Putting life back into biodiversity literature

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So whats wrong with paper?

You can’t find anything

Searchable

You can’t refind what you already read

Persistent links

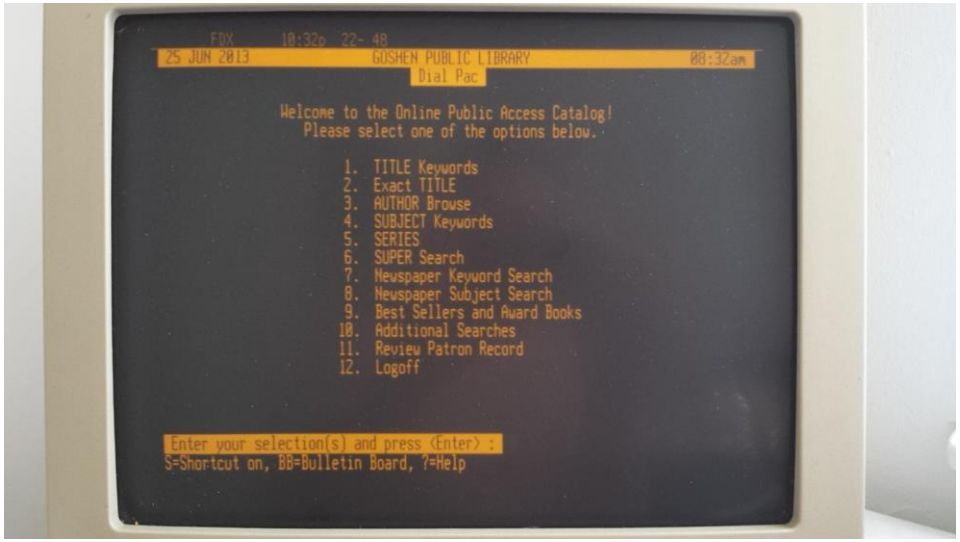
You can’t follow the citation chain

Linkable

You can’t pool data from multiple sources

Hackable

libraries aren’t what they were



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Digital Libraries

Biodiversity Heritage Library
44 million pages

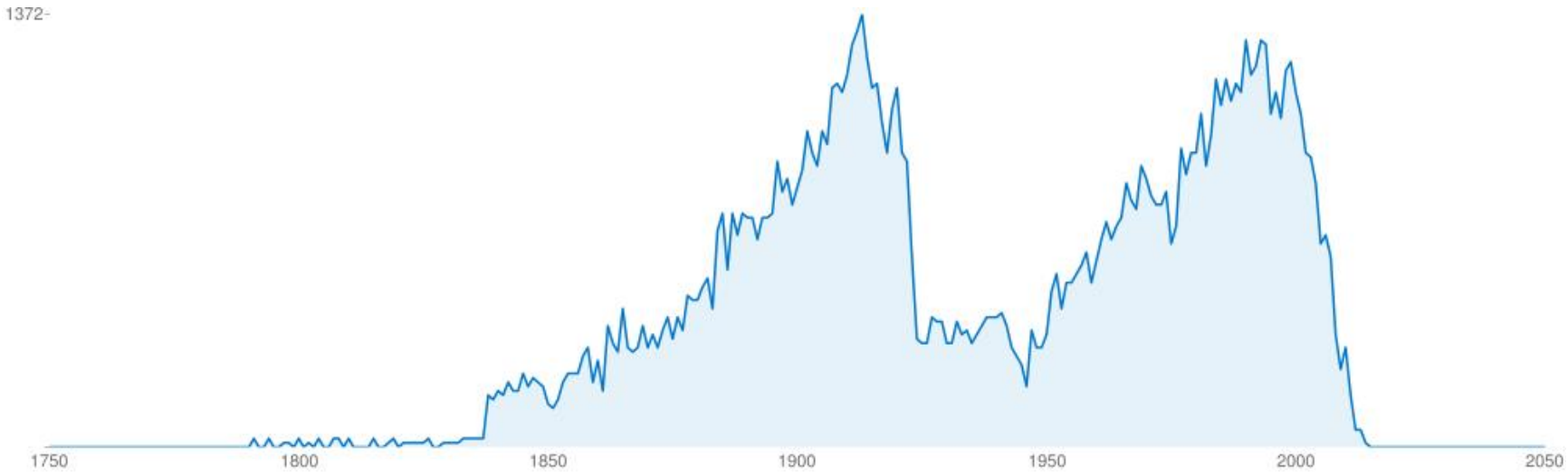
Wikisource
763,684 pages

Real Jardín Botánico of Madrid
1,613,330 pages

World Digital Library
11,645 items

Internet Archive
7.9 million texts

Not just old stuff



Source:
Page, R. D. What is BioStor? http://biostor.org/ (accessed 19 May 2015) and Biodiversity Heritage Library http://www.biodiversitylibrary.org/

