# ARTICLES

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# Discovery of New Island Populations of the Recently Described False Geckos (*Pseudogekko pungkaypinit* and *Pseudogekko ditoy*): Conservation Implications for the Eastern Philippines

**NICHOLAS A. HURON***
*Sam Noble Oklahoma Museum of Natural History and Department of Biology, University of Oklahoma, Norman, Oklahoma 73072-7029, USA*
**NIKKI DYANNE C. REALUBIT**
*Institute of Biological Sciences, University of the Philippines Los Baños, College 4031, Laguna, Philippines*
**KERRY A. COBB**
*Biodiversity Institute, University of Kansas, 1345 Jayhawk Blvd, Lawrence, Kansas 66045, USA*
**JOSEPH C. BROWN**
*Herpetology Department, San Diego Zoo, San Diego, California, 92101, USA*
**PHILIP BERGMANN**
*Department of Biology, Clark University, 950 Main Street, Worcester, Massachusetts 01610, USA*
**GEN MORINAGA**
*Department of Biology, Clark University, 950 Main Street, Worcester, Massachusetts 01610, USA*
**ARVIN C. DIESMOS**
*Herpetology Section, National Museum of the Philippines, Manila, Philippines*
**MAE L. DIESMOS**
*University of Santo Tomas, Espana Blvd, Manila, Philippines*
**RAFE M. BROWN**
*Biodiversity Institute, University of Kansas, 1345 Jayhawk Blvd, Lawrence, Kansas 66045, USA*
**CAMERON D. SILER**
*Sam Noble Oklahoma Museum of Natural History and Department of Biology, University of Oklahoma, Norman, Oklahoma 73072-7029, USA*

**Corresponding author; e-mail: nahuron@ou.edu*

Philippine False Geckos (genus *Pseudogekko*) comprise a small clade of secretive geckos, all of which are endemic to this unique Southeast Asian archipelago. Seven species of False Geckos are currently recognized, with a genus-wide distribution that encompasses three faunal regions in the country (West Visayan [central], Luzon [northern], and Mindanao [southeastern]), as well as the small, isolated group of islands making up the Romblon Island Group (Brown et al. 2013a; Siler et al. 2014a; Davis et al. 2015). Recent studies by Siler et al. (2014a) and Davis et al. (2015) focused on revising the taxonomy of the *P. compresicorpus* and *P. brevipes* species complexes. Although our understanding of these secretive geckos has increased as a result of phylogenetic studies (Siler et al. 2014b) and detailed comparisons of external morphology (Siler et al. 2014a; Davis et al. 2015), to date, many species are known from only a few vouchered specimens and even fewer genetic samples (Siler et al. 2014a,b). In fact, most species are represented by ≤ 10 specimens in collections, which has led to concerns regarding the conservation status of these enigmatic taxa. Members of the genus *Pseudogekko* appear to have microhabitat preferences for *Pandanus* spp. (screw pines) plants found in primary and secondary forests (Taylor 1922a,b; Brown and Alcala 1978; Siler et al. 2014a), and many of these existing forests are under heavy pressure from surrounding human populations in the Philippines (Lasco et al. 2011). The paucity of vouchered specimens has led to the assumption of restricted ranges (IUCN 2014), but our experience leads us to believe that future studies may reveal broader geographic distributions for several members of the genus (Siler et al. 2014a,b).

The *Pseudogekko compresicorpus* complex includes newly described species whose distributions have been hypothesized to extend beyond their current, empirically established ranges (Siler et al. 2014a). Formerly recognized as a widespread species spanning the entire eastern island arc of the Philippines (Brown et al. 2013a), the *P. compresicorpus* complex is now recognized to include four taxa: *P. chavacano*, *P. compresicorpus*, *P. ditoy*, and *P. pungkaypinit* (Taylor 1915; Siler et al. 2014a). All four members of the complex differ from each other in a number of morphological features, including overall body size, dorsolateral coloration and patterning, and scale and pore counts (Siler et al. 2014a; Davis et al. 2015).

