

SELECTED AND ANNOTATED BIBLIOGRAPHY
OF THE CALIFORNIA RED-LEGGED FROG
(*Rana draytonii*)

This list does not include citations that refer exclusively to the northern red-legged frog, *Rana aurora*, because its biology is significantly different from *R. draytonii* in several respects. References to *R. draytonii* in numerous checklists are also omitted.

1. **Altig, R. and P.C. Dumas. 1972. *Rana aurora*.
Catalogue of American Amphibians and Reptiles 160:1-4.**

Summary of descriptions, illustrations, distribution, fossil record, nomenclatural history, and biological data; and a source for a nearly complete, pre-1971, bibliography.

2. **Alvarez, J.A. 2004. *Rana aurora draytonii* (California Red-Legged Frog). Microhabitat. Herpetological Review 35:162-162.**

Red-legged frogs used desiccation cracks for refuge in a dry pond.

3. **Alvarez, J.A., C. Dunn and A.F. Zuur. 2004. Response of California red-legged frogs to removal of non-native fish. 2002-2003 Transactions of the Western Section of the Wildlife Society 38/39:9-12.**

Six ponds with exotic fish had little use by adult red-legged frogs and almost no successful reproduction. After the fish were removed, frog reproduction was successful, with counts up to 650 juvenile frogs in a single pond.

4. **Arnold, S.J. and T. Halliday. 1986. Life history notes: *Hyla regilla*, predation. Herpetological Review 17:44.**

Predation on *H. regilla* by *R. draytonii*.

5. **Baird, S.F. and C. Girard. 1852. Descriptions of new species of reptiles, collected by the U.S. Exploring Expedition under the command of Capt. Charles Wilkes, U.S.N. Proceedings of the Academy of Natural Sciences, Philadelphia 6:174-177.**

Original descriptions of *R. draytonii*, type locality "San Francisco, California, and on Columbia River"; and *R. aurora*, type locality "Puget Sound".

6. Baldwin, K.S., and R.A. Stanford. 1987. Life history notes: *Ambystoma tigrinum californiense* (California tiger salamander): Predation. *Herpetological Review* 18:33.

California red-legged frog ate a larval tiger salamander.

7. Bland, D. 2006. Relocations of California red-legged frogs, California, USA. *Re-introduction News, Newsletter of the Re-introduction Specialist Group, IUCN*, No. 25:12-13.

Nine frogs were re-located into nearby ponds when their ponds were to be subject to sediment removal. They were radio-tracked for two months. Four remained in the new habitat for at least 1 month. Two frogs returned to their ponds of origin, and 3 others ended up in dense cover in a direction towards their original ponds.

8. Boulenger, G.A. 1920. A monograph of the American frogs of the genus *Rana*. *Proceedings of the American Academy of Arts and Sciences* 55:413-480.

Diagnoses of the subspecies of *R. aurora*, including *R. a. draytonii*.

9. Bridges, C.M. and R.D. Semlitsch. 2000. Variation in pesticide tolerance of tadpoles among and within species of Ranidae and patterns of amphibian decline. *Conservation Biology* 14:1490-1499.

Rana a. draytonii and *R. pretiosa* tadpoles showed a higher tolerance of the pesticide carbaryl than other species of *Rana* tested.

10. Bugg, R.L. 2007. Reports of the decline of Mark Twain's "Celebrated Jumping Frog" have not been exaggerated. *Sustainable Agriculture* 19:1-3.

Popular article describing the status of *Rana draytonii* and some of the conservation efforts on its behalf.

11. Bulger, J.B., N.J. Scott Jr., and R.B. Seymour. 2003. Terrestrial activity and conservation of adult California red-legged frogs *Rana aurora draytonii* in coastal forests and grasslands. *Biological Conservation* 110:85-95.

Study of seasonal movements of radio-tagged frogs in the Santa Cruz Mountains, California. Documents winter and summer habitats and seasonal movements by 11-22% of adult population, most moving in a direct line rather than by following habitat corridors.

- 12. Camp, C.L. 1917. Notes on the systematic status of the toads and frogs of California. University of California Publications in Zoology 17:115-125.**

First publication to treat *R. aurora* and *R. draytoni* as subspecies of a single species, *R. aurora*.

- 13. Case, S.M. 1978. Biochemical systematics of members of the genus *Rana* native to western North America. Systematic Zoology 27:299-311.**

Early study that detected the deep evolutionary split between eastern and western North American ranids, the former putatively derived from western European ancestors and the latter from Eurasian ranids that crossed a Bering land bridge. Unfortunately conclusions regarding the relationships within the western group were confounded by the fact that the "*Rana aurora*" sample was a composite of true *R. aurora* and *R. draytonii*.

- 14. Christopher, S.V. 2004. Introduced predator effects on a threatened anuran. Ph.D. Dissertation, University of California, Santa Barbara. 356 pp.**

In experimental and correlative studies, introduced fishes had stronger negative effects on *Rana a. draytonii* tadpoles and populations than bullfrogs or crayfish. Red-legged frog populations that coexisted in the study area with introduced predators are probably maintained by immigration from nearby sources that are free of the predators.

- 15. Cochran, D.M. and C.J. Goin. 1970. The new field book of reptiles and amphibians. G.P. Putnam and Sons, New York. 359 pages.**

Black and white photograph and a little information on identification.

