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Fossil skink bones from Northland, New Zealand, and description of a new species of *Cyclodina*, Scincidae

T.H. Worthy*

Holocene fossil skink bones are described from three sites in Northland, New Zealand. A new *Cyclodina* species is described, and other bones are referred to a large indeterminate *Leiolopisma* species. The Holocene skink fauna of Northland therefore contained, in addition to those species that still survive, at least two additional species, one equal in size to the largest extant New Zealand skinks, the other approximately 40% larger.

Keywords: fossil skinks, Northland, New Zealand, Cyclodina, *new species*

INTRODUCTION

New Zealand's herpetofauna is limited, lacking land snakes, tortoises and crocodilians. However, among the species it does have are several unique and well known taxa, such as tuatara (*Sphenodon*) and leiopelmatid frogs. The lizards, all diplodactyline geckos and lygosomine skinks, are mainly small, and only recently has their real systematic diversity begun to be appreciated (Towns *et al.*, 1985; Patterson and Daugherty, 1990). Hardy (1977) reviewed the New Zealand skinks, erecting four new species (bringing the total to 21 indigenous species), and diagnosing *Cyclodina* as a genus distinct from *Leiolopisma*. Pickard and Towns (1988) alluded to recent research on *L. nigriplantare* (Peters) suggesting that a complex of cryptic species was masquerading under this name. Patterson and Daugherty (1990) described the first of the taxa within this species group, and indicated that more descriptions will follow.

In contrast, there has been little detailed research on the fossil members of the New Zealand lizard fauna, although lizard remains are often listed in fossil faunal assemblages from dune and cave deposits, or from archaeological sites (*e.g.* Yaldwyn, 1958; Townsend, 1961; Millener, 1981; Millener and Templer, 1982; Worthy, 1984a, b, 1985, 1986, 1987a, 1988; Ritchie, 1982; Ritchie and Harrison, 1981; Butts, 1982).

Hutton (1899) recorded "a lower jaw of a pleurodont lizard" from a central Otago cave which, if the reference to pleurodont dentition was correct, may reasonably be expected to have come from either a skink or a gecko. The specimen has not been re-located and the description, based on Hutton's memory, suggested that the mandible was about the same size as that of a tuatara. At the same time, and from the same cave, Hutton also recorded a small curved bone which he speculated may have been the rib of a "kumi or ngarara" (Maori names for large lizards). Recently Hutton's work has been re-assessed by Bauer and Russell (1988), who concluded that the "rib" may be the cloacal bone of a gecko either conspecific with or similar in size to *Hoplodactylus delcourti*, and that a tuatara-sized pleurodont jaw would also be consistent with a gecko of this dimension [on the other hand, the jaw may be from an Otago skink (*Leiolopisma otagense* McCann) which has a mandible length up to 30mm and is still extant in central Otago].

Rich *et al.* (1979) examined the vertebrate remains from a Quaternary deposit in north

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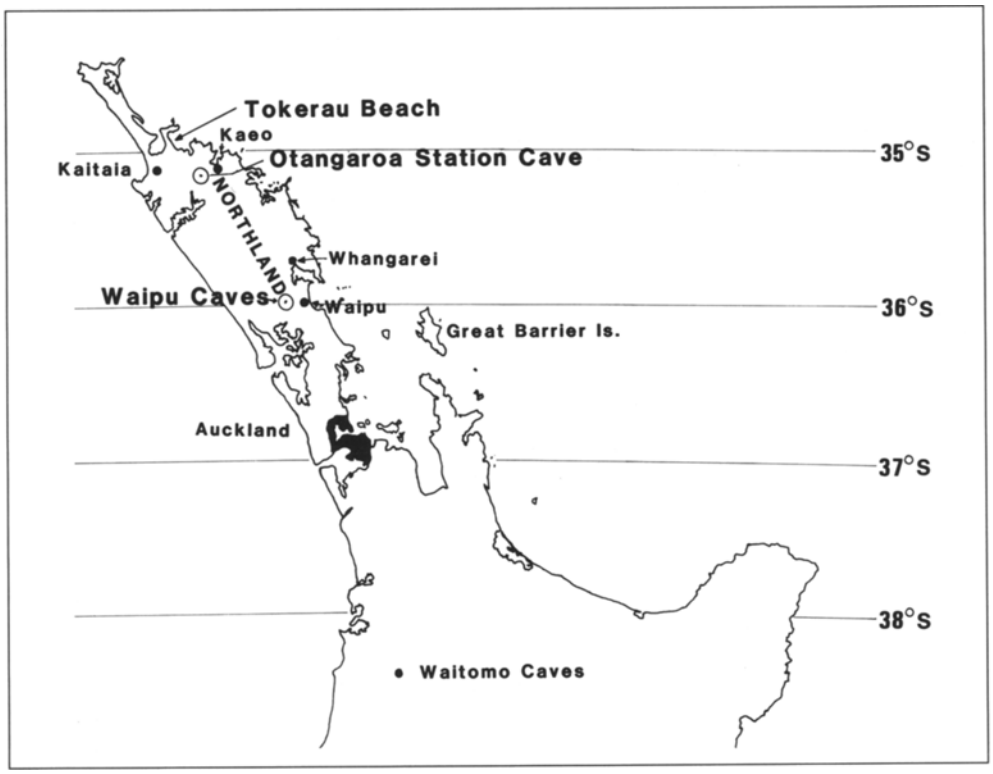

Fig. 1 – Map of the North Island, New Zealand, showing location of sites and principal areas mentioned in the text.

Canterbury, describing a number of lizard bones, and Gill (1985) reported the discovery of bones from a large skink (subsequently identified as *Cyclodina alani* (Robb) by Worthy (1987b)) from a midden site on Motutapu Island, near Auckland.

The distribution of fossil remains of the larger *Cyclodina* species and of *Hoplodactylus duvaucelii* (Duméril and Bibron) was studied by Worthy (1987b), who found evidence that both were formerly widespread on the mainland. That study reported the finding of fossil bones of a large skink from Otangaroa Station Cave, Northland, and others from dunes at Tokerau Beach, Northland. This paper describes these fossil bones, and refers them to a new *Cyclodina* species and *Leiolopisma* sp. indet., respectively.

DESCRIPTION OF COLLECTION SITES

All sites are in Northland, the northernmost province of New Zealand (Fig. 1).

Otangaroa Station Cave (Grid Ref NZMS 260 O 04/627 700). This cave, described by Worthy (1985), has developed in a small karst field. The site at which the fossil bones were found is a rock debris pile about 50 m upstream from the cave entrance and immediately before a very low section of cave passage. The bones were found on the rock pile, but only above the level of flood-deposited silts, and their position along the strand line suggests that they were carried in as carcasses by floodwaters, entering *via* an entrance in the unexplored, upstream reaches of the cave. The fine sediment between the rocks was taken out of the cave, and wet-sieved to extract the bones. The passing of previous cave visitors had resulted in considerable disturbance to the deposits on the passage floor, and had probably destroyed many other fossils.

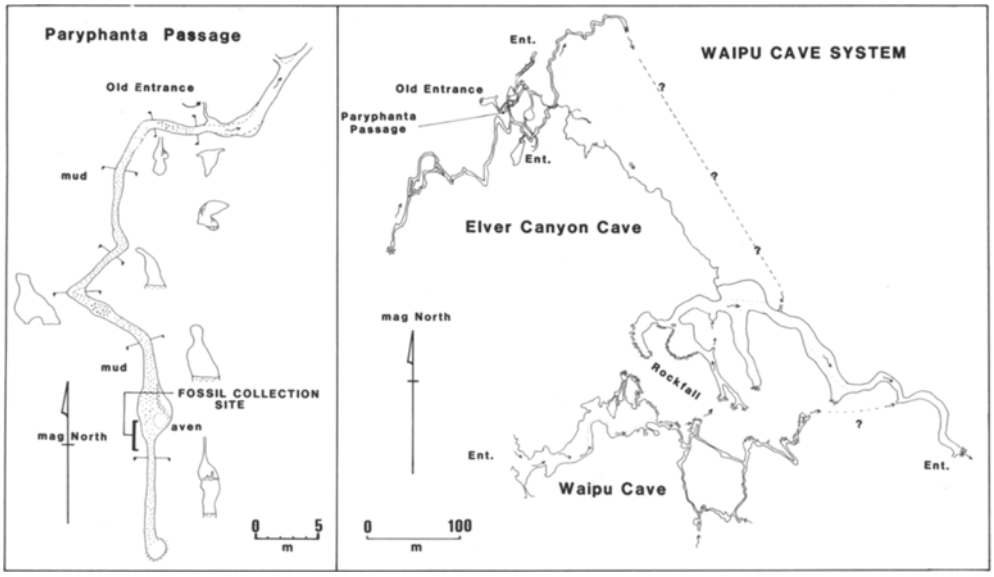

Fig. 2 – Plan of Waipu Cave System showing location of Paryphanta Passage, and detail of the same (inset). Published with permission of the N.Z. Speleological Society.

Elver Canyon Cave (Grid Ref NZMS 260 Q 07/331 845). This cave, described by Martin (1989), forms part of the Waipu Cave System (Fig. 2). The collection site is in Paryphanta Passage, and fossils were extracted from fine silts from the floor, over which a trickle of water flows. At the base of the aven (vertical shaft intersecting the cave passage from above), beside the collection site (Fig. 2) there is some rockfall debris which provides an effective sediment trap, causing fine silts and small fossils to accumulate on the upstream side. Material was bagged at the site and carried down the crawlway to the junction with the "Old Entrance" passage, where the mud was sieved out using water entering the passage at that point. The fossil deposit probably extends about 10 m upstream of the collection site, in an area covered by dozens of fossil *Paryphanta* snail shells.

