

# Biodiversity checklists for Bhutan

Choki Gyeltshen<sup>‡</sup>, Karunya Prasad<sup>‡</sup>

<sup>‡</sup> National Biodiversity Centre, Thimphu, Bhutan

Corresponding author: Choki Gyeltshen ([chokig@moaf.gov.bt](mailto:chokig@moaf.gov.bt))

Academic editor: Dmitry Schigel

## Abstract

## Background

The species checklists for Bhutan published in the Global Biodiversity Information Facility (GBIF) were originally collated for the publication 'Biodiversity Statistics of Bhutan 2017, A Preliminary Baseline' (BSB 2017). This document was published in 2019 and is the first comprehensive overview of Bhutan's species richness, recording more than 11,000 species across all five kingdoms. Collation of biodiversity checklists has been limited in Bhutan. Thus, this paper and its associated data provide an overview of all species from the kingdoms Plantae, Animalia, Fungi, Chromista and Eubacteria in the country that have been recorded in scientific publications.

## New information

The checklists showcase 11,175 species from the kingdoms Plantae, Animalia, Fungi, Chromista and Eubacteria. Research conducted into identifying species from the kingdoms Protista and Archaeobacteria revealed zero records. These checklists include at least 33 species new to science and 566 species new to Bhutan, discovered between 2009 and 2017. Unidentified species are not taken into account in this publication.

## Keywords

checklist, Bhutan, plants, animals, insects, vertebrates, mammals, birds, reptiles, amphibians, fish, invertebrates, fungi, chromista, eubacteria, protista, biodiversity

## Introduction

The Himalayan country of Bhutan is renowned for its rich biodiversity (Table 1) consisting of endemic, native and endangered flora and fauna which inhabit ecosystems including tropical/subtropical/temperate forests, tropical/subtropical grasslands, alpine meadows and

scree. A total of 70.46% of the nation's land is protected habitat and the elevation ranges from 100 metres above sea level (masl) to 7,570 masl at the peak of Gangkhar Phuensum. The International Union for Conservation of Nature (IUCN) Red List has categorised 131 species from the kingdoms Animalia and Plantae as being threatened with extinction: 24 species are critically endangered, 47 species endangered and 60 species vulnerable (IUCN 2021).

While the biodiversity found in these diverse habitats has been recorded both formally and informally over time, the collaboration of stakeholders interested in the conservation of these species and collation of related data have been limited. Therefore, in December 2016, the National Biodiversity Centre (NBC) in Thimphu, Bhutan, began the coordination and gathering of species checklists from various taxonomic experts and specialist institutions in Bhutan. The taxonomic data were discussed over multiple workshops before being finalised by a range of contributors from government agencies, universities, local and international non-government organisations, as well as other private institutions and colleges. Comprehensive literature reviews were conducted to collect as much information as possible to develop the checklists.

## General description

**Purpose:** The checklists were created to provide biodiversity statistics baselines for Bhutan. These species checklists can now be updated regularly with new species records and discoveries made within the country. As the nation's first comprehensive biodiversity list, these data deliver a reliable reference point for Bhutan's species, available for use by scientists, researchers, civil servants and the general public.

## Project description

**Title:** Biodiversity checklists for Bhutan

**Personnel:** National Biodiversity Centre

**Study area description:** Bhutan - eastern Himalayas

**Design description:** Biodiversity data were obtained from various sources and a national biodiversity checklist was developed and published in 2019 as the BSB 2017, by the National Biodiversity Centre (National Biodiversity Centre (NBC) 2019). This checklist has been divided into categories taxonomically and all species have been registered with GBIF. The Plantae and Animalia kingdoms account for a majority 93.2% of the total number of species found in Bhutan (Table 2).

**Funding:** BIFA - GBIF (BIFA5\_008)

## Sampling methods

**Description:** Bhutan

**Sampling description:** Data sources include: NBC; Sherubtse College; College of Natural Resources; Naturalis Biodiversity Centre (The Netherlands); Ugyen Wangchuck Institute for Conservation and Environmental Research; Department of Forests and Park Services; Department of Livestock; National Mushroom Centre; National Plant Protection Centre; National Herbarium and the National Invertebrate Repository Centre at the NBC. Comprehensive literature reviews were conducted in order to access all available scientific publications containing information on species records.

