Digital database of biodiversity in Vietnam: current situation, opportunities and recommendations

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Starting figures of Vietnam

World's top 16 highest biodiversity

World's 25th in diversity of plants, birds and mammals per square unit (World Atlas of Biodiversity; Groombridge & Jenkins 2002)

7 of World's 200 priority ecoregions (Olson & Dinerstein, 2002)

Part of World's 25 biodiversity hotspots (Myers et al., 2000)

5 of World's 250 centers of plant diversity (Davis & Heywood, 1995)

Significant part of biodiversity is unknown

- 2021: 91 new species discovered from Vietnam

Langbiangia gen. nov.
(Luu et al., 2023, PLOS ONE, in press)

Ensete lecongkietii

Curcuma leonidii

Aspidistra truongii

Arisaema honbaense

Ophiopogon tristyla

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Starting figures of Vietnam

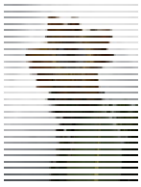
50,000 species identified (UNDP, 2021):

- ~7,500 microorganisms,
- 20,000 terrestrial & water plants,
- 10,500 terrestrial animals
- 2,000 invertebrates & freshwater fish
- > 11,000 marine species

Diverse benefits:
- livelihoods
- clean water
- soil stability
- against climate shocks
- tourism

➔ sustainable development

Langbiangia gen. nov.
(Luu et al., 2023, PLOS ONE, in press)



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Erosion and threats

Rapid biodiversity loss: endangered species
- 21% of mammals
- 6.5% of birds
- 19% of reptiles
- 24% of amphibians
- 38% of fishes
- 2.5% of vascular plants

Due to human activities:
- population growth
- overexploitation of natural resources
- illegal logging
- expansion and intensification of agriculture

Reasons **ranked by economic sectors**:
- Agriculture, forestry and aquaculture

Most frequent impacting drivers:
- biological use
  - *hunting and collecting wildlife*
  - *timber logging*
  - *harvesting aquatic resources*
- forested land conversion especially for agriculture and aquaculture

(Source: Thuaire et al., 2021)

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Questions remaining

Many questions:

- Area of natural terrestrial and marine ecosystems have been reduced = known in figures?
  - 51% of remaining virgin forests were lost during 2000-2005 (FAO report)
  - 2.8 million ha of natural forests lost during the last 20 years
  - 10,544 km² of forested areas were lost from 2000 to 2018, of which:
    - 4,855 km² for plantations and orchards
    - 5,028 km² for croplands
  - 45.4% of seagrass coverage lost last 2 decades = 4.4% annually
    - Mangroves, lagoons, and coastal tidal flats were impacted because of intensive aquaculture
- Quality of ecosystems have been reduced = known but to what extent?
- Function of ecosystems has been reduced = known but to what extent?
- Biodiversity has been reduced = known but to what extent?

But:

- Changes expected to be stronger/faster
- Higher risk of extinction
- Impacts by climate change

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Role of digital database

- Crucial for understanding changes and management
- Sound foundation for sustainable uses of biological resources (biofuel, bioeconomy, natural product development, etc.)
- An effective tool for raising public awareness and actions
- Levels of biodiversity for databasing:
  - Ecosystem
  - Species
  - Gene

  - taxonomic/ecological/biological information
  - distribution (coordinates of records, area)
  - natural stock and quantitative changing
- What do we have by now?
  - Monitoring forest areas every 5 years (by MARD)
  - Monitoring biodiversity every 5 years (by MONRE)
    - National report of biodiversity (most recent: 2022 by MONRE)
      - Present status and changing trend
      - No actual monitoring programs for ecosystems, species and gene
      - Lack of actual and scientific-based data that could promote appropriate conservation planning
  - Checklists of species available (national, provincial, protected area) without database
  - Misunderstanding: electric form vs. digital database

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Digital database for Vietnam

- First introduced by GBIF in 2009
  - Database training workshop in Ho Chi Minh City
  - 36 participants from Vietnam, Laos and Cambodia
  - BRAHMS (for herbarium) trained afterwards
  - Still applied at herbaria of IEBR, ITB, SIE, National University of Laos
  - Used internally
- Vietnam National Biodiversity Database System:
  - Started in 2012 by BCA (MONRE) with funding from JICA
  - Available at http://nbds.vea.gov.vn/
  - Mostly checklists of species in certain protected areas/static data and information
  - Limited useful information on species distribution and ecological characteristics
  - Not widely used

