

LIZARD POPULATIONS ON ISLANDS WITH AND WITHOUT
POLYNESIAN RATS, *RATTUS EXULANS* (PEALE)

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SUMMARY: On three island groups off the northeast coast of New Zealand, fewer lizard species and markedly fewer individuals occurred on islands inhabited by Polynesian rats or kiore than on other islands without rats. Nocturnal, ground-dwelling lizards that forage in the open were most affected, which suggests that predation by kiore is the cause. The generally low densities and disjunct distributions of some lizards on the New Zealand mainland may have resulted from the introduction of kiore at least 600 years ago.

INTRODUCTION

The impact of the Polynesian rat or kiore, *Rattus exulans* (Peale), on the New Zealand biota may have been under-estimated. By eating the seeds, seedlings and bark of some plant species the kiore is capable of modifying whole stands of vegetation, at least on small islands (Atkinson 1964, 1972). Far from being a strict herbivore, the kiore also eats a variety of animals ranging from earthworms and insects (Bettesworth 1972) to albatrosses (Kepler 1967). It may seriously affect populations of small petrels (Thoresen 1967), and Crook (1973) described its probable influence on tuatara (*Sphenodon punctatus*) populations.

Predation by kiore has been suggested as an explanation of the differing numbers of lizards that occur on some islands around the New Zealand coast—those with kiore having fewer species and fewer individuals than those without (Towns 1971, 1972, Whitaker 1968). Apart from a single record of skink remains in a kiore stomach (Bettesworth 1972) the evidence for such predation has been indirect and largely dependent on comparisons of a few widely separated islands, or islands of markedly unequal size, where the effects of kiore may be obscured by variables such as latitude, climate, topography and vegetation. To reduce these variables this study compares lizard faunas of rat-free and rat-inhabited islands within compact island groups.

The lizard faunas of three islands groups off the northeast coast of the North Island (Fig. 1)

were surveyed between 1968 and 1972. The Hen and Chickens Islands (centered 174°45'E, 35°56'S) were visited in January 1968, October 1968 and March 1971; the Mercury Islands (175°54'E, 36°38'S) in June 1970 and November 1972; and the Aldermen Islands (176°05'E, 36°58'S) in November 1972. As many islands, islets, and stacks as possible in each group were visited, all major lizard habitats being examined by day and, whenever possible, by night. On each island a determined effort was made to locate every lizard species known from the group. The abundance of each species was assessed as follows:

- Rare — only a few specimens found despite careful and prolonged searching at suitable times and in likely habitats.
- Frequent — specimens observed frequently in areas of suitable habitat.
- Abundant — numerous specimens seen in all favourable habitats.

In addition, quadrats were used on some islands to measure minimum density, and relative densities on different islands or in different habitats were estimated from numbers of lizards encountered per hour (see appendix).

In the absence of a more recent account the taxonomy of the lizards follows McCann (1955).

RESULTS

The results of the surveys are summarised in Tables 1, 2 and 3. Lizards were found on all 33 of the islands visited; kiore were caught on ten

