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Checklist and Comments on the Terrestrial Amphibian and Reptile Fauna from Utai, Northwestern Papua New Guinea

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New Guinea, the world's largest and highest tropical island, has been identified as one of the world's five High Biodiversity Wilderness Areas (Mittermeier et al. 2003). The island occupies less than 0.6% of global land area but harbors 5–7% of the world's biodiversity (Beehler 1993; Dinerstein and Wikramanayake 1993; Myers et al. 2000). The herpetofauna of New Guinea currently accounts for approximately 5% of the world's reptile and amphibian diversity (Allison et al. 1998). Remarkably, this is an underestimate of true diversity as species accumulation curves for both lizards and frogs continue to increase dramatically without hint of plateau (Fig. 1). The tallest peak on the island exceeds 5000 m and the rugged topography encompasses a wide range of habitat

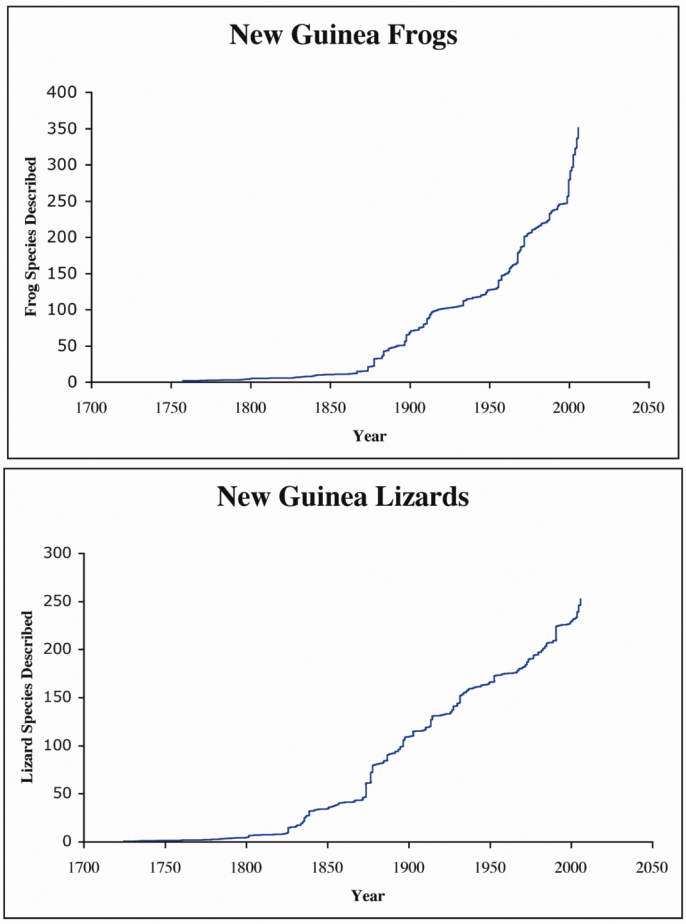

FIG. 1. Species accumulation curves for New Guinea frogs and lizards.

types packed into an area one-tenth the size of the United States. These habitats include mangrove forests, lowland eucalypt savannas, dense lowland rainforests, sago palm swamps, montane moss forests, cloud forests, alpine grasslands, and tropical glaciers on the tallest peaks. The New Guinea herpetofauna can be found in all but the last of these habitats.

Over the last several decades extensive logging has severely impacted the expansive lowland rainforest on the north coast of Papua New Guinea (Beehler 1993). Here we report on a 15-day survey of terrestrial amphibians and reptiles from the area surrounding Utai Village (3°23.765'S, 141°34.974'E, 208 m elev.) in north-central New Guinea in Sandaun Province, Papua New Guinea. Utai Village is situated on the Gedik River, a northern tributary of the Sepik River. The Sepik is the longest river on the island and possibly the largest uncontaminated drainage system in Australasia with a catchment of approximately 80,000 km^2 (Allen and Coates 1990). Utai Village is located at the intersection of upland and forest flood plains. North of Utai the rolling hills give rise to foothills of the Bewani Mountains and to the south is vast expanse of nipa flood plain forest that extends to the Sepik River. The forest includes primary, successional, and riparian lowland broadleaf evergreen forest as well as extensive Sago Palm (*Metroxylon sagu*) swamps. The immediate areas surrounding Utai village have been used for traditional shifting fruit and vegetable gardens and extensive harvesting of Sago Palms for food. The larger surrounding areas are largely unspoiled lowland rainforest in the extensive and broadly contiguous Northern New Guinea lowland ecoregion that contains diverse habitats including lowland and hill forest, grassy swamps, swamp forests, savannas, peat swamp forests, and woodlands (Conn 1995; Gressitt 1982; Henty 1981; Womersley 1978). Although the forests around Utai have

FIG. 2. Map of New Guinea showing Utai in northwestern Papua New Guinea and Kau Wildlife Area in northcentral Papua New Guinea.

