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A NEW SUBSPECIES OF SOFT-SHELLED TURTLE
FROM THE CENTRAL UNITED STATES, WITH
COMMENTS ON THE APPLICATION OF
THE NAME *AMYDA*

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It is clear, from studies we began on North American soft-shelled turtles in 1941, that the wide-ranging *Amyda spinifera* does not consist of two subspecies—as indicated by Stejneger and Barbour in 1939 and 1943 and explained by Stejneger in 1944—but of three. These are *spinifera spinifera* LeSueur of the Northeast, *spinifera aspera* (Agassiz) of the Southeast, and another race, indigenous to tributaries flowing into the Mississippi River from the west, that may be called

Amyda spinifera hartwegi, new subspecies¹

HOLOTYPE.—U.M.M.Z. No. 95365. An adult male; length of carapace, 168 mm.; collected at Wichita, Sedgwick County, Kansas, during the end of May, 1945, by Robert Young, and secured through the courtesy of Charles E. Burt. Young's field notes state: "The stream it was caught in runs through the southeast part of town and is called the Canal.

¹ Named for Dr. Norman E. Hartweg, of the Museum of Zoology, University of Michigan, who is one of the principal students of North American turtles.

It was formerly the old Chisolm Creek Bed and runs northwest and southeast and empties into the Big Arkansas River at the south side of Wichita." Two additional specimens of *hartwegi* (U.M.M.Z. Nos. 95363-64) and a specimen of *A. mutica* (U.M.M.Z. No. 95362) were collected at the same time and place as the type.

PARATYPES.—All from Kansas. Atchison County: Atchison (U.M.M.Z. Nos. 66939-41). Cowley County: Winfield (U.S.N.M. Nos. 91022, 100529-30; U.M.M.Z. No. 75963); eleven miles southeast of Winfield (U.S.N.M. No. 95301). Ellis County: Ellis (M.C.Z. No. 5758). Greenwood County: (U.S.N.M. No. 55683). Hamilton County: Syracuse (U.K. No. 2990). Neosho County: thirty-two miles north of Parsons (U.M.M.Z. No. 69294). Pratt County: State Fish Hatchery (U.K. No. 15934). Russell County: (U.K. No. 3289). Sedgwick County: Wichita, collected with the type (U.M.M.Z. Nos. 95363-64). Shawnee County: Kansas River at Topeka (U.S.N.M. No. 123446). Stafford County: Little Salt Marsh (U.K. No. 3758). Trego County: ten miles north of Utica (U.K. No. 3769).

DIAGNOSIS.—A soft-shelled turtle of the genus *Amyda* in which the carapace is marked with numerous dark spots or small ocelli (or both), such markings being the same size (or only slightly larger) in the center of the carapace as they are near its perimeter.

In the subspecies *spinifera*, ocelli are well developed, and those toward the center of the carapace are distinctly larger than the ones near the perimeter of the shell. In the subspecies *aspera*, there are also ocelli on the upper shell, but turtles of that race are characterized by the possession of two or more dark, usually interrupted, lines around the rear and lateral edges of the carapace. In both *spinifera* and *hartwegi* there is a single more or less continuous dark line paralleling the edge of the carapace. Also in *aspera*, the postocular and postlabial light lines usually meet on the side of the head; in the other two subspecies they do not normally meet.

As in the other members of the genus *Amyda*, the pattern in all these forms may be seen best in juvenile females and in males; in large females, which undergo a remarkable change in coloration and pattern as they grow older, the markings may be made out only with difficulty, if at all.

DESCRIPTION OF THE HOLOTYPE.—Carapace subovoid and nearly flat, widest just anterior to the hind legs; margin entire. Surface beset with a great number of small tubercles, so that the shell is as rough as coarse sandpaper. A row of short poorly developed spines projects forward and upward from the nuchal edge of the carapace. A slight vertebral ridge widens anteriorly and terminates in a flat, rounded protuberance; posteriorly, the ridge narrows and flattens, disappearing on the posterior third of the shell. Faint indications of the underlying bony structure may be seen along, and to either side of, the vertebral ridge. A small whitish scar at the perimeter of the shell directly above the right foreleg; a few other faint, chiefly transverse, scars on the posterior third of carapace. Total length, 168 mm.; greatest width, 136 mm.; greatest depth (carapace and plastron combined), 41 mm.

Plastron small, extending slightly farther forward than the carapace, but failing to cover the hind limbs and tail. Fore and hind lobes rounded. Surface smooth, except for numerous well-healed scars. Plastron rigidly fastened to the carapace; plastral plates not developed, but some sutures and other features of the underlying bony structure may be seen through the translucent skin. Total length, 127 mm.

