

New distribution record, ecology and tail trifurcation of *Cyrtodactylus mamanwa* (Gekkonidae) on Dinagat Islands, Philippines

Erl Pfan T. Maglangit^{1,2}, Riza Jane C. Tapdasan¹, Rico C. Medija Jr.¹,
Maria Fe P. De Alba¹, Liza A. Adamat¹, Olive A. Amparado¹,
Olga M. Nuñez^{1,2}, Mae Lowe L. Diesmos³, Arvin C. Diesmos⁴

¹ Department of Biological Sciences, College of Science and Mathematics, Mindanao State University-Iligan Institute of Technology, Andres Bonifacio Avenue, Iligan City 9200, Philippines

² Premier Research Institute of Science and Mathematics (PRISM), Mindanao State University-Iligan Institute of Technology, Iligan City, Philippines

³ Biological Science Department, College of Science and Research Center for Natural and Applied Sciences, University of Santo Tomas, España Boulevard, Manila 1015, Philippines

⁴ Herpetology Section, Zoology Division, Philippine National Museum, Rizal Park, Burgos Street, Ermita 1000, Manila, Philippines

<http://zoobank.org/AF1357D3-F4C7-4EB8-B4CA-04BA54F2D5E9>

Corresponding author: Erl Pfan T. Maglangit (erlpfianmaglangit@gmail.com)

Academic editor: Yurii Kornilev ♦ Received 10 April 2021 ♦ Accepted 13 August 2021 ♦ Published 2 September 2021

Abstract

This study highlights the ecology, natural history, and a new distribution record by providing a unique habitat occurrence record in karst ecosystem and describes a tail anomaly of the endemic Mamanwa Bent-toed Gecko *Cyrtodactylus mamanwa* in the province of Dinagat. The detection of a new population on Unib Island in the southwestern Dinagat extends the previously known distribution of this gekkonid by approximately 100 km south from its known distribution.

Key Words

Dinagat Islands, gekkonid, new island record, reptile, tail abnormality

Introduction

Gekkonidae is one of the most comprehensively studied reptilian families in the Philippines. It is widespread, species-rich, charismatic, and includes many iconic species popular with the general public. Philippine gekkonids are mostly arboreal, ground, and rock dwellers, with a few species demonstrating extraordinary commensal behavior living in close association with humans (Parves and Alam 2015). Mostly nocturnal, they feed on insects and small arthropods and play a vital role in pest control (Newbery and Jones 2007; Tkaczenko et al. 2014; Meiri 2019). They inhabit a range of environments from built-up areas, mixed agricultural plantations, and lowland

forests (Siler et al. 2012; Sanguila et al. 2016; Supsup et al. 2016, 2020).

Recent taxonomic revisions and discoveries reveal 55 species of Philippine gekkonids from eight genera: *Cyrtodactylus* (9), *Gehyra* (1), *Gekko* (14), *Hemidactylus* (5), *Hemiphyllodactylus* (2), *Lepidodactylus* (6), *Luperosaurus* (8), and *Pseudogekko* (10) (Taylor 1915; Taylor 1922; Brown and Alcala 1978; Gaulke et al. 2007; Brown et al. 2007, 2011, 2020; Welton et al. 2009; Welton et al. 2010; Wood et al. 2020). The genus *Cyrtodactylus* comprises *C. agusanensis* (eastern Mindanao Island), *C. annulatus* (Mindanao Island and Western Visayas), *C. gubaot* (western Leyte Island), *C. jambangan* (western Mindanao Island), *C. mamanwa* (northern

Dinagat Island), *C. philippinicus* (Northern and Central Philippines), *C. redimiculus* (Palawan Island), *C. sumoroi* (eastern Samar Island) and *C. tautbatorum* in Palawan Island (Welton et al. 2010).

The Mamanwa Bent-toed Gecko *C. mamanwa* is a recently described cryptic species of lizard endemic to the province of Dinagat, split from the *C. agusanensis* complex (Welton et al. 2010). A nocturnal, arboreal, and medium-sized lizard, it occurs in ultramafic habitats (e.g., large boulders, fallen logs on stream banks) from sea level up to 195 m elevation in northeastern Dinagat islands (Welton et al. 2010; Sanguila et al. 2016). Females (maximum snout to vent length, SVL = 92 mm) are larger than males (maximum SVL = 67.5 mm) (Welton et al. 2010). However, its ecology and distribution remain understudied since its discovery.

For most lizards including gekkonids, an intact tail plays a vital role in locomotion, e.g., balance, locomotor performance, ecological flexibility, foraging, predation avoidance, obstacle evasion (Ballinger 1973; Garland and Losos 1994; Iverson et al. 2004; Ofori et al. 2018), storage of nutrients (Daniels 1984), and intraspecific interaction, e.g., courtship, mating, social status, territory defense (Bateman and Fleming 2009; McElroy and Bergmann 2013; Jagnandan et al. 2014). However, their ability to shed the tail and regenerate it does not always function perfectly and may result in unusual tail malformation during regeneration.

