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A CHECKLIST AND KEY TO THE HERPETOFAUNA OF NEW CALEDONIA, WITH REMARKS ON BIOGEOGRAPHY

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ABSTRACT: A checklist and key to all amphibian and reptile species, terrestrial and marine, from New Caledonia and the Loyalty Islands are provided. Thirty-six of 68 extant amphibian and reptile species of the New Caledonian region are represented by 1,643 specimens in the collections of the California Academy of Sciences. Specimen lists and natural history and systematic notes of these taxa are presented. The reptile fauna of the New Caledonian mainland is largely endemic. Certain taxa, especially arboreal geckos and leaf-litter-dwelling skinks, are restricted to regions of lateritic soils and/or high rainfall within the island. Other faunal components include regional endemics (New Caledonia and Loyalty Islands and Vanuatu), pan-oceanic taxa, and known human introductions in historical times. The gekkonine geckos are generally easily transported and have colonized the region only after Vanuatu and the Loyalty Islands obtained their present configuration with respect to New Caledonia. The endemic diplodactyline geckos are most closely related to New Zealand and Australian forms and probably became isolated as a result of Mesozoic tectonic movements and sea-level changes. The zoogeography of most of the scincids remains obscure. Human activity in New Caledonia has likely been responsible for the extinction of additional reptile taxa representative of a once broader herpetofaunal diversity.

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INTRODUCTION

New Caledonia is unique among the islands of the tropical Pacific in possessing a speciose herpetofauna composed largely of endemic forms (Bauer 1988a). The native terrestrial herpetofauna, which consists only of geckos and skinks, remains poorly known as a consequence of the isolation of New Caledonia, its mountainous terrain, and large size (19,103 km^2). Almost every major collecting trip to the region has revealed new species or rediscovered others not seen since their description. Recent systematic treatments of the skinks (Greer 1974; Böhme 1976; Sadlier 1986; Ineich and Sadlier 1990) and carphodactyline geckos (Bauer 1986, and in press; Sadlier 1989) of New Caledonia and its satellites, the Loyalty Islands, have provided useful information regarding distribution, morphology, and phylogeny. Nonetheless, most of the taxa remain poorly known, and new forms undoubtedly remain to be discovered.

In this paper we present a checklist and key to

the herpetofauna of the New Caledonian region and summarize biological information for 36 of the 68 species inhabiting the New Caledonian area (33 of 53 terrestrial taxa). This information is derived primarily from specimens housed in the herpetological collections of the California Academy of Sciences (CAS).

The New Caledonian amphibians and reptiles in the CAS collection originate from several sources. The first eight specimens accessioned, including two paralectotypes, were obtained by exchanges from the Naturhistorisches Museum Basel, the repository of the large New Caledonian collections made by Fritz Sarasin and Jean Roux during the period 1911–1912. Until the last decade, Basel (NMBA) and Paris (MNHN) were the only major collections of reptile material from the island, although type specimens and smaller collections were housed in a number of other museums. Two of these collections, those of the Museu de Lisboa and the Musée de l'Ecole de Medécine Navale de Brest, are no longer extant, the former having been destroyed by fire and the latter dispersed or lost.

An important collection of 120 specimens was donated to the Academy by F. X. Williams in 1940, including material from the Ile des Pins. Unfortunately, there are no precise locality and collection data associated with some of this material, and the Academy's archives include no field notes or records from Williams's collecting trip. Other additions include sea snakes obtained through Stanford University (CAS-SU), a small collection from Ted Case (University of California, San Diego), and a specimen of *Leiolopisma steindachneri* obtained through exchange with the Australian Museum, now a leading repository of New Caledonian reptile specimens. The remainder of the California Academy of Sciences New Caledonian collection was built by material obtained by the senior author as a result of ongoing research on the systematics, morphology, and biogeography of the geckos of the southwest Pacific. These additions make the California Academy of Sciences a repository for one of the largest collections of New Caledonian reptile material in the world, with 1,643 specimens, including eight types.

Materials and Methods

The standard abbreviations m (meters), mm (millimeters), mybp (million years before present), and SVL (snout–vent length) are used in the following text. Collection abbreviations follow Leviton et al. (1985). A checklist is provided listing original authors, representation in the CAS collection, and broad distributional patterns of all species in the region, including fossil taxa. An artificial key to the living taxa—using, when available, invariant characters easily determined from museum specimens—is also provided.

Species accounts are for those taxa represented in the CAS collections. Specimens examined include only those in the California Academy of Sciences (CAS and CAS-SU), although New Caledonian specimens from 17 additional institutions have been examined by the senior author (see Bauer 1986 for a complete listing of gekkonid specimens examined). Synonymies are limited to first description, junior synonyms (if applied to New Caledonian populations), and first or establishing usage of the currently employed combination. More complete synonymies are available in the literature for *Litoria aurea* (Duellman 1977; Cogger et al. 1983), sea turtles (Wermuth and Mertens 1977), geckos (Wermuth 1965; Bauer 1986; Ineich 1987; Sadlier 1989), *Ramphotyphlops braminus* (Robb 1966; McDowell 1974; Ineich 1987), *Candoia bibroni* Stimson (1969), and sea snakes (Stejneger 1907; Smith 1926; Gail and Rageau 1958). Unfortunately, complete synonymies more recent than Boulenger (1887) are not available for most New Caledonian skinks, although Sadlier (1986) provided partial synonymies. Remarks on natural history, diet, and reproduction are limited to CAS material, of which the authors have field knowledge, and are provided to supplement, confirm, or rectify information available in the literature. The basic biological data pertinent to the other large collections of New Caledonian material have already been presented (Roux 1913; Sadlier 1986, 1989). Summaries of the biology of some species may be found in Bavay (1869), Roux (1913), Meier (1979), Sadlier (1986, 1989), Bauer (1986), and Bauer and Devaney (1987). A comprehensive bibliography of New Caledonian herpetology was prepared by Bauer (1985b).

Localities represented by collected material are number coded and appear in Figure 1. Many of these localities were visited on several occasions during different seasons in an attempt to achieve a representative sample of the fauna. The coordinates, elevation, and basic vegetational characteristics of these sites are summarized below.

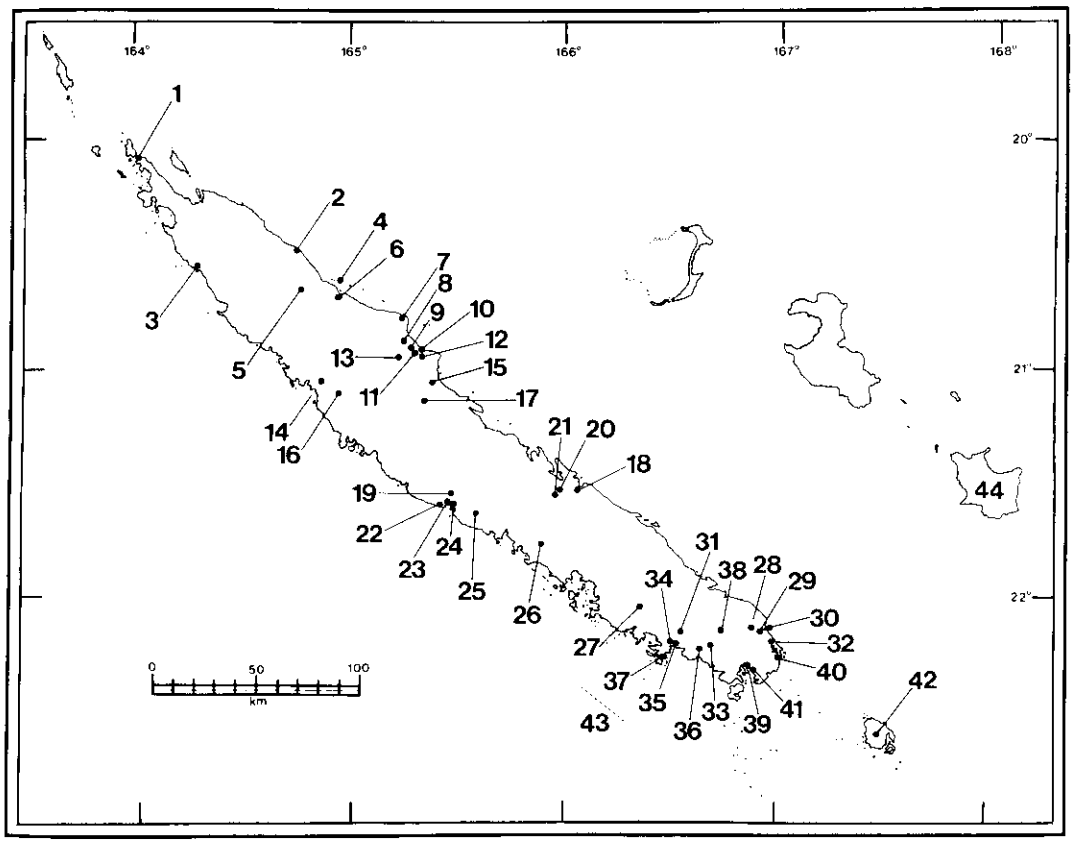

FIGURE 1. Map of New Caledonia showing collecting sites represented by specimens in the California Academy of Sciences. See text for key to numbered localities.

LOCALITIES REPRESENTED BY SPECIMENS IN THE CAS COLLECTIONS

Collection Dates: A = July–October 1940; B = March–April 1984; C = September–October 1984; D = May–June 1985; E = December 1985–January 1986; F = December 1986; and G = miscellaneous dates including exchanges.

LOCALITY 1: Boat Pass Beach (Pointe Narian), 20°05′S, 164°00′E, sea level (C). Northernmost point of mainland New Caledonia. White sandy beach bounded by mangrove vegetation.

LOCALITY 2: Cascade de Galarino, 20°30′S, 164°46′E, elevation 0–20 m (C). Base of large waterfall dropping steeply from southeast slopes of Mt. Colnett (1,505 m) to coast. Vegetation transitional from humid forest to narrow strand palm belt.

LOCALITY 3: Koumac Caves, 20°34′S, 164°17′E, elevation 20–100 m (E). Limestone outcrop in savanna/niaouli (*Melaleuca quinquenervia*, the dominant myrtaceous tree in drier areas of New Caledonia) mosaic. *Ficus* and other trees are invested within the outcrop itself.

LOCALITY 4: Ilot de Hiénghène, 20°38′S, 164°56′E, sea level (C). Small, flat, coralline island, 3.5 km off coast of Ouanpouès, near Hiénghène. Vegetation includes palms, *Ficus*, and variety of other trees and shrubs, excluding truly mesic forms.

LOCALITY 5: Campement Vanhalle, 20°40′S, 164°44′E, elevation ca. 800 m (C). Densely forested region between drainages of Hiénghène and Ouaième rivers. Characterized by mature humid forest, including tree ferns and *Agathis*. Traversed by several small, rocky streams. Forest clearings bounded by palms and cut by small, weed-choked brooks.

LOCALITY 6: Hiénghène, 20°41′S, 164°56′E, sea level (A and G). Town in region of large black limestone cliffs, crags, and caves. Vegetation in

and around townsite highly disturbed, surrounding areas—including mountains behind the town (400–450 m)—covered in dense humid forest.

LOCALITY 7: Touho, 20°47′S, 165°14′E, elevation 0–50 m (C and E). Grassy field on hill overlooking Touho airport and adjacent forested region inland from the town center. Vegetation in townsite largely disturbed; inland forests typical humid types.

LOCALITY 8: North bank, Tiwaka River, 4 km W of Rte. 3, 20°54′S, 165°13′E, elevation 0–30 m (D). Hilly area, typified by humid forest vegetation, broken by small riverside plantations.

LOCALITY 9: Vallée d'Amoa, 0–1.0 km W of Rte. 3, 20°55′S, 165°17′E, sea level (C, E and F). Short transect along north bank of Amoa River. Vegetation of humid forest type broken by small family dwellings and plantations.

LOCALITY 10: Vallée d'Ina, 20°56′S, 165°19′E, elevation 10–20 m (C). Grassy pasture with scattered rocks in forest clearing near Ina River.

LOCALITY 11: Poindimié, 20°56′S, 165°20′E, elevation 0–20 m (B, C, D, E and F). Disturbed roadside vegetation, house and hotel walls, and sheets of corrugated metal in town.

LOCALITY 12: Mount Koyaboa, 20°57′S, 165°20′E, elevation 20–390 m (C, D, E and F). Lower slopes (to ca. 50 m) characterized by secondary-growth scrub and some primary and secondary mixed non-coniferous forest associations. Middle elevations (50–140 m) with fern scrub and niaouli. Above 140 m, vegetation primarily secondary growth with some primary humid-forest trees (see Bauer and DeVaney 1987 for detailed description of this site).

LOCALITY 13: St. Thérèse, Vallée d'Amoa, 20°59′S, 165°13′E, elevation 0–20 m (B). Densely forested region along Amoa River, some *Araucaria* (Araucariaceae, column pines) present.

LOCALITY 14: Koné, 21°04′S, 164°52′E, sea level (B and C). Sclerophyll forest, residential gardens, disturbed riverbanks, and banana grove.

LOCALITY15: Vallée de Nimbayes, 21°05′S, 165°21′E, elevation 0–30 m (C). Humid forest.

LOCALITY 16: 10 km E of Pouembout, 21°08′S, 164°59′E, elevation ca. 50 m (B). Sclerophyll forest with thick layer of leaf litter along banks of Pouembout River in area of forest/savanna mosaic.

LOCALITY 17: Creek crossing, 1 km NE of Mt. Aoupinie, 21°08′S, 165°21′E, elevation 500 m (G). Locality described by Sadlier (1986).