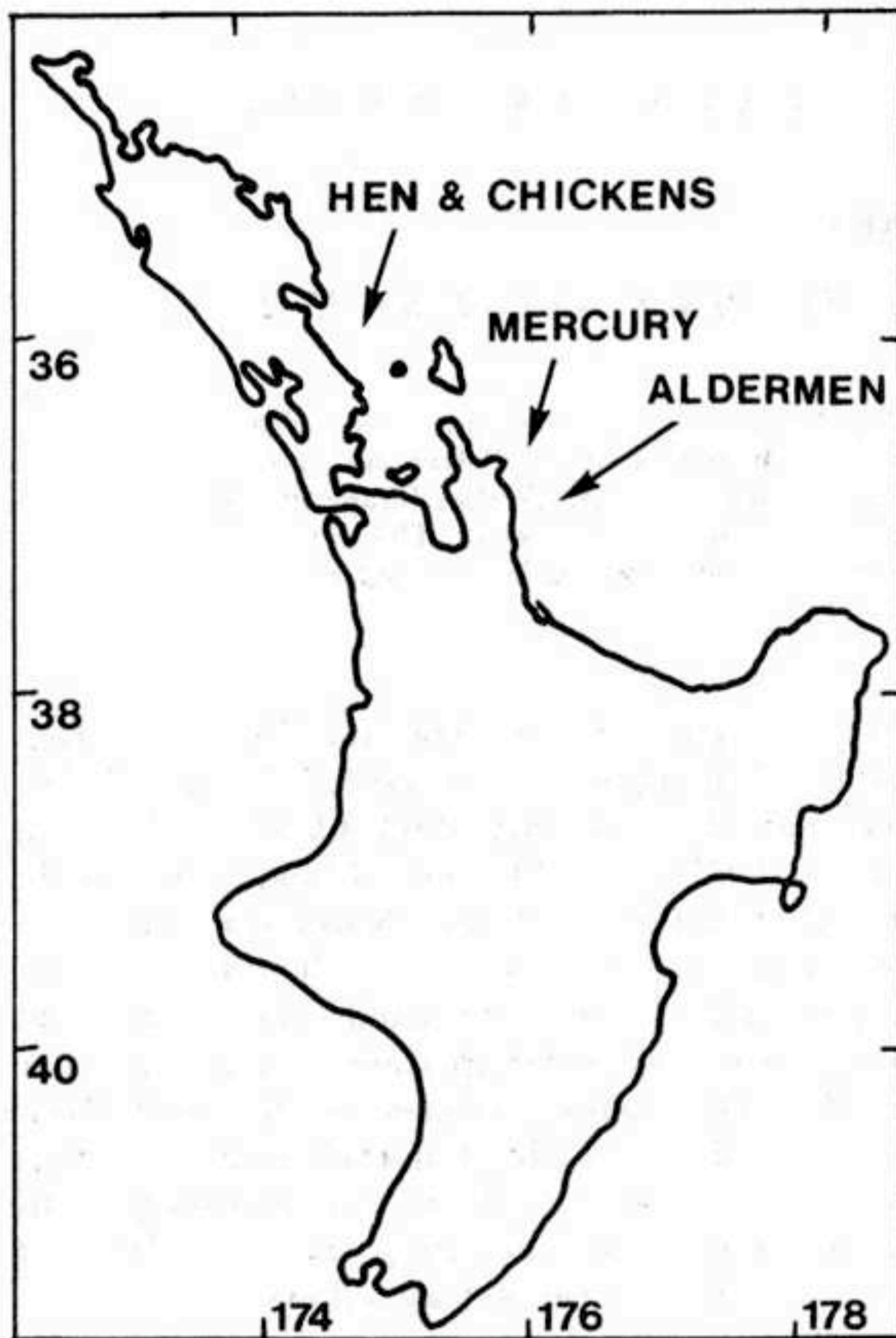


FIGURE 1. Locality diagram showing the three island groups studied.

and are believed to be on one other—Araara I. (Hen and Chickens group). Nine lizard species (2 geckos, 7 skinks) were observed; seven of them (*Hoplodactylus pacificus*, *H. duvauceli*, *Leiolopisma smithi*, *L. moco*, *L. suteri*, *L. oliveri*¹ and *Sphenomorphus pseudornatus*) occurred on all three island groups, one skink (*Sphenomorphus* sp.²) was confined to the Hen and Chickens and another (*Leiolopisma homalonotum*³) to the Mercury group.

¹ Apparently referable to *Leiolopisma oliveri* McCann though adults are smaller and more slender.

² An undetermined species of *Sphenomorphus*, most closely allied to *L. homalonotum*.

³ Considered by Robb (1969) to be a distinct species, *L. alani*.

Hoplodactylus pacificus

Hoplodactylus pacificus occurred abundantly on most of the islands without kiore in all habitats from the high-water mark through shore, cliff and coastal scrub to forests. Night counts under favourable conditions were about 30/hour on the shore, cliffs or coastal scrub and rather fewer in forest. *Hoplodactylus pacificus* was easy to find by day under stones or bark; several groups of between 40 and 50 were found in rock crevices or under stones. On two very small rocks, "Starfish Rock" (Hen and Chickens group) and the stack north of Korapuki I. (Mercury group) lack of cover and vegetation presumably limited the numbers.

On islands with kiore *H. pacificus* was rare or possibly absent. Only one was collected on Coppermine I. (Hen and Chickens group) in ten days and fewer than ten were seen on Whatapuke I. (Hen and Chickens group), and Red Mercury I. and Korapuki I. (Mercury group) even though several days were spent on each. None were found on Marotiri (Lady Alice) I. in the Hen and Chickens group despite an 11-day visit and careful searching. Most of the *H. pacificus* seen on islands with rats were on the shore or coastal cliffs.

