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NATURAL HISTORY OBSERVATIONS OF *KINOSTERNON HERRERAI (TESTUDINES: KINOSTERNIDAE)*

John L. CARR*
Roderic B. MAST**

ABSTRACT

Aspects of the biology of Herrera's Mud Turtle, *Kinosternon herrerai*, are reported based upon observations of a population near Rancho Nuevo in Tamaulipas, México. The habitat there consists of a permanent stream surrounded by gallery forest. The only other turtle occurring in the stream was *Trachemys scripta cataspila*. The males of *K. herrerai* attain a larger size than females, with a proportionally smaller plastron, and narrower and shallower carapace. Symbionts reported include a balanomorph barnacle, leeches of the genus *Placobdella*, and the filamentous green alga *Basicladia*. The food items identified indicate an omnivorous diet, with wild figs the major plant component, and several insect orders and millipedes represented. Courtship in *K. herrerai* agrees in most respects with courtship of other kinosternid species. Sexual maturity in females is apparently attained between 115-130 mm. carapace length. Clutch size is estimated to range from 2-4, and the average size of three eggs was 35.0 mm. long by 18.0 mm. wide (7.1 g.). Several clutches may be laid in a reproductive season.

RESUMEN

Se presentan algunos aspectos sobre la biología de la tortuga del lodo de Herrera, *Kinosternon herrerai*, basados en observaciones de una población localizada cerca a Rancho Nuevo, Tamaulipas, México. El hábitat estaba compuesto por una corriente de agua rodeada por bosque de galería. Sólo una especie adicional de tortugas existe en el área, *Trachemys scripta cataspila*. Los machos de *K. herrerai* alcanzan mayor tamaño que las hembras, e igualmente tienen plastron proporcionalmente menor y un caparazón más angosto y menos profundo. Los simbiontes encontrados comprenden un percebe balanomorfo, sanguijuelas del género *Placobdella* y un alga verde filamentosa *Basicladia* sp. La dieta es omnívora, siendo el mayor componente vegetal frutos de *Ficus* sp. y varios órdenes de insectos y milpies conforman la porción animal. El cortejo concuerda en la mayoría de los aspectos con el de otras especies congenéricas. La madurez sexual se alcanza entre los 115 y los 130 mm. de longitud del caparazón, con una nidada de 2 a 4 huevos cuyos diámetros en promedio son de 35.0 x 18.0 mm. y 7.1 g. de peso, llegando a depositar varias nidadas en la misma estación reproductiva.

* Department of Zoology, Southern Illinois University, Carbondale, IL 62901-6501, USA.

** World Wildlife Fund, 1250 Twenty-Fourth Street NW, Washington, D.C. 20037, USA.

Key Words: *Kinosternon herrerai*, behavior, reproduction, diet, habitat, symbionts, sexual dimorphism, México.

Since the description of *Kinosternon herrerai* by Stejneger in 1925, the literature concerning the species has dealt almost exclusively with distribution (IVERSON & BERRY, 1979; SHANNON & SMITH, 1949; SMITH & BRANDON, 1968; WEBB *et al.*, 1967; WILLIAMS & WILSON, 1965). Recent reviews by BERRY & IVERSON (1980) and SMITH & SMITH (1980) have noted a distinct lack of ecological information for this turtle. References have been made only with regard to the circumstances under which a specimen was caught (POGLAYEN & SMITH, 1958; REESE, 1971), observations of a captive individual (POGLAYEN, 1965), and descriptions of specimens sold in markets as souvenirs (PRITCHARD, 1969; MITTERMEIER, 1971).

