

TAXONOMY



www.bionet-intl.org | bionet@bionet-intl.org

This presentation was compiled by BioNET
(Posa Skelton & Kornelia Rassmann)
with input from

Henrik Enghoff
Natural History Museum of Denmark

Ulf Gärdenfors
ArtDatabanken, Swedish Species
Information Centre

Fabian Haas
African Insect Science for Food
and Health

Chris Lyal
Natural History Museum, London

Yves Samyn
Royal Belgian Institute of Natural
Sciences



Understanding the world around you!



Ensifera ensifera (Boissonneau, 1840)
Drawing: Ernst Haeckel

WHO AM I?

*Want to know?
Ask a taxonomist*

Or click on this link...

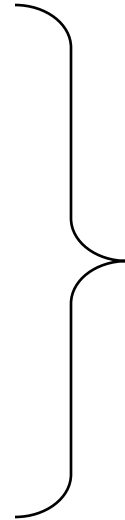


© Stuart Wynne

TAXONOMY IS...

the science of

discovering
naming
describing
classifying



organisms

to understand **biodiversity** (and more...)

Taxonomy from Greek words:

taxis = division/arrangement; *nomos* = law

DISCOVERING



Dracula fish

Danionella dracula
Discovered in Burma
Documented 2009

© Ralf Britz | Natural History Museum, London

The discovery of new organisms is the first step of taxonomy. Every year, new discoveries are made throughout the world, as taxonomists explore new areas, or new tools become available for analyzing specimens.

NAMING

Electrolux addisoni (Compagno & Heemstra, 2007)



What's in a name?

A scientific name is the passport by which all organisms are known.

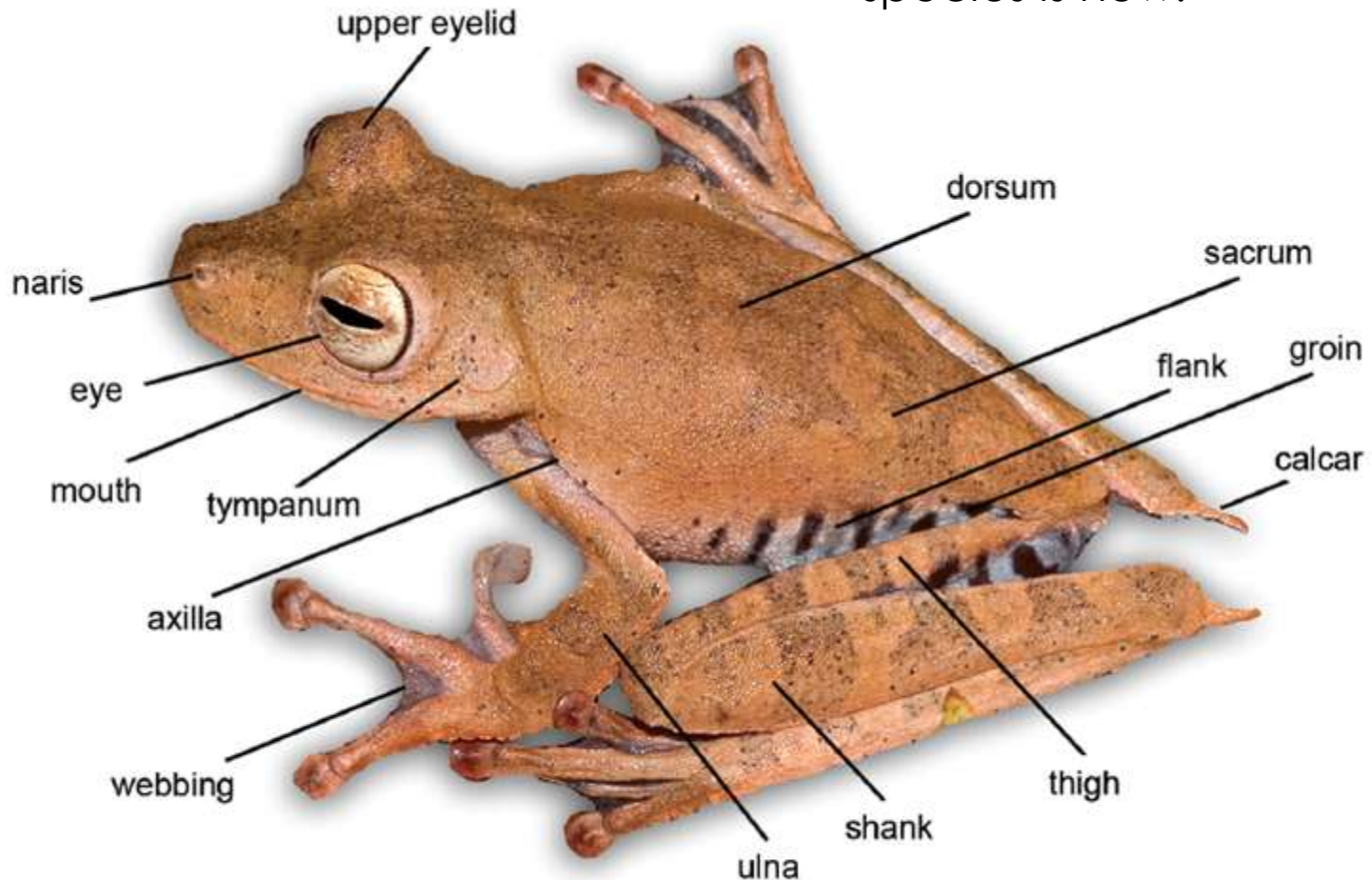
Photo: Phil Heemstra |
Wikimedia Commons