Tail anomalies (e.g., bifurcation, trifurcation) have been widely documented. Bifurcation is noted among multiple lizard families: Agamidae (Ofori et al. 2018), Anguillidae (Conzendey et al. 2013), Corytophanidae (Cervera and Novelo 2020), Dactyloidae (Najbar and Skawiński 2018; Hoefler and Robinson 2020), Gekkonidae (De Andrade et al. 2015; Gogoi et al. 2018; Maria and Al-Razi 2018; Bhattari et al. 2020), Gymnophthalmidae (Pheasey et al. 2014), Iguanidae (Koleska et al. 2017; Lozano and Siro 2020), Lacertidae (Koleska et al. 2017; Baeckens et al. 2018; Kornilev et al. 2018; Ramadanovic and Zimic 2019; Sorlin et al. 2019), Mabuyidae (Vrcibradic and Niemeyer 2013), Phrynosomatidae (Álvarez et al. 2020), Phyllodactylidae (Filadelfo et al. 2017; Koleska 2018; Tzoras et al. 2020), Polychrotidae (Goin and Goin 1971), Scincidae (Jablonski 2016; Turner et al. 2017; Vergilov and Natchev 2017; Mendes et al. 2019; Magalhães et al. 2020; Miles et al. 2020), Teiidae (Sales and Freire 2019; Da Silva et al. 2019) and Tropicuridae (Passos et al. 2014). However, supernumerary (e.g., tail trifurcation) caudal anomalies were reported only for a few families: Dactyloidae (Camper and Camper 2017), Gymnophthalmidae (Pheasey et al. 2014), Iguanidae (Hayes et al. 2012), Lacertidae (Koleska and Jablonski 2015), Phrynosomatidae (Mata-Silva et al. 2010), Gekkonidae (Crouch 1969) and Teiidae (Trauth et al. 2014; Passos et al. 2016).

In the Philippines, bifurcation was documented only for Gekkonidae [*C. mamanwa* (Welton et al. 2010)] and Scincidae [*Eutropis indeprensa* (Sy and Dalabajan 2018)]

from Palawan Island. Herein we present additional knowledge on the ecology, natural history, the distribution, and tail trifurcation anomaly of *C. mamanwa* on Unib Island.

Materials and methods

We conducted a field survey of the herpetofauna at the limestone karst Unib Island (10°01'12.55"N, 125°30'55.90"E, datum WGS 84, 5–120 m elevation), part of the southwestern Dinagat Islands, Barangay Columbus, Municipality of Basilisa, Dinagat Province on 4–15 September 2019. We surveyed 5 transects into each of two habitats (mixed agricultural areas and mature secondary growth forests). Transects were 100 m long by 10 m wide (Heyer et al. 1994; Diesmos 2008; Supsup et al. 2016), marked with luminous ribbon strips placed 10 m apart. We employed visual encounters, opportunistic catching, and microhabitat searches (e.g., limestone crevices, tree trunks, and decaying logs), during daytime (07:30–11:30 h) and night time (18:30–23:30 h). We specifically noted natural history and behavioral observations of *C. mamanwa* during our 10-day sampling (720 person-hours by 6 individuals).

Previous distribution records of *C. mamanwa* were summarized (Welton et al. 2010; Sanguila et al. 2016). All captured individuals were measured using a digital caliper (e.g., SVL), weighed using an electronic weighing scale (± 0.1 g), were identified using published references by Taylor (1922), Welton et al. (2010), Sanguila et al. (2016), and we followed the taxonomic arrangements of The Reptile Database (Uetz et al. 2020). Captured *C. mamanwa* were humanely preserved (euthanized with aqueous chloretone, fixed in 10% buffered formalin and consequently transferred to 70% ethanol), following a standard preservation protocol (Heyer et al. 1994; Simmons 2002) and were deposited in Mindanao State University-Iligan Institute of Technology Natural Science Museum (MSU-IIT NSM).

Results

We documented 51 individuals of *C. mamanwa* in our survey on Unib Island. We observed adults, subadults, and juvenile individuals. We collected 18 adult individuals as voucher specimens (12 males, SVL: 55.5–90.1 mm, mean = 77.01 ± 13.9 SD, weight range: 2.64–11.9 g; 6 females, SVL: 76.5–94.2 mm, mean = 88.7 ± 7.1 SD, weight range: 9.05–12.9 g; vouchers ## 3982–3985, 4019–4023, 4027–4028, 4030–4032, 4038, 4041, 4044, 4049). Specimens from this population were all collected from microhabitats in the proximity of limestone karst outcrops, rock crevices, karst walls and caves, and tree trunks.

This gekkonid displays a variable dorsal color pattern, from canary-yellow to dark-brown depending on the environment it inhabits. It had a distinct red lining with irregular patterns of branching streaks at the cornea and



Figure 1. Tail trifurcation in *Cyrtodactylus mamanwa* on Unib Island. Note the distinct appearance, color, and pattern of the regenerated secondary tail (top), and the supernumerary tail at the tip of the original regenerated tail.

distinctive eyelashes with yellow coloration. The dorsum portrays moderate longitudinal dark bands projecting from the anterior to the posterior (Welton et al. 2010), with hindlimbs and forelimbs forming an asymmetrical stripe extending to its digits. We observed lizards actively foraging and feeding on cockroaches, termites, and small arthropods at night. We located them in limestone outcrops, rock crevices, and tree trunks in mixed agricultural areas and secondary growth forests over limestone karst habitat at night, and found them utilizing cave walls, tree branches, and underneath a decaying log for shelter and refuge during the day.

