A New Species of Mud Turtle (Testudines: Kinosternidae) from the Tres Marías Islands, Nayarit, Mexico.

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ABSTRACT. – The mud turtles in the Islas Tres Marías archipelago, off western Nayarit, are one of the earliest known *Kinosternon* populations from Mexico, with discovery dating from the late 19th century. Though known for almost a sesquicentennial, the identity of the species there was originally confused in a nearly century-long serial fluctuation that vacillated between that of *K. integrum* and that of *K. hirtipes*. This taxo-nomenclatural history is fully reviewed here, and following the neotype designation and sensu stricto redefinition of *Kinosternon integrum* LeConte, 1854 by Joseph-Ouni *et al.* (2025), these insular mud turtles were investigated from a taxo-morphological perspective. They are described here as constituting a distinct new species in the *K. integrum* complex based on a suite of morphometric, morphological and colorimetric characters. The origin of these mud turtles is believed to be vicariant, as no evidence of human introduction is apparent. As no suitable habitat exists on the remaining islands, the new species is endemic solely to Isla María Madre, joining a long list of endemic vertebrates from this spectacular hotspot of biodiversity.

Keywords: Testudines; Kinosternidae; new species; Isla Tres Marías, Nayarit, Mexico; *Kinosternon integrum* complex.

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Figure 1.
An alert adult Tres Marías Mud Turtle *Kinosternon mariamadre* **sp. nov.** from Isla María Madre, Islas Tres Marías, Nayarit, Mexico.

INTRODUCTION & HISTORY

The population of mud turtles of the genus *Kinosternon* occurring in the Tres Marías Islands off western Nayarit was one of the earliest recorded of those in Mexican herpetological history, being first mentioned and illustrated almost a sesquicentennial ago by Günther (1885). They only inhabit María Madre Island, the largest and second most northerly in the four-island archipelago, and even then only in reduced select habitat. The other three main islands - San Juanito, María Magdalena and María Cleofas - all lack suitable freshwater habitat, and no mud turtles have historically been noted.

Terrestrial vertebrate colonization there is believed to be either vicariant or through serendipitous saltwater rafting (Zweifel, 1960), and no evidence for human introduction is documented in the case of the mud turtles. Their particular morphology as discussed here is clearly mainland-derived, as is that of numerous species and subspecies of mammals, birds and other reptiles, several of these being entirely endemic. How a group of freshwater turtles with such an obscure existence came to be discovered so early in nascent zoology remains fascinatingly rooted in the saga of a forgotten natural history collector (Feest, 2023), discusssed below.

Equally interesting is that these turtles figured prominently in a disquieting debate about their true taxo-morphological identity for nearly 75 years, in a frustrating situation that Iverson (1981) observed "has plagued herpetologists". Since Günther's (1885) original disclosure, the population of which he determined to be referrable to the species '*Cinosternum hirtipes*' (=*Kinosternon hirtipes*), the nomenclatural identification has vacillated in a serial fluctuation between that taxon and that of *K. integrum* (Iverson, 1981), apparently finally coming to rest in the favor of the latter in a last word by Hardy & McDiarmid (1969).

Günther (1885) features illustrations of a juvenile and an adult female from the "Tres Marias Islands", two specimens which exist to this today in the Natural History Museum, United Kingdom (formerly named the British Museum of Natural History). From a morphological perspective, he confined his remarks solely to that of the condition of the development of the "axillary and inguinal plates" (scutes in modern parlance), denoting the scutational gap between those two scutes and the state of the axillary being "merely rudimental" from this locality. Günther erred in his attribution of the Tres Marías form to that of '*Cinosternum hirtipes*' which we now know almost always displays broad contact of those scutes along the bridge. However, in those days, he as well as others (Dugés, 1888 for example) considered *K. hirtipes* to be simply a "southern and more developed form of *Cinosternon pennsylvanicum*" (itself a synonym of the endemic United States *K. subrubrum - our comment*) then believed to range widely throughout North America and Mexico. Günther's (1885) black and white (grayscale) renderings of the Tres Marías mud turtle specimens are featured on plates 12 and 15 (original applicable text and both plates reproduced in Appendix B, *this current study*), capturing several of the characteristics that we consider to demarcate this taxon in the *K. integrum* species complex (see formal description below).

After Günther (1885), Boulenger (1889 - pertinent text reproduced in Appendix C, *this current study*) revisited the identification of those two specimens in his catalogue of the turtles in the British Museum. He determined them to be referrable to '*Cinosternum integrum*' without explicit analysis but in a footnote commented that his colleague Dr Günther remained in adherence to the opinion that the species in the Tres Marías and the nearby Sinaloan mainland of western Mexico was '*Cinosternum hirtipes*'.

In his catalogue of turtle specimens housed in St. Petersburg, Russia, Strauch (1890 - pertinent text reproduced in Appendix D, *this current study*) placed the specimens of mud turtle of western Mexico under '*Cinosternon integrum*'. Though he did not mention the Tres Marías Islands specifically, his synonymy contains the references to the specimens identified by Günther as '*Cinosternum hirtipes*'; therefore, by virtue of this, he also considered Tres Marías specimens as well to '*C. integrum*'.

Following the acclaimed biological expedition to Mexico (1892-1906) conducted by E.W. Nelson and E.A. Goldman, both of the United States National Museum, Stejneger (1899 - pertinent text reproduced in Appendix E, *this current study*)), now with access to five newly collected specimens, had "no hesitation in endorsing Boulenger's view that the Tres Marias mud turtles are *K. integrum* and not *K. hirtipes*, as held by Günther". Intriguingly, Stejneger (1899) states that the "island specimens...do not differ from those of Colima, Guanajuato, Cuernavaca (Morelos), Acaponeta (Tepic), Guadalajara (Jalisco), Presidio, and Mazatlan (Sinaloa), from all of which localities I have examined specimens". That is, he did not or could not, differentiate the Tres Marías *K. integrum* from those populations across all of western, central and southern Mexico. Importantly, the application of the modern nomenclature of *Kinosternon integrum* to the identification of the Tres Marías mud turtle first emerges here.

The see-saw suddenly tilted again with Gadow (1905 - pertinent text reproduced in Appendix F, *this current study*), who claimed that '*Cinosternum hirtipes*' "ranges from Arizona and New Mexico along the Pacific side into Jalisco, and includes the Tres Marias Islands".

Just one year later, Siebenrock (1906 - pertinent text reproduced in Appendix G, *this current study*) tilted back in favor of the indentification of the western Mexico mud turtles belonging to *Kinosternon integrum* (Siebenrock favored the subspecies status *Cinosternum scorpioides integrum*) and against that of *K. hirtipes*. He perhaps fires an ungracious rebuttal here at Günther with the loaded comment "However, individual differences between the two species are so great that it seems hardly believable how Günther (Biol. Cent. Amer. Rept. 1885) could have confused these species" (our translation from the original German). Siebenrock (1906) continues: "and although Boulenger (l. c.) has already corrected Günther's error, Gadow (Proc. Zool. Soc. 1905) nevertheless supports Günther's view, stating in his last treatise on the geographical distribution of amphibians and reptiles in Mexico that *C. hirtipes* Wagl. is distributed from Arizona and New Mexico along the Pacific coast in Jalisco, including the Tres Marias Islands".

The second application of the modern nomenclature of *Kinosternon integrum* to the identification of the Tres Marías mud turtle was used by Slevin (1926 - pertinent text reproduced in Appendix H, *this current study*), based on a newly obtained specimen "found half buried in the mud under an old stump in the creek at Arroyo Hondo, María Madre Island, May 17, 1925." Strangely, the measurements of this specimen's shell provided by Slevin point to the most monstrously large extant mud turtle on record but are significantly in error (see Notes section below for commentary and correction).

In what may be interpreted as unsubstantiable, since no specimens were examined to justify it, Smith & Taylor (1950 - pertinent text reproduced in Appendix I, *this current study*) simply listed both *K. integrum* and *K. hirtipes* as found in the Tres Marías, followed by Casas Andreu (1967). In between, there were two other shifts, one by Wermuth & Mertens (1961) who reproduced portions of Günther's (1885) plates and his identification to *K. hirtipes*, and the other in a confident comment by Norman Hartweg (in Zweifel 1960) that "*K. integrum* is the only species of the genus that gets to the Tres Marías". Zweifel's (1960 - pertinent text reproduced in Appendix J, *this current study*) summary was based on a well-marked male specimen that was collected on April 7, 1957 at the same Arroyo on María Madre Island as Slevin's (1926) specimen and which serves as the holotype

of the new species description below.

As an epilogue, Hardy & McDiarmid (1969 - pertinent text reproduced in Appendix K, *this current study*) in their review of the herpetofauna of Sinaloa briefly discuss the history of confusion between the attribution of western Mexico *Kinosternon* to *K. hirtipes* versus *K. integrum* and umabiguously conclude in favor of the latter.

In what Iverson (1981 - pertinent text reproduced in Appendix L, *this current study*) hoped was "the final chapter in this prolonged story" he "emphatically" supported Hartweg's opinion to Zweifel (1960) that *K. integrum* is the only species in the Tres Marías. His hope has been proven true in the literature and in reality ever since.

Following the neotype designation and sensu stricto redefinition of *Kinosternon integrum* LeConte, 1854 by Joseph-Ouni *et al.* (2025), the population of mud turtles on Maria Madre Island in the Tres Marías archipelago of Nayarit, Mexico formerly assigned to that taxon are currently examined here and found to constitute a distinct undescribed species in the *K. integrum* species complex, formally diagnosed and described below.

METHODOLOGY

See Joseph Ouni *et al.* (2025) for a full description of the *Kinosternon* diversity project and methodology used, including specimen pools and description and illustration of the suite of 246 numerical (140 enumerated) morphological character states used in these serial contributions. The new species here is directly compared to *Kinosternon integrum* sensu stricto with which it forms part of the *K. integrum* complex. The five designated paratypes of the new species housed in the Smithsonian National Museum of Natural History will be analyzed and figured in a supplementary effort when further access to the specimens becomes available.

A full monograph comparing this new species to all other taxa in the *K. integrum* species complex as well as other *Kinosternon* species will be presented as a standalone production (*in prep.*). We expect genetic investigation will be conducted by other colleagues in the future to further assess the distinctiveness of these proposed species that may currently lack molecular data.

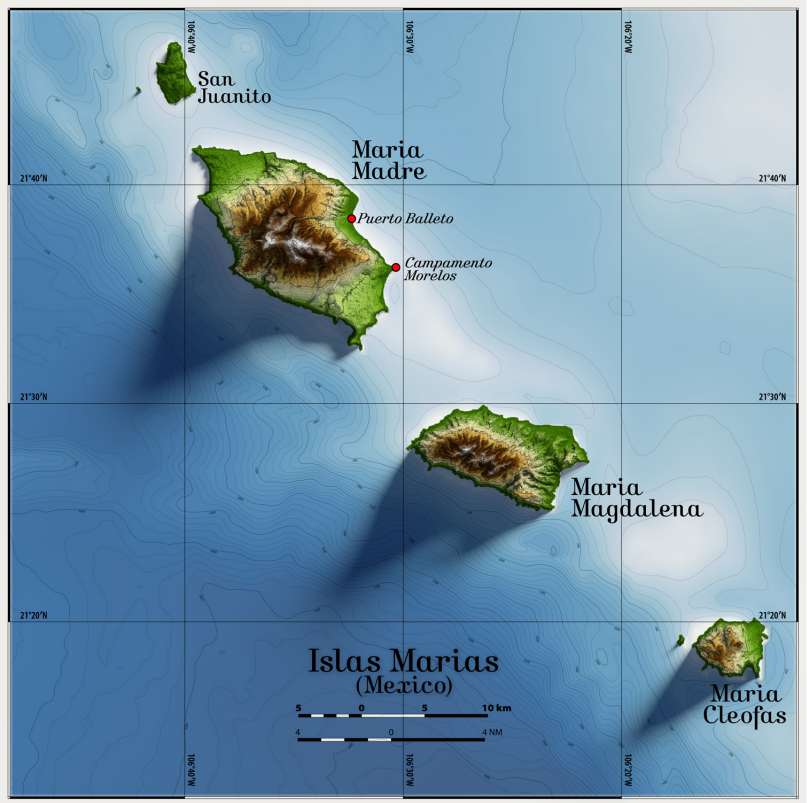

Figure 2. Topographical map of the Islas Marías archipelago, Nayarit, Mexico.
Image credit: author Vallee, https://commons.wikimedia.org/wiki/File:Islas_Maria.png License link: https://creativecommons.org/licenses/by-sa/4.0/deed.en

SYSTEMATICS

Order: Testudines Batsch, 1788
Suborder: Cryptodira Cope, 1869
Family: Kinosternidae Hay, 1892
Genus: *Kinosternon* Spix, 1824
Subgenus: *Kinosternon* Spix, 1824

TRES MARÍAS MUD TURTLE

Kinosternon (Kinosternon) mariamadre **sp. nov.**
(Figures 2 through 9; 11, 12)

ZOOBANK REGISTRATION
urn:lsid:zoobank.org:pub:FFA3A58C-42B0-4C80-A599-C7D02954623A
urn:lsid:zoobank.org:act:7BE07620-88AB-41E4-8F29-8710198F66EE

Holotype.- An adult male, AMNH R77437 (Figure 2) collected by Richard G. Zweifel from Arroyo Hondo, María Madre Island, Tres Marías Islands, Nayarit, Mexico on April 7, 1957 (original registration number RZ 3355 in the Zweifel collection, Puritan-American Museum of Natural History).

Paratypes.- USNM 24606; USNM 24607; USNM 24608; USNM 24609; USNM 24610 (four adults, one juvenile) all collected on May 15, 1897 (Stejneger, 1899) from María Madre Island during the visit to the Tres Marías Islands, from April 28 to June 1, 1897 during the Nelson and Goldman biological survey expedition to Mexico from 1892 to 1906 (Goldman, 1951); CAS 58675, an adult male specimen collected at Arroyo Hondo, María Madre Island, on May 17, 1925. The British Museum specimens examined by Günther(1885) were collected by A. Forrer in 1881, with registration numbers NHMUK 1881.10.1.74 and NHMUK 1881.10.1.111 (Loc-Barragán & Ramírez-Silva, 2024) and are considered referred specimens for the purposes of this current paper.

