Storage and curation of collections in Luomus

Biological collections course
August 2022

What is Luomus and what does it do?

- Universities Act 72§: *The Finnish Museum of Natural History is attached to the University of Helsinki and is responsible for the preservation, accumulation and exhibition of the national natural history collections and for research and education relating to them.*
- Legally binding tasks also from
  - laws of nature protection, geographical information infrastructure, and information management
  - some intergovernmental treaties
- In addition, the duties of the Finnish Museum of Natural History include:
  - conduct research in its focal fields and provide teaching based on the research
  - serve as a comprehensive expert in chronological and isotopic methods
  - serve as a consulting specialist in society in its fields
  - provide its collection for use in research and teaching, particularly in the fields of zoology, geology, botany, and mycology
  - coordinate the collaboration of Finnish natural history museums and botanic gardens

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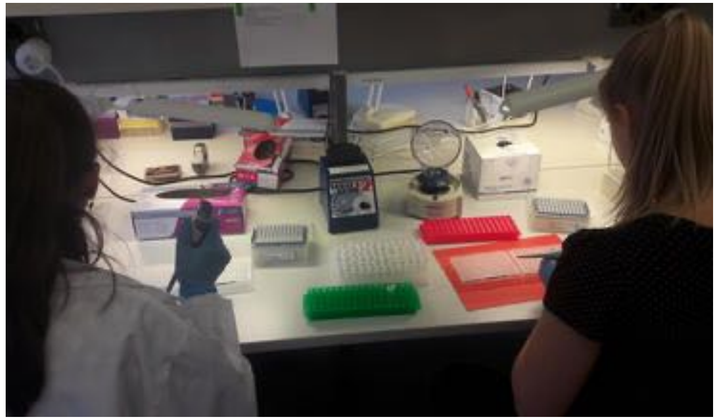
Natural history collections and curation

- A natural history/science collection is a compilation of systematically organised natural science specimens and their metadata

Luomus General Collections Policy

- Geology collection policy
- Living plant collections policy
- Plant and fungi herbarium collection policy
- Invertebrate collection policy
- Vertebrate collection policy
- DNA and tissue sample collection policy
- Palaeontology collection policy

Luomus’ collections



- The collections constitute an archive of biological and geological diversity and of the changes in our environment caused by natural phenomena and human intervention as well as the connections between them.

- The purpose of the collections is to offer reliable, high-standard research material for the future needs of humanity.

Accumulation principles

- 1) Scientifically valuable specimens of a high technical quality which support the strengths of Luomus and are important for current or future research
- 2) Specimens which complement existing scientifically valuable collections and increase their scope (e.g., represent missing stages of development, add to time series or increase the geographical or taxonomic scope of the collection)
- 3) Specimens with no immediate research value, but which may serve other social interests such as environmental education or the exhibition of biodiversity

Accepting specimens

- What is the number of specimens, and how much space do they require?
- Do the specimens have scientific significance or historical value?
- Do the specimens genuinely expand the content of the collection, or do they duplicate existing collections?
- How do the specimens promote Luomus' strengths and the goals laid down in its collection and research policies?
- Is the data associated with the specimens reliable and sufficient as defined in the collection-specific policies?
- Were the specimens collected in an ethical and legal manner?

- In addition, the following aspects must be considered before deciding to accept large collections:
- To what extent will these collections be stored in Luomus?
- How will the specimens be preserved before their addition to the collection?
- How much time and resources will be needed to curate the new collection?
- What are the long-term overall costs of the collection's maintenance, curation, storage and metadata management?
- What are the logistics required to receive the collection, what are its costs, and how will funding be arranged?

Enhancing the content of the collections

- Enhancing the content of the collections seeks to increase their scientific value in a way that is financially sustainable.

- The content of the collections is enhanced through quality criteria which guide accumulation and deaccessioning and pertain to specimens and their metadata.

- The scientific and perceived value of the Luomus collections is ultimately dependent on their accessibility.

Preservation

- The preservation of the national collections as a reliable, high-quality research resource is one of the duties set for Luomus in the Universities Act.

Use of the collections

- The collections are to be used primarily for scientific research and university teaching, and secondarily for other types of education and environmental education.
- Research use of the collections takes place in Luomus facilities, and collection material may be loaned outside Luomus free of charge according to international museum practices.

- Before lending Luomus collection specimens to other organisations, the person responsible for the loan must determine that the person receiving the loan represents a scientific institution or is otherwise undeniably qualified to handle the specimens and to use them for scientific purposes.

Deaccessioning specimens

- The purpose of deaccessioning is to remove poor-quality material from the collections and thus streamline collections maintenance and the use of space without compromising the scientific value of the collection.
- Before deaccessioning, it should be considered whether an image of the specimen could be created and its metadata stored.
- Deaccessioning may also seek to reduce duplicates, in which case the deaccessioned specimens can be used for swaps

Botanical and mycological collections in Luomus

Contents

- Why botanical collections and what is their profile?
- What and where are the botanical collections?
- What is a botanic garden?
- Different botanical and mycological collections
  - Kumpula botanic garden
  - Kaisaniemi botanic garden
  - Greenhouse collections
  - Herbarium collections (“botanical museum”)
  - Seed bank

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Why botanical collections and what is their profile?

Luomus as a whole is profiling three equally important sectors:

1. scientific collections and datasets, i.e., research infrastructure
2. research (and teaching)
3. expert functions (including public education)

Botanical collections largest in Finland, internationally significant

- global coverage in herbarium collection (botanical and mycological)
- in outdoor living collections Southern Finland and similar climatic areas
- in greenhouse collections — the longitude rule (especially in tropics)
- these are defined in collection polices:
  - General collection policy
  - Living collections policy
  - Herbarium collection policy

