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E. Reyes-Grajales and J. B. Iverson. 2020. *Kinosternon abaxillare.*

Kinosternon abaxillare Baur *in* Stejneger 1925
Central Chiapas Mud Turtle

Kinosternon abaxillare Baur *in* Stejneger 1925:462. Type locality, "Tuxtla [Gutiérrez], Chiapas, Mexico." Holotype, United States National Museum (USNM; now Smithonian Institution National Museum of Natural History) 7518, the shell of an adult male collected by Dr. C. H. Berendt, apparently in 1863 or 1864 (see Smith and Smith 1980). The holotype is lost, but the junior author has examined the 11 paratypes (USNM 7519-29; Cochran 1961).

Kinosternun abaxillare: Alvarez del Toro 1973:20. *Lapsus*.

Kinosternon scorpioides abaxillare: Berry 1979:3186-B (also Ernst and Barbour 1989; Smith and Smith 1980). First use of combination.

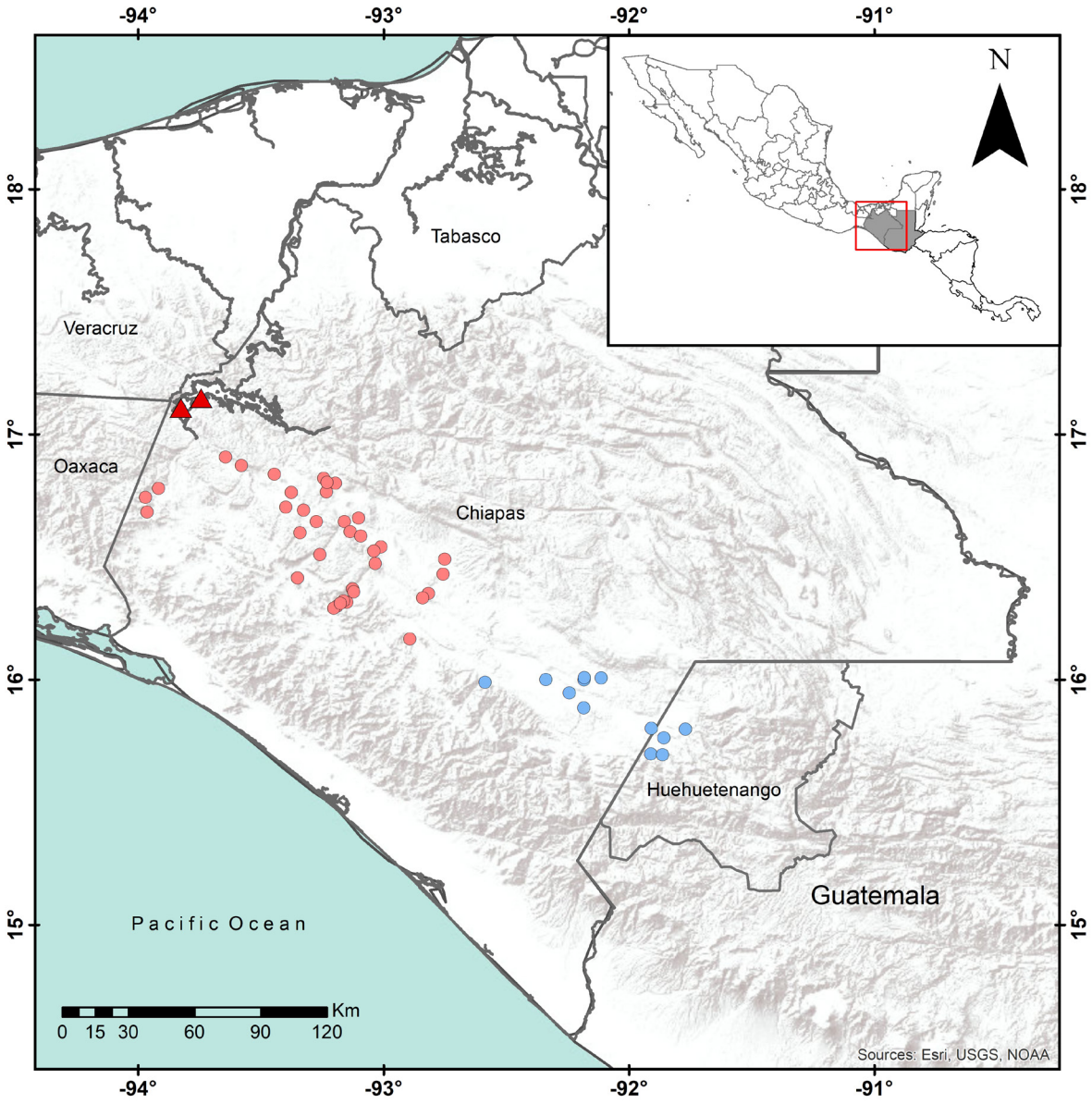
Kinosternon cruentatum abaxillare: Artner 2003:xix. First use of combination.

