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## COVID-19 and civil unrest undoing steady gains in karst conservation and herpetological research in Myanmar, and an impediment to progress

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**Abstract:** The COVID-19 pandemic and political turmoil in Myanmar has dealt a severe blow to the country's progress in herpetological research and the protection of limestone habitats. Both afflictions have reversed much of the scientific and conservation gains made in the past decade, and continue to hinder exploratory surveys and continued monitoring of threatened karst ecosystems. There is an urgent need to resume field studies and conservation effort as soon as possible and continue enhancing the capacity of local scientific and technical staff in Myanmar.

**Keywords:** Biodiversity, *Cyrtodactylus*, endemism, geckos, limestone.

In the last decade, Myanmar was riding the crest of a wave of renewed interest in herpetological research, particularly in karst ecosystems (Grismer et al. 2020c). Karst habitats are generators and refugia for biodiversity but are unfortunately also amongst the most threatened ecosystems in the world (Grismer et al. 2020a,c, 2021; Quah et al. 2021). Despite there being a great

concentration of karst in Myanmar, many locations are already being quarried to produce cement (Grismer et al. 2018a).

The resurgence in herpetological research in Myanmar resulted in the staggering discovery of nearly 50 new species of reptiles and amphibians, especially geckos of the genus *Cyrtodactylus*, of which most species are micro-endemics (Figure 1; Grismer et al. 2018a, 2020b). Among the discoveries was a new species of slender gecko, *Hemiphyllodactylus tonywhitteni*, named in honour of the late Dr. Tony Whitten of Fauna and Flora International, who championed karst conservation throughout southeastern Asia (Grismer et al. 2018b). The results of these discoveries in turn have aided in the formal protection of some karst landscapes in Myanmar, that not just benefit the endemic geckos but all other flora and fauna that inhabit them (Komerci et al. 2020).

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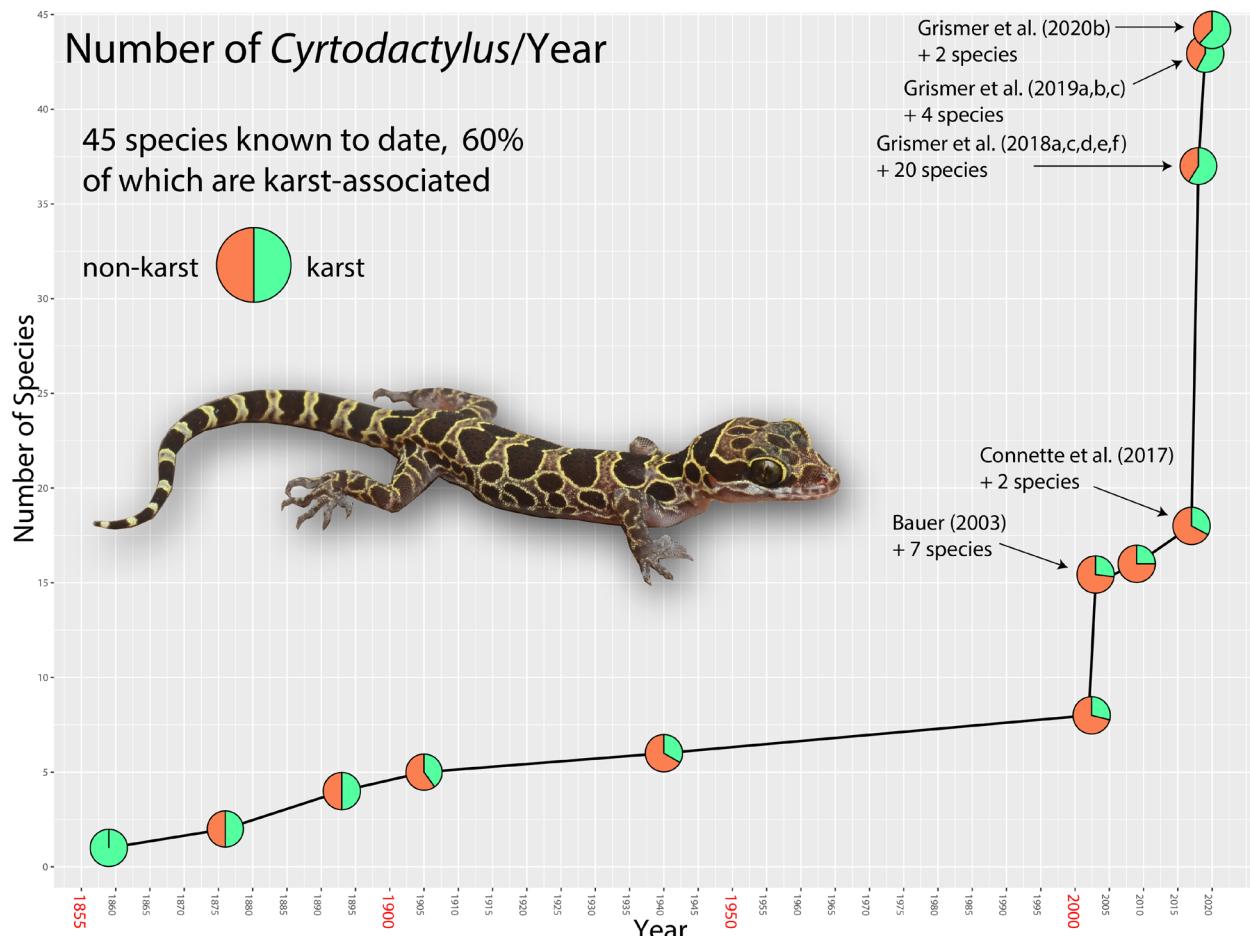
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**Figure 1.** Numbers of *Cyrtodactylus* gecko species known from Myanmar at time intervals of the descriptions of new species (i.e., at the pie charts) and the percentage of those species at those time intervals that are karst-associated (adapted from Grismeyer et al. 2020c)