Distribution.- As currently understood, endemic to Isla María Madre, Islas Tres Marías, San Blas municipality, Nayarit, Mexico. No suitable habitat exists on the remaining islands, and no historical records of specimens there are known. The *Kinosternon* species in the *K. integrum* species complex on the adjacent Nayarit mainland are believed to constitute a separate taxon (*in prep.*).

Etymology.- A toponym named for the island of inhabitation, María Madre.

Notes.- This María Madre population was neither plotted in the distribution map nor mentioned specifically in the text as part of the *K. integrum* evaluation profile by Iverson *et al.*, 1998) but its taxo-nomenclatural history was expounded by Iverson (1981). The population is plotted by TTWG (2021).

Adult male paratype specimen of *Kinosternon mariamadre* **sp. nov.** CAS 58675 was taken by the California Academy of Sciences expedition which voyaged on the *U.S.S Ortolan* to the Tres Marías and Revillagigedo Islands in the spring of 1925. It was collected after being "found half buried in the mud under an old stump in the creek at Arroyo Hondo, María Madre Island, May 17, 1925". Unfortunately the specimen's measurements presented by Slevin (1926) point to a large animal, given as 290 mm carapace length, 270 mm plastron length, 192 mm carapace width, and 161 mm plastron width, which are clearly in error for *Kinosternon*. The correct measurements are 144.6 mm maximum carapace length, 137.1 mm maximum plastron length and 97.9 mm carapace width (courtesy of J.B. Iverson, pers. comm.).

Adult male holotype specimen of *Kinosternon mariamadre* **sp. nov.** AMNH R77437 was taken from a large pool at Arroyo Hondo, María Madre Island, which contained no other sign of aquatic vertebrates. Zweifel (1960) gives the life colors of this specimen as: "top of the head, carapace, limbs, and tail a nearly uniform, patternless, dull black. The chin and the side of the head were mottled with yellow, and the plastron was yellow, with dark brown markings following the sutures".

Diagnosis and Description.- A medium-sized species of mud turtle in the *Kinosternon integrum* species complex measuring to 170-180 mm in adult males and 165-175 mm in adult females (some specimens potentially slightly larger); defined by the following combination of characters:

Carapace: (Figure 3a) - dark brown to black overall carapace in color, an elongated oval in dorsal view, body shape somewhat cylindrical in males with posterior marginal flaring; in male holotype the following metrics: carapace length 1.65x the width; carapace length 2.94x the depth; carapace width 1.78x the depth; carapace length 2.38x the posterior length and 4.8x the P3 length; cervical scute narrow long rectangle with nuchal emargination slight; M2 larger than M1; V1 width subequal to length; V1-P1 sulcus contacts exteriormost M1 or the M1/M2 sulcus; V4 the largest of V2, V3, V4; V1-P1 sulcus with interior insinuation; posterior profile of lateral shell compressed with moderate 50-55 % drop off; V1 strongly carinated, with overall unicarinate shell; tricarination (sagittal keel minor but present); lateral marginals with minor to moderate curling, starting at M4 to M5; M9 higher than M8; M10 higher than M9 and strongly higher than M11; M10 with moderate diagonal flaring; posterior shape of carapace in posterior view strongly domed; carapace sculpture smooth with minor pock-marking and ridging; V1-V2 sulcus shape straight; M10/V5 sulcus strongly lies to the exterior of the level of the V4-P3-P4 conjunction.

Plastron: (Figure 3b) - plastron yellow to orangish-yellow in base color with darker sulci; dark brown to black lines mirroring all plastral sulci; ventral marginals base yellow with heavy darker brown muting; axillary scute ranging from posterior M4 to posterior M5 and is brown in color; inguinal scute ranging from posteriormost M5 to middle M8 and in color base yellow with heavy darker brown muting; slight axillary-inguinal gap always present except in obvious inframarginal deformation; anterior plastral lobe shorter than posterior lobe, both lobes longer than fixed lobe in both sexes; anal scute notch minor; posterior plastral hinge with strong posterior bow; plastron almost entirely covers ventral shell opening; plastral midline sulcus formulae IPH>IAn>IGSL>IG>IF>IAH; widest point of plastron occurring at approximately 36 anterior percent of the plastral midline; axillary notch present but reduced; inguinal notch present and moderately viewable; interfemoroanal sulcus lies posterior to the M9-M10 sulcus; in the male holotype, the following metrics: intergular scute shorter than wide; bridge length 1.16x the IAn; IAn 0.79

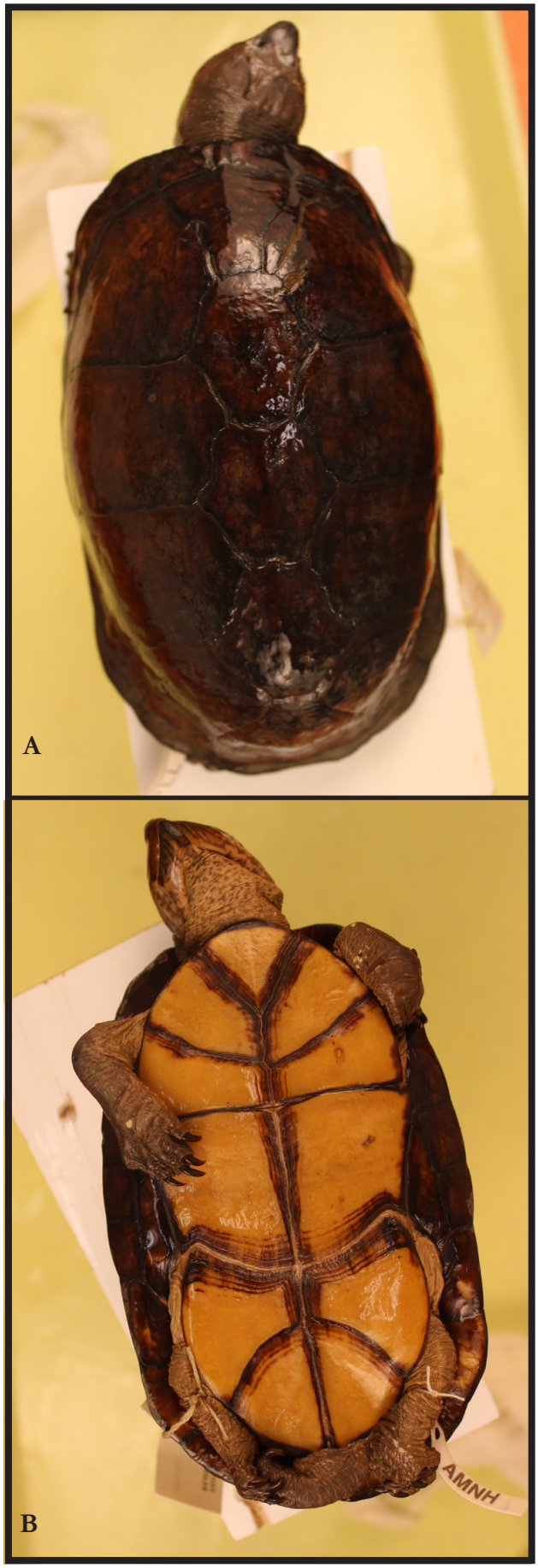

Figure 3. Adult male holotype of *Kinosternon mariamadre* **sp. nov.** AMNH R77437 from María Madre Island, Tres Marías Islands, Nayarit, Mexico.

length of IHP; axillary notch opening accounts for 8% of axillary plastron width; inguinal notch opening accounts for 12% of inguinal plastral width; inguinal scute 2.28x length of axillary; inguinal length 1.27x the length of M6/M7; inguinal scute terminates strongly posterior of exterior point of posterior plastral hinge; inframarginal row length 1.22-1.23x that of anterior lobe and that of posterior lobe; carapace length 3.97x bridge length; and carapace width 2.40x the bridge length; plastral midline length 2.44x the width of the posterior hinge; plastral midline length 2.34x that of inframarginal row length.

Head and Limbs: (Figure 4) - in the male holotype, the following metrics: head length approximately 1.58x depth; head length approximately 1.11x width; carapace length 3.93x head length; head width 90% of anterior scutes width; maxillary beak sharp but overall moderately developed in males; overall head coloration is yellow to yellow-brown with moderate dark brown to black reticulations on lateral face; dorsal head slightly darker with darker outline yellow to pale spots positioned post-orbitally; nasal scale yellowish with darker markings and heavy darker muting; maxillary and mandibular rhamphothecae yellow in base color with thin but heavy dark brown to black linear markings and reticulatiosn; posteriormost point of maxillary rhamphotheca ends level to posterior orbit; dorsal terminus of madibular rhamphotheca ends level to maxillary terminus in males; ventral terminus of manidbular rhamphotheca ends posterior to dorsal terminus; males with strong single premaxillary black stripe and strong single symphyseal black stripe; nasal scale strongly laterally compressed bell-shaped with deep posterior emargination (length being only 1.82x emargination); nasal scale lateral termini end anterior to the posterior orbit and are moderately truncated in shape with strong or minor bilobing; throat is pale yellow to pale gray-brown with moderate fine black spotting scattered throughout; width across the nasal scale termini approximately 1.38x the preorbital width; midline nasal scale length approximately 68% of width of nasal scale across termini; 2 pairs of small-to-moderate chin barbels present and one small pair of throat barbels; dorsal coloration of the limbs and tail dark brown to dark gray/brown and paler shades of these ventrally; dorsal forelimb contains three thin, laterally elongated scales all relatively even in shape and size and are equidistant; phalangeal scales present but not well-developed, each phalange bearing 2-3 scales.

Figure 4. Additional images of adult male holotype of *Kinosternon mariamadre* **sp. nov.** AMNH R77437: A) left lateral head; B) direct dorsal head and nasal scale; C) direct ventral head and throat; D) scalation of dorsal right forelimb).

Figure 5. Images of adult female Tres Marías Mud Turtle *Kinosternon mariamadre* **sp. nov.** from Isla María Madre, Islas Tres Marías, Nayarit, Mexico.

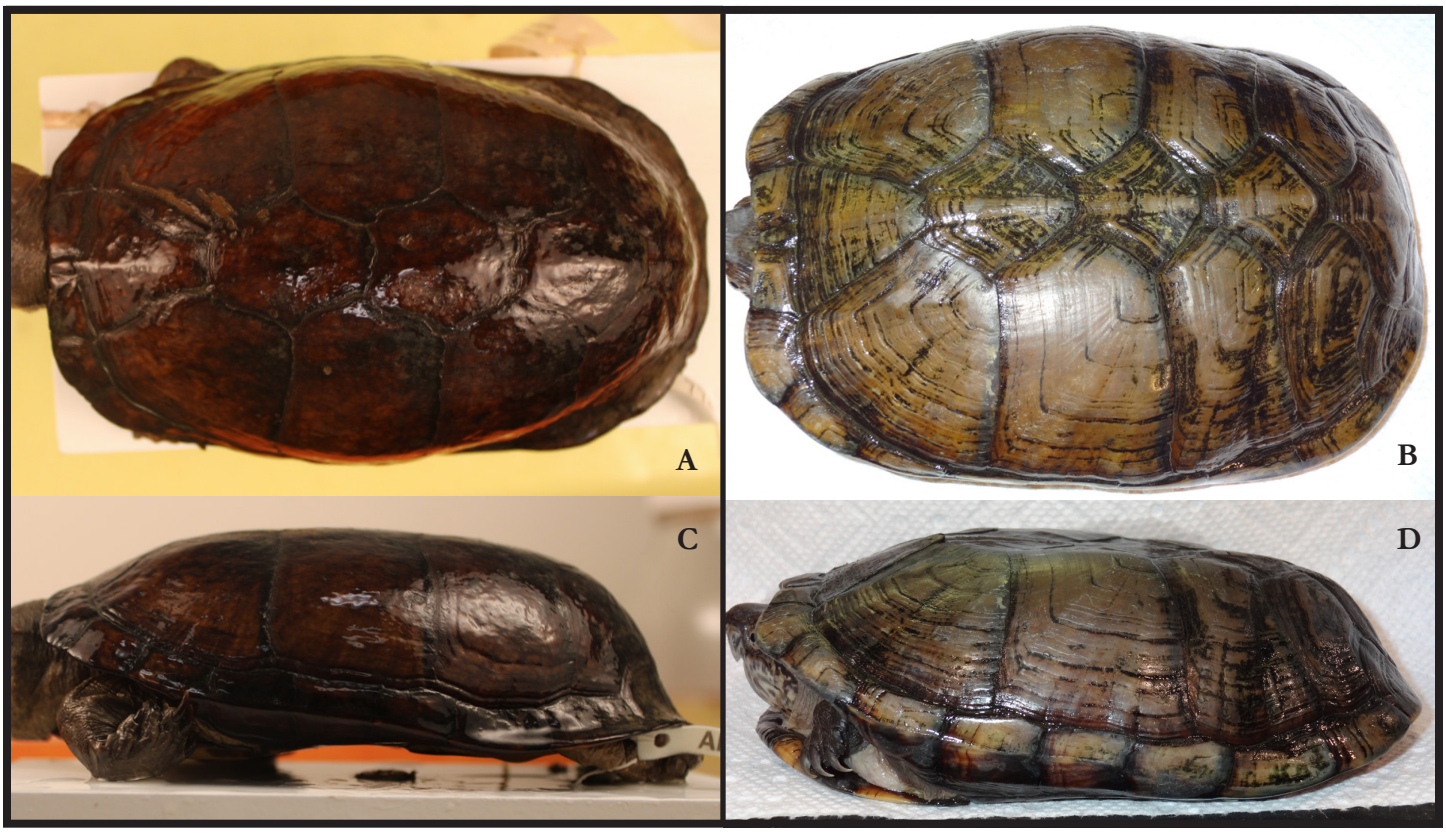

Figure 6. Comparison of the dorsal carapace (letter A) and lateral carapace (letter C) of the adult male holotype of *Kinosternon mariamadre* **sp. nov.** AMNH R77437 with that of a live male *K. integrum* sensu stricto (letters B and D).