The individuals we collected were visibly in good physical condition except for one male (MSU-IIT NSM 4020; SVL = 89.1 mm; weight = 11.7 g, Fig. 1), which had an unusual tail trifurcation. The original regenerated tail measured 71 mm. It presented a pronounced asymmetrically forked tail split near the tip of the regenerated autotomized tail (59 mm, posterior to the base of the original regenerated tail), with a distinct pale-greyish color pattern and exhibited a terminated regenerated tail end. The supernumerary tails were of different lengths. The secondary tail axis (bifurcated tail) measured 13.5 mm, forming a 67° angle with the main tail axis while the under-developed offshoot and less noticeable tertiary branch (trifurcated tail extension) measured 2.3 mm and created a 10° angle from the tip of the main tail axis (Fig. 1). The re-grown tail after autotomy varied distinctively from the

original tail based on its color pattern and replacement of the bone and cartilage (Fig. 2). This observation suggests complete autotomy with incomplete tail regeneration possibly due to tail development injuries that may have triggered unparalleled growth of secondary tail, and subsequently with the tertiary tail. More than half of the collected specimens had regenerated tails ($n = 11$, 57.9%). Caudal autotomy was mostly detected in collected males ($n = 9$, 81.8%) rather than females ($n = 2$, 25.0%). We used three voucher specimens to represent the whole population documented on Unib Island and present tail features, patterns of sexual dimorphism, and a tail trifurcation anomaly of *C. mamanwa* (MSU-IIT NSM; ## 3982, 4020 and 4021).

Table 1. Distribution records of *Cyrtodactylus mamanwa* on Dinagat Islands, Philippines.

Sites	Locality	Municipality	Coordinates	Elevation	Reference
1	Esperanza	Loreto	10°23'06.0"N, 125°36'50.4"E	48 m	Welton et al. 2010
2	Kawayanan	Loreto	10°21'00.0"N, 125°36'57.6"E	255 m	Sanguila et al. 2016
3	Esperanza	Loreto	10°22'53.8"N, 125°36'57.6"E	5–116 m	Sanguila et al. 2016
4	San Juan	Loreto	10°21'31.0"N, 125°34'48.0"E	26–72 m	Sanguila et al. 2016
5	Santiago	Loreto	10°20'37.0"N, 125°37'04.8"E	No data	Sanguila et al. 2016
6	Columbus	Basilisa	10°01'12.6"N, 125°30'55.9"E	5–120 m	This work

