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# *Kinosternon acutum* Gray 1831 – Tabasco Mud Turtle, Montera, Chechagua de Monte

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**Summary.– The Tabasco Mud Turtle, *Kinosternon acutum* (Family Kinosternidae) is a small turtle (carapace length in females to 120 mm and in males to 105 mm) that ranges from central Veracruz across the Tabasco lowlands of Mexico to northern Guatemala and Belize. It has previously been recognized as a highly derived member of the *K. scorpioides* species complex, but may actually be a member of the *K. leucostomum* complex. It lives in small streams, marshes, and ponds in forests and savannas, is carnivorous, and lays multiple clutches of 1 to 3 eggs each. Its former rarity in collections may be due to its secretive, nocturnal habits. Although it has a relatively restricted range, it is common at some sites. It is eaten locally, but inhabits some of the least disturbed regions of southeastern Mexico and northern Central America.**

**Distribution. – Belize, Guatemala, Mexico. Atlantic versant of southeast Mexico, Belize, and Guatemala, excluding the Yucatan peninsula.**

**Synonymy. – *Kinosternon scorpioides acuta* Gray 1831, *Kinosternon acutum*, *Cinosternum berendtianum* Cope 1865, *Cinosternon berendtianum*, *Kinosternon berendtianum*, *Swanka maculata* Gray 1869 (partim), *Cinosternon effeldtii* Peters 1873, *Cinosternum effeldtii*.**

**Subspecies. – There are no recognized subspecies.**

**Status.– IUCN 2011 Red List: Near Threatened (LR/nt) (assessed 1996, needs updating); CITES: Not Listed; Mexico: Norma Oficial Mexicana (NOM059 ECOL 2001): Special Protection.**

**Taxonomy**. — *Kinosternon acutum* was originally described as a variety of *K. scorpioides* by Gray in 1831 based on a single specimen from "Central America" (according to the data with the holotype), although the type locality was later restricted to "British Honduras" [= Belize] by Schmidt (1941). The species was subsequently also described as *Cinosternum berendtianum* by Cope (1865) based on two syntypes from "Tabasco", Mexico; as *Swanka maculata* by Gray (1869) based on a composite of specimens of *K. acutum* and *K. leucostomum* from Mexico and Guatemala; and as *Cinosternon effeldtii* by Peters (1873) based on a specimen from Veracruz, Mexico. However, it has correctly been known as *Kinosternon acutum* since the first use of that combination by Stejneger in 1941. Iverson reviewed the literature

**Figure 1.** Adult female *Kinosternon acutum* from Belize. Photo by John Iverson.

**Figure 2.** Adult female *Kinosternon acutum* from Belize. Photo by John Iverson.

for the species (1980), provided morphometric comparisons with its suspected sister taxon *Kinosternon creaseri* (1988), included it in a family-wide phylogenetic analysis (1991, 1998), and mapped its known distribution (1992). Pritchard (1979), Smith and Smith (1979), and Ernst and Barbour (1989) provided general reviews of this species.

Based on a phylogenetic analysis of morphology (Iverson 1991) and mitochondrial DNA (Iverson 1998), *K. acutum* was considered to be a member of the "*scorpioides*" group (e.g., *scorpioides*, *integrum*, *oaxacae*, etc.); however, recent unpublished molecular data (Iverson et al., in prep.) places it within the "*leucostomum*" group (*leucostomum*, *herrerai*, *dunni*, *angustipons*, and *creaseri*). Because of its parapatric distribution with *K. creaseri* from the Yucatan peninsula of Mexico, and their similar morphology, it was earlier hypothesized to be the sister taxon of that species (Iverson 1991), and this is supported by unpublished molecular studies (Iverson et al., in prep.). Although no subspecies are recognized, Iverson's (1988) analysis revealed some morphometric variation, with Veracruz and Oaxaca specimens differing slightly from those in Tabasco, Guatemala, and Belize. Furthermore, Vogt and Legler (in press) report that specimens from Veracruz have the ninth marginal elevated above the eighth, but not in specimens from Tabasco, Chiapas, Belize, and Guatemala, possibly indicating recognizable geographic variation in the species.

**Description**. — This is one of the smallest kinosternid turtles, with males reaching only about 105 mm and females reaching about 120 mm in carapace length (CL) (100 and 115 mm maximum plastron length, respectively). The adult carapace is usually unicarinate, but a faint pair of lateral keels is sometimes evident in subadults. The first vertebral scute is in contact with the second marginal, and the fourth pleural scute usually touches the eleventh marginal. The tenth and eleventh marginals are elevated above the level of the preceding marginals. The maximum shell height is less than 45% of CL. The carapace is brown to black in color and has dark seams.