**Quality control:** Data were validated using published resources, such as peer-reviewed journals, books, institutional databases, theses and museum specimens located at the NBC and other national taxonomic agencies. Online databases, such as the Catalogue of Life, IUCN, BirdLife, GBIF and Australian Plant Name Index, were also used for nomenclature and taxonomic classification verification.

Species records from media sources, such as newspapers, magazines, television and social media, as well as anecdotal and non-scientific sources, were not included. Additionally, a lack of access to paid scientific publications and limited publishing of new records in peer-reviewed journals and other scientifically-robust modes of communication by local researchers could have led to some new records and discoveries being overlooked. Unidentified species have also not been taken into account.

### Step description:

1. Data collected from various sources, literature reviews conducted and draft checklists produced.
2. Cross-checked and conducted quality control of draft checklists against validation resources.
3. Two national stakeholder workshops conducted with attendees from all relevant agencies and institutions across Bhutan gathering to discuss the first and second drafts of the checklists. Relevant experts who were unable to attend the workshops were also requested to review the checklists before they were finalised.
4. BSB 2017 (National Biodiversity Centre (NBC) 2019) published.
5. Registered checklists (with minor revisions) with GBIF.

## Geographic coverage

**Description:** Bhutan, entire country

**Coordinates:** 27°31'53.11"; 90°26'9.07".

## Taxonomic coverage

Taxa included:

Rank	Scientific Name
kingdom	Animalia
kingdom	Plantae
kingdom	Fungi
kingdom	Chromista
kingdom	Eubacteria

## Temporal coverage

Formation period: Data collected until end 2017.

## Usage licence

Usage licence: Creative Commons Public Domain Waiver (CC-Zero)

## Data resources

Data package title: Biodiversity Checklists for Bhutan

Number of data sets: 6

Data set name: Bhutan: Chromista & Eubacteria species

Download URL: <https://doi.org/10.15468/rsvcsf>; [https://cloud.gbif.org/bifa/resource?r=bhutan\\_chromista\\_eubacteria](https://cloud.gbif.org/bifa/resource?r=bhutan_chromista_eubacteria)

Description: A total of 75 records including diatom, brown algae, cyanobacteria, bacteria and protozoa species (Gyeltshen and Prasad 2022b).

Column label	Column description
Kingdom	Kingdom
Phylum	Phylum
Class	Class
Order	Order
Family	Family

Scientific Name	Species / subspecies / variety name
Vernacular Name	Common name
Scientific Name Authorship	Scientific name authorship

**Data set name:** Bhutan: Fungi species

**Download URL:** <https://doi.org/10.15468/x49n78>; [https://cloud.gbif.org/bifa/resource?r=bhutan\\_fungi](https://cloud.gbif.org/bifa/resource?r=bhutan_fungi)

**Description:** A total of 690 records including insect-fungi, Basidiomycota, Ascomycota, Oomycota and lichen species (Gyeltshen and Prasad 2022a).

Column label	Column description
Kingdom	Kingdom
Phylum	Phylum
Class	Class
Order	Order
Family	Family
Scientific Name	Species / variety name
Vernacular Name	Common name
Scientific Name Authorship	Scientific name authorship

**Data set name:** Bhutan: Invertebrate species

**Download URL:** <https://doi.org/10.15468/rjuepc>; [https://cloud.gbif.org/bifa/resource?r=bhutan\\_invertebrates](https://cloud.gbif.org/bifa/resource?r=bhutan_invertebrates)

**Description:** A total of 3,917 records including crab, spider, Psocoptera, mite, snail, slug and nematode species (Gyeltshen and Prasad 2022c).

Column label	Column description
Kingdom	Kingdom
Phylum	Phylum
Class	Class
Order	Order
Scientific Name	Family / genus / species / subspecies name

**Data set name:** Bhutan: Nonvascular plant species

**Download URL:** <https://doi.org/10.15468/kv2xcp>; [https://cloud.gbif.org/bifa/resource?r=nonvascular\\_plants](https://cloud.gbif.org/bifa/resource?r=nonvascular_plants)

**Description:** A total of 801 records including fern, liverwort, hornwort, moss and algae species (Gyeltshen and Prasad 2022f).

