

# AN ANNOTATED AND ILLUSTRATED KEY TO MULTISTAGE LARVAE OF OHIO SALAMANDERS<sup>1</sup>

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A key to the adult salamanders of Ohio has recently appeared (Gehlbach, 1960), but no adequate key to larval forms is available. All previously published keys, such as those of Pratt (1935), Bishop (1941), and Smith (1956), are only useful to a limited extent because of non-inclusion of many forms occurring in Ohio, or because criteria are for larvae of only a few sizes. Larvae of the species of *Ambystoma* in Ohio, except *A. laterale*, are discussed in a recent paper (Brandon, 1961). The present key is offered in the hope that it might help stimulate further interest in the collection and proper identification of salamander larvae, and thus encourage their increased use in distributional and taxonomic studies.

Three major sources of difficulty in identifying salamander larvae are individual, geographic, and ontogenetic variation. Individual variation is the nemesis of all keys since the key characters are based on the norm for the species, and individuals may differ greatly. The best solution to this difficulty is provided by the examination of a representative series of specimens. Because of the possibility that some or all species included in this key may show considerable geographic variation, the key is intended for use in Ohio only. It may be used in nearby areas if the user is alert to the possibility of geographic variation and the presence of species other than those included here. It is hoped that adequate compensation has been made in the key for ontogenetic variation.

Since this is not a synoptic treatment of diagnostic features of families, genera, and species, the characteristics used in the key are not necessarily those used in classifying the taxa involved, but are those found to be useful in practical identification of these taxa in Ohio. Although most of the included taxa have been studied from Ohio material, some of the information (some estimates of size at hatching and metamorphosis, certain pigmentary patterns, etc.) is taken from the literature of other areas, notably New York (Bishop, 1941).

All length measurements in the key are of total length, from the snout to the tip of the tail fin. Absence of the posterior part of the tail fin, therefore, will decrease the usefulness of these measurements. In determining the number of costal grooves between limbs, count one groove in the axilla and one (usually) in the groin. Forking grooves in the groin must be counted as two.

The figures are not intended to be accurate in all details; they are diagrammatic, and are used only to point out some of the traits mentioned in the text.

*Plethodon cinereus*, *P. richmondi*, *P. glutinosus*, *P. wehrlei*, and *Aneides aeneus*, although recorded from Ohio, are not treated here because they lack a free-living, aquatic larva. *Ambystoma laterale* is not included because, to date, series of larvae have not been available for examination; larvae of this form are probably similar to those of *A. jeffersonianum*.

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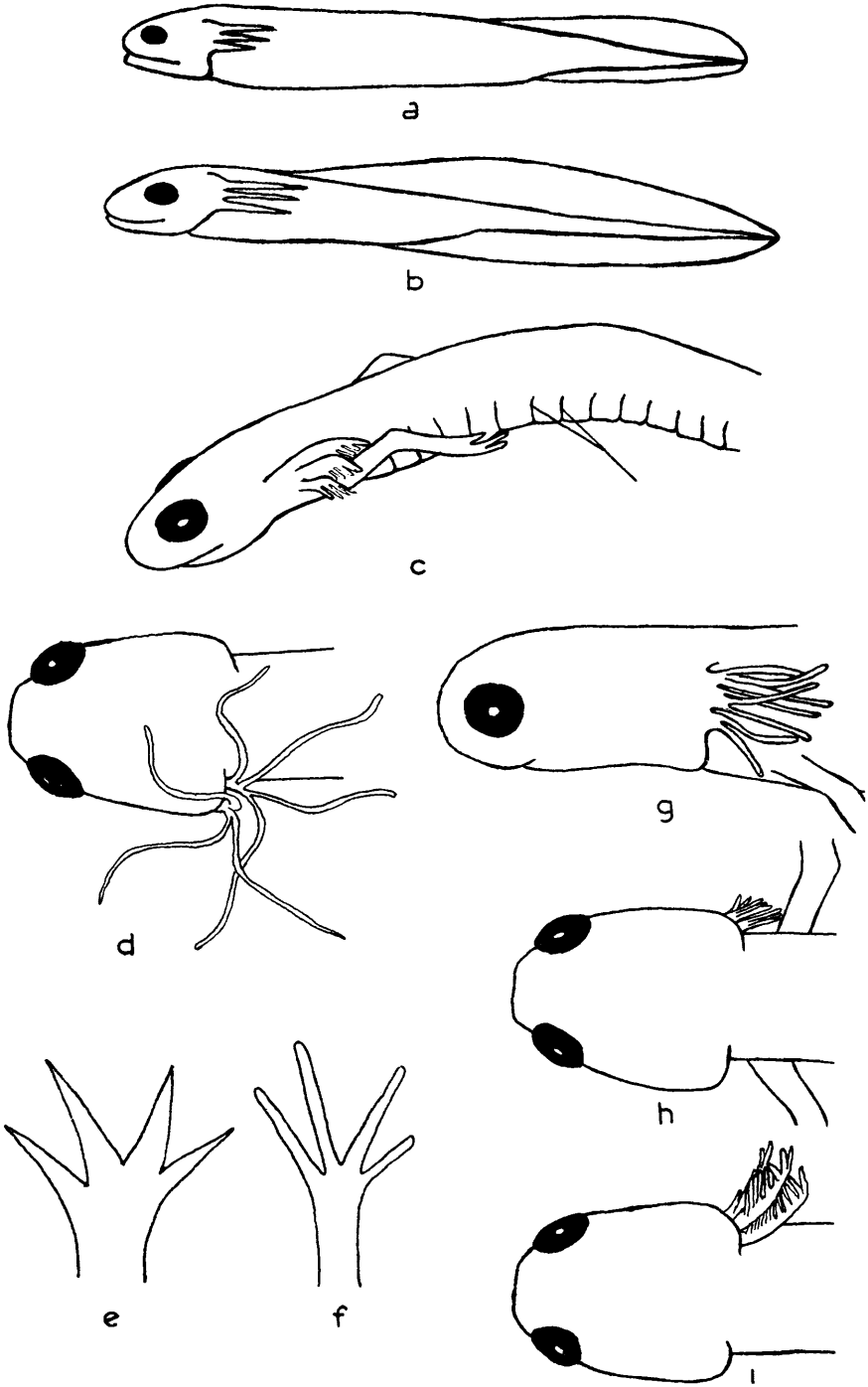


