

Building evidence for conservation globally

Journal of Threatened Taxa

10.11609/jott.2025.17.8.27323-27406

www.threatenedtaxa.org

26 August 2025 (Online & Print)

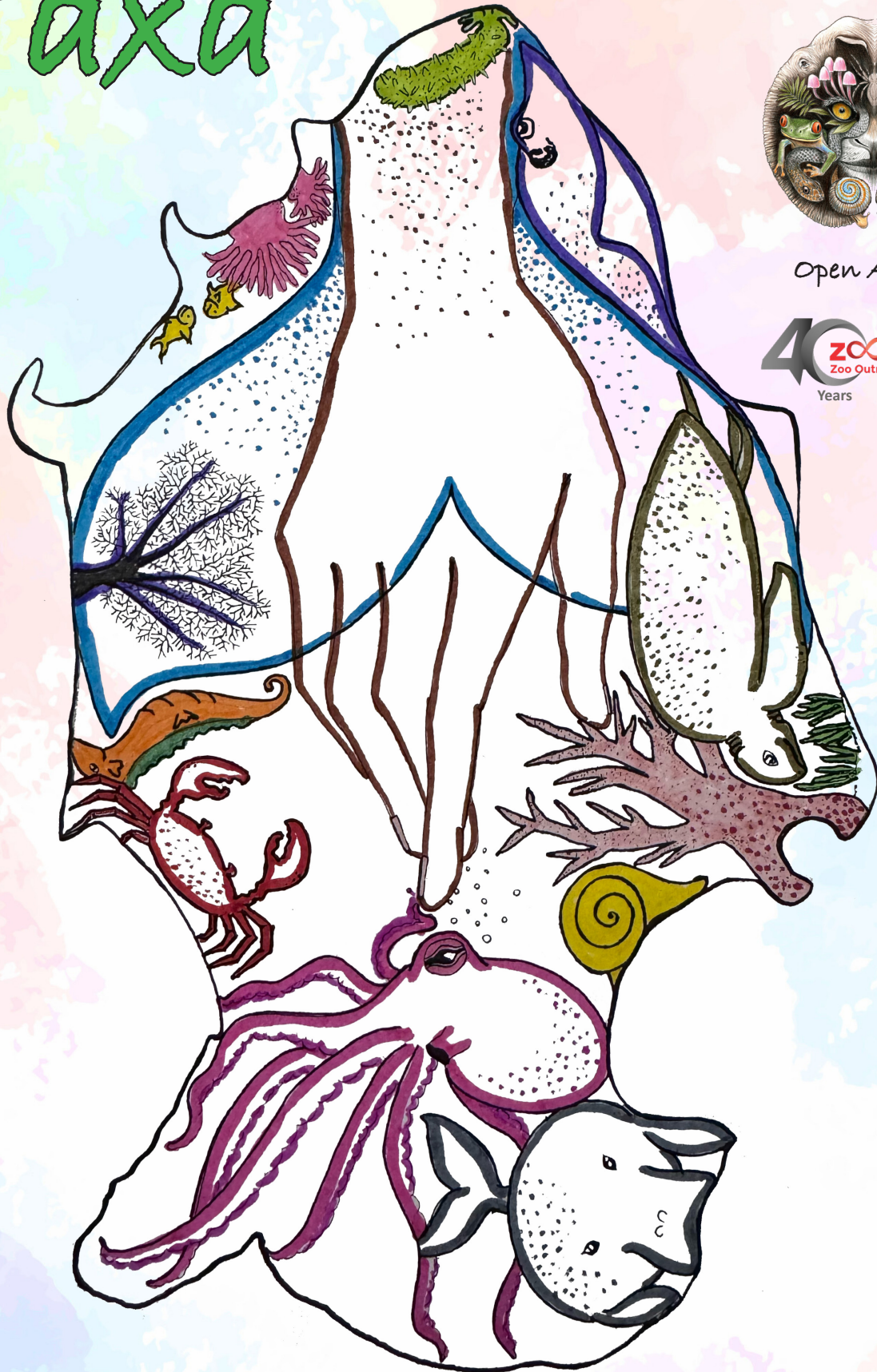
17(8): 27323-27406

ISSN 0974-7907 (Online)

ISSN 0974-7893 (Print)



Open Access





ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher
Wildlife Information Liaison Development Society
www.wild.zooreach.org

Host
Zoo Outreach Organization
www.zooreach.org

Srivari Illam, No. 61, Karthik Nagar, 10th Street, Saravanampatti, Coimbatore, Tamil Nadu 641035, India
Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Ph: +91 9385339863 | www.threatenedtaxa.org
Email: sanjay@threatenedtaxa.org

EDITORS

Founder & Chief Editor

Dr. Sanjay Molur

Wildlife Information Liaison Development (WILD) Society & Zoo Outreach Organization (ZOO),
Coimbatore, Tamil Nadu 641006, India

Assistant Editor

Dr. Chaithra Shree J., WILD/ZOO, Coimbatore, Tamil Nadu 641006, India

Managing Editor

Mr. B. Ravichandran, WILD/ZOO, Coimbatore, Tamil Nadu 641006, India

Associate Editors

Dr. Mandar Paingankar, Government Science College Gadchiroli, Maharashtra 442605, India

Dr. Ulrike Streicher, Wildlife Veterinarian, Eugene, Oregon, USA

Ms. Priyanka Iyer, ZOO/WILD, Coimbatore, Tamil Nadu 641006, India

Board of Editors

Dr. Russel Mittermeier

Executive Vice Chair, Conservation International, Arlington, Virginia 22202, USA

Prof. Mewa Singh Ph.D., FASc, FNA, FNAsc, FNAPsy

Ramanna Fellow and Life-Long Distinguished Professor, Biopsychology Laboratory, and
Institute of Excellence, University of Mysore, Mysuru, Karnataka 570006, India; Honorary
Professor, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore; and Adjunct
Professor, National Institute of Advanced Studies, Bangalore

Stephen D. Nash

Scientific Illustrator, Conservation International, Dept. of Anatomical Sciences, Health Sciences
Center, T-8, Room 045, Stony Brook University, Stony Brook, NY 11794-8081, USA

Dr. Fred Pluthero

Toronto, Canada

Dr. Priya Davidar

Sigur Nature Trust, Chadapatti, Mavinhalla PO, Nilgiris, Tamil Nadu 643223, India

Dr. John Fellowes

Honorary Assistant Professor, The Kadoorie Institute, 8/F, T.T. Tsui Building, The University of
Hong Kong, Pokfulam Road, Hong Kong

Prof. Dr. Mirco Solé

Universidade Estadual de Santa Cruz, Departamento de Ciências Biológicas, Vice-coordenador
do Programa de Pós-Graduação em Zoologia, Rodovia Ilhéus/Itabuna, Km 16 (45662-000)
Salobrinho, Ilhéus - Bahia - Brasil

Dr. Rajeev Raghavan

Professor of Taxonomy, Kerala University of Fisheries & Ocean Studies, Kochi, Kerala, India

English Editors

Mrs. Mira Bhojwani, Pune, India

Dr. Fred Pluthero, Toronto, Canada

Copy Editors

Ms. Usha Madgunaki, Zooreach, Coimbatore, India

Ms. Trisa Bhattacharjee, Zooreach, Coimbatore, India

Ms. Paloma Noronha, Daman & Diu, India

Web Development

Mrs. Latha G. Ravikumar, ZOO/WILD, Coimbatore, India

Typesetting

Mrs. Radhika, Zooreach, Coimbatore, India

Mrs. Geetha, Zooreach, Coimbatore India

Fundraising/Communications

Mrs. Payal B. Molur, Coimbatore, India

Subject Editors 2021–2023

Fungi

Dr. B. Shivaraju, Bengaluru, Karnataka, India

Dr. R.K. Verma, Tropical Forest Research Institute, Jabalpur, India

Dr. Vatsavaya S. Raju, Kakatiya University, Warangal, Andhra Pradesh, India

Dr. M. Krishnappa, Jnana Sahyadri, Kuvempu University, Shimoga, Karnataka, India

Dr. K.R. Sridhar, Mangalore University, Mangalagangothri, Mangalore, Karnataka, India

Dr. Gunjan Biswas, Vidyasagar University, Midnapore, West Bengal, India

Dr. Kiran Ramchandra Ranadive, Annasaheb Magar Mahavidyalaya, Maharashtra, India

Plants

Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India

Dr. N.P. Balakrishnan, Ret. Joint Director, BSI, Coimbatore, India

Dr. Shonil Bhagwat, Open University and University of Oxford, UK

Prof. D.J. Bhat, Retd. Professor, Goa University, Goa, India

Dr. Ferdinando Boero, Università del Salento, Lecce, Italy

Dr. Dale R. Calder, Royal Ontario Museum, Toronto, Ontario, Canada

Dr. Cleofas Cervancia, Univ. of Philippines Los Baños College Laguna, Philippines

Dr. F.B. Vincent Florens, University of Mauritius, Mauritius

Dr. Merlin Franco, Curtin University, Malaysia

Dr. V. Irudayaraj, St. Xavier's College, Palayamkottai, Tamil Nadu, India

Dr. B.S. Kholia, Botanical Survey of India, Gangtok, Sikkim, India

Dr. Pankaj Kumar, Department of Plant and Soil Science, Texas Tech University, Lubbock, Texas, USA.

