

Population structure and morphometrics of Northern Watersnakes (*Nerodia sipedon*) in an anthropogenic habitat

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Abstract

The current pattern of human population growth means that other organisms are faced with an increasing scope of anthropogenic influences. While such influences are typically viewed as having adverse effects on a species' life history, non-human organisms can have stable populations areas that have undergone some sort of anthropogenic modification. We present data from a 4-year mark-recapture effort of Northern Watersnakes (*Nerodia sipedon*) found in and around an artificial lake and an adjacent river that was channelized so that water could be diverted to the lake. Within this population, adult females (49.6% of captures) have greater snout-vent lengths (SVL) and body mass than males (50.4% of captures), but tail lengths were similar between the sexes. Subadult snakes (22.2% of captures) experience an increased growth rate at around 250 mm SVL. Our recapture rate of marked individuals is less than 7% indicating a large population exists at this site. We observed some form of injury on 10% of the adult snakes, however, which we suggest is exacerbated by frequent snake-human (mostly people fishing) encounters at this site. The characteristics of our study population appear similar to those reported for other populations of this species elsewhere within their range. The long-term stability of this watersnake population can be assured by outreach programs with the humans using this site.

Background

- In addition to their broad distribution in the U.S. (2), populations of Northern Watersnakes appear stable even in wetland areas that have undergone human modification (3,4).
- Some anthropogenic modifications to wetland habitat might increase availability of resources (*e.g.*, prey, shelter, *etc.*), thereby supporting large populations of watersnakes.
- The Lake Charleston Reservoir and adjacent Embarras River (Fig. 1) offer numerous foraging opportunities for watersnakes, and the levee system separating these 2 habitats provides many retreat sites.

Purpose

We describe demographic and morphometric parameters for a Northern Watersnake (*Nerodia sipedon*) population based on subjects captured and marked over a 4-year period along the Lake Charleston levee, and adjacent aquatic habitats.

