Fungal research, and Resources at the U.S. National Fungus Collections

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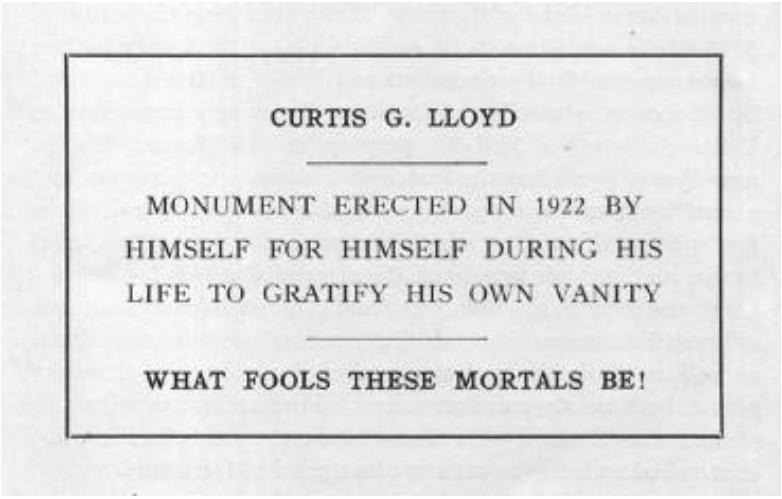
USDA ARS

Mycology & Nematology Genetic Diversity & Biology Laboratory

Beltsville, MD

U.S. National Fungus Collections (BPI=Bureau of Plant Industry) "The Smithsonian for Fungi"



1869 – fungus collections of the Smithsonian transferred to USDA

1,000,000 reference specimens

- **General Collection**
- **C.G. Lloyd Collection**
- **Exsiccati**

All specimen data at BPI available on the Internet
http://nt.ars-grin.gov/fungaldatabases

United States Department Of Agriculture
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Fungal Databases - Quick Search

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1. For advanced searches select one of the databases above

OR

2. Quickly search all the databases using a SINGLE name

Enter a complete name (no wildcards)
Examples: Alternaria porri, Alternaria porri f. sp. solani

OR
Enter the first four letters of the species epithet

Is this a fungus? ◉ or a host name? ○
Use synonyms ☑

Search | Clear Fields

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Systematic Botany and Mycology Laboratory

Tell us why you value the fungal databases

Specimens - 6 records were found using the criteria: name = Cryphonectria parasitica

Cryphonectria parasitica

Castanea dentata - BPI 631860, BPI 749121, BPI 843498, BPI 871080
Castanea sativa - BPI 1112738
Coriaria myrtifolia - BPI 871296

Systematic Mycology and Microbiology Laboratory Specimens Database. May 30, 2014

U.S. Department of Agriculture, Agricultural Research Service

Send comments or questions about the databases to HerbariumBPI@ars.usda.gov

Suggested citation: Farr, D.F., & Rossman, A.Y. Fungal Databases, Systematic Mycology and Microbiology Laboratory, ARS, USDA. Retrieved May 30, 2014, from http://nt.ars-grin.gov/fungaldatabases/

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78 records were found using the criteria Fungus Name = diaporthe parasitica

Tell us why you value the fungal databases

Diaporthe parasitica BPI 616746
Castanea americana ((dentata))
United States - Connecticut. Wallingford
Coll: Henry W. A.? on 1908 DEC 01
Detr: Clinton G. P.

Diaporthe parasitica BPI 616747
Castanea americana
United States - Connecticut. Stamford
Coll: Clinton G. P. on 1909 Apr 23
Detr: Clinton G. P.

Diaporthe parasitica BPI 616748
Castanea americana
United States - Connecticut. Harwinton
Coll: Stevens F. N.? on 1909 AUG 25
Detr: Clinton G. P.

Diaporthe parasitica BPI 616749
Castanea americana
United States - Connecticut. Westville. Beaver Creek by Farnham's
Coll: Clinton G. P. on 1909 Apr 06
Detr: Clinton G. P.

Diaporthe parasitica BPI 616750
Castanea americana
United States - Connecticut. Middlebury. Roadside
Coll: Clinton G. P. on 1909 JUL 14
Detr: Clinton G. P.

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Cryphonectria parasitica (Murrill) M.E. Barr 1978 (Ascomycetes, Diaporthales)

≡ Diaporthe parasitica Murrill 1906
≡Endothia gyrosa var. parasitica (Murrill) Clinton 1912
≡Endothia parasitica (Murrill) P.J. Anderson & H.W. Anderson 1912
≡Valsonectria parasitica (Murrill) Rehm 1907
= Endothiella parasitica Roane 1986

Distribution: Asia, Europe, North America.

Substrate: Stems, twigs.

Disease Note: Chestnut blight.

Host: *Castanea* spp., *Fagus sylvatica*, *Quercus* spp. (Fagaceae). Also reported from other hosts with some in other families, but these are not verified.

Supporting Literature:

Bascon, J., Castillo, S., Borrero, C., Orta, S., Gata, A., and Aviles, M. 2014. First Report of Chestnut Blight Caused by ***Cryphonectria parasitica*** in a Chestnut Orchard in Andalusia (Southern Spain). Pl. Dis. 98: 283.

Gryzenhout, M. , Wingfield, B.D., and Wingfield, M.J. 2009. Taxonomy, Phylogeny, and Ecology of Bark-Inhabiting and Tree-Pathogenic Fungi in the Cryphonectriaceae. APS Press, St. Paul, Minnesota, 119 pages.

Updated on Feb 04, 2014

Systematic Mycology and Microbiology Laboratory Nomenclature Database. May 30, 2014
U.S. Department of Agriculture, Agricultural Research Service
Send comments or questions about the databases to HerbariumBPI@ars.usda.gov

Suggested citation: Farr, D.F., & Rossman, A.Y. Fungal Databases, Systematic Mycology and Microbiology Laboratory, ARS, USDA. Retrieved May 30, 2014, from http://nt.ars-grin.gov/fungaldatabases/

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Fungus-Host - 115 records were found using the criteria: name = Cryphonectria parasitica

Cryphonectria parasitica:

Acer sp.: United States - 43508,
Aesculus hippocastanum China - 44190,Japan - 44190,Korea - 44190,
Carya ovata United States - 43508,
Castanea crenata Asia - 46046,China - 30582,Japan - 30582, 42066, 43508, 44259,Korea - 39503, 42829,New York - 46046,
Castanea dentata California - 39058,Canada - 8376, 44661,Canada, Ontario - 30582, 39058,China - 44190,Connecticut - 39058, 42904, 46664,Europe - 6739,Japan - 42066, 44190, 44259,Korea - 44190,Kentucky - 30582,Maryland - 30582, 39058, 39397,New Hampshire - 30582,New Jersey - 30582,North America - 43010,New York - 30582, 39397, 40720,Rhode Island - 44747,United States - 33984, 36907, 37417, 40818, 40868, 42168, 43508,Virginia - 30582,West Virginia - 30582,
Castanea mollisima Japan - 44495,
Castanea mollissima China - 30582, 36727, 43508, 45342,Japan - 40706, 42066, 43508, 44259,
Castanea pumila Florida - 8444,Texas - 39058,United States - 43508,
Castanea sativa Albania - 39058,Austria - 33439,Azerbaijan - 42512,Bulgaria - 41321, 46055,California - 3929, 25284,Canada - 8376,Czech Republic - 39319,Europe - 43508,France - 39058,Greece - 37190,Iran - 42623,Italy - 30511, 30582, 39058,Portugal - 45282,Slovakia - 41099, 46817,Spain - 46967,Switzerland - 30582, 39058,United States - 45282,
Castanea sp. California - 3929, 25284,China - 39058,Japan - 39058,Korea - 39058,Rhode Island - 44747,United States - 45342,
Eucalyptus camaldulensis Japan - 43508,
Eucalyptus haemastoma Japan - 43508,
Eucalyptus microcorys Japan - 43508,
Eucalyptus punctata Japan - 43508,
Eucalyptus robusta Japan - 43508,
Quercus alba United States - 43508,
Quercus coccinea Pennsylvania - 28571,
Quercus frainetto Italy - 39058,
Quercus prinus United States - 43508,
Quercus pubescens Italy - 39058,
Quercus serrata Japan - 40504, 43508,
Quercus sp. Asia - 46046,Japan - 42066,New York - 46046,Rhode Island - 44747,
Quercus stellata Canada - 5977,
Quercus velutina United States - 43508,
Quercus virginiana Mississippi - 36907,United States - 37861, 40706, 44495,Virginia - 36907, 47202,
Rhus typhina United States - 43508,

