

Eastern Indigo Snake (*Drymarchon couperi*)

Melissa M. Kendrick¹ and Michael T Mengak²

Introduction

The Eastern indigo snake is the largest non-venomous snake found in North America. It is also the longest snake native to the U.S., with some individuals reaching lengths upwards of 9 ft. It is a heavy-bodied snake with glossy, bluish-black coloration across its entire body – except for the chin and cheek regions which may be orange to reddish-brown. Significant population declines resulting from over-collecting, human-induced mortality, and habitat loss prompted its listing as a Threatened species on January 31, 1978 pursuant to the Endangered Species Act of 1973. Though populations once existed throughout the Southeast, the species' current range is limited to south Georgia and Florida. The Eastern indigo snake was first described by Holbrook in 1842.

Taxonomy

Family: Colubridae

Genus: *Drymarchon*

Species: *couperi*

The family *Colubridae* is the largest and most diverse family of snakes, comprising approximately 75% of the total genera and 75% of snake species in the world. The sheer magnitude of this family's size is even more prominent in the U.S., where members constitute approximately 85% of the genera and 84% of snake species. Colubrids are the most abundant snakes on every continent except Australia.

At the time of its listing, the Eastern indigo snake was considered to be a subspecies of the indigo snake (*D. corais*), which ranges from the Southeast to Argentina. At that time, the species had two distinct subspecies which were known to occur in the U.S. – the Eastern indigo (*D. c. couperi*) and Texas indigo (*D. c. erebennus*). In the following decades, however, the Eastern subspecies was found to merit specific



Photo Credit: <http://www.stewart.army.mil/dpw/fish/nonvenomoussnakes.htm>

¹ Graduate student and ² Professor-Wildlife Ecology and Wildlife Specialist, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30602

status (based on diagnosibility and allopatry), and in 1991 was elevated from *D. c. couperi* to *D. couperi*.

Status

The Eastern indigo snake is federally threatened throughout all of its range. The species does have an approved recovery plan in place (created April 22, 1982), but no critical habitat has been designated. Only 0-25% of its recovery objectives have been met due to an inability to adequately survey remaining viable populations. The species' current "declining" status is due to a decline in both the quality and quantity of available habitat throughout its range.

In Georgia and Florida, the Eastern indigo snake is state-listed as a threatened species. Mississippi has designated the species as "endangered." Alabama designates it as a nongame wildlife species, and unofficially considers the species "endangered." However, there have not been any recent confirmed sightings in MS or AL.

At the time of listing, Eastern indigo snakes had faced two serious threats: removal of wild snakes for the national and international pet trade (due in part to their gentle disposition); and secondary mortality caused by rattlesnake hunters' "gassing" of gopher tortoise (*Gopherus polyphemus*) burrows, which Eastern indigo snakes use as refuge. However, these threats have since been considerably reduced since listing under the Endangered Species Act. Current threats facing this species are mainly habitat degradation and destruction due to human encroachment.

Distribution

Historically, the Eastern indigo snake was found from southeastern Mississippi, across the Coastal Plain of Alabama and Georgia down into most of Florida. The species may have existed in South Carolina along the southern tip of the Georgia-South Carolina border, but its occurrence there is unconfirmed. Georgia and Florida now harbor the remaining endemic populations.

In Georgia, Eastern indigo snakes have been recorded in 25 counties. The snakes are fairly widespread in the southeastern and south-central portions of the state, and are often observed along the Altamaha, Canoochee, and Ochopee rivers. In addition, they have recently (2006) been documented on the following public lands and preserves: Big Hammock Wildlife Management Area (WMA), Broxton Rocks Preserve, Crooked River State Park, General Coffee State Park, Grand Bay WMA, Fort Stewart Military Installation, Griffin Ridge WMA, Little Satilla WMA, Moody Air Force Base, Moody Forest Natural Area Preserve, Ochopee Dunes Natural Area Preserve, Okefenokee National Wildlife Refuge, and Sansavilla Wildlife Management Area.

In Florida, only a few populations currently exist in the panhandle region. Public lands in this region that support Eastern indigo snakes include: Allen Mill Pond Conservation Area (CA), Apalachicola National Forest, Blackwater River State Forest, Eglin Air Force Base, Lafayette Blue Springs State Park, Middle Aucilla CA, Troy Springs CA, Twin Rivers State Forest, and Withlacoochee West CA. The majority of snakes in Florida occur in the peninsular region, with occurrences being documented from over 80 public lands since 2001.

Description

Eastern indigo snakes generally grow to 5 – 7 ft. in length, although some individuals have been documented at upwards of 9 ft. The scales are large and normally smooth, with 17 scale rows at mid-body and a single anal plate. Some males (notably the larger more mature individuals) display faintly keeled scales on up to five mid-dorsal rows. The third from last upper labial scale (large scales below the eye and near the upper lip) is wedge-shaped and is cut off from above by the two adjacent labials. Young appear very similar to adults except for head and belly coloration, which tend to be more reddish upon hatching.

