

# Not Another Damn Name Change! Why Blue Dicks is not a *Dichelostemma*

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## ABSTRACT

Figuring out the relationships among the members of the Brodiaea Family (Themidaceae) has been a struggle that has taken over 200 years and is an ongoing process. On example is blue dicks, which has long been considered to be a member of *Dichelostemma* (*D. capitatum*) due to its similarity to *D. congestum* and *D. multiflorum*. However, multiple lines of evidence (morphology, embryology, genetics) indicate that these similarities are superficial – they share some ancestral traits (symplesiomorphies), not derived traits (synapomorphies). The blue dicks lineage diverged much earlier than the rest of the *Brodiaea-Dichelostemma* lineages, which is reflected in its much broader range and its high level of ecotypic diversification. The genus name *Dipterostemon*, first proposed by Per Axel Rydberg, should be resurrected for blue dicks.

## BLUE DICKS ARE A WIDESPREAD, COMMON SPECIES. WHY SHOULD CHANGE THE NAME?

- Scientific names are more than labels; they are an hypotheses about species’ relationship with other species.
- Hypotheses are tested and often disproven; names change when new hypotheses are proposed.
- In the case of blue dicks, the name has been in flux for almost two centuries, so change is nothing new.
- New data has changed our understandings about brodiaeas and their kin, and name changes are needed to reflect these new hypotheses.