Kinosternon scorpioides abaxilare: Acuña and Merchán 2003:31. *Lapsus*.

CONTENT. No subspecies are recognized.

DESCRIPTION. *Kinosternon abaxillare* is a medium to large *Kinosternon*, with males in some populations exceeding 156 mm in carapace length, and females reaching 160 mm. The carapace is moderately to strongly tricarinate in all but the oldest, largest individuals. The shell is somewhat depressed (shell height averages 35% of carapace length in males, 38% in females). The first vertebral scute is wider than long; vertebral scutes 1–4 have distinct posterior notches at the midline in all but the oldest, largest individuals. In immature individuals, the second vertebral shield is the longest, and in mature specimens (of both sexes) the third vertebral shield is the longest; in both size classes the fifth vertebral shield is the shortest. The tenth marginal scute is higher than the ninth. The shape of the carapace is

Figure 1. Male *Kinosternon abaxillare* from Villa Hidalgo, Chiapas, México. Photograph by Eduardo Reyes-Grajales.



Map. Distribution of *Kinosternon abaxillare* in Chiapas, México, and Huehuetenango, Guatemala. The red dots indicate localities verified by the authors and the blue dots represent localities verified by collaborators (see **Acknowledgments**). The red triangles designate unverified records.

approximately oval (more evident in immature individuals and females than in males); the margins are distinctly flared outward in most populations. The carapace is highly variable in color, ranging from light brown to olive to black, with darker seams in all but the darkest individuals.

The plastron has two kinetic hinges, anterior and posterior to the abdominal scutes, and is concave to flat in males but slightly convex or flat in females. The plastron completely closes the shell (width of posterior plastral lobe averages 47% of maximum carapace length in males, 48% in females) with adult males having a smaller plastron than females. Maximum plastron length averages 100% of maximum carapace length in males, and 99% in females (Reyes-Grajales 2019). The posterior plastral lobe bears only a tiny posterior notch, or more typically none at all. Bridge length averages 28% of carapace length in males and 31% in females. The in-

Figure 2. Female *Kinosternon abaxillare* from Villa Hidalgo, Chiapas, México. Photograph by Eduardo Reyes-Grajales.

terabdominal seam length averages 30% of carapace length in males and 33% in females. Axillary scutes are usually absent, although the axillary-abdominal scute seam may be incomplete in some individuals (<15% in a population). For medial length of plastral scutes, the most common formula for all class sizes and sexes is interabdominal > interanal > gular > interhumeral > interfemoral > interpectoral. The interabdominal scute seam is long, averaging 29% of maximum carapace length (27–33%), and the interpectoral seam is short (3%). The color of the plastron may be yellow, orange, brown or black, usually with darker seams. The dorsal head shield is rhomboidal, bell-shaped, or triangular. The maxillary sheaths are weakly to strongly hooked, more strongly hooked in older males than in females or younger individuals. Head markings consist of yellow, cream, or pale gray dots or reticulations on a gray or olive background. The jaw sheaths are cream to yellow (more evident in adult females) with darker vertical streaks most conspicuous in older males. The skin of other soft parts is gray or brown, usually with many small, darker spots. There are three to four pairs of gular barbels, with the anterior pair the largest. Elevated patches of horny scales ('clasping organs' or 'vinculae') are absent from the posterior thigh and leg of both males and females. Males have longer, more prehensile tails than do females; the cloacal aperture is at or posterior to the carapace margin in males but is anterior to the carapace margin in females. The tails of both sexes have terminal spines, but the spines are larger in males.