Better access is changing scientific communication

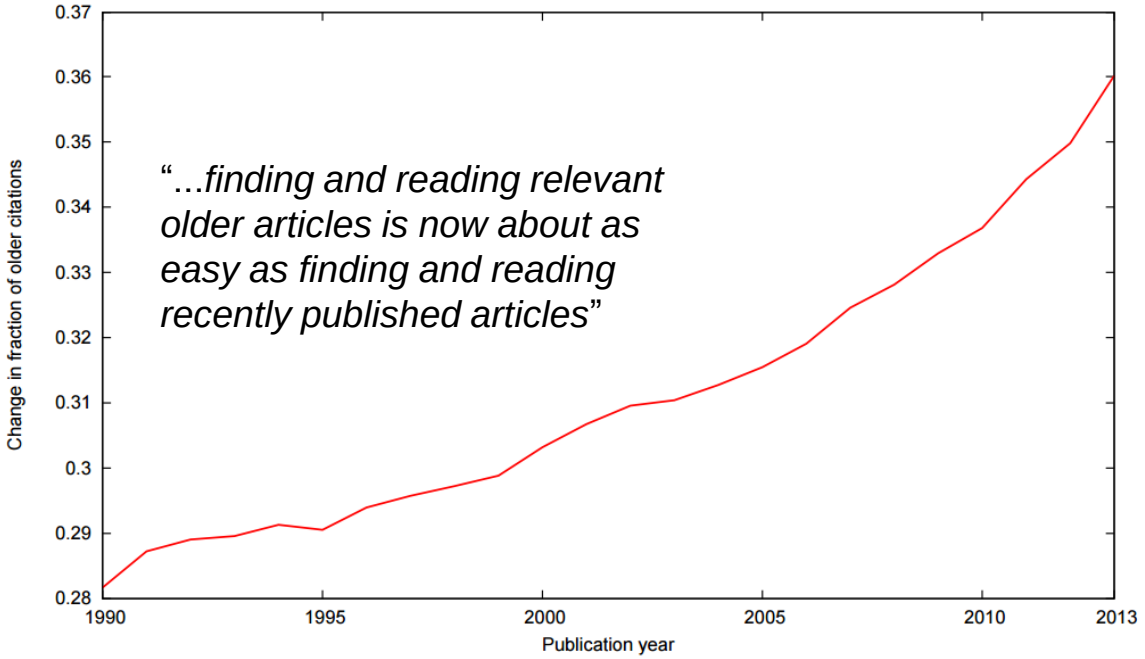
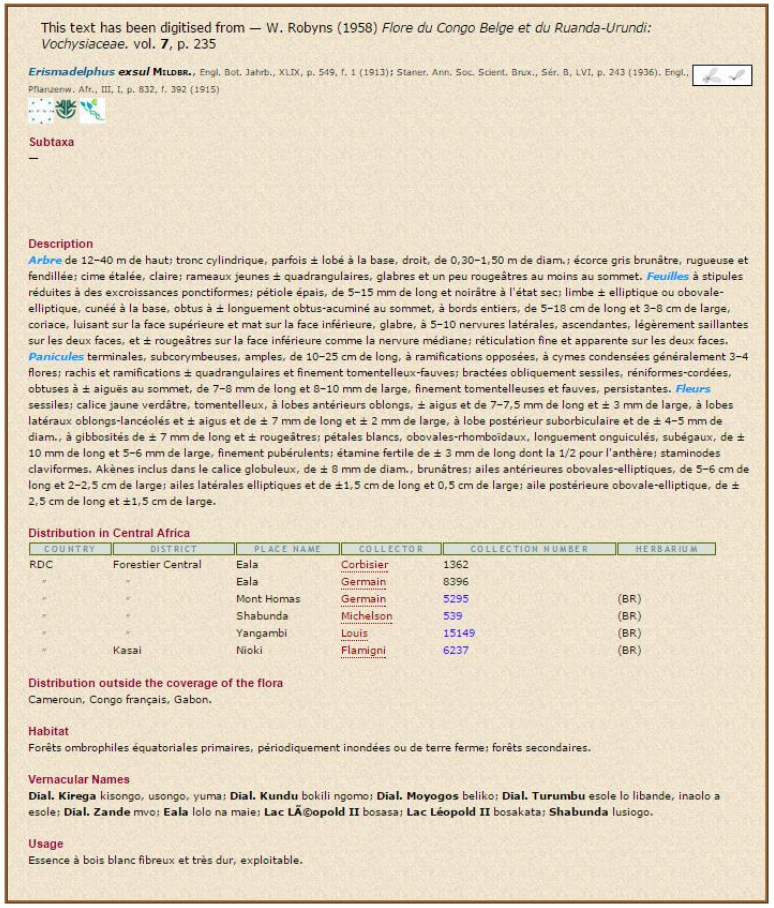


Figure 1: Fraction of older citations from all papers published in 1990-2013.

