

A Key to Stream Breeding Amphibians of Coastal Southern California



Prepared by:
Chris Brown, Cynthia Hitchcock, Cheryl Brehme, Adam
Backlin, Dustin Wood and Robert Fisher

A Key to Stream Breeding Amphibians of Coastal Southern California

Index

Introduction.....	1
How to Use	1
Key to Aquatic Amphibian Larvae	2
Part 1. Limbless Larvae (limb buds present)	2
Part 2. Larvae with Developed Limbs.....	12
Aquatic Amphibian Larvae Species Accounts	19
Quick Key Index	22
Appendix 1. Eggs.....	23
Acknowledgements and Additional Reading	25

DRAFT

Introduction

The goal of this key is to identify the rare and common stream breeding amphibian larvae in coastal southern California. The key does not cover the exotic southern leopard frogs (*Rana sphenocephala*) which only occur in the Prado Basin or the foothill yellow-legged frog (*Rana boylei*) which are extirpated in southern California. Additional frog and toad species that occur in the Sonoran Desert of California are not covered by this key.

How to Use

The key features three elements, a full dichotomous key with illustrations of diagnostic characters of the species, a quick reference guide with photos of the individual larvae and a one page key that parallels the full key to ease field usage. These three parts can be used in connection with each other, or as stand alone references.

The diagnostic characteristics used in the key were chosen to ease field usage, trying to minimize the usage of characters that are often visible only under a dissecting scope. However, many of the characters are still very small and often difficult to discern without the aid of a hand lens or magnifying glass. It is often necessary to place the larvae in a plastic bag filled with water from the site in order to better examine individual characteristics.

Many young larvae are difficult to determine even with a key. In some cases, larvae under the size of 20 mm total length cannot be differentiated beyond the genus.

Lengths listed are all total lengths and in millimeters. Characters used in the abbreviated key and the quick reference guide are illustrated in the full length key.

A guide to common aquatic breeding amphibian eggs is included at the end of the guide as an appendix.

Part 1. Limbless Larvae (limb buds present)

Key to Aquatic Amphibian Larvae Part 1. Limbless Larvae (limb buds present)

1. Tentacles:

A. Tentacles extending from the corners of the mouth present (when extremely small, 10 mm or less, larvae may lack tentacles, but have flattened head, transparent body and eyes on side of head). Can often be confused with mosquito fish (*Gambusia affinis*), see page 21.

→African Clawed Frog (*Xenopus laevis*)



B. No tentacles from the corners of the mouth present

→Go to Number 2

2. External gills:

A. External gills present dorsally.

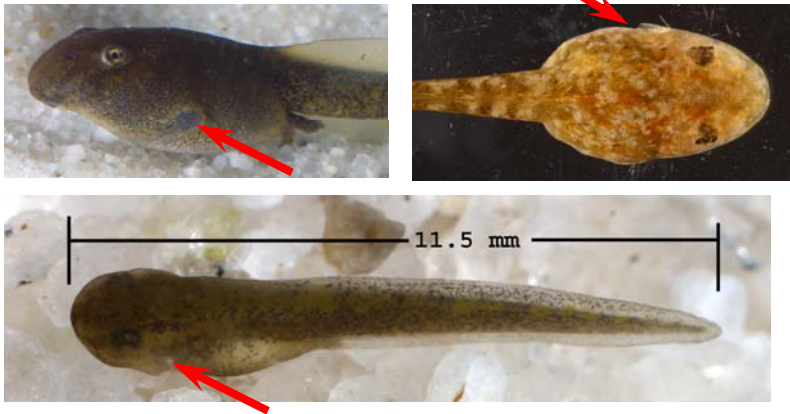
→Go to Number 3 (Salamanders)



Part 1. Limbless Larvae (limb buds present)

B. No external gills present (spiracle present) or external gills present ventrally on very small larvae (~10 mm total length)

→Go to Number 4 (Frogs and Toads)



3. Salamanders—Dorsal stripes:

A. Two irregular dark stripes along dorsum present. Low tailfin, eyes near edge of head.

→California Newt (*Taricha torosa*)



B. No stripes on dorsum. High tailfin, head wide.

→Tiger Salamander (*Ambystoma tigrinum*)



Part 1. Limbless Larvae (limb buds present)

4. Frogs and Toads—Eye position:

A. Eye position lateral. Eyes protrude beyond the outline of head when viewed from above

→Pacific Treefrog (*Pseudacris regilla*)



B. Eye position dorsal. Eyes do not protrude beyond the outline of head when viewed from above. Dorsally positioned eyes may have a lateral orientation (face laterally).