Interestingly, three of the four species of the *Pseudogekko compresicorpus* complex occur in the Mindanao Faunal Region of the southeastern Philippines, which includes the larger islands of Bohol, Leyte, Mindanao, and Samar, in addition to the small islands of Biliran, Dinagat, and Siargao (Heaney 1986; Siler et al. 2014a). Although the smaller species, *P. ditoy*, has been

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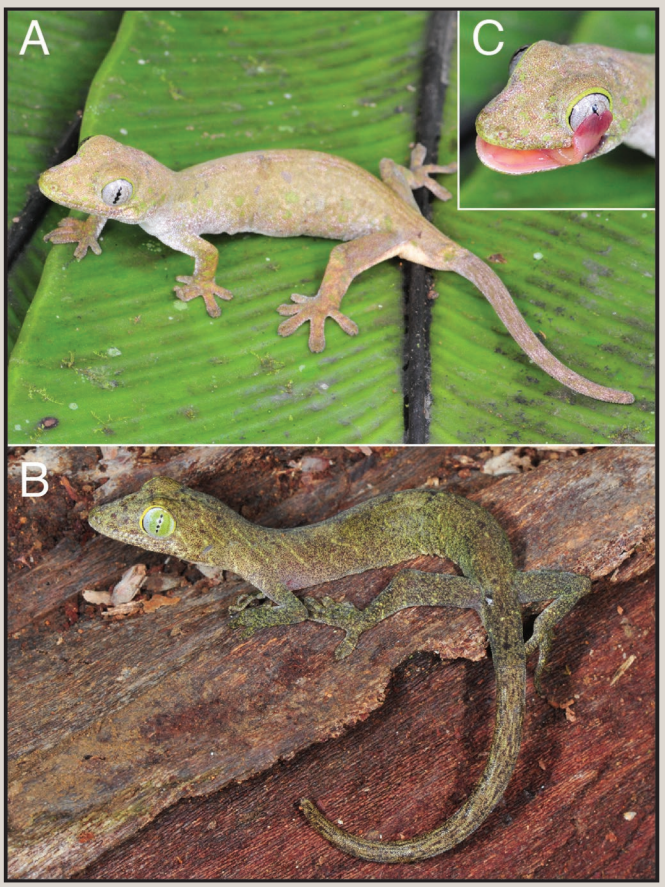


FIG. 1. Photographs in life of *Pseudogekko ditoy* (A, KU 338507) and *P. pungkaypinit* (B, KU 338497) from Mt. Huraw, Barangay San Jose de Buan, Municipality of San Jose de Buan, Samar Province, Samar Island, Philippines shown for comparison. A close up of the lateral view of *P. ditoy* shows yellow-green circumorbital scale coloration (C, also KU 338507).

found on Leyte Island, a larger species, *P. pungkaypinit*, has been collected on Bohol, Leyte, and Mindanao islands (Siler et al. 2014a). Despite both species occurring on Leyte, they have yet to be collected at the same site (Siler et al. 2014a).

Although the documentation of these False Geckos at distinct but geographically proximate sites on Leyte Island does not confirm sympatry, it does suggest the possibility of co-occurrence. Interestingly, no species from the complex have been documented with vouchered specimens from Samar, a large island just east of Leyte. In fact, the only species documented with a corresponding voucher specimen from Samar Island is the holotype of *Pseudogekko brevipes* (Senckenberg Research Institute and Natural History Museum [SMF] 8988; Davis et al. 2015). Current understanding of species' distributions suggests that all three taxa may occur in sympatry and even syntopy within the Mindanao Faunal Region (i.e., Samar Island; Siler et al. 2014a).

During field surveys from 1 June to 9 July 2014, 11 adult specimens of *Pseudogekko pungkaypinit* and two adult specimens of *P. ditoy* were collected at two sites in low- to mid-elevation forest on Samar Island. Here we report on natural history observations, discuss novel morphological variation, and provide photographs in life for the newly discovered populations of both species. Both of these records are the first on Samar Island and the northern-most documentation of the geographical ranges of both taxa.

*Materials and Methods.*—Field survey protocols follow Brown et al. (2013b). Vouchered specimens collected in the field were deposited at the University of Kansas Biodiversity Institute (KU) and the National Museum of the Philippines (PNM). We examined fluid-preserved specimens for variation in qualitative, meristic, and mensural characters. Sex was determined for all newly collected individuals based on the presence of everted hemipenes (males) or by the presence of eggs (females). Measurements were taken to the nearest 0.1 mm with digital calipers by NAH. Morphological characters were chosen based on Siler et al. (2014b): snout–vent length, tail length, total length, tail width, tail height, head length, head width, head height, midbody width, snout length, eye diameter, eye–narial distance, internarial distance, interorbital distance, axilla–groin distance, femur length, tibia length, and numbers of supralabials, infralabials, circumorbitals, pore-bearing precloacal scales, Finger III scansors, Toe IV scansors, paravertebral scales, ventral scales, and interorbital scales. A comparative summary of morphological variation for both species is provided in Table 1.

