

# Taxonomic Insights from a Comprehensive Review of *Antennaria* (Asteraceae) in British Columbia

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March 6, 2019



# Context of Study

- Context of Study
- The genus *Antennaria*
- *Antennaria media-alpina* complex
- *Antennaria pulvinata*

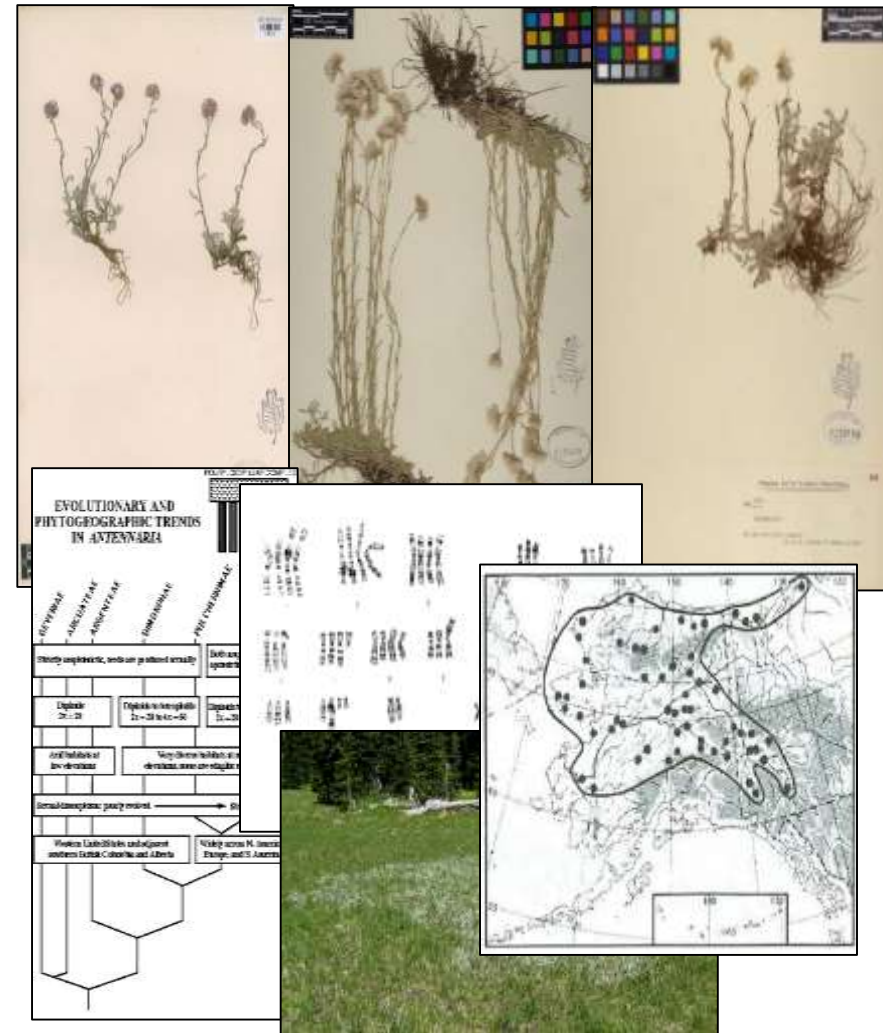


# Context of Study

Traditional taxonomic study of morphological variation within the genus ( $\alpha$ -taxonomy)

Integrative Taxonomy

Testing alternative taxonomic approaches directly on specimens



# Context of Study



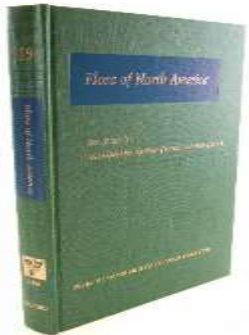
***Randall J. Bayer***

Publ. 1981-2000  
(2006)



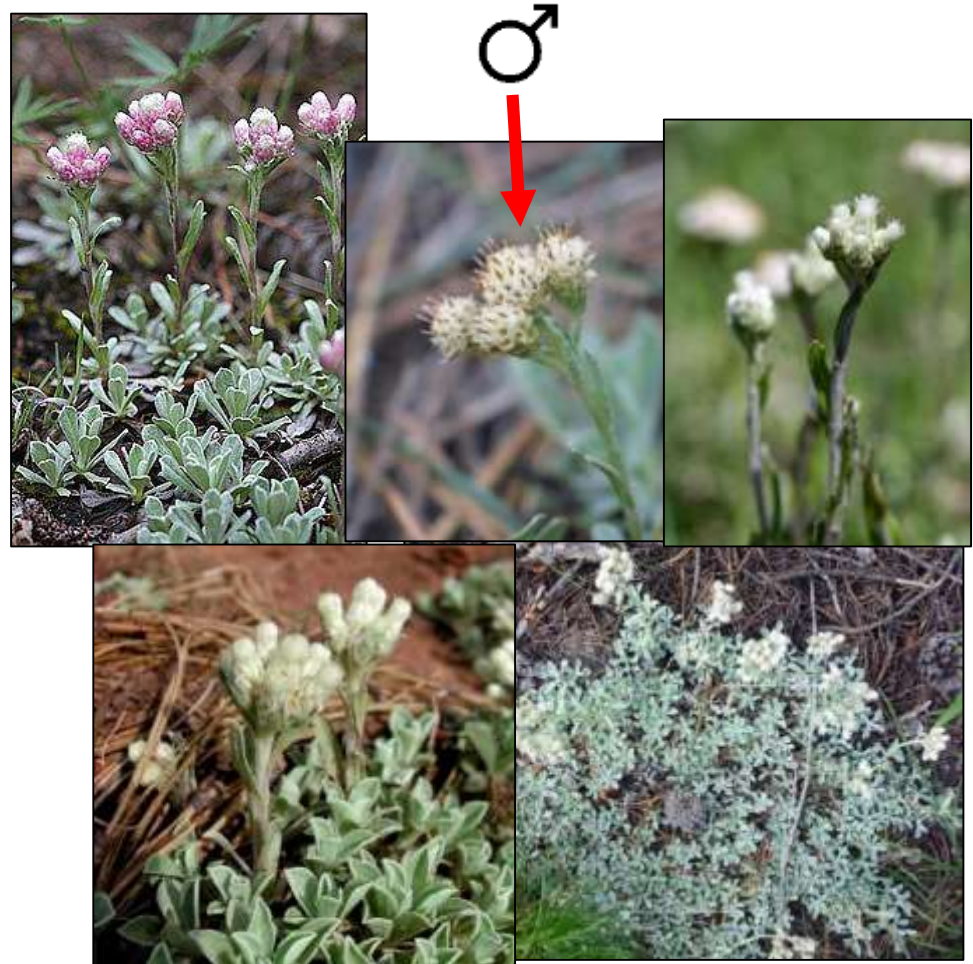
***Jerry Chmielewski***

Publ. 1986-2006



# The Genus *Antennaria*

- dioecious perennials
- c. 45 species worldwide; c. 34 species in North America
- 1700+ specimens reviewed