FIGURE 1. Sketches illustrating features referred to in key to Ohio salamander larvae.

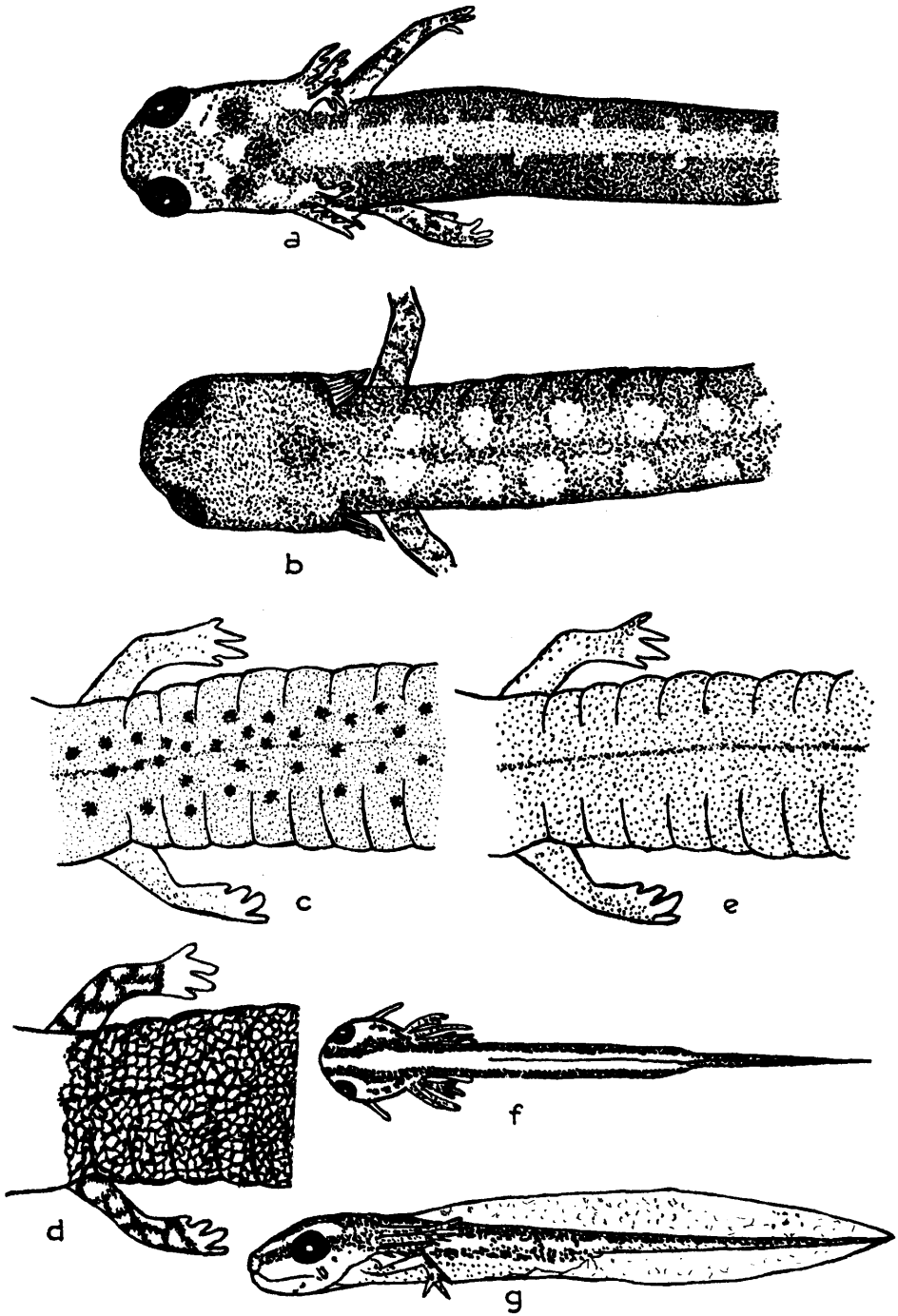


FIGURE 2. Sketches illustrating features