

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/357794390>

ChiroVox: a public library of bat calls

Article in PeerJ · January 2022

DOI: 10.7717/peerj.12445

CITATIONS

2

READS

315

26 authors, including:



Tamás Görföl

University of Pécs

133 PUBLICATIONS 1,353 CITATIONS

SEE PROFILE



Joe Chun-Chia Huang

36 PUBLICATIONS 260 CITATIONS

SEE PROFILE



Gábor Csorba

Hungarian Natural History Museum

197 PUBLICATIONS 1,960 CITATIONS

SEE PROFILE



Dorottya Győrössi

Szent István University, Godollo

3 PUBLICATIONS 2 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Biodiversity Survey and Vertical Stratification Study in Peninsular Malaysia East-Coast Region [View project](#)



Effect of Extreme Heat Event on *Pteropus medius* (Indian Flying Foxes) and its role in AMR Spillover in Pakistan [View project](#)



ChiroVox: a public library of bat calls

Tamás Görföls^{1,2,*}, Joe Chun-Chia Huang^{3,4,5,*}, Gábor Csorba¹, Dorottya Györössy^{1,6}, Péter Estók⁷, Tigga Kingston^{5,8}, Kriszta Lilla Szabadi^{1,6}, Ellen McArthur^{5,9}, Juliana Senawi⁴, Neil M. Furey^{5,10,11}, Vuong Tan Tu^{12,13}, Vu Dinh Thong^{5,12,13}, Faisal Ali Anwarali Khan⁹, Emy Ritta Jinggong⁹, Melissa Donnelly^{14,15}, Jayaraj Vijaya Kumaran^{5,16}, Jian-Nan Liu¹⁷, Shiang-Fan Chen^{5,18}, Mao-Ning Tuanmu³, Ying-Yi Ho³, Heng-Chia Chang¹⁹, Nurul-Ain Elias^{5,20}, Nur-Izzati Abdullah^{20,21}, Lee-Sim Lim^{5,21}, C Daniel Squire^{5,22} and Sándor Zsebök^{23,24}

¹ Department of Zoology, Hungarian Natural History Museum, Budapest, Hungary

² National Laboratory of Virology, Szentágotthai Research Centre, University of Pécs, Pécs, Hungary

³ Biodiversity Research Center, Academia Sinica, Taipei, Taiwan

⁴ Department of Biological Sciences and Biotechnology, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia

⁵ Southeast Asian Bat Conservation Research Unit, Lubbock, TX, United States of America

⁶ Hungarian University of Agriculture and Life Sciences, Gödöllő, Hungary

⁷ Department of Zoology, Eszterházy Károly Catholic University, Eger, Hungary

⁸ Department of Biological Sciences, Texas Tech University, Lubbock, TX, United States of America

⁹ Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak, Malaysia

¹⁰ Harrison Institute, Kent, United Kingdom

¹¹ Fauna & Flora International, Phnom Penh, Cambodia

¹² Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, Hanoi, Vietnam

¹³ Graduate University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam

¹⁴ Operation Wallacea Ltd., Lincolnshire, United Kingdom

¹⁵ Proyecto CUBABAT, Matanzas, Cuba

¹⁶ Global Entrepreneurship Research & Innovation Center, Universiti Malaysia Kelantan, Pengkalan Chepa, Kota Bharu, Malaysia

¹⁷ Department of Forestry and Natural Resources, National Chiayi University, Chiayi, Taiwan

¹⁸ Center for General Education, National Taipei University, New Taipei City, Taiwan

¹⁹ Formosan Golden Bat's Home, Yunlin, Taiwan

²⁰ School of Biological Sciences, Universiti Sains Malaysia, Penang, Malaysia

²¹ School of Distance Education, Universiti Sains Malaysia, Penang, Malaysia

²² Department of Educational Psychology & Leadership, Texas Tech University, Lubbock, TX, United States of America

²³ Department of Systematic Zoology and Ecology, Eötvös Loránd University, Budapest, Hungary

²⁴ Institute of Ecology and Botany, Centre for Ecological Research, Vácrátót, Hungary

* These authors contributed equally to this work.

Submitted 18 August 2021
Accepted 15 October 2021
Published 13 January 2022

Corresponding author
Tamás Görföls, tamas@gorfol.eu

Academic editor
Madhava Meegaskumbura

Additional Information and
Declarations can be found on
page 10

DOI 10.7717/peerj.12445

© Copyright
2022 Görföls et al.

Distributed under
Creative Commons CC-BY 4.0

OPEN ACCESS

ABSTRACT

Recordings of bat echolocation and social calls are used for many research purposes from ecological studies to taxonomy. Effective use of these relies on identification of species from the recordings, but comparative recordings or detailed call descriptions to support identification are often lacking for areas with high biodiversity. The ChiroVox website (www.chirovox.org) was created to facilitate the sharing of bat sound recordings together with their metadata, including biodiversity data and recording circumstances. To date, more than 30 researchers have contributed over 3,900 recordings of nearly 200

species, making ChiroVox the largest open-access bat call library currently available. Each recording has a unique identifier that can be cited in publications; hence the acoustic analyses are repeatable. Most of the recordings available through the website are from bats whose species identities are confirmed, so they can be used to determine species in recordings where the bats were not captured or could not be identified. We hope that with the help of the bat researcher community, the website will grow rapidly and will serve as a solid source for bat acoustic research and monitoring.

Subjects Biodiversity, Bioinformatics, Ecology, Taxonomy, Zoology

Keywords Bats, Chiroptera, Database, Call library, Echolocation, Acoustics, Survey, Monitoring

INTRODUCTION

Bats are the second most specious group of mammals with more than 1400 known species (*Simmons & Cirranello, 2020*). They play crucial roles in ecosystems and provide important ecosystem services to humans through suppression of agricultural pests, seed dispersal and pollination (*Kunz et al., 2011*). More than one-third of bat species listed by the International Union for Conservation of Nature (IUCN) are considered threatened or data deficient and information on species' distributions, habitat use, and population trends are required to ensure appropriate conservation measures for these taxa (*Frick, Kingston & Flanders, 2020*).

Due to their elusive nature, bats are among the least known mammals. This is especially true for tropical bat species. Observation of bats is challenging because they are active at night and roost in crevices or inaccessible places during the day. There are several methods to determine species occurrence and abundance, for example by catching individuals with mist nets, harp traps, or visiting roosts. However, these methods cannot be used equally for various species and usually preclude observation of natural behaviors (e.g., *Larsen et al., 2007; MacSwiney, Clarke & Racey, 2008; Kingston, 2013; Marques et al., 2013; Tanshi & Kingston, 2021*). Approximately 86% of bat species use echolocation for navigation, and the calls of many species are sufficiently intense that they can be recorded while the bat is flying freely in the natural environment. This provides an opportunity for researchers to “eavesdrop” on bats in their natural habitats, such that acoustic methods have become a mainstay in bat research in recent decades (*Zamora-Gutierrez et al., 2021*).

Acoustic approaches have several advantages. They can be used without disturbing bats and automatic recorders can be deployed for several days or months. Multiple recording devices can also simultaneously be used across large areas for comparisons of land use (e.g., *Frick, 2013; Gibb et al. 2019*). However, acoustic methods also have disadvantages, the most critical being that it is generally challenging to identify all calls to species level, especially in areas with high bat diversity. Echolocation calls of many species, including co-distributed taxa, are similar and overlap in acoustic parameters, making it difficult to distinguish among species. This is compounded by within species and even within individual variations in call parameters, as species' calls vary geographically and bats commonly adjust calls in the course of a call sequence (*Russo & Voigt, 2016; Rydell et al.,*