TABLE 1. Checklist of the terrestrial amphibian and reptile fauna of Utai northwestern Papua New Guinea. We refer to a species as 'Common' if it is typically encountered in an approximate 8-person-hour search period. Species listed as 'Uncommon' are encountered infrequently in the area around Utai and typically require more than a single day/night search of 8-person-hours to locate. References refer to general literature associated with each species.

SPECIES		FAMILY	COMMENTS AND REFERENCES
SNAKES			
Candoia	*aspera*	Boidae	Uncommon; (Austin, 2000; O'Shea, 1996)
Candoia	*carinata*	Boidae	Uncommon; (Austin, 2000; O'Shea, 1996)
Boiga	*irregularis*	Colubridae	Uncommon; (O'Shea, 1996)
Dendrelaphis	*punctulatus*	Colubridae	Uncommon; (McDowell, 1974; O'Shea, 1996; McDowell, 1975; McDowell, 1979)
Dendrelaphis	sp.	Colubridae	Uncommon; (McDowell, 1974; O'Shea, 1996; McDowell, 1975; McDowell, 1979)
Stegonotus	*modestus*	Colubridae	Uncommon; (O'Shea 1996; McDowell, 1972)
Stegonotus	*parvus*	Colubridae	Uncommon; (O'Shea 1996; McDowell, 1972)
Stegonotus	sp.	Colubridae	Uncommon; (O'Shea 1996; McDowell, 1972)
Tropidonophis	*doriae*	Colubridae	Uncommon; (O'Shea, 1996; Malnate and Underwood, 1988)
Tropidonophis	*mcdowelli*	Colubridae	Uncommon; (O'Shea, 1996; Malnate and Underwood, 1988)
Tropidonophis	*multiscutellatus*	Colubridae	Uncommon; (O'Shea, 1996; Malnate and Underwood, 1988)
Tropidonophis	*picturatus*	Colubridae	Uncommon; (O'Shea, 1996; Malnate and Underwood, 1988)
Aspidomorphus	*muelleri*	Elapidae	Uncommon; (O'Shea, 1996; McDowell, 1967)
Aspidomorphus	sp.	Elapidae	Uncommon; (O'Shea, 1996; McDowell, 1967)
Micropechis	*ikaheka*	Elapidae	Uncommon; (O'Shea 1996)
Morelia	*viridis*	Pythonidae	Uncommon; (low density) (Rawlings and Donnellan, 2003)
LIZARDS			
Hypsilurus	*modestus*	Agamidae	Common; (Moody, 1980; Manthey and Denzer, 2006)
Hypsilurus	sp.	Agamidae	Uncommon; (Moody, 1980; Manthey and Denzer, 2006)
Cyrtodactylus	*sermowaiensis*	Gekkonidae	Common; (de Rooij, 1915; Brown and Parker, 1973)
Cyrtodactylus	sp.	Gekkonidae	Uncommon; (de Rooij, 1915; Brown and Parker, 1973)
Gehyra	cf. *lampei*	Gekkonidae	Uncommon; (King and Horner, 1989; King, 1984; Chrapliwy et al., 1961; Beckon, 1992)
Gekko	*vittatus*	Gekkonidae	Uncommon; (de Rooij, 1915; Brown and Parker, 1973)
Hemidactylus	*frenatus*	Gekkonidae	Common; (Mortiz et al., 1993)
Lepidodactylus	*lugubris*	Gekkonidae	Uncommon; (Mortiz et al., 1993)
Nactus	cf *multicarinatus*	Gekkonidae	Common; (Donnellan and Moritz 1995; Moritz 1987; Zug and Moon 1995; Kraus, 2005)
Nactus	*vankampeni*	Gekkonidae	Common; (Donnellan and Moritz 1995; Moritz 1987; Zug and Moon 1995; Kraus, 2005)
Cryptoblepharus	sp.	Scincidae	Uncommon; (Mertens, 1928)
Emoia	*caeruleocauda*	Scincidae	Common; (Brown, 1991)
Emoia	*jakati*	Scincidae	Common; (Brown, 1991)
Emoia	*kordoana*	Scincidae	Uncommon; (Brown, 1991)
Emoia	*longicauda*	Scincidae	Uncommon; (Brown, 1991)
Emoia	*obscura*	Scincidae	Common; (Brown, 1991)
Emoia	*pallidiceps*	Scincidae	Common; (Brown, 1991)
Lamprolepis	*smaragdina*	Scincidae	Common; (Greer, 1970)
Lipinia	*albodorsalis*	Scincidae	Uncommon; (Austin, 1998; Zweifel, 1979; Shea and Greer, 2002)
Lipinia	*pulchra*	Scincidae	Uncommon; (Austin, 1998; Zweifel, 1979)
Lobulia	*brongersmai*	Scincidae	Uncommon; (Greer et al., 2005; Zweifel, 1972; Allison and Greer, 1986)
Prasinohaema	*virens*	Scincidae	Uncommon; (Mys, 1988)
Sphenomorphus	*jobiensis*	Scincidae	Common; (Donnellan and Aplin, 1989)
Sphenomorphus	*minutus*	Scincidae	Uncommon; (Greer, 1974)
Sphenomorphus	*pratti*	Scincidae	Uncommon; (Greer, 1974)
Sphenomorphus	*simus*	Scincidae	Common; (Shea and Greer, 1999)
Sphenomorphus	*solomonis*	Scincidae	Common; (de Rooij, 1915)
Tiliqua	*gigas*	Scincidae	Uncommon; (Shea, 1990)
Tribolonotus	*gracilis*	Scincidae	Uncommon; (Zweifel, 1966; Cogger, 1972)
Varanus	*jobiensis*[2]	Varanidae	(Böhme, 2003)