**Figure 3.** Adult male *Kinosternon acutum* from Belize. Photo by John Iverson.

**Figure 4.** Adult female *Kinosternon acutum* from Belize. Photo by John Iverson.

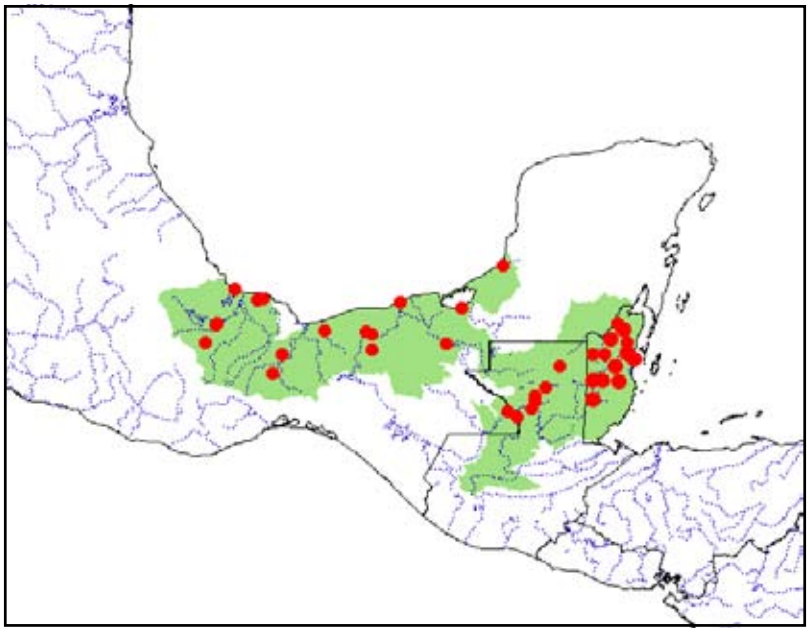

**Figure 5.** Distribution of *Kinosternon acutum* in southern Mexico, northern Guatemala, and Belize. Red dots = museum and literature occurrence records of native populations based on Iverson (1992), plus more recent and authors' data; green shading = projected native distribution based on GIS-defined hydrologic unit compartments (HUCs) constructed around verified localities and then adding HUCs that connect known point localities in the same watershed or physiographic region, and similar habitats and elevations as verified HUCs (Buhlmann et al. 2009), and adjusted based on authors' data.

The double-hinged plastron is not emarginate posteriorly. The gular scute length exceeds 50% of the plastral forelobe length. The interabdominal seam length is more than 27% of the maximum plastral length and more than 80% of the plastral forelobe length. The forelobe length is 27–33% of CL. The anterior width of the plastral hindlobe is 38-45% of CL, and the bridge length exceeds 29% of CL. The plastron and bridge are yellow to light brown with darker brown seams.

**Figure 6.** Juvenile *Kinosternon acutum* in its 3rd year of growth, basking on a rustic turtle trap in La Florida, Municipio Angel de Cabada, Veracruz, Mexico. Photos by R.C. Vogt.

The skin varies in color from gray to yellow to red. Yellow to red markings are always apparent on the limbs and on the head from the temporal region posteriorly onto the neck. The light color on the head, neck, and limbs is often obliterated by brown to black mottling. The chin color varies from white to yellow, and is mottled with brown or black. The nasal scale is bell-shaped and covers most of the dorsal surface of the skull. The adult female has a lighter chin, and a short stubby tail, whereas the male has a darker chin and and a long, thick tail. Both sexes have a terminal tail spine and lack tuberculate scales (clasping organs) on the posterior surface of the crus and thigh of each hind leg. Females are larger than males, have a more extensive plastron, a longer bridge, and a longer interanal seam.

*Kinosternon acutum* can be distinguished from all other mud turtles by the combination of small size, weakly keeled carapace, elevated eleventh marginals, large unnotched plastron, spade-shaped plastral hindlobe, long gular and abdominal scutes, lack of clasping organs, and large bell-shaped dorsal nasal scale. Photographs of the adult appear in Neill (1965), Pritchard (1979), Iverson (1980), Ernst and Barbour (1989), Lee (1996, 2000), Campbell (1998), Stafford and Meyer (2000), Schilde (2001), Köhler (2003), and Bonin et al. (2006).