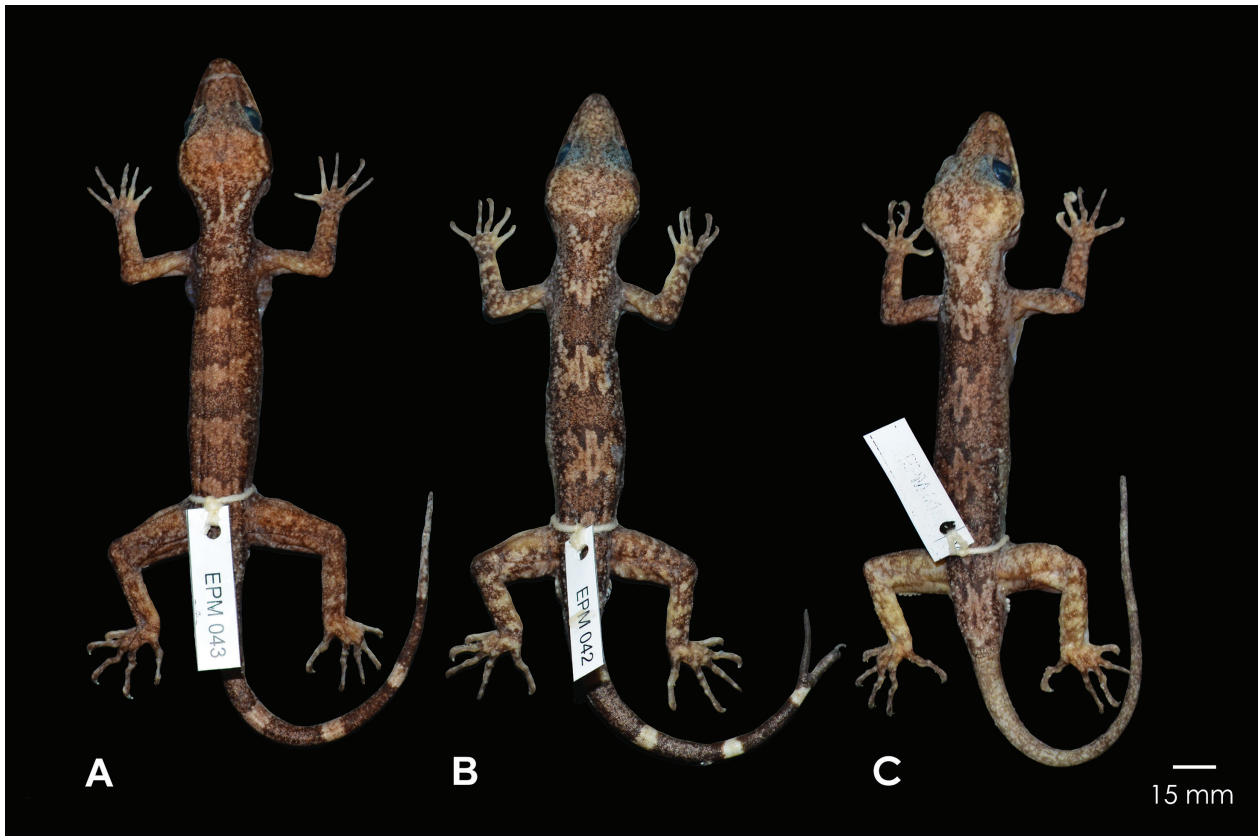


Figure 2. Differences in the morphology of male and female *Cyrtodactylus mamanwa*, emphasizing tail features (A. female, Original tail; B. male, trifurcated tail; C. male, regrown tail) documented on Unib Island.

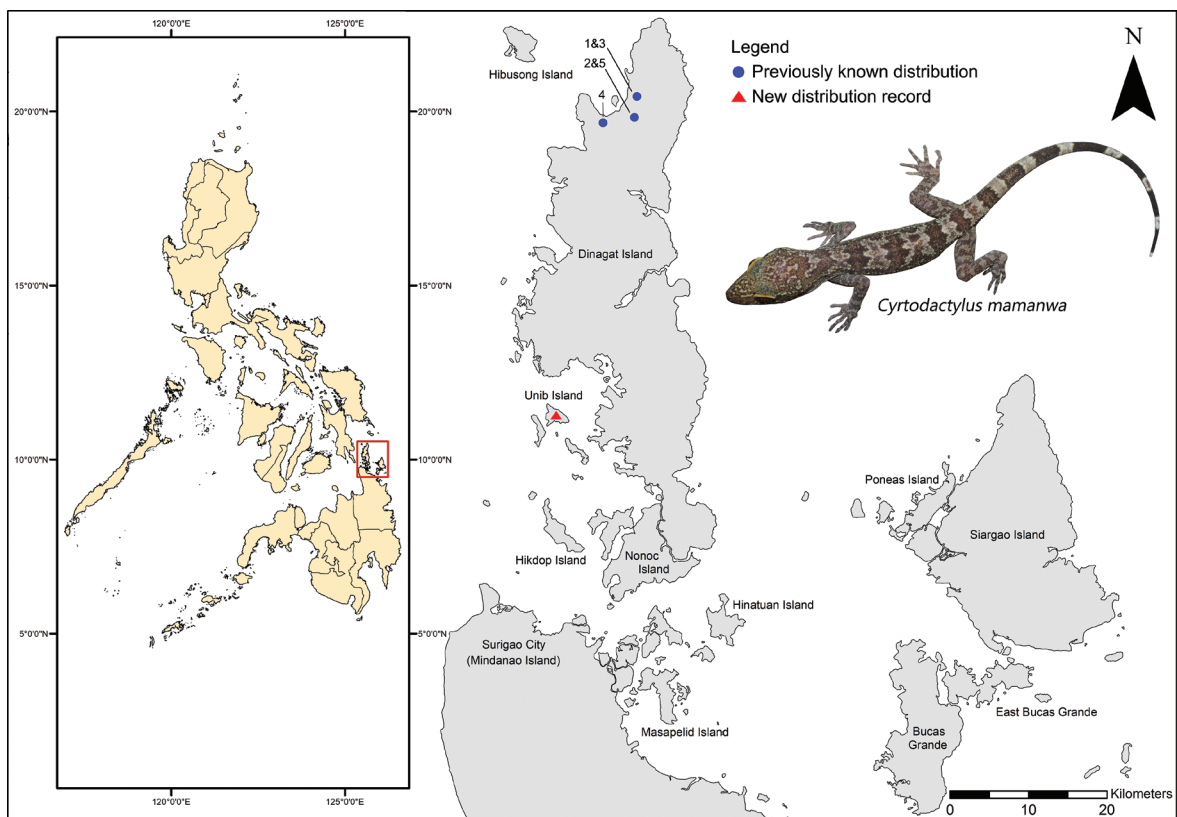


Figure 3. Map of Dinagat Islands with other numerous adjacent islands including Bucas Grande and Siargao (right) within the Philippines (left). Previously known distribution (blue dots) and new distribution record (right triangle) of *Cyrtodactylus mamanwa* in Dinagat Islands. Numbers refer to records presented in Table 1.

Discussion

Cyrtodactylus mamanwa is endemic to the province of Dinagat. Published reports on its distribution are concentrated on the northern part of Dinagat Island (Municipality of Loreto; Sanguila et al. 2016). The detection of a seemingly numerous and healthy population of *C. mamanwa* on the island of Unib, approximately 25 km east of the large Dinagat Island, extends its known distribution by approximately 100 km southwest. It occupies diverse macro- and micro-habitats (e.g., ultramafic forest, forest over limestone or karst).