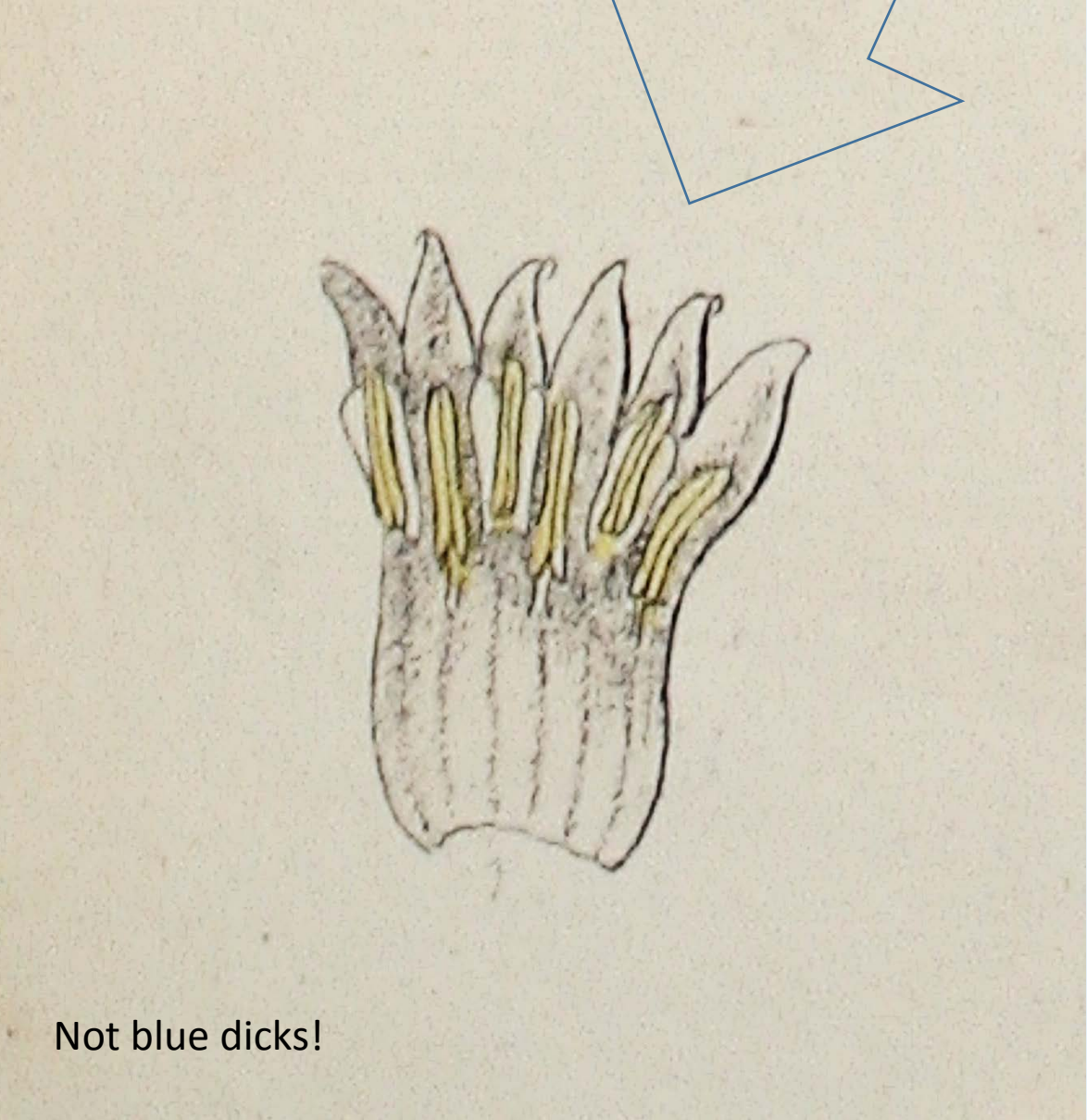
## SIDEBAR: HISTORICAL CONFUSION OVER THE NAME FOR BLUE DICKS

For many years, the names *Brodiaea pulchella* or *Dichelostemma pulchella* have wrongly been applied to blue dicks. Why is that?

In 1808, Richard Salisbury (1) described a new species from “California”, *Hookera pulchella*. He precisely described the three appendages that occur on the outer perianth lobes, but he interpreted them as three “emarginate” (i.e., with a bifid apex) filaments that had lost their anthers. Salisbury was adamant that the flowers were hexandrous and suggested that others who disagreed and considered the flowers to be triandrous were mistaken because the anthers of three stamens must have fallen off and had been unnoticed. Salisbury reinforced his mistaken belief that *H. pulchella* was hexandrous when he and several others examined what he believed to be that species blooming in the garden of an acquaintance, and all had noticed that the plants possessed six anthers. The origin and identity of the garden plants Salisbury cited are unknown.

Salisbury backed up his argument with an illustration of a dissected *H. pulchella* flower that shows six stamens placed at two levels on the perianth tube, with the appendages opposite the outer perianth lobes. However, the stamens of blue dicks are on the same level on the perianth tube, the appendages are opposite the inner perianth lobes, and the perianth lobes are longer than the tube; therefore, the illustration does not represent that species. Instead, the drawing appears to be a composite of *D. congestum* and another species: the herbarium sheet at the British Museum bearing part of Archibald Menzies’ type collection includes a specimen of *Triteleia grandiflora* subsp. *howellii*, which has winged outer filaments.

Unfortunately, Salisbury’s description and illustration of a hexandrous brodiaea misled many botanists into believing that he had actually described blue dicks, including Robert Hoover (2), whose monograph on *Dichelostemma* was the source reference for Munz’ treatment in “A Flora of California” and Reveal’s treatment in “Intermountain Flora”.



Blue dicks is not:

*Hookera pulchella*  
*Brodiaea pulchella*  
*Dichelostemma pulchellum*

(even though some floras still use one of these names!)

## \**Dipterostemon*

*Dipterostemon*: “two-winged stamen”, coined by Per Axel Rydberg in 1912, who suggested that possessing 6 stamens was sufficiently diagnostic to merit generic status for blue dicks. Not taken seriously by any other botanists ...

... until Berg (5) found features of the embryology unique to blue dicks and laid out a substantial argument for resurrecting *Dipterostemon*, based on multiple lines of evidence. Again, [sound of crickets chirping] ...

... until Pires and Sytsma (6) found that molecular data show that the blue dicks lineage split off from the rest of the brodiaea lineage well before the other brodiaeas began to diversify – based on molecular clock estimates, millions of years before the other brodiaeas. Pires hinted that Berg’s argument had some merit but made no formal recommendations.

My research ([7] and ongoing) suggests that blue dicks is much more diverse morphologically and ecologically than any of the other species of *Dichelostemma* (ask me about it!). It is time to give it the recognition it deserves.