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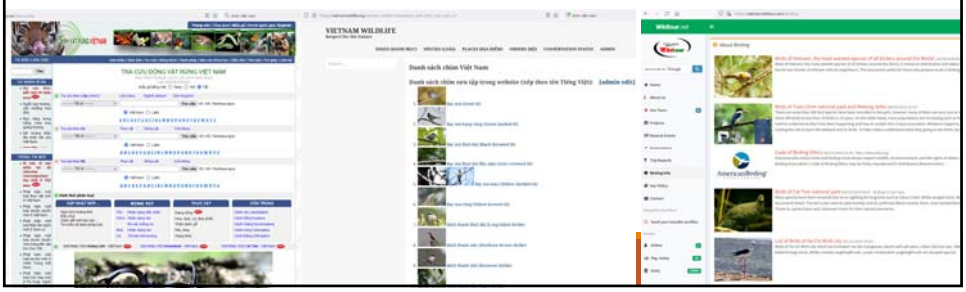
Digital database for Vietnam

- Some useful information can be found online from enthusiastic Vietnamese individuals and groups
  - https://www.botanyvn.com/
  - https://vietnamwildtour.com/
  - http://www.vncreatures.net/tracuu.php
- Scientific data need verification (not actual database)



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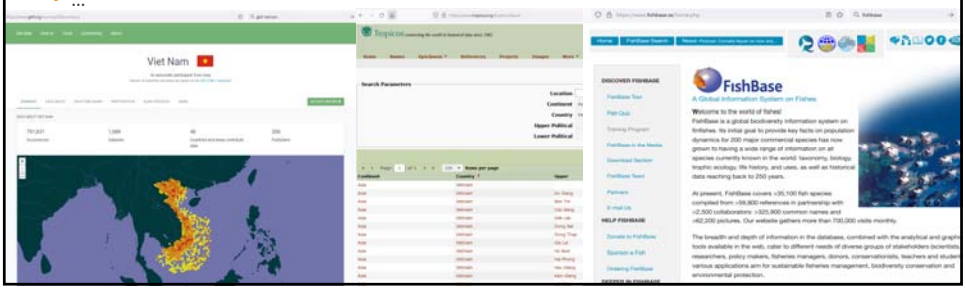
Digital database for Vietnam

- Scientific data mostly taken online from GBIF and others international sources
  - IUCN Red List of Threatened Species: https://www.iucnredlist.org
  - Tropicos: https://www.tropicos.org
  - Muséum national d'Histoire naturelle, Paris: https://www.mnhn.fr
  - FishBase: https://www.fishbase.se
  - Reptile database: http://www.reptile-database.org
  - Marine species database: https://www.marinespecies.org/
  - …



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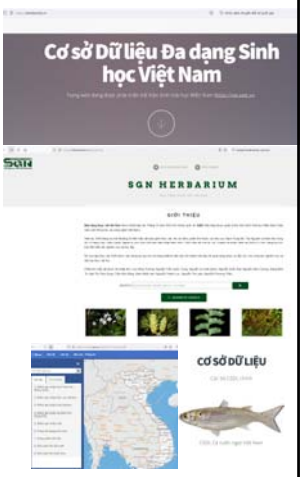
Prospectives

- SIE: https://biodiversity.vn (WebGIS-based, user interface, dynamic information/data)
  - biodiversity information collected by SIE scientists (mainly from southern Vietnam) with some 50,000 specimens of over 7,000 species: funding from VAST
    - 3,000 species by 2025
  - Monitoring plot systems for key forest ecosystems with funding from MOST and Smithsonian institutions (US)
    - 6 plots (=25 ha primary forest) with some 1,500 plant species
    - Data on ForestGEO in late 2023
  - linked Ecobank Mekong with funding from the Mekong-Republic of Korea Cooperation Fund (coming soon):
    - all ecosystems & 2,000 species in Mekong Delta of Vietnam & Cambodia
    - available by 2025
  - linked biodiversity database of key RAMSAR sites with funds from WWF Switzerland

    (coming soon with Ca Mau Biosphere Reserve)



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Recommendations

Targets for databasing & monitoring:
- Ecosystem
- Species
- Gene

International cooperation in building a standard and effective database for biodiversity conservation, monitoring and management.
- International experience and capacity building in databasing & monitoring
  - Existing collections
  - Updating data
  - DNA barcoding for species identification
- New technologies
  - Automating digitizing tools
  - Environmental DNA-based monitoring
  - Fast DNA barcoding
- Equipment

National long-term investment
- Target capable institutions
- Specific locations before national consensus database: protected areas, province, landscape, ecosystems
- Funding from MOST, MONRE, provincial level

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Thank you for your attention!

Acknowledged funding from

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