The present work provides an additional distribution record of *C. mamanwa* from the Dinagat Islands. It is not surprising that the distribution of *C. mamanwa* extends to the southwestern part of Dinagat islands since previous records suggest that it might be present on the neighboring islands of Bucas Grande and Siargao (Welton et al. 2010; Sanguila et al. 2016). However, the population on which we report here illustrates unique habitat occurrence where they are found to inhabit limestone karst ecosystem.

Tropical gekkonids demonstrate a high rate of tail autotomy (Arnold 1984). It is an important defensive strategy of lizards in escaping predators (Gogoi et al. 2018). However, this limits locomotion performance, decreases social status, and reduces mating opportunities (Chapple and Swain 2002; Bateman and Fleming 2009). The individuals we collected that exhibited caudal autotomy might have survived predatory attacks (e.g., birds, snakes) represented by a trifurcated regenerated tail. However, tail malformation may hamper locomotory ability and fitness which attracts putative predatory encounters reducing the survival of the lizards and affects them negatively (Bateman and Fleming 2009; Camper and Camper 2017). We presume that *C. mamanwa* is a natural prey item of predators such as the snakes *Chrysopelea paradisi variabilis*, *Stegonotus muelleri*, *Dendrelaphis marenae*, the birds *Cexy argentatus*, *Halcyon coromanda*, *Penelopides panini* that are present on Unib Island. We have documented a *Chrysopelea paradisi variabilis* preying on *Lepidodactylus herrei* (Maglangit et al. 2021), a closely related gekkonid species to *C. mamanwa*. The higher occurrence of caudal autotomy in males than in females may suggest intraspecific aggression during mating and territorial fights (Iverson et al. 2004; Koleska et al. 2017) and male-male competition over food resources (Koleska 2018). Although the cause of autotomy of these gekkonids is unknown, this species may be a good model for predator-prey interaction studies.

To further understand the process of tail regeneration and the incidence of tail malformations, we encourage herpetologists and biologists to focus on areas of developmental biology (e.g., mechanisms of tail regeneration), histology (e.g., anatomical and histological cause of tail breakage), and physiology (e.g., signals that trigger tail autotomy, effects on fitness and locomotion).

Acknowledgements

We are grateful to the Department of Science and Technology-Science Education Institute (DOST-SEI) through *Accelerated Science and Technology Human Resource Development Program* (ASTHRDP). We thank the Philippine Department of Environment and Natural Resources through DENR CARAGA Region XIII for providing a research permit (Wildlife Gratuitous Permit No: R13-2019-49). We thank The Provincial Environment and Natural Resource Office (PENRO) of Dinagat Islands for their technical support in logistics and transportation, to the local government unit of Municipality of Basilisa for their active support, to our enthusiastic field colleagues R.B. Caballero, M.A. Alcular, J.R. Rondina, C. Badelles, R.L. Calago, K.M. Calago, R.Y. Sayson, E.M. Flores, J. Degoma, D.R. Calumba, D.N. Razo and our field assistants and guides C. Caballes, J. Hipolan, N. Hipolan, B. Glico, N. Glico, F. Glico, E. Baptisma, and S. Baptisma. We extend our appreciation to Mr. Emerito B. Batara and Ms. Alyana O. Macapayag of Mindanao State University - Iligan Institute of Technology Natural Science Museum (MSU-IIT NSM) for facilitating herpetofaunal specimen collection. We thank R.E. Venturina, Y.L. Del Prado, and N.A.A. Caguimbal for their comments and suggestions on an earlier draft of this manuscript. We are grateful to Y. Kornilev and M. Sanguila for their constructive comments and critical inputs in reviewing the manuscript.

References

- Álvarez JA, Valdéz-Villavicencio JH, Wilcox JT, García AP (2020) Bifurcation in the tail of Black-tailed Brush Lizard (*Urosaurus nigricaudus*) in northern Baja California, Mexico. *Sonoran Herpetologist* 33(3): 81.
- Arnold EN (1984) Evolutionary aspects of tail shedding in lizards and their relatives. *Journal of Natural History* 18: 127–169. <https://doi.org/10.1080/00222938400770131>
- Baeckens S, Leirs W, Scholliers J (2018) *Podarcis melisellensis* (Dalmatian Wall Lizard) Tail bifurcation. *Herpetology Review* 49(4): 746.
- Ballinger RE (1973) Experimental evidence of the tail as balancing organ in the lizard *Anolis carolinensis*. *Herpetologica* 29: 65–66.
- Bateman PW, Fleming PA (2009) To cut a long tail short: a review of lizard caudal autotomy studies carried out over the last 20 years. *Journal of Zoology* 277(2009): 1–14. <https://doi.org/10.1111/j.1469-7998.2008.00484.x>
- Bhattari S, Lamichhane BR, Subedi N (2020) Tail bifurcation in a yellow-bellied house gecko, *Hemidactylus flaviviridis* Rüppel 1835, in Chitwan, Nepal. *IRCF Reptiles and amphibians* 27(1): 48–49. <https://doi.org/10.17161/randa.v27i1.14448>
- Brown RM, Diesmos AC, Duya MV (2007) A new *Luperosaurus* (Squamata: Gekkonidae) from the Sierra Madre of Luzon Island, Philippines. *Raffles Bulletin of Zoology* 55: 167–174.
- Brown RM, Diesmos AC, Oliveros CH (2011) New Flap-Legged Forest Gecko (Genus *Luperosaurus*) from the Northern Philippines. *Journal of Herpetology* 45(2): 202–210. <https://doi.org/10.1670/10-123.1>