In female specimens, the carapace is more evenly oval in dorsal view and shell overall rounded in shape and a lighter dull gray-brown to dull black in color; the head is a paler greenish to grayish yellow with overall fewer dark markings but still with pale to light spots and markings on a darker dorsal head; plastron is overall broader and yellow in color with overall less dark muting and fewer dark sulci outlines.

The full suite of 246 numerical (140 enumerated) character states for the male holotype is presented in Appendix A. Figure 5 presents live coloration and patterns of an adult female.

SPECIES COMPARISONS

Kinosternon mariamadre **sp. nov.** is morphologically differentiated from *Kinosternon integrum* sensu stricto by the following characters and character states (Figs 6 - 9; 12):

In the male holotype: Carapace an elongate oval in dorsal view with stronger posterior marginal flaring (carapace length 1.65x width vs 1.48x) in dorsal view, and a more tapered anterior and posterior marginal rim; carapace sculpture smooth with light pock-marking and ridging versus a strongly annulated texture; a minimal anal scute notch versus moderately stronger developed; a higher V1 length vs width (0.99 vs 0.77); a higher V5 length vs width (0.92 vs 0.65); an overall rounded lateral profile; less extensive lateral curling of the marginals involving more posterior marginals (versus stronger curling with more anterior marginals); a more evenly rounded anterior arch of the carapace (versus depressed); a much higher domed posterior carapace arch (versus more depressed); a lower carapace width vs V1 width (2.46x vs 2.92x); a lower carapace width vs V3 width (2.69x vs 3.14x); a lower carapace width vs V4 width (2.50x vs 2.98x); a lower carapace length vs V4 length (4.13x vs 4.41x); a sagittal keel exterior of the V-P conjunctions (vs coincident with); a lower V2 width vs V1/V2 (2.46x vs 2.99x); a lower V3 width vs V2/V3 (2.21x vs 2.84x); a lower V4 width vs V3/V4 (2.7x vs 3.01x); a lower V4 width vs V4/V5 (3.00x

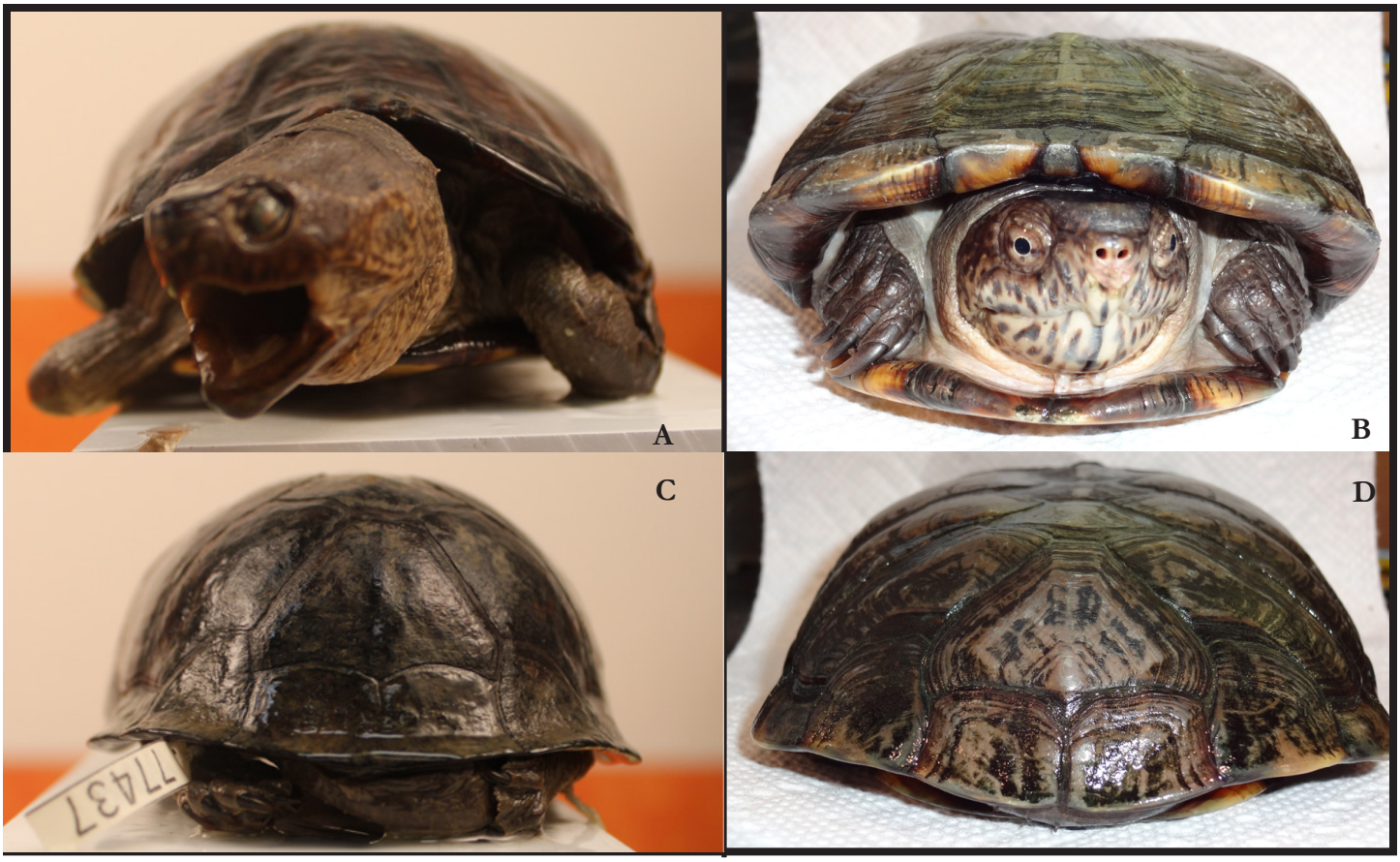

Figure 7. Comparison of the anterior view of carapace (letter A) and ventral view of carapace (letter C) of the adult male holotype of *Kinosternon mariamadre* **sp. nov.** AMNH R77437 with that of a live male *K. integrum* sensu stricto (letters B and D).

vs 5.13x); a smaller V2 vs V3, V3 vs V4 and V2 vs V4 (vs larger size respectively); V1/P1 sulcus contact at the exteriormost M1 or M1/M2 sulcus (vs anterior M2 or M1/M2 less typically); a V1-P1 sulcus shape with interior curving (vs straight); a straight P4/V5 sulcus shape vs outwardly curved; a P3-P4 contact of M9 at the anterior 1/3 point (vs anterior 1/4 point); a higher M9 than M8 (vs M8 even with M9); a V5-M11 width vs V4/V5 width of 3.10x vs 6.84x; a M10/V5 sulcus vs P4-P3-P4 conjunction that is strongly exterior (vs slightly exterior); a V5+M11 length vs M10/M11/V5 sulcus length of 2.50x vs 1.94x); a straight M10-V5 sulcus shape vs outwardly curved; an M10-V5 sulcus vector that is anteriorly divergent (vs outwardly curved); a higher anterior lobe length vs IPH (1.15x vs 0.94x); a higher posterior lobe length vs IPH (1.16x vs 1.01x); a higher gular scute length vs width (0.91 vs 0.62); a higher gular vs IG/IAH sulcus length (1.02x vs 0.81); an interfemoroanal suclus that lies posterior of M9/M10 (vs anterior of); a minor anal scute notch (vs moderately developed); an inguinal notch posterior of the posterior plastral hinge opening (vs coincident); a lower carapace length vs anterior lobe (3.16x vs 3.60x); a higher carapace length vs fixed plastron (3.59x vs 3.39x); a lower carapace width vs anterior plastral lobe length (1.91x vs 3.35x); a lower carapace width vs posterior plastral lobe length (1.90x vs 2.27x); a lower carapace length vs intergular scute length (6.17x vs 7.94x); a lower carapace length vs IAH length (14.48x vs 18.62x); a lower carapace width vs bridge length (2.40x vs 2.84x); a lower carapace width vs intergular scute length (3.73x vs 5.37x); a lower carapace width vs IG sulcus length (6.92x vs 7.79x); a lower carapace width vs IAH (8.76x vs 10.33x); a lower carapace width s IF length (6.06x vs 7.23x); a lower carapace width vs IAn length (2.79x vs 3.12x); a higher carapace length vs width at the inter-gular-anterohumeral sulcus (2.60x vs 2.30x); higher carapace length vs the widths of the anterior fixed plastron, posterior fixed plastron, widest femoral scutes and inter-femoroanal sulcus of 2.15x, 2.68x, 2.37x and 3.27x, respectively (vs 1.87x, 2.06x, 1.91x and 2.41x respectively); a higher carapace width vs inter-femoroanal sulcus width (1.98x vs1.63x); a lower posterior hinge width vs IPH sulcus (1.36x vs 1.64x); a higher plastral midline vs posterior width of the anterior lobe (2.03x vs 1.70x); a higher plastral midline length vs anterior width of the fixed plastron (1.96x vs 1.65x); a higher plastral midline vs width of the posterior hinge (2.44x vs 1.81x); a higher plastral midline vs width at the widest femoral scute point (2.16x vs 1.68x); a subequal

Figure 8. Comparison of the plastron (left) of the adult male holotype of *Kinosternon mariamadre* **sp. nov.** AMNH R77437 with that of a live male *K. integrum* sensu stricto (the InterAnterohumeral sulcus is typically shorter than shown in this specimen).

width of the inguinal vs the adjacent marginal (vs 2.41x); a posterior lobe that is rounded (vs broadly rounded); an axillary situated more posteriorly; an inguinal scute that is situated more posteriorly; an axillary gap factor of 4-5x (vs 3-4x when present); a lower plastral midline vs anterior lobe length (2.88x vs 3.17x); a higher plastral midline vs fixed plastron length (3.28x vs 2.98x); a higher plastral midline vs inframarginal row length (2.34x vs 1.99x); a lower inframarginal row length vs anterior lobe (1.23x vs 1.60x); a lower inframarginal row length vs posterior lobe (1.22x vs 1.49x); shape, size and positioning of the drosal forelimb scales; eye color; lateral face pattern; maxillary and mandibular rhamphothecae pattern; a less inflated nasal scale bulge; orbital wider than rostral width; a higher orbital than maxillary beak; a higher orbital than maxillary depth; a maxillary terminus level with postorbital (versus exceeding); a lower nasal scale terminus width vs preorbital (1.38x vs 1.61x); different nasal scale pattern, shape and termini; nasal scale termini that end anterior to postorbit (versus clearly exceeding); a lower nasal scale emargination factor (1.82x vs 4.78x); a higher nasal scale anterior factor (1.78x vs 1.47x); a different posterior head pattern and throat color/pattern; a lower head length vs head width (1.11x vs 1.53x); a higher head width vs head depth (1.43x vs 1.09x); a lower carapace length vs head width (4.35x vs 6.16x); a lower carapace length vs head depth (6.23x vs 6.68x); a lower carapace width vs head length (2.38x vs 2.73x); a lower carapace width vs head

Figure 9. Comparison of the left lateral head (letter A) and the bridge, axillary and inguinal scutes (letter D) of the adult male holotype of *Kinosternon mariamadre* **sp. nov.** AMNH R77437 with that of a live male *K. integrum* sensu stricto (letters B and C).

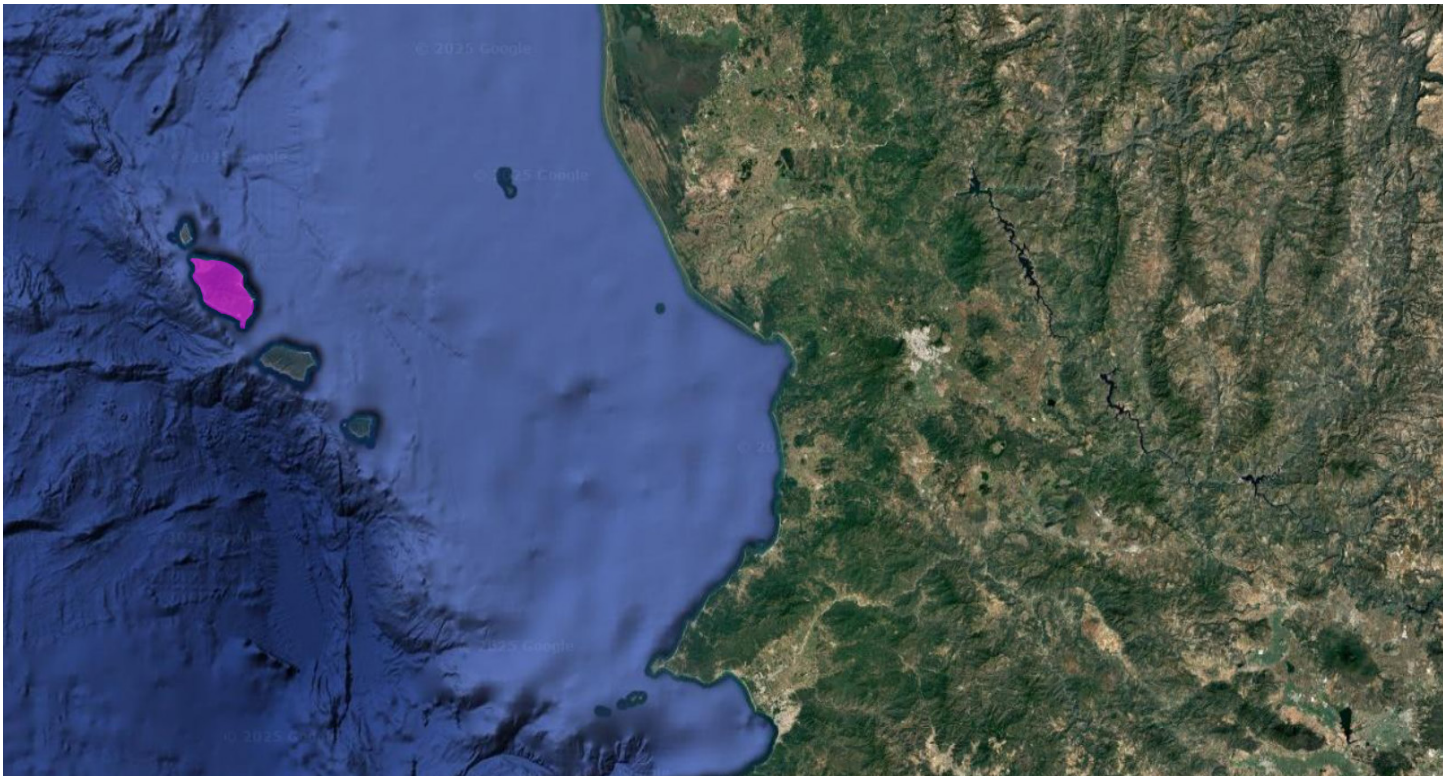

Figure 10. Distribution map of *Kinosternon mariamadre* **sp. nov.**, Isla María Madre, Islas Tres Marías, Nayarit, Mexico (purple shading). Base map from Google.com

width (2.63x vs 4.16x); a lower carapace width vs head depth (3.77x vs 4.52x); a lower plastral length vs head width (3.97x vs 5.42x); a lower plastral width vs head length (1.89x vs 2.29x); a lower plastral width vs head width (2.09x vs 3.50x); a lower plastral width vs head depth (3x vs 3.8x); a higher head length vs interorbital (3.51x vs 2.74x); a higher head width vs interorbital (3.18x vs 1.79x); and a higher head depth vs interorbital (2.22x vs 1.65x).