Head moderately small, subconical in shape, and terminating in a long, pointed, and slightly flexible snout. Eyes only slightly protuberant; mandibles covered with fleshy lips, except at their anterior parts, where the horny beak of each jaw is exposed. Nostrils divided by a septum from which a narrow ridge, running back into the nasal passage, projects into each nostril.

Feet well webbed; five digits on each foot, but only the first three have claws. Skin smooth, except that each fore-

limb bears four elongated, forward-pointing scales on the anterodorsal surface of the wrist.

Tail stout, projecting well beyond the posterior margin of the carapace, and terminating in a short, soft point. Anus near the tip. Penis everted. Length of tail from anus to tip, 10 mm.; from posterior edge of plastron to tip; 77 mm.

COLORATION AND PATTERN.—In life: ground color of carapace, Sepia;² slightly more reddish in the nuchal region. Carapace marked with numerous, chiefly rounded, Black spots and a few small ocelli; such markings are only slightly larger in the middorsal region than near the perimeter of the shell. Lateral and posterior margins of carapace, uniform Olive Citrine and separated from the ground color by a continuous row of Black dots and dashes that impart the appearance of a black line more or less paralleling the edge of the shell.

Ground color of underparts varying from uniform Pale Olive-Buff to Ivory Yellow, but showing several small patches of Reed Yellow around the edge of the carapace, particularly in the lateral parts. Perimeter of underside of carapace marked with numerous small Black or Slate Color spots. The bony patches that show through the skin are Light Celandine Green.

Top of head, Saccardo's Olive changing to Buffy Citrine on the nape. A narrow Black line from each eye to the tip of the snout. Intraocular bar incomplete, represented by two short Black lines extending toward each other from near the anterior corners of the eyes. A band of Olive Lake, bordered above and below by a narrow, irregular Black line, begins on the posterior part of the snout, passes through the eye, and extends onto the neck. Another Black-bordered light band of Citrine Yellow begins at the underside of the tip of the snout and extends backward through the fleshy lips of both mandibles onto the neck. These two light bands fail to meet. Ground color of chin, Artemisia Green,

² Capitalized color names are those of Robert Ridgway's *Color Standards and Color Nomenclature* (Washington, D. C. : Published by the Author, 1912).

marked with several irregular Slate Color spots. Neck, Dull Citrine, changing to Naphthalene Yellow where the skin meets the plastron; neck heavily marked with spots and lines of Slate Color, especially on the sides. Pupil of eye, Black; iris, Old Gold.

Ground color of forelimbs, Olive Citrine, changing to Old Gold on the outer (lateral) edge of the foot between the toes. There is a short, light streak of Old Gold along the inner (thumb) edge of the foot just anterior to the first scale. Forelimbs, both above and below, heavily marked with streaks and spots of Black and Slate Color. Ground color of hind limbs, Yellowish Citrine. Dorsal surface of hind limbs and soles of feet heavily marked with spots and streaks of Black. Claws, Olive Lake to Buff Citrine.

Dorsal surface of tail, Saccardo's Olive. A light band of Citrine Yellow on each side of the tail, bordered above and below by an irregular Slate Color stripe.

As a result of preservation in alcohol the lighter colors, especially the yellows, have faded, and the hues in general, are now more somber than they were in life.

VARIATION.—The paratypes consist of seven males, seven females, and five juveniles in which sex was not determined. In four of the juveniles (lengths of shells, 44, 45, 52, and 72 mm.) the carapaces are more or less uniformly covered with small dark spots or tiny ocelli (or both). In the fifth juvenile (M.C.Z. No. 5758; length of shell, 57 mm.) the spotting is similar, except that on the anteromesial part of the carapace the markings are obscure, as is the case in numerous adults (especially females) in which ontogenetic changes may produce a dark, mottled pattern and bring about a darkening of the area directly above the vertebral column and the ribs.

In the smallest female (U.S.N.M. No. 100530; length of shell, 109 mm.) the markings are largely obliterated, although it is obvious that they originally consisted of small spots. In the next smallest female (U.M.M.Z. No. 95364; length of shell, 128 mm.) dots are prominent, but the juvenile pattern is starting to break up. In the remaining five specimens

(lengths of shells, 143, 149, 187, 190, and 275 mm.) the original markings have largely disappeared, except for a few small dots along the sides and rears of the carapaces.

Among the males, dark spots and small ocelli are numerous on the carapaces. Such markings are uniformly present on all parts of the carapaces of four specimens (lengths of shells, 115, 121, 130, and 184 mm.), and some of the ocelli in each are as large as, or slightly larger than, the largest ones in the type. In another specimen (U.S.N.M. No. 123446; length of shell, 150 mm.) the ocelli tend to fade and change to streaks and spots. In the remaining two males (U.S.N.M. No. 100529 and U.S.N.M. No. 55683; lengths of shells, 170 and 160 mm., respectively) there are small ocelli toward the perimeter of the shells, but the anteromesial part of the carapaces is more or less uniformly dark, the underlying bony structure is readily apparent, and the original markings are obscure or absent.

