

Taxonomic and ecological review of California *Delphinium*

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Resum

WARNOCK, M. J. (1990). Revisió taxonòmica i ecològica dels *Delphinium* de Califòrnia. Collect. Bot. (Barcelona) 19: 45-74.

A l'interior dels límits de Califòrnia es troben la totalitat o parts de les àrees de bona part dels *Delphinium* nadius de Nordamèrica. Es reconeixen 28 espècies de *Delphinium* a Califòrnia; ultra llurs respectives subspècies nominals, es reconeixen 17 altres subspècies. Es presenten una clau i les descripcions corresponents als tàxons presents a Califòrnia. Juntament amb les descripcions, s'hi inclouen comentaris sobre la distribució, preferències d'hàbitat, propensió per a la hibridació i abundància de cada tàxon. Alguns híbrids que es poden trobar (sovint com a resultat de perturbacions causades per l'home) són separats a les claus.

Mots clau: *Delphinium*, *Ranunculaceae*, Taxonomia, Ecologia, Califòrnia.

Abstract

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Included within the boundaries of California are all or parts of the ranges of many of the *Delphinium* native to North America. Currently, 28 species of *Delphinium* are recognized as occurring in California. In addition to nominal subspecies in these species, another 17 subspecies are recognized. A key to, and descriptions of, the taxa of *Delphinium* found in California are presented. Included with descriptions are comments on distribution, habitat preferences, propensity for hybridization and abundance of each taxon. Certain hybrids which may be found (often as a result of human disturbance) are separated in the key.

Keywords: *Delphinium*, *Ranunculaceae*, Taxonomy, Ecology, California.

INTRODUCTION

Information presented here is the result of study completed in conjunction with a revision of the Jepson Manual (HICKMAN & AL., in prep.). Due to constraints of space in that publication, only very basic descriptions and keys could be included. Somewhat more complete descriptions of the taxa are given here, along with a more complete synonymy, a revised key (using different terminology) and ecological discussion. The manual for which the work was undertaken is to be extensively illustrated, with many of the key features of *Delphinium* shown in drawings from specimens. Portions of drawings from that work are reproduced here to illustrate some of the terms used in the key and descriptions.

California is extremely rich in habitat diversity and this abiotic diversity is reflected in the diversity of plants found in the state (MUNZ 1959). *Delphinium* shows this general pattern of high diversity in California relative to other parts of North America. Over 1/2 of the taxa of

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Delphinium that exist in North America, occur in California. Most taxa that occur in California exist nowhere else. Much of the habitat diversity in California is relatively recent in origin, implying that much of the species diversity is due to relatively recent evolutionary events (RAVEN & AXELROD 1978). As might be expected, these recent evolutionary divergences produce groups of taxa that are difficult to delimit. *Delphinium* shows the typical pattern in this respect. While groups of related taxa are reasonably easy to recognize, relationships within these groups are often unclear. The present treatment is an attempt to clarify relationships in and among groups of California *Delphinium*. Only native California species of *Delphinium* are treated here. Several Eurasian *Delphinium* and *Consolida* have been or are cultivated. As far as is known, none of the non-native taxa are naturalized in California. Probably (see MALYUTIN [1987] and discussion here for *D. hansenii*), all California representatives of *Delphinium* belong in subg. *Delphinastrum* (DC.) Peterm. Applicable infrageneric taxa within the subgenus are indicated in the key. Unless noted otherwise in discussion of individual species, epispecific classification follows MALYUTIN (1987). Malyutin's classification relied primarily on seed characters, while other features are included in the present refinements of his treatment.

Certain features of *Delphinium* species from California may be summarized as follows. All are perennial, and although sepal color is noted in each description, most taxa occasionally produce plants with white flowers. Four free petals are present, lower petals clawed, usually with a dense mass of coiled hairs centered just below junction of blade and claw. In most, lower petals cover stamens. Each flower normally has 3 carpels, occasional plants have 4-5(7). Most taxa have seed coat cells with smooth margins, although surfaces are often ornamented. Exceptions to these general features are noted in descriptions; otherwise, the general condition may be assumed. Natural hybridization occurs regularly among certain taxa, particularly in areas of disturbance (i.e., roadcuts, drainage ditches, clearcuts, etc.). The more common and easily recognized hybrids are included in the key. Base chromosome number appears to be 8.

CHARACTER DEFINITIONS

In an effort to shorten descriptions, certain terms and short phrases are used to convey some rather complex features. Most of these terms describe features found on *Delphinium* plants that are either uncommon or nonexistent in other genera. Some terms are used in a less than typical sense. Use of these terms in descriptions or key without further modification implies definitions shown below. The key includes terms in leads with their contrasting features. Descriptions include these terms where the features they represent are present, but generally do not include contrasting, more «typical» morphologies when these are found in the plants. Unless otherwise noted, descriptions and key leads refer to fresh material. Some features may be significantly altered by pressing, but can usually be determined with a certain amount of effort and experience, even from herbarium sheets. Some minor discrepancies may be noted between the key and descriptions. These result from an attempt to make the key workable for the majority of specimens, while descriptions include a more complete summary of variation within a taxon. Ecological notes refer to populations visited during field study. Cytological data are taken from LEWIS & AL. (1951), although their counts for many of the taxa have been corroborated by other workers. Geographic range notes are from field study and herbarium label data.

Buds prominent. Large stem buds that form as much as a year before elongation; white and easy to see when fresh but dark and shriveled in dried specimens (see Fig. 2-I).

Cell margins undulate. Found on seeds of some species, edges of the cells meander and interlock, much like the pieces of a jigsaw puzzle (must be magnified to > 15 X).



Fig. 1.—Map of California showing counties and Floristic Provinces. CA = California; Ca = Cascade; ChI = Channel Islands; c or C = Central; Co = Coast; D = Desert; DSon = Sonoran (or Colorado) Desert; e or E = East; F = foothills; FP = Floristic Province; GB = Great Basin; GV = Great Valley; H = high; I = Inner; K = Klamath; MP = Modoc Plateau; Moj = Mojave; Mtns = Mountains; n or N = North; O = Outer; P = Peninsula; R = Range; s or S = South; Sc = Sacramento; SnBr = San Bernardino; SN = Sierra Nevada; SnFrB = San Francisco Bay area; SnGb = San Gabriel; SnJt = San Jacinto; SnJ = San Joaquin; Son = Sonoran; Teh = Tehachapi; T = Transverse; V = Valley; w or W = West; W&I = White & Inyo Mtns.; Wrn = Warner Mtns. (from HICKMAN 1989; used by permission).

- Fruit slender.** Follicle length $> 4X$ width (see Fig. 2-G).
Fruit stout. Follicle length $< 3X$ width (see Fig. 2-B).
Fruits erect. Fruits essentially parallel (see Fig. 2-B).
Fruits spreading. Fruits divergent for $> 1/3$ length (see Fig. 2-G).
Inflorescence cylindric. Base of inflorescence less than 2 times as wide as apex.
Inflorescence dense. At least some flowers touch one another on a branch.
Inflorescence open. Flowers do not touch one another on the same branch.
Inflorescence pyramidal. Base of inflorescence > 2 times as wide as apex.
Leaf lobe. A lobe at least 80 % of leaf blade radius.
Lower petals flattened. Angle between surface of blade and claw $130-180^\circ$ (see Fig. 2-D).
Lower petals raised. Blade of lower petal raised (see Fig. 2-A).
Pedicels ascending. Diverge from inflorescence rachis at angle of $< 40^\circ$ (see Fig. 2-D).
Pedicels spreading. Diverge from inflorescence rachis at angle $> 40^\circ$ (see Fig. 2-A).
Pubescence arched. Hairs white, hairs bend through $135-300^\circ$ of arc.
Pubescence glandular. Hairs swollen in lower $1/3$ to $1/2$ (see Fig. 2-D).
Pubescence shaggy. Hairs long, straight, spreading (see Fig. 2-H).
Pubescence simple. Used in a typical sense (see Fig. 2-C).
Root length. Refers to coarse parts of root and does not include thread-like parts.
Root massive. Central root axis > 2 cm diam, profusely branched, usually > 25 cm long.
Seeds ringed. Seeds bear small ridge around chalazal end (see Fig. 2-G).
Seeds winged. Angles (usually all of them) of seeds narrowly winged.
Sepals erect. Sepals point forward (see Fig. 2-C).
Sepals reflexed. Sepals fold backward (see Fig. 2-A, 2-D).
Sepals spreading. Sepals oriented \pm perpendicular to spur (see Fig. 2-E).
Stem base narrow. Stem base narrows to $< 1/2$ its diameter above ground (see Fig. 2-F).

KEY

1. Seeds ringed; fruits spreading; stem base narrowed, attachment weak [sect. *Grumosa* Malyutin] 2
- Seeds not ringed; fruits erect; stem base narrowed or not, attachment firm 19
2. Sepals red, orange or yellow; lower petals flattened, blade glabrous or hairs short and sparse (hairs obscure without a lens) 3
- Sepals not red, orange or yellow (sometimes maroon or pink); lower petals not flattened, blades with at least a few hairs apparent without a lens 4
3. Sepals bright, clear yellow, not red **D. luteum**
- Sepals reddish or orange, not bright yellow (rarely dull yellow) **D. nudicaule**
4. Sepals maroon; plants distinctly different individuals within populations and often with some degree of infertility 5
- Sepals not maroon; plants \pm like other individuals in the population, \pm fully fertile 6
5. Leaf segments > 5 , ≤ 5 mm wide **D. nudicaule** \times **D. nuttallianum**
- Leaf segments ≤ 5 , > 5 mm wide **D. nudicaule** \times **D. decorum**
6. Leaves mostly above lower 30 % of stem; stems usually > 50 cm tall; flowers usually > 15 /main inflorescence axis—leaf lobe width ≥ 1 cm at widest 7
- Leaves mostly in lower 30 % of stem; stems usually < 50 cm; flowers usually > 20 /main inflorescence axis 9
7. Sepals pinkish to light blue **D. trolliifolium** \times **D. nudicaule**
- Sepals dark blue 8
8. Leaf lobe tips crenate; Sonoma County—pedicels glandular **D. bakeri**
- Leaf lobe tips incised; N of Sonoma County **D. trolliifolium**
9. Roots > 10 cm long, fibrous-twisted, not fascicled or round 10
- Roots ≤ 10 cm long, fascicled or round 12

10. Sepals blue **D. antoninum**
 — Sepals pinkish 11
11. Plants in populations with red flowers **D. nudicaule** × **D. trolliifolium**
 — Plants in populations with blue flowers **D. antoninum** × **D. nudicaule**
12. Sepals dark blue-purple (often faded and mottled on herbarium sheets), distinctly
 puberulent outside, not reflexed; lower stem hairy; lower petal blade ≥ 6 mm long ... 13
 — Sepals bright blue (less purple), to white or pink (typically not fading), usually
 glabrous, often reflexed; if sepals purplish, puberulent and not reflexed, then: lower
 stem subglabrous or lower petal blade < 6 mm long 14
13. Leaves (at least some of them) > 5 lobed **D. decorum** subsp. **tracyi**
 — Leaves 3-5 lobed **D. decorum** subsp. **decorum**
14. Inflorescence rarely 2 times as long as broad; leaves with > 5 lobes, lobes < 7 mm
 wide **D. nuttallianum**
 — Inflorescence typically > 2 times as long as broad; leaves with ≤ 5 lobes (if > 5 , then
 pedicels puberulent), lobes often > 7 mm wide 15
15. Terminal leaf lobe widest in distal 1/3; angle from pedicel to rachis nearly 90
 degrees; leaf lobes 5 **D. gracilentum**
 — Terminal leaf lobe widest near midlength; angle from pedicel to rachis < 70
 degrees; leaf lobes 3-many 16
16. Lobes of lower leaves > 1.5 cm wide; basal and lower leaves rarely lobed to
 $< 80\%$ radius of blade **D. patens** subsp. **hepaticoideum**
 — Lobes of lower leaves < 1.5 cm wide; basal and lower leaves lobed to $> 80\%$ radius
 of blade 17
17. Pedicels puberulent **D. patens** subsp. **montanum**
 — Pedicels glabrous 18
18. Hairs of lower petals white **D. patens** subsp. **patens**
 — Hairs of lower petals yellow **D. patens** × **D. decorum**
19. Root massive; buds prominent; stem usually > 1 m tall (may be as short as 15 cm),
 often > 1 /root system [subsect. *Exaltata* Malyutin] 24
 — Root usually < 15 cm long, (if longer, then buds not prominent); stem usually < 1
 m tall (may be as tall as 180 cm), rarely > 1 /root system [subsect. *Subscaposa* Ewan] ... 26
20. Sepals red; lower petal flattened, hairs short, sparse (hairs obscure without
 a lens) **D. cardinale**
 — Sepals not red; lower petal not flattened, hairs dense, apparent 21
21. Flowers rare after 30 June; sepals lavender to white 22
 — Flowers rare before 1 July; sepals bluish, sometimes greyish due to pubescence ... 23
22. Sepals greenish white; inflorescence rachis glabrous ... **D. californicum** subsp. **interius**
 — Sepals lavender; inflorescence rachis puberulent ... **D. californicum** subsp. **californicum**
23. Leaves present on lower 20 % of stem at anthesis 24
 — Leaves absent on lower 20 % of stem at anthesis 25
24. Spur ≤ 12 mm long; sepals white-light blue **D. inopinum**
 — Spur ≥ 11 mm long; sepals dark blue **D. polycladon**
25. Stem puberulent below; sepals bright blue, lateral with a lighter median line
 outside due to pubescence **D. stachydeum**
 — Stem glabrous below; sepals purplish-blue, lateral +/- uniform **D. glaucum**
26. Plants with sepals rose-pink; pedicel hairs yellow, glandular; fruits erect; pedicels
 ascending; lower petals flattened **D. purpusii**
 — Plants in at least one way not as above 27
27. Rarii of flattened leaf base margins < 90 degrees **D. uliginosum**
 — Rarii of flattened leaf base margins > 90 degrees 28
28. Lower petioles shaggy pubescent 29