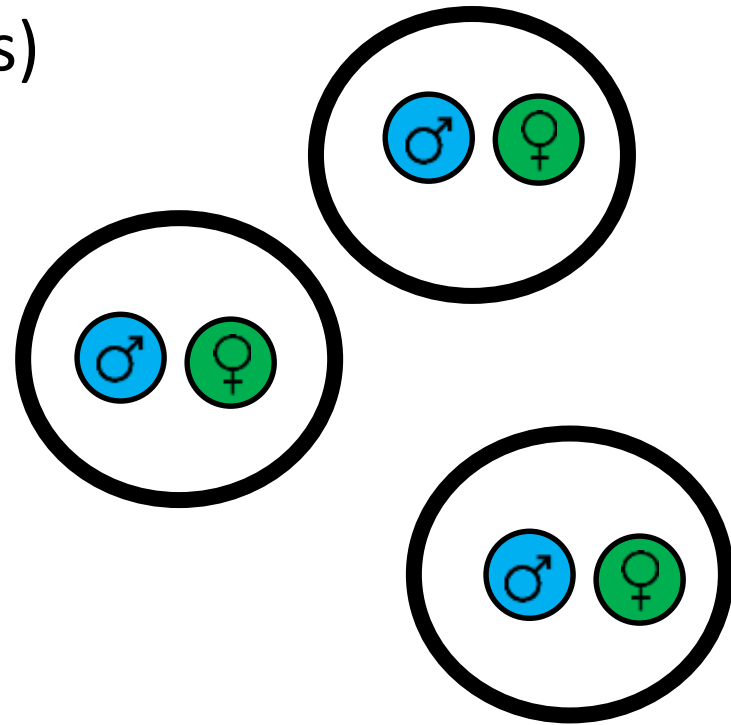
# The Genus *Antennaria*

- Hybridization
- Polyploidy
- Apomixis
  
- Poorly-defined species limits
- Overlapping species concepts



# The Genus *Antennaria*

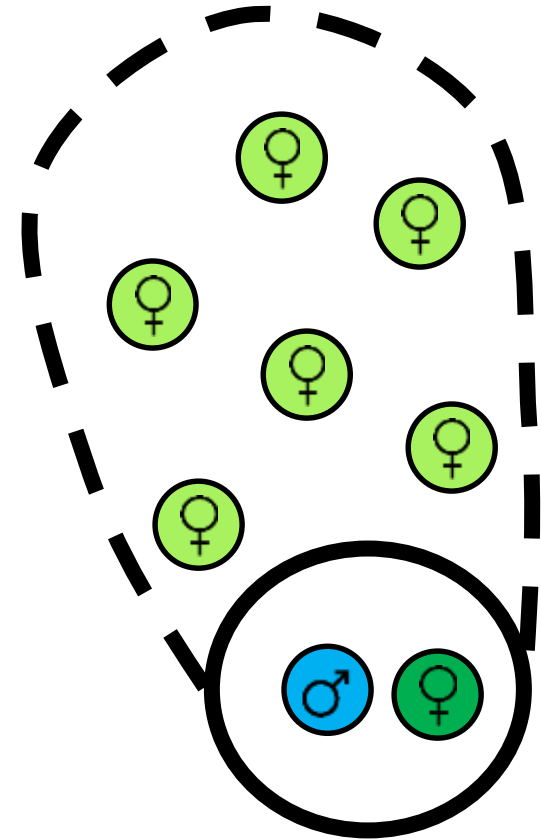
- Sexual diploids (tetraploids)