→Go to Number 5

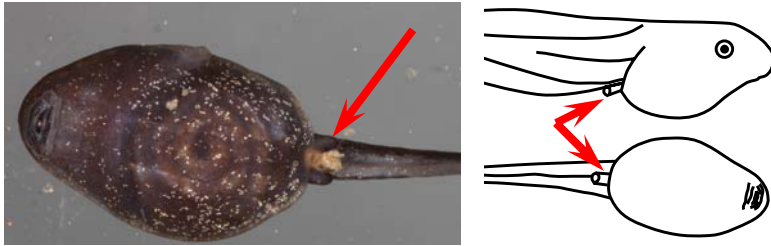


Part 1. Limbless Larvae (limb buds present)

5. Vent position:

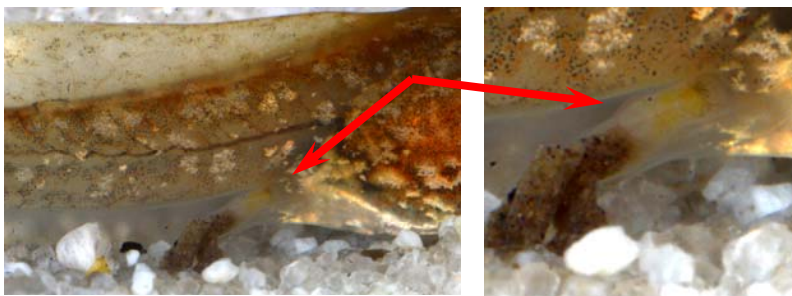
A. Vent medial. The vent leaves the body directly beneath the tail, in front of the start of the lower tailfin, along the midline of the body—note that excrement will still tend to drift to one side.

→Go to Number 6 (Toads)



B. Vent dextral. The vent leaves the body along the right side of the lower tailfin. It is still placed under the tail musculature, only it is next to the lower tail fin which starts anterior of where the tail musculature meets the body. This character is most discernable while excrement is being released.

→Go to Number 11 (Frogs)



Part 1. Limbless Larvae (limb buds present)

6. Toads—Oral papillae:

A. Oral papillae completely encircle mouth

→Western Spadefoot (*Spea hammondi*)



B. Upper lip without oral papillae (sides of mouth with papillae)

→Go to Number 7 (True Toads, *Bufo*)



7. True Toads (*Bufo*)—Size of Larvae:

A. Less than 20 mm in length. Larvae of the genus *Bufo* which are less than 20 mm in length can be very difficult to distinguish, with attention being paid to subtle color differences and mouthparts. (All *Bufo* larvae close to or less than 10 mm in length may appear as solid black and are indistinguishable.)

→Go to Number 8

B. More than 20 mm in length

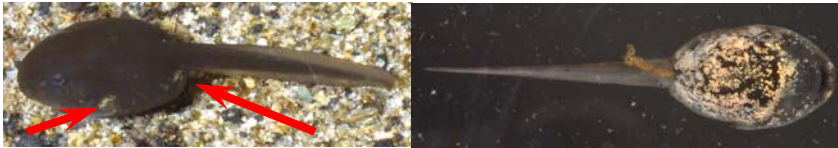
→Go to Number 9

Part 1. Limbless Larvae (limb buds present)

8. Body coloration (small larvae, <20 mm):

A. Dark body with white spot on side and at the base of tail (often difficult to see). The body of very young larvae may have light markings starting to appear on an otherwise translucent or dark ventral surface that may appear as coppery iridescence.