- Lower petioles glabrous to puberulent with short and/or curved hairs 36
- 29. Seeds echinate, appearing fuzzy to naked eye; lateral sepals ≤ 13 mm long; usually > 12 flowers on main inflorescence axis [ser. *Echinatae* Ewan] 30
- Seeds not echinate, surface (except margins) appearing \pm smooth to naked eye; lateral sepals ≥ 10 mm long; usually < 12 flowers/main inflorescence axis 32
- 30. Sepals very dark, violet-purple to maroon **D. hansenii** subsp. **ewanianum**
- Sepals lighter colored, dark blue-purple to white or pink 31
- 31. Leaves mostly basal (these may be dry at anthesis and thus lost in herbarium specimens); usually < 3 cauline leaves **D. hansenii** subsp. **kernense**
- Leaves mostly cauline; ≥ 3 cauline leaves **D. hansenii** subsp. **hansenii**
- 32. Hair on margin of lower petal blade absent; sepal spur downcurved for > 3 mm at apex **D. hutchinsonae**
- Hair on margin of lower petal blade present; sepal spur straight or downcurved for < 3 mm at apex 33
- 33. Plants of mainland; sepals dark royal blue **D. variegatum** subsp. **variegatum**
- Plants of islands; sepals lighter colored 34
- 34. Sepals bright blue **D. variegatum** subsp. **thornei**
- Sepals white to light blue **D. variegatum** subsp. **kinkiense**
- 35. Seed coat cell margins undulate; mature fruit length usually $\leq 3 \times$ width [ser. *Pelligerae* Ewan] 37
- Seed coat cell margins smooth; mature fruit length usually $> 3 \times$ width 43
- 36. Sepals rarely reflexed; stems > 60 (may be only 30) cm tall; sepals white, light pink to very light blue 37
- Sepals (especially laterals) usually reflexed; stems < 60 (–100) cm tall; sepals bright blue (white) 39
- 37. Lower petal blade 5–8 mm long; lateral sepal ≥ 10 mm long **D. gypsophilum** subsp. **gypsophilum**
- Lower petal blade 3–4 mm long; lateral sepal ≤ 10 mm long 39
- 38. Sepals white to pink **D. gypsophilum** subsp. **parviflorum**
- Sepals light blue **D. gypsophilum** subsp. **parviflorum** \times **D. parryi** subsp. **parryi**
- 39. Lower petal white; sepals light blue **D. recurvatum**

1. **Delphinium andersonii** A. Gray, Bot. Gaz. (Crawfordsville) 12: 53 (1887). LECTOTYPE (WARNOCK, 1989: 469): Nevada, Trinity Mts. May 1868, *Watson 39* (GH!). *Delphinium tricornae* Michaux δ *andersonii* (A. Gray) Huth, Helios 10: 31 (1893) *Delphinium decorum* subsp. *andersonii* (A. Gray) Huth, Bot. Jahrb. Syst. 20: 343 (1895). *Delphinium decorum* var. *nevadense* Wats., Geol. Surv. Calif. 1: 11 (1880). *Delphinium pauciflorum* Nuttall var. *nevadense* (S. Wats.) A. Gray, in B. L. Robins., Syn. Fl. N. Amer. 1: 50 (1895). *Delphinium sonnei* E. Greene, Pittonia 3: 246 (1897). *Delphinium pauciflorum* var. *sonnei* (E. Greene) Smiley, Univ. California Publ. Bot. 9: 190 (1921). *Delphinastrum andersonii* (A. Gray) Nieuwland, Amer. Midl. Naturalist 3: 172 (1914). All based on the same type.

Delphinium cognatum E. Greene, Pittonia 3: 14 (1896). *Delphinium andersonii* subsp. *cognatum* (E. Greene) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2: 295 (1945). *Delphinium andersonii* var. *cognatum* (E. Greene) R. J. Davis, Madroño 11: 144 (1951). *Delphinium bicolor* Nuttall var. *cognatum* (E. Greene) K. C. Davis, Minnesota Bot. Stud. 2: 438 (1900).

Delphinium megacarpum Nels. & Macbr., Bot. Gaz. (Crawfordsville) 55: 373 (1913).

Root usually > 10 cm long, fibrous, branched. Stem single, (20)30–60(90) cm tall, usually glabrous below the inflorescence, base often narrowed but firmly set to root. Leaves mostly in lower 1/2 stem, round, 7–30 lobed, subglabrous. Inflorescence open, cylindric, 10–25 flowers;

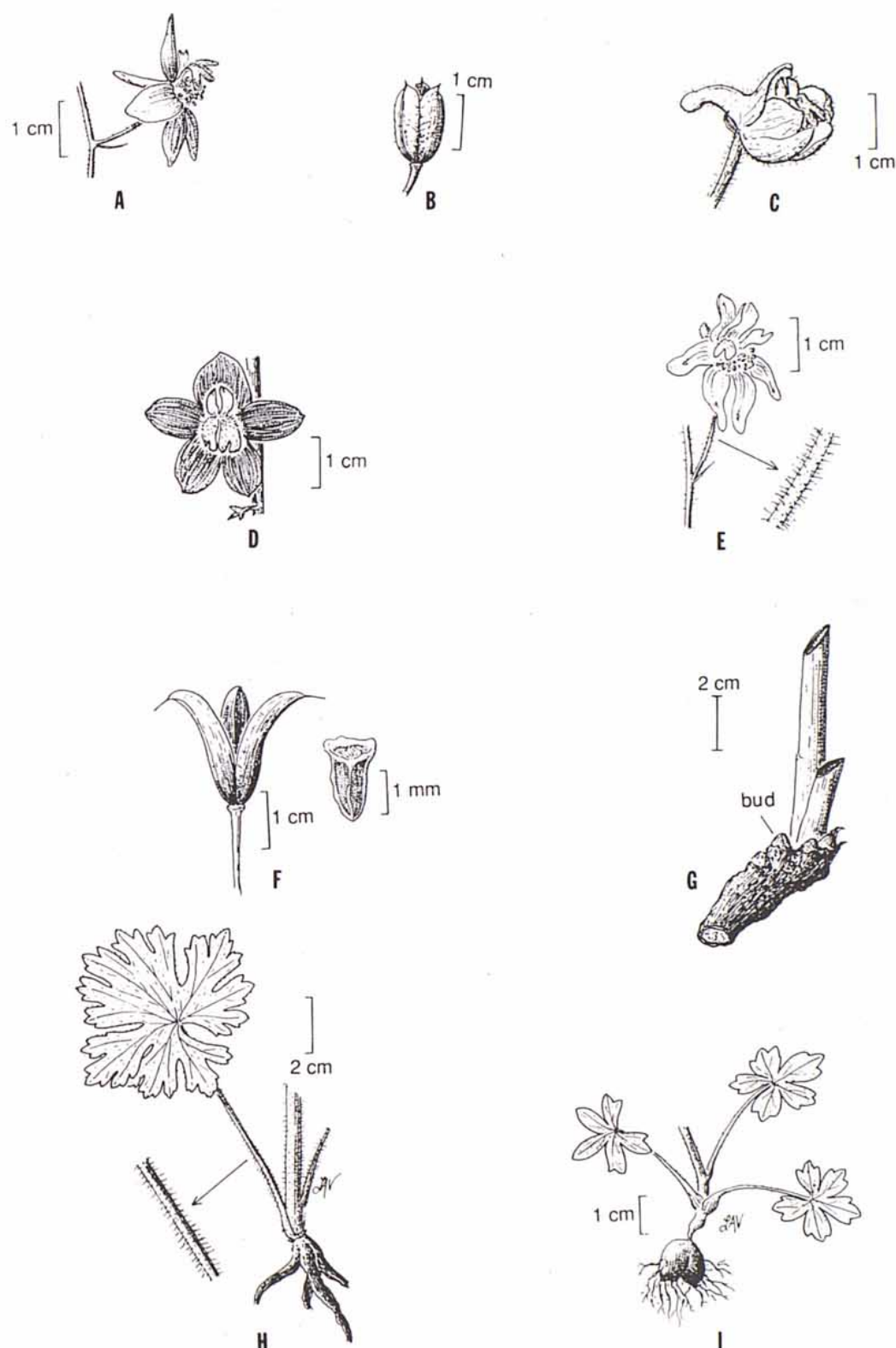


Fig. 2.— Illustrations of technical features of *Delphinium*. A) Flower of *D. patens* showing reflexed sepals, spreading pedicels and raised petals. B) Fruit of *D. gypsophilum* showing erect, stout fruits. C) Flower of *D. californicum* showing erect sepals and simple pubescence. D) Flower of *D. trolliifolium* showing spreading sepals and normal petal orientation. E) Flower of *D. purpusii* showing reflexed sepals, flattened lower petals, ascending pedicels and glandular pubescence. F) Fruits and seed of *D. nudicaule* showing spreading, slender fruit and ringed seed. G) Lower stem and upper root of *D. glaucum* showing prominent buds and non-narrowed lower stem. H) Leaf of *D. hansenii* showing shaggy pubescence. I) Lower stem and root of *D. decorum* showing narrowed stem base. (from HICKMAN, in prep.; used by permission).

pedicels 8-68 mm long, spreading but sigmoid, glabrous to simple puberulent. Flower: sepals spreading, dark blue, lateral 9-16 mm long, spur 11-18 mm long; lower petal blade 4-8 mm long. Fruit 17-32 mm long, slender, erect. Seed +/- rectangular, smooth, shiny, +/- translucent coat, unwinged. $2n = 16$. (LEWIS & AL., 1951).

D. andersonii is locally common in talus and cold desert scrub. Plants often grow up through shrubs or in open areas in low spots where snow collects in winter; 1300-2000 m. NE California, E of Cascade/Sierra divide, ranging to S Idaho and Utah. Flowers open from late May to early July. Hybridizes occasionally with members of the *D. nuttallianum* complex in much of the range of *D. andersonii*, and apparently with *D. parishii* in Mono Co., California. These 3 taxa form an interesting group in that they appear to be ecological replacements for one another, with *D. parishii* occupying arid, hot deserts to the S (California, Arizona, S Nevada), *D. andersonii* growing in cooler, higher latitude and altitude deserts further N (California, Nevada, Utah, S. Idaho, E Oregon) and *D. nuttallianum* being found from edges of cold deserts to treeline (California, N. Nevada N. Arizona, New Mexico to S Canada). Apparently also involved in this ecological replacement complex is *D. scaposum* (not treated here) of Arizona, S. Utah, Colorado and W New Mexico.

While the ecological relationships of these taxa are apparent, their phylogenetic relationships are less clear. Some common features are seen between *D. parishii* and *D. scaposum*, with each of these sharing a few character states with *D. andersonii*, but the *D. nuttallianum* complex appears to be quite distinct morphologically. MALYUTIN (1987) placed *D. andersonii* in subsect. *Exaltata* of sect. *Delphinastrum*. However, the alliances of *D. andersonii* are not with the members of subsect. *Subscaposa* in synonymy under his subsect. *Bicoloria*. Since Ewan's name has nomenclatural priority, and the taxa included here under subsect. *Subscaposa* are probably different at least at the subsectional level from *D. bicolor* Nuttall (the type of subsect. *Bicoloria*), subsect. *Subscaposa* in the epithet used in this work.

Often mistaken for *Delphinium nuttallianum*, most specimens of *D. andersonii* can easily be distinguished. Roots of *D. andersonii* are much larger and more fibrous than those of *D. nuttallianum*, stems are solidly attached to roots in the former, tenuously attached in the latter. The former has long, narrow, erect fruits, while the latter has shorter, proportionally thicker, spreading fruits. Seeds of *D. andersonii* are winged, while those of *D. nuttallianum* are ringed. Inflorescences of the former tend to be longer and narrower based, with sigmoid pedicels, while those of the latter are relatively shorter and wider based, with nearly straight pedicels. Although roots of *D. andersonii* are quite similar to those of *D. antoninum*, the two taxa may be readily distinguished by most features that separate *D. nuttallianum* from *D. andersonii*.

2. *Delphinium antoninum* Eastwood, Leaf. West. Bot. 3:126 (1942). HOLOTYPE: California, between Mendocino & Tehama cos., Anthony Peak, 10 Jul 1941, *Eastwood & Howell 9861* (CAS!).

Root usually > 15 cm long, fibrous, branched. Stem single, (7)15-30(60) cm tall, glabrous to simple puberulent, base narrow. Leaves mostly in lower 1/3 of stem, 3-15 lobed, +/- fleshy, subglabrous. Inflorescence pyramidal, 3-25 flowered; pedicels 6-32 mm long, +/- spreading, usually simple puberulent. Flower: sepals reflexed to spreading, dark blue, lateral 11-13 mm long, spur 12-16 mm long; lower petal blade 4-8 mm long, hairs mostly on inner lobe. Fruit 14-22 mm long, +/- spreading. Seed obpyramidal; ringed, surface roughened.

Populations of *Delphinium antoninum* are uncommon on moist talus slopes, above 1100 m. Range is NW California, in Klamath Range and N Coast Range. The species is endemic to California. Flowers open from June to July. Hybridizes with *D. decorum* subsp. *tracyi* and *D. nudicaule*.

Most often confused with *D. decorum* subsp. *tracyi*, but separable on the basis of the longer root, usually reflexed sepals and typically colorfast flowers of *D. antoninum*, as opposed to the alternate character states in *D. decorum* subsp. *tracyi*. May be confused with *D. andersonii*, but see discussion under that species. Except for its fibrous roots, *D. antoninum* readily fits into sect. *Grumosa* where it was assigned by MALYUTIN (1987).

3. ***Delphinium bakeri*** Ewan, Bull. Torrey Bot. Club 69:144 (1942). HOLOTYPE: California, Sonoma Co., Coleman Valley, May 1939, *Baker 9489* (COLO).

Root usually > 10 cm long, fascicled. Stem (45)60-85(100) cm tall, base narrow, +/— glabrous. Leaves all cauline at anthesis; +/— pentagonal, 3-5 lobed, tips crenate. Inflorescence open, narrowly pyramidal; pedicels 8-91 mm long, spreading, glandular puberulent. Flower: sepals spreading, dark bluish purple, lateral 9-11 mm long, spur 9-13 mm long; lower petal blade 4-8 mm long, hairs few. Fruit 18-20 mm long, +/— spreading. Seed obpyramidal, ringed, surface smooth and shiny.

Delphinium bakeri grows in brushlands and coastal chaparral; 100-300 m. Valleys near border of Sonoma Co. and Marin Co. The species is endemic to California. Flowers are found from April to May. Exceedingly rare, possibly extinct in wild due to cultivation and sheep grazing in the small area where it grows. Known from only two localities and not collected in the wild since 1960. Plants have been grown at the Strybing Arboretum, but their current status is unknown to me.

MALYUTIN (1987) placed *Delphinium bakeri* in subsect. *Exaltata* of sect. *Delphinastrum*. A more logical placement, based on a multitude of characters (see key), would be in sect. *Grumosa*. Although their geographic ranges are distinct, *Delphinium bakeri* is most similar, and probably closely related to *D. trolliifolium*. The former has more rounded incisions on the leaves than the latter, and the pedicels of *D. bakeri* are consistently glandular, while this feature appears only occasionally in *D. trolliifolium*.