## REFERENCES

(1) Salisbury, R.A. 1808b. *Hookera pulchella*: neat hookera. *Paradisus Londinensis* 2: 117.  
(2) Hoover, R.F. 1940. The genus *Dichelostemma*. *American Midland Naturalist* 24: 463–476.  
(3) Keator, G. 1968. A taxonomic and ecological study of the genus *Dichelostemma* (Amaryllidaceae). Ph.D. dissertation. University of California, Berkeley, CA.  
(4) Lenz, L.W. 1976. The nature of the floral appendages in four species of *Dichelostemma* (Liliaceae). *Aliso* 8: 383–389.  
(5) Berg, R.Y. 1996. Development of ovule, embryo sac, and endosperm in *Dipterostemon* and *Dichelostemma* (Alliaceae) relative to taxonomy. *American Journal of Botany* 83: 790–801.  
(6) Pires, J.C., and K.J. Sytsma. 2002. A phylogenetic evaluation of a biosystematic framework: *Brodiaea* and related petaloid monocots (Themidaceae). *American Journal of Botany* 89: 1342–1359.  
(7) Preston, R.E. 2014. Vernal pool blue dicks (*Dichelostemma lacuna-vernalis*; Asparagaceae: Brodiaeoidae) revisited. *Madroño* 61(4): 350–366.

## DIVERSITY WITHIN THE BRODIAEA COMPLEX



A-C: *D. capitatum*. A. *D. capitatum* subsp. *lacuna-vernalis*. B. *D. capitatum* subsp. *pauciflorum*. C. *D. capitatum* subsp. *capitatum*. D. *Dichelostemma congestum*. E. *Dichelostemma multiflorum*. F. *Brodiaea coronaria*. G. *Dichelostemma ida-maia*. H. *Brodiaea minor*. I. *Brodiaea filifolia*. J. *Brodiaea californica*. K. *Brodiaea stellaris*. (not to scale)