Verstak, A., Acharya, A., Suzuki, H., Henderson, S., Iakhiaev, M., Lin, C. C. Y., & Shetty, N. (2014). **On the Shoulders of Giants: The Growing Impact of Older Articles**. arXiv preprint arXiv:1411.0275.

Reuse and Republish

Flore d'Afrique Centrale



This text has been digitised from — W. Robyns (1958) *Flore du Congo Belge et du Ruanda-Urundi: Vochysiaceae*. vol. **7**, p. 235

Erismadelphus exsul **Milbr.**, Engl. Bot. Jahrb., XLIX, p. 549, f. 1 (1913); Staner, Ann. Soc. Scient. Brux., Sér. B, LVI, p. 243 (1936). Engl., Pflanzenw. Afr., III, I, p. 832, f. 392 (1915)

Subtaxa
—

Description
Arbre de 12–40 m de haut; tronc cylindrique, parfois ± lobé à la base, droit, de 0,30–1,50 m de diam.; écorce gris brunâtre, rugueuse et fendillée; cime étalée, claire; rameaux jeunes ± quadrangulaires, glabres et un peu rougeâtres au moins au sommet. ***Feuilles*** à stipules réduites à des excroissances ponctiformes; pétiole épais, de 5–15 mm de long et noirâtre à l'état sec; limbe ± elliptique ou obovale-elliptique, cunéé à la base, obtus à ± longuement obtus-acuminé au sommet, à bords entiers, de 5–18 cm de long et 3–8 cm de large, coriace, luisant sur la face supérieure et mat sur la face inférieure, glabre, à 5–10 nervures latérales, ascendantes, légèrement saillantes sur les deux faces, et ± rougeâtres sur la face inférieure comme la nervure médiane; réticulation fine et apparente sur les deux faces. ***Panicules*** terminales, subcorymbeuses, amples, de 10–25 cm de long, à ramifications opposées, à cymes condensées généralement 3–4 flores; rachis et ramifications ± quadrangulaires et finement tomentelleux-fauves; bractées obliquement sessiles, réniformes-cordées, obtuses à ± aiguës au sommet, de 7–8 mm de long et 8–10 mm de large, finement tomentelleuses et fauves, persistantes. ***Fleurs*** sessiles; calice jaune verdâtre, tomentelleux, à lobes antérieurs oblongs, ± aigus et de 7–7,5 mm de long et ± 3 mm de large, à lobes latéraux oblongs-lancéolés et ± aigus et de ± 7 mm de long et ± 2 mm de large, à lobe postérieur suborbiculaire et de ± 4–5 mm de diam., à gibbosités de ± 7 mm de long et ± rougeâtres; pétales blancs, obovales-rhomboïdaux, longuement onguiculés, subégaux, de ± 10 mm de long et 5–6 mm de large, finement pubérulents; étamine fertile de ± 3 mm de long dont la 1/2 pour l'anthère; staminodes claviformes. Akènes inclus dans le calice globuleux, de ± 8 mm de diam., brunâtres; ailes antérieures obovales-elliptiques, de 5–6 cm de long et 2–2,5 cm de large; ailes latérales elliptiques et de ±1,5 cm de long et 0,5 cm de large; aile postérieure obovale-elliptique, de ± 2,5 cm de long et ±1,5 cm de large.

Distribution in Central Africa

COUNTRY	DISTRICT	PLACE NAME	COLLECTOR	COLLECTION NUMBER	HERBARIUM
RDC	Forestier Central	Eala	Corbisier	1362	
"	"	Eala	Germain	8396	
"	"	Mont Homas	Germain	5295	(BR)
"	"	Shabunda	Michelson	539	(BR)
"	"	Yangambi	Louis	15149	(BR)
"	Kasai	Nioki	Flamigni	6237	(BR)