115 records were found using the criteria: Name = Cryphonectria parasitica

An * indicates a questionable report. Click on associated reference link for more information.

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Literature - 77 records were found using the criteria: name = Cryphonectria parasitica

Park, S.-M., Kim, J.-M., Chung, H.-J., Lim, J.-Y., Kwon, B.-R., Lim, J.-G., Kim, J.-A., Kim, M.-J., Cha, B.-J., Lee, S.-H., Kim, K.-H., Lee, Y.-S., Yang, M.-S., and Kim, D.-H. 2008. Occurrence of diverse dsRNA in a Korean population of the chestnut blight fungus, ***Cryphonectria parasitica***. Mycol. Res. 112: 1220-1226. (42829)

Aghayeva, D.N., and Harrington, T.C. 200857. First report of ***Cryphonectria parasitica*** on chestnut (***Castanea sativa***) in Azerbaijan. Pl. Pathol. 57: 383. (42512)

Anagnostakis, S.L. 1987. Chestnut blight: the classical problem of an introduced pathogen. Mycologia 79: 23-37. (20308)

Anagnostakis, S.L. 1988. ***Cryphonectria parasitic***, cause of chestnut blight. Advances Pl. Pathol. 6: 123-136. (6739)

Anagnostakis, S.L. 1997. Chestnuts and the Introduction of Chestnut Blight. Connecticut Agric. Exp. Sta. Bull. Immed. Inform. : 1-3. (45641)

Bascon, J., Castillo, S., Borrero, C., Orta, S., Gata, A., and Aviles, M. 2014. First Report of Chestnut Blight Caused by ***Cryphonectria parasitica*** in a Chestnut Orchard in Andalusia (Southern Spain). Pl. Dis. 98: 283. (46967)

Braganca, H., Rigling, D., Diogo, E., Capelo, J., Phillips, A. , and Tenreiro, R. 2011. ***Cryphonectria natercia***: A new species in the ***Cryphonectria-Endothia*** complex and diagnostic molecular markers based in microsatellite-primed PCR. Fung. Biol. 115: 852-861. (45282)

Brasier, C.M. 2008. The biosecurity threat to the UK and global environment from international trade in plants. Pl. Pathol. 57: 792-808. (44190)

Breuillin, F., Dutech, C., and Robin, C. 2006. Genetic diversity of the chestnut blight fungus ***Cryphonectria parasitica*** in four French populations assessed by microsatellite markers. Mycol. Res. 110: 288-296. (40661)

Broders, K.D., and Boland, G.J. 2011. Reclassification of the butternut canker fungus, ***Sirococcus clavigignenti-juglandacearum***, into the genus ***Ophiognomonia***. Fung. Biol. 115: 70-79. (44661)

Brown, J.K.M., and Hovmoller, M.S. 2002. Aerial dispersal of pathogens on the global and continental scales and its impact on plant disease. Science 297: 537-541. (37780)

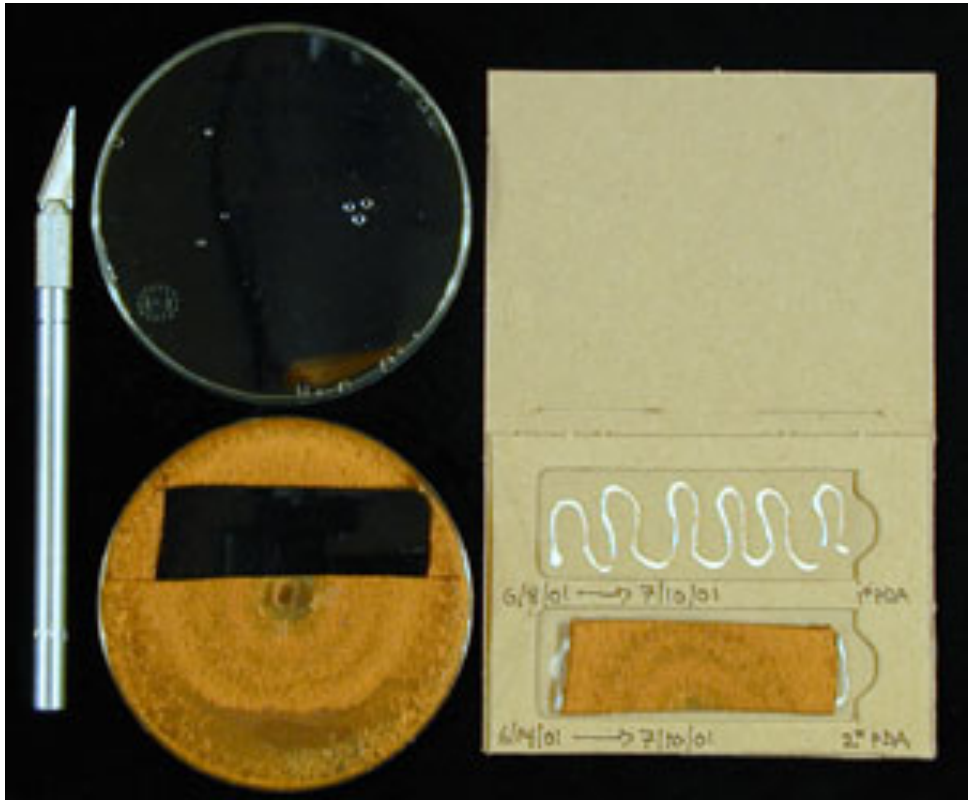
CABI/EPPO 2010. ***Cryphonectria parasitica***. Distrib. Maps Pl. Dis. 66: 1-6. (44266)

Chen, S., Gryzenhout, M., Roux, J., Xie, Y., Wingfield, M.J., and Zhou, X. 2011. Novel species of ***Celoporthe*** from ***Eucalyptus*** and ***Syzygium*** trees in China and Indonesia. Mycologia 103: 1384-1410. (45342)

Chen, S.F., Gryzenhout, M. , Roux, J., Xie, Y.J., Wingfield, M.J., and Zhou, X.D. 2010. Identification and pathogenicity of ***Chrysoporthe cubensis*** on ***Eucalyptus*** and ***Syzygium*** spp. in South China. Pl. Dis. 94: 1143-1150. (44495)