Dr. V. Sampath Kumar, Botanical Survey of India, Howrah, West Bengal, India

Dr. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Vijayasankar Raman, University of Mississippi, USA

Dr. B. Ravi Prasad Rao, Sri Krishnadevaraya University, Anantpur, India

Dr. K. Ravikumar, FRLHT, Bengaluru, Karnataka, India

Dr. Aparna Watve, Pune, Maharashtra, India

Dr. Qiang Liu, Xishuangbanna Tropical Botanical Garden, Yunnan, China

Dr. Noor Azhar Mohamed Shazili, Universiti Malaysia Terengganu, Kuala Terengganu, Malaysia

Dr. M.K. Vasudeva Rao, Shiv Ranjani Housing Society, Pune, Maharashtra, India

Prof. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Mandar Datar, Agharkar Research Institute, Pune, Maharashtra, India

Dr. M.K. Janarthanam, Goa University, Goa, India

Dr. K. Karthikeyan, Botanical Survey of India, India

Dr. Errol Vela, University of Montpellier, Montpellier, France

Dr. P. Lakshminarasimhan, Botanical Survey of India, Howrah, India

Dr. Larry R. Noblick, Montgomery Botanical Center, Miami, USA

Dr. K. Haridasan, Pallavur, Palakkad District, Kerala, India

Dr. Analinda Manila-Fajard, University of the Philippines Los Banos, Laguna, Philippines

Dr. P.A. Sinu, Central University of Kerala, Kasaragod, Kerala, India

Dr. Afroz Alam, Banasthali Vidyapith (accredited A grade by NAAC), Rajasthan, India

Dr. K.P. Rajesh, Zamorin's Guruvayurappan College, GA College PO, Kozhikode, Kerala, India

Dr. David E. Boufford, Harvard University Herbaria, Cambridge, MA 02138-2020, USA

Dr. Ritesh Kumar Choudhary, Agharkar Research Institute, Pune, Maharashtra, India

Dr. A.G. Pandurangan, Thiruvananthapuram, Kerala, India

Dr. Navendu Page, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand, India

Dr. Kannan C.S. Warriar, Institute of Forest Genetics and Tree Breeding, Tamil Nadu, India

Invertebrates

Dr. R.K. Avasthi, Rohtak University, Haryana, India

Dr. D.B. Bastawade, Maharashtra, India

Dr. Partha Pratim Bhattacharjee, Tripura University, Suryamaninagar, India

Dr. Kailash Chandra, Zoological Survey of India, Jabalpur, Madhya Pradesh, India

Dr. Ansie Dippenaar-Schoeman, University of Pretoria, Queenswood, South Africa

Dr. Rory Dow, National Museum of Natural History Naturalis, The Netherlands

Dr. Brian Fisher, California Academy of Sciences, USA

Dr. Richard Gallon, Llandudno, North Wales, LL30 1UP

Dr. Hemant V. Ghate, Modern College, Pune, India

Dr. M. Monwar Hossain, Jahangirnagar University, Dhaka, Bangladesh

For Focus, Scope, Aims, and Policies, visit https://threatenedtaxa.org/index.php/JoTT/aims_scope
For Article Submission Guidelines, visit <https://threatenedtaxa.org/index.php/JoTT/about/submissions>
For Policies against Scientific Misconduct, visit https://threatenedtaxa.org/index.php/JoTT/policies_various

continued on the back inside cover

Cover: Little Andaman is part of the island chain with incredible biodiversity, but these amazing species are threatened by development projects, and need our support.
Pen and ink artwork by Priyanka Iyer.



Tectonic turmoil: consequences of violent earthquake-2025 on biodiversity collapse in Myanmar

Hsu Htoo¹ , Imon Abedin² , Sang Van Vu³ , Hyun-Woo Kim⁴ & Shantanu Kundu⁵

^{1,4} Department of Marine Biology, Pukyong National University, Busan 48513, Republic of Korea.

² Department of Zoology, Bodoland University, Kokrajhar, Assam 783370, India.

³ Faculty of Biology, University of Science, Vietnam National University, Hanoi, Hanoi 11400, Vietnam.

⁴ Marine Integrated Biomedical Technology Center, National Key Research Institutes in Universities, Pukyong National University, Busan 48513, Republic of Korea.

⁵ Ocean and Fisheries Development International Cooperation Institute, College of Fisheries Science, Pukyong National University, Busan 48513, Republic of Korea.

¹hsuhtoo95@gmail.com, ²imon.jabedin@gmail.com, ³vuvansangts50@gmail.com, ⁴kimhw@pknu.ac.kr (corresponding author), ⁵shantanu1984@pknu.ac.kr (corresponding author)

Abstract: This study provides a preliminary rapid-response assessment of the immediate impacts of the 2025 violent earthquake in Myanmar on biodiversity. The photographic evidence and communication with the local communities reported mass mortality of freshwater gastropods in Inle Lake, with predictions of substantial losses among several bithyniid species, including endemic ones. Additionally, the unnatural deaths of freshwater fishes (e.g., carps and catfishes) in the Mahamuni Pagoda Pond, Mandalay, indicate that the earthquake also affected larger freshwater vertebrates. This first documentation highlights the need for further investigations into freshwater ecosystems, particularly within the Irrawaddy River basin, to comprehensively assess the earthquake's impact on native biodiversity. The study also recommends further scientific validation and long-term monitoring efforts in Inle Lake to support the restoration of lost biodiversity and to safeguard the livelihoods of the native Intha communities that depend on this freshwater ecosystem.

Keywords: Aquatic species, biodiversity loss, conservation, Gastropods, freshwater fishes, seismic impact, southeastern Asia.

Burmese: ဤလေ့လာမှုသည် ၂၀၂၅ ခုနှစ်တွင် မြန်မာနိုင်ငံရှိ မြစ်နားဒေသ ဖြစ်သည့် လေကြောင်း ဇီဝမျိုးစုံမျိုးကွဲများအပေါ် ချက်ချင်းရိုက်ခတ်မှုများကို အခြေခံဆင့် လျှင်မြန်စွာ ပြန်လည်ဆန်းစစ်ချက် တစ်ရပ်ကို ပံ့ပိုးဖော်ပြပေးထားသည်။ ဓာတ်ပုံမှတ်တမ်းများနှင့် ဒေသခံကျေးရွာများ၏ ဆက်သွယ်ပြောဆိုမှုများအရ အင်းလေးကန်အတွင်းရှိ ရေချိုးစုပက်ကဲ့သို့ အစုလိုက် သေဆုံးမှုကို တွေ့ရှိရပြီး ဒေသရင်း အပါအဝင် ဆက်စပ်မျိုးစိတ်များစွာတွင် သိသာထင်ရှားသော ဆုံးရှုံးမှုများ ရှိနိုင်ကြောင်း လေ့လာတွေ့ရှိရသည်။ ထို့အပြင် ယူလေးမြို့ရှိ မဟာမုနိရေကန်တွင် ရေချိုးငါးများ၏ သဘာဝဓာတ် မဟုတ်သော သေဆုံးမှုများကိုကြည့်ရှုခြင်းအားဖြင့် အဆိုပါ လေ့လာမှုသည် ရေချိုးကျော့ကဲ့သို့သောကိစ္စများ အပေါ်ပါ သက်ရောက်မှုရှိကြောင်း ညွှန်ပြနေသည်။ ဤလေ့လာမှုသည် မြန်မာနိုင်ငံအတွက် ပထမဆုံး မှတ်တမ်းတင်ချက်ဖြစ်ပြီး ဒေသရင်း ဇီဝမျိုးစုံမျိုးကွဲများအပေါ် လေ့လာသက်ရောက်မှုကို နက်ရှိုင်းစွာ အကဲဖြတ်နိုင်ရန်အတွက် အထူးသဖြင့် ဧရာဝတီမြစ်ဝှမ်းဒေသ အတွင်းရှိ ရေချိုးပေစနစ်များကို နောက်ထပ်လေ့လာမှုများ ပြုလုပ်ရန် လိုအပ်ကြောင်း ထင်ဟပ် ဖော်ပြလျက်ရှိနေသည်။ ယခုလေ့လာမှုတွင် ဆုံးရှုံးသွားသော ဇီဝမျိုးစုံမျိုးကွဲများ ပြန်လည်ထူထောင်ရေးနှင့် ဤရေချိုးပေစနစ်ကို မှီခိုနေသော ဒေသခံအင်းသားကျေးရွာများ၏ ရှင်သန်ရပ်တည်ရေးကို ပံ့ပိုးရန်အတွက် အင်းလေးကန်အတွင်း နောက်ထပ်သိပ္ပံနည်းကျ စိစစ်အတည်ပြုမှုများနှင့် ရေရှည်စောင့်ကြည့်လေ့လာမှုများ ဆောင်ရွက်ရန် အကြံပြုထားပါသည်။

Editor: Ngwe Lwin, Myanmar Program at Fauna and Flora International, Myanmar.

