



Visual Encounter Surveys Reveal a New Population of Black Pinesnakes (*Pituophis melanoleucus lodingi*) in Mississippi

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The Black Pinesnake (hereafter BPS), *Pituophis melanoleucus lodingi* (Blanchard 1924), is a large colubrid with one of the smallest ranges of any North American snake. It occupies a patchy distribution restricted to southern parts of Mississippi, Alabama, Florida, and Louisiana (Boundy and Carr 2017), although it is considered extirpated from Louisiana (Louisiana Department of Wildlife and Fisheries, unpubl. data). As of November 2015, the BPS was federally listed as Threatened under the Endangered Species Act by the U.S. Fish and Wildlife Service (2015). This listing was based on continued habitat loss and degradation from silviculture, urbanization, and fire suppression, along with road mortality and human persecution, all of which threaten the long-term viability of remaining populations. The distribution of the BPS in Mississippi, its stronghold state, has been restricted to east of the Pearl River, based on county occurrence records and targeted survey efforts (Duran 1998; Duran and Givens 2001; USFWS 2015). Within Mississippi, the BPS holds an S2 imperiled status from the Mississippi Department of Wildlife, Fisheries, and Parks (NatureServe 2020).

Optimal BPS microhabitat can be characterized by low canopy cover, low basal area, frequent fires, and grasses, bare soil, and forbs in the understory (Baxley et al. 2011). Habitat fragmentation and loss has caused population declines in Mississippi (Duran and Givens 2001; USFWS 2015). Based on five individuals, we herein report a previously unknown population of BPS in Mississippi.

Methods

Due to the imperiled status of BPS, specific study site location details will be provided to researchers only on request in order to mitigate potential threats and ensure the continued protection of this vulnerable population. The study site is located in Pearl River County, Mississippi, USA, in a sandhill that consists of deep, sandy soils dominated by a mix of previously planted Loblolly Pines (*Pinus taeda*), Turkey Oak (*Quercus*

laevis), and a few remnant Longleaf Pines (*Pinus palustris*). While minimal ground cover in the form of grasses and forbs is available, the sandhill is home to a population of Gopher Tortoises (*Gopherus polyphemus*), whose burrows can provide shelter for the BPS. Optimal microhabitat soil composition varies across site, with Wadley Series (very deep, well drained marine soils) being the most prominent.

Snakes were found and captured via visual encounter surveys between 1 April 2023 and 1 May 2024. Snakes were captured, measured, and released at their point of capture within 30 minutes. We recorded total length, sex, and body condition of each individual snake. A skin swab was taken from each snake for future PCR tests for the presence of ophidiomycosis.

Results

Between 1 April 2023 and 20 April 2024, two live BPSs were encountered at the site, along with three road-killed snakes found nearby. At 1103 h on 1 April 2023, during a light rain shower (ambient temperature 27 °C), we encountered an adult (TL = 140 cm) female BPS moving from the edge of a larger sandhill toward a nearby wetland branch (Fig. 1A). This individual had four small 1-cm lesions on the base of the tail. At 1252 h on 22 May 2023 (ambient temperature 29 °C), we found a road-killed adult male (TL = 128 cm) BPS on a highway adjoining suitable sandhill habitat after recent light rain (Fig. 1B). The intact, fresh carcass showed limited scavenging and was the only dead snake in that road segment.

At 1547 h on 8 December 2023, during a rain shower (ambient temperature 14 °C), we observed an adult (TL = 162 cm) female BPS basking 5 m from a Gopher Tortoise burrow in open sandhill habitat (Fig. 1C). Based on pronounced scale patterning divergence and gross visual length discrepancies, we confirmed that this was not the same individual encountered previously at this site. This snake had disfigured facial scales as well as crusting of the eye scales.



Figure 1. Five Black Pinesnakes (*Pituophis melanoleucus lodingi*) found at or near our study site in Pearl River County, Mississippi: (A) Live snake found on 1 April 2023; (B) road-killed snake found on 22 May 2023; (C) live snake found on 8 December 2023; (D) road-killed snake found on 1 April 2024; (E) road-killed snake found on 20 April 2024. Photographs by McAulay Jaunsen (A and E), Zachary Gray (B and C), and Dominic Muguira (D).

At 1344 h on 1 April 2024, prior to a light rain (ambient temperature 27 °C), we found a road-killed juvenile (TL = 36 cm) BPS on a highway dissecting suitable sandhill habitat (Fig. 1D). The mostly intact, fresh carcass showed no evidence of scavenging and was one of many dead snakes in this road segment; others were Eastern Diamondback Rattlesnakes (*Crotalus adamanteus*), Gray Ratsnakes (*Pantherophis spiloides*), and an Eastern Hognose Snake (*Heterodon platirhinos*).

At 1254 h on 20 April 2024, after a light rain shower (ambient temperature 27 °C), we found a road-killed subadult (TL = 76 cm) BPS on a highway adjoining suitable sandhill habitat and wetland branch (Fig. 1E). The intact, stiff snake carcass showed no signs of scavenging and was the only dead snake in the road segment.