- 16. Conlon, M. J., N. Al-Ghafari, L. Coquet, J. Leprince, T. Jouenne, H. Vaudry, and C. Davidson. 2006. Evidence from peptidomic analysis of skin secretions that the red-legged frogs, *Rana aurora draytonii* and *Rana aurora aurora*, are distinct species. Peptides 27:1305-1312.**

Analysis of skin peptides found differences between *R. aurora* and *R. draytonii* equivalent to differences among other species of western U.S. *Rana*.

17. Conlon, J. M., A. Al-Dhaheri, E. Al-Mutawa, R. Al-Kharrge, E. Ahmed, J. Kolodziejek, N. Nowotny, P. F. Nielsen, and C. Davidson. 2007. Peptide defenses of the Cascades frog *Rana cascadae*: implications for the evolutionary history of frogs of the *Amerana* species group. *Peptides* 28:1268-1274.

A phylogeny of western *Rana* based on skin peptides differs somewhat from that of Shaffer et al. (2004), but clearly indicates the separation of *R. aurora* from *R. draytonii* as distinct species.

18. Cook, D. 1997a. Microhabitat use and reproductive success of the California red-legged frog (*Rana aurora draytonii*) and bullfrog (*Rana catesbeiana*) in an ephemeral marsh. M.S. Thesis, Sonoma State University, California. 47 pp.

Habitat preferences in Ledyard Marsh, Sonoma County changed with changes in the vegetation and water levels during the year. Dead spikerush in shallow water (mean=39 cm) was important early in the year, and flooded smartweed dominated in the summer and fall. Frogs tended to avoid open water and bulrush cover. There was a 2-month gap between red-legged frog and bullfrog breeding seasons and bullfrog oviposition sites were in deeper water (mean=63 cm vs. 33 cm for red-legged frogs).

The marsh is typically dry by fall, seriously limiting survival of bullfrog tadpoles. Survivorship from eggs to metamorphosis was estimated at 1.9% for red-legged tadpoles and 0.0001% for bullfrogs.

19. Cook, D. 1997. Biology of the California red-legged frog: a synopsis. *Transactions of the Western Section of the Wildlife Society* 33:79-82.

A short summary of the distribution, biology, and threats to the California red-legged frog.

20. Cook, D. 2002. *Rana aurora draytonii* (California red-legged frog). Predation. *Herpetological Review* 33:303.

Bullfrog (*Rana catesbeiana*) had an adult red-legged frog in its stomach.

21. Cook, D.G. and M.R. Jennings. 2001. *Rana aurora draytonii* (California red-legged frog). Predation. *Herpetological Review* 32:182-183.

Juvenile and larval *Rana draytonii* were found in the stomachs of bullfrogs (*Rana catesbeiana*).

22. Cook, D.G. and M.R. Jennings. 2007. Microhabitat use of the California red-legged frog (*Rana draytonii*) and introduced bullfrog (*Rana catesbeiana*) in a seasonal marsh. *Herpetologica* 63:430-440.

Published version of Cook (1997).

23. Cort, W.W. 1919. A new distome from *Rana aurora*. *University of California Publications in Zoology* 19(8):283-298.

Description of a new genus of trematode from 30 red-legged frogs obtained from a frog farm near San Francisco.

24. Cunningham, J.D. 1955. Notes on abnormal *Rana aurora draytoni*. *Herpetologica* 11:149.

Two deformed museum specimens are described—one with one forelimb and the other with five limbs.

25. Cunningham, J.D. 1959. Reproduction and food of some California snakes. *Herpetologica* 15:17-19.

Specimens of *Thamnophis hammondi* with *R. a. draytonii* in their stomachs.

26. D'Amore, A., E. Kirby and V. Hemmingway. 2009. Reproductive interference by an invasive species: an evolutionary trap? *Herpetological Conservation and Biology* 4:325-330.

Rana draytonii males were found in amplexus with juvenile non-native bullfrogs (*Lithobates catesbeianus*) at a much higher frequency than they were observed clasping conspecific females. This preference for inappropriate large mates may disrupt the adaptive mechanisms of sexual selection in the California red-legged frog.

27. D'Amore, A., E. Kirby & M. McNicholas. 2009. Invasive species shifts ontogenetic resource partitioning and microhabitat use of a threatened native amphibian.

**Aquatic Conservation: Marine and Freshwater
Ecosystems 19:534-541.**

Adult California red-legged frogs were observed at higher densities and in more open habitats in ponds where bullfrogs were removed.

- 28. D'Amore A., V. Hemingway and K. Wasson. 2010. Do a threatened native amphibian and its invasive congener differ in response to human alteration of the landscape? Biological Invasions 12:145-154.**

A comparison of the different habitat correlates of sympatric bullfrogs and *R. draytonii* in an agricultural landscape. Several human-mediated factors favor bullfrogs.

- 29. D'Amore A., V. Hemingway and K. Wasson. 2010. Do a threatened native amphibian and its invasive congener differ in response to human alteration of the landscape? Biological Invasions 12:155.**

A minor correction to the previous article.

- 30. Davidson, C. 1995. Frog and toad calls of the Pacific Coast: Vanishing voices. Library of Natural Sounds, Cornell Laboratory of Ornithology and U.S.D.A. Forest Service.**

Booklet and tape cassette or CD. The best recordings of *R. a. draytonii* calls generally available.

