Notophthalmus viridescens (Rafinesque)

Triturus (Diemyctylus) viridescens Rafinesque, 1820:5. Type-locality, “in Lake George, Lake Champlain, the springs and brooks of the neighborhood.” No type designated and collector not given. Diemyctylus proposed as a subgenus.

Notophthalmus viridescens: Baird, 1850:284.
Diemyctylus viridescens: Hallowell, 1856:11.
Notophthalmus viridescens: Gray, 1858:138.
Triton viridescens: Struch, 1870:50.
Notophthalmus viridescens: Gill, 1907:256.
Diemyctylus viridescens: Gill, 1907:256. Given as a synonym of Notophthalmus viridescens.

Diemyctylus viridescens viridescens: Cope, 1889:207. N. viridescens reduced to the nominal subspecies with the inclusion of N. meridionalis in the same species.


• CONTENT. Four subspecies are recognized: Notophthalmus v. viridescens, N. v. dorsalis, N. v. louisianensis, and N. v. piaopicaola.

• DEFINITION. Aquatic adults (for definition of newt and eft stages see Conant 1958:213) have a total length of 65-112 mm, and a snout-vent length of 31-51 mm. Cranial ridges are slightly to prominently developed, and sides of the head are nearly parallel behind the eyes. The head width is 71-75 percent of the head length. The eye is of moderate size, its long diameter distinctly less than the distance from the anterior angle of the eye to the nostril. Vomero-palatine teeth usually originate slightly behind or opposite the level of the posterior margin of the internal nares. Hedonic pits are 3-3 in males, 0-0 to 3-3 in females. Skin of the adult is smooth to finely granular; skin of the eft is granular to spinose. Adults are yellow below and yellowish brown or olive green to dark brown above, with many small and irregular black spots scattered over ventrum and dorsum. Black spots on sides of the tail are larger and more diffused in breeding males. The eft is orange red to reddish brown above, lighter below, and has some elements of the adult dorsal pattern. The eft stage is typically present, although rare in some areas. Neoteny is frequent on the southeastern coastal plain, but rare elsewhere.

• DESCRIPTIONS. Bishop (1943) provides comprehensive descriptions of the subspecies viridescens, dorsalis, and louisianensis, including information on the eft and larval stages. Conant (1958) furnishes brief descriptions of all subspecies, and Carr & Goin (1959) give precise descriptions of the adult of the subspecies viridescens, louisianensis, and piaopicaola. Of the many descriptions of N. v. viridescens, the most complete is by Bishop (1941a), who provides detailed information on the egg, larva, eft, and adult. A detailed description of the larva, as well as information on other stages, is also given by Pope (1924). Woltersroff's original (1914) description of N. v. louisianensis is detailed, and was based on a number of living specimens. Breckenridge (1944) describes adult, eft, and larval stages of this subspecies from Minnesota, and Smith (1961) the eft and adult from Illinois. The newly hatched larva of N. v. louisianensis is described by Goin (1951). The most complete description of N. v. piaopicaola is the original one by Schwartz & Duellman (1952). Supplemental information is furnished by Peterson (1952) and Duellman & Schwartz (1958).

• ILLUSTRATIONS. Bishop (1943) provides photographs of the subspecies viridescens (adults, efts), dorsalis (adult female), and louisianensis (adult male). Colored illustrations of all subspecies and the eft and transforming eft of N. v. viridescens are given by Conant (1958). Cope (1889) includes diagrams of the head, mouthparts, and feet of the adult (as Diemyctylus v. viridescens) and eft (as D. m. minitus). The spermatophore is illustrated by Jordan (1933). The most complete set of illustrations of N. v. viridescens is provided by Bishop (1941a). Included are photographs of adults, the eft, mature larva, and drawings of the adult male (two views), spermatophore, egg, newly hatched larva, advanced larva (two stages), newly transformed young, neotenic adult, female in oviposition, and two courtship positions. Pope (1924) gives photographs of both sexes, eggs, and advanced larvae; Gage (1981) has a colored plate with drawings of eggs, dorsal and ventral views of adults, the eft, newly transformed young, and advanced larva. Woltersroff (1914) and Smith (1956) have photographs of the adult, and Smith (1961) of the eft of N. v. louisianensis. Goin (1951) has a drawing of the newly hatched larva of this subspecies. Hughes (1962) provides photographs of the embryo and early larva of N. v. louisianensis, N. v. viridescens, and the hybrid between these two forms. Schwartz & Duellman (1952) have drawings and Peterson (1952) a photograph of N. v. piaopicaola showing variation in ventral pigmentation.