Not your average vacuum cleaner!



DESCRIBING

Part of this process involves the comparison to related organisms to confirm if the species is new.



Hypsiboas calcaratus (Troschel, 1848) | Photo: P. J. R. Kok

CLASSIFYING

Kingdom - Animalia

Phylum - Chordata

Class - Mammalia

Infraclass - Eutheria

Order - Artiodactyla

Family - Bovidae

Subfamily - Caprinae

Genus - *Ovis*

Species - *Ovis aries*



CLASSIFICATION matters in your daily life



Classification is part of our everyday life.

It allows us to place things in order, such as in a stock inventory in a supermarket.

Would you look for dairy products next to house-hold cleaning items?

Photo: G. R. South

NAMES matter in your daily life

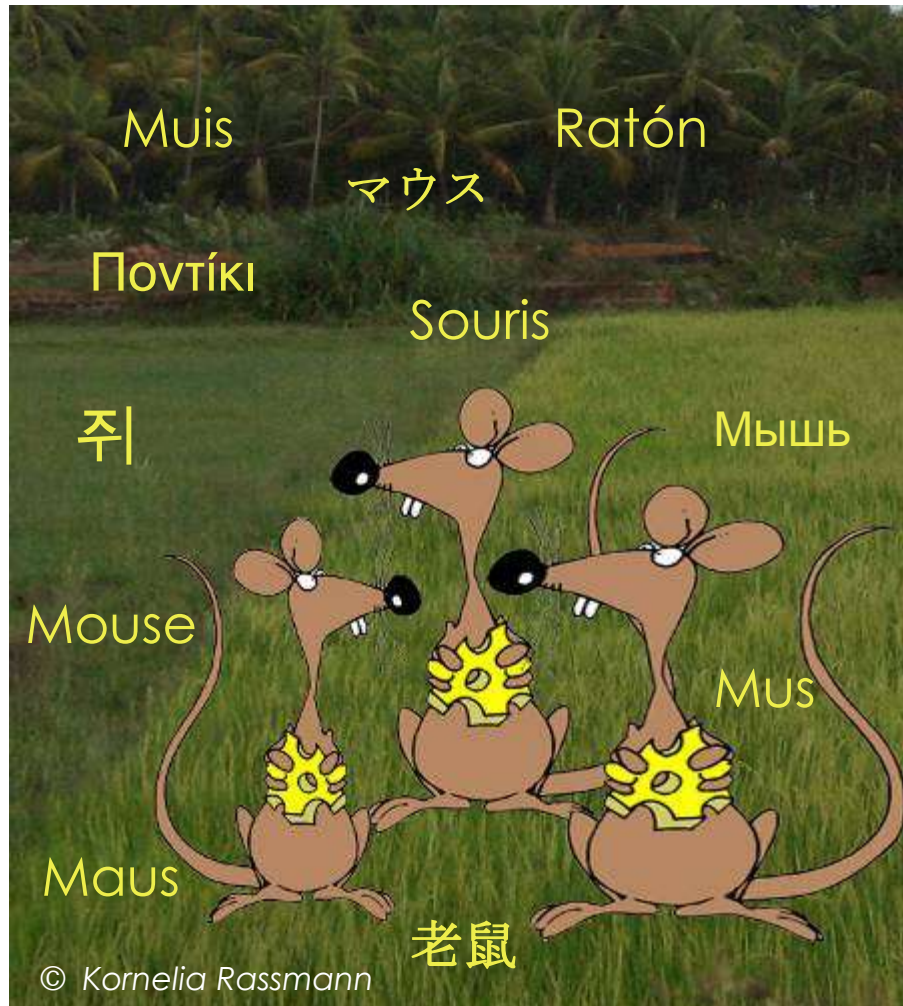
Photo: Sergio Kaminski | Wikimedia commons Drawing: Peter Aertsen