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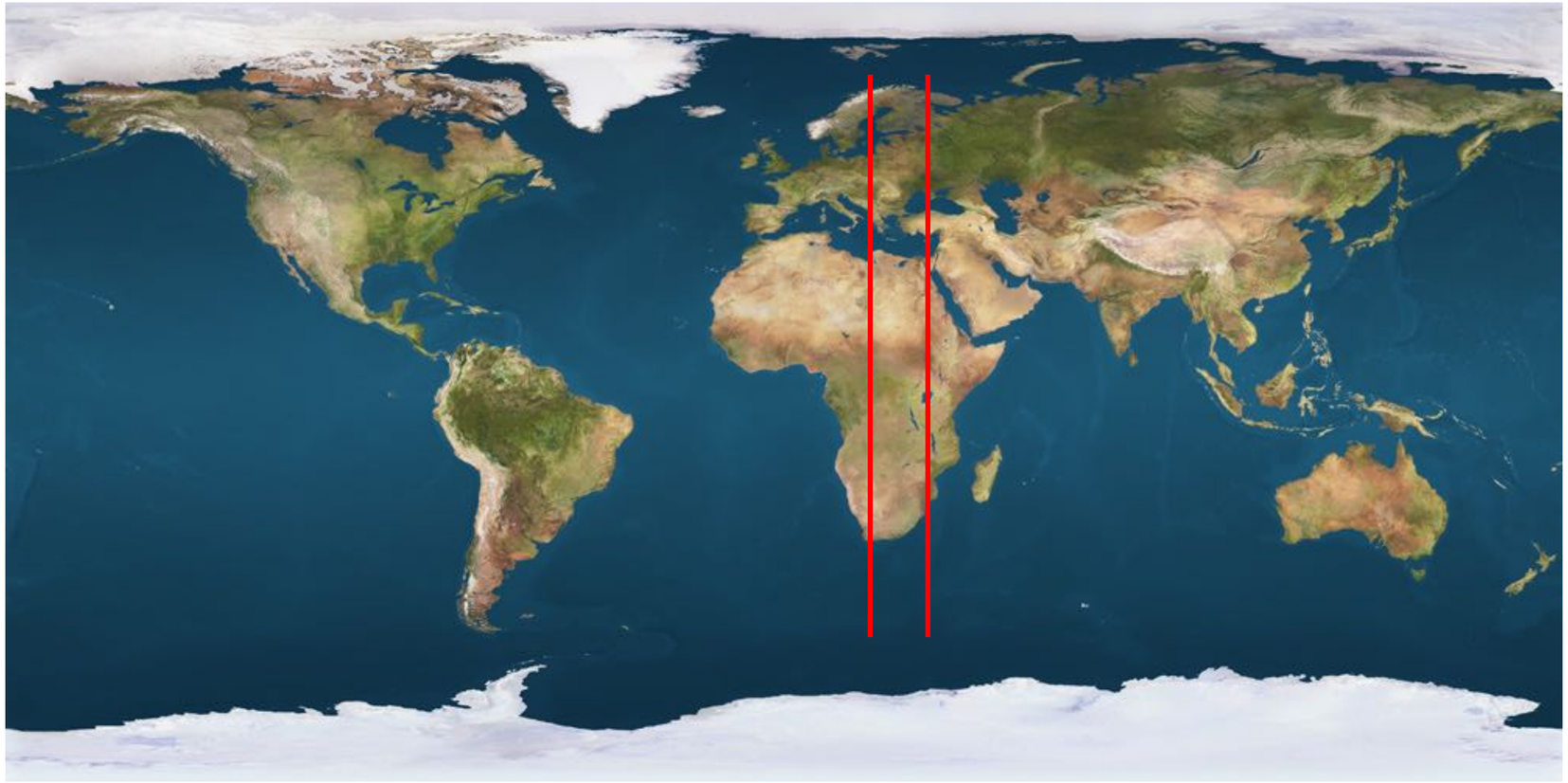
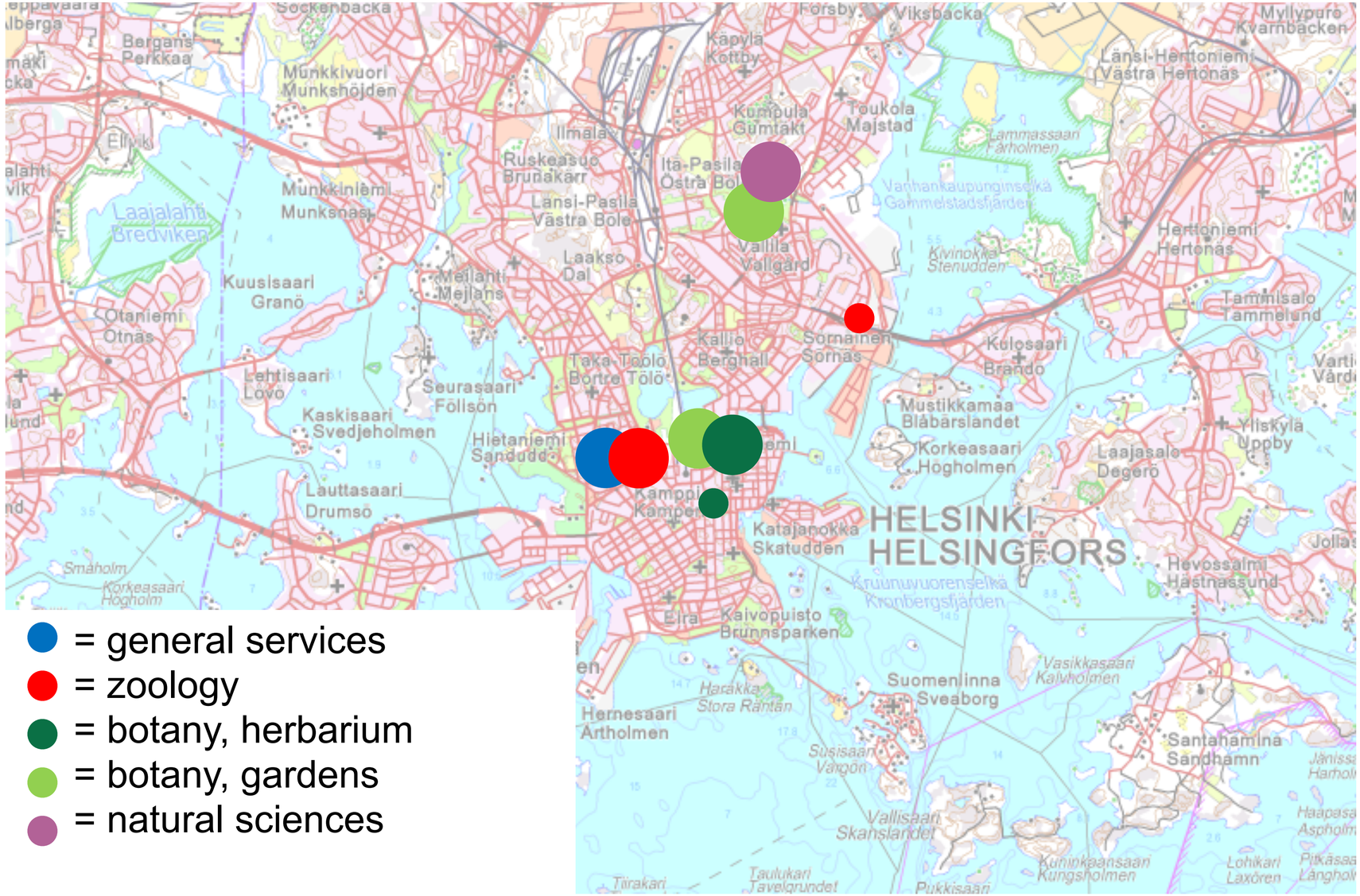
The longitude rule (from 21°E to 29°E)



Hyvärinen, M. et al. (2020) Living plant collections policy of the Finnish Museum of Natural History. RIO https://doi.org/10.3897/rio.6.e60450

What and where are the botanical collections?



- = general services
- = zoology
- = botany, herbarium
- = botany, gardens
- = natural sciences

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What is a botanic garden?

