

## Diet of *Kinosternon scorpioides* in Serra dos Carajás, Eastern Amazonia

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Franco (1999) recorded 124, 127 (N = 2) male ventrals and 131–137 (N = 9) female ventrals, 32, 39 (N = 2) male subcaudals and 29–32 (N = 9) female subcaudals. Because of only two males, he did not comment on sexual dimorphism. Franco et al. (2001) and Carreira and Meneghel (2004) have data from additional specimens. Carreira and Meneghel (2003) recorded 147 ventrals and 24 subcaudals in the female ZVC-R 5710; we reexamined the specimen and the correct information is 137 ventrals and 32/31 subcaudals. With all of the additional information, we have the following ranges: males (N = 3), ventrals 124–128, subcaudals 32–39; and females (N = 11), ventrals 131–137, subcaudals 29–34. Actually the difference in subcaudal counts is proportionally greater (~12%) than in the ventral counts (~6%).

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The New World genus *Kinosternon* includes 19 species of small to medium-sized (< 300 mm) aquatic turtles, occurring from southern Canada to Argentina (Ernst and Barbour 1989). The biology of many species of *Kinosternon* has been studied (e.g., Frazer 1991; Gibbons 1983; Iverson 1991; Loben Sels et al. 1997; Morales-Verdeja and Vogt 1997; Vogt and Guzman 1988), but little is known of the biology of *K. scorpioides*. Studies on this species have focused mostly on morphology and information on diet, behavior, and reproduction is limited (Acuña-Mesen 1992; Cabrera and Colantonio 1997; Marquez 1995; Pritchard and Trebbau 1984; Moll 1990).

Current evidence suggests that *K. scorpioides* is a visually oriented omnivore that feeds on fish, amphibians (tadpoles and adults), dead vertebrates, invertebrates, algae and plant material, but with the exception of Moll (1990), most of these data are anecdotal (Cunha 1970; Vanzolini et al. 1980) or based on observation of captives (Monge-Nágera and Moreva-Brenes 1987; Pritchard and Trebbau 1984). In this paper, we describe the diet of *K. scorpioides* at Serra Sul, Floresta Nacional de Carajás, eastern Amazonia.

*Materials and Methods.*—Serra Sul (6°20'S, 5°25'W) is a narrow plateau (600–800 m above sea level) developed upon a “banded iron formation” at Serra dos Carajás, eastern Amazonia, Brazil (Sifeddine et al. 1994). Climate is seasonal, with most annual rains (1500–2000 mm) falling from November to May. Mean annual temperature is 24°C. Vegetation on the plateau consists mostly of open and shrub savannas (“canga vegetation”), while the steep borders and surrounding lowlands are covered by rainforest. The plateau is covered with many shallow lakes at various stages of silting.

We conducted our sampling in March and April 2005, at the end of the rainy season, when a large part of the study area was flooded. Turtles were captured in lakes, marshes and slow-moving streams, by hand or in Tomahawk live traps (model 202, 47 × 15 × 15 cm) baited with meat and placed partially submerged in water. Traps were checked at 1–6 h intervals. Turtles were sexed, mass was measured with spring scales, and straight-line carapace length (CL) was measured with vernier calipers. All turtles were marked and kept in damp cloth bags for 6 h before release at their capture site. Turtles usually defecated in the bags and these fecal samples were collected and stored in 70% alcohol. We identified each food item to the lowest possible taxon (usually order) and

TABLE 1. Summary of food items found within fecal samples from 23 *Kinosternon scorpioides* (NUM = Sum of individual prey recorded in all feces; IND = Number of individual fecal samples containing a particular prey category; Prey habitat: A = aquatic, T = terrestrial, ? = habitat unknown).