referred to in key to Ohio salamander larvae.

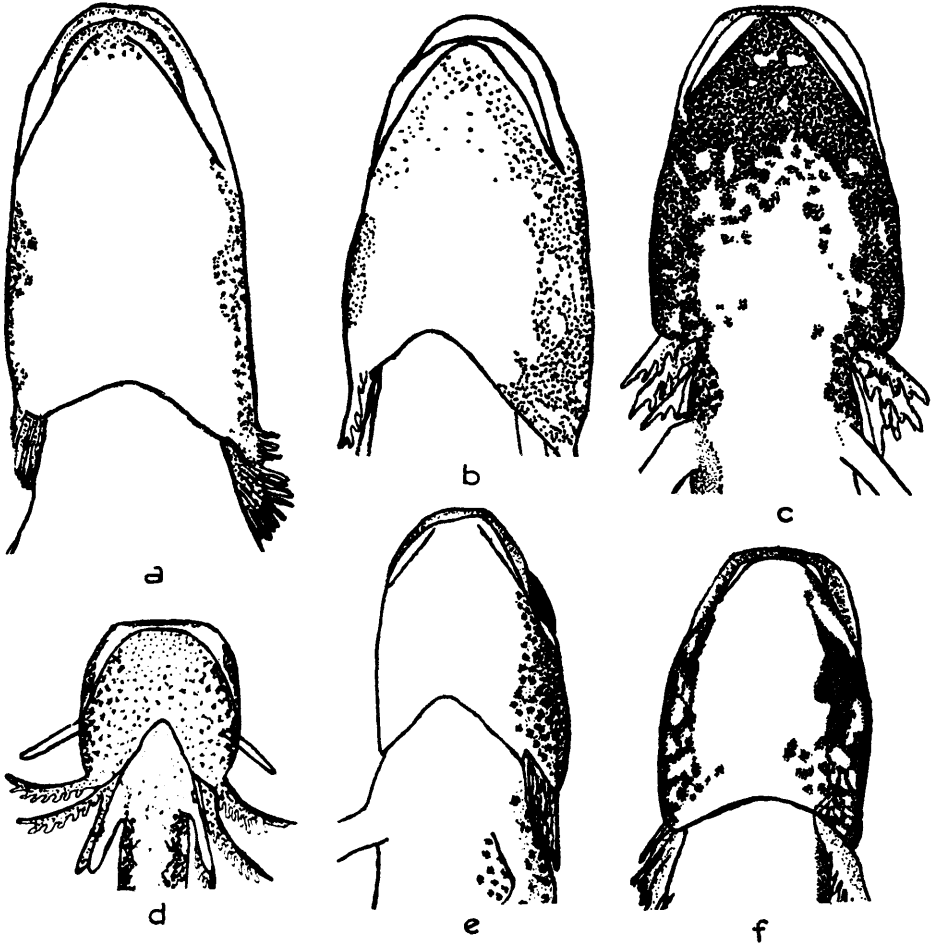


FIGURE 3. Sketches illustrating features referred to in key to Ohio salamander larvae.