Definition of a botanic garden by BGCI

A reasonable degree of permanence

An underlying scientific basis for the collections

Proper documentation of the collections, including wild origin

Monitoring of the plants in the collections

Adequate labelling of the plants

Open to the public

Communication of information to other gardens, institutions and the public

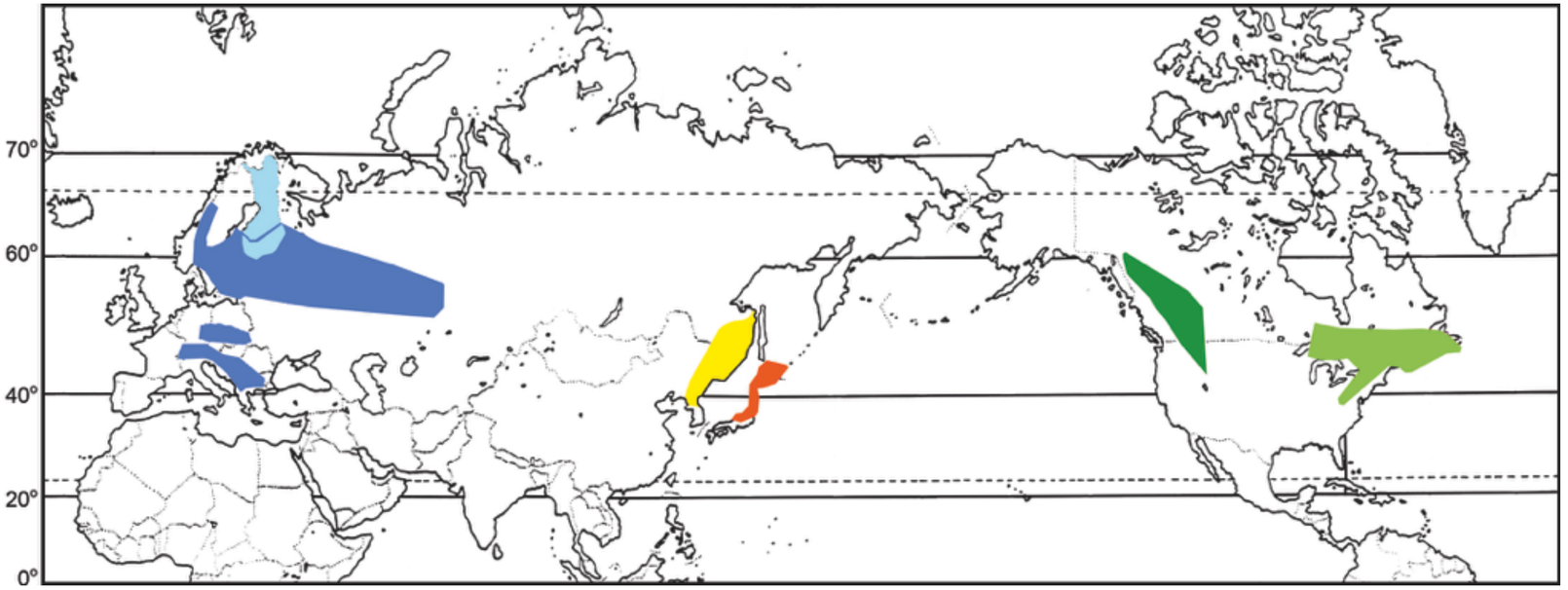
Exchange of seed or other materials with other botanic gardens, arboreta or research institutions

Undertaking of scientific or technical research on plants in the collections

Maintanence of research programs in plant taxonomy in associated herbaria.

Collections more in detail: Kumpula botanic garden

Geographic sections (Hortus geobotanicus) and economic plants + traditional medicinal garden (Hortus ethnobotanicus), *ex situ* conservation



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Area: 6 ha
Accessions: c. 5400
(inc. seed collection)
Taxa: 2800

Of wild origin!

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Kaisaniemi botanic garden

Evolution tree (systematic section)
Lichen garden
Moss garden
Rock garden
Sensory garden
Arboretum (trees)
Traditional ornamentals

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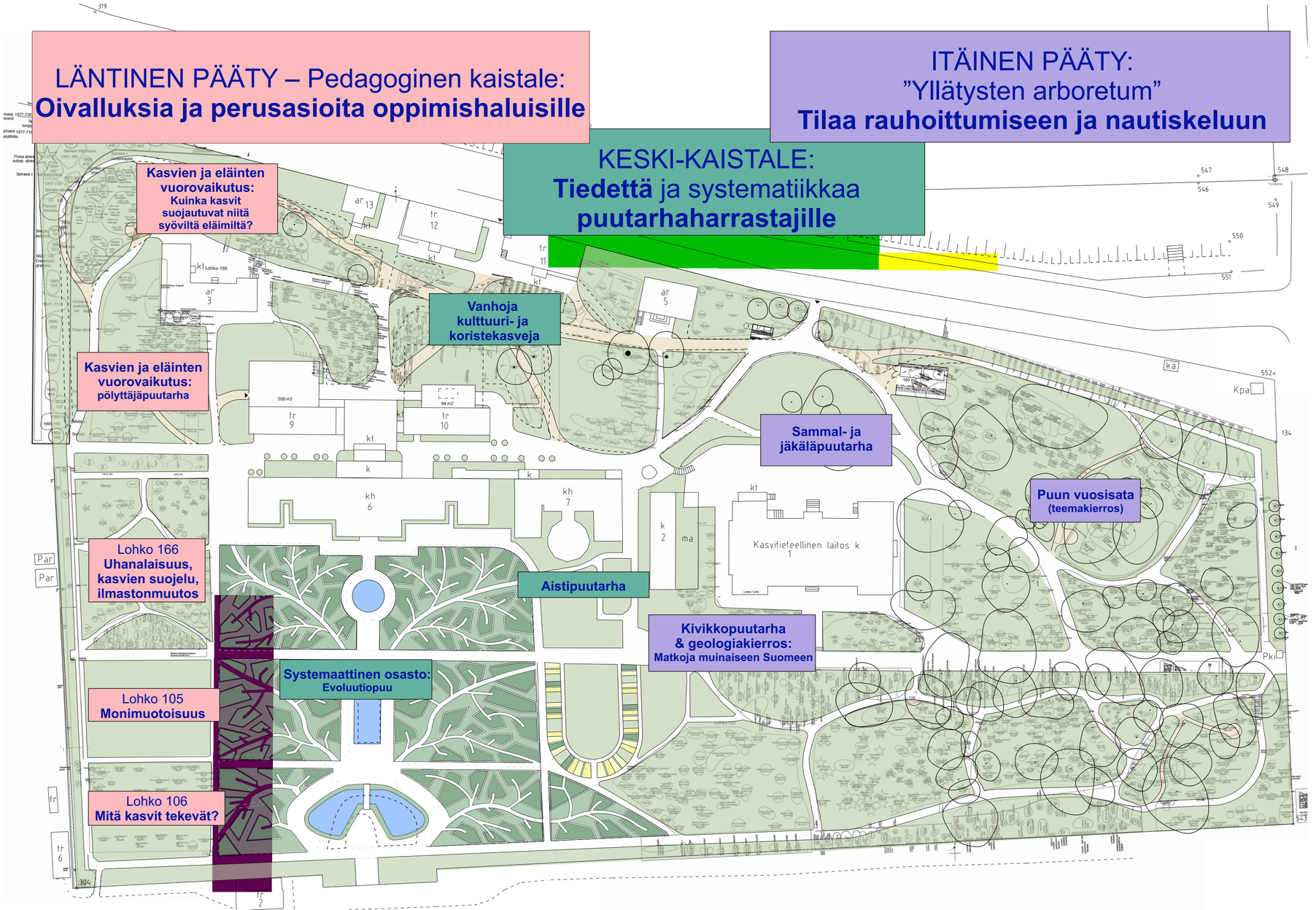
Area: 5 ha
Accessions: 1300
Taxa: 840

Accessions: e.g. through seed exchange



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Greenhouse collections

Accessions: 1240
Taxa: 1050

- Tropical rainforest
- Palm house
- Savanna
- Dry forest
- Island room
- Victoria house
- Mediterranean
- Desert
- Saintpaulia room (ex situ collection)

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The herbarium

Total no of specimens c. 3.5. million (rank 15. -17. in the world)

- Vascular plants c. 1.8 M
    - c. 20 000 type specimens
- Fungi (inc. lichens) c. 0.9 M
    - Separate collections: e.g. Erik Achariuses fungal collection, William Nylander’s lichen collection
    - c. 19 000 type specimens (12 t lichenized, 7 t non-lichenized)
- Bryophytes c. 0.6 M
    - Separate collections: Viktor Ferdinand Brotherus, Sextus Otto Linberg
    - 25 000 type specimens