4. ***Delphinium californicum*** Torrey & A. Gray, Fl. N. Amer. 1:31 (1838). LECTOTYPE (EWAN, 1945: 145): California, *Douglas* (GH!).

Root usually massive; buds prominent. Stems usually more than one per root, (60)100-220 + cm tall, simple puberulent. Leaves cauline at anthesis, 3-15 lobed, usually simple puberulent. Inflorescence cylindric, often branched, usually > 50 flowers; pedicels 5-65 mm long, spreading, simple puberulent. Flower: sepals lavender to greenish white, erect, lateral 6-11 mm long, spur 7-14 mm long; lower petal blade 3-5 mm long, often raised. Fruit 11-16 mm long, erect. Seed lunate, +/— overlapping scales on seed coat, unwinged.

Delphinium californicum is endemic to California. Among the California species, it can only be confused with *D. glaucum*. The two may be separated by the abundant pubescence, early flowering date and low elevation sites of *D. californicum* as compared to *D. glaucum*.

a. subsp. ***californicum***, based on *D. californicum* Torrey & A. Gray. *D. exaltatum* Aiton β *californicum* (Torrey & A. Gray) Huth, Helios 10:35 (1893).

Delphinium californicum forma *longipilis* Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:146 (1945).

Stem puberulent most of its length. Leaves simple puberulent below and marginally. Inflorescence simple puberulent. Sepals erect, lavender, densely puberulent, lateral 7-11 mm long, spur 7-14 mm long; upper petals with simple subapical hairs. $2n = 16$. (LEWIS & AL., 1951).

Populations are found on generally coastward slopes in dense coastal chaparral, often within sight of the Pacific Ocean; 0-1000 m. Flowers are found from May to June. Locally common, but populations tend to be scattered and often are in areas prized for housing development. Plants grow in Outer Coast Range from Sonoma Co. to Santa Barbara Co. A general trend of increased density and length of pubescence, correlated with increased frequency and density of coastal fog is apparent. Specimens that have been called forma *longipilis* are so named for their abundance of pubescence and grow in areas of abundant fog. This subspecies has formed garden hybrids with *D. cardinale*.

b. subsp. *interius* (Torrey & A. Gray) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:146 (1945). Based on *D. californicum* var. *interius* Eastwood, Leaflet. West. Bot. 2:137 (1938). LECTOTYPE (WARNOCK, 1989: 471): California, San Joaquin Co., Hospital Canyon, 24 May 1938, *Eastwood & Howell 5796* (CAS!).

Stem base sparsely simple puberulent, remainder +/– glabrous. Leaves glabrous. Inflorescence subglabrous. Sepals spreading to erect, greenish white, hairs usually near apex only, lateral 6–8 mm long, spur 7–10 mm long; upper petals glabrous.

Usually found growing on inland facing slopes in open woods; 300–800 m. Flowers open in May. Very uncommon in Inner Coast Range from Contra Costa Co. to Santa Clara Co. Known from fewer than a dozen localities. Apparently hybridizes with *Delphinium hesperium* subsp. *pallidum*.

5. *Delphinium cardinale* Hooker, Curtis' Bot. Mag. 11:t. 4887 (1855). LECTOTYPE (WARNOCK, 1989: 472): grown from seed collected by *Lobb* (K!).

Delphinium coccineum Torrey, Pacific RR Reports, Bot. Whipple Exped. V(4):62 (1857).

Delphinium cardinale Hooker var. *angustifolium* Huth, Bot. Jahrb. Syst. 20:473 (1895).

Root usually massive. Stem usually single, (30)60–120(270+) cm tall, sparsely simple or arched puberulent. Leaves glabrous above, often simple puberulent below; basal usually 0 at anthesis except in small plants; if present, then with larger lobes than cauline; 5–27 lobed. Inflorescence often branched, open, narrow pyramidal, 10–60 flowers; pedicels spreading, 15–55 mm long, usually puberulent. Flower: sepals bright red, forward pointing to spreading, lateral 11–15 mm long, spur 15–24 mm long; upper petals exserted, to 35 mm long; lower orange-red, flattened, blade 4–5 mm long, hairs simple, yellow, sparse. Fruit erect, 12–18 mm long. Seed lunate, dark brown, surface wavy, unwinged. $2n = 16$. (LEWIS & AL., 1951).

Preferred habitat of *Delphinium cardinale* is slopes (often steep, unstable) in chaparral; 300–1500 m. Range is in S Coast Range from S San Benito Co., S to Baja California. Flowers open from May to early July. Plants are quite variable in size, leaf distribution and pubescence, resulting in considerable differences between (sometimes within) populations. However, no patterns could be seen to justify recognition of separate taxa within what is here treated as *D. cardinale*. Populations farther S (in Baja California) may represent a distinct entity which requires further study before a conclusion is made as to the taxonomic level at which to recognize them. Hybrids between *D. cardinale* and *D. parryi* have been named *D. inflexum* Davidson. Due to horticultural interest in red flowered *Delphinium*, garden hybrids have been made with *D. elatum*, *D. hesperium*, *D. hutchinsonae*, *D. nudicaule*, *D. parishii*, *D. penardii*, *D. scopulorum*, *D. tatsienense*, *D. uliginosum* and *D. zailii*, although *D. cardinale* does not normally grow with any of these.

The only possible confusion between this species and other California species might be with *Delphinium nudicaule*. Seeds of *D. nudicaule* are ringed, those of *D. cardinale* are not. Fruits of the former are spreading, those of the latter erect. The former grows in moist habitats, the latter in much drier sites. The two are separated geographically, and for the most part, phenologically (although *D. cardinale* may begin flowering in S California before *D. nudicaule* has finished in N California).

6. *Delphinium decorum* Fisch. & Meyer, Ind. Tert. Sem. Hort. Bot. Petrop. 3:650 (1837). TYPE: California, Bodega Bay, near the Russian colony of Ruthenorum (LE).

Root spheric or fascicled, < 5 cm long. Stem single, +/– erect, at least 2 lower internodes densely puberulent, base narrow. Leaves mostly in lower 1/3 of stem, 3–15 lobed, +/– glabrous above, often sparsely simple puberulent below. Inflorescence pyramidal, open but short, 2–20 flowers; pedicels spreading, 10–63 mm long, puberulent. Flower: sepals purple-blue, spreading, puberulent, often fading in press to brown along veins, lateral 11–24 mm long, spur 13–20 mm long; lower petal blade 6–11 mm long, hairs denser on inner lobe. Fruits spreading, 9–20 mm long. Seed obpyramidal, ringed, surface rough.

Delphinium decorum is often referred to, in California floristic works, as *D. menziesii* DC (which does not occur in California). The latter lacks the fading sepals of the former, generally has darker colored sepals, with less lavender, than *D. decorum*, and has more finely dissected leaves than *D. decorum* subsp. *decorum*. Often confused with *D. patens*, *D. decorum* is sometimes circumscribed so as to include that species. The spreading, fading, blue purple sepals, pubescent lower stems and large lower petal blade of *D. decorum*, compared to the reflexed, colorfast, bluer sepals, glabrous lower stems and smaller lower petal blade of *D. patens* adequately distinguish the two taxa.

a. subsp. *decorum*, based on *D. decorum* Fisch. & Meyer.

Stem (8)15-25(35) cm tall. Leaf 3-5 lobed, merely cleft near apices. Inflorescence puberulent, hairs simple or glandular. Flower: lateral sepal 12-24 mm long, spur 13-19 mm long; lower petal hairs yellow. KURITA (1956) reports $n = 32$ for *D. decorum*, but the source of his material is unclear.

Plants of subsp. *decorum* are found in grasslands, open coastal chaparral; 0-100 m. Near coast from Humboldt Co. to San Mateo Co. Found only in California. Flowers open from March to May. Various hybrids with *Delphinium patens* have been named *D. decorum* var. *racemosum* Eastwood and *D. decorum* var. *sonomensis* Eastwood. The type of the latter variety appears to represent a nearly direct intermediate between *D. decorum* and *D. patens*. These hybrids are quite common in the San Francisco Bay region where habitats have been disturbed. Normally a woodland plant, *D. patens* contrasts with *D. decorum* which occurs in grassland and brushland. Also hybridizes with *D. luteum*, *D. nudicaule* and *D. trolliifolium*.

b. subsp. *tracyi* Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:100 (1945). HOLOTYPE: California, Humboldt Co., Larabee Valley, 3000 ft, 25 May 1930, Parks & Tracy 789 (UTC).

Stem 7-20(45) cm tall. Leaf 5-15 lobed with pronounced apical lobes. Inflorescence glabrous or nearly so. Flower: lateral sepal 11-18 mm long, spur 13-20 mm long; lower petal hairs white. $2n = 16$ (LEWIS & AL., 1951).

Delphinium decorum subsp. *tracyi* grows in meadows in montane forests; 700-2000 m. Range is in N Coast Range and Klamath Range N of Mendocino Co. Probably occurs into S Oregon although no specimens have been seen from that state. Flowers are seen from mid May to late June. Habitat appears to be the main isolating mechanism between this and *D. antoninum*, but hybrids do occur. Also hybridizes with *D. nudicaule* and *D. trolliifolium*.

May be confused with *D. antoninum* or *D. nuttallianum*. For distinctions from the former, see discussion under that species. Separations between subsp. *tracyi* and *D. nuttallianum* may be made on basis of spreading, fading, bluish purple sepals of the former as opposed to reflexed, colorfast, dark blue to white sepals of the latter. Pubescent lower stem and larger lower petal blades of subsp. *tracyi* are also useful to distinguish from usually glabrous lower stem and smaller lower petal blade of *D. nuttallianum*.

7. *Delphinium depauperatum* Nutt. in Torrey & A. Gray, Fl. N. Amer. 1:33 (1838). LECTOTYPE (EWAN, 1945: 114): Oregon, Blue Mts., in shade of pine woods, Nuttall (PH!). *Delphinium pauciflorum* Nuttall var. *depauperatum* (Nuttall) A. Gray, Bot. Gaz. 12:54 (1887). *Delphinium tricornis* Michaux & *depauperatum* (Nuttall) Huth, Helios 10:37 (1893).

Delphinium diversifolium Greene, Pittonia 3:93 (1896). *Delphinium scopulorum* A. Gray var. *diversifolium* (E. Greene) K. C. Davis, Minnesota Bot. Stud. 4:449 (1900).

Delphinium diversifolium E. Greene subsp. *harneyense* Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:115 (1945). *Delphinium diversifolium* E. Greene var. *harneyense* (Ewan) R. J. Davis, Madroño 1:1144 (1951).

Root fibrous, fascicled, < 5 cm long. Stem single, 7-40(65) cm tall, subglabrous below, +/- glandular puberulent above. Leaves: basal +/- round; cauline angular, fewer than basal, rapidly smaller upward, subglabrous, 5-10 lobed. Inflorescence cylindric, often branched,

white glandular puberulent, +/- secund; pedicels appressed-ascending. Flower: sepals dark blue, puberulent, lateral 10-13 mm long, spur 12-16 mm long, perpendicular to rachis, lower petal blade 4-8 mm long. Fruit erect, 9-16 mm long. Seed winged, shiny, surface roughened. $n = 8$ (ORNDUFF, 1957, *sub Delphinium cyanoeiros* Piper).

Delphinium depauperatum grows in moist meadows; 1900-2600 m. N Sierra Nevada and Warner Mts. in California, also in mountain ranges of N Nevada, E Oregon and SW Idaho. Flowers may be seen from June to early August. This species and *D. nuttallianum* are often found in the same meadows, with *D. depauperatum* occupying wetter sites, often very near streams, while *D. nuttallianum* is found in drier, better drained sites. In typical years, ground surface will be dry around *D. nuttallianum* plants, while ground surface is damp near *D. depauperatum* plants as they flower. In addition, within a meadow, *D. depauperatum* flowers later than *D. nuttallianum*, so there is normally little overlap in flowering phenology of these two taxa. While hybridization between these two is rare, hybrids do occur. Specimens labeled subsp. *harneyense* represent the phase with more abundant yellow glandular trichomes in inflorescence and slightly larger flowers. Considerable variation in these features may be found within populations. Presence of yellow glandular hairs generally increases in more northern populations. Type specimens of *D. diversifolium* are intermediate in amount of glandular pubescence.

Often confused with *Delphinium nuttallianum*, *D. depauperatum* may be distinguished by the cylindrical inflorescence, less dissected leaves, winged seeds and erect fruits of the latter. These character states contrast with the pyramidal inflorescence, more dissected leaves, ringed seeds and spreading fruits of *D. nuttallianum*. Dwarfed phases of *D. polycladon* may be confused with *D. depauperatum*, but may be distinguished on the basis of prominent buds, sigmoid pedicels and bluish purple flowers in the former and lack of prominent buds, straight pedicels and dark blue flowers in the latter.

8. *Delphinium glaucum* Wats. in Brewer & Watson, Geol. Surv. Calif. 2:427 (1880). LECTOTYPE (WARNOCK, 1989: 476): California, Big Tree Rd., near Camp 129, 6000 ft, 30 Jul 1863, Brewer 1940 (GH!). *Delphinium scopulorum* A. Gray var. *glaucum* (S. Wats.) A. Gray, Bot. Gaz. (Crawfordsville) 12:52 (1887). *Delphinium exaltatum* Aiton & *glaucum* (S. Wats.) Huth, Helios 10:35 (1893). *Delphinastrum glaucum* (S. Wats.) Nieuwland, Amer. Midl. Naturalist 3:172 (1914).

Delphinium splendens G. N. Jones, Madroño 6:84 (1941).

Root massive, usually > 20 cm long, buds prominent. Stems usually > 1/root, (80)150-220(300) cm long, glabrous, glaucous below. Leaves usually glabrous, all cauline at anthesis, 5-9 lobed. Inflorescence usually branched, cylindric, > 50 flowers; pedicels 10-48 mm long, spreading to ascending, glabrous to puberulent. Flower: sepals bluish purple to dark lavender, erect to spreading, lateral 8-14(21) mm long, sparsely puberulent, spur 10-19 mm long; lower petal blade 4-8 mm long. Fruit erect, 9-20 mm long. Seed. +/- rectangular, surface roughened, unwinged. $2n = 16$ (LEWIS & AL., 1951).

Preferred habitats of *Delphinium glaucum* are wet thickets, streamsides and near edges of wet subalpine meadows; 1600-3200 m. This species is found in San Gabriel, Klamath and Sierra Nevada Ranges in California, ranging N to Alaska and E to Colorado. Flowers open from July to September. Occasionally hybridizes with *D. polycladon*. Specimens named *D. splendens* represent plants grown in high moisture, low light conditions and may occur anywhere from California to Alaska.