- Brown RM, Meneses CG, Wood PL, Fernandez JB, Cuesta MA, Clores MA, Tracy C, Buehler MD, Siler CD (2020) Unexpected discovery of another new species of Philippine false gecko (Gekkonidae: *Pseudogekko*) from the Bicol Peninsula of Luzon Island. *Herpetologica* 76(3): 315–329. <https://doi.org/10.1655/Herpetologica-D-19-00029.1>
- Brown WC, Alcalá AC (1978) Philippine Lizards of the Family Gekkonidae. Silliman University Press, Dumaguete City, Philippines.
- Camper BT, Camper JD (2017) *Anolis equestris* (Knight Anole) Tail trifurcation. *Herpetological Review* 48: 634.
- Cervera PE, Novelo JR (2020) *Basiliscus vittatus* (Brown Basilisk) Habitat use and tail bifurcation. *Herpetological Review* 51(3): 595–596.
- Chapple D, Swain R (2002) Effect of caudal autotomy on locomotor performance in a viviparous skink, *Niveoscincus metallicus*. *Functional Ecology* 16: 817–825. <https://doi.org/10.1046/j.1365-2435.2002.00687.x>
- Conzende P, Campos SPS, Lanna FM, De Amorim JDCG, De Sousa BM (2013) *Ophiodes striatus* (Striped Worm Lizard). Bifurcated tail. *Herpetological Review* 44: 145–146.
- Crouch CR (1969) Old fellow. *Wildlife in Australia* 1969: 101.
- Da Silva TL, Xavier MA, Dos Santos Carvalho GD, Gonzaga FD, Da Costa SM, Dos Reis Dias EJ (2019) *Glaucomastix itabaiaensis* Tail bifurcation. *Herpetological Review* 50(4): 784–785.
- Daniels CB (1984) The importance of caudal fat in the gecko *Phyllo-dactylus marmoratus*. *Herpetologica* 40: 337–334.
- De Andrade MJM, Lopes JRZ, De Sales RF, Freire EM (2015) *Hemidactylus agrius* (Country leaf-toad gecko): Polydactyl and tail bifurcation. *The Herpetological Bulletin* 131(2015): 28–29.
- Diesmos AC (2008) Ecology and diversity of herpetofaunal communities in fragmented lowland rainforests in the Philippines. PhD Thesis. National University of Singapore.
- Filadelfo T, Soeiro M, Coelho DP, Hamdan B (2017) *Phyllopezus pollicaris* (Brazilian Gecko) Tail Bifurcation. *Herpetological Review* 48(3): 656.
- Garland T, Losos JB (1994) Ecological morphology of locomotor performance in squamate reptiles. In [book]: *Ecological morphology: Integrative organismal biology*. Publisher: University of Chicago Press, Chicago.
- Gaulke MH, Roesler H, Brown RM (2007) A new species of *Luperosaurus* (Squamata: Gekkonidae) from Panay Island, Philippines, with comments on the taxonomic status of *Luperosaurus cumingii* (Gray, 1845). *Copeia* 2007(2): 413–425. <https://www.jstor.org/stable/25140644>
- Gogoi M, Kundu S, Goswami J, Saikia D, Pandey N (2018) First record of tail bifurcation in Tokey Gecko (*Gekko gekko*) from the Kaziranga, Assam, India: a field observation. *International Journal of Experimental Research and Review* 15: 5–18.
- Goin CJ, Goin OB (1971) *Introduction to Herpetology* 2nd ed. San Francisco. W. H. Freeman and Co., 353 pp.
- Hayes WK, Iverson JB, Knapp CR, Carter RL (2012) Do invasive rodents impact endangered insular iguana populations? *Biodiversity Conservation* 21: 1893–1899. <https://doi.org/10.1007/s10531-012-0276-4>
- Heyer WR, Donnelly MA, McDiarmid RW, Hayek LAC, Foster MS (1994) *Measuring and monitoring biological diversity; standard methods for amphibians (XVII)*. Smithsonian Institution Press, Washington DC.
- Hoefler S, Robinson NJ (2020) Tail bifurcation in a Brown Anole, *Anolis sagrei* (Dumeril & Bibron, 1837). *Herpetology Notes* 13: 333–335.