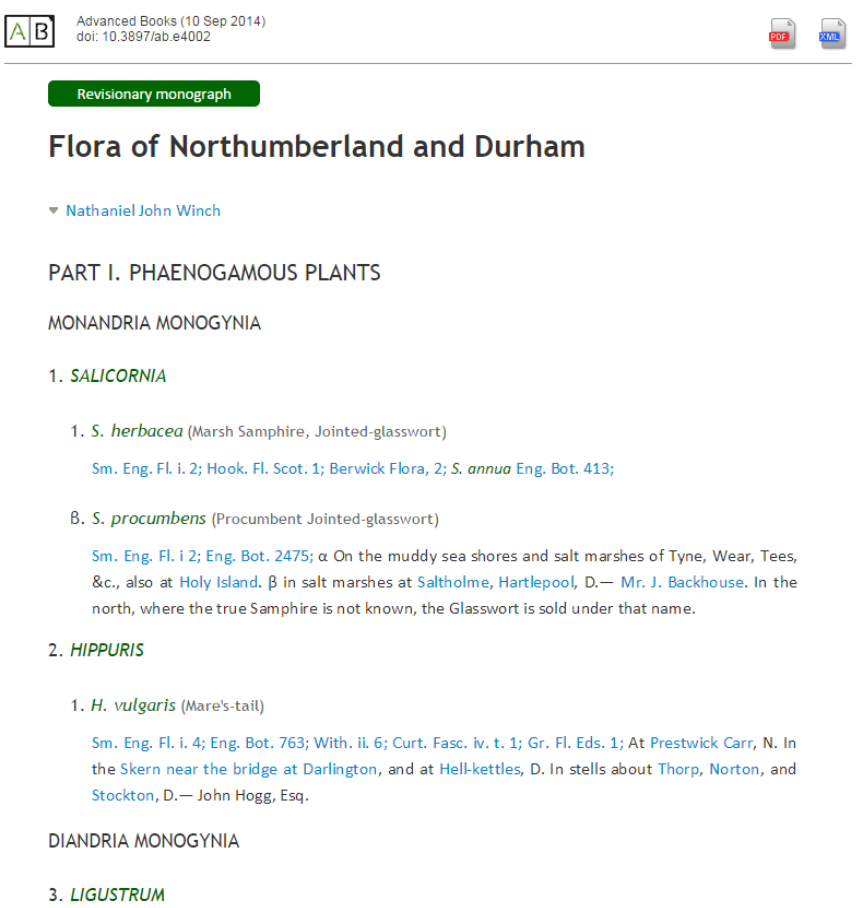
Distribution outside the coverage of the flora
Cameroun, Congo français, Gabon.

Habitat
Forêts ombrophiles équatoriales primaires, périodiquement inondées ou de terre ferme; forêts secondaires.

Vernacular Names
Dial. Kirega kisongo, usongo, yuma; **Dial. Kundu** bokili ngomo; **Dial. Moyogos** beliko; **Dial. Turumbu** esole lo libande, inaolo a esole; **Dial. Zande** mvo; **Eala** lolo na maie; **Lac LÃ©opold II** bosasa; **Lac Léopold II** bosakata; **Shabunda** lusiogo.

Usage
Essence à bois blanc fibreux et très dur, exploitable.

Flora of Northumberland and Durham



Advanced Books (10 Sep 2014)
doi: 10.3897/ab.e4002

Revisionary monograph

Flora of Northumberland and Durham

Nathaniel John Winch

PART I. PHAENOGAMOUS PLANTS

MONANDRIA MONOGYNIA

1. *SALICORNIA*

1. *S. herbacea* (Marsh Samphire, Jointed-glasswort)

Sm. Eng. Fl. i. 2; Hook. Fl. Scot. 1; Berwick Flora, 2; *S. annua* Eng. Bot. 413;

β. *S. procumbens* (Procumbent Jointed-glasswort)

Sm. Eng. Fl. i 2; Eng. Bot. 2475; α On the muddy sea shores and salt marshes of Tyne, Wear, Tees, &c., also at Holy Island. β in salt marshes at Saltholme, Hartlepool, D.— Mr. J. Backhouse. In the north, where the true Samphire is not known, the Glasswort is sold under that name.

2. *HIPPURIS*

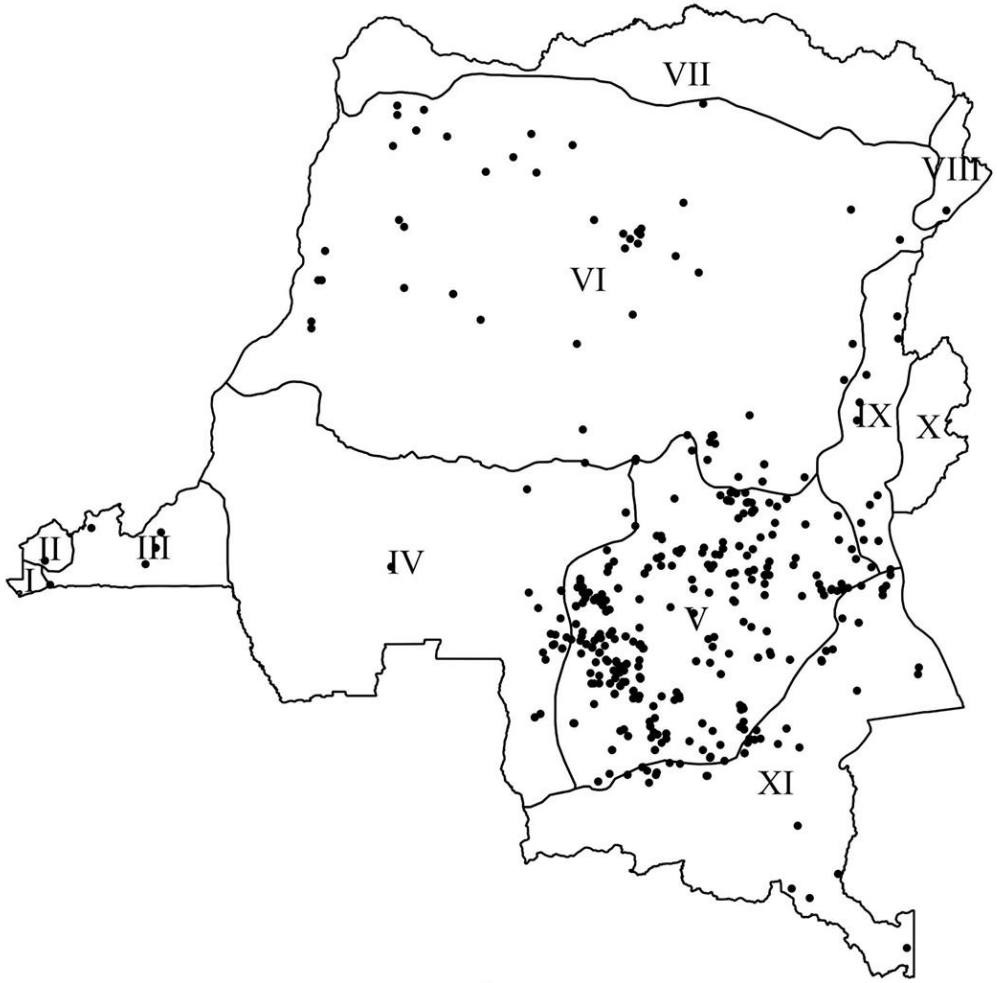
1. *H. vulgaris* (Mare's-tail)