Hoplodactylus duvauceli

This large, nocturnal gecko was recorded only on islands larger than one hectare. On islands without kiore it occupies as wide a range of habitats as *H. pacificus* but occurs at about one fifth the density. Counts of *H. duvauceli* in shore or cliff habitats are generally higher on islands with kiore than on those without them but in forests numbers drop from about three/hour to about 0.4/hour when rats are present.

Leiolopisma smithi

This widespread skink was observed on most of the islands visited. Diurnal in habit, it occupies shore and coastal scrub habitats where it sometimes reaches extremely high densities. The boulder beach at the southern end of Green I. (Mercury group) supported the greatest numbers seen, where basking *L. smithi* were estimated at six per square metre on an area of five by ten metres. Elsewhere densities on suitable beaches

TABLE 1. *The Distribution and Abundance of Lizards and Kiore in the Hen and Chicken Islands.*

	Area (ha)	Day/night search	KIORE	<i>H. duvauceli</i>	<i>H. pacificus</i>	<i>L. smithi</i>	<i>L. moco</i>	<i>L. suteri</i>	<i>L. oliveri</i>	<i>S. pseudornatus</i>	<i>Sphenomorphus</i> sp.	No. of lizard species	Likely maximum no. of spp.
HEN AND CHICKENS ISLANDS													
Hen I	484	d/n	●	●	•	●	●	●		●		6	7
Marotiri I	138	d/n	●	●		●	●	●		●		5	7
Whatupuke I	90	d/n	●	●	•	●		●		•		5	7
Coppermine I	72	d/n	●	●	•	●	●	●				5	7
Mauitaha I	22	d/n	●	●		●	●			●		4	7
Araara I	1.8	d/n	?	●		●	●					3	5
Muriwhenua I (+ Wareware)	4	d/n		●	●	●		●	●			5	6
Pupuha I	1.0	d/			●	●			●			3	6
"Middle Stack"	0.3	d/n			●	●		●	●			4	5
"Keyhole Rk"	0.3	d/			●	●						2	3
"Gunsight Rk"	0.2	d/n			●	●	●					3	4
"Starfish Rk"	0.1	d/			?	●						2	2
Sail Rk	2.1	d/			●	●					●	3	4
			6	7	10	13	6	6	3	4	1		
			• - rare	● - frequent	● - abundant								

were approximately two per square metre both on islands with kiore, for example Korapuki I., and those without, Ruamahua-iti I. (Aldermen group). *L. smithi* is less common on rocky shores and in coastal scrub than on boulder beaches and, where kiore occur, may be rare or absent from the former habitats.

Leiolopisma moco

Leiolopisma moco occupies shores, coastal scrub and grassland. On Ruamahua-nui I. and Raumahua-iti I. (Aldermen group) it was commonly seen basking or foraging in the grassy clearings on the higher ridges, while elsewhere it was usually

observed along the margins of coastal scrub and on beaches. Where kiore occur this skink is more restricted, being more or less confined to boulder beaches, flax and dense tangles of *Muehlenbeckia*. On boulder beaches numbers were approximately equal on islands with and without rats. The lack of records for some islands, e.g. Middle I. and Green I. (Mercury group), probably do not mean absence.

Leiolopisma suteri

This species has rather precise habitat requirements, being restricted to the shore where it forages about the high-water mark, and requiring

TABLE 2. *The Distribution and Abundance of Lizards and Kiore in the Mercury Islands.*

	Area (ha)	Day/night search	KIORE	<i>H. duvauceli</i>	<i>H. pacificus</i>	<i>L. smithi</i>	<i>L. moco</i>	<i>L. suteri</i>	<i>L. oliveri</i>	<i>L. homalonotum</i>	<i>S. pseudornatus</i>	No. of species	Likely maximum no. of spp.
MERCURY ISLANDS													
Red Mercury I	220	d/n	●	•	•	•	• ^x	•			•	5	8
Stanley I	95	d/n	●	•	•		•				•	4	8
Double I	31	d/n	●	•	•	•	•	•				5	8
Korapuki I	18	d/n	●	•	•	•	•				•	5	8
Middle I	10	d/n		●	●	●		●	•	●		6	7
Green I	3	d/n		●	●	●		●	●	●		6	7
Stack N of Stanley	1.3	d/			●	●		●				3	6
"Mokomoko Rk"	1.2	d/			●	●						2	2
Stack W of Green	0.2	d/			●	●						2	2
Stack N of Korapuki	0.2	d/			•	●						2	2
			4	5	10	9	4	5	2	2	3		