MATERIAL AND METHODS

During the summer of 1981, we observed a population of *Kinosternon herrerai* near Rancho Nuevo, Tamaulipas, México, near the northernmost extent of its range (PRITCHARD, 1969). We captured and observed 17 specimens from our study site, which was visited intermittently between 6 June and 7 August. Most specimens were captured by hand, though a few were caught in baited traps. After recordings measurements we marked the specimens and returned them to the pool where captured. Only two recaptures were made. Two of these specimens are deposited in the National Museum of Natural History (USNM 266194-95) and a third was held captive until 1987 (deposited in the Texas Cooperative Wildlife Collection, TCWC S-563). Three specimens from other localities were also observed: (1) a male caught on the road between Aldama and Barra del Tordo, Tamaulipas, on 13 July 1981; (2) and adult female (TCWC 60531) from 49.6 km. N Gonzales, Hac. Acuña, Tamaulipas, collected 22 July 1979; and (3) a male (TCWC) 65391 from Río de los Gatos, 1.6 km. W Chantol, San Luis Potosí, collected 20 May 1981.

RESULTS AND DISCUSSION

HABITAT

The study site was an approximately 0.5 km. length of the stream Arroyo La Coma situated south of Rancho Nuevo, Municipio de Aldama, in the state of Tamaulipas (23°, 11' N; 97°, 47' W). Arroyo La Coma is a short (7-8 km. total length), coastal plain stream which begins in the low hills (*ca.* 80 m.a.s.l.) west of Rancho Nuevo, runs south of the village and east toward the Gulf of México (DETENAL, 1980). Our study site was near the middle of the stream, beginning at the point where Arroyo La Coma opened into a permanent pool in a forested area. From there the stream flowed through a series of shallow pools separated by short cascades or narrow rivulets for a distance of approximately one half kilometer. Below the end of the study site, the stream widened and deepened, meandering *ca.* 3.3 km. to the coast, and emptying into the lagoon behind Barra La Coma. During periods of high rainfall, as during most of July, the outlet to the Gulf was open. Throughout the period of our observations, flow in the pools of the study area was slight, with heavier flow confined to periods inmediately following rains.

The area surrounding the stream throughout its length was vegetated with tropical thorn forest typical of the Tamaulipan coastal plain (MARTIN *et al.*, 1954). A narrow band of gallery forest lined both banks and the adjacent slopes of the study area, with pasture beyond the forest. This gallery forest was a more mesic formation than that of the surrounding lowlands, showing similarity to the tropical deciduos forest described by MARTIN *et al.* (1954). The trees formed a closed canopy about 15 m. above the stream throughout the study site, and for some distance downstream.

The stream itself was narrow, the uppermost pool being about two (2) m. wide and up to 30 cm. deep, with a soft mud bottom. Most pools contained exposed rocks, with one pool having an entirely rock bottom only 15-20 cm. deep. The water in all of the upper study site pools was clear, except immediately following rains when they were turbid for at least two days. The lowest and largest pool in the study area was located at the base of a 1 m. waterfall. This pool had a mud bottom and was always turbid, approximately six m. wide, one m. deep, and 15 m. long.

Approximately 1.5-2 km. downstream was a low dam with an elongate pool behind it. About 50 m. downstream from the dam was a grade level road crossing, upstream from which there also was a large pool. Downstream from the road, Arroyo La Coma became wider and increasingly brackish as it neared the Gulf. Turtles were not observed downstream from the road.

ECOLOGICAL ASSOCIATES

Kinosternon herrerai was the only turtle species found throughout the series of study pools. The lowest pool below the waterfall also contained the Huastecan Slider, *Trachemys scripta cataspila*. This species commonly was seen downstream in areas above the road crossing and above the dam (MAST & CARR, 1986). Two specimens of *Terrapene carolina mexicana* were found in June in nearby areas of thorn forest. Several specimens of *Kinosternon scorpioides cruentatum* were encountered inland near the Río Carrizal, but none near the study stream in association with *Kinosternon herrerai*.

POPULATION STRUCTURE

All specimens were relatively large and exhibited dimorphic sexual characteristics. Specimens of smaller, inmature size classes were neither captured nor seen. Of the 17 specimens captured, seven were males and ten were females. The sex ratio of this small sample is not significantly different from 1:1 ($X^2 = 0.53$,

MORPHOMETRICS

As judged by carapace length, the turtles (TABLE 1) were larger than specimens of *Kinosternon herrerai* reported by PRITCHARD (1969), MITTERMEIER (1971), and IVERSON (In Press). *Kinosternon herrerai* is among the largest of *Kinosternon* species (IVERSON, In Press) and exhibits a large degree of sexual dimorphism, with a male to female carapace length ratio of 1.15 for our sample. In addition to the males being larger than the females, there are several other morphometric differences between the sexes (TABLE 1). Females have a more ex-

TABLE 1. Measurements of *Kinosternon herrerai*. (1).

