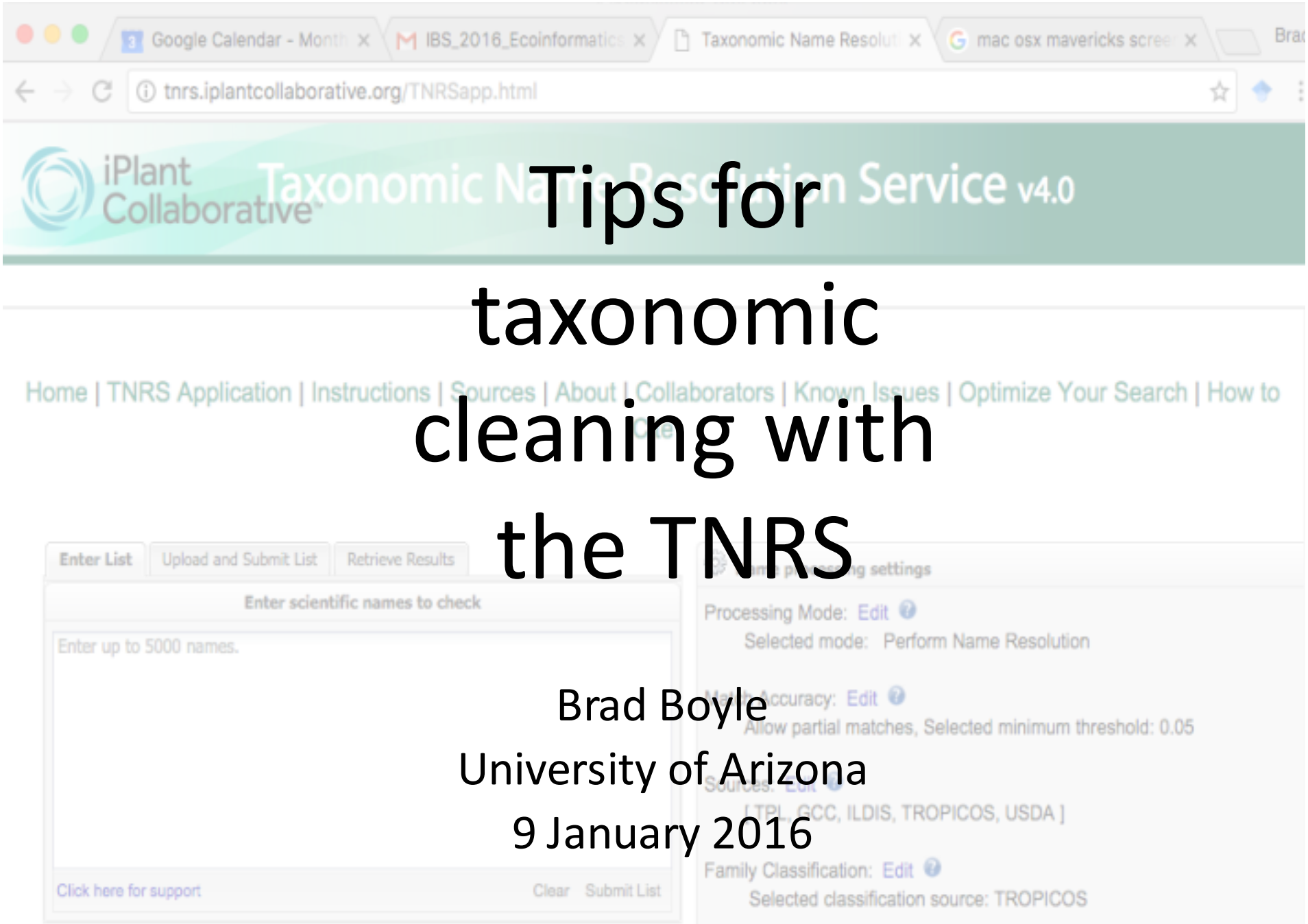

Tips for taxonomic cleaning with the TNRS

Brad Boyle
University of Arizona
9 January 2016

Taxonomic cleaning

- Why bother?
- Taxonomic scrubbing applications
- General glitches and gotchas
- TNRS glitches and gotchas
- Pre-processing
- Post-processing
- Understanding the output

Taxonomic cleaning: why bother?

Widespread tropical tree

Hieronyma oblonga

Taxonomic cleaning: why bother?

Widespread tropical tree

Hieronyma oblonga

Synonym of *Hieronyma oblonga*, once thought to be endemic to Costa Rica

Hieronyma poasana

Taxonomic cleaning: why bother?

Widespread tropical tree

Hieronyma oblonga

Common misspellings of *Hieronyma oblonga*

Hyeronima oblonga
Hieronima oblonga

Synonym of *Hieronyma oblonga*, once thought to be endemic to Costa Rica

Hieronyma poasana

Why bother?

Table 5 Total names within two plant taxonomic databases before and after name resolution using the TNRS

Name source	Original names	After matching by TNRS	After matching & synonym conversion by TNRS
NCBI	99743	97734	90142
ITIS	46483	45960	45025
NCBI+ITIS (shared names)	4412	19935	20670
NCBI+ITIS (total unique names)	141814	123759	114497

10% “bad” names

Boyle *et al. BMC Bioinformatics* 2013, **14**:16
http://www.biomedcentral.com/1471-2105/14/16

BMC Bioinformatics

SOFTWARE Open Access

The taxonomic name resolution service: an online tool for automated standardization of plant names

Brad Boyle[1,2*], Nicole Hopkins[2,3], Zhenyuan Lu[2,4], Juan Antonio Raygoza Garay[2,3], Dmitry Mozzherin[5], Tony Rees[6], Naim Matasci[1,2,3], Martha L Narro[2,3], William H Piel[7], Sheldon J Mckay[2,3,4], Sonya Lowry[2,3], Chris Freeland[8], Robert K Peet[9] and Brian J Enquist[1,10]

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Overlap between databases only 3%!