Date of publication: 26 August 2025 (online & print)

Citation: Htoo, H., I. Abedin, S.V. Vu, H.-W. Kim & S. Kundu (2025). Tectonic turmoil: consequences of violent earthquake-2025 on biodiversity collapse in Myanmar. *Journal of Threatened Taxa* 17(8): 27355–27362. <https://doi.org/10.11609/jott.9928.17.8.27355-27362>

Copyright: © Htoo et al. 2025. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use, reproduction, and distribution of this article in any medium by providing adequate credit to the author(s) and the source of publication.

Funding: This research received no external funding.

Competing interests: The authors declare no competing interests.

Author details & Author contributions: See end of this article.

Acknowledgments: The authors are thankful to Professor Rainer Breitling from the Bioinformatics Institute (BII), Agency for Science, Technology and Research (A*STAR), Singapore and Manchester Institute of Biotechnology, University of Manchester, United Kingdom for his invaluable critical comments, and suggestions. H.H. would like to convey their appreciation for the assistance provided by the Global Korea Scholarship 2021 (Student ID: CS01211030), which enabled their Doctoral Program in the Department of Marine Biology at Pukyong National University, Busan, Republic of Korea. We express our profound appreciation to the local inhabitants of Inle Lake and Myanmar community volunteers, especially July Hnin, and Thadoe Wai for sharing detailed information, and photographs.



BACKGROUND

Earthquakes occur when stress accumulates at plate boundaries due to friction and is suddenly released, causing fault movement, and generating seismic waves (Ide 2010). These natural phenomena significantly affect the environment through ground shaking, surface rupture, landslides, soil liquefaction, and tsunamis, leading to both immediate and long-term consequences (Ratnapradipa et al. 2012). Specifically, earthquakes trigger tsunamis that flood coastal areas, alter salinity, deposit harmful sediments, and damage critical marine habitats such as coral reefs, mangroves, and seagrass beds, disrupting aquatic biodiversity (Lebrato et al. 2019). In freshwater systems, earthquakes can shift river courses or create new reservoirs, hindering species migration, and water quality. Furthermore, the soil liquefaction can collapse habitats, particularly in reservoirs and lakes, causing further decline in many aquatic species. Moreover, the groundwater biodiversity is also significantly impacted by seismic activity, with loss of subterranean species (Galassi et al. 2014). It has been shown previously that the 2011 Tohoku earthquake and tsunami caused notable shifts in species diversity in rocky intertidal zones (Urabe et al. 2013). Additionally, earthquakes can trigger biogeochemical shifts in hydrothermal vents, disrupting aquatic ecosystems (Lebrato et al. 2019). A previous global study shows that earthquakes increase extinction risks for various species (Gonçalves et al. 2024).

In particular, the 2009 earthquake that affected the karstic Gran Sasso Aquifer in Italy is presumed to have induced significant biogeographical and ecological disturbances, altering habitats, disrupting ecosystem dynamics, and influencing species distribution patterns (Fattorini et al. 2017). Such seismic activity likely caused physical damage to critical ecosystems, including forests, wetlands, and agricultural lands, leading to habitat loss for numerous species, as observed across various biogeographic regions (Qiu et al. 2015; Sidle et al. 2018). The displacement of flora and fauna due to land shifts, landslides, and infrastructure damage has altered local biodiversity patterns, while disruption to natural habitats may impede species migration, reproduction, and access to food sources, potentially leading to long-term ecological imbalances (Li et al. 2022; Yuan et al. 2024). Additionally, earthquake impact on soil stability, and water systems has been reported to exacerbate threats to vegetation growth, and aquatic ecosystems, jeopardizing both terrestrial, and aquatic biodiversity (Galassi et al. 2014).

On 28 March 2025, Myanmar was struck by a series of earthquakes, beginning with a magnitude 7.7 tremor near Mandalay at 0620 h UTC (Coordinated Universal Time) (United States Geological Survey, <https://earthquake.usgs.gov/earthquakes/eventpage/us7000pn9s/executive>), followed by a 6.7-magnitude quake at 0632 h UTC in the western part of the country, and several subsequent aftershocks (Image 1). These included a magnitude 4.8 quake near Taungdwingyi at 06:39 UTC, a 4.9-magnitude tremor in Sagaing at 0642 h UTC, and a 4.9-magnitude earthquake near Taungngu at 0645 h UTC. Additional aftershocks continued throughout the morning, with several quakes of magnitudes 4.5–4.6, impacting areas such as Shwebo, Pyinmana, and Mandalay. The earthquake, caused by a strike-slip movement along the Sagaing Fault, underscores the ongoing tectonic strain between the Indian and Eurasian Plates (Shahzada et al. 2025). This event serves as a reminder of the region's high seismic risk, where the continuous pressure from the plate collision leads to the release of energy through fault ruptures. The earthquake sequence caused over 2,700 civilian deaths, 4,500 injuries, and 450 missing, with widespread destruction in Mandalay, Myanmar, and tremors spreading up to Thailand. Subsequently, countries like China, India, and the U.S. provided emergency aid, including supplies, medical help, and rescue teams, while the UN coordinated relief efforts. The immediate consequences of this natural disaster shift focus to human casualties, infrastructure damage, and emergency response, temporarily overlooking biodiversity loss. In the face of immediate humanitarian needs, attention is often distracted from ecological concerns, eventually relegating the habitat damage, ecosystem disruption, and species loss. Therefore, long-term recovery efforts must prioritize both human well-being, and biodiversity conservation by identifying, and restoring key ecological habitats to enhance resilience, and ensure sustainable future ecosystems.

The seismotectonics of this region are primarily driven by the ongoing collision between the Indian Plate and the Eurasian Plate, which began approximately 50 million years ago and continues to this day (Hurukawa et al. 2012). This collision has resulted in the formation of the Himalayan Mountain range and the Tibetan Plateau, generating significant seismic activity (Shahzada et al. 2025). The region is characterized by several fault systems, including the Main Himalayan Thrust (MHT), the Main Boundary Thrust (MBT), and the Sagaing Fault, each of which plays a crucial role in earthquake generation (Li et al. 2024). Myanmar, located at the eastern edge

