

## **Herpetofauna of the Nakanai Mountains, East New Britain Province, Papua New Guinea**

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## Chapter 5

### Herpetofauna of the Nakanai Mountains, East New Britain Province, Papua New Guinea

Stephen Richards

#### SUMMARY

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This chapter summarises the results of a survey that documented herpetofaunal diversity, endemism and conservation status in the Nakanai Mountains of East New Britain Province, Papua New Guinea. A total of 39 species (23 frogs and 16 reptiles) were documented across a 1,500 m elevational gradient. Four species of frogs are new to science and of the 16 described frog species assessed by IUCN eight (50%) are classified as Data Deficient, and a further two (12.5%) are listed as Vulnerable on the basis of their small or fragmented distributions and threats from habitat conversion. Herpetofaunal diversity decreased with increasing altitude, with 22 species at the lowland site (200 m), 19 species at the mid-elevation site (850 m), and only eight species at the montane site (1,500-1,700 m). However the highest elevation site had the largest proportion of undescribed frog species, with three of the eight species (37.5%) found there being new to science. The Nakanai Mountains represent a significant refuge for a large number of new, poorly known and vulnerable frog species. Their recognition as a World Heritage Area would be a critical first step in ensuring the long-term survival of this unique frog assemblage.

#### INTRODUCTION

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The herpetofauna of New Britain is extremely rich. Sixty-six species of frogs and reptiles were reported from the island nearly 15 years ago (Allison 1996), and several new frog species of the genus *Platymantis* have been discovered and described since then (e.g. Brown and Foufopoulos 2004, Brown et al. 2006, Foufopoulos and Richards 2007, Kraus and Allison 2007, 2009). Indeed the genus *Platymantis*, which has major centres of diversity in the Philippines, Solomon Islands and islands off the north and north-east of mainland New Guinea dominates the frog fauna of New Britain with 15 species currently recognized. Perhaps more significantly New Britain's *Platymantis* fauna is largely endemic to the island with just one species, *P. magnus*, shared with New Ireland (Foufopoulos and Richards 2007).

In contrast the two frog families that dominate the anuran fauna of mainland New Guinea, the Microhylidae and Hylidae, are represented by just two and three species respectively. The two microhylids, *Austrochaperina novaebritanniae* and *Oreophryne brachypus*, are both endemic to New Britain but the status of the hylids is less clear. *Litoria infrafrenata* is a large, green treefrog occurring widely across New Guinea and northern Queensland, Australia. Although superficially similar to animals on mainland New Guinea, populations of this species on New Britain and New Ireland are recognized as a distinct subspecies (*L. infrafrenata militaria*; e.g. Davies 1978). *Litoria thesaurensis* is a medium-sized, predominantly brown treefrog that was described from the Solomon Islands. It comprises a species-complex with acoustically and morphologically divergent populations on mainland New Guinea and New Britain, and genetic data are required to determine the relationships of the New Britain populations. An undescribed member of the *Litoria bicolor* species-complex has long been known to occur on

New Britain (Zweifel and Tyler 1982). However it was not formally described until Menzies et al. (2008) revised the complex and assigned New Britain populations to *Litoria lodesdema*, a species also known from in the lowlands of northern New Guinea.

Although reptile diversity is moderately high, especially among scincid lizards, endemism is quite low with few species restricted to New Britain or the Bismarck Islands generally (Foufopoulous and Richards 2007). However several of the endemic reptiles are species of extreme biogeographic or evolutionary interest, including the rarely seen ‘crocodile skink’ *Tribolonotus annectens* and the monotypic python genus *Bothrochilus*.

Recent discoveries of new *Platymanthis* species in the Nakanai Mountains by a team from Wisconsin University (Foufopolous 2001), and during a short survey near Marmar (Kraus and Allison 2007) hinted that the rugged forested interior of East New Britain may still harbor a wealth of undocumented herpetological diversity. This study assessed the diversity and endemism of herpetofauna in the Nakanai Mountains of East New Britain Province in April 2009, and the results are presented here.

## METHODS

### Sites (see Executive Summary for more detailed description)

**Site 1: Lamas (5°36.853'S, 151°24.483'E; 200 m), 3-9 April 2009**  
Lamas camp was situated in lowland rainforest near Irena Village. The forest appeared to be relatively undisturbed and had an open under storey and many large trees with DBH over 50 cm. Aquatic habitats were scarce, and water was restricted to small puddles in a predominantly dry creek bed running adjacent to camp and to a small spring feeding a short stretch of stream several hundred metres from camp.