LOCALITY 18: Nakety, 21°22′S, 166°34′E, elevation ca. 350 m (C). Open grassy area in forest/savanna mosaic.

LOCALITY 19: 16 km NW of Plage de Poé, 21°34′S, 165°24′E, elevation ca. 120 m (C and E). Open sclerophyll forest bordered by cultivated fields. Traversed by dry creek beds, dead standing trees and thick leaf litter abundant.

LOCALITY 20: Cascade de Ciu, 21°34′S, 165°58′E, elevation ca. 270 m (C). Rocky pools at top of waterfall in disturbed area of shrubs and grass.

LOCALITY 21: Mt. Canala, 21°35′S, 165°56′E, elevation 100–1,051 m (G). Exact site unknown. Area of high rainfall with *Araucaria* stands and generally humid-forest vegetation.

LOCALITY 22: Plage de Poé, 21°37′S, 165°24′E, sea level (C, D and E). Grassy site bordering white sand beach. Roadsides bordered by water-filled ditches and tall grass.

LOCALITY 23: Baie de Gouaro, 21°37′S, 165°26′E, sea level (D). Beach wrack and grassy borders of white sand beach.

LOCALITY 24: Baie des Tortues, 21°37′S, 165°27′E, sea level (C and D). Beach wrack and vegetation along small seaside cliffs. Area of large coastal grove of *Araucaria columnaris*.

LOCALITY 25: 15 km S of Bourail on Rte. 1, 21°41′S, 165°35′E, elevation ca. 50 m (D). Grassy ditch on west side of highway in hilly area of forest/savanna mosaic.

LOCALITY 26: 63 km S of Bourail on Rte. 1, 21°47′S, 165°50′E, elevation ca. 40 m (D). Grassy ditch on west side of highway in area of savanna dotted with scattered naiouli.

LOCALITY 27: Mt. Mou, 22°04′S, 166°21′E, elevation ca. 500 m (F). Humid forest on the lower slopes of mountain. Area of very large trees and high canopy with abundant ground cover traversed by several small streams.

LOCALITY 28: ca. 5 km W of Yaté off Rte. 2, 22°09′S, 166°53′E, elevation ca. 500 m (F). Rocky, open area of edaphic scrub vegetation.

LOCALITY 29: Yaté (Waho), 22°09′S, 166°54′E, sea level (C). On main road through town in area of humid forest/maquis (mediterranean shrub vegetation) interface.

LOCALITY 30: Islet next to Yaté [Ile Potino?], 22°09′S, 166°57′E, sea level (G). Exact locality uncertain (F. X. Williams locality—no field notes). Possibly Ile Potino, a small island in the mouth of the Yaté River typified by maquis vegetation.

LOCALITY 31: Mt. Koghis, 22°10′S, 166°32′E,

elevation ca. 460–800 m (D, E and F). Dense, mixed humid forest with *Ficus* and, more rarely, tree ferns and *Araucaria*. Forest floor covered by stones and moist leaf litter.

LOCALITY 32: Touaourou, 22°11′S, 166°58′E, elevation 0–20 m (B, C, D, E and F). Open grassy areas and adjacent white sand beach, maquis forest along abandoned mining roads, and disturbed roadside habitats.

LOCALITY 33: 20 km SE of St. Louis, 22°12′S, 166°42′E, elevation ca. 200 m (C). Roadside maquis off highway.

LOCALITY 34: Border of Commune de Mont Dore, on Rte. 2 at intersection of Tina-sur-Mer road, 22°13′S, 166°29′E, sea level (F). Partially flooded, low-lying grassy and marshy areas near housing development.

LOCALITY 35: Vallée de Yahoué, 22°14′S, 166°30′E, elevation ca. 30 m (A and F). Small, dense forest patch along Yahoué River, interrupted by small banana plantations and habitations.

LOCALITY 36: Col de Mourirange, 22°14′S, 166°39′E, elevation 258 m (D). Area of short, shrubby maquis in hilly region of lateritic soils.

LOCALITY 37: Nouméa, 22°16′S, 166°27′E, sea level (A, C, D, E and F). Capital city of New Caledonia. Urban building walls, gardens, and beach front.

LOCALITY 38: Rivière Bleue, 22°18′S, 166°50′E, 50–100 m (D). Maquis vegetation.

LOCALITY 39: Prony Bay, 22°19′S, 166°49′E, sea level (A). Region of maquis vegetation. Exact collecting localities unknown.

LOCALITY 40: Goro, 22°19′S, 167°00′E, elevation 0–20 m (C, D, E and F). Area near Gite Wadiana, along coral flats and in adjacent grassy areas with scattered coconut palms; also in narrow belt of coastal forest with rocky substrate and along the margins of roadsides, in leaf litter, grass and rocks.

LOCALITY 41: Mt. L'Aiguillon, 22°21′S, 166°50′E, elevation ca. 200 m (D). Transitional zone between humid forest and maquis vegetation. Substrate rather rocky, traversed by several small streams.

LOCALITY 42: Ile de Pins (A). Exact location unknown.

LOCALITY 43: Marine environments off the coast of Nouméa (G).

LOCALITY 44: Maré, Loyalty Islands (G). Exact location unknown.

ARTIFICIAL KEY TO THE EXTANT REPTILES OF THE NEW CALEDONIAN REGION

1a. Limbs present 2
1b. Limbs absent (snakes) 53
2a. Carapace present, limbs modified as flippers (turtles) ... Family Cheloniidae . . . 50
2b. No carapace, limbs unmodified (lizards) 3
3a. Body scales generally small, granular, juxtaposed ..... Family Gekkonidae . . . 4
3b. Body scales imbricate ..... Family Scincidae . . . 24
4a. Subdigital scansors present 5
4b. Subdigital scansors absent ..... *Nactus pelagicus*
5a. Digit I of manus and pes clawless 6
5b. All digits clawed 8
6a. Digit I rudimentary, without scansors ..... *Hemiphyllodactylus typus*
6b. Digit I small but well developed, with scansors 7
7a. Penultimate phalanx completely free from scansorial pad ..... *Gehyra vorax*
7b. Penultimate phalanx partially subsumed in pad ..... *Lepidodactylus lugubris*
8a. Digit I with apical plates 10
8b. Digit I without apical plates ..... *Hemidactylus* . . . 9
9a. Two pairs of enlarged post-mental chin shields contact infralabials ..... *Hemidactylus frenatus*
9b. Second pair of enlarged postmentals excluded from infralabials by series of small scales ..... *Hemidactylus garnotii*
10a. Subdigital scansors divided ..... *Bavayia* . . . 11
10b. Subdigital scansors undivided 17
11a. Claw of digit I situated medial to single terminal scansor 12
11b. Claw of digit I situated between halves of cleft apical scansor 13
12a. Lateral surface of hindlimb with distinct, contrasting pale spots on a dark background ..... *Bavayia ornata*
12b. Lateral surface of hindlimb without pale spots, or spots indistinct ..... *Bavayia sauvagii*
13a. Dorsal pattern with pale, broad vertebral strip 14

TABLE 1. Checklist of the recent and fossil* herpetofauna of New Caledonia.

Taxon	New Caledonian specimens in CAS collection	Distribution		
		New Caledonia	Loyalty Islands	Marine
Class Amphibia				
Order Anura				
Family Hylidae				
Litoria aurea (Lesson, 1830) [introduced]	70 (including 20 tadpoles)	X	X	
Class Reptilia				
Order Chelonia				
Family Cheloniidae				
Caretta caretta (Linnaeus, 1758)	–			X
Chelonia mydas (Linnaeus, 1758)	–			X
Eretmochelys imbricata (Linnaeus, 1766)	–			X
Lepidochelys olivacea (Eschscholtz, 1829)	–			X
Family Meiolaniidae				
**Meiolania mackayi* Anderson, 1925	–	(Walpole Is.)		
**Meiolania* sp. (see Gaffney et al. 1984)	–	X	X	
Order Crocodylia				
Family Mekosuchidae				
**Mekosuchus inexpectatus* Balouet and Buffetaut, 1987	–	X		
Order Squamata				
Suborder Lacertilia				
Family Gekkonidae				
Bavayia crassicollis Roux, 1913	1	X	X	
Bavayia cyclura (Günther, 1872)	62	X	X	
Bavayia montana Roux, 1913	1	X		
Bavayia ornata Roux, 1913	–	X		
Bavayia sauvagii (Boulenger, 1883)	299	X	X	
Bavayia septuiclavis Sadlier, 1989	–	X		
Bavayia validiclavis Sadlier, 1989	–	X		
Eurydactylodes symmetricus (Andersson, 1908)	–	X		
Eurydactylodes vieillardi (Bavay, 1869)	1	X		
Gehyra vorax Girard, 1857	–		X	
Hemidactylus frenatus Duméril and Bibron, 1836 [introduced]	28	X	X	
Hemidactylus garnotii Duméril and Bibron, 1836	4	X	X	
Hemiphyllodactylus typus Bleeker, 1860	2	X	X	
Lepidodactylus lugubris (Duméril and Bibron, 1836)	23	X	X	
Nactus pelagicus (Girard, 1857)	51	X	X	
Rhacodactylus auriculatus (Bavay, 1869)	38	X		
Rhacodactylus chahoua (Bavay, 1869)	4	X		
Rhacodactylus ciliatus (Guichenot, 1866)	–	X		
Rhacodactylus leachianus (Cuvier, 1829)	9	X		
Rhacodactylus sarasinorum Roux, 1913	1	X		
Rhacodactylus trachyrhynchus Bocage, 1873	–	X		
Family Scincidae				
Caledoniscincus atropunctatus (Roux, 1913)	16	X	X	
Caledoniscincus austrocaledonicus (Bavay, 1869)	727	X	X	
Caledoniscincus festivus (Roux, 1913)	8	X		
Caledoniscincus orestes Sadlier, 1986	–	X		
Cryptoblepharus novocaledonicus Mertens, 1928	5	X	X	
Emoia cyanura (Lesson, 1830)	–		X	
Emoia loyaltiensis (Roux, 1913)	–		X	
Geoscincus haraldmeieri (Böhme, 1979)	–	X		
Graciliscincus shonae Sadlier, 1986	1	X		
Leiolopisma greeri Böhme, 1979	–	X		

TABLE 1. Continued.

Taxon	New Caledonian specimens in CAS collection	Distribution		
		New Caledonia	Loyalty Islands	Marine
Leiolopisma nigrofasciolatum (Peters, 1869)	21	X	X	
Leiolopisma novaecaledoniae (Parker, 1926)	1	X		
Leiolopisma steindachneri (Bocage, 1873)	1	X		
Leiolopisma n. sp. Ineich and Sadlier	–	X		
Marmorosphax euryotis (Werner, 1909)	1	X		
Marmorosphax tricolor (Bavay, 1869)	95	X		
Nannoscincus gracilis (Bavay, 1869)	26	X		
Nannoscincus greeri Sadlier, 1986	12	X		
Nannoscincus mariei (Bavay, 1869)	35	X		
Nannoscincus rankini Sadlier, 1986	–	X		
Nannoscincus slevini (Loveridge, 1941)	1	X		
Phoboscincus bocourti (Brocchi, 1876)	–	X		
Phoboscincus garnieri (Bavay, 1869)	–	X	X	
Sigaloseps deplanchei (Bavay, 1869)	65	X		
Tropidoscincus aubrianus Bocage, 1873	–	X		
Tropidoscincus roehssii (Andersson, 1908)	15	X		
Tropidoscincus variabilis (Bavay, 1869)	2	X		
Family Varanidae				
**Varanus* sp. (see Gaffney et al. 1984)	–	X		
Suborder Serpentes				
Family Typhlopidae				
Ramphotyphlops angusticeps (Peters, 1878)	–	?		
Ramphotyphlops braminus (Daudin, 1803) [introduced]	7	X	X	
Ramphotyphlops willeyi (Boulenger, 1900)	–		X	
Family Boidae				
Candoia bibroni (Duméril and Bibron, 1844)	–		X	
Family Hydrophiidae				
Acalyptophis peronii (Duméril, 1853)	–			X
Aipysurus duboisii Bavay, 1869	–			X
Aipysurus laevis Lacépède, 1804	–			X
Disteira major (Shaw, 1802)	–			X[1]
Emydocephalus annulatus Krefft, 1869	–			X
Hydrophis gracilis (Shaw, 1802)	–			X[1]
Hydrophis coggeri (Kharin, 1984)	1			X
Hydrophis ornatus (Gray 1842)	–			X[1]
Laticauda colubrina (Schneider 1799)	8			X
Laticauda laticaudata (Linnaeus 1758)	3			X
Pelamis platurus (Linnaeus 1766)	–			X
Total species/species represented in CAS collection (extant taxa only)	68/36	48/33	20/12	15/3
Total specimens in CAS collection	1643	1629	2	12

[1] The occurrence of these taxa in New Caledonia has been reported in the literature, but specimens from the region were not recorded by Cogger (1975) nor have they been verified by the authors. The confusion surrounding the identification of *Hydrophis*-like New Caledonia sea snakes was discussed by Minton and Dunson (1985).

