



Necrotized Facial Deformities in an Urban Population of Common Snapping Turtles (*Chelydra serpentina*, Chelydridae) from Bronx, New York

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Photographs by the author except where indicated.

One pathology has been well documented in turtles, but most affect the shell and originate during embryonic development or subsequent poor care in captivity (Bell et al. 2006, McArthur et al. 2010). Facial deformities have also been documented, but most have been attributed to improper captive care, particularly when the turtles were juveniles.

Bell et al. (2006) conducted a thorough study of the incidences and probable causes of embryonic deformity in urban (Philadelphia, Pennsylvania) populations of Painted Turtles (*Chrysemys picta*) and Common Snapping Turtles (*Chelydra serpentina*). Croteau et al. (2008) reviewed the considerable toxicological issues potentially affecting especially aquatic species of herpetofauna in urban environments.

Although less thoroughly documented, bone and soft-tissue pathologies in wild populations of turtles are a concern in chelonian conservation. Jacobson et al. (2000) briefly reviewed mycotic diseases of reptiles; I found no similar overview of bacterial agents.

Methods

In 2009–2010, I conducted a field study of Common Snapping Turtles (*Chelydra serpentina*) from the Bronx River and adjacent study sites in Bronx (New York City), New York (Fig. 1). I collected data from 285 specimens, all of which were greater than 102 mm in carapace length. Turtles smaller than that were captured occasionally but were not included at this stage of my study. All turtles captured were individually marked by notching marginal scutes (Cagle 1939).

Results

Females from the Bronx River population were significantly smaller than males (Figs. 2 & 3), although sexes did not differ significantly in body-mass-index (BMI) expressed as kg/cm carapace length (Fig. 4). Of all turtles captured, five indi-

viduals representing two sites (Table 1), showed pronounced necrotic facial conditions (2.5% of the individuals captured). Four of these turtles were males and in the upper level of carapace length (and probably age) for the population. Although individuals M3 and M4 were noted as in the lower range of BMI, all four males were within population limits, as was the sole female.

Turtles with these deformities lose soft tissue and bone from their faces, resulting in apparently permanent damage. In severe cases (e.g., M1; Figs. 5a & b), the entire front of the face was deteriorated, the eyes were swollen shut, and the nose was entirely missing. Large quantities of bone in the front of the skull (including sections of the prefrontal, maxilla, *fossa nasalia*, *foramen praepalatinum*, and the entire premaxilla and *apertura narium externa*) were completely absent in some individuals. In other cases (Table 1; Figs. 6–9), the soft tissue



Fig. 1. The author with a 22.7-kg (50-lb) Common Snapping Turtle (*Chelydra serpentina*) from Van Cortland Park in Bronx, New York. Photograph by Rick Zeidler.

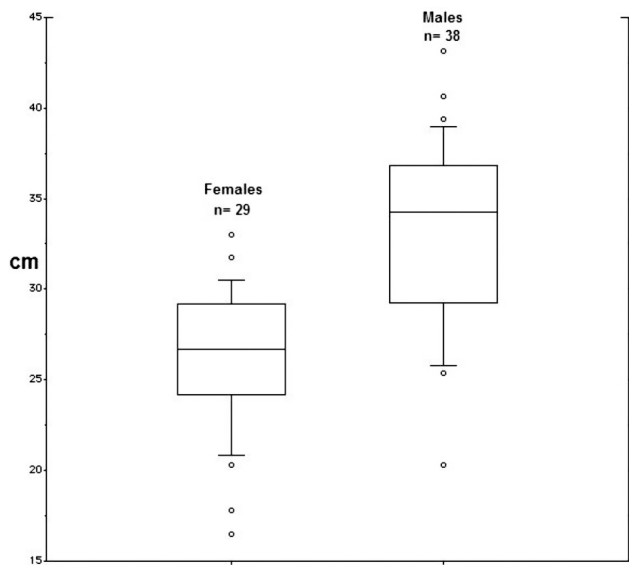


Fig. 2. Female and male carapace lengths (cm) in adult Common Snapping Turtles (*Chelydra serpentina*) from the Bronx River. Female mean = 26.23 ± 4.03 cm; male mean = 33.09 ± 5.41 cm; Mann-Whitney U, Z (corrected) = -4.79, p < 0.01.

