



Building knowledge and narratives through open networks



Sandy Knapp President, Linnean Society of London

Senior Research Botanist, Natural History Museum





National Biodiversity Network





Linnaean Herbarium

The Linnaean Herbarium

Images of the specimens from the Herbarium of Carl Linnaeus (1707-1778) held at the Linnean Society of London.

Browse the Linnaean Herbarium

by genus

Search the Linnaean Herbarium

Search More search options.

Search by Savage number



Currently, the specimens in this herbarium are only searchable using the names written on the sheets by Linnaeus and his son, Linnaeus Fil., and by some subsequent determinations. The currently accepted names for these Linnaean era names can be sourced using the Natural History Museum's Linnaean Plant Name Typification Project (http://www.nhm.ac.uk/ourscience/data/linnaean-typification/) or by other online resources such as TROPICOS or IPNI. The annotations on the sheets, which are largely by Linnaeus but also bear the handwriting of others including Linnaeus Fil. or James Edward Smith, have not been transcribed into the database. For further information on these annotations please consult:



LINN 694.7 Delphinium grandiflorum (Herb Linn)









Gymnocephalus cernuus

What are data?

"I have come to these conclusions by personally leading my pupils on wanderings through the tangled web of nature, in order that I can spur others on to an examination and explanation of nature rather than a reiteration of perceived ideas ... I shall take exception to the tales of actors and the barking of dogs with equal measure."

Linnaeus (1748) Systema naturae ed. 6

New research opportunities with open data









Digitisation workflows



Big science from big natural history data

conservationists and researchers

applicable at the local scale.

50-100 100-100

180-280

200-250

250 - 300

att - 2102



CATHERINE S. JARNEVICH¹⁰,¹ NICHOLAS E. YOUNG²,² MARIAN TALBERT,³ AND COLIN TALBERT^{1,3}

⁸U.S. Geological Survey Fort Collins Science Center, 2150 Centre Ave Bldg C. Fort Collins, Colorado 80526 USA ²Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, Colorado 80523-1499 USA ³Department of Interior, North Central Climate Science Center, Colorado State University, Fort Collins, Colorado 80523 USA

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Occurrence records
Datasets
Publishing institutions
Peer-reviewed papers using data

1,357,090,812
47,859
1,536
4,013

Image: Note of the state of the stat

Explore and download the Natural History Museum's research and collections data. Login

25

3.5M

"From local data to global impact, but also from global data to local solutions."

Global Biodiversity Information Facility

Barcodes

GUIDs

Data and supplementary materials have sufficiently rich metadata and a unique

and persistent identifier.

DOIs

FINDABLE

Metadata and data are understandable to humans and machines. Data is deposited in a trusted repository. ACCESSIBLE

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Darwin Core

Metadata use a formal, accessible, shared, and broadly applicable language for knowledge representation. INTEROPERABLE

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> This is a work in progress and there are many species still lacking formal descriptions, but new information will be added as we continue populating the taxonomy database with new descriptions, images, specimens, and other relevant information about individual species.

> resulting records will take you to a given species web page with all the information, if complete,

Esula occurring in the United States, including introduced species. Clicking on any of the

about nomenclature, distribution, images, description, literature, etc.

How to cite individual species pages

Species Page Editor(s). Current year. Species name. In: *Euphorbia* Planetary Biodiversity Inventory. Available from Tolkin (http://app.tolkin.org/projects/72/taxa).

Example: Riina, R. 2011. Euphorbia peplus L. In: Euphorbia Planetary Biodiversity Inventory.

Solaraceae Softreams to provide a workwise taxonomic monograph of the nightshade family, solaraceae. The family is of considerable economic importance and contains species that are used as food (potatoes, tomatoes and eggplants), medicines (henbane and deadly nightshades) and in

(henbane and deady nightshades) and in horticulture (petunias). We began this journey with the on-line monograph of all species in the mega-diverse genus Solanum. The <u>National Science Foundation (INSF)</u> funded the Solanum project as part of the <u>Planetary Biodiversity Inventories (PBI)</u> mission from 2004-2009.