KEY TO OHIO SALAMANDER LARVAE

1. Dorsal tail fin extending onto body as a dorsal body fin, reaching at least half way to head (fig. 1b).....14
- Dorsal tail fin not extending onto body as a dorsal body fin, but ending at base of tail (fig. 1a)..... 2
2. Ramus of gill shorter than gill filaments (fig. 1d, g, h)..... 3
- Ramus of gill longer than gill filaments (fig. 1i)..... 5
3. A series of 5 to 7 pairs of dorsal light spots (fig. 2b).....
- Desmognathus fuscus*, Dusky Salamander
- Ohio subspecies: *D. f. fuscus*. Larvae hatch at ca. 15 mm and metamorphose at ca. 30 mm. At hatching the gill filaments are extremely long, but they gradually shorten (fig. 1d, g, h).
- No dorsal light spots..... 4
4. Total length greater than 25 mm.....*Desmognathus fuscus*
- Larvae of this form about to metamorphose (25 to 30 mm) sometimes lose nearly all traces of the light dorsal spots.

- Total length less than 25 mm.....*Desmognathus ochrophaeus*, Mountain Salamander  
Ohio subspecies: *D. o. ochrophaeus*. A light dorsal stripe extends from head onto tail; larval period short; specimens from 18 to 20 mm long.
- 5. A flap-like keel extending outward from the posterior margin of at least the forelimbs...  
*Cryptobranchius alleganiensis*, Hellbender  
Ohio subspecies: *C. a. alleganiensis*. Larvae hatch at 27 to 32 mm and metamorphose at 97 to 137 mm.
- No flap-like keel extending from posterior margin of limbs..... 6
- 6. A dark mid-dorsal stripe bordered on each side by a light stripe.....  
*Necturus maculosus*, Waterdog  
Ohio subspecies: *N. m. maculosus*. This form hatches at 21 to 25 mm and retains its larval appearance throughout life, reaching an adult length of 12 to 17 inches. Small larvae of *Eurycea l. longicauda* (17 to 20 mm) were examined with a well developed mid-dorsal dark stripe and the lateral light stripes. *E. l. longicauda* with this pattern may be distinguished from *Necturus* by five toes on the hind feet of the former, four toes on the hind feet of the latter.
- No dark mid-dorsal stripe..... 7
- 7. Paired dorsal light spots and/or a light mid-dorsal stripe present; 14 to 15 costal grooves (fig. 1c)..... 8
- Dorsal surface without paired light spots or mid-dorsal stripe; 16 to 19 costal grooves..10
- 8. Anterior half of throat well covered with pigment (fig. 3c); lateral pigment strongly encroaching onto the belly, and extending ventral to limb insertions.....  
*Eurycea lucifuga*, Cave Salamander  
Larvae hatch at 11 to 14 mm and metamorphose at ca. 50 mm.
- Anterior half of throat only slightly or not at all pigmented (fig. 3a, b); lateral pigment ending above limb insertion, or encroaching onto belly only very slightly..... 9
- 9. A series of dorsal light spots; on larger specimens the spots may be partially or completely fused with a mid-dorsal light stripe (fig. 2a); throat unpigmented (fig. 3a)...  
*Eurycea bislineata*, Two-lined Salamander  
Ohio subspecies: *E. b. rivicola*. Larvae hatch at ca. 12 mm and metamorphose at 43 to 76 mm. Larvae about to metamorphose have the mid-dorsal yellowish stripe and dorsolateral black lines characteristic of adults.
- No dorsal light spots; a dorsal light stripe, which on larger specimens contains many dark flecks; several flecks of pigment on the anterior half or fourth of throat (fig. 3b)  
*Eurycea longicauda*, Long-tailed Salamander  
Ohio subspecies: *E. l. longicauda*. Larvae hatch at ca. 12 mm and metamorphose at 43 to 60 mm.
- 10. Dorsal body pigmentation consisting of black dots and/or flecks on a rather uniformly light ground color (fig. 2c, e).....11
- Dorsal body pigmentation consisting of a reticulated pattern of dark pigment on a lighter ground color; no spots or flecks (fig. 2d).....13
- 11. Dark spots and/or flecks distributed rather uniformly over back and sides.....12
- Dark spots and/orflecks concentrated along the dorsolateral region.....  
*Gyrinophilus porphyriticus duryi*, Kentucky Spring Salamander  
Smaller larvae of this form do not have dark flecks, but are lightly reticulated; larger larvae (80 to 120 mm) approaching metamorphosis have dark flecks as do adults. Larvae hatch at ca. 25 mm.
- 12. Black dots and flecks very numerous (hundreds) and of several sizes, though mostly small (fig. 2e).....*Pseudotriton ruber*, Red Salamander  
Ohio subspecies: *P. r. ruber*. Larvae hatch at ca. 15 mm and metamorphose at 75 to 100 mm.
- As above, but with larger, fewer dots superimposed over the smaller ones (fig. 2c).....  
*Pseudotriton montanus*, Mud Salamander  
Ohio subspecies: *P. m. diastictus*. Larvae hatch at ca. 15 mm and metamorphose at 65 to 90 mm.