TABLE 1.—Continued.

SPECIES		FAMILY	COMMENTS AND REFERENCES
FROGS			
Litoria	cf. *genimaculata*[1]	Hylidae	(Menzies, 2006)
Litoria	*huntorum*	Hylidae	Uncommon; (Richards et al., 2006)
Litoria	*infrafrenata*	Hylidae	Common; (Zweifel, 1980; Menzies, 2006)
Litoria	*nigropunctata*	Hylidae	Uncommon; (Menzies, 2006)
Litoria	*thesaurensis*	Hylidae	Uncommon; (Menzies, 2006; Kraus and Allison, 2004)
Litoria	sp.	Hylidae	Uncommon; (Menzies, 2006)
Austrochaperina	sp.	Microhylidae	Uncommon; (Menzies, 2006)
Choerophryne	*rostellifer*	Microhylidae	Uncommon; (Menzies, 2006)
Cophixalus	cf. *bewaniensis*	Microhylidae	Uncommon; (Menzies, 2006; Kraus and Allison, 2000)
Cophixalus	*balbus*	Microhylidae	Common; (Menzies, 2006)
Cophixalus	sp.	Microhylidae	Uncommon; (Menzies, 2006)
Copiula	sp.	Microhylidae	Common; (Burton, 1990; Menzies, 2006)
Hylophorbus	sp. 1	Microhylidae	Common; (Günther, 2001; Menzies, 2006)
Hylophorbus	sp. 2	Microhylidae	Uncommon; (Günther, 2001; Menzies, 2006)
Hylophorbus	sp. 3	Microhylidae	Uncommon; (Günther, 2001; Menzies, 2006)
Hylophorbus	sp. 4	Microhylidae	Uncommon; (Günther, 2001; Menzies, 2006)
Mantophryne	*lateralis*	Microhylidae	Uncommon; (Menzies, 2006)
Oreophryne	*biroi*	Microhylidae	Uncommon; (Menzies, 2006; Zweifel et al., 2003)
Oreophryne	*hypsiops*	Microhylidae	Uncommon; (Menzies, 2006; Zweifel et al., 2003)
Oreophryne	sp. 1	Microhylidae	Uncommon; (Menzies, 2006; Zweifel et al., 2003)
Oreophryne	sp. 2	Microhylidae	Uncommon; (Menzies, 2006; Zweifel et al., 2003)
Sphenophryne	*cornuta*	Microhylidae	Common; (Menzies, 2006; Bickford, 2002)
Xenobatrachus	*tumulus*[2]	Microhylidae	Uncommon; (Menzies, 2006; Kraus and Allison, 2002; Blum and Menzies, 1988)
Xenobatrachus	sp.	Microhylidae	Uncommon; (Menzies, 2006; Kraus and Allison, 2002; Blum and Menzies, 1988)
Xenorhina	*oxycephala*[1]	Microhylidae	(Menzies, 2006; Blum and Menzies, 1988)
Lechriodus	*melanopyga*	Myobatrachidae	Uncommon; (Menzies, 2006)
Limnonectes	*grunniens*	Ranidae	Uncommon; (Menzies, 2006)
Platymantis	*cheesmanae*	Ranidae	Uncommon; (Menzies, 2006)
Platymantis	*papuensis*	Ranidae	Common; (Zweifel, 1969; Menzies, 1982a; Menzies, 1982b; Menzies, 2006)
Rana	*arfaki*	Ranidae	Uncommon; (Menzies, 2006)
Rana	*daemeli*	Ranidae	Uncommon; (Menzies, 2006)
Rana	cf *grisea*	Ranidae	Common; (Menzies, 2006)
Rana	*volkerjane*[2]	Ranidae	(Menzies, 2006)