TAXON	NUM	IND	HABITAT
PLANT MATERIAL			
Fam. Graminae			
<i>Echinochloa</i> sp.	1138	16	A
Unidentified Graminae	711	9	?
Unidentified plant material	—	16	?
INVERTEBRATES			
Class Insecta			
Order Coleoptera	1	1	T
Order Diptera	1	1	T
Order Hemiptera			
<i>Limnocoris</i> sp.	55	20	A
Order Hymenoptera			
Fam. Formicidae	5	2	T
Order Isoptera	8	6	T
Order Lepidoptera	2	2	T
Order Odonata			
Adults	16	9	T
Naiads	19	13	A
Order Orthoptera	3	3	T
Unidentified invertebrate	2	2	T
VERTEBRATES			
Class Anura	—	2	T, A
Class Reptilia			
Fam. Colubridae (scales)	1	1	?
Class Aves (eggshell)	1	1	T
Class Mammalia (fur)	1	1	T

counted the total number of each. The number of each prey type present in each sample was considered as the minimum number of individuals that could have contributed to the disarticulated parts (Lima et al. 1997).

**Results and Discussion.**— We captured 36 *K. scorpioides* a total of 42 times. Our sample included 17 males (mean CL = 123.4 mm, SD = 8.4, range = 96–134 mm; mean mass = 262.7 g, SD = 39.2, range = 150–320 g), 17 females (mean CL = 126.5 mm, SD = 5.8, range = 96.5–135 mm; mean mass = 284.4 g, SD = 62.2, range = 125–385 g), and two unsexed juveniles.

Twenty-eight fecal samples were obtained from 23 turtles. Feces from the same individuals were pooled for the analysis (thus, N = 23). Consistent with previous studies, *K. scorpioides* used a wide range of animal and plant resources (Moll 1990; Monge-Nágera and Moreva-Brenes 1987; Pritchard and Trebbau 1984; Vanzolini et al. 1980). We found 16 different prey taxa in the fecal samples including invertebrates, vertebrates and plant material (Table 1). The most common item was grass seeds (mostly *Echinochloa* sp.), followed by aquatic Hemiptera (*Limnocoris* sp.) and Odonata naiads and adults (Table 1). The most common prey types were aquatic, but some were terrestrial. However, terrestrial prey

species were probably consumed in the water, after falling in and becoming trapped (e.g., adult dragonflies; Pritchard and Trebbau 1984). Seeds and other plant material passed undigested through the digestive tract. We do not know if these food items were consumed accidentally or intentionally. However, aquatic plants have been reported in the diet of *K. scorpioides* from Belize (Moll 1990). Captive *K. scorpioides* have been reported to consume vertebrates, including fish, reptiles, and rodents (Pritchard and Trebbau 1984). The rarity of vertebrates in our samples suggested opportunistic feeding, however, we were unable to determine if vertebrates were eaten alive or as carrion. Amphibians were recorded only in three samples, despite being very common within *K. scorpioides* habitat. But our results may have been misleading because amphibians, particularly tadpoles, are easily digested and leave few remains in feces (Daltry et al. 1998).

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**Nomenclatural Status of the Malagasy Snake  
Genus *Bibilava* Glaw, Nagy, Franzen, and Vences,  
2007: Resurrection of *Thamnosophis* Jan and  
Designation of a Lectotype for *Leptophis lateralis*  
Duméril, Bibron, and Duméril (Serpentes:  
Colubridae)**

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The new generic name *Bibilava* was recently applied to an assemblage of colubrid snakes from Madagascar that had previously been associated with the genus *Liopholidophis* (Glaw et al. 2007; Glaw and Vences 2007), but we here show that the earlier name *Thamnosophis* Jan (1863) is the appropriate name for this group. In addition, we designate a lectotype for *Leptophis lateralis* Duméril, Bibron, and Duméril, the type species of *Thamnosophis*, to resolve some ambiguity in the application of this name.

