

Checklist and Comments on the Terrestrial Reptile Fauna of Kau Wildlife Area, Papua New Guinea

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The island of New Guinea has been identified as a megadiverse region because of its extraordinary biodiversity and highly endemic biota (Mittermeier and Mittermeier 1997). New Guinea, the world's largest and highest tropical island, occupies less than 1% of global land area yet 5–7% of the world's biodiversity is found on the island (Beehler 1993; Dinerstein and Wikramanayake 1993; Mack 1998; Myers et al. 2000). The herpetofauna of New Guinea currently known to science accounts for about 5% of the world's reptile and amphibian diversity (Allison et al. 1998). Remarkably, this is an underestimate of true diversity; it is predicted that 30–60% of the reptile and amphibian fauna of New Guinea remains unknown to science (Allison 1993). The vast diversity of biological life on New Guinea is a result of the island's diverse topography, extensive range of habitat types, and complex geological history. With elevations ranging from sea level to over 5000 m, the varied habitat zones, packed into an area one-tenth the size of the United States, include relictual tropical glaciers, alpine grasslands, montane moss forests, dense lowland rainforests, sago palm swamps, and eucalypt savannas.

The lowland rainforest on the north coast of Papua New Guinea has been severely impacted by logging (Beehler 1993). One of the few areas of lowland rainforest set aside for conservation and scientific study is the Kau Wildlife Area (KWA: 05°09'S, 145°46'E) near the provincial capital of Madang, Madang Province. The KWA is community owned and managed by the Didipa Clan of Kau and Baitabag Villages. The 800-ha KWA reserve is part of the extensive and broadly continuous Northern New Guinea lowland ecoregion that is made up of lowland, freshwater, and peat swamp forests. The lowland forests and freshwater swamps from this ecoregion contain diverse habitats, including lowland and hill forest, grass swamps, swamp forests, savannas, and woodlands (Conn 1995; Gressitt 1982; Henty 1981; Womersley 1978). The KWA, between 20–70 m in elevation, includes primary, successional, and riparian lowland broadleaf-evergreen forest. As many as 155 species of trees have been identified within a 1-ha plot of primary forest in the KWA (Bonaccorso et al. 2002). Dense stands of sago palm (*Metroxylon sagu*) are found in the low wet areas along the Kau and Biges Rivers. Many areas of the KWA have historically been subjected to traditional shifting fruit and vegetable gardens and many old abandoned garden areas surround the reserve. The climate of this region is wet tropical forest and in nearby Nagada Harbor annual precipitation averaged 3460 mm from 1994–96. The area is typified by distinct wet and dry seasons with less than 100 mm of monthly precipitation from June through August (Bonaccorso et al. 2002).

The northern region of New Guinea is a very active tectonic

area with a complex geologic history. Over the last 40 million years interplate impact resulted in considerable uplift and volcanism and importantly the accretion of at least 32 tectonostratigraphic terranes along the northern leading edge of the island that have influenced the biodiversity of the region (Pigram and Davies 1987; Polhemus and Polhemus 1998).

To date there has been no comprehensive herpetofaunal reports from the KWA. Here I compile a list of terrestrial reptile species present in the KWA based on fieldwork over the past 14 years. The KWA terrestrial reptile fauna, exclusive of crocodylians and turtles, currently includes 25 lizards and 7 snakes representing 8 families and 21 genera (Table 1). A similar compilation is underway for the amphibians of the region (S. Richards, pers. comm.). Specific specimen and locality information as well as associated tissues can be accessed via a searchable database of the LSU Museum of Natural Science reptile and amphibian collection (<http://www.lsu.edu/museum>).

SPECIES RICHNESS, TAXONOMY AND SPECIES-COMPLEX GROUPS

There are a large number of species complexes in the diverse New Guinea reptile fauna, especially among the scincid lizards. In addition to species complexes, many currently recognized species likely represent more than one taxon. Species richness, therefore, is likely much greater than is currently recognized. Below I comment on and address some of the taxonomic impediments to understanding the KWA terrestrial reptile fauna.

The agamid genus *Hypsilurus* is a poorly understood group. The taxonomy of the genus has been muddled by inadequate original descriptions, misidentified museum specimens, and the fact that the last comprehensive work on this group is 90 years old (de Rooij 1915). In particular, the geographic distribution and specific-level variation for virtually all species of *Hypsilurus* is not well understood. A recent comprehensive review of all type material has provided a much needed taxonomic summary and clarification (Manthey and Denzer 2006). Manthey and Denzer recognize 14 species of *Hypsilurus* acknowledging that this diversity is undoubtedly an underestimate (Manthey and Denzer 2006; Moody 1980). There are two species of *Hypsilurus* in the KWA: *H. modestus* and *H. papuensis*. *Hypsilurus modestus* is a relatively common small-bodied (maximum SVL = 107 mm) *Hypsilurus* with a broad range throughout the Papuan region (New Guinea and nearby associated islands), whereas *H. papuensis* is large bodied (maximum SVL = 190 mm) and uncommon with a poorly identified distribution throughout the Papuan region.