Attention should be called to the fact that the method of preservation apparently has much to do with the extent to which the carapace darkens and the costals and vertebrae show through the skin. Many of the specimens that we have examined have been so "burned" and discolored, as a result of being preserved in too strong formalin, that details of both pattern and structure are obscure.

Specimens of *hartwegi* vary considerably in the amount of pigmentation in evidence on the ventral surface of the carapace. There apparently is no correlation with sex in this characteristic; some males as well as some females may have considerable dark spotting below, whereas others may have few or no spots. Among the paratypes, the juveniles have somewhat more ventral pigmentation than have the adults.

The postocular and the postlabial light stripes fail to meet on the sides of the head—at least in those turtles that have their heads far enough extruded from the shell so that the markings may be seen. Among the paratypes there is no indication of more than one narrow dark line bordering the perimeter of the carapace. In all adults tubercles are well

developed along the anterior edge of the carapace and, in most adults, on the dorsal surface of the shell as well. The tubercles are lacking or only slightly developed in the juveniles.

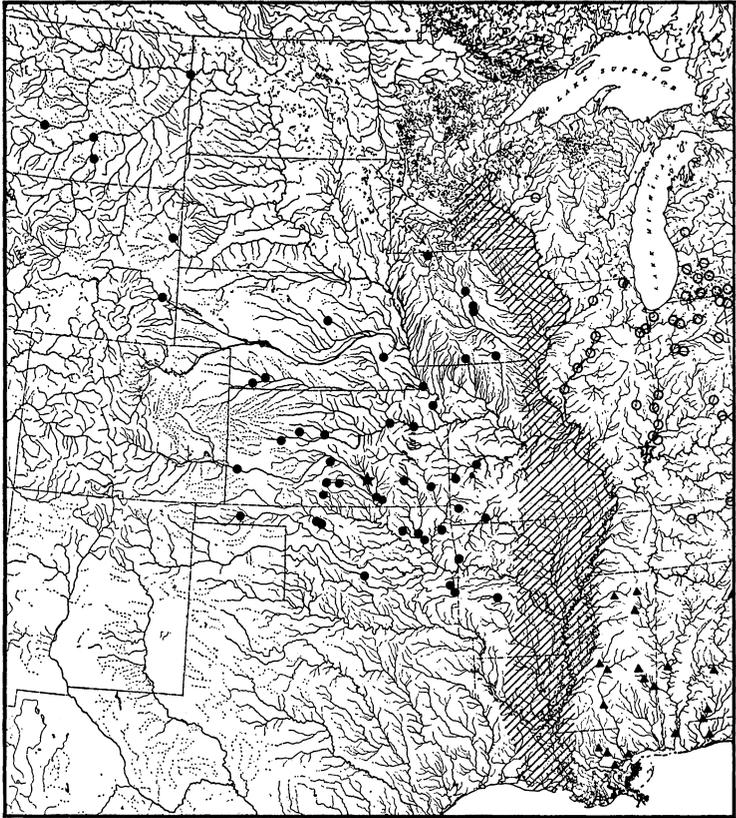
In the series of specimens of *hartwegi* (other than the paratypes) there is relatively little variation except for differences in sex and the normal changes that are associated with age. There are two individuals, however, that have large ocelli (or remnants of them) on their carapaces. One of these (U.N. No. 308) is an adult female from near McCook, Nebraska, with a shell about 175 mm. long, in which it is obvious that large ocelli once were present even though the original markings are largely obscured by the development of the mottled pattern that is normal among large females. In the other individual (U.S.N.M. No. 7648), an adult male from Fort Laramie, Wyoming, with a shell about 160 mm. long, the ocelli are as well developed as they are in typical specimens of *spinifera*. Whether these specimens indicate local variations or show evidences of characteristics that may appear occasionally in populations of *hartwegi*, or whether the locality data for them are incorrect (an unlikely possibility) can only be determined by the examination of more material. Sexual and age variation is so great that a true interpretation of the population in any given locality is only possible when a series of specimens is available for examination.

RANGE.—Nebraska, Kansas, and Oklahoma eastward toward the Mississippi River in southern Minnesota, Iowa, Missouri, and Arkansas; northwest to Wyoming and Montana (see Map 1).

In addition to the types we identify the following turtles as *hartwegi*. They are listed by localities.

Arkansas. Crawford County: Lee Creek, near Natural Dam (U.S.N.M. No. 95352). Garland County: Ouachita River, near Mountain Pine (C.N.H.M. No. 28567).