All other characters identified in the suite are considered shared characters or within reasonable variation of each other or characters potentially inherent to the genus itself.

Kinosternon mariamadre **sp. nov.** is a distinct species of mud turtle from María Madre Island, Nayarit, Mexico in the *Kinosternon integrum* species complex, known from atleast nine male and female museum specimens, and we offer here differentiation of the unique male holotype from *K. integrum* sensu stricto males by 108 characters out of the 246 character suite utilized in these studies.

Figure 11. Right antero-lateral view of adult male holotype of *Kinosternon mariamadre* **sp. nov.** AMNH R77437.

DISCUSSION

The advancement and accomplishments of herpetological sciences in Mexico have a long and distinguished history; the chelonology of mud turtles is notably rich (Smith & Taylor, 1950; Iverson, 1981; Loc-Barragán & Ramírez-Silva, 2024). While diversity of the genus *Kinosternon* has figured prominently in early studies, the story of the mud turtles on María Madre Island, Nayarit, Mexico, confined to a few arroyos on a single island, is particularly interesting. How such a restricted and unostentatious population came to prominence arguably so early in Mexican herpetology lies rooted in the propitious travels of the late 19th century natural history collector Alphonse Forrer, a man whose life and career are considered all but forgotten today (Feest, 2023). Leech (1950) set that description of Forrer, having seen his name non-descriptively inked on specimen tags and of whom no one seemed to know much.

Alphonse Forrer (aka Alfonse) was born in London, England on January 4, 1839 and emigrated by 1861 to New Orleans, where evidence indicates he would eventually serve in the American Civil War in the European Brigade of the Louisiana Militia; upon capture of the city by the Union in April 1862, Forrer served the Union as a Navy Clerk on the formerly-Confederate CSS Calhoun, a privateer operating in the West Gulf and Lower Mississippi (Feest, 2023).

It is believed Forrer relocated to San Francisco by 1869, and here along the west coast his extensive collecting of natural history specimens flourishes, with numerous revisitations to Europe, including to the Zoological Society of London where he presented preserved as well as live animal specimens. Having already planned a trip to Mexico, Frederick DuCane Godman commissioned Forrer to visit the Tres Marías Islands for the massive Biologia Centrali-Americana project which would cover the natural history of Mexico and Central America, surveying the island chain between February to April, 1881 (Feest, 2023).

It was on María Madre where Forrer obtained the British Museum mud turtle specimens in 1881 (Goldman, 1951) which would figure initially in the plates and profile in Günther (1885), setting off the long see-saw debate as to the turtles' identity and species relationships (Iverson, 1981). Those specimens represent a population formally described herein as *Kinosternon mariamadre* **sp. nov.,** a distinct species of mud turtle in the *Kinosternon integrum* species complex.

Forrer passed away on March 15, 1899 in his home in Santa Cruz, California at only the age of 60, having succumbed to kidney disease, leaving behind his widow, Elisabeth; he bequeathed science an exhaustive natural history collection orchestrated from across the zoological spectrum (Breninger, 1899; Feest, 2023), lying now in repose in world institutions, with worn tags with an inscriptional name forgotten but not gone.

Figure 12. Lateral view of the posterior shell shape of the adult male holotype of *Kinosternon mariamadre* **sp. nov.** AMNH R77437.

Figure 13. Portrait of Alphonse Forrer (January 4, 1839 - March 15, 1899). Original from Breninger (1899). Public Domain.

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Museum acronyms: AMNH (American Musuem of Natural History); ANSP (Academy of Natural Sciences, Philadelphia; CAS (California Academy of Sciences); MCZ (Museum of Comparative Zoology); MNHN (Musee National d'Histoire Naturelle); NHMUK (Natural History Museum, United Kingdom); USNM (Smithonian National Museum of Natural History); YPM (Yale Peabody Museum).

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Appendix A

Table of 246 numerical (140 enumerated) character states for the adult male holotype of *Kinosternon mariamadre* **sp. nov.** Character states for female specimens as well as further male specimens will be forthcoming.

No.	Character Description	Adult male *K. mariamadre* sp. nov holotype
1	Overall Carapace Shape	elongated oval with posterior margional flaring
2a	Carapace Length vs Width	1.65
2b	Maximum width occurrence (marginal)	V2/V3
3a	Vertebral Length vs Width V1	0.99
3b	Vertebral Length vs Width V2	1.17
3c	Vertebral Length vs Width V3	0.95
3d	Vertebral Length vs Width V4	0.90
3e	Vertebral Length vs Width V5	0.85
4a	Carapace Length vs Depth	2.94
4b	Maximum depth occurrence (vertebral)	middle M6
4c	Carapace Width vs Depth	1.78
5a	Profile Posterior Lateral Shell	compressed with moderate drop off
5b	Lateral Marginal Curling	minor to moderate
5c	Marginal Curling Count	7.00
5d	Intial Marginal Curling	M4
5e	Final Marginal Curling	M10
6	M10 Flaring	moderate diagonal
7a	Carapace Length vs Posterior Length	2.38
7b	Carapace Length vs P3 Length	4.80
8	Anterior Arch of Carapace	depressed rounded
9	Posterior Arch of Carapace	highly domed
10a	Vertebral Width vs Carapace Width V1	2.46
10b	Vertebral Width vs Carapace Width V2	2.93
10c	Vertebral Width vs Carapace Width V3	2.69
10d	Vertebral Width vs Carapace Width V4	2.50
10e	Vertebral Width vs Carapace Width V5	2.20
11a	Vertebral Width vs Carapace Length V1	4.07
11b	Vertebral Width vs Carapace Length V2	4.84
11c	Vertebral Width vs Carapace Length V3	4.45
11d	Vertebral Width vs Carapace Length V4	4.13
11e	Vertebral Width vs Carapace Length V5	3.64
12a	Vertebral Length vs Carapace Length V1	0.24
12b	Vertebral Length vs Carapace Length V2	0.24
12c	Vertebral Length vs Carapace Length V3	0.21
12d	Vertebral Length vs Carapace Length V4	0.22
12e	Vertebral Length vs Carapace Length V5	0.23
13a	Vertebral Length vs Carapace Width V1	0.25
13b	Vertebral Length vs Carapace Width V2	0.21
13c	Vertebral Length vs Carapace Width V3	0.22
13d	Vertebral Length vs Carapace Width V4	0.24
13e	Vertebral Length vs Carapace Width V5	0.27
14	Carapace Carination	minor to moderate unicarinate, slight tricarination
15	Carination vs V-P Conjunction	exterior of
16	Carination Origination P1	posterior
17	Carination Vector P1	slightly convergent
18	Carination Orgination V1	anteriormost point
19a	Carination Termination P4	anteriormost
19b	Carination Termination V5	posterior
20a	V1-P1 Length vs V1 Width	0.94
20b	V1-P1 Length vs V1-V2 Width	2.75
21a	Width V1 vs V1/V2	2.92
21b	Width V2 vs V1/V2	2.46
21c	Width V3 vs V2/V3	2.21
21d	Width V4 vs V3/V4	2.70
21e	Width V4 vs V4/V5	3.00
22a	Size of V2 vs V3	smaller
22b	Size of V3 vs V4	smaller
22c	Size of V2 vs V4	smaller
23	P1-V2 vs P2-V2 Sulcus Length	1.11

24a	V1-V2 Sulcus Shape	straight
24b	V2-V3 Sulcus Shape	posterior convex
24c	V3-V4 Sulcus Shape	slight posterior bilobed
24d	V4-V5 Sulcus Shape	relatively straight
25	Nuchal Emargination	minor
26	Cervical Scute Shape	long rectangle
27	V1 Contact Marginals	exteriormost M1 or M1/M2
28a	Shape 1st Marginals	trapezoidal
28b	Shape 2nd Marginals	trapezoidal
28c	M1 vs M2 Size	smaller
29	V1-P1 Sulcus Shape	moderately interiorly curved
30	V1 vs V2 Width	shorter
31	V2-P1 Sulcus Shape	slight exterior curve
32	V4-P3 Sulcus Shape	slight interior curve
33	P3-V4 vs P4-V4 Sulcus Length	1.13
34	V5-P4 Sulcus Shape	straight
35	M11 Sulcus Shape	strongly anterior curve
36	M11 Shape	rounded squarish
37	P3-P4 Contact Marginal 9	anterior 1/3 point
38	M9 vs M8 Height	higher
39	M10 vs M9 Height	higher
40	M10 vs M11 Height	strongly higher
41	Shape V5-M11 Midline Sulcus	posteior dip
42	V5-M11 width vs V4-V5 Sulci	3.10
43	M10/M11 vs M10/V5 Sulci	1.65
44	V5 Length vs M11 Sulcus	2.76
45	M10/V5 Sulcus vs V4-P3-P4 Conjunction	strongly exterior of
46	V5+M11 vs M10=M11-V5 Sulcus Length	2.50
47	M11 Sulcus vs M10/M11 Sulcus	0.99
48	M10-V5 Sulcus Shape	straight
49	M10-V5 Sulcus Vector	anteriorly divergent
50	P4-V5 vs V5-M11 Sulci	1.54
51	Carapace Sculpture	relatively soomth with minor pockmarking/ ridging
52	Length Anterior Lobe vs InterPosterohumeral Sulcus	1.15
53	Length Posterior Lobe vs InterPosterohumeral Sulcus	1.16
54	Plastral Midline Sulcus Formulae	IPH>IAn>IGSL>IG>IF>IAH
55	Length Anterior vs Posterior Lobes	0.99
56	Length vs Width Gular Scute	0.91
57	Bridge Length vs InterAnal Sulcus	1.16
58	Length Gular vs Intergular/InterAnterohumeral Sulci	1.02
59	Inguinal vs Antero Posterior Lobe	strongly posterior of
60	Inter-Femoral-Anal Sulcus vs Marginal	posterior of
61a	Anal Scute Notch	minor
61b	Anal Scute Tip Shape	rounded triangular
62a	InterAnal vs InterPosterohumeral Sulcus	0.79
62b	InterAnal vs Inter-FemoroAnal Sulcus	1.05
63	Shape of Posterior Plastral Hinge	strongly posteriorly emarginated
64a	Plastral Coverage	nearly entire
64b	Axillary Notch Opening	0.92
64c	Inguinal Notch Opening	0.88
64d	Inguinal Notch vs Posterior Hinge	posterior of
65	Carapace Length vs Anterior Length	3.16
66	Carapace Length vs Fixed Length	3.59
67	Carapace Length vs Posterior Length	3.14
68	Carapace Width vs Anterior Length	1.91
69	Carapace Width vs Fixed Length	2.17
70	Carapace Width vs Posterior Length	1.90
71	Plastral Lobe Formulae	posterior>anterior>fixed
72a	Carapace Length vs Intergular Scute Length	6.17
72b	Carapace Length vs Intergular Sulcus Length	11.44
72c	Carapace Length vs InterAnterohumeral Length	14.48
72d	Caraapce Length vs InterPosterohumeral Length	3.64
72e	Carapace Length vs Interfermoral Length	10.02
72f	Carapace Length vs Interanal Length	4.62