Tokerau Beach The fossils from Tokerau Beach come from late Holocene dune deposits well known for their fossil avifauna (Millener, 1981). All material collected had been exposed by wind erosion of the dunes. Associated moa remains ranged in age from about 1,000 to 5,000 years old (Millener, 1981).

ABBREVIATIONS

Abbreviations for dimensions and institutions cited in the text are: SVL, snout-vent length; NMNZ, National Museum of New Zealand; AU, Auckland University Geology Department; WO, Waitomo Caves Museum; AIM, Auckland Institute and Museum; L, left; R, right.

All bones were measured with vernier calipers to the nearest 0.1 mm.

MATERIAL USED IN COMPARISONS

Skeletal: *Cyclodina alani* NMNZ R1854: *C. oliveri* NMNZ R920, AIM H885, AIM H882; *C. whitakeri* AIM H839; *C. macgregori* NMNZ R1634, unreg; *C. ornata* AIM H837, unreg. author's collection; *Leiolopisma moco* AIM H886; *L. infrapunctatum* NMNZ R1853, NMNZ unreg; *L. striatum* NMNZ R1736; *L. zelandicum* NMNZ R1683; *L. nigriplantare maccanni* NMNZ unreg. 2 ind.; *L. acrinasum* NMNZ unreg; *L. lineoocellatum* NMNZ R1740; *L. suteri* NMNZ unreg., AIM H674; *L. smithi* NMNZ unreg.

Radiograph: *C. alani* NMNZ S666-668, S670-672, S760; *L. fallai* NMNZ R850, R1583, R1869; *L. homalonotum* NMNZ S1508.

SYSTEMATIC PALAEONTOLOGY

Order Reptilia
Suborder Lacertilia
Family Scincidae

Genus *Cyclodina* Girard, 1857

Known distribution: Holocene and recent from North Island and associated offshore islands, New Zealand.

Diagnosis

According to Hardy (1977), *Cyclodina* is distinguishable by external morphological characters from *Leiolopisma* as follows: lower eyelid scaly or at least covered by one or two large opaque scales not clearly differentiated from surrounding scales (lower eyelid with transparent palpebral disc in *Leiolopisma*); suboculars in a continuous series (interrupted by enlarged supralabial); external ear opening lacking projecting scales on anterior margin (with one or more projecting scales); body squarish in cross section (oval); limbs with shortened digits (long digits).

I suggest that this diagnosis should include the following osteological characters. *Cyclodina* includes lygosomine skinks (those that have fused frontals) with an alpha palatal pattern (*i.e.* no posteriorly developed process on palatal ramus of pterygoid); 11 premaxillary teeth; no postorbital; meckelian canal completely overlapped by dentary; but which differ from *Leiolopisma* osteologically as follows: on braincase (occipital capsule) a well developed ridge extends only partway to anterior end of prootic – supraoccipital suture (over whole suture in *Leiolopisma*); quadrate has pronounced anteriomedial ridge arising dorsally and aligned vertically (*Leiolopisma* has not); lower posterior notch on dentary does not extend anterior of upper notch (it does in *Leiolopisma*)[1].

Cyclodina northlandi sp. nov.

Diagnosis

A large species of *Cyclodina*, with adults larger than all congeners: femora are 30% longer than those of the largest fossil femora and 50% longer than those in the available recent skeleton of *C. alani*, the species closest in size; dentary with 33 teeth (or teeth and empty alveoli) (26-29 in *C. alani*), maxilla with 25 or 26 teeth (23 in *C. alani*); quadrate widest in dorsal third of height (widest at mid-height in other *Cyclodina*) with prominent ridge on lateral flange; lower and upper posterior notches on dentary are of equal depth, or lower notch is shallower (lower notch always shallower in other *Cyclodina* species).

Holotype

WO 332.1 (Figs. 3, 5-8) Partial skeleton comprising LR mandibles, braincase, parietal, frontal, partial L and R maxillae, R quadrate, R prefrontal, LR scapulocoracoids, R clavicle, LR humeri, LR femora, R part L tibia, R fibula, 17 vertebrae.

Type locality

Otangaroa Station Cave, Northland, New Zealand (Worthy, 1985). Grid reference NZMS 260 O 04/627 700. Holotype and associated paratype series formed part of a flood-deposited

[1] Reference to *Leiolopisma* in the emended diagnosis, and elsewhere, includes only New Zealand species unless otherwise stated.

fauna collected in July 1984 from the top of a rock debris pile that extended about 3m above the present stream level.

Age

Undated. Probably late Holocene.

Referred specimens

Paratypes: W0332.5, collected July 1984 Otangaroa Station Cave: fragmentary 1L 2R dentaries, R articular, 2 braincases and fragments of a third, partial R pterygoid, fragment R maxilla, a frontal, 1 distal R humerus, fragments 2 R femora, 2 R tibia, 1 dorsal vertebra, 1 rib.

WO 371 collected 23 October 1988 and August 1986 from Paryphanta Passage of Elver Canyon Cave, Waipu, Northland. L dentary and L articular of probably one individual, R dentary.

Other specimens: WO 370, Paryphanta Passage, Elver Canyon Cave, – L and part L articular, L pterygoid, partial palatine, 7 presacral vertebrae, iliac process of coxal bone, 2 L scapulocoracoids, 2 R clavicles, 1 frontal, L femur, distal R tibia, 1 rib. These specimens have not been included in the type series because there is the possibility they may have been confused with bones of *C. alani* which were also present in the deposit. This is especially likely for non-cranial elements, since the upper size range of *C. alani* (now very rare) is not known. All the referred bones are however, much bigger than other known or referred bones of *C. alani*.

Known distribution

Otangaroa Station Cave 20 km southwest of Kaeo and Elver Canyon Cave 10 km northwest of Waipu, Northland, North Island, New Zealand. Holocene.

Etymology

Named after the geographic northernmost province of North Island, New Zealand.

Description

Mandible (Fig. 3) The holotype dentary has the angular, coronoid and articular still articulated but the posterior edge of both left and right articulars are broken. The length of the tooth row is 18.7 mm and there are 33 alveoli (all teeth are absent in both left and right mandibles). Of the paratypes, WO371, the tooth row of the left dentary measures 18.1 mm with 33 alveoli (5 alveoli without teeth) and the right dentary, 16.7 mm with 33 alveoli, *C. macgregori* has 25-26 alveoli, *C. alani* 26-29, *C. ornata* 28, *C. oliveri* 29-30, and *C. whitakeri* 31 (Worthy, 1987b), thus *C. northlandi* n.sp. has more dentary teeth than other *Cyclodina* species. This trend does not appear to be allometrically related to size, as *C. ornata* is the smallest and *C. alani* the largest of the compared species. Fig. 4 shows number of alveoli plotted against length of tooth row for *C. alani* and *C. northlandi* n.sp.; there is no allometric increase of number of teeth with length of tooth row, as demonstrated in *Leiolopisma telfairii* and *L. mauritiana* by Arnold (1980). The length of the tooth row of *C. alani* NMNZ R1854 is 13.0 mm. The mandible length of WO371 is 36.3 mm and the length of the articulating surface of the articular is 7.8 mm. The latter measurement suggests that the length of the holotype mandible, if complete, would have been about 36 mm.

The height of the holotype mandible at the coronoid process is 7.3 mm. The posterior edge of the coronoid is steeper than the anterior edge. The teeth are cylindrical and have expanded and rounded tips with vertical striations. In dorsal view the tooth row is straight over most of its length and curves medially for only the 7 most anterior of the 33 teeth. In lingual view the ledge from which the teeth arise is much flatter than in *C. alani,* where it is markedly concave. In the holotype dentary the lower posterior notch is the same depth as the upper notch, but in both paratypes included in WO 371 the upper notch is deeper (the dentaries included in WO332.5 are incomplete posteriorly).

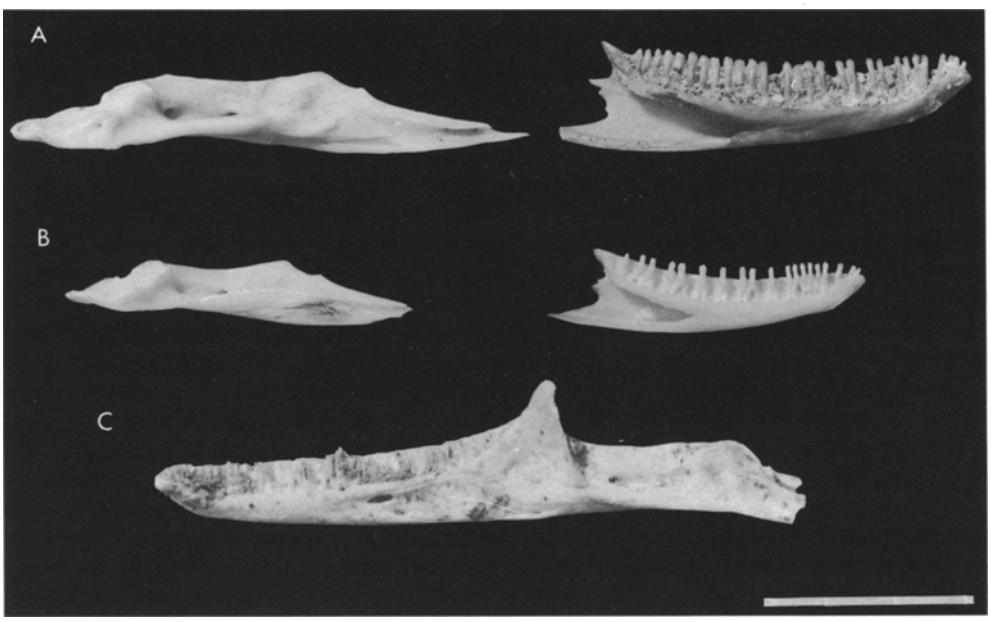

Fig. 3 – Lingual views of left dentary and articular of A – *Cyclodina northlandi* n.sp. paratype (WO 371); B – *C. alani* (NMNZ R1854); C – right mandible – *C. northlandi* n.sp. holotype (WO 332.1). Scale bar = 10 mm.