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The seed bank

Accessions: c. 550
Taxa: 350

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Curation of collections

Scientific curation

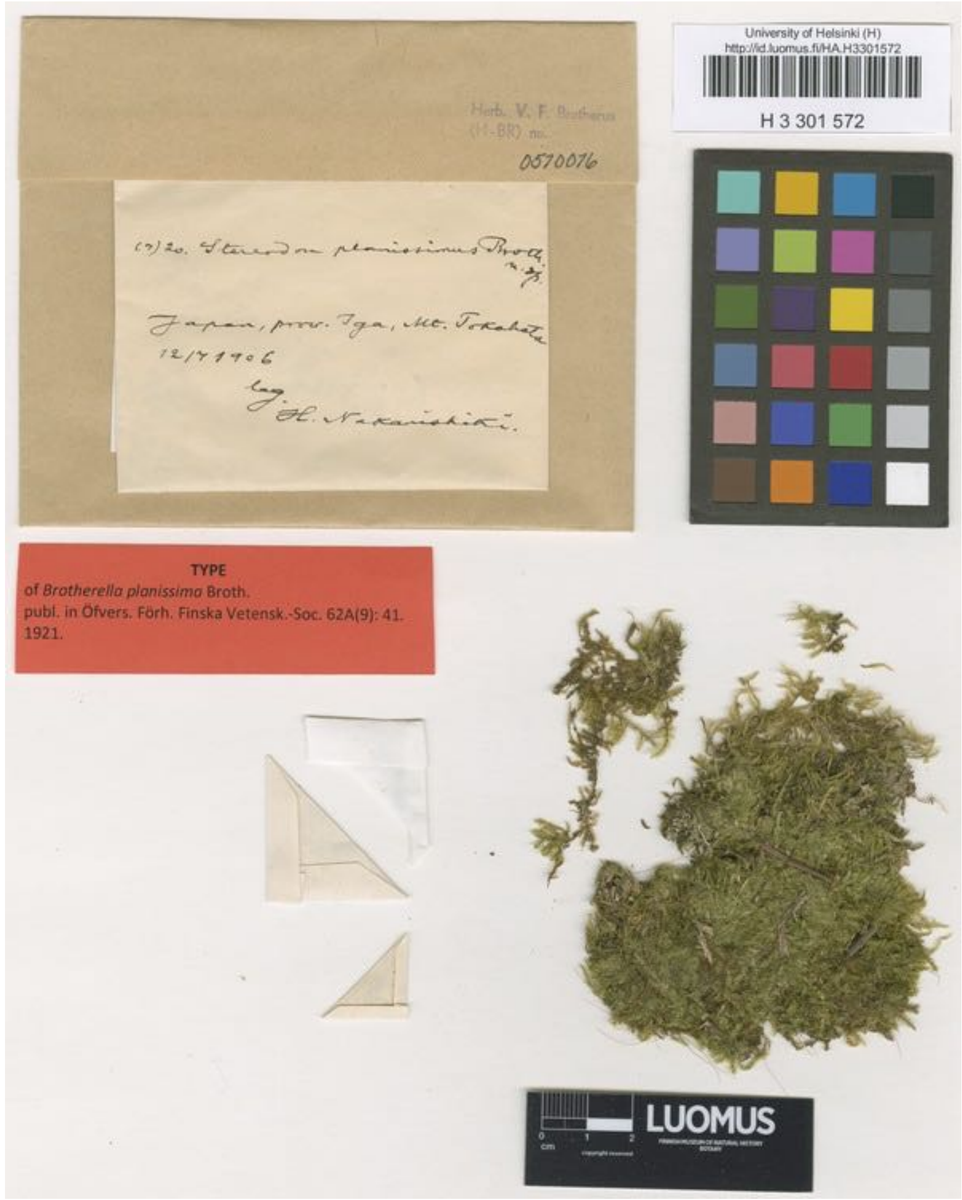
- taxonomic and literature research
- work on scientific nomenclature
- re-organisation
- renaming
- relabelling etc.

Technical curation

- preparation
- re-organisation
- loans/exchange
- database management

Digital curation

- digitisation
- scientific
- re-organisation of databases
- changing/adding information on specimens and collections



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STORAGE AND CURATION OF ZOOLOGICAL COLLECTIONS IN LUOMUS

HELSINGIN YLIOPISTO
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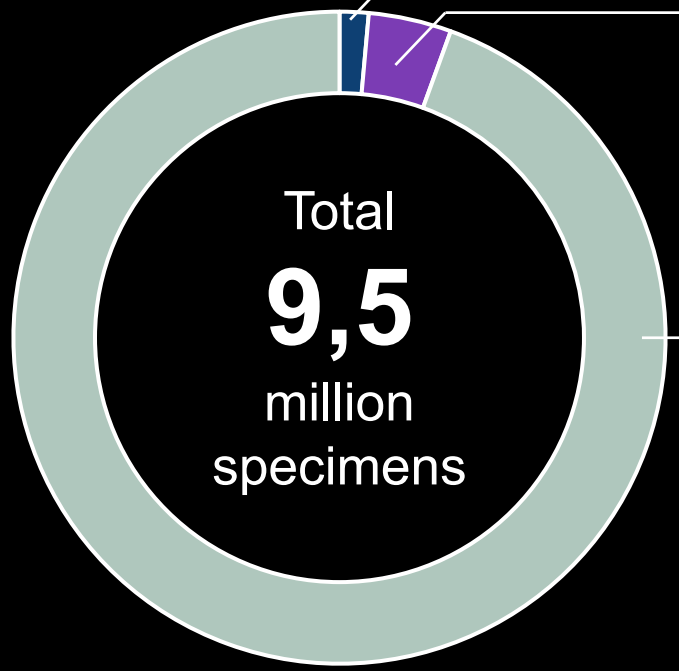
Zoology Unit

NATURAL HISTORY COLLECTION

- ”Compilation of systematically organized specimens and their metadata from which the specimens can be retrieved either based on the associated collection data files or on the physical placement of the specimens.”

ZOOLOGY COLLECTIONS



Vertebrate 140 000

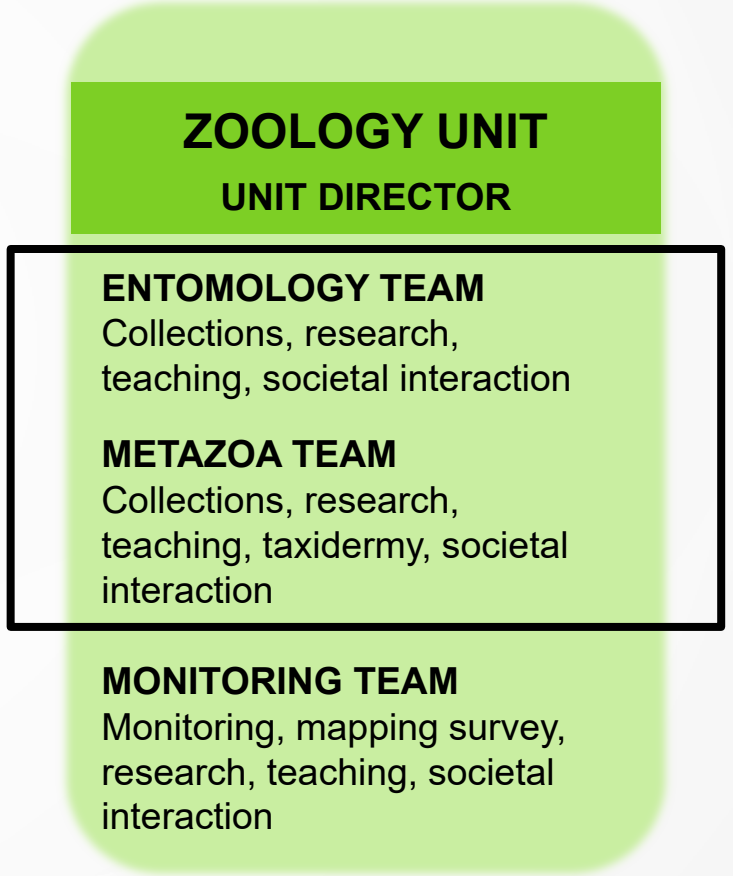
Invertebrate 400 000

Insects 9 200 000

ZOOLOGY UNIT

65 persons

- Staff about 35 persons: unit director, senior curators, curators, DNA laboratory manager, coordinators, senior museum technicians, taxidermists, post doctoral researchers, PhD students, research assistants
- Visiting researchers about 30 persons: grant researchers, emeritus staff