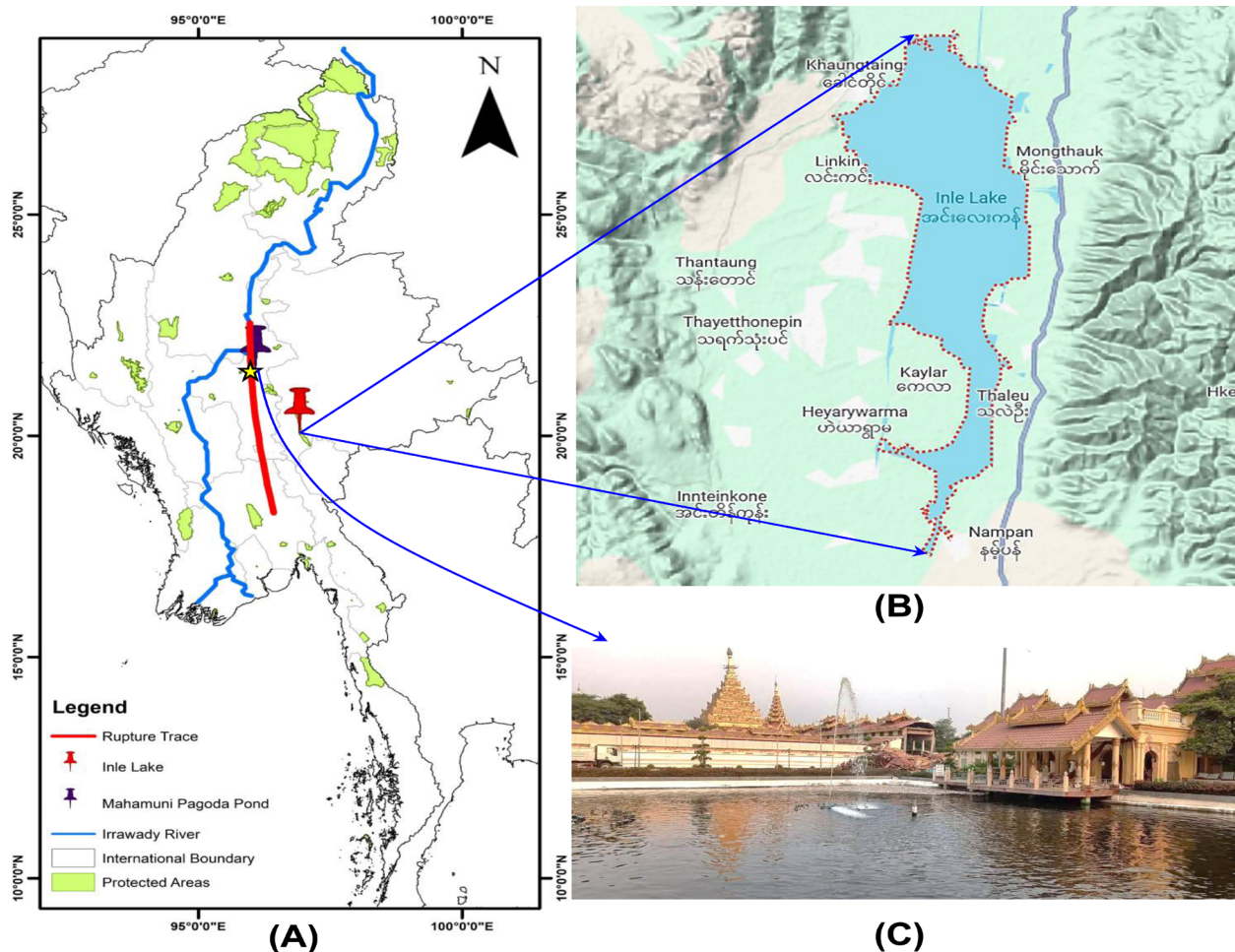


Image 1. A—map showing the rupture trace of the 28 March 2025, Myanmar earthquake in red. The underlying raster data was obtained from the United States Geological Survey. The yellow star marks the epicenter, the blue line represents the Irrawaddy River, and the green polygons indicate protected areas in Myanmar. The survey sites — Inle Lake and Mahamuni Pagoda Pond — are marked with color-coded pins. The map was manually edited using Adobe Photoshop CS 8.0 | B—location of Inle Lake | C—Mahamuni Pagoda Pond in Myanmar.

of the Indian Plate's interaction with the Eurasian Plate, is influenced not only by Himalayan tectonics but also by the subduction zone off its coast, where the Indian Ocean Plate subducts beneath the Sunda Plate (Taylor & Yin 2009). The Sagaing Fault, a major strike-slip fault running through Myanmar, accommodates lateral motion between the Indian and Eurasian Plates, contributing to the region's seismic activity (Wang et al. 2014). Due to the relatively underdeveloped seismic monitoring and mitigation infrastructure in this region compared to other seismically active areas, there is a critical need for increased research into the region's seismotectonics for more effective risk assessment, and disaster preparedness in these earthquake-prone regions. Therefore, in light of the recent 2025 violent earthquake in Myanmar, the present study aims to undertake a rapid assessment of its immediate impacts

on biodiversity in two ecologically and culturally significant sites: (i) Inle Lake, a naturally biodiversity-rich area located on the southern Shan Plateau and (ii) the Mahamuni Pagoda Pond in Mandalay, an artificial but conservation-relevant aquatic habitat. Given the critical role of both sites in regional biodiversity and conservation, this preliminary report offers an early overview of biodiversity loss resulting from the disaster. This study is intended to serve as a foundational baseline for more comprehensive post-disaster assessments of diverse biogeographic regions and native biota across Myanmar.

STUDY DESIGN

Following the earthquake on 28 March 2025, ecological alterations and biodiversity loss were assessed at Inle Lake (20.552° N, 96.916° E), located on the southern Shan Plateau, and at Mahamuni Pagoda Pond (21.951° N, 96.080° E) in Mandalay, Myanmar. Inle Lake is the second-largest lake in Myanmar and the only ancient lake on the Indochinese Peninsula. Despite its relatively small size (~116 km²) and shallow depth (with an average of only two meters), this lake supports significant freshwater biodiversity and endemism, similar to other ancient lakes, such as Baikal in Russia, Tanganyika in Africa, and Biwa in Japan (Hampton et al. 2018). Furthermore, the Mahamuni Pagoda Pond harbours a diverse assemblage of aquatic fauna, including various species of carp (Cyprinidae), catfish (Siluriformes), and freshwater turtles. These animals are frequently released by pilgrims as part of long-standing religious and cultural rituals that symbolize the act of merit-making. The recent assessment was carried out at both study sites through a randomized questionnaire survey conducted among local inhabitants and community volunteers. The field documentation was supported by photographic evidence captured using a Canon EOS 7D Mark II camera equipped with an 18–135 mm lens.

The generation of the maps involved multiple stages of data retrieval and processing of vector files. Initially, global administrative boundary shapefiles were obtained from the DIVA-GIS platform (<https://diva-gis.org/data.html>), which provides high-resolution vector datasets suitable for spatial analysis. These shapefiles were imported into ArcMap (ArcGIS v10.6) for subsequent processing and overlay analysis. Furthermore, the rupture trace associated with the violent earthquake 2025 in Myanmar was obtained from the United States Geological Survey (USGS) Earth Explorer platform (<https://www.usgs.gov/>). Data on Myanmar's protected areas were acquired from the Protected Planet database (<https://www.protectedplanet.net/en>). This dataset includes officially designated protected regions and supports the assessment of environmental vulnerability. All spatial datasets were standardized by reprojecting them into the WGS 84 geographic coordinate system to ensure consistency and compatibility across layers. The processed data were compiled and exported for the generation of the final thematic maps.

OBSERVATION

Gastropod mortality in Inle Lake

This study documents the sudden mortality of millions of gastropods from multiple species in Inle Lake (Image 1). To date, 36 species of freshwater molluscs, including 18 endemic species, have been recorded from the Inle Lake basin (Annandale 1918a; Annandale & Rao 1925). The family Bithyniidae, one of the most common groups of freshwater snails within the basin, is widely distributed across Africa, Eurasia, and Australia, inhabiting rivers, wetlands, ponds, and lakes. Six species of bithyniid snails have been documented in the Inle Lake basin and surrounding regions, viz., *Hydrobioides turrita*, *H. nassa*, *H. physcus*, *H. avarix*, *Gabbia nana*, and *G. alticola*. Four of these species (*H. physcus*, *H. avarix*, *G. nana*, and *G. alticola*) are considered endemic to the Inle Lake basin (Zhang et al. 2025). In light of the recent earthquake in Myanmar, the widespread mortality of molluscs in Inle Lake suggests a dramatic loss of native biodiversity, including many endemic species (Image 2). The decaying carcasses of these snails have contributed to the rapid deterioration of water quality, potentially exacerbated by the release of unpleasant odours and the proliferation of harmful microbes. This microbial surge poses further risks to the remaining native freshwater species in the lake.

Fish mortality at Mahamuni Pagoda Pond

The study also documents the unnatural mortality of sacred freshwater fish in the Mahamuni Pagoda Pond following the recent earthquake (Images 1 & 2). This seismic disturbance appears to have triggered adverse ecological conditions in the confined aquatic environment, including potential shifts in water chemistry, hypoxia, and the suspension of sediment-bound pollutants, all of which could have contributed to the observed fish die-offs (Devane et al. 2014). This pond also supports breeding activities, where fish populations occasionally reach densities high enough to require transfer or release into nearby natural water bodies, most notably the Irrawaddy River (Global new light of Myanmar 2024). Such movement of fauna between managed and wild habitats presents both ecological opportunities and biosecurity risks, particularly following stress events like earthquakes. Furthermore, the presence of several freshwater turtle species within the pond is of particular conservation concern, including the Critically Endangered Burmese Roofed Turtle *Batagur trivittata*, and the Burmese Peacock Softshell *Nilssonina formosa* (Calle et al. 2021). Both species are endemic to



Image 2. Consequences of the 28 March 2025 violent earthquake on Myanmar's Biodiversity. A–D—mass mortality of millions of gastropods in Inle Lake | E—unnatural death of freshwater fish in the captivity at Mahamuni Pagoda, Mandalay. © July Hnin and Thadoe Wai.

Myanmar and are facing severe threats due to habitat loss, overexploitation, and illegal trade (Platt et al. 2019; Horne et al. 2021).