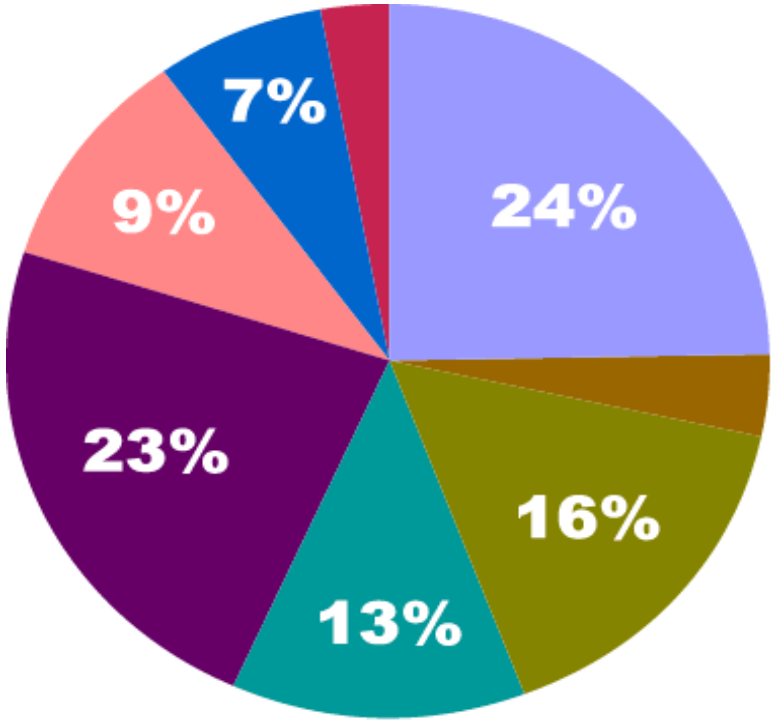
Cho, W.D., and Shin, H.D., Eds. 2004. List of plant diseases in Korea. Fourth edition. Korean Society of Plant Pathology, 779 pages. (39503)

Specimens are gently dried and totally dead.



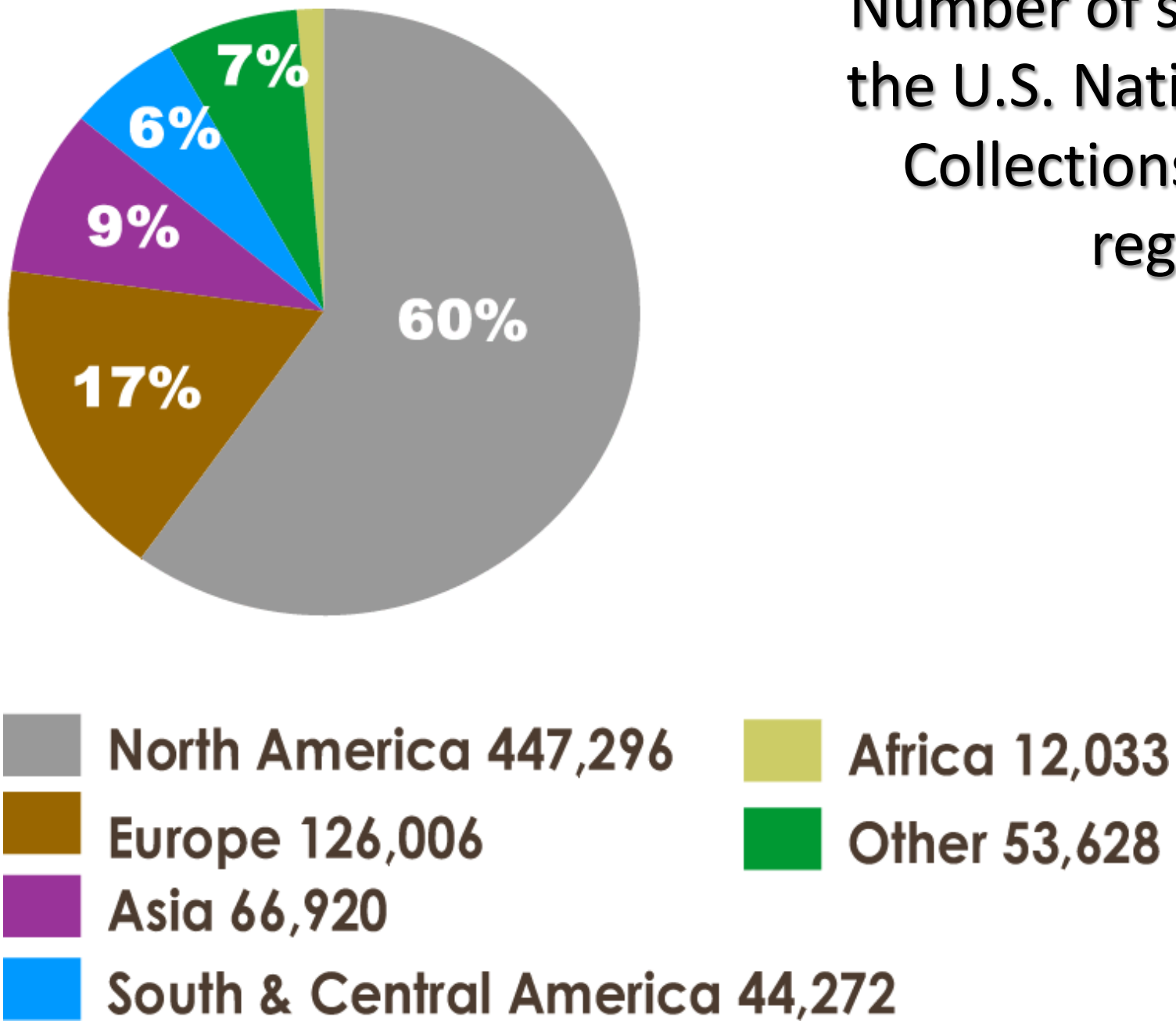
Why keep/study herbarium specimens?

- “time capsule” of genetic information of extinct and extant organisms.
- changes in genetic structure of “old” versus “new” populations
- resolve disputes about taxonomy, nomenclature, or phylogenetics
- track of origins of populations and historical epidemics
- reference material for future work and validation by others.