Discussion

In addition to the two live snakes, based on known BPS spatial ecology and average home range sizes documented in adjacent woodland habitat types (Baxley and Qualls 2009), the three road-killed snakes likely originated from our study site. While capable of traversing suboptimal habitat, the study site's position as the closest sandhill ecosystem within expected daily movement radii suggests that these individuals likely set forth from our study area sandhill habitats rather than more distant forest patches.

The five snakes we encountered likely represent a previously unknown, potentially viable population in Pearl River County, Mississippi. According to U.S. Fish and Wildlife Service (2015), 11 viable populations of the BPS were thought to persist, with six occurring in Mississippi and five in Alabama. The report defined distinct populations as those separated by over 2.1 km, based on the known spatial ecology and dispersal capabilities of this species. Notable is that the USFWS report claimed that the BPS had been extirpated from Pearl River County (U.S. Fish and Wildlife Service 2015). However, our discovery corroborates recent citizen-science observations documented on the iNaturalist platform (iNaturalist 2025) that contradict the alleged absence of this species from Pearl River County. The newly discovered population represents the sole documented population in this county.

Suitable BPS habitat in Pearl River County, Mississippi, could be limited due to the lack of fire-maintained Longleaf Pine savannas and sandhills. The sandhill habitat described herein consists of several relevant corridors of varying size, most of which fit the criteria of known suitable habitat for the BPS. These currently consist of residential, agricultural, private outdoor recreational use, as well as state-owned land and national forest, each with varying levels of fire suppression (ZG, pers. obs.) Habitats within the private outdoor recreational areas currently receive the most frequent burning, with all others

being continuously dominated by woody midstory vegetation or other human development (ZG, pers. obs.). These properties usually are separated by barbed wire fencing and naturally occurring thickets, allowing most animals to freely select habitat. Because of residential housing, vehicular traffic is a major concern (Wagner et al. 2021). Snakes could be occupying state-owned land alongside Gopher Tortoises, but the sandhill habitat described herein, which includes a small nearby track of De Soto National Forest, is at risk of becoming unsuitable for many local endangered species due to fire suppression and the use of heavy machinery and recreational vehicles in sensitive sandhill ecosystems (Diemer 1986).

According to the current understanding of BPS habitat use, Little Bluestem (*Schizachyrium scoparium*)-dominated pine savannas and sandhills comprise the majority of suitable environments in southern Mississippi (Baxley and Qualls 2009). Fringe habitats often lack the proper conditions to sustain sensitive species of herpetofauna, leading to more locally adapted populations (Orizaola et al. 2010). The survival of primary overwintering habitat is often not enough to sustain populations of the BPS when secondary savanna and tertiary wetlands are developed and unusable. Currently, very few areas are capable of sustaining BPS populations as part of long-term management plans (Baxley 2007).

The proximity of sightings to major highways and documentation of road mortalities highlight significant ongoing threats even in suitable habitats. While federal listing confers habitat protections in some areas, this population exists on private land that lacks special management designations. Development pressures could rapidly degrade its sandy longleaf pine ecosystem. Fire suppression also allows hardwood and other midstory woody encroachment, reducing open understory cover. Furthermore, the apparent small size and isolation of this community renders it vulnerable to extirpation from stochastic events, similar to other small snake and wildlife populations (Lacy 2000; Todd et al. 2010; Dubey et al. 2011).

Consequently, delineating the spatial extent and demographic structure is a conservation priority. Quantifying population size estimates, survival rates, spatial ecology, resource use, dispersal distances, and genetic variation in the population would inform state and federal species status assessments and guide management decisions. Specifically, habitat-corridor modeling linking other northern Gulf Coast populations could identify conservation targets to maintain connectivity.

While data restrictions prevent public disclosure of the locality due to the threat of illegal collection, documenting unknown populations highlights information gaps and opportunities to implement conservation initiatives preventing biodiversity losses. Safeguarding vulnerable, peripheral populations like this will require proactively addressing habitat integrity and connectivity to other subpopulations. Possible conservation easements could also mitigate conver-

sion threats as urbanization expands outward. Meanwhile, the feasibility of road underpasses, wildlife fencing, and culvert improvements merits investigation to mitigate collision risks on dangerous arterial stretches. Quantifying genetic diversity for populations statewide also clarifies the degree of isolation to guide any augmentation strategies that might be deemed necessary. Regardless of regulatory status, developing an updated formalized conservation plan, which must include research initiatives centered on core habitat protection and enhancing dispersal avenues between coastal plain habitats, remains the surest pathway to securing the viability of remaining BPS populations into the future.

Acknowledgements

This material is based on work supported by the National Science Foundation under Grant No. 1930451. We thank Dominic Muguira and McAulay Jaunsen for their assistance in finding and photographing animals in the field, and the All You Need Institute for their support throughout this project.

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