**Site 2: Vouvou (5°26.740'S, 151°27.842'E; 850-950 m), 10-18 April 2009**

Vouvou Camp was located next to a dirt road, currently under construction, connecting Pomio to the interior. The ultimate destination of this road appeared to be a mystery. The hill forest was heavily disturbed along the edge of the road but was much less disturbed within 200 m either side of the road. Aquatic habitats included a small, clear stream running adjacent to camp, a dry stream with a deep pool of murky water about 200 m from camp, and a small, temporary pool at the edge of the road adjacent to the camp.

**Site 3: Tompoi (5°20.623'S, 151°18.875'E; 1,500-1,700 m), 19-25 April 2009**

Tompoi Camp was located in a patch of mossy pre-montane forest surrounded by dense thickets of Bamboo. The site was extremely wet from the frequent rain and dense fog that shrouded the forest on most days but no aquatic habitats were found in the vicinity of the camp and helipad.

## Field methods

All sampling was done by myself and 1-2 local assistants. At each site we conducted intensive searches for frogs and reptiles along trails established for this purpose. During the day we searched for heliothermic (basking) reptiles along trails through forest, clearings, and on stream banks. Small lizards were collected by hand or were stunned with a large rubber band. Large lizards and snakes were collected by hand. Non-basking reptiles were sampled by searching in deeply shaded forest, during rain, or at dusk. We searched for nocturnal reptiles, including geckos, by walking along forest trails at night with a headlamp.

We searched for frogs at night by conducting visual-encounter and aural surveys along streams, and in and around small ponds. Because a large proportion of New Britain's frogs have life cycles that are independent of free-standing water, we also conducted extensive visual and aural searches along trails in forest away from water.

Frog calls are an important diagnostic character that assist greatly with species identification. Whenever possible we recorded the advertisement calls of frogs with a Marantz PMD-661 Solid-state Recorder and Sennheiser ME66 microphone. Most species were photographed alive before preparation as voucher specimens. Specimens were euthanized by submersion in chlorotone (for amphibians and small reptiles), or with lethal injection of chlorotone for larger reptiles. Specimens were fixed in 10% formalin solution, and then stored in 70% ethanol. Samples of liver tissue for DNA analyses were extracted from representative specimens of each species and stored in 95% ethanol. Voucher specimens will be deposited in the University of Papua New Guinea's Natural Sciences Resource Centre, Port Moresby, and the South Australian Museum, Australia.

## RESULTS

A total of 39 species (23 frogs and 16 reptiles) were documented during this survey (Table 5.1). At least four species of frogs are new to science, and one additional frog species may also be new but further studies are required to confirm its status. Herpetofaunal diversity decreased with increasing elevation, with 21 species at the lowland site (200 m), 19 species at the mid-elevation site (850-950 m), and only 8 species at the montane site (1,500-1,700 m). However the highest elevation site had the highest proportion of undescribed species, with three of the four new species found at this site (Table 5.1).

### Significant species

#### Reptiles

##### *Hypsilurus longii*

This large and spectacular agamid lizard is rarely seen. A single male was collected by local hunters from high in a tree at Lamas Camp.

## Frogs

### *Litoria* sp. nov.

This moderate-sized treefrog appeared to be quite uncommon. Only two individuals were found, both at Vouvou Camp, where the morphologically similar *Litoria thesaurensis* occurred in large numbers. Males have a very soft call and were extremely difficult to find in dense forest undergrowth near the small stream at this camp. This new species represents only the fourth hylid frog reported from New Britain, which has a frog fauna dominated by species in the family Ceratobatrachidae.

### *Batrachylodes* sp. nov. 1

This tiny (SVL < 20 mm) undescribed frog is the first record of the genus *Batrachylodes* from outside of the Solomon Islands Archipelago (including Bougainville and Buka). It was found only in very wet sub-montane forest around Tompoi Camp where males called from hidden positions in leaf litter on the wet forest floor.

### *Platymantis* sp. nov. 1

A moderately small (SVL ~ 30 mm), ground-dwelling frog that was found only at the highest elevations surveyed in the Nakanai Mountains. Males called from holes among roots, and from crevices between fallen logs, on the forest floor.