Unfortunately, this progress came to a sudden halt in 2020 due to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 or COVID-19) pandemic which prevented travel for field work as nations around the globe went into lockdown in an effort to curb the spread of the virus (Corlett et al. 2020; Zahawi et al. 2020). Matters were compounded by the civil unrest which erupted in Myanmar beginning early 2021 which has once again caused great discord in the country. Apart from having cost numerous lives and crippled the economy, both these afflictions have reversed much of the gains that have been made in the past few years in terms of cataloguing the biological diversity of Myanmar, conserving critical habitats, and the enhancement of local capacity of scientific and technical staff in Myanmar.

With the COVID-19 pandemic continuing to rage on around the world and political instability in the country, it may be many more years before research efforts can resume safely in the country. By which time, some of the karst outcrops may have already been completely

destroyed and along with it the many countless species found on them, similar to what has happened in Brazil due to weakened environmental protection (Schwartz et al. 2020; Vale et al. 2021). The undoing of a decade of progress in research and conservation is a woeful reminder of the urgency to lay the foundations for on the ground conservation efforts by local stakeholders through knowledge transfer and training. Nevertheless, we remain hopeful that the in-country situation will improve, and researchers will be able to continue the much-needed exploration and discovery phase of the conservation process in the Indo-Burmese biodiversity hotspot.

## References

- Bauer, A.M. (2003). Descriptions of seven new *Cyrtodactylus* (Squamata: Gekkonidae) with a key to the species of Myanmar (Burma). *Proceedings of the California Academy of Sciences* 54: 463–498.  
Connette, G.M., P. Oswald, M.K. Thura, K.J.L. Connette, M.E.