Iowa. Appanoose County: Chariton River, 4.3 miles north of Centerville (I.S.C. No. 1192). Decatur County: Thompson River (locally known as Grand River), 3.5 miles west-south-



MAP 1. Distribution of *Amyda spinifera hartwegi*. Solid circles indicate localities from which specimens have been examined; the type locality is designated by a solid star. The crosshatching delineates (1) the approximate area of intergradation between *hartwegi* and *spinifera* (based on material seen by the authors), and (2) the region in Louisiana, Mississippi, and Arkansas where there is an extremely complex population of soft-shelled turtles that exhibits characteristics of the three subspecies, *hartwegi*, *spinifera*, and *aspera*.

Localities for *Amyda spinifera spinifera* are indicated by hollow circles; the type locality for this race is designated by a hollow star.

Localities for *Amyda spinifera aspera* are indicated by triangles.

west of Decatur (I.S.C. No. 1191). Dickinson County: Spirit Lake (I.S.C. No. 1210). Hamilton County: Webster City (U.S.N.M. No. 9928). Story County: Squaw Creek at Ames (I.S.C. No. 1193); Skunk River, five miles north-northeast of Ames (I.S.C. No. 1205).

Kansas. (A.N.S.P. No. 99; U.S.N.M. No. 51529). Barber County: Lake City (U.S.N.M. No. 100580). Cowley County: one mile west of Winfield (U.S.N.M. Nos. 90441-44). Kingman County: two miles east of Calista (U.S.N.M. No. 95261). Riley County: Manhattan (U.M.M.Z. No. 64434).

Missouri. Newton County: Shoal Creek (U.M.M.Z. No. 82822). St. Clair County: Osage River, near Osceola (Anderson No. 539). Stone County: (U.S.N.M. No. 55684). Vernon County: Marmathon River, seven miles north of Moundville (Anderson No. 1246).

Montana. Yellowstone River (M.C.Z. Nos. 3427-28). Yellowstone County: Fort Custer (U.S.N.M. No. 14535). Bighorn County: Crow Agency (U.S.N.M. Nos. 54421-23, 59736). Richland County: Yellowstone River (?) at Fort Union (U.S.N.M. No. 58). Wheatland County: Musselshell River, near Shawmut (U.M.M.Z. No. 92005).

Nebraska. Richardson County: two miles south of Rulo (W.S.C. No. 41-243). Hitchcock County: three miles east of Stratton (U.N. No. 296). Lancaster County: Lincoln (U.N. Nos. 97 and 106). Redwillow County: fourteen miles northwest of McCook (U.N. No. 308). Wheeler County: two miles west of Erickson (U.N. No. 200).

Oklahoma. Cleveland County: Norman (U.O.M.Z. No. 22973). Delaware County: Spavinaw (U.M.M.Z. No. 81476). Le Flore County: Wister (C.M. No. 3056a-g, seven specimens); one and one-half miles east of Zoe (U.O.M.Z. No. 16802). Osage County: Big Hominy Creek (U.M.M.Z. No. 89628). Rogers County: (U.M.M.Z. Nos. 81473-74); near Inola (U.M.M.Z. No. 81475); Verdigris River, five miles west of Claremore (U.O.M.Z. No. 7317). Texas County: (U.O.M.Z. No. 5005). Woods County: Waynoka (C.N.H.M. No. 11809); two and one-half miles west of Waynoka (U.O.M.Z. No. 9432);

one mile south of Waynoka (U.O.M.Z. No. 9579, Nos. 9581-82).

Wyoming. Goshen County: Platte River (M.C.Z. No. 29309); Fort Laramie (U.S.N.M. No. 7648). Weston County: Beaver Creek (U.M.M.Z. No. 78080).

The specimens from Wyoming and Montana are included provisionally. Much more material is needed from these and adjacent states before the status of the soft-shelled turtles of the upper Platte River and upper Missouri River basins can be settled. Eventually, it may be demonstrated that *hartwegi* extends southward into Louisiana. We have seen a few specimens from that state which are indistinguishable from *hartwegi*, but the population of soft-shelled turtles in the lower Mississippi River and its tributaries is so extremely variable that no single subspecific name may be assigned to individual specimens. Our studies indicate that at least three subspecies, *spinifera*, *hartwegi*, and *aspera*, intergrade with one another in that region.

INTERGRADATION. — *Amyda spinifera hartwegi* intergrades with *Amyda spinifera spinifera* over a wide area paralleling the Mississippi River. Population samples consisting of intermediates between the two subspecies have been seen from the vicinity of Minneapolis, Minnesota; Allamakee County, Iowa; Jackson County, Illinois; Reelfoot Lake, Tennessee; and Lawrence Country, Arkansas.