Quadrate (Fig. 5 G, H) Known only from the holotype specimen. Height 9.4 mm, maximum width 5.6 mm (in *C. alani* NMNZ R1854, height is 6.7 and width 3.4 mm). The lateral flange is widest in the dorsal third of its height, whereas in other *Cyclodina* species it is widest at mid-height. In posterior view the concave internal border is formed by a prominent flange off a strong dorso-ventral ridge. Dorsally this ridge is expanded to partially

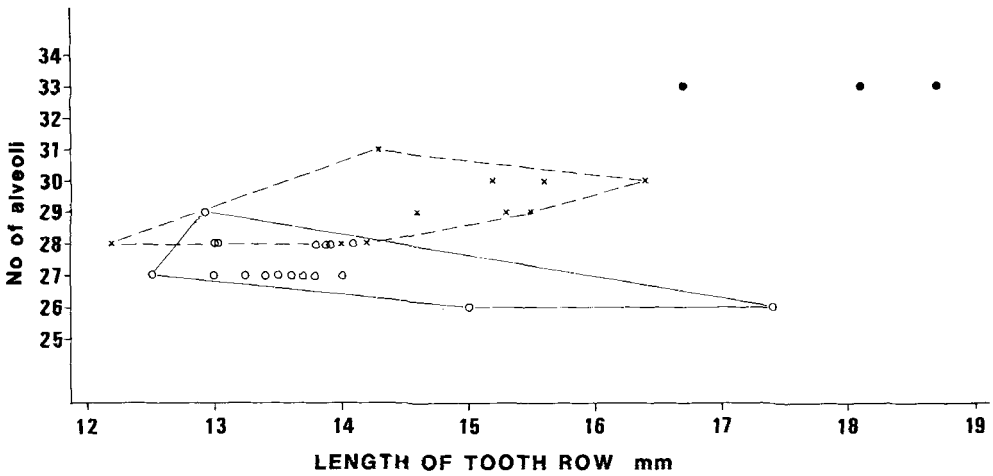

Fig. 4 – Number of alveoli plotted against length of tooth row for *C. alani* (open circles) *C. northlandi* n.sp. (closed circles) and the Tokerau *Leiolopisma* sp. (crosses). Specimens used are as follows: *C. alani* Unregistered specimens NMNZ – DM Cave 1 and Fissure 2, Ruakokopatuna; NMNZ R1854; Motutapu Island from (Gill, 1986); WO 331.2, WO 346, WO348, WO330.2, AU7700 all from the Waitomo region; WO 369 Elver Canyon; *C. northlandi* WO 332.1, 371; Tokerau *Leiolopisma* sp AU 5872.31, AU 5850.2O3-.204, AU 6202.20, AU 6807.C, AU 7407.H.

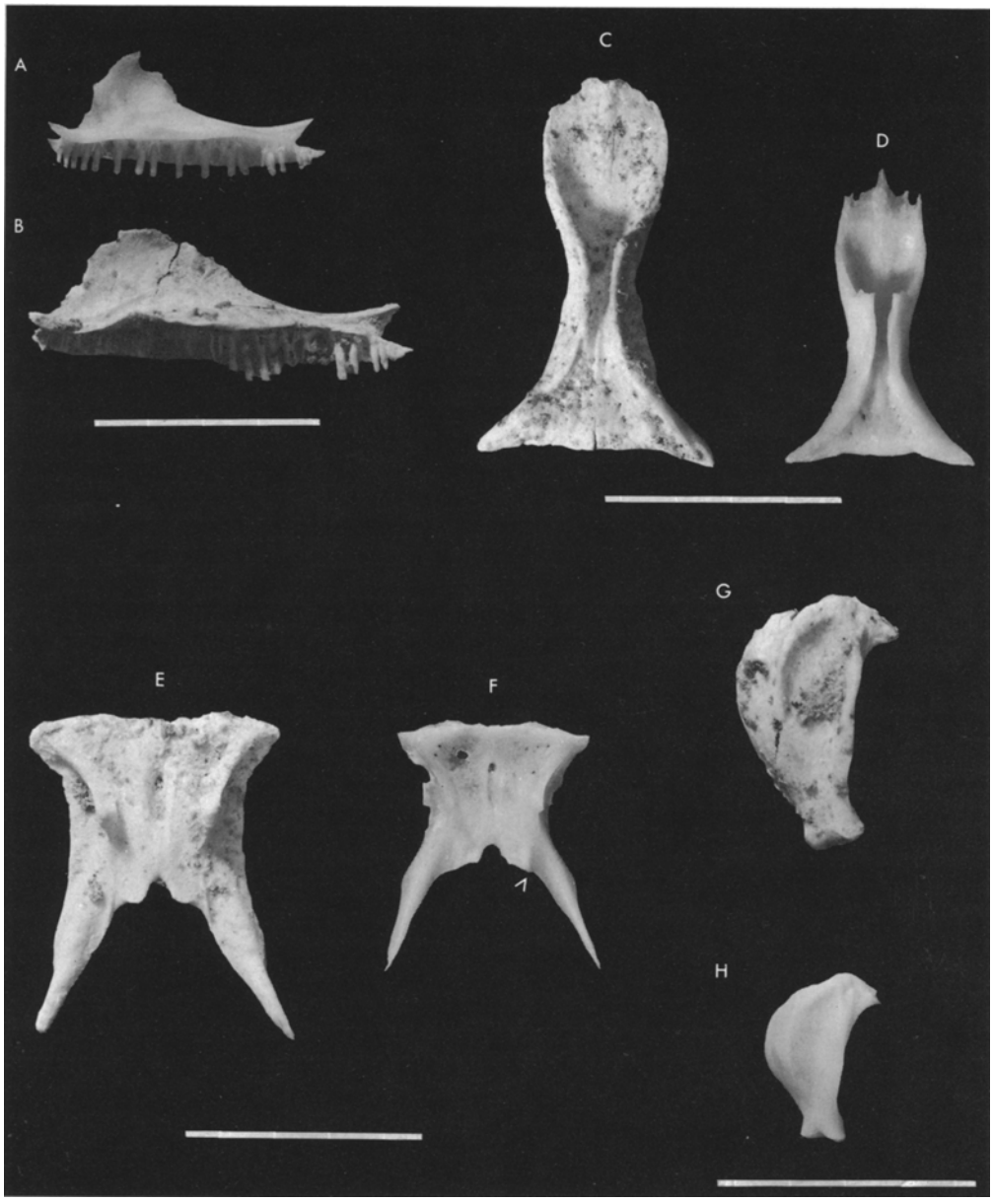

Fig. 5 – Lingual views of right maxilla A – *C. alani* (NMNZ R1854), B – *C. northlandi* n.sp. holotype – (WO 332.1); ventral views of frontal C – *C. northlandi* holotype; D – *C. alani* (NMNZ R1854); ventral views of parietal E – *C. northlandi* n.sp. Holotype, F – *C. alani* (NMNZ R1854); anterior view of right quadrate G – *C. northlandi* n.sp. Holotype, H – *C. alani* (NMNZ R1854). Scale bar = 10 mm.

enclose a deep notch in the lateral flange. In anterior view a prominent ridge, characteristic of *Cyclodina*, originates on the dorsal margin and subsumes into the lateral flange in its lower third. There is a small foramen just mesial to the dorsal origin of this ridge. In this respect it is most similar to *C. oliveri* and *C. alani* ; the foramen in *C. macgregori*, *C. whitakeri* and *C. ornata* is relatively much larger.

Premaxilla Not known in *C. northlandi* n.sp. *C. alani* NMNZ R1854 and all other lygosomine taxa in New Zealand have 11 teeth.

Maxilla (Fig 5. A,B) The holotype has the right and the posterior half of the left maxilla. The complete bone is 16.9 mm long. The tooth row is partially eroded but the number of alveoli suggest that 25 or 26 teeth were present. The pars facialis has eroded margins, so cannot be compared with other species. Posteriorly the pointed extension of the pars facialis does not extend as far as that of the pars palatina, as in other *Cyclodina* species except *C. macgregori*, where they are of equal length. The pars palatina has a flat ventral margin, not domed as in *C. macgregori*. In external view there is a row of 4 fenestrae below the high part of the pars facialis. There are 4 fenestrae in the maxilla of *C. alani* NMNZ R1854, which is 12.5 mm long.