13b. Dorsal pattern composed of pale, transversely oriented blotches 15

14a. Preanal pores in 2 rows; supranasal generally separated by a single internasal scale ..... *Bavayia validiclavis*

14b. Preanal pores in a single row, internasal region fragmented ..... *Bavayia septuiclavis*

15a. First pair of infralabials usually contacting medially ..... *Bavayia montana*

15b. First pair of infralabials usually separated 16

16a. Distinct bold, dark transverse bands bordering the pale, dorsal blotches ..... *Bavayia cyclura*

16b. Pale dorsal blotches and dark bands obscure and poorly defined ..... *Bavayia crassicollis*
17a. Body scales greatly enlarged, body compressed ..... *Eurydactylodes* . . . 18
17b. Body scales small and granular or tubercular ..... *Rhacodactylus* . . . 19
18a. Cruciform patch of raised, rounded scales on nape; continuous slit from angle of jaw to ear ..... *Eurydactylodes symmetricus*
18b. No raised scales on nape, slit from angle of jaw to ear interrupted by skin fold ..... *Eurydactylodes vieillardi*
19a. Body with loose folds of skin along throat and flanks, digits half-webbed 20
19b. Body without lateral folds, digits less than one third webbed 21
20a. Rostral contacts nostril ..... *Rhacodactylus chahoua*
20b. Rostral excluded from nostril ..... *Rhacodactylus leachianus*
21a. Paired, converging ciliated crests on dorsum ..... *Rhacodactylus ciliatus*
21b. Dorsal scales generally homogeneous .. 22
22a. Head with raised bosses or rugosities .. 23
22b. Head smooth ..... *Rhacodactylus sarasinorum*
23a. Snout rugose ..... *Rhacodactylus trachyrhynchus*
23b. Raised orbital and aural bosses present, snout smooth ..... *Rhacodactylus auriculatus*
24a. "Ablepharine eye" (completely fused brill) ..... *Cryptoblepharus novocaledonicus*
24b. Brill not completely fused 25
25a. Ear opening minute or absent 26
25b. Ear opening not minute 31
26a. Body elongate, snout blunt and flattened; 5 supralabial scales ..... *Graciliscincus shonae*
26b. Body elongate, snout pointed; 6 supralabial scales ..... *Nannoscincus* . . . 27
27a. Ear opening absent . *Nannoscincus mariei*
27b. Ear opening minute 28
28a. Frontoparietals distinct, lower eyelid scaly 29
28b. Frontoparietals fused, lower eyelid with semi-translucent central area 30
29a. Forelimb pentadactyl ..... *Nannoscincus gracilis*
29b. Forelimb tetradactyl ..... *Nannoscincus slevini*
30a. Phalangeal formula for pes 2.3.4.5.4 ..... *Nannoscincus greeri*
30b. Phalangeal formula for pes 2.3.4.4.3 ..... *Nannoscincus rankini*
31a. Supranasal scales present 32
31b. Supranasal scales absent 35
32a. Lower eyelid scaly, limbs short, teeth recurved ..... *Phoboscincus* . . . 33
32b. Lower eyelid with transparent disk, limbs overlap when adpressed; teeth not recurved ..... *Emoia* . . . 34
33a. Supranasals broadly contacting; 32–34 midbody scale rows ..... *Phoboscincus garnieri*
33b. Supranasals narrowly separated, 66 midbody scale rows ..... *Phoboscincus bocourti*
34a. Mid-vertebral stripe present; 52–64 scale rows between parietal and tail base ..... *Emoia cyanura*
34b. No vertebral stripe; 62–71 scale rows between parietal and tail base ..... *Emoia loyaltiensis*
35a. Dorsal body scales smooth 36
35b. Dorsal body scales carinate 40
36a. Frontoparietals fused 37
36b. Frontoparietals distinct 38
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Species Accounts

Amphibia
Anura
Family Hylidae

Litoria aurea (Lesson)

Rana aurea Lesson, 1830:60. Type locality: "Macquarie River, Bathurst, New South Wales, Australia." Lectotype locality: "Port Jackson" [New South Wales, Australia] (designated by Roux-Estève 1979).
Litoria aurea Tyler, 1971:352.

Material examined (50 adults; 20 tadpoles).—Locality 5: 6 Oct. 1984 (CAS 157654); Locality 8: 6 June 1985 (CAS 158555); Locality 9: 15 Dec. 1986 (CAS 162169); Locality 11: 10–11 Oct. 1984 (CAS 157655–6); Locality 14: 29 Mar. 1984 (CAS 157104–5), 1 Oct. 1984 (CAS 157652–3); Locality 19: 20 Oct. 1984 (CAS 157658–73); Locality 20: 17 Oct. 1984 (CAS 157674, lot of 20 tadpoles); Locality 21: 27 May 1985 (CAS 158311–20, 159025–8); Locality 32: 17 Oct. 1984 (CAS 157657), 4 Jan. 1986 (CAS 159569), 20 Dec. 1986 (CAS 162174–5); Locality 34: 17 Dec. 1986 (CAS 162170–3); Locality 35: 23 Dec. 1986 (CAS 162176); Locality 40: 5 Jan. 1986 (CAS 159570–1).

Remarks.—The date of introduction of this Australian species into New Caledonia is unknown. Specimens referenced by Copland (1957) and Moore (1961), however, indicate that *Litoria aurea* has been present for over a century. By the time of Sarasin and Roux's expedition (1911–1912), this frog was widely distributed across the mainland of New Caledonia (Sarasin 1925), whence it was introduced into the New Herbrides [=Vanuatu] (Tyler 1976, 1979). The few specimens in early collections, however, suggest that *L. aurea* was not abundant until quite recently. Although it is now found in almost all habitats, *L. aurea* is most common in disturbed lowland sites such as gardens and ditches.

Specimens from areas of native forest were typically found singly, with males calling from the ground or from low branches. The species is carnivorous (Cogger et al. 1983) and even cannibalistic (Cogger 1986), and in Australia it has been known to take large vertebrate prey, including elapid snakes (Tyler 1976). One individual collected at Locality 34 disgorged a *Caledoniscincus austrocaledonicus.*

The presence of both calling males and free-swimming tadpoles in October is consistent with the reported breeding period of *L. aurea* in New Zealand (Bell 1982) and its native Australia (Barker and Grigg 1977). Tadpoles were collected from small rock pools at the top of a waterfall, but were also observed in slow-flowing creeks and vegetation-choked ponds from sea-level to 800 m (Campement Vanhalle—Locality 5).

Reptilia

Squamata
Family Gekkonidae

Bavayia crassicollis Roux

Bavayia cyclura crassicollis Roux, 1913:89. Type locality: "Maré: Netché, Rô, Pénélo; Lifou: Quépénée; Ouvéa: Fayaoué." Lectotype locality: "Maré, Loyalty Insel" (restricted by Kramer 1979).
Bavayia crassicollis Sadlier, 1989:365.

Material examined (1 specimen).—Locality 4: 13 Oct. 1984 (CAS 157695).

Remarks.—One large specimen (70 mm SVL) was collected under loose bark of a dead standing tree on Ilot de Hiénghène, a tiny coralline island off the coast of Hiénghène. The species may be sympatric with other *Bavayia* in forest clearings (Sadlier 1989), but appears to be most common in the coastal lowland forest and mangroves on New Caledonia and the Loyalty Islands (Roux 1913).

Bavayia cyclura (Günther)

Peripia cyclura Günther, 1872:422. Type locality: "New Caledonia."
Lepidodactylus neocaledonicus Bocage, 1873a:206. Type locality: "Nouvelle Calédonie."
Hemidactylus (*Peripia*) *Bavayi* Sauvage, 1879:71. Type locality: "Nouvelle-Calédonie."
Bavayia cyclura Roux, 1913:88.

Material examined (62 specimens).—Locality 9: 1 Jan. 1986 (CAS 159546, 159550–1), 8 Jan. 1986 (CAS 165877), 14–15 Dec. 1986 (CAS 162203–9, 162219–21); Locality 11: 7 Apr. 1984 (CAS 165878–9), 10 Oct. 1984 (CAS 157696), 1–2 June 1985 (CAS 158549–50); Locality 12: 6 June 1985 (CAS 158548); Locality 19: 20–21 Oct. 1984 (CAS 157697–704, 165884–7), 13 Jan. 1986 (CAS 165861–74); Locality 35: July–Aug. 1940 (CAS 80842, 80849–50, 80853), 23 Dec. 1986 (CAS 162237–9); Locality 37: July–Oct. 1940 (CAS 80864–71); Locality 39: July–Aug. 1940 (CAS 80863).

Remarks.—Although widely distributed on New Caledonia and all of the Loyalty Islands, *Bavaya cyclura* is restricted to the vicinity of trees and rotten or hollow logs. Only in the Forêt de Yahoué (Locality 35) were specimens of this species found to be syntopic with *B. sauvagii.* In this area, specimens of both species were collected from the trunks of trees at heights of 1–3 m. At Mt. Koyaboa (Locality 12) *B. cyclura* were found only at higher altitudes than *B. sauvagii*

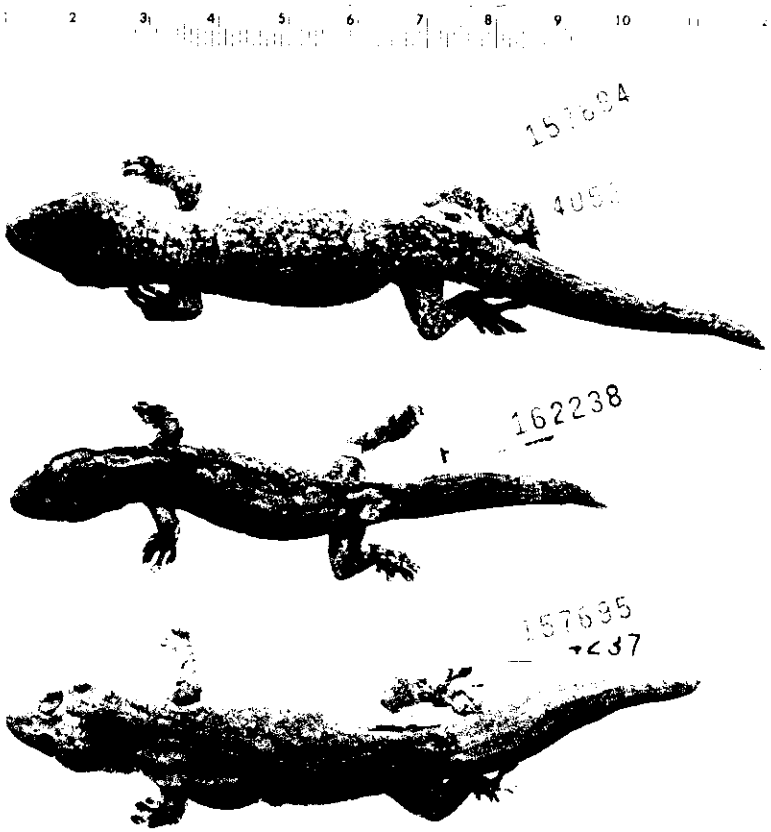

FIGURE 2. Variation in color and body proportion in *Bavayia* species. Specimens (bottom to top): *B. crassicollis* from Ilot de Hiénghène (Locality 4); *B. cyclura* from Vallée de Yahoué (Locality 35); and *B. montana* from Mt. Koyaboa (Locality 12).

and in conjunction with logs, rather than stones, as hiding places. A few individuals were found in association with human habitation. *Bavaya cyclura* is generally more gracile and boldly patterned than are *B. crassicollis* and *B. montana* (Fig. 2). A striped individual (CAS 165885) was collected with many typically patterned ones—we thus doubt that this pattern is of significance. The largest individual examined (from Locality 19) was 72 mm SVL.

Bavayia montana Roux

Bavayia cyclura montana Roux, 1913:88. Type locality: "Mount Ignambi, altit. 700–800 m, près Tao, altit. 400 m, Mont Canala, altit. 700 m, Coindié, altit. 250 m, Ni, altit. 250 m."

Lectotype locality: "Mount Ignambi, 700–800 m, Neu-Kaledonien" (restricted by Kramer 1979).
Bavayia montana Sadlier, 1989:365.

MATERIAL EXAMINED (1 specimen).—Locality 12: 3 Oct. 1984 (CAS 157694).

REMARKS.—One individual (Fig. 2) was collected inside a moist log at about 200 m elevation on Mt. Koyaboa. In life the specimen displayed pale speckling over the basic pattern of indistinct dorsal blotches, and had a canary-yellow venter.

Bavayia sauvagii (Boulenger)

Lepidodactylus sauvagii Boulenger, 1883:122. Type locality: New Caledonia by implication (the original description seems to refer to the species now recognized as *Bavayia sauvagii*; however, the purported holotype is conspecific with *B. cyclura* and possibly is not the specimen designated by Boulenger).
Bavayia sauvagei Roux, 1913:91.

MATERIAL EXAMINED (299 specimens).—Locality 5: 6 Oct. 1984 (CAS 157706, 157711–4); Locality 11: 4 Oct. 1984 (CAS 157705, 157707–10); Locality 12: 3–5 Oct. 1984 (CAS 157914–61), 8 Oct. 1984 (CAS 165903–10), 11–12 Oct. 1984 (CAS 157962–70, 165881–3, 165888–9, 165893–4), 17 Oct. 1984 (CAS 165880), 1–9 June 1984 (CAS 158430–508, 165875–6), 29 Dec. 1985 (CAS 159513–25), 1 Jan. 1986 (CAS 159528–43), 8–9 Jan. 1986 (CAS 159555–61, 159566–7), 13–15 Dec. 1986 (CAS 162193–200, 162213–8); Locality 27: 11–12 Dec. 1986 (CAS 162186–92); Locality 31: 25 May 1985 (CAS 158378), 15–16 Jun. 1985 (CAS 158379–83), 11 Dec. 1986 (CAS 162184–5); between localities 32 and 39: 21 Oct. 1984 (CAS 157715); Locality 35: July–Aug. 1940 (CAS 80823–36, 80838–41, 80843–8, 80851–2, 80854–8), 17 Dec. 1986 (CAS 162225), 23 Dec. 1986 (CAS 162240–3); Locality 39: July–Aug. 1940 (CAS 80859–62); Locality 40: 18–20 Oct. 1984 (CAS 157716–8), 19–22 May 1985 (CAS 158321–31), 15 June 1985 (CAS 158332), 4 Jan. 1986 (CAS 159552–3), 18–20 Dec. 1986 (CAS 162228–32, 162235); Locality 41: 30 May 1985 (CAS 158386–8); Locality 43: exch. from NMBA, 1914 (CAS 38826). CAS 80837 exchanged to G. Pasteur.