	MALES			FEMALES			
Measurement	N	Range	Mean	Ratio	N	Range	Mean	Ratio
Carapace L	7	147-172	156.2	...	10	116-148	135.9	...
Maximun PL*	7	113-127	120.1	.77	8	107-121	113.1	.81
Forelobe L	7	38-44	42.1	.27	10	32-40	35.8	.26
Hindlobe L*	7	34-39	36.5	.23	10	36-43	38.5	.28
IPH SL*	7	31-35	33.2	.21	10	26-33	31.4	.23
Carapace W*	7	89-106	100.6	.64	10	84-96	92.3	.68
Bridge L*	7	19-25	21.7	.14	10	19-25	22.3	.16
Carapace H*	3	51-62	56.0	.36	5	49-57	54.7	.40

(1) Ranges and means are in mm. The ratio indicated is the mean of each measurement divided by the corresponding carapace length. Significant differences between the male and female mean ratio is indicated by asterisk with $p<.05$. L= length, PL= plastron length, IPH SL= inter-posterior humeral seam length, W= width, H= height.

tensive plastron than males, as indicated by several plastral measurements, and a relatively longer bridge. Total plastron length is greater in females, the difference being in the relatively longer fixed posterior humeral portion and the length of the slightly kinetic hindlobe. There was no significant difference between the sexes in the length of the forelobe. Females also had a wider and deeper shell than males.

BEHAVIOR

We observed *Kinosternon herrerai* to be active during dayligth hours. Five of our captures were between the hours of 09:00 and 12:00 CST. Another eight captures took place from 15:30 to 18:45 CST. Another eight captures took place from 15:30 to 18:45 CST. We did not see any turtles on the few trips we made after dark. In this respect, we cannot confirm nocturnal activity in the wild as reported by REESE (1971). The three specimens reported by SMITH & BRANDON (1968) were captured in shallow water after dark (BRANDON, pers. comm.). The female specimen TCWC 60531 was collected in a small mountain stream at night (J. W. SITES Jr., *in litt.*), and J. B. IVERSON (pers. comm.) has reported catching *K. herrerai* after dark.

Out observations of two captive individuals indicate that they may be active at any time of a ligth-dark cycle. Both captive animals were observed sleeping during the day and at night. The female rested on the bottom of the aquarium with eyes closed and the head slightly extended. The male rested with his head entirely out of the shell, extended across the substract with eyes closed, and limbs drawn in.

We did not observe *Kinosternon herrerai* basking in the wild, nor did we note any inclination to do so by the captive individuals. *Trachemys scripta cataspila* was observed basking at the water surface in sun dapples on the lowest study pool, and individuals of this species commonly were seen aerial basking on emergent snags in open areas downstream from the stuy site.

REESE (1971) commented upon the speed of *Kinosternon herrerai* on land. In only one case did we observe an individual crossing a highway as did REESE (1971), and that was in the middle of the day (11:30). Our observations were confined to the clear, shallow waters of the study area. When a turtle saw one of us in pursuit, it moved with a burst of speed. In one case, a turtle fled and buried itself below several centimeters of mud. We never saw *K. herrerai* specimens out of the water in the study area. The water was often very shallow, in some cases just deep enough to cover the entire shell as the animal moved about.

SYMBIONTS

The empty test of a balanomorph barnacle was noted on the posterior carapace of a male *Kinosternon herrerai*. This corresponds with a "light infestation" according to the classification of SEIGEL (1983). This is apparently the first report of a barnacle on a kinosternid turtle (FRAZIER, 1986) and indicates that this particular animal inhabited a brackish portion of the stream near the Gulf a some time prior to capture.