The manner in which intergradation takes place may be illustrated by summarizing the pattern characteristics exhibited by a series of thirty-two specimens collected in the Elkville City Reservoir, Elkville, Jackson County, Illinois, by Fred R. Cagle, M. Stanton, and W. Carlisle, in July, 1941. Among these there are eight large females in which the original pattern is completely obliterated. Among the others, fourteen are strongly marked with ocelli that are largest and most prominent toward the center of the shell; in this lot are nine males, one female, and four juveniles (sex not determined). All of these are indistinguishable from specimens of *spinifera* from eastern Illinois, Indiana, Ohio, and other eastern states. Six additional male specimens have small

ocelli which are little larger toward the center of the carapace than they are near the perimeter of the shell. In the remaining four (a male, a subadult female, and two juveniles) the carapaces are marked with spots and very small ocelli (or both) that are more or less uniform in size irrespective of their positions on the shells. The dorsal patterns of the last ten turtles are within the range of variation of specimens of *hartwegi* from Kansas.

Other population samples from the intergrading region have similar mixtures of genetic factors, the characteristic markings of *spinifera* predominating in some and those of *hartwegi* predominating in others. There is considerable evidence to indicate that intergradation occurs over a fairly wide area, at least as far west as east central Iowa, east central Missouri, and central Arkansas. Occasional individuals from well west in these states show strong tendencies toward *spinifera*. Conversely, specimens with markings approaching those of *hartwegi* are found in western Wisconsin, central Illinois, and western Tennessee. It is obvious, however, from the material we have seen, that the characteristics of *spinifera* extend farther west of the Mississippi River than those of *hartwegi* extend east of the river. It will be impossible to delineate accurately the area of intergradation between *spinifera* and *hartwegi* until series of specimens from a great many additional localities are available for study. In the meantime we consider that all individuals from the area shown in crosshatching on Map 1 are members of intermediate populations.

We conclude that *hartwegi* intergrades with *aspera* through the interesting complex of soft-shelled turtles that inhabits the lower Mississippi Valley. The population from southeastern Arkansas, western Mississippi, and Louisiana exhibits characteristics of all three forms, *spinifera*, *aspera*, and *hartwegi*.

THE USE OF THE NAME *Amyda*

During the course of our studies upon American soft-shelled turtles we have had occasion to investigate the

controversial question concerning whether the proper generic name for these reptiles should be *Amyda* or *Trionyx*. The situation, in brief, may be summed up as follows:

Geoffroy, in 1809, first used the name *Trionyx*, assigning eight species to it. One of these he called *coromandelicus*, a form which subsequent authors have almost universally split from the main group, placing it in a monotypic genus. But there has been much difference of opinion as to whether *coromandelicus* or the other species should bear the name *Trionyx*.

Several British herpetologists (Gray, 1831 and 1844; Boulenger, 1889; Smith, 1930 and 1931) and the many followers of the catalogues of the British Museum are in agreement that the name *Trionyx* should not be applied to *coromandelicus*.

Conversely, numerous continental and American students of turtles (Oken, 1816; Wagler, 1830; Bonaparte, 1836; Fitzinger, 1843; Agassiz, 1857; Baur, 1893; Hay, 1903; Stejneger, 1905 and 1944) have considered that *Trionyx* properly belongs to the monotypic *coromandelicus* (= *granosa* of Schoepff, 1792). These authors have used various names for the other soft-shelled turtles, but *Amyda* appears frequently. Most contemporary American writers, following the conclusions of Stejneger (1905 and 1944), have employed *Amyda* for the North American forms and their congeneric allies in other parts of the world. Among them, however, Pope is perhaps the most conspicuous exception. He utilized *Trionyx* in his popular book on turtles (1939), although in his earlier monograph on Chinese reptiles (1935) he assigned members of the same genus to *Amyda*.

The basic contention hinges upon whether or not Geoffroy (1809a and b) actually selected a type for his genus *Trionyx*. Those who argue in favor of applying the name *Trionyx* to the majority of soft-shelled turtles claim that he did; those who favor *Amyda* claim that he did not. To settle the matter in our own minds we have re-examined all original sources and have again sifted the evidence. As a

result of these studies we feel that we are fully justified in using *Amyda*. Correspondence with one of our herpetological colleagues, who defends *Trionyx* with vigor, indicates that, in making this decision, we may run the risk of being branded as "name changers." *Amyda*, however, is so firmly entrenched in American nomenclatorial literature that it seems to us that the re-establishment, of *Trionyx* for the polytypic genus would constitute much more of a change. *Trionyx* properly belongs to the monotypic turtle (with two subspecies in India and one in Burma) for which Smith (1931, 154) recently proposed the new name *Lissemys*.

