

CPBG



Applied DNA Barcoding in Plants

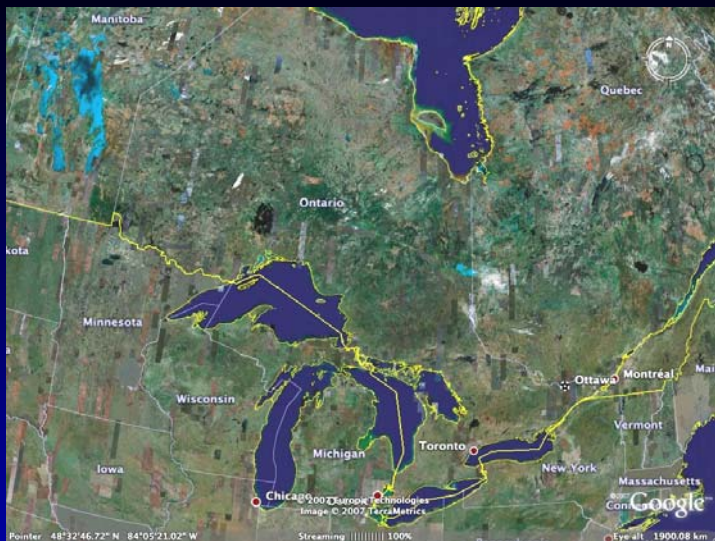


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Taxonomic Applications: Barcoding a regional flora

Taxonomic group	Flora of Canada	Flora of Ontario
Lichens	2500	700
Bryophytes, ferns	1100	810
Gymnosperms	34	15
Flowering plants	3800	3400

Number sources:
CANM; FOIBIS - BIO

- 3 samples / species
 - Photograph
 - Herbarium
 - DNA voucher
 - BOLD
- 450 species (10%)
- 540 DNA extractions

Taxonomic applications: Barcoding a local flora

- Koffler Scientific Reserve (University of Toronto)
 - Basic research (~ 40 papers since 1999)
- ~ 600 species
 - Biodiversity
 - Seedlings
 - Seed banks
 - Invasive & rare
 - Hybrids