# The Genus *Antennaria*

- Sexual diploids (tetraploids)
- Sexual in some regions, apomictic in others

**AUTOPOLYPLOID**





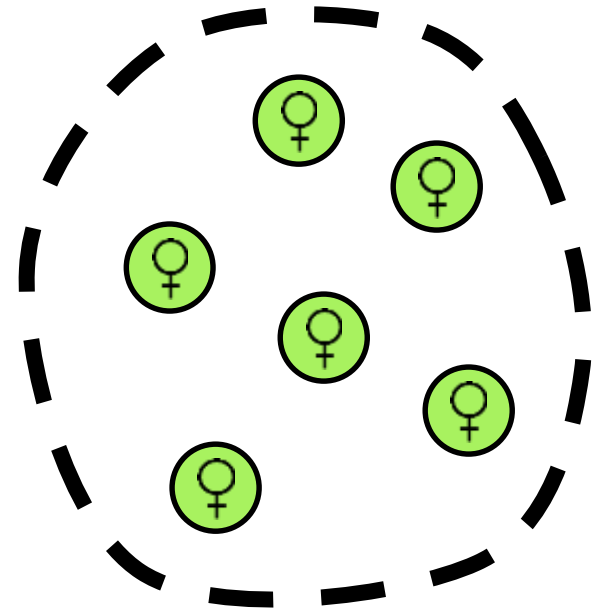
# The Genus *Antennaria*

- Sexual diploids (tetraploids)
- Sexual in some regions,  
apomictic in others

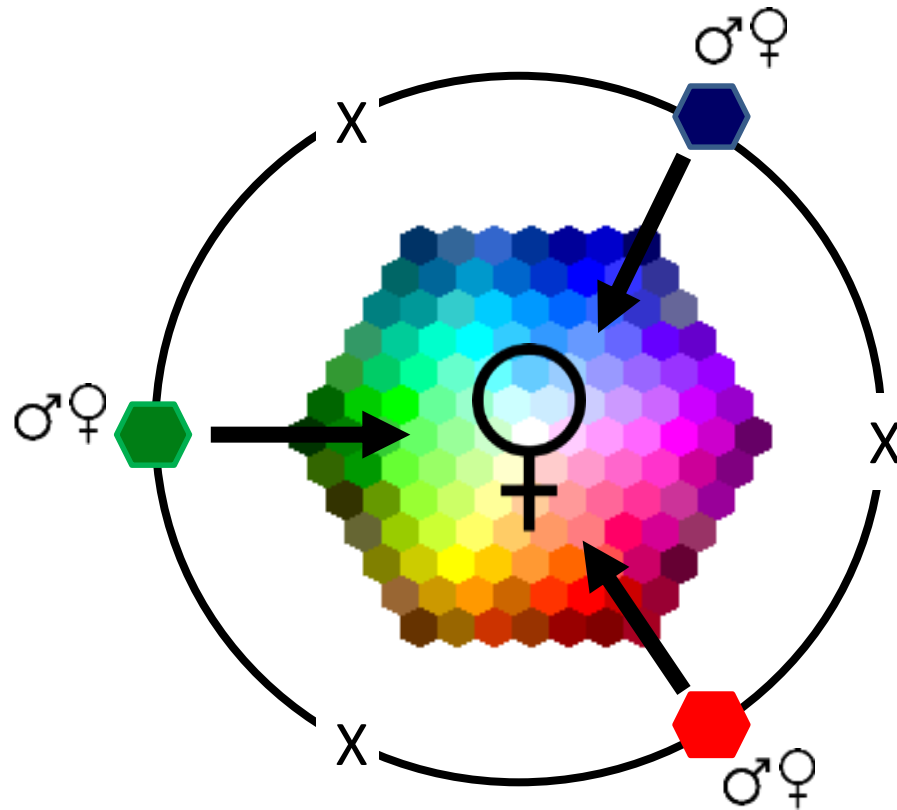
**AUTOPOLYPLOID**

- Fully apomictic

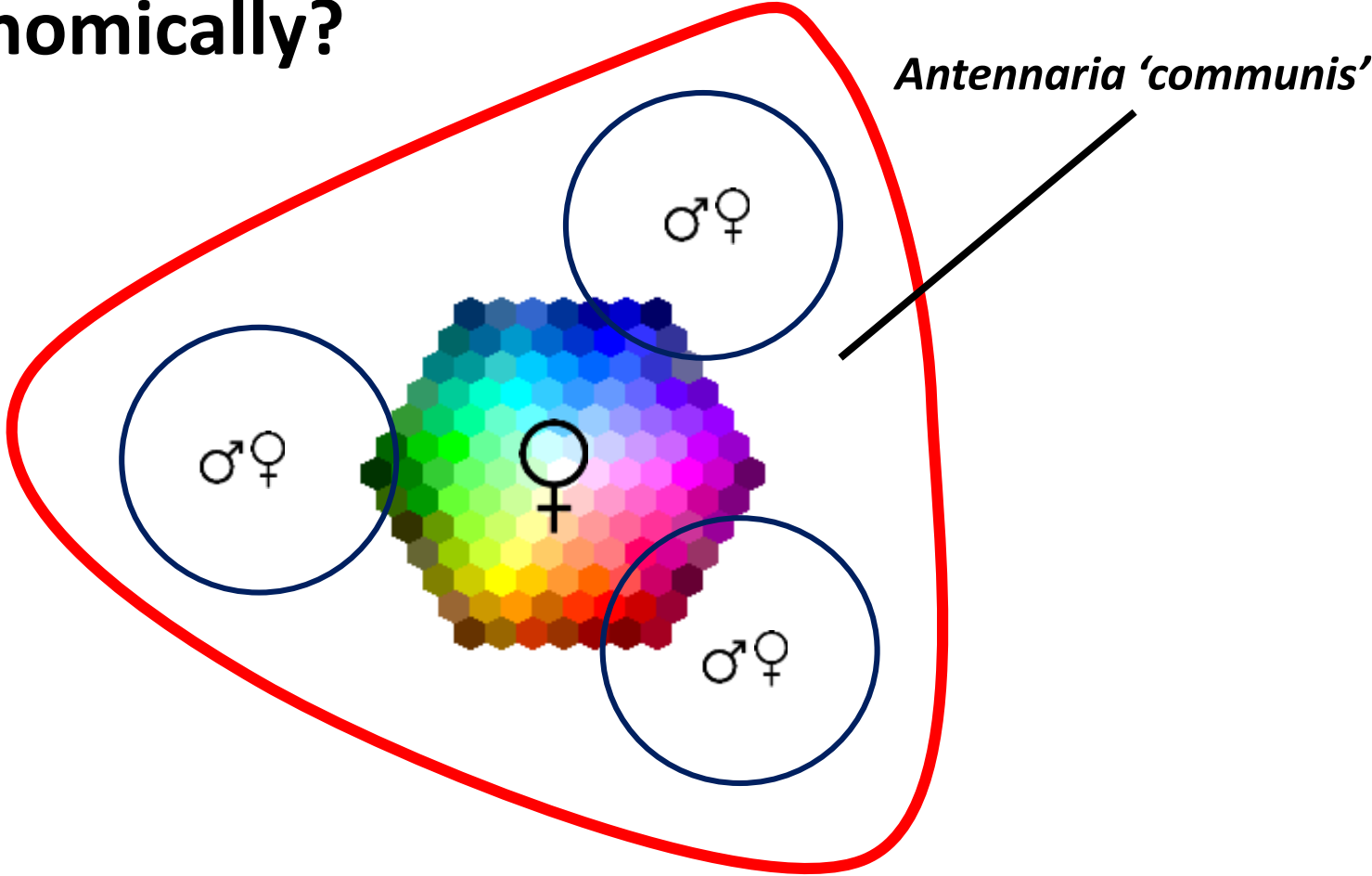
**ALLOPOLYPLOID**



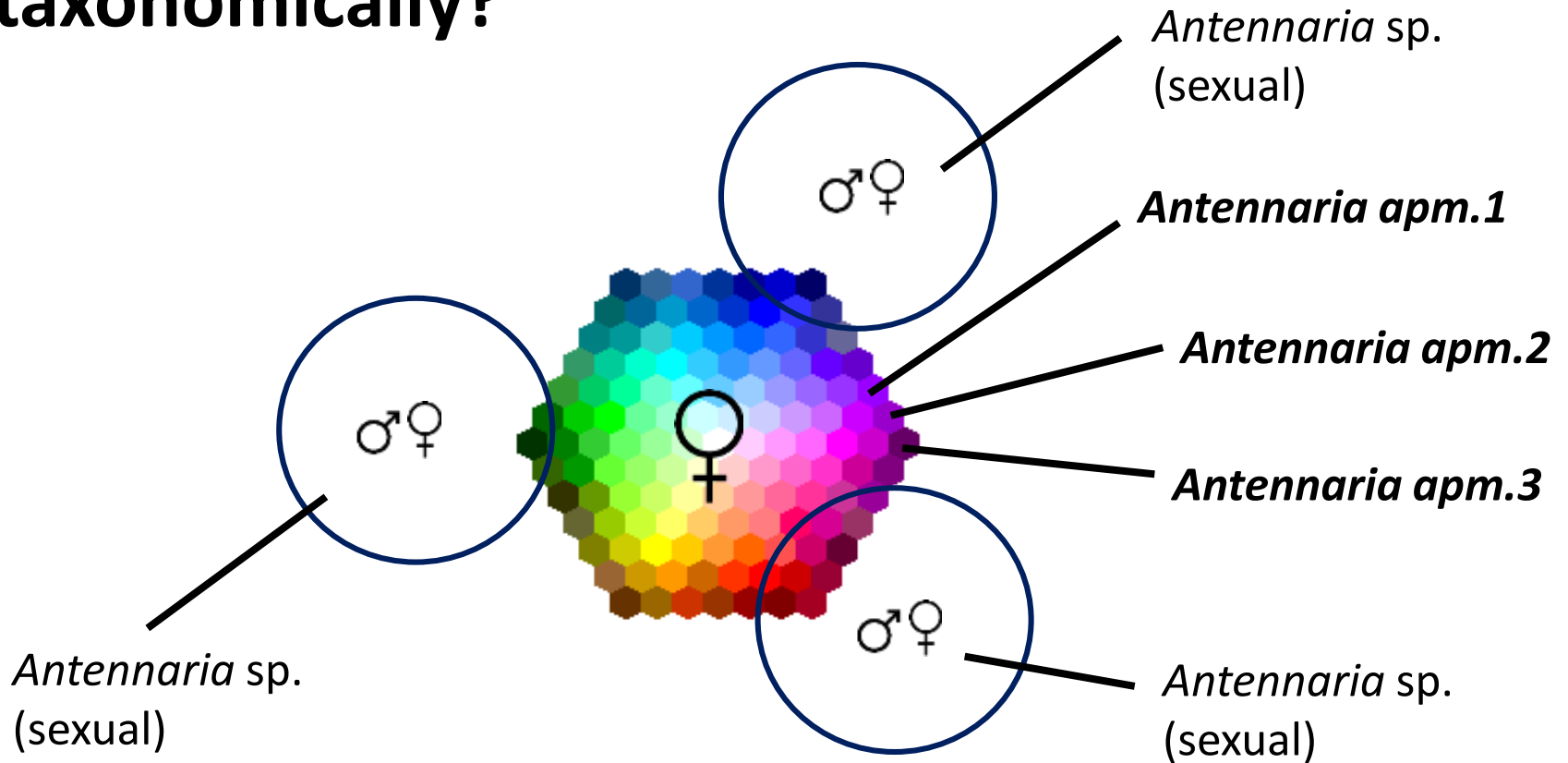
# The Genus *Antennaria*



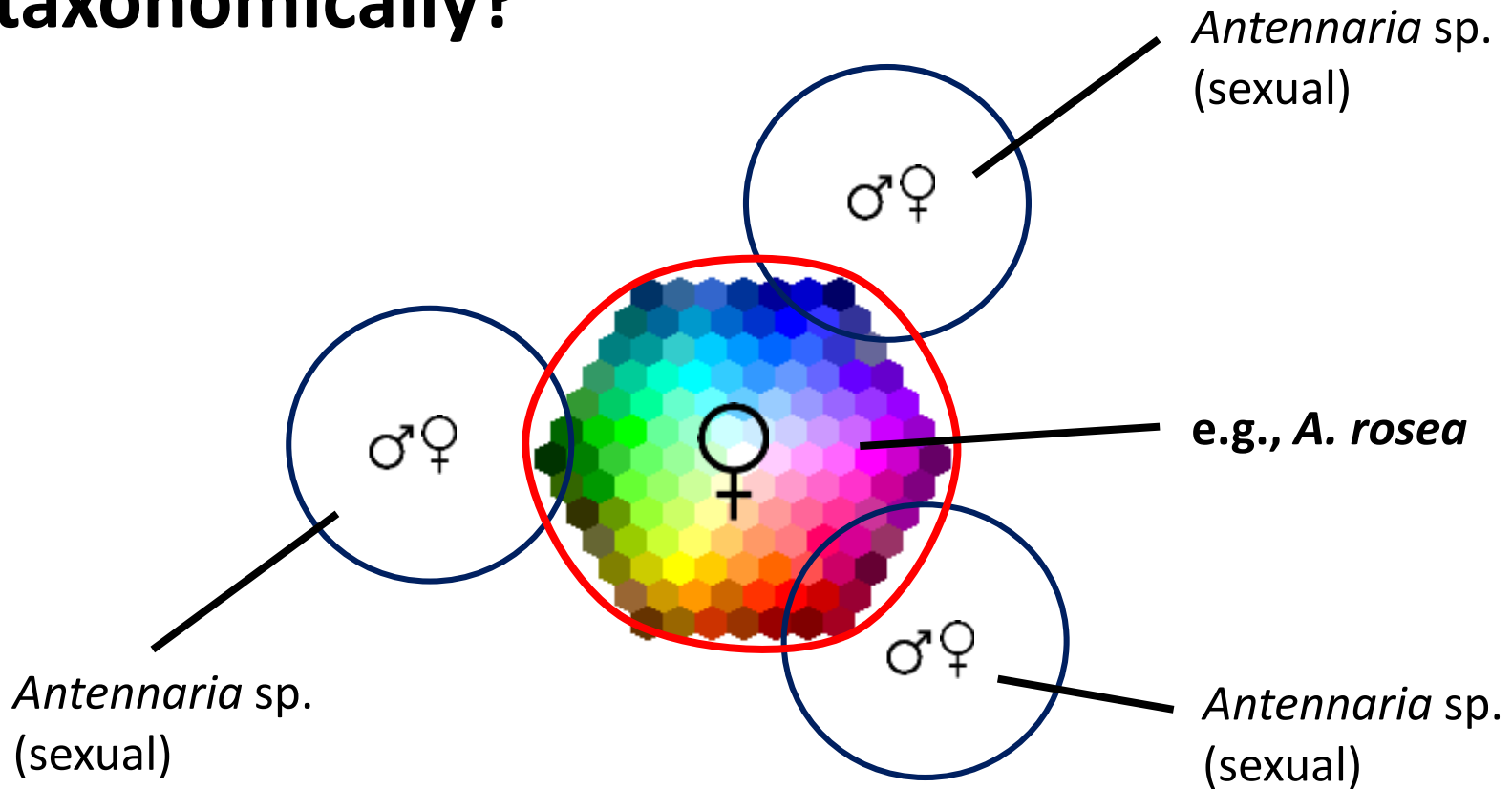
# How do we deal with this taxonomically?