Form and Function

Due to their glossy bluish-black coloration and large size, Eastern indigo snakes are rarely confused with other species. If confusion does occur, however, it is more than likely with the Southern black racer (*Coluber constrictor*) or Eastern hognose snake (*Heterodon platirhinos*) during its melanistic (dark) color phase. Racers are dark gray to black in coloration, but have a white or brownish patch on the chin region and only grow to 3 – 5 ft. in length. Eastern hognose snakes have a distinct, upturned snout, and only grow to 2 – 3 ft. in length. All other solid black snakes within the Eastern indigo's range either have keeled scales, a divided anal plate, or both.

Ecology

Reproduction: Sexual maturity is assumed to be reached at 3 – 4 years of age, or at approximately 5 ft. total length. Breeding typically occurs between the months of November and April, with females depositing 4 – 12 eggs from May to August. Eggs are deposited in an underground burrow or cavity. Young hatch approximately 3 months later, and are approximately 1 ft. in length. Peak hatching generally occurs late summer and into early fall, with peak yearling activity occurring the following April and May. Captive females generally lay eggs on an annual basis, but wild individuals may lay eggs once a year or once every other year.

Female Eastern indigo snakes may have the ability to store sperm and in turn delay egg fertilization, as one female has been documented laying 5 eggs (at least one being viable) after more than 4 years of isolation. However, parthenogenesis (form of asexual reproduction whereby embryo grows and develops without fertilization) may also be responsible for this occurrence, as cases have recently been reported in some virginal snakes.

Information is lacking on longevity in the wild, but captive individuals can live up to 26 years.

Feeding: The Eastern indigo snake is a very strong fossorial and terrestrial predator. Although less common, the snakes may act as arboreal predators, climbing up vegetation in search of prey. This is one of a few snake species that is truly diurnal. They are active and forage during the day, and retreat to their dens at night. Eastern indigo snakes are not constrictors, but instead consume their prey while alive. Common prey items of adults include: fish, frogs and toads, snakes (venomous and non-venomous), lizards, turtles and their eggs, juvenile gopher tortoises, small alligators, birds, and small mammals. Staple juvenile prey items include a variety of invertebrates.

Behavior: In the event an Eastern indigo snake feels threatened, the snake will vertically flatten its neck, hiss, and vibrate its tail as a warning display. These snakes are very docile toward humans, though; and once caught, will rarely attempt to bite. Indigo snakes exhibit site fidelity in colder portions of their range, annually returning to a previous over-wintering den. Evidence exists of cannibalistic and ritualized combat behaviors (usually between males during the breeding season). As a result, little overlap exists in home ranges of same-sex adults.



Southern black racer. Photo credit:
<http://ilherps.tripod.com/id302.html>



Eastern hognose snake. Photo credit:
<http://www.animalpicturesarchive.com>

Habitat: Habitat types vary both spatially and seasonally. Preferred habitat types include pine and scrubby flatwoods, drier, upland pine sites, agricultural fields, dry prairie, tropical hardwood hammocks, freshwater marsh edges, and coastal dunes. Eastern indigo snakes require refuge from winter and drought conditions, as they are ectothermic (depend on environmental temperatures for thermoregulation). They will often inhabit vacant gopher tortoise burrows during these times, or occasionally even share burrows with the tortoises. In regions where gopher tortoise burrows are lacking, Eastern indigo snakes may take advantage of hollowed-out root channels, hollow logs, or the burrows of other wildlife.

Home range size varies both seasonally and between sexes. Summer home ranges are generally much larger than those in winter. In Georgia, home ranges for females are usually 87.5 – 885 ac, while males encompass 350 – 3,825 ac. In peninsular Florida, females generally range over 4.75 – 375 ac, while males comprise 4 – 818 ac.

Enemies: Confirmed predators include the red-tailed hawk, alligator, domestic cats and dogs, and occasionally a larger Eastern indigo snake. Potential predators include other large raptors, bears, feral hogs, bobcats, and coyotes. Hatchlings and juveniles are at greater risk for depredation. Additional threats for this species are human-induced, such as intentional killing out of fear, vehicular injury or mortality, and habitat degradation resulting from human encroachment.

Populations: Its broad distribution and expansive home range size complicate assessment of population status and dynamics. Thus, data at the population level is largely absent. Sex ratio estimates of hatchlings and juveniles are generally 1:1. However, as the snakes mature, ratios become more male biased, ranging from 1.5 – 2.1 males per female.

Disease

In southeastern Georgia during the winter months, a high percentage of snakes have been found exhibiting skin lesions. These lesions vary from superficial wounds to protrusions down into the muscle tissue. However, the lesions are seasonal, being that they are not evident during the summer months. A case of pneumonia has also been confirmed in one individual.

