Taxonomic concept mapping in support of floristic studies

OregonFlora

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Introduction

Scientific names are the language used to convey taxonomic concepts. As a part of preparing a flora for the state of Oregon, we have developed a database framework to capture the taxonomic concepts encountered. A taxonomic concept, represented by a number, encompasses all scientific names associated with that concept, whether it is the currently accepted name or a synonym. Described here is our method of handling scientific names that have been described in other regional floras and represent more than one concept in our flora.

In the example below, *Balsamorhiza hookeri* was inadvertently used in the Peck Manual (1961)[1] to describe morphologies for two taxa discerned in the *Oregon Vascular Plant Checklist (2017)*[2], *B. incana* and *B. hookeri*. For this reason, any use of *B. hookeri* applied on collections, photos, or references could either represent *B. hookeri* as intended in the Oregon Checklist, *B. hookeri* as applied in the Peck Manual, or *B. incana.* Because it is usually not apparent which reference a botanist used to make an identification, or which taxonomic concept a scientific name was used to convey, a process is needed to handle these ambiguities along with a data structure to house them.

One species or two?

B. hookeri
Oregon
Vascular Plant
Checklist,
2017

B. incana,
Oregon
Vascular Plant
Checklist, 2017

B. hookeri Peck Manual, 1961

Photos by Gerald and Robert Carr
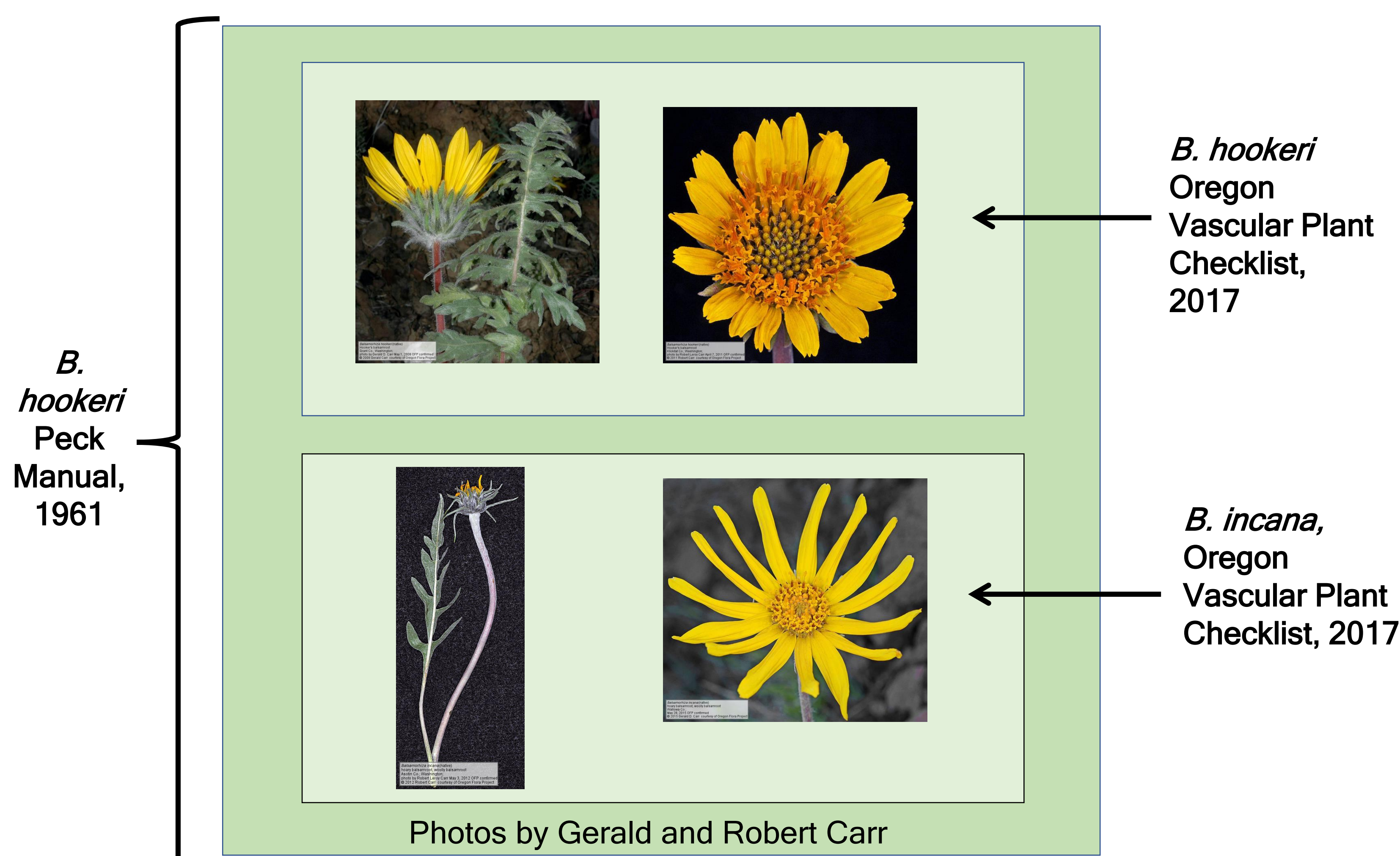
Data structure to handle ambiguities