• - rare

● - frequent

● - abundant

*Towns 1972

a sand or soil substrate for egg-laying. In the absence of kiore *L. suteri* was observed on wave-platforms, for example on Muriwhenua I. (Hen and Chickens group), rocky shores, for example on the stack north of Stanley I. (Mercury group), boulder beaches, for example on Ruamahua-nui I., and shingle beaches, for example on "Middle Stack" (Hen and Chickens group). Where kiore occur it was found only on boulder beaches. Nocturnal in habit, *L. suteri* rests by day in the gravel or stones just above the high-water mark. Four excavations, totalling 11.25 m², to a depth of 30 cm near the high-water mark on the boulder beach at Scran Point on Coppermine I., revealed a density of ten per square metre (8.89-10.67/m²) and

similar densities could be expected at similar sites on other islands. It is probably absent from Korapuki I. because of the lack of suitable nest sites, there being little or no sand beneath the boulders.

Leiolopisma oliveri

Leiolopisma oliveri is confined to forested habitats where it passes the day under stones or logs, emerging at night to forage in the leaf-litter. Strangely, only two *L. oliveri* were seen on Ruamahua-iti I., perhaps because the early seral vegetation on this island provides few forest floor retreats. None were found on islands inhabited by kiore.

TABLE 3. *The Distribution and Abundance of Lizards and Kiore in the Aldermen Islands.*

	Area (ha)	Day/night search	KIORE	<i>H. duvauceli</i>	<i>H. pacificus</i>	<i>L. smithi</i>	<i>L. moco</i>	<i>L. suteri</i>	<i>L. oliveri</i>	<i>S. pseudornatus</i>	No. of lizard species	Likely maximum no. of spp.
ALDERMEN ISLANDS												
Middle Chain I	21	d/n	●	●			●				2	7
Ruamahua-nui I	27	d/n		●	●	●	●	●	●	●	7	7
Ruamahua-iti I	20	d/n		●	●	●	●	●	●	●	6	7
Hongiora I	15	d/n		●	●	●			●		4	7
Hernia I	3	d/n		●	●	●					3	6
Half I	1.2	d/n		●	●	●			●		4	5
"North Stacks" (southern)	0.8	d/			●	?					2	6
"North Stacks" (northern)	0.3	d/			●	●					2	2
"Middle Chain Stack"	0.4	d/			●	●					2	3
"West Middle Chain Stack"	0.2	d/			●						1	2
			1	6	9	8	3	2	4	1		
			● - rare	● - frequent	● - abundant							

Leiopisma homalonotum

Leiopisma homalonotum, another nocturnal, forest-dwelling species with similar habits to *L. oliveri*, was recorded only from rat-free islands. It was most common in the milk-tree (*Paratrophis banksii*) forest on the plateau on Middle I. but was much scarcer elsewhere and on Green I.

Sphenomorphus pseudornatus

This small secretive skink was found only on the arger islands, Korapuki I. (18 ha) being the mallest from which it was recorded, the smaller slands perhaps failing to meet this species' prefer-

ence for damp situations. *Sphenomorphus pseudornatus* inhabits scrub or forest where it lives in stone heaps, screes and under logs and rocks. Five 100 m² quadrats in taraire (*Beilschmiedia tarairi*) forest on Hen I. (Hen and Chickens group) produced local density estimates of 40/ha and similar numbers may have occurred elsewhere. There was no apparent difference in the numbers or habitat of this species on islands with and without kiore.

Sphenomorphus sp.

This large, nocturnal skink was found in all habitats on Sail Rock (Hen and Chickens group), especially in forested sites, but on no other island.