Frontal (Fig. 5 C,D) In the holotype, the posterior width is 10.2 mm, neck width 3.2 mm, maximum anterior width 5.5 mm, length (anterior edge eroded) 15.9 mm. The specimens in WO 370 include a perfectly preserved frontal with equivalent measurements of 10.7, 2.8, 4.9, 16.7 mm. By contrast, *C. alani* NMNZ R1854 has the measurements: 8.4, 2.9, 4.0, 12.6 mm. The shape of the frontal at the border between the superficial dorsal surface and the nasal bones roughly mirrors the absolute anterior border of the frontal and has a dominant central anterior projection from which the border slopes backwards. On each side there are prominent anteriorly-directed projections, smaller than the central one.

Parietal (Fig. 5 E,F) The holotype has an anterior width of 10.6 mm, width across ventral processes 5.3 mm, width across posterior processes 11.0 mm, length of anterior edge to tip of posterior processes 14.0 mm. Comparable measurements in *C. alani* NMNZ R1854 are 8.4, 4.4, 9.3, 10.2 mm. *C. alani*, in ventral aspect, has a marked groove (arrowed in Fig. 5F) bounded laterally by the posterior process and medially by the shelf that encloses the central posterior notch. In *C. northlandi* n.sp. there is no groove, and the lateral borders of the posterior processes are only slightly bowed outward, not markedly as in *C. alani*.

Braincase (Occipital capsule) Fig. 6. In the holotype the basisphenoids are broken off, otherwise it is perfect. Width across zygomatic processes (zp) 13.1 mm, and across the dorsal projections of the prootic (p) 6.0 mm, 10.2 mm and 4.8 mm in *C. alani* NMNZ R1854. As in *Cyclodina* species, the suture between the prootic and the supraoccipital (so) supports a ridge which is prominent on the posterior half of the suture but merges into the bone surface before reaching the anterior end of the suture. *C. northlandi* is similar to *C. alani* in that in dorsal view the posterior edges of the supraoccipitals are only slightly expanded, not projecting beyond a line drawn across the zygomatic processes, as in the other species in the genus. In lateral view the parasphenoid process (ps) projects well below the basisphenoid (b), as in *C. alani*, but not in other congeners.

Among the paratypes WO 332.5 are two occipital capsules, one less and one more perfect than the holotype. Their respective measurements, as above, are 12.6 and 5.0 mm, 12.9 and 5.4 mm. The perfect one measures 14.8 mm between the zygomatic and the tip of the basisphenoid processes (bp), 11.0 mm in *C. alani* NMNZ R1854. There is variation among these three braincases in the outline shape of the dorsal process of the prootic. One, in addition, has a secondary ridge enclosing a pit dorsally on the prootic (Fig. 6B), but little significance is attached to this as such variation is common in both *Cyclodina* and *Leiolopisma* species (Worthy, 1987b). The structure of the spines at the base of the basisphenoid processes (bp) can be studied in one paratype. The principal spines do not extend beyond the mesial origin of the basisphenoid processes, unlike *C. oliveri* but as in *C. whitakeri*, *C. macgregori* and *C. alani*. Their length is similar to the width of their basal separation, as in *C. alani*: in *C. whitakeri* the spines are shorter than wide, and in *C. macgregori* they are longer than wide.

Prefrontal The holotype includes the right prefrontal, with length 7.3 mm (although the posterior tip and the anterior flange are broken), height 6.8 mm, width of superficial dorsal surface 2.3 mm. It is very similar in shape to that of *C. alani* NMNZ R1854, which has equivalent measurements of 7.2, 5.0 and 1.8 mm.

Pterygoid and Ectopterygoid The paratype series WO 332.5 includes a partial right pterygoid. The posterior process is broken across the ventral foramen, and the tip of the palatal ramus is broken. The lateral flange is still articulated with the ectopterygoid to

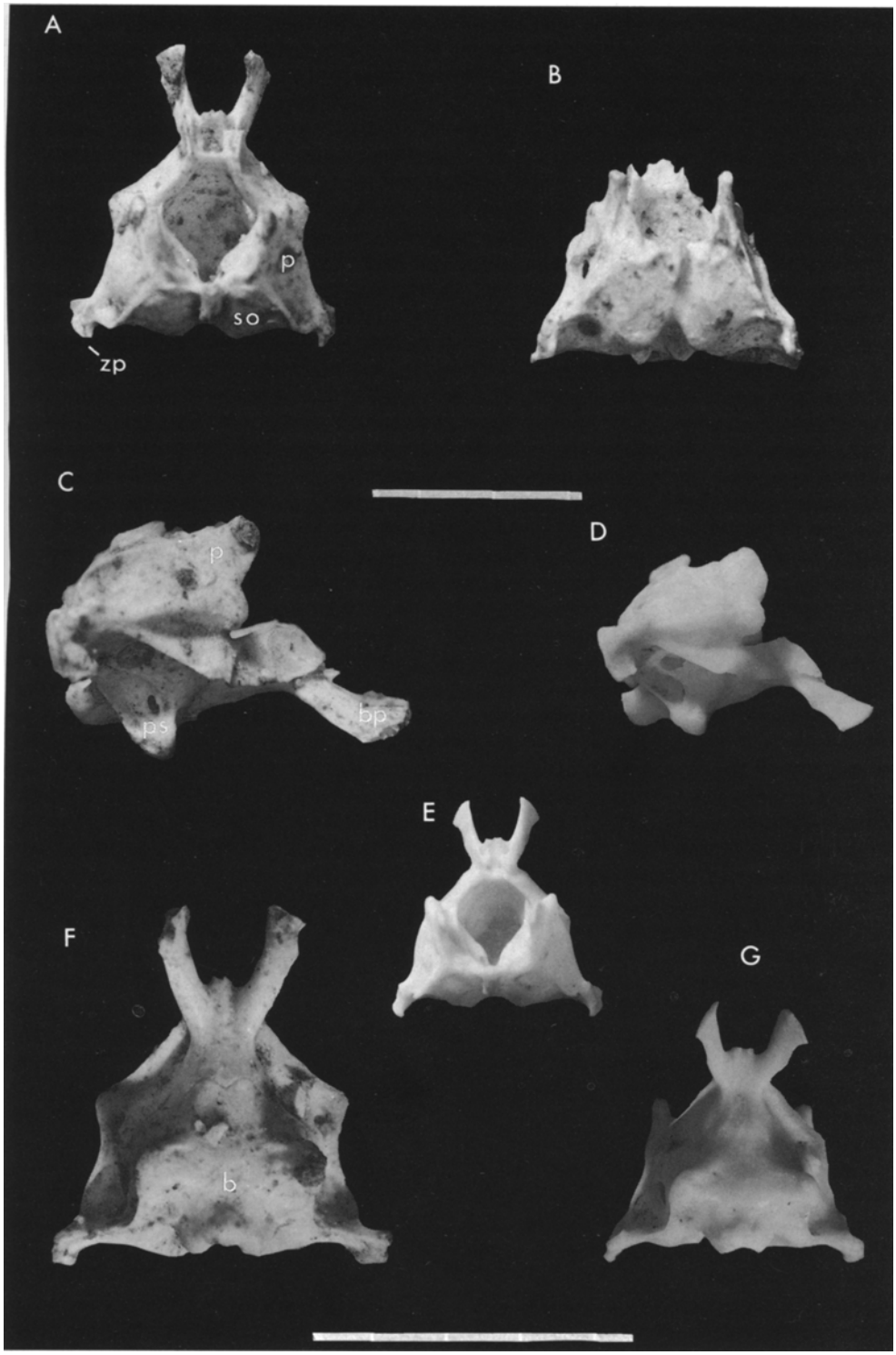

Fig. 6 – Dorsal (A,B,E), ventral (F,G), lateral (C,D) views of braincases of *C. northlandi* n.sp. A,C,F are paratypes (WO 332.5); B is part of the – holotype (WO 332.1) and D,E,G, are of *C. alani* (NMNZ R1854). Scale bar = 10 mm.

produce a marked anteriorly directed hook. There is a short process on the ectopterygoid that extends part way up the anterolateral side of the palatal ramus of the pterygoid. The combined fragment is very similar in shape to that of the equivalent bones in *C. alani*, although much larger – the mesial length of the ectopterygoid is 4.8 mm compared with 3.7 mm in NMNZ R1854. A more complete left pterygoid (L = 15.7 mm) is included in the referred material of WO 370; the comparable measurement in *C. alani* NMNZ R1854 is 10.9 mm.

Vertebral column (Fig. 7) The 17 vertebrae forming part of the holotype partial skeleton comprise 15 presacral (the axis, characterized by a well developed posteriorly-directed ventral spine, 3 cervical and 11 dorsal vertebrae, the latter with no ventral process), and 2 caudal vertebrae characterized by transverse processes. The neural spines are robust and slope posteriorly. The transverse diameters of the centra of the dorsal vertebrae are about 2mm, and the height from centrum to neural spine ranges from 6.0 to 7.5 mm. Among the referred specimens in WO 370 are 1 axis, 1 cervical, 4 dorsal and 2 caudal vertebrae. The vertebrae are virtually the same shape as those of *C. alani*, which has 29 presacral vertebrae.

Clavicle The holotype specimen includes the right clavicle. This bone has a solid outer border, sigmoid in shape. It is broken anteriorly but apparently entire posteriorly. The large fenestrated medial flange is, however, broken, so the extent of the fenestra cannot be determined. Among the referred bones in WO 370 are two right clavicles in which only the anterior portions are complete. The reconstructed shape of the clavicle in *C. northlandi* n.sp is very similar to that of *C. alani*.

