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A NEW TURTLE, TOXOCHELYS WEEKSI, FROM THE UPPER CRETACEOUS OF WEST TENNESSEE

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INTRODUCTION

The Upper Cretaceous deposits of the Gulf Coastal Plain have been recognized and studied for well over one-hundred years, but comparatively few vertebrate remains, most of them fragmentary, had been recorded up to 1935. Since then, a paper by T. T. Renger (1935), the collecting efforts of Charles M. Barber, and papers by Karl P. Schmidt (1940, 1944) and Rainer Zangerl (1948) have demonstrated that rather well preserved vertebrate remains occur in some of the Cretaceous horizons. Some of the vertebrates described since 1935 consist of turtle remains belonging to the families Pelomedusidae and Thalassemydidae. Zangerl (1948, p. 13) records from the Selma formation of Alabama, turtles belonging to the Protostegidae, Toxochelyidae and, Pelomedusidae and, in addition, hadrosaurian and probably ornithomimid dinosaurs, small mosasaurs of the *Clidastes* type, and remains of shark-like and bony fishes. He also cites earlier finds of fossil vertebrates in the Selma of Alabama. Lull and Wright (1942, p. 15, pl. 2, Map) also mention the occurrence of hadrosiurian dinosaur remains from Alabama and Mississippi.

The present paper describes a new species of *Toxochelys* which is based on rather meagre remains from the Coon Creek tongue of the Ripley formation which is somewhat younger than the remains described by Schmidt from Arkansas and Zangerl from Alabama.

UPPER CRETACEOUS DEPOSITS OF TENNESSEE

The Upper Cretaceous deposits of Tennessee lie largely west of the Tennessee River where they outcrop in a wedge-shaped belt which extends northward across the west central part of the State (Wade, 1926, p. 4). They were deposited along the eastern side of a large embayment of the Gulf of Mexico which at one time extended as far north as Cairo, Illinois.

Wade (1926, p. 4) divided the Upper Cretaceous deposits of Tennessee into the lithologic units shown below. Stephenson and others

Wade, 1926	*Stephenson et al., 1942*
Ripley formation	Owl Creek formation
Owl Creek tongue	Ripley formation
McNairy sand member	McNairy sand member
Coon Creek tongue	Coon Creek tongue
Selma formation	Selma chalk
Eutaw formation	Coffee sand
Coffee sand member	Tuscaloosa formation
Tombigbee sand member	
Tuscaloosa formation	

(1942, chart, pl. 9) have revised Wade's units and recognize the divisions here listed in the latitude of Selmer, McNairy County, Tennessee. The locality from which the turtle remains were collected lies in the Coon Creek tongue or lower part of the Ripley formation. This horizon is in the *Exogyra costata* zone or, better still, at the top of the *Exogyra cancellata* zone of Stephenson (1933, p. 1356).

The Dave Weeks Place

The Dave Weeks place on Coon Creek (Wade, 1926, Fig. 1, Map) lies in the northeastern part of McNairy County, 3½ miles south of Enville, 7½ miles north of Adamsville, and one-eighth of a mile east of the main Henderson-Adamsville road. The fossil beds are exposed in the valley about 250 yards east of the Weeks house along the headwaters of Coon Creek, a small stream flowing northward into White Oak Creek, a tributary of the Tennessee River. Here a thickness of more than 30 feet of fossiliferous beds is exposed along the creek banks (Wade, 1926, p. 9). The sediments are dark bluish-green and gray, clayey sands. The sand is medium fine with angular and rounded quartz grains as the major constituent and glauconite grains, small mical flakes, and shell fragments as minor constituents. Pieces of lignitic wood and small nodular masses of pyrite are common. Locally there is sufficient lime to cement the sediment into nodular and concretionary masses (Wade, 1926, p. 10). The beds are highly fossiliferous and contain beautifully preserved marine forms belonging to almost every invertebrate phylum. In addition they have furnished the only vertebrate remains reported from the formation in Tennessee.

