THERYA, 2023, Vol. 14 (3): 313-317
DOI: 10.12933/therya-23-5058 ISSN 2007-3364

Letter to the Editor:

The (integrative) taxonomy driving conservation of cryptic species: an example of Neotropical *Myotis*

Taxonomy is a discipline in biology responsible for describing, classifying, and naming organisms, as well as postulating hypotheses about the evolutionary relationships between taxa (Tancoigne *et al.* 2011). Taxonomic studies have profound implications in several areas of biology, such as ecology, evolution, genetics, epidemiology, and zoonotic surveillance, as well as directly influencing public policies focused on health and the environment (Cracraft 2002; Pearson *et al.* 2011; Cook *et al.* 2020). However, for decades, taxonomy has experienced a global crisis, which is largely related to the lack of large investments compared to other fields of biology (Buyck 1999; Godfray 2002; Drew 2011; Pearson *et al.* 2011).

The economic devaluation of taxonomy has created a cyclical problem, causing an abrupt reduction in the formation of new taxonomists over the past decades (Buyck 1999; Joppa *et al.* 2011; Drew 2011; Bacher 2012; Boubli *et al.* 2012). Consequently, (i) there are fewer citations from taxonomic studies, an index that is used to measure researcher productivity in many institutions; and (ii) self-citations are more frequent among taxonomy-specialized journals, which has resulted in a lower impact factor when compared to those in other areas (Zeppelini *et al.* 2020). This scenario can influence the choice of projects to be financed, feeding the cycle of disinterest and marginality of taxonomy in the biological sciences.

Knowing the real diversity of organisms on our planet is essential for the sustainable use of natural resources and the management and conservation of species (May 1988). Anthropogenic activities are transforming the Earth's surface, changing the composition of the atmosphere, and altering the climate, all of which are pointed out as important causes of biodiversity loss (Butchart *et al.* 2010). The decline in species richness has been documented for different taxa around the world (Pimm *et al.* 1995; Li *et al.* 2006; Spooner *et al.* 2018). The current species extinction rate is 100 to 1,000 times higher than the background extinction rate, with the highest species loss average in the last 65 million years, giving rise to the sixth mass extinction event on Earth (Pimm *et al.* 1995; Ceballos *et al.* 2015, 2017). It is estimated that a large part of these extinctions is represented by species still unknown to science since less than 25 % of the estimated biological diversity of eukaryotes has been formally described (Mora *et al.* 2011; Costello *et al.* 2013), putting taxonomic studies at the forefront of the biological sciences. In addition, taxonomic imprecision can generate bias in the management and conservation of Earth's biological heritage (Morrison *et al.* 2009; Gutiérrez and Helgen 2013).

Taxonomic studies often include hundreds or thousands of museum specimens and can, in addition to defining the real range of distribution, provide information on the natural and demographic history of species, which is essential for the management and conservation of biodiversity. The challenge is that many of the organisms that have yet to be described are within the gray zone, which is composed of phenotypically identical species, although they represent independent evolutionary lineages (Roux *et al.* 2016). A solid example of the importance of taxonomy for the conservation of cryptic taxa was revealed by the recent taxonomic revisions of the neotropical bats of the genus *Myotis*, which have revealed a high diversity of species, many endemic and with geographic distributions restricted to habitats severely impacted by modern human action (*e. g.*, Moratelli *et al.* 2011, 2013, 2016, 2017; Novaes *et al.* 2021a, b, c, 2022a, b).

Myotis is the most speciose bat genus, with more than 140 living species distributed in all ecoregions of the Earth, except for the polar icecaps (Moratelli *et al.* 2019a). In the Neotropics, there are *ca*. 35 species currently recognized, although this number is still under-sampled (Clare *et al.* 2011; Larsen *et al.* 2012; Novaes *et al.* 2022a, b, c). A comprehensive and exhaustive taxonomic review of *Myotis* has been conducted by our research team for over a decade, resulting in the description of new species and the recognition of cryptic complexes that have refined the taxonomic and geographic limits of species (see the list of references by R. Moratelli and R. L. M. Novaes in this letter). Our results support a conservation status revaluation for some species and may contribute to the creation of conservation plans for these taxa.