- Iverson JB, Smith GR, Pieper L (2004) Factors affecting long term growth of the Allen Cays rock iguana in the Bahamas. In: Alberts AC, Carter RL, Hayes WK, Martins EP (Eds) *Iguanas: Biology and Conservation*. University of California Press, Berkeley, 176–192. <https://doi.org/10.1525/california/9780520238541.003.0015>
- Jablonski D (2016) Tail bifurcation in a Desert lidless skink (*Ablepharus deserti*) from Kyrgyzstan. *IRCF Reptiles and Amphibians* 23(3): 171–172. <https://doi.org/10.17161/randa.v23i3.14126>
- Jagnandan K, Russell AP, Higham TE (2014) Tail autotomy and subsequent regeneration alter the mechanics of locomotion in lizards. *Journal of Experimental Biology* 217: 3891–3897. <https://doi.org/10.1242/jeb.110916>
- Koleska D (2018) First record of tail bifurcation in *Ascaccus gallagheri* from the United Arabian Emirates. *Herpetology Notes* 11: 115–116.
- Koleska D, Jablonski D (2015) Tail trifurcation recorded in *Algyroides nigropunctatus* (Duméril and Bibron, 1839). *Ecologica Montenegrina* 3: 26–28. <https://doi.org/10.37828/em.2015.3.4>
- Koleska D, Kulma M, Vrabec V (2017) *Teira dugesii* (Madeiran Wall Lizard) Tail bifurcation. *Herpetology Review* 48(2): 440–441.
- Koleska D, Svobodova V, Husák T, Kulma M, Jablonski D (2017) Tail bifurcation recorded in *Sauromalus ater*. *Herpetology Notes* 13: 483–484.
- Kornilev YV, Popgeorgiev G, Vacheva E, Tzankov N (2018) First records of melanism (including tail bifurcation) of lacertid lizards (Reptilia: Lacertidae) in Bulgaria. *North-western Journal of Zoology* 14(1): 142–144.
- Lozano JA, Siro DP (2020) Regenerate tail bifurcation in the Green Iguana (*Iguana iguana* Linnaeus, 1758). *Herpetology Notes* 13: 483–484.
- Magalhães FM, Camurugi F, Silveira-Filho RR, Mângia S, Da Conceição BM (2015) *Brasiliscincus heathi* (Brazilian Mabuya) Tail bifurcation in. *Herpetological Review* 46(4): 624–625.
- Maglangit EPT, Medija Jr RB, Tapdasan RJC, De Alba MFP, Adamat LA, Amparado OA, Nuñez OM, Diesmos MLL, Diesmos AC (2021) Range extension of the White-lined Smooth-scaled Gecko (*Lepidodactylus herrei*) and predation by the Paradise Tree Snake (*Chrysopelea paradisi variabilis*), Unib Island, Philippines. *Sonoran Herpetologist* 34(1): 1–20.
- Maria M, Al-Razi H (2017) Observation of tail bifurcation in *Hemidactylus frenatus* (Schlegel, 1836). *Herpetology Notes* 11: 953–954.
- Mata-Silva V, Rocha A, Gandara A, Johnson JD (2010) *Cophosaurus texanus* (Greater Earless Lizard). Multiple tails. *Herpetological Review* 41: 352–353.
- McElroy EJ, Bergmann PJ (2013) Tail autotomy, tail size, and locomotor performance in lizards. *Physiological and Biochemical Zoology* 86(6): 669–679. <https://doi.org/10.1086/673890>
- Meiri S (2019) What geckos are – an ecological-biogeographic perspective. *Israel Journal of Ecology & Evolution* 66(3–4): 1–11. <https://doi.org/10.1163/22244662-20191075>
- Mendes DM, Neto AM, Sobral R, Rafael JA (2019) *Trachylepis atlantica* (Noronha Skink) Tail bifurcation. *Herpetological Review* 50(4): 793.
- Miles DC, Danser CL, Shoemaker KT (2020) Tail bifurcation in *Plestiodon skiltonianus*. *Herpetology Notes* 13: 343–345.
- Najbar A, Skawiński T (2018) *Anolis bimaculatus* (Panther Anole) Tail bifurcation. *Herpetological Review* 49(2): 325.