In 2011 we added the names for all members of the family to the resource with the collaboration of the International Plant Names Index (URM), and are working through these with the help of the Solanaceae community worldwide. This increases the coverage to all 90+ genera of the family and will contribute to diverse projects such as the <u>World Flora On-Line</u> that is contributing the the <u>Global Strategy for Plant Conservation</u>. The **Solanaceae Source** BRAHMS database serves data on

Welcome to Solanaceae Source

Solanaceae Source aims to produce a worldwide taxonomic monograph of the nightshade family, Solanaceae. We began with the on-line monograph of all species in the mega-diverse genus *Solanum*. The <u>National Science</u> <u>Foundation (NSF)</u> funded the Solanum project as part of the <u>Planetary Biodiversity Inventories (PBI)</u> mission from 2004-2009.

Grant number: DEB-0316614

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A Revision of Solanum Section Gonatotrichum

Stephen Stern,^{1,4,5} Lynn Bohs,¹ Leandro Giacomin,² João Stehmann,² and Sandra Knapp³

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²Departamento de Botânica, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, Avenida Antônio Carlos, 6627, 31270-901, Belo Horizonte, MG, Brazil
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Communicating Editor: Carol Anne Wilso

A revision of the Old World Black Nightshades (Morelloid clade of Solanum L., Solanaceae)

PhytoKeys Home Articles About About Pensoft Books E-Books Ble	Tiina Särkinen¹, Peter Poczai², Gloria E. Barboza³, Gerard M. van der Weerden⁴, Maria Baden⁵, Sandra Knapp ⁶							
Monograph PhytoKeys 106: 1-223 https://doi.org/10.3897/phytokeys.106.21991 (25 Jul 2018)								
A revision of the Old World Black Nightshades	Contents Article info Citation Metrics Comment Related							
A revision of the old world black highlishades	Figs Tabs Map Taxa Data Refs Cited							
(Morelloid clade of Solanum L., Solanaceae)	Article title							
▼ Tiina Särkinen, Peter Poczai, Gloria E. Barboza, Gerard M. van der Weerden, Maria Baden, Sandra Knapp	Abstract Control Contr							
Abstract 🔺	History, taxonomy and relationships of the Morelloid clade							
The Morelloid clade, also known as the black nightshades or "Maurella" (Morella), is one of the 10	Habit and stems							
major clades within Solanum L. The pantropical clade consists of 75 currently recognised non-spiny								
herbaceous and suffrutescent species with simple or branched hairs with or without glandular tips,	Leaves							
with a centre of distribution in the tropical Andes. A secondary centre of diversity is found in Africa,	— Pubescence							
where a set of mainly polyploid taxa occur. A yet smaller set of species is found in Australasia and	Inflorescences							
Europe, including Solanum nigrum L., the type of the genus Solanum. Due to the large number of	Pedicels							
published synonyms, combined with complex morphological variation, our understanding of species								
limits and diversity in the Morelloid clade has remained poor despite detailed morphological studies	Powered by < <a>rea arpha							

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Solanum in Peru

- 253 native species (276)
- ca. 15,000 collection events (24,000 specimens
- 65 herbaria

Särkinen et al. (2015) Revista Peruana de Biología 22, 3-62

Särkinen et al. (2013) PhytoKeys 31, 1-20.

Dispersal and exchange?

- Dated family level phylogeny from Särkinen et al. (2013)
- Seven areas all species in tree coded for distribution
 - South America
 - North America
 - Central America
 - Caribbean
 - Africa
 - Eurasia
 - Oceania
- Methods: Matzke (2014) BioGeoBEARS