A striking example comes from Caribbean species. For more than four decades, *Myotis nesopolus* remained divided into two subspecies: *M. n. nesopolus*, occurring on the islands of Bonaire and Curaçao, in the Lesser Antilles; and *M. n. larensis*, occurring in semi-arid lowland habitats on mainland Venezuela (Genoways and Williams 1979; Moratelli *et al.* 2019a). However, recently we raised *M. larensis* to the species level using an integrative approach based on molecular and morphological data (Novaes *et al.* 2021a). Consequently, *M. nesopolus* is now an endemic species of two small Caribbean islands, and the restriction of the species to the islands of Curaçao and Bonaire raises a strong concern about its conservation. Solari (2016) indicates that these populations are under threat due to habitat loss caused by agriculture and urbanization that aim to meet greater tourist demand and human population growth. Therefore, we suggest a review of the conservation status of this species, currently classified as Least Concern in the IUCN Red List of Threatened Species (Solari 2016). Currently, *M. nesopolus* has a distribution range of 738 km^2, and the occupied area is certainly much smaller. Moreover, populations are fragmented, with only two known occurrence localities, and its habitat is experiencing continued decline due to human activities. Possibly, *M. nesopolus* is seriously threatened with extinction, and the conditions presented above allow us to classify the species in the IUCN category 'Endangered' by the criteria B1ab(iii), following IUCN (2016). The same rationale was applied for the other species of Caribbean *Myotis* (*M. dominicensis*, *M. martiniquensis*, and *M. nyctor*), currently classified as 'Vulnerable' due to endemism on small islands with progressive habitat loss (Larsen 2016a, b, c).

The conservation status of *M. attenboroughi* —an endemic species from Tobago that was recently described by our research group— has, however, not been defined yet (Moratelli *et al.* 2017). An integrative study based on molecular and morphological data resulted in the description of *M. attenboroughi* from individuals collected in 1981, which are the only known records for the species (Moratelli *et al.* 2017). Tobago is an island of 300 km^2 and experiences a marked change in its original vegetation cover (Maharaj *et al.* 2019). Therefore, comparing the information available on this species to the conservation status and potential threats identified for other Caribbean congeners, it is likely that *M. attenboroughi* also faces a serious risk of extinction (Moratelli *et al.* 2017).

Additional examples emerge from South American rainforests. An important focus of our studies was *M. nigricans*, a species historically considered widely distributed in the Neotropics, occurring from México southward to northern Argentina (LaVal 1973; Wilson 2008). However, our taxonomic assessments (some with integrative approach) revealed that *M. nigricans* is a species complex yet to be unveiled. Different populations previously included in *M. nigricans* have already been given new names and now represent full species (*i. e.*, Moratelli and Wilson 2011; Moratelli *et al.* 2011, 2013, 2016, 2017, 2019b; Novaes *et al.* 2022a). Far beyond taxonomy, this review made an unexpected discovery: many of these newly identified species may be at risk of extinction due to habitat loss and climate change. This appears to be the case for *M. dimimutus*, *M. izecksohni*, and *M. handleyi*, which were treated under *M. nigricans* until recently.

The tiny and delicate species *M. diminutus* was described in 2011 from a single specimen collected in 1979 in Los Ríos, a locality on the western slope of the Ecuadorian Andes (Moratelli and Wilson 2011). Later, a second specimen for the species, collected in 1959, was discovered in a biological collection, extending its distribution range to southern Colombia (Moratelli and Wilson 2014). Although we have examined over seven thousand specimens of neotropical *Myotis* deposited in over 40 biological collections worldwide, *M. diminutus* turned out to be an incredibly rare species, known from less than 10 specimens. This species appears to be associated with the lowlands in the western Andes, which are part of the Tumbes-Chocó-Magdalena biodiversity hotspot. The region includes moist and dry forests and other ecosystem formations, extending from the Panama Canal southward along the Pacific lowlands to northwestern Perú. The area houses high levels of species diversity and endemism and has experienced severe habitat loss in the last few decades (Myers *et al.* 2000; Ceballos and Ehrlich 2006). The Ecuadorian moist forests, where the holotype of *M. diminutus* was collected, currently include a disrupted series of small fragments under continuing threat (Moratelli and Wilson 2011). Given this loss of habitat and the absence of *M. diminutus* in collections from recent fieldwork in Ecuador (*e. g.*, the material in the Texas Tech University, Lubbock, Texas), the current conservation status of *M. diminutus* is uncertain. The species is known from a few individuals collected from the 1950s to the 1980s. Based on this meager documentation, it is likely that *M. diminutus* is facing problems maintaining its population viability in the long term, which deserves a reassessment of its conservation status at regional and global levels. No wonder Moratelli and Wilson (2014) recommend surveys in the Chocó ecoregion (where *M. diminutus* potentially still occurs) to try to confirm whether the species survives in those forest remnants.