In instances where considerable controversy exists, one can have recourse solely to the letter of the law. To strengthen our conclusions and to lend to them the weight of authority, we have petitioned Francis Hemming, secretary of the International Commission on Zoological Nomenclature, for an interpretation of the questions involved, submitting to him the following information:

1. Geoffroy Saint-Hilaire (1809a) proposed the generic name *Trionyx* with the following species included: *coromandelicus*, *javanicus*, *carinatus*, *stellatus*, *egyptiacus*, *subplanus*, *georgianus*, and *euphraticus*. None of these was designated as the type. In the synonymy of *javanicus* he listed "*Amyda Javanica*, par M. Schweigger, dans un manuscrit communique a l'Institut."

2. Geoffroy Saint-Hilaire (1809b) in a more extensive, illustrated paper, described the genus *Trionyx* in detail and included the following species: *subplanus*, *aegyptiacus*, *stellatus*, *carinatus*, *javanicus*, *coromandelicus*, *georgicus*, and *euphraticus*. Here again he listed *Amyda javanica* as a synonym. In the body of the paper he made no mention of a type of *Trionyx*. He did, however, in the explanation of the plates, state: "Le trionyx d'Égypte, représenté planche I, vue en dessous et de côté, nous donnant une idée exacte du port et des caractères génériques des trionyx, nous sommes bornés, dans les planches suivantes, à faire figurer les seules

parties caractéristiques des autres espèces, telles que leurs carapaces en A, et leurs plastrons en B."

3. Oken (1816, 348) subdivided the plurispecific genus, placing *granosa* in the genus *Trionyx* and giving the others the generic name *Amyda*.

4. *Coromandelicus* (Geoffroy, 1809) is a synonym of *granosa* (Schoepff, 1792).

5. Fitzinger (1843, 30) selected *granosa* (= *coromandelicus*) as the type of *Trionyx*.

6. *Javanicus* (Geoffroy, 1809) is a synonym of *cartilaginea* (Boddaert, 1770).

7. *Cartilaginis* is congeneric with *egyptiacus*.

8. *Coromandelicus* (= *granosa*) is not congeneric with *cartilaginea* and *egyptiacus*.

Under date of December 29, 1946, Hemming replied in part as follows:

Amyda (Schweigger MS.) Geoffroy, July, 1809

I agree with you in considering that without doubt *Trionyx javanicus* Geoffroy, July, 1809, is the type of this genus by monotypy.

Trionyx Geoffroy, 1809

Before considering in detail the position as regards this genus I should like, if I may, to refer to two general points which have a direct bearing upon it:

(1) The International Code of Zoological Nomenclature lays down various rules (in Article 30) by which the types of genera are to be determined. The rules in this Article operate successively and it is necessary to run through each rule one after the other to determine in any given case which rule is applicable. In the case of *Trionyx* none of the first six rules (Rules (a) to (f)) are applicable. The next (and last) rule (Rule (g)) does, however, apply to this name. This rule ("type by subsequent designation") expressly states that "The meaning of the expression *select the type* is to be rigidly construed. Mention of a species as an illustration or example of a genus does not constitute a selection of a type."

(2) Article 30 of the Code contains no provision of a mandatory kind giving valid force to the so-called principle of restriction. That principle is referred to in that Article among the "Recommendations" which it is there stated "authors will do well to govern themselves by" in selecting the types of genera under Rule (g). Authors are not

bound to follow these recommendations and there is accordingly no ground for arguing that the type of such and such a genus is fixed [by] restriction. Nor is Opinion 6 applicable to a case such as *Trionyx*, for that Opinion applies only to the very limited class of case where a genus was originally established with only two included species, neither of which was designated as the type, and where later one of those species was made the type of a new genus.

Turning to the case of *Trionyx*, we find:

(a) that the statement by Geoffroy in his August, 1809, paper in regard to the "*Trionyx d'Egypte*" cannot be regarded as a definite selection of that species as the type of *Trionyx* within the meaning of Rule (g) in Article 30 of the Code (see 1 above);

(b) that in view of (a) above, it is clear that no type was selected by Geoffroy for this genus in his 1809 paper;

(c) that Oken (1816) did not designate a type for *Trionyx* within the meaning of Article 30, since that article contains no mandatory provision enforcing the principle of "restriction" (see 2 above);

(d) that (according to the information given in your letter) Fitzinger (1843) did fix a type for *Trionyx*, the species which he so selected being *T. granosus* (= *coromandelicus*);

(e) that, in view of (d) above, *T. granosus* (= *coromandelicus*) is the validly-fixed type of the genus *Trionyx* Geoffroy, 1809;

Turning from nomenclatorial to systematic questions, I note that, in your view, *T. coromandelicus* Geoffroy, 1809, is identical with "*granosa* Schoeff, 1792." I further note that you consider on taxonomic grounds that *coromandelicus* (= *granosa*) and *javanicus* are not congeneric. This being so, as the names *Amyda* and *Trionyx* are both available nomenclatorially, the former can properly be used for *javanicus* and the latter for *coromandelicus*.