### *Platymantis* sp. nov. 2

A moderately small (SVL ~ 32 mm) frog with large toe pads that was found only at the highest elevations surveyed in the Nakanai Mountains. This attractive frog called from perches about one metre above the ground in dense bamboo forest near the helipad at ~1,650 m.

## DISCUSSION AND CONSERVATION RECOMMENDATIONS

A remarkable proportion of the frog species documented during this survey are listed by the IUCN with a status other than Least Concern. Of the 16 species assessed by IUCN eight (50%) are classified as Data Deficient, and a further two (12.5%) are listed as Vulnerable on the basis of their small or fragmented distributions and threats from habitat conversion (Table 5.2). Only six of the assessed species (37.5%) are listed as Least Concern. One of the major recommendations of the IUCN assessments of Data Deficient and Vulnerable species was to further document their distribution, ecological requirements and status. This RAP survey has partially fulfilled this process, providing valuable information about new populations and habitat requirements for these species. The presence of such a large number of Data Deficient and Vulnerable species in the area surveyed is a powerful argument for protection of the local rainforest ecosystems. Declaration of the area as a World Heritage Area, with a management plan that aims to minimize forest conversion for oil palm, gardens and timber extraction, will

provide some measure of protection for these poorly-known species.

Six frog species are currently known only from the Nakanai Mountains, and each of these is known only from a single site. Vouvou is the type locality for the recently-described *Platymantis bufonulus* and *P. sulcatus*. *P. sulcatus* was abundant at this site in moist gullies, but *P. bufonulus* was observed (and heard) only twice. The presence of an undescribed treefrog of the genus *Litoria* at Vouvou was a surprise because only three species of treefrogs were previously known from New Britain. The discovery of three new frog species at Vouvou in the last few years indicates that the hill forest (~800-1,000 m) in this area warrant further conservation action. The construction of a road through these forests has damaged roadside vegetation and improved access to the forest for loggers. Efforts should be made to restrict damage to forest adjacent to the road in this area.

Three new frog species were found only at Tompoi. Two of these (*Batrachylodes* sp. nov. and *Platymantis* sp. nov. 1) were found predominantly in a large remnant block of forest that has survived the ravages of the El Nino drought and cyclone in 1997, although *Platymantis* sp. nov. 1 was also heard calling in dense bamboo thickets above camp. In contrast (*Platymantis* sp. nov. 2.) was found only in the dense bamboo thicket that dominates much of the highest montane forest accessed during this survey. Its absence from 'good' forest around camp appears to be related to elevational preference rather than a choice for bamboo habitats because this species was heard calling only at the top of the ridge above camp, and not in bamboo thickets at lower elevations around camp; and because all individuals of this species were found on low foliage in tiny pockets of remnant 'natural' undergrowth within the bamboo thickets. The original undergrowth on top of the ridge had been 'smothered' by bamboo following fires and a cyclone that accompanied the 1997 El Nino event and killed most canopy-forming trees and it is possible that *Platymantis* sp. nov. 2 populations have declined in the near-monoculture of dense bamboo. Certainly numbers of this species appeared to be much lower than other species encountered at Tompoi. Future fires may destroy these remaining isolated pockets of undergrowth which may in turn severely impact populations of this species. Management of the proposed Nakanai World Heritage Area should include promoting awareness about the importance of preventing fires from spreading into this area. Further surveys should also be conducted on other parts of the Galowe Plateau where the density of bamboo appears to be lower, to determine whether this species occurs in other patches of upland forest.

On a more general level, the discovery of four new frog species during this RAP survey has added to the recent descriptions of three new species of ceratobatrachid frogs from the Nakanai Mountains by Kraus and Allison (2007, 2009) and highlights the importance of the Nakanai Mountains as a treasure trove of undocumented diversity within this important vertebrate group. It is unclear whether any of

these recently discovered species are endemic to the Nakanai Mountains or if they are more widespread in other mountain ranges of New Britain, but there is little doubt that they are endemic to the island of New Britain. In this context recognition of the Nakanai Mountains as a globally significant environment through World Heritage listing will provide vital protection for a suite of forest-dependent species found no-where else on earth.

