Growth in Kyphotic Ringed Sawbacks, 
*Graptemys oculifera* (Testudines: Emydidae) 

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**ABSTRACT.** – Kyphosis has not been reported in any *Graptemys* species (map turtles and sawbacks). We captured four kyphotic individuals of *Graptemys oculifera* from the Pearl River system, Mississippi, with three individuals recaptured 5 to 12 yrs later; one juvenile female had measurable growth, and two adult females had negligible growth. All kyphotic individuals
were females, with an overall occurrence rate of 0.10% (4 of 3830 individuals) at five G. oculifera sample sites.

Kyphotic turtles have been reported from many chelonian groups, with most reports of cryptodiran species (for species review, see Saumure 2001; Trembath 2009). Kyphotic deformities are rare within turtle populations, with reported occurrence rates in emydid species of 0.06% in Trachemys scripta (Tucker et al. 2007), 0.2% in Clemmys guttata (Ernst 1976), 0.2–1.5% in Chrysemys picta (Ernst 1971; MacCulloch 1981; Stuart 1996), and 2.1% in Trachemys gaigeae (Stuart and Painter 2008). There is one report for a severely deformed Graptemys ouachitensis (Ouachita map turtle; Carpenter 1958), but there are no specific reports of kyphosis for any of the 14 formally recognized Graptemys species (map turtles and sawbacks; Lindeman, in press). Herein we report the first records of kyphosis in a Graptemys species, Graptemys oculifera (ringed sawback), and document growth in three kyphotic individuals.

During ecological studies of G. oculifera conducted by RLJ, three kyphotic G. oculifera females were captured at the Ratliff Ferry site on the Pearl River (Madison County, Mississippi; described by Jones 2006). Kyphotic female #1 was captured on 29 May 1987 with a carapace length (CL) of 14.6 cm and was permanently marked as 8, 11 R – 1, 9 L. Female #1 was recaptured on 31 May 1995 with a CL of 14.8 cm, thus exhibiting only 0.2 cm of growth over 8 yrs. Kyphotic female #2 was captured on 12 September 1989 (midline plastron length, MPL: 7.7 cm) with no evidence of kyphosis and was permanently marked (3, 8, 9 R). Female #2 was recaptured over 5 yrs later on 31 May 1995 with kyphotic abnormalities present and measuring 11.4 MPL (3.7 cm growth). Kyphotic female #3 (1, 9 R – 1, 2, 10 L) was captured on 18 April 2002 with a MPL of 10.0 cm.

During the same study, kyphotic female #4 was captured on 9 September 1994 by RLJ at the Columbia site (Marion County, Mississippi) with a MPL of 10.1 cm. The female was permanently marked (2, 12 R – 3 L) and released at the capture site. Almost 11 yrs later on 10 August 2005, WS captured female #4 at the same site, and she measured 11.2 cm PL (Fig. 1). On 11 October 2006, female #4 was captured for a third time in the same locality as 2005 (within 6.1 m GPS accuracy); she measured 11.3 cm PL.

Presumably, female #1 from Ratliff Ferry and female #4 from Columbia were at or near maturity, with little growth (0.2 cm CL and 1.2 cm MPL) occurring over capture intervals spanning 8 and 12 yrs, respectively. These two females were also at or above the mean body size for females reported at those sites (12.6 cm Columbia and 13.4 cm Ratliff Ferry; Jones and Hartfield 1995), indicating that the spinal deformity had not dramatically impacted overall body size. It is likely that female #4 was at least 20–25 yrs of age at the last point of capture in 2006, with no observable long-term impacts of this shell deformity. However, based upon published growth curves for G. oculifera (Jones and Hartfield 1995), female #4’s growth interval was below the expected range of growth at the 10–11-cm size range, whereas female #1 was within the growth rate range expected at the 14-cm size range. Harding and Bloomer (1979) found a kyphotic wood turtle (Glyptemys insculpta) and, based upon the number of growth rings present, concluded that the individual was smaller than expected for that age class; they concluded that the abnormality may have slowed growth. However, Wilhoft (1980) found that a kyphotic juvenile Chelydra serpentina (common snapping turtle) gained more mass per month than did a normal clutch mate.

Of the four kyphotic females, only two were captured during the nesting season (#1, captured twice; #2, captured once), which lasts from 30 April to 15 July (Jones 2006); neither of these females was gravid. It is possible that females #1 and #2 produced a clutch of eggs during those years, but our capture dates may have preceded or followed those reproductive events. Other researchers have found that kyphotic females are capable of nesting and laying fertile eggs (Wilhoft 1980; J. Iverson, pers. comm., December 2011).

Only a single kyphotic G. oculifera was encountered in 713 captures at the Columbia site (0.14%), whereas three of 1751 captured from the Ratliff Ferry site were kyphotic (0.17%). In all five populations studied since 1987, only these 4 kyphotic females were encountered among 3830 total individuals (0.10%); therefore, it is unclear whether this condition occurs in male G. oculifera. However, it may be more difficult to determine the presence of this condition in Graptemys males because of the heavily spined and taller dorsal keel of males relative to females (Cagle 1953; Jones and Selman 2009).

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Figure 1. Kyphotic female Graptemys oculifera #4, captured near Columbia in Marion County, Mississippi.
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LITERATURE CITED


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