- 31. Davidson, C. 2004. Declining downwind: Amphibian population declines in California and historical pesticide use. Ecological Applications 14:1892-1902.**

Using the same *R. draytonii* data set as Davidson et al. (2002), the author concluded that total upwind pesticide use, especially organophosphates and carbamates, was a strong correlate of population disappearances.

- 32. Davidson, C., H.B. Shaffer, and M.R. Jennings. 2001. Declines of the California red-legged frog: Climate, UV-B, habitat, and pesticides hypotheses. Ecological Applications 11:464-79.**

Testing four hypotheses (climate change, UV-B radiation, pesticides, habitat destruction) for their relevance to the disappearance of red-legged frogs from habitats in California, the authors determined that frogs had disappeared disproportionately from lower latitudes, from

higher elevations, from near urbanized centers, and upwind of agricultural land use.

- 33. Davidson, C., H.B. Shaffer, and M.R. Jennings. 2002. Spatial tests of the pesticide drift, habitat destruction, UV-B, and climate-change hypotheses for California amphibian declines. Conservation Biology 16:1588-1601.**

Using a slightly different data set and more refined analytical techniques, the results for the red-legged frog are the same as those in Davidson et al. (2001).

- 34. Dickerson, M.C. 1906. The frog book: North American toads and frogs with a study of the habits and life histories of those of the northeastern states. Doubleday, Page and Company, New York.**

The first detailed description and summary of the biology of the California red-legged frog. The photographs (some in color!) are among the best ever published.

- 35. Dixon, J.R. 1967. Amphibians and reptiles of Los Angeles County California. Los Angeles County Museum Science series 23, Zoology 10:1-64.**

A little biological information and a black and white photograph.

- 36. Doubledee, R.A., E.B. Muller, and R.M. Nisbet. 2003. Bullfrogs, disturbance regimes, and the persistence of California red-legged frogs. Journal of Wildlife Management 67:424-438.**

A model simulation concluded that winter floods and draining stockponds every two years benefited red-legged frog survival, whereas shooting adult bullfrogs was only effective with extreme effort. A strategy combining pond drainage with bullfrog shooting was the most effective at facilitating red-legged frog survival.

- 37. Drost, C.A. and G.M. Fellers. 1996. Collapse of a regional frog fauna in the Yosemite area of the California Sierra Nevada. Conservation Biology 10:414-425.**

Retracing a route across the Sierra Nevada taken by biologists in 1915 and 1919, they found many fewer amphibian populations. Three species, including *R. aurora draytonii*, were not found at all.

38. Elliot, L., C. Gehardt, and C. Davidson. 2009. **The frogs and toads of North America: a comprehensive guide to their identification, behavior, and calls.** Houghton Mifflin Harcourt, Boston, New York.

Brief descriptions, outstanding photographs, range maps, and a CD of calls. The text for *Rana draytonii* underestimates the role that introduced predatory fishes have had on the disappearance of the red-legged frog (Jennings and Hayes 1985). The California red-legged frog calls on the CD (track 75) are not as clear as the ones in Davidson (1995).

39. Fellers, G.M. 2005. ***Rana draytonii* Baird and Girard 1852(b). California red-legged frog. Pages 552-554 in M. Lanoo (editor). Amphibian declines: The conservation status of United States species.** University of California Press, Berkeley, Los Angeles, London. 1094 pages.

An up-to-date and exhaustive compilation of historic and current distribution and abundance, life history features, and conservation.

40. Fellers, G. M. 2005. **California red-legged frog Baird and Girard *Rana draytonii*. Pages 198-201 in L. L. C. Jones, W. P. Leonard and D. H. Olson (editors). Amphibians of the Pacific Northwest.** Seattle Audubon Society, Seattle, Washington. 227 pages.

A field guide account of the description, identification characters, distribution, natural history. and habitat of *Rana draytonii*. There are excellent photographs of an egg mass, tadpole, and an exceptionally red adult frog.

41. Fellers, G.M., A.E. Launer, G. Rathbun, S. Bobzien, J. Alvarez, D. Sterner, R.B. Seymour, and M. Westphal. 2001. **Overwintering tadpoles in the California red-legged frog (*Rana aurora draytonii*).** Herpetological Review 32:156-157.

Documentation of the relatively rare occurrence of overwintering tadpoles at several sites from Point Reyes south through the Bay Area to San Luis Obispo County, California.

42. Fellers, G.M. and P.M. Kleeman. 2006. **Diurnal versus nocturnal surveys for California red-legged frogs.** Journal of Wildlife Management 70:1805-1808.

Many more frogs were detected during nocturnal surveys. However, diurnal surveys provided information on habitat structure, eggs and tadpoles that was difficult to secure at night.

- 43. Fellers, G.M. and P.M. Kleeman. 2007. California red-legged frog (*Rana draytonii*) movement and habitat use: Implications for conservation. Journal of Herpetology 41:276-286.**

Many frogs were radiotracked on Point Reyes, Marin County, California. 66% of females and 25% of males moved from the breeding pond to non-breeding areas. Ponds were breeding habitat and streamsides were summer habitat.

- 44. Fellers, G.M. and L.L. Wood. 2004. *Rana aurora draytonii* (California Red-legged Frog). Predation. Herpetological Review 35:163.**

Red-legged frogs are eaten by Great Blue Herons (*Ardea herodias*).

