Western U.S. Newts (*Taricha*)

- Upper left is *T. rivularis*. This salamander is adapted to a highly terrestrial existence and probably has adult survival rate greater than 90%/year.
- Bottom *Taricha* in defensive "unken" position that ventral *aposematic* colors.
- *Taricha* lacks eft stage, but terrestrial adults return to water to breed; tail becomes laterally compressed during this period.

“salamander” ‘wet’skin type salamandrids

- Adults mate on land.
- Several months later:
  - Near-term eggs laid in water & soon hatch.
  - Young born alive in water.
- Bright *aposematic* coloration identifies protection by noxious-chemical defense mechanisms.

Family **Plethodontidae**

lungless salamanders

- About 27 genera and about 267++ living species.
- About 60% of all living salamander species.
- Unusual distribution - eastern U.S., Pacific coast; southern Mexico to northern South America (plus several disjunctly distributed taxa).
- A single *bolitoglossine* genus occurs in southern Europe and Sardinia (*Hydromantes*) - also in mountains of California!!
- Center of origin appears to be Appalachian Mountains - basal taxa still occur there, but new whole mtDNA data . . .
- Family characterized by loss of lungs and nasolabial groove that aids in chemoreception
- The only truly successful invader of the tropics.
- Terrestrial, aquatic, burrowing, cave-dwelling, and arboreal species.

Family **Plethodontidae**

- Lunglessness thought to have arisen in response to the problem of positive buoyancy in cold fast moving streams (with plenty of O₂).
- Plethodontids are small because all respiration takes place across the skin (cutaneous).
- Reproduction (on land or in water) but **direct development** common.
Subdivisions: Subfamilies and Tribes

Plethodontidae

Radiation related to **2 key adaptations** that evolved within **Plethodontidae**:
1. **Evolution of direct development**, which freed them to diversify into terrestrial habitats.
2. **Loss of lungs** and corresponding switch to **cutaneous respiration**, freed the glossal skeleton allowing it to be co-opted for **projectile tongue protrusion**.

*Hydromantes* projectile feeding

- Extreme tongue protrusion (80% +of SVL) has evolved 4-6 times in plethodontids (also evolved in lungless salamandrids-evidence for lunglessness being key).
Plethodontidae

- **Bolitoglossini** (tribe subdivision) includes 14 genera, ~200 species including the U.S. west coast genera *Batrachoseps* and *Hydromantes*.
- Range in size from tiny (*Thorius*) to large (*Pseudoeurycea*).
- Extensive radiation and dispersal into Central and South America probably related to direct development and extremely derived projectile tongue protrusion feeding.

Cryptobranchus
asymmetrical suction feeding