VERTEBRATE COLLECTION

- 140 000 specimens
- Majority of samples are from Finland
  - skeletons, skins, wings, nests
  - bird egg collection
- Frozen tissue collection, suitable for molecular work
- > 90 % specimens are digitised

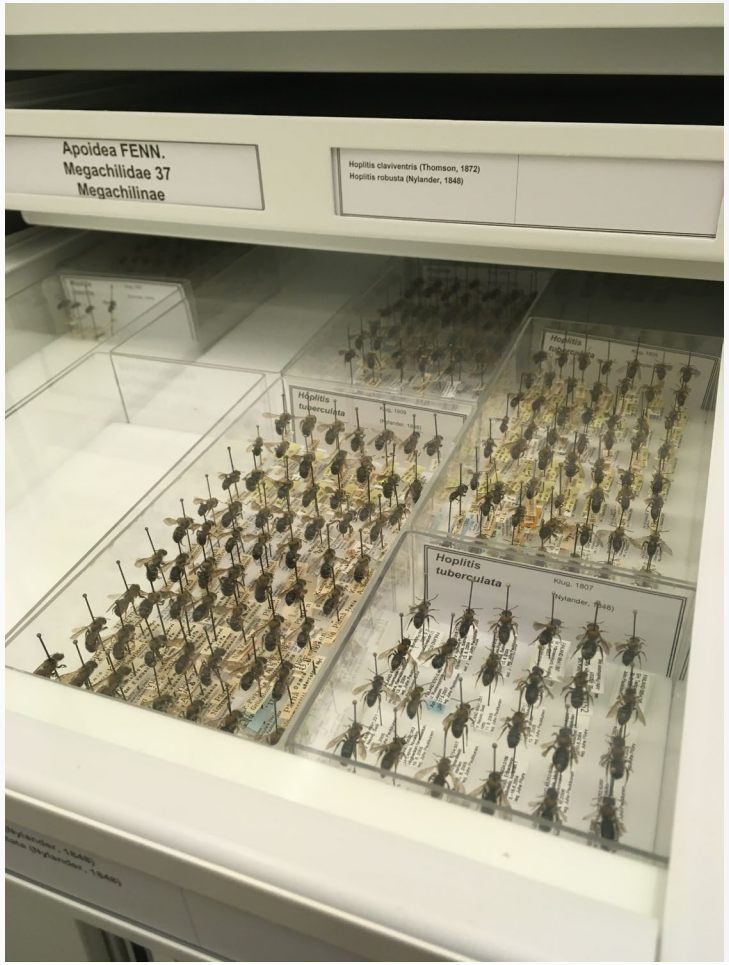
INVERTEBRATE COLLECTION

- 400 000 specimens
- Majority of samples are from Finland
  - spiders, mites, molluscs, oligochetes and turbellarians
- Mostly stored in ethanol
- > 30 % specimens are digitised

ENTOMOLOGY COLLECTION

- 9 200 000 specimens
- Majority of samples are from Finland
  - Coleoptera, Hymenoptera, Lepidoptera, Diptera largest collections
  - Includes also immature stages
- Mostly dry, pinned specimens
- Separate room for ethanol samples
- > 10 % specimens are digitised

ENTOMOLOGY DRY COLLECTION



ENTOMOLOGY WET COLLECTION

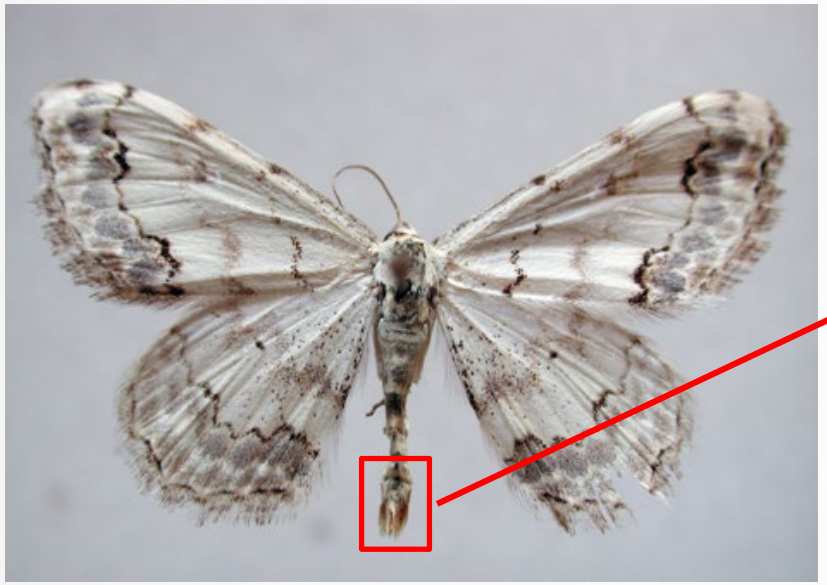
ENTOMOLOGY FOSSIL COLLECTION

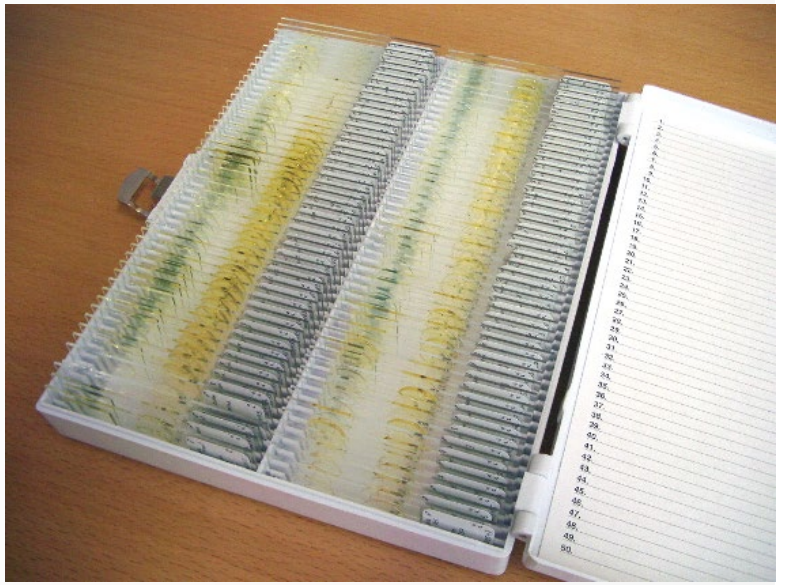
- Few hundred specimens
- Majority of samples are non-Finnish
  - Coleoptera, Hymenoptera, Lepidoptera, Diptera largest collections
- Samples in amber
- Few samples digitised for research purposes

PRESERVATION EXAMPLES

- Mounted skins (taxidermy): mammals, fish, birds
- Non-mounted skins: mammals, birds
- Dry, pinned: insects
- Dry, card mounted: insects
- Dry: shells, skeletons, bird eggs, corals
- Ethanol: insects, other invertebrates, fish
- Microscope slides: animal parts, small insects