Sm. Eng. Fl. i. 4; Eng. Bot. 763; With. ii. 6; Curt. Fasc. iv. t. 1; Gr. Fl. Eds. 1; At Prestwick Carr, N. In the Skern near the bridge at Darlington, and at Hell-kettles, D. In stells about Thorp, Norton, and Stockton, D.— John Hogg, Esq.

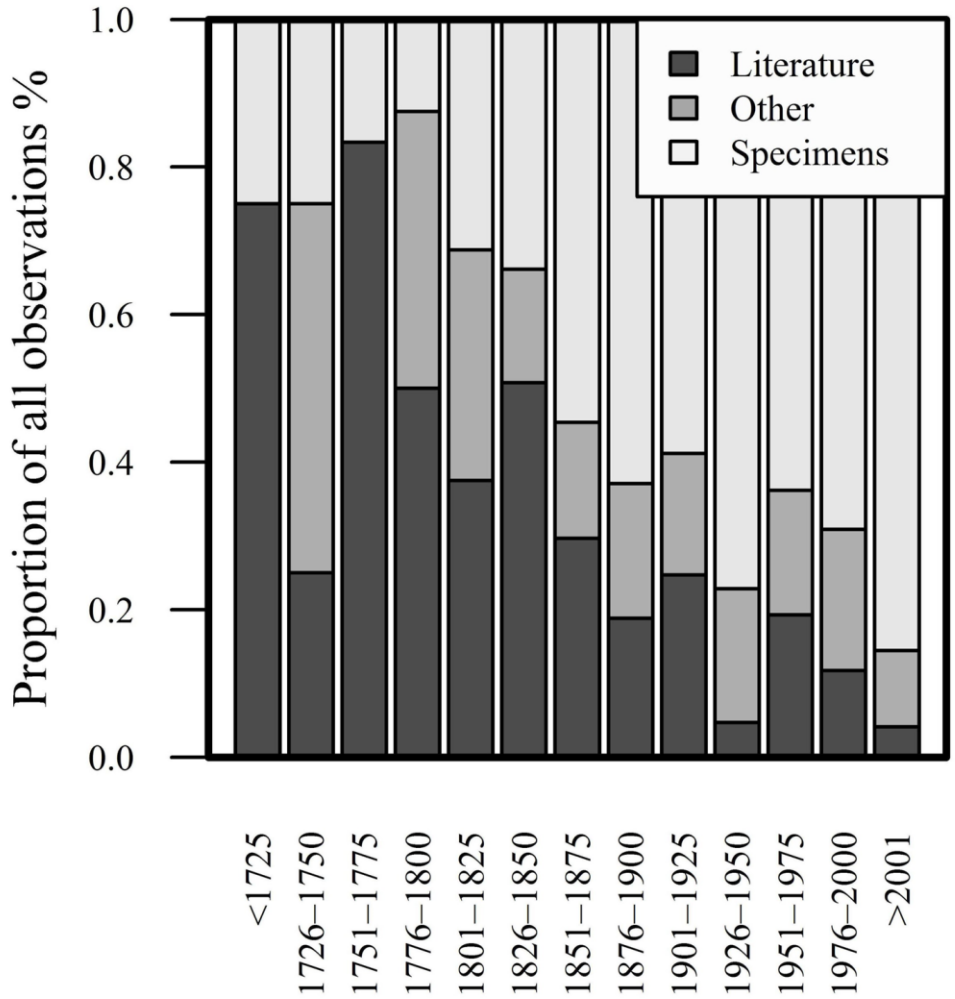
DIANDRIA MONOGYNIA

3. *LIGUSTRUM*

Georeferencing



Literature can fill gaps



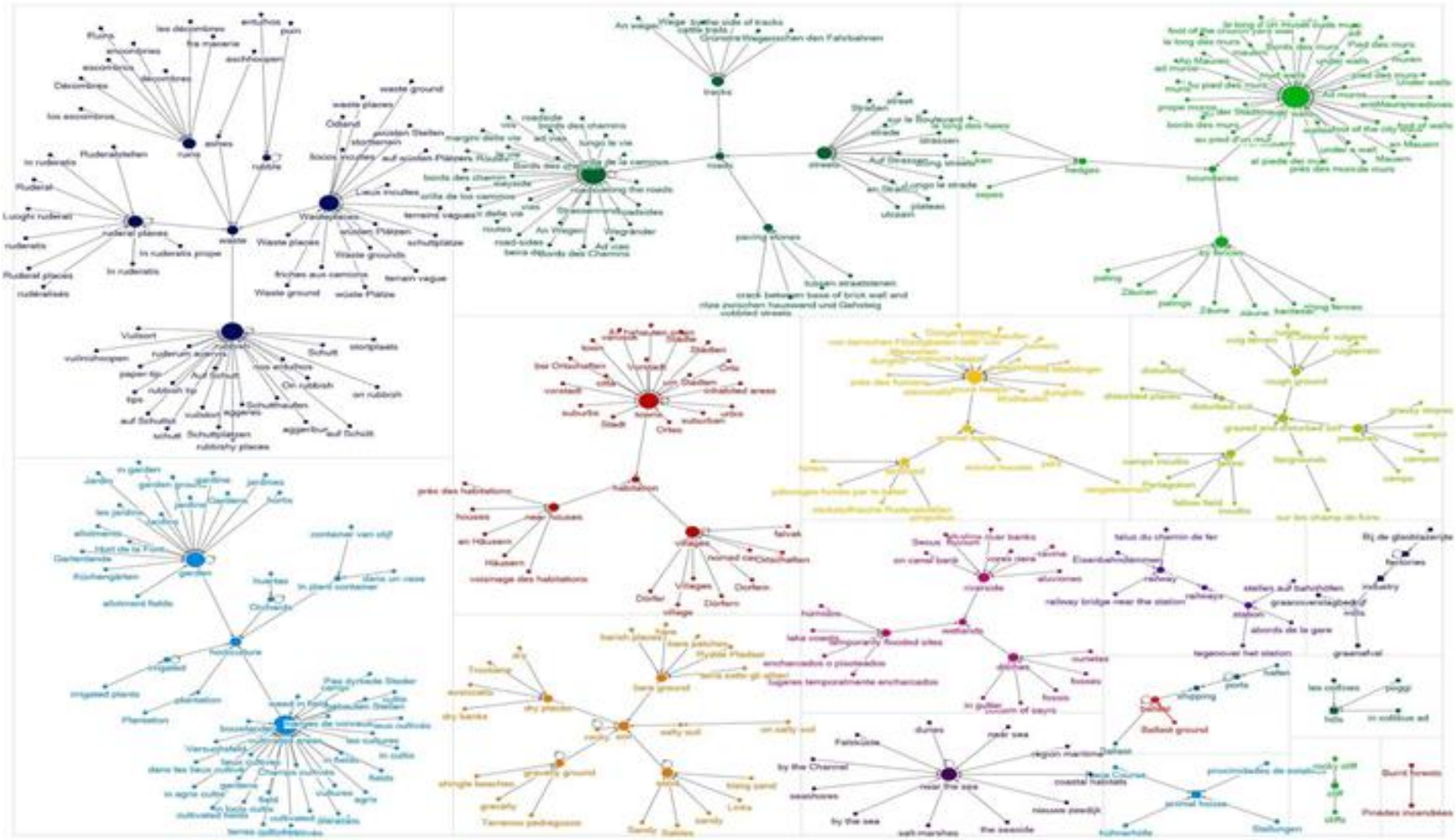
Groom QJ. (2015) Piecing together the biogeographic history of Chenopodium vulvaria L. using botanical literature and collections. PeerJ 3:e723https://dx.doi.org/10.7717/peerj.723