- Grindley, M. Songer, G.R. Zug & D.G. Mulcahy (2017).** Rapid forest clearing in a Myanmar proposed national park threatens two newly discovered species of geckos (Gekkonidae: *Cyrtodactylus*). *PloS ONE* 12: e0174432. <https://doi.org/10.1371/journal.pone.0174432>
- Corlett, R.T., R.B. Primack, V. Devictor, B. Maas, V.R. Goswami, A.E. Bates, L.P. Koh, T.J. Regan, R. Loyola, R.J. Pakeman, G.S. Cumming, A. Pidgeon, D. Johns & R. Roth (2020).** Impacts of the coronavirus pandemic on biodiversity conservation. *Biological Conservation* 246: 108571. <https://doi.org/10.1016/j.biocon.2020.108571>
- Grismer, L.L., P.L. Wood Jr., M.K. Thura, T. Zin, E.S.H. Quah, M.L. Murdoch, M.S. Grismer, A. Lin, H. Kyaw & N. Lwin (2018a).** Twelve new species of *Cyrtodactylus* Gray (Squamata: Gekkonidae) from limestone habitats in east-central and southern Myanmar demonstrate high localized diversity and unprecedented microendemism. *Zoological Journal of the Linnean Society* 182: 862–959. <https://doi.org/10.1093/zoolinnean/zlx057>
- Grismer, L.L., P.L. Wood Jr., M.K. Thura, T. Zin, E.S.H. Quah, M.L. Murdoch, M.S. Grismer, A. Lin, H. Kyaw & N. Lwin (2018b).** Phylogenetic taxonomy of *Hemiphyllodactylus* Bleeker, 1860 (Squamata: Gekkonidae) with descriptions of three new species from Myanmar. *Journal of Natural History* 52: 881–915. <https://doi.org/10.1080/00222933.2017.1367045>
- Grismer, L.L., P.L. Wood Jr., M.K. Thura, N.M. Win, M.S. Grismer, L.A. Trueblood & E.S.H. Quah (2018c).** A redescription of *Cyrtodactylus chrysopylos* Bauer (Squamata: Gekkonidae) with comments on the adaptive significance of bright orange coloration in hatchlings and descriptions of two new species from eastern Myanmar (Burma). *Zootaxa* 4527: 151–185. <https://doi.org/10.11646/zootaxa.4527.2.1>
- Grismer, L.L., P.L. Wood Jr., M.K. Thura, E.S.H. Quah, M.S. Grismer, M.L. Murdoch, R.E. Espinoza & A. Lin (2018d).** A new *Cyrtodactylus* Gray (Squamata: Gekkonidae) from the Shan Hills and the biogeography of Bent-toed Geckos from eastern Myanmar. *Zootaxa* 4446: 477–500. <https://doi.org/10.11646/zootaxa.4446.4.4>
- Grismer, L.L., P.L. Wood Jr., M.K. Thura, E.S.H. Quah, M.L. Murdoch, M.S. Grismer, M.W. Herr, A. Lin & H. Kyaw (2018e).** Three more new species of *Cyrtodactylus* (Squamata: Gekkonidae) from the Salween Basin of eastern Myanmar underscore the urgent need for the conservation of karst habitats. *Journal of Natural History* 52: 1243–1294; <https://doi.org/10.1080/00222933.2018.1449911>
- Grismer, L.L., P.L. Wood Jr., E.S.H. Quah, M.L. Murdoch, M.S. Grismer, M.W. Herr, R.E. Espinoza, R.M. Brown & A. Lin (2018f).** A phylogenetic taxonomy of the *Cyrtodactylus peguensis* group (Reptilia: Squamata: Gekkonidae) with descriptions of two new species from Myanmar. *PeerJ* 6: e5575. <https://doi.org/10.7717/peerj.5575>
- Grismer, L.L., P.L. Wood Jr., M.K. Thura, E.S.H. Quah, J.R. Oaks & A. Lin (2019a).** A new species of Bent-toed Gecko (Squamata, Gekkonidae, *Cyrtodactylus*) from the Shan Plateau in eastern Myanmar (Burma). *Zootaxa* 4624: 301–321. <https://doi.org/10.11646/zootaxa.4624.3.1>