The Composition of the Fauna

The invertebrate fauna is exceedingly rich and varied and appears to be typically marine. Wade (1926, pp. 20-21) remarks that all evidence from a study of the Coon Creek fauna indicates that it lived in agitated waters near the coast of a low-lying land mass. In his discussion of the habitat Wade (1926, p. 20) states that no Foraminifera were found. However, Berry and Kelly (1929) and Cushman have reported on the Foraminifera from Coon Creek. Cushman (1931, p. 15) lists some 16 species from the Dave Weeks place. These are all small species. The author has considerable foraminiferal material that has been washed from matrix surrounding mollusks from the locality, and some are easily discernable without magnification. No sponge remains have been recorded in the past, but many of the shells of *Exogyra* show ravages, similar to those produced by the living boring or sulphur sponge, *Cliona*.

The fauna contains some 237 genera and 361 species. Forms recorded include 13 genera and 16 species of Foraminifera, 2 corals, 2 "worms," 2 echinoderms, 16 genera and 22 species of Bryozoa and

one brachiopod. The molluscan fauna is very rich with 65 genera and 114 species of pelecypods, 2 genera and 4 species of scaphopods, 102 genera and 174 species of gastropods and 4 genera and 5 species of cephalopods. Crustacea are relatively common and are represented by some 9 genera and 10 species. Vertebrate remains, on the other hand, are very poorly represented, only 9 genera including 7 fish and 2 reptiles are known at the present time.

Earlier Records of Fossil Vertebrates

Wade's 1926 report (pp. 191-192) includes a discussion of the reptiles by C. W. Gilmore. The following remains are figured in the report: a right coronoid, the centrum of a dorsal vertebra, a cervical vertebra and the posterior portion of a right dentary of undetermined species of mosasaurians, large marine reptiles.

In the same paper (p. 192) J. W. Gidley, listed the fish remains. Those figured include a tooth of the pharyngeal plate of *Anomoedus* sp., a tooth of *Ischyrhiza mira* Leidy, scales and teeth of *Enchodus* sp. teeth of *Saurodon?* sp., selachian vertebra (*Corax* sp.), and a single teleost fish ear bone or otolith. Hay (1929, vol. 1) accepts most of Gidley's determinations. He cites (p. 589) *Corax* sp. indet. on plate LXII, Fig. 11 in Wade's report. There is no figure 11 on this plate, figure 9 is the correct designation. Gidley's *Saurodon* sp. Hay (p. 764) places in the genus *Sphyraena* mentioning that the genus is doubtful.

New Turtle Remains

The new turtle is the second reptile to be recorded from the Coon Creek horizon in Tennessee. The remains apparently represent a single individual and are rather meagre, but well preserved. They are cracked in places, but not distorted to any appreciable degree, are black in color and strongly impregnated with iron sulphide.

The parts found include three fused peripherals that appear to be numbers 8, 9 and 10 of the left side of the carapace or dorsal shell (Pl. I, figs. 1-2). No costals or neural bones were discovered. The plastron or ventral shell (Pl. I, figs. 3-4) is represented by slightly less than the right half of the entoplastron bone, the fused right hyoplastron, hypoplastron, and xiphiplastral bones, and the inner half of the left hyoplastron. All of the bones are smooth save for vascular markings. The traces of the marks left by the dermal scutes covering the bones are visible in places. Figure 3, plate II, shows the probable pattern of the dermal scutes. A picture of the bones and partial restoration of the shell was published by David Dickey (1950, p. 70, upper figure), one of the author's students. The remains indicate a turtle with a carapace length of about 500 mm. and a width of about 400 mm. The plastron was about 330 mm. long and about 360 mm. wide.