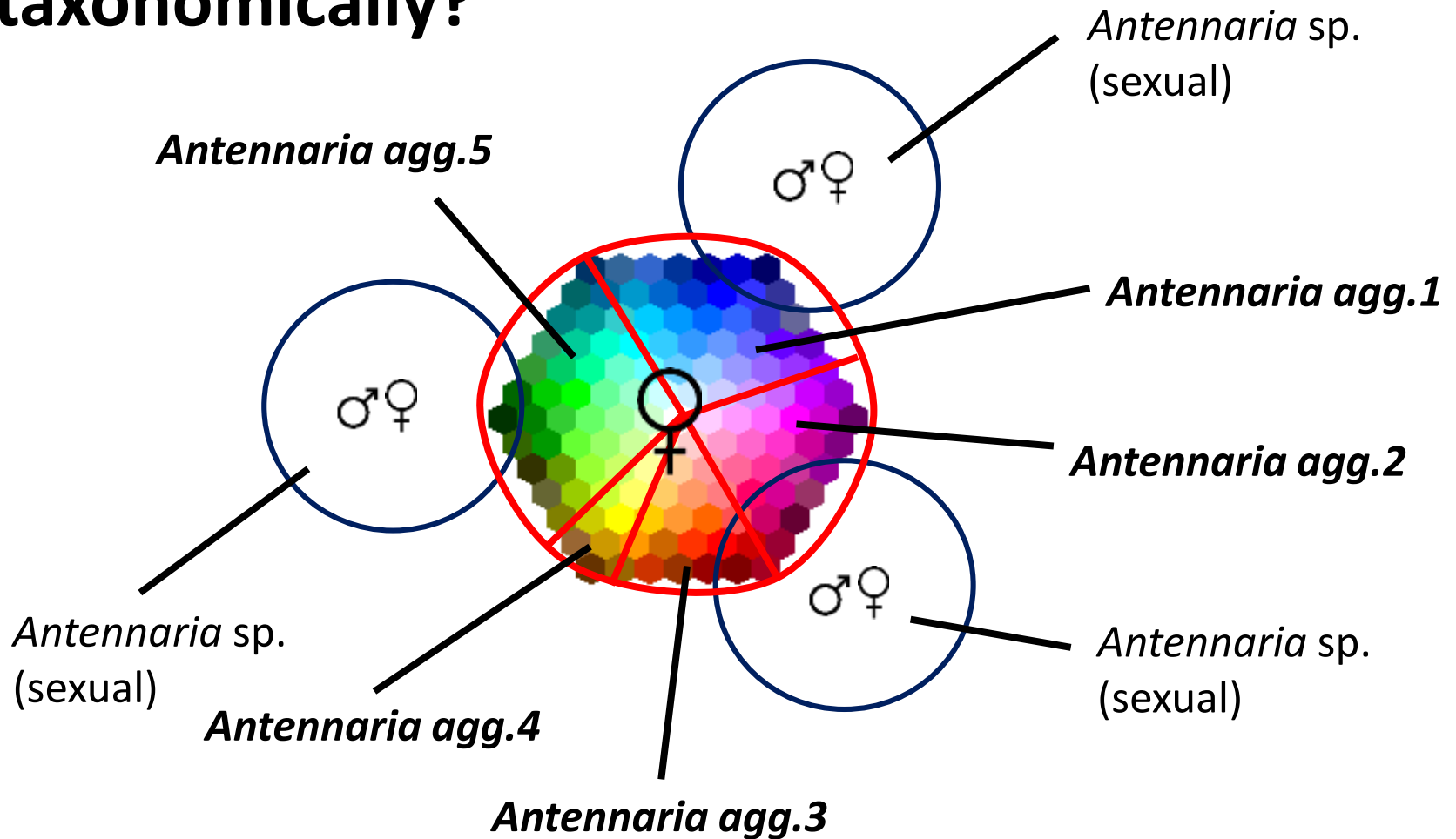
# How do we deal with this taxonomically?