TABLE 4. *The Abundance of Lizards in Different Habitats on Islands With and Without Populations of Kiore.**

HABITATS	<i>L. homalonotum</i>	<i>L. oliveri</i>	<i>Sphenomorphus</i> sp.	<i>S. pseudornatus</i>	<i>H. duvauceli</i>	<i>H. pacificus</i>	<i>L. moco</i>	<i>L. smithi</i>	<i>L. suteri</i>	
<hr/>										
Shore					●	●	●	●	●	
Cliffs and bluffs			●		●	●	●	●	●	
Coastal vegetation		●	●	●	●	●	●	●	●	Kiore-free islands
Open herbaceous/scrub edge		●	●	●	●	●	●	●	●	
Forest	●	●	●	●	●	●				
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Shore					●	●	●	●	●	
Cliffs and bluffs					●	●	●	●	●	
Coastal vegetation				●	●	●	●	●	●	Kiore-inhabited islands
Open herbaceous/scrub edge				●	●	●	●	●	●	
Forest				●	●	●				
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● - rare ● - frequent ● - abundant

*The apparent contradictions between the abundance of *H. duvauceli*, *L. smithi* and *L. suteri* in this table and Tables 2-4 is because the latter consider the species' abundance in all habitats on one island where here the assessment is made for one habitat from all islands.

DISCUSSION

Diversity of the Lizard Fauna

The maximum number of lizard species recorded from these island groups was seven (Aldermen) or eight (Hen and Chickens, Mercury) and Figure 2 shows that this maximum could be expected on islands of approximately three hectares or larger. With one exception (Hen I.), islands that have all (Ruamahua-nui I.) or most (Ruamahua-iti I., Middle I., Green I.) of the lizard species known from their respective island groups are without kiore. In marked contrast, and despite their generally larger size, islands inhabited

by kiore usually have two or three species missing. Data from a rat-free island group elsewhere (Whitaker 1968) have shown that the greatest number of lizard species can be expected on the largest islands in a group. On islands of less than three hectares the number of lizard species varied from two to four depending on the variety of habitat available. Only one of these small islands was inhabited by kiore and it had three lizard species.

Three species of lizard never occurred sympatrically with kiore. The distribution of two of them, *L. oliveri* and *L. homalonotum*, leaves no doubt that they once existed on islands now occupied by