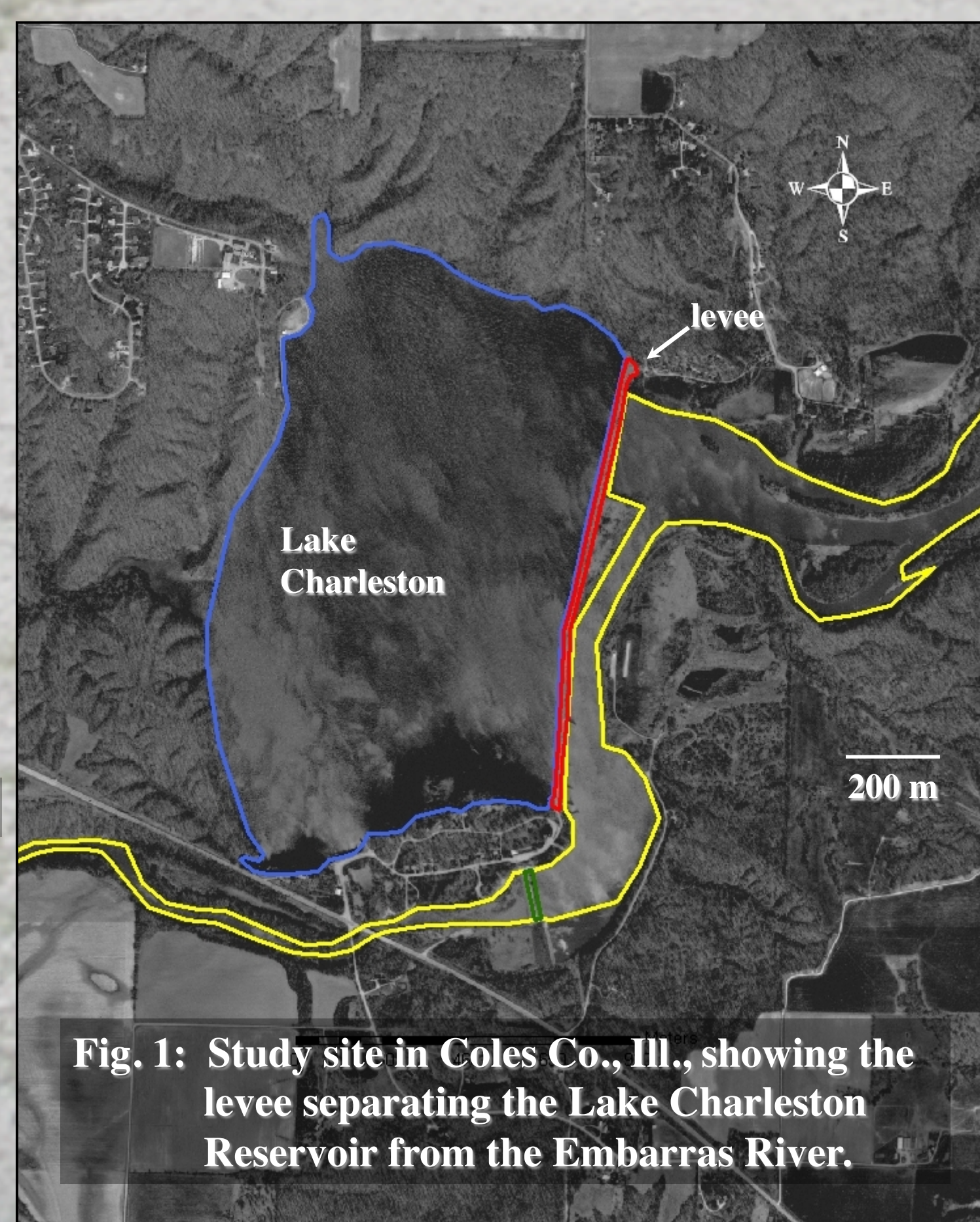


Fig. 1: Study site in Coles Co., Ill., showing the levee separating the Lake Charleston Reservoir from the Embarras River.

Study Site (Fig. 1)

- Originally (pre-1981), the river flowed along the north and west banks of what is now Lake Charleston (surface area = 137 ha).
- The Embarras River was redirected into its current channel in 1981, when a levee was built to establish Lake Charleston as a drinking water source.
- The levee (total length = 1280 m) is constructed of boulders and crushed rock.
- Vegetation along the levee includes annual grasses, and perennial vines, shrubs, and sapling trees; all are managed (usually pruned back) annually.

Methods

- Over 4 years ('06-'09), we caught watersnakes by hand or noose between Apr. and Oct. and recorded gender, snout-vent length (SVL; ± 1 mm), tail length (TL), and mass (± 1 g).
- We uniquely mark each subject either by scale clipping or branding (7); we also injected PIT tags into each subject (1), except neonates.

Results

- We caught a total of 161 snakes – of these, we classified 129 as adults (a subadult:adult ratio of 0.24).
- Watersnakes of both sexes were caught with nearly the same frequency, with 50.9 and 49.1% of them being male and female, respectively.
- SVL and mass were greater in female than in male subjects (Table 1).
- Change in subject SVL over time appears to increase during their 2nd activity season (upon attaining *circa* 250 mm SVL; Fig. 2).
- Both male and female adult subjects exhibited similar relationships between SVL and mass (Fig. 3).