→ Arroyo Toad (*Bufo californicus*)



B. Uniform dark or black coloration

→Go to Number 10



9. Body coloration (large larvae, >20 mm):

A. Olive, gray or tan mottled dorsum, white spot on side of the tail at the base of the tail on the lower part of the tail musculature. Tail musculature with distinct dark blotches. Light "opercular spot" on side of body. White or cream colored venter.

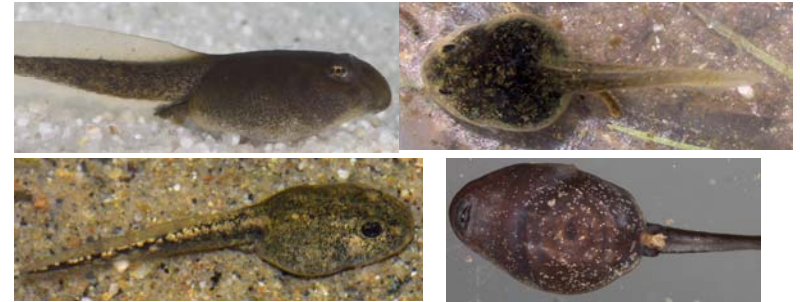
→Arroyo Toad (*Bufo californicus*)



Part 1. Limbless Larvae (limb buds present)

B. Uniform black, brown, green or gray with light or non-pigmented venter. Some individuals may have exceptionally light coloration with mottled tail. Larger individuals (> 30 mm) may have small white spots on venter and/or dark speckling on tail.

→Go to Number 10



Additional Notes on *Bufo boreas* and *B. californicus*:

Bufo californicus can often be distinguished from like colored *B. boreas* without capture by observation of the distinct white markings on the ventral surface near the base of the tail. The photo below shows a few *B. californicus* among several like colored *B. boreas*. Arrows point to *B. californicus*, the other larvae being *B. boreas*. Red arrows are clearly discernable *B. californicus* with visible white venters, blue arrows are likely *B. californicus*.



Part 1. Limbless Larvae (limb buds present)

10. Mouthparts:

A. The ends of the upper tooth row extend to or below the midline of the mouthparts.

→ **Red Spotted Toad (*Bufo punctatus*)**



A. The ends of the upper tooth row do not drop down to the midline of the mouthparts.

→ **Western Toad (*Bufo boreas*)**



Part 1. Limbless Larvae (limb buds present)

11. Oral disc (lip margin):

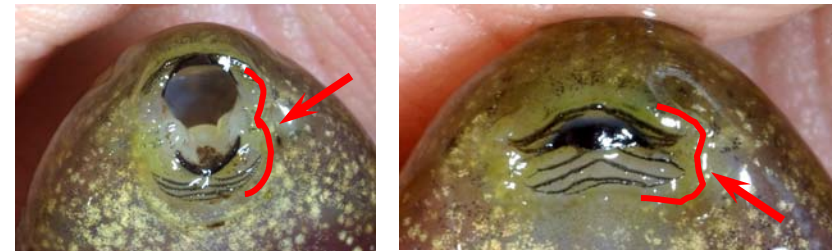
A. Oral disc (lip margin) is round (not indented). This character is more apparent when the larvae are placed in a clear container with water from the site.

→ **California Treefrog (*Pseudacris cadaverina*)**



B. Oral disc (lip margin) indented on sides. This character is often difficult to distinguish in the field and may appear as blunt corners of the mouth.

→ **Go to Number 12 (True Frogs, *Rana*)**

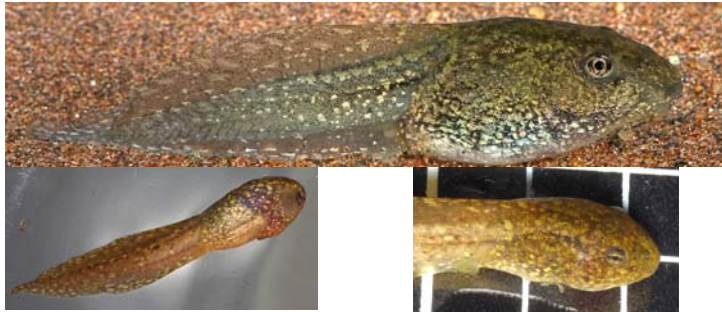


Part 1. Limbless Larvae (limb buds present)