Dupin et al. (2016) *Journal of Biogeography* **44**

Diversification dynamics

Echeverria-Londoño et al. (2018) bioRXiv

14,003 species

herbs trees shrubs 6,727 epiphytes 48% climbers

GUIANA SHIELD

3,349

COLOMBIA

4,489 2,245 ECUADOR

3,607 1,705

> PERU 5,401 2,717

BRAZIL

10,674 total species 4,539 tree species

BOLIVIA 3,518

1,532

Amazon plant diversity revealed by a taxonomically verified species list

Domingos Cardoso^{6,1,2}, Tiina Särkinen^{6,1}, Sara Alexander^c, André M. Amorim^d, Volker Bittrich^e, Marcela Celis^{f,g}, Douglas C. Daly^h, Pedro Fiaschi¹, Vicki A. Funk⁺, Leandro L. Giacomin⁺, Renato Goldenberg⁵, Gustavo Heiden¹, João Iganc¹^m, Carol L. Kelloff⁺, Sandra Knapp⁰, Haroldo Cavalcante de Lima⁶, Anderson F. P. Machado⁶, Rubens Manoel dos Santos⁹, Renato Mello-Silva⁴, Fabián A. Michelangeli^h, John Mitchell^h, Peter Moonlight^b, Pedro Luis Rodrígues de Moraes⁴, Scott A. Morl¹, Teonildes Sacramento Nunes⁹, Terry D. Pennington⁴, José Rubens Pirani⁷, Ghillean T. Prance[†], Luciano Paganucci de Queiroz⁹, Alessandro Rapin⁹, Ricarda Riina⁴, Carlos Alberto Vargas Rincon⁴, Nádia Roque⁴, Gustavo Shimizu⁴⁰, Marcos Sobral⁴, João Renato Stehmann⁴, Warren D. Stevens⁴, Charlotte M. Taylor⁴, Marcelo Trovo⁴⁰, Cássio van den Berg⁶, Henk van der Werff⁴, Pedro Lage Viana⁴⁰, Charles E. Zartman⁴⁰, and Rafaela Campostrini Forzza⁰

*National Institute of Science and Technology in Interdisciplinary and Transdisciplinary Studies in Ecology and Evolution (INCT IN-TREE), Instituto de Biologia, Universidade Federal da Bahia, 4077-115 Sahador, BA, Farzii, "Roya Ibtanic Garden Edinburgh, Edinbur

Edited by Michael J. Donoghue, Yale University, New Haven, CT, and approved August 11, 2017 (received for review April 24, 2017)

Recent debates on the number of plant species in the vast lowland rain forests of the Amazon have been based largely on model estimates, neglecting published checklists based on verified voucher data. Here we collate taxonomically verified checklists to present a list of seed plant species from lowland Amazon rain forests. Our list comprises 14,003 species, of which 6,727 are trees. These figures are similar to estimates derived from nonparametric ecological models, but they contrast strongly with predictions of much higher tree diversity derived from parametric models. Based on the known proportion of tree species in neotropical lowland rain forest communities as measured in complete plot censuses, and on overall estimates of seed plant diversity in Brazil and in the neotropics in general, it is more likely that tree diversity in the Amazon is closer to the lower estimates derived from nonparametric models. Much remains unknown about Amazonian plant diversity, but this taxonomically verified dataset provides a valid starting point for macroecological and evolutionary studies aimed at understanding the origin, evolution, and ecology of the exceptional biodiversity of Amazonian forests.

Amazonia | floristics | rain forests | seed plants | species diversity

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The Amazon is renowned for harboring the world's largest portioned of rain forest, which spreads across the Amazon, orinoco, and Atlantic North Coast river basins (including Essequibo and Cuarantyne), as well as the Tocantins and the Western Atlantic hydrological basins (including Mearim). The exceptional species diversity of these forests, here referred to collectively as the Amazon rain forest, has long captured the attention of scientists and explorers alike aiming to understand the origins, evolution, and ecology of this rich biota and the processes that created and now maintain its hyperdiverse communities (1–13). Long-standing debates about the number and

identity of seed plant species found in the region remain unresolved. The Amazon basin has been estimated to host up to \$0,000 plant species, depending on which model is used and how the region is defined (5). Of these, between 6,000 and 16,000 species are predicted to be trees reaching ≥10 cm stem diameter at breast height (DBH) (5, 14).