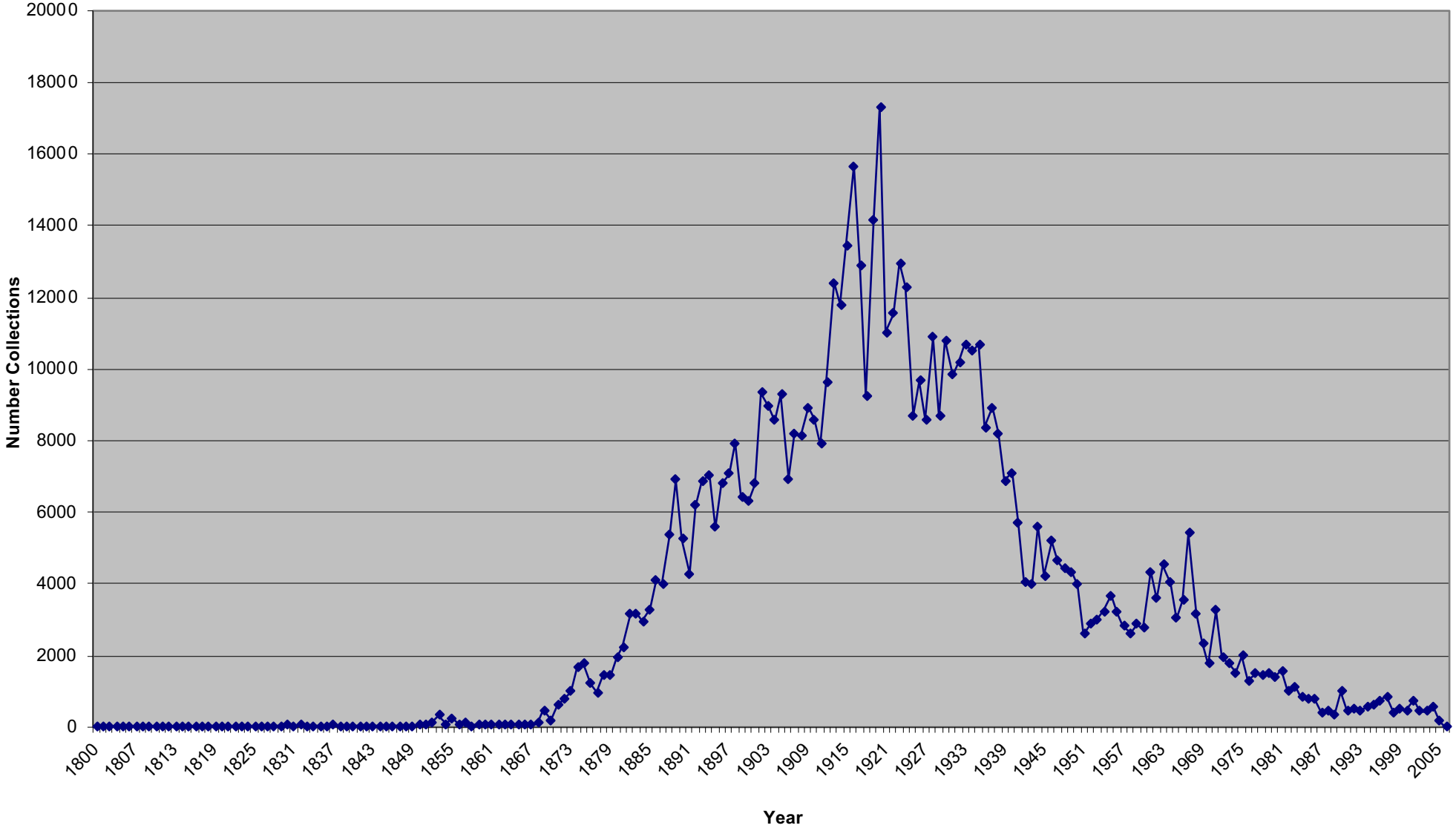
Number of fungal specimens by major group represented in the U.S. National Fungus Collections

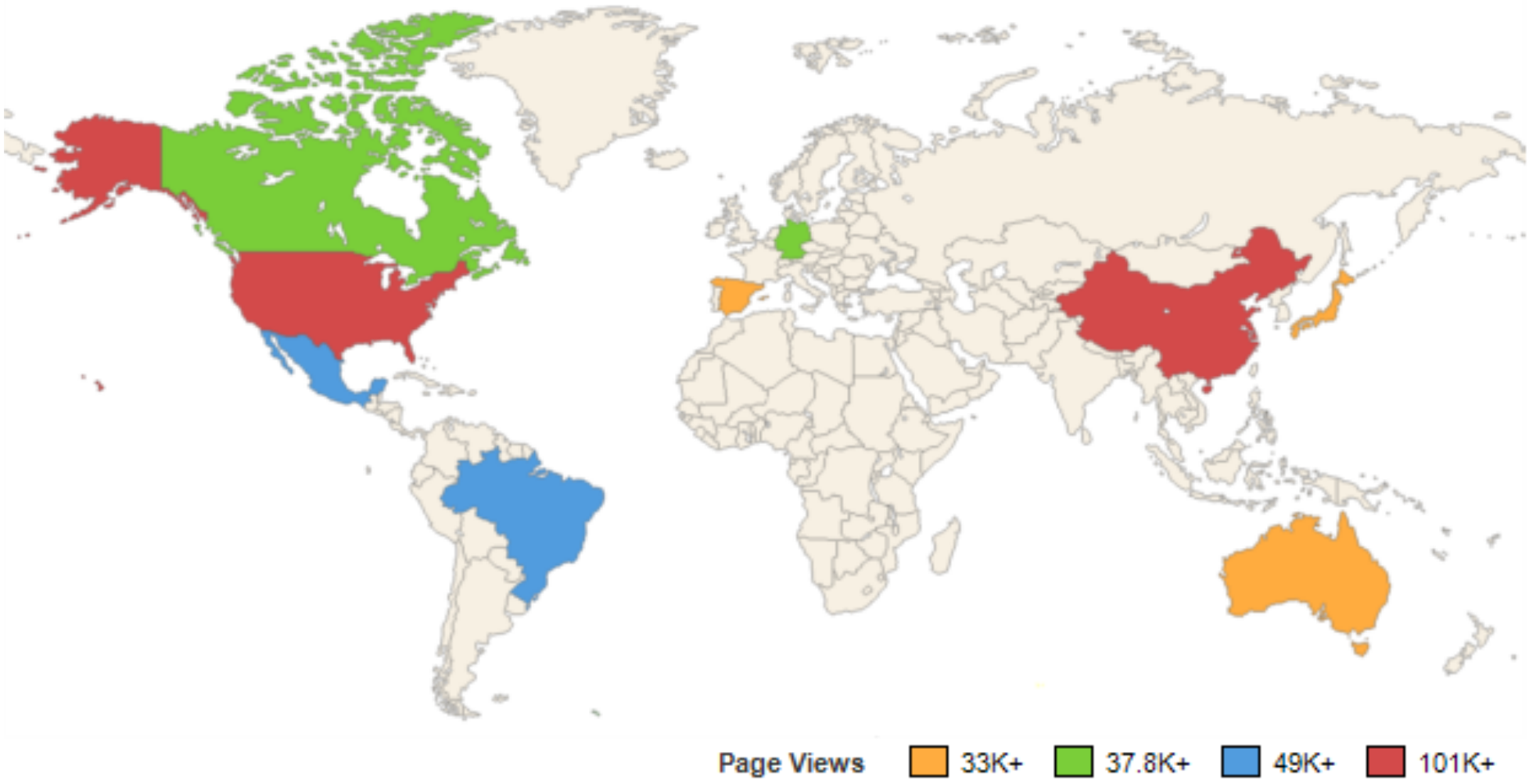
- Basidiomycota - Uredinales 184,437
- Basidiomycota - Ustilaginales 20,777
- Basidiomycota - Polyporales 96,889
- Basidiomycota - other 121,746
- Ascomycota 172,061
- Anamorphic fungi - Coelomycetes 67,031
- Anamorphic fungi - Hyphomycetes 57,034
- Others 30,214