Leeches were collected from a female *Kinosternon herrerai* at the study site, and also from TCWC 60531. Two species of the glossophionid genus *Placobdella* were represented. Six specimens of an as yet undescribed species of *Placobdella* were found on a female at the study site (KLEMM, *in litt.*). Sixteen specimens of *P. moorei* were removed from the inguinal and nuchal regions of TCWC 60531.

A filamentous green alga was found on the carapace of 7 of the 17 turtles from the study site. The alga represents the epizoophyte genus *Basicladia*, commonly reported from Neartic turtles (ERNEST & BARBOUR, 1972; MOORE *et al.*, 1975). This same alga was also found growing on *Trachemys scripta cataspila* at the study site.

FEEDING HABITS.

Information about foods eaten by *Kinosternon herrerai* was obtained from examination of the contents of two digestive tracts and feces samples from four other turtles (TABLE 2). Our only observation of feeding in the wild was made in June when turtle No. 3 was recaptured in the afternoon on a sunny day as she was ingesting a plant stem picked from the bottom of a pool about 15 cm. deep.

Both plant remains and invertebrate parts were found in all samples. The great preponderance of the plant material was fig remains (*i.e.* fruits of *Ficus* sp.). The strongly hooked jaws and massive adductor musculature (see FIG. 1) may allow the explotation of globular, tough skinned fruits like figs as they bob on the water surface. These physical attributes could enable the turtles to grasp and pierce the thick skin of the 3+ cm. diameter fruits. Fig trees were fruiting during the period of our study. The availability of such fruits is seasonal, making it likely that there are shifts in diet as food availability changes throughout the year.

Five orders of insects and millipedes were represented in the samples. The only clearly aquatic prey was an odonate larva (*Gomphidae*). The other invertebrates

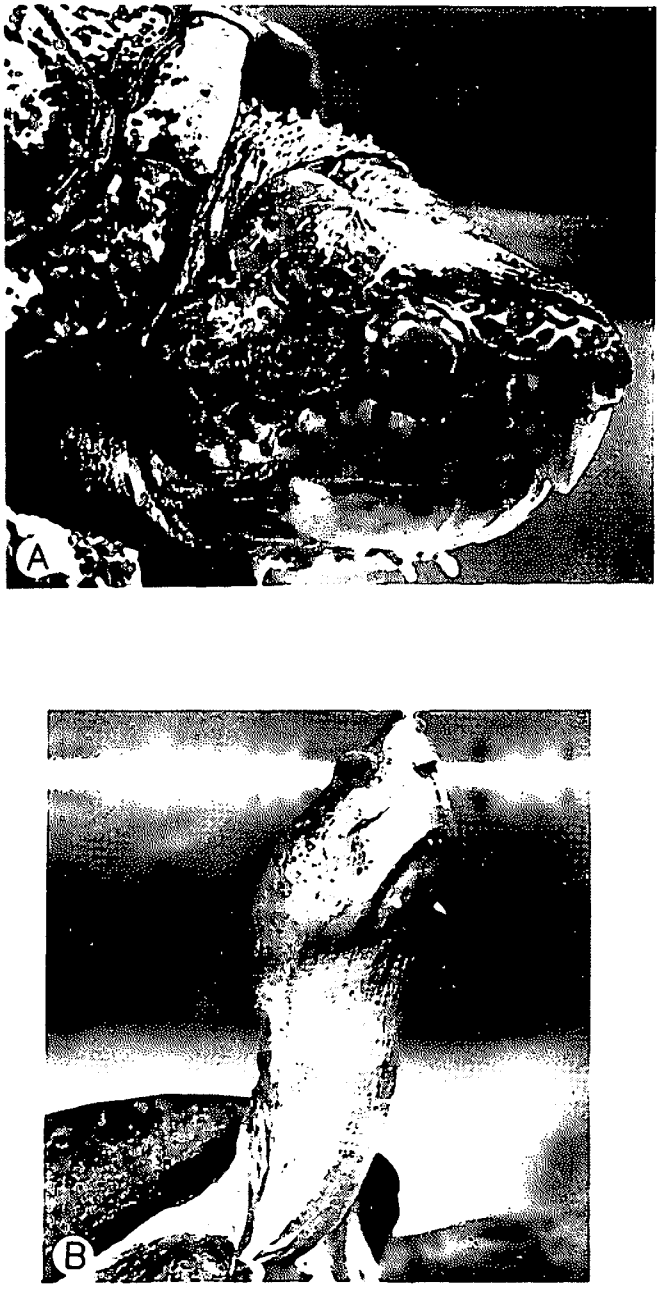

FIGURE 1. (A) Male *Kinosternon herrerai* snowing the massive head. (B) Female *K. herrerai* (TCWC S-563) with head extended showing chin barbels.