Surveys were conducted between 1 June and 9 July 2014 in low- and mid-elevation forest habitats adjacent to the Kadakan River in Barangay San Rafael, Municipality of Taft, Eastern Samar Province, Samar Island, Philippines (11.80255°N, 125.29276°E, WGS 84; 140 m elev.; hereafter referred to as the Taft site). One adult male specimen of *Pseudogekko ditoy* was collected at the Taft site (KU 338508). Further collection occurred in low- and mid-elevation coconut field and dry forest habitats on Mt. Huraw, Barangay San Jose de Buan, Municipality of San Jose de Buan, Samar Province, Samar Island, Philippines (12.05262°N, 125.03429°E, WGS 84; 209 m elev.). On Mt. Huraw, 11 adult specimens of *P. pungkaypinit* (four males; seven females; KU 338496–338506) and one adult specimen of *P. ditoy* (female; KU 338507) were collected.

*Results and Discussion.*—Our records of both taxa from the northern reaches of the Mindanao Faunal Region (Samar Island) represent new island records and significant range extensions, substantiating previous hypotheses of broader geographic ranges in both species (Siler et al. 2014a).

The only previously published vouchered record of *Pseudogekko* species on Samar was the holotype for *P. brevipes* (SMF 8988, inspected and verified by Davis et al. 2015), collected from an unidentified site (Boettger 1897). Interestingly, no individuals of *P. brevipes* were observed or collected during the most recent expedition in 2014. The addition of *P. ditoy* and *P. pungkaypinit* increases the number of species of False Geckos observed on Samar to three. Documentation of these two congeners at sites in both northern and eastern Samar also suggests that undiscovered populations may exist elsewhere on the island.

Within the genus *Pseudogekko*, observations of congeneric sympatry have been limited to a few examples within the Luzon and Mindanao Faunal Regions (Siler et al. 2014a), with little published about differences among sympatric species (i.e., ecology, size, etc.). However, it is worth noting that examples exist of sympatric communities of the same relative size (e.g., *P. compresicorpus* and *P. smaragdinus* on Polillo Island in the Luzon Faunal Region), as well as communities composed of species with disparate body sizes (e.g., populations of *P. ditoy* and *P. pungkaypinit* on Leyte and Samar in the Mindanao Faunal Region; Table 1; Siler et al. 2014a,b). The new records for *P. ditoy* and *P. pungkaypinit* further support the possibility of sympatry of either or both species with *P. brevipes* on Samar; however, future

TABLE 1. Summary of representative meristic and mensural characters of adult specimens from recently discovered Samar Island populations of *Pseudogekko pungkaypinit* and *P. ditoy*. Mensural characters are given in mm as a range followed by mean ± standard deviation in parentheses where sample size allows and are given as individual values otherwise. In cases of scale count variation within species, numbers of individuals showing specific counts are given in parentheses.

| | *pungkaypinit* Siler et al. (2014) | *pungkaypinit* Samar Island | *ditoy* Siler et al. (2014) | *ditoy* Samar Island |
|---|---|---|---|---|
| Sample size (female, male) | 2, 4 | 7, 4 | 1, 1 | 1, 1 |
| Snout–vent length (female) | 75.2, 75.3 | 61.9–74.5 (70.0 ± 4.2) | 52.6 | 49.7 |
| Snout–vent length (male) | 66.6–76.8 (71.8 ± 5.1) | 61.3–70.8 (64.9 ± 4.6) | 49.4 | 46.5 |
| Axilla–groin distance | 37.2–41.2 (39.6 ± 1.8) | 33.4–42.4 (37.6 ± 3.0) | 25.1, 29.7 | 25.7, 24.2 |
| Total length | 125.3–141.2 (135.2 ± 8.6) | 111.7–141.4 (129.1 ± 10.1) | — | — |
| Midbody width | 7.7–9.1 (8.2 ± 0.6) | 6.5–10.2 (8.0 ± 1.0) | 6.3, 7.3 | 8.3, 7.9 |
| Head length | 11.4–13.6 (12.6 ± 0.9) | 10.4–13.1 (11.9 ± 1.0) | 9.3, 9.6 | 9.3, 9.1 |
| Head length/snout–vent length | 17–18 (17 ± 0) | 16–19 (17 ± 1) | 18, 19 | 19, 20 |
| Head width | 9.3–11.2 (10.6 ± 0.9) | 8.8–11.0 (10.0 ± 0.7) | 7.7, 7.9 | 8.0, 7.7 |
| Head width/snout–vent length | 14–15 (15 ± 0) | 14–15 (15 ± 0) | 15, 16 | 16, 17 |
| Snout length | 6.7–7.5 (7.2 ± 0.4) | 6.8–8.7 (7.5 ± 0.6) | 5.4, 5.7 | 5.4, 5.4 |
| Snout length/head length | 54–60 (58 ± 3) | 55–68 (63 ± 4) | 57, 59 | 58, 59 |
| Finger III scansor count | 15 (3)<br>16 (1)<br>17 (2) | 13 (2)<br>14 (8)<br>15 (1) | 14 (1)<br>15 (1) | 14 (2) |
| Toe IV scansor count | 17 (1)<br>18 (2)<br>19 (2)<br>21 (1) | 18 (3)<br>19 (6)<br>20 (2) | 16 (1)<br>17 (1) | 17 (1)<br>21 (1) |
| Supralabial count | 16 (1)<br>18 (2)<br>19 (2)<br>20 (1) | 18 (1)<br>19 (3)<br>20 (3)<br>21 (4) | 17 (1)<br>20 (1) | 19 (1)<br>21 (1) |
| Infralabial count | 17 (4)<br>18 (1)<br>19 (1) | 16 (2)<br>17 (7)<br>18 (1)<br>20 (1) | 16 (1)<br>17 (1) | 16 (1)<br>19 (1) |
| Circumorbital count | 50–55 | 43–61 | 40, 43 | 44, 42 |
| Paravertebral scale count | 265–280 | 235–278 | 180, 185 | 163, 178 |
| Ventral scale count | 125–155 | 127–158 | 111, 118 | 112, 154 |
| Enlarged pore series count (males) | 17–20 | 18–20 | 18 | 17 |