REMARKS.—Like *Bavayia cyclura, B. sauvagii* is extremely variable in pattern, and to a lesser extent, body form. In general, the specimens from the west coast of New Caledonia are larger (max. SVL 62 mm, CAS 162184) than those from the east coast. Most specimens were collected during daylight hours from under rocks in humid forest (Bauer and DeVaney 1987), although some were collected at night on bushes and trees. The species is broadly insectivorous with crickets making up the bulk of the diet on Mt. Koyaboa (Bauer and DeVaney 1987). *Bavayia sauvagii* is broadly sympatric and syntopic with *Nactus pelagicus* throughout the range of the former and is also frequently found in association with *Marmorosphax tricolor.*

Eurydactylodes vieillardi (Bavay)

Platydactylus Vieillardi Bavay, 1869:10. Type locality: "Houagape" [=Wagap, Nouvelle-Calédonie].
Eurydactylodes vieillardi Wermuth, 1965:30.

MATERIAL EXAMINED (1 specimen).—Locality 36: 10 May 1985 (CAS 158556).

REMARKS.—Little is known about this arboreal species. It occurs in the southern lateritic region of New Caledonia and in regions of edaphic vegetation throughout the remainder of the island.

Hemidactylus frenatus Duméril and Bibron

Hemidactylus frenatus Duméril and Bibron, 1836:366. Type locality: "l'Afrique australe, et . . . tout l'archipel des grandes Indes" (restricted to "Java" by Loveridge 1947).

MATERIAL EXAMINED (28 specimens).—Locality 11: 10 Oct. 1984 (CAS 157738–40), 2–4 June 1985 (CAS 158551–2); Locality 14: 1 Oct. 1984 (CAS 157737); Locality 37: 27 Sept. 1984 (CAS 157727–36), 16 May–16 June 1985 (CAS 158289, 158294–303); Locality 38: June 1985 (CAS 172736).

REMARKS.—These geckos are extremely common in urban habitats in New Caledonia. They are also present in much lower densities in areas of native vegetation. This species was not recorded by Roux (1913), nor was it collected by F. X. Williams in 1940. As in other parts of the Pacific, *Hemidactylus frenatus* has spread swiftly in recent years. It was not listed among the Hawaiian fauna by Oliver and Shaw in 1953, but it has established itself since being introduced in the 1950s (Hunsaker 1966; Hunsaker and Breese 1967). By 1978 it was the most common gecko in the islands, supplanting *H. garnotii* from both urban and native habitats (McKeown 1978). Likewise, *H. frenatus* was not recorded in Fiji by Pernetta and Watling (1978), but by 1985 it had displaced *H. garnotii* in edificarian habitats (Gibbons 1985). In New Caledonia, as in Hawaii, its introduction may have been associated with troop movement during World War II (Hunsaker and Breese 1967), and has certainly been facilitated by increased post-war contact with neighboring islands. *Hemidactylus frenatus* is approximately the same size as *H. garnotii* (max. SVL 60 mm [CAS 158552] vs. 61 mm [CAS 162223] for *H. garnotii*) and appears to outcompete it in natural and disturbed situations (Hunsaker and Breese 1967). In the Pacific the two species are known to be sympatric only in Hawaii, the Marquesas, and New Caledonia, and it appears likely that the spread of *H. frenatus,* especially on smaller

islands, may cause local extinctions of *H. garnotii.*

Hemidactylus garnotii Duméril and Bibron

Hemidactylus Garnotii Duméril and Bibron, 1836:368. Type locality: "l'île de Taïti."

MATERIAL EXAMINED (4 specimens).—Locality 9: 15 Dec. 1986 (CAS 162222–3); Locality 37: July–Aug. 1940 (CAS 80876, 80878).

REMARKS.—Although formerly widespread in New Caledonia (Bavay 1869; Roux 1913), *Hemidactylus garnotii* appears to have retreated in the face of expansion by *H. frenatus.* Extensive searches in Nouméa indicate that the species has become extinct in the area since F. X. Williams's visit in 1940. The specimens collected in 1986 were active at night on forest tree trunks along with *Nactus pelagicus* and *Lepidodactylus lugubris.* The patchy distribution of this species in the Pacific (Ineich 1982; Blanc et al. 1983; Crombie and Steadman 1988) suggests that its spread has been mediated by human movements, and that its success on small islands is dependent on the absence of competitors, particularly *H. frenatus.*

Hemiphyllodactylus typus Bleeker

Hemiphyllodactylus typus Bleeker, 1860:327. Type locality: "Agam, Sumatra" [Indonesia] (see Kluge 1968 for a discussion of the type locality).

Platydactylus crepuscularis Bavay, 1869:8. Type locality: Nouvelle-Calédonie by implication.

MATERIAL EXAMINED (2 specimens).—Locality 38: June 1985 (CAS 172739–40).

REMARKS.—Little is known about the biology of this species in New Caledonia. It is rarely encountered and appears to be restricted to areas of undisturbed vegetation.

Lepidodactylus lugubris (Duméril and Bibron)

Platydactylus Lugubris Duméril and Bibron, 1836:304. Type locality: "l'île d'Otaïti."

Lepidodactylus lugubris Fitzinger, 1843:98.

Gymnodactylus Caudeloti Bavay, 1869:13. Type locality: "Nouvelle-Calédonie, surtout dans le Nord."

MATERIAL EXAMINED (23 specimens).—Locality 9: 10–12 Oct. 1984 (157741–6), 14–15 Dec. 1986 (CAS 162210, 162224); Locality 11: 6 June 1985 (CAS 159498), 8 June 1985 (CAS 158553–4), 8 Jan. 1986 (CAS 159511), 13–15 Dec. 1986 (CAS 162201–2, 162211); Locality 37: July–Aug. 1940 (CAS 80872–5, 80877), 17 May 1985 (CAS 158290); Locality 38: June 1985 (CAS 172737–38).

REMARKS.—*Lepidodactylus lugubris* is the most widely distributed gecko in the Pacific Basin. In New Caledonia it is common in and around houses and in lowland vegetation including humid forest and palm stands. In situations of cooccurrence with *Hemidactylus frenatus,* the smaller *L. lugubris* (max. SVL 44 mm, CAS 162201) is relatively secretive, foraging near shelter and on the periphery of the area of *Hemidactylus* activity. This situation parallels that seen in areas of sympatry in Hawaii (Hunsaker and Breese 1967). As in most areas of its range (Cuellar and Kluge 1972; Ineich 1982, 1988), the New Caledonian populations of *L. lugubris* appear to be all female. Adults collected in October contained enlarged ovarian or oviductal eggs, and communal egg clutches of up to nine eggs were observed under bark in December 1986. All specimens, regardless of date of collection, possessed enlarged extracranial endolymphatic sacs clearly visible through the skin.

Nactus pelagicus (Girard)

Gymnodactylus Arnouxii Duméril, 1851:44. Type locality: "Nouvelle-Zélande" (sic) (see Kluge 1983 for a discussion of probable locality).

Heteronota pelagica Girard, 1857:197. Type locality: "Feejee and Navigator Islands" [=Fiji and Samoa].

Nactus pelagicus Bauer and DeVaney, 1987:353.

MATERIAL EXAMINED (51 specimens).—Locality 9: 11 Oct. 1984 (CAS 157769), 1 Jan. 1986 (CAS 159544–5, 159547–9), 8 Jan. 1986 (CAS 159562–5); Locality 12: 3–11 Oct. 1984 (CAS 157758–67), 2–9 June 1985 (CAS 158509–21, 158543), 1 Jan. 1986 (CAS 159526–7), 8 Jan. 1986 (CAS 159554), 15 Dec. 1986 (CAS 162212); Locality 30: 25 Oct. 1940 (CAS 80882–3, 80885–6); Locality 40: 18 Oct. 1984 (CAS 157768), 20 May 1985 (CAS 158333–4), 11 June 1985 (CAS 158335), 18–20 Dec. 1986 (CAS 162226–7, 162233–4, 162236). CAS 80884 exchanged to G. Pasteur.

REMARKS.—Kluge (1983), when erecting the genus *Nactus,* placed *N. pelagicus* into the synonymy of *N. arnouxii.* However, the use of the older but unused name *arnouxii* disrupts stability and causes confusion in usage (Zug 1985a, 1989). We therefore use the specific epithet *pelagicus. Nactus pelagicus* (max. SVL 69 mm, CAS 158520) is widespread in New Caledonia but rather secretive. It was collected under stones during the day, frequently in dry streambeds (Bauer and DeVaney 1987), and low (< 1 m) on the trunks of trees at night. The species has a broad insectivorous diet, similar in most respects to that of sympatric *Bavayia sauvagii.* All adult

specimens in the collection are female, and Moritz (1987) has demonstrated that the same is true of populations from southern Vanuatu and the eastern Pacific, suggesting a parthenogenetic species (2N = 35) of hybrid origin.

Rhacodactylus auriculatus (Bavay)

Platydactylus auriculatus Bavay, 1869:6. Type locality: "Mont d'Or" [=Mont Dore, Nouvelle Calédonie].
Ceratolophus hexaceros Bocage, 1873a:205. Type locality: "Nouvellé Calédonie."
Rhacodactylus auriculatus Boulenger, 1883:127.

MATERIAL EXAMINED (38 specimens).—Locality 29: 19 Oct. 1984 (CAS 157684); Locality 32: 18–19 Oct. 1984 (CAS 157679, 157681–2), 20 May 1985 (CAS 158923), 11 June 1985 (CAS 158925); on road between localities 32 and 39: 18–21 Oct. 1984 (CAS 157676–8, 157680, 157683, 165858–9, 165892, 165901), 18–20 May 1985 (CAS 158919–20, 158922), 4 Jan. 1986 (CAS 159512), 20–22 Dec. 1986 (CAS 162179–83); Locality 33: 19 Oct. 1984 (CAS 165891); Locality 40: 20 May 1985 (CAS 158921, 158924), 12–14 June 1985 (CAS 165860, 165902), 2–5 Jan. 1986 (CAS 165895–900), 19 Dec. 1986 (CAS 162178); Locality 41: 30 May 1985 (CAS 158389–90).

REMARKS.—*Rhacodactylus auriculatus* is endemic to southern New Caledonia. Within this region it has been collected widely. By night the animals are active in trees (generally at heights of <3 m) and on the ground. Most CAS specimens were collected along dirt roads from dusk until about 2100 hr. The diet of this species includes flowers (Bavay 1869), lizards (Bauer and DeVaney 1987), and probably insects and fruits as well. Females with shelled eggs were collected in October, December–January, and May–June; in captivity *R. auriculatus* breeds year round. This is the smallest species of *Rhacodactylus*; the largest specimen examined, CAS 162181, was a female of SVL 118 mm.

Rhacodactylus chahoua (Bavay)

Platydactylus chahoua Bavay, 1869:3. Type locality: "Kanala, Lifou" (sic, see Bauer 1985a for a discussion of this locality). Neotype locality: "Vallée d'Amoa, near St. Thérèse, approx. 15 km NW of Poindimié, New Caledonia" (neotype designated by Bauer 1985a).
Rhacodactylus chahoua Boulenger, 1883:125.

MATERIAL EXAMINED (4 specimens).—Locality 9: 1 Jan. 1986 (CAS 167764), 13 Dec. 1986 (CAS 162177); Locality 13: 6 Apr. 1984 (CAS 156691, 156692 [NEOTYPE]).

REMARKS.—Bauer (1985a) designated a neotype to replace the lost type of Bavay (1869), which bore the locality "Kanala, Lifou" (probably a lapsus for Canala, New Caledonia). All specimens were collected at heights of 2–5 m in trees along the Amoa River in eastern New Caledonia. *Rhacodactylus chahoua* appears to be active after dusk on the trunks and branches of trees of moderate size (maximum trunk diameter ca. 2 m).

Rhacodactylus leachianus (Cuvier)

Ascalabotes Leachianus Cuvier, 1829:54. Type locality: not given.
Rhacodactylus Leachianus Bocage, 1873a:201.
Rhacodactylus Aubrianus Bocage, 1873a:202. Type locality: "Nouvelle Calédonie."

MATERIAL EXAMINED (9 specimens).—Locality 6: July–Aug. 1940 (CAS 80881); Locality 7: Nov. 1985 (CAS 159510); Locality 13: 6 Apr. 1984 (CAS 156690); Locality 15: 28 Aug. 1984 (CAS 165890); Locality 27: 11 Dec. 1986 (CAS 172734); Locality 35: July–Aug. 1940 (CAS 80879–80), 12 Dec. 1986 (CAS 165857, 172735).