Economic Value

The species' economic value stems from its commercial popularity and collection for the national and international pet trade. However, since its listing in 1978, further collection of wild individuals has largely been abated. Currently, captive-born snakes sell for upwards of \$1,000 each. Occurrence of Eastern indigo snakes can also facilitate indirect economic benefits, as they depredate animals which may harm agricultural crops.

Medicinal Value

There is no medicinal value recognized for this species.

Damage

There is no known damage caused by this species.

Legal Aspects

With the exception of South Carolina, every state within the Eastern indigo snake's historic range provides some level of protection for the species. South Carolina has delisted the species due to lack of documented occurrence in the state. Alabama protects the species primarily via regulatory

mechanisms, as it is considered a nongame wildlife species there. Georgia, Florida, and Mississippi protect the snake via state laws, as it is listed as a threatened (Georgia, Florida) or endangered (Mississippi) species in these states. State laws primarily focus on prohibitions against removal of Eastern indigo snakes from the wild; and possessing, selling, or exporting them. The Lacey Act also provides protection against removal of wild snakes for the pet trade. Gassing of gopher tortoise burrows is currently illegal in both Georgia and Florida, though it probably remains a local threat.

Of these, Florida is the only state to offer legal protection from some forms of habitat destruction (through its Preservation 2000 program and Florida Forever Act), with over 3 million acres protected to date. In addition, the Gopher Tortoise Management Plan completed by the Florida Fish and Wildlife Conservation Commission will indirectly benefit the Eastern indigo snake by restoring and maintaining protected gopher tortoise habitat.

Control to Reduce

There are currently no efforts to reduce population numbers of this species.

Other Threats

Due in part to its expansive home range size, this species is especially vulnerable to habitat loss, fragmentation, and degradation. In Florida, Eastern indigo snake habitat is lost at a minimum rate of 5% each year. Residential housing is a potential threat because it increases the likelihood of snake injury or mortality caused by property owners and domestic pets. Urban sprawl and road construction may also threaten snakes with increased odds of vehicular injury or mortality. Various pollutants that can bioaccumulate through the food web, such as pesticides and rodenticides, may also pose a hazard to the Eastern indigo snake. If populations become small and isolated as a result of future habitat loss, fragmented patches will likely be insufficient to support viable populations of the species.

Management to Enhance

Because data on population viability and its relationship to habitat requirements is currently lacking, estimations have to be made in terms of management. Due to the Eastern indigo snake's considerable home range size and somewhat reclusive behavioral traits, it is estimated that at least 2,500 acres of habitat is necessary to provide adequate conservation benefits for a few individuals. Preserve sizes of at least 10,000 acres would likely ensure survival of a local population comprising approximately 53 males and 210 females. This estimate assumes, however, that all home ranges between males and females overlap (which in reality is probably rare), and that the entire preserve would be suitable habitat (which also is not realistic). Thus, a much larger tract of land would probably be necessary to accommodate this species.

Expansive tracts of wild, open land are clearly the most important consideration for populations of this species, and thus should be protected. Though the Eastern indigo can sometimes function as a habitat generalist, undeveloped areas are the preferred form of habitat. Considering this species' current status, any additional threats may lead to local extirpations.

Human Use

Native Americans: There are no known uses by Native Americans.

Colonists: There are no known uses by colonists.

Further Readings

- Conant, R., and J. T. Collins. 1998. A field guide to reptiles and amphibians of Eastern/Central North America. Third edition. Houghton Mifflin, New York, New York, USA.
- Diemer, J. E., and D. W. Speake. 1983. The distribution of the Eastern indigo snake, *Drymarchon corais couperi*, in Georgia. *Journal of Herpetology* 17:256-264.
- Holbrook, J. E. 1842. North American Herpetology: A Description of the Reptiles Inhabiting the United States. Second edition. J. Dobson, Philadelphia, Pennsylvania, USA.
- Irwin, K. J., Lewis, T. E., Kirk, J. D., Collins, S. L., and J. T. Collins. 2003. Status of the Eastern indigo snake (*Drymarchon couperi*) on St. Vincent National Wildlife Refuge, Franklin County, Florida. *Journal of Kansas Herpetology* 7:13-20.
- U.S. Fish and Wildlife Service. 1999. Multi-species recovery plan for south Florida. South Florida Ecological Services Office. <<http://www.fws.gov/verobeach/images/pdf/Library/eisn.pdf>>. Accessed 18 Nov 2009.
- U.S. Fish and Wildlife Service. 2007. Eastern indigo snake (*Drymarchon couperi*) 5-year review: summary and evaluation. Southeast Region, Ecological Field Office. <<http://www.fws.gov/southeast/5yearReviews/5yearreviews/easternindigofinal.pdf>>. Accessed 18 Nov 2009.

Warnell School of Forestry and Natural Resources
Athens, Georgia 30602-2152
Telephone 706.542.2686 Fax 706.542.8356

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