MICROSCOPE SLIDES

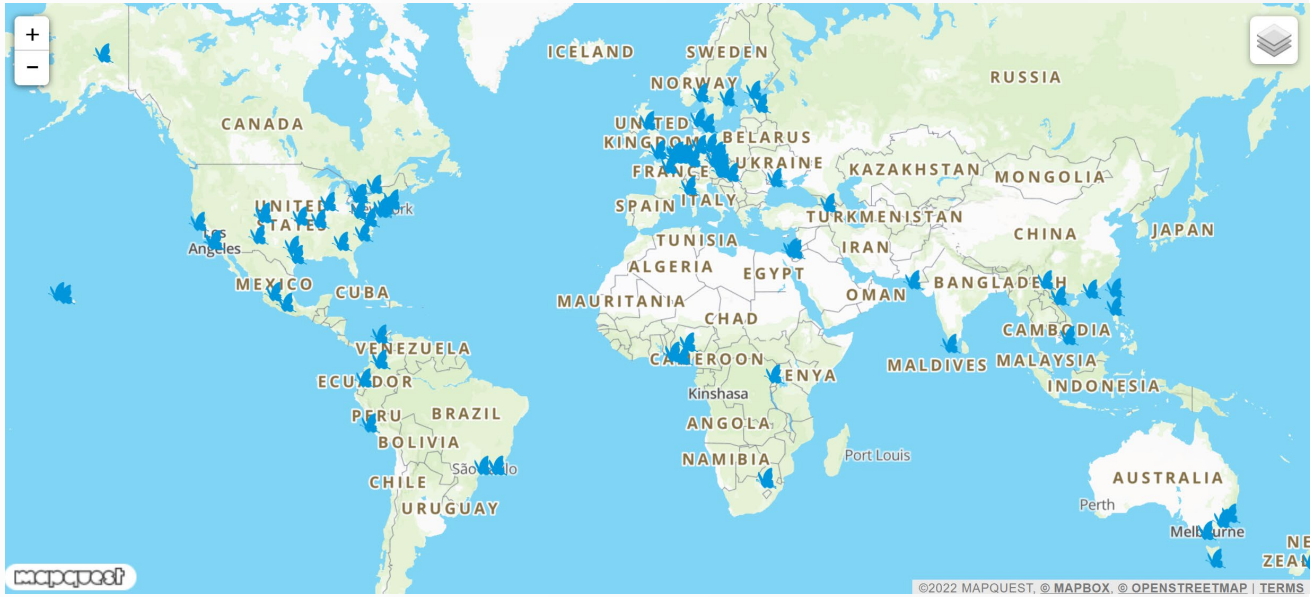




USSR, Tadzhikistan
39° N 71° E, 2050m
8.6.1991
U.Jürivete leg.

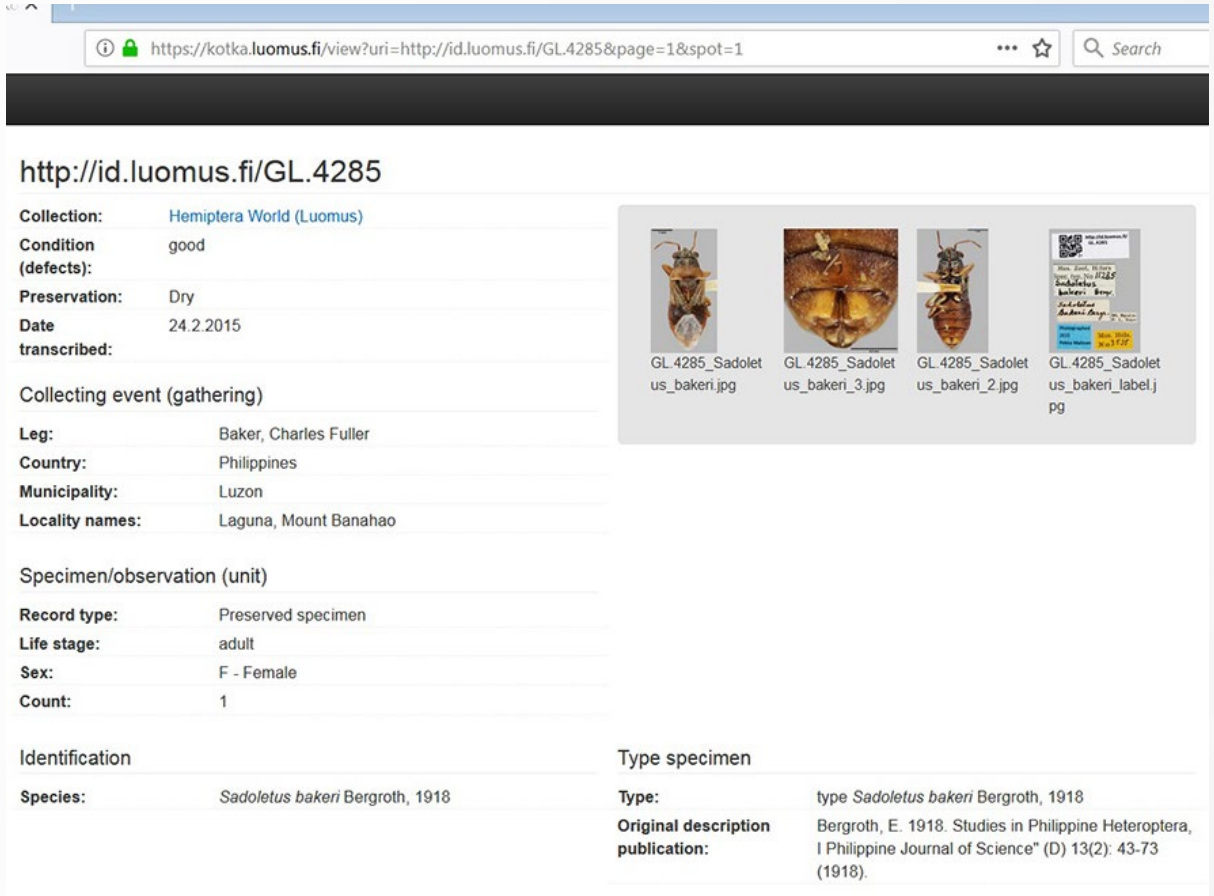
GENOMIC RESOURCES COLLECTION

- Luomus is a member in Global Genome Biodiversity Network
- Objective is to make genomic collections discoverable for research
  - collaborate to ensure quality standards for DNA and tissue collections
  - improve best practises
  - harmonize exchange and use of material
- https://www.ggbn.org/ggbn_portal/



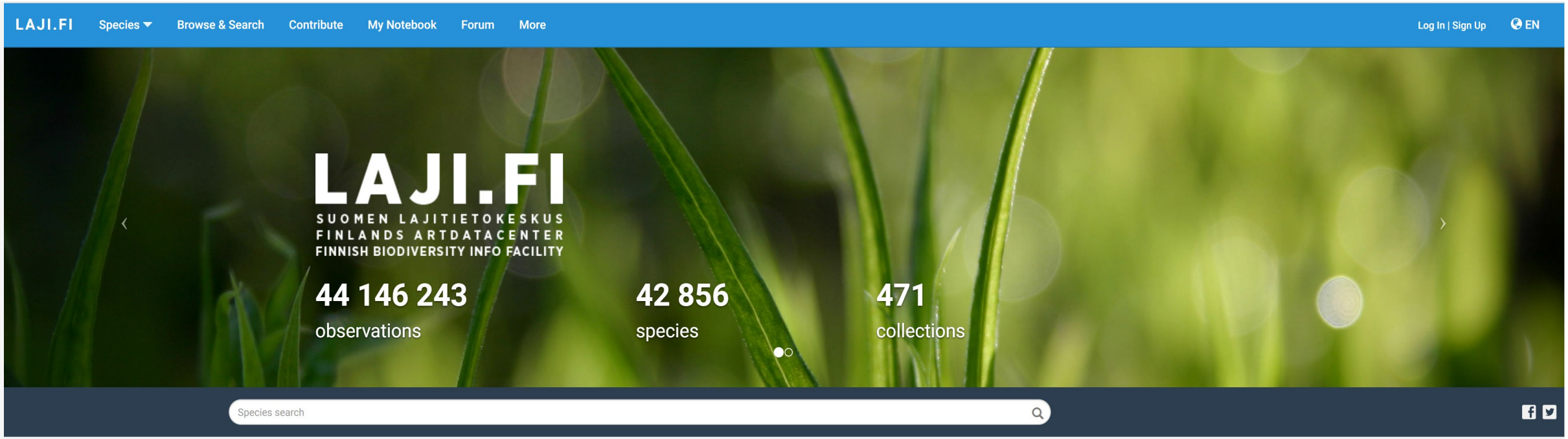
DIGITAL COLLECTION MANAGEMENT

- Kotka – collection management tool https://kotka.luomus.fi/
- Collection management: e.g. accession, deaccession, loans, unique object identifiers
- Majority of data available online https://laji.fi/en