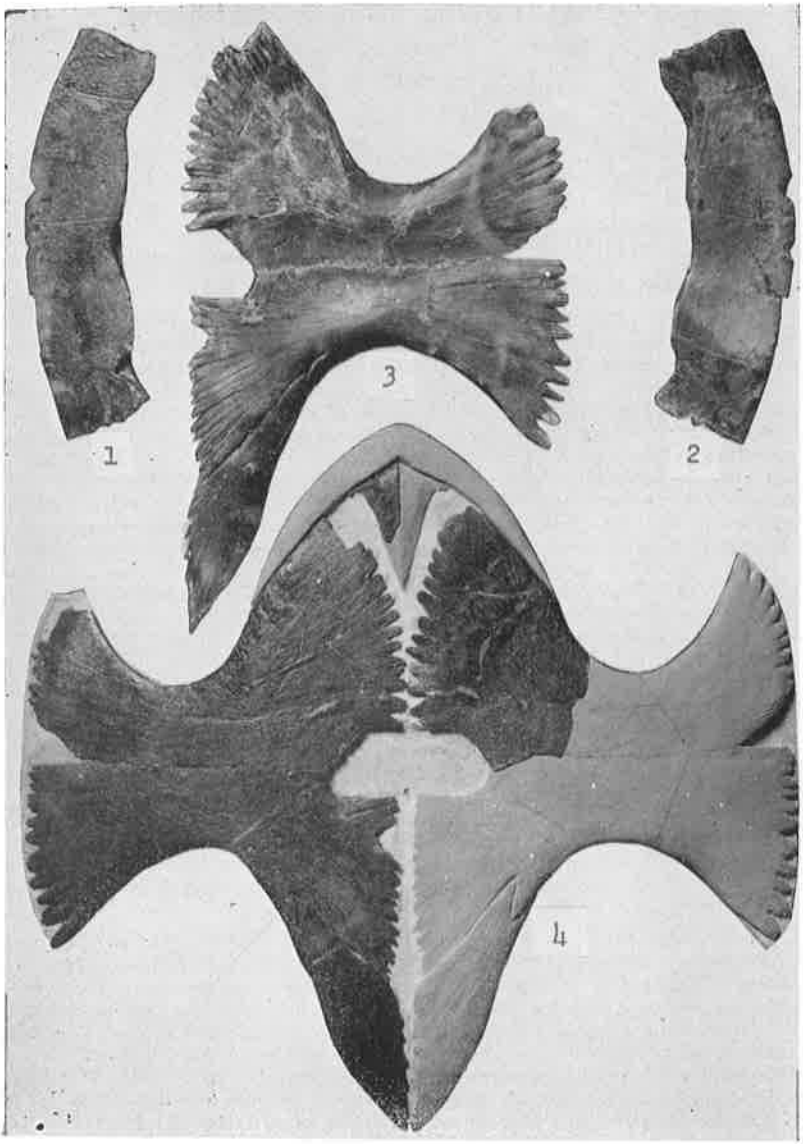

Plate I. *Toxochelys weeksi* type X 1/3. Figs. 1, 2. Fused left peripheral bones 8, 9, 10. Fig. 1. Dorsal view. Fig. 2. Ventral view. Fig. 3. Fused hyoplastron, hypoplastron, and xiphiplastron bones viewed from the visceral surface. Fig. 4. Restored plastron. Light gray parts represent missing elements.

ORDER TESTUDINATA BONAPARTE

FAMILY TOXOCHELYIDAE BAUER

GENUS TOXOCHELYS COPE

Toxochelys weeksi sp. nov.

Type.—University of Tennessee, No. K. 20 Collins Collection, fused left peripherals 8, 9, 10, part of entoplastron, inner portion of left hyoplastron and the fused right hyo-, hypo- and xiphi-plastral bones.

Horizon and Locality.—Coon Creek tongue of the Ripley formation, late Cretaceous. Dave Weeks place, Coon Creek, McNairy County, Tennessee.

Collector and Date.—R. Lee Collins, September 15, 1946.

Description.—The only parts of the carapace recovered were the three fused peripheral bones from the posterior part of the left rim of the shell. These appear to be numbers 8, 9 and 10 of the series of eleven paired bones which are commonly present in the turtle carapace margin. They have on their visceral surfaces broad and deep pits which received the peg-like ends of the costal plates. There do not appear to be any sutural markings on their inner dorsal margins. They therefore indicate an incomplete carapace with large lateral vacuities or fontanelles between the costal disk and the peripherals like those present in such modern marine genera as *Caretta* and *Chelone*. A cross section of the anterior end of peripheral 8 (Pl. II, Fig. 1) is broadly wedge-shaped. The series flattens rapidly and the section of the posterior end of peripheral 10 (Pl. II, Fig. 2) is quite narrow with almost parallel sides near the inner part of the bone. Vascular markings are more strongly developed on the dorsal than on the ventral surface of the peripherals but the marks of the dermal scutes are about equally developed on both surfaces. The photographs of the peripherals (Pl. I, Figs. 1, 2) show small irregularities along the sharp outer margins which are breaks and chipped places in the bone. The postero-lateral margins of the carapace appear to have been smooth and not notched like those of the living snapping turtle *Chelydra* and other recent and extinct forms. The pits on the visceral surfaces of the peripherals are 10 mm. or more in depth and their locations vary in the different bones. In 8 the pit is just slightly posterior to the middle; in 9 it is still farther posteriorly; in 10 it lies about one-third the distance from the posterior end. This last pit intersects the dorsal surface of bone 10 forming a distinct V-shaped notch that is clearly shown in the lower part of the photograph (Pl. I, Fig. 1). Both the dorsal and ventral margins on the visceral side of the peripherals are somewhat undulating.