# How do we deal with this taxonomically?



# How do we deal with this taxonomically?



# I. *Antennaria media-alpina* complex



V. Skilton

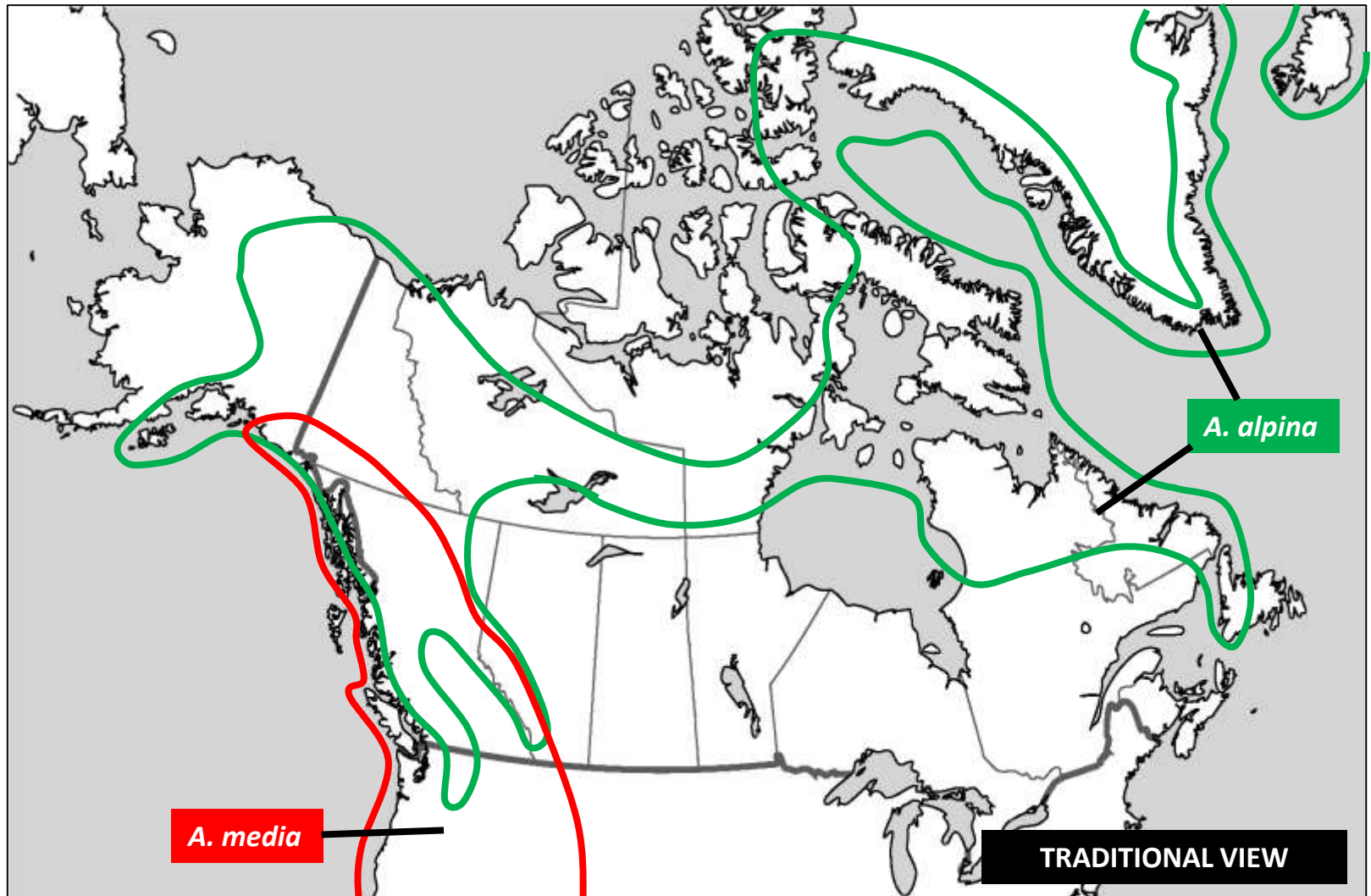


B. Kelly-McArthur



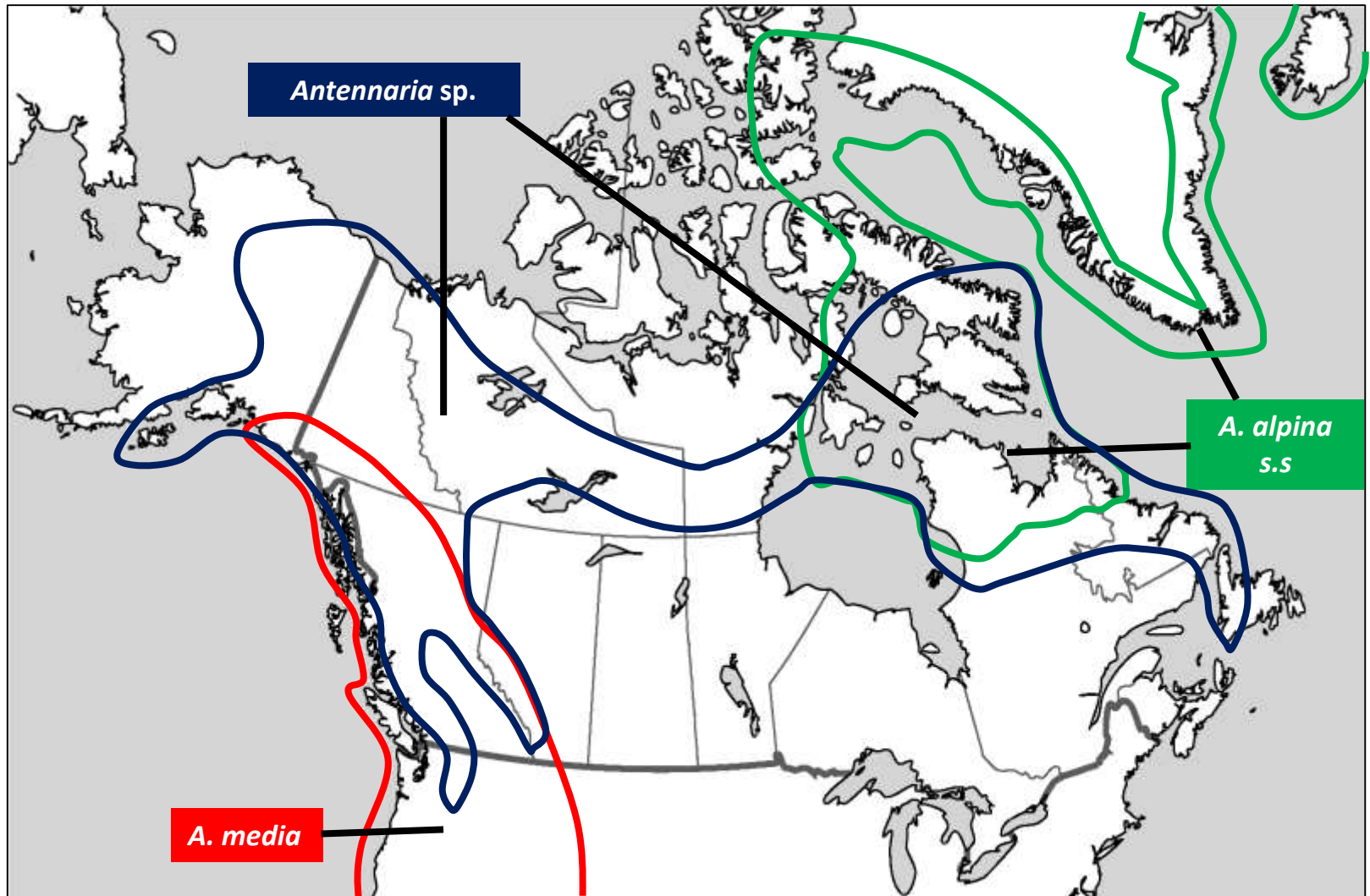
J. Riley

# I. *Antennaria media-alpina* complex





# I. *Antennaria media-alpina* complex



# I. *Antennaria media-alpina* complex



*A. media*



*Antennaria* sp.



*A. alpina* s.s.

# I. *Antennaria media-alpina* complex



J. Fenneman

*A. media*



J. Lehmuskallio

*A. alpina* s.s.

# I. *Antennaria media-alpina* complex

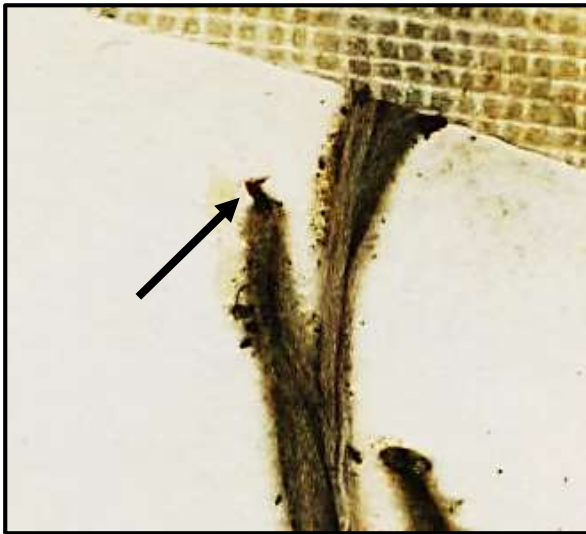
BUT WHAT ABOUT LEAF FLAGS?



# I. *Antennaria media-alpina* complex

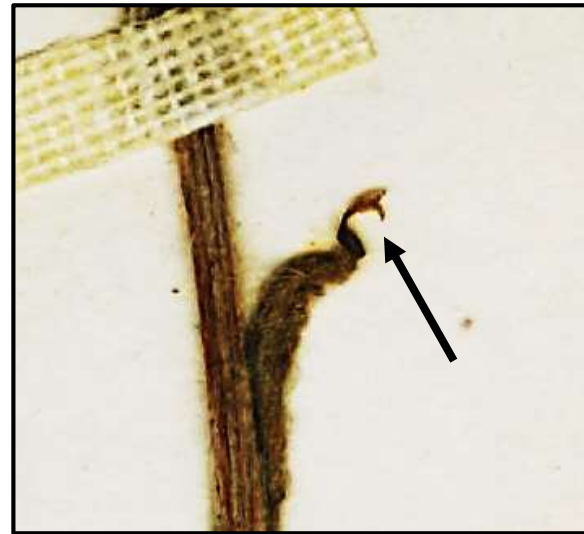


# I. *Antennaria media-alpina* complex



**Isolectotype**

*Sonne s.n.* [NY]



**Paratype**

*J.M. Macoun 11242* [NY]

**Type material of *Antennaria media***

# I. *Antennaria media-alpina* complex



*A. media*



*Antennaria* sp.



*A. alpina* s.s.

# I. *Antennaria media-alpina* complex

American Journal of Botany 82(8): 1049–1055. 1995.

## REVISION OF *ANTENNARIA ISOLEPIS*, *A. PALLIDA*, *A. PEDUNCULATA*, AND *A. ROUSSEAU* (ASTERACEAE: INULEAE): APOMICTIC NORTH AMERICAN ARCTIC-ALPINE SPECIES

JERRY G. CHMIELEWSKI

Department of Biology, Slippery Rock University, Slippery Rock, Pennsylvania 16057

Canonical discriminant analysis was used to assess the taxonomic status of the broad-phyllaried taxa *Antennaria isolepis*, *A. pallida*, *A. pedunculata*, and *A. rousseaui*. High cross-validation assignment rates as well as high Geisser assignment probabilities for each of the taxa included in the phenetic study indicate that *A. gaspensis*, *A. media*, *A. microphylla*, *A. parvifolia*, *A. pulvinata*, *A. rosea*, and *A. umbrinella* are morphologically distinct from these broad-phyllaried species. Several characteristics may be used to distinguish the latter species from the former, the most distinguishing of which is, however, the atypically broad involucre bracts. Qualitative gross morphology, reproductive biology, floret phenology, and provenance also may be used to help distinguish among the species. These characteristics, in addition to the results of the canonical discriminant analysis, support a classification scheme that recognizes the broad-phyllaried species as *A. pallida*. Type collections of *A. isolepis*, *A. pedunculata*, and *A. rousseaui* were assigned to *A. pallida* through the use of the classification criterion. Included in the taxonomic treatment of *A. pallida* is a synonymy, species description, and citation of representative specimens.

North American species of the genus *Antennaria* have been the focus of considerable phenetic (Bayer, 1985a, b, 1987, 1989c, 1990a, c; Chmielewski, 1993, 1994a, b; Chmielewski and Chinnappa, 1988a, 1991; Chmielewski, Chinnappa, and Semple, 1990a, b; Chmielewski, Chinnappa, and Warner, 1990), cytologic (Bayer, 1984; Chinnappa, 1984, 1986; Bayer and Stebbins, 1987; Chmielewski and Chinnappa, 1988b, c, 1990), and enzymatic (Bayer and Crawford, 1986; Bayer, 1988, 1989a, b, 1990b, 1991, 1992a) attention for the past decade. Despite this attention, substantial work is still necessary to resolve morphological limits and phylogenetic associations among numerous species and complexes. Although the 300 plus described species of North American *Antennaria* may comprise an unworkable taxonomy, we must be cautious not to reduce this list to a series of complexes or species that in their own right lack morphological integrity or do not adequately reflect the evolutionary history of the genus.

Babcock and Stebbins (1938) proposed a classification system for the genus *Crepis*, which like *Antennaria*, is also taxonomically complex as a consequence of polyploidy

from two or more of the sexual diploids, whether sexual or asexual, were also assigned specific rank. The latter authors recommended that this system be adopted in subsequent revisions of the genus *Antennaria*.

Several species of *Antennaria*, including *A. pallida* E. Nelson (= *A. borealis* Greene, not Gandoger), *A. isolepis* Greene, *A. rousseaui* A. E. Porsild, and *A. pedunculata* A. E. Porsild were described as broad-phyllaried, apomictic, and arctic-alpine in distribution. Greene (1899) considered *A. borealis* to be most similar in habit and foliage to *A. media* Greene. Floristic works that followed this publication and included North American arctic-alpine taxa have recognized *A. pallida* as distinct (Hultén, 1949, 1968; Porsild, 1950; Anderson, 1959; Scoggan, 1979), whereas others have excluded the species (Rydberg, 1917; Raup, 1934; Polunin, 1940, 1959; Cronquist, 1955; Wiggins and Thomas, 1962; Porsild and Cody, 1980) or placed it in synonymy with *A. umbrinella* Rydberg (Welsh, 1974).