DIGITAL COLLECTIONS

- Digitisation of entire collections > https://laji.fi/en
- Digitisation on demand > https://laji.fi/en
- Digitisation of research material > https://laji.fi/en, publications, data repositories
- Digital teaching material



Finnish Biodiversity Information Facility

The Finnish Biodiversity Information Facility (FinBIF) is an open access data repository for researchers, government and the public. FinBIF consolidates many collections and datasets of living Finland in a single source. Our online portal, laji.fi, allows you to browse, search and download information about all forms of biological life, and to record and share your own observations. FinBIF is committed to the sharing and promotion of open access data.

Study species | Browse & Search | Submit observations

Latest News

Degraded service performance / Försämrad servicepre-standa 28.6.- 1.7. -
technical 01.07.2022

Fault in Notebook forms Sunday 15.5. f 0.00 to 13.00 (GMT+3) / Fel i anteckningsbokformulär
technical 15.05.2022

Vikatila 31.3-1.4. (korjattu) / Service problem 1.4. (fixed)
technical 01.04.2022

State-of-the-art bridge from FinBIF to GBIF
release 02.02.2022

Vihko kuvien lisäys on rikki (korjattu) / Adding images is broken (fixed)

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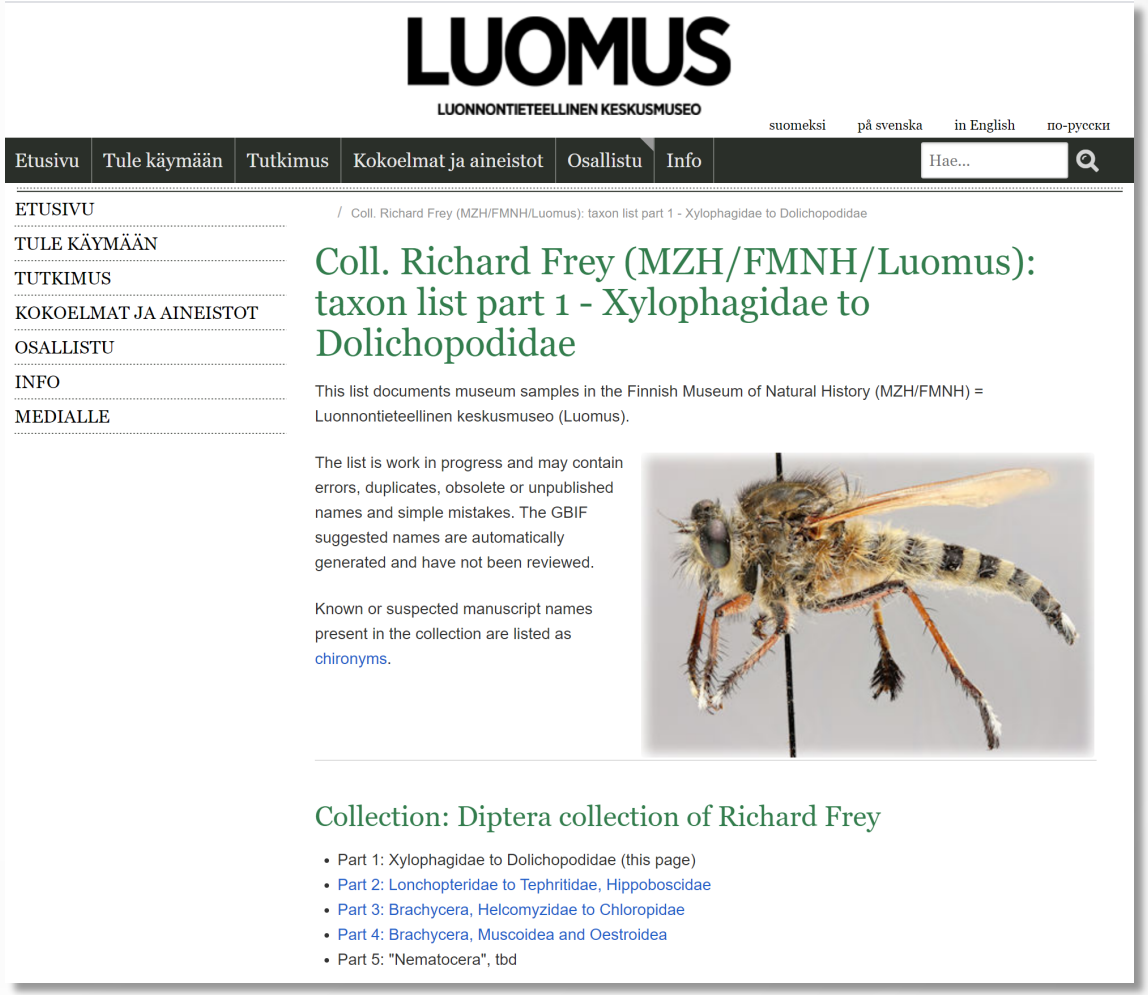
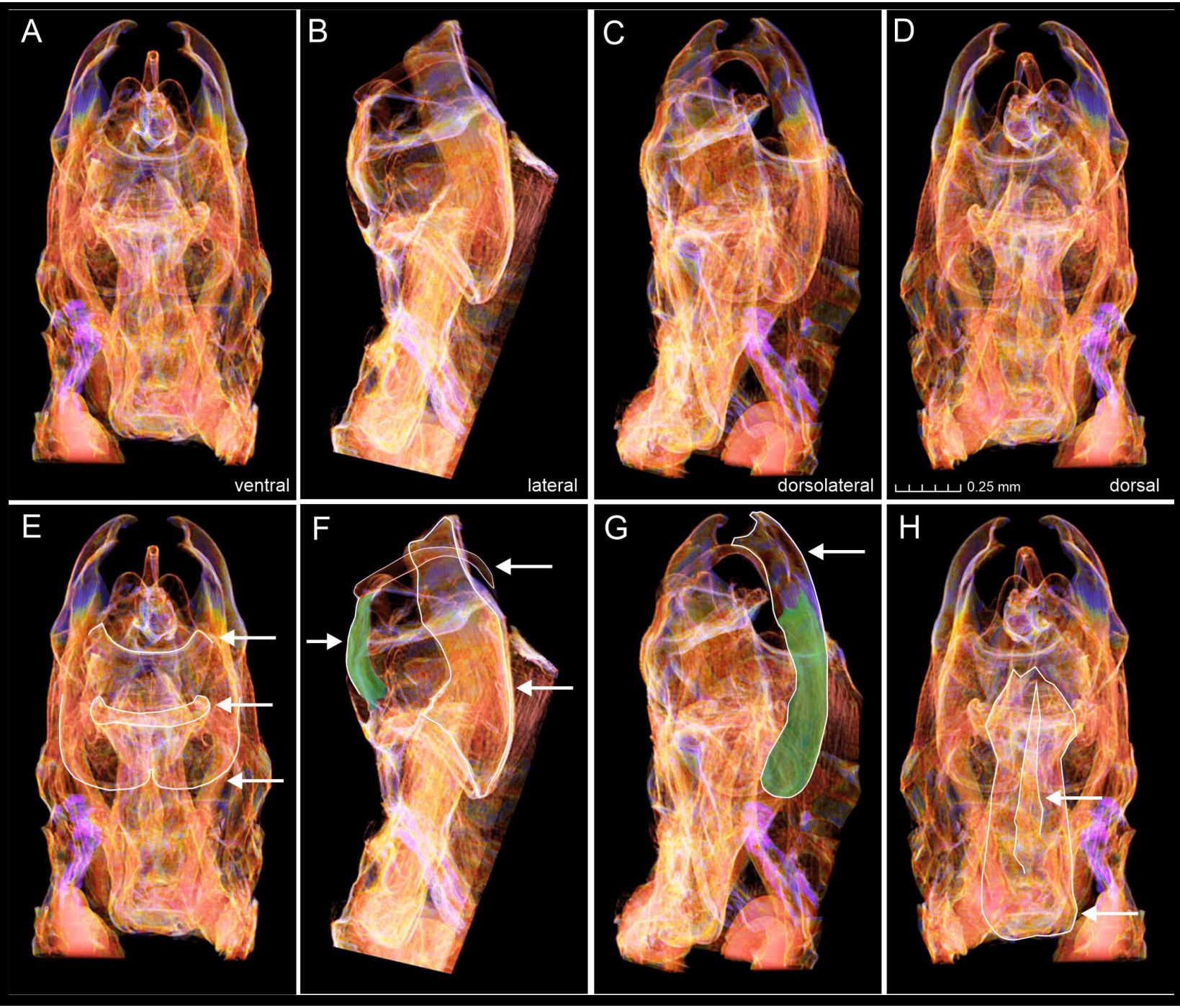
LUOMUS