REMARKS.—This is the largest living species of gecko, attaining 245 mm SVL (CAS 165890). Animals were collected from the trunks and lower branches of trees in humid forests throughout the wetter areas of New Caledonia, most frequently those immediately bordering streams or rivers. Males are much more commonly captured and observed at lower heights on trees, whereas females generally remain in the canopy. In addition to specimens captured, many more *R. leachianus* were observed at heights of 7–30 m in trees where they could not be collected. In the wild this species eats birds, insects, and fruit, and in captivity will also eat mice and other small mammals (Bauer and DeVaney 1987).

Rhacodactylus sarasinorum Roux

Rhacodactylus sarasinorum Roux, 1913:99. Type locality: "Forêt de Prony (env. 100 m. d'altitude)" [New Caledonia].

MATERIAL EXAMINED (1 specimen).—Locality 32: 18 Oct. 1984 (CAS 157675).

REMARKS.—The single specimen was collected at ca. 2000 hr on the branches of a small tree in an area where both *Rhacodactylus auriculatus* and *R. leachianus* are common. The specimen is large (125 mm SVL) and extremely dark, lacking the spots and nuchal collar common in juveniles and smaller adults (Henkel 1987).

Family SCINCIDAE

Caledoniscincus atropunctatus (Roux)

Lygosoma austro-caledonicum atropunctatum Roux, 1913:117. Type locality: "en Nouvelle-Calédonie et aux trois îles Loyalty." Lectotype locality: "Outbatche, Neu-Kaledonien" (restricted by Kramer 1979).
Caledoniscincus atropunctatus Sadlier, 1986:42.

MATERIAL EXAMINED (16 specimens).—New Caledonia: exchange from NHMB, 1914 (CAS 38828 [PARALECTOTYPE]); Locality 12: 3 Oct. 1984 (CAS 158073), 4 Oct. 1984 (CAS 158080), 1 June 1985 (CAS 158542), 1–2 Jan. 1986 (CAS 159639–40), 15 Dec. 1986 (CAS 162311); Locality 31: 28 Dec. 1985 (CAS 159616), 11 Dec. 1986 (CAS 162273–4); Locality 40: 4 Jan. 1986 (CAS 159643–5), 19–20 Dec. 1986 (CAS 162332, 162347, 162363).

REMARKS.—Museum specimens of species of this genus are often difficult to distinguish from one another, as the primary diagnostic features relate to coloration, which is extremely variable. The specimens listed above include all those that are unambiguously assignable to *Caledoniscincus atropunctatus*. Although this small species (max. SVL 51 mm, CAS 162274) is broadly sympatric and syntopic with *C. austrocaledonicus*, and to a lesser extent *C. festivus*, it is more often associated with forests than is *C. austrocaledonicus* (Sadlier 1986). All CAS specimens come from dense forest or forest-edge habitats. In Vanuatu this species is primarily insectivorous and similar to *C. austrocaledonicus* in the breadth of prey categories taken (Medway and Marshall 1975).

Caledoniscincus austrocaledonicus (Bavay)

Lygosoma Austro-Caledonica Bavay, 1869:21. Type locality: "partout en Calédonie et dans les îles Loyalty." Neotype locality: "4 km from summit of Mt. Aoupinie by road, New Caledonia, 21°11'S, 165°16'E" (designated by Sadlier 1986).

Euprepes haplorhinus Günther, 1872:419. Type locality: "New Caledonia."

Lygosoma austro-caledonicum dorsovittatum Roux, 1913:118. Type locality: "du nord au sud de la Calédonie et sur les 3 îles Loyalty." Lectotype locality: "Hienghiene (sic) Neu-Kaledonien" (restricted by Kramer 1979).

Leiolopisma dorsovittatum bodei Börner, 1980:8. Type locality: "unter einerm Baumstamm auf einer trockenen Wiese bei Kutio auf der Ile des Pins südlich von Neu Kaledonien."

Caledoniscincus austrocaledonicus Sadlier, 1986:37.

MATERIAL EXAMINED (727 specimens).—New Caledonia: exchange from NHMB, 1914 (CAS 38829 [PARALECTOTYPE of *Lygosoma austrocaledonicum dorsovittatum* Roux, 1913], 38830); Locality 1: 2 Oct. 1984 (CAS 158072); Locality 2: 9 Oct. 1984 (CAS 158081); Locality 3: 10–11 Jan. 1986 (CAS 159648-55); Locality 4: 13 Oct. 1984 (CAS 158048–59, 158084); Locality 5: 6–7 Oct. 1984 (CAS 157984–8013); Locality 6: July–Aug. 1940 (CAS 80793–5); Loclaity 7: 10 Oct. 1984 (CAS 158014–34); Locality 10: 12 Oct. 1984 (CAS 158045–7, 158082–3); Locality 11: 12 Oct. 1984 (CAS 158035–44), 2 Jun. 1985 (CAS 158875); Locality 12: 3 Oct. 1984 (CAS 158079), 6 June 1985 (CAS 158546–7), 8 Jan. 1986 (CAS 159646); Locality 14: 1 Oct. 1984 (CAS 157983); Locality 16: 29 Mar. 1984 (CAS 169524); Locality 18: 17 Oct. 1984 (CAS 158064–8, 158096–7); Locality 19: 21 Oct. 1984 (CAS 158086–7); Locality 22: 13–14 Jan. 1986 (CAS 159656–85); Locality 23: 26 May 1985 (CAS 158895–918); Locality 24: 20 Oct. 1984 (CAS 158060); Locality 25: 10 June 1985 (CAS 158867–70); Locality 26: 10 June 1985 (CAS 158866); Locality 28: 18 Dec. 1986 (CAS 162316); Locality 31: 25 May 1985 (CAS 158384–5), 28-29 Dec. 1985 (CAS 159611–5, 159618–37), 10–12 Dec. 1986 (CAS 162244–5, 162271–2, 162275–90); Locality 32: 30 Sept. 1984 (CAS 157974–82, 158069–71, 158077–8), 3 Oct. 1984 (CAS 158074–6), 18 Oct. 1984 (CAS 158061–3, 158088–95); Locality 35: July–Aug. 1940 (CAS 80770, 80772–4, 80776, 80778–82, 80784, 80786–92); Locality 37: 18–20 May 1985 (CAS 158291–3), 28 Dec. 1985 (CAS 159610), 10 Dec. 1986 (CAS 162262); Locality 38: June 1985 (CAS 172743–46); Locality 40: 18–19 Oct. 1984 (CAS 158085, 158098), 18–23 May 1985 (CAS 158557–673), 11–14 June 1985 (CAS 158674–863), 4 Jan. 1986 (CAS 159641–2), 18–22 Dec. 1986 (CAS 162318–21, 1620323–31, 162333–51, 162354–62, 162364–461); Locality 41: 30 May 1985 (CAS 158393–8); Locality 42: 24 Oct. 1940 (CAS 80887–8). CAS 80785, 80796–7 missing from collection.

REMARKS.—As mentioned above, the current means of distinguishing species of *Caledoniscincus* from one another is not satisfactory. Some specimens of *C. austrocaledonicus* approach the coloration patterns of each of its congeners, as well as exhibiting a wide array of intermediate patterns. The intermediate size of this species (max. SVL 55 mm, CAS 158561) places individuals well within the range of at least some individuals of each of the other *Caledoniscincus* species. The ventral coloration in life of a series of *C. austrocaledonicus* collected on 12 June 1985 at Locality 40 exemplifies the intrapopulational variability (salmon, orange, yellow, bronze, cream, grey, white, and brown venters were recorded). In other populations, such as that of Plage de Poé, dorsal and ventral coloration are more or less uniform. The chevron marks on the tail employed in the accompanying key are occasionally absent from specimens with original tails, and frequently lacking on regenerated tails. An electrophoretic analysis of variation within and between putative *C. austrocaledonicus* populations may clarify systematic relationships in this group. At least two species are presently included under this name (R. A. Sadlier, pers. comm.).

Caledoniscincus austrocaledonicus is the most common lizard in New Caledonia. It appears to be excluded from dense forest but is common in clearings, forest margins, grassy fields, roadbanks, and nearshore and beach habitats from Boat Pass to the Ile des Pins as well as on the Loyalty Islands.

Bauer and DeVaney (1987) reported a wide range of prey items in the diet of *C. austrocaledonicus* (as *Leiolopisma austrocaledonicum*), including large numbers of crickets and caterpillars. They found some evidence for the pref-

erential feeding of juveniles on collembolans and other very small prey. Beach-wrack-dwelling specimens feed to a great extent on amphipods living in the sand in the splash zone. The species, in turn, is prey to a wide variety of saurian and avian predators, as well as *Litoria aurea* and probably predaceous insects.

Caledoniscincus festivus (Roux)

Lygosoma austrocaledonicum intermedium Roux, 1913:119. Type locality: "Nouvelle-Calédonie: Canala et environs (altit. 300 m), Coindé, Vallée de la Ngoï." Lectotype locality: "Ciu oberhalb Canala, Neu-Kaledonien (restricted by Kramer 1979).

Lygosoma austro-caledonicum festivum Roux, 1913:120. Type locality: "Nouvelle-Calédonie: Coné, environs de Canala, La Foa, Vallée de la Ngoï, Yaté." Lectotype locality: "Canala, Neu-Kaledonien" (restricted by Kramer 1979).

Caledoniscincus festivus Sadlier, 1986:45.

MATERIAL EXAMINED (8 specimens).—Locality 5: 6 Oct. 1984 (CAS 157971–3); Locality 12: 9 Jan. 1986 (CAS 159647); Locality 26: 10 June 1985 (CAS 158864–5); Locality 31: 28–29 Dec. 1985 (CAS 159617, 159638).

REMARKS.—This large species of *Caledoniscincus* (max. SVL 68 mm, CAS 157972) was encountered in open grassy habitat (Locality 26) and in clearings and grassy patches at medium (Locality 12) to high elevations (Locality 5). Campement Vanhalle is a northern record for the species and is very close to Mt. Panié, the only known locality of the very similar *C. orestes*. These skinks appear to be generalist carnivores; CAS 158864 (recorded by Bauer and DeVaney 1987 as *Leiolopisma austrocaledonicum*) had a 2.0 g *Caledoniscincus austrocaledonicus* in its stomach.

Cryptoblepharus novocaledonicus (Mertens)

Cryptoblepharus boutonii novo-caledonicus Mertens, 1928:88. Type locality: "Hienghiène [=Hiénghène] Neukaledonien."

Cryptoblepharus novocaledonicus Sadlier, 1986:53.

MATERIAL EXAMINED (5 specimens).—Locality 6: 1911 (exchanged from NMBA, 1921) (CAS 53991); Locality 24: 20 Oct. 1984 (CAS 157725–6); Locality 32: 29 Sept. 1984 (CAS 157724); Locality 35: July–Aug. 1940 (CAS 80783).

REMARKS.—Despite the high densities and widespread occurrence in nearshore habitats of its congener, *Cryptoblepharus poecilopleurus*, on the islands to the north and east of New Caledonia (Loveridge 1945), *C. novocaledonicus* appears to be greatly outnumbered by members of the genus *Caledoniscincus* over most of its range. CAS 157725–6 from the Baie des Tortues on the central west coast confirm Sadlier's (1986) assumption that the absence of *C. novacaledonicus* from the west of the island was a collecting artifact. The largest CAS specimen (157725), 42 mm SVL, is an adult female carrying one oviductal egg.

Graciliscincus shonae Sadlier

Graciliscincus shonae Sadlier, 1986:12. Type locality: "4 km along the Mt Gouemba road from turnoff 3 km south of La Fause Yaté Bridge, New Caledonia, 22°09'S, 166°54'E."

MATERIAL EXAMINED (1 specimen).—Locality 31: 28 Dec. 1985 (CAS 159576 [PARATYPE]).

REMARKS.—CAS 159576 is one of two known in this monotypic genus. It was collected under a large stone in warm rainy weather.

Leiolopisma nigrofasciolatum (Peters)

Lygosoma (Mocoa) nigrofasciolatum Peters, 1870:435. Type locality: "Neu Kaledonien."

Lygosoma arborum Bavay, 1869:19. Type locality: Nouvelle-Calédonie by implication. Neotype locality: "Mouac Island off Poum, New Caledonia, 20°13'S, 164°00'E" (designated by Sadlier 1986).

Lygosoma Deplanchei Bocage, 1873b:229 (non *Lygosoma Deplanchei* Bavay, 1869). Type locality: "Nouvelle Calédonie." Neotype locality: "Outbache, New Caledonia, 20°26'S, 164°38'E" (designated by Sadlier 1986).

Leiolopisma nigrofasciolatum Greer, 1974:17.

MATERIAL EXAMINED (21 specimens).—New Caledonia, July–Aug. 1940 (CAS 80890); Locality 6: July–Aug. 1940 (CAS 80801); Locality 14: 29 Mar. 1984 (CAS 156757); Locality 32: 29–30 Sept. 1984 (CAS 157719–21); Locality 35: July–Aug. 1940 (CAS 80809–11); Locality 40: 18 Oct. 1984 (CAS 157722–3), 23 May 1985 (CAS 158344), 11 June 1985 (CAS 158345), 14 June 1985 (CAS 158346), 4–5 Jan. 1986 (CAS 159573–5), 21 Dec. 1986 (CAS 162463–5); Locality 44: exchanged from NMBH, 1914 (CAS 38825).

REMARKS.—Bavay's (1869) name *Lygosoma arborum* has priority over *L. nigrofasciolatum* Peters, 1870. However, the former name has not been used by subsequent authors and we regard it as a nomen oblitum.