Hemming has subsequently advised us that, at our request, he is submitting the case to the International Commission for consideration "with a view to the issue by the Commission of an Opinion thereon as soon as possible."

Detailed arguments for the use of *Amyda* are summarized in Stejneger's posthumous paper (1944). For the sake of future investigators we must point out several unfortunate errors in this work, which may or may not have been committed by the author. The manuscript was incomplete at the time of his death, and he did not see proofs. On page 7 the statement is made that Fitzinger (1843: 30) selected *T. coromandelicus* Geoffroy as the type of the genus *Trionyx*.

Fitzinger (1843: 30) placed *T. granosus* Schweigger and no other species in that genus; he did not mention *coromandelicus*. However, since the two are universally considered to be synonyms, this matter has no bearing upon the main argument for the proper name for the American soft-shelled turtles. On page 6, line 7, the date for Baur's paper should be 1893, instead of 1898, and the date for Hay's paper should be 1903, instead of 1904; in the same line Agassiz's name was omitted before the 1857 date, and footnote 2 on this page refers to a paper by Agassiz and not one by Bonaparte.

Smith (1947) has recently commented upon the validity of *Amyda* as opposed to *Trionyx*.

In view of the above and based upon our own studies of the problem, we believe that *Amyda* should be used as the generic name for North American soft-shelled turtles until such time as they are shown to be separable on zoological grounds from *javanicus* (Geoffroy, 1809) and its congeners.

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LITERATURE CITED

AGASSIZ, LOUIS

1857 Contributions to the Natural History of the United States of America. Boston: Little Brown. I (II): 233-452.

BAUR, GEORGE

1893 Notes on the Classification and Taxonomy of the Testudinata. Proc. Amer. Phil. Soc., XXXI (141): 210-25.

BODDAERT, PETER

1770 De Testudine Cartilaginea. Amsterdam. Pp. 1-39, Pl. 3.

BONAPARTE, CAROLUS L.

1836 Cheloniorum Tabula Analytica. Rome. Pp. 1-9.

BOULENGER, GEORGE ALBERT

1889 Catalogue of the Chelonians, Rhynchocephalians, and Crocodyles in the British Museum. London: British Museum. Pp. i-x, 1-311, Figs. 1-73, Pls. 1-6.

FITZINGER, LEOPOLD

1843 Systema Reptilium. Vienna: Braumüller and Seidel. Fasc. 1: 1-106.

GEOFFROY SAINT-HILAIRE, ÉTIENNE

1809a Memoire sur les tortues molles. *Nouv. Bull. Sci. Philom.*
Paris, 22, July: 363-67.

1809b Memoire sur les tortues molles. *Ann. mus. hist. nat. Paris*,
14, August: 1-20, Pls. 1-5.

GRAY, JOHN EDWARD

1831 *Synopsis Reptilium*. London: Treuttel, Wurtz, and Co.
Pp. i-viii, 1-85.

1844 Catalogue of the Tortoises, Crocodiles, and Amphisbaenians
in the Collection of the British Museum. London:
i-viii, 1-80.

HAY, OLIVER PERRY

1903 On the Existing Genera of the Trionychidae. *Proc. Amer.*
Phil. Soc., XLII (174): 268-74.

OKEN, LORENZ

1816 *Lehrbuch Zoologie (Naturgeschichte III, 2)*. Leipzig: C.
H. Reclam. Pp. i-xvi, 1-1270.

POPE, CLIFFORD HILLHOUSE

1935 *The Reptiles of China. . . . The Natural History of Central*
Asia, X. New York: Amer. Mus. Nat. Hist. Pp. i-111,
1-604, Figs. 1-78, Pls. 1-27.

1939 *Turtles of the United States and Canada*. New York:
A. A. Knopf. Pp. i-xviii, 1-343, Pls. 1-99.

SCHOEFFER, JOHANN DAVID

1792 *Historia Testudinum*. Erlangae: J. J. Palm. Pp. 127-31.

SMITH, HOBART M.

1947 *Kyphosis and Other Variations in Soft-shelled Turtles*.
Univ. Kansas Publ., I: 117-24, Figs. 1-3.

SMITH, MALCOLM A.

1930 *The Reptilia and Amphibia of the Malay Peninsula*. *Bull.*
Raffles Mus., 3: i-xviii, 1-149, Figs. 1-13.

1931 *Reptilia and Amphibia. . . . The Fauna of British India*.
London: Taylor and Francis. I: i-xxviii, 1-185, Figs.
1-42, Pls. 1-2.

STEJNEGER, LEONHARD

1905 *Generic Names of Soft-shelled Turtles*. *Science*, n. s., XXI
(528): 228-29.

1944 *Notes on the American Soft-shell Turtles with Special*
Reference to Amyda agassizii. *Bull. Mus. Comp. Zool.*,
XCIV (1): 1-75, Pls. 1-30.