- 45. Fidenci, P. 2004. The California red-legged frog, *Rana aurora draytonii*, along the Arroyo Santo Domingo, northern Baja California, Mexico. Herpetological Bulletin 88:27-31.**

The southernmost *Rana draytonii* population (250 miles south of the US-México border) seems to be in good shape.

- 46. Fisher, R.N. and H.B. Shaffer. 1996. The decline of amphibians in California's Great Central Valley. Conservation Biology 10:1387-1397.**

California red-legged frogs were not found in 24 of 28 Central Valley counties where they formerly occurred.

- 47. Fisher, R.N. and T.J. Case. 1997. A field guide to the reptiles and amphibians of coastal Southern California. Department of Biology, University of California at San Diego. 46 pages.**

A well-illustrated color guide, but without maps or good locality descriptions. Red-legged frogs no longer occur in the area covered by the guide.

- 48. Foster, C.D., J. Traverse, P. Martin, A. Varsik, and E. Stanhaus. 2007. Anuran conservation through collaborations: Santa Barbara Zoo teams up with the U.S. Forest Service. Herpetological Review 38:141-142.**

Cooperative surveys of *R. draytonii* and *Bufo californicus* in streams of coastal central California Photographs of *R. draytonii* egg masses.

49. Frost, D.R., T. Grant, J. Faivovich, R.H. Bain, A. Haas, C.F.B. Haddad, R.O. De Sá, A. Channing, M. Wilkinson, S.C. Donnellan, C.J. Raxworthy, J.A. Campbell, B.L. Blotto, P. Moler, R.C. Drewes, R.A. Nussbaum, J.D. Lynch, D.M. Green, and W.C. Wheeler. 2006. The amphibian tree of life. *Bulletin of the American Museum of Natural History* 297:1-370.

A monumental work that distinguished the extreme western North American frogs derived from a predominantly Asian radiation (Genus *Rana*, including *R. draytonii*), from the majority of North American frogs that evolved in eastern and central North America, and Central and South America. The latter group were placed in the genus *Lithobates*, which includes the bullfrog, *L. catesbeianus*.

50. Frost, R. 2001. The California red-legged frog: A species in crisis. *Outdoor California* 62:21-23.

A concise, slightly dated, popular description of the frog's status.

51. Glaser, H.S.R. 1970. The distribution of amphibians and reptiles in Riverside County, California. Riverside Museum Press, Natural History Series no. 1. 40 pages.

Three locality records of populations now extinct.

52. Green, D.M. 1985a. Differentiation in amount of centromeric heterochromatin between subspecies of the red-legged frog, *Rana aurora*. *Copeia* 1985:1071-1074.

Rana a. draytonii chromosomes have greatly enlarged centromeres compared to *R. a. aurora*.

53. Green, D.M. 1985b. Biochemical identification of red-legged frogs, *Rana aurora draytoni* (Ranidae), at Duckwater, Nevada. *Southwestern Naturalist* 30:614-616.

Rana population in Duckwater Marsh, Nevada is probably introduced *R. a. draytonii* from Contra Costa County, California.

54. Green, D.M. 1986a. Systematics and evolution of western North American frogs allied to *Rana aurora* and

***Rana boylei*: Karyological evidence. Systematic Zoology 35:273-282.**

Based on karyotypes, *R. aurora* (*sensu lato*) is most closely related to *R. pretiosa* and *R. cascadae*.

55. Green, D.M. 1986b. Systematics and evolution of western North American frogs allied to *Rana aurora* and *Rana boylei*: Electrophoretic evidence. Systematic Zoology 35:283-296.

Based on electromorphs, *R. aurora/draytonii* and *R. cascadae* form a sister taxon to a *R. boylei*-*R. muscosa* clade, but see Macey et al. (2001) and Shaffer et al. (2004) for later analyses.

56. Grinnell, J. and C.L. Camp. 1917. A distributional list of the amphibians of California. University of California Publications in Zoology 17:127-208.

The first range map of the California distribution of *R. a. draytonii*. Interestingly enough, the zone of intergradation between *R. a. draytonii* and *R. a. aurora* in western Mendocino and Humboldt counties that they defined is very close to where recent genetic studies indicate a zone of contact between two species.

57. Grismer, L.L. 2002. Amphibians and reptiles of Baja California, including its Pacific Islands and the islands in the Sea of Cortés. University of California Press, Berkeley, Los Angeles, London. 399 pages.

Account of *R. draytonii* (as *R. aurora*) in Baja California. Although Grismer says otherwise, in our experience, this frog does not "emit a squawking sound as it jumps into the water" as do bullfrogs.

58. Hays, M.R. 1955. Ultragulosity in the frog *Rana aurora draytoni*. Herpetologica 11:153.

Red-legged frog in captivity for two years that ate especially large food items, including a cricket frog, bullfrog tadpole, and western toad.

59. Hayes, M.P. and M.R. Jennings. 1986. Decline of ranid frog species in western North America: Are bullfrogs (*Rana catesbeiana*) responsible? Journal of Herpetology 20:490-509.

Bullfrogs, habitat alteration, and introduced fishes have contributed to the decline of ranid frogs, with the latter probably having the most serious effect.

60. Hayes, M.P. and M.R. Jennings. 1989. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylei*): Implications for management. Pages 144-158 in R.E. Szaro, K.E. Severson, and D.R. Patton (technical coordinators). Proceedings of the Symposium on the Management of Amphibians, Reptiles, and Small Mammals in North America. U.S. Department of Agriculture, Forest Service General Technical Report RM-166.

