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Oodles of Noodles: a Large Aggregation of *Batrachoseps gavilanensis* in the Central Coast of California

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***Abstract*.—Despite being one of the most common and widespread genera of salamanders in California, relatively little is known about the natural history of slender salamanders (*Batrachoseps*). Here we report on an unusually large aggregation of Gabilan Mountains Slender Salamander (*Batrachoseps gavilanensis*) found within a highly modified and fragmented coastal urban environment. While we cannot conclusively determine the purpose of this aggregation, it is possible that this observation represents a communal copulatory or oviposition site.**

Key Words.—aggregation; congregation; copulation; cover; Gabilan Mountains Slender Salamander; gravid; mating; microhabitat; oviposit; refugia.

California has one of the most diverse assemblages of plethodontid salamanders in western North America (McGinnis and Stebbins 2018). Within some habitats of the U.S., plethodontid salamanders are likely the most abundant vertebrates (Semlitsch et al. 2014). Slender salamanders (genus *Batrachoseps*), representing at least 19 species in California (Hansen and Shedd 2025), play an important role in regulating invertebrate detritivores (Walton 2005, 2013; Walton et al. 2006). Most of these species inhabit a home range of < 2 m^2 (Hendrickson 1954; Anderson 1960; Maiorana 1978), with Anderson (1960) reporting movements of 9 m for gravid females.

The habitat requirements for slender salamanders are shaped by several physiological constraints (Huey 1991). This group of salamanders has a reliance on cutaneous respiration, which requires individuals to seek out cool and moist habitats to persist (Spotila 1972; Gatz et al. 1975; Wells 2007). Additionally, within those habitats, their survival depends on access to humid microhabitats to prevent dehydration and hyperthermia (Sinervo et al. 2010). Members of the genus *Batrachoseps* move vertically in the soil through the use of burrows and natural crevices that are often found under logs, rocks, and anthropogenic materials (Storer 1925; Vessel and Wong 1987; Diefenbacher 2007; Caceres-Charneco and Ransom 2010; Drake et al. 2012). This vertical movement allows them to exploit below ground refugia when surface conditions are not ideal (Grizzell 1949; Caldwell 1975; Stebbins 1951; Houck 1977). During more moist seasons of the year, slender salamanders may be found above ground using cover objects as refuge and oviposition sites (Jockusch and Mahoney 1997; Stebbins and McGinnis 2012; Hansen and Shedd 2025). It has been reported that some species of *Batrochoseps* exhibit communal ovipositioning (e.g., Black-bellied Slender Salamander, *B. nigriventris*, California Slender Salamander, *B. attenuates*, and others; Burke 1911; Jockusch and Mahoney 1997). Members of this genus can commonly be found under cover objects as single animals or in groups ranging from 2–7 (pers. obs.). Large numbers of *Batrochoseps* are rarely reported, although Stebbins (1951) observed 12 California Slender Salamander under a log, Campbell reported 15–20 Southern California Slender Salamander (*B. major*) under a board (Stebbins 1951), and Jockusch et al. (2012) found 20 Relictual Slender Salamander (*B. relictus*) under a rock.

Here we report on several large aggregations of the Gabilan Mountains Slender Salamander (*B. gavilanensis*) found under asphalt and concrete debris, which may have congregated for communal ovipositioning or copulation. We conducted construction monitoring in Seaside, California (36.611111, -121.844722) for a project that included ground disturbing activity and the removal of loose pieces of concrete and asphalt. The approximately 22.6 ha project site was a highly modified coastal landscape characterized by extensive anthropogenic infrastructure, including parking lots, roadways, and pedestrian walkways (Fig. 1). These developed features were interspersed with remnant natural habitat, primarily maritime chaparral and small, fragmented patches of oak woodland. The majority of the natural habitats within the project site had been heavily invaded by Iceplant (*Carpobrotus edulis*), which occurs as dense and expansive mats. Monitoring included closely watching construction activity (i.e., vegetation removal and initial ground disturbance via heavy equipment operation) with the potential to impact sensitive species, including the Northern Legless Lizard (*Anniella pulchra*).

