

First Documented Case of Snake Fungal Disease in a Free-ranging Wild Snake in Louisiana

Brad M. Glorioso^{1,*}, J. Hardin Waddle¹, D. Earl Green², and Jeffrey M. Lorch²

Abstract - Snake fungal disease (SFD) is a recently documented mycotic disease characterized by scabs or crusty scales, subcutaneous nodules, abnormal molting, cloudiness of the eyes (not associated with molting), and localized thickening or crusting of the skin. SFD has been documented in many species in the Eastern and Midwestern United States within the last decade. SFD has proven lethal in many snakes, and the disease is recognized as an emerging threat to wild snake populations. Herein we describe the first documented case of SFD in Louisiana in a free-ranging wild snake.

Recently, fungal pathogens have been implicated in severe population declines in vertebrates such as bats (Blehert et al. 2009) and anurans (Skerratt et al. 2007). Wild snakes have also been affected by fungal pathogens, notably *Ophidiomyces ophiodiicola* (Guarero, Deanna A. Sutton, Wickes, & Rajeev) Sigler, Hambleton, & Paré, which is believed to be the causative agent of snake fungal disease (SFD; Allender et al. 2011, 2015; Smith et al. 2013).

Cases of SFD in *Sistrurus catenatus* (Rafinesque) (Massasauga) are reported to be 100% lethal (Allender et al. 2011, Tetzlaff et al. 2015), whereas 2 infected *Crotalus horridus* L. (Timber Rattlesnake) had improved health over 10 weeks in captivity without treatment to the point of one being asymptomatic (Smith et al. 2013). Little is known about the prevalence, severity, and population-level impacts of SFD (Smith et al. 2013).

Recently, as awareness of SFD has increased, the Amphibian Research and Monitoring Initiative team at the Wetland and Aquatic Research Center (WARC) has been opportunistically examining all captured snakes for clinical signs of the disease during the course of amphibian monitoring at locations in Louisiana and Texas. One location where we routinely see snakes with clinical signs of infection is Cypress Island Preserve. The property, better known as Lake Martin, is owned by The Nature Conservancy, and is located in St. Martin Parish, LA, about 8 km south of Breaux Bridge. On 26 March 2015, we observed a juvenile *Nerodia fasciata confluens* (Blanchard) (Broad-banded Watersnake) coiled and basking alongside the trail on the southwestern part of the lake at Cypress Island Preserve. When captured, the snake was lethargic (despite warm temperatures near 25 °C), emaciated, and had numerous areas of ulceration, crusting, and firm swelling on the skin of the body and head (Fig. 1). We collected the snake and brought it to the laboratory, where its health continued to decline. The snake was moribund when checked on 30 March 2015 (extremely unresponsive and unable to right itself), and was euthanized with an intracoelomic injection of MS-222. Sterile field methodology, disinfection, and animal welfare protocols were reviewed and approved by the IACUC committee at the US Geological Survey WARC.

Necropsy and histological examination of the snake performed at the US Geological Survey National Wildlife Health Center showed that, in addition to the skin lesions noted above, the snake was in poor body condition (minimal body fat) as evidenced by the ratio

¹US Geological Survey, Wetland and Aquatic Research Center, 700 Cajundome Boulevard, Lafayette, LA 70506. ²US Geological Survey, National Wildlife Health Center, 6006 Schroeder Road, Madison, WI 53711. *Corresponding author - gloriosob@usgs.gov.

of its snout–vent length (266 mm) to its weight (10.2 g). On microscopic examination, fungi consistent with *O. ophiodiicola* were observed in the skin lesions, and *O. ophiodiicola* was isolated in culture from multiple skin lesions. Fungal identification was confirmed by sequencing the entire internal transcribed spacer region of the ribosomal RNA gene as described in Bohuski et al. (2015).

This is the first documented occurrence of SFD in a free-ranging wild snake in Louisiana, and one of the few documented cases in the United States of SFD in juvenile snakes. Clinical signs consistent with the disease have been observed in snakes from many areas of Louisiana in the last few years, and we do not believe the snake in this report represents an isolated case. In some areas where we capture snakes frequently, we have not found individuals with clinical signs of the disease, although this does not preclude its presence. We plan on conducting additional surveillance and diagnostic testing for SFD in wild snakes in Louisiana to help elucidate the epidemiology and ecological significance of this emerging disease.

