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Plethodon welleri Walker
Weller's salamander

Plethodon welleri Walker, 1931:48. Type-locality, "Grandfather Mountain, above 5,000 feet, near Linville, North Carolina." Holotype, U.S. Natl. Mus. 84135, adult male, collected by Hamilton Weller and Ralph Dury, 27 August 1930.

• CONTENT. Two subspecies are described, *P. w. welleri* and *P. w. ventromaculatus*.

• DEFINITION. A small slender *Plethodon*—living specimens rarely exceed 47 mm snout-to-vent length (45 mm in preserved specimens); the maximum head width characteristically does not exceed 7 mm and usually falls between 5 and 6 mm in adults, and this width goes into the snout-vent length 6 or more times. The unregenerated adult tail characteristically exceeds the length from the snout to the posterior margin of the hind limb by no more than 2 mm, and the tail length is usually less than the body length when both are measured from the anterior angle of the vent. There are nearly always 16 costal grooves, including one each in axilla and groin, and 17 trunk vertebrae. Many metallic iridophores (typically coppery, golden, or brassy, but not white or silvery) form large variously fused blotches dorsally; the belly and lower flanks are dark, never mottled with light pigment, but sometimes have light spots (small melanophore gaps usually covered by white iridophores); the gular area is not quite as dark, and is also unmottled, though often with some white spots. Red pigment is characteristically lacking, but small spots or flecks may sometimes be visible. Neither premaxillary teeth nor their cusps are elongated in adult males. During the breeding season adult males show a rounded mental pad of hedonic glands that is slightly longer than wide and fails to reach the jaw rami laterally; other hedonic glands, distinguishable from the background of scattered mucous glands by their larger size and a seasonal orange-gold secretion in life, are clustered around the vent and on the proximoventral portion of the tail of adult males, but sometimes are scattered thinly over the rest of the venter and even onto the cheeks.

• DESCRIPTIONS. Adult *P. w. welleri* have been described in detail by Walker (1931) and Bishop (1943); adult *P. w. ventromaculatus* by Thurow (1956, 1963); eggs by Hoffman & Kleinpeter (1948), and Organ (1960); the spermatophore by Organ (1960); and embryos and hatchlings by Organ (1960) and Highton (1962). Hilton (1951) notes a superficial nasal gland. Highton (1962) describes pigmentation of the ovaries and peritoneum; and Thurow (1956, 1963) gives some preliminary descriptions of relative and absolute growth, and of variation in secondary sexual characters.

• ILLUSTRATIONS. See Bishop (1943, dorsal and ventral views of *P. w. welleri*), Conant (1958, dorsolateral view of *P. w. ventromaculatus*, in color, in company with several other species of the genus), Thurow (1956, ventral views of preserved *P. w. welleri* and *P. w. ventromaculatus*; 1963, dorsal and ventral views of live *P. w. ventromaculatus*), and Organ (1960, a partial dorsal view of *P. w. ventromaculatus*, eggs, embryos, hatchlings, and a drawing of the spermatophore).

• DISTRIBUTION. *Plethodon welleri ventromaculatus* is reported from Mt. Rogers and nearby Whitetop Mountain in Virginia, southwestward in approximately a straight line along the Unaka mountain ridges through Johnson and Unicoi Counties in Tennessee, into Yancey County, North Carolina. *Plethodon w. welleri* is known only from about 5000-5900 feet on Grandfather Mountain, North Carolina, approximately 27 airline miles from the nearest *P. w. ventromaculatus* locality. Elsewhere *P. welleri* is recorded from between 2300 or 2400 feet altitude, up to 5500 or 5720 feet. The records all fall in the Southern Section of the Blue Ridge Physi-

graphic Province, and suggest an association with coarse talus in areas of partly metamorphosed sedimentary or volcanic rock in preference to igneous rock. The species is found in forests of spruce-fir, hemlock-yellow birch, and at lower altitudes in deciduous forests including some hemlock and *Rhododendron maximum*. Though usually found in or under forest floor cover, *P. welleri* is found also under cover in some open areas (grassy spots or boulder fields) but never on stream-bed alluvium.

• FOSSIL RECORD. None.

• PERTINENT LITERATURE. Publications on *P. welleri* are not numerous, and most are included in the literature cited here. Most information is given by Bishop (1943), Highton (1962), Organ (1960), Thurow (1956, 1963), and Walker (1931). Additional life history studies are in preparation by Organ. The original accounts of the known localities are given by Walker (1931, 1934), Snyder (1946), Hoffman & Kleinpeter (1948), Hoffman (1953), and Thurow (1963).

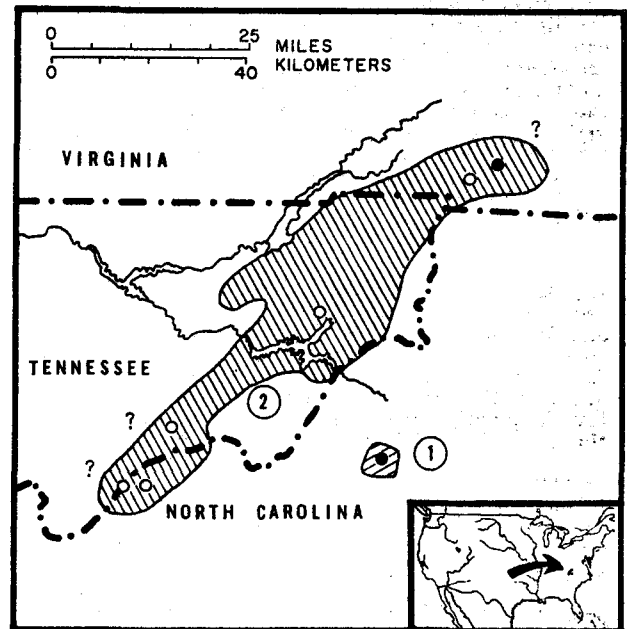
• ETYMOLOGY. The species is named for Worth Hamilton Weller, a promising young Cincinnati herpetologist who first found the species (with Ralph Dury) in 1930, and who died in a fall on Grandfather Mountain after collecting additional specimens in 1931. The name *ventromaculatus* refers to the ventral spotting and is derived from the Latin *venter*, "belly," and *macula*, "spot" or "stain."