Myotis izecksohni was described in 2011 based on specimens from the Brazilian Atlantic Forest as being endemic to this biome, where it appears to be strongly associated with highlands above 900 masl (Moratelli *et al.* 2011). The species occurs in dense rainforest habitats located on mountain tops in southeastern South America, where the landscape of the Atlantic Forest is highly fragmented due to a historical process of land occupation for agricultural activities and, more recently, due to the expansion of urbanization (Ribeiro *et al.* 2009). The Atlantic Forest is one of the most threatened biomes in the world and is currently reduced to less than 10 % of its original forest coverage (Ribeiro *et al.* 2009). At the northern portion of the South American continent is *M. handleyi*, described in 2013 from specimens that inhabit two cordilleras in northern Venezuela at altitudes between 1,000 and 2,200 masl (Moratelli *et al.* 2013). These mountains are formed by a complex landscape, which includes areas of deciduous dry forest in lower altitudes, evergreen rainforests in higher altitudes, and secondary areas with strong agricultural pressure and intense degradation of the original vegetation (Anderson and Gutiérrez 2009; Quiroga-Carmona and Molinari 2012).

Despite completely different evolutionary trajectories and biogeographical contexts, what can unite *M. izecksohni* and *M. handleyi* towards a single destination is climate change. It is widely recognized that biotic (*i. e.*, resource availability) and abiotic (*i. e.*, temperature and rainfall) changes along elevation gradients are among the main determinants of species occupation, richness, and abundance (McCain 2007; Byamungu *et al.* 2021). Both *M. izecksohni* and *M. handleyi* occur in mountainous habitats, and environmental changes may lead these species to shifts in their ranges; the shift to higher elevation habitats may represent the loss of a significant percentage of their current range or even regional extinction. Although no investigations have been carried out on the susceptibility of neotropical *Myotis* to climate change, it is not merely speculative to think that species associated with mountainous areas and high altitudes, especially endemic ones, could be at risk.

Species newly described from recently revealed cryptic complexes may also be under threat, as in *M. moratellii* —endemic to the same lowland area where *M. diminutus* occurs in Ecuador (Novaes *et al.* 2021b); in *Myotis pampa*— the only bat endemic to the subtropical grassland plains of the South American Pampa, with a very restricted occurrence area and strong anthropogenic pressure (Novaes *et al.* 2021c); and in *M. arescens*— a bat endemic to Chile and recently raised to species level, which occupies a narrow and highly impacted area of desertic shrubland and sclerophyllous forest (Novaes *et al.* 2021b). These species were only revealed from integrative taxonomic reviews that evaluated many morphological, genetic, and bioacoustic characters.

The message we want to highlight here is that studies that act on the frontiers of cryptic diversity have often revealed new species and indicated small distribution areas for several species, many of which come from environments already quite disturbed (*e. g.*, Moratelli and Wilson 2011, 2014; Novaes *et al.* 2021b). The case of neotropical *Myotis* is an emblematic and valuable example of this issue. Without this broad (integrative) taxonomic revision, all the newly described species of *Myotis* would still be considered part of a much less diverse evolutionary and ecological group and, therefore, of least concern from a conservation point of view. Thus, in the case of cryptic organisms, taxonomy becomes the initial step and, consequently, a very important tool for conservation.