73	Carapace Length vs Bridge Length	3.97
74	Carapace Length vs Plastron Length	1.10
75	Carapace Width vs Plastron Length	0.66
76	Carapace Width vs Intergular Scute Width	3.38
77	Carapace Width vs Bridge Length	2.40
78a	Carapace Width vs Intergular Scute Length	3.73
78b	Carapace Width vs Intergular Sulcus Length	6.92
78c	Carapace Width vs InterAnterohumeral Length	8.76
78d	Carapace Width vs InterPosterohumeral Length	2.20
78e	Carapace Width vs Interfemoral Length	6.06
78f	Carapace Width vs Ineranal Length	2.79
79a	Carapace Length vs Anterior Lobe A	2.60
79b	Carapace Length vs Anterior Lobe B	2.22
80a	Carapace Length vs Fixed Lobe A	2.15
80b	Carapace Length vs Fixed Lobe B	2.68
81a	Carapace Length vs Posterior Lobe A	2.37
81b	Carapace Length vs Posterior Lobe B	3.27
82a	Carapace Width vs Anterior Lobe A	1.57
82b	Carapace Width vs Anterior Lobe B	1.35
83a	Carapace Width vs Fixed Lobe A	1.30
83b	Carapace Width vs Fixed Lobe B	1.62
84a	Carapace Width vs Posterior Lobe A	1.43
84b	Carapace Width vs Posterior Lobe B	1.98
85a	Anterior Hinge vs Fixed Width	0.97
85b	Anterior Hinge vs Posterior Hinge Width	1.20
86	Anterior Hinge Width vs InterPosterohumeral Sulcus	1.69
87	Posterior Hinge Width vs InterPosterohumeral Sulcus	1.36
88a	Plastral Midline vs Anterior Hinge Width Anterior Lobe	2.03
88b	Plastral Midline Length vs Anterior Hinge Width Fixed	1.96
88c	Plastral Midline Length vs Posterior Hinge Width	2.44
89	Plastral Midline Length vs Femoral Width	2.16
90	Width of Inguinal vs Adjacent Marginal	1.05
91	Shape of Exterior Plastral Lobe	moderately rounded
92	M5 Expansion	minor
93a	Marginal Start Axillary	posterior M4
93b	Marginal End Axillary	posterior M5
94a	Axillary Inguinal Contact	absent
94b	Axillary-Inguinal Gap	present
95a	Marginal Start Inguinal	anterior M6
95b	Marginal End Inguinal	middle M8
96	Length of Inguinal vs Axillary Scute	2.48
97	Length of Axillary vs M5	0.93
98a	Length of Inguinal vs M6/M7	1.27
98b	Length of Interposterohumeral Sulcus vs M6/M7	1.33
99	Axillary-Inguinal Contact vs M5-M6 Sulcus	absent
100a	Plastral Midline vs Anterior Lobe Length	2.88
100b	Plastral Midline vs Fixed Length	3.28
100c	Plastral Midline vs Posterior Lobe Length	2.87
100d	Plastral Midline vs Inframarginal Row Length	2.34
101a	Inframarginal Length vs InterPosterohumeral Sulcus	1.42
101b	Inframarginal Row Length vs Anterior Lobe	1.23
101c	Inframarginal Row Length vs Posterior Lobe	1.22
102	Plastral Intersection	0.36
103	Posterior Hinge vs Marginal 7	middle M7
104	Bridge Grooves	absent
105a	Number of Scales	3.00
105b	Shape of Scales	3 thin elongated
106a	Finger Scales	all
106b	Number Present	2-3 per
107	Heel Scales Present	present
108	Presence of Copulatory Organs	absent
109a	Terminal Spur Present	present
109b	Spur in Both Sexes	present
110	Tail Papillae	sparse

111	Eye Color	grayish-yellow sclera with darker brown barring; dark brown iris
112	Lateral Face Pattern	grayish-yellow with dark brown to black reticulations
113a	Maxillary Pattern	yellow with heavy short dorso-ventral black marks
113b	Mandible Pattern	yellow with heavy short lateral black marks, sometimes coalescing
114	Nasal Scale Bulge	minimal
115a	Male Beak	moderate
115b	Female Beak	minimal
116	Orbital-Rostral Width	longer
117	Orbital depth Beak	larger
118	Orbital Width Maxillary	larger
119	Maxillary Terminus	level/ even
120a	Mandible Terminus, Dorsal	even
120b	Mandible Terminus, Ventral	posterior
121	Nasal Scale Shape	laterally compressed bell shape with deep posterior emargination
122	Nasal Scale Terminus Shape	moderately lobed
123	Terminus Width vs preorbital	1.38
124	Lateral Nasal Scale Terminus	anterior of
125a	Midline Nasal Scale Terminus	NA
125b	Nasal Scale Emargination	1.82
125c	Nasal Scale Anterior	1.78
125d	Midline Nasal vs Nasal Width	0.68
126	Nasal Scale Pattern	dark yellow with heavy black muting
127	Posterior Head Pattern	dark brown to dark gray brown with yellow spotting
128a	Head Length vs Head Width	1.11
128b	Head Width vs Anterior Scutes	0.90
128c	Head Length vs Head Depth	1.58
128d	Head Width vs Head Depth	1.43
129a	Carapace Length vs Head Length	3.93
129b	Carapace Length vs Head Width	4.35
129c	Carapace Length vs Head Depth	6.23
130a	Carapace Width vs Head Length	2.38
130b	Carapace Width vs Head Width	2.63
130c	Carapace Width vs Head Depth	3.77
131a	Plastron Length vs Head Length	3.59
131b	Plastron Length vs Head Width	3.97
131c	Plastron Length vs Head Depth	5.69
132a	Plastron Width vs Head Length	1.89
132b	Plastron Width vs Head Width	2.09
132c	Plastron Width vs Head Depth	3.00
133	Color Carapace	dark orangish-brown to dull gray black
134a	Color Plastron	orangish-yellow with dark brown to dark black sulci
134b	Pattern Plastron	dark brown to black radiations mirroring all sulci
134c	Color Ventral Marginals	yellow with heavy darker brown muting
134d	Color Axillary Scute	yellow with heavy darker brown muting
134e	Color Inguinal Scute	yellow with heavy darker brown muting
135a	Throat Color	light brown to grayish brown with moderate fine darker spotting
135b	Dorsal Neck Color	dark brown to gray brown
135c	Ventral Neck Color	lighter brown with darker spotting
136a	Dorsal Forelimb Color	dark brown to gray brown
136b	Ventral Forelimb Color	pale brown to pale gray-brown
136c	Dorsal Hindlimb Color	dark brown to gray brown
136d	Ventral Hindlimb Color	pale brown to pale gray-brown
137a	Dorsal Tail Color	dark brown to gray brown
137b	Ventral Tail Color	pale brown to pale gray-brown
138a	Head length vs interorbital	3.51
138b	Head width vs interorbital	3.18
138c	Head depth vs interorbital	2.22
139	Autapomorphy/ Unique Character	thick black premaxillary and symphyseal stripes present
140	Chin & Throat Barbels	2 pairs of small to moderate chin; 1 pair tiny throat

Appendix B

Günther, A.C.L.G. 1885. Reptilia and Batrachia. In: Godman, F.D. & Salvin, O. eds. Biologica Centrali-Americana, or, Contributions to the knowledge of the fauna and flora of Mexico and Central America. Porter, London. 326 pp. 76 plates.

tion of the sternum shorter than either of the two lobes; axillary and inguinal scutes touching each other by a point; jaws and throat uniform yellowish.

I have not seen a specimen of this apparently very distinct species.

5. **Cinosternum hirtipes.** (Tabb. XII., XIII., XIV., XV.)

Cinosternum hirtipes, Wagl. Descr. & Ic. Amphib. t. 30; Strauch, Vertheil. Schildkr. p. 101.
Kinosternum henrici, Leconte, Proc. Ac. N. Sc. Phil. 1859, p. 4; Yarrow in Wheeler's Report upon Expl. and Surv., Rept. p. 583, t. 16.

Hab. North America, New Mexico (*Leconte*), Arizona (*Yarrow*).—Mexico, Mazatlan and Tres Marias Islands (*Forrer*).

I consider this species to be the southern and more developed form of *Cinosternon pennsylvanicum*, but the shell is broader in young specimens, and generally more convex and raised along the vertebral line in old ones. The sternum is emarginate behind, the joint of the hind lobe forming a somewhat curved line. The fixed part of the sternum is always somewhat shorter than either the front or the hind lobes; gular plate not much shorter than the median suture of the front lobe. The development of the axillary and inguinal plates is subject to variation in this species; in a half-grown specimen from Mazatlan these two scutes are broadly in contact with each other, whilst they barely touch each other in full-grown examples; so it is also in a young specimen from Tres Marias Islands, an adult individual from this last locality having a merely rudimental axillary plate, which is separate from the inguinal.

The vertebral keel is very indistinct, even in young examples, the vertebral region of the shell being flattened, but never concave as in *Cinosternum pennsylvanicum*. The first vertebral is as broad as long, in old examples bell-shaped, the lateral margins being concave. Upper parts of the head brownish or blackish, with irregular yellowish spots; sides of the head, jaws, and throat yellow, marbled and streaked with black. The tail is very strong and long in the male, and armed with a curved claw; in the female it is much shorter and clawless.

Of this species I have examined five specimens—three (male, female, and half-grown) from Mazatlan, and two (female and young) from Tres Marias Islands. The variation of form of the shell is well represented in this series. The shell of the largest male is $6\frac{1}{2}$ inches long, the females being $\frac{1}{2}$ inch shorter. The specimens named *C. henrici* were collected in New Mexico and Arizona, and prove the close affinity of the Mexican form to *C. pennsylvanicum*.

To show the great variation of form to which some species of this genus may be subject, three views of each are given of an adult male and female from Mazatlan, and of an adult female from Tres Marias Islands, together with the arrangement of the axillary and inguinal plates in a half-grown specimen from Mazatlan.

Figure 14a. Reproduction of page 15 from Günther (1885) citing '*Cinosternum hirtipes*' in the Tres Marias Islands and discussing specimens. All Appendix B imaged from *www.archive.org*

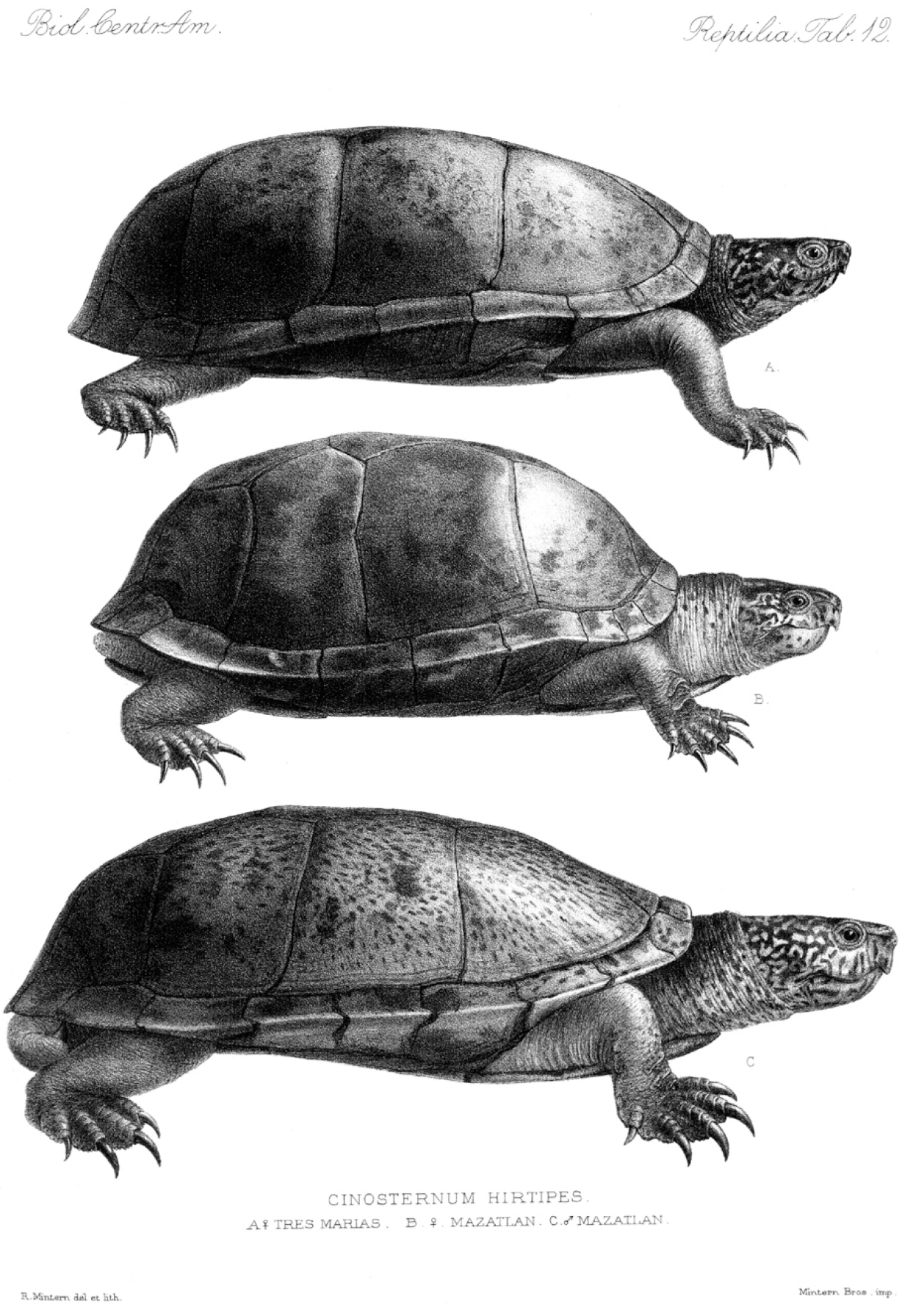

Figure 14b. Reproduction of Plate 12 from Günther (1885) illustrating a '*Cinosternum hirtipes*' specimen from the Tres Marias Islands.