Possibly confused among the California species with *Delphinium californicum*, *D. polycladon* or *D. stachydeum*. For distinctions from *D. californicum*, see discussion under that species. Lack of basal or lower cauline leaves, generally much larger plants (> 1.5 m), more flowers in the inflorescence and shorter petioles on the leaves of *D. glaucum* are features that serve to distinguish this species from *D. polycladon*. In the latter, the leaves are primarily on the lower stem, plants often < 1.5 m tall, flowers more scattered and petioles > twice as long as leaf blades. Features of the sepals may be used to distinguish *D. glaucum* (dark lavender to blue purple, usually only minutely puberulent) from *D. stachydeum* (bright blue, densely puberulent). Vegetative parts of *D. stachydeum* are also densely puberulent, while those of *D. glaucum* typically are glabrous.

9. ***Delphinium gracilentum*** E. Greene, Pittonia 3:15 (1896). Based on citation of *D. patens* Benth., in E. Greene, Fl. Francis. 306 (1892). LECTOTYPE (EWAN, 1945: 103): California, Amador Co., Hansen 559a (ND-G!). *D. decorum* Fischer & Meyer var. *gracilentum* (E. Greene) K.C. Davis, Minnesota Bot. Stud. 4:439 (1900).

Delphinium pratense Eastwood, Bull. Torrey Bot. Club 28:669 (1901).

Delphinium greenii Eastwood, Bull. Torrey Bot. Club 28:674 (1901). *Delphinium patens* subsp. *greenii* (Eastwood) Ewan, Bull. Torrey Bot. Club 69:147 (1942).

Delphinium gracilentum E. Greene forma *versicolor* Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:104 (1945).

Root +/- round to fibrous fascicled, < 5 cm long. Stem simple, (15)30-50(80) cm tall, subglabrous below, glabrous to glandular in inflorescence, base narrowed. Leaves mostly cauline, subglabrous, 3-5 lobes wedge shaped, apex obtuse. Inflorescence: +/- pyramidal, open, 5-20 flowers; pedicels spreading, 15-45 mm long, glabrous to glandular. Flower: sepals reflexed, dark blue purple to pink or white, lateral 7-13 mm long, spur 9-14 mm long; lower petal blade 4-8 mm long, hairs usually yellow. Fruits spreading, 8-13 mm long. Seed obpyramidal, ringed, surface roughened. $2n = 16$ (LEWIS & AL., 1951 [from an equivocal population between this and *Delphinium patens*]).

Delphinium gracilentum is usually found in open coniferous forest, although occasionally in broadleaf woods, generally among shrubs in well drained sites; 150-2700 m. W slope of Sierra Nevada from Plumas Co. to N Tulare Co. Range is restricted to California. Flowers are seen from late April to late June (July). Hybridizes with *D. patens* subsp. *patens* in N Sierra Nevada foothills, but very similar to that species and hybrids are difficult to discern. While the two taxa are easily separated in most of their ranges, morphological distinctions between *D. gracilentum* and *D. patens* are blurred in that region, particularly in Butte Co. Coniferous woods are preferred by *D. gracilentum* while *D. patens* is more often found in broadleaf woods. The former has more widely spreading pedicels than the latter, and *D. gracilentum* usually has wider leaf lobes than *D. patens* subsp. *patens*. In S Sierra Nevada, *D. gracilentum* may come in contact with *D. patens* subsp. *montanum*. Though hybrids are not common, some gene flow has apparently occurred. The type of *D. gracilentum* represents the northern, lower elevation, eglandular, dark flowered phase. The type of f. *versicolor* is similar to the typical phase except for the pink or white flowers. A limited range of intermediate colors occurs, and populations may be made up of plants of a single color, or several different colors. The type of *D. greenii* represents the southern, higher elevation, glandular (at least pedicels) expression. The type sheet includes representatives of dark and light flowered individuals of this phase. The type of *D. gracilentum* forma *versicolor* was not seen, but this is the «albino» phase referred to by Greene in his description of *D. gracilentum*. Several of the paratypes cited by Ewan have been seen, as have a number of individuals in natural populations. As Ewan states with his description, the color form is not stable and considerable variation occurs within populations.

Delphinium gracilentum may be confused with *D. patens* or *D. nuttallianum*. From the latter, it may be distinguished by the wider lobes of the leaves, smaller fruits and more elongate inflorescence. As to *D. patens*, the two taxa may be distinguished by wider leaf lobes, more open inflorescence and usually shorter fruits of *D. gracilentum*.

10. ***Delphinium gypsophilum*** Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:189 (1945).

TYPE: California, Fresno Co., mouth of Pinoche Cr, 550 ft, 25 Apr 1937, Ewan 10295 (COLO).

Root often > 10 cm long, fibrous, branched. Stem (30)60-100(150) cm tall, usually glabrous, often glaucous, base sometimes narrow, but attached firmly to root. Leaves 5-18 lobed, dimorphic, basal less dissected than cauline, but basal usually 0 at anthesis, margins often puberulent. Inflorescence cylindric, usually branched, 10-30 flowers; pedicels +/- spreading, 5-25 mm long, glabrous. Flower: sepals white to pink, lateral 7-19 mm long, spur 7-15 mm long. Fruit 9-18 mm long, erect, stout. Seed winged, cell margins undulate.

Delphinium gypsophilum grows only in California and is sometimes confused with *D. hesperium* subsp. *pallidum*, *D. recurvatum* and the white flowered phases of *D. hansenii* subsp. *kernense*. The echinate seeds and shaggy haired petioles of *D. hansenii* immediately distinguish this taxon from *D. gypsophilum* which has neither. Similar in many respects, and related to *D. recurvatum*. The two may be distinguished morphologically by the fact that *D. recurvatum* has reflexed blue sepals, while those of *D. gypsophilum* are spreading and white (although they may fade to light blue when dry); plants of *D. recurvatum* normally are < 60 cm tall while those of *D. gypsophilum* are usually > 60 cm tall. Ecologically, *D. recurvatum* occupies level ground among shrubs, typically in alkaline valley bottoms; while *D. gypsophilum* is found on well drained slopes among grasses on hillsides. From *D. hesperium* subsp. *pallidum*, specimens of *D. gypsophilum* may be separated by the presence of much more finely dissected leaves, with less surface area, stem base usually anthocyanous, frequently glaucous lower stem, undulate margins of seed coat cells and absence of striations in stem base of dried specimens. The contrasting features of *D. hesperium* subsp. *pallidum* are leaves less dissected, with greater surface area, stem base rarely anthocyanous, lower stem not glaucous, seed coat cells with smooth margins and striations are present on the lower stem of dried specimens.

MALYUTIN (1987) placed *Delphinium gypsophilum* in subsect. *Bicoloria* of sect. *Kolobopetala*. A better assignment would be in subsect. *Subscaposum* (see discussion under *D. andersonii*).

a. subsp. *gypsophilum*, based on *D. gypsophilum* Ewan.

Stem (50)70-100(150) cm tall. Inflorescence open. Flower: sepals white, spreading, lateral 10-19 mm long, spur 10-15 mm long; lower petal blade 5-8 mm long, white. $2n = 16, 32$. (LEWIS & AL., 1951).

Plants of subsp. *gypsophilum* grow on slopes in grassland and open oak woods; 150-1200 m. Plants are found in loose colonies, scattered through S Inner Coast Range, San Joaquin Valley margins, and foothills of Tehachapi mountains and S Sierra Nevada. Flowers are found from April to May. Tetraploid individuals occur in populations intermingled with diploid individuals and are normally indistinguishable on morphological grounds. Hybridization may occur with *Delphinium recurvatum* in the San Joaquin Valley, *D. parryi* in Coast Range, *D. hansenii* in the foothills of Sierra Nevada and Tehachapi Mountains, and probably with *D. hesperium* subsp. *pallidum* in Coast Range. LEWIS & EPLING (1959) is a summary of the possible hybrid origin of *D. gypsophilum*.

b. subsp. *parviflorum* Lewis & Epling, Brittonia 8:5 (1954). LECTOTYPE (WARNOCK, 1989: 477): California, San Luis Obispo Co., 8.8 mi W US Hwy 101 on N rd to Adelaida, Lewis & Epling 686 (LA!).

Stem (30)60-90(140) cm tall. Inflorescence +/- dense. Flower: sepals white to pink, erect, lateral 7-10 mm long, spur 7-11 mm long; lower petal blade 3-4 mm long, white or yellow. $2n = 16$ (LEWIS & AL., 1951, as *D. gypsophilum*).

Preferred sites for subsp. *parviflorum* are open oak woods, chaparral and grassland; 200-350 m. Plants range from S Monterey Co. to N San Luis Obispo Co. Flowers are seen in May. Hybrids occur with *Delphinium parryi*.

Sometimes confused with *Delphinium parishii* subsp. *pallidum*. Plants of *D. gypsophilum* subsp. *parviflorum* are usually taller and grow in grasslands to woodlands, while *D. parishii* subsp. *pallidum* plants are usually shorter and grow in chaparral and shrubland.

11. *Delphinium hansenii* (E. Greene) E. Greene, Pittonia 3:94 (1896). Based on *D. hesperium* var. *hansenii* E. Greene, Fl. Francis. 304 (1892). LECTOTYPE. (EWAN 1942: 140): California, Amador Co., 1891, Hansen (ND-G!).

Root usually < 10 cm long, fibrous fascicled. Stem single, (25)40-80(180) cm tall, simple puberulent (denser above), mixed (especially below) with shaggy hairs. Leaves 3-18 lobed, simple to shaggy pubescent, especially underneath, basal leaf petioles shaggy pubescent,

cauline leaves rapidly smaller higher on the stem. Inflorescence cylindric, usually dense, usually > 25 flowers; pedicels 3-16(57) mm long, appressed-ascending. Flower: sepals spreading to erect, violet to white, lateral 7-13 mm long, spur 6-16 mm long; lower petal blade 4-8 mm long, hairs usually more common on inner lobe than outer. Fruits 8-20 mm long, erect, stout. Seed +/- obpyramidal, echinate.

Delphinium hansenii was assigned to subsect. *Subscaposa* and ser. *Echinatae* Ewan by EWAN (1942). MAYLUTIN (1987) placed *D. hansenii* in subsect. *Echinata* (Ewan) Malyutin of sect. *Albocoerulea* in subgen. *Oligophyllum* Dimitrova. Malyutin's primary distinction between subgen. *Delphinastrum* and subgen. *Oligophyllum* is smooth to rugose seeds in the former with squamose seeds in the latter. Seeds of *D. hansenii* are, as far as known, unique, bearing numerous, elongated processes (extensions of single cells or small groups of cells) over the entire surface. These structures, interpreted as squamae by Malyutin, are quite different from the wave like structures (formed from many cells) found on other North American representatives of subgen. *Oligophyllum*. Other than the seeds, *D. hansenii* fits neatly with the features of what is recognized here as subsect. *Subscaposa* and should be placed there. *D. hansenii* is often confused with *D. hesperium*, but, if available, seeds will instantly identify specimens as one of these species or the other. If seeds are lacking, larger flowers, more open inflorescence (except in *D. hesperium* subsp. *cuyamaca*) and general lack of shaggy hairs of *D. hesperium* are apparent upon comparison of specimens between the two species. Difficulty may also occur in separating *D. hansenii* from *D. variegatum*. Again, seeds, if available, leave no doubt. In addition, smaller flowers and greater number of flowers per plant of *D. hansenii* should serve to distinguish them from *D. variegatum*. White flowered *D. hansenii* may be confused with *D. gypsophilum* and *D. hesperium* subsp. *pallidum*. Other than seeds, shaggy pubescence and smaller flowers present in *D. hansenii*, while absent in the others, will distinguish them. *Delphinium hansenii* is found only in California.

a. subsp. *hansenii*, based on *D. hansenii* (E. Greene) E. Greene.

Delphinium hansenii (E. Greene) E. Greene subsp. *arcuatum* (E. Greene) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:193 (1945). Based on *D. hansenii* (E. Greene) E. Greene *l. arcuatum*. E. Greene, Pittonia 3:94 (1896).

Delphinium hesperium A. Gray forma *hirsutum* Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:179 (1945).

Stem 40-80(180) cm tall, base simple and/or shaggy puberulent. Leaves: basal often withered at anthesis, petioles usually shaggy pubescent. Inflorescence dense, less commonly open. Flower: sepals dark blue purple to white or pink, lateral 7-13 mm long, spur 8-13 mm long. $2n = 16, 32$ (LEWIS & AL., 1951).

Habitats of subsp. *hansenii* include open oak woods and grasslands; 150-3000 m. Sometimes large (500 or more plants), but more often smaller colonies are scattered through Sierra Nevada and Cascade foothills, Sacramento Valley, N Inner Coast Range, higher elevations of central Sierra Nevada. Flowers may be seen from April to May (July). Produces natural hybrids with *Delphinium gypsophilum*, *D. hesperium* and *D. variegatum*.

b. subsp. *kernense* (Davidson) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:193 (1945). Based on *D. hansenii* (E. Greene) E. Greene var. *kernense* Davidson, Muhlenbergia 4:37 (1908). LECTOTYPE (EWAN 1942: 143): California, Kern Co., Tehachapi Mts., Mt. Cummings, 6000 ft, dry sunny slope, 10 Jun 1907, *Hasse & Davidson 1703* (RSA!).

Stem (34)50-80(110) cm tall, base simple puberulent. Leaves nearly all basal, often dried but present at anthesis, although rarely on herbarium sheets, petioles shaggy pubescent. Inflorescence open. Flower: sepals dark blue to white, lateral 7-13 mm long, spur 8-16 mm long. $2n = 16, 32$ (LEWIS & EPLING, 1954).

Plants are found in loose colonies in open oak woods or Sierra chaparral; 800-1900 m. Range includes Tehachapi Mts. and S Sierra Nevada. Flowers are present in April and May (June). Hybridizes with *Delphinium gypsophilum*, *D. parishii* and *D. purpureum*.

c. subsp. **ewanianum** Warnock, *Phytologia* 68(1):3 (1990). HOLOTYPE: California, Madera Co., just N of jct of Co. Rd. 400 and Co. Rd. 415, W of Coarsegold, SW facing slope, open oak woods, 30 Apr. 1989, *Warnock 7457* (SHST!).

Stem (25)60-100(130) cm tall, base usually simple puberulent. Leaves: basal generally withered at anthesis, petioles shaggy pubescent. Inflorescence dense or open. Flower: sepals dark maroon to reddish purple, lateral 8-12 mm long, spur 6-16 mm long. $2n = 32$ (LEWIS & EPLING, 1951).