12. True frogs (*Rana*):

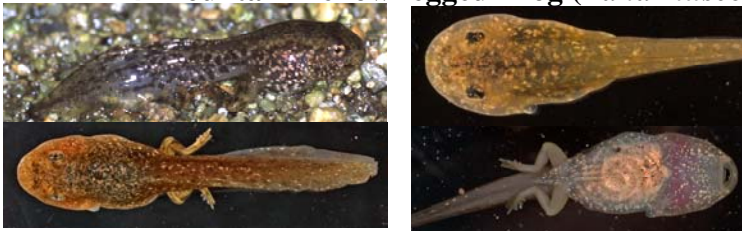
A. Venter with pinkish iridescence and pink tint under tail. Tail fin is highest near or slightly anterior of the middle of the tail. No conspicuous black spots. Tooth rows typically 2/3; length to 118 mm. Typically found in slow moving lowland streams and pools.

→ **California Red-legged Frog (*Rana draytonii*)**



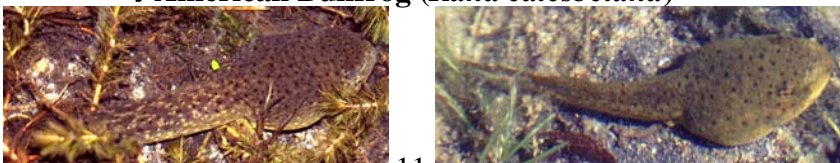
B. Mottled body with copper or bronze flecks, faint yellow to white venter, dark spots on tail. Tooth rows typically 3/4, length to 61 mm. Tail fin is highest posterior of middle of tail. This species is only found in boulder sided mountain streams of southern California.

→ **Mountain Yellow-legged Frog (*Rana muscosa*)**



C. Uniform yellow, green or gray dorsum with round, black, well defined dorsal spots; a white, yellow, or cream venter with no iridescence. Tooth rows 2/3 or 3/3. Largest larvae in area, length up to 162 mm.

→ **American Bullfrog (*Rana catesbeiana*)**



Part 2. Larvae with Developed Limbs

Part 2. Larvae with Developed Limbs

13. Presence of claws:

A. Darkened and hardened tips on toes of hind feet.

→ **African Clawed Frog (*Xenopus laevis*)**



B. No Claws

→ **Go to Number 14**

14. External gills:

A. External gills present.

→ **Go to Number 15 (Salamanders)**



B. No external gills present.

→ **Go to Number 16 (Frogs and Toads)**



15. Salamanders—Dorsal stripes:

- A. Two irregular dark stripes along dorsum present.
Low tailfin, eyes near edge of head.

→California Newt (*Taricha torosa*)



- B. No stripes on dorsum. High tailfin, head wide.

→Tiger Salamander (*Ambystoma tigrinum*)



16. Toe pads:

- A. Toes ending in bulbous pad.

→Go to Number 17 (Treefrogs)



- B. No toe pads at ends of toes.

→Go to Number 18

17. Treefrogs—Eye stripe:

- A. Dark stripe extending from nose through the eye.
Dark triangle on head in between eyes.

→Pacific Treefrog (*Pseudacris regilla*)



- B. Lacking eye stripe and triangle on head.

→California Treefrog (*Pseudacris cadaverina*)

18. Vent position:

- A. Vent medial (The vent leaves the body directly beneath the tail, in front of the start of the lower tailfin).

→Go to Number 19 (Toads)



- B. Vent dextral (The vent leaves the body along the right side of the lower tailfin. It is still placed under the tail musculature, only it is next to the lower tail fin). This character is most discernable while excrement is being released.

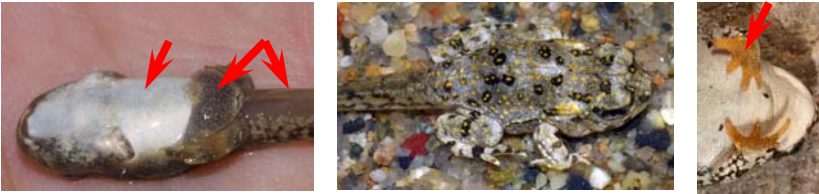
→Go to Number 23 (Frogs)



19. Toads—Coloration:

A. Venter is solid white or cream coloration (with the exception of tail and drink patch). Dorsum is typically light gray/green with fine yellow spotting. Snout becomes narrow as metamorphosis approaches. Palms of hands and feet light, not contrasting with pads.