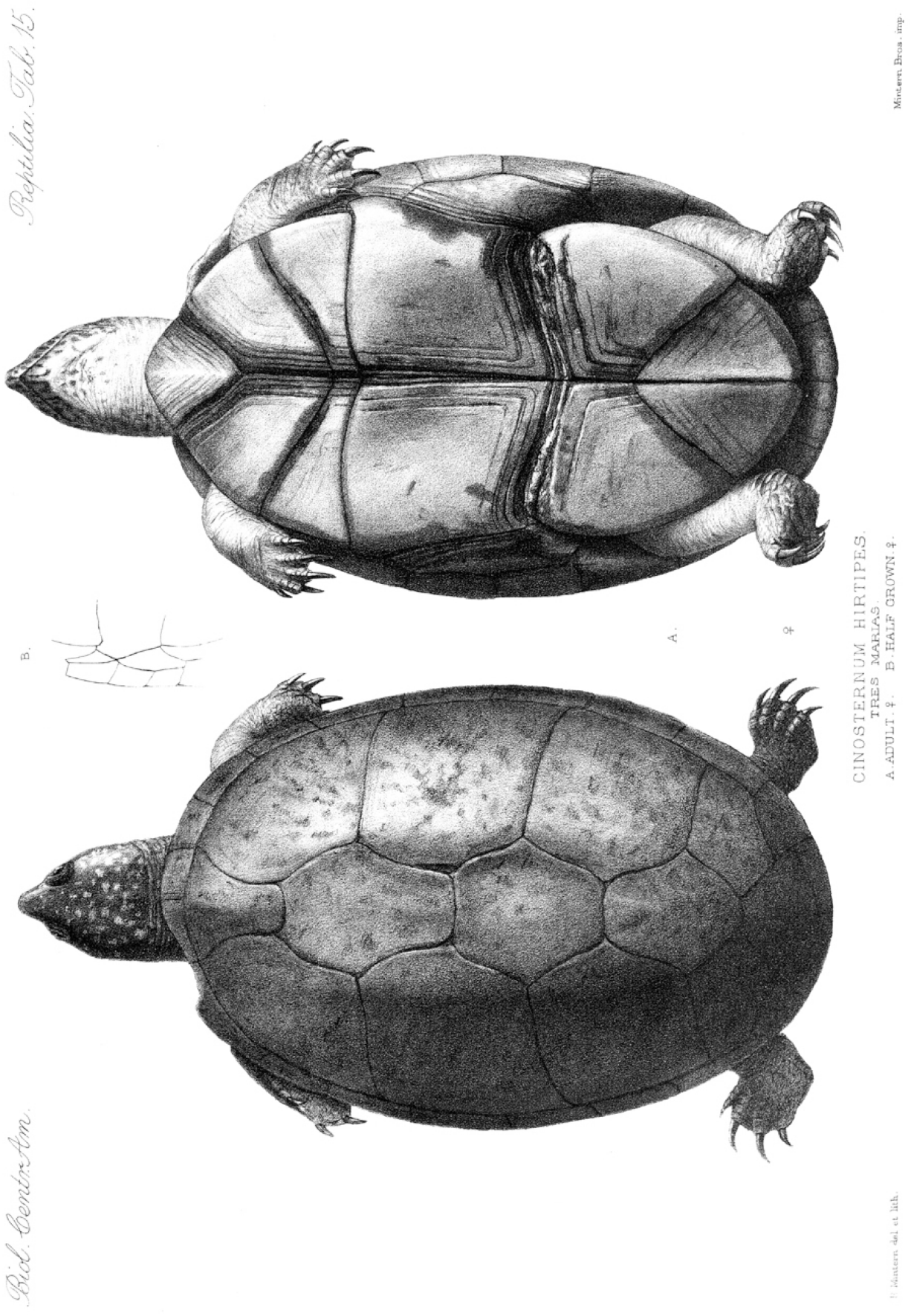

Figure 14c. Reproduction of Plate 15 from Günther (1885) illustrating '*Cinosternum hirtipes*' specimens from the Tres Marias Islands.

Appendix C

Boulenger, G.A. 1889. Catalogue of the chelonians, rhynchocephalians, and crocodiles in the British Museum (Natural History). Taylor and Francis, London. 311 pp. 6 plates.

8. Cinosternum integrum.

Kinosternum integrum, *Leconte, Proc. Ac. Philad.* 1854, p. 183; *Bocourt, Journ. de Zool.* v. p. 393 (1876); *Günth. Biol. C.-Am., Rept.* p. 26 (1885).
Thyrosternum integrum, *Agassiz, Contr. N. H. U. S.* i. p. 429 (1857).
Swanka integra, *Gray, Suppl. Cat. Sh. Rept.* i. p. 69 (1870).
Cinosternum rostellum, *Bocourt, l. c.* p. 391.
—— hirtipes (*non Wagl.*), *Günth. l. c.* p. 15, pls. xii.–xv.*
—— pensylvanicum (*non Gmel.*), *Dugès, La Naturaleza* (2) i. p. —, pl. xi. figs. 1–4 (1888).

Head rather large; jaws strong; beak feebly hooked. Digits extensively webbed. Carapace with a feeble keel in the male and young, keelless in the adult female. Plastron entirely closing the box, feebly nicked posteriorly, and without bridge in the adult; lobes well movable, anterior longer than the immovable portion; gular shield not half the length of the front plastral lobe; suture between the pectoral shields much shorter than that between the humerals; axillary and inguinal shields narrowly in contact, or narrowly separated. Tail of male ending in a nail-like horny tubercle. Carapace brown, with small blackish dots in the male, with radiating lines in the halfgrown specimen; the sutures between the shields blackish; plastron yellowish or brown; head dark brown above, spotted or marbled with yellowish; throat and jaws yellowish, spotted with dark brown.

Length of shell 16 centim.

Mexico.

a–b, c. ♂, ♀, & hgr., spir.	Mazatlan.	Mr. A. Forrer [C.].
d–e. ♀ & yg., spir.	Tres Marias Islands.	Mr. A. Forrer [C.].
f. Yg., spir.	Presidio.	Mr. A. Forrer [C.].

9. Cinosternum leucostomum.

Cinosternum leucostomum, *A. Dum. Cat. Méth. Rept.* p. 17 (1851), *and Arch. Mus.* vi. p. 239, pl. xvii. (1855); *Gray, Cat. Sh. Rept.* i. p. 46 (1855); *Cope, Proc. Ac. Philad.* 1865, p. 189; *Bocourt, Miss. Sc. Mex., Rept.* p. 25 (1870); *Sclater, Proc. Zool. Soc.* 1871, p. 745; *Bocourt, Journ. de Zool.* v. p. 394 (1876).
—— scorpioides, part., *Gray, l. c.* p. 44.
Swanka scorpioides, part., *Gray, Suppl. Cat. Sh. Rept.* i. p. 67 (1870).
—— maculata, part., *Gray, l. c.* p. 68.
—— leucostoma, *Gray, l. c.* p. 69.
Cinosternum leucostomum, part., *Günth. Biol. C.-Am., Rept.* p. 17, pl. xvii. (1885).
—— brevigulare, *Günth. l. c.* p. 17, pl. xviii. f. A.
—— cobanum, *Günth. l. c.* p. 18, pl. xviii. f. B.
—— brevigulare, *Cope, Proc. Am. Philos. Soc.* xxii. p. 389 (1885).
—— postinguinale, *Cope, Bull. U.S. Nat. Mus.* no. 32, p. 23 (1887).

* It should be mentioned that Dr. Günther, who obtained the type of Wagler's *C. hirtipes* from the Munich Museum on loan, still adheres to his opinion that the specimens from Mazatlan and Tres Marias Islands should be referred to that species rather than to *C. integrum*.

Figure 15. Reproduction of page 42 from Boulenger (1889) citing '*Cinosternum integrum*' in the Tres Marias Islands. Imaged from *www.archive.org*

Appendix D

Strauch, A. 1890. Bemerkungen uber die Schildkrötensammlung in zoologischen Museum der kaiserlichen Akademie der Wissenschaften zu St. Petersburg. Mémoires de l'Académie Impériale des Sciences de St.-Pétersbourg. Series 7, 38 (2) 1- 127.

138	in Weingeist (36 mm.)	Fundort ?	Kunstkammer.
	in Weingeist (34 mm.)	Fundort ?	Kunstkammer.
139	in Weingeist (136 mm.)	Fundort ?	Kunstkammer.
2370	in Weingeist (119 mm.)	Süd-Amerika.	Herr Effeldt 1868.
2371	in Weingeist (128 mm.)	Süd-Amerika.	Herr Effeldt 1868.
3608	in Weingeist (109 mm.)	Brasilien.	Herr Effeldt 1868.
5461	Skelet (147 mm.)	Brasilien.	Herr Braconnier 1879.
6277	in Weingeist (81 mm.)	Fundort ?	Herr Frank 1884.

Bei der grossen Variabilität, welcher sämmtliche *Cinosternon*-Arten unterworfen sind, ist es nicht unwahrscheinlich, dass das Stück № 139, das ich früher unter dem Namen *C. longicaudatum* Spix als besondere Art kurz beschrieben habe, nur eine abweichende Form des Männchens von *C. scorpioides* L. ist; ich habe es daher zu dieser Art gezogen, muss aber bemerken, dass mir kein zweites Exemplar vorgekommen ist, bei welchem die Kinn- und Kehlbärtel in 3 hinter einander liegenden Querreihen angeordnet gewesen wären.

81. **Cinosternon integrum** Leconte.

Kinosternum integrum Leconte. Proc. Acad. Philadelph. VII (1854), p. 183.
Cinosternum integrum Boulenger. Catal. of the Chelonians etc. p. 42.
Cinosternon hirtipes Günther in Godman and Salvin. Biol. centr.-amer. Rept. p. 15, pl. XII—XV.

2372 in Weingeist (148 mm.)	Mexico.	Herr Effeldt 1868.
4814 in Weingeist (165 mm.)	Laguna.	Herr H. Schilling 1877.
5816 in Weingeist (163 mm.)	Mazatlan.	Dr. Steindachner 1881.
5817 in Weingeist (135 mm.)	Mazatlan.	Dr. Steindachner 1881.
6211 ausgestopft (171 mm.)	Presidio.	Herr Forrer 1884.
6212 ausgestopft (165 mm.)	Presidio.	Herr Forrer 1884.
6213 ausgestopft (164 mm.)	Presidio.	Herr Forrer 1884.
6214 ausgestopft (176 mm.)	Presidio.	Herr Forrer 1884.
6215 ausgestopft (164 mm.)	Presidio.	Herr Forrer 1884.
6216 ausgestopft (166 mm.)	Presidio.	Herr Forrer 1884.
6217 ausgestopft (162 mm.)	Presidio.	Herr Forrer 1884.
6218 in Weingeist (132 mm.)	Presidio.	Herr Forrer 1884.
8037 in Weingeist (160 mm.)	Acapulco.	Mus. Comp. Zool. 1890.
8038 in Weingeist (128 mm.)	Acapulco.	Mus. Comp. Zool. 1890.

82. **Cinosternon leucostomum** Dum.

Cinosternon leucostomum Duméril. Catal. méth. des Reptiles, p. 17.
Cinosternum leucostomum Boulenger. Catal. of the Chelonians etc. p. 42.
Cinosternon leucostomum Duméril. Archives du Muséum. VI, p. 239, pl. XVII.

Figure 16. Reproduction of page 91 from Strauch (1899) citing '*Cinosternon integrum*' and discussing specimens. Imaged from Google.

Appendix E

Stejneger, L.H. 1899. Reptiles of the Tres Marias and Isabel islands. North American Fauna 14: 63-71.

TESTUDINATA.

[The tortoise-shell turtle frequents the sea about the Tres Marias, approaching the shores to mate and deposit eggs in May and June each year. At the same time the large green sea turtle abounds along these shores, where they congregate for the same purpose.—E. W. N.]

Kinosternon integrum Leconte.

I have no hesitation in endorsing Boulenger's view (Cat. Chel. Brit. Mus., p. 42) that the Tres Marias mud turtles are *K. integrum* and not *K. hirtipes*, as held by Günther (Biol. Centr.-Am., Rept., p. 15, pls. xii–xiv). They have the broader bridge and broader plastron of the former and agree with undoubted specimens from the mainland. The island specimens, of which there are four adults and one young, do not differ from those from Colima, Guanajuato, Cuernavaca (Morelos), Acaponeta (Tepic), Guadalajara (Jalisco), Presidio, and Mazatlan (Sinaloa), from all of which localities I have examined specimens. *K. hirtipes* I believe to be confined to the eastern side of Mexico.

List of specimens of Kinosternon integrum.

U. S. National Museum number.	Collectors' number.	Locality.	Date.
24606	712	Maria Madre Island	May 15, 1897
24607	713	do	May 15, 1897
24608	714	do	May 15, 1897
24609	715	do	May 15, 1897
24610	716	do	May 15, 1897

LORICATA.

Crocodylus americanus Laur.

No specimens were secured, but Mr. Nelson assures me that the crocodile occurs on Maria Magdalena Island. There can be but little doubt that it is the present species which is distributed all along the coast of Central America, Mexico, the West Indies, and southern Florida.

[The unmistakable furrow in the mud where a crocodile had hauled up on the border of a brackish lagoon on the eastern side of Maria Magdalena, the sight of a small head in the water, and the testimony of the people on Maria Madre established the fact of their occurrence. They appeared to be limited to Maria Magdalena.—E. W. N.]

SQUAMATA.

SAURI.

Phyllodactylus tuberculosus Wiegm.

This species is distributed over Mexico and Central America, and has also been collected in the Cape Saint Lucas region of Lower Cali-

Figure 17. Reproduction of page 64 from Stejneger (1899) citing '*Kinosternon integrum*' in the Tres Marias Islands and discussing specimens. Imaged from *www.archive.org*

Appendix F

Gadow, H.F. 1905. The distribution of Mexican amphibians and reptiles. Proceedings of the Zoological Society of London. 1905:191-245.

CROCODILIA.

Crocodilus americanus is the commonest tropical American Crocodile, from Florida to Northern South America. In Mexico it is strictly confined to the Tierra Caliente, with Mazatlan as its north-western limit. It ascends the Rio Balsas at least up to Mescala, but this is not much more than 1700 feet above sea-level. Common in the lagoons on the coast of Guerrero and Oaxaca, except where it has recently been well-nigh exterminated by American skin-hunters. More exist in the river-systems of the State of Vera Cruz, ascending occasionally up to Motzorongo, *i. e.* 1500 feet. During the rainy season they often forsake the then turbid rivers, and roam at night through the forests in search of lagoons.