Acknowledgments. We thank Anne E. Ballmann and the necropsy and diagnostic laboratory technicians at the US Geological Survey NWHC for assistance in coordinating sample submission and processing samples. We appreciate the field assistance received from Lindy Muse, Sidney Godfrey, and Brome McCreary. Matt Pardue and Kacy King of the TNC provided permitting and logistical assistance. Animal husbandry methods were reviewed and authorized by the Institutional Animal Care and Use Committee (IACUC)

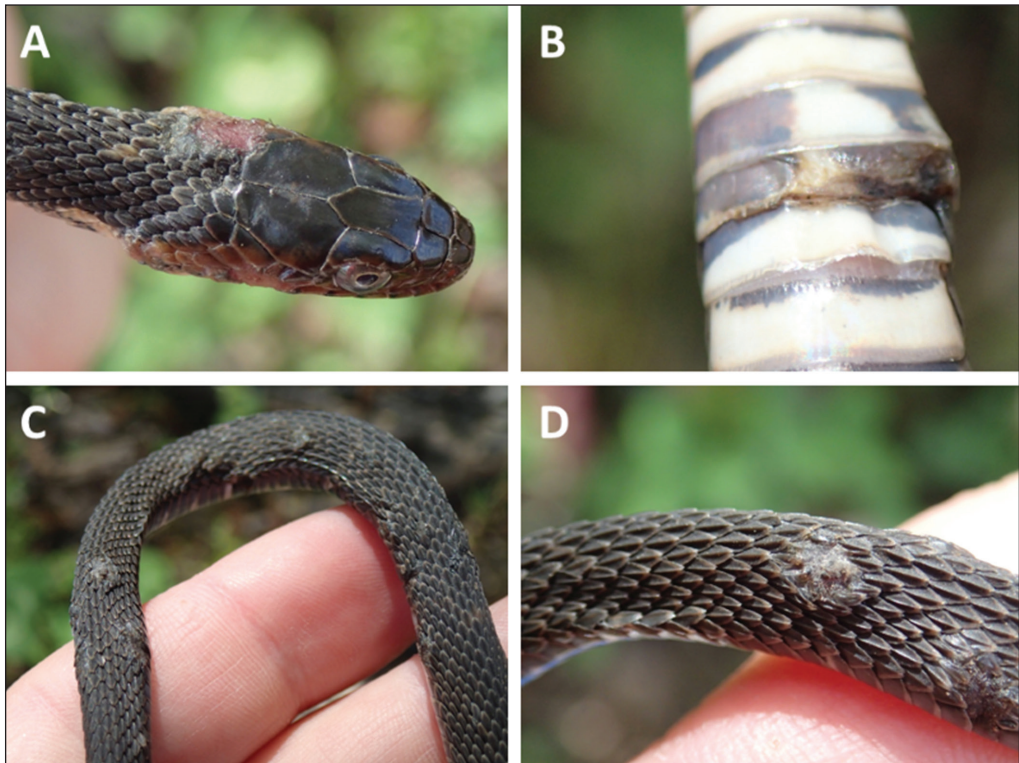


Figure 1. A juvenile Broad-banded Watersnake (*Nerodia fasciata confluens*) collected during a survey at Cypress Island Preserve, St. Martin Parish, LA, which tested positive for *Ophidiomyces ophiodiicola*. The snake exhibited ulceration of the skin on the head (A), several crusty ventral scales (B), and numerous nodules overlaid by areas of roughened skin on the dorsal surface (C, D).

B.M. Glorioso, J.H. Waddle, D.E. Green, and J.M. Lorch

at the US Geological Survey Wetland and Aquatic Research Center. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the US Government.

Literature Cited

- Allender, M.C., M. Dreslik, S. Wylie, C. Phillips, D.B. Wylie, C. Maddox, M.A. Delaney, and M.J. Kinsel. 2011. *Chrysosporium* sp. infection in eastern massasauga rattlesnakes. *Emerging Infectious Diseases* 17:2383–2384.
- Allender, M.C., D.B. Raudabaugh, F.H. Gleason, and A.N. Miller. 2015. The natural history, ecology, and epidemiology of *Ophidiomyces ophiodiicola* and its potential impact on free-ranging snake populations. *Fungal Ecology* 17:187–196.
- Blehert, D.S., A.C. Hicks, M.J. Behr, C.U. Meteyer, B.M. Berlowski-Zier, E.L. Buckles, J.T.H. Coleman, S.R. Darling, A. Gargas, R. Niver, J.C. Okoniewski, R.J. Rudd, and W.B. Stone. 2009. Bat white-nose syndrome: An emerging fungal pathogen? *Science* 323:227.
- Bohuski, E., J.M. Lorch, K.M. Griffin, and D.S. Blehert. 2015. TaqMan real-time polymerase chain reaction for detection of *Ophidiomyces ophiodiicola*, the fungus associated with snake fungal disease. *BMC Veterinary Research* 11:95.
- Skerratt, L.F., L. Berger, R. Speare, S. Cashins, K.R. McDonald, A.D. Phillott, H.B. Hines, and N. Kenyon. 2007. Spread of chytridiomycosis has caused the rapid global decline and extinction of frogs. *EcoHealth* 4:125–134.
- Smith, C.E., J. Edwards, and J.M. Lorch. 2013. *Crotalus horridus* (Timber Rattlesnake): Fungal pathogens. *Herpetological Review* 44:519–520.
- Tetzlaff, S., M. Allender, M. Ravesi, J. Smith, and B. Kingsbury. 2015. First report of snake fungal disease from Michigan, USA involving Massasaugas, *Sistrurus catenatus* (Rafinesque 1818). *Herpetology Notes* 8:31–33.