#### Specific recommendations

1. Continue efforts to declare the Nakanai Mountains as a World Heritage Area.

2. Assist local communities to develop a management plan for the area that addresses a) restricting impacts to forest along existing roads, b) minimizes forest conversion for oil palm, gardens and timber extraction, c) promotes awareness of the impact of fires on this environment.
3. Conduct targeted surveys for new and poorly-known species, particularly above ~1,500 m at other sites on the Galowe Plateau, to confirm the presence of these species in less impacted forest habitats.

**Table 5.1.** List of herpetofauna documented during 2009 Nakanai Mountains RAP survey.

| Species                                | Lamas Camp (200 m) | Vouvou Camp (800-900 m) | Tompoi Camp (1,500-1,700 m) |
|--|--------------------|-------------------------|-----------------------------|
| <b>Frogs</b>                           |                    |                         |                             |
| <b>Ceratobatrachidae</b>               |                    |                         |                             |
| <i>Batrachylodes</i> sp. nov.          |                    |                         | X                           |
| <i>Discodeles guppyi</i> *             |                    |                         |                             |
| <i>Platymantis adiasolus</i>           | X                  | X                       | X                           |
| <i>Platymantis akarithymus</i>         | X                  | X                       |                             |
| <i>Platymantis boulengeri</i>          | X                  | X                       |                             |
| <i>Platymantis bufonulus</i>           |                    | X                       |                             |
| <i>Platymantis caesiops</i>            |                    | X                       |                             |
| <i>Platymantis gilliardi</i>           |                    | X                       |                             |
| <i>Platymantis macrosceles</i>         |                    | X                       |                             |
| <i>Platymantis mamusiorum</i>          |                    |                         | X                           |
| <i>Platymantis nakanaiorum</i>         |                    |                         | X                           |
| <i>Platymantis nexipus</i>             | X                  |                         |                             |
| <i>Platymantis schmidtii</i>           | X                  | X                       |                             |
| <i>Platymantis sulcatus</i>            |                    | X                       |                             |
| <i>Platymantis</i> sp. nov. 1          |                    |                         | X                           |
| <i>Platymantis</i> sp. nov. 2          |                    |                         | X                           |
| <b>Hylidae</b>                         |                    |                         |                             |
| <i>Litoria lodesdema</i>               |                    | X                       |                             |
| <i>Litoria thesaurensis</i>            | X                  | X                       |                             |
| <i>Litoria</i> sp. nov.                |                    | X                       |                             |
| <b>Microhylidae</b>                    |                    |                         |                             |
| <i>Austrochaperina novaebritanniae</i> | X                  |                         |                             |
| <i>Oreophryne brachypus</i>            | X                  | X                       | X                           |
| <b>Ranidae</b>                         |                    |                         |                             |
| <i>Rana daemeli</i> *                  |                    |                         |                             |
| <i>Rana novaebritanniae</i>            |                    | X                       |                             |

| Species                          | Lamas Camp (200 m) | Vouvou Camp (800-900 m) | Tompoi Camp (1,500-1,700 m) |
|----------------------------------|--------------------|-------------------------|-----------------------------|
| <b>Reptiles</b>                  |                    |                         |                             |
| <b>Lizards</b>                   |                    |                         |                             |
| Agamidae                         |                    |                         |                             |
| <i>Hypsilurus longi</i>          | X                  |                         |                             |
| <i>Hypsilurus modestus</i>       | X                  |                         |                             |
| Gekkonidae                       |                    |                         |                             |
| <i>Lepidodactylus</i> sp.        | X                  |                         |                             |
| <i>Nactus</i> sp.                | X                  |                         |                             |
| Scincidae                        |                    |                         |                             |
| <i>Carlia mysi</i>               | X                  |                         |                             |
| <i>Emoia kordoana</i>            | X                  | X                       |                             |
| <i>Emoia jakati</i> **           |                    |                         |                             |
| <i>Eugongylus albobasculatus</i> | X                  | X                       |                             |
| <i>Sphenomorphus jobiensis</i>   | X                  |                         |                             |
| <i>Sphenomorphus 'maindroni'</i> |                    |                         | X                           |
| <i>Sphenomorphus pratti</i>      | X                  |                         |                             |
| <i>Sphenomorphus simus</i>       | X                  |                         |                             |
| <b>Snakes</b>                    |                    |                         |                             |
| <i>Acutotyphlops</i> sp.         |                    | X                       |                             |
| <i>Bothrochilus boa</i>          | X                  | X                       |                             |
| <i>Candoia carinata</i>          | X                  |                         |                             |
| <i>Stegonotus</i> sp.            | X                  | X                       |                             |
| <b>Total</b>                     | <b>21</b>          | <b>19</b>               | <b>8</b>                    |