Photo: Wikimedia commons | public domain

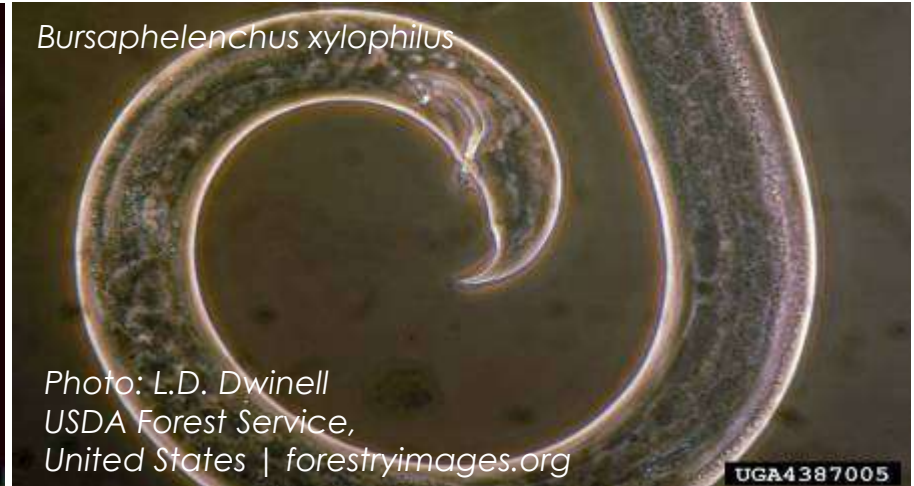
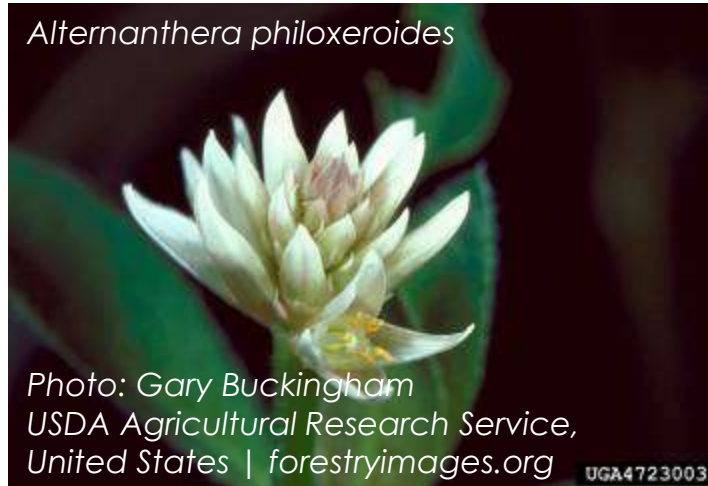
Imagine if
people and
things didn't
have a name...