*Antennaria isolepis* Greene was described as a well-marked species that was allied to that group of northern Rocky Mountain species that includes *A. parvifolia* Nuttall

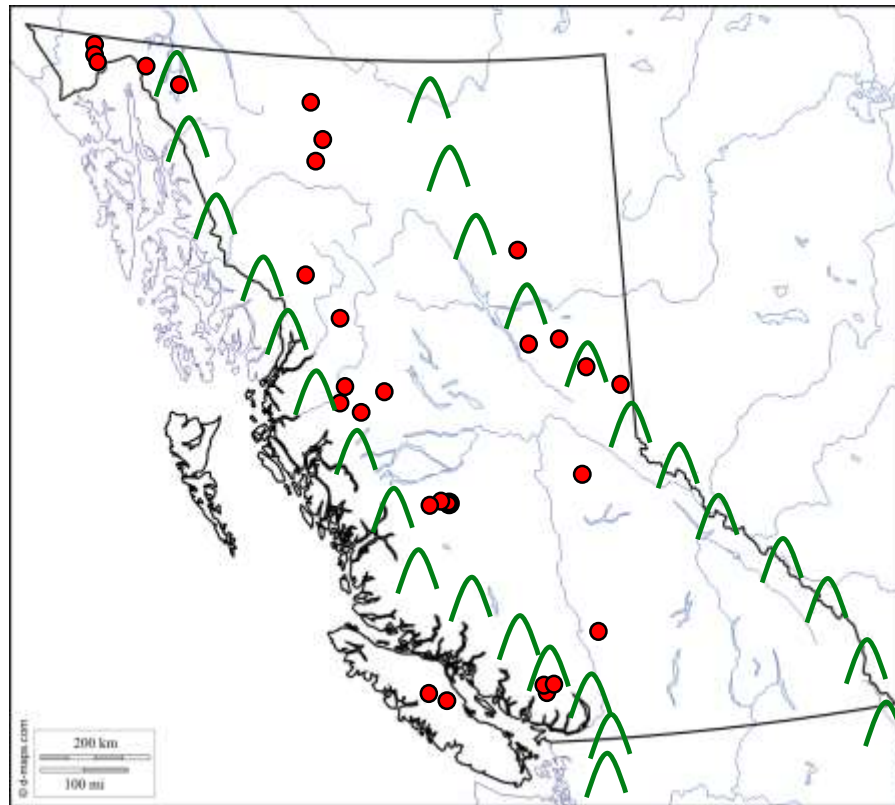


# I. *Antennaria media-alpina* complex



*Antennaria pallida*

# I. *Antennaria media-alpina* complex



Distribution of *A. pallida* in  
British Columbia

## II. *Antennaria pulvinata*



# II. *Antennaria pulvinata*

## A NEW SPECIES OF *ANTENNARIA* (ASTERACEAE) FROM MONTANA AND WYOMING

ERWIN F. EVERT  
1476 Tyrell, Park Ridge, IL 60068

### ABSTRACT

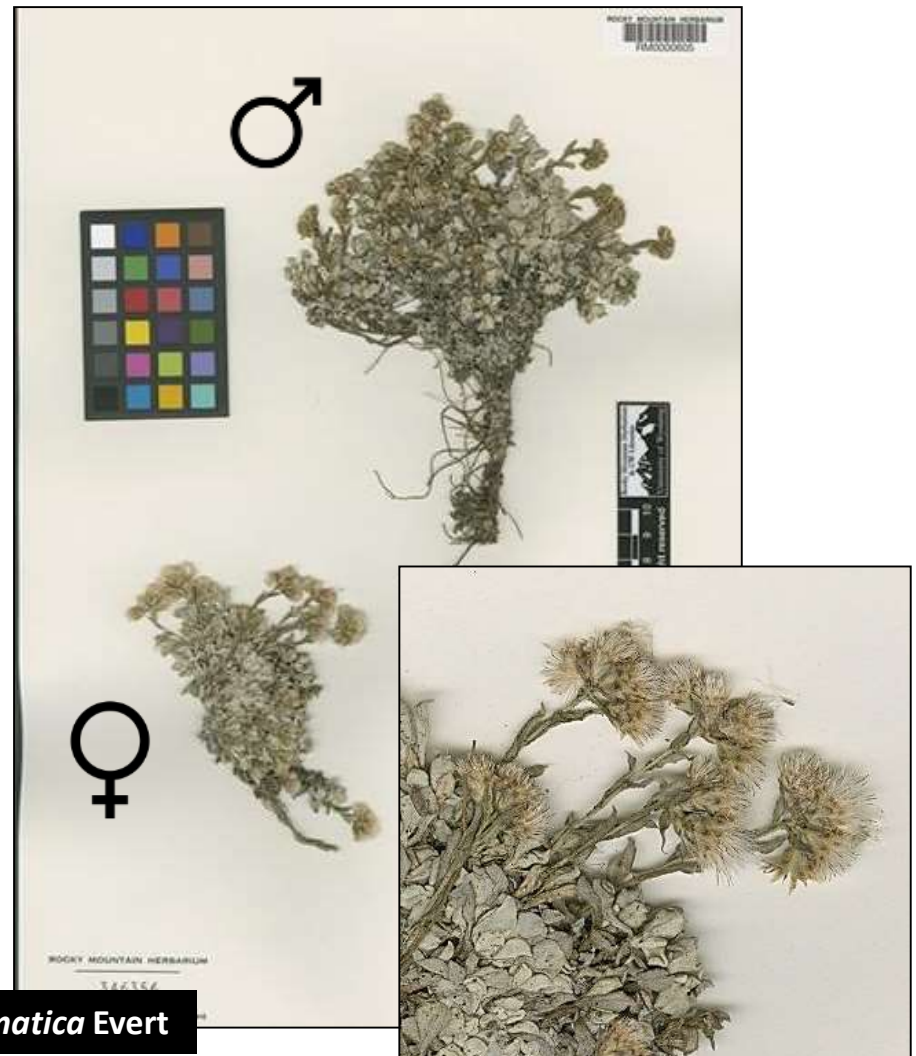
A new species, *Antennaria aromatica*, from Montana and Wyoming is described and compared with the morphologically similar *A. media*, *A. umbrinella*, and *A. alpina*.

Because over three hundred North American species of *Antennaria* are listed in the Gray Herbarium Card Index, it is with some trepidation that I describe yet another one. However, field observations, examination of herbarium specimens, and cytological evidence indicate that a distinct species, *Antennaria aromatica*, exists in the mountains of Montana and Wyoming.

### *Antennaria aromatica* Evert, sp. nov.

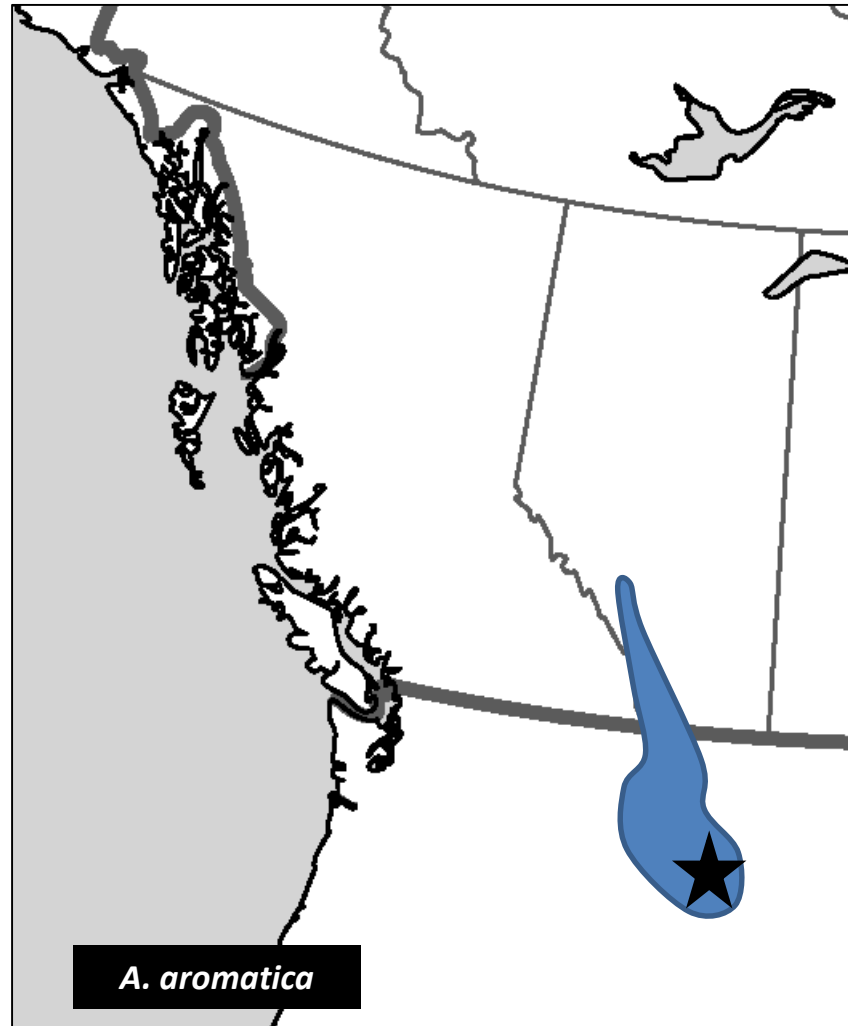
Herba perennis humilis tomentosa glandifera aromatica, 2–6 cm alta. Folia basalia cuneata vel spatulata, tomentosa, 5–10 mm longa, 3–8 mm lata. Caules tomentosi glandiferi, 2–5 cm longi. Capitula 2–5, in cyma subcapitata. Involucra fuscata, acuta vel obtusa, 4–7 mm alta. Corollae pistillatae 4 mm longae, corollae staminatae 3 mm longae. Achenia tuberculata 1.5–2.0 mm longa. Pappus pistillatus capillaris ca. 4 mm longus, pappus staminatus clavatus 3 mm longus (Fig. 1).