TABLE 2.Food items of *Kinosternon herrerai* identified from the digestive tracts of USNM 266194 and 266195, and from fecal samples. (1).

	USNM		Feces				Percent.
Food Item	266194	266195	1	2	3	4	Ocurrence
Plants							
figs (*Ficus* sp.)	+	+	+	+	+	+	100.0
unidentified leaves &/or stem		+			+	+	50.0
seeds						+	16.7
Invertebrates							
Insecta							
Coleoptera	+	+	+	+	+	+	100.0
Hymenoptera (ants)		+				+	33.3
Lepidoptera	+						16.7
Odonata		+					16.7
Orthoptera	+	+		+	+		66.7
Diplopoda	+	+				+	50.0

(1) All insects were adults except the *Odonata* and *Lepidoptera*, wich were larvae. += present.

were terrestrial, and likely had fallen onto the water surface, though the lepidopteran larvae and some of the beetles may have been aquatic. Other than the ants, all of the insects were relatively large (1—2 cm. length minimum). Other studies have noted more benthic invertebrates (MAHMOUD, 1968; HULSE, 1974) and a high frequency of mollusk (MAHMOUD, 1968) in the diet of temperate zone kinosternids. LEGLER (1966) noted that three Central American species of *Kinosternon* were "predominantly herbivorous", and IVERSON (1986) found the Mexican species *K. oaxacae* to be largely herbivorous. Our limited data for *K. herrerai* indicate that frugivory is at least seasonally common, and that invertebrates in or on the water are eaten as well. Our sample does not provide any evidence of molluscivory, as hypothesized for *K. herrerai* by BRAMBLE *et al.* (1984).

COURTSHIP

The following courtship description is based on 12 partial behavioral sequences observed in 1985 and 1986 in an aquarium between TCWC S-563 and 65931. Reference to the observations SEXTON (1960) and MAHMOUD 1967) facilitates comparison of courtship behavior in *Kinosternon herrerai* with other species of kinosternids. MAHMOUD (1967) divided the courtship behavioral sequence into three phases: the "tactile", "mounting and intromission", and "biting and rubbing" phases.

We did not observe a pre-mounting tactile phase in *Kinosternon herrerai.* MAHMOUD (1967:316) observed that the mounting phase sometimes occurred with-

out the tactile phase preceding it in the four species he studied.

The male mounted the female with his shell directly over hers, and gripped her shell with all four feet, with his head extended. The pair rested on the bottom. We did not observe the details of intromission during the phase as did MAHMOUD (1967), but he stated that intromission followed mounting within 5-10 seconds. We always observed the male intromittent while mounted. The terminal spine on the male's tail assisted either in achieving intromission or in helping maintain it. The region surrounding the female's vent was bleeding and abraded after several courtship sequences as a result of the use of the spine.

The "biting and rubbing" phase of MAHMOUD (1967) immediately followed intromission. In *Kinosternon herrerai*, the male's head and neck were fully extended while mounted and intromittent. The head was bent down toward the female's shell, and was moved rapidly from side to side several times. He stopped and then repetead another series of these motions. The frequency of these events was not recorded, but there were at least 3 or 5 bouts of lateral undulation per copulatory sequence. During the lateral undulations, the male's gular region rubbed the anterior margin of the female's carapace (*i.e.* the nuchal and anteriormost marginals). The male did not seem to be attempting to rub the top of the female's head as SEXTON (1960) and MAHMOUD (1967) described this phase, because the female's head was retracted. This "rubbing" activity did not appear to elicit a response from the female. During this phase, the male sometimes took intermittent breaths, but the female was unable to do so.