DIAGNOSIS. The body size is medium relative to other *Kinosternon* (to only 170 mm carapace length). In addition to its localized geographic distribution, the most important character distinguishing *Kinosternon abaxillare* from congeners is the lack of axillary scutes; however, some individuals (< 10%) have full or partial axillary scutes (Iverson 2008; Reyes-Grajales 2019).

Figure 3. Details of the carapace (top row) and plastron (bottom row) of an adult female (left column) and an adult male (right column) of *Kinosternon abaxillare* from Villa Hidalgo, Chiapas, México. Photographs by Eduardo Reyes-Grajales.

PHYLOGENETIC RELATIONSHIPS. The relationships among the species of the genus *Kinosternon* are still uncertain. A tree based on combined mtDNA + nuDNA presented by Iverson et al. (2013) contained a clade with *Kinosternon abaxillare* and *Kinosternon oaxacae* as sister species, then most closely related to a clade comprising *Kinosternon scorpioides cruentatum* and *Kinosternon scorpioides scorpioides*. A subsequent phylogenetic analysis of the family Kinosternidae (Spinks et al. 2014) did not include *Kinosternon abaxillare*, but the sister species identified in the analysis by Iverson et al. (2013), *Kinosternon oaxacae*, was most closely aligned with *Kinosternon integrum* and *Kinosternon sonoriense*.

CONSERVATION STATUS. Not evaluated.

PUBLISHED DESCRIPTIONS. General descriptions were provided by Alvarez del Toro (1960, 1973, 1982), Berry (1978, 1979), Berry and Iverson (2001), Bonin et al. (2006a, 2006b), Legler and Vogt (2013), Reyes-Grajales (2018a, 2018b), Smith and Smith (1980), and Stejneger (1925). Specific descriptions include comparisons with other *Kinosternon* (*Kinosternon chimalhuaca*, *Kinosternon hirtipes*, *Kinosternon integrum*, *Kinosternon oaxacae*, *Kinosternon scorpioides* and *Kinosternon sonoriense*; Reyes-Grajales 2019); shell shape and morphometrics (Iverson, 2008, 2010; Reyes-Grajales et al. 2020; Sánchez-M. et al. 2000), and lack of cloacal bursae (Smith and James 1958).

ILLUSTRATIONS. Color photographs were published by Alvarez del Toro (1960, 1973, 1982; dorsal views), Arai (1998; general profile), Legler and Vogt (2013; dorsal and ventral views of male and female), Reyes-Grajales (2019; general, ventral, dorsal, head views

Figure 4. Dorsal (left column) and ventral (right column) views of adult, juvenile, and neonate (top to bottom) of *Kinosternon abaxillare* from Villaflores, Chiapas, México. Photographs by Eduardo Reyes-Grajales.

of neonates, juveniles, males and females), Turtle Taxonomy Working Group (2017; general profile), and Vetter (2005; general profile, the plastron, the side of the head, and the bridge). **Black-and-white photographs** were presented by Alderton (1988a, 1988b), Berry (1978; dorsal, ventral, head and bridge area), Freiberg (1972; general profile), and Pritchard (1979a; general profile and plastron).