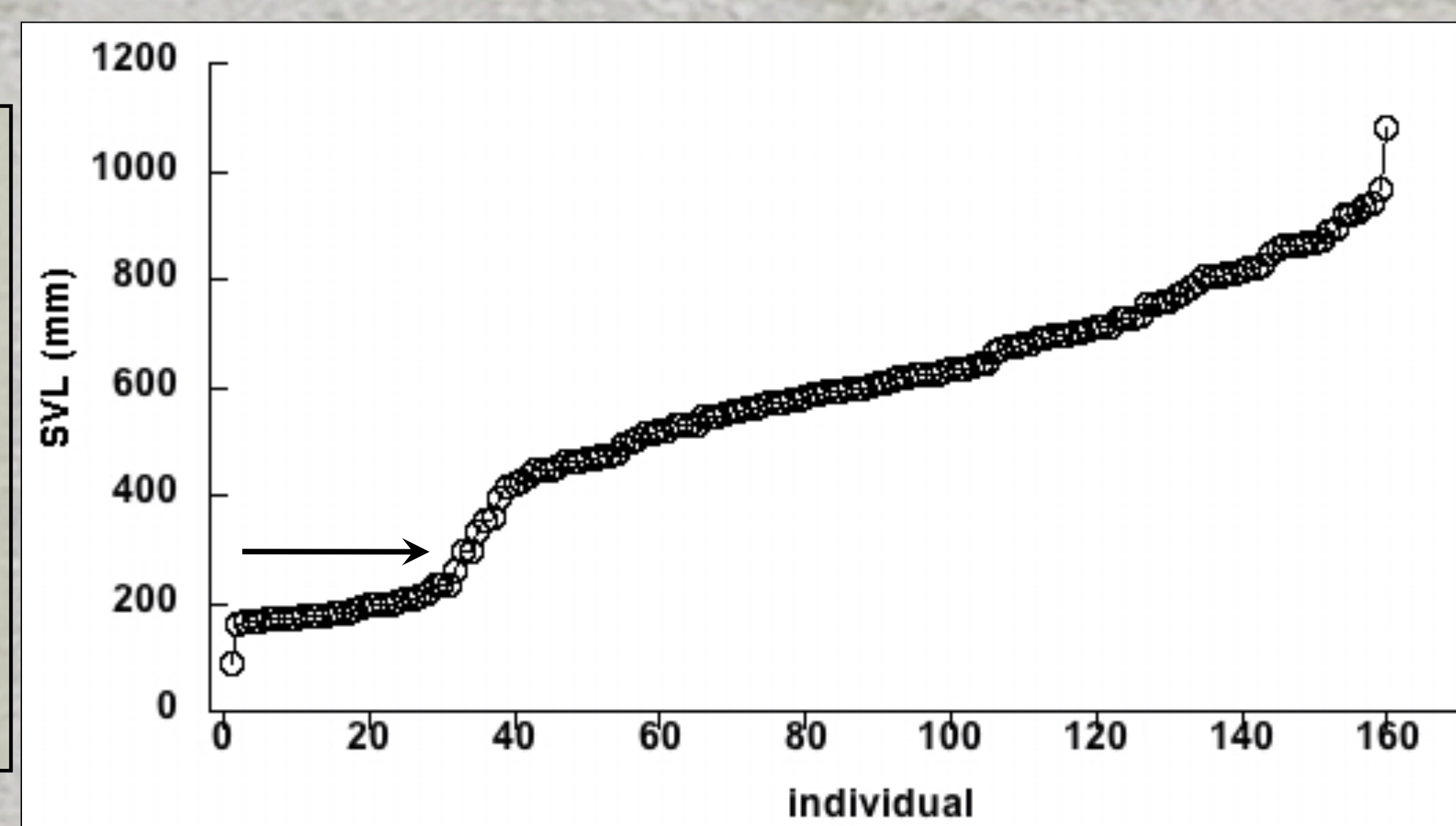


Fig. 2. Snout-vent lengths (SVL; mm) of subjects collected over study period. Arrow indicates few individuals within that range of SVLs (235-293 mm); suggesting rapid growth at that body size).

Table 1. Morphometric values for Northern Watersnakes caught from 2006-'09 at Lake Charleston, Coles Co., Illinois. Female subjects were larger than males ($t = 9.85$; $p << 0.0001$). Means are reported ± 1 SE (SVL = snout-vent length; TL = tail length).

Cohort	SVL (mm)	TL (mm)	Mass (g)
Adult males	536.7 \pm 12.5	175.8 \pm 5.9	112.2 \pm 7.1
Adult females	746.0 \pm 17.4	190.2 \pm 7.1	375.4 \pm 24.8
Subadults	182.2 \pm 6.5	60.6 \pm 1.8	8.7 \pm 2.7