→Arroyo Toad (*Bufo californicus*)



B. Venter coloration not solid white or cream colored. May appear dull gray (center photo) due to dark and light pigmentation on belly, or may have dark blotches as metamorphosis approaches. Palms of hands and feet dark, accentuating yellow pads.

→Go to Number 20



20. Toe pads:

A. Larval mouthparts still visible.

→Go to Number 21

B. Larval mouthparts not visible.

→Go to Number 22

21. Mouthparts:

A. Oral papillae completely encircle mouth

→Western Spadefoot (*Spea hammondi*)



B. The ends of the upper tooth row extend to or below the midline of the mouthparts.

→Red Spotted Toad (*Bufo punctatus*)



C. The ends of the upper tooth row do not drop down to the midline of the mouthparts.

→Western Toad (*Bufo boreas*)



22. Coloration and eyes:

By the time the larvae lose the mouthparts, they are starting to exhibit coloration of the juveniles.

A. Drab dorsal coloration with orange or ruddy spots, venter being mottled or darkish. Pupils showing signs of being horizontal in orientation.

→ **Western Toad (*Bufo boreas*)**



B. Light coloration with small but distinct red spots on dorsal surface not corresponding with larger dark spots or bumps. Pupils showing signs of being horizontal in orientation.

→ **Red Spotted Toad (*Bufo punctatus*)**

C. Blunt snout and sign of pupils being vertical in orientation.

→ **Western Spadefoot Toad (*Spea hammondi*)**



23. True Frogs (*Rana*):

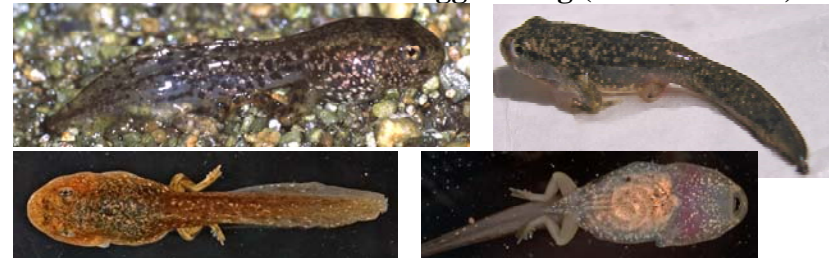
A. Venter with pinkish iridescence and pink to reddish tint under tail. Tail fin highest near or slightly anterior of the middle of the tail. No conspicuous black spots (may be mottled). Larger larvae will show dorsolateral fold. Tooth rows typically 2/3; length to 118 mm. Typically in slow moving lowland streams and pools.

→ **California Red-legged Frog (*Rana draytonii*)**



B. Mottled body with copper or bronze flecks, faint yellow to white venter, dark spots on tail. Tooth rows typically 3/4, length to 61 mm. This species is found in boulder sided mountain streams of southern California.

→ **Mountain Yellow-legged Frog (*Rana muscosa*)**



C. Uniform yellow, green or gray dorsum with round, black, well defined dorsal spots which are retained through complete metamorphosis; a white, yellow, or cream venter with no iridescence. Length to 162 mm

→ **American Bullfrog (*Rana catesbeiana*)**

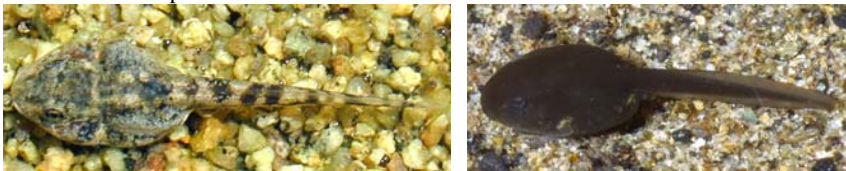


Aquatic Amphibian Larvae Species Accounts



Western Toad, *Bufo boreas*

50 mm. Typically uniform black, brown or gray dorsum; possible gray or black speckling on tail; similar, light or nonpigmented venter; may have dark speckles on throat. Similar species: *Bufo californicus* has flatter belly and distinct white spot on side and at base of tail