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400% increase in overlap

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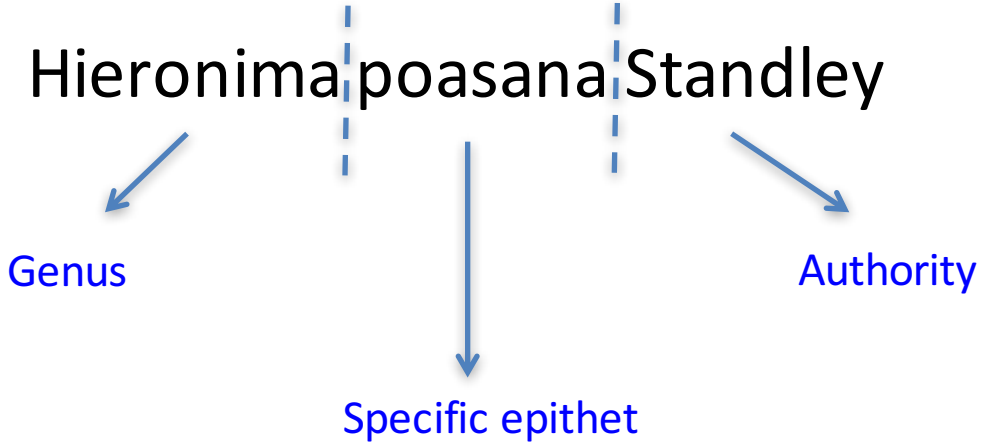
Taxonomic cleaning applications

- TNRS
  - (http://tnrs.iplantcollaborative.org/index.html)
- TaxonStand
  - http://onlinelibrary.wiley.com/doi/10.1111/j.2041-210X.2012.00232.x/full
- Global Name Resolver
  - http://resolver.globalnames.org/
- PlantMiner
  - http://www.plantminer.com/
- Many others…

General architecture

- **Name parser**
  - Breaks up and classifies name components



General architecture

- **Name resolver**
  - Matches the name to reference database
  - Tries fuzzy matching if exact match fails

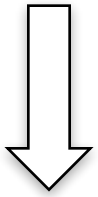
Misspelled Hieronima poasana Standley

Correct spelling (as published) Hieronyma poasana Standl.

General architecture

- **Taxonomic status & synonym conversion**
  - Some applications do no do this last step

Synonym — Hieronyma poasana Standl.



Currently accepted name — Hieronyma oblonga (Tul.) Müll. Arg.

Example workflow with TNRS API

- **Script**: tnrs_api_example.R
- **Steps:**

1. Extract the names
2. Turn into a string separated by commas
3. URL-encode and send to the TNRS API
4. Convert the returned JSON to data frame
5. Update your names

Pros and Cons of TNRS API

- **Advantages**
  - Fast, simple, fully automated
- **Disadvantages**
  - Can't adjust all settings available in web interface
  - Uses Tropicos as only source
  - Can't take advantage of web interface to inspect results, choose alternative matches and research names
  - Can't access download options available in web interface
  - Parse-only option not available

Example basic workflow with TNRS web interface

- **Script**: tnrs_gui_example.R
- **Steps**:

1. Extract names to CSV file with two columns: Unique ID & names
2. Upload to TNRS using bulk "Upload and Submit List" tab, checking box "My file contains an identifier as first column"
3. Adjust name processing settings and submit
4. Inspect results online, selecting alternate matches if appropriate
5. Download results, using options: Best matches only, Detailed results, UTF-8 format
6. Import TNRS results as tab-delimitted file
7. Remaining processing as for API

Pros and Cons of TNRS Web Interface

- **Disadvantages**
  - Not fully automated
- **Advantages**
  - Can adjust name resolution settings
  - More name resolution sources
  - Use web interface to inspect results, choose alternative matches and research names
  - Select and download alternative matches on the fly
  - More download options, including "All matches" (useful if you don't like how TNRS chooses best match and want to script it yourself)
  - Parse-only more (useful for comparing part of original name to matched name)

TNRS Tips & Gotchas

- Tip: Pre-pend family to name to prevent matching similar names in different families
- Gotcha: If you want to use The Plant List, *always* select TPL + ILDIS + GCC together
- Tip: Research any name where Taxonomic Status <> Accepted or Synonym
- Gotcha: Even accepted names can be wrong!

Taxonomic Status

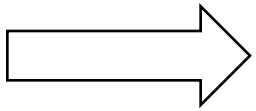
Taxonomic Status refers to the **Matched Name**

- **Accepted:** Good to go!
- **Synonym**: Good to go, as long as accepted name supplied
- **No opinion**: Could be good or bad name. RESEARCH IT
- **Invalid**: Never validly published. DON'T USE
- **Illegitimate**: Violates nomenclatural rules. DON'T USE
- **Rejected name**: Rejected by nomenclatural committee. DON'T USE
- **Misapplied name**: Commonly misapplied to the the wrong species. May or may not be correct. RESEARCH IT

Even accepted names can be wrong!

Name submitted	Tropicos	The Plant List
Henriettea fascicularis	=Henriettella fascicularis	=Henriettella fascicularis
Henriettea ramiflora	Accepted	Accepted
Henriettea succosa	Accepted	Accepted
Henriettella fascicularis	Accepted	Accepted
Henriettella tuberculosa	Accepted	=Henriettea tuberculosa

Actually, all belong in *Henriettea*



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Henrietteeae (Melastomataceae): A New Neotropical Berry-Fruited Tribe

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