DIGITAL COLLECTIONS

- Digitisation of collection's metadata > online

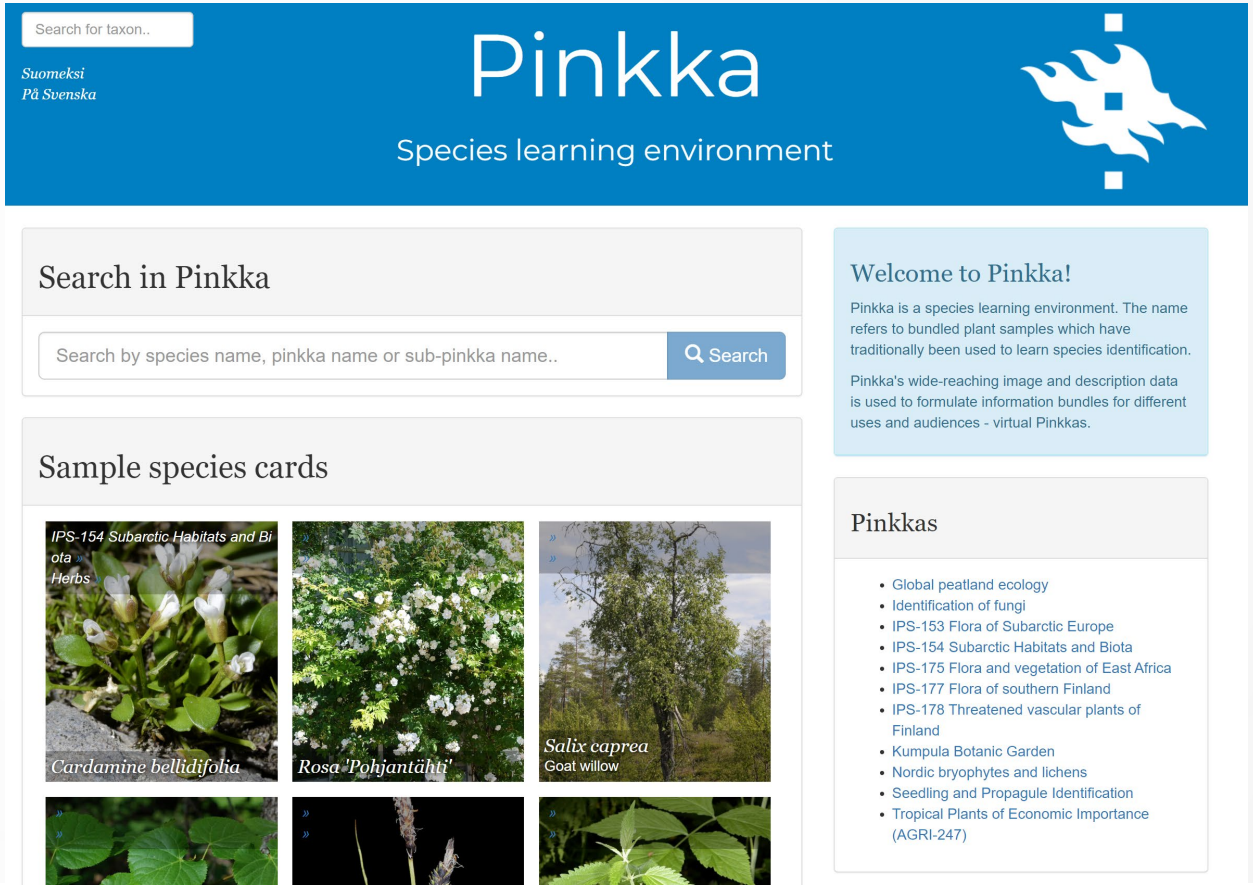


DIGITAL COLLECTIONS
MICRO CT


A
ventral
B
lateral
C
dorsolateral
D
0.25 mm
dorsal
E
F
G
H

DIGITAL COLLECTIONS: TEACHING

- Digitisated material in https://laji.fi/en can be use for teaching
- Pinkka: species learning environment https://pinkka.helsinki.fi/pinkat/#/

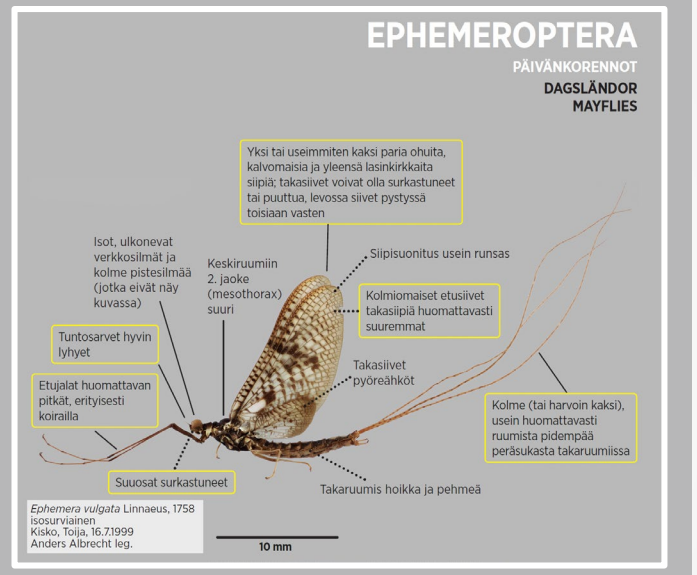


DIGITAL COLLECTIONS: TEACHING

- Digitisated material in https://laji.fi/en can be use for teaching
- Extended species identification in agricultarul entomology AGRI-273
- Students digitise material

DIGITAL COLLECTIONS: TEACHING

- Digitisated material in https://laji.fi/en can be use for teaching
- Free PDF available on https://laji.fi/en/theme/hyonteisopas



VIRTUAL COLLECTIONS?

- Online access to collections via virtual platform?
- Virtual reality?
- Museums' need new expertise
  - Recent: digitisation coordinator, micro CT expert
  - Potential future positions: virtual collections manager, digitisation-on-demand expertise, DNA-on-demand expertise?