COMMENTARY

Earlier evidence suggests that earthquakes and their subsequent effects can influence the ecological

dynamics, genetic composition, and structural changes within molluscan communities in Japan (Sato & Chiba 2016; Miura et al. 2017). Additionally, studies have documented that earthquakes impact molluscan species and their toxic metal accumulation, potentially posing significant risks to human health (Tapia et al. 2019). Thus, immediate intervention by local governments and conservation agencies is crucial to mitigate the ecological impacts of this event and protect the lake's unique biodiversity. In addition to its rich biodiversity, Inle Lake in Myanmar plays a pivotal role in supporting the livelihoods of the local Intha communities (Htwe et al. 2015). This aquatic ecosystem is also regarded as United Nations Educational, Scientific and Cultural Organization (UNESCO) — Man and the Biosphere Reserve (MAB) and is a wetland of International Importance designated under the Ramsar Convention (Oo et al. 2022). Furthermore, this ecosystem is also designated as a Wildlife Sanctuary and ASEAN Heritage Park in Myanmar. The lake serves as a critical source of several endemic freshwater fish and other aquatic species, providing essential sustenance and income through fishing activities (Annandale 1918b; Michalon 2015; Kano et al. 2016, 2022; Win 2018; Fuke et al. 2021, 2022; Musikasinthorn et al. 2023). A recent assessment of endemic fish species in Inle Lake revealed that Cypriniformes were the most dominant (70%), followed by Synbranchiformes (20%) and Anabantiformes (10%) in terms of relative abundance (Naing & Tun 2022). Aside from the discovery of new species of decapods and gastropods (Annandale 1918a; Kemp 1918; Annandale & Rao 1925; Ng et al. 2000; Sawada 2022; Zhang et al. 2025), the abundance, and diversity of other freshwater invertebrates in the lake have not yet been systematically assessed. Furthermore, the surrounding wetlands are home to distinctive floating gardens, where crops and vegetables are cultivated on platforms made from vegetation, enabling year-round agriculture in the nutrient-rich waters (Win 1996). Inle Lake also draws significant tourism, contributing to the local economy through hospitality services, guided tours, and the sale of regional crafts (Su & Jassby 2000). As an important transportation hub, the lake facilitates daily commutes for those residing in stilted houses along its shores, ensuring access to essential services and trade. Moreover, the lake is intricately linked to the cultural heritage of the area, with traditional crafts such as silk and lotus fiber weaving, alongside religious, and cultural practices centered around numerous pagodas, and monasteries. In addition, recent studies have documented significant alterations in land use and land cover change (LULCC) in the Inle Lake

region, characterized by declining trends in forest, and perennial wetland areas primarily due to anthropogenic pressures (Karki et al. 2018; Michalon et al. 2019). The recent earthquake may have further intensified LULCC patterns in this ecosystem, underscoring the urgent need for comprehensive investigation to understand its dynamics, and ecological implications.

The artificial pond at Mahamuni Pagoda has been designated as a conservation priority site, where the resident turtles are afforded daily offerings and protection. This site serves as a semi-natural refuge that complements ex-situ conservation initiatives. The earthquake may have compromised water quality parameters such as dissolved oxygen levels, ammonia concentration, and temperature fluctuations, all of which are critical to the health of ectothermic reptiles (Qian et al. 2013). Given the ecological significance of the Mahamuni Pagoda reservoir, further interdisciplinary research is essential to evaluate the earthquake's impact on both aquatic biodiversity and water quality. This includes post-seismic monitoring and management of physicochemical parameters, histopathological assessments and treatments of affected fauna, and population surveys of key species. The results will be pivotal in formulating evidence-based conservation strategies to protect these culturally and biologically important aquatic organisms from future disturbances.

A key limitation of this study is its exclusive reliance on photographic evidence and information obtained through local communication following the March 2025 seismic event in Myanmar. Estimating the number of snails that died was based on visual documentation alone, which may have introduced significant biases in quantification. The lack of pre-event baseline data further complicates the assessment of how much of the population was impacted, making it difficult to determine whether the mortality event signifies a threat of extinction or a temporary fluctuation in population size. These constraints highlight the challenges of accurately assessing the biodiversity impacts of this natural calamity through remote observations. Additional scientific validation through water quality assessments, histopathological analyses of deceased species, and genetic studies aimed at evaluating ecosystem resilience is urgently needed to monitor the native biodiversity in this key ecosystem following the earthquake. Several protected areas in Myanmar are located in close proximity to active fault lines, including those possibly affected by the Violent March 2025 earthquake. In addition to Inle Lake, the region encompasses several protected areas located to the east of the fault line,

including Panlaung & Padalin Cave Wildlife Sanctuary (WS), Pyin-O-Lwin Bird Sanctuary, Shwe-U-Daung WS, Minwuntaung WS, and Taunggyi Bird Sanctuary. On the western side of the fault line, key protected areas such as North Zamrari WS, Moeyungyi Wetland Ramsar Site, Minsontaung WS, Moeyungyi Wetland WS, and Popa Mountain Park harbour ecologically significant floral, and faunal assemblages. Given the ecological sensitivity of these areas, further investigation into the impacts of the March 2025 earthquake is essential to inform comprehensive post-disaster ecological assessments, and conservation strategies.

REFERENCES

- Annandale, N. (1918a). Aquatic molluscs of the Inle Lake and connected waters. *Records of the Indian Museum* 14: 103–182. <https://doi.org/10.5962/bhl.part.18607>
- Annandale, N. (1918b). Fish and fisheries of the Inle Lake. *Records of the Indian Museum* 14: 33–64. <https://doi.org/10.5962/bhl.part.18603>
- Annandale, N. & H.S. Rao (1925). Further observations on the aquatic gastropods of the Inle watershed. *Records of the Zoological Survey of India* 27: 101–127. <https://doi.org/10.26515/rzsi/v27/i2/1925/163462>
- Calle, P.P., B.L. Raphael, T. Lwin, K.D. Ingerman, A. Perry, B. Motkowicz, A.T. Brown, B.D. Horne, T.Y. Chang, A. Seah, S.G. Platt, K. Platt & T.A. Seimon (2021). Burmese Roofed Turtle *Batagur trivittata* disease screening in Myanmar. *Journal of Zoo and Wildlife Medicine* 52: 1270–1274. <https://doi.org/10.1638/2021-0017>
- Devane, M.L., E.M. Moriarty, D. Wood, J. Webster-Brown & B.J. Gilpin (2014). The impact of major earthquakes and subsequent sewage discharges on the microbial quality of water and sediments in an urban river. *Science of the Total Environment* 485–486: 666–680. <https://doi.org/10.1016/j.scitotenv.2014.03.027>
- Fattorini, S., P. Lombardo, B. Fiasca, A. Di Cioccio, T. Di Lorenzo & D.M. Galassi (2017). Earthquake-related changes in species spatial niche overlaps in spring communities. *Scientific Reports* 7: 443. <https://doi.org/10.1038/s41598-017-00592-z>
- Fuke, Y., T.P. Satoh, Y. Kano & K. Watanabe (2021). Annandale's collection of freshwater fishes from Inle Lake, Myanmar, housed in the Kyoto University Museum. *Ichthyological Research* 68: 556–560. <https://doi.org/10.1007/s10228-021-00806-5>
- Fuke, Y., Y. Kano, S. Tun, L.K.C. Yun, S.S. Win & K. Watanabe (2022). Cryptic genetic divergence of the red dwarf rasbora, *Microrasbora rubescens*, in and around Inle Lake: Implications for the origin of endemicity in the ancient lake in Myanmar. *Journal of Fish Biology* 101: 1235–1247. <https://doi.org/10.1111/jfb.15195>
- Galassi, D.M., P. Lombardo, B. Fiasca, A. Di Cioccio, T. Di Lorenzo, M. Petitta & P. Di Carlo (2014). Earthquakes trigger the loss of groundwater biodiversity. *Scientific Reports* 4: 6273. <https://doi.org/10.1038/srep06273>
- Gonçalves, F., H. Farooq, M. Harfoot, M.M. Pires, N. Villar, L. Sales, C. Carvalho, C. Bello, C. Emer, R.S. Bovendorp, C. Mendes, G. Beca, L. Lautenschlager, Y. Souza, F. Pedrosa, C. Paz, V.B. Zipparro, P. Akkawi, W. Bercê, F. Farah, A.V.L. Freitas, L.F. Silveira, F. Olmos, J. Geldmann, B. Dalsgaard & M. Galetti (2024). A global map of species at risk of extinction due to natural hazards. *Proceedings of the National Academy of Sciences of the United States of America* 121: e2321068121. <https://doi.org/10.1073/pnas.2321068121>
- Hampton, S.E., S. McGowan, T. Ozersky, S.G. Virdis, T.T. Vu, T.L. Spanbauer, B.M. Kraemer, G. Swann, A.W. Mackay, S.M. Powers, M.F. Meyer, S.G. Labou, C.M. O'Reilly, M. DiCarlo, A.W.E. Galloway & S.C. Fritz (2018). Recent ecological change in ancient lakes. *Limnology and Oceanography* 63: 2277–2304. <https://doi.org/10.1002/lno.10938>
- Horne, B.D., K. Platt & P. Praschag (2021). *Nilssonia formosa*. The IUCN Red List of Threatened Species 2021: e.T14765A546244. <https://doi.org/10.2305/IUCN.UK.2021-1.RLTS.T14765A546244.en>. Accessed on 8.iv.2025.
- Htwe, T.N., M. Kywe, A. Buerkert & K. Brinkmann (2015). Transformation processes in farming systems and surrounding areas of Inle Lake, Myanmar, during the last 40 years. *Journal of Land Use Science* 10: 205–223.
- Hurukawa, N., P.P. Tun & B. Shibazaki (2012). Detailed geometry of the subducting Indian Plate beneath the Burma Plate and subcrustal seismicity in the Burma Plate derived from joint hypocenter relocation. *Earth, Planets and Space* 64: 333–343. <https://doi.org/10.5047/eps.2011.10.011>
- Ide, S. (2010). Striations, duration, migration, and tidal response in deep tremor. *Nature* 466: 356–359. <https://doi.org/10.1038/nature09251>
- Kano, Y., P. Musikasinthorn, A. Iwata, S. Tun, L. Yun, S. Win, S. Matsui, R. Tabata, T. Yamasaki & K. Watanabe (2016). A dataset of fishes in and around Inle Lake, an ancient lake of Myanmar, with DNA barcoding, photo images and CT/3D models. *Biodiversity Data Journal* 4: e10539. <https://doi.org/10.3897/bdj.4.e10539>
- Kano, Y., Y. Fuke, P. Musikasinthorn, A. Iwata, T.M. Soe, S. Tun, L. Yun, S.S. Win, S. Matsui, R. Tabata & K. Watanabe (2022). Fish diversity of a spring field in Hopong Town, Taunggyi District, Shan State, Myanmar (the Salween River Basin), with genetic comparisons to some “species endemic to Inle Lake”. *Biodiversity Data Journal* 10: e80101. <https://doi.org/10.3897/BDJ.10.e80101>
- Karki, S., A.M. Thandar, K. Uddin, S. Tun, W.M. Aye, K. Aryal, P. Kandel & N. Chettri (2018). Impact of land use land cover change on ecosystem services: a comparative analysis on observed data and people's perception in Inle Lake, Myanmar. *Environmental Systems Research* 7: Article 24. <https://doi.org/10.1186/s40068-018-0128-7>
- Kemp, S. (1918). Crustacea Decapoda of the Inle Lake Basin. *Records of the Indian Museum* 14: 81–102 + pls. 24, 25.
- Lebrato, M., Y.V. Wang, L.C. Tseng, E.P. Achterberg, X.G. Chen, J.C. Molinero, K. Bremer, U. Westernströer, E. Söding, H.U. Dahms, M. Küter, V. Heinath, J. Jöhnck, K.I. Konstantinou, Y.J. Yang, J.S. Hwang & D. Garbe-Schönberg (2019). Earthquake and typhoon trigger unprecedented transient shifts in shallow hydrothermal vents biogeochemistry. *Scientific Reports* 9: 16926. <https://doi.org/10.1038/s41598-019-53314-y>
- Li, B.V., C.N. Jenkins & W. Xu (2022). Strategic protection of landslide vulnerable mountains for biodiversity conservation under land-cover and climate change impacts. *Proceedings of the National Academy of Sciences of the United States of America* 119: e2113416118. <https://doi.org/10.1073/pnas.2113416118>
- Li, S., V. Schulte-Pelkum, W.D. Barnhart, L. Chen, M. Karplus & O. Oncken (2024). Weak, vertically stronger Main Himalayan Thrust in the India–Asia collision. *Geophysical Research Letters* 51: e2024GL110222. <https://doi.org/10.1029/2024GL110222>
- Michalon, M. (2015). The gardener and the fisherman in globalization: the Inle Lake (Myanmar), a region under transition. Thesis for master degree. <https://doi.org/10.13140/2.1.4600.6083>
- Michalon, M., Y. Gunnell, J. Lejot, F. Mialhe & T. Aung (2019). Accelerated degradation of Lake Inle (Myanmar): a baseline study for environmentalists and developers. *Land Degradation & Development* 30: 928–941. <https://doi.org/10.1002/ldr.3279>
- Miura, O., G. Kanaya, S. Nakai, H. Itoh, S. Chiba, W. Makino, T. Nishimura, S. Kojima & J. Urabe (2017). Ecological and genetic impact of the 2011 Tohoku Earthquake Tsunami on intertidal mud snails. *Scientific Reports* 7: 44375. <https://doi.org/10.1038/srep44375>
- Musikasinthorn, P., Y. Kano, R. Tabata, S. Matsui, S. Tun, L.K.C. Yun, B. Touch, P. Thach & K. Watanabe (2023). Origin of endemic species in a moderately isolated ancient lake: the case of a snakehead