Rana a. draytonii recorded most commonly from intermittent streams that had pools >0.6 m deep and intact shoreline or emergent vegetation. Negative habitat components included bullfrogs, introduced fishes, and perennial water.

61. Hayes, M.P., M.R. Jennings and G.B Rathbun. 2006. *Rana draytonii* (California red-legged frog). Prey. Herpetological Review 37:449.

Two records of rodents in stomachs of female red-legged frogs.

62. Hayes, M.P. and D.M. Kremple. 1986. Vocal sac variation among frogs of the genus *Rana* (Anura: Ranidae) from western North America. Copeia 1986:927-936.

Rana a. draytonii has paired vocal sacs and *R. a. aurora* lacks vocal sacs, with a 480 km strip between the subspecies where intermediate forms occur.

63. Hayes, M.P. and M.M. Miyamoto. 1984. Biochemical, behavioral, and body size differences between *Rana aurora aurora* and *R. a. draytoni*. Copeia 1984:1018-1022.

Differences between the subspecies suggest differentiation at the specific level, but critical specimens from the contact zone need to be analyzed.

64. Hayes, M.P. and M.R. Tennant. 1986. Diet and feeding behavior of the California red-legged frog (*Rana aurora draytonii*) (Ranidae). Southwestern Naturalist 30:601-605.

Diet consisted of a wide variety of crustaceans and other arthropods, but only the largest frogs contained

invertebrates >20 mm or vertebrates (*Gasterosteus aculeatus*, *Hyla regilla*, *Peromyscus californicus*).

65. Hill, H.R. 1948. **Amphibians and reptiles of Los Angeles County.** Los Angeles County Museum Science series 12, Zoology 5:1-30.

Little information and a couple of records of populations now extinct.

66. Jennings, M.R. 1988a. **Origin of the population of *Rana aurora draytonii* on Santa Cruz Island, California.** Herpetological Review 19:76.

Population introduced, probably from the San Francisco Bay area.

67. Jennings, M.R. 1988b. **Natural history and decline of native ranids in California.** Pages 61-72 in H.F. DeLisle, P.R. Brown, B. Kaufman, and B.M. McGurty (editors). **Proceedings of the conference on California herpetology.** Southwestern Herpetologists Society Special Publication No. 4.

Summary of biology and habitat for *R. draytonii*, and discussion of current threats.

68. Jennings, M.R. 2004. **An annotated check list of the amphibians and reptiles of California and adjacent waters.** California Fish and Game 90:161-213.

An up-to-date fully annotated and documented list of the California herpetofauna.

69. Jennings, M.R. and M.M. Fuller. 2004. **Origin and distribution of leopard frogs, *Rana pipiens* complex, in California.** California Fish and Game 90(3):119-139.

Keys to California *Rana* adults and tadpoles, including *R. draytonii*.

70. Jennings, M.R. and M.P. Hayes. 1984. **The frogs of Tulare.** Outdoor California 45(6):17-19.

A summary of the historical harvesting of red-legged frogs for their legs.

71. Jennings, M.R. and M.P. Hayes. 1985. **Pre-1900 overharvest of California red-legged frogs (*Rana aurora draytonii*): The inducement for bullfrog (*Rana catesbeiana*) introduction.** Herpetologica 41:94-103.

Because of declining red-legged frog populations, bullfrogs were introduced to California to satisfy the frogleg market.

- 72. Jennings, M.R. and M.P. Hayes. 1994. Decline of native ranid frogs in the desert Southwest. Pages 183-211 in P.R. Brown and J.W. Wright (editors). Herpetology of the North American deserts: Proceedings of a symposium. Southwestern Herpetologists Society Special Publication No. 5.**

California red-legged frogs have not been seen since 1968 in any of the desert slope streams where they formerly occurred.

- 73. Jennings, M.R. and M.P. Hayes. 1995. Amphibian and reptiles species of special concern in California. Final report submitted to the California Department of Fish and Game, Inland Fisheries Division, Contract No. 8023. 255 pages.**

Distribution map for *R. a. draytonii* and summaries of its taxonomy, biology, and presumed threats.

- 74. Klauber, L.M. 1934. Annotated list of the amphibians and reptiles of the southern border of California. Bulletin of the Zoological Society of San Diego (11):1-28.**

Brief natural history notes of populations of *R. draytonii* that are now extinct.

- 75. Kozicki, N. 2001. Catching outlaws red-legged. Outdoor California 62:23.**

A costly cautionary tale of the undoing of an unethical biological consultant.

- 76. Lawler, S.P., D. Dritz, T. Strange, and M. Holyoak. 1999. Effects of introduced mosquitofish and bullfrogs on the threatened California red-legged frog. Conservation Biology 13:613-622.**

In experimental ponds, *Gambusia* did not affect red-legged frog tadpole survival, but they did inhibit growth and delayed metamorphosis. Bullfrog tadpoles reduced survivorship of red-legged tadpoles to about 5%.

77. Linsdale, J.M. 1932. **Amphibians and reptiles from Lower California. University of California Publications in Zoology 38:345-386.**

Baja California Norte locality records for red-legged frogs.

78. Linsdale, J.M. 1938. **Amphibians and reptiles in Nevada. Proceedings of the Academy of Arts and Sciences 73:197-257.**

Rana draytonii were brought to Nevada by former California residents.