C. moreleti inhabits the Tierra Caliente from Tampico to Honduras.

Caiman sclerops s. *punctulatus* has its centre in South America. In America it occurs only in the Atlantic hot-lands. I met with very large specimens (length of skull 20 inches) at Agua fria in the same lagoons and rivers as the Crocodile. Whilst the latter, anyhow not averse to brackish water, inhabits the Greater Antilles, the Caiman has found its way only into Trinidad and, if report is true, to Martinique. The Alligator of the southern United States does not seem to cross the Rio Grande.

CHELONIA.

It seems almost incredible that *Chelydra* has never been recorded from Mexico, considering the wide range of *Ch. serpentina* in the United States and the existence of the other species, *Ch. rossignoni*, from Guatemala to Ecuador. The Papaloapan and S. Juan Rivers of the State of Vera Cruz are certainly large enough, with pools and backwaters, but I could not ascertain the presence of a large, snappy species.

DERMATEMYDIDÆ.—The few species of this family are peculiar to Central America. *Dermatemys mawi* extends from Honduras into Yucatan and Vera Cruz; it occurs, for instance, in the pools of the forests and savannahs near Tetela, where it is known as the "Tortuga blanca." *Staurotypus* seems to have a similar range: *S. triporcatus* going up to Vera Cruz; *S. biporcatus* only up to the Isthmus.

CINOSTERNIDÆ, with the sole genus *Cinosternum*. About 10 species in North and Central America, one extending to Guiana. Well represented in Mexico by 6 species. Of these, *C. pennsylvanicum*, previously recorded from the Valley of Mexico, was found by myself in South Guerrero, at San Luis Allende. *C. hirtipes* ranges from Arizona and New Mexico along the Pacific side into Jalisco, and includes the Tres Marias Islands.

Figure 18. Reproduction of page 209 from Gadow (1905) citing '*Cinosternum hirtipes*' in the Tres Marias Islands. Imaged from *www.archive.org*

Appendix G

Siebenrock, F. 1906. Schildkröten aus Sudmexiko. Zoologische Anzeiger 30: 94-102.

kiefer mitten nur unbedeutend hakenförmig verlängert. Vorder- und Hinterfüße mit breiten Schwimmhäuten versehen; ein ovaler Fleck mit Horntuberkeln an der Hinterseite des Unterschenkels, welcher mit einem zweiten am Oberschenkel korrespondiert. Schwanz lang und dick, am Ende mit einem kräftigen Nagel versehen.

Rückenschild nußbraun, die einzelnen Schilder schwarz eingesäumt; Plastron gelb, die Nähte schwarz, Brücke dunkelbraun. Kopf oben schwarz mit kleinen gelben Flecken, die sich seitlich an den Schläfen zu 2 Streifen formieren, von denen der eine über dem Trommelfell zum hinteren Augenrand geht und der zweite unterhalb liegt. Kiefer gelb mit braunen Querstreifen, ein sehr breiter und intensiver Streifen auf der Unterkiefersymphyse, welcher sich am Oberkiefer fortsetzt. Hals oben und Gliedmaßen samt Schwanz beim größeren Exemplar dunkelbraun, beim kleineren grau; Kehle und Hals unten lichtgrau.

Leconte (Proc. Ac. Philad. 1859) hielt *C. hirtipes* Wagl. für eine Zwischenform von *C. odoratum* Daud. und *C. pensylvanicum* Gm., während es Bocourt (Journ. de Zool. V. 1876) nach den Abbildungen Waglers zwischen letztere Art und *C. integrum* Leconte stellte; und diese Annahme scheint mir auch die richtigere zu sein. *C. hirtipes* Wagl. hat entschieden mit *C. scorpioides integrum* Leconte (Siebenrock, Denk. Ak. Wien 76, 1904) die größte Ähnlichkeit, was die Gesamtform des Tieres anbelangt; allerdings sind einzelne Unterschiede zwischen beiden Arten wieder so groß, daß es wohl kaum glaublich erscheinen muß, wie Günther (Biol. Cent. Amer. Rept. 1885) diese Arten miteinander verwechseln konnte. Und obwohl Boulenger (l. c.) Günthers Irrtum schon richtig gestellt hat, vertritt Gadow (Proc. Zool. Soc. 1905) trotzdem noch Günthers Anschauung, indem er in seiner letzten Abhandlung über die geographische Verbreitung der Amphibien und Reptilien Mexikos anführt, daß *C. hirtipes* Wagl. von Arizona und Neu-Mexiko an der pazifischen Küste in Jalisco mit Einschluß der Tres Marias Inseln verbreitet sei.

Die markantesten Unterschiede zwischen *C. hirtipes* Wagl. und *C. scorpioides integrum* sind:

C. hirtipes Wagl.	*C. scorpioides integrum* Leconte.
Rückenschale mit 1 Kiel.	Rückenschale mit 3 Kielen.
Vorderlappen d. Plastron länger als der Hinterlappen.	Vorderlappen des Plastron kürzer oder ebenso lang als der Hinterlappen.
Vorderlappen vorn eingekerbt.	Vorderlappen vorn abgerundet.
Hinterlappen hinten ausgeschnitten.	Hinterlappen hinten eingekerbt.

Figure 19. Reproduction of page 96 from Siebenrock (1906) discussing the misidentification of '*Cinosternum hirtipes*' and '*C. integrum*' in western Mexico. See Introduction for translation of original German, *this current study*. Imaged from *archive.org*.

Appendix H

Slevin, J.R. 1926. Notes on a collection of reptiles and amphibians from the Tres Marias and Revillagigedo islands, and west coast of Mexico, with description of a new species of *Tantilla*. Expedition to the Revillagigedo Islands, Mexico, in 1925, III. Proceedings of the California Academy of Science 15 (3): 195-207.

11. **Drymarchon corais melanurus** (Duméril & Bibron)

An adult male (No. 58993) was taken late in the afternoon, May 21, 1925, in the bottom of a creek bed on Maria Magdalena Island. It has 17 scale rows, gastrosteges 201, urosteges 78+, anal 1, supralabials x—8, infralabials 7—6, preoculars 1—1, postoculars 2—2, loreal 1—1, temporals 2+2 and 2+2.

Color above black; a few scattered scales brownish, mottled with black; top of head uniform black; 58 posterior gastrosteges and under surface of tail black; anterior gastrosteges white, spotted or edged with black; gular region white.

12. **Boa imperator** Daudin

A male of this species (No. 58681) taken on Maria Madre Island May 21, 1925, has the following scale counts: Scale rows 77, gastrosteges 258, urosteges 66c, anal 1, supralabials 19—20, infralabials 23—24.

This species was also collected on Maria Magdalena Island.

13. **Pelamydrus platurus** (Linnæus)

A dead specimen (No. 58992) was picked up on the beach at Maria Magdalena Island, May 21, 1925.

14. **Kinosternon integrum** Leconte

A single specimen (No. 58675) was found half buried in the mud under an old stump in the creek bottom at Arroyo Hondo, Maria Madre Island, May 17, 1925.

Length of carapace.....290 mm.
Length of plastron.....270 mm.
Width of carapace.....192 mm.
Width of plastron.....161 mm.

Figure 20. Reproduction of page 202 from Slevin (1926) recording collection of a specimen of Tres Marias Island '*Kinosternon integrum*', registration number CAS 58765. The measurements given are entirely erroneous (see Notes section, main text *this current study*). Imaged from *archive.org*.

Appendix I

Smith, H.M. & Taylor, E.H. 1950. An annotated checklist and key to the reptiles of Mexico exclusive of the snakes. Bulletin of the Smithsonian Institution United States National Museum 199: 1-253.

KINOSTERNON HIRTIPES Wagler

Cinosternon hirtipes WAGLER, Natürliches System der Amphibien, . . ., 1830, pl. 5, figs. 29, 30.

Cinosternum hirtipes, GÜNTHER, Biologia Centrali-Americana, 1885, p. 15, pl. 12–15.—SIEBENROCK, Zool. Anz., vol. 30, 1906, pp. 94–97, figs.

Cinosternum henrici LECONTE, Proc. Acad. Nat. Sci. Philadelphia, 1859, p. 4 (type presumably in Acad. Nat. Sci. Philadelphia; type locality, New Mexico, T. C. Henry collector).—DITMARS, Reptile book, 1907, p. 26, pl. 11, fig.

Type.—Munich Museum.

Type locality.—Mexico, here restricted to Mazatlán, Sinaloa.

Range.—Western Texas and southern Arizona southward through the main Mexican Plateau, from Chihuahua to México; recorded from the states of Chihuahua, Sinaloa, Michoacán, Colima, Guanajuato, San Luis Potosí, Hidalgo, México, and from Distrito Federal and the Tres Marías Islands.

KINOSTERNON INTEGRUM LeConte

Kinosternum integrum LECONTE, Proc. Acad. Nat. Sci. Philadelphia, 1854, p. 183.

Cinosternum integrum, BOULENGER, Catalogue of the chelonians, rhynchocephalians and crocodiles in the British Museum, 1889, p. 42.

Cinosternum scorpioides integrum, SIEBENROCK, Zool. Anz., vol. 30, 1906, pp. 96–97.

Cinosternum rostellum BOCOURT, Journ. Zool., vol. 5, 1876, pp. 391–392 (type locality, Guanajuato, Mexico; type in Mus. Hist. Nat. Paris).

Type.—Acad. Nat. Sci. Philadelphia; Mr. Pease collector.

Type locality.—Mexico, here restricted to Acapulco, Guerrero.

Range.—The plateau of Mexico from Sonora to Oaxaca east to Veracruz. Known from Tres Marías Islands and the states of Sonora, Sinaloa, Nayarit, Colima, Michoacán, Guerrero, Oaxaca, Morelos, Guanajuato, Aguascalientes, Jalisco, San Luis Potosí, Puebla, and Veracruz.

KINOSTERNON LEUCOSTOMUM Duméril and Bibron

C[*inosternon*] *leucostomum* DUMÉRIL and BIBRON, *in* Duméril and Duméril, Catalogue méthodique de la collection des reptiles, livr. 1, 1851, p. 17, figs. 1–3.—GÜNTHER, Biologia Centrali-Americana, Reptilia and Batrachia, 1885, p. 17, pls. 16, 17.—SIEBENROCK, Zool. Anz., vol. 30, 1906, pp. 97–98.

Swanka leucostoma, GRAY, Catalogue of the shield reptiles in the British Museum, pt. 1, Testudinata, 1855, p. 69.

Swanka maculata GRAY, *ibid.*, p. 68 (type locality, "Vera Paz," Guatemala, and Cosamaloapam, Veracruz, here restricted to the latter; type in Brit. Mus. Nat. Hist.).

Cinosternum brevigulare GÜNTHER, Biologia Centrali-Americana, Reptilia and Batrachia, 1885, pp. 17–18 (type locality, Playa Vicente, Mexico, Sallé collector; type in Brit. Mus. Nat. Hist.).

Cinosternum cobanum GÜNTHER, *op. cit.*, p. 18, pl. 18, fig. B (type in Brit. Mus. Nat. Hist.; type locality, Cobán and Cahabon, Guatemala, here restricted to Cobán).

Type.—Mus. Hist. Nat. Paris.

Type locality.—"N. Orléans; Mexique; Rio-Sumasinta (Amér.

Figure 21. Reproduction of page 25 from Smith & Taylor (1950) recording both '*Kinosternon hirtipes*' and '*Kinosternon integrum*' from the Tres Marias Islands. Imaged from *archive.org*.

Appendix J

Zweifel, R.G. 1960. Herpetology of the Tres Marias Islands. Results of the Puritan-American Museum of Natural History Expedition to western Mexico. part 9. Bulletin of the American Museum of Natural History 119(2): 77-128.

mask passes from the tip of the snout, bisects the eye, includes the tympanum, and becomes obscure posterior to the forearm insertion. The ventral surfaces are pale and transparent, with a scattering of brown melanophores most numerous in the gular region." Specimen A.M.N.H. No. 60393 was recorded as "The same golden brown [as 60392]. Body surface slightly pustulose, each pustule slightly darker and browner than the background color." These descriptions are at slight variance with the description of the holotype of *pallidus* given by Duellman (1958, p. 6): "In life, the ground color is pale tan and the dorsal markings dark chocolate brown." The differences may merely reflect individual variation in the frogs.

The specimens from the Tres Marías were examined and reported on by Duellman (1958), who assigned them to a new subspecies, *S. modestus pallidus*, found also on the mainland of Nayarit. The typical subspecies, *S. m. modestus*, occurs in Colima and western Jalisco. *Syrrhophus modestus pallidus* shares with *Bufo mazatlanensis* the distinction of being the first amphibian to be reported from the Tres Marías Islands.

Eretmochelys imbricata (Linnaeus)

Testudo imbricata LINNAEUS, 1766, Systema naturae, ed. 12, p. 350, type locality American seas, restricted to the Bermuda Islands by Smith and Taylor, 1950, p. 17.

María Magdalena Island (A.M.N.H. No. 78717).

A member of the crew of the "Puritan" captured this turtle near the bottom in about 20 feet of water at the southeastern edge of the island. The turtle had a carapace length of approximately 17 inches (43 cm.), width of 13 inches (33 cm.), and a weight of 15 pounds. Only the head was saved.

There are no published records for specimens of this species from the territorial waters of Nayarit, but it is well known both north and south of Nayarit.

E. W. Nelson (*in* Stejneger, 1899, p. 64) comments, "The tortoise-shell turtle frequents the sea about the Tres Marías, approaching the shores to mate and deposit eggs in May and June each year."

Chelonia mydas (Linnaeus)

Testudo mydas LINNAEUS, 1758, Systema naturae, ed. 10, p. 197, type locality Ascension Island, South Atlantic.

San Juanito Island (A.M.N.H. No. 78695).

The specimen from San Juanito Island is a skull; remains of several other turtles littered the beach, a testimony to the high esteem in which this species is held by human beings as an article of food.

A large turtle very probably of this species was seen on April 8, approximately 8 miles east-northeast of María Madre Island, where the water at 12.30 P.M. was 23.1° C. (73.5° F.).

According to E. W. Nelson (*in* Stejneger, 1899, p. 64), "the large green sea turtle abounds along these shores [the Tres Marías]."