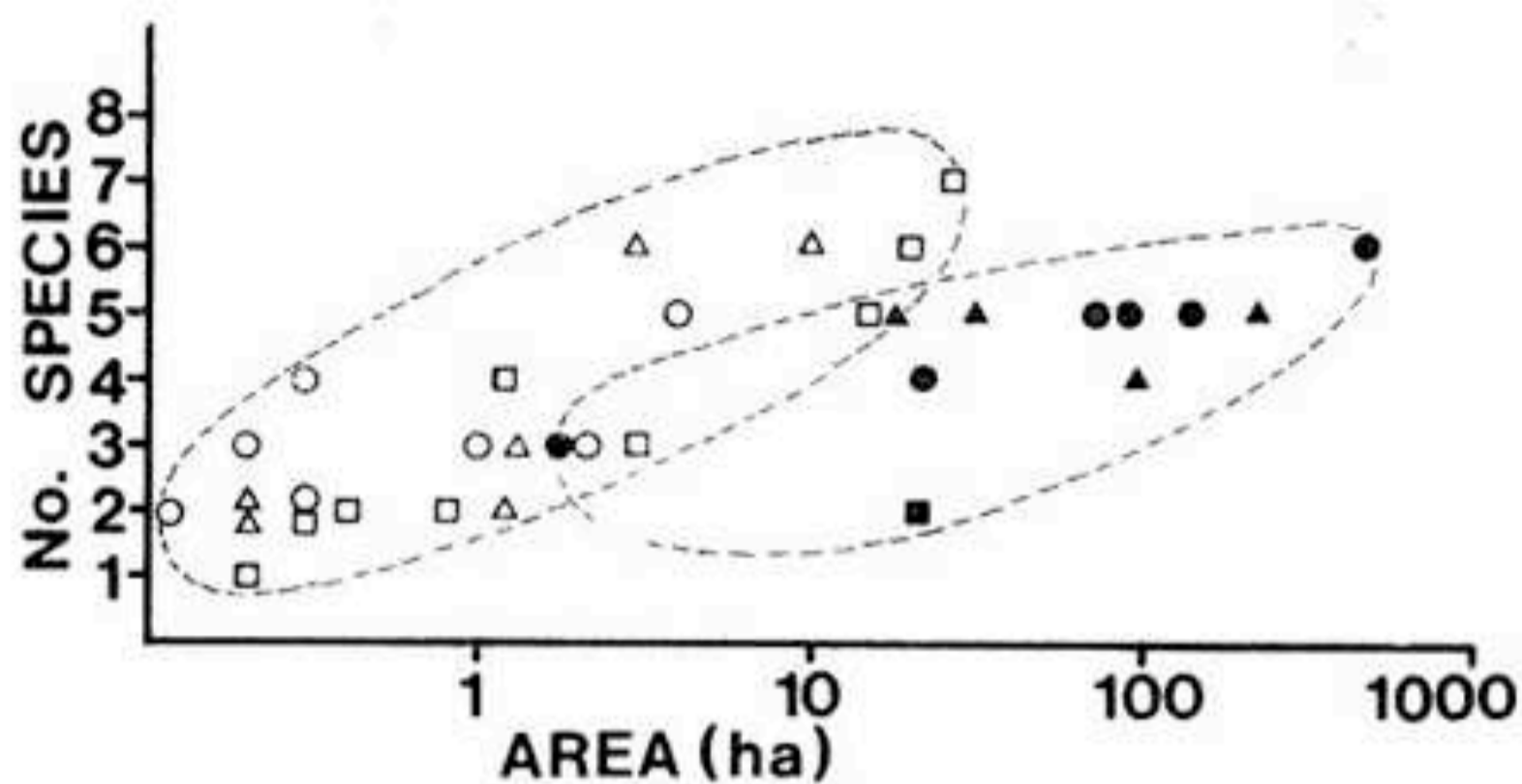


FIGURE 2. The relationship between island size, the number of lizard species and the presence of kiore. Each symbol represents a separate island; circles for the Hen and Chickens, triangles for the Mercury Islands, and squares for the Aldermen Islands. Open symbols are islands without kiore, solid symbols are islands inhabited by kiore.

kiore; they are both easy species to find so are unlikely to have been overlooked on these other islands. The third species, *Sphenomorphus* sp., is known only from Sail Rock and may never have been more widespread in the Hen and Chickens group. Atkinson (1972), in commenting on the unusual flora and fauna of Sail Rock, notes there has apparently been no connection with the rest of the Hen and Chickens group.

The remaining six lizards (*H. duvauceli*, *H. pacificus*, *L. smithi*, *L. moco*, *L. suteri*, *S. pseudornatus*) were all found with kiore but none of them was collected from all eleven kiore-inhabited islands.

Density of the Lizard Populations

Without exception, the overall population densities of lizards on islands without kiore were higher (all "abundant") than those where rats occurred (all "frequent"). My earlier estimate (Whitaker 1968) that total lizard densities on islands inhabited by rats are about one quarter of those on rat-free islands may have to be revised as present evidence suggests they are considerably lower than this.

Whether or not kiore were present maximum numbers of lizards were on the shore, with fewer in coastal scrub and fewest in the forests. On beaches and coastal cliffs the densities of lizards

were generally similar on islands with and without kiore. In coastal scrub habitats the kiore-free islands had overall lizard densities approximately two to five times greater than those with rats, and in forested habitats the difference was greater still, due principally to the absence of *L. oliveri* and *L. homalonotum* from kiore-inhabited islands. Lizard populations in forest on islands without kiore are vastly greater than those on islands where kiore occur; counts of geckos (*H. pacificus*, *H. duvauceli*) and quadrat studies of forest skinks (*L. oliveri*, *S. pseudornatus*) suggest this overall difference may be at least twenty-five fold.

Some lizards appear more sensitive to the presence of kiore than others, though, with one exception (*Leiolopisma oliveri* on Ruamahua-iti I.), there were no "rare" lizards on islands without kiore and no "abundant" ones on islands with them. Some species (e.g. *S. pseudornatus*) showed little or no reduction in numbers in the presence of rats, others (e.g. *H. pacificus*) were severely reduced; some (e.g. *L. suteri*) occupied fewer habitat types, others (e.g. *H. duvauceli*) occurred in the same habitats but at different densities; and finally some species (e.g. *L. oliveri*) did not co-exist with rats at all.

Examination of the habits and habitats of the lizards reveals which species would be vulnerable to kiore predation. The kiore is a small (*ca.* 70 g), nocturnal rat which, where it occurs, occupies all habitats on the islands visited in this survey. Though it does climb, it is not especially agile. It follows, therefore, that nocturnal lizards would be more vulnerable than diurnal species, obligatory ground-dwelling species more vulnerable than those that can climb, and species that forage in the open more vulnerable than those that do not. It could be expected that lizard species vulnerable to kiore predation for any combination of these reasons would survive only in areas of protective cover. The relationship between the abundance of certain lizard species, the habitat and the presence of kiore is shown in Table 4.