Although generally regarded as arboreal (Meier 1979; Sadlier 1986), *Leiolopisma nigrofasciolatum* has been collected in a wide variety of open habitats. Many of the specimens from Goro were collected in vertical crevices in boulders, including several in the splash zone. One *L. nigrofasciolatum* (CAS 158344) was found sharing the same crevice with a *Laticauda colubrina* (CAS 158309). The Goro and Touaourou records are the first published for the southeastern coast of the New Caledonian mainland. The species preys upon cockroaches and other large insects (Bauer and DeVaney 1987), as well as smaller skinks

FIGURE 3. *Marmorosphax euryotis* (CAS 80889) from the Ile des Pins showing dorsal color pattern.

(Roux 1913). The largest specimen is CAS 38825 (112 mm SVL), containing 10 oviductal eggs, presumably collected in December, 1911 (Roux 1913). This is the only CAS specimen lacking a solid dark brown median stripe on the nape and shoulders.

Leiolopisma novaecaledoniae (Parker)

Lygosoma (*Leiolopisma*) *novae-caledoniae* Parker, 1926:493. Type locality: "Upper Houailou River, New Caledonia."
Leiolopisma novaecaledoniae Sadlier, 1986:21.

MATERIAL EXAMINED (1 specimen).—Locality 6: July–Aug. 1940 (CAS 80799).

REMARKS.—*Leiolopisma novaecaledoniae* is known from only a few specimens and localities in New Caledonia. CAS 80799 (SVL 44 mm) fills in part of the gap between the eastern coastal records of Oue Camme and Houailou (Sadlier 1986). It closely matches the squamation and coloration of specimens in previously published accounts.

Leiolopisma steindachnerii (Bocage)

Lioscincus Steindachnerii Bocage, 1873b:228. Type locality: "Nouvelle Calédonie." Neotype locality: "Mt Panie (500 m), New Caledonia, 20°36'S, 164°46'E" (designated by Sadlier 1986).
Lygosoma (*Liolepisma*) *steindachneri* Roux, 1913:129.
Leiolopisma steindachneri Greer, 1974:17.

MATERIAL EXAMINED (1 specimen).—Locality 17: 13 Dec. 1978 (CAS 162121).

REMARKS.—Received in exchange from Australian Museum, original number AMS 77723.

Marmorosphax euryotis (Werner)

Lygosoma euryotis Werner, 1909:271. Type locality: "Ile des Pins, Nouvelle-Calédonie."
Marmorosphax euryotis Sadlier, 1986:36.

MATERIAL EXAMINED (1 specimen).—Locality 41: 24 Oct. 1940 (CAS 80889).

REMARKS.—This species is evidently quite rare, and Sadlier (1986) examined only two specimens. CAS 80889 comes from the type locality and matches the holotype in squamation and approximate size (SVL 36 mm). The coloration of this specimen differs in some respects from that described by Sadlier (1986) and exhibits some features not reported for either of the two known specimens, particularly a distinct, dark nuchal band (see Fig. 3).

Marmorosphax tricolor Bavay

Lygosoma tricolor Bavay, 1869:17. Type locality: Nouvelle-Calédonie by implication. Neotype locality: "summit of Mt Aoupinie (1,086 m), New Caledonia, 21°11'S, 165°16'E" (designated by Sadlier 1986).
Marmorosphax tricolor Sadlier, 1986:32.

MATERIAL EXAMINED (95 specimens).—Locality 6: July–Aug. 1940 (CAS 80800); Locality 9: 11 Oct. 1984 (CAS 157756); Locality 12: 3–10 Oct. 1984 (CAS 157747–55), 12 Oct. 1984 (CAS 157757), 1–9 June 1985 (CAS 158399–429, 158544–5), 29 Dec. 1985–1 Jan. 1986 (CAS 159590–8), 8 Jan. 1986 (CAS 159600–5), 15 Dec. 1986 (CAS 162306–10); Locality 21: 1913 (exchanged from NHMB, 1921) (CAS 53988); Locality 31: 25 May 1985 (CAS 158367–71), 15–16 June 1985 (CAS 158372–7), 28 Dec. 1985 (CAS 159586, 159588), 10–11 Dec. 1986 (CAS 162258–61, 162263–4); Locality 35: July–Aug. 1940 (CAS 80802–8); Locality 40: 5 Jan. 1986 (CAS 159599), 18 Dec. 1986 (CAS 162317), 19 Dec. 1986 (CAS 162322).

REMARKS.—This is the most common skink in heavily forested areas of the wetter regions of New Caledonia. These moderately large skinks (max. SVL 66 mm, CAS 162264) were often found under large stones, where they feed on ants, scorpions, and terrestrial arthropods (Bauer and DeVaney 1987). Juveniles of this viviparous species were collected only during December and January 1985/86 and measured 22–25 mm SVL, confirming Sadlier's (1986) observations.

Nannoscincus gracilis (Bavay)

Lygosoma gracilis Bavay, 1869:24. Type locality: Nouvelle-Calédonie by implication.
Mocoa micropus Günther, 1872:420. Type locality: "Feejee Islands" (amended to New Caledonia in British Museum [Natural History] catalogue).
Nannoscinicus gracilis Sadlier, 1986:58.

MATERIAL EXAMINED (26 specimens).—Locality 12: 4–5 Oct. 1984 (CAS 157685–9), 1–9 June 1985 (CAS 158522–3, 158527–41), 1 Jan. 1986 (CAS 159608–9), 13 Dec. 1986 (CAS 162305) 15 Dec. 1986 (CAS 162313).

REMARKS.—This is the largest (max. SVL 41 m, CAS 162305) and most widespead member of the genus. All material was obtained in very moist conditions under logs and stones (Bauer and DeVaney 1987). The species appears particularly prone to dehydration. Like all members of the genus, *Nannoscincus gracilis* appears to be at least partially fossorial, and it frequently attempts to escape by burrowing rapidly into the substrate. The largest individual, collected in mid-December, contained two very large eggs filling most of the body cavity. This confirms Sadlier's (1986) report and suggests that the rainy December–January period and the periods immediately bracketing it are the periods of breeding and/or birth/hatching for many New Caledonian lizard species.

Nannoscincus greeri Sadlier

Nannoscincus greeri Sadlier, 1986:63. Type locality: "lower east slope of Mt Koyaboa, Poindimié, ca. 20°56'S, 165°20'E" [New Caledonia].

MATERIAL EXAMINED (12 specimens).—Locality 12: 12 Oct. 1984 (CAS 157692–3), 2 June 1985 (CAS 15825–6 [PARATYPES]), 29 Dec. 1985 (CAS 159606 [HOLOTYPE]), 1 Jan. 1986 (CAS 159607 [PARATYPE]), 15 Dec. 1986 (CAS 162312, 162314–5); Locality 35: July–Aug. 1940 (CAS 80819–21), CAS 158524 [PARATYPE] exchanged to Australian Museum, registered as AMS R-123000.

REMARKS.—This smallest of *Nannoscincus* species (max. SVL 34 mm, CAS 162312) has been reported only from central eastern and southwestern New Caledonia. Its microhabitat is identical to that of the sympatric *N. gracilis.* The smallest individual (CAS 162315, 22 mm SVL) was collected in December and differs from larger individuals (as reported by Sadlier 1986) in possessing a prominent light spot on the nape and a broken, pale midvertebral stripe.

The date of collection of the holotype was incorrectly reported as January 1, 1986, by Sadlier (1986).

Nannoscincus mariei (Bavay)

Anotis Mariei Bavay, 1869:29. Type locality: Nouvelle-Calédonie by implication.
Nannoscincus fuscus Günther, 1872:421. Type locality: "Feejee Islands" (amended to New Caledonia in British Museum [Natural History] catalogue).
Nannoscincus mariei Sadlier, 1986:56.

MATERIAL EXAMINED (35 specimens).—Locality 27: 11–12 Dec. 1986 (CAS 162297–304); Locality 31: 25 May 1985 (CAS 158358–9), 15–16 June 1985 (CAS 158360–66), 28–29 Dec. 1985 (CAS 159583–5), 10 Dec. 1986 (CAS 162254–7), 11–12 Dec. 1986 (CAS 162291–5); Locality 35: July–Aug. 1940 (CAS 80813–8). CAS 80812 exchanged to Museum of Comparative Zoology.

REMARKS.—This is another southern New Caledonian endemic and was collected only in extremely moist microhabitats, under rocks and logs, and among the roots of trees. All females of this small skink (max. SVL 39 mm, CAS 158363) collected in December 1986 contained one or two large, elongate eggs.

Nannoscincus slevini (Loveridge)

Lygosoma slevini Loveridge, 1941:193. Type locality: "Mont Canala, New Caledonia."
Nanoscincus slevini Sadlier, 1986:61.

MATERIAL EXAMINED (1 specimen).—Locality 35: July–Aug. 1940 (CAS 80822).

REMARKS.—This species had not been previously recorded from southwestern New Caledonia. Other specimens are from the region of Canala. The Yahoué locality is unique in supporting three species of *Nannoscincus*—*N. greeri, N. mariei,* and *N. slevini.*

Phoboscincus bocourti (Brocchi)

Eumeces Bocourti Brocchi, 1876:95. Type locality "Nouvelle-Calédonie."
Phoboscincus bocourti Greer, 1974:15.

MATERIAL EXAMINED: No CAS specimens.

REMARKS.—This species is known only from the holotype (SVL 275 mm). The senior author observed what was apparently an individual of this species at ca. 2030 hr on 21 December 1986 just south of the Kuébini River. The sighting may have been of a *Phoboscincus garnieri* or an unknown species, but the estimated size of the animal (ca. 400 mm total length) is consistent with *P. bocourti.*

According to Greer's (1974) hypothesis of lygosomine relationships, the separation of *Phoboscincus* and *Tachygia* from *Eugongylis* leaves the last genus paraphyletic. Böhme (1976) considered the generic distinctions proposed by Greer (1974) to be continuously variable in a morphocline of constituent taxa and relegated *Phoboscincus* spp. as well as a new species, *Eugongylus haraldmeieri* (*Geoscincus haraldmeieri* of Sadlier 1986), to the single genus *Eugongylus.* Present evidence tends to favor Böhme's treatment of the group, but in the absence of strictly cladistic analysis, we retain the genera *Phoboscincus* and *Geoscincus* as lineages putatively independent of *Eugongylus.*

Sigaloseps deplanchei (Bavay)

Lygosoma Deplanchei Bavay, 1869:23 (non *Lygosoma Deplanchei* Bocage, 1873). Type locality: Nouvelle-Calédonie by implication.
Hinulia tetragonurus Günther, 1872:420. Type locality: "Feejee Islands" (amended to New Caledonia in British Museum [Natural History] catalogue).
Sigaloseps deplanchei Sadlier, 1986:50.

MATERIAL EXAMINED (65 specimens).—Locality 31: 25 May 1985 (CAS 158871–4, 158876), 15–16 June 1985 (CAS 158877–94), 28 Dec. 1985 (CAS 159577–82, 159587, 159589), 10–12 Dec. 1986 (CAS 162246–53, 162265–70, 162296); Locality 35: July–Aug. 1940 (CAS 80768–69, 80771, 80775, 80777); Locality 40: 19 Oct. 1984 (CAS 157690–1), 19 May 1985 (CAS 158336–8), 14 June 1985 (CAS 158339–43), 20 Dec. 1986 (CAS 162352–3); Locality 41: 30 May 1985 (CAS 158391–2).

REMARKS.—This small (max. SVL 46 mm, CAS 162246) skink is a southern New Caledonian endemic. Specimens were collected from underneath rocks and debris in shaded areas of forest floor in humid montane forest (Localities 31 and 41) and in coastal forest belt (Locality 40). It is intermediate in habitat between *Marmorosphax tricolor* and *Nannoscincus* spp. and eats a variety of small terrestrial prey (Bauer and DeVaney 1987).

Tropidoscincus roehssii (Andersson)

Lygosoma röhssii Andersson, 1908:4. Type locality: "New Caledonia."
Tropidoscincus rohssii Sadlier, 1986:30.

MATERIAL EXAMINED (15 specimens).—Locality 38: June 1985 (CAS 172741–42); Locality 40: 22 May 1985 (158349–50), 11–14 June 1985 (CAS 158347–8, 158351–7), 4 Jan. 1986 (CAS 159572), 21 Dec. 1986 (CAS 162462).

REMARKS.—Like all members of this genus, juveniles of *Tropidoscincus roehssii* have distinctive yellowish dorsolateral and midlateral stripes on the forebody, and a generally reddish-brown tail. Adults are greyish to olive-brown and lack stripes. The venter of adult males is orange-red, fading somewhat on the limbs and tail; the chin and anterior part of the throat are white. Juveniles were most frequently encountered during May–June 1985 (nine of 11 specimens collected during this period). The largest adult specimen measured (CAS 158348) was 75 mm SVL. Comments about the ecology of *Leiolopisma variabile* in Bauer and DeVaney (1987) refer to this taxon.

Tropidoscincus variabilis (Bavay)

Tropidolopisma variabilis Bavay, 1869:26. Type locality: Nouvelle-Calédonie by implication. Neotype locality: "Mt. Panie (750 m), New Caledonia, 20°33'S, 164°45'E" (designated by Sadlier 1986).
Tropidoscincus variabilis Sadlier, 1986:24.

MATERIAL EXAMINED (2 specimens).—New Caledonia: exchanged from NMBA, 1914 (CAS 38827); Locality 6: July–Aug. 1940 (CAS 80798).

REMARKS.—The larger of the two specimens (CAS 38827) measures 67 mm SVL.

Family TYPHLOPIDAE

Ramphotyphlops braminus (Daudin)

Eryx braminus Daudin, 1803:279. Type locality: "Vizagatapam, Bengale, Inde."
Ramphotyphlops braminus Robb, 1966:676.