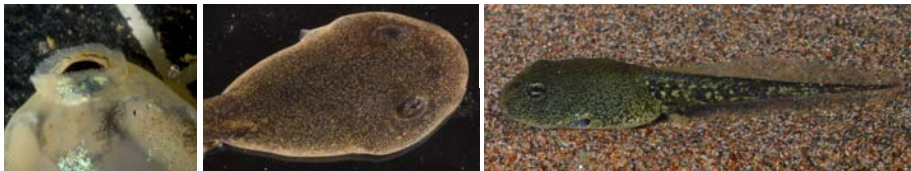
Arroyo Toad, *Bufo californicus*

37 mm. Olive, gray or tan mottled dorsum; tail musculature with dark blotches; white or cream venter. Larvae <20 mm: dark with white or yellow spots on sides. Similar species: *Bufo boreas* has rounder belly and no distinct white spot on side and at base of tail.



Red Spotted Toad, *Bufo punctatus*

30 mm. Uniform or mottled gray dorsum and tail musculature; white or cream venter; arrowhead shaped body when viewed from above. Young larvae: dark gray or solid black. Similar species: *Bufo californicus* and *B. boreas* do not have upper tooth row drop down to midline of mouthparts.



Western Spadefoot, *Spea hammondi*

70 mm. Uniform olive, brown, silver or black; square or diamond shaped body (anteriorly broad), eyes set close together, facing up. Beak like teeth completely encircled by oral papillae. Similar species: *Bufo spp.* larvae lack oral papillae on upper lip.



California Treefrog, *Pseudacris cadaverina*

44 mm. Light to dark brown or green dorsum; speckling on body and tail; large blotches on tail musculature; intestines visible; heart shaped body; eyes within outline of head when viewed from above. Similar species: *Bufo californicus* has a medial vent; *Pseudacris regilla* has lateral eyes.



Pacific Treefrog, *Pseudacris regilla*

44 mm. Gray, brown, or olive venter, may have black speckles; tail with dendritic pattern; white venter with copper sheen, intestines are not visible. Eyes protrude from the outline of head when viewed from above. Similar species: small *Ranid* species have indented lip margins and dorsolateral eyes.



California Red-legged Frog, *Rana draytonii*

118 mm. Large larvae have a dark brown or yellowish dorsum, and a pinkish iridescence ventrally with small brown spots. Their eyes sit well within the outline of the head as viewed from above. The oral disc is indented on the opposite sides. Similar species: *Rana muscosa* typically has 3/4 tooth row configuration.



Mountain Yellow-Legged Frog, *Rana muscosa*

61 mm. Dark brown or green dorsum with gold or bronze flecks on body and tail. Dark spots on tail. Tail musculature opaque. Intestines evident but not visible on white to yellow venter. Similar species: *Rana aurora* typically has 2/3 tooth row configuration



Exotic



Broad, flattened, saucer shaped snout with diagnostic tentacles protruding from the corners of the mouth; laterally compressed eyes on the side of the transparent head. **Exotic**



This fish can often be confused with the African clawed frog (*Xenopus laevis*) larvae. They both have a broad head and upturned mouth and behave similarly in pooling water. Closer examination will reveal the bony fins of the mosquito fish.

Tentacle from each end of the mouth	Gills Present		No Gills or Tentacles Present						
		Eyes lateral (eyes protrude beyond the shape of the head when viewed from above)	Eyes dorsolateral or dorsal (eyes do not protrude beyond outline of head when viewed from above)						
Xenopus laevis	Lateral stripes on dorsum, eyes on side of head	No lateral stripes on dorsum, eyes on top of head	Pseudacris regilla	Vent medial (vent positioned directly below tail in midline of body)	Vent dorsal (vent positioned at base of tail to the side, not directly along midline of body)	Lip margin indented at sides		Faint yellow to white venter, no pinkish iridescence	
				Oral papillae entirely encircle mouth	Upper lip without oral papillae				
	Taricha torosa	Ambystoma tigrinum		Upper lip and tooth row run downward along side of mouth	Mottled dorsum, dark blotches on tail, white/yellow spots on side	Uniform dorsum, no distinct white or yellow spots on side	Venter with pinkish iridescence	Mottled body with bronze flecks	Round, well defined dorsal spots
				Bufo punctatus	Bufo californicus	Bufo boreas	Rana draytonii	Rana muscosa	Rana catesbeiana