79. Macey, J.R., J.L. Strasburg, J.A. Brison et al. 2001. **Molecular phylogenetics of western North American frogs of the *Rana boylei* species group. Molecular Phylogenetics and Evolution 19:131-143.**

A reanalysis of Green (1986b) casts doubt on his description of relationships among the western *Rana*. See Shaffer et al. (2004) for the definitive study.

80. McCasland, C., J. Davis, and D. Krofta. 2001. **Endangered and threatened wildlife and plants: Final determination of critical habitat for the California red-legged frog; final rule. Federal Register 66:14626-14758.**

An accurate, up-to-date summary of the biology and habitat requirements of the California red-legged frog. Includes detailed maps and description of the 1,674,582 ha critical habitat.

81. Miller, K.J. 1994. **Endangered and threatened wildlife and plants: Proposed endangered status for the California red-legged frog. Federal Register 59:4888-4895.**

U. S. Fish and Wildlife Service listing package with a summary of the frog's biology and threats to its persistence.

82. Miller, K.J., A. Willy, S. Larsen, and S. Morey. 1996. **Endangered and threatened wildlife and plants: Determination of threatened status for the California red-legged frog. Federal Register 61:25813-25833.**

Notification of the listing the California red-legged frog as threatened under the Endangered Species Act.

83. Morafka, D. and B. Banta. 1972. The herpetozoogeography of the Gabilan Range, San Benito and Monterey counties, California. *Wasmann Journal of Biology* 30:197-240.

The biogeography of the reptiles and amphibians, including *R. draytonii*, of the mountain range included in Pinnacles National Monument.

84. Morafka, D.J. and B.H. Banta. 1976. Ecological relationships of the recent herpetofauna of Pinnacles National Monument, Monterey and San Benito Counties, California. *The Wasmann Journal of Biology* 34: 304-324.

Rana draytonii (as *R. aurora*) was seen active in all months except January and February; it was most active in the warmer months March through October.

85. Moyle, P.B. 1973. Effects of introduced bullfrogs, *Rana catesbeiana*, on the native frogs of the San Joaquin Valley, California. *Copeia* 1973:18-22.

The bullfrog appears to have displaced the red-legged frog from all of its former habitat in the San Joaquin Valley.

86. Padgett-Flohr, G. E. 2008. Pathogenicity of *Batrachochytrium dendrobatidis* in two threatened California amphibians: *Rana draytonii* and *Ambystoma californiense*. *Herpetological Conservation and Biology* 3:182-191.

Six of 12 *Rana draytonii* tadpoles had chytrid infections when collected. The tadpoles were maintained for 18 months through metamorphosis, during which none died. Infected tadpoles/frogs maintained weight and growth equal to the non-infected controls.

87. Padgett-Flohr, G. E. and R. L. Hopkins II. 2009. *Batrachochytrium dendrobatidis*, a novel pathogen approaching endemism in central California. *Diseases Of Aquatic Organisms* 83:1-9.

A total of 687 amphibian museum specimens from four species collected between 1897 and 2005 from central California were examined for chytrid fungus infection. The earliest infections detected (1961) were in *Lithobates catesbeianus* on the Stanford University campus, followed by infections in *Rana boylei* (1966), *Pseudacris regilla* (1970s), and *Rana draytonii* (1980s). *Bd* appears to have spread in a radial pattern through central California from an initial central

location over a period of 40 yr. *Pseudacris regilla* appears to be the major vector of the disease.

88. Peabody, F.E., and J.M. Savage. 1958. Evolution of a Coast Range corridor in California and its effect on the origin and dispersal of living amphibians and reptiles. Pages 159-186 in C.L. Hubbs (editor). Zoogeography. American Association for the Advancement of Science, Washington, D.C.

The historical zoogeography of the Coast Range, and its bearing on the origin of *R. a. draytonii* from an Arcto-Tertiary ancestor.

89. Phillips, K. 1994. Tracking the vanishing frogs. St. Martin's Press, New York. 244 pp.

An accurate, popularly-written assessment of the declining amphibian phenomenon, including the California red-legged frog.

90. Pickwell, G. 1947. Amphibians and reptiles of the Pacific states. Stanford University Press, Palo Alto, California. 234 pages.

Black and white photograph and very detailed keys to amphibian adults and larvae. Minimal biological information.

91. Rathbun, G.B. 1998. *Rana aurora draytonii* (California red-legged frog). Egg predation. Herpetological Review 29:165.

Egg predation by newts (*Taricha* sp.).

92. Rathbun, G.B. and T.G. Murphey. 1996. Evaluation of a radio-belt for ranid frogs. Herpetological Review 27:187-189.

Description of a method for attaching radios to frogs.

93. Rathbun, G.B. and J. Schneider. 2001. Translocation of California red-legged frogs (*Rana aurora draytonii*). Wildlife Society Bulletin 29:1300-1303.

Describes juvenile and adult frogs homing after being moved from breeding pond. One adult male returned 2.8 km back to the breeding pond in less than 32 days.

94. Rathbun, G.B., N.J. Scott, Jr., and T.G. Murphey. 1997. *Rana aurora draytonii* (California red-legged frog). Behavior. Herpetological Review 28:85-86.

Red-legged frogs climbed over a fence designed to be a frog barrier.

- 95. Reaser, J.K. 2003. Occurrence of the California red-legged frog (*Rana aurora draytonii*) in Nevada, USA. Western North American Naturalist 63:400-401.**

Museum specimens of putative *Rana luteiventris* from five Nevada localities were reidentified as *R. draytonii*. They are all believed to be introduced populations.

