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ADDITIONAL COMMENTS ON THE NESTING BEHAVIOR OF *BATRACHOSEPS WRIGHTI* (BISHOP)

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Since the description of *Plethopsis wrighti* (Bishop 1937) and a report by Stebbins and Lowe (1949) that provided characteristics relating it to the genus *Batrachoseps,* much attention has been focused on reproduction (Stebbins 1949, Tanner 1953, Jockusch and Mahoney 1997). My intent in this paper is to review and provide further explanation of the reproduction and nesting behavior of *B. wrighti,* based on a reexamination of my field notes and observations made in 1952.

The discovery of *B. wrighti* in rotting fir logs was first reported by Bishop (1937). This species was also found in logs by Tanner (1953) and Jockusch and Mahoney (1997); see also Petranka 1998:234. Adults and juveniles also occur under fallen limbs, chips, and other surface objects, suggesting that they forage and disperse through various forest habitats. On several collecting trips in Oregon I have found adults and juveniles abroad and not always near rotting fir logs; these observations include records from Clakamas County, June 1952, 1954 (BYU 10344, 11224–11228); Multnomah County, June 1954 (BYU 12631–12632); Linn County, June 1963 (BYU 31981–31995); and Marion County, May 1985 (BYU 12693). Whether nesting occurs only in rotting logs or whether surface debris mentioned above is used is yet to be determined. Dying trees and fallen logs are attacked by different species of boring beetles that make trailways in wood immediately beneath the bark. Dr. S.L. Wood, an authority on bark beetles, advised me that some of the large Cerambycidae occurring in Oregon are capable of making the large trailways in which salamanders noted above were found. Trailways reported by Tanner (1953) crisscrossed the log, with some pupation tunnels ending in a hole deep within the log. Salamanders were found within the log, although most were in trailways just beneath the bark.

Batrachoseps wrighti eggs, found in an enlargement of a trailway on 19 June 1952, were in a spiral cluster surrounded by soggy wood fibers. The female was nestled in wood fibers on the perimeter of the nest with a few fibers between her and the eggs (Fig. 1). The nesting chamber, although not measured, provided ample room for the female to occupy the nesting area. For further clarification and to avoid a misconception, it is important to note that the attending adult was identified as a female (see Jockusch and Mahoney 1997:703–704). She was not in direct contact with the eggs; nor did it appear, from my observations, that she had been in contact since the eggs were laid.

The nest found by Tanner (1953) was unique in that eggs were clustered, with 6 tied together by gelatinous strands that formed a spiral chain (Stebbins 1949) and 2 others loose but still within the cluster. The nest's location on the upper surface of the log may be significant because, from that position, it would more likely receive added solar radiation. Two nests reported by Jockusch and Mahoney (1997) were also found in fir logs, but locations within the logs were not given. Location in the log may be important, particularly if beetle trailways are favored as nesting sites and if solar radiation is a factor affecting choice of nest site. Jockusch and Mahoney (1997) reported that the eggs they found were not together in a nest nor in a cluster, but scattered within an area of 10 cm. This suggests, based on the finding of Tanner (1953), that the nest may have been disturbed and did not represent a typical nesting