DISTRIBUTION. *Kinosternon abaxillare* is endemic to the Grijalva River basin in the Central Depression of Chiapas and northwest Guatemala (Reyes-Grajales et al. 2020; Sánchez-M. et al. 2000). Our personal data and information presented by Rogner (1996) suggest that *Kinosternon abaxillare* occurs at altitudes of 300 to 860 m. This taxon occurs in a variety of permanent, semipermanent, and temporary aquatic habitats, primarily at low and medium elevations across its range. The general distribution was described by Turtle Taxonomy Working Group (2017). Additional distributional information is available for México (Alvarez del Toro 1960, 1973, 1982; Bannikov 1969; Bonin et al. 1998, 2006a, 2006b; Bour 2004; Darevskiy and Orlov 1988; Ferri 1999, 2002; Fotolulu 2018; Fritz and Havaš 2007; Iverson 1985, 1986, 1992; Johnson 1989; Nelson and Nickerson 1966; Rhodin et al. 2008; Smith and Smith 1980; Turtle Taxonomy Working Group 2007, 2009, 2010, 2011, 2012, 2014).

FOSSIL RECORD. None.

PERTINENT LITERATURE. General reviews were published by Alvarez del Toro (1960, 1973, 1982), Berry (1978, 1979), Berry and Iverson (2001), Casas Andreu (1965,

Figure 5. Presence of axillary scutes in a juvenile of *Kinosternon abaxillare* from San Fernando, Chiapas, México. Photograph by Eduardo Reyes-Grajales.

1967), Gijzen and Wermuth (1958a, 1958b), Pritchard (1967, 1979a, 1979b), Smith and Smith (1980). This taxon is listed in numerous species checklists (David 1994; Ernst and Barbour 1989; Ferri 1999, 2002; Ferri and Soccini 2015; Fritz and Havaš 2007; Iverson 1985, 1986, 1991, 1992; Jordan 1972; King and Burke 1989; Kirkpatrick 2006; Maldonado-Koerdell *in* Beltran 1953; Mertens and Wermuth 1955; Rhodin et al. 2008; Schilde 2001; Smith and Smith 1976; Turtle Taxonomy Working Group 2007, 2009, 2010, 2011, 2012, 2014; Welch 1994; Wermuth and Mertens 1961, 1977). Other important references are **activity** (Reyes-Grajales 2019; Reyes-Grajales et al. 2020), **anatomy** (Parsons 1968; Smith and James 1958), **blood and blood proteins** (Sullivan and Riggs 1967a, 1967b, 1967c), **captive breeding** (Lucas and Biegler 1971; Pawley 1971; Slavens 1976), **chromosomes and karyotypes** (Bickham and Carr 1983; Gilboa 1975; Moon 1972, 1974; Sites et al. 1979), **climate change effects** (Berriozabal-Islas 2018; Berriozabal-Islas et al. 2018), **conservation status** (Macip-Ríos et al. 2015; Rhodin et al. 2018), **distribution** (Amori and Luiselli 2019; Bannikov 1969; Bour 2004; Darevskiy and Orlov 1988; Johnson 1989; Johnson et al. 2015; Köhler 2000; Smith and Smith 1980; Smith and Taylor 1950a), **ecology** (Iverson 1982; Reyes-Grajales 2018a, 2018b, 2019; Reyes-Grajales et al. 2020, in review; Sánchez-M. et al. 2000), **feeding** (Reyes-Grajales 2018a, 2018b; Sánchez-M. et al. 2000), **habitat** (Alvarez del Toro 1960, 1973, 1982), **longevity** (Mertens 1970; Nöllert 1992; Slavens 1981, 1982, 1987, 1988; Slavens and Slavens 1991, 2000), **morphology** (Berlant and Stayton 2017; Casas Andreu 1965, 1967; Gijzen and Wermuth 1958a, 1958b; Iverson 1984; Kilias 1957; Smith and Smith 1980), **parasites** (Reyes-Grajales 2018a, 2018b), **phylogeny** (Bickham and Carr 1983; Iverson 1988; Iverson et al. 2013; Ramirez Guerra 2016; Spinks et al. 2014), **population size and density** (Iverson 1982; Reyes-Grajales 2018a, 2018b, 2019; Reyes-Grajales et al. 2020; Sánchez-M. et al. 2000), **predators** (Reyes-Grajales, 2018a, 2018b), **reproduction** (Alvarez del Toro 1973, 1982; Bull et al. 1974; Iverson 2008; Macip-Ríos et al. 2017; Moll 1979; Vázquez Gómez et al. 2015), **sexual dimorphism** (Ceballos and Iverson 2014; Iverson 2008; Reyes-Grajales 2019; Reyes-Grajales et al. 2020), **size and growth** (Iverson 2008; Reyes-Grajales 2019), **taxonomy** (Anony-