- 96. Reis, D.K. 1999. Habitat characteristics of California red-legged frogs (*Rana aurora draytonii*): Ecological differences between eggs, tadpoles, and adults in a coastal brackish and freshwater system. M.S. Thesis, San Jose State University, California. 58 pages.**

A multivariate analysis of habitats showed eggs and larvae were found in relatively shallow, warm water, with a high abundance of pondweed (*Potamogeton*) an indicator of larval habitat. Adults were found in deeper water.

- 97. Schmidt, K.P. 1953. A check list of North American amphibians and reptiles. Sixth edition. American Society of Ichthyologists and Herpetologists. viii+280 pages.**

The type locality for *Rana draytonii* is restricted to the "vicinity of San Francisco".

- 98. Shaffer, H.B., G.M. Fellers, S.R. Voss, J.C. Oliver, and G.B. Pauly. 2004. Species boundaries, phylogeography and conservation genetics of the red-legged frog (*Rana aurora/draytonii*) complex. Molecular Ecology 13:2667-2677.**

A definitive survey of the mitochondrial DNA of the complex, determining that *R. aurora* and *R. cascadae* are monophyletic sister species, and that *R. draytonii* is more distantly related. The zone of overlap is about 5 km wide south of Elk, southern Mendocino County, California, where the species may occur together in the same pond. Data from the last population in California south of Los Angeles, now effectively extinct, indicate that reestablishment efforts there should draw from populations in Baja California, rather than geographically closer but genetically more distant populations in Los Angeles and Ventura counties.

99. Slevin, J.R. 1928. **The amphibians of western North America. Occasional Papers of the California Academy of Sciences 16:1-152.**

Description, distribution, and a photograph of *R. a. draytonii*.

100. Snyder-Velto, D.K. 2008. **Moving quickly saves a breeding season. Endangered Species Bulletin 33:32-33.**

After a flood, a rapid response by the Forest Service and the Fish and Wildlife Service created breeding habitat for a critically vulnerable population of red-legged frogs, one of only two known in Los Angeles County.

101. Stebbins, R.C. 1951. **Amphibians of western North America. University of California Press, Los Angeles, California. 539 pages.**

Lots of good biological information. Composite description of the "species" *R. aurora*, which includes the subspecies *aurora*, *draytonii*, and *cascadae*. *Rana draytonii* cannot be separated out in the composite morphological description. The illustration labeled "aurora" is nonetheless *R. draytonii*.

102. Stebbins, R.C. 1959. **Reptiles and amphibians of the San Francisco Bay region. California Natural History Guides: 3, University of California Press, Berkeley and Los Angeles. 72 pages.**

A well-illustrated guide with a plate useful in comparing frogs in the Bay Area.

103. Stebbins, R.C. 1966. **A field guide to western reptiles and amphibians. Houghton Mifflin Company, Boston, Massachusetts. 279 pages.**

Identification guide, distribution map, and illustrations of eggs, larva, and adults of the composite species *R. aurora*, including *aurora* and *draytonii*.

104. Stebbins, R.C. 1972. **Amphibians and reptiles of California. University of California Press, Berkeley, Los Angeles, and London. 152 pages.**

Same color plate as Stebbins (1959) and same information as in Stebbins (1966).

- 105. Stebbins, R.C. 1985. A field guide to western reptiles and amphibians. Second edition. Houghton Mifflin Company, Boston, Massachusetts. 336 pages.**

Identification guide, distribution map, and illustrations of eggs, larva, and adults of the composite species *R. aurora*, including *aurora* and *draytonii*.

- 106. Stebbins, R.C. 2003. A field guide to western reptiles and amphibians. Third edition. Houghton Mifflin Company, Boston, Massachusetts. 539 pp.**

Identification guide, distribution map, and illustrations of eggs, larva, and adults of the composite species *R. aurora*, including *aurora* and *draytonii*.

- 107. Stitt, E.W. and G.T. Downard. 2000. Status of the California red-legged frog and California tiger salamander at Concord Naval Weapons Station, California. Transactions of the Western Section of the Wildlife Society 36:32-39.**

Extensive survey of red-legged frog habitats and comments on the disappearance of bullfrogs from the station.

- 108. Storer, T.I. 1925. A synopsis of the Amphibia of California. University of California publications in Zoology 27:1-307.**

First synthetic work on the amphibians of California. Synonymy, description, taxonomic history, and detailed summary of the biology of *R. a. draytonii*, with photographs of animals and their habitats, and quotations from field notes.

- 109. Symonds, K. 2008. Ranchers restore amphibian-friendly ponds. Endangered Species Bulletin 33(1):30-31.**

Short description of a program developed by the Alameda County Resource Conservation District, the National Resource Conservation Service, and the Fish and Wildlife Service to encourage Alameda County ranchers to repair stock ponds, thus creating habitat for red-legged frogs and tiger salamanders.

- 110. Symonds, K. 2008. Ranchers restore amphibian-friendly ponds. Endangered Species Bulletin 33(4):20-21.**

A reprint of the article above.

111. Tatarian, P.J. 2008. **Movement patterns of California red-legged frogs (*Rana draytonii*) in an inland California environment.** *Herpetological Conservation and Biology* 3:155-169.