- Newbery B, Jones DN (2007) Presence of Asian House Gecko *Hemidactylus frenatus* across an urban gradient in Brisbane: influence of habitat and potential for impact on native gecko species. Royal Zoological Society of New South Wales Forum Proceedings, 59–65. <https://doi.org/10.7882/FS.2007.009>
- Ofori BY, Martey P, Musah Y, Attuquayefio D (2018) Tail bifurcation in the African Rainbow lizard (*Agama picticauda* Peters 1877) from Ghana, West Africa. Herpetology Notes 11: 843–845.
- Parves N, Alam SMI (2015) *Hemidactylus flaviviridis* (Reptilia: Gekkonidae): Predation on congeneric *Hemidactylus frenatus* in Dhaka, Bangladesh. The Herpetological Bulletin 132(132): 28–29.
- Passos DC, Fonseca PHM, Romeo De Vivar PR, Kanayama CY, Teixeira VPA, Martinelli AG (2016) Tail trifurcation in the lizard *Salvator merianae* (Squamata: Teiidae) investigated by computer tomography. Phyllomedusa 15(1): 79–83. <https://doi.org/10.11606/issn.2316-9079.v15i1p79-83>
- Passos DC, Pinheiro LT, Galdino CAB, Rocha CFD (2014) *Tropidurus semitaeniatus* (Calango de Lagedo) Tail bifurcation. Herpetological Review 45(1): 138.
- Pheasey H, Smith P, Brouard JP, Atkinson K (2014) *Vanzosaura rubicauda* (Red-Tailed Vanzosaur) bifurcation and trifurcation. Herpetological Review 45: 138–139.
- Ramadanovic D, Zimic A (2019) Record of a *Lacerta agilis* Linnaeus, 1758 with *erythronotus* colour morph and tail bifurcation. Herpetology Notes 12: 779–781.
- Sales RF, Freire EM (2019) *Ameivulla ocellifera* (Spix's Whiptail). Tail bifurcation. Herpetological Review 50(4): 780.
- Sanguila MB, Cobb KA, Siler CD, Diesmos AC, Alcalá AC, Brown RM (2016) The amphibians and reptiles of Mindanao Island, southern Philippines, II: the herpetofauna of northeastern Mindanao and adjacent islands. Zookeys 624: 1–132. <https://doi.org/10.3897/zookeys.624.9814>
- Simmons J (2002) Herpetological collecting and collections management. Utah: Society for the Study of Amphibians and Reptiles 31: 1–153.
- Sorlin MV, Gangloff EJ, Kouyoumdjian L, Cordero GA, Darnet E, Aubret F (2019) *Podarcis muralis* (Common Wall Lizard) Tail bifurcation. Herpetological Review 50(2): 377–378.
- Supsup CE, Puna N, Asis A, Redoblado BR, Panaguinit MF, Guinto FM, Rico EL, Diesmos AC, Brown RM, Mallari NAD (2016) Amphibians and reptiles of Cebu, Philippines: the poorly understood herpetofauna of an island with very little remaining natural habitat. Asian Herpetological Research 7: 151–179.
- Sy EY, Dalabajan AC (2018) Tail bifurcation in *Eutropis indeprensa* on Palawan Island, Philippines. Southeast Asian Vertebrate Records 2018: 006–007.
- Taylor EH (1915) New species of Philippine lizards. Philippine Journal of Science 10: 89–108.
- Taylor EH (1922) The Lizards of the Philippine Islands. Philippine Bureau of Science Monograph 17. <https://doi.org/10.5962/bhl.title.55346>
- Tkaczko GK, Fischer AC, Weterings R (2014) Prey preference of the Common House Geckos *Hemidactylus frenatus* and *Hemidactylus platyurus*. Herpetology Notes 7: 483–488.
- Trauth SE, Walker JM, Cordes JE (2014) *Aspidoscelis sexlineata sexlineata* (Six-lined Racerunner) supernumerary caudal anomalies and a bifid tail. Herpetological Review 45: 492–493.
- Turner H, Griffiths RA, Garcia G, Outerbridge ME (2017) *Plestiodon longirostris* (Bermuda Skink) Tail bifurcation. Herpetological Review 48(1): 198–199.
- Tzoras E, Papaioannou S, Monas M, Panagiotopoulos A (2020) *Tarentola mauritanica* (Moorish Gecko) Tail bifurcation. Herpetological Review 51(2): 336.
- Uetz P, Freed P, Hošek J (2020) The Reptile Database.
- Vergilov V, Natchev N (2017) First record of tail bifurcations in the snake-eyed skink *Ablepharus kitaibelii* Bibron & Bory de Saint-Vincent, 1833 from Pastrina hill (northwestern Bulgaria). Arxius de Miscel·lània Zoològica 15: 224–228. <https://doi.org/10.32800/amz.2017.15.0224>
- Vrcibradic D, Niemeyer J (2013) *Mabuya frenata*, *M. macrorhyncha*: Tail bifurcation. Herpetological Review 44: 510–511.
- Welton LJ, Siler CD, Diesmos AC, Brown RM (2009) A new bent-toed gecko (Genus *Cyrtodactylus*) from southern Palawan Island, Philippines, and clarification of the taxonomic status of *C. annulatus*. Herpetologica 65(3): 323–343. <https://doi.org/10.1655/08-057R1.1>
- Welton LJ, Siler CD, Linkem CW, Diesmos AC, Brown RM (2010) Philippine bent-toed geckos of the *Cyrtodactylus agusanensis* complex: multilocus phylogeny, morphological diversity, and descriptions of three new species. Herpetological Monographs 24: 55–85. <https://doi.org/10.1655/HERPMONOGRAPHS-D-10-00005.1>
- Wood PL, Xianguang G, Travers SL, Su YC, Olson KV, Bauer AM, Grismer LL, Siler CD, Moyle RG, Andersen MJ, Brown RM (2020) Parachute geckos free fall into synonymy: *Gekko* phylogeny, and a new subgeneric classification, inferred from thousands of ultraconserved elements. Molecular Phylogenetics and Evolution. 146(2020): 106731. <https://doi.org/10.1016/j.ympev.2020.106731>

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Herpetozoa](#)

Jahr/Year: 2021

Band/Volume: [34](#)

Autor(en)/Author(s): Maglangit Erl P fian T., Tapdasan Riza Jane C., Medija Jr. Rico C., De Alba Maria Fe P., Adamat Liza A., Amparado Olive A., Nuneza Olga M., Diesmos Mae Lowe L., Diesmos Arvin C.

Artikel/Article: [New distribution record, ecology and tail trifurcation of *Cyrtodactylus mamanwa* \(Gekkonidae\) on Dinagat Islands, Philippines 175-181](#)