NAMES are needed for communication



Common or
vernacular names
are useful for
everyday
communication
but are limited by
location and
language

SCIENTIFIC NAMES for global communication



A scientific name ensures
that we are talking about
the same organism
regardless of our
geographic location or
language

Knowing the right NAME

- saves money



Photo: Oliver Spalt | Wikimedia commons



Scotinophara lurida

Photo: Natasha Wright, Florida Department of Agriculture and Consumer Services, Bugwood.org

Taxonomy helped to identify 24 different 'black bugs' in the Philippines, of which only 2 are pests found feeding on rice. This knowledge saves millions of dollars on the use of insecticides for control and helps to safeguard the environment.



NOT knowing the NAME - may kill!



Boletus aurantiacus | Photo: Wikimedia commons | public domain

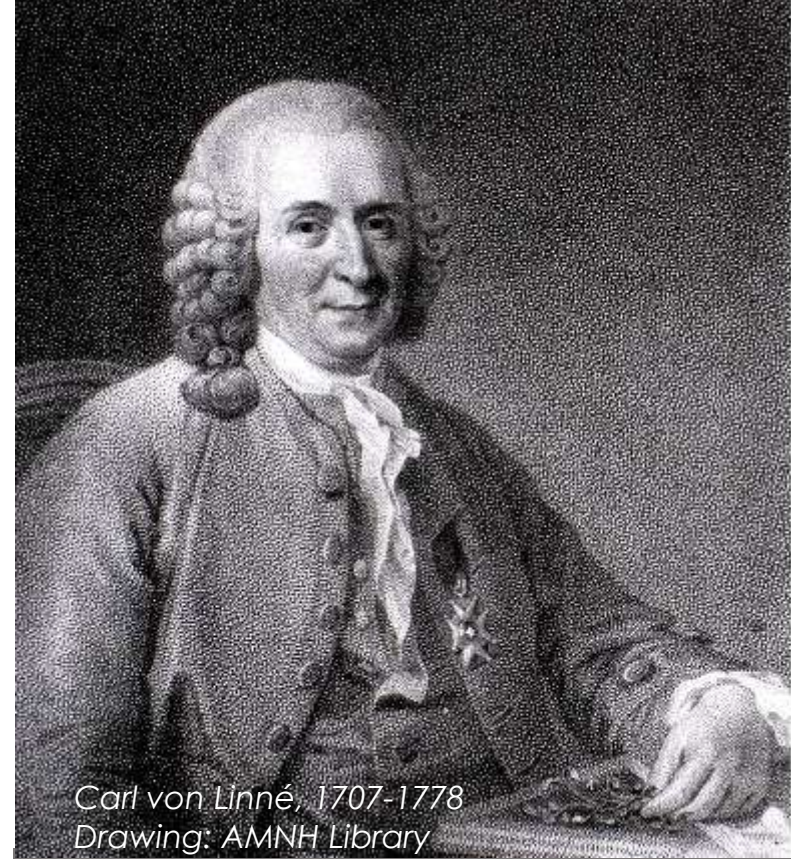
*To eat or not to eat?
Ask a mushroom taxonomist (mycologist)!*

LINNAEUS

"If you do not know
the names of things,
the knowledge of
them is useless"

Critica Botanica 1737

Carl von Linné (or
Linnaeus), the “father
of taxonomy”, laid the
foundations for the
modern scheme of
nomenclature - the
discipline of naming
species.



Carl von Linné, 1707-1778
Drawing: AMNH Library

Linnaeus gave classification the consistency and precision we need when we describe biodiversity, trade commodities, buy seeds for farming, manage pests, or deal with any other of the many areas in which humans need taxonomic knowledge.



RELEVANCE AND LINKS TO BIODIVERSITY



© A. De Kesel

Taxonomy is beneficial to many sectors that either work directly or indirectly with biodiversity. Whether you are engaged with import/export trade, food security, medicine & public health, climate change, biosecurity, agriculture, horticulture, fisheries, veterinary science, mining, tourism, farming - or working in the kitchen, aspects of all these sectors require knowledge of the Living World.

