

SHORT COMMUNICATION

Novel cave habitat used by the cryptic lizard *Pinoyscincus abdictus abdictus* (Squamata: Scincidae) on Dinagat Islands, Philippines

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The Philippines supports the highest concentration of endemic terrestrial vertebrates (Heaney 2000, 2007) per unit land area in the world and is intrinsically linked to diverse tropical habitats and a rich geological history (Catibog-Sinha and Heaney 2006, Brown and Diesmos 2009) that included larger landmasses during periods of low sea levels often referred to as Pleistocene aggregate island complexes

(PAICs: Brown and Diesmos 2002, Brown *et al.* 2013). A recent comprehensive account of the reptile diversity throughout the entire archipelago included 355 species (Gonzalez *et al.* 2018). The Dinagat island is the third largest island in the Mindanao biogeographic subregion (e.g., Bohol, Leyte, Samar islands), situated just north of northeastern Mindanao (Villanueva 2009, Lillo *et al.* 2019) with approximately 80,212 hectares of land area including 47 islands and islets adjacent to mainland Dinagat (Lillo *et al.* 2019). Topographically, the Dinagat islands are composed of several habitats including

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limestone forest and karst caves spanning from northwestern Dinagat to southwestern part of the island group and shelters numerous endemic reptiles. Cave dwelling reptiles were frequently recorded utilizing different cave microhabitats (e.g., cave walls, crevices, groundwater) for shelter (Sy and Parcon 2014, Nuñez and Galorio 2015), and as a source of available food (Nuñez et al. 2015). They are not uniformly distributed in the Philippines and have limited dispersal ability (Romero 2009, Culver and Pipan 2013), depending on specific microclimatic features (e.g., temperature, humidity, illuminance) (Lunghi et al. 2017) and degree of anthropogenic disturbance on cave habitats. Despite such rich biodiversity and wide array of ecosystems, habitat loss, human overpopulation, high rates of deforestation (Mallari et al. 2001, Ong et al. 2002, Venturina et al. 2020), mining and logging (Lillo et al. 2019), illegal hunting, wildlife trade (Gonzalez et al. 2018), and persecution of wildlife (i.e. particularly reptiles) for food consumption are the threats to the habitats and associated reptilian communities throughout the Dinagat Islands.

The genus *Pinoyscincus* is a group of scincid lizards that contains both morphologically distinct and cryptic species (Linkem et al. 2010, 2011). Earlier studies support the recognition and validity of taxonomic species and subspecies within this group, recognized through sufficient ecological evidence, morphological distinctiveness, distinct biogeographic faunal boundaries and collective information on field surveys (Brown et al. 1996, 2000, Ferner et al. 2000). Recent taxonomic revision of the genus *Sphenomorphus* resulted in the recognition of the genus *Pinoyscincus* as a distinct group of Philippine skinks (Greer 1974, Linkem et al. 2010, 2011). There are eight known species within this genus of which five are reported in Mindanao PAIC and three out five species are partitioned into two subspecies (Linkem et al. 2011). This includes the enigmatic *P. abdictus abdictus* (Brown and Alcala 1980) with a co-cryptic subspecies [*P. abdictus aquilonius* (Brown and Alcala 1980)] in Greater Luzon and *P. jagori*

jagori (Peters, 1864) with a co-cryptic subspecies [*P. jagori grandis* (Taylor, 1922)] in West-Visayas, respectively found in Eastern Mindanao and Dinagat; *Pinoyscincus coxi coxi* (Taylor, 1915) in Central-Western Mindanao with a co-cryptic subspecies [*P. coxi divergens* (Taylor, 1922)] in Southern Luzon and Mindoro; *P. llanosii* (Taylor, 1919) in Samar and Leyte and *P. mindanensis* (Taylor, 1915) in Northern Mindanao (Linkem et al. 2011).

The Mindanao forest skink *P. abdictus abdictus* (Brown and Alcala 1980) was formerly known as *Sphenomorphus abdictus abdictus*; it is a moderately large (SVL range: 81–98 mm) terrestrial skink endemic to Mindanao PAIC subregion (Linkem et al. 2010). This scincid lizard is known to occur in the islands of Bohol, Camiguin Sur, Dinagat, and Northeastern Mindanao (Buekema 2011, Nuñez et al. 2015, Sanguila et al. 2016, Uetz et al. 2020), inhabiting riparian and open forested habitats (Linkem et al. 2010) up to 500 m a.s.l. (Uetz et al. 2020). Other than this knowledge, its natural history and ecology remains poorly understood.