[1]Previously collected by CD in 2005.
[2]Reported by Kraus and Allison 2006.

yet to be commercially logged, logging roads are encroaching rapidly from the north and will reach the village within the next several years.

To date there have been no comprehensive herpetofaunal reports from northwestern Papua New Guinea. Here we compile a list of terrestrial reptile and amphibian species from the vicinity of Utai based on a field survey conducted from 27 June to 12 July 2006 (Table 1) as well as from previous fieldwork (CD) and published reports (Kraus and Allison 2006). Kraus and Allison (2006) reported range extensions for reptiles and amphibians along the northern versant of Papua New Guinea that included three species not collected by our team but reported within 5 km of Utai village. The fauna, exclusive of crocodilians and turtles, includes 79 species comprising 16 snakes, 30 lizards, and 33 frogs representing 40 genera in 11 families (Table 1). This list undoubtedly is an underestimate of the true diversity present in the region. Specific specimen (and associated tissues) and locality information 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 herpetofauna, especially among the scincid lizards and microhylid frogs (e.g., Austin 2006). In addition to obvious species complexes, many currently recognized species likely harbor cryptic species (Bickford et al. 2006). Species richness, therefore, is likely much greater than is presently documented from our survey. We are taking a multidisciplinary approach using morphological and molecular data to tease apart many of the species complexes as well as to describe the species obviously new to science. Below we comment on and address some of the taxonomic impediments to understanding the terrestrial amphibian and reptile fauna in the Utai area.

Treesnakes of the genus *Dendrelaphis* are easy to identify to the generic level but extensive geographic variation in color pattern and scalation, inadequate keys, and cryptic diversity make *Dendrelaphis* a problematic group (McDowell 1974; O'Shea 1996). We collected one species that keys out to *Dendrelaphis punctulatus* but has a drastically different color pattern and thus

may represent an undescribed species. In addition, we collected several specimens of what is clearly an undescribed species of *Dendrelaphis*. Keelback snakes of the genus *Tropidonophis* have had a taxonomically complicated history, having been assigned to such diverse genera as *Amphiesma*, *Macropophis*, *Natrix*, and *Styporhynchus* (Malnate and Underwood 1988; O'Shea 1996). *Tropidonophis* are easily distinguished from other New Guinean snakes by having prominently keeled dorsal scales, but species identification remains difficult. We collected three specimens of the elapid genus *Aspidomorphus*. One adult and juvenile were easily assigned to *A. muelleri* and a third specimen was not readily assignable to any of the three currently recognized species of *Aspidomorphus* and likely represents a species new to science.