Plants of subsp. *ewanianum* grow on rock outcrops in open oak woods, grasslands; 60-600 m. Geographic range is Sierra Nevada foothills from Calaveras Co. to Kern Co. Flowers open from late March to early May. Extremely local, subject to extirpation by future housing development.

12. *Delphinium hesperium* A. Gray, Bot. Gaz. (Crawfordsville) 12:53 (1887). LECTOTYPE (EWAN, 1945: 179): California, Contra Costa Co., Antioch, May 1883, *Curran 6* (GH!).

Root usually < 10 cm long, fibrous fascicled. Stem single, (10)40-80(120) cm tall, base subglabrous to simple puberulent, lined in dried specimens due to contraction between vascular bundles. Leaves 3-14 lobed, subglabrous above, simple puberulent, prominently veined below, basal usually absent at anthesis. Inflorescence cylindric, 5-100 flowers; pedicels (6)12-30(75) mm long. Flower: sepals dark blue to white, lateral 7-16 mm long, spur 9-18 mm long; lower petal blade 4-8 mm long, hairs more dense on inner lobe. Fruit erect, sometimes stout, 8-18 mm long. Seed +/- rectangular, winged, otherwise smooth.

Delphinium hesperium grows only in California and is often confused with *D. hansenii*. See discussion under that species for distinguishing features. MALUYTIN (1987) placed *D. hesperium* in subsect. *Bicoloria* of sect. *Kolobopetala*. A preferable assignment would be to subsect. *Subscaposa* (see discussion under *D. andersonii*).

a. subsp. **hesperium**, based on *D. hesperium* A. Gray.

Stem glabrous to simple puberulent (shaggy hairs rare). Inflorescence usually < 30 flowers, open; pedicels ascending. Flower: sepals dark blue purple, spreading, lateral 8-16 mm long, > 4 mm wide, spur 10-18 mm long; lower petal blade 5-8 mm. long. $2n = 16$ (LEWIS & AL., 1951).

Populations occur in open oak woods, grasslands, openings in coastal chaparral; 10-1100 m. Range includes Outer N Coast Range from Siskiyou Co. to Santa Clara Co. Populations are found on W slope of Coast Range. Flowers may be seen from April to early June. Hybrids are known with *Delphinium parryi* and *D. variegatum*.

At times confused with *Delphinium parryi*, but may be recognized by presence in subsp. *hesperium* of usually darker blue sepals, lack of curled pubescence on lower stem and pronounced venation on underside of leaves. *Delphinium parryi* has brighter blue sepals, arched pubescence on lower stems and leaves are not prominently veined underneath.

b. subsp. **cuyamacae** (Abrams) Lewis & Epling, *Brittonia* 8:11 (1954). Based on *D. cuyamacae* Abrams, *Bull. Torrey Bot. Club* 32:538 (1905). LECTOTYPE (EWAN, 1945: 175): California, San Diego Co., borders of Cuyamaca Lake, grassy slopes, 1550 m, 26 Jun 1902, *Abrams 3888* (DS!). *Delphinium hesperium* A. Gray var. *cuyamacae*. (Abrams) Jepson, *Fl. Calif.* 1:524 (1914).

Stem base arched puberulent. Inflorescence generally > 25 flowers, dense; pedicels ascending. Flower: sepals dark blue purple, spreading to erect, lateral 7-10 mm long, < 5 mm wide, spur 8-12 mm long.; lower petal blade 3-5 mm long. $2n = 16$ (LEWIS & AL., 1951).

Extremely rare, local in grassland and open pine woods near Cuyamaca Lake; ca 1500 m. Reported also from Mt. Palomar, but this specimen not seen. Flowers open in June.

No other *Delphinium* with similar features grows in the region where subsp. *cuyamacae* grows. Superficially, specimens of this taxon resemble those of some *D. hansenii* subsp. *hansenii*. Seeds are quite different, as are pubescence patterns and venation on underside of leaves. *Delphinium parryi* occurs near subsp. *cuyamacae*, but flowers of *D. parryi* in that area are much larger and more widely spaced on the inflorescence than in subsp. *cuyamacae*.

c. subsp. ***pallescens*** (Ewan) Lewis & Epling, Brittonia 8:10 (1954). Based on *D. hesperium* A. Gray forma *pallescens*, Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:179 (1945). HOLOTYPE: California, Napa Co., Steel Canyon Rd, 0.5 mi from jct with Monticello-Winters Rd., 30 Apr 1934, Ewan 8835 (COLO).

Stem usually glabrous. Inflorescence usually < 25 flowers, open; pedicels +/- spreading. Flower: sepals white to pinkish, spreading, lateral 10-15 mm long, > 4 mm wide, spur 10-17 mm long; lower petal blade 4-7 mm long. $2n = 16$ (LEWIS & AL., 1951).

Populations of subsp. *pallescens* are scattered in open oak woods and grasslands; 20-1000 m. Found in N Sacramento Valley, Cascade foothills and Inner Coast Range from Shasta Co. to S Monterey Co. Plants of subsp. *pallescens* grow only E of Coast Range divide. Flowers are open from April through May. Hybridizes with *Delphinium gypsophilum*, *D. parryi*, *D. recurvatum*, *D. uliginosum* and *D. variegatum*. Intermediates are occasionally found between subsp. *pallescens* and subsp. *hesperium* (particularly in Napa Co.), but the two taxa remain, for the most part, geographically isolated.

Sometimes confused with *Delphinium gypsophilum* or white flowered plants of *D. hansenii*, but see discussion under those species.

13. *Delphinium hutchinsonae* Ewan, Bull. Torrey Bot. Club 78:379 (1951). HOLOTYPE: California, Monterey Co., 2.5 mi S of Monterey, sand of beach, 28 May 1938, Hutchinson 7423 (COLO).

Root usually < 10 cm long, fibrous, branched. Stem single, (25)50-80(100) cm tall, base simple puberulent, glabrous above. Leaves all cauline at anthesis, 3-17 lobed with spreading secondary lobes; petioles shaggy puberulent. Inflorescence open, +/- cylindric, usually branched, rarely > 10 flowers/branch; pedicels 8-40 mm long, +/- ascending, puberulent. Flower: sepals dark bluish purple, spreading, lateral 12-24 mm long, spur 11-19 mm long, usually downcurved apically; lower petal blade 5-10 mm long, nearly glabrous, hairs more dense on inner lobe, absent on margin. Fruit erect, 9-21 mm long, stout, veins often blue. Seed +/- rectangular, winged, otherwise smooth.

Very rare, known from only a few populations from near Monterey, S to the Big Sur region. Plants grow in coastal chaparral and open coniferous woods; 0-400 m. Flowers are present from late April to mid-May. *Delphinium hutchinsonae* is endemic to California. Of historical interest, Hartweg collected this species as early as 1846. Hybrids have been produced between *D. hutchinsonae* and *D. cardinale* grown in a common garden. Hybrids also occur with *D. parryi* subsp. *maritimum*.

Similar and probably closely related to *Delphinium variegatum*. The two may be distinguished by decurved spur of *D. hutchinsonae*, while spur of *D. variegatum* is normally straight (or decurved nearer apex) and lack of marginal hairs on lower petals of the former, these being present in the latter. The two species are also geographically separated. MALYUTIN (1987) treated *D. hutchinsonae* as belonging to subsect. *Bicoloria* of sect. *Kolobopetala*. A preferable assignment would be to subsect. *Subscaposa* (see discussion under *D. andersonii*).

14. *Delphinium inopinum* (Jepson) Lewis & Epling, Brittonia 8:11 (1954). Based on *D. parishii* A. Gray var. *inopinum* Jepson, Fl. Calif. 1:526 (1914). LECTOTYPE (WARNOCK, 1989: 481): California, Tulare Co., Kern River Canyon, near Junction Meadows, 7800 ft, 13 Jul 1912, Jepson 5012 (JEPS!).

Root massive, buds prominent. Stem often > 1 per root, (80)100-150 cm tall, glabrous, usually glaucous. Leaves 3-7 lobed, mostly in lower 1/3 of stem, basal absent at anthesis. Inflorescence cylindric, dense, usually > 25 flowers; pedicels 5-25 mm long, ascending, glabrous. Flower: sepals white to light blue, usually erect, lateral 8-12 mm long, spur 9-12 mm long; lower petal +/- flattened, blade 3-5 mm long. Fruit erect, 12-20 mm long. Seed winged, otherwise smooth.

Delphinium inopinum is rare and local on rock outcrops in open conifer woods; 2200-2800 m. Known only from type locality in Tulare Co. and summit of Piute Mts. in Kern Co. Apparently endemic to a white metamorphic rock in these regions. Flowers are found from July into early August. The species is endemic to California. Not known to hybridize with any other species, although *D. patens* subsp. *montanum* has been collected within 1 km of *D. inopinum* and probably occurs much closer.

Often confused with *Delphinium parishii* subsp. *pallidum* and superficially resembles some white flowered *D. hansenii*, as well as *D. gypsophilum* and *D. hesperium* subsp. *pallidum*. The massive roots with prominent buds readily distinguish *D. inopinum* from all of these. In addition, the pubescence found on *D. hansenii* will separate it from *D. inopinum*, which is glabrous. Leaves are rare at anthesis near the base of the stem in *D. hesperium* subsp. *pallidum*, while they are present in *D. inopinum*. Assigned by MALYUTIN (1987) to subsect. *Bicoloria* of sect. *Kolobopetala*, the affinities of *Delphinium inopinum* lie with *D. glaucum*, a species with which it is not likely to be confused, but with which it shares a number of traits. This similarity with *D. glaucum* suggests a placement of *D. inopinum* in subsect. *Exaltata* of sect. *Delphinastrum*.

15. *Delphinium luteum* Heller, Bull. S. California Acad. Sci. 6:68 (1903). LECTOTYPE (EWAN, 1945: 119): California, Sonoma Co., near Bodega Bay along road to Bodega, grassy slopes about rocks, 11 Apr 1902, Heller & Brown 5256(PH!). *Delphinium nudicaule* Torrey & A. Gray var. *luteum*. (Heller) Jepson, Man. Fl. Pls. Calif. 376 (1923).

Root usually > 15 cm long, fibrous, branched. Stem single, 20-40(55) cm tall, subglabrous, base narrowed. Leaves usually +/- basal, +/- fleshy, 3-5 lobed, subglabrous. Inflorescence pyramidal, often branched, open, 5-25 flowers; pedicels +/- spreading, 8-68 mm long, puberulent. Flower: sepals bright yellow, appearing waxy when fresh, +/- erect, lateral 11-16 mm long, spur 13-20 mm long; lower petal flattened, blade 3-4 mm long, subglabrous. Fruits +/- spreading, 11-14 mm long. Seeds obpyramidal, ringed, otherwise smooth. $n = 8$ (GUERRANT, 1978).

Extremely rare, growing on wet cliffs in coastal grassland or chaparral; 0-50 m. Presently known from only two populations, one near Bodega Bay, at the edge of a subdivision and one in NE Marin Co. Probably should be considered endangered nationally. Flowers may be found from March to mid-May. Known to hybridize with *Delphinium decorum* and *D. nudicaule*. Populations of *D. hesperium* subsp. *hesperium* also occur at the type locality, but *D. luteum* flowers earlier and hybrids are not known.

Not likely to be mistaken for any other California *Delphinium*. It has been treated as a variety of *D. nudicaule* and is almost certainly closely related to that species. However, sepals of the rare yellow flowered phase of *D. nudicaule* have a much more drab appearance compared with the bright shining yellow of the sepals in *D. luteum*.

16. *Delphinium nudicaule* Torrey & A. Gray, Fl. N. Amer. 1:33 (1838). LECTOTYPE (EWAN, 1945: 117): California, Douglas (GH!). *Delphinium decorum* Fischer & Meyer δ *nudicaule* (Torrey & A. Gray) Huth, Helios 10:33 (1893). *Delphinastrum nudicaule* (Torrey & A. Gray) Nieuwland, Amer. Midl. Naturalist 3:172 (1914).

Delphinium sarcophyllum Hooker & Arnott, Bot. Beechey Voy. 317 (1838). *Delphinium nudicaule* Torrey & Gray var. *elatium* Thompson, The Garden 19:234 (1881). *Delphinium nudicaule* Torrey & A. Gray forma *elatium* (Thompson) Ewan, Bull. Torrey Bot. Club 69:146 (1942).

Delphinium peltatum Hooker ex Huth, Bot. Jahrb. Syst. 20:449 (1895) *nomem nudum*.

Delphinium armeniacum Heller, Leaflet. West. Bot. 2:219 (1940). Not *D. armeniacum* Stapf ex Huth, Bot. Jahrb. Syst. 20:329 (1895).

Delphinium nudicaule Torrey & A. Gray var. *foliosum* Torrey, Bot. U.S.-Mexican Bound. Surv. 2:30 (1859).

Root often > 15 cm long, usually fibrous, branched. Stem single, (15)25-50(125) cm tall, usually glabrous, base narrowed. Leaves mostly in lower 1/3 of stem, variable from 3-5 lobed and +/- fleshy (in plants from coastal and very shaded areas) to 5-12 lobed and thin, subglabrous. Inflorescence pyramidal, open, 5-30 flowers; pedicels spreading, 15-80 mm long, glabrous to glandular pubescent. Flower: sepals scarlet to orange-red, rarely dull yellow (maroon to magenta in hybrids), erect, lateral 8-16 mm long, spur 12-34 mm long; lower petals flattened, blade 2-3 mm long, subglabrous. Fruits spreading, 13-26 mm long. Seed obpyramidal, ringed, otherwise smooth. $2n = 16$ (LEWIS & AL., 1951).

Delphinium nudicaule is locally abundant on rocky slopes or moist talus; 0-2600 m. One of the most widespread and common of California *Delphinium*. Populations are found scattered in Coast Range from S Oregon (Josephine Co.) to San Luis Obispo Co. Plants may be found on cliffs at sea level or on mountain summits in Coast Range. Populations are more local inland from Coast Range, being mostly restricted to shaded canyons and N facing slopes throughout California portion of Cascade Range and N Sierra Nevada. An outlying population from Yosemite Park region is represented by a single specimen. One of the earliest larkspurs to flower in any given locality, flowers may be found from mid-March to early July. Douglas' type collection of *D. nudicaule* (*D. sarcophyllum* and *D. peltatum*) represents plants grown under very moist conditions, probably quite near the ocean. The type of *D. armeniacum* Heller represents plants grown under unusually dry conditions. This species hybridizes with most other taxa it encounters. Apparent hybrids involving *D. nudicaule* and seen by the author (either in field or as specimens), include *D. andersonii*, *D. antoninum*, *D. decorum*, *D. luteum*, *D. nuttallianum*, *D. patens* and *D. trolliifolium*. In addition, garden grown plants have been hybridized with *D. cardinale*, *D. elatum*, *D. menziesii*, *D. parishii*, *D. penardii*, *D. tatsiense*, *D. triste* and *D. uliginosum* although *D. nudicaule* does not normally grow with these species.