- Grismer, L.L., P.L. Wood Jr., E.S.H. Quah, M.K. Thura, M.W. Herr & A.K. Lin (2019b).** A new species of forest-dwelling *Cyrtodactylus* Gray (Squamata: Gekkonidae) from the Indawgyi Wildlife Sanctuary, Kachin State, Myanmar. *Zootaxa* 4623: 1–25. <https://doi.org/10.11646/zootaxa.4623.1.1>
- Grismer, L.L., P.L. Wood Jr., M.K. Thura, N.M. Win & E.S.H. Quah (2019c).** Two more new species of the *Cyrtodactylus peguensis* group (Squamata: Gekkonidae) from the fringes of the Ayeyarwady Basin, Myanmar. *Zootaxa* 4577: 274–294. <https://doi.org/10.11646/zootaxa.4577.2.3>
- Grismer, L.L., P.L. Wood Jr., M.D. Le, E.S.H. Quah & J.L. Grismer (2020a).** Evolution of habitat preference in 243 species of Bent-toed geckos (Genus *Cyrtodactylus* Gray, 1827) with a discussion of karst habitat conservation. *Ecology and Evolution* 10: 13717–13730. <https://doi.org/10.1002/ece3.6961>
- Grismer, L.L., P.L. Wood Jr., E.S.H. Quah, M.S. Grismer, M.K. Thura, J.R. Oaks & A. Lin (2020b).** Two new species of *Cyrtodactylus* Gray, 1827 (Squamata: Gekkonidae) from a karstic archipelago in the Salween Basin of southern Myanmar (Burma). *Zootaxa* 4718: 151–183. <https://doi.org/10.11646/zootaxa.4718.2.1>
- Grismer, L.L., P.L. Wood Jr., E.S.H. Quah & M.K. Thura (2020c).** Origin, diversity, and conservation of karst-associated Bent-toed Geckos (Genus *Cyrtodactylus*) in Myanmar (Burma). *Israel Journal of Ecology & Evolution* 2020: 202–208. <https://doi.org/10.1163/22244662-20191094>
- Grismer, L.L., P.L. Wood Jr., N.A. Poyarkov, M.D. Le, S. Karunaratna, S. Chomdej, C. Suwannapoom, S. Qi, S. Liu, J. Che, E.S.H. Quah, F. Kraus, P.M. Oliver, A. Riyanto, O.S.H. Pauwels & J.L. Grismer (2021).** Karstic Landscapes are Foci of Species Diversity in the World's Third Largest Vertebrate Genus *Cyrtodactylus* Gray, 1827 (Reptilia: Squamata; Gekkonidae). *Diversity* 13: 183. <https://doi.org/10.3390/d13050183>
- Komerički, A., A. Lin, L. Ngwe & F. Momberg (2020).** Myanmar karst key biodiversity areas. Fauna and Flora International Special Report, 104 pp.
- Quah, E.S.H., L.L. Grismer & A.M.S. Shahrul (2021).** Conservation of Peninsular Malaysia's Karst Herpetofauna: A review of herpetological discoveries, research trends, and challenges. *Raffles Bulletin of Zoology* 69: 235–252.
- Schwartz, M.W., J.A. Glikman & C.N. Cook (2020).** The COVID-19 pandemic: A learnable moment for conservation. *Conservation Science and Practice* 2: e255. <https://doi.org/10.1111/csp.2.255>
- Vale, M.M., E. Berenguer, M.A. de Menezes, E.B.V. de Castro, L.P. de Siqueira & R.d.C.Q. Portella (2021).** The COVID-19 pandemic as an opportunity to weaken environmental protection in Brazil. *Biological Conservation* 255: 108994. <https://doi.org/10.1016/j.biocon.2021.108994>
- Zahawi, R.A., J.L. Reid & M.E. Fagan (2020).** Potential impacts of COVID-19 on tropical forest recovery. *Biotropica* 52: 803–807. <https://doi.org/10.1111/btp.12851>





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