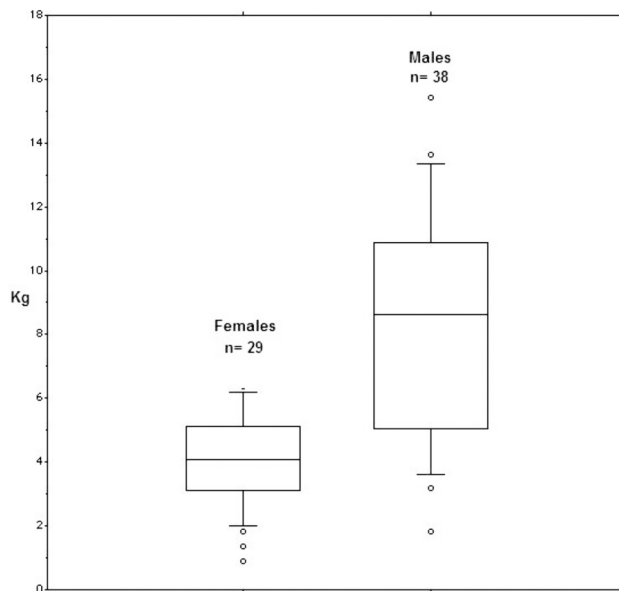


Fig. 3. Female and male mass (kg) in Bronx River adult Common Snapping Turtles (*Chelydra serpentina*) from the Bronx River. Female mean = 4.0 ± 1.53 kg; male mean = 8.2 ± 3.67 kg; Mann-Whitney U, Z (corrected) = -4.76, p < 0.01.

in the nose was deteriorated, leaving the turtles with a single facial aperture where their nostrils once were.

Three turtles with facial necrosis (Table 1a) were found in the Bronx River, in the section running through the Bronx Zoo and the nearby New York Botanical Gardens (NYBG). Two were found within NYBG in a pond known as Twin Lakes, which is only about 90 m from the Bronx River. Of these five, two turtles, both with severe facial deformities, also exhibited other morphological abnormalities. One individual (M3) had a deformed front left foot, in which digits 1–3 were fused together. Digits 4 and 5 were barely recognizable and were fused together in a fleshy mass that grew separately from the rest of the foot (Fig. 10). Another individual with this condition (M4) also had damage to its shell, which was partially discolored and included necrotic areas. All five turtles were captured multiple times in 2009, and four of them were recaptured in 2010.

The first observed case of extensive facial necrosis was an adult male captured on 30 June 2009 (M4). This turtle was found resting on a bank about 5 m from the water. It was very weak, and only two-thirds the weight of other turtles its size. It was listless and appeared to be moribund.

The extent of facial tissue damage of a different individual (M1) that was recaptured in 2010 worsened from the previous year. When it was recaptured on 26 June 2010, it was in very bad overall condition. It was found buried in mud about 30 cm beneath the water’s surface with only its head exposed, about 1.6 km from where it was found initially. Both eyes were swollen, with one entirely shut. It appeared to be completely blind. When first captured in 2009, the entire front of