The threat category of species is essential for directing biodiversity conservation efforts on local, regional, and global scales. However, the classification of taxa into any of the existing categories requires stable taxonomic knowledge and a considerable accumulation of information on species' population variation, natural history, distributional limits, habitat disturbances, etc. (*e. g.*, IUCN 2016). In the absence of ecological studies —which is a reality for most cryptic species— much of this information emerges from taxonomic reviews. Studies based on diverse datasets, such as DNA sequences and ecological niche modeling, have helped to understand the demographic trajectory of species in historical time, identifying factors such as the absence of gene flow, effective geographical barriers, and distributional limits based on the occupation capacity of specific habitats. Indeed, modern taxonomic studies have focused on delimiting species as products of a unique evolutionary trajectory, analyzing large sets of morphological, genetic, ecological, bioacoustic, and behavioral data that help tell the life story of taxa. These datasets can and should be considered during risk assessments of threatened species.

Taxonomy, especially when using integrative approaches, can be decisive in pointing out priority localities for research and conservation actions due to the presence of endemic species and high diversity. Also, the enormous systematic knowledge that has been generated lays the groundwork for studies with biogeographic and demographic approaches, which are essential to assess environmental threats to species and support action plans for conservation (Costello *et al.* 2015).

Considering this, the strengthening of taxonomy in the face of the current biodiversity crisis is imperative. In this way, a stimulus for the training of new taxonomists who maintain an integrated view of other branches of biology is also essential. Therefore, we point out here the need to create specific funding for taxonomic research, increasing the knowledge on the biological diversity on Earth and, consequently, determining the real conservation status of species in a changing world.

Acknowledgments

RLMN has received support from Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ, E-26/204.243/2021; E26/200.631/2022 and E26/200.395/2022). VCC has received support from FAPERJ (E-26/205.820/2022 and 205.821/2022). RM has received financial support from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, Brazil; 313963/2018-5) and FAPERJ (E-26/200.967/2021).

Roberto Leonan M. Novaes[1]*, Vinícius C. Cláudio[1], and Ricardo Moratelli[1]

[1]Fundação Oswaldo Cruz, Fiocruz Mata Atlântica, 22713-560. Rio de Janeiro, Brazil. Email: roberto.novaes@fiocruz.br (RLMN), vcclaud@gmail.com (VCC), ricardo.moratelli@fiocruz.br (RM).

* Corresponding author: https://orcid.org/0000-0003-1657-2807

Literature cited

Anderson, R. P., and E. E. Gutiérrez. 2009. Taxonomy, distribution, and natural history of the genus *Heteromys* (Rodentia: Heteromyidae) in Central and Eastern Venezuela, with the description of a new species from the Cordillera de la Costa. Bulletin of the American Museum of Natural History 331: 33–93.

Bacher, S. 2012. Still not enough taxonomists: reply to Joppa et al. Trends in Ecology and Evolution 27: 65–66.

Boubli, J. P., et al. 2019. On a new species of titi monkey (Primates: *Plecturocebus* Byrne et al., 2016), from Alta Floresta, southern Amazon, Brazil. Molecular Phylogenetics and Evolution 132:117–137.

Butchart, *et al*. 2010. Global biodiversity: Indicators of recent declines. Science 328:1164–1168.

Buyck, B. 1999. Taxonomists are an endangered species in Europe. Nature 401:321.

Byamungu, R. M., *et al*. 2021. Abiotic and biotic drivers of functional diversity and functional composition of bird and bat assemblages along a tropical elevation gradient. Diversity and Distribution 27:2344–2356.

Ceballos, G., and P. R. Ehrlich. 2006. Global mammal distributions, biodiversity hotspots, and conservation. PNAS 103:19374-19379.

Ceballos, G., *et al*. 2015. Accelerated modern human–induced species losses: entering the sixth mass extinction. Science Advances 1:e1400253.

Ceballos, G., P. R. Ehrlich, and R. Dirzo. 2017. Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines. PNAS 114:E6089–E6096.

Clare, E. L., *et al*. 2011. Neotropical bats: estimating species diversity with DNA barcodes. PLoS One 6:e22648.

Cook, J. A., *et al*. 2020. Integrating biodiversity infrastructure into pathogen discovery and mitigation of emerging infectious diseases. BioScience 70:531–534.

Costello, M. J., R. M. May, and N. E. Stork. 2013. Can we name Earth's species before they go extinct? Science 339:413–416.

Costello, M. J., B. Vanhoorne, and W. Appeltans. 2015. Conservation of biodiversity through taxonomy, data publication, and collaborative infrastructures. Conservation Biology 29:1094–1099.