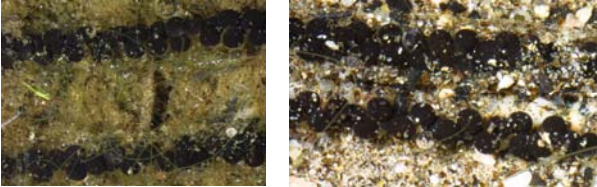
Abbreviated Key to Aquatic Larvae
(See full key for descriptions and examples of diagnostic characters)

Appendix 1. Eggs



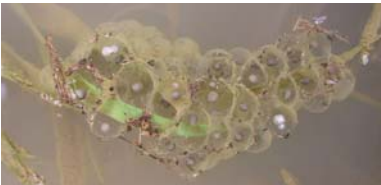
Western Toad, *Bufo boreas*

Eggs laid in strings with 1-3 rows and can be long and tangled. Eggs have a double envelope, appearing more spaced out within the string.



Arroyo Toad, *Bufo californicus*

Eggs laid in strings with 1-3 rows. Strings can be long, but are typically shorter than *B. boreas*. Eggs have one envelope.



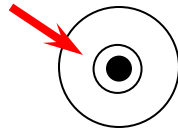
Western Spadefoot, *Spea hammondi*

Eggs laid in irregular cylindrical clusters resembling clusters of grapes.



California Treefrog, *Pseudacris cadaverina*

Small, well defined singular or loosely clustered eggs. Eggs have a single envelop.



Pacific Treefrog, *Pseudacris regilla*

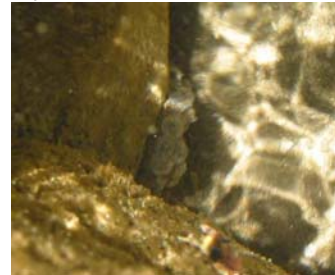
Clustered eggs attached to submerged vegetation. Eggs have a double envelop.

Appendix 1. Eggs



California Red-legged Frog, *Rana draytonii*

Eggs laid in loose grape like clusters attached to submerged vegetation at or just below the waters surface, 75-255 mm.



Mountain Yellow-Legged Frog, *Rana muscosa*

Eggs laid in firm grape like clusters under debris and boulders or in shallows near edge of stream, 50-100 mm.



California Newt, *Taricha torosa*

Eggs laid in tight, firm cluster attached to underside of debris or submerged vegetation.



Bullfrog, *Rana catesbeiana*

Eggs laid in a floating cluster attached to emergent vegetation, 12-60 inches.

Acknowledgements and Additional Reading

Acknowledgements

This key was produced with the help and input of field crews that have been conducting field investigations for amphibians as part of National Biological Survey and later US Geological Survey, San Diego Field Station amphibian programs in southern California since 1995. This was essential in producing a key that uses characters that can be distinguished in the field with minimal impact to the individual animals.

Photos were provided by Adam Backlin, Cheryl Brehme, Chris Brown, Liz Gallegos, Cindy Hitchcock and Manna Warburton.

Additional reading can be found at:

Fisher, Robert N. and Ted J. Case, 1997. A Field Guide to the Reptiles and Amphibians of Coastal Southern California. US Geological Survey. <http://www.werc.usgs.gov/fieldguide/>

McDiarmid, Roy W. and Ronald Altig, 1999. Tadpoles: the Biology of Anuran Larvae. The University of Chicago Press, Chicago, IL.

Stebbins, Robert C., 2003. A Field Guide to Western Reptiles and Amphibians, Third Edition. Houghton Mifflin Co., New York, NY.