STEJNEGER, LEONHARD, and THOMAS BARBOUR

1939 *A Check List of North American Amphibians and Reptiles*.
4th ed.; Cambridge: Harvard Univ. Press. Pp. i-xvi,
1-207.

1943 A Check List of North American Amphibians and Reptiles.
5th ed.; Bull. Mus. Comp. Zool., XCIII (1): i-xix,
1-260.

WAGLER, JOHN

1830 Natürliches System der Amphibien. München: J. G. Cotta.
Pp. i-iv, 1-354.

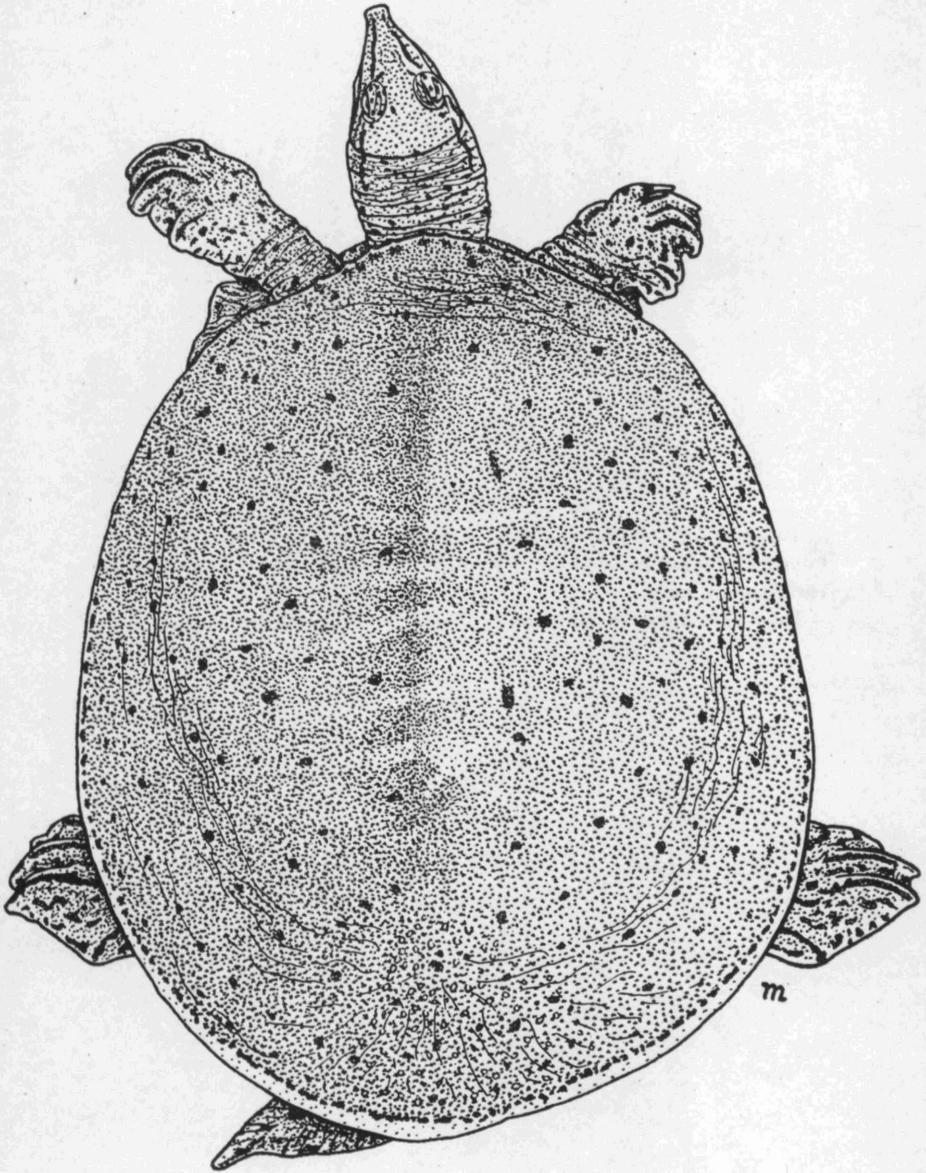
Conant and Goin

PLATE I

Holotype of *Amyda spinifera hartwegi*; Wichita, Sedgwick County, Kansas; male, U.M.M.Z. No. 95365. The dorsal markings are small and are but little larger toward the center of the carapace than near the perimeter of the shell.

Drawn by Edmond Malnate.

PLATE I



Conant and Goin

PLATE II

Topotype of *Amyda spinifera spinifera*; near New Harmony, Posey County, Indiana; male, M.C.Z. No. 1615. The ocelli near the center of the carapace are large.

Drawn by Edmond Malnate.

PLATE II