The only three species on these islands that are nocturnal, ground-dwelling and forage in the open are *L. oliveri*, *L. homalonotum* and the *Sphenomorphus* sp. from Sail Rock, and none of these was recorded from islands with kiore. *L. oliveri*

and *L. homalonotum* must be considered particularly vulnerable because of their habit of resting in exposed sites (Whitaker 1968 and unpubl.). If these species are ever recorded from islands inhabited by kiore they will, without doubt, be occupying a habitat affording a high degree of protection from rats.

S. pseudornatus is nocturnal, or crepuscular, and ground-dwelling but when foraging rarely, perhaps never, leaves the shelter of piles of rocks or logs. It showed no change in habitat or numbers on kiore-inhabited islands. The fifth species that is nocturnal and ground-dwelling is *L. suteri*. On islands without rats it occupied habitats such as wave platforms and shingle beaches where it had to forage in the open. On islands with kiore *L. suteri* occurred only on boulder beaches where it could forage in complete safety in the interstices of the stones. The best example of this was on Marotiri I. where *L. suteri* was found only on the boulder beach at the eastern end of the island, yet less than 200 m away on "Middle Stack" it was abundant on a shingle beach.

Both the geckos, *H. pacificus* and *H. duvauceli*, are nocturnal and forage in the open but are, however, adept climbers. On islands without kiore they occupy a wide variety of habitats and forage both on the ground and in trees. When present with kiore these species are found only on boulder beaches, cliff faces (virtually inaccessible to kiore) and, less commonly, in trees. On Whatapuke I., eight of the twelve *H. duvauceli* seen in the forest were foraging on the gnarled and knotty trunks of puriri (*Vitex lucens*) (the others were on pohutukawa (*Metrosideros excelsa*)) into which they would dash at the slightest alarm—in marked contrast with the normally placid geckos of rat-free islands.

The remaining two species, *L. smithi* and *L. moco*, seem less vulnerable because of their diurnal habits. Nevertheless when they occur on islands with kiore they are normally at slightly lower densities and occupy habitats where stones or thick, matted vegetation provide good cover.

Within New Zealand a number of lizard species have rather peculiar disjunct distributions; for instance *H. duvauceli* occurs on islands in Cook

Strait and on islands off the northeast coast of the North Island, and the *Sphenomorphus* sp. on Sail Rock is elsewhere known only from Mana I., near Wellington, also without rats. *H. pacificus* has a patchy distribution in the North Island where, except for some coastal scree and boulder beaches, its densities are much less than on rat-free islands. Further, the restriction of *L. oliveri* to several island groups along the northeast coast of the North Island is unlikely to represent its original range.

If the difference in lizard populations on the northern islands described here can be attributed to predation by kiore, then a minimum of 600 years occupation of the North Island by kiore (Watson 1956) could easily have produced the disjunct and discontinuous distributions described above. Indeed sub-fossil remains of a large gecko (*H. duvauceli*?) and a large skink (*Sphenomorphus*?) have been found in the Wairarapa associated with the bones of a recent forest fauna, including kiore (S. Markham, pers. comm.). No species of similar size exist in that region today.

It is vitally important, therefore, that islands not yet occupied by rats should be preserved in this state, for only there does the distribution, diversity and abundance of lizards represent most closely the original state of the New Zealand herpetofauna.

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APPENDIX

Data from 170 Counts of Lizards, 64 on Islands Without Kiore and 106 from Islands With Kiore.