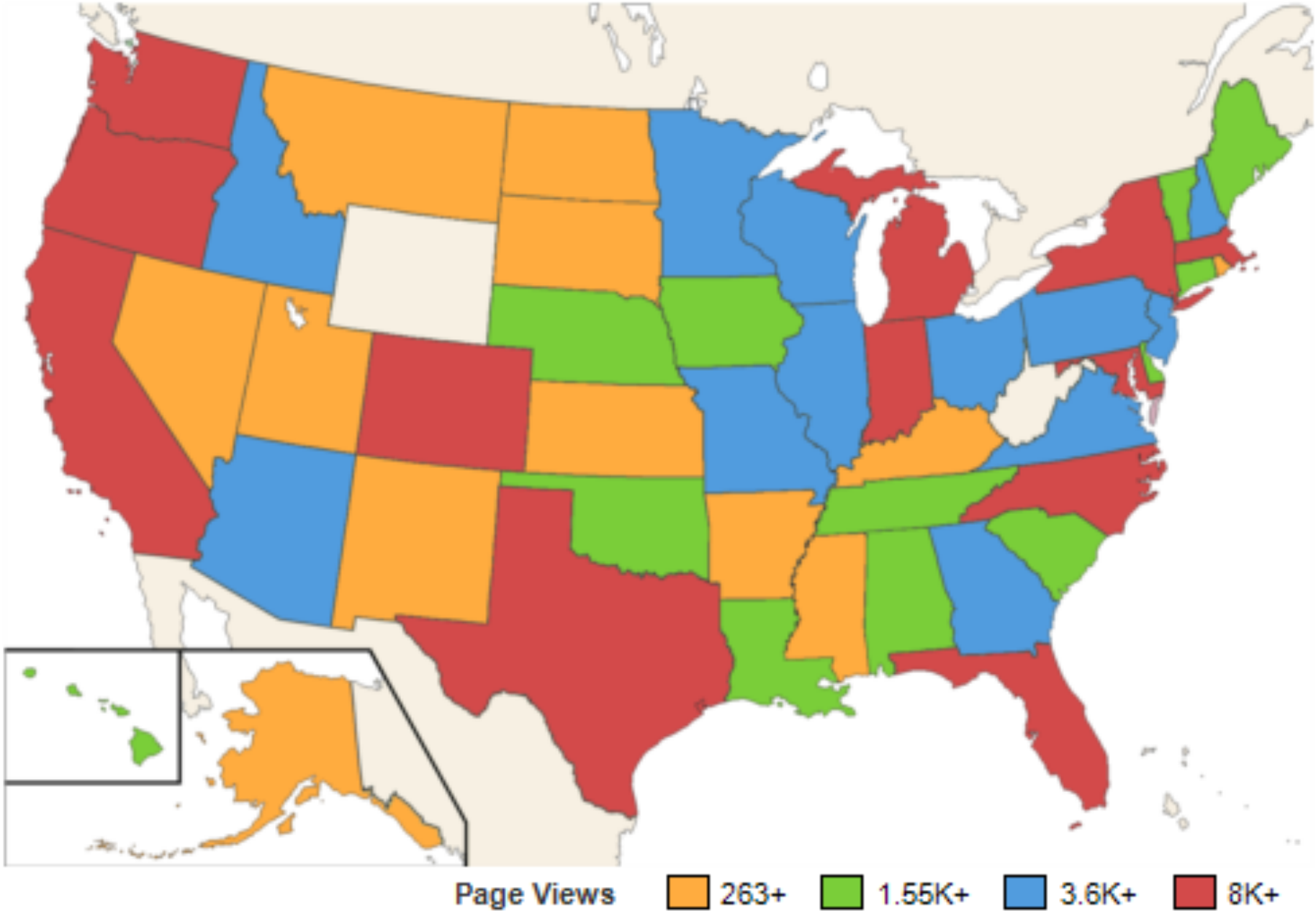


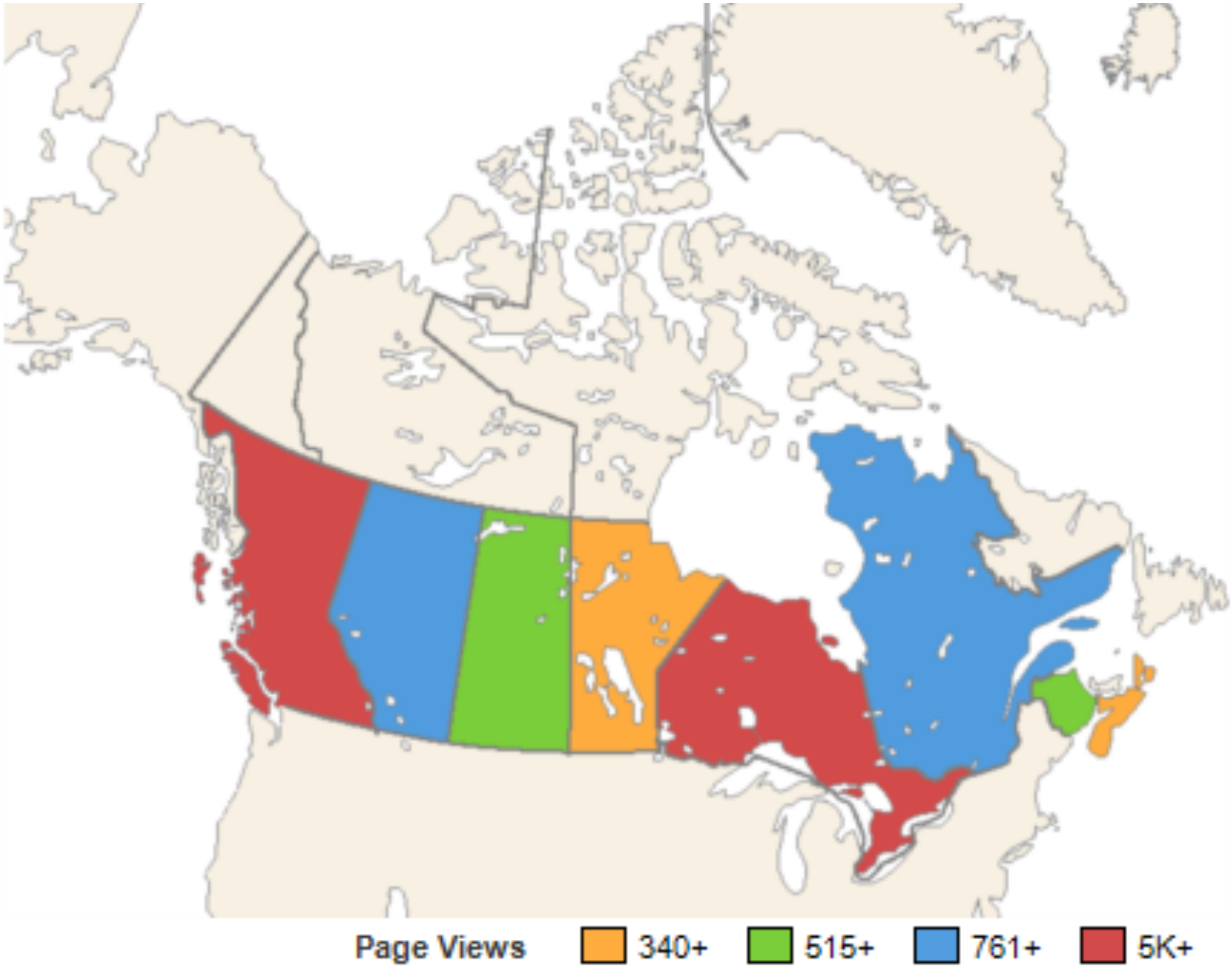
Number of specimens in the U.S. National Fungus Collections by major region