A large pile of asphalt pieces (Fig. 2), approximately 1 m wide by 2.5 m long, was stockpiled in the center of a former parking lot, positioned against a vegetated median containing eucalyptus trees (*Eucalyptus* sp.) and an understory of Iceplant and Poison Oak (*Toxicodendron*

Figure 1. Aerial drone image of the project area and surrounding habitat within the Seaside, California. The yellow arrow points to the location of the asphalt debris pile where the Gabilan Mountains Slender Salamanders (*Batrachoseps gavilanensis*) were found. All existing asphalt in the foreground parking lots (gray areas) was removed. (Photograph courtesy of Harris & Associates).

diversilobum). While the stockpiled asphalt and adjacent median was surrounded on all sides by a minimum of 8 m of open asphalt parking lot, accumulated leaf litter and trash on the asphalt provided a potentially protected movement corridor for amphibians from the southeastern edge of the median to more naturalized scrub habitat nearby (Fig. 1).

On 18 September 2025, as equipment operators began to remove the pieces of asphalt for off-site disposal, the senior author noted that a large number (approximately 10–20) of slender salamanders previously sheltering under the asphalt had been exposed. Construction activities were temporarily halted to allow the slender salamanders to be collected and relocated, after which work resumed. This pattern was repeated with each successive scoop of asphalt, indicating that the debris pile as a whole had been utilized as cover by a large aggregation of salamanders.

Figure 2. Asphalt debris pile where we found a large aggregation of Gabilan Mountains Slender Salamanders (*Batrachoseps gavilanensis*). (Photographed by Elena Scott).

During the course of observations at the removal of the pile, we counted 100 individual slender salamanders (Fig. 3), though the precise number of salamanders under each individual piece of asphalt within the pile could not be determined due to the high level of disturbance. We discontinued counts at 100 due to time limitations associated with the pace of work. Given the difficulty of detecting small-bodied species within heavy equipment disturbance zones and the observed encounter rate, however, we conservatively estimated the total number of individuals present at 150–300.

Figure 3. A portion of the Gabilan Mountains Slender Salamanders (*Batrachoseps gavilanensis*) rescued from the asphalt debris pile, which we temporarily held in a 15.2 × 15. 2 cm (6 × 6 in) plastic container. (Photographed by Elena Scott).

We made a second observation of a large aggregation of slender salamanders on 7 October 2025. The senior author documented an additional aggregation of approximately 30 slender salamanders under a parking lot curb located 65 m to the east of the original asphalt pile, within the same former parking lot. The curb was buried to a depth of 15–18 cm, and the subsurface space occupied by the salamanders appeared to be inaccessible except through invertebrate burrows.

We identified the slender salamanders we found as *B. gavilanensis* based on the geographic location and the characteristic extended digits (Hansen and Shedd 2025). While individual females of the genus *Batrachoseps* can be determined to be gravid by direct observation of eggs through the ventral surface of the abdomen (Jockusch and Mahoney 1997), we made no attempt to determine if animals were gravid at the time of the observation. We found one dead individual from the asphalt pile that had a small number of eggs protruding from a puncture wound in the abdomen. Additionally, we found one very small (approximately 2 cm long) individual within the same pile. Based on the size of this salamander, we suspect it was a juvenile, or more likely a hatchling (Stebbins and McGinnis 2012). We found no other eggs or signs of eggs from this species, though the likelihood of detection in this actively excavated environment would have been very low. Other than the single hatchling, all other salamanders we found appeared to be full or nearly full grown.

The exceptionally large aggregation of *Batrachoseps gavilanensis* documented here represents the largest reported aggregation for this species and, to our knowledge, for the genus *Batrachoceps*. We can only speculate on the purpose of the aggregation, but it may be a complex condition of temporal, spatial, and natural history components. We recognize the aggregation included gravid and likely hatchling individuals, which may suggest a communal copulatory or oviposition site. The observation reported here, however, cannot conclusively determine the purpose of the aggregation. It is notable that Anderson (1960) reported gravid females moving as far as 9 m, and numerous authors suggest that *Batrachoceps* inhabit a home range of < 2 m^2 (Hendrickson 1954; Anderson 1960; Maiorana 1976). This indicates that either the aggregated salamanders moved from outside habitat to these few locations farther than previously reported, or that natural densities of this species can be exceptionally high. The details remain unclear.

Slender salamanders are very diverse in California, yet little appears to be known about the details of their natural history. Their requirement for thermally appropriate microhabitats is especially important in light of the changing climate and there is predicted to be substantial loss of suitable plethodontid salamander habitat as a result of climate change (Milanovich et al. 2010). At sites where a species forms aggregations, populations may be especially vulnerable to localized disturbance. Professional biological monitoring of ground disturbing activities may allow for aspects of the natural history of species to be collected and reported well before species begin to decline, which we consider important. If, in the case of *Batrachoseps gavilanensis*, some species of *Batrachoseps* form large aggregations of individuals, they may be more vulnerable to disturbance, particularly as climate change confounds persistence in some areas.

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