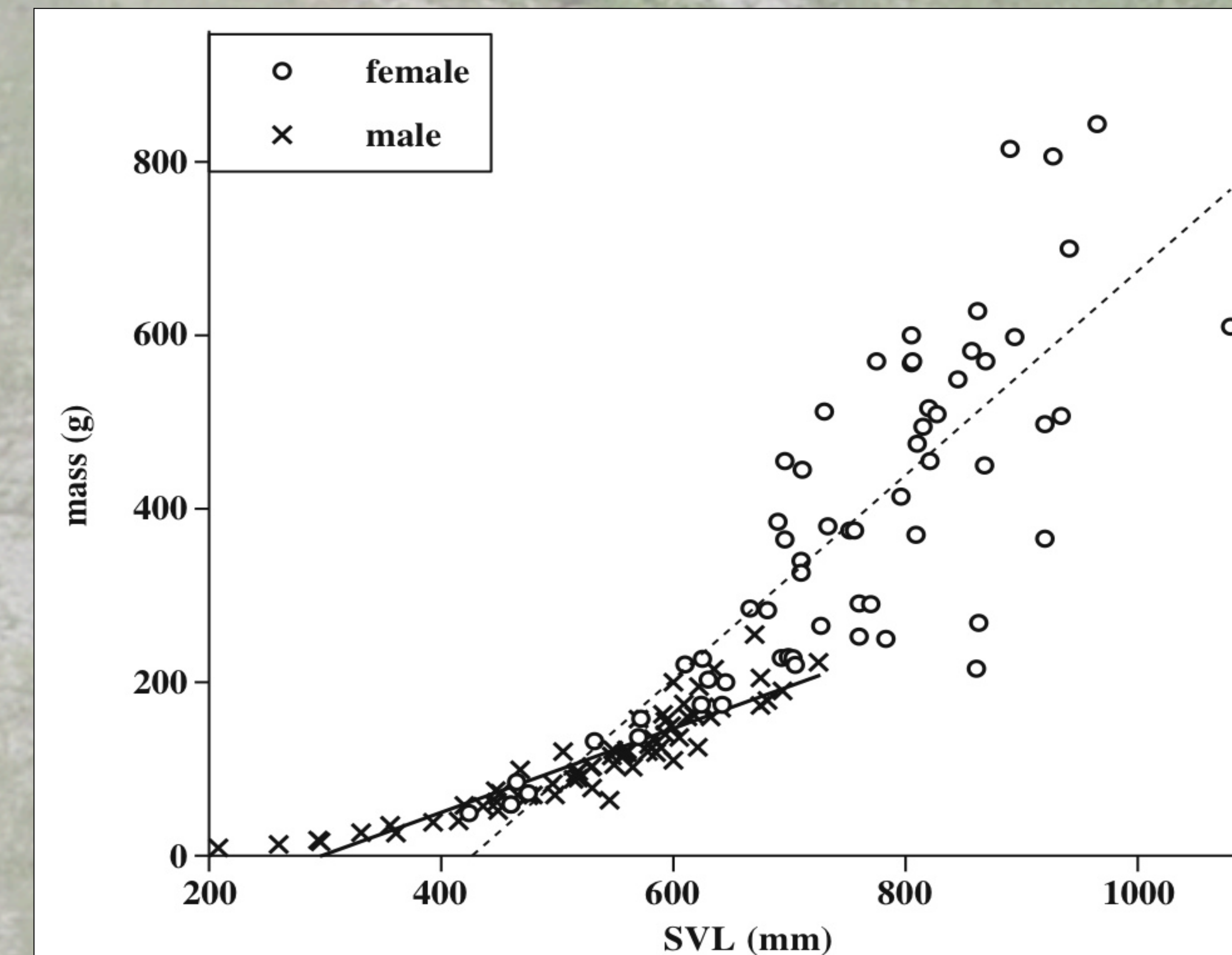


Fig. 3. Body mass of female and male subjects as a function of snout-vent length (SVL). The r^2 -values for linear correlations are 0.68 and 0.83 for females and males, respectively.

Discussion

- Subjects in the Lake Charleston/levee population are sexually dimorphic, as is typical for *N. sipedon* (6).
- SVL appears to be a better predictor of body mass in male watersnakes than in females, presumably because of the changes in mass that occur in females during gestation (5).
- Given the average clutch size for this species (6), we suggest that the low subadult to adult ratio is due to higher predation pressure on subadults.
- Although our recapture effort was insufficient to accurately estimate population size, recaptures were relatively infrequent suggesting a stable population size at this site. We cannot rule out some combination of dispersal or mortality as a feature that keeps this population stable.
- We have observed anthropogenic mortality that could be minimized with educational outreach efforts.

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