A change in the female's behavior appeared to initiate the termination of coitus, as noted by SEXTON (1960) and MAHMOUD (1967). The female attempted to move out from under the male, often lifting her body from the substrate, hopping, and violently rocking both laterally and anteroposteriorly at the same time. The male's penis still protruded when copulation was broken off (once he was drug along by the penis momentarily as the female broke loose). The female darted away rapidly once free of the male. Copula lasted as long as five minutes, and may have been longer.

REPRODUCTION

Data were gathered regarding aspects of reproductions from four females (TABLE 3). Sexual maturity in females appears to be reached between 115-130 mm. carapace length. The largest female lacking oviducal eggs, corpora lutea, and enlarged ovarian follicles measured 130.3 mm. CL and was considered immature. The smallest reproductive female, as judged by the presence of corpora lutea and enlarged follicles, measured 116.1 mm. CL.

Eggs were collected from TCWC 60531 upon sacrifice in the laboratory on 8 August, 1979 (captured 22 July). Data on eggs were also gathered from TCWC S-563 nearly a year after she was captured. The average dimensions for three *Kinosternon herrerai* eggs were 35.0 by 18.0 mm., and weight of 7.1 g. The eggshell was brittle, with a smooth surface.

Clutch size was estimated to range from two to four eggs, as judged by counts of the largest follicle class, corpora lutea, and oviducal eggs. The captive female (TCWC S-563) had a minimun clutch size of two, having deposited and destroy-

TABLE 3. Reproductive data for *Kinesternon herrerai* females from Tamaulipas, México. (1).

Specimen No. and size	L	Eggs W	WT	Follicle Diameters	Corpora Lutea	Date
TCWC 60531 CL— 125.4	34.0 34.5	17.9 18.0	6.9 7.0	4: 14 mm. 4: 9-11 mm. 2: 5, 7 mm.	...	9 Aug. 1979
TCWC S-563 CL— 143.1 WT— 486	36.5	18.2	7.5	..	...	16 Jul. 1982
USNM 266194 CL— 130.3	..	..	-	all 5 mm.	none	11 Jun. 1981
USNM 266195 CL— 116.1	..	..	-	2:12, 14 mm. 5: 7-9 mm.	2	11 Jul. 1981

(1) Carapace length (CL), length (L), and width (W) in mm.; weight (WT) in grams.

ed at least one egg before one egg was obtained by oxytocin injection in July of 1982 (TABLE 3). Again in March of 1985, this female laid one or more eggs in an aquarium, however only shell fragments were found. SEXTON (1960) and EWERT & LEGLER (1978:316) have reported that kinosternids will destroy and/or eat their own eggs when confined.

Whether the reproduction of *Kinosternon herrerai* is seasonal or not remains unknown. Our data indicate that multiple clutches may be laid in a single year. One female (TCWC 60531) had an oviducal clutch of two, and two sets of enlarged follicles, an indication of the potential for at least three clutches. Another female (USNM 266195) had a set of corpora lutea, indicating a clutch laid prior to capture, and she had a set of large follicles (> 10 mm. diameter).

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LITERATURE CITED

BERRY, J.F. & J.B. IVERSON.
1980 *Kinosternon herrerai. Cat. Amer. Amphib. Rep.* 239:1-2.

BRAMBLE, D.M., J.H. HUTCHISON, & J.M. LEGLER.
1984 Kinosternid shell kinesis: structure, function and evolution. *Copeia*, 1984:456-475.

DETENAL.
1980 Nuevo Progreso, Tamaulipas, F14B44. Topographic map, 1:50,000.

ERNST, C.H. & R.W. BARBOUR.
1972 *Turtles of the United States.* x + 347 pp. Lexington: Univ. Press, of Kentucky.

EWERT, M.A. & J.M. LEGLER.
1978 Hormonal induction of oviposition in turtles. *Herpetologica*, 34:314-318.

FRAZIER, J.G.
1986 Epizoic barnacles on pleurodiran turtles: is the relationship rare? *Proc. Biol. Soc. Washington*, 99:472-477.