Although *Delphinium nudicaule* was often associated with and suggested to be closely related to *D. cardinale* by many early authors, similarities between the two end with their red flowers. For distinctions between these species, refer to discussion under *D. cardinale*. Except for its fibrous roots, *D. nudicaule* readily fits into sect. *Grumosa* where it was assigned by MALYUTIN (1987).

17. *Delphinium nuttallianum* Pritzel, in Walpers, Repert. Bot. Syst. Suppl. 1:744 (1843). Based on *D. pauciflorum* Nuttall, in Torrey & A. Gray, Fl. N. Amer. 1:33 (1838). LECTOTYPE (EWAN, 1945: 112): Oregon, Rocky Mts. & Blue Mts., Nuttall (PH!). Not *D. pauciflorum* D. Don, Prod. Fl. Nepal. 196 (1825). Not *D. pauciflorum* Reichenbach ex Chamisso, Linnaea 6:582 (1831). *Delphinastrum nuttallianum* (Pritzel) Nieuwland, Amer. Midl. Naturalist 3:172 (1914).

Root fascicled or grumose, usually < 5 cm long. Stem single, (5)15-40(100) cm tall, base narrow, pubescence variable. Leaves 7-25 lobed, mostly in lower 1/4 of stem, subglabrous. Inflorescence open pyramidal, mostly < 12 flowers; pedicels 7-75 mm long, spreading, variable simple pubescence. Flower: sepals usually reflexed, dark blue to white, lateral 8-18 mm long, spur 8-20 mm long; lower petal blade 4-8 mm long. Fruit 7-17 mm long, +/- spreading. Seed obpyramidal, ringed, smooth, shiny. $2n = 16$ (LEWIS & AL., 1951).

Delphinium nuttallianum is found in open woods, sage scrub, meadow edges and well drained streambanks (generally not in very wet sites); 300-3300 m. In California, found in Klamath, Cascade and

Sierra Nevada Ranges, and E. Members of this complex range N to S Canada, E to New Mexico and South Dakota. This is an extremely difficult complex, with many variations in a number of morphological traits. The complex has been and continues to be a major source of confusion for identification of *Delphinium* in North America. Type sheets of *D. nuttallianum* represent plants growing under dry conditions but in open areas. These are typically found at 1200-2000 m in sage scrub or lower montane forest. Hybrids have been seen between this taxon and *D. depauperatum*, *D. nudicaule* and *D. polycladon*.

Delphinium nuttallianum may be confused with *D. andersonii*, *D. antoninum*, *D. depauperatum*, *D. gracilentum* and two subsp. of *D. patens* (subsp. *patens* and subsp. *montanum*). Features that may be used to separate *D. nuttallianum* from the first four, are enumerated under the respective species discussions. From *D. patens* subsp. *patens*, *D. nuttallianum* may be separated on basis of narrower leaf lobes, larger fruits and more compact inflorescence of the latter as opposed to the former. Frequent presence of glandular hairs in inflorescence of *D. patens* subsp. *montanum*, with these lacking in *D. nuttallianum*, will separate these taxa. Dwarfed plants of *D. polycladon* may be confused with *D. nuttallianum*, but the former does not have ringed seeds, does have prominent buds and sigmoid pedicels, while the latter has ringed seeds, does not have prominent buds or sigmoid pedicels.

18. *Delphinium parishii* A. Gray, Bot. Gaz. (Crawfordsville) 12:53 (1887). LECTOTYPE (EWAN, 1945: 201): California, Riverside Co., Agua Caliente, Apr. 1882, *Parish & Parish 1222* (GH!). *Delphinium decorum* Fischer & Meyer subsp. *parishii* (A. Gray) Huth, Bot. Jahrb. Syst. 20:343 (1895).

Root often > 15 cm long, fibrous, branched. Stem single, (17)30-60(100) cm tall, base often somewhat narrowed, but firmly attached, glabrous to puberulent. Leaves scattered or mostly basal, 3-20 lobed, glabrous to puberulent. Inflorescence cylindric, usually open, 6-75 flowers; pedicels +/- spreading, 3-25(48) mm long, glabrous to puberulent. Flower: sepals dark blue to white to pink, lateral 7-13 mm long, spur 8-14 mm long; lower petals usually raised, blade 3-6 mm long. Fruit 8-21 mm long, erect, stout. Seed +/- winged, coat inflated, cell margins undulate.

Delphinium parishii was placed in subsect. *Subscaposa* and ser. *Pelligerae* Ewan by Ewan (1936). MALYUTIN (1987) assigned *D. parishii* to subsect. *Bicoloria* of sect. *Kolobopetala*. Ewan's placement is followed here as to subsection (see discussion under *D. andersonii*).

a. subsp. *parishii*, based on *D. parishii* A. Gray.

Delphinium amabile Tidestrom, Contr. U.S. Natl. Herb. 25:207 (1925). Based on *D. coelestinum* Rydb., Bull. Torrey Bot. Club 39:320 (1912). *Delphinium amabile* Tidestrom subsp. *typicum* Ewan, Bull. Torrey Bot. Club 63:334 (1936). Not *D. coelestinum* Franchet, J. Bot. (Morot) 8:276 (1894).

Delphinium apachense Eastwood, Proc. California Acad. Sci., ser. 4 20:142 (1931). *Delphinium amabile* Tidestrom subsp. *apachense* (Eastwood) Ewan, Bull. Torrey Bot. Club 63:334 (1936).

Delphinium amabile Tidestrom subsp. *clarianum* Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:199 (1945). *Delphinium amabile* race *A* Ewan, Bull. Torrey Bot. Club 63:336 (1936).

Delphinium mohavense Parish ex Jepson, Fl. Calif. 526 (1914) *nomen nudum*.

Stem (17)30-60(100) cm tall. Leaves: basal 3-5 lobed, but often absent at anthesis; cauline 3-15 lobed, usually much smaller, with narrower lobes than basal. Inflorescence: pedicels 10-48 mm long, 8-25 mm apart. Flower: sepals bright blue, reflexed, lateral 8-12 mm long, 3-6 mm wide, spur 8-15 mm long; lower petal blade 3-6 mm long. Fruit 9-21 mm long. $2n = 16$ (LEWIS & AL., 1951).

Plants grow in desert scrub and juniper woods in Mohave, Sonoran and Colorado Deserts; 300-2500 m. Range in California is E of a line formed by Peninsula Range, Tehachapi Mts and Sierra Nevada. Plants

are found S into Baja California, E to central Arizona and in S NV and SE Utah. Typical phase is found on floor of desert canyons just E of Peninsula Range. These plants have sky blue flowers, often weak stems and blades of lower leaves are rarely present at anthesis. The phase represented by the type of *Delphinium amabile* grows in low elevation desert in most of range in California, Nevada, Utah and W Arizona. These plants also have sky blue sepals, but stout stems and often retain blades of lower leaves at anthesis. The phase named subsp. *clarianum* is found primarily at higher elevations in desert mountains within the range and is recognized by its darker blue sepals. The type of *D. apachense* represents a phase that grows under relatively high moisture conditions, grows larger and retains more lower leaves at anthesis. Sepals may be sky blue or dark blue. Flowers open from late March through May. Hybridizes with *D. andersonii*, *D. cardinale*, *D. hansenii* subsp. *kernense* and *D. nudicaule*.

Likely to be confused only with *Delphinium andersonii*. See discussion under that species for distinguishing features and ecological relationships of these two taxa.

b. subsp. pallidum (Munz) Warnock, Phytologia 68(1):2 (1990). Based on *D. parishii* A. Gray var. *pallidum* Munz, Bull. S. Calif. Acad. Sci. 31:61 (1932). HOLOTYPE: California, Ventura Co., Seymour Cr., Mt. Pinos, 5900 ft, heavy soil, 10 Jun 1923, Munz 6954 (POM!). *Delphinium amabile* Tidestrom subsp. *pallidum* (Munz) Ewan, Bull. Torrey Bot. Club 63:337 (1936).

Stem (27)40-60(95) cm tall. Leaves primarily in lower 1/3 of stem, 3-7 lobed, abruptly reduced with narrower lobes upward. Inflorescence: pedicels usually < 15 mm long, 4-17 mm apart. Flower: sepals white to pink or blue, spreading to erect, lateral 6-11 mm long, 2-4 mm wide, spur 7-13 mm long; lower petal blade 3-4 mm long. Fruit 11-14 mm long. $2n = 16$ (LEWIS & AL., 1951, as *D. inopinum*).

Populations are found scattered in sage scrub, open pine woods and chaparral S of Mt Pinos; 900-1900 m. Flowers are found from (late April) mid-May to early July. Nowhere common, subsp. *pallidum* may be in danger of significant population reductions due to housing developments. *Delphinium parishii* subsp. *pallidum* is endemic to California and hybridizes with *D. parryi* subsp. *purpureum*.

Delphinium parishii subsp. *pallidum* is frequently confused with *D. inopinum*. Most of the data attributed to *D. inopinum* in the paper by LEWIS & EPLING (1954) pertains to *D. parishii* subsp. *pallidum*. Refer to discussion under *D. inopinum* for features used to distinguish these two taxa. Plants of subsp. *pallidum* might be confused with *D. gypsophilum* subsp. *parviflorum*. Distinguishing characteristics are found under that taxon.

c. subsp. subglobosum (Wiggins) Lewis & Epling, Brittonia 8:15 (1954). Based on *D. subglobosum* Wiggins, Contr. Dudley Herb. 1:99 (1929). HOLOTYPE: CA, San Diego Co., about 5 mi below Julian, open grassy slope near Banner, 20 Mar. 1926, Wiggins 2003 (DS!). *D. parryi* var. *subglobosum* (Wiggins) Munz, Bull. S. California Acad. Sci. 31:61 (1932).

Delphinium collinum Ewan, Bull. Torrey Bot. Club 63:338 (1936).

Stem (19)30-50(78) cm tall. Leaves 7-12 lobed, lobes narrow on basal as well as cauline. Inflorescence: pedicels 3-20 mm long, 8-17 mm apart. Flower: sepals dark blue, usually spreading, lateral 9-13 mm long, 5-7 mm wide, spur 12-14 mm long; lower petal blade 4-6 mm long. Fruit 8-11 mm long $2n = 16$ (LEWIS & AL., 1951, as *D. parishii*).

Uncommon in dry chaparral and desert scrub on E slope of Peninsula Ranges from Riverside Co. to Baja California; 1000-1300 m. Flowers are seen from March to April. Hybridizes with *D. parryi* subsp. *parryi*.

Likely only to be confused with *Delphinium parryi*, *D. parishii* subsp. *subglobosum* may be differentiated from that species by lack of arched hairs on stems of subsp. *subglobosum*.

19. *Delphinium parryi* A. Gray, Bot. Gaz. 12:53 (1887). LECTOTYPE (WARNOCK, 1989: 481): California, San Bernardino Co., 1876, Parry & Lemmon 5 (GH!). *Delphinium decorum* Fischer & Meyer subsp. *parryi* (A. Gray) Huth, Bot. Jahrb. Syst. 20:342 (1895).

Root fibrous, often fascicled, sometimes > 10 cm long. Stem single, (15)40-70(110) cm tall,

arched hairs sparse or dense (especially below). Leaves 5-27 lobed, usually puberulent, basal present or absent at anthesis. Inflorescence +/- cylindric, dense to open, 3-60 flowers; pedicels 5-68 mm long, +/- ascending, usually puberulent. Flower: sepals dark blue, spreading or reflexed, lateral 9-25 mm long, spur 8-21 mm long; lower petal blade 3-10 mm long. Fruits erect, 10-19 mm long. Seed winged, otherwise roughened.

Delphinium parryi is widespread in California and its range extends S into Baja California. A number of local phases are found within the range, five of which appear consistently distinct and are recognized formally here. Other phases may be locally distinct but grade into other, nearby phases. MALYUTIN (1987) treated *D. parryi* as belonging to subsect. *Bicoloria* of sect. *Kolobopetala*. A preferable assignment would be to subsect. *Subscaposa* (see discussion under *D. andersonii*).

a. subsp. *parryi*, based on *D. parryi* A. Gray.

Delphinium hesperium A. Gray var. *seditiosum* Jepson, Fl. Calif. 525 (1914). *Delphinium parryi* subsp. *seditiosum* (Jepson) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:183 (1945).

Root 5-20 cm long. Stem (40)60-90(110) cm tall. Leaves: basal usually absent at anthesis, cauline 7-27 lobed. Flower: sepals usually spreading, lateral 9-15 mm long, spur 8-15 mm long; lower petal blade 3-8 mm long. $2n = 16$ (LEWIS & AL., 1951).

Locally abundant populations are found in chaparral and brushy to open oak woods; 200-1700 m. Ranges from Contra Costa Co., through S Coast Range, Transverse Range and Peninsula Range into N Baja California. Flowers are present from April to early June. Two morphotypes may be recognized in this taxon. That corresponding to the type of subsp. *parryi* has larger flowers (especially lower petal blades), less abundant pubescence, somewhat more coarsely dissected leaves and is usually found in woodlands or relatively moist chaparral. This phase is found as far N in the range as San Luis Obispo Co. The second morphotype corresponds to plants which, in their extreme development, are represented by the type of var. *seditiosum*. This phase has smaller flowers, more pubescence, more finely dissected leaves and is usually found in chaparral and less often, in dry woodlands. The second phase may occur sporadically throughout the range of subsp. *parryi*, although it is most common N of Transverse Range. Hybrids with *Delphinium cardinale* have been named *D. inflexum*. Hybrids are also known with *D. gypsophilum* subsp. *parviflorum*, *D. hesperium* subsp. *pallenscens*, *D. umbraculorum* and *D. variegatum*.

Delphinium parryi subsp. *parryi* may be confused with the blue flowered phases of *D. hesperium*, but see discussion under that species for distinguishing features.

b. subsp. *blochmanae* (E. Greene) Lewis & Epling, Brittonia 8:19 (1954). Based on *D. blochmanae* E. Greene, Erythraea 1:247 (1893). This in turn based on *D. ornatum* E. Greene, Fl. Francis. 304 (1892). LECTOTYPE (WARNOCK, 1989: 482): California, San Luis Obispo Co., Nipoma Mesa, 10 Apr. 1861, Brewer 409 (UC!). Not *D. ornatum* Bouche, Bot. Zeit. 1:25 (1843). *Delphinium bicolor* Nuttall & *ornatum* (E. Greene) Huth, Helios 10:32 (1893). *Delphinium variegatum* Torrey & A. Gray var. *blochmanae* (E. Greene) K. C. Davis, Minnesota Bot. Stud. 4:440 (1900). *Delphinium parryi* E. Gray var. *blochmanae* (E. Greene) Jepson, Fl. Calif. 525 (1914).