The angle head lizards of the agamid genus *Hypsilurus* have been recently revised (Manthey and Denzer, 2006). Manthey and Denzer (2006) recognize 14 species of *Hypsilurus*, while acknowledging that this diversity is undoubtedly an underestimate. There are two species of *Hypsilurus* in the Utai region. *Hypsilurus modestus* is a small-bodied (maximum SVL = 107 mm) *Hypsilurus* with a broad distribution throughout the Papuan region (New Guinea and nearby associated islands) and is common in the Utai area. A second *Hypsilurus* species does not key to any of the currently described species and likely represents a species new to science.

The gecko fauna of New Guinea consists of seven genera: *Cyrtodactylus*, *Gehyra*, *Gekko*, *Hemidactylus*, *Hemiphyllodactylus*, *Lepidodactylus*, and *Nactus*. Six of these seven gecko genera were found in the Utai region with the seventh, *Hemiphyllodactylus*, representing an uncommon, hard to find and/or patchily distributed gecko poorly represented in collections; one of us (CCA) has collected just three individuals of *Hemiphyllodactylus* in 18 years of fieldwork on the island. Although *Hemiphyllodactylus* was not recorded from the Utai area it may occur in the region. *Cyrtodactylus*, *Gehyra*, and *Nactus* represent taxonomically challenging groups in need of revision and study. The geographic distribution and specific-level delineation for virtually all species of New Guinea geckos is not well understood and many collections have misidentified taxa. Currently ten species of *Cyrtodactylus* are described from New Guinea, but several undescribed species exist in collections (Kraus and Allison 2006). *Cyrtodactylus sermowaiensis* was collected regularly at night and was the most abundant species of *Cyrtodactylus* present. Two specimens of a much larger species of *Cyrtodactylus* where collected. These are similar to *C. novaeguineae*, but differ in several aspects of morphology and likely represent an undescribed species.

The diverse skink fauna of New Guinea includes many species complexes (Austin 2006). Preliminary molecular investigations have revealed significant population structure within most widespread species, indicating a greater level of species-level diversity than currently recognized.

The frog fauna of New Guinea is incredibly diverse with more than 350 described species (Amphibian Species of the World Database http://research.amnh.org/herpetology/amphibia/index.php) with 90% endemism (Mittermeier et al. 2003). The rate at which new species are being described is extremely rapid and there is no sign of an asymptote (Fig. 1). Frog diversity in the region is expected to exceed 600 species (Günther 2006). Microhylid frogs are the most diverse group in New Guinea. Our survey included sound recordings of male frogs in order to identify and describe new taxa. Preliminary analyses suggest multiple species new to science in the microhylid genera *Hylophorbus*, *Oreophryne*, and *Xenobatrachus* (Table 1). In addition to the diverse microhylids, the hylid genus *Litoria* is also species rich with a new *Litoria* recently described from Utai (Richards et al. 2006) and another likely undescribed species recorded on our survey.

Notably absent from the Utai region were the common and widespread introduced toad *Bufo marinus* and the skink genus *Carlia*. The latter has a broad range across New Guinea and its members are typically some of the most abundant diurnal lizards in village, garden, and forest edge habitats. *Bufo* and *Carlia* were, however, common in the Provincial capital of Vanimo 75 km NW of Utai on the coast.

Although our survey targeted terrestrial herpetofauna we did collect one specimen of a juvenile *Elseya novaeguineae* (McDowell 1983). In addition, the New Guinea freshwater crocodile (*Crocodylus novaeguineae*) were reported by locals to be in the general vicinity but had been primarily extirpated from the nearby area. Freshwater crocodiles are distributed in lowland to upland areas throughout the island of New Guinea (Hall 1989).

Regional checklists for New Guinean herpetofauna are extremely limited. The only other checklists for the north coast are both from the Kau Wildlife Area (Austin 2006; Read 1998). These limited data allow partial comparative measurements of species richness across a spatial scale of approximately 500 km (Fig. 2). Alpha diversity refers to the total diversity for a given site or region; alpha diversity is 79 at Utai and 67 at Kau. Gamma diversity is the total summed diversity across all sites and the gamma diversity for Utai and Kau is 104. Beta diversity refers to the change in species richness between different sites and is a summed measure of those species unique to two or more compared areas, thus beta diversity reflects the non-overlap of species diversity. The beta diversity between Utai and Kau is 62, meaning that there are 62 species that are found either solely in Utai or Kau (conversely, there are 42 species in common between the two sites). These data suggest that alpha diversity is similar across these two sites and that beta diversity is quite high.

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