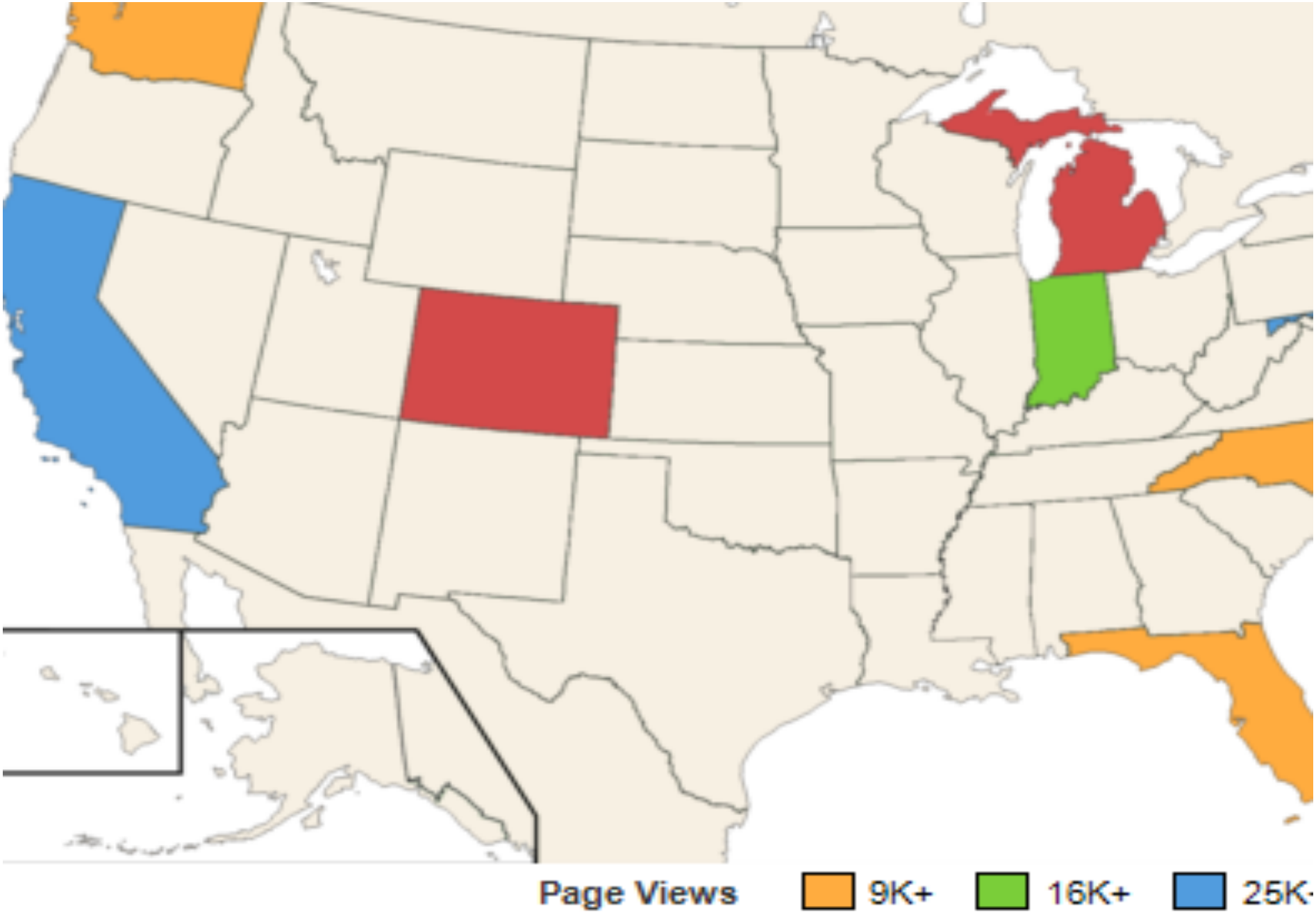
Number of collections by date

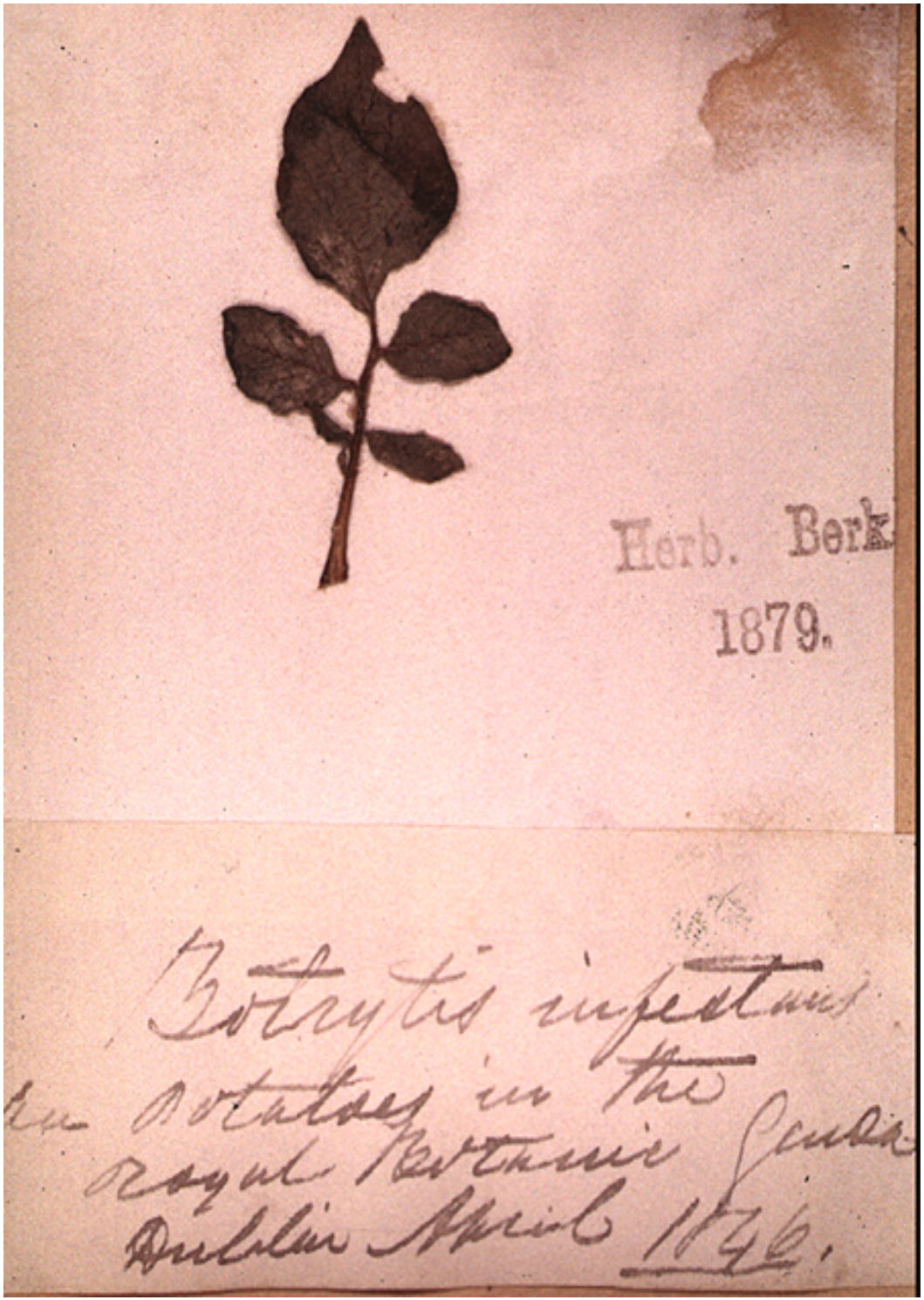



Page Views
33K+
37.8K+
49K+
101K+


Page Views
263+
1.55K+
3.6K+
8K+


Page Views
340+
515+
761+
5K+


Page Views
9K+
16K+
25K-



Oldest Irish potato sample infected with *P. infestans* from the Great famine

Lisa Castlebury, Research Interests & Expertise

- Director of the U.S. National Fungus Collections
  - Fungal specimen imaging: smuts & rusts
- Fungal systematics & taxonomy:
  - Rusts
  - Smuts
  - Diaporthales
- Nomenclatural resolution of fungi affected by 1F=1N

Duellman, et al 2019. *Diaporthe gulyae*: the new pathogen on common buckwheat (Fagopyrum esculentum). Plant Health Progress. 1(1):70-72.