Taxonomy enables us to understand our biological diversity.

COMPREHENSION OF THE LIVING WORLD



© Kornelia Rassmann

**Diversity makes
our living world
complex.**


**Taxonomy helps
us comprehend
this diversity by
arranging and
categorizing our
living world into
intelligible units.**

TAXONOMY benefits human well-being



Taxonomy delivers basic and indispensable information for many fields of human interest including biodiversity conservation, climate change adaptation, biosecurity , agriculture, aquaculture, health, tourism, trade, and many more.

TAXONOMY is of global importance

It supports informed decision making of **policy and regulatory bodies**, provides hidden but pivotal services for many **industries** (e.g. agriculture, pharmaceutical), and is fundamental infrastructure for the **Millennium Development Goals**  of poverty alleviation, combating disease, and environmental sustainability.



A KNOWLEDGE BASE for other sciences



Taxonomy supports various scientific disciplines including conservation science, evolutionary biology, biodiscovery, ecology, biogeography, medicine and many more.

BIODIVERSITY Conservation



© Posa A. Skelton

By knowing our biodiversity we are able to conserve it and to sustainably utilize it.

For example:
Numerous nature reserves have been established because of the discovery of a rare species, or rediscovery of a species thought to be extinct.

Brachylophus bulabula – a new endemic iguana of Fiji

CLIMATE CHANGE adaptation



Distributions of species are expected to shift as a consequence of climate change.

Taxonomic collections provide us with a permanent record of the historical distribution of species, allowing the prediction of extinction, pest and disease prevalence and supporting ecosystem adaption measures.

INVASIVES & PEST management

The beetle *Cyrtobagous salviniae* as a biocontrol for the weed *Salvinia molesta*, a major aquatic pest.