Lots of words

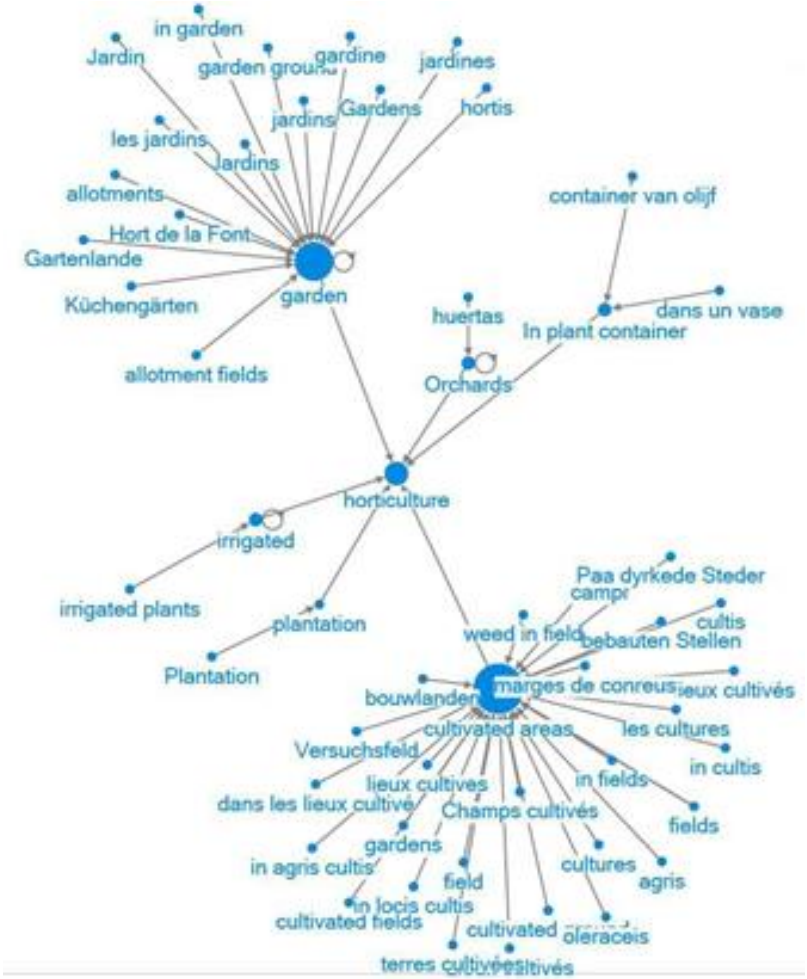
Habitat descriptions from 104 floras, 33 scientific articles, 119 specimens and 5 websites, covering the years 1787 to 2014.

English, German, French, Latin, Dutch, Italian, Portuguese, Spanish, Hungarian, Danish, Catalan and Czech.