Less than half of 49 radiotagged frogs moved away from their source pools over two seasons. Most movement occurred after the first rains and before the breeding season. Upland sites where frogs located were closer to pools and had more cover than random sites.

112. Turner, F.B. 1962. **An analysis of geographic variation and distribution of *Rana pretiosa*.** *American Philosophical Society Yearbook* 1962:325-328.

Some of the so-called "*R. pretiosa*" were probably *R. draytonii* (Reaser 2003).

113. Twain, Mark. 1865. **Jim Smiley and his frog.** The Saturday Press.

The first publication of Twain's story of the jumping frog of Calaveras County.

114. Twain, Mark. 1867. **The celebrated jumping frog of Calaveras County and other sketches.** C.H. Webb, New York.

A republication of Twain (1865).

115. U.S. Environmental Protection Agency. 2010. **Pesticides: Endangered Species Protection Program. Effects determinations for the California red-legged frog and other California listed species. Web site:** <http://www.epa.gov/espp/litstatus/effects/redleg-frog/>

A list of pesticides and their effects on California species. The information is species specific, but much of the general amphibian data is probably applicable to *Rana draytonii*.

116. U.S. Fish and Wildlife Service. 1997. **Guidance on site assessment and field surveys for California red-legged frogs (*Rana aurora draytonii*).** Web site: http://sacramento.fws.gov/es/documents/ca_redleg_frog_survey.htm.

Obsolete protocol for site assessments and frog surveys.

117. U.S. Fish and Wildlife Service. 2002. Recovery plan for the California red-legged frog (*Rana aurora draytonii*). U.S. Fish and Wildlife Service, Portland, Oregon. 173 pp.

Summary of biology and description of conservation measures needed to remove frog from federal list of threatened and endangered species.

118. U.S. Fish and Wildlife Service. 2005. Revised guidance on site assessments and field surveys for the California red-legged frog. Web site: http://www.fws.gov/sacramento/es/documents/crf_survey_guidance_aug2005.doc.

Current protocol for site assessments and frog surveys.

119. U.S. Fish and Wildlife Service. 2006. Endangered and threatened wildlife and plants; designation of critical habitat for the California red-legged frog, and special rule exemption associated with final listing for existing routine ranching activities; final rule. Federal Register 71:19244-19292.

A revision of McCasland et al. (2001) that greatly reduced the critical habitat from 1.7 million ha to 182,225 ha by ignoring the frog's biology, and by eliminating areas covered by Habitat Conservation Plans and existing or draft management plans of other agencies. Areas where the frog has been extirpated were also excluded.

120. U.S. Fish and Wildlife Service. 2008. Endangered and threatened wildlife and plants; revised critical habitat for the California red-legged frog (*Rana aurora draytonii*); proposed rule. Federal Register 73:53492-53680.

Spurred by a lawsuit from the Center for Biological Diversity, this proposes to fix, by using biological data, most of the problems of U.S. Fish and Wildlife Service (2006) by increasing critical habitat from 182,225 ha to 730,402 ha. The comment period ended in November, 2008.

121. U.S. Fish and Wildlife Service. 2009a. Endangered and threatened wildlife and plants; revised critical habitat for the California red-legged frog (*Rana aurora draytonii*); proposed rule; reopening of comment period, notice of availability of draft economic analysis, and

amended required determinations. Federal Register 74:19184-19192.

A reopening of the comment period on critical habitat until May, 2009. The comment period was reopened in order to include a draft economic analysis.

122. U.S. Fish and Wildlife Service. 2009b. Endangered and threatened wildlife and plants; revised designation of critical habitat for the California red-legged frog (*Rana aurora draytonii*); proposed rule; reopening of comment period, availability of revised draft economic analysis, and amended required determinations. Federal Register 74:51825-51829.

A re-reopening of the comment period on critical habitat until November, 2009.

123. U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; revised designation of critical habitat for the California red-legged frog (*Rana draytonii*); final rule. Federal Register 75:12816-12959.

More than 647,000 ha are encompassed in this final (we hope), biologically based, ruling on critical habitat.

124. Walker, M.V. 1946. Reptiles and amphibians of Yosemite National Park. Yosemite Nature Notes 25:1-48.

Locality records of extinct populations and a black-and-white photograph from Slevin (1928).

125. Welsh, H.H. 1988. An ecogeographic analysis of the herpetofauna of the Sierra San Pedro Mártir region, Baja California, with a contribution to the biogeography of the Baja California herpetofauna. Proceedings of the California Academy of Sciences, 4th series, 46:1-72.

Records of *Rana a. draytonii* from northern Baja California.

126. Wilkinson, J.A. 2006. *Rana aurora draytonii* (California red-legged frog). Defensive behavior. Herpetological Review 37:207-208.

Less than 10 subadults out of ~800 captured frogs of all ages exhibited the behavior.

127. Wright, A.H. and A.A. Wright. 1949. Handbook of frogs and toads of the United States and Canada.

Comstock Publishing Associates, Ithaca, New York. 640 pages.

Distribution, habitat, description of *R. a. draytonii*, and a summary of its biology, with quotes from field notes and photographs of animals.

128. Zweifel, R.G. 1955. Ecology, distribution, and systematics of frogs of the *Rana boylei* group. University of California Publications in Zoology 54:207-292.

Rana a. draytonii inhabits ponds and slowly moving streams with banks covered by grass and herbaceous vegetation.

1 May 2010

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