**Distribution**. — This species is known from the Atlantic lowlands (< 300 m altitude) from northeastern Oaxaca

**Figure 7.** *Kinosternon acutum* habitat in Tecolapia, Veracruz, Mexico. Turtles forage in these shallow pools at night, and hide under leaf litter under trees and shrubs during the day. Photos by R.C. Vogt, 1998.

and central Veracruz, Mexico (Perez-Higareda 1978), east through northern Chiapas (Alvarez del Toro 1973, 1982) to southwestern Campeche (Duellman 1965), northern Guatemala (Stuart 1935), and northern Belize (Schmidt 1941; Neill 1965; Iverson 1976), but excluding the Yucatan peninsula. Contrary to Smith and Smith (1979), *K. acutum* does not occur in Laguna Escondida in Veracruz as stated by Perez-Higareda (1978); the habitat is inappropriate, twelve years of trapping of the Laguna by Vogt failed to produce this species, and Perez-Higareda's (1978) records were apparently based primarily on interviews with local fishermen (Vogt, unpubl. data). The species can be found in microsympatry with *K. scorpioides* and *K. leucostomum*.

**Habitat and Ecology**. — In the Rio Papaloapan drainage in Veracruz, Mexico, this species inhabits small ponds and marshlands in open areas (Vogt and Legler, in press; Vogt, unpubl. data). In Guatemala, it occurs in ponds and lakes in savanna habitats (Stuart 1935). Populations in Chiapas (Vogt and M. Ewert, unpubl. data), Quintana Roo (Duellman 1965), and Belize (John Polisar, pers. comm.; Vogt and Legler, in press) inhabit temporary forest pools, permanent ponds, sluggish streams, and shallow river margins in forested regions. They do not inhabit deep lakes as stated by Perez-Higareda (1978), nor are they found in deep rivers (unless washed there by floods; Vogt and Legler, in press).

Jim Buskirk (pers. comm.) reported that this species is known as "pochitoque jaguactero" in the Tabasco lowlands, because it is often found in association with an edible aquatic plant called "jaguacte". According to Stafford and Meyer (2000) the species is nocturnal in Belize. In Veracruz, Vogt and Legler (in press) found that during the rainy season (July–March), this species spends the day in the leaf litter at the base of shrubs or under fallen logs, but returns to shallow pools at night to forage. It is sometimes found large distances from water (Campbell 1998), indicating that it estivates terrestrially. The origin of the local name "Montera" in Veracruz comes from the fact that they leave drying pools and marshes and estivate by burying under vegetation in the surrounding low hills. Vogt and Legler (in press) found them estivating from April to July or August (the beginning of the rainy season).

In Veracruz, these turtles are often found in pairs (male and female), both in pools and in the leaf litter. Telemetry showed that they rarely were more than two meters apart for at least six months, and usually were within 6 cm of one another (Vogt and Legler, in press). Monitored females had home ranges of 169.5 $m^2$ (29–314; n = 4); whereas males had ranges of only 99 $m^2$ (52–198; n = 4) (Vogt et al. 2000; Vogt and Legler, in press). These authors also noted that individual turtles repeatedly used the same terrestrial resting sites and moved directly to and from the pool in which they regularly fed. Of 40 adult museum specimens examined by Iverson, 20 were females. In addition, Vogt and Legler (in press) reported equal sex ratios in each age class they examined.

Cope (1865) stated that the species nests in March and April (repeated by Campbell 1998 and Lee 2000, among others). Campbell (1998) reported that eggs are 30–33 mm x 18–19 mm and weigh 7–8 g, and hatch after 122–191 days, depending on temperature. Schilde (2001) documented that eggs of a female from Veracruz hatched after 127 days incubation at 28°C, and the hatchlings reached sexual maturity in about four years.

The female reproductive cycle at Lerdo, Veracruz, Mexico, has been studied by Vogt and Ewert (unpubl. data; see also Vogt and Legler, in press) and is characterized by the production of two to four clutches from the onset of the heavy fall rainy season in early September until the beginning of the dry season in March (see also Vogt, in Iverson 1999). One nest found 12 February was in loamy soil and covered with a mixture of dry leaves and soil; a second was found 2 June under similar conditions (Vogt and Legler, in press). One to three (mean 1.6) brittle-shelled, elliptical eggs are laid in two to four clutches per year. Twenty eggs averaged 33 mm (30–39) x 17 mm (15–19), and 6.2 g (4.4–9.1) (Vogt and Legler, in press). Incubation lasts 98–180 days at 25°C,

and varies depending on moisture and temperature regimes; the embryo exhibits both embryonic diapause and estivation (see also Ewert 1991, and Horne 2007). Sex is determined by incubation temperature, with the threshold temperature being about 27°C, and females produced at higher temperatures (Vogt and Legler, in press).