Scapulocoracoid (Fig. 7) The holotype has both right and left elements, although the right is most complete and only the anterior processes are broken. Its height is 13.6 mm. Two left scapulocoracoids among the referred material of WO 370 are 13.8 and 13.0 mm in height. There is variation in the degree of ossification of the thin flanges surrounding the anterior processes, but the upper notch is deeper and wider than the lower notch. There is a small fenestra between the bases of the anterior processes adjacent to the humeral socket. The scapulocoracoid of *C. northlandi* n.sp. is very similar to that of *C. alani* NMNZ R1854, which has a height 9.6 mm.

Humerus (Fig. 8) Measurements of the holotype humeri are shown in Table 1. Lengths range from 19.9 to 20.0 mm. They are well preserved bones with fused epiphyses. Their proportions and shape are very like those of *C. alani*. Anteriorly there is a deep excavation adjacent to the deltopectoral crest. The ectepicondylar foramen is prominent in anterior view; it is on a ridge adjacent to a deep sulcus proximal to the condyles and adjacent to the widest part of the convex lateral border. Humeri of *C. alani* are much smaller: NMNZ R1854 is 13.2 mm; the largest measurement of a recent specimen, estimated from X-rays, is 13.8 mm (Worthy, 1987b), and the largest fossil, a specimen from Opening Day Cave, Waitomo (WO 330.2), is 16.7 mm in length.

Other forelimb elements No other forelimb elements of *C. northlandi* n.sp. have been collected.

Table 1 – Measurements of humeri of *Cyclodina northlandi* in mm. Proximal and distal measurements are maxima: shaft width is the minimum across the posterior surface

	Side	Length	Prox.W	Shaft.W	Dist.W
Holotype W0332.1	Right	20.0	5.9	2.0	5.4
Holotype W0332.1	Left	19.9	5.9	2.0	5.4
Paratype W0332.5	Right	-	-	-	5.8

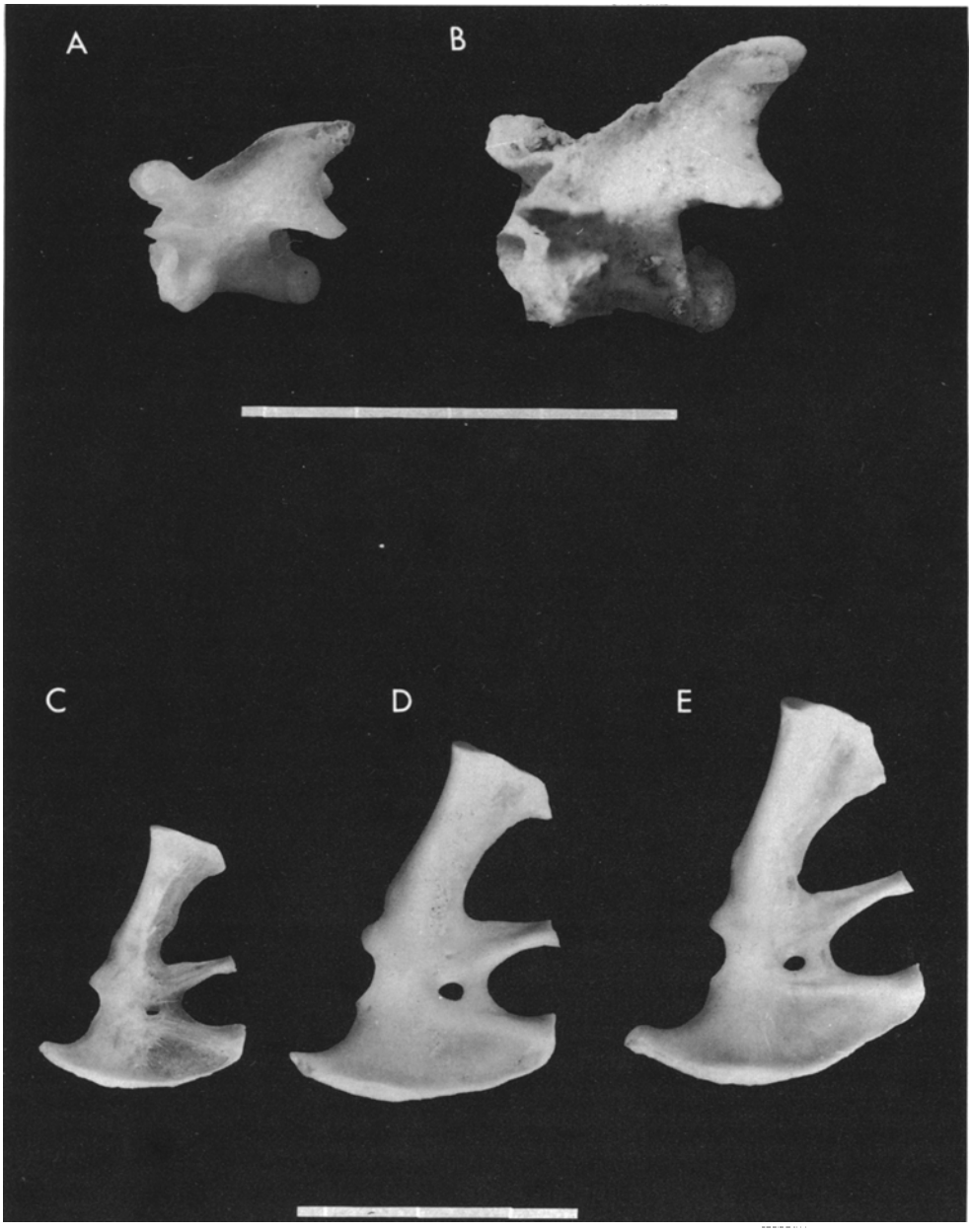

Fig. 7 – Presacral vertebra A – *C. alani* (NMNZ R1854); B. – *C. northlandi* n.sp. holotype (WO 332.1); left scapulocoracoids C – *C. alani* (NMNZ R1854), D,E – *C. northlandi* n.sp. (WO 370), Scale bar = 10 mm.

Femur (Fig. 8) Measurements of the holotype and referred femora are shown in Table 2. Lengths range from 21.4 to 23.7 mm. The epiphyses are fused in the holotype femora. Their shape closely resembles the femur of *C. alani*, except that *C. alani* is considerably smaller: the length of NMNZ R1854 is 15.4 mm, and fossil femora of *C. alani* are up to 18.5 mm (Worthy, 1987b).

Tibia (Fig. 8) Measurements of the holotype left tibia (right element missing distal end) are: length 14.1 mm, proximal width 4.0 mm, shaft width 1.8 mm, distal width 2.6 mm. The

Fig. 8 – Limb bones of *C. northlandi* n.sp. holotype (WO 332.1) larger, and *C. alani* (NMNZ R1854) smaller. A – humeri, B – tibia, C – femora. Scale bar = 10 mm.

paratype series WO 332.5 contains 2 right tibiae of length 12.7 mm and 11.6 mm. The latter was apparently not quite mature as the lateral and medial tubercles are not well developed and the distal end has not developed the characteristic trigonal point. Tibiae of *C. alani* are very similar in shape except that the centre shaft region is more flattened. The length of NMNZ R1854 is 9.4 mm.

Fibula The length of the holotype right fibula is 12.7 mm: that of *C. alani* NMNZ R1854 is 9.2 mm.

DISCUSSION

The above descriptions of bones of *C. northlandi* n.sp. show that this skink clearly has affinities with *C. alani*, and if it were not for size, the individual bones of the two species

Table 2 – Measurements of femora of *Cyclodina northlandi* in mm. Proximal and distal measurements are maxima: shaft width is the minimum across the posterior surface

	Side	Length	Prox.W	Shaft.W	Dist.W
Holotype W0332.1	Left	23.7	3.7(worn)	2.0	5.3
Holotype WO332.1	Right	23.7	4.3	2.0	5.2
WO370	Left	21.4	3.7	1.8	4.9

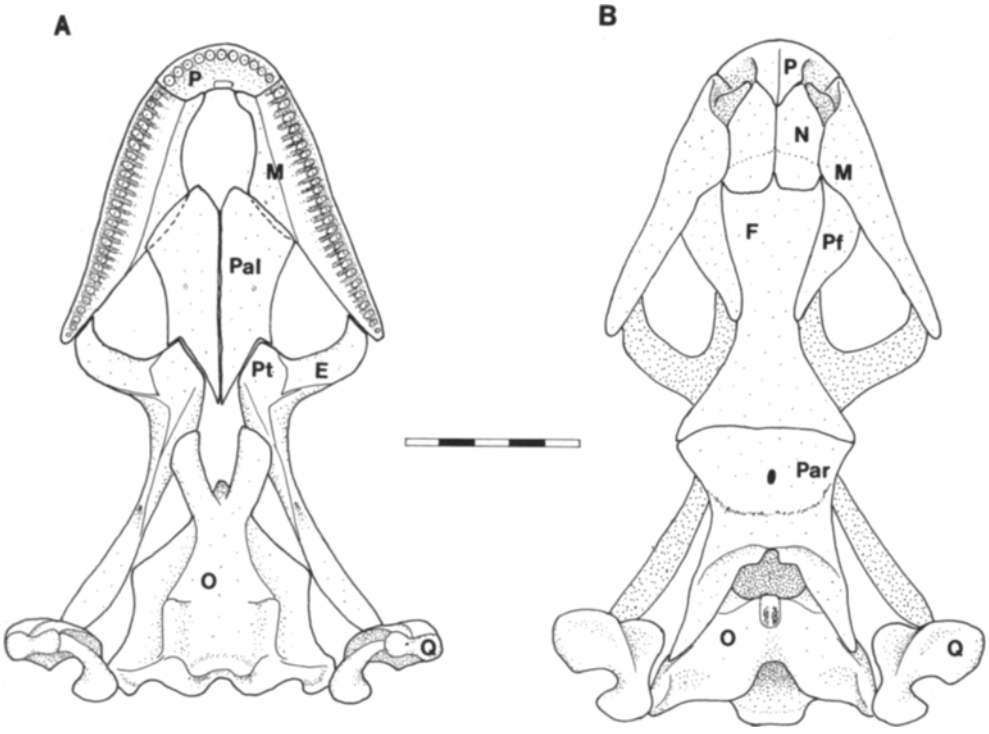

Fig. 9 – Partial reconstruction of skull of *C. northlandi* in A. ventral and B. dorsal aspects. The form of the premaxillae, nasals and distal end of the palatines is based on these bones in *C. alani*. P – premaxilla, M – maxilla, Pal – palatine, P – Pterygoid, E – ectopterygoid, O – occipital capsule, N – nasal, Pf – prefrontal, Par – parietal, F – frontal, Q – quadrate. Scale bar in mm.

