspecific interactions, or perhaps attempted predation events.

The dark coloration of the skinks is consistent with other New Zealand coastal lizards (coastal *O. zelandicum* are often darker than their forest-dwelling counterparts) and is presumably an adaptation to increase heat absorption.

An analysis of scats collected from skinks whilst they were in captivity revealed both fruit and insect fragments including a seed from *Muehlenbeckia axillaris* (Rory Logan pers. com.). A second seed found in scats was tentatively identified as *Melicytes* species.

4. Conservation of Big Bay *Oligosoma* new species

The Mouth site consisted of a small cobble patch with gorse encroaching severely from the margins (Figure 9). This situation highlights the need to continue to control gorse along the Big Bay coast line. Although skinks may very well benefit from the shelter gorse provides (e.g. protection from predation), they will not persist if the gorse completely covers the cobble and eliminates sheltered, sun-drenched basking spots. Available cobble for skinks is at a premium: skinks were present without exception at sites containing appropriate cobble, so the threat of gorse should not be overlooked.

During the survey, only one set of cat prints was seen on the beach, and locals do not recall seeing many cats (Graeme & Anne Mitchell pers. comm.). Stoats, however, are prolific, and were observed by the survey party by day. Due to the stoats feeding/foraging behaviour of killing and storing food, regardless of whether or not they are hungry, stoats may be a significant predator of the skinks. However, based on the numbers of skinks observed here, and the difficulty we all experienced catching them (see behaviour section above), I do not believe stoats pose a serious threat to the skinks, at least at current population densities. Possum droppings were found extensively over the dunes and cobble of both Martins Bay and Big Bay. Skinks are likely to be active when possums are not, offering them some protection from possum predation.

More information is required on the following, to allow an accurate ranking of Big Bay skinks using the Molloy and Davis (1994) criteria:

- total number of populations and their size,
- the size of the largest population,
- geographic distribution - especially between Awarua Point and Barn Bay

- species status - populations in decline? stable?
- predation threats and threats to habitat in other areas of their range,
- degree of habitat specificity,
- the ability to keep animals and breed them in captivity.

However, based on available information (some of which is incomplete/not known accurately), Big Bay skinks probably rank as a Category B or C species (Molloy and Davis 1994).

Table 1: Measurements taken from skinks caught during this survey, including skinks which were released following measurement (not collected). Photo numbers correspond to a reference collection of photos of individual skinks lodged with the Southland Conservancy, DOC. Upper case F or M (sex) refers to a definite female or male, respectively, and lower case (f or m) refers to skinks where sex was not able to be accurately determined, but is most likely to be female or male respectively.

		Weight	SVL mm	VTL mm	regeneration length(mm)	Sex	Notes
Site 1							
Mid Big Bay							
28-1-98	skink 1 (collected)	2.55	53	30	1	F	2 medium sized embryos, natural toecode of 0004. Photo: 4
28-1-98	skink 2 (collected)	2.5	52	41	0	F	big scar on tail Photo: 5
28-1-98	skink 3 (collected)	3.35	59	51	0.5	F	tip only gone from tail Photo: 0, 1,2,3
29-1-98	skink 4 (not collected)	3.6	63	73	0	f	scar on tail Photo: 38,39
Site 2							
2/3rds Big Bay							
29-1-98	skink 5 (collected)	3.5	51	70	8	F	prominent mid-dorsal stripe Photo: 10, 24-35
30-1-98	skink 6 (collected)	3.0	54	69	3	f	mid tan coloured dorsum Photo: 11,12,36,37
Site 3							
Mouth							
29-1-98	skink 7 (collected)	2.25	50	55	16	m	regeneration is old Photo: 17-23
29-1-98	skink 8 (collected)	3.0	50	39	30	F	gravid, natural toecode 0001, regeneration is old Photo: 13-14
29-1-98	skink 9 (collected)	5.7	60	58	29	F	gravid, regeneration is old Photo: 15-16
29-1-98	skink 10 (not collected)	0.7	46	53	0	1	scar on chest Photo: 40-41
29-1-98	skink 11 (not collected)	6.9	74	73	21	F	gravid with 2-3 embryos Photo: 42-43
Site 4							
Awarua point							
30-1-98	skink 12 (collected)	0.8	32	49	0	1	Photo: 6,7,8
30-1-98	skink 13 (collected)	3.6	55	56.5	20	F	scar on throat and tail Photo:9
30-1-98	skink 14 (collected)	1.15	37	52	0	1	Photo: 6,7,8
30-1-98	skink 15 (not collected)	0.65	35	22	15	1	Photo: 44,45