Root < 10 cm long. Stem (19)30-50(65) cm tall. Leaves 7-25 lobed, lobes narrow, basal usually 0 at anthesis. Flower: sepals reflexed, lateral 16-25 mm long, spur 11-16 mm long; lower petal blade 7-10 mm long, lighter color than sepals (more when dry). $2n = 16$ (LEWIS & AL., 1951).

Plants grow in coastal chaparral, deep sand of dunes; 0-200 m. Very local in S San Luis Obispo Co. and N Santa Barbara Co. No other *Delphinium* is normally found within its limited range. Flowers are present from March through April.

This taxon is easily recognized by its very large sepals and lower petals. The only taxon with which it might be confused is the large flowered phase of *Delphinium variegatum*, which has shaggy pubescence on the lower petioles, this lacking in subsp. *blochmanae*.

c. subsp. **eastwoodae** Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:182 (1945). HOLOTYPE: California, San Luis Obispo Co., McDonalds Ranch, 2 May 1896, *Eastwood* (CAS!). *Delphinium parryi* A. Gray subsp. *ramosum* (Eastwood) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:87 (1945) *nomen nudum*.

Root < 10 cm long. Stem 15-40 cm tall. Leaves mostly in lower 1/3 of stem, 5-15 lobed. Flower: sepals usually reflexed, lateral 11-20 mm long., spur 11-17 mm long.; lower petal blade 6-9 mm long.

Very local, but in a few localities abundant in coastal chaparral and grassland; 50-500 m. As far as known, this taxon grows only on soil derived from serpentine. Restricted to San Luis Obispo Co.

Likely to be confused only with *Delphinium variegatum*, *D. parryi* subsp. *eastwoodae* does not have shaggy pubescence which is present on lower petioles of that species.

d. subsp. **maritimum** (Davidson) Warnock, Phytologia 68(1):2 (1990). Based on *D. parryi* A. Gray var. *maritimum* Davidson, Muhlenbergia 4:35 (1908). LECTOTYPE (EWAN, 1945: 182): California, Los Angeles Co., Ballona Harbor, 1 Apr. 1901, *Abrams 1186* (DS!). *Delphinium maritimum* (Davidson) Davidson, Fl. S. Calif. 140 (1923). Not *D. maritimum* Cavanilles. *Delphinium parryi* A. Gray forma *maritimum* (Davidson) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:182 (1945).

Root < 10 cm long. Stem 15-40 cm tall. Leaves well distributed, basal and cauline present at anthesis, 5-10 lobed, lobes usually > 6 mm wide. Flower: sepals usually spreading, lateral 9-20 mm long, spur 8-21 mm long; lower petal blade 4-11 mm long. $2n = 16$ (LEWIS & AL., 1951 as *D. parryi*).

Plants are found in coastal chaparral and open woods; 0-300 m. Populations are local, very near the coast from Monterey Peninsula S into Baja California. Also occurs on islands off S California and N Baja California. Occasional individuals with white to grayish blue sepals occur (mostly in Ventura and W Los Angeles counties, where entire populations may consist of these individuals). Early (before 1940) collections of subsp. *maritimum* are numerous, but recent collections much less common. Population reductions have probably resulted from urbanization of its preferred habitat.

May be confused with *Delphinium variegatum*, *D. parryi* subsp. *maritimum* lacks the shaggy hairs of that species. Some plants of subsp. *maritimum* from very near the coast appear superficially like some plants of *D. nuttallianum*, but seeds, fruit and pubescence will immediately distinguish them, the former having non ringed seeds, erect fruits and arched hairs, while the latter has ringed seeds, spreading fruits and lacks arched hairs.

e. subsp. **purpureum** (Lewis & Epling) Warnock, Phytologia 68(1):2 (1990). Based on *D. parishii* A. Gray subsp. *purpureum* Lewis & Epling, Brittonia 8:15 (1954). LECTOTYPE (WARNOCK, 1989: 483): California, Ventura Co., Cuddy Valley Rd., 0.1 mi from jct with Cuddy Canyon Rd., Mt. Pinos, 5 Jun 1943, *Lewis & Dunn 478* (LA!).

Root usually > 10 cm long. Stem 30-90 cm tall. Leaves mostly in lower 1/3 of stem, 3-20 narrow lobes. Flower: sepals usually reflexed, lateral 7-11 mm long, spur 10-13 mm long; lower petal blade 3-5 mm long. $2n = 16$ (LEWIS & AL., 1951, as *D. parishii*).

Plants are found in dry chaparral, sage scrub and lower montane woods; 1000-1600 m. Endemic to Transverse Range from Santa Barbara Co. to Los Angeles Co. and N into Kern Co. Flowers open from late May to early July. Hybridizes with *Delphinium parishii* subsp. *pallidum*.

May be confused with *D. parishii*, but abundant arched hairs and lack of wider lobed basal leaves in plants of *D. parryi* subsp. *purpureum* will distinguish them.

20. *Delphinium patens* Benth., Pl. Hartweg. 296 (1848). HOLOTYPE: California, in Valle Sacramento, 1847, Hartweg 1632 (224) (K!). *Delphinium decorum* Fischer & Meyer var. *patens* (Benth.) A. Gray, Bot. Gaz. (Crawfordsville) 12:54 (1887) *Delphinium tricornis* Michaux β *patens* (Benth.) Huth, Helios 10:37 (1893). *Delphinium decorum* Fischer & Meyer subsp. *patens* (Benth.) Huth Bot. Jahrb. Syst. 20:343 (1895).

Root round to diffuse, fibrous, < 5 cm long. Stem simple, (10)20-50(90) cm tall, base narrowed, glabrous to puberulent. Leaves 3-10 lobed, subglabrous, mostly in lower 1/3 of stem. Inflorescence narrow pyramidal, open, 4-25 flowers; pedicels 10-78 mm long, spreading, glabrous to glandular. Flower: sepals dark blue, reflexed, lateral 7-20 mm long, spur 8-18 mm long; lower petal blade 3-8 mm long. Fruit 12-23 mm long, spreading. Seed obpyramidal, ringed, otherwise smooth.

Delphinium patens has not been collected outside California, but may grow in mountains of N Baja California. Often confused with *D. decorum*, *D. gracilentum* and *D. nuttallianum*. Refer to discussion under those taxa for distinguishing features.

a. subsp. *patens*, based on *D. patens* Benth.

Stem 10-90 cm tall. Leaves 3-5 lobed; basal usually present at anthesis, lobes usually < 15 mm wide. Inflorescence: pedicels usually glabrous. Flower: lateral sepal 9-20 mm long, spur 10-15 mm long; lower petal blade 4-6 mm long, hairs asymmetrical. $2n = 16$ (LEWIS & AL., 1951).

Populations occur in grasslands or open woods; 80-1100 m. Range of subsp. *patens* includes Coast Range from Tehama Co. to W Fresno Co., on W edges of lower San Joaquin Valley and on promontories in and around Sacramento Valley. Flowers open from mid-March through mid-May. Hybridizes with *Delphinium decorum* (see discussion under *D. decorum*), *D. nudicaule* and *D. variegatum*.

Plants of *Delphinium patens* subsp. *patens* may be confused with *D. decorum*, *D. gracilentum* and *D. nuttallianum*. See discussions under those species for distinguishing features.

b. subsp. *hepaticoideum* Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:103 (1945). HOLOTYPE: California, Los Angeles Co., Old Wilson Trail, 1 mi below Orchard Camp, San Gabriel Mts., 3000 ft., 30 May 1929, Ewan 3497 (COLO).

Stem 25-80 cm tall. Leaves 3-5 lobed; basal usually present at anthesis, lobes > 15 mm wide. Inflorescence: pedicels usually glabrous. Flower: lateral sepal 11-17 mm long, spur 10-18 mm long; lower petal blade 5-8 mm long, hairs symmetrically distributed (LEWIS & AL., 1951, as *D. patens*).

Populations are usually found in deep wooded ravines, near streams; 300-1300 m. Range of subsp. *hepaticoideum* is from N Santa Lucia Mts. to San Diego Co. Flowers may be present from mid-March to late May. Hybridizes with *Delphinium parryi* or *D. umbraculorum*, but subsp. *hepaticoideum* usually flowers early enough not to overlap in any given site with flowering of these species.

Likely to be confused only with *Delphinium umbraculorum*, *D. patens* subsp. *hepaticoideum* may be distinguished from this species by lack of arched hairs, presence of ringed seeds and recurved fruits. Contrasting features of *D. umbraculorum* are presence of arched hairs, winged seeds and erect fruits.

c. subsp. *montanum* (Munz) Ewan, Bull. Torrey Bot. Club 69:147 (1942). Based on *D. parryi* A. Gray var. *montanum* Munz, Bull. S. California Acad. Sci. 31:61 (1932). HOLOTYPE:

California, Los Angeles Co., Vincent Gulch, San Gabriel Mts., dry shaded slopes, 6600 ft., 26 May 1923, *Munz 6846* (POM!).

Stem 30-70 cm tall. Leaves: basal usually absent at anthesis, cauline 5-10 lobed, lobes < 10 mm wide. Inflorescence: pedicels generally glandular puberulent. Flower: lateral sepal 7-11 mm long, spur 8-14 mm long; lower petal blade 3-6 mm long, hairs symmetrically distributed. $2n = 16$ (LEWIS & AL., 1951, as *D. patens*).

Populations are found in open coniferous forest; 1500-2800 m. Range of subsp. *montanum* is from S Sierra Nevada in Tulare Co., into Transverse Range, W to E Santa Barbara Co. and S along Peninsula Range to San Diego Co. *Delphinium patens* subsp. *montanum* is usually found on drier, leeward sides of mountain ranges, while subsp. *hepaticodeum* is found on wetter, windward sides of many of the same mountain ranges. Flowers may be found from mid-May through June. No cases of hybridization with other species are known.

Likely to be confused with *Delphinium gracilentum* or *D. nuttallianum*, but see discussion under those species for distinguishing features.

21. *Delphinium polycladon* Eastwood, Bull. Torrey Bot. Club 28:669 (1901). LECTOTYPE (EWAN, 1945: 141): California, Fresno Co., S Fork Kings River, near the forks of Bubbs Cr., in a thicket in springy ground, 9 Jul. 1899, *Eastwood* (CAS!). *Delphinium scopulorum* A. Gray var. *polycladon* (E. Greene) Jepson, Fl. Calif. 523 (1914).

Delphinium luporum E. Greene, Leaf. Bot. Observ. Crit. 1:76 (1904).

Root generally > 15 cm long (except in very small plants), fibrous, buds prominent. Stem single or several/root, (15)80-120(160) cm tall, glabrous. Leaves mostly in lower 1/3 of stem, 3-5 lobed, glabrous, petioles usually > twice as long as blades. Inflorescence open cylindric, 3-35 flowers, often branched, often +/- secund; pedicels 10-150 mm long, +/- sigmoid, glabrous to puberulent. Flower: sepals dark bluish purple, spreading, lateral 12-18 mm long, spur 11-22 mm long; lower petal blade 4-8 mm long. Fruit +/- erect, 13-20 mm long. Seed rectangular to lunate, unwinged, +/- striate. $2n = 16$ (LEWIS & AL., 1951).

Colonies are found in wet sites near springs, streamsides, bogs and wet talus at base of cliffs; 2200-3600 m. *Delphinium polycladon* is found in the high Sierra Nevada from the region of Lake Tahoe, S to S Tulare Co. and in the White Mts. of the California-Nevada border. Flowers open from mid-July to September. This species hybridizes with *D. depauperatum* and *D. glaucum*.

Plants of *Delphinium polycladon* are extremely variable. Individuals from very rocky, thin soiled, sunny sites at higher elevations tend to be quite compact, but show the features of the species in a dwarfed state. Lower internodes are especially shortened. Plants from areas of deeper soil (high or low elevations), especially those growing among shrubs, usually are much taller, with lower internodes elongated and other vegetative parts proportionally larger. Shorter plants may be confused with *D. depauperatum* or *D. nuttallianum*, but see discussion under those species for distinguishing features. Taller plants may be confused with *D. glaucum*, but leaves predominately in lower part of stem, sigmoid pedicels and fewer flowers of *D. polycladon* will distinguish it.

22. *Delphinium purpusii* Brandege, Bot. Gaz. (Crawfordsville) 27:444 (1899). LECTOTYPE (EWAN, 1945: 97): California, Kern Co., Erskine Cr., rocky slopes, 3-5000 ft., May 1897, *Purpus 5015* (UC!).

Delphinium roseum Heller, Muhlenbergia 2:35 (1905).

Root often > 15 cm long, fibrous branched. Stem single, (30)50-90(120) cm tall; base narrow, subglabrous. Leaves mostly in lower 1/2 stem, 0-5 lobed, puberulent; petioles +/- glandular puberulent. Inflorescence +/- cylindric, open, usually branched, 8-25 flowers; pedicels 5-48 mm long, +/- ascending, glandular puberulent. Flower: sepals reflexed, magenta, rose, lateral 10-16 mm long, spur 10-19 mm long; lower petals flattened, blade 3-4 mm long,

subglabrous. Fruit usually erect, 11-29 mm long. Seed +/- rectangular, shiny, coat inflated, +/- clear, winged. $2n = 16$ (LEWIS & AL., 1951).

Uncommon and very local, in scattered populations in and near the Lower Kern River Canyon in Kern Co. and Tulare Co. Plants are found on talus, cliffs, on and near large boulders; 300-1300 m. Not known to grow naturally outside the area near the Lower Kern River Canyon. Flowers may be found from March to May. Hybrids with *Delphinium hansenii* subsp. *kernense* are known to occur.

This species is not likely to be confused with any other *Delphinium* in North America. MALYUTIN (1987) omitted *D. purpusii* from his treatment. This species should be assigned to subsect. *Subscaposa* in sect. *Kolobopetala* of subgenus *Delphinastrum*.

23. *Delphinium recurvatum* Greene, Pittonia 1:285 (1889). LECTOTYPE (EWAN, 1945: 188): California, Contra Costa Co., Byron, 23 Mar. 1888, Greene (ND-G!). *Delphinium hesperium* A. Gray var. *recurvatum* (E. Greene) K.C. Davis, Minnesota Bot. Stud. 2:440 (1900).