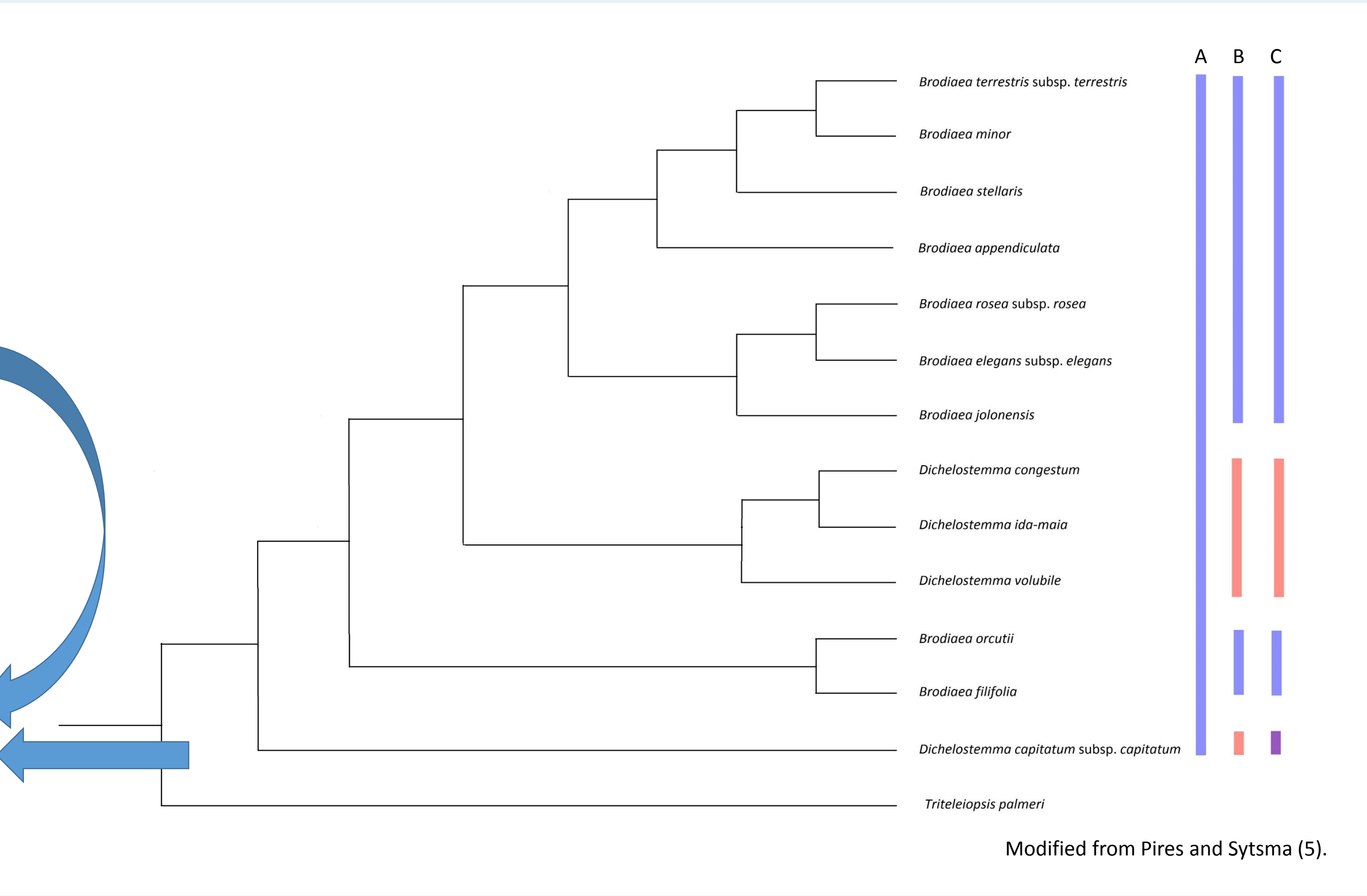
## BLUE DICKS DIFFER IN MANY WAYS FROM *DICHELOSTEMMA* AND *BRODIAEA*

| Character                                              | Blue dicks                            | <i>Dichelostemma</i> spp.                                | <i>Brodiaea</i> spp.                 |
|--------------------------------------------------------|---------------------------------------|----------------------------------------------------------|--------------------------------------|
| Basic chromosome number (3)                            | N = 9                                 | N = 9                                                    | N = 6                                |
| Hybridizes with other <i>Dichelostemma</i> species (3) | No                                    | Yes                                                      | No                                   |
| Cormlets (2, 3)                                        | At base of corms and on short stolons | At base of corms                                         | At base of corms (rarely on stolons) |
| Scape pubescence (3)                                   | Glabrous                              | Scabrous                                                 | --                                   |
| Leaf width (3)                                         | Broader                               | Narrower                                                 | --                                   |
| Leaf morphology (2, 3)                                 | Keeled                                | Keeled                                                   | Rounded                              |
| Stamens                                                | 6                                     | 3                                                        | 3                                    |
| Staminodes                                             | No                                    | No (Yes in <i>D. volubile</i> )                          | Yes                                  |
| Perianth tube (3)                                      | Not narrowed above the ovary          | Narrowed above the ovary (except in <i>D. ida-maia</i> ) | Narrowed above the ovary or not      |
| Seed coat cells (3)                                    | Isogonal                              | Longer than broad                                        | Longer than broad                    |
| Seed germination (3)                                   | Epigeous                              | Hypogeous                                                | Hypogeous                            |
| Origin of floral appendages (4)                        | Staminal tissue                       | Perianth tissue (staminal in <i>D. volubile</i> )        | (No floral appendages)               |
| Ovary inner integument (5)                             | 2 cells thick                         | 5-7 cells thick                                          | 5-7 cells thick                      |

## COMPETING HYPOTHESES – WHICH NAMES FIT BEST?

| 1 Genus                                                                                                                                    | 2 Genera                                                                  | 3 Genera                                                  | 4 Genera                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Brodiaea</i>                                                                                                                            | <i>Brodiaea</i>                                                           | <i>Brodiaea</i>                                           | <i>Brodiaea</i>                                                                                                                                   |
|                                                                                                                                            | <i>Dichelostemma</i>                                                      | <i>Dichelostemma</i>                                      | ??                                                                                                                                                |
|                                                                                                                                            |                                                                           | <i>Dipterostemon</i> *                                    | <i>Dichelostemma</i>                                                                                                                              |
|                                                                                                                                            |                                                                           |                                                           | <i>Dipterostemon</i> *                                                                                                                            |
| Rationale                                                                                                                                  |                                                                           |                                                           |                                                                                                                                                   |
| Monophyletic, but doesn’t address the distinct evolutionary trajectories of some groups of species, as indicated by the morphological data | Traditional, but doesn’t reflect the unique characteristics of blue dicks | Best fit of the data, based on multiple lines of evidence | Suggested by the molecular data but not by the morphological data: the two groups of brodiaeas don’t appear different enough to warrant splitting |

## PHYLOGENENETIC RELATIONSHIPS BASED ON DNA MARKERS



Modified from Pires and Sytsma (5).

## CONCLUSIONS

- Multiple lines of evidence, including morphological and molecular data, indicate that blue dicks is sufficiently distinct from the other members of the *Brodiaea* complex to warrant recognition at the rank of genus.
- The genus name *Dipterostemon* and the new combination *Dipterostemon capitatus* have already been made and are available for immediate use.
- This poster is way too busy and really needed to have more pictures and perhaps a graph or two.