1. *Plethodon welleri welleri* Walker
Weller's salamander

Plethodon welleri Walker, 1931. See species account. *Plethodon welleri welleri*: Thurow, 1956:344.

• DEFINITION. The lower flanks and particularly the belly appear almost uniformly dark, as white pigment spots and discrete gaps in the melanophore rete (other than minute skin gland openings, characteristic throughout the genus) are small or lacking, particularly toward the posterior end of the trunk. The darkness of the venter is rather variable, and in some individuals may be markedly lighter than the dorsal melanophore rete. Dorsal thinning of the melanophores, so as to suggest a stripe in preserved specimens, is rare and only poorly developed.

• REMARKS. This race differs from *P. w. ventromac-*



MAP. Solid dots mark type-localities; hollow dots are other known localities. Question marks indicate doubtful distributional boundaries of the probable range.

ulatus in additional pigment characters, though these appear to be of limited taxonomic value: various illustrations and comments of the authors mentioned above suggest that the iridophore pigment in *P. w. welleri* averages slightly less on the back and sides, and that the dorsal metallic pigment may be on the average less coppery and more brassy; no definite remnants of red pigment are reported for *P. w. welleri* as they are for *P. w. ventromaculatus* (Highton, 1962).

Further field studies are needed to determine if *P. welleri* really fails to occur below 5000 feet on Grandfather Mountain, and if there is a correlation with the metamorphic rock cap of the mountain, vegetation, ground temperatures, or other factors.

2. *Plethodon welleri ventromaculatus* Thurow Spot-bellied salamander

Plethodon welleri ventromaculatus Thurow, 1956:344.

Type-locality, "Mt. Rogers at 5500' altitude, Grayson County, Virginia." Holotype, Amer. Mus. Nat. Hist. 54448 (study no. 790), adult male, collected by C. M. Bogert and class, 8 July 1949.

Plethodon welleri ventromaculatus: Organ, 1960:292.

Plethodon welleri: Highton, 1962:274.

• **DEFINITION.** Conspicuous white iridophore spots occur on the belly and lower flanks; spots characteristically larger than unpigmented skin-gland orifices usually extend back to the posterior end of the trunk and are usually underlain by gaps in the melanophore rete (on the lower flank such gaps are clearly larger than gland openings, and usually extend to the groin). The belly, exclusive of any spots, is characteristically dark, and not markedly lighter than the dorsal melanophore rete; a thinning of the dorsal melanophores so as to suggest a wavy-margined stripe is frequently seen in preserved specimens and is occasionally rather striking.

• **REMARKS.** If red pigment and a dorsal stripe are accepted as primitive (Hairston & Pope, 1948), and if ventral spotting, as in *P. yonahlossee*, is regarded as more primitive than the absence of such spotting (Pope, 1950), then the *P. w. ventromaculatus* population has remained more primitive or changed less than the isolated *P. w. welleri*. The trend toward disappearance of the ventrolateral row of gaps in the melanophore rete of *P. w. welleri* can also be interpreted as a divergence from a more primitive state (Dunn, 1926:49). The variable reduction or partial loss of iridophore and ventral melanophore pigment in *P. w. welleri* is more readily interpreted as divergence than the converse can be. The sum of these characteristics suggests that the Grandfather Mountain population is small and isolated and its gene frequencies may be influenced by the genetic drift effect of Sewall Wright (1932). Ecological arguments indicating greater continuity of range between scattered *P. w. ventromaculatus* localities are given in Thurow (1956:350-353).

The vernacular name is taken from Conant (1958:233).

COMMENT

Highton (1962) does not recognize *P. w. ventromaculatus*. He acknowledges that *P. welleri* from Mt. Rogers and Whitetop Mountain, Virginia, have more ventral spotting than those on Grandfather Mountain, and in fact notes additional differences cited above, but he argues that too few specimens have been collected from less frequently visited sites to justify making the distinction. He and I both have examined the specimens from Johnson County, Tennessee, (U.S. Natl. Mus. 132823-324) and agree that they have spotted bellies (even though the white pigment has faded and only the gaps remain). Apparently he collected from the general area an additional specimen that was too young to yield data on this point. Highton's specimen (Cornell Univ. 4768) "without white mottling" from Flat Top Mountain is apparently Snyder's (1946) specimen with "conspicuous mottling on the belly" (in life), although the two adjacent dots on the distribution map suggest two specimens. Twelve additional specimens

collected from Unicoi County (Thurow, 1963 and unpublished data) are also spotted ventrally. Although the assumed status of any population can be changed by additional data, the recognition of a spot-bellied subspecies embracing all known *P. welleri* localities other than Grandfather Mountain seems presently justified.

Although the range of *P. welleri* is restricted, and is a relict from a more widespread parent population, this latter was not *P. richmondi*, or a pre-*richmondi* stock as tentatively suggested by Green (1938) and more definitely by Grobman (1944). Neither is it a recent montane derivative of a *P. cinereus*-type parent stock, as suggested by Hoffman (1953). Both taxonomic and ecological evidence indicate that *P. welleri* is a primitive member of the eastern small plethodons (Thurow, 1956; Highton, 1962), rather than a recent or advanced derivative.

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