• DISTRIBUTION. The species is found in southern Canada, including the Maritime Provinces and southern Quebec and southern Ontario, and the eastern United States west to north-central Minnesota, eastern Iowa, extreme eastern Kansas, eastern Oklahoma, and south-central Texas. Notophthalmus v. viridescens occupies the Canadian portion of the range (except in western Ontario), and the eastern United States west to central Michigan (lower peninsula), central Indiana, Kentucky and Tennessee east of the Mississippi Embayment, and exclusive of the southeastern coastal plain. N. v. louisianensis is distributed over the coastal plain from southeastern South Carolina to south-central Texas, and extends north to Canada west of the range of N. v. viridescens. The range of N. v. louisianensis is now discontinuous in Illinois (Smith, 1961) and perhaps elsewhere in the middle Mississippi Valley because of habitat desiccation. The presence of N. v. viridescens on the coastal plain in western Florida, sympatric with N. v. louisianensis, requires confirmation. The range of N. v. dorsalis includes the coastal plain from Harnett and Craven counties, North Carolina, south to southern Georgetown County, South Carolina. N. v. piaopicaola occupies peninsular Florida south of central Alachua County.

Adults and larvae occur in ponds and pools, particularly those with abundant submerged vegetation, and in swamps and quiet pools of small streams. Adults occasionally are
found under cover near dried ponds or swamps. Logier (1952) states that in some northern localities adults may hibernate on land. Adults and larvae of *N. v. louisianensis* and *N. v. piauripica* may be abundant in beds of water hyacinth. The terrestrial efts are most common in mesic wooded areas. In northern Florida they occur in mesophytic hammocks (Carr, 1940).

- **Fossil Record.** Holman (1962) records this species from the Pleistocene (Kansan?) of Alachua County, Florida.

- **Pertinent Literature.** The most recent comprehensive taxonomic account is by Bishop (1943), and includes descriptions of all subspecies except *N. v. piauripica*. Although emphasis is placed on characters, some information on habitat and breeding is included. Schwartz & Duellman (1952) and Duellman & Schwartz (1958) give some information on the ecology of *N. v. piauripica*. The most comprehensive account of reproduction and ecology of *N. v. viridescens* is by Pope (1925, 1928); detailed information is also given by Bishop (1941a). Other useful sources for the species include Noble (1926, 1929, life cycle and neotony on Long Island), Brandon & Bremer (1966, neoteny in Illinois), Humphries (1955, mating behavior), Jordan (1893, reproductive biology, embryonic development), Gage (1891, life history), Rogoff (1927, structure and function of hepatic glands), Adams (1940, reproductive cycle, including metamorphosis), Hatch (1942, environmental factors and the sperm cycle), Hutchison (1961, critical thermal maxima), Adams & Rae (1929, fat bodies), Walhert (1963, oviduct, cloaca), and Logier & Toner (1953, Canadian distribution). Humphrey (1925) and Obrenicke (1924) discuss the multiple testis; Grant (1961) reviews studies on the water drive and the endocrinology of changes associated with the first and second metamorphosis. Neill (1952) and Christman (1959) remark on sound production. Morgan & Grisetz (1932), Wood & Goodwin (1954), and Hamilton (1932, 1940) give information on food and feeding; Reese (1912) and Copeland (1912) discuss olfactory reactions. See also Lipsett & Platt (1936, experimental hybridization between the subspecies *viridescens* and *symmetrica* (=*dorsalis*?)), Hughes (1962, experimental hybridization between the subspecies *viridescens* and *louisianensis*, and heteroploidy), Lehman & Younga (1958, experimental hybridization of *N. v. viridescens* with *N. v. trichgraunosa*), Fankhauser (1938, 1941, chromosome number, natural triplody), Fankhauser & Watson (1942, heat-induced triplody), Fankhauser & Griffiths (1969, cold-induced triplody, haploidy), Kaylor (1937, 1941, androgenesis), and Fankhauser (1963, 1965). See also Boulenger (1929).

- **Etymology.** The name *viridescens* (Latin, *vivere*, "green") refers to the greenish color often found in this species; *dorsalis* (directly from Latin, "pertaining to the back") presumably alludes to the broken red lines on the dorsum; *louisianensis* refers to the state in which the type-latitude is located, *piauripica* (Greek, *pia*, "fat," or "thick") alludes to propensity of the newts to inhabit beds of water hyacinths (*Piaropus*).