In the database of names and concepts, *B. hookeri* has two taxonomic concepts assigned to it. The name is accepted in our flora, but it is has also been misapplied to *B. incana in the Peck Manual*. Any data entry performed to capture occurrences, photos or literature using this name must be manually assessed in a later step to determine which taxonomic concept is appropriate for the record. Therefore, a series of acronyms are used to represent the possible ways the ambiguity could be resolved. Below is a snapshot of the acronyms involved in this ambiguity.

Taxon	Ambiguity Code	Acronym	Nomenclatural Status	Concept Number
Balsamorhiza hookeri Nutt.	8	BALHOO1	Accepted	570
Balsamorhiza hookeri Nutt.	8	BALHOO7	Ambiguous	99999
Balsamorhiza hookeri Nutt.	8	BALHOO7-	Ambiguous	99999
Balsamorhiza hookeri Nutt.	8	BALHOO7BALINC	Misapplied	576
Balsamorhiza incana Nutt.		BALINC	Accepted	576

Acronym Categories Defined

Unresolved ambiguity: Acronyms available for data entry

- Ending in 7 (BALHOO7): Dropdown lists with acronyms for data entry of ambiguous names only include the acronym in an ambiguous cluster (in this case #8) that ends in 7. This denotes an untranslated, or unprocessed, ambiguity; that is, a scientific name without a resolved taxonomic concept.

Resolved ambiguity: Acronyms available for the resolution of scientific names into taxonomic concepts

The Oregon database stores several hundred thousand instances where scientific names are applied. Periodically, records with names identified as ambiguous (ending in a 7) are investigated and resolved where possible. The following are the types of acronyms in each ambiguous cluster, using *Balsamorhiza hookeri* as an example.

- **Ending in 1 (BALHOO1):** Represents instances where the ambiguous name is resolved as itself, but in the sense represented in the Flora of Oregon Checklist, 2017 (as true *B. hookeri*)
- **Ending in the acronym for a different taxon (BALHOO7BALINC):** Represents instances where *B. hookeri* has been applied to a record that really represents what we now call *B. incana*.
- **Ending in 7- (BALHOO7-):** Indicates that the record is unresolvable.

Resolution of ambiguities in the dataset

Since scientific names are the language used to convey taxonomic concepts, we need to ensure that the taxonomic concepts further define the scientific names in order to insure the accuracy of all data points arising from the use of these names. In this way, distribution maps, photo galleries and morphological data supporting interactive keys are curated and are not susceptible to the confusion caused by these ambiguities.

The image above shows a data entry form intended for the resolution of ambiguous names that were databased in a previous step, specifically field photos of *Balsamorhiza hookeri* (BALHOO7). All occurrence, photo and literature research records for this name are originally entered using the acronym ending in a '7', indicating that the name requires further checking and resolution in a later step.

This form allows someone informed of the nature of the ambiguity to view cursory information about each ambiguous record and select from a drop down list of acronyms within the ambiguous cluster, to 'disambiguate' each record if possible, using the acronyms defined in the previous column.

1. Peck, M. 1961. *A Manual of the Higher Plants of Oregon, 2nd edition*. Binfords & Mort Publishers, Portland, Oregon.
2. Jaster, Thea, Stephen C. Meyers and Scott Sundberg, eds. 2017. Oregon Vascular Plant Checklist. http://oregonflora.org/checklist.php.Version 1.7.