Plants low, mat-forming, short-stoloniferous, tomentose, stipitate-glandular, aromatic in life, dioecious, perennial, 2–6 cm tall, from suffrutescent caudices clothed with marcescent leaves; basal leaves widely cuneate-spatulate to occasionally oblanceolate, densely persistently white-tomentose on both surfaces, glandular, mucronate, 5–10(–13) mm long, 3–8(–10) mm wide; cauline leaves densely to loosely tomentose on both surfaces, glandular, oblanceolate, 0.5–2.0 mm wide, 3–7 mm long.



*Antennaria aromatica* Evert

## II. *Antennaria pulvinata*



# II. *Antennaria pulvinata*

RHODORA, Vol. 95, No. 883/884, pp. 261-276, 1993

## ANTENNARIA PULVINATA GREENE: THE LEGITIMATE NAME FOR *A. AROMATICA* EVERT (ASTERACEAE: INULEAE)

JERRY G. CHMIELEWSKI

### ABSTRACT

Canonical variates analysis was used as an analytical technique to document morphological discontinuities among individuals of *Antennaria media* ( $n = 63$ ), *A. pulvinata* ( $n = 103$ ), *A. rosea* ( $n = 64$ ) and *A. umbrinella* ( $n = 65$ ). Evaluation of the defined classification criterion indicated that 94% of the specimens were classified correctly. The classification criterion was subsequently used to classify type collections of *A. aromatica* ( $n = 26$ ) into one of the previously defined groups. Results based on these analyses as well as previously published information demonstrate that *A. aromatica* and *A. pulvinata* are morphologically indistinguishable. The analyses also indicate that *A. pulvinata* and *A. rosea* exhibit morphological integrity relative to each other and would best be treated as distinct species. The four species, *A. media*, *A. pulvinata*, *A. rosea* and *A. umbrinella*, exhibit morphological integrity and should be treated as distinct. A list of synonymy is provided for *A. pulvinata*.

Key Words: *Antennaria media*, *A. pulvinata*, *A. rosea*, *A. umbrinella*, *A. aromatica*

### INTRODUCTION

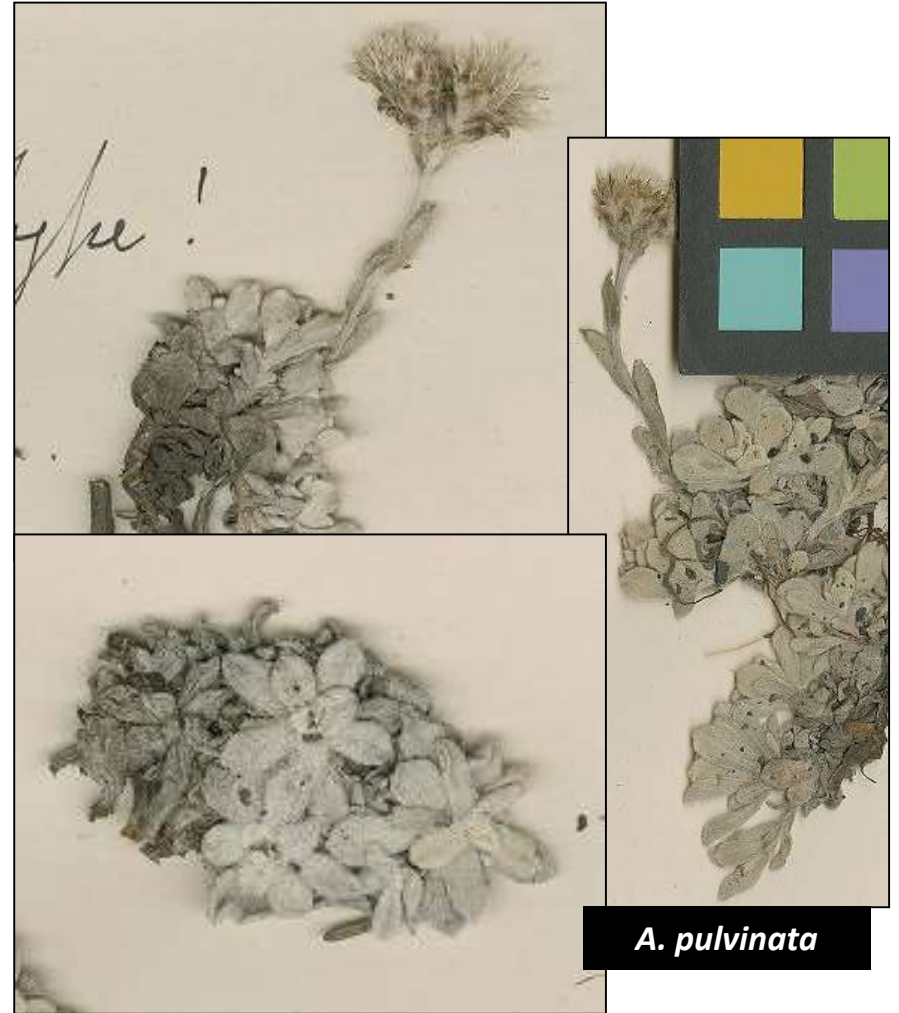
*Antennaria aromatica* Evert was originally described as a sexual diploid Cordilleran species (Evert, 1984). Subsequent studies have demonstrated that the species is morphologically, cytologically and reproductively more variable (Bayer and Stebbins, 1987; Bayer, 1984, 1989a), as well as more widely distributed (Chmielewski and Chinnappa, 1988a; Bayer, 1989a), than initially proposed. Additional interest in *A. aromatica* stems from the implication



## II. *Antennaria pulvinata*



*A. aromatica*



*A. pulvinata*

## II. *Antennaria pulvinata*

C. Delmatier



T. Steen

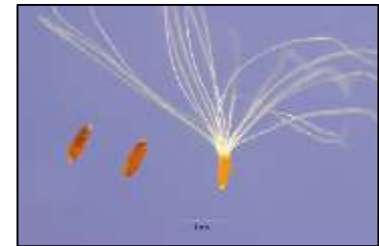
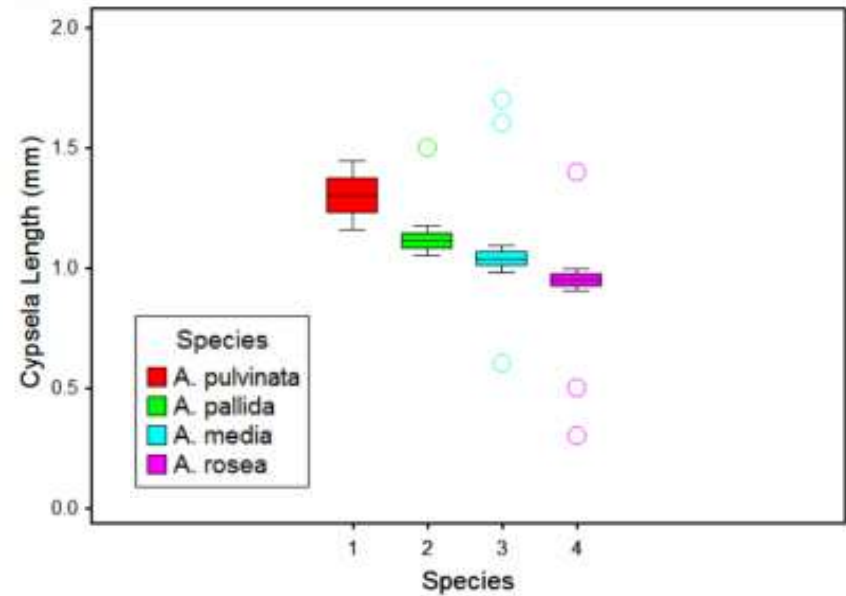