Hatchlings averaged 26.0 mm CL (25–29) and 3.8 g (2.8–4.7) (n = 12) (Vogt and Legler, in press). Plastral annuli on museum specimens measured by Iverson suggest that there is great variability in growth rates; Belize specimens had 2 (57 mm CL), 7 (94 mm CL female), and 9 annuli (85 mm CL male), whereas a Guatemalan specimen had 4 annuli (53 mm CL). Based on recaptures of marked turtles in Veracruz, Vogt and Legler (in press) determined that only a single scute annulus was produced per year. They found no difference in juvenile growth rate for males vs. females. Turtles with 3 annuli averaged 69 mm CL (54–82) and 41 g (22–64; n = 7); those with 4 annuli, 78 mm (52–103) and 63 g (18–140; n = 14); 5 annuli, 87 mm (62–102) and 91 g (28–147; n = 23); 6 annuli, 89 mm (60–108) and 93 g (26–142; n = 49); 7 annuli, 91 mm (64–104) and 94 g (30–157; n = 47); 8 annuli, 96 mm (78–108) and 110 g (62–185; n = 36); 9 annuli, 96 mm (76–107) and 107 g (46–150; n = 31); 10 annuli, 99 mm (91–110) and 116 g (91–154; n = 21); 11 annuli, 99 mm (75–111) and 124 g (51–171; n = 17); and 12 annuli, 100 mm (93–106) and 101g (102–165; n = 10). Vogt and Legler (in press) also reported that sexual maturity is reached in females at 77–97 mm CL after 5–8 yrs, and that males mature at sizes as small as 74 mm CL.

This species feeds primarily on insects and other small invertebrates captured at night in Veracruz (Vogt and Legler, in press). Stomach flushing of adults yielded larvae of Coleoptera, Lepidoptera, Odonata, dyticid beetles, small snails, and soil, but no plant material. The species is also carnivorous in captivity (Iverson, unpubl. data).

The estimated population size of *K. acutum* in a 5 ha area of temporary ponds in semi-open, *Acacia* grassland with some grazing in Veracruz was 756 (Vogt et al. 2000). This density indicates a standing crop biomass of about 16 kg/ha. Raccoons are known to prey on eggs and adults (Vogt and Legler, in press).

**Population Status.** — This species is locally abundant in small grassland ponds in Veracruz, Mexico, near Lerdo de Tejada, where Vogt and students collected and marked 419 in 1997 (Vogt and Legler, in press). They are easiest to find when ranchers are burning their pastures during the dry season, when turtles are estivating. Although many of the turtles perish, others are simply driven from their estivation sites. The species is still relatively common in undisturbed areas near the Rio Hondo in northern Belize (John Polisar, pers. comm.). Nothing is known of the current status of this turtle over the rest of its range.

**Threats to Survival**. — This species may be vulnerable to extinction because of its restricted range, but also because it is eaten locally by humans. All kinosternid turtles are indiscriminately eaten in Veracruz and Tabasco, Mexico, regardless of species or size. Specimens were also made into stuffed ornaments (often playing guitars and other instruments) and were sold in markets; in the Villahermosa markets many of these were *K. acutum*. This practice has been curtailed and is prohibited by law. Live turtles of any kind are no longer readily found in Mexican markets. But this does not mean they are not being sold or eaten. Habitat destruction (particularly pollution, deforestation, and draining of marshlands) is surely impacting some populations, but the species also occurs in some of the least disturbed habitats of Mexico and northern Central America.

**Conservation Measures Taken**. — The species is listed as Near Threatened on the IUCN Red List, being assessed in 1996. This assessment needs to be updated. It is listed as a species for Special Protection by the Norma Oficial Mexicana (NOM059 ECOL 2001).

There is a population within the Monte Azules Biosphere Reserve in the Selva Lacandona in Chiapas, Mexico, where there is no local interest in capture for food or sale. Vogt collected one there in 1984 and another in 1988 after they had been washed into large rivers following torrential rains. Locals in the region of Chiringuicharo, Selva Lacandona, often saw scores of this species when they burned their fields between 1980 and 2000 (Vogt, unpubl. data). The species is known from Tikal National Park in Guatemala (Stuart 1935).

**Conservation Measures Proposed**. — Populations in lowland Veracruz are particularly vulnerable and the establishment of Reserves there should be a top priority.

**Captive Husbandry**. — See Habitat and Ecology section.

**Current Research**. — Vogt and Flores are investigating geographic variation in this species (see Taxonomy section), since it may include two forms.

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