Column label	Column description
Kingdom	Kingdom
Phylum	Phylum
Class	Class
Order	Order
Family	Family
Scientific Name	Genus / species / subspecies / variety name
Scientific Name Authorship	Scientific name authorship

**Data set name:** Bhutan: Vascular plant species

**Download URL:** <https://doi.org/10.15468/p82afy>; [https://cloud.gbif.org/bifa/resource?r=v\\_plants](https://cloud.gbif.org/bifa/resource?r=v_plants)

**Description:** A total of 4,546 records of seed plant species (Gyeltshen and Prasad 2022e).

Column label	Column description
Kingdom	Kingdom
Phylum	Phylum
Class	Class
Order	Order
Family	Family
Scientific Name	Genus / species / subspecies / variety name

**Data set name:** Bhutan: Vertebrate species

**Download URL:** <https://doi.org/10.15468/n6jv4s>; [https://cloud.gbif.org/bifa/resource?r=bhutan\\_vertebrates](https://cloud.gbif.org/bifa/resource?r=bhutan_vertebrates)

**Description:** A total of 1,146 records including mammal, bird, amphibian, reptile and fish species (Gyeltshen and Prasad 2022d).

Column label	Column description
--------------	--------------------

Kingdom	Kingdom
Phylum	Phylum
Class	Class
Scientific Name	Species / subspecies name

## References

- Gyeltshen C, Prasad K (2022a) Bhutan: Fungi species. Version 1.1. Checklist dataset. National Biodiversity Centre via GBIF.org. URL: <https://doi.org/10.15468/x49n78>
- Gyeltshen C, Prasad K (2022b) Bhutan: Chromista & Eubacteria species. Version 1.1. Checklist dataset. National Biodiversity Centre via GBIF.org. URL: <https://doi.org/10.15468/rsvcsf>
- Gyeltshen C, Prasad K (2022c) Bhutan: Invertebrate species. Checklist dataset. National Biodiversity Centre via GBIF.org. URL: <https://doi.org/10.15468/rjuepc>
- Gyeltshen C, Prasad K (2022d) Bhutan: Vertebrate species. Checklist dataset. National Biodiversity Centre via GBIF.org. URL: <https://doi.org/10.15468/n6jv4s>
- Gyeltshen C, Prasad K (2022e) Bhutan: Vascular plant species. Checklist dataset. National Biodiversity Centre via GBIF.org. URL: <https://doi.org/10.15468/p82afy>
- Gyeltshen C, Prasad K (2022f) Bhutan: Nonvascular plant species. Checklist dataset. National Biodiversity Centre via GBIF.org. URL: <https://doi.org/10.15468/kv2xcp>
- IUCN (Ed.) (2021) The IUCN Red List of Threatened Species. Version 2021-3. <https://www.iucnredlist.org>
- Mora C, Tittensor DP, Adl S, Simpson AG, Worm B (2011) How many species are there on Earth and in the ocean? PLoS Biol 9 (8): 1001127. <https://doi.org/10.1371/journal.pbio.1001127>
- National Biodiversity Centre (NBC) (Ed.) (2019) Biodiversity Statistics of Bhutan 2017, a preliminary baseline. URL: <http://biodiversity.bt/biodiv/content/documents/document-0f89f358-790f-40a2-bbca-2da3ee6d8efd/630.pdf>

Table 1.

Number of species in Bhutan compared to the world (Mora et al. 2011).

Kingdom	World	Bhutan	Bhutan %
Animalia	1124516	5063	0.45
Plantae	224244	5347	2.38
Fungi	44368	690	1.56
Chromista	17892	57	0.32
Protista	16236	0	0.00
Eubacteria	11010	18	0.16
Archaeobacteria	503	0	0.00



Table 2.  
Number and percentage of species by kingdom.

Kingdom	Number	Percentage
Animalia	5063	45.31
Plantae	5347	47.85
Fungi	690	6.17
Chromista	57	0.51
Protista	0	0.00
Eubacteria	18	0.16
Archaeobacteria	0	0.00