MATERIAL EXAMINED (7 specimens).—Locality 37: Nov. 1986 (CAS 162092–4), 12 Dec. 1986 (CAS 162095–6), 18 Dec. (CAS 162097), 22 Dec. 1986 (CAS 162098).

REMARKS.—These are the first collected specimens (Bauer 1987) of this widespread, parthenogenetic species and range in size from 66 to 161 mm SVL. The only other typhlopid reported

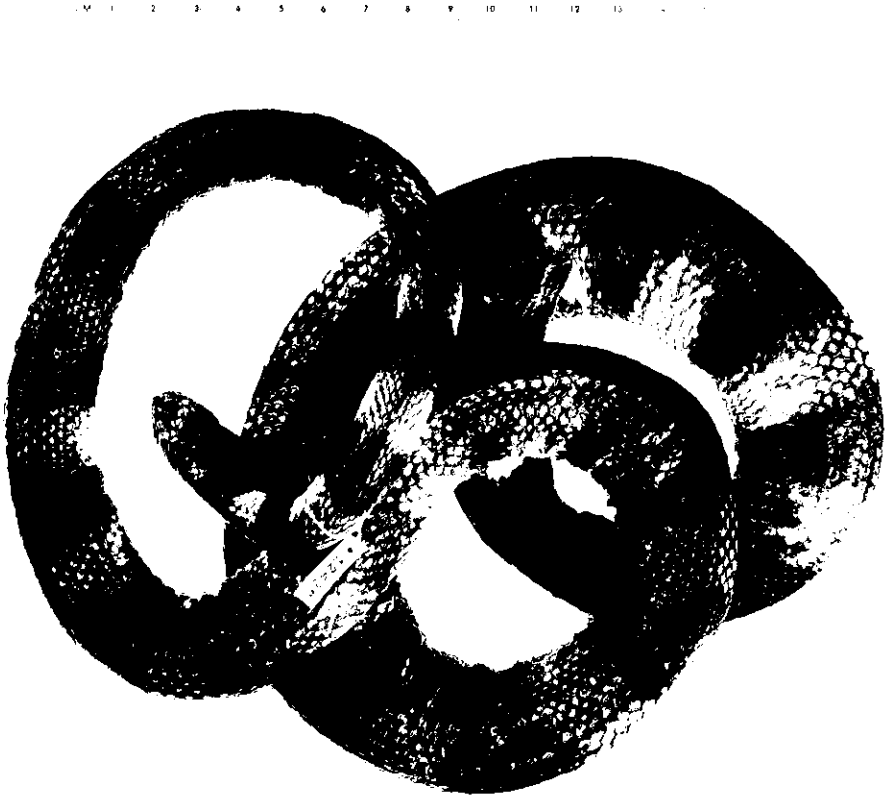

FIGURE 4. *Hydrophis coggeri* (CAS-SU 12430). First record from New Caledonian waters.

from the New Caledonian mainland is *Ramphotyphlops angusticeps,* and only the type of this species, otherwise distributed in the Solomons, bears this locality. It is probable, however, that Peters's (1877) holotype locality of "Neu Kaledonien" is an error (Roux 1913; McDowell 1974), most likely a lapsus for Neu Pommeranien or Neu Brittanien, as this taxon is otherwise known only from the Solomon Islands. Discussion with natives in New Caledonia suggests that typhlopids probably became established within the last decade and that they are now present in most disturbed areas of both the east and west coasts of the island.

Family HYDROPHIIDAE

Hydrophis coggeri (Kharin)

Leioselasma coggeri Kharin, 1984:1538. Type locality: "Fiji, Port Suva" [translated from original Russian].
Hydrophis coggeri Cogger, 1986:658.

MATERIAL EXAMINED (1 specimen).—Locality 43: Apr. 1945 (CAS-SU 12430).

REMARKS.—This specimen (SVL 1,024 mm) (Fig. 4) represents the first confirmed New Caledonian record for the species. It is similar to sea snakes from the Coral Sea and the vicinity of Fiji first reported by McDowell (1972) and Cogger (1975) as *Hydrophis melanocephalus* and later

used by Kharin (1984) in his revision of *Leioselasma*. Minton and Dunson (1985) collected specimens probably also referable to this species at the Chesterfield Reefs. We here retain the more familiar generic designation *Hydrophis* for this species.

Laticauda colubrina (Schneider)

Hydrus colubrinus Schneider, 1799:238 (Linnaeus 1758 based his *Coluber laticaudatus* partly on this species and partly on the following species, fide Andersson 1899). Type locality: unknown.
Laticauda colubrinus Stejneger, 1907:406.

MATERIAL EXAMINED (8 specimens).—Locality 39: 19–23 May 1985 (CAS 158304–10); Locality 43: Apr. 1945 (CAS-SU 12438).

REMARKS.—This species is by far the most common nearshore sea snake in New Caledonia. Hundreds of individuals may come ashore, particularly during the period of egglaying (Saint Girons 1964). Most individuals collected were resting in rock crevices at water's edge during daylight hours. The largest specimen examined is CAS 158306, SVL 860 mm.

Laticauda laticaudata (Linnaeus)

Coluber laticaudatus (part) Linnaeus, 1758:222. Type locality: "Indiis."
Laticauda laticaudata Stejneger, 1907:402.

MATERIAL EXAMINED (3 specimens).—Locality 40: 2 Jan. 1986 (CAS 159568); Locality 43: Apr. 1945 (CAS-SU 12441–2).

REMARKS.—This species occurs with *Laticauda colubrina* in most New Caledonia nearshore habitats. The specimen collected in 1986 was obtained in 0.5 m of water at ca. 2100 hr and was one of several specimens that were swimming towards shore. CAS-SU 12441 (SVL 1,088 mm) is the largest specimen.

BIOGEOGRAPHY OF THE NEW CALEDONIAN HERPETOFAUNA

Roux (1913) first analyzed New Caledonian herpetofaunal characteristics and identified four faunal elements: strictly New Caledonian endemics, regional endemics (New Caledonia and the Loyalty Islands), Melanesian-Polynesian elements, and cosmopolitan elements. Sternfeld (1920), Sarasin (1925), Burt and Burt (1932), Mertens (1934), Brown (1956), Virot (1956), Gibbons (1985), and Bauer (1986, 1988a), among others have since discussed the biogeographic affinities of the herpetofauna of the region. Most of these authors stressed the high levels of endemism and the contrast provided by New Caledonia to the trend of Papuan diminution that typifies many of the islands of the central and eastern Pacific, and have focused on the potential faunal ties of New Caledonia to Australia and New Zealand. With an increased knowledge of the historical geology of the region and the phylogeny of its herpetofauna, it is now possible to begin to redefine the faunal elements of the region.

The marine taxa of New Caledonian waters show little tendency towards endemism, although *Hydrophis coggeri* appears to be restricted to a relatively small area between the Coral Sea and Fiji (Kharin 1984). Most of the sea snakes are primarily inhabitants of the waters of the Australian continental shelf and reach their easternmost limits in New Caledonia, or like *Hydrophis ornatus* and *Laticauda* spp., are distributed broadly from western Asia to the western Pacific (Cogger 1975). These taxa favor shallow waters, and their occurrence around New Caledonia is not surprising given that the Chesterfield Reefs and the northern tip of the Lord Howe Rise provide a shallow-water corridor from the Queensland coast, with only two narrow deeper basins intervening (O.R.S.T.O.M. 1981). The remaining New Caledonian sea snakes, *Emydocephalus annulatus* and *Pelamis platurus*, are both more widely distributed in the Pacific, the latter to the coast of the Americas. All of the New Caledonian sea turtles range widely in the tropical and subtropical Pacific (Iverson 1986). Although turtle populations are conspicuous and easily monitored during nesting periods, the same is not true of the hydrophiids. Some of the sea snake records for New Caledonia are doubtful (see checklist), and more sampling is needed to complete the species list accurately for the region.

Among terrestrial species, *Litoria aurea* and *Hemidactylus frenatus*, and almost certainly *Ramphotyphlops braminus*, have been introduced by man into New Caledonia during historical times. Their arrival in New Caledonia is easily explained by human transport from adjacent, or even distant, regions. *Litoria aurea* presumably arrived from Australia, although the species was already established in parts of New Zealand by the late 1860s (Bell 1982), and the North Island could conceivably have been the

source of at least some of the New Caledonian populations. The advent of rapid and frequent shipping contact in the South Pacific during and after World War II makes the determination of the origin of the other two species more problematic. Although this European-era faunal element is of little interest to historical biogeography, it is of prime ecological concern since, at least in the case of *H. frenatus,* native forms appear to be adversely affected by recent migrants (see *Hemidactylus* species accounts).

A second element includes *Lepidodactylus lugubris, Nactus pelagicus, Hemidactylus garnotii,* and *Hemiphyllodactylus typus*—species that are widespread in Oceania or the Pacific and South-East Asia. These are "weedy" species (Bauer 1988a), which by virtue of small size, the calcareous gekkonine eggshell (Werner 1972; Dunson 1982), and parthenogenesis (at least in the first three species and possibly the fourth [Kluge and Eckardt 1969; Cuellar and Kluge 1972; Moritz 1987; Ineich 1988]) have been able to colonize successfully over water.

McCann (1953), Brown (1956), Kluge (1969) and Ineich (1987) outlined suites of biological characteristics conducive to over-water dispersal and colonization. All of the taxa in the first and second faunal-element categories possess most of these features. However, the additional features of human-aided dispersers as outlined by Kluge (1969) are: (1) undifferentiated from probable parent stock; (2) distributed primarily in areas of human settlement; (3) primarily coastal (associated with ports); and (4) dates of introduction established do not necessarily hold true for the second faunal element.

Little work has been done on the variability of the wide-ranging taxa of oceanic lizards. Morphological differentiation among Polynesian populations of *Lepidodactylus lugubris* is low (Blanc and Ineich 1985), and there is high histocompatibility between Hawaiian and French Polynesian populations (Cuellar 1984), but genetic studies have demonstrated that there are at least two bisexual populations and five clonal races in the central South Pacific (Ineich 1987, 1988). In contrast, only a single genetic clone was found by Moritz (1987) among several widely distributed populations of *Nactus pelagicus* from the western Pacific (including New Caledonia). Genetic homogeneity may be an indication of recent establishment or fragmentation of populations, as suggested for the skink *Lipinia noctua* (Zweifel 1979), or it may be a reflection of intrinsically limited genetic variability, as in clonal lineages such as the parthenogenetic New Caledonian taxa *Lepidodactylus lugubris, Nactus pelagicus, Hemidactylus garnotii,* and probably *Hemiphyllodactylus typus* (Cuellar and Kluge 1972; Cuellar 1984; Pasteur et al. 1987). Thus, for parthenogens, Kluge's (1969) first criterion does not distinguish between human-aided and naturally occurring dispersal.

The distribution of *Hemiphyllodactylus, Nactus, Lepidodactylus,* and *Hemidactylus garnotii* is not limited to human habitations or to coastal localities in New Caledonia, and at least the former two taxa are restricted to more undisturbed habitats there. Finally, all of these taxa were recorded by Bavay in 1869, during the earliest stages of French colonization of the island. Their presence in undisturbed areas at this early date argues strongly against dispersal by Europeans, although the transport of some taxa by ship is so easy that it cannot be ruled out entirely (Schnee 1901).

Transportation to New Caledonia via human aid in pre-European times remains a strong possibility, and this means of dispersal has been argued for many lizard species in the central and eastern Pacific (Garman 1908; Zweifel 1979; Gibbons 1985; Crombie and Steadman 1988). Crombie and Steadman (1988) dismissed natural rafting as statistically unlikely between the tiny islands of the central Pacific and suggested that *Lepidodactylus lugubris* arrived in the Cook Islands with the Polynesians, while *Hemidactylus garnotii,* which is spottily distributed and frequents edificarian habitats in Polynesia, may have been an import of the post-Polynesia era. Ineich (1982), however, believed that *L. lugubris,* at least, may have antedated man in Oceania. While lowered sea levels in the Pleistocene (and earlier) (Gibbons 1985) may have had only a minor effect on the small, isolated islands of the central and eastern Pacific, their effect in the New Caledonian region was marked. More "stepping stones" would have been emergent on routes from Australia and New Guinea (Gibbons 1985:135, fig. 3).

Although the navigational prowess and frequent travels of the Polynesians are well established (see Crombie and Steadman 1988), the pre-European movements of Melanesians to and from New Caledonia are less well understood. Nonetheless, data obtained from Lapita pottery

(White et al. 1988) and largely untapped ethnobotanical sources (see O.R.S.T.O.M. 1981) clearly indicate a strong cultural link at least 6,000 years old to northern Melanesia, in particular the Solomons and Bismarks, as well as more recent connections via Fiji into Polynesia. Clearly the possibility exists for the human transport of at least some of the second-element taxa. By the same token, however, other seemingly easily transported taxa such as *Gehyra mutilata* and *Emoia cyanura*, which occur both southeast and northwest of New Caledonia along the probable routes of prehistoric contact, are absent from New Caledonia. For the present, the origin of the four species of second-element lizards remains problematic, although a reasonably recent (post-Pliocene) but pre-European introduction, whether human-aided or not, appears likely.

All species in the first two categories are present in the Loyalty Group as well as on the New Caledonian mainland. Only one species, *Caledoniscincus atropunctatus*, occurs in New Caledonia, the Loyalty Islands, and parts of neighboring Vanuatu, and it is part of a primarily New Caledonian radiation of skinks (Sadlier 1986). It is likely that this species has only recently established itself in Vanuatu (Bauer 1988b), as the paleoposition of Vanuatu would have precluded easy dispersal prior to 6–8 mybp (Chase 1971).