would often be indistinguishable. With one known exception all skeletal elements referred to *C. northlandi* n.sp. are larger than the same elements in *C. alani*. The exception is a left dentary with a tooth row length of 17.4 mm and 26 alveoli (see Fig. 4) that was found with bones of *C. northlandi* n.sp. in Elver Canyon Cave. Although this dentary is larger than one of those referred to *C. northlandi* n.sp., and hence much larger than other *C. alani*, I referred it to *C. alani* because of its low tooth count and the markedly curved dorsal surface of the lingual border to its tooth row. This considerably extends the accepted size range for *C. alani* known from recent or fossil specimens (Worthy, 1987b). Its presence in this fauna therefore introduces the possibility that non-diagnostic elements may belong to either species.

However, there are interesting proportional differences between the various skeletal elements of *C. northlandi* n.sp. and *C. alani*, as shown when measurements of the holotype of *C. northlandi* n.sp. are compared with those of *C. alani* NMNZ R1854. For example, in *C. northlandi* n.sp the fibula is 38% longer, tibia 50% longer, femur 54% longer, humerus 51.5% longer, scapulocoracoid 42% higher, pterygoid 30% bigger, prefrontal 36% higher, braincase 28% wider at zygomatic processes, parietal 26% wider and 37% longer, frontal 21.5% wider and >26% longer, maxilla 35% longer, quadrate 40% higher, tooth row of dentary 44% longer. The legs of *C. northlandi* n.sp., in relation to *C. alani*, appear to have been proportionally more elongate, especially in the proximal elements, than would be expected from comparisons of any skull bone measurements. The skull bone measurements primarily concerning width, *i.e.* braincase, parietal and frontal widths, show proportionally smaller increases than those primarily concerning length, *i.e.* parietal length, pterygoid, maxilla and dentary or those concerning skull height such as prefrontal and quadrate,

suggesting that *C. northlandi* n.sp. had a relatively narrower, longer and higher head than *C. alani*. The skull of *C. northlandi* n.sp. is partially reconstructed in Fig. 9.

These differences in relative size of bones compared with those of *C. alani*, mean that it is not possible to determine probable SVL from any one bone by direct allometry. However, it is reasonable to suggest that *C. northlandi* n.sp. was probably at least 40% larger than *C. alani* NMNZ R1854. From the ratios provided by Worthy (1987b), I estimate that *C. alani* NMNZ R1854 was probably between 115 and 120 mm SVL, so the holotype of *C. northlandi* n.sp. was probably at least 160-170 mm SVL.

There is no skeletal material available for the large and rare *Leiolopisma fallai* and *L. homalonotum*. The former is endemic to the Three Kings Islands, north of New Zealand, and the latter is apparently endemic to Great and Little Barrier Is. These are large skinks, by contemporary New Zealand standards, and some specimens were examined by X-ray photography (Fig. 10). In *L. fallai* NMNZ R850, of SVL 120 mm, the femora were 16 mm long; R1583 of SVL 132 mm had humeri 16.5 mm long and femora 18.6 mm long; R1869 of SVL 123 mm had femora of 16.6 mm long. Gill (1986) recorded the maximum size for this species as 140 mm SVL, which would correspond to femora measurements of 19 mm. Thus *L. fallai* appears to have been smaller than *C. northlandi* n.sp. Similarly, the maximum size recorded for *L. homalonotum* is 143 mm SVL. Humeri length in NMNZ S1508, of SVL 117 mm, was 11.4 mm and femora length was 15.0 mm, determined from X-rays. So the expected femur length for a 143 mm specimen would be only a little over 18 mm, again assuming allometric proportions. These species, though small, would have the characteristic quadrates, dentaries and braincases seen in all the other *Leiolopisma* species examined (Worthy, 1987b), even if other differences could not be detected. Fig. 10 compares X-rays of the skulls of the three largest extant species from the northern New Zealand, *L. homalonotum*, *L. fallai*, *C. alani*.

Although the three skulls are inclined forwards to varying degrees, thereby causing apparent foreshortening, there are obvious differences. Skulls of *Leiolopisma* have a braincase that is relatively narrower anteriorly (ratio of width across zygomatic processes to anterior prootic width 1.88 in *L. fallai*; 1.87 in *L. homalonotum*; 1.6 in X-ray, 1.59 in R1854 for *C. alani*), and have a flat posterior margin. Only 26 and 27 teeth could be counted in the mandibles of *L. fallai* and *L. homalonotum* respectively. These observations clearly show that these *Leiolopisma* species differ considerably from *C. northlandi* n.sp., which has 33 teeth in the mandible and a braincase width ratio, as above, of 1.72 in the holotype; 1.78 and 1.74 in other specimens, and a relatively narrower skull than *C. alani*.

Palaeoecology

The faunas found associated with *C. northlandi* n.sp. are listed in Appendices 1 and 2, and strongly indicate that it was a forest animal.

The mollusca of both sites are characteristic of deep litter, except for the hydrobiids, whose presence is explained by the stream at the deposition site. Similarly, among the lizards, the predominance of *Cyclodina* species indicates a forested environment. The only *Leiolopisma* species present is *L. infrapunctatum*, which is regarded as a species of well vegetated sites in forest margins or open forest (A.H. Whitaker, pers. comm, 1990). Remains of *L. infrapunctatum* have been found at Waitomo (WO342, a skeleton from Haggas Hole) and north Taranaki, at Mahoenui (WO 376, a skeleton from Boundary Cave). The frog fauna suggests forested habitat (Worthy, 1987c), as does the avifauna.

Both sites are at low altitude: Otangaroa Station Cave is 100 m a.s.l. and Elver Canyon Cave is 150 m a.s.l., so at the time of deposition of these fossils the vegetation was probably a lowland mixed podocarp – hardwood forest (McGlone, 1988). The rainfall of the region is relatively high (1200-1600mm), so the forests would have been generally damp, although drier in summer, as the late Holocene climate was not markedly different from that now. This suggests *C. northlandi* n.sp. probably lived in a densely forested habitat with deep litter, a habitat similar to that described for *C. alani* (Towns *et al.*, 1985).