The plastron of T. *weeksi* is broadly cruciform, somewhat wider than long and loosely constructed with both lateral and median fontanelles. The restored plastron (Pl. I, Fig. 4) shows the approximate position of the bony elements with the missing parts reproduced in plaster. The slender and thin digitations on the lateral margins of the hyo- and hypo-plastral bones precludes their direct connection along the median line of the plastron as well as with the peripheral bones of the carapace. The xiphiplastra are also digitate on their inner margins and apparently were not directly joined along the mid line. At the anterior end of the plastron, the epiplastra were connected to the hyoplastron by well marked sutures. That on the left hyoplastral fragment is better preserved than the one on the right. Its length is 52 mm. The hastate or spear shaped entoplastron was connected to the epiplastra, but not to the hyoplastra. The epiplastra in this group of turtles are rather slender and in T. *weeksi* they may have been even smaller than those shown in the restoration. The hyoplastra and hypoplastra are alate and connected by a long interdigitating suture except at the inner and outer margins where they are separated by plastral vacuities. The xiphiplastron is united to the hypoplastron by a deeply notched suture. The plastral bridge is broad and the inguinal notches evenly curved. The greatest thickness of the plastron (15 mm.) lies within the

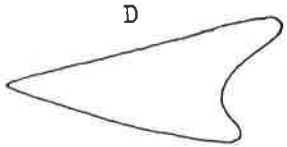

Fig. 1

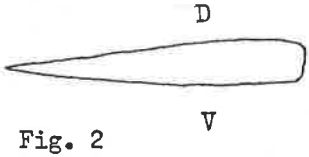

Fig. 2

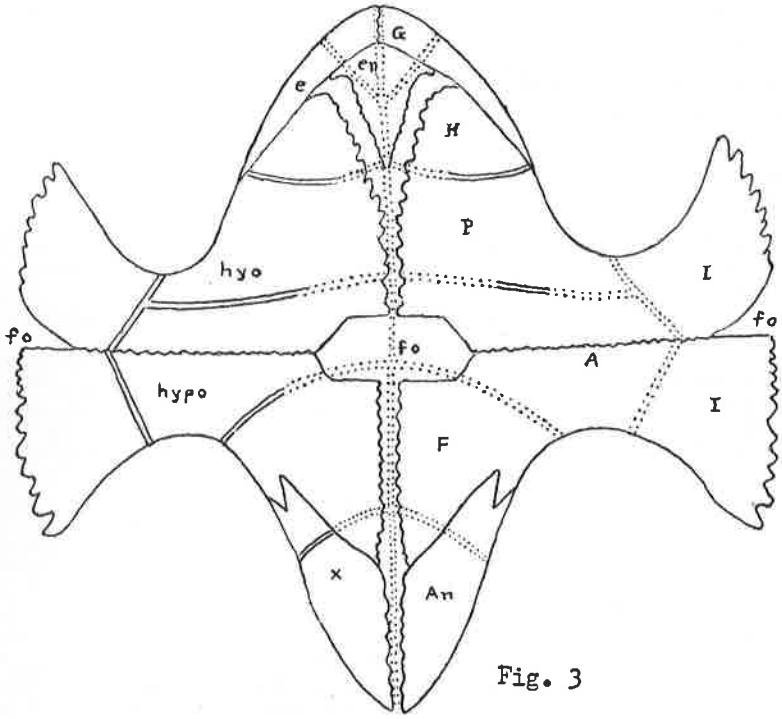

Fig. 3

Plate II. *Toxochelys weeksi* Type. Figs. 1, 2, Cross section of peripheral bones, natural size. D and V indicate the dorsal and ventral surfaces. Fig. 1. Section of the anterior end of peripheral 8. Fig. 2. Section of the posterior end of peripheral 10. Fig. 3. Sketch of the complete plastron X 1/3 showing the probable arrangement of the bones and outlines of the dermal shields or scutes. Solid parallel lines indicate visible parts of the shield furrows, dotted parallel lines indicate inferred positions.