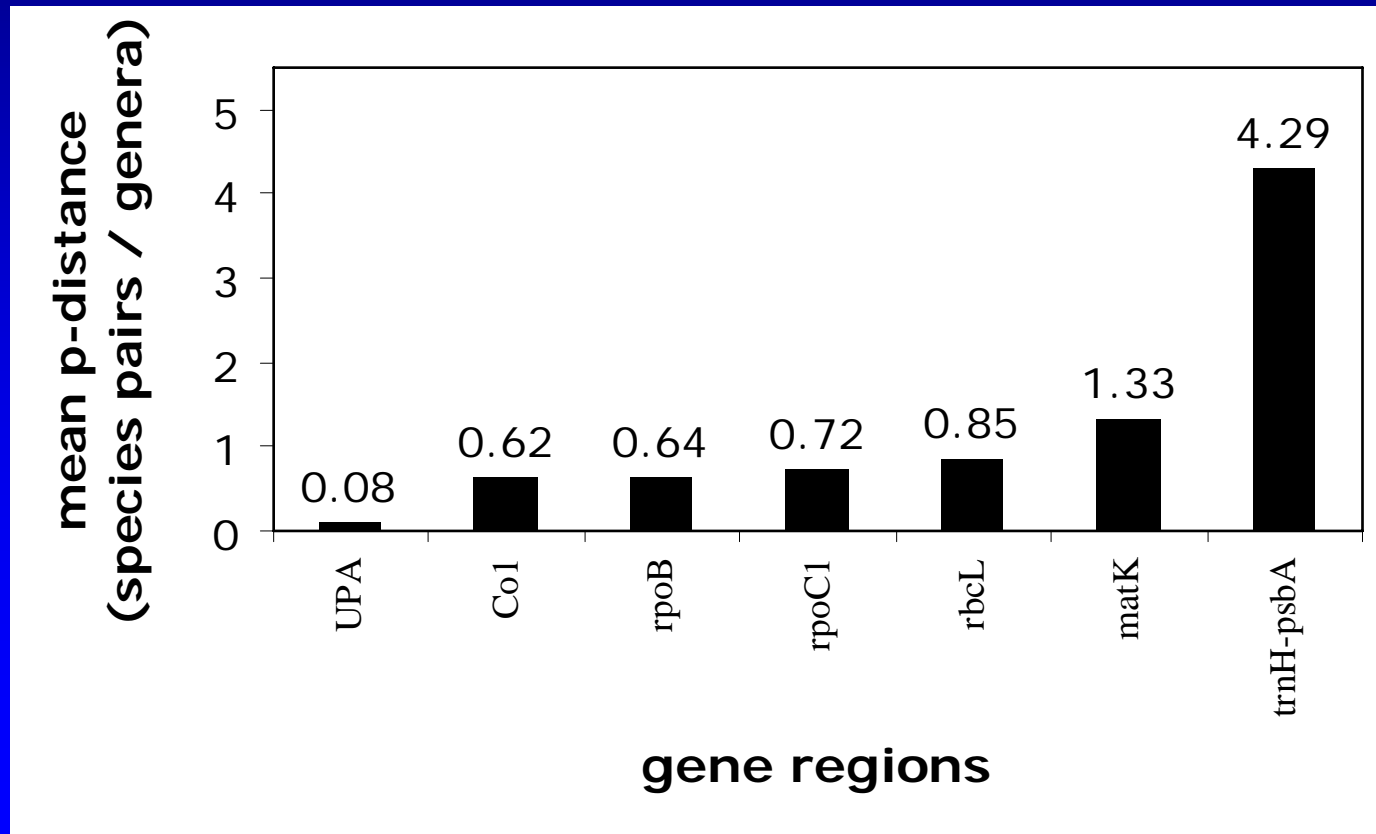
Barcoding a local flora

- 3 samples / individual
 - Photograph
 - Herbarium (KSR, ROM, BIO)
 - DNA voucher - “Type”
 - BOLD
- 370 species (~ 62%)
- 350 DNA isolations



Barcoding regional & local floras

- Barcode evaluation and analysis

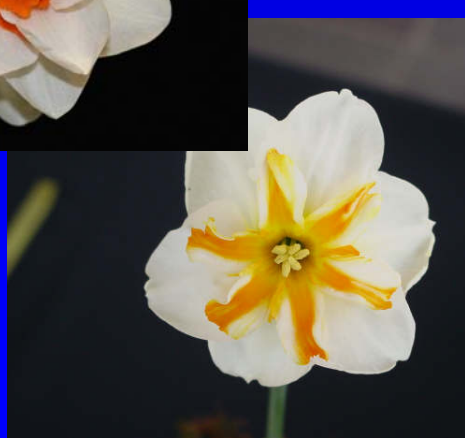


Taxonomic applications: Barcoding Horticultural taxa

- Horticultural industry has identified an number of needs
 - Verifying cultivated lineages
 - Determining parentage of material in breeding programs
- Taxonomically complex groups (TCG's)
- Cultivated varieties derived from native species
 - Clones
 - Polyploids
 - Inter- or intra-specific hybrids

Barcoding Daffodils (*Narcissus*)

- Cultivated varieties (13 divisions)
 - species, clones, hybrids, polyploid taxa



Barcoding Daffodils (*Narcissus*)

- Most important bulb crop worldwide





Utility of DNA barcodes

- Daffodil Industry
 - Cultivar confirmation
 - Bulb identification
 - Importers / exporters of bulbs (\$)
- Plant breeders
 - Parentage of unknown hybrids or cultivars that have desired traits
 - Identifications of seedlings/bulbs
- Garden Enthusiasts
 - Flower shows & festivals



Barcoding Daffodils (*Narcissus*)