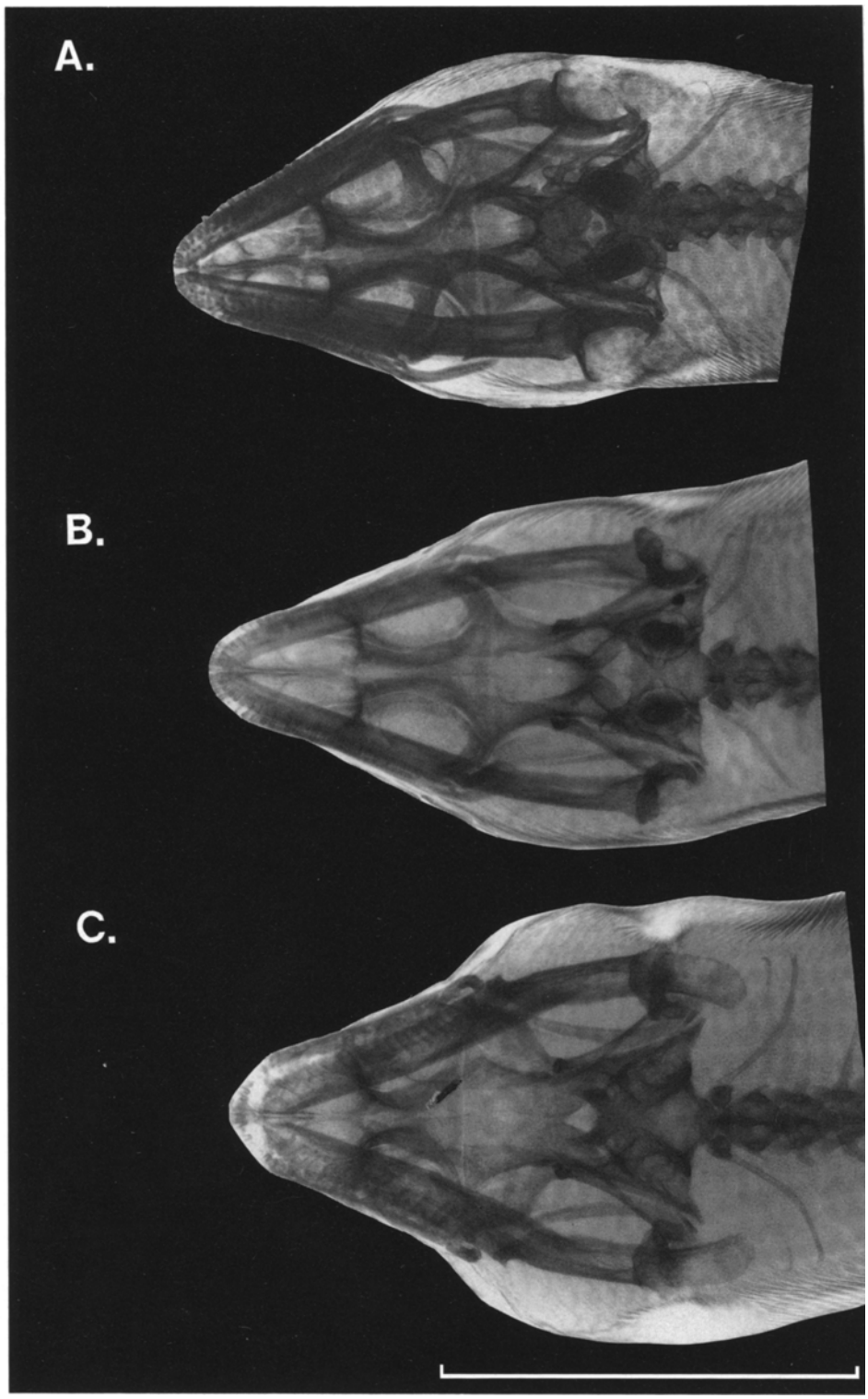

Fig. 10 – Radiographs of the skulls of: A. *C. alani* (NMNZ S667); B. ***Leiolopisma homalonotum*** (NMNZ S1508); C. *L. fallai* (NMNZ R1869). Scale bar = 2 cm.

GENUS *LEIOLOPISMA* DUMÉRIL AND BIBRON, 1839

Diagnosis

Hardy (1977) diagnosed *Leiolopisma* from external characters, which, in addition to those listed under *Cyclodina* (above), are as follows: small to relatively large (SVL = 150 mm), primarily terrestrial skinks lacking supranasals, moveable lower eyelid, well developed prefrontals, frontoparietals fused or distinct (all New Zealand species), external ear opening fairly well developed, body oval in cross-section. I propose that this diagnosis should be amended to include the following osteological characters: *Leiolopisma* has fused frontals, an alpha palatal pattern, 11 premaxillary teeth, no postorbital, meckelian canal overlapped by dentary, a well developed ridge on braincase extending over the entire prootic – supraoccipital suture, quadrate with no ridge arising dorsally and aligned vertically on anteriomedial surface, lower posterior notch on dentary extends anterior of upper notch.

Leiolopisma species indeterminate

Known distribution

Tokerau Beach, Northland, New Zealand

Referred specimens

AU4628.68 L humerus; AU 4659.8 R humerus; AU 4831.H L humerus; AU 4871 part R humerus, R femur; AU 5850 2 R dentaries; AU 5872.31 L dentary; AU 5872.32 R humerus; AU 5873.33 L femur; AU 5875E 1R 1L femora; AU 6119.26 – .27 2R femora; AU6121 – F L humerus, 2R femora; AU 6202.20 L dentary; AU 6202.21 L humerus; AU 6202.22 R humerus; AU 6203 L maxilla; AU 6754-D 2 R humeri, 2R 1L femora; AU 6762-C 2R femora; AU 6807-C 1R2L humeri, 5L4R femora, 3R1L dentaries, 1L maxilla, 1 vertebra, 1 coxal bone fragment; AU 6808-A 2R, 2 shafts, 1 prox L femora; AU 7407-H 2L1R humeri, 3R dentaries, 1 tibia; AU 8559 1R humerus; AU 8560 1R humerus, 1L 1R femora.

DISCUSSION

As only the more robust and larger bones have been recovered from the harsh sand dune environment of the fossil site, diagnostic elements are few. The dentaries are large, and, when complete (for example AU5850: Fig. 11), have a typically *Leiolopisma* characteristic, the ventral notch deeper than the dorsal notch, not shallower as in *Cyclodina*. This rules out referral of these bones to a *Cyclodina* species, among which only *C. alani* or *C. northlandi* n.sp. would be of sufficient size. Also, *C. alani* has generally fewer teeth; and *C. northlandi* n.sp more teeth, than the Tokerau Beach skink, which has 28-31.

The only *Leiolopisma* species of similar size known from the same geographic area are *L. fallai* and *L. homalonotum*. These lizards are rare and fully protected, so no cleared and stained specimens, nor any skeletal preparations of recent material, are available. Data for humeri and femora lengths obtained from radiographs of these species are presented above. Length data for the fossil bones from Tokerau Beach are summarized as follows:

humeri: mean = 15.76 mm, n = 10, SD = 0.588, CV = 3.73, range = 14.6 – 16.8 mm
femora: mean = 17.96 mm, n = 17, SD = 0.829, CV = 4.61, range = 16.1 – 19.2 mm
tibia: 11.8 mm (n = 1)
maxilla tooth row: 14.5 mm with 26 alveoli (n = 1).

The ectepicondylar foramen on the humerus is relatively larger in the Tokerau Beach fossils than in *C. northlandi* n.sp. or *C. alani*. Clearly these fossils represent a *Leiolopisma* species of size equivalent to *L. fallai* or *L. homalonotum*, which if not actually referrable to one of these taxa, is probably an undescribed species.

CONCLUSIONS

This paper shows that two species of large skink, *C. northlandi* n.sp and an indeterminate

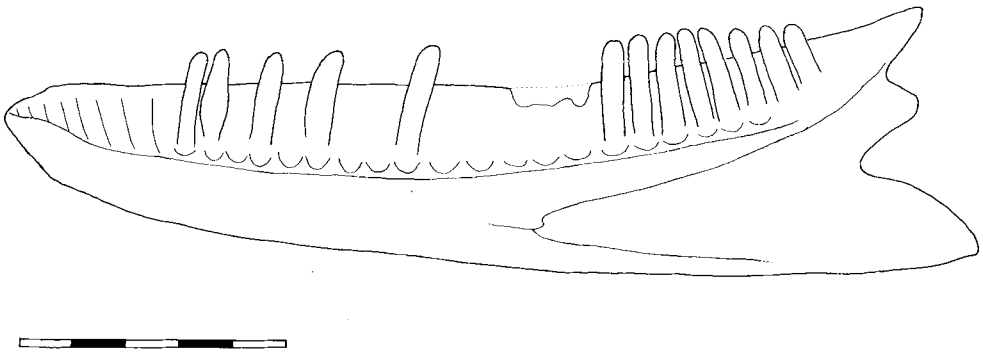

Fig. 11 – Lingual view of a fossil right dentary of an undetermined *Leiolopisma* species (specimen AU 5850 – 203) from Tokerau Beach, Northland. Scale bar in mm.

Leiolopisma species, were present on the mainland of Northland, New Zealand, in at least the late Holocene. *C. northlandi* n.sp. was at least 160-170 mm in SVL, bigger than any other New Zealand skink. The *Leiolopisma* species was about the same size as *L. homalanotum* or *L. fallai*, and may even prove to be referrable to one of these species if more complete material is found.

Hardy (1977) collected literature records of unspecified large lizards from New Zealand and discussed them in relation to *Leiolopisma gracilicorpus*, a species known only from the holotype which was collected in the Hokianga district in Northland. These same records were discussed in depth by Bauer and Russell (1987) with respect to *Hoplodactylus delcourti*, a large gecko believed to have lived only in northern New Zealand. However, the evidence presented here makes it possible, if not probable, that at least some of the Northland records may relate to *C. northlandi* n.sp.

Leiolopisma telfairii is the biggest surviving member of the genus, as defined by Greer (1974), growing to at least 171 mm SVL but probably up to 200 mm SVL (Arnold, 1980). *L. (=Didosaurus) mauritianus* probably reached SVL's of over 340 mm. *C. northlandi* n.sp may have equalled *L. telfairii* in size but was certainly not the largest lygosomine skink. The eight largest nonattenuate skinks listed by Greer (1976) range from *Tiliqua scincoides* (335 mm SVL) to *T. nigrolutea* (269 mm SVL).

The fossils described above not only document new lizards, but also two further cases of extinctions in the New Zealand fauna in recent times. *C. northlandi* n.sp. is certainly extinct, and the *Leiolopisma* is, at the very least, extinct on the mainland of the North Island. These two species can be added to the long list of extinct species of New Zealand. For the herpetofauna, the true extent of our recent losses is only now being realised (Worthy, 1987b, 1987c): the extinct species include three frogs (*Leiopelma* species), and at least three lizards (*Hoplodactylus delcourti*, *Cyclodina northlandi* and *Leiolopisma gracilocorpus*). Furthermore, many other members of the herpetofauna have suffered severe range reductions and now survive only as small relict populations.

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REFERENCES

Arnold, E.N., 1980. Recently extinct reptile populations from Mauritius and Réunion, Indian Ocean. *Journal of Zoology, London* 191: 33-47.

Bauer, A. M. and Russell, A. P., 1987. *Hoplodactylus delcourti* (Reptilia: Gekkonidae) and the kawekaweau of Maori folklore *Journal of Ethnobiology* 7(1): 83-91.