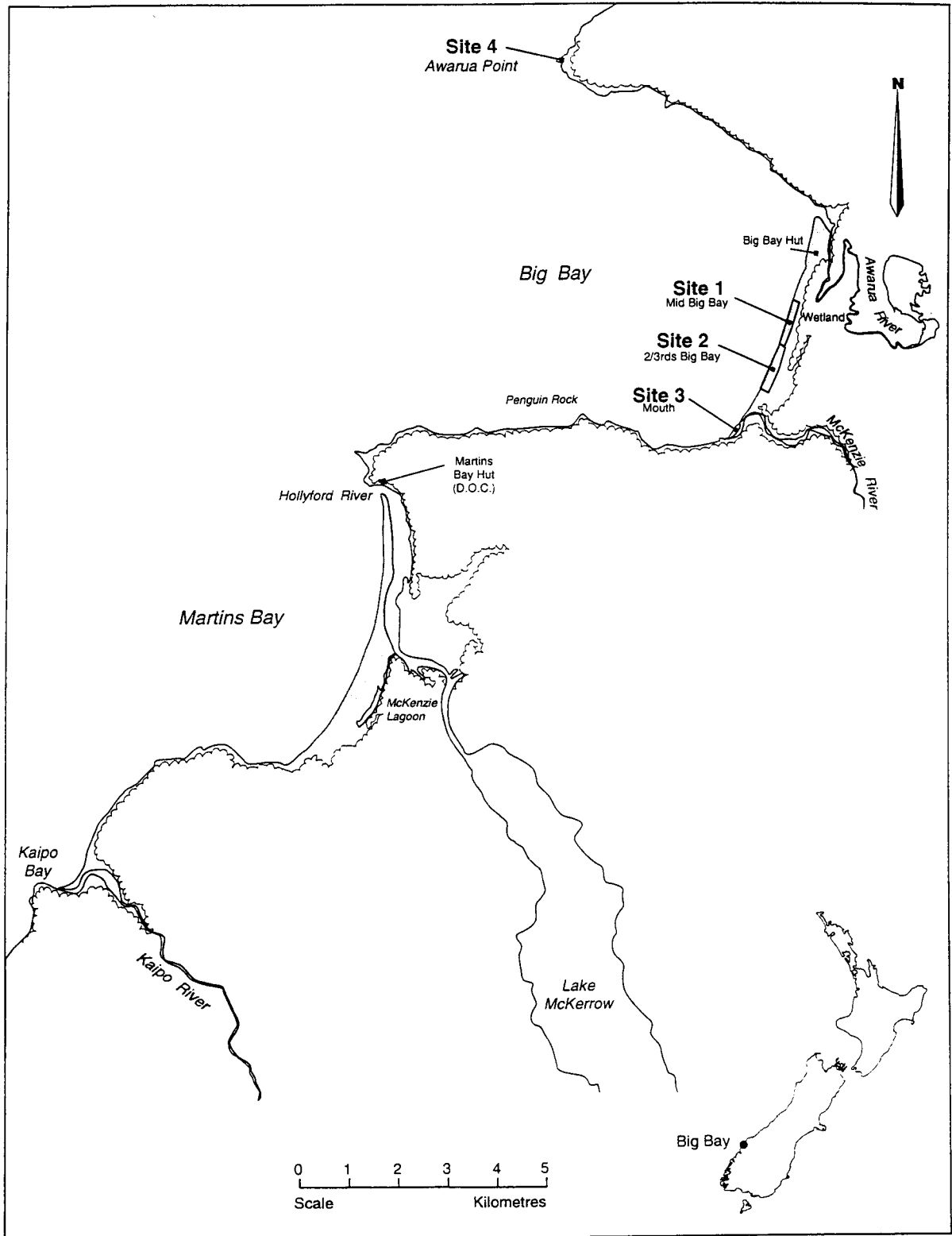


Figure 1. Location of Sites 1-4, Big Bay, Westland.



Figure 2. North end of Site 1 showing wind shorn *Coprosma propinqua* (top photo) and view looking down towards Site 2 (bottom photo).



Figure 3. View of Site 3, the South side of the mouth of the McKenzie River.



Figure 4. Awaura point, Big Bay (Site 4).