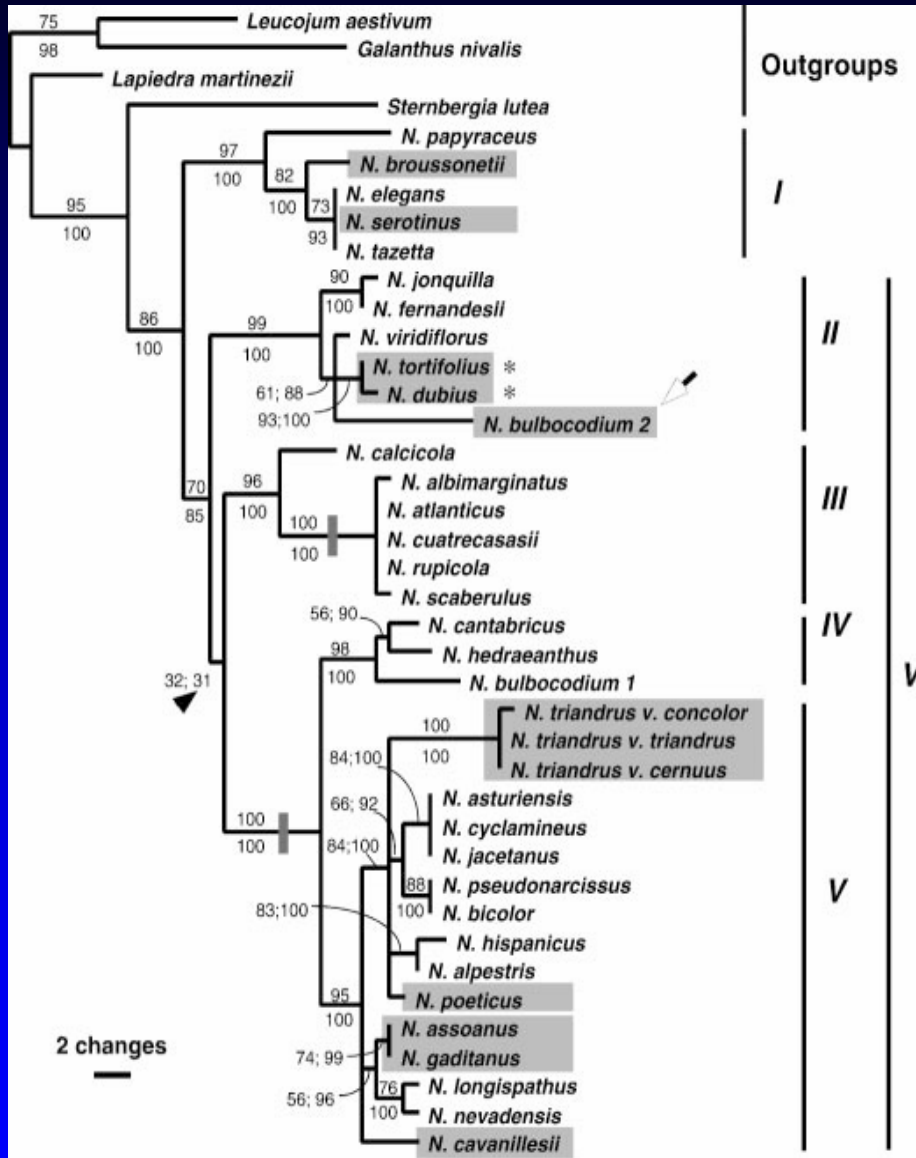


Botanical Gardens (RBG, TBG, MBG, NPBG, UBC)	102
Horticultural Industry (Virginia - importer / exporter)	141
University of Guelph Research Program	30
Master Gardeners / flower shows	36

Barcoding *Narcissus*

- 2 flowering plants / cultivar
 - Photograph
 - Herbarium (BIO)
 - DNA voucher - “Type”
 - BOLD
- 309 cultivars / species
 - Known provenance
 - Clones & polyploids
 - Hybrids and their parents
 - Unknowns
- DNA isolations initiated





- cpDNA barcodes
 - Non-coding (trnL-trnF)
 - Coding (ndhF)
- Cultivar identification
 - Inter-specific variation
 - Intra-specific variation
 - Parentage assignment
 - Unknown samples

Analysis

- Barcode each sample using regions described in the barcode evaluation report
- R&D to determine the utility of nuclear barcodes
- Clade-based testing at inter- intra-specific level
- Correlations of molecular results with morphometric analysis
 - Discriminant Function Analysis
- Determine parentage of cultivars of hybrid origin
 - Maximum likelihood analysis
- Multivariate analysis to comparing samples of unknown lineage with those of known provenance

Narcissus as a model for Barcoding in Industry

- Other Taxonomically Complex Groups
 - Ornamental Horticultural & Landscaping industry
 - Floriculture industry
 - Fruit & vegetable crop industry
 - Crop science research

Taxonomic Applications: Barcoding plant collections

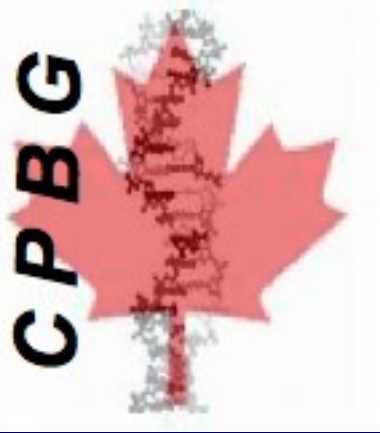
- Botanical Garden & Arboreta community have identified a number of needs
 - Verification of contemporary collections
 - Tracking the provenance of historical collections
 - Identification of collections of unknown provenance
- Public interest and interpretative potential

Barcoding plant collections

- Collections management
 - Royal Botanical Gardens
 - Toronto Botanical Gardens
- *Narcissus* model
 - Verifying
 - Unknowns
- Lilacs



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Acknowledgements



- Royal Botanical Gardens, Hamilton
- Toronto Botanical Gardens
- Niagara Parks Botanical Gardens
- UBC Botanical Gardens
- Montreal Botanical Gardens
- Brent & Becky's Bulbs, Gloucester, Virginia
- Mid-Atlantic Daffodil Show, Gloucester, Virginia
- Master Gardeners of Guelph
- Ontario Ministry of Natural Resources
- Parks Canada
- University of Guelph
- Royal Ontario Museum
- Koffler Scientific Reserve
- University of Toronto