Mocquard (1904) erected the snake genus *Liopholidophis* to accommodate snakes from Madagascar placed in *Tropidonotus* by Boulenger (1893), primarily because the Malagasy snakes have hemipenes dissimilar to those of *Tropidonotus* with which Boulenger had associated them. Mocquard (1904, 1909) also recognized that several species he included in the genus had an unusually exaggerated sexual dimorphism in tail length (reviewed by Cadle 1996 and Glaw et al. 2007). Apart from the subset of species that shared this unusual sexual dimorphism, *Liopholidophis* came to include other generalized Malagasy colubrids that lacked derived characters linking them to other named Malagasy colubrid genera.

Mocquard (1904) explicitly included the following taxa in *Liopholidophis*: *Leptophis lateralis* Duméril, Bibron, and Duméril, 1854; *Dromicus stumpffi* Boettger, 1881a; *Dromicus sexlineatus* Günther, 1882; *Dromicus dollicocercus* Peracca, 1892; and the new species *Liopholidophis grandidieri* Mocquard, 1904. Subsequent authors (e.g., Cadle 1996; Guibé 1958; Mocquard 1909; Parker 1925) have used Mocquard's name *Liopholidophis* for this assemblage. Williams and Wallach (1989) designated *L. grandidieri* Mocquard (1904) as the type species of *Liopholidophis*; Glaw et al. (2005: 83) erroneously stated that the type species was *L. sexlineatus* (Günther).

Parker (1925) defined two species groups within *Liopholidophis*, which were amplified by Cadle (1996): the *sexlineatus* group for the species having the exaggerated sexual dimorphism in tail length, and the *stumpffi* group for the species lacking that extreme dimorphism. After accommodating subsequently described species and nomenclatural adjustments (Cadle 1996, 1998; Glaw et al. 2005), Parker's *sexlineatus* group comprised the nominal species *sexlineatus*, *dollicocercus*, *grandidieri*, *rhadinaea*, and *varius*, whereas his *stumpffi* group included the nominal species *stumpffi*, *epistibes*, *infrassignatus*, *lateralis*, and *martae*. Cadle (1996) found evidence to support the monophyly of each of the species groups but he suspected that *Liopholidophis* was non-monophyletic because he found no characters to support the monophyly of the genus as a whole. Several authors (e.g., Boulenger 1893; Cadle 1996; Domergue "1972" [1973]; Guibé 1954, 1958; Williams and Wallach 1989), recognized the relevance of the name *Thamnosophis* Jan, 1863 (type species: *Leptophis lateralis* Duméril, Bibron, and Duméril, 1854) to the nomenclature of "*Liopholidophis*" by including the name in the synonymies of *L. lateralis* and *L. stumpffi*. Being the earlier name, *Thamnosophis* has priority over *Liopholidophis* when the two names are applied to the same taxon. However, because Cadle (1996) questioned the relationship of the two species groups of *Liopholidophis* to one another, and the type species of *Liopholidophis* and *Thamnosophis* are in different species groups (*sexlineatus* and *stumpffi* groups, respectively), he chose to leave the generic nomenclature alone until stronger evidence bearing on the systematics of the species groups accrued.

Glaw et al. (2007) provided evidence for the partition of *Liopholidophis* in a molecular phylogenetic analysis of eight species of *Liopholidophis* (three species of the *sexlineatus* group and five species of the *stumpffi* group) along with other representative Malagasy colubrids. They found that each species group was monophyletic. However, species of the *L. sexlineatus* group were more closely related to several species of *Liophidium* than to species of the *L. stumpffi* group, thus making *Liopholidophis* sensu lato non-monophyletic. In revising the nomenclature to conform to their phylogenetic hypothesis, Glaw et al. (2007) restricted the name *Liopholidophis* to the former *sexlineatus* group (which includes the type species, *L. grandidieri*) and described a new species, *Liopholidophis dimorphus*. Glaw et al. (2007) also named a new genus, *Bibilava*, to accommodate species of the former *stumpffi* group and designated, as its type species, *Leptophis lateralis* Duméril, Bibron, and Duméril, 1854.

Thus, Glaw et al. (2007) overlooked the available generic name, *Thamnosophis* Jan, for the *stumpffi* species group. Its type species