13. Costal grooves usually 16 (rarely 15 or 17); pigmentation on side of jaw consisting of small individual dark dots (fig. 3e)..... *P. r. ruber*  
 On some specimens the dorsal dots are numerous enough to give the impression of reticulations.  
 Costal grooves 17 to 18 (rarely 19); pigmentation on side of jaw chiefly of dark mottling (individual dots, if recognizable, are few or fused) (fig. 3f).....  
*Gyrinophilus porphyriticus*, Spring Salamander  
 Ohio subspecies: *G. p. porphyriticus* and *G. p. duryi*. Small larvae of *G. p. duryi* differ from those of *p. porphyriticus* only by being paler. Larger larvae of *p. duryi* approaching metamorphosis (80 to 120 mm) have a concentration of dark dots and flecks dorsolaterally. Large larvae of *p. porphyriticus* are darkly reticulated and lack dark dots and flecks.
14. Head with a lateral longitudinal dark stripe continued through the eye (fig. 2g)..... 15  
 Head without lateral longitudinal dark stripe..... 18
15. Legs and toes well developed and easily counted..... 16  
 Legs and toes not well developed; impossible to count toes accurately..... 17
16. Fore and hind feet with 4 toes each..... *Hemidactylium scutatum*, Four-toed Salamander  
 Larvae hatch at 11 to 15 mm and metamorphose at 18 to 24 mm.  
 Fore feet with 4 toes, hind feet with 5 toes..... *Notophthalmus viridescens*, Newt  
 Ohio subspecies: *N. v. viridescens*. Larvae hatch at 7 to 8 mm and metamorphose at 35 to 39 mm.
17. A pair of dorsolateral dark stripes running from head back onto tail (fig. 2f, g).....  
*N. v. viridescens*  
 No dorsolateral dark stripes; a series of distinct or partially fused light spots along each side of the dorsal body fin..... *H. scutatum*
18. Throat well pigmented (fig. 3d)..... 19  
 Throat not well pigmented; pigment sometimes present bordering jaws..... 21
19. Dorsal pigment uniformly distributed; no dark transverse bands dorsally..... 20  
 A series of dark transverse bands dorsally.....  
*Ambystoma texanum*, Small-mouthed Salamander  
 Larvae hatch at ca. 13 mm and metamorphose at ca. 41 mm.
20. A distinct row of lateral light spots; costal grooves 12 to 13 (see introduction for method of counting)..... *Ambystoma opacum*, Marbled Salamander  
 Larvae hatch at 14 to 19 mm and metamorphose at 63 to 75 mm.  
 No distinct row of lateral light spots; costal grooves 15..... *A. texanum*
21. Dorsal pigment uniformly distributed; no large dark blotches dorsally..... 22  
 Dorsal pigment forming large dark blotches along both sides of the dorsal body fin..... 24
22. Toes broad at base, pointed at tip (fig. 1e)..... *Ambystoma tigrinum*, Tiger Salamander  
 Ohio subspecies: *A. t. tigrinum*. Larvae hatch at 15 to 17 mm and metamorphose at 90 to 120 mm. Large individuals lose most traces of the dorsal blotches characteristic of smaller larvae.  
 Toes not broad at base, nor pointed at tip (fig. 1f)..... 23
23. Tail fin intensely pigmented, appearing mottled with black; head much wider than trunk..... *Ambystoma jeffersonianum*, Jefferson Salamander  
 Smaller larvae have the dorsal blotches. Larvae hatch at 11 to 14 mm and metamorphose at 48 to 75 mm.  
 Tail fin not intensely pigmented; head not much wider than trunk.....  
*Ambystoma maculatum*, Spotted Salamander  
 Larvae hatch at 12 to 13 mm and metamorphose at 40 to 70 mm.
24. Total length of specimen less than 16 mm..... 25  
 Total length of specimen more than 15 mm..... 26
25. Balancers present on side of head, (fig. 2f, g); anterior limb buds well developed, sometimes with two toe buds..... *A. jeffersonianum*  
 Balancers absent; anterior limb buds very small, without toe buds..... *A. t. tigrinum*
26. Toes broad at base, pointed at tip (fig. 1e)..... *A. t. tigrinum*  
 Toes not broad at base, nor pointed at tip (fig. 1f)..... *A. jeffersonianum*

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