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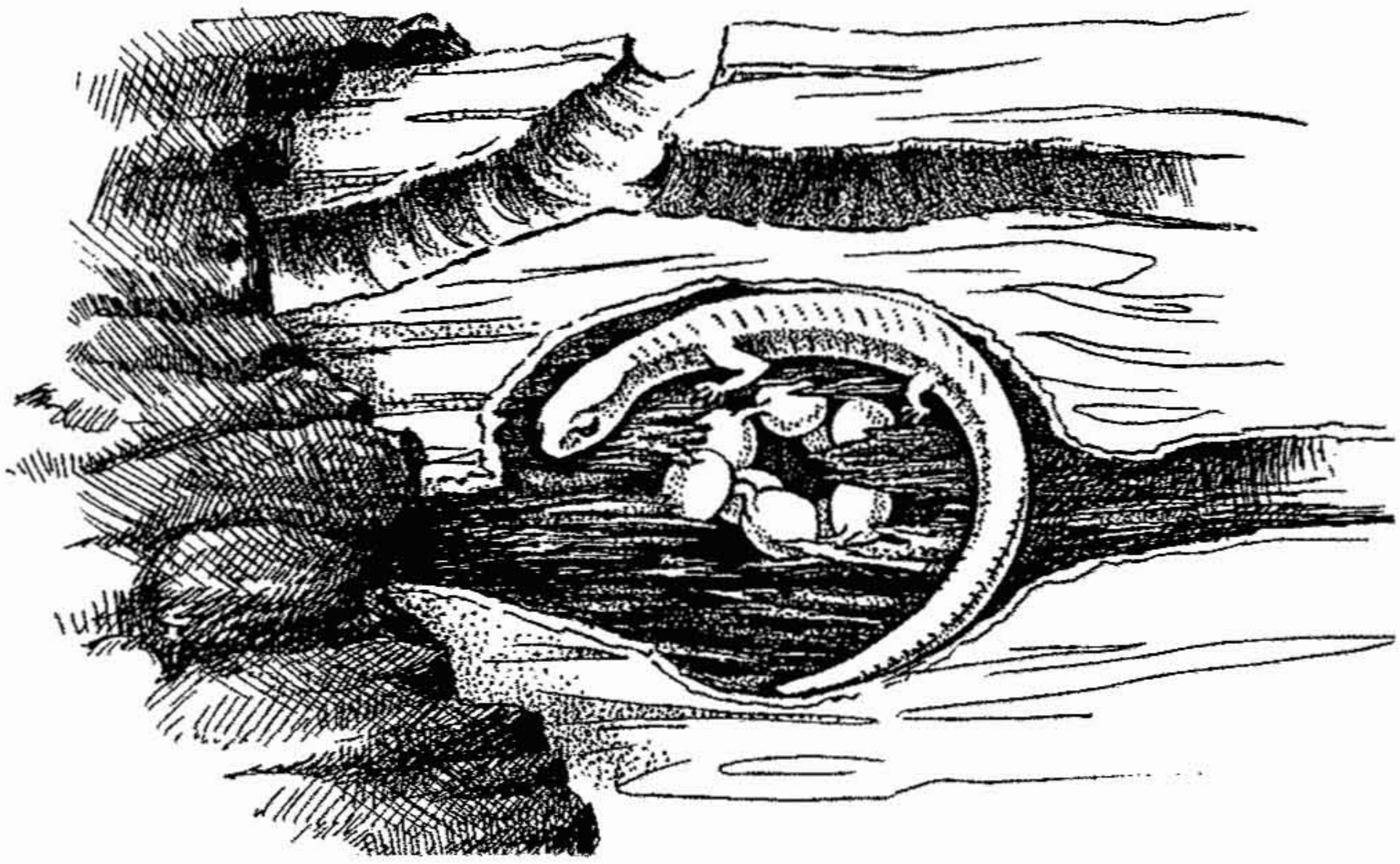

Fig. 1. Sketch simulating the nest of *Batrachoseps wrighti* observed in 1952 (Tanner 1953). Drawing by Randal Baker.

site, assuming that Tanner's nest was typical. Eggs laid in the laboratory, as reported by Stebbins and Lowe (1949) and Stebbins (1949), were also in clusters, tied together by gelatinous strands, and with only a few eggs unattached.

Laboratory studies involving reproduction in *B. wrighti* strongly indicate that brooding does not occur in the laboratory. Gravid females that have oviposited either with or without pituitary implants have shown no inclination to brood (Stebbins 1949). The question arises as to whether brooding occurs naturally in *B. wrighti*, or if the change from natural habitat to laboratory alters their behavior (Stebbins 1949, Jockush and Mahoney 1997). Although laboratory data are suggestive, the finding of a female in the nest with eggs (Tanner 1953) may indicate that under natural habitat conditions some *B. wrighti* females remain at the nest. This single observation does not suggest that either brooding or abandoning the nest occurs; it merely demonstrates that in this instance a female was at the nest. Whether the nest is soon abandoned, as suggested by Jockusch and Mahoney (1997), or is attended for a time, as indicated by Tanner (1953), must be determined by additional research.

From their observations Jockusch and Mahoney (1997) conclude that brooding in *B. wrighti* does not occur. Observations of the 3 nests mentioned (1 attended but not disturbed; 2 unattended but with indications of possible disturbances) suggest the evidence is not yet definitive. The attending female at the nest (Tanner 1953) was nestled in rotting wood near the eggs and did not move until collected. How long she had been in the nest with the eggs is unknown. However, the only embryo that developed from eggs taken from that nest in 1952 was compared to growth stages reported by Stebbins (1949). I suggested then that 1–2 wk might have elapsed since oviposition occurred, during which time the female possibly remained in the nest or nesting area. Some plethodontid females remain in the nest with their eggs during incubation, some remain for a time near the eggs, and others abandon the nesting area soon after oviposition (Bachmann 1984, Carreño and Harris 1998).

Speculations of Jockusch and Mahoney (1997) are seemingly an attempt based on limited data to bring the reproductive patterns of *B. wrighti* into close conformity with attenuate species of *Batrachoseps*. While some aspects may conform, it should be understood that *B.*

wrighti is morphologically different from *B. nigriventris* and other closely related attenuate species of *Batrachoseps* (Bishop 1937, Stebbins and Lowe 1949). In addition, it appears that *B. wrighti* reproduction differs from that of attenuate species in the following ways: (1) eggs are laid in spiral, beadlike clusters; (2) eggs are laid in single, not communal, nests; and (3) apparently, eggs are laid in rotting fir logs. Available data indicate that nesting occurs during May and June. A comprehensive research study should be conducted for *B. wrighti*, comparable to the detailed study of *B. nigriventris* (Jockusch and Mahoney 1997), to eliminate uncertainties and preclude further speculation.

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