Figure 6. Dorsal view of hatchling (top) and egg (bottom) of *Kinosternon abaxillare* from Villa Hidalgo, Chiapas, México. Photograph by Eduardo Reyes-Grajales.

Figure 7. Typical habitat of *Kinosternon abaxillare* in Villa Hidalgo, Chiapas, México. Photographs by Eduardo Reyes-Grajales.

mous 2014; Berry 1978; Bickham and Carr 1983; Bonin et al. 1998, 2006a, 2006b; Bour 2004; Casas Andreu 1965, 1967; Cochran 1961; CONABIO 2009; Darevskiy and Orlov 1988; Forero-Medina and Castaño-Mora 2011; Fotolulu 2018; Frair 1972; Greene [1971]; IUCN/SSC Tortoise and Freshwater Turtle Specialist Group 1989; Iverson 1989; Iverson et al. 2013; Liner 2007; Mueller 1998; Müller 1987; Otani and Kawazoe 2018; Rhodin et al. 2008; Rogner 1996; Rojas-Runjaic et al. 2015; Rust 1938; Slavens 1976, 1981, 1982, 1987, 1988; Slavens and Slavens 1991, 2000; Smith and Smith 1980; Smith and Taylor 1950b, 1966; Turtle Taxonomy Working Group 2007, 2009, 2010, 2011, 2012, 2014), and **vernacular names** (Darevskiy and Orlov 1988; Fotolulu 2018; Franklin 2007; Liner 1994; Obst 1986a, 1986b; Reyes-Grajales 2019; Wrobel 2004).

ETYMOLOGY. The specific name *abaxillare* is a descriptive adjective derived from the Latin *axillares*, referring to the axilla (axillary

Figure 8. Variation in color and pigment in the carapace of *Kinosternon abaxillare.* Photographs by Eduardo Reyes-Grajales.

scute, in this case), and preceded by the prefix *ab* meaning "without;" hence, "without an axillary scute."

ADDITIONAL VERNACULAR NAMES. People in the Tuxtla Gutierrez region often call this turtle casquito, casquito moteada, casquito de cabeza pintada, tortuga, tortuga apestosa (unpublished observations by the authors), and casquito pardo (Liner 1994). This species has also been referred to as the Chiapas Mud Turtle (Obst 1986a, 1986b; Sokolov 1988; Wrobel 2004), Чьяпасская Замыкающаяся Черепаха (Darevskiy and Orlov 1988), Chiapas-Klappschildkröte (Müller 1987; Sokolov 1988); Central Chiapas Mud Turtle (Artner 2008; Berry and Iverson 2011; Franklin 2007; Legler and Vogt 2013; Liner 1994; Mueller 1998; Turtle Taxonomy Working Group 2017), Zentral-Chiapas-Klappschildkröte (Rogner 1996), Cinostserne [sic] de Chiapas (Wrobel 2004), Mexican Red-spotted Mud Turtle (Slavens 1981, 1982, 1987, 1988), and Baur's Skorpion-Klappschildkröte (Fotolulu 2018).

REMARKS. *Kinosternon abaxillare* was considered a subspecies of *Kinosternon scorpioides* for 34 years; consequently, many general literature references to *Kinosternon scorpioides* between the years of 1979–2013 do not pertain to *Kinosternon abaxillare*.

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