Herein, we provide a novel cave utilization and unique habitat use of the cryptic Mindanao forest skink *Pinoyscincus abdictus abdictus* found in Hinophopan Cave (10°21'40.8" N, 125°34'00.5" E, WGS 84) at 80 m a.s.l. in a mixed agricultural limestone habitat of Barangay San Juan, Municipality of Loreto in Dinagat Islands. We observed five adults of *P. abdictus abdictus* in the twilight zone (13 m from entrance) and at the entrance zone of a cavern, crawling and actively foraging for food (Figure 1B–C) on cave floors and crevices from 9:00 to 18:00 h during our herpetological survey conducted from 28 January to 4 February 2020. They were observed feeding on ants, crickets and small arthropods in the vicinity of the entrance zone and twilight zone and often basked in the opening of the cave. The vegetation surrounding the cave was mainly composed of limestone outcrops dominated by *Cocos nucifera* L., *Musa acuminata* L., *Aglaomorpha quercifolia* (L.) J. Sm., *Lygodium circinnatum* Sw., *Phyllanthus ramosii* Quisumb and Merr., and

other understory plants. We spent almost 1.3 hours during each visit (three visits; five persons) searching in crevices and cave walls for lizards. We collected a single adult male of moderate size (SVL 83.1 mm, tail length 71.1 mm, weight 13.76 g) in Hinophopan Cave. The dorsum of the individual of *P. abdictus abdictus* had a distinct dark brown pattern with a uniformly ragged, yellow pattern along the rear creating a dorsolateral band from head to tail (less pronounced). The ventral body scales were relatively gray with white fissured lines along the lateral surface of the body. An external tympanum was present and the forelimbs were smaller than the hind limbs. The specimen had large eyes with a unique yellow eye ring coloration and smooth scales on the entire body (Figure 1D).

Lizards were identified using the published accounts of Linkem *et al.* (2011) and Sanguila *et al.* (2016). Voucher specimen was collected and preserved (humanely euthanized with aqueous chloretone, fixed in 10% buffered formalin and subsequently transferred to 70% ethanol) following the standard preservation protocol (Heyer *et al.* 1994, Simmons 2002), and deposited in the Mindanao State University-Iligan Institute of Technology Natural Science Museum (MSU-IIT NSM; collection number NSM 4087).

Utilization of cave habitats by Philippine lizards (e.g., breeding site, foraging, refuging) were also previously reported from different parts of the Philippine archipelago. Records include *Draco spilopterus* (Wiegmann, 1834)




Figure 1. The Mindanao Forest Skink *Pinoyscincus abdictus abdictus* is frequently encountered in limestone habitat and utilized Hinophopan cave system of Loreto Dinagat Island (A) to forage for food (B-D). Photos by EPM.

and *Gekko mindorensis* (Taylor, 1919) in Cebu and Panay Island (Ferner *et al.* 2000, Supsup *et al.* 2016), *Gekko gigante* (Brown and Alcalá, 1978) in Gigantes Island (Bucol *et al.* 2010), *Cyrtodactylus agusanensis* (Taylor, 1915), *Cyrtodactylus annulatus* (Taylor, 1915), *Pinoyscincus jagori jagori* (Peters, 1864), *Sphenomorphus faciatus* (Gray, 1845), *Sphenomorphus variegatus* (Peters, 1867), and *Tropidophorus misaminius* (Stejneger, 1908) in Mindanao Island (Sy and Parcon 2014, Nuñez *et al.* 2015, Sanguila *et al.* 2016), *Cyrtodactylus philippinicus* (Steindachner, 1867) in Romblon Island Group (Siler *et al.* 2012), and *Gekko gecko* (Linnaeus, 1758) in Siargao Island (Nuñez and Galorio 2015). *Pinoyscincus abdictus abdictus* have not been reported to use cave habitats before.

Further herpetological surveys and research on Dinagat island group and other areas throughout the Mindanao PAIC are needed to better evaluate the population status and use of cave systems (e.g., seasonal or temporal) and species-habitat association (e.g., niche differentiation, niche overlap) of *P. abdictus abdictus* to other *Pinoyscincus* sympatric species (e.g., *P. jagori jagori* and *P. mindanensis*).

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