1. **Notophthalmus viridescens viridescens** *(Rafinesque)*

**Red-spotted newt (aquatic adult), red eft (juvenile land stage)**

*Trinitus viridescens* Rafinesque. See species account.

*Diemyctylus viridescens viridescens* (Wolterstorf, 1914:1). See species account.

*Notophthalmus viridescens viridescens* (Lutgen & Barbour, 1917:8).

*Trinitus viridescens viridescens* (Lutgen & Barbour, 1929:4).

*Trinitus viridescens* Rafinesque. See species account.

*Notophthalmus miniangus* Kinnick, 1855:593.

*Diemyctylus miniangus* Hallowell, 1856:1. Given as a synonym of *D. viridescens*.


*Diemyctylus miniangus* Yarrow, 1882:161. Trinomen used for the eft stage.

*Diemyctylus miniangus viridescens* Yarrow, 1882:161. Trinomen used for the adult.

*Diemyctylus miniangus viridescens* Yarrow, 1882:161. Trinomen used for the adult.

*Salamandra symmetrica* Harlan, 1823:157. Type-locality, "North Carolina." Accepted by Bishop, 1941b, p. 2, as *N. v. piaropicola*. Descriptions given by Bishop, 1940a, 1940b, and Bishop, 1917a.

*Triton symmetricus* Duméril & Bibron, 1841:154.

triburus viridescens: Carr, 1940:45. Use of the binomen apparently based on observed sympathy between N. v. louisianensis and N. perstriatus, the latter form being treated as a race of N. viridescens (given as "Triturus viridescens symmetrical.


- **Definition.** Aquatic adults have a total length of 65-100 mm, and a snout-vent length of 31-48 mm. Proportions are similar as compared with the nominal race; skin of the adult is smooth to finely granular. Hedonic pits are 3-3 in males, absent in females. Adults are yellow below, olive green to yellowish or olive above, with the dark dorsum clearly demarcated from the ventral. Dark spots on dorsum and ventral are used quite small, and may be reduced to fine specks on the dorsal surface. Dorsal red spots are typically absent, but if present are small, faint, and incompletely ringed with black. The eft resembles that of N. v. viridescens, except that the dorsal red spots are greatly reduced or absent, and coloration may be dark brown rather than red above, and yellowish white rather than yellow orange below. The advanced larva is similar in color and pattern to the aquatic adult. The eft stage is rare. Neoteny is common.

- **Notophthalmus viridescens piaropiicola (Schwartz & Duellman)**

**Peninsula newt**


L. Neil Bell, and Thomas M. Raymond, on 14 April, 1952. Neill (1954) points out that Schwartz & Duellman's paper appeared slightly in advance of that of Peterson, and evergladensis is, therefore, a junior synonym of piaropiicola.

- **Definition.** Aquatic adults have a total length of 68-100 mm, and a snout-vent length of 33-45 mm. Proportions are slender, and the skin is granular to finely spinose. Hedonic pits are 3-3 in males, absent in females. The dorsum is dark brown to almost black; dorsalateral red spots are absent or very small and faint, and are not ringed by black. The venter is heavily marked with numerous fine, diffuse dark spots on a yellow ground color clouded with sparsely distributed melanophores. Advanced larvae resemble adults but are somewhat lighter, and the dorsal dark spots are more apparent. The eft stage is rare. Neoteny is common.

**Comment**

The distributional relationships of the races of *N. viridescens* are inadequately understood. The allocation of populations as distantly removed as western Ontario and southern Georgia to *N. v. louisianensis* is unconvincing and should be reexamined. Schwartz & Duellman (1952) and Conant (1958) limit the range of *N. v. piaropiicola* to southern and central Florida, but Carr & Gein (1959) include all of Florida east of Apalachicola River. A detailed study of variation over the entire range of the species is needed. Neill (1954) indicates sympathy between *N. v. viridescens* and *N. v. louisianensis* in western Florida, but confirmation is needed. The nature of the contact between *N. v. dorsalis* and *N. v. louisianensis* in South Carolina also needs study. Intergradation between *N. v. dorsalis* and *N. v. viridescens* has been well documented (Bishop, 1941), but has not been recorded between dorsalis and louisianensis.

**LITERATURE CITED**


— 1858. Proposal to separate the family of Salamandridae,
Gray, into two families, according to the form of the skull.


J. S. MECHAM, TEXAS TECHNOLOGICAL COLLEGE, LUBBOCK, TEXAS 79409.

Published 20 November 1967 by the American Society of Ichthyologists and Herpetologists. Publication is supported by National Science Foundation grant 24231.

Primary editor for this account, James D. Anderson.