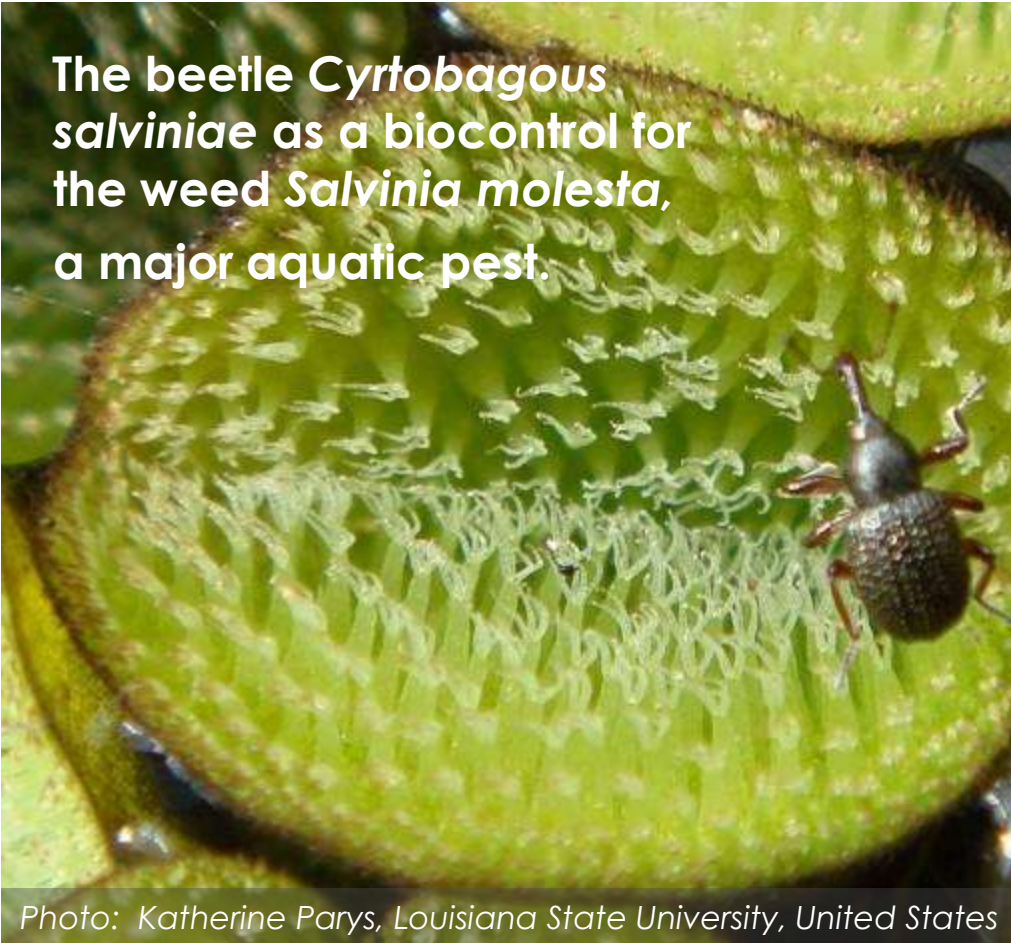


Photo: Katherine Parys, Louisiana State University, United States

Invasive species affect nearly every ecosystem type on the planet and pose a big threat to biodiversity. Managing these risks calls for experienced and adequately equipped taxonomists able to provide the species information and rapid identification tools necessary for managers and society.



POLICY/DECISION MAKING

The CITES Appendices are lists of species afforded different levels or types of protection from over-exploitation.



Almost all orchids are listed by CITES, many in Appendix II which includes species that are not necessarily now threatened with extinction but may become so unless trade is closely controlled.

Taxonomic information assists with making policies and other regulatory frameworks.

For example: the Convention for the International Trade of Endangered Species (CITES ⓘ), relies on correct taxonomic information to allow proper control of the trade of vulnerable species, such as orchids.

© Martin Voggenreiter
clockwise: *Ophrys fusca*, *Orchis italica*,
Cypripedium calceolus, *Ophrys lutea*

BIODISCOVERY & HEALTH



© Posa Skelton - *Morinda citrifolia*



© Stuart Wynne - *Niphates digitalis*

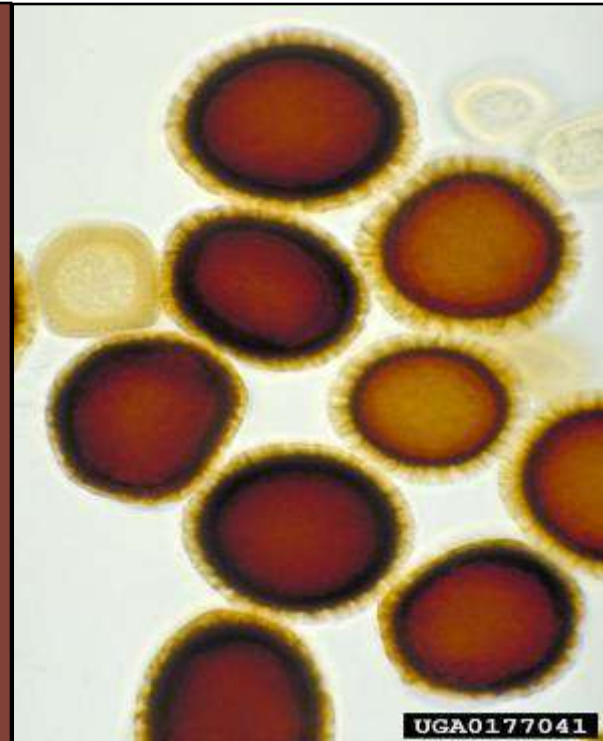
Medicinal plants are important in many parts of the world, and taxonomy provides us with the identity of those that are useful, such as the Noni fruit.

Marine sponges are a good source of compounds useful for drugs, food ingredients and other materials of commercial application. Taxonomy helps discovering and identifying these.

BIOSECURITY & TRADE

When an unknown insect is found in an agricultural shipment, global commerce is slowed and shipments are held at great cost pending identification. Rapidly available taxonomic support saves money.