Aime et al. 2018. Competing sexual and asexual generic names in Pucciniomycotina and Ustilaginomycotina (Basidiomycota) and recommendations for use. IMA Fungus. 9(1):75-90.

Voglmayr et al. 2017. *Juglanconis* gen. nov. on Juglandaceae, and the new family Juglanconidaceae (Diaporthales). Persoonia: Molecular Phylogeny and Evolution of Fungi. 38(1):136-155.

Martin, et al. 2017. *Macruropyxis fulva* sp. nov., a new rust (Pucciniales) infecting sugarcane in southern Africa. Australasian Plant Pathology. 46(1):63–74.

Savchenko, et al. 2017. What causes flag smut of wheat? Plant Pathology. doi:10.1111/ppa.12657.

Demers et al. 2017. Rust fungi on *Panicum*. Mycologia. 109(1):1-17.

Catalina Salgado-Salazar, Research Interests & Expertise

- April 2019, started as USDA-ARS scientist
- Started research of tar spot of corn
- Interested in systematics of forest pathogens

Jo Anne Crouch, Research Interests & Expertise

- Downy mildew, grasses and specialty crops
- Old work: turfgrass pathogen diversity/taxonomy
- Boxwood blight

Boxwood blight

Malapi-Wight et al 2019. Global distribution of mating types shows limited opportunities for mating across populations of fungi causing boxwood blight disease. Fungal Genetics and Biology. https://doi.org/10.1016/j.fgb.2019.103246.

Leblanc, et al. 2019. SSRs identify limited genetic diversity across pathogen populations responsible for the global emergence of boxwood blight. Plant Pathology. 68(5):861-868.

Salgado-Salazaret al. 2018. Coccinonectria pachysandricola, causal agent of a new foliar blight disease of Sarcococca hookeriana. Plant Disease. 103(6):1337-1346.

Leblanc et al2018. Boxwood blight: an ongoing threat to ornamental and native boxwood. Applied Microbiology and Biotechnology. 102(10):4371-4380.

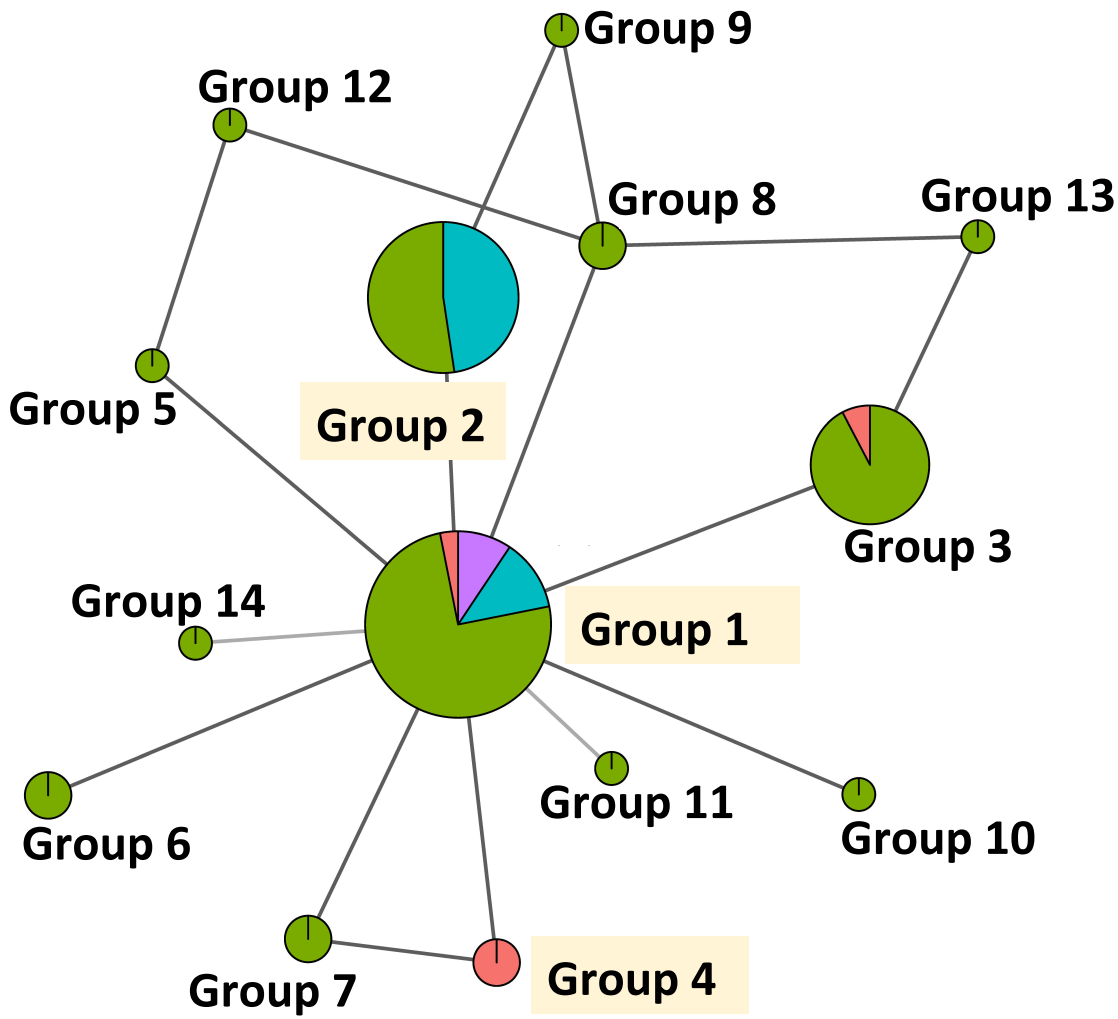
Crouch, J.et al 2017. Genome datasets for Calonectria henricotiae and C. pseudonaviculata causing boxwood blight disease and related species. Ag Data Commons. http://dx.doi.org/10.15482/USDA.ADC/1410184.

Malapi-Wight et al 2016. LAMP detection assays for boxwood blight pathogens: a comparative genomics approach. Scientific Reports. doi: 10.1038/srep26140.

Malapi-Wight et al . 2016. Sarcococca blight: Use of whole genome sequencing as a strategy for fungal disease diagnosis. Plant Disease. 100(6):1093-1100.