Root sometimes > 15 cm long, fascicled to fibrous. Stem single, (18)30-60(85) cm tall; base often narrowed but firmly attached, subglabrous. Leaves 3-11 lobed, cauline much smaller than basal, +/- glabrous, mostly cauline. Inflorescence cylindric, open, 10-25 flowers; pedicels 10-56 mm long, +/- spreading, subglabrous. Flower: sepals reflexed, usually light blue when fresh (often darker when dry), lateral 11-16 mm long, spur 10-18 mm long; lower petal white, blade 4-8 mm long. Fruit erect, 8-21 mm long, stout. Seed +/- rectangular, winged, cell margins undulate. $2n = 16$ (LEWIS & AL., 1951).

Populations are rare in the Central (especially San Joaquin) Valley of California. This species was probably much more common in the past, but most of its habitat has been converted into irrigated croplands. *Delphinium recurvatum* grows in *Atriplex* scrub and associated vegetation in poorly drained, alkaline soils on valley floors; 30-600 m. Flowers may be found from March to early May. Hybrids are known to occur with *D. gypsophilum*, *D. hesperium*, *D. parryi* and *D. variegatum*.

D. recurvatum is most likely confused with *D. gypsophilum* or *D. hesperium* subsp. *pallenscens*. Distinguishing features are found in discussion of those taxa. MALYUTIN (1987) treated *D. recurvatum* as part of subsect. *Bicoloria* of sect. *Kolobopetala*. A preferable assignment would be to subsect. *Subscaposa* (see discussion under *D. andersonii*).

24. *Delphinium stachydeum* (A. Gray) Tidestrom, Proc. Biol. Soc. Washington 27:61 (1914). Based on *D. scopulorum* A. Gray var. *stachydeum* A. Gray, Bot. Gaz. (Crawfordsville) 12:52 (1887). LECTOTYPE (WARNOCK, 1989: 488): Oregon, Union Co., Jul. 1886, Cusick 487 (GH!). *Delphinium umatillense* Ewan, Bull. Torrey Bot. Club 69:149 (1942).

Root massive, buds prominent. Stem often > 1/root, (40)70-150(200) cm tall, simple puberulent. Leaves mostly in lower 1/2 of stem, 3-18 lobed, simple puberulent, basal usually absent. Inflorescence cylindric, dense, usually branched, > 30 flowers; pedicels 10-15(30) mm long, spreading, simple puberulent. Flower: sepals bright blue, spreading, simple puberulent, lateral 9-13 mm long, spur 11-16 mm long, lower petal blade 4-8 mm long. Fruit erect, 10-15 mm long. Seed +/- rectangular, +/- striate, unwinged.

Populations are widely scattered in isolated mountain ranges surrounded by desert or grassland. Plants are found in swales in high elevation sage scrub above 2000 m. Range is from NE California (Warner Mts.) to NE Oregon, SW Idaho and N Nevada. The plant has been reported in NW Utah, but I have seen no specimens to confirm this. Flowers may be found from July through September. Hybrids between *Delphinium stachydeum* and other species are not known.

Among California species, *Delphinium stachydeum* is likely to be confused only with *D. glaucum*. Refer to the discussion under that species for distinguishing features.

25. *Delphinium trolliifolium* A. Gray, Proc. Amer. Acad. Arts 8:375 (1872). LECTOTYPE (EWAN, 1945: 142): Oregon, 1871, Hall 15 (GH). *Delphinium exaltatum* Aiton *trolliifolium* (A. Gray) Huth, Helios 10:35 (1893). *Delphinium exaltatum* subsp. *trolliifolium* (A. Gray) Huth, Bot. Jahrb. Syst. 20:344 (1895). *Delphinastrum trolliifolium* (Gray) Nieuwland, Amer. Midl. Naturalist 3:172 (1914).

Root fascicled, +/- fibrous, usually < 10 cm long. Stem single, (40)60-100(180) cm tall, base narrowed, glabrous to simple puberulent. Leaves: 3-7 lobed, lobes lacinate at apex, subglabrous; basal usually absent at anthesis. Inflorescence narrowly pyramidal, +/- open, 5-40 flowers; pedicels 7-96 mm long, glabrous to puberulent, spreading. Flower: sepals dark blue, spreading, lateral 8-21 mm long, spur 10-23 mm long; lower petal blade 4-8 mm long. Fruit spreading, 15-34 mm long. Seed obpyramidal, ringed, else smooth. $2n = 16$ (LEWIS & AL., 1951).

Populations are scattered in open oak woods, coastal chaparral; 30-1100 m. At times the plants are abundant and color entire hillsides. Distributed in N Coast Range of Del Norte, Humboldt and Trinity counties of California. Also found in Columbia River Valley to just E of Mt. Hood and Willamette Valley of Oregon upstream to Lane Co. Flowers may be found from late April into June. Hybrids are known with *Delphinium decorum*, *D. nudicaule* and *D. nuttallianum*.

MALYUTIN (1987) placed *Delphinium trolliifolium* in subsect. *Exaltata* of sect. *Delphinastrum*. A more logical placement would be in sect. *Grumosa*. Likely to be confused only with *D. bakeri*. Refer to discussion under that species for differences. California plants differ slightly from Oregon plants in pubescence patterns and habitat preferences. Further study may show that two entities are involved here.

26. *Delphinium uliginosum* Curran, Proc. California Acad. Sci. 1:151 (1885). LECTOTYPE (EWAN, 1945: 98): California, Colusa Co., near Epperson's, swampy ground, Jul. 1884, Curran (CAS!). *D. decorum* Fischer & Meyer *uliginosum* (Curran) Huth, Helios 10:39 (1893).

Root fibrous, < 10 cm long. Stem 8-40(70) cm tall; base often narrowed but firmly attached to root, subglabrous. Leaves mostly basal, +/- fleshy, glabrous, lobes < 1/2 blade length. Inflorescence cylindric, +/- dense, 5-45 flowers, often branched; pedicels 3-104 mm long, ascending, puberulent. Flower: sepals dark blue, spreading, lateral 9-14 mm long, spur 10-14 mm long; lower petal blade 4-8 mm long, hairs more dense on inner lobe. Fruit erect, 10-18 mm long. Seed +/- rectangular, winged, surface roughened. $2n = 16$ (LEWIS & AL., 1951).

Although some populations are large, *Delphinium uliginosum* is very local, found only along rivulets across serpentine in chaparral or meadows; 400-600 m. Known only from Colusa, Lake, Napa and Yolo counties of California. Flowers open from mid-May through June (early July in wet years). Hybrids with *D. hesperium* subsp. *pallenscens* have been seen.

Delphinium uliginosum is a very distinctive species, not likely to be confused with any other. The fan-shaped, slightly dissected leaves are apparently unique in the genus. MALYUTIN (1987) provisionally placed *D. uliginosum* in subsect. *Echinata* of sect. *Albicoerulea* in subgen. *Oligophyllon*. This was one of the few species that Malyutin did not have seeds from. Had he had them, he probably would have placed *D. uliginosum* in subsect. *Bicoloria* of sect. *Kolobopetala* in subgen. *Delphinastrum*. A preferable assignment would be to subsect. *Subscaposa* (see discussion under *D. depauperatum*).

27. *Delphinium umbracolorum* Lewis & Epling, Brittonia 8:19 (1954). LECTOTYPE (WARNOCK 1989: 490): California, Santa Barbara Co., San Rafael Mts., 1.4 mi N Davy Brown Campground, 14 May 1949, Lewis, Lewis & Mathias 792 (LA!).

Root fibrous, fascicled, < 15 cm long. Stem single, 40-85 cm tall; base sometimes narrowed but firmly attached, glabrous to arched puberulent. Leaves 3-10 lobed, scattered on stem, subglabrous, basal few or absent at anthesis. Inflorescence open, +/- cylindric, 5-25

flowers; pedicels 6-73 mm long, +/- ascending, glabrous or puberulent. Flower: sepals dark blue, reflexed, lateral 10-16 mm long, spur 11-14 mm long; lower petal blade 4-8 mm long. Fruit 15-19 mm long, erect. Seed +/- rectangular, winged, otherwise smooth. $2n = 16$ (LEWIS & AL., 1951).

Populations of *Delphinium umbraculorum* are generally small and scattered in closed or nearly closed canopy, moist, oak forests; 400-1600 m. Range is from mountains of NW San Benito Co. to Ventura Co. Flowers open from mid-May through June. Hybrids occur with *D. parryi*.

Most often confused with *D. patens* subsp. *hepaticoides*, refer to discussion of that taxon for distinguishing features. MALYUTIN (1987) treated *D. umbraculorum* as belonging to subsect. *Bicoloria* of sect. *Kolobopetala*. A preferable assignment would be to subsect. *Subscaposa* (see discussion under *D. andersonii*).

28. *Delphinium variegatum* Torrey & A. Gray, Fl. N. Amer. 1:32 (1838). LECTOTYPE (EWAN, 1945: 184): California, Douglas (GH!). *Delphinium grandiflorum* L. β *variegatum* (Torrey & A. Gray) Hooker & Arnott, Bot. Beechey Voy. 317 (1838). *Delphinium bicolor* Nuttall γ *variegatum* (Torrey & A. Gray) Huth, Helios 10:32 (1893).

Root fascicled, fibrous, < 10 cm long. Stem single, 14-50(85) cm tall, base densely simple puberulent. Leaves mostly in lower 1/3 of stem, 3-15 lobed, lobes often overlapping; petioles shaggy puberulent. Inflorescence usually branched, open, 4-25 flowers, +/- cylindric; pedicels 6-73 mm long, +/- ascending, glabrous or puberulent. Flower: sepals usually rich blue purple, spreading, lateral 10-25 mm long, spur 10-19 mm long; lower petal blade 4-11 mm long, hairs asymmetrical, margin hairy. Fruit erect, 9-19 mm long, often stout, veins usually blue. Seed +/- rectangular, winged.

Delphinium variegatum is found only in California. MALYUTIN (1987) placed *D. variegatum* in subsect. *Bicoloria* of sect. *Kolobopetala*. A preferable assignment would be to subsect. *Subscaposa* (see discussion under *D. andersonii*).

a. subsp. *variegatum*, based on *D. variegatum* Torrey & A. Gray.

Delphinium apiculatum E. Greene, Pittonia 1:282 (1889). *Delphinium variegatum* Torrey & A. Gray var. *apiculatum* (E. Greene) E. Greene, Fl. Francis. 304 (1892). *Delphinium bicolor* Nuttall γ *apiculatum* (E. Greene) Huth, Bot. Jahrb. Syst. 20:471 (1895). *D. variegatum* Torrey & A. Gray subsp. *apiculatum* (E. Greene) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:185 (1945).

Delphinium emiliae E. Greene, Erythea 2:120 (1894). *Delphinium variegatum* Torrey & A. Gray var. *emiliae* (E. Greene) K.C. Davis, Minnesota Bot. Stud. 2:441 (1900). *Delphinium variegatum* forma *emiliae* (E. Greene) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:185 (1945).

Delphinium subnudum Eastwood, Bull. Torrey Bot. Club 28:670 (1901). *Delphinium variegatum* forma *subnudum* (Eastwood) Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:186 (1945).

Delphinium variegatum Torrey & A. Gray forma *superbum* Ewan, Univ. Colorado Stud., ser. D, Phys. Sci. 2:186 (1945).

Inflorescence usually with < 10 flowers/branch. Flower: sepals dark royal blue (rarely white or lavender), lateral 10-25 mm long; lower petal blade 4-11 mm long. $2n = 16, 32$ (LEWIS & AL., 1951).

Populations are found in grassland and open oak woods; 20-800 m. Some populations may be found on serpentine, but these are not well marked morphologically and are not recognized as distinct taxa. This taxon is one of the most commonly encountered plants in the state, plants at times coloring foothills of

Coast Range. The range of subsp. *variegatum* extends from Mendocino Co. to San Luis Obispo Co. in Coast Ranges, around edge of and occasionally to floor of Central Valley and in foothills of California portion of Cascade Range, S along foothills of Sierra Nevada to Tulare Co. Flowers may be found from Late March through May. Hybrids are known with *Delphinium hansenii*, *D. hesperium*, *D. parryi* and *D. recurvatum*.

Delphinium variegatum is sometimes confused with *D. hansenii* or *D. hesperium*. Distinguishing features can be found in discussion under those taxa. Plants recognized under this name exhibit considerable morphological variation. However, this variation could not be correlated in such a way as to make defensible taxonomic segregates within subsp. *variegatum*. Further study may indicate some means of consistently recognizing some phases. For instance, the type of forma *superbum* represents a phase with huge flowers. Plants with this feature may be found scattered almost throughout the range of subsp. *variegatum* (either as isolated plants or as populations made up largely of this morphotype), although they are most common in San Francisco Bay area. It is tempting to associate these large flowered individuals with tetraploidy. However, LEWIS & AL. (1951) were not able to establish this correlation. The type of *D. subnudum* represents plants with few cauline leaves, a feature which also appears apparently at random throughout the range of subsp. *variegatum*. Type sheets of *D. emiliae* appear to represent a population with an influx of alleles from *D. hesperium*. The type of *D. apiculatum* represents the most common and widespread phase of subsp. *variegatum*, with flowers intermediate in size between those of the type of *D. variegatum* and those of forma *superbum*.

b. subsp. **kinkiense** (Munz) Warnock, Phytologia 68(1):2 (1990). Based on *D. kinkiense* Munz, Aliso 7:69 (1969). HOLOTYPE: California, Los Angeles Co., San Clemente Island, canyon N of Nanny, grassy slope, 800 ft., 18 Mar. 1967, *Beauchamp* 290 (RSA!).

Inflorescence usually with < 12 flowers/branch. Flower: sepals white or lavender, lateral 11-18 mm long; lower petal blade 4-9 mm long.

Plants are rare in chaparral or oak woods, 0-500 m. Flowers present from March to April. Known only from islands off S California. A very poorly known plant, specimens are very few. *Delphinium parryi* is the only other species normally found on these islands.

c. subsp. **thornei** Munz, Aliso 7:70 (1969). HOLOTYPE: CA, Los Angeles Co., NE side of San Clemente Island, near reservoirs on top of plateau between Boulder and Horton, grassland, 1600 ft, 17 Apr. 1966, *Thorne* 36078 (RSA!).

Inflorescence usually with < 16 flowers/branch. Flower: sepals bright blue to light blue, lateral sepal 17-21 mm long; lower petal blade 6-11 mm long.

Populations are rare in grassland and oak woods, 0-500 m. Flowers present from April to May. Known only from islands off S California. A very poorly known plant, specimens are few. *D. parryi* is the only other species normally found on these islands.

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