HULSE, A.C.
1974 Food habits and feeding behavior in *Kinosternon sonoriense (Chelonia: Kinosternidae). J. Herp.*, 8:195-199.

IVERSON, J.B.
1986 Notes on the natural history of the Oaxaca Mud Turtle, *Kinosternon oaxacae. J. Herp.*, 20:119-123.

In Press. Natural history of the Alamos Mud Turtle *Kinosternon alamosae (Kinosternidae). Southwestern Naturalist.*

IVERSON, J.B. & J.F. BERRY.
1979 The mud turtle genus *Kinosternon* in northeastern Mexico. *Herpetologica*, 35:318-324.

LEGLER, J.M.
1966. Notes on the natural history of a rare Central American turtle, *Kinosternon angustipons* Legler. *Herpetologica*, 22:118-122.

MAHMOUD, I.Y.
1967 Courtship behavior and sexual maturity in four species of kinosternid turtles. *Copeia*, 1967:314-319.

1968 Feeding behavior in kinosternid turtles. *Herpetologica*, 24:300-305.

MARTIN, P.S., C.R. ROBINS, & W. B. HEED.
1954 Birds and biogeography of the Sierra de Tamaulipas, an isolated pine-oak habitat. *Wilson Bull.*, 66:38-57.

MAST, R.B. & J.L. CARR.
1986 *Trachemys scripta cataspila* (Huastecan Slider) : reproduction. *Herp. Rev.*, 17:25.

MITTERMEIER, R.A.
1971 Status - the market in southeastern Mexico. *Int. Turt. Tort. Soc. J.*, 5(3):15-19, 36-38.

MOORE, F.L., D. KEAMMERER, & H.M. SMITH.
1975 Symbiotic relationship between epizoophytes and herpetofauna. *Bull. Philadelphia Herp. Soc.*, 22:17-26.

POGLAYEN, I.
1965 Observations on Herrera's Mud Turtle *Kinosternon herrerai* Stejneger. *Int. Zoo. Yrbk.*, 5:171-173.

POGLAYEN, I. & H.M. SMITH.
1958 Noteworthy herptiles from Mexico. *Herpetologica*, 14:11-15.

PRITCHARD, P.C.H.
1969 Herrera's Mud Turtle. *Int. Turt. Tort. Soc. J.*, 3(3):6-9, 35.

REESE, R.W.
1971 Notes on a small herpetological collection from northeastern Mexico. *J. Herp.*, 5:67-69.

SEIGEL, R.A.
1983 Ocurrence and effectos of barnacle infestations on Diamondback Terrapins *(Malaclemys terrapin)*. *Amer. J. Nat.*, 109:34-39.

SEXTON, O.J.
1960 Notas sobre la reproducción de una tortuga venezolana, la *Kinosternon scorpioides*. *Mem. Soc. Cienc. Nat. La Salle.*, 20:189-197.

SHANNON, F.A. & H.M. SMITH.
1949 Herpetological results og the University of Illinois field expedition, spring 1949.1. Introduction, *Testudines, Serpentes*. *Trans. Kansas Acad. Sci.*, 52:494-509.

SMITH, H.M. & R.A. BRANDON
1968. Data nova herpetologica mexicana. *Trans. Kansas Acad. Sci.*, 71:49-61.

SMITH, H.M. & R.B. SMITH.
1980 *Synopsis of the herpetofauna of Mexico. Vol. VI. Guide to Mexican turtles, bibliographic addendum III.* North Bennington, VT/Jhon Johnson.

STEJNEGER, L.
1925 New species and subspecies of American turtles. *J. Wash. Acad. Sci.*, 15:462-463.

WEBB, R.G., R.H. BAKER, & P.L. DALBY.
1967 Vertebrados de la Isla del Toro, Veracruz. *An. Inst. Biolo. Univ. Nac. Auto. Mex.*, 38:1-8.

WILLIANS, K.L. & L.D. WILSON.
1966 Noteworthy Mexican reptiles in the Louisiana State University Museum of Zoology. *Proc. Louisiana Acad. Sci.*, 28:127-130.