The gekkonid genus *Nactus* includes the widespread *Nactus pelagicus* complex that undoubtedly consists of several distinct species, the identification of which has been hindered by morphological conservatism and lack of adequate study. Based on morphological data, Zug and Moon (1995) determined the distribution of the asexual *N. pelagicus*, which includes Micronesia, southern Vanuatu (Erromango and Tanna Islands), New Caledonia, and eastward to Melanesia and Polynesia. *Nactus multicarinatus*, a bisexual species, has a range from the southern Solomon Islands and Vanuatu (excluding the islands of Tanna and Erromango) (Zug and Moon 1995). Donnellan and Moritz (1995) identified two highly differentiated populations of the *Nactus pelagicus* complex in Madang Province, Papua New Guinea based on allozymes. One of these Madang populations showed no fixed differences

TABLE 1. Checklist of the terrestrial reptile fauna of Kau Wildlife Area, Papua New Guinea. I refer to a species as 'Common' if it is typically encountered in an appropriate 8-h search period. Species listed as 'Uncommon' are encountered infrequently in the KWA and typically require more than a single day/night search of 8 h to locate.

Species	Comments & Literature
Lizards	
Agamidae	
<i>Hypsilurus modestus</i>	Common (Manthey and Denzer 2006; Moody 1980)
<i>Hypsilurus papuensis</i>	Uncommon (Manthey and Denzer 2006; Moody 1980)
Gekkonidae	
<i>Nactus multicaarinatus</i>	Common (Donnellan and Moritz 1995; Moritz 1987; Zug and Moon 1995)
<i>Cyrtodactylus</i> sp.	Uncommon (Brown and Parker 1973)
<i>Gekko vittatus</i>	Common (de Rooij 1915)
<i>Gehyra</i> sp.	Uncommon (Beckon 1992; Chrapliwy et al. 1961; King 1984; King and Horner 1989)
<i>Hemidactylus frenatus</i>	Common (Mortiz et al. 1993)
<i>Lepidodactylus lugubris</i>	Common (Mortiz et al. 1993)
Scincidae	
<i>Carlia mysi</i>	Common (Zug [2004] revised the <i>Carlia fusca</i> complex)
<i>Emoia caeruleocauda</i>	Common (Brown 1991)
<i>Emoia longicauda</i>	Uncommon (Brown 1991)
<i>Emoia jakati</i>	Common (Brown 1991)
<i>Emoia kordoana</i>	Uncommon (Brown 1991)
<i>Lamprolepis smaragdina</i>	Common (Greer 1970)
<i>Lipinia noctua</i>	Uncommon (Austin 1998; Zweifel 1979)
<i>Lobulia brongersmai</i>	Uncommon (Allison and Greer 1986; Zweifel 1972)
<i>Prasinohaema virens</i>	Uncommon (Mys 1988)
<i>Sphenomorphus jobiensis</i>	Common (Donnellan and Aplin 1989)
<i>Sphenomorphus mulleri</i>	Uncommon (de Rooij 1915)
<i>Sphenomorphus simus</i>	Common (formally <i>S. stickli</i> , Shea and Greer 1999)
<i>Sphenomorphus solomonis</i>	Common (de Rooij 1915)
<i>Sphenomorphus derooyae</i>	Uncommon (de Rooij 1915)
<i>Triblonotus gracilis</i>	Uncommon (Cogger 1972; Zweifel 1966)
Varanidae	
<i>Varanus indicus</i>	Common (low density) (Böhme 2003)
<i>Varanus prasinus</i>	Uncommon (low density) (Böhme 2003; Sprackland 1991)
Snakes	
Boidae	
<i>Candoia aspera</i>	Common, the most common terrestrial snake found in Kau (Austin 2000)
<i>Candoia carinata</i>	Uncommon (Austin 2000)
Pythonidae	
<i>Morelia viridis</i>	Uncommon (low density) (Rawlings and Donnellan 2003)
Colubridae	
<i>Boiga irregularis</i>	Uncommon (O'Shea 1996)
<i>Stegonotus modestus</i>	Uncommon (O'Shea 1996)
<i>Stegonotus parvus</i>	Uncommon (O'Shea 1996)
Elapidae	
<i>Micropechis ikaheka</i>	Uncommon (O'Shea 1996)

with the Solomon and northern Vanuatu bisexual *Nactus multicaarinatus* populations and thus this name should apply to one of the two Madang populations (Zug and Moon 1995). The con-

tact zone, if there is one, between the two genetically distinct Madang populations has not been identified and it is possible that both populations, likely corresponding to two distinct species, occur

in the KWA.