S. Mincemoyer © MTNHP - Scott Mincemoyer

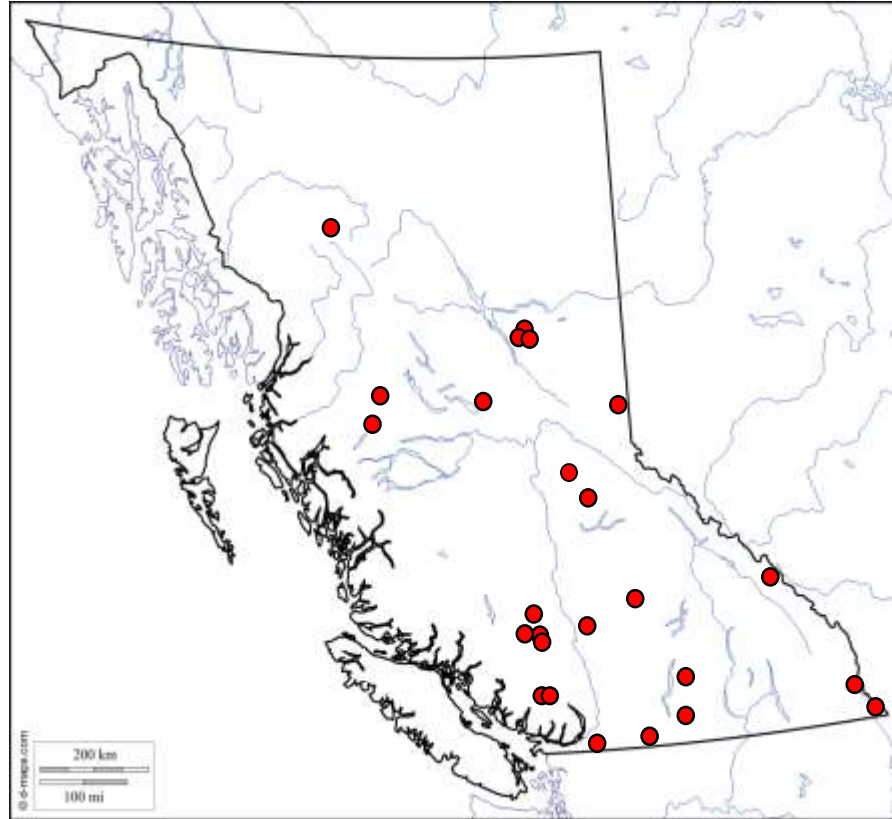


# II. *Antennaria pulvinata*

|       |                             |        |     |      |      |     |     |
|-------|-----------------------------|--------|-----|------|------|-----|-----|
| -1969 | <i>Antennaria pulvinata</i> | 21720  | 4   | 6    | 5    | 1   | 3   |
| -1969 | <i>Antennaria pulvinata</i> | 37977  | 5   | 6.5  | 5.75 | 2   | 2.9 |
| -1969 | <i>Antennaria pulvinata</i> | 67786  | 6   | 9    | 7.5  | 1.7 | 4   |
| -1969 | <i>Antennaria pulvinata</i> | 69071  | 7.5 | 9.5  | 8.5  | 2.5 | 4   |
| -1969 | <i>Antennaria pulvinata</i> | 86502  | 5   | 7    | 6    | 2   | 3   |
| -1969 | <i>Antennaria pulvinata</i> | 89449  | 6   | 7    | 6.5  | 2   | 2.5 |
| -1969 | <i>Antennaria pulvinata</i> | 125197 | 5   | 7    | 6    | 3   | 3.3 |
| -1969 | <i>Antennaria pulvinata</i> | 125198 | 5   | 7    | 6    | 1.2 | 2   |
| -1969 | <i>Antennaria pulvinata</i> | 128031 | 8   | 11   | 9.5  | 3   | 4   |
| -1969 | <i>Antennaria pulvinata</i> | 128033 | 5   | 7.5  | 6.25 | 2.2 | 2.5 |
| -1969 | <i>Antennaria pulvinata</i> | 128034 | 10  | 12   | 11   | 4   | 5   |
| -1969 | <i>Antennaria pulvinata</i> | 128035 | 4   | 7    | 5.5  | 2.5 | 2.4 |
| -1969 | <i>Antennaria pulvinata</i> | 128038 | 6.5 | 9.5  | 8    | 2.5 | 2.5 |
| -1969 | <i>Antennaria pulvinata</i> | 128639 | 7   | 8    | 7.5  | 2.7 | 3   |
| -1969 | <i>Antennaria pulvinata</i> | 158268 | 7   | 9    | 8    | 4   | 3   |
| 70-   | <i>Antennaria pulvinata</i> | 145290 | 4.5 | 5    | 4.75 | 2.7 | 1.8 |
| 70-   | <i>Antennaria pulvinata</i> | 145946 | 8   | 9    | 8.5  | 3   | 2.5 |
| 70-   | <i>Antennaria pulvinata</i> | 145947 | 9   | 10.5 | 9.75 | 3   | 3   |
| 70-   | <i>Antennaria pulvinata</i> | 147614 | 9   | 9    | 9    | 4   | 5   |
| 70-   | <i>Antennaria pulvinata</i> | 152906 | 6   | 8    | 7    | 1.7 | 2.5 |
| 70-   | <i>Antennaria pulvinata</i> | 155751 | 6   | 6    | 6    | 2   | 2.2 |
| 70-   | <i>Antennaria pulvinata</i> | 168882 | 8   | 10.5 | 9.75 | 3   | 3   |

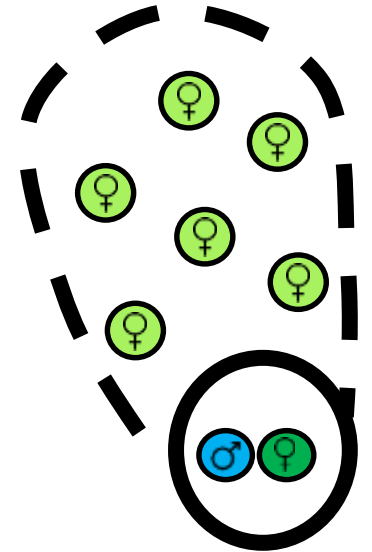
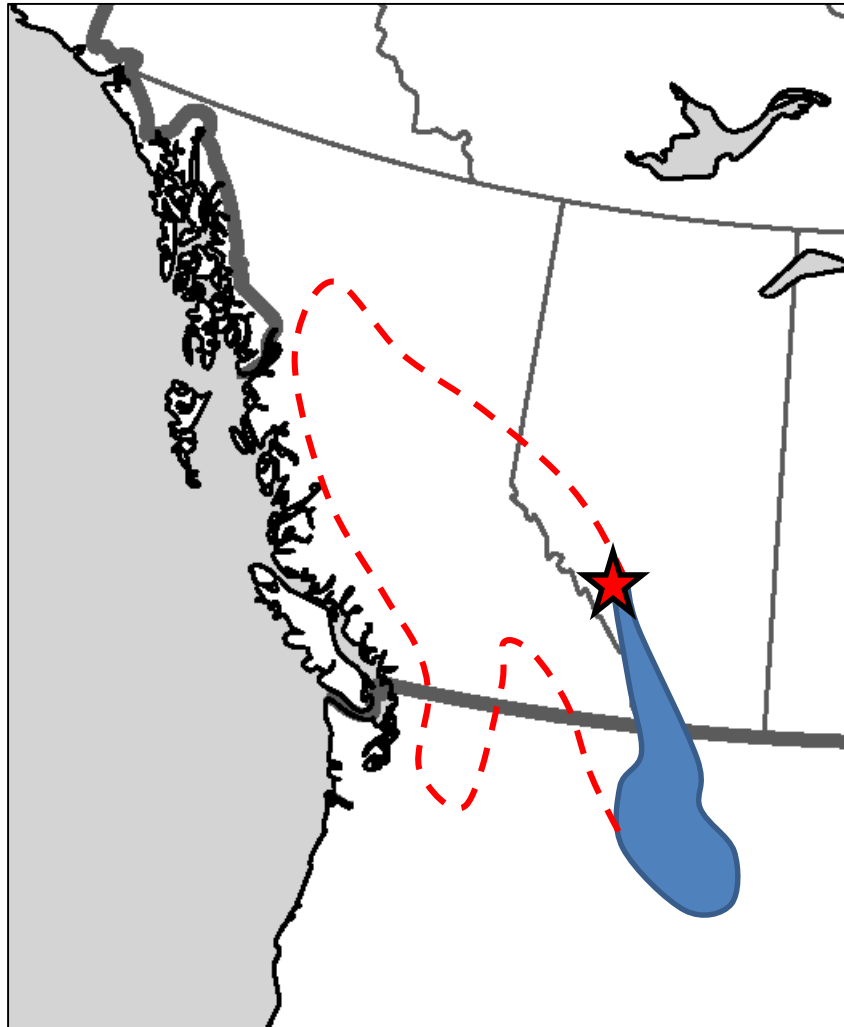


## II. *Antennaria pulvinata*



Distribution of *A. pulvinata* in  
British Columbia

## II. *Antennaria pulvinata*



A photograph of a rolling green landscape. The foreground is dominated by a field of tall grasses, many of which have small, light-colored flowers. The grasses are dense and appear to be blowing in a breeze. In the background, there are rolling hills covered in similar vegetation, leading up to a line of trees. The sky is a clear, bright blue with scattered, fluffy white clouds. The overall scene is bright and sunny, suggesting a clear day in late summer or early autumn.

***THANK YOU!***