- in Inle Lake, Myanmar. *Zoologica Scripta* 00: 1–16. <https://doi.org/10.1111/zsc.12633>
- Naing, M. & M.N. Tun (2022). Species composition and relative abundance of some endemic fish species in Inle Lake. *University of Yangon Research Journal* 11: 493–501.
- Ng, P.K.L., W. Mar & D.C.J. Yeo (2020). On the taxonomy of the endemic Inle Lake crab, *Inlethelphusa acanthica* (Kemp, 1918) (Crustacea: Brachyura: Potamidae) of Myanmar. *Raffles Bulletin of Zoology* 68: 453–463.
- Oo, M.T., Z.W. Aung & C. Puzzo (2022). The floating garden agricultural system of the Inle Lake (Myanmar) as an example of equilibrium between food production and biodiversity maintenance. *Biodiversity and Conservation* 31: 2435–2452. <https://doi.org/10.1007/s10531-021-02347-9>
- Platt, K., B.D. Horne & P. Praschag (2019). *Batagur trivittata* (errata version published in 2019). The IUCN Red List of Threatened Species 2019: e.T10952A152044061. <https://doi.org/10.2305/IUCN.UK.2019-1.RLTS.T10952A152044061.en>. Accessed on 8.iv.2025.
- Qian, F., B. Hu, J.J. Liu, W. Lin & M.B. Xiong (2013). Analysis of the relationship between river flow and water quality before and after the Wenchuan Earthquake. *Advanced Materials Research* 664: 164–168. <https://doi.org/10.4028/www.scientific.net/AMR.664.164>
- Qiu, S., M. Xu & Y. Zheng (2015). Impacts of the Wenchuan earthquake on tree mortality and biomass carbon stock. *Natural Hazards* 77: 1261–1274. <https://doi.org/10.1007/s11069-015-1653-6>
- Ratnapradipa, D., J. Conder, A. Ruffing & V. White (2012). The 2011 Japanese earthquake: an overview of environmental health impacts. *Journal of Environmental Health* 74: 42–50.
- Sato, S. & T. Chiba (2016). Structural changes in molluscan community over a 15-year period before and after the 2011 Great East Japan Earthquake and subsequent tsunami around Matsushima Bay, Miyagi Prefecture, northeastern Japan. *PLoS ONE* 11: e0168206. <https://doi.org/10.1371/journal.pone.0168206>
- Sawada, N. (2022). Revisiting the Annandale malacological collection from Inle Lake, Myanmar kept in the Kyoto University Museum. *Molluscan Research* 42: 212–220. <https://doi.org/10.1080/13235818.2022.2097043>
- Shahzada, K., U.A. Noor & Z.D. Xu (2025). In the Wake of the March 28, 2025 Myanmar Earthquake: a detailed examination. *Journal of Dynamic Disasters* 1(2): 100017. <https://doi.org/10.1016/j.jdd.2025.100017>
- Sidle, R.C., T. Gomi, M. Akasaka & K. Koyanagi (2018). Ecosystem changes following the 2016 Kumamoto earthquakes in Japan: Future perspectives. *Ambio* 47: 721–734. <https://doi.org/10.1007/s13280-017-1005-8>
- Su, M. & A.D. Jassby (2000). Inle: a large Myanmar lake in transition. *Lakes & Reservoirs: Science, Policy and Management for Sustainable Use* 5: 49–54. <https://doi.org/10.1046/j.1440-1770.2000.00090.x>
- Tapia, J., F. Villagra, C. Bertrán, J. Espinoza, S. Focardi, P. Fierro, C. Tapia, R. Pizarro & L. Vargas-Chacoff (2019). Effect of the earthquake-tsunami (Chile, 2010) on toxic metal content in the Chilean abalone mollusc *Concholepas concholepas*. *Ecotoxicology and Environmental Safety* 169: 418–424. <https://doi.org/10.1016/j.ecoenv.2018.11.040>
- Taylor, M. & A. Yin (2009). Active structures of the Himalayan-Tibetan orogen and their relationships to earthquake distribution, contemporary strain field, and Cenozoic volcanism. *Geosphere* 5: 199–214. <https://doi.org/10.1130/GES00217.1>
- Urabe, J., T. Suzuki, T. Nishita & W. Makino (2013). Immediate ecological impacts of the 2011 Tohoku earthquake tsunami on intertidal flat communities. *PLoS ONE* 8: e62779. <https://doi.org/10.1371/journal.pone.0062779>
- Wang, Y., K. Sieh, S.T. Tun, K.-Y. Lai & T. Myint (2014). Active tectonics and earthquake potential of the Myanmar region. *Journal of Geophysical Research: Solid Earth* 119: 3767–3822. <https://doi.org/10.1002/2013JB010762>
- Win, S.S. (2018). Assessment on fishery sustainability in Inle wetland, Nyaung Shwe Township, southern Shan State. *International Journal of Avian & Wildlife Biology* 3: 345–350. <https://doi.org/10.15406/ijawb.2018.03.00118>
- Win, T.D. (1996). Floating island agriculture (ye-chan) of Inle Lake. Master's thesis, Department of Geography, Yangon University, Yangon, 180 pp.
- Yuan, R., N. Zhang & Q. Zhang (2024). The impact of habitat loss and fragmentation on biodiversity in global protected areas. *Science of the Total Environment* 931: 173004. <https://doi.org/10.1016/j.scitotenv.2024.173004>
- Zhang, L.J., S.S. Shu, X.Y. Song, N.H. Naing, T.N. Oo & X.Y. Chen (2025). A revision of Bithyniidae (Mollusca, Gastropoda) from the Inle Lake Basin, Myanmar. *Zoosystematics and Evolution* 101: 643–660. <https://doi.org/10.3897/zse.101.143936>