Alleged presence of Karnal bunt (fungus) in Australian wheat led to the rejection of a shipment to Pakistan. Taxonomy resolved that the spores were from a related, non-invasive species and the \$4billion wheat export trade was resumed.



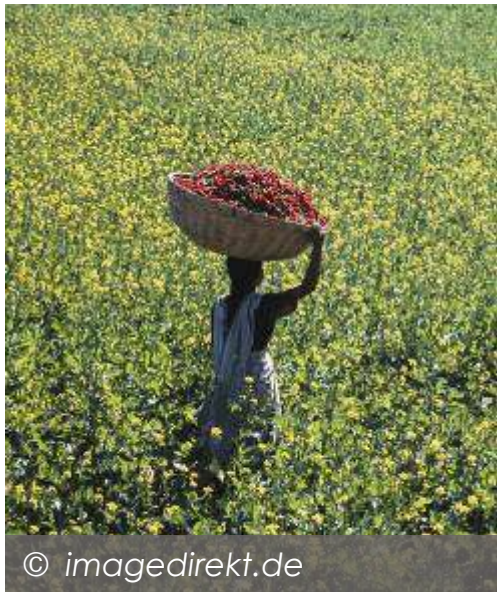
For a similar case study see [bionet case study no. 8](#)

Tilletia indica | Photo: Ruben Durán,
Washington State University, Bugwood.org

POVERTY REDUCTION & FOOD SECURITY



Poverty alleviation, food security and biodiversity conservation are inextricably intertwined. Globally, poverty and food insecurity are often found where biodiversity loss is especially pronounced.



Taxonomic knowledge helps to sustain healthy ecosystems in developing countries, where we find the greatest biological diversity on earth, but also the highest number of low-income rural people threatened by biodiversity loss.

TAXONOMY: advancing our knowledge

18,500 species were
described as new in **2007**

To date about
1.8 million species
have been described,
yet, estimates of the
absolute species
number range from
5-50 million.

Just one example:
In a study of about 500
Australian cricket
species 76% of these
were described as new.

*From Otte, D., and R. D. Alexander. 1983.
The Australian Crickets (Orthoptera: Gryllidae).
Academy of Natural Sciences of Philadelphia.*

Austroicetes vulgaris | Wikimedia Commons
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Not just the BIG & CUDDLY matter



© Tatiana Goydenko | Dreamstime.com



© Josef Szasz-Fabian | Dreamstime.com

Taxonomy is not just about the charismatic creatures known to everyone, such as the Giant Panda, Blue Whale and Polar Bears.

It is also about the small creatures that drive our ecosystems. Some of these small organisms may have significant impacts on our lives both in positive (e.g. yeast) and negative ways (e.g. malaria mosquitoes)!

What a WONDEROUS WORLD



Hippocampus satomiae | © Rudie Kuiter



© John Sear

Our planet holds many wonders and treasures - new species are being discovered each day yet these finds often get little attention from *Homo sapiens*.

This species – first described in 2008 – is the smallest known seahorse with a standard length of 13.8mm and an app. height of 11.5mm.

Getting interested in TAXONOMY ?

Here you find more information on ...



Taxonomy

[Global Taxonomy Initiative \(GTI, UN Convention of Biological Diversity\)](#) | [European Distributed Institute of Taxonomy \(EDIT\)](#) | [Natural History Museum, London, UK](#) | [Royal Belgian Institute of Natural Sciences](#) | [BioNET](#)

Species

[Encyclopedia of Life \(EoL\)](#) | [Wikispecies](#) | [ARKive](#) | [IUCN Red List](#) | [Top 10 New Species Discoveries International Institute for Species Exploration \(IIES\)](#) | [Tree of Life](#) | [Census of Marine Life \(CoML\)](#) | [Catalogue of Life \(ITIS, Species2000\)](#) | [Global Biodiversity Information Facility \(GBIF\)](#)

The importance of taxonomy, species & biodiversity

[BioNET case studies](#) | [GTI case study on taxonomy & climate change](#) | [UN Convention of Biodiversity – 2010 International Year of Biodiversity](#)