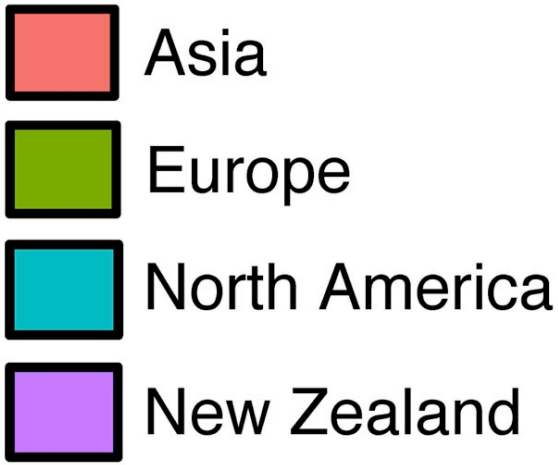
Gehesquière et al. 2015. Characterization and taxonomic re-assessment of the box blight pathogen Calonectria pseudonaviculata, introducing Calonectria henricotiae sp. nov. Plant Pathology. DOI.org/10.1111/ppa.12401.

Global *Calonectria pseudonaviculata populations*: SSR genotypes



- 11 SSR markers
- 14 multilocus genotypes from 234 isolates

Colors represent proportion of isolates in each group from Asia, Europe, North America, or New Zealand.



Multilocus SSR genotypes generated from *Calonectria pseudonaviculata* and *C. henricotiae*.

Group	# strains	Oldest strain	0368 CAA	2683 CTGCT	2134 GAGCAT	1281 CAGCA	1816 GAA	4152 CA	0610 AAC	2373 TTCA	0662 AC	1455 AC	1647 ACA
C. pseudonaviculata													
G1	134	1998	18	10	13	14	17	13	19	12	18	13	14
G2	71	2005	18	12	13	14	17	13	19	12	18	13	14
G3	29	2005	18	10	13	14	17	13	19	12	16	13	14
G4	25	2012	18	10	13	14	17	13	25	12	18	13	14
G5	7	2010	18	10	13	14	18	13	19	12	18	13	14
G6	2	2001	18	10	13	14	17	13	19	12	18	13	15
G7	3	2005	18	10	13	14	17	13	20	12	18	13	14
G8	2	2010	18	10	13	15	17	13	19	12	18	13	14
G9	2	2012	18	12	13	15	17	13	19	12	18	13	14
G10	1	2006	18	10	13	14	17	13	19	6	18	13	14
G11	1	2009	17	10	13	14	17	13	19	12	18	14	14
G12	1	2010	18	10	13	15	18	13	19	12	18	13	14
G13	1	2010	18	10	13	15	17	13	19	12	16	13	14
G14	1	2011	18	10	12	14	17	14	19	12	18	13	14
C. henricotiae													
G1	35	2005	15	9	5	7	10	16	25	7	18	8	9
G2	1	2011	15	9	5	7	10	16	0	7	18	8	9

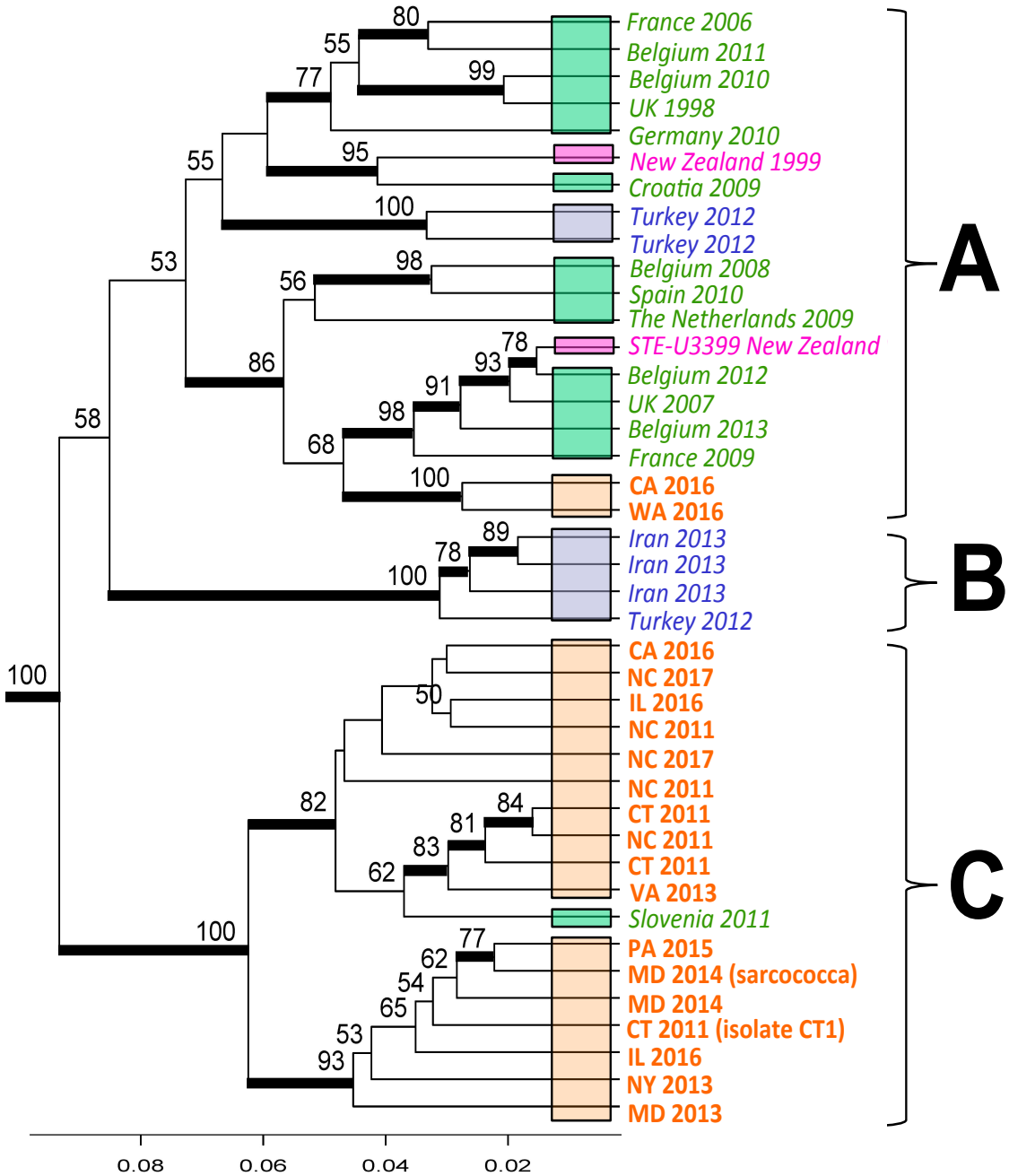
- One allele difference out of 11 loci = 9% difference
- G11 and G14, have two different alleles relative to the G1 group (i.e. 18% difference).

Bi-allelic SNPs from sequenced *Cps* isolates

- 68 *Cps* sequenced to date
- 1,365 bi-allelic SNPs identified (<0.002% of approx. 54 Mb genome)
- 226 (~16%) are within coding sequences of predicted genes
- 562 SNPs considered informative, based on being present in >2 individuals

Shown: SNPs mapped to 22 of 27 contigs of *Cps* CT1 reference genome. (Not to scale)

Differentiation of *Cps* using 1,365 bi-allelic SNPs

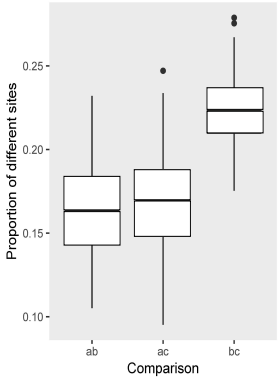


Pop A versus other pops:

223-229 SNPs

Pop B versus Pop C:

305 SNPs



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