Author details: Hsu Htoo is a Ph.D. student in the Department of Marine Biology, College of Fisheries Science, Pukyong National University, Busan, South Korea. IMON ABEDIN is a Ph.D. scholar in the Department of Zoology at Bodoland University and a Biologist at Aaranyak (a Scientific and Industrial Research Organization), Assam, India. SANG VAN VU is a lecturer in the Faculty of Biology, University of Science, Vietnam National University, Hanoi, Vietnam. HYUN-WOO KIM is a professor in the College of Fisheries Science, Pukyong National University, Busan, South Korea. SHANTANU KUNDU is an assistant professor in the College of Fisheries Science, Pukyong National University, Busan, South Korea.

Author contributions: Conceptualization—HWK and SK; Data collection—HH and IA; Writing original draft preparation—HH, IA, and SVV; Writing review and editing—HWK and SK; Visualization—HH and SVV; Supervision—HWK and SK. All authors have read and agreed to the published version of the manuscript.

Mr. Jatishwor Singh Irungbam, Biology Centre CAS, Branišovská, Czech Republic.
Dr. Ian J. Kitching, Natural History Museum, Cromwell Road, UK
Dr. George Mathew, Kerala Forest Research Institute, Peechi, India
Dr. John Noyes, Natural History Museum, London, UK
Dr. Albert G. Orr, Griffith University, Nathan, Australia
Dr. Sameer Padhye, Katholieke Universiteit Leuven, Belgium
Dr. Nancy van der Poorten, Toronto, Canada
Dr. Kareen Schnabel, NIWA, Wellington, New Zealand
Dr. R.M. Sharma, (Retd.) Scientist, Zoological Survey of India, Pune, India
Dr. Manju Siliwal, WILD, Coimbatore, Tamil Nadu, India
Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India
Dr. K.A. Subramanian, Zoological Survey of India, New Alipore, Kolkata, India
Dr. P.M. Sureshan, Zoological Survey of India, Kozhikode, Kerala, India
Dr. R. Varatharajan, Manipur University, Imphal, Manipur, India
Dr. Eduard Vives, Museu de Ciències Naturals de Barcelona, Terrassa, Spain
Dr. James Young, Hong Kong Lepidopterists' Society, Hong Kong
Dr. R. Sundararaj, Institute of Wood Science & Technology, Bengaluru, India
Dr. M. Nithyanandan, Environmental Department, La Ala Al Kuwait Real Estate. Co. K.S.C., Kuwait
Dr. Himender Bharti, Punjabi University, Punjab, India
Mr. Purnendu Roy, London, UK
Mr. Saito Motoki, The Butterfly Society of Japan, Tokyo, Japan
Dr. Sanjay Sondhi, TITLI TRUST, Kalpavriksh, Dehradun, India
Dr. Nguyen Thi Phuong Lien, Vietnam Academy of Science and Technology, Hanoi, Vietnam
Dr. Nitin Kulkarni, Tropical Research Institute, Jabalpur, India
Dr. Robin Wen Jiang Ngiam, National Parks Board, Singapore
Dr. Lionel Monod, Natural History Museum of Geneva, Genève, Switzerland.
Dr. Asheesh Shivam, Nehru Gram Bharti University, Allahabad, India
Dr. Rosana Moreira da Rocha, Universidade Federal do Paraná, Curitiba, Brasil
Dr. Kurt R. Arnold, North Dakota State University, Saxony, Germany
Dr. James M. Carpenter, American Museum of Natural History, New York, USA
Dr. David M. Claborn, Missouri State University, Springfield, USA
Dr. Kareen Schnabel, Marine Biologist, Wellington, New Zealand
Dr. Amazonas Chagas Júnior, Universidade Federal de Mato Grosso, Cuiabá, Brasil
Mr. Monsoon Jyoti Gogoi, Assam University, Silchar, Assam, India
Dr. Heo Chong Chin, Universiti Teknologi MARA (UiTM), Selangor, Malaysia
Dr. R.J. Shiel, University of Adelaide, SA 5005, Australia
Dr. Siddharth Kulkarni, The George Washington University, Washington, USA
Dr. Priyadarsanan Dharma Rajan, ATREE, Bengaluru, India
Dr. Phil Alderslade, CSIRO Marine And Atmospheric Research, Hobart, Australia
Dr. John E.N. Veron, Coral Reef Research, Townsville, Australia
Dr. Daniel Whitmore, State Museum of Natural History Stuttgart, Rosenstein, Germany.
Dr. Yu-Feng Hsu, National Taiwan Normal University, Taipei City, Taiwan
Dr. Keith V. Wolfe, Antioch, California, USA
Dr. Siddharth Kulkarni, The Hormiga Lab, The George Washington University, Washington, D.C., USA
Dr. Tomas Ditrich, Faculty of Education, University of South Bohemia in Ceske Budejovice, Czech Republic
Dr. Mihaly Foldvari, Natural History Museum, University of Oslo, Norway
Dr. V.P. Uniyal, Wildlife Institute of India, Dehradun, Uttarakhand 248001, India
Dr. John D.D. Caleb, Zoological Survey of India, Kolkata, West Bengal, India
Dr. Priyadarsanan Dharma Rajan, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Bangalore, Karnataka, India

Fishes

Dr. Topiltzin Contreras MacBeath, Universidad Autónoma del estado de Morelos, México
Dr. Heok Hee Ng, National University of Singapore, Science Drive, Singapore
Dr. Rajeev Raghavan, St. Albert's College, Kochi, Kerala, India
Dr. Robert D. Sluka, Chiltern Gateway Project, A Rocha UK, Southall, Middlesex, UK
Dr. E. Vivekanandan, Central Marine Fisheries Research Institute, Chennai, India
Dr. Davor Zanella, University of Zagreb, Zagreb, Croatia
Dr. A. Biju Kumar, University of Kerala, Thiruvananthapuram, Kerala, India
Dr. Akhilesh K.V., ICAR-Central Marine Fisheries Research Institute, Mumbai Research Centre, Mumbai, Maharashtra, India
Dr. J.A. Johnson, Wildlife Institute of India, Dehradun, Uttarakhand, India
Dr. R. Ravinesh, Gujarat Institute of Desert Ecology, Gujarat, India

Amphibians

Dr. Sushil K. Dutta, Indian Institute of Science, Bengaluru, Karnataka, India
Dr. Annemarie Ohler, Muséum national d'Histoire naturelle, Paris, France

Reptiles

Dr. Gernot Vogel, Heidelberg, Germany
Dr. Raju Vyas, Vadodara, Gujarat, India
Dr. Pritpal S. Soorae, Environment Agency, Abu Dhabi, UAE.
Prof. Dr. Wayne J. Fuller, Near East University, Mersin, Turkey
Prof. Chandrashekhar U. Rivonker, Goa University, Taleigao Plateau, Goa. India
Dr. S.R. Ganesh, Chennai Snake Park, Chennai, Tamil Nadu, India
Dr. Himansu Sekhar Das, Terrestrial & Marine Biodiversity, Abu Dhabi, UAE

Birds

Dr. Hem Sagar Baral, Charles Sturt University, NSW Australia
Mr. H. Byju, Coimbatore, Tamil Nadu, India
Dr. Chris Bowden, Royal Society for the Protection of Birds, Sandy, UK
Dr. Priya Davidar, Pondicherry University, Kalapet, Puducherry, India
Dr. J.W. Duckworth, IUCN SSC, Bath, UK
Dr. Rajah Jayapal, SAGON, Coimbatore, Tamil Nadu, India
Dr. Rajiv S. Kalsi, M.L.N. College, Yamuna Nagar, Haryana, India
Dr. V. Santharam, Rishi Valley Education Centre, Chittoor Dt., Andhra Pradesh, India
Dr. S. Balachandran, Bombay Natural History Society, Mumbai, India
Mr. J. Praveen, Bengaluru, India
Dr. C. Srinivasulu, Osmania University, Hyderabad, India
Dr. K.S. Gopi Sundar, International Crane Foundation, Baraboo, USA
Dr. Gombobaatar Sunde, Professor of Ornithology, Ulaanbaatar, Mongolia
Prof. Reuven Yosef, International Birding & Research Centre, Eilat, Israel
Dr. Taej Mundkur, Wetlands International, Wageningen, The Netherlands
Dr. Carol Inskipp, Bishop Auckland Co., Durham, UK
Dr. Tim Inskipp, Bishop Auckland Co., Durham, UK
Dr. V. Gokula, National College, Tiruchirappalli, Tamil Nadu, India
Dr. Arkady Lelej, Russian Academy of Sciences, Vladivostok, Russia
Dr. Simon Dowell, Science Director, Chester Zoo, UK
Dr. Mário Gabriel Santiago dos Santos, Universidade de Trás-os-Montes e Alto Douro, Quinta de Prados, Vila Real, Portugal
Dr. Grant Connette, Smithsonian Institution, Royal, VA, USA
Dr. P.A. Azeez, Coimbatore, Tamil Nadu, India