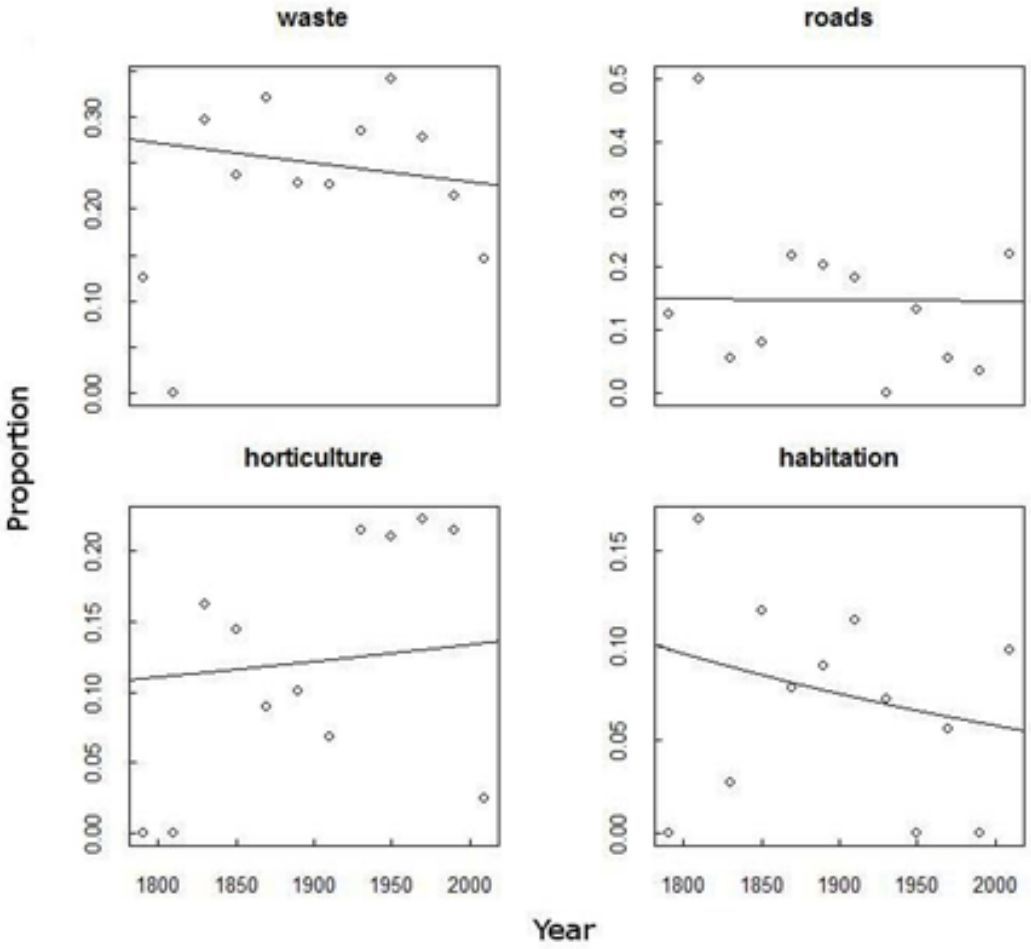
making order from choas



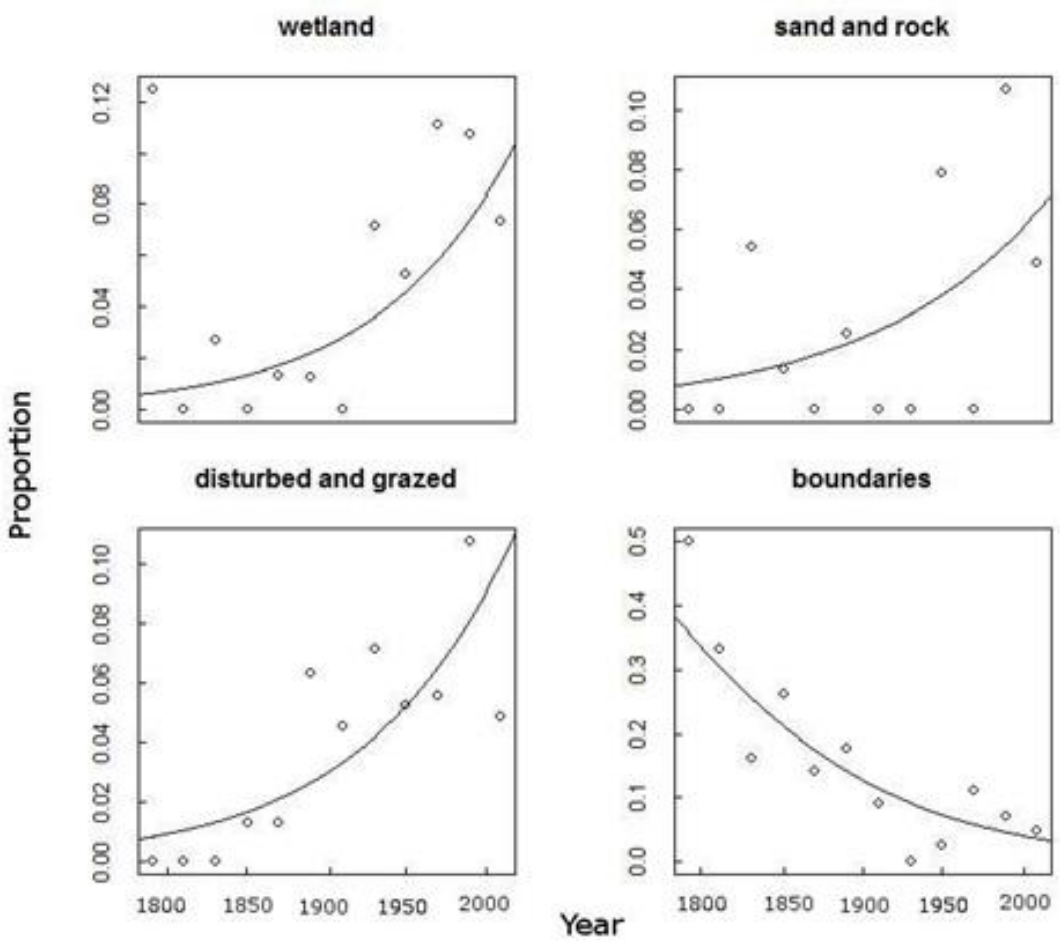
in detail


in garden
Jardin
garden groups
gardine
jardines
jardins
Gardens
hortis
les jardins
Jardins
allotments
Hort de la Font
Gartenlande
Küchengärten
garden
allotment fields
container van olijf
dans un vase
In plant container
huertas
Orchards
horticulture
irrigated
irrigated plants
plantation
Plantation
Paa dyrkede Steder
campi
cultis
weed in field
bebauten Stellen
bouwlanden
marges de conreus
lieux cultivés
cultivated areas
les cultures
Versuchsfeld
in cultis
lieux cultivés
in fields
dans les lieux cultivé
Champs cultivés
fields
gardens
in agris cultis
field
cultures
agris
in locis cultis
cultivated fields
cultivated
oleraceis
terres cultivées
cultivés

Text analysis of change



Significant changes



An ontology is a controlled vocabulary of a domain

Annotate documents

Aggregate information

Computer reasoning

Organise documents

Share knowledge

A model of a domain that is stable and persistent

What biodiversity information can be mined?

Names (what)
Distributions (where)
Dates (when)
Biography (who)

Morphology	Uses	Ecology	Chemistry
Cytology	Diet	Habitat	Associations
Citations	Variability	Toxicity	Abundance

Take home message

- The role of libraries is changing
- The future of books is not just scanned documents
- Legacy literature is an input to new analysis
- Synergy from synthesis

Thank you for listening!

http://orcid.org/0000-0002-0596-5376