Cracraft, J. 2002. The seven great questions of systematic biology: an essential foundation for conservation and the sustainable use of biodiversity. Annals of the Missouri Botanical Garden 89:303–304.

Drew, L. W. 2011. Are we losing the science of taxonomy? As need grows, numbers and training are failing to keep up. BioScience 61:942–946.

Godfray, H. C. J. 2002. Challenges for taxonomy. Nature 417:17–19.

Genoways, H. H., and S. L. Williams. 1979. Notes on bats (Mammalia: Chiroptera) from Bonaire and Curaçao, Dutch West Indies. Annals of the Carnegie Museum 48:311–321.

Gutiérrez, E. E., and K. M. Helgen. 2013. Outdated taxonomy blocks conservation. Nature 495:314–314.

IUCN. 2016. Rules of procedure for IUCN Red List assessments 2017–2020. Version 3.0. Approved by the IUCN SSC Steering Committee in September 2016. Downloadable on 07 April 2019 from [http://cmsdocs.s3.amazonaws.com/keydocuments/Rules of Procedure for Red List 2017-2020.pdf](http://cmsdocs.s3.amazonaws.com/keydocuments/Rules_of_Procedure_for_Red_List_2017-2020.pdf)

Joppa, L. N., D. L. Roberts, and S. L. Pimm. 2011. The population ecology and social behaviour of taxonomists. Trends in Ecology and Evolution 26:551–553.

Larsen, R. 2016a. *Myotis dominicensis*. The IUCN Red List of Threatened Species 2016:e.T14155A22057933.

Larsen, R. 2016b. *Myotis martiniquensis*. The IUCN Red List of Threatened Species 2016:e.T76435251A22066280.

Larsen, R. 2016c. *Myotis nyctor*. The IUCN Red List of Threatened Species 2016:e.T76435059A76435083.

Larsen, R. J., M. C. Knapp, H. H. Genoways, *et al.* 2012. Genetic diversity of Neotropical *Myotis* (Chiroptera: Vespertilionidae) with emphasis on South American species. PLoS One 7:e46578.

LaVal, R. K. 1973. A revision of the neotropical bats of the genus *Myotis*. Natural History Museum, Los Angeles County, Science Bulletin 15:1–54.

Li, H., *et al*. 2006. Large numbers of vertebrates began rapid population decline in the late 19th century. PNAS 113:14079–14084.

Maharaj, S. S., *et al*. 2019. Assessing protected area effectiveness within the Caribbean under changing climate conditions: A case study of the small island, Trinidad. Land Use Policy 81:185–293.

May, R. M. 1988. How many species are there on Earth? Science 241:1441–1449.

McCain, C. M. 2007. Could temperature and water availability drive elevational species richness patterns? A global case study for bats. Global Ecology and Biogeography 16:1–13.

Mora, C., *et al*. 2011. How many species are there on Earth and in the ocean? PLoS Biology 9:e1001127.

Moratelli, R., and D. E. Wilson. 2011. A new species of *Myotis* Kaup, 1829 (Chiroptera, Vespertilionidae) from Ecuador. Mammalian Biology 76:608–614.

Moratelli, R., and D. E. Wilson. 2014. A second record of *Myotis diminutus* (Chiroptera: Vespertilionidae): its bearing on the taxonomy of the species and discrimination from *M. nigricans*. Proceedings of the Biological Society of Washington 127:533–542.

Moratelli, R., *et al*. 2011. Geographic variation in South American populations of *Myotis nigricans* (Schinz, 1821) (Chiroptera, Vespertilionidae), with the description of two new species. Mammalian Biology 76:592–607.

Moratelli, R., *et al*. 2013. Review of *Myotis* (Chiroptera, Vespertilionodae) from northern South America, including description of a new species. American Museum Novitates 3780:1–36.

Moratelli, R., *et al*. 2016. A new species of *Myotis* (Chiroptera: Vespertilionidae) from Suriname. Special Publications of the Museum of Texas Tech University 65:49–66.

Moratelli, R., *et al*. 2017. Caribbean *Myotis* (Chiroptera, Vespertilionidae), with description of a new species from Trinidad and Tobago. Journal of Mammalogy 98:994–1008.