Mammals

Dr. Giovanni Amori, CNR - Institute of Ecosystem Studies, Rome, Italy
Dr. Anwaruddin Chowdhury, Guwahati, India
Dr. David Mallon, Zoological Society of London, UK
Dr. Shomita Mukherjee, SAGON, Coimbatore, Tamil Nadu, India
Dr. Angie Appel, Wild Cat Network, Germany
Dr. P.O. Nameer, Kerala Agricultural University, Thrissur, Kerala, India
Dr. Ian Redmond, UNEP Convention on Migratory Species, Lansdown, UK
Dr. Heidi S. Riddle, Riddle's Elephant and Wildlife Sanctuary, Arkansas, USA
Dr. Karin Schwartz, George Mason University, Fairfax, Virginia.
Dr. Lala A.K. Singh, Bhubaneswar, Orissa, India
Dr. Mewa Singh, Mysore University, Mysore, India
Dr. Paul Racey, University of Exeter, Devon, UK
Dr. Honnavalli N. Kumara, SAGON, Anaikatty P.O., Coimbatore, Tamil Nadu, India
Dr. Nishith Dharaiya, HNG University, Patan, Gujarat, India
Dr. Spartaco Gippoliti, Socio Onorario Società Italiana per la Storia della Fauna "Giuseppe Altobello", Rome, Italy
Dr. Justus Joshua, Green Future Foundation, Tiruchirappalli, Tamil Nadu, India
Dr. H. Raghuram, The American College, Madurai, Tamil Nadu, India
Dr. Paul Bates, Harison Institute, Kent, UK
Dr. Jim Sanderson, Small Wild Cat Conservation Foundation, Hartford, USA
Dr. Dan Challender, University of Kent, Canterbury, UK
Dr. David Mallon, Manchester Metropolitan University, Derbyshire, UK
Dr. Brian L. Cypher, California State University-Stanislaus, Bakersfield, CA
Dr. S.S. Talmale, Zoological Survey of India, Pune, Maharashtra, India
Prof. Karan Bahadur Shah, Budhanilakantha Municipality, Kathmandu, Nepal
Dr. Susan Cheyne, Borneo Nature Foundation International, Palangkaraja, Indonesia
Dr. Hemanta Kafley, Wildlife Sciences, Tarleton State University, Texas, USA

Other Disciplines

Dr. Aniruddha Belsare, Columbia MO 65203, USA (Veterinary)
Dr. Mandar S. Paingankar, University of Pune, Pune, Maharashtra, India (Molecular)
Dr. Jack Tordoff, Critical Ecosystem Partnership Fund, Arlington, USA (Communities)
Dr. Ulrike Streicher, University of Oregon, Eugene, USA (Veterinary)
Dr. Hari Balasubramanian, EcoAdvisors, Nova Scotia, Canada (Communities)
Dr. Rayanna Hellem Santos Bezerra, Universidade Federal de Sergipe, São Cristóvão, Brazil
Dr. Jamie R. Wood, Landcare Research, Canterbury, New Zealand
Dr. Wendy Collinson-Jonker, Endangered Wildlife Trust, Gauteng, South Africa
Dr. Rajeshkumar G. Jani, Anand Agricultural University, Anand, Gujarat, India
Dr. O.N. Tiwari, Senior Scientist, ICAR-Indian Agricultural Research Institute (IARI), New Delhi, India
Dr. L.D. Singla, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India
Dr. Rupika S. Rajakaruna, University of Peradeniya, Peradeniya, Sri Lanka
Dr. Bahar Baviskar, Wild-CER, Nagpur, Maharashtra 440013, India

Reviewers 2021–2023

Due to pausity of space, the list of reviewers for 2021–2023 is available online.

The opinions expressed by the authors do not reflect the views of the Journal of Threatened Taxa, Wildlife Information Liaison Development Society, Zoo Outreach Organization, or any of the partners. The journal, the publisher, the host, and the partners are not responsible for the accuracy of the political boundaries shown in the maps by the authors.

Print copies of the Journal are available at cost. Write to:
The Managing Editor, JoTT,
c/o Wildlife Information Liaison Development Society,
3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore,
Tamil Nadu 641006, India
ravi@threatenedtaxa.org & ravi@zooreach.org

Journal of Threatened Taxa is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64



www.threatenedtaxa.org

OPEN ACCESS



The Journal of Threatened Taxa (JoTT) is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at www.threatenedtaxa.org. All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use, reproduction, and distribution of articles in any medium by providing adequate credit to the author(s) and the source of publication.

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

August 2025 | Vol. 17 | No. 8 | Pages: 27323–27406

Date of Publication: 26 August 2025 (Online & Print)

DOI: 10.11609/jott.2025.17.8.27323-27406

Articles

Taxonomic studies and breaking seed dormancy of *Hibiscus lobatus* (Murray) Kuntze, 1898 (Magnoliopsida: Malvales: Malvaceae) — a native plant of the central Western Ghats

– T.D. Karthik, V. Krishna, B.U. Sourabh Giri, K. Raagavalli & A.S. Syeda, Pp.27323–27332

Environmental drivers of zooplankton diversity and composition of Pargwal Wetland, Jammu & Kashmir, India

– Neha Jamwal & Arti Sharma, Pp. 27333–27345

***Cypris decaryi* Gauthier, 1933 (Crustacea: Ostracoda: Cyprididae): a new record for Maharashtra, India, with a note on its distribution**

– Shruti Milind Yeola, Renuka Rajendra Khairnar & Yugandhar Satish Shinde, Pp. 27346–27354

Tectonic turmoil: consequences of violent earthquake-2025 on biodiversity collapse in Myanmar

– Hsu Htoo, Imon Abedin, Sang Van Vu, Hyun-Woo Kim & Shantanu Kundu, Pp. 27355–27362

Communications

First record of the *Coelliccia svihleri* Asahina, 1970 (Odonata: Platycnemididae) in Arunachal Pradesh, India

– R. Mahesh, Rajesh Gopinath, Gaurav Joshi & Roshan Upadhaya, Pp. 27363–27370

Spider (Araneae) fauna in paddy ecosystem of Kangra Valley, Himachal Pradesh, India

– Manoj Bhaurao Salunkhe, Muthusamy Sampathkumar & Ajay Kumar Sood, Pp. 27371–27377

Short Communications

A new variety of *Chara corallina* Willd. (Charophyta: Characeae) from Kamrup District, Assam, India

– Partha Pratim Baruah, Shaswatee Bhattacharjee, Nilamjyoti Kalita & Bishmita Boruah, Pp. 27378–27383

Re-collection of two climbing asclepiads: *Cynanchum corymbosum* and *Oxystelma esculentum* (Apocynaceae: Asclepiadoideae) from Assam, India

– Gitartha Saikia, Saurav Kumar Boruah, Trishna Roy Prodhani & Nilakshee Devi, Pp. 27384–27390

New distribution record of two jumping spider species of the genus *Pellenes* Simon, 1876 and *Thyene* Simon, 1885 (Araneae: Salticidae) from Gujarat, India

– Subhash I. Parmar, Heena Prajapati, Pranav J. Pandya & Dhruv A. Prajapati, Pp. 27391–27395

***Sympetrum orientale* (Selys, 1883) (Odonata: Libellulidae): a new addition to the Odonata fauna of Kashmir Himalaya, India**

– Altaf Hussain Mir, Sahiba Khan, Beenish Bashir, Mohd Hussain & Tanveer Ahmad Dar, Pp. 27396–27399

First confirmed sighting of the elusive Eurasian Otter in Goa, India

– Abhijeet Patil, Shricharan Desai, Swanand Patil & Mirjoy Mathew, Pp. 27400–27402

First photographic record of Smooth-coated Otter *Lutra perspicillata* (Carnivora: Mustelidae) from Nandhaur Wildlife Sanctuary, Uttarakhand, India

– Nishant Bhardwaj, Hritik Nautiyal, Harish Guleria & Bilal Habib, Pp. 27403–27406

Publisher & Host



Threatened Taxa