Native regional endemics (occurring both in New Caledonia and the Loyalty Islands) include the geckos *Bavayia crassicollis, B. cyclura, B. sauvagii*, and the skinks *Caledoniscincus austrocaledonicus, Cryptoblepharis novocaledonicus, Leiolopisma nigrofasciolatum*, and *Phoboscincus garnieri*. All but *C. novocaledonicus* and *P. garnieri* are representatives of New Caledonian radiations, probably of great age (Sadlier 1986; Bauer 1986, in press). Colonization of the Loyalty Islands from New Caledonia probably took place recently, perhaps during the Pleistocene period of low sea levels. Most of the Loyalty Islands have probably only been emergent since this time (Bauer 1988a), and being low-lying, have only been able to support those species occurring in coastal forest or marginal strand habitats. Interestingly, *Bavayia sauvagii* is restricted to Maré, the only island with substantial non-coralline areas. This is consistent with this gecko's preference for rocky substrates (Bauer and DeVaney 1987), otherwise lacking in the Loyalties.

Cryptoblepharis novocaledonicus is a member of a pan-Pacific genus of 36 morphologically similar skinks formerly considered as subspecies of a single variable species (Mertens 1934; Greer 1974). Distinct morphological differentiation within the genus supports the pre-human occurrence of *Cryptoblepharis* in the region (Mertens 1931), but its age in the region is uncertain. Like *Bavayia sauvagii, C. novocaledonicus* favors rocky habitats and has been recorded only from Maré in the Loyalties. *Phoboscincus garnieri* (with *P. bocourti* restricted to the New Caledonian mainland) is an offshoot of the genus *Eugongylus* (Greer 1974), a Papuan lineage. Its ancestors may well have arrived via over-water dispersal, and like the previous taxon, it represents an unambiguous pre-human arrival. This is supported by the known dispersal abilities of *Eugongylus* sensu stricto, but too little is known of the biology of the endemic Caledonian taxa to shed light on the issue.

A few species occur only in the Loyalty Islands or in the Loyalties and Oceania at large, excluding New Caledonia (*Emoia cyanura*), or in the Loyalties and the Solomon Islands and other Melanesian Outer Arc (Holloway 1979) islands (*Candoia bibroni, Gehyra vorax*). It appears likely that these taxa reached the Loyalties quite recently via over-water dispersal from northern and/or eastern source areas, and that there has been insufficient time for speciation to occur in the region. The presence of *Candoia* in the Loyalty Islands remains puzzling. The genus shows the typical diminution of species expected for a group of Papuan origin (Gibbons 1985; Bauer 1988b), but if they are correctly identified as boas, their occurrence in the Pacific at all is difficult to understand. Phylogenetic analysis being undertaken by Kluge (1988) may shed light on the problem. Only *Emoia loyaltiensis*, which shares great affinity with the *Emoia samoensis* group, has apparently speciated in the Loyalties (Brown in press). *Rhamphotyphlops willeyi*, described from Lifou in the Loyalties, has also been recorded from the Solomon Islands (McCoy 1980). However, snakes in these two areas may be specifically distinct from one another (McDowell 1974), although they are certainly closely related.

The absence of these Loyalty taxa from New Caledonia has long been recognized (Roux 1913), but its basis is by no means well established. The recent movement of Vanuatu to its present position (Chase 1971) and the emergence of the Loyalty Islands may reduce the problem to one that is analyzable under the equilibrium model

of island biogeography (MacArthur and Wilson 1967). The prevailing southern tropical counter current (O.R.S.T.O.M. 1981) would tend to bring propagules to the Loyalties from New Caledonia, while other currents lead from Fiji and Vanuatu toward the Loyalties (Gibbons 1985). Apparently the preference of *Gehyra vorax* and *Emoia* spp. for vegetated over edificarian habitats has prevented accidental transportation and establishment of these taxa on the mainland, in spite of daily boat and air crossings of cargo and passengers.

Among the remaining taxa, 29 species belonging to 8 genera occur only on the New Caledonian mainland or adjacent islands, such as the Ile de Pins, Ile Ouen, and the Iles Belep, which were connected to the mainland during the Pleistocene (Gibbons 1985, fig. 3). These species are limited in vagility by saltwater-permeable eggs (all), specific habitat requirements (such as rainforest; e.g., some *Rhacodactylus*), and low resistance to desiccation (e.g., *Nannoscincus*).

The carphodactyline geckos *Rhacodactylus, Eurydactylodes,* and *Bavayia* represent a natural group that has invaded Australia (Bauer 1986, in press). King (1987) has proposed a Gondwanan origin for geckos as a whole and subsequent phylogenesis associated with the breakup of the supercontinent. We believe that evidence supports the origin of the subfamily Diplodactylinae as a result of the isolation (both geographical and climatical) of eastern Gondwanaland from its neighbors. Immunological investigations in the context of molecular clock dating suggest that the New Caledonian carphodactylines last shared a common ancestor with Australian members of the group at least 66 mybp (King 1987; Bauer and Rainey in prep.). This is compatible with the accepted age of the opening of the Tasman and Coral seas some 80 mypb (see Bauer 1986 for complete discussion).

The origin of the endemic skinks of New Caledonia is less easily explained. *Phoboscincus bocourti* and *Geoscincus haraldmeieri,* following the reasoning outlined above, probably arrived as a result of over-water rafting of a *Eugongylus*-like ancestor. Most of the remaining taxa fall into Greer's (1974) *Leiolopisma* group and were arranged by Sadlier (1986) into the genera *Leiolopisma* sensu stricto, *Caledoniscincus, Tropidoscincus, Marmorosphax,* and *Sigaloseps.* The first genus is apparently paraphyletic, but Sadlier (1986) grouped its New Caledonian members and the following three genera as each other's closest relatives, with *Sigaloseps, Graciliscincus,* and *Nannoscincus* (including the Australian *N. maccoyi*) as separate lineages. Even after the reshuffling of *Leiolopisma,* the biogeography of the group makes no more sense than it did following Greer's generic concepts (see Zug 1985b), and neither vicariance nor dispersal hypotheses alone adequately account for the observed distribution patterns.

The minor radiation of some taxa such as *Tropidoscincus* and *Nannoscincus* in New Caledonia demonstrates that the New Caledonian land mass is large enough and diverse enough ecologically to have supported "continental" speciation (sensu Diamond 1984) in reptiles. The occurrence of the purportedly monophyletic *Leiolopisma* group skinks certainly suggests a long period of evolution in isolation in New Caledonia. Unfortunately, the absence of a broader, explicit phylogenetic hypothesis for the Lygosominae does not permit an application of narrative historical biogeographical methods (sensu Humphries and Parenti 1986), nor are the phylogenies of other biotic components of the region well established enough to effectively utilize the analytical approach of cladistic biogeography. The scincids thus represent the most glaring gap in our general understanding of the zoogeography of the New Caledonian herpetofauna.

Within New Caledonia, some ecogeographic trends are seen. Most noticeably there is a faunal element which, via the vegetation, is tied to the regions of lateritic soils that cover about one third of the land area of the mainland (O.R.S.T.O.M. 1981; Morat et al. 1986; Jaffré et al. 1987). This group includes *Graciliscincus shonae, Tropidoscincus roehssii, Sigaloseps deplanchei, Nannoscincus mariei, Rhacodactylus auriculatus,* and *R. sarasinorum.* All of these taxa occur only in the southern third of the island, the largest single region of lateritic soils. Unfortunately, the exact nature of the relationship between the soil type and these lizards is unclear, although the effect of soil on the peculiar "New Caledonian growth form" of much of the flora is well known (Jaffré 1980).

Other components of the endemic fauna appear to have ranges associated with pluviometric features of the island. The greatest diversity of species occurs on the more humid east coast, where the winter wet season is most pronounced. This is especially true of geckos (Bauer 1986) and

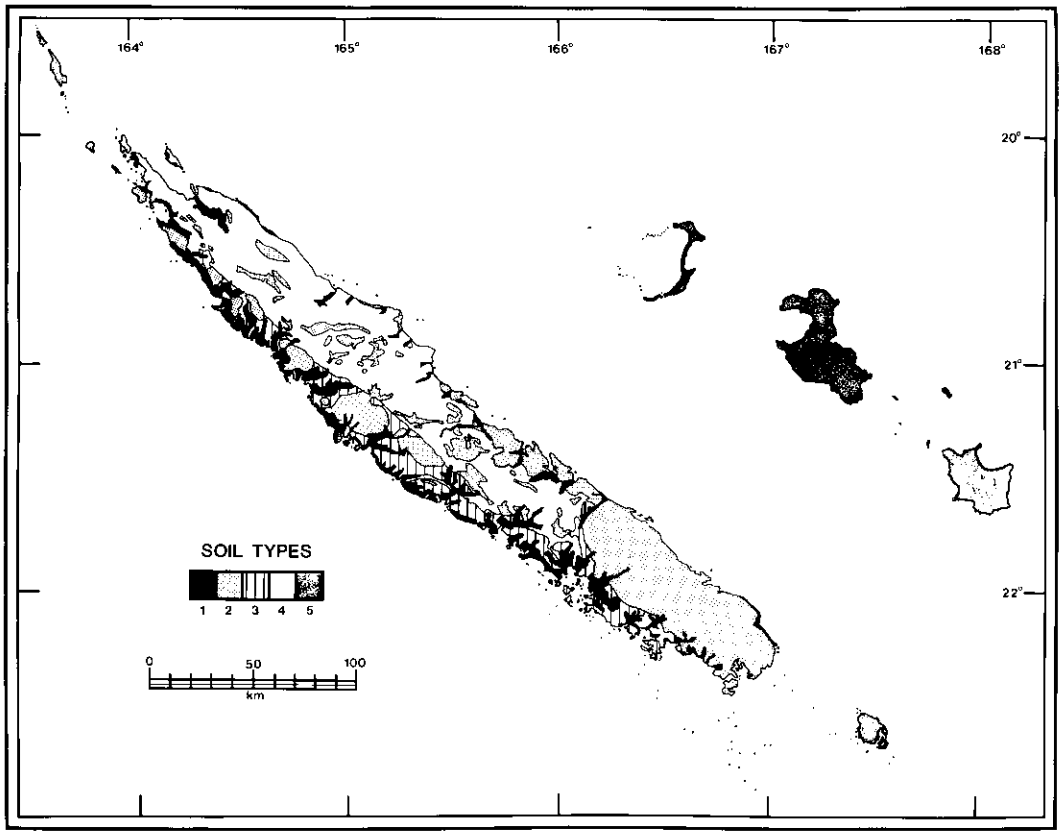

FIGURE 5. Soil types of New Caledonia; 1, alluvial soils; 2, feralitic soils on ultramafic rocks; 3, brown soils over basic rocks; 4, other non-carbonate soils; 5, carbonate soils. Many patterns of intra-island endemism are associated with the lateritic soil types (2 in legend), especially in the large continuous region in southern New Caledonia. (Map modified from Atlas de la Nouvelle-Calédonie et Depéndences, 1981, O.R.S.T.O.M., Paris.)

the sub-fossorial skink species (Sadlier 1986). Elevation appears to play less of a role in New Caledonia than on other high islands, and there are no known high-elevation endemics, although herpetological investigations of the many peaks over 1,000 m has been limited and should have high priority for future research.

Perhaps one of the most intriguing features of the zoogeography of New Caledonia concerns the taxa now extinct, including meiolaniid turtles (Gaffney et al. 1984), mekosuchian crocodiles (Buffetaut 1983; Balouet and Buffetaut 1987), and varanids (Gaffney et al. 1984). All of these animals were probably contemporaneous with man. The occurrence of these fossil forms is somewhat unsettling, as they disrupt the established picture of reptile distribution in the Pacific and may weaken existing hypotheses if applied in the context of cladistic biogeography. Their presence again raises the question of the role of man in shaping the present herpetofauna, not only by means of introductions, but by extinction as well (Cassels 1984; Steadman 1985). For example, *Varanus* may have been a native form that was exterminated by early settlers, or, as in Palau and the Caroline islands, it may have been brought to New Caledonia as food and subsequently died out. Fossil geckos and skinks (perhaps including new taxa) have also recently been discovered, but probably predate the arrival of man in New Caledonia (Balouet and Olson 1989).

The addition of both phylogenetic and geologic hypotheses that are well corroborated has added much to the progress in interpretation of the herpetofauna of New Caledonia. Perhaps the most significant insights since the work of Roux (1913) are that (1) some faunal elements, such as the carphodactyline geckos and some of the skinks,

are probably present as the result of vicariant events associated with the breakup of Gondwanaland (Bauer 1986, in press), and (2) the recognition that the fauna of the region, like that of other Pacific high islands (Gibbons 1985; Bauer 1988a, b), is a mosaic of elements derived from a variety of sources.

Among the priorities for establishing a firmer understanding of the biogeography of the new Caledonian herpetofauna are: (1) the erection of an explicit hypothesis of lygosomine relationships; (2) the genetic analysis of Pacific populations of widespread taxa in order to trace potential migration or transport routes (this work has already begun, e.g., Ineich 1988; Moritz 1987); and (3) the study of additional fossil material that may indicate a once broader faunal diversity. Perhaps most basically, more locality data and careful field work in neglected regions of New Caledonia, particularly fossorial and montane habitats, are needed in order to establish the patterns of ecogeographic variation and complete the herpetofaunal list for the region.

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