Abbreviations: Bones: e—epiplastron, en—entoplastron, hyo—hyoplastron, hypo—hypoplastron, x—xiphiplastron, fo—umbilical and lateral fontanelles; Scutes or Shields: A—abdominal, An—anal, F—fermoral, G—gular, H—humeral, I—inframarginals, P—pectoral.

posterior margin of the hypoplastron about 25 mm. beyond the end of the sutural notch which receives the xiphiplastron. Viewed from the visceral surface (Pl. I, Fig. 3), the plastron is somewhat excavated and thin on either side of the hyo-hypoplastral suture, with the margins immediately adjacent to the umbilical fontanelle almost as thin as paper.

The umbilical fontanelle was apparently roughly hexagonal in outline. It is estimated to have been about 75 mm. wide and some 32 mm. long. V-shaped fontanelles occur in the lateral margins of the plastron. The transverse arch of the plastron is broad and low with the central part almost flat and the bridges sloping gently toward the shell margins. Longitudinally the plastron is slightly upturned at the anterior and posterior ends.

Scale furrows are well marked on the peripheral bones and partly traceable on the plastron. Plate II, figure 3 shows the restored plastron and probable arrangement of the scutes. Infra marginal scutes were apparently present over the lateral extremities of the plastron, but their shapes and sizes are unknown. The position of the paired gular scutes at the anterior end of the plastron is conjectural.

Measurements in Millimeters

(*Indicates measurements where part of the bone is missing.)

Combined right hyo- hypo- and xiphi-plastra:	
Length (straight line)	290*
Transverse diameter	185
Least width of plastral bridge	77.5
Length of hyo- hypoplastral suture	117
Entoplastron fragment:	
Length	37.5*
Width	23.7*
Greatest thickness	4.1*
Right hyoplastron:	
Length medially	120*
Length near lateral margin	70*
Greatest thickness (at bridge)	11.5
Right hypoplastron:	
Length medially	105
Length near lateral margin	90
Greatest thickness (at bridge)	15
Right xiphiplastron:	
Length (ventral surface)	123.5
Greatest length (visceral surface)	134
Width	34.5
Greatest thickness (near anterior end)	12
Left hyoplastron fragment:	
Length medially	125*
Left peripherals 8, 9, 10 (fused):	
Length (straight line)	199
Height anterior end 8	19
Height anterior end 9	15
Height posterior end 10	7
Width (dorsal surface) anterior end 8	42
Width (dorsal surface) anterior end 9	48.7
Width (dorsal surface) posterior end 10	46*
Width (ventral surface) anterior end 8	34.7
Width (ventral surface) anterior end 9	45
Width (ventral surface) posterior end 10	46.9
Length along outer margin 8	65
Length along outer margin 9	68.5

Length along outer margin 10	70*
Length along visceral surface 8	55
Length along visceral surface 9	54.6
Length along visceral surface 10	63

Remarks

The genus *Toxochelys* Cope was based on a lower jaw and coracoid (Hay, 1908, p. 168). Subsequently, numerous fragmentary remains of shells and bones were assigned to the genus. Considerable confusion exists in the literature regarding the type of shell which belongs to the genus. Dr. Rainer Zangerl of the Chicago Natural History Museum has collected some new turtle remains from the Cretaceous of Alabama where skulls of the *Toxochelys* type were found in association with shells (personal communication). Casts of the Tennessee materials were sent to Dr. Zangerl and he has also examined the specimens at the University of Tennessee. He concurs with the author's designation of the Coon Creek specimen as a new species of *Toxochelys*. Comparisons with described specimens and new material from Alabama and elsewhere will be left to Dr. Zangerl who is working on a revision of some of the groups of Mesozoic turtles.

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NEWS OF TENNESSEE SCIENCE

(Continued from page 261)

Dr. J. X. Khym, Biology Division, ORNL, attended the Gordon Conference on chemistry research at New Hampton, New Hampshire, July 16-20, 1951, and presented a paper entitled "Some Biological Applications of Ion Exchange."

Dr. Howard Gest of the microbiology division of the Western Reserve University, Cleveland, presented a seminar talk on "Metabolic Problems in Photosynthetic Bacteria" at the Biology Division, ORNL, on August 2, 1951. Dr. Gest was formerly an associate of Dr. Max Delbrück when the latter was on the staff of Vanderbilt University.

Recent Publications by Tennessee Authors

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