Moratelli, R., *et al*. 2019a. Family Vespertilionidae (Vesper Bats). Pp. 716–981, *in* Handbook of the Mammals of the World, Volume 9 - Bats (Wilson, D. E. and R. A. Mittermeier, eds.). Lynx Editions, Barcelona.

Moratelli, R., R. L. M. Novaes, and D. E. Wilson. 2019b. A new species of *Myotis* (Chiroptera, Vespertilionidae) from Peru. Special Publications of the Museum of Texas Tech University 71:239–256.

Morrison, W. R., *et al*. 2009. The impact of taxonomic change on conservation: does it kill, can it save, or is it just irrelevant? Biological Conservation 142:3201–3206.

Myers, N., *et al*. 2000. Biodiversity hotspots for conservation priorities. Nature 403:853–858.

Novaes, R. L. M., *et al*. 2018. The taxonomic status of *Myotis aelleni* Baud, 1979 (Chiroptera, Vespertilionidae). Zootaxa 4446:257–264.

Novaes, R. L. M., *et al*. 2021a. The taxonomic status of *Myotis nesopolus larensis* (Chiroptera, Vespertilionidae) and new insights on the diversity of Caribbean *Myotis*. ZooKeys 1015:145–167.

Novaes, R. L. M., *et al*. 2021b (2022). Variation in the *Myotis keaysi* complex (Chiroptera, Vespertilionidae), with description of a new species from Ecuador. Journal of Mammalogy 103:540–559.

Novaes, R. L. M., D. E. Wilson, and R. Moratelli. 2021c. A new species of *Myotis* (Chiroptera, Vespertilionidae) from Uruguay. Vertebrate Zoology 71:711–722.

Novaes, R. L. M., *et al*. 2022a. Systematic review of *Myotis* (Chiroptera, Vespertilionidae) from Chile based on molecular, morphological, and bioacoustic data. Zootaxa 5188:430–452.

Novaes, R. L. M., *et al*. 2022b. Argentinean *Myotis* (Chiroptera, Vespertilionidae), including the description of a new species from the Yungas. Vertebrate Zoology 72:1187–1216.

Novaes, R. L. M., D. E. Wilson, and R. Moratelli. 2022c. Catalogue of primary types of Neotropical *Myotis* (Chiroptera, Vespertilionidae). ZooKeys 1105:127–164.

Pearson, D. L., A. L. Hamilton, and T. L. Erwin. 2011. Recovery plan for the endangered taxonomy profession. BioScience 61:58–63.

Pimm, S. L., *et al*. 1995. The future of biodiversity. Science 269:347–350.

Quiroga-Carmona, M. and J. Molinari. 2012. Description of a new shrew of the genus *Cryptotis* (Mammalia: Soricomorpha: Soricidae) from the Sierra de Aroa, an isolated mountain range in northwestern Venezuela, with remarks on biogeography and conservation. Zootaxa 3441:1–20.

Ribeiro, M. C., *et al*. 2009. The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for conservation. Biological Conservation 142:1141–1153.

Roux, C., C. Fraïsse, *et al*. 2016. Shedding light on the grey zone of speciation along a continuum of genomic divergence. Plos Biology 14:e2000234.

Solari, S. 2016. *Myotis nesopolus*. The IUCN Red List of Threatened Species 2016:e.T14184A22065759.

Spooner, F. E. B., R. G. Pearson, and R. Freeman. 2018. Rapid warming is associated with population decline among terrestrial birds and mammals globally. Global Change Biology 24:4521–4531.

Tancoigne, E., C. Bole, A. Sigogneau, and A. Dubois. 2011. Insights from Zootaxa on potential trends in zoological taxonomic activity. Frontiers in Zoology 8:5.

Wilson, D. E. 2008. Genus *Myotis* Kaup 1829. Pp. 468–481, *in* Mammals of South America, volume 1: marsupials, xenarthrans, shrews, and bats (Gardner, A. L., ed). University of Chicago Press. Chicago, U.S.A.

Zeppelini, D., *et al*. 2021. The dilemma of self-citation in taxonomy. Nature Ecology and Evolution 5:2.

Associated editor: Sergio Ticul álvarez Castañeda
Submitted: July 7, 2023; Reviewed: July17, 2023
Accepted: July 20, 2023; Published on line: August 22, 2023