——— 1988. Osteological evidence for the prior occurrence of a giant gecko in Otago, New Zealand. *Cryptozoology* 7: 22-37.

Butts, D., 1982. Faunal identifications from Mahunoa West midden (N152/50), Horowhenua. *N.Z. Archaeological Newsletter* 25(3): 191-194.

Gill, B.J., 1985. Subfossil bones of a large skink (Reptilia: Lacertilia) from Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum* 22: 69-76.

——— 1986. *Collins Handguide to the Frogs and Reptiles of New Zealand.* Collins, Auckland.

Greer, A.E., 1976. On the evolution of the giant Cape Verde scincid lizard *Macroscincus coctei. Journal of Natural History* 10: 691-712.

Hardy, G.S., 1977. The New Zealand Scincidae (Reptilia: Lacertilia); a taxonomic and zoogeographic study. *N.Z. Journal of Zoology* 4: 221-325.

Hutton, F.W., 1899. On a supposed rib of the kumi, or ngarara. *Transactions and Proceedings of the N.Z. Institute* 31: 485.

McGlone, M.S., 1988. Post glacial New Zealand. *In* G. Stevens, M. McGlone and B. McCulloch (Eds): *Prehistoric New Zealand*, pp 92-96, 201-209. Heinemann Reed, Auckland.

Martin, W., 1989. Waipu Cave – Elver Canyon System, Northland. *N.Z. Speleological Bulletin* 8 (148): 235 – 238.

Millener, P.R., 1981. *The Quaternary avifauna of the North Island, New Zealand.* Unpubl. Ph.D. thesis. University of Auckland, New Zealand.

Millener, P.R. and Templer, C.J., 1982. The subfossil deposits of Paryphanta (Mac's Quarry) Cave, Waitomo. *Journal of the Royal Society of N.Z.* 11: 157-166.

Patterson, G.B. and Daugherty, C.H., 1990. Four new species and one new subspecies of skinks, genus *Leiolopisma* (Reptilia: Lacertilia: Scincidae) from New Zealand. *Journal of the Royal Society of N.Z.* 20: 65-84.

Pickard, C.R. and Towns, D.R., 1988. *Atlas of the amphibians and reptiles of New Zealand.* Conservation Sciences Publication No. 1 Publ. Science and Research Directorate, Dept. Conservation, Wellington.

Rich, T.H.V., Rich, P.V., Fordyce, R.E., Gatehouse, P. and Scarlett, R.J., 1979. A deceptive terrestrial vertebrate fossil site on the Waipara River, North Canterbury, New Zealand. *In* Anderson A. (Ed.): *Birds of a Feather*, pp 25-52. New Zealand Archaeological Association Monograph 2, British Archaeological Research International Series 62.

Ritchie, N., 1982. Two sub-fossil faunal deposits uncovered near Cromwell, Central Otago. *N.Z. Archaeological Newsletter* 25(2): 86-102.

Ritchie, N.A. and Harrison, A.R., 1981. Clutha Valley archaeology 1980-1981: an interim report. *N.Z. Archaeological Newsletter* 24(2): 97-105.

Towns, D.R., Daugherty, C.H. and Newman, D.G., 1985. An overview of the ecological biogeography of the New Zealand lizards (Gekkonidae, Scincidae). *In* G. Grigg, R. Shine, and H. Ehmann (Eds): Biology of Australasian Frogs and Reptiles, pp 107-115. Royal Zoological Society of New South Wales.

Townsend, J.I., 1961. A record of tuatara remains from the Takaka District. *N.Z. Speleogical Bulletin* 2(37): 154-157.

Worthy, T.H., 1984a. Faunal and floral remains from F1, a cave near Waitomo. *Journal of the Royal Society of N.Z.* 14: 367-377.

——— 1984b. An extensive subfossil deposit in Gardners Gut Cave, Waitomo. *N.Z. Speleological Bulletin* 7(130): 257-262.

——— 1985. Two caves near Kaitaia. *N.Z. Speleological Bulletin* 7 (132): 368-371.

——— 1986. *Subfossil bones of the frog* Leiopelma *in New Zealand.* Unpubl. MSc Thesis, Victoria University of Wellington.

——— 1987a. Ten acre cave system, Mahoenui. *N.Z. Speleological Bulletin* 7(138): 535-539.

——— 1987b. Osteological observations on the larger species of the skink *Cyclodina* and the subfossil occurrence of these and the gecko *Hoplodactylus duvaucelii* in the North Island, New Zealand. *N.Z. Journal of Zoology* 14: 219-229.

——— 1987c. Osteology of *Leiopelma* (Amphibia: Leiopelmatidae) and descriptions of three new subfossil *Leiopelma* species. *Journal of the Royal Society of N.Z.* 17: 201-251.

——— 1988. Opening Day Cave, Stubb's farm, Waitomo. *N.Z. Speleological Bulletin* 7(140): 588-595.

Yaldwyn, J.C., 1958. Notes on the environment and age of the subfossil deposits of the Martinborough Caves. *Records of the Dominion Museum* 3(2): 129-133.

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APPENDIX 1: ASSOCIATED FAUNA FROM OTANGAROA STATION CAVE, NORTHLAND.

Mollusca determined by Dr Frank Climo. MNI = minimum number of individuals. For mollusca the number of specimens was recorded (No.).

Mollusca (Specimens in NMNZ collection)	No.
Rotadiscidae	
Huonodon pseudoleida (Suter)	1
Fectola mira (Webster)	1
Helicodiscidae	
Egestula egesta (Gray)	3
Punctidae	
Paralaoma caputspinulae (Reeve)	1
punctid c.f. *cymbalum* n.sp.	5
punctid n.sp.	1
? family	
Therasiella cf neozelanic n.sp.	1
T. tamora (Hutton)	1
T. celinde (Gray)	1
Endodontidae	
Thalassohelix ziczag (Gould)	3
Suteria ide (Gray)	1
n.gen golden *Phenacohelix* n.sp.	1
Rhytidae	
Rhytidarex (Amborhytida) dunniae (Gray)	1
Delos jeffreysiana (Pfeiffer)	2
D. coresia (Gray)	1
Laireidae	
Liaiea hochstetteri (Pfeiffer)	2
Cytora pallida (Hutton)	1

Herpetofauna (specimens in Waitomo Caves Museum)		MNI
Leiopelmatidae		
Leiopelma waitomoensis Worthy	WO311.2	18
Leiopelma markhami Worthy	WO311.1	2
Leiopelma extant species indet	WO311.3	2
Scincidae		
Cyclodina northlandi n.sp.	WO332.1,.5	3
C. ornata (Gray)	WO332.2	1
C. macgregori (Robb)	WO332.3	3
C. alani (Robb)	WO332.7	2
C. oliveri (McCann)	WO332.6	1
Sphenodontidae		
Sphenodon punctatus (Gray)	WO225.12	2
Avifauna		
Rallidae		
Gallirallus australis (Sparrman)	WO225.14	1

APPENDIX 2: FAUNA FROM PARYPHANTA PASSAGE, ELVER CANYON CAVE, NORTHLAND.

Mollusca determined by Dr Frank Climo. The number of each snail (No.) was recorded, and the minimum number of individuals (MNI) for vertebrate species determined.

Mollusca (Specimens in NMNZ collection)

	No.
Rotadiscidae	
Huonodon pseudoleioda (Suter)	1
Mocella prestoni (Sykes)	1
M. eta (Pfeiffer)	1
Fectola mira (Webster)	2
Helicodiscidae	
Egestula egesta (Gray)	12
Punctidae	
Sericoconcha conella (Pfeiffer)	1
Kaupotaka lampra Climo	1
Rhytididae	
Delos jeffreysiana (Pfeiffer)	1
Paryphantidae	
Paryphanta busbyi (Gray)	Common
?Family	
Therasiella cf. neozelanica n.sp.	1
Liareidae	
Cytora pallida (Hutton)	2
Liarea egea (Gray)	3
L. turriculata (Pfeiffer)	2
L. hochstetteri (Pfeiffer)	9
Hydrobiidae	
Potamopygrus antipodarum (Gray)	24
Catapyrgus spelaeus Climo	1

Herpetofauna (Specimens in Waitomo Caves Museum)		MNI
Leiopelmatidae		
Leiopelma waitomoensis Worthy	WO375	6
Leiopelma markhami Worthy	WO374.1 + 374.2	5
Leiopelma hochstetteri Fitzinger	WO373	2+
Leiopelma archeyi Turbott	WO372	1+
Scincidae		
Cyclodina northlandi n.sp.	WO370, WO371	3
Cyclodina alani (Robb)	WO369	2
Cyclodina ?ornata (Gray)	WO368 (Skeleton)	1
skink species indet. large	WO367	2+
skink species indet small cf. *ornata*	WO366	3+
Leiolopisma infrapunctatum (Boulenger)	WO365 (Skeleton)	1
Gekkonidae		
Hoplodactylus pacificus (Gray)	WO364	1
Sphenodontidae		
Sphenodon punctatus (Gray)	WO363	1
Avifauna		
Apterygidae		
Apteryx owenii Gould	WO252.1	1
Apteryx sp juveniles	WO252.2	2
Psittacidae		
Strigops habroptilus (Gray)	WO251	1
Callaeidae		
Callaeas cinerea (Gmelin)	WO250	1
Muscicapidae		
Petroica australis (Sparrman)	WO249	1
Acanthisittidae		
Pachyplichas jagmi Millener	NMNZ S 27810	1