The gekkonid genus *Gehyra* in New Guinea consists of several species, the taxonomy of which is in need of revision (King 1984; King and Horner 1989). The geographic distribution and specific-level variation for virtually all species of New Guinea *Gehyra* is not well understood and many collections have misidentified taxa.

The scincid *Sphenomorphus jobiensis* complex was first identified from allozyme data and, to a limited extent, morphology, but these data were not used to delineate species boundaries (Donnellan and Aplin 1989). DNA sequence data (Austin, unpubl. data) confirm the apparent specific-level differentiation found by Donnellan and Aplin (1989). In addition to the *S. jobiensis* complex, there are many other complexes that involve multiple cryptic species. These include the complexes within the genus *Sphenomorphus* (*S. derooyae*, *S. leptofasciatus*, *S. mulleri*, *S. pratti*, and *S. solomonis*, complexes). *Sphenomorphus derooyae* is likely a complex of several species with many names available for different populations (*cranei*, *derooyae*, *maindroni*, and *wolffi*; G. Shea, pers. comm.). In addition, other problematic groups include the *Lipinia noctua* complex (Austin 1999a,b), *Papuascincus stanleyanus* complex, *Emoia longicauda* complex, and *Carlia fusca* complex (Zug 2004). Only the latter complex has been adequately studied with 14 morphologically distinct species identified and taxonomically delineating in the New Guinea region (Zug 2004). *Carlia mysi*, with a broad range across the northeast coast of New Guinea and the Bismarck Archipelago, is the only *Carlia* species recorded from the KWA.

UNCONFIRMED SPECIES THAT POSSIBLY ARE PRESENT IN THE KWA

Species not collected or visually confirmed, but likely present in the KWA, include (1) members of the *Cryptoblepharus boutonii* complex, which includes up to 36 'forms' (Mertens 1931) many of which are likely distinct species. Although not seen in the KWA, forest populations of *Cryptoblepharus* are often more secretive than coastal intertidal populations. (2) The genus *Emoia* includes approximately 42 species from New Guinea and associated archipelagos. The diversity and morphological conservatism in New Guinea *Emoia* has led to considerable confusion concerning the identification and taxonomy of this group. The genus *Emoia*, comprising 72 species, was revised by Brown (1991). This much-needed revision helped, but did not eliminate taxonomic obstacles for this large genus. In addition to the four *Emoia* recorded from KWA, six species of *Emoia* that occur in adjacent areas may be present in KWA. These include *Emoia battersbyi*, *E. cyanogaster*, *E. loveridgei*, *E. pallidiceps mehelyi*, *E. popei*, and *E. veracunda* (Brown 1991). (3) Seven other skinks with widespread yet patchy distributions along the north coast of New Guinea may be present in the KWA. These include *Eugongylus rufescens*, *Lipinia longiceps*, *L. pulchra*, *Sphenomorphus minutus*, *S. neuhaussi*, *S. pratti*, and *Tiliqua gigas* (Austin 1995, 1998; Mys 1988). *Sphenomorphus minutus*, although currently included in the *Sphenomorphus* group of Lygosomine skinks (Greer 1974, 1989; Hutchinson 1993), is actually a member of the *Eugongylus* group (Austin, unpubl. data). (4) Three pythons (*Apodora papuana*, *Leiopython albertisii*, and *Morelia amethystina*), while not recorded from the KWA, are likely present as they have been collected in nearby forested and human-disturbed areas adjacent to the KWA. (5) *Dendrolaphis calligasta* and *D. punctulatus* have both been

recorded from Madang Province and likely occur in the KWA (O'Shea 1996). (6) *Acanthophis* spp. have been recorded from Madang Province, but are typically found in open grassland not heavily forested regions like the KWA (O'Shea 1996). Various specific epithets have been given to the several geographic races of New Guinea populations of *Acanthophis*, yet authors differ in their assignment and the taxonomy of this group needs examination (McDowell 1984; Storr 1981; Wüster et al. 2005).

Acknowledgments.—I thank the people of KWA for the privilege to conduct fieldwork on their land. I also thank I. Bigilale and F. Bonaccorso from the PNG National Museum for their support of my field efforts. B. Roy, V. Kula, and B. Wilmot from the PNG Department of Environment and Conservation, and J. Robins from the PNG National Research Institute provided assistance with research visas and export permits. This research was funded in part by the National Science Foundation (DEB 0445213) and a Louisiana State University Faculty Research grant. I also thank A. Bauer and L. Grismer for helpful comments on an earlier version of this manuscript.

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Bufo typhonius (Bufonidae). Locality: Vereda Guaimia, Bajo Anchicayá, Valle del Cauca, Pacific coast of Colombia. Illustration by Fernando Vargas Salinas.