—, Total length not available without intact original tail.

surveys are necessary to confirm the distribution of sympatric communities on this island.

We observed morphological variation between populations of *Pseudogekko ditoy* and *P. pungkaypinit* from Samar and those from Leyte (Table 1; Siler et al. 2014a), which differed from previously published mensural and meristic data (Table 1), and which was similar to intraspecific variation in *P. compresicorpus* (Siler et al. 2014a,b). Future studies of *Pseudogekko* should incorporate the study of intraspecific phenotypic variation across the geographic ranges of both species to facilitate species identification. Photographs in life of both species show additional, novel variation of pigmentation characters that may assist in field identification (Fig. 1). Notably, populations of both species on Samar Island were observed to possess neon yellow-green circumorbital scales, which differ significantly from published observations of Leyte Island populations (Fig. 1B,C). Also, specimens of both species from Samar have mottled pigmentation on the eyes, the irises of *P. ditoy* are darker brown, and vibrantly green in *P. pungkaypinit*, which is congruous with conspecifics collected from the rest of their ranges respectively (Fig. 1). Although this coloration appears consistent with photographs in life of other populations of both species, it seems that *P. pungkaypinit* on Samar have a more conspicuous green iris (Fig. 8: Siler et al. 2014a). These populations also contain dark blotches of pigmentation that span the dorsal surface of the body and appear to vary in density among individuals, which has not been documented in other conspecific populations (Siler et al. 2014a). Blotches are distributed irregularly on some individuals (KU 338498) and form a single, middorsal line in others (KU 338497; Fig. 1). Observed variation among populations of *P. ditoy* and *P. pungkaypinit* may provide future insights into intraspecific lineage diversity that may exist within each of these two species.

Discovery of populations of *Pseudogekko ditoy* and *P. pungkaypinit* on Samar Island should be considered in any re-evaluation of conservation status for both species. Currently, three of the species in the genus qualify for vulnerable status under IUCN criteria for classification (IUCN 2014); however, many members of the genus suffer from a lack of data available to evaluate threats to conservation (Siler et al. 2014a; Davis et al. 2015). Owing to its widespread distribution and our additional observations from Samar Island that suggest that the species is widespread throughout the Mindanao Faunal Region, *P. pungkaypinit* appears to be a species of lesser conservation concern. However, its presumed preference for forested habitats in the Philippines suggests that the species may be at risk in the future as a result of the continued loss of suitable habitats (Brown and Alcala 1978; Lasco et al. 2011; Siler et al. 2014a). In contrast, *P. ditoy* may be more vulnerable to extirpation due to its smaller documented range (Siler et al. 2014a). Observations at both sites on Samar suggest both species prefer vegetation 1–3 m from the ground, in undisturbed forest habitats at elevations between 100–210 m (Siler et al. 2014a). The results of this study reinforce our poor understanding of range size for species of this endemic Philippine clade of geckos, and future studies should work to document species' distributions across the archipelago. More importantly, survey efforts should coincide with studies of ecological and microhabitat preferences to increase our understanding of these secretive species.

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