\*heard calling near Marmar Village

\*\*Palmal only

**Table 5.2.** Conservation status (IUCN 2010) of frog species encountered during the 2009 RAP survey in the Nakanai Mountains

| Species                        | IUCN Status <sup>1</sup> | Major causes of threat or uncertainty  | Proposed actions  |
|--------------------------------|--------------------------|--|---|
| <b>Ceratobatrachidae</b>       |                          |  |   |
| <i>Batrachylodes</i> sp. nov.  | N/A                      | N/A  | N/A   |
| <i>Discodeles guppyi</i>       | LC                       | N/A  | N/A   |
| <i>Platymantis adiahtolus</i>  | DD                       | No direct information about threats but there is insufficient information about distribution, status and ecological requirements                               | Surveys needed to determine distribution, ecological requirements and conservation status |
| <i>Platymantis akarithymus</i> | VU                       | Restricted, severely fragmented distribution, continuing decline in extent and quality of habitat due to extensive logging                                     | Further research to assess population status, distribution and habitat requirements       |
| <i>Platymantis boulengeri</i>  | LC                       | N/A  | N/A   |
| <i>Platymantis bufonulus</i>   | DD                       | Logging and conversion of forest to oil-palm – there is insufficient information about distribution, status and ecological requirements                        | Surveys needed to determine distribution, ecological requirements and conservation status |
| <i>Platymantis caesiops</i>    | N/A                      | N/A  | N/A   |
| <i>Platymantis gilliardi</i>   | DD                       | Extensive logging is occurring within range - insufficient information about distribution, status and ecological requirements                                  | Surveys needed to determine distribution, ecological requirements and conservation status |
| <i>Platymantis macrosceles</i> | DD                       | Threats unclear - insufficient information about distribution, status and ecological requirements  | Surveys needed to determine distribution, ecological requirements and conservation status |
| <i>Platymantis mamusiorum</i>  | DD                       | Potential habitat loss and effects of invasive species - insufficient information about distribution, status and ecological requirements                       | None recommended but same as above  |
| <i>Platymantis nakanaiorum</i> | DD                       | May be impacted by logging and increased fires resulting from climate change - insufficient information about distribution, status and ecological requirements | Surveys needed to determine distribution, ecological requirements and conservation status |
| <i>Platymantis nexipus</i>     | DD                       | May be impacted by logging-insufficient information about distribution, status and ecological requirements   | Surveys needed to determine distribution, ecological requirements and conservation status |
| <i>Platymantis schmidtii</i>   | LC                       | N/A  | N/A   |
| <i>Platymantis sulcatus</i>    | DD                       | May be impacted by logging and conversion of forest to Oil Palm -insufficient information about distribution, status and ecological requirements               | Surveys needed to determine distribution, ecological requirements and conservation status |
| <i>Platymantis</i> sp. nov. 1  | N/A                      | N/A  | N/A   |
| <i>Platymantis</i> sp. nov. 2  | N/A                      | N/A  | N/A   |
| <b>Hylidae</b>                 |                          |  |   |
| <i>Litoria lodesdema</i>       | N/A                      | N/A  | N/A   |
| <i>Litoria thesaurensis</i>    | LC                       | N/A  | N/A   |
| <i>Litoria</i> sp. nov.        | N/A                      | N/A  | N/A   |

table continued on next page

Table 5.2. *continued*

| Species                                | IUCN Status <sup>1</sup> | Major causes of threat or uncertainty   | Proposed actions  |
|--|--------------------------|---|---|
| <b>Microhylidae</b>                    |                          |   |   |
| <i>Austrochaperina novaebritanniae</i> | VU                       | Restricted, fragmented distribution, continuing decline in extent and quality of habitat due to extensive logging in lowlands | Further research to assess population status, distribution and habitat requirements |
| <i>Oreophryne brachypus</i>            | LC                       | N/A   | N/A   |
| <b>Ranidae</b>                         |                          |   |   |
| <i>Rana daemeli</i>                    | LC                       | N/A   | N/A   |
| <i>Rana novaebritanniae</i>            | N/A                      | N/A   | N/A   |

<sup>1</sup>NA = Not Assessed, LC = Least Concern, DD = Data Deficient, VU = Vulnerable

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