The uncertainty surrounding Amazon rain forest plant species richness and identity compromises downstream science focused on conservation (15) and the evolutionary and ecological patterns and processes that drive biodiversity (10–12, 16), leaving studies dependent on incomplete and/or extrapolated datasets (e.g., refs. 9, 14, 17), often resulting in incomplete and irreproducid conclusions. Floristic lists can now be generated quickly for any region through automated data harvesting (e.g., refs. 14, 17, 18), using the increasing amounts of digitally available occurrence data

Author contributions: D.C. and T.S. designed reasenty; D.C., T.S. S.A., M.A., V.B., M.C., D.C.D., PF, V.A.F. LLG, R.G. (H.), L.C.K. S.K., HCLL, A.F.PM, KMS, R.M., S.F.M., S.M.M., M.P. M., PLR.M.K., S.A.M., TSM, T.D.P., J.R., G.T.P., LOL, Q., A.R., R.R., C.A.Y., R.R., G.S. M.S., J.R.S., M.D.S., CM.T., M.T., CudB, HVUGW, PLV, C.E.Z. and R.C.F. performed research; D.C., T.S., and K.C.F. analyzed data; D.C., T.S., D.C.D., R.G., S.K., FAM, L.P.Q., A.R., R.G., C.M.T., and R.C.F. wrote: the paper; D.C., T.S., J.A., V.A.F., C.L.K., and R.C.F. collected the checklist and C.F. Sas, A.A.M., V.B. M.C., D.C.D., F.V., A.F.L, B.G., G.H.J., L.C.K., S.H., C.L., A.F.PM, R.M.d.S., R.M.S., F.A.M., J.M., P.M., PLR, M.S., SAM, T.SM, T.D.P., J.R.P., G.T.P., J.P.d.Q., A.R., R.R., C.A.V.R., R.G., S.M., S.J.S., WDS, C.M.T., M.T., C.vd.B., H.vd.W., PLV, C.E.Z., and R.C.F. reviewed and reviewed the checklist. The authors detextine to conflict of interest.

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www.pnas.org/cgi/doi/10.1073/pnas.1706756114

PNAS Early Edition | 1 of 6

Cardoso et al. (2017) PNAS

Who gets the credit?

Big science from big natural history data

50-100 100-180

180-280

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250.300 200-400

att - 2102

applicable at the local scale.

CATHERINE S. JARNEVICH¹⁰,¹⁴ NICHOLAS E. YOUNG¹⁰,² MARIAN TALBERT,³ AND COLIN TALBERT^{1,3}

¹U.S. Geological Survey Fort Collins Science Center, 2150 Centre Ave Bldg C. Fort Collins, Colorado 80526 USA ²Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, Colorado 80523-1499 USA. ³Department of Interior, North Central Climate Science Center, Colorado State University, Fort Collins, Colorado 80523 USA.

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Sandra Knapp

Sandy Knapp

botany, biodiversity, taxonomy, nightshades, Solanaceae

bttps://orcid.org/0000-0001-7698-3945

Natural History Museum, London, London, GB
United Kingdom of Great Britain and Northern Ireland
O Field notes

https://bloodhound-tracker.net/

Overview	Specialties	Network	Deposited At	Science Enabled	Specimens	
Identified 37,6 Collected 14,8 23,878 specin	Progress					

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Virtual access to data

"In an era of rapid climate change, botanical and other natural history collections hold increasingly valuable data for understanding long-term change and supporting conservation. Strengthening specimen collection, curation, and data availability should be a priority."

Hart et al. (2014) PNAS 111:10615-10619

1mm

Narrow by:

Results 1 - 1 of 1

- Resource Type
- Geography

Herbarium

Collection

50 100 Sort by

Taxonomy

Page 1 of 1

Solanum kifinikense

25

Isolectotype of Solanum kifinikense Bitter [family SOLANACEAE]

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Collector Volkens G., #1909 Collection Date 1894-03-01 Resource Type Specimens Country Tanzania Herbarium BR Identifications Isolectotype of Solanum kifinikense Bitter [family SOLANACEAE] (stored under name); Verified by Edmonds J.M., 1993/07/09

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SYNTHESYS+

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https://www.un.org/sustainabledevelopment/

17 PARTNERSHIPS FOR THE GOALS

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- Tiina Särkinen and Rebeca Hilgenhof, RBGE
- Andy Purvis, Adriana de Palma and Susy Echeverria, NHM
- All collectors and recorders everywhere, forever.....

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