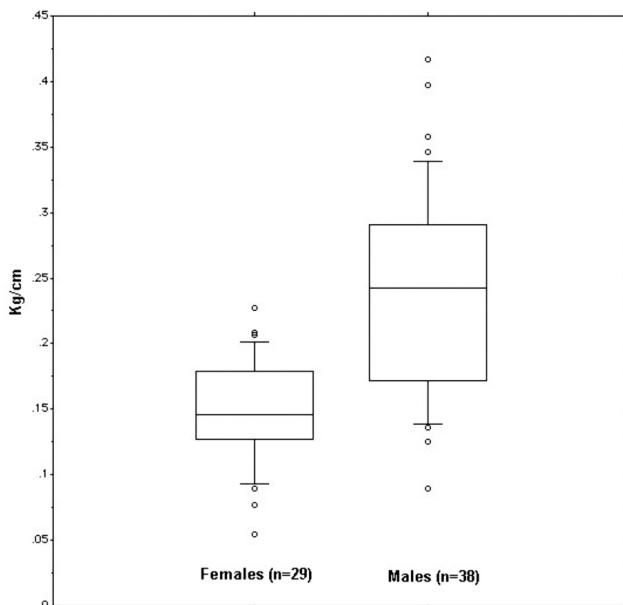


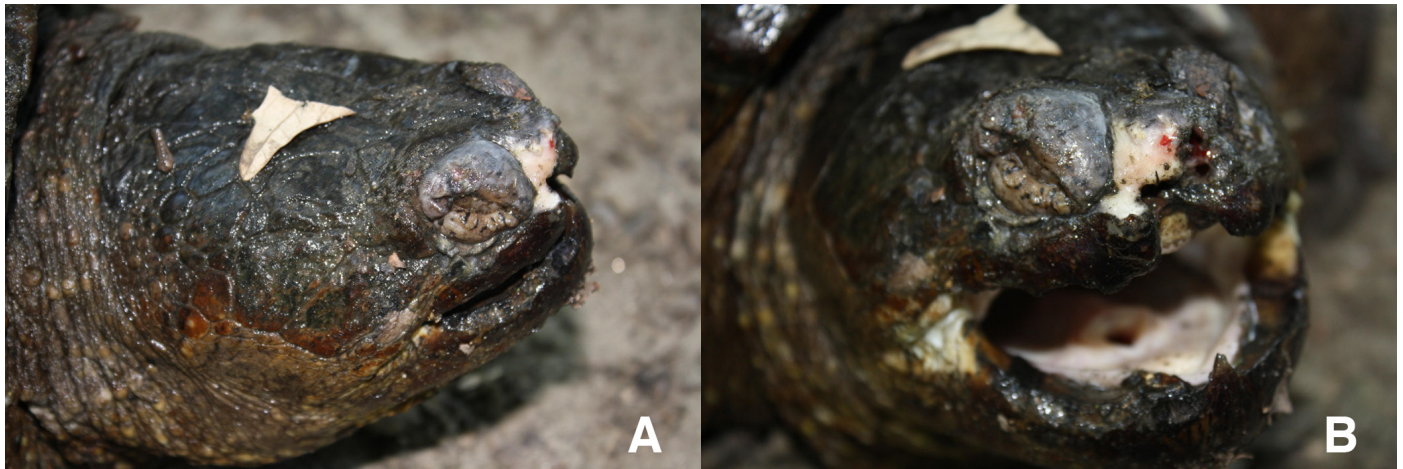
Fig. 4. Female and male body-mass index (mass/cm-carapace-length) in adult Common Snapping Turtles (*Chelydra serpentina*) from the Bronx River. Female mean = 0.15 ± 0.04; male mean = 0.24 ± 0.08; p (0.95) = n.s.

its face was gone. In 2010, more facial tissue had been lost, and the area around the front of the face was swollen and showed considerable inflammation; a peach-colored exudate covered much of the area that formerly was the animal’s nose. The affected areas, which were once hard bone, were soft and rubbery.

Other deformities and abnormalities documented from this population included deformed feet, shells, and tails

Table 1. Data for Common Snapping Turtles described in the text.

Code	Carapace length (cm)	Mass (kg)	Locality	Capture Dates	Extent of damage
M1	38.1	11.82	Bronx River	01 July 09	Extreme
				03 Aug 09	
				26 June 10	
M2	38.7	15.00	Twin Lakes	24 Apr 09	Limited, abnormal shell shape
				25 Apr 09	
				30 Apr 09	
				04 May 10	
M3	34.9	9.55	Twin Lakes	29 Apr 09	Severe, left front foot deformed
				30 July 09	
M4	38.1	9.10	Bronx River	30 June 09	Extreme, shell abnormality
				16 July 10	
F1	29.2	5.45	Bronx River	22 July 09	Limited
				06 July 10	

**Fig. 5.** An adult male Common Snapping Turtle (*Chelydra serpentina*) from the Bronx River (M1). The entire front of the face was deteriorated, the eyes were swollen shut, and the nose was entirely missing.**Fig. 6.** An adult female Common Snapping Turtle (*Chelydra serpentina*) from the Bronx River (F1). Facial abnormalities were limited.

(Table 2). I also examined snapping turtles from elsewhere in the Bronx, but observed no major facial deformities in those populations.

Discussion

Given the appearance of open lesions on adults, I doubt that they resulted from injuries to turtles when they were juveniles. Some individuals were thought at first to have lost facial tissue as a consequence of injuries inflicted by other snapping turtles, perhaps during male-male combat (e.g., Brown and Brooks 1993), predation attempts, or encounters with fish hooks. However, virtually no fishing occurs at these sites in protected city parks, and the skull of adult snapping turtles presumably is tough enough to withstand even the powerful bite of conspecifics without tissue damage to the extent noted in this report.

Table 2. Other observed deformities, Bronx River and Twin Lakes populations.