Kinosternon integrum LeConte

Kinosternum integrum LECONTE, 1854, Proc. Acad. Nat. Sci. Philacelphia, p. 183, type locality Mexico, restricted to Acapulco, Guerrero, by Smith and Taylor, 1950, p. 25.

Cinosternum hirtipes, GÜNTHER, 1885 (1885–1902), p. 15, pls. 12A, 15A–B.

Cinosternum integrum, BOULENGER, 1889, p. 42.

Kinosternon integrum, STEJNEGER, 1899, p. 64. SLEVIN, 1926, p. 202. SMITH AND TAYLOR, 1950, p. 25.

Kinosternon hirtipes, SMITH AND TAYLOR, 1950, p. 25.

Arroyo Hondo, María Madre Island (A.M.N.H. No. 77437).

The only specimen found was captured in the largest of the few small pools in the arroyo (see p. 86). *Kinosternon* has been found only on María Madre Island, to which, in view of the scarcity of water on the other islands, it may be restricted. The species is common on the adjacent mainland and ranges widely from Sonora to Guerrero and eastward to Veracruz.

The two specimens collected by Forrer are identified as *hirtipes* by Günther (1885–1902, p. 15, pls. 12A, 15A–B), but the same specimens are called *integrum* by Boulenger (1889, p. 42). With five specimens collected by Nelson and Goldman available to him, Stejneger (1899, p. 64) had "no hesitation in endorsing Boulenger's view." Smith and Taylor (1950, p. 25) committed themselves

Figure 22a. Reproduction of page 94 from Zweifel (1960) recording collection of a specimen of Tres Marias Island '*Kinosternon integrum*', registration number AMNH 77437 (now holotype of *Kinosternon mariamadre* sp. nov., formal descripition *this current study*). Imaged from *archive.org*.

to neither alternative and record both species from the islands. The American Museum specimen was submitted for identification to Dr. Norman Hartweg, who replied (*in litt.*), "This specimen is *K. integrum*, the only species of the genus that gets to the Tres Marías."

In life, A.M.N.H. No. 77437 had the top of the head, carapace, limbs, and tail a nearly uniform, patternless, dull black. The chin and the side of the head were mottled with yellow, and the plastron was yellow, with dark brown markings following the sutures.

On the mainland, *Kinosternon integrum* occurs in small streams or disconnected pools, situations similar to those in Arroyo Hondo. This species probably shares with others of its genus the ability to survive periods of drought, when surface water is unavailable. This ability would be advantageous on the Tres Marías, where the water supply is precarious in the dry season.

Crocodylus acutus Cuvier

Crocodilus acutus Cuvier, 1807, Ann. Mus. Hist. Nat. Paris, vol. 10, p. 55, type locality Santo Domingo.

Crocodylus americanus, Stejneger, 1899, p. 64.

Crocodylus acutus acutus, Smith and Taylor, 1950, p. 211.

The crocodile has been included in the fauna of the Tres Marías on the basis of observations by E. W. Nelson (Stejneger, 1899, p. 64): "The unmistakable furrow in the mud where a crocodile had hauled up on the border of a brackish lagoon on the eastern side of María Magdalena, the sight of a small head in the water, and the testimony of the people on María Madre established the fact of their occurrence. They appeared to be limited to María Magdalena."

Although no specimens are yet known from the Tres Marías, it seems likely that Nelson's sight record will eventually be confirmed by tangible evidence. *Crocodylus acutus* is known from the adjacent coast of Nayarit (Zweifel, 1959c) and is found from Sinaloa and Florida to South America.

Phyllodactylus lanei Smith

Plate 43, figure 2

Phyllodactylus lanei Smith, 1935, Univ. Kansas Sci. Bull., vol. 22, pp. 125–132, type locality near Tierra Colorada, Guerrero. Smith and Taylor, 1950, p. 48.

Phyllodactylus tuberculosus, Boulenger, 1885 (1885–1887, vol. 1), p. 80. Günther, 1893 (1885–1902), p. 80. Stejneger, 1899, pp. 64–65. Slevin, 1926, p. 198.

María Madre Island (A.M.N.H. Nos. 78737, 78738, 78763–78766); María Magdalena Island (A.M.N.H. No. 78697).

The specimen from María Magdalena Island was found in a crack in the shale wall of an arroyo; those from María Madre were purchased, so no information on habitat is available. Stejneger (1899, p. 65) and Slevin (1926, p. 198) report specimens taken on houses and under the bark of trees. A notable feature of the pattern of individuals with complete tails is distinct banding distally with black and white, contrasting with the drab grays of the body and proximal part of the tail.

With the addition of María Magdalena Island to the known distribution, the species is now unrecorded only from San Juanito Island. On the mainland, *Phyllodactylus lanei* is said to range from Sinaloa to Guerrero (Smith and Taylor, 1950, p. 48). Other *Phyllodactylus* possibly subspecifically related to *lanei* are found in southern California, Baja California, Sonora, and southward to South America.

Anolis nebulosus (Wiegmann)

Plate 44, figure 1

D[actyloa] nebulosa Wiegmann, 1834, Herpetologica Mexicana, p. 47, type locality Mexico by inference, restricted to Mazatlán, Sinaloa, by Smith and Taylor, 1950, p. 66.

Anolis nebulosus, Günther, 1885 (1885–1902), p. 49. Boulenger, 1885 (1885–1887, vol. 2), p. 77. Van Denburgh, 1897, p. 460. Stejneger, 1899, p. 65. Slevin, 1926, p. 198. Smith and Taylor, 1950, p. 66.

San Juanito Island (A.M.N.H. No. 77151); María Madre Island (A.M.N.H. Nos. 77144–77150, 77177); María Magdalena Island (A.M.N.H. Nos. 77152–77167); María Cleofas Island (A.M.N.H. Nos. 77168–77176).

The specimens collected on the Puritan-American Museum expedition were sent for examination to Dr. Hobart M. Smith, who reports (*in litt.*) that they are typical *nebulosus* and cannot be differentiated from the

Figure 22b. Reproduction of page 95 from Zweifel (1960) recording collection of a specimen of Tres Marias Island '*Kinosternon integrum*', registration number AMNH 77437 (now holotype of *Kinosternon mariamadre* sp. nov., formal descripition *this current study*). Imaged from *archive.org*.

Appendix K

Hardy, L.M. & McDiarmid, R.W. 1969. The amphibians and reptiles of Sinaloa, Mexico. University of Kansas Publications Museum of Natural History 18(3): 39-252.

Kinosternon hirtipes Wagler

Cinosternon hirtipes Wagler, Naturl. Syst. der Amphibien, p. 137, pl. 5, figs. 29, 30, 1830 (based on a specimen from México).

In 1885-1902, Günther (page 15, plates 12-15) reported specimens of *Kinosternon* from Mazatlán, Sinaloa, and from the Tres Marías Islands as *K. hirtipes*. Boulenger (1889:42) referred the same specimens to *K. integrum*. Subsequent authors (Taylor, 1938:529; Smith and Taylor, 1950b:25) reported *K. hirtipes* from Sinaloa. Zweifel (1960:94) referred the Tres Marías *Kinosternon* to the species *integrum*. Our work in Sinaloa complements Zweifel's work on the fauna of the Tres Marías Islands and we agree that all specimens of *Kinosternon* from Sinaloa are typical *integrum*. On this basis we reject the records and reports of *K. hirtipes* from Sinaloa, and suggest that these records are based on misidentified specimens of *K. integrum*. Additional information pertaining to the differences between *K. integrum* and *K. hirtipes* are presented in the account for *K. integrum*. It should be pointed out that the wholesale restrictions of type localities, as exemplified by the restriction of the type locality for *K. hirtipes* to Mazatlán by Smith and Taylor (1950a:343) have no validity and such restrictions should be ignored. This is especially relevant in the above instance where the type locality is restricted to a place where the species apparently does not occur.

Anolis nebuloides Bocourt

Anolis nebuloides Bocourt, Mission scientifique au Méxique . . ., Etudes sur les reptiles, livr. 2, pp. 74-75, pl. 13, fig. 10, 1873 (type locality, Putla, Oaxaca).

An examination of specimens of *Anolis* from Sinaloa has convinced us that the reports of *Anolis nebuloides* are based on misidentified specimens of *Anolis nebulosus*. In addition, all specimens examined had, to the best of our knowledge, an orange dewlap. *Anolis nebuloides* has a pink dewlap.

Gerrhonotus imbricatus ciliaris Smith

Gerrhonotus levicollis ciliaris Smith, Proc. U. S. Nat. Mus., 92:365, 1942 (type locality, Sierra Gaudelupe, Coahuila).

Gerrhonotus imbricatus ciliaris: Stebbins, Amer. Mus. Novitates, 1883:23, March 21, 1958.

There is a specimen of *Gerrhonotus imbricatus ciliaris* in the American Museum of Natural History (AMNH 585) collected by Paul R. Ruthling at "Escuinapa." The lizard was re-examined and the identity confirmed as reported by Tihen (1949:245) and Smith and Taylor (1950b:202). According to Tihen (1949:252), Stebbins (1958:18, fig. 4), and Duellman (1961:88) *Gerrhonotus imbricatus* is found at relatively high altitudes usually in pine forests. Escuinapa is located on the coastal plain at less than 50 meters elevation in tropical dry or deciduous forest. Because of the obvious differences in habitat between Escuinapa and other localities at which *Gerrhonotus imbricatus* has been collected, and because of the provenance of certain other specimens from the Ruthling collection, we do not consider Escuinapa, Sinaloa, to be the

Figure 23. Reproduction of page 218 from Hardy & McDiarmid (1969) discussing the rejection of the identification of '*Kinosternon hirtipes*' from westen Mexico. Imaged from *archive.org*.

Appendix L

Iverson, J.B. 1981. Biosystematics of the *Kinosternon hirtipes* species group (Testudines: Kinosternidae). Tulane Studies in Zoology and Botany 23(1): 1-74.

(1890:330; 1891:46; 1893:339; 1904:5), (1890:330; 1891:46; 1893:339; 1904:5), Herrera and Lope (1899:281), Westphal-Castelnau (1872:278), and Strauch (1890:88); *Cinosternonus pensylvanicum,* Herrera (1899:28; for discussion see H.M. Smith and R.B. Smith, 1975:86); *Cinosternum pennsilvanicum,* Cope (1900:1229); *Cinosternum pennsylvanicum,* Gadow (1905:209); *Cynosternon pensylvanicum,* Herrera and Lope (1899:131); *Cynosternon pennsylvanicum,* Herrera (1893:342); and *Kinosternum pennsilvanicum,* Cope (1896:1021).

The failure of these person to recognize their specimens as *K. hirtipes* Wagler is probably a consequence of the lack of a nuchal scute by Wagler's only type specimen (see later). Unaware that a missing nuchal scute (actually worn away) is an uncommon, though natural anomaly, A.M.C. Duméril and G. Bibron (1834:370), A.H.A. Duméril (1870:25), Bocourt (1876:50) and Dugès (1888:106) used the absence of that scute as *the* key character in identifying *hirtipes.*

Several additional orthographic variations were not, however, based on *K. hirtipes.* Gadow's (1905:194) record of *Cinosternum pennsylvanicum* from Guerrero must be based on *K. integrum* if the datum is correct, because it is the only *Kinosternon* found there.

Lampe's (1901:185) description of *Cinosternum pensylvanicum* from north Mexico makes it clear he is referring to *Kinosternon subrubrum hippocrepis* (probably from Texas).

Siebenrock's (1905:465) erroneous record of *Testudo pensylvanica* from Veracruz is possibly based on a specimen of *K. herrerai.*

Cinosternon hippocrepis (another synonym of *K. subrubrum;* see Iverson, 1977b) was erroneously recorded from Sonora by Strauch (1865:100, 184) presumably based on a specimen of *K. sonoriense.*

Kinosternon flavescens.

Several *K. flavescens* records are in part based on members of the *K. hirtipes* species group. Most of these have been previously discussed (Iverson, 1978). In addition, Cooper (1870:66) recorded *Platythyra flavescens* from the Colorado River Valley along the California border (precise locality unknown). I have elsewhere (Iverson, 1978:477) questioned the existence of *K. flavescens* in the Colorado River basin and here suggest that Cooper's record was almost certainly based on *K. sonoriense.*

Kinosternon scorpioides group.

The true identity of the species of *Kinosternon* occuring on María Madre Island in the Tres Marías Islands off the coast of Nayarit has plagued herpetologists. Gunther (1885:15) first recorded and figured *K. hirtipes* from the island, but the same specimens were called *K. integrum* by Boulenger (1889:42). Both Strauch (1890:91) and Stejneger (1899:64) supported Boulenger's view, yet Gadow (1905:209) advocated Gunther's original designation. Siebenrock (1906:96) was the next to support Boulenger's position. H.M. Smith and Taylor (1950a:25) avoided the problem by recording both species from the islands. Zweifel (1960:94) next addressed the problem in his study of the herpetofauna of the islands. In collaboration with Norman Hartweg, he finally corrected the record; *K. integrum* is the only species of the genus occurring in the Tres Marías. Wermuth and Mertens (1961:Fig. 13, p. 20) reproduced Gunther's (1885) figures and recommitted the latter's error. Casas Andreu (1967:44) likewise repeated the error, apparently following Smith and Taylor (1950a).

Hardy and McDiarmid (1969:218) were next to discuss the problem and they supported Hartweg, Zweifel, and Boulenger's position. In what I hope is the final chapter in this prolonged story, I can only repeat and emphatically support Hartweg's opinion (in Zweifel 1960:95) that *K. integrum* is "the only species of the genus that gets to the Tres Marías."

Kinosternon hirtipes group.

Garman (1887:16) erroneously record-

Figure 24. Reproduction of page 22 from Iverson (1981) discussing the history of confusion of the identification of the Tres Marias mud turtles between '*Kinosternon hirtipes*' and '*Kinosternon integrum*'. Imaged from *archive.org.*