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(Short Communication)

NOTES ON THE MOVEMENT AND AQUATIC BEHAVIOR OF SOME KINOSTERNID TURTLES

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RESUMEN. Las tortugas semi–acuáticas de la familia Kinosternidae han evolucionado varias adaptaciones en respuesta a cambios ambientales desfavorables, los cuales incluyen el movimiento terrestre de larga distancia en búsqueda de refugios durante sequía, y la tolerancia a altos incrementos de salinidad acuática. Sin embargo, el comportamiento y movimiento acuático de estas tortugas ha recibido poca atención.

The behavior of kinosternid turtles is characterized by long distance terrestrial movement in response to fluctuating aquatic conditions. For instance, Ernst *et al.* (1994) speculated that *Kinosternon flavescens* was capable of traveling as far as 8 km on land based on its presence in farm ponds and the location of the nearest permanent body of water. Hall & Steidl (2007) observed movements of 500 m or greater by *Kinosternon sonoriense* in desert springs, including movements by adult males of up to 2.7 km. Stone (2001) also reported evidence of long distance movement by *K. sonoriense* individuals, of which 13 traveled distances greater than1 km. In Mexico, *Kinosternon leucostomum* individuals occupying a temporary lake were reported to travel distances of up to 600 m to nesting and aestivation sites (Morales-Verdeja & Vogt 1997). Similarly, 17 *Kinosternon scorpiodes* traveled distances of up to 500 m away from a riverine marsh during the dry season in Costa Rica (Teska 1976).

Terrestrial movement has been studied extensively in Kinosternidae of eastern North America, where most observations have taken place within ephemeral bodies of water and adjacent terrestrial habitats. As a result, recorded long distance movements were associated with drought conditions or interpond migration. During the latter, the greatest terrestrial distance traveled by *K. subrubrum* was estimated at 900 m (Larese-Casanova 1999). Long distance movement is not restricted to the terrestrial environment in this family, and aquatic movement has received little attention. Nevertheless, a study of *Sternotherus odoratus* provided an estimate of mean aquatic home range size of 155 ha (minimum convex polygon) for males (Edmonds 1998). Additionally, homing behavior studies of this species demonstrated its ability to travel up to 1.1 km in water (Adres & Chamber 2006).

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In addition to exceptional movement capability, kinosternid turtles are adapted to variable salinity conditions. Such is exemplified by *K. scorpiodes* of San Andres Island (Forero-Medina *et al.* 2007), which is located at approximately 180 km due east of the Nicaraguan Coast. However, in comparison, more information is available on estuarine kinosternid turtles of North America. The presence of *K. subrubrum* on Atlantic coastal barrier islands has been well documented (see reviews by Gibbons & Coker 1978; Mitchell 2007). Also, there is evidence from physiological studies to suggest that kinosternid turtles are better suited to low salinity or brackish water conditions than most freshwater turtles of the North American Atlantic coast (Dunson 1986; Dunson & Seidel 1986). These studies focused on *Kinosternon baurii*, and subsequent behavioral work revealed the use of terrestrial retreats in response to increasing salinity levels (Dunson 1981).

Observations of behavioral responses to fluctuating aquatic environmental conditions, though not related to salinity, have been made for *Kinosternon subrubrum* on the Coastal Plain of Maryland, USA (pers. obs.). During low tide cycles a significant area of a freshwater marsh was drained and exposed for periods lasting up to 4 hrs. Then, observed turtles sought cover in mud or decaying vegetation. While in a burrow form, some turtles created a small opening in the mud for breathing and remained still. Presumably, burrowing behavior would serve as a predator avoidance or thermoregulatory strategy. On the other hand, turtles appeared to be more active and were, in some cases, observed swimming during high tide cycles. Often, turtles would lodge themselves tightly through the stems of *Nuphar advena* and *Peltandra virginica* as they maintained a firm grip with their forearms. Such action would function positively in resisting current velocity and water level fluctuations given that this species is not optimally adapted for swimming (Davenport *et al.* 1984). Unlike most freshwater turtles of the region, *K. subrubrum* rarely basks, but individuals were most frequently observed doing so during high tides.

It is possible that adaptive strategies for coping with estuarine bimodal disturbance regimes may vary within and among populations. For instance, it is not clear whether *K. subrubrum* shifts its position in conjunction with low tidal cycles as an alternative to burrowing, and behavioral responses of populations in high salinity estuaries may resemble those of *K. baurii*. Additional observational studies of other kinosternid species, particularly in the neotropics or in coastal zones, may reveal similar or novel adaptive strategies in response to fluctuating aquatic environments.

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LITERATURE CITED

Adres, K. M. & R.M. Chambers. 2006. A test of Philopatry by Common Musk Turtles. *American Midland Naturalist,* 156:45–51.

Davenport, J., S.A. Munks & P. J. Oxford. 1984. A Comparison of the Swimming of Marine and Freshwater Turtles. *Proceedings of the Royal Society of London, Series B, Biological Sciences,* 220:447-475.

Dunson, W.A. & M.E. Seidel. 1986. Salinity Tolerance of Estuarine and Insular Emydid Turtles (*Pseudemys nelsoni* and *Trachemys decussata*). *Journal of Herpetology,* 20:237-245.

Dunson, W.A. 1981. Behavioral Osmoregulation in the Key Mud Turtle, *Kinosternon b. baurii*. *Journal of Herpetology,* 15:163-173.

Dunson, W.A. 1986. Estuarine Populations of the Snapping Turtle (*Chelydra*) as a Model for the Evolution of Marine Adaptations in Reptiles. *Copeia,* 1986:741-756.

Edmonds, J.H. 1998. Population ecology of the stinkpot turtle (*Sternotherus odoratus*) in Georgian Bay, Ontario. Unpubl. Master's thesis. University of Guelph, Guelph, Ontario.

Ernst, C.H., R.Barbour, J.& J. Lovich. 1994. *Turtles of the United States and Canada*. Smithsonian Institution Press, Washington, D.C.

Forero-Medina, G., O.V Castano–Mora & O. Montenegro.2007. Abundance, Population Structure, and Conservation of *Kinosternon scorpioides albogulare* on the Caribbean Island of San Andres, Colombia. *Chelonian Conservation and Biology,* 6:163–169.

Gibbons, J.W. & J.Coker.1978. Herpetofaunal Colonization Patterns of Atlantic Coast Barrier Islands. *American Midland Naturalist,* 99:219–233.

Hall, D.H. & R. Steidl. 2007. Movements, Activity, and Spacing of Sonoran Mud Turtles (*Kinosternon sonoriense*) in Interrupted Mountain Streams. *Copeia,* 2007:403–412.

Larese-Casanova, M. 1999. The Ecology of an Insular Population of Eastern Mud Turtles (*Kinosternon subrubrum subrubrum*). Unpubl. Master's thesis, University of Connecticut, Storrs.

Mitchell, J.C. 2007. Message from a peat bank: First record for the Eastern Mud Turtle (*Kinosternon subrubrum subrubrum*) from Cobb Island, Virginia. *Banisteria,* 29:36-38.

Morales-Verdeja, S.A. & R. Vogt. 1997. Terrestrial movements in relation to aestivation and the annual reproductive cycle of *Kinosternon leucostomum*. *Copeia,* 1997:123–130.

Stone, P.A. 2001. Movements and demography of the Sonoran mud turtle, *Kinosternon sonoriense*. *Southwestern Naturalist,* 46:41–53.

Teska, W.R. 1976. Terrestrial Movements of Mud Turtle *Kinosternon scorpioides* in Costa Rica. *Copeia,* 1976:579–580.

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