ID	Sex	Carapace length (cm)	Mass	Description of deformity (kg)
41	F	29.21	5.45	Section of nose missing
37	?	19.05	1.40	Aberration/deformity on tip of tail
45	F	30.48	5.00	Reversed claw on upper left foot
51	M	34.29	9.99	Extra tail spines, spines appear deformed
67	F	25.4	4.09	Tail shortened, ends in a growth/aberration
72	F	27.94	4.54	Tumor/growth on left side of lower jaw
39	M	35.56	9.99	Half of tail missing (bifid tail regeneration)



Fig. 7. An adult male Common Snapping Turtle (*Chelydra serpentina*) from Twin Lakes (M2). Facial deformities were minimal, but the shell shape was abnormal. The carapace was raised high above the body and did not reflect the more “streamlined” shell structure seen in most aquatic turtles.

Although Bronx River drainage water quality in terms of dissolved O₂, turbidity, etc. was deemed generally good in the sections above and including the Bronx Zoo (USACE 2006), the water quality parameters measured were by no means extensive. The river has had periodic problems resulting from storm runoff with accompanying bank damage, sedimentation, and untreated sewage discharge (Crimmens and Larson 2006). As of 2003, the Bronx River contained significant amounts of PCB mixtures (primarily Aroclors and congeners; Litten 2003) and “average” total dioxin-like toxic equivalents (TEQ), although higher accumulations were recorded below the Bronx Zoo (Rodenburg et al. 2011). The considerable urbanization within the drainage suggests potential for contamination (at least seasonally) at my down-stream sites, and I suggest that these could cause developmental anomalies in snapping turtles.

However, although deformities in turtles often result from chemical pollution (Bell et al. 2006), verification is difficult. Abnormalities resulting from environmental PCBs and related pollutants seem to originate during embryogenesis

prior to hatching (Bell et al. 2006, Holliday and Holliday 2011), occur in the population at percentages greater than I observed, and are not of necrotic nature. Also important is the fact that the necrosis I recorded affected only the areas around the nose. This might be attributable to the fact that the turtles in my study area spend a great deal of time using their noses to forage in mud (pers. obs.), which might harbor a pathogen or unknown toxic substances. Recaptures of M1 were indicative of advancing facial necrosis, and this was the first individual found exhibiting what I termed “mid-infection,” suggesting that this condition is due at least in part to some fungal and/or bacterial pathogen. Also, my observations of that individual suggest that any such pathogen has active and inactive phases. Observations of specimen M4 (Table 1a & b) indicated that damage can persist throughout life.

Although a highly speculative assumption, but because all five turtles (especially the males) are in the same general size class, and because they have other deformities, a single-point influx of a chemical contaminant might have caused one season’s eggs to hatch with developmentally deformed young of which these animals are among the sole survivors.



Fig. 8. An adult male Common Snapping Turtle (*Chelydra serpentina*) from the Bronx River (M4). In addition to facial deformities, portions of the shell were discolored and included necrotic areas.



Fig. 9. An adult male Common Snapping Turtle (*Chelydra serpentina*) from Twin Lakes (M3). Facial abnormalities were severe and the left front foot was deformed (Fig. 10).

Consequently, the conditions I observed might be the result of these turtles having hatched with facial deformities that have made them more susceptible over time to various infections as they forage.

PCBs or other toxins might result in immuno-compromise (Keller et al. 2006), rendering exposed individuals more susceptible to infections that would quickly heal under “normal” conditions. No tissue or blood samples have as yet been taken from these turtles, although the study is ongoing. Hence, any conclusions drawn about the causes of these facial deformities are at present speculative. However, nothing like the conditions observed in *C. serpentina* from the lower Bronx River has been previously documented. Searches at <http://scholar.google.com> using several combinations of keywords (*Chelydra*, facial, necrosis, turtles, mycotic, diseases, abnormal, lesion, bone, pathology, nose) returned no significant references beyond those cited herein.

Further studies are plainly needed to fully understand the causes of these conditions. Whatever the cause, this highly resilient and hardy species is able to survive after being afflicted, which is remarkable considering that *Chelydra serpentina* relies heavily on its sense of smell (Steyermark et al. 2008). Two turtles with the most severe cases even managed to navigate around or over a waterfall between recaptures. They possibly have been living with this condition for years, demonstrating that even in the midst of urban New York City, exceptional species are able to overcome the challenges of living among humans.

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Fig. 10. The left front foot of an adult male Common Snapping Turtle (*Chelydra serpentina*) from Twin Lakes (M3). Digits 1–3 were fused and digits 4 and 5 were barely recognizable and were fused in a fleshy mass.

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