	ISLANDS WITHOUT KIORE			ISLANDS WITH KIORE		
	Total	Mean/hour	Range/hour	Total	Mean/hour	Range/hour
SHORE HABITATS						
Night counts	N = 5			N = 14		
Time (mins.)	175			339		
<i>H. duvauceli</i>	2	0.69	0-2	39	6.91	0-27
<i>H. pacificus</i>	36	12.33	0-20	1	0.18	0-2
<i>L. smithi</i>	4	1.37	0-6	—	—	—
<i>L. suteri</i>	55	18.84	0-60	24	4.25	0-285
Day counts	N = 12			N = 21		
Time (mins.)	245			1401		
<i>H. duvauceli</i>	5	1.23	0-6	34	1.46	0-24
<i>H. pacificus</i>	65	15.9	0-55	3	0.13	0-1
<i>L. smithi</i>	123	30.08	0-120	77	3.30	0-33
<i>L. moco</i>	—	—	—	116	4.97	0-44
<i>L. suteri</i>	55	13.45	0-90	78	3.34	0-48
<i>S. pseudornatus</i>	—	—	—	4	0.18	0-5.6
CLIFFS AND BLUFFS						
Night counts	N = 4			N = 23		
Time (mins.)	115			1116		
<i>H. duvauceli</i>	9	4.69	0-12	166	8.93	0-72
<i>H. pacificus</i>	57	29.69	9-39	23	1.24	0-11
Day counts	N = 1			N = 0		
Time (mins.)	20			—		
<i>H. pacificus</i>	17	51	—	—	—	—
<i>L. smithi</i>	2	6	—	—	—	—
COASTAL VEGETATION						
Night counts	N = 9			N = 9		
Time (mins.)	604			410		
<i>H. duvauceli</i>	24	2.39	0-10	38	5.56	0-36
<i>H. pacificus</i>	190	18.87	4.6-45.6	4	0.59	0-1.7
<i>L. oliveri</i>	20	1.99	0-15.6	—	—	—
<i>L. homalonotum</i>	1	0.10	0-0.42	—	—	—
<i>S. pseudornatus</i>	—	—	—	1	0.15	0-0.5

	ISLANDS WITHOUT KIORE			ISLANDS WITH KIORE		
	Total	Mean/hour	Range/hour	Total	Mean/hour	Range/hour
Day counts	N = 14			N = 6		
Time (mins.)	896			393		
<i>H. duvauceli</i>	2	0.14	0-2.5	3	0.46	0-0.9
<i>H. pacificus</i>	251	16.8	0-150	1	0.16	0-0.9
<i>L. smithi</i>	57	3.82	0-60	15	2.29	0-18
<i>L. moco</i>	5	0.34	0-24	32	4.89	0-66
<i>L. suteri</i>	3	0.20	0-5.4	—	—	—
<i>L. oliveri</i>	38	2.55	0-32	—	—	—
<i>L. homalonotum</i>	1	0.07	0-2.5	—	—	—
OPEN HERBACEOUS/ SCRUB EDGE						
Night counts	N = 1			N = 1		
Time (mins.)	20			120		
<i>H. pacificus</i>	2	6	—	—	—	—
Day counts	N = 7			N = 3		
Time (mins.)	580			126		
<i>H. duvauceli</i>	1	0.11	0-0.19	2	0.96	0-2
<i>H. pacificus</i>	96	9.93	0-90	—	—	—
<i>L. smithi</i>	21	2.18	0-27.4	1	0.48	0-6
<i>L. moco</i>	11	1.14	0-4.32	4	1.92	1-12
<i>L. oliveri</i>	12	1.24	0-2.25	—	—	—
<i>S. pseudornatus</i>	—	—	—	2	0.96	0-2
FOREST						
Night counts	N = 8			N = 24		
Time (mins.)	1083			2171		
<i>H. duvauceli</i>	41	2.28	0.53-12	16	0.45	0-3.2
<i>H. pacificus</i>	98	5.43	0.55-11.3	6	0.17	0-4
<i>L. oliveri</i>	10	0.56	0-2.26	—	—	—
<i>L. homalonotum</i>	20	1.11	0-2.95	—	—	—
<i>S. pseudornatus</i>	—	—	—	1	0.03	0-0.4
Day counts	N = 3			N = 5		
Time (mins.)	385			780		
<i>H. duvauceli</i>	7	1.09	0-42	2	0.16	0-0.6
<i>H. pacificus</i>	43	6.70	0-8.2	—	—	—
<i>L. smithi</i>	2	0.32	0-0.4	—	—	—
<i>L. moco</i>	—	—	—	1	0.08	0-0.3
<i>L. oliveri</i>	1	0.16	0-6	—	—	—
<i>L. homalonotum</i>	7	1.09	0-5.6	—	—	—
<i>S. pseudornatus</i>	—	—	—	4	0.31	0-1.34
<i>Sphenomorphus</i> sp.	35	7.0	0-7.0	—	—	—