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TWO NEW SUBSPECIES OF *GRAPTEMYS*
PSEUDOGEOGRAPHICA

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THE development of a procedure for obtaining map turtles in quantity has permitted the field crews of Tulane University to obtain population samples from several of the major rivers of the Gulf Coast (Chaney and Smith, 1950). Scrutiny of this material reveals the existence of two undescribed populations in Louisiana. Although the relationships of these new forms cannot be determined conclusively until better materials are available from the northern and western parts of the range, their descriptions are here recorded.

I am indebted to the following individuals for permitting the study of specimens from their respective institutions: Dr. Doris M. Cochran, United States National Museum (USNM); Mr. Arthur Loveridge, Museum of Comparative Zoology (MCZ); Mr. Clifford H. Pope, Chicago Natural History Museum (CNHM); Mr. Charles M. Bogert, American Museum of Natural History (AMNH); Dr. Hobart M. Smith, University of Illinois (UIMNH); Dr. A. I. Ortenburger, University of Oklahoma (UOMZ); Dr. Edward H. Taylor, University of Kansas (KU); Dr. Norman E. Hartweg, University of Michigan (UMMZ); Dr. Edward C. Raney, Cornell University; Dr. Frank Blair, University of Texas; Dr. W. J. Breckenridge, Minnesota Museum of Natural History; Mr. W. E. Dickinson, Milwaukee Public Museum. This research was aided by a grant from the National Science Foundation.

I am particularly obligated to Dr. Hobart M. Smith, who permitted the examination of his notes and relinquished his own advanced plans for description of a new form.

The following abbreviations are used in the descriptions: Cl., carapace length (not along curve); Cw., carapace width; Pl., plastron length; Pw., plastron width; Hw., head width; Ht., height; Aw., alveolar width. All measurements are maximum unless otherwise indicated. The size

of individuals is expressed as plastron length. Measurements were made with vernier calipers and the measuring device previously described (Cagle, 1946: 687-88).

Graptemys pseudogeographica sabinensis, new subspecies

HOLOTYPE.—UMMZ 104351, mature female, collected from the Sabine River, eight miles southwest of Negreet, Louisiana, on July 5, 1950, by A. H. Chaney and Clarence L. Smith.

PARATYPES.—Tulane 13110-11; 13116; 13119-21; 13127-8; 13131; 13139; 13141-2; 13148-9; 13152; 13160; 13166; 13172; 13175; 13177-9; 13181; 13185-6; 13190; 13194-5; 13197; 13200; 13202-4; 13206-9; 13253; 13258; 13261-2; 13510 (2); 13564 (3); 13740 (13); 13741 (7); 13743 (8); 13744 (7); 13745 (4); 13746 (5); 13747 (2); 13748 (17); 13760 (15); UMMZ 104352-69; CNHM 67105-15; UIMNH 26718-22; 6 hatchlings, 49 juveniles, 70 males, 33 females collected at the type locality July 5-9, 1950, by a Tulane University field group.

DIAGNOSIS.—*Graptemys p. sabinensis* differs from *G. p. pseudogeographica* in that the postorbital spot is oval or elongate, 5-9 of the longitudinal neck lines enter the orbit, the ventral surface of the jaw has transverse bands, the head is not broadened, the size at sexual maturity is smaller (Cl. 6 cm. in males and 11 cm. in females), individuals of both sexes retain the spines of the second and third vertebrae, and the carapace remains high and arched; it differs from *G. p. versa* in that the pattern of neck lines is uninterrupted and the lines enter the orbit, the carapace is high and steep-sided and retains the vertebral spines, and the plastron has a central black pattern of longitudinal lines; it differs from *G. p. ouachitensis* in that the postorbital marking is oval or elongate, 5-9 of the longitudinal lines enter the orbit, the ventral surface of the jaw has transverse bands, and there are more than four lines on the anterior surface of the forelimb.

DESCRIPTION OF HOLOTYPE.—Maximum carapace length, 15.30 cm.; carapace width at juncture of fourth and fifth marginals, 10.27 cm.; carapace width at juncture of seventh and eighth marginals, 11.70 cm.; maximum plastron length, 13.40 cm.; maximum width of posterior lobe of plastron, 6.65 cm.; maximum height (measured in vertical line through spine of second vertebral), 6.60 cm.; height at spine of third vertebral, 6.10 cm.; maximum head width (measured at anterior edge of tympanum), 2.10 cm.; length of symphysis of lower jaw, 0.83 cm.; alveolar width of upper jaw, 0.40 cm.

First marginal with distal corner projecting 3 mm. beyond the second marginal; rear corner of eighth to eleventh marginals projecting beyond next posterior marginal; eleventh and twelfth marginals deeply emarginate. Each marginal with a black smudgelike spot on posterior corner. A similar black spot on the posterior medial part of each costal. A well-defined black middorsal line traversing nuchal and the first and second vertebrae; line but faintly visible on anterior half of third, fourth, and fifth vertebrae but conspicuous and broadened on spines of second and third and on posterior parts of fourth and fifth. A faint network of narrow, yellow lines on the costals and marginals. General color of carapace light olive.

Plane of the plastron 2 cm. below a plane through the edge of the fourth to seventh marginals; ventral surface of fourth to seventh marginals, axillary and inguinal plates, and bridge section of the pectoral and abdominal plates visible in lateral view. Plastron irregularly suffused with black, but retaining some parts of a longitudinal pattern of black lines; four of these present as distinct diagonal lines crossing the humeral plate. General color of plastron olive-yellow.

Bridge distinctly marked with 8-9 narrow, longitudinal black lines. Lower surface of marginals similarly marked with pattern of longitudinal black lines.

Neck with 49 longitudinal light lines alternating with black lines; light lines wider on ventral surface of neck. These lines interrupted anteriorly in postorbital region by a J-shaped mark encircling three other less well-defined J-shaped marks that enclose an oval yellow spot immediately posterior to the eye. Ventral to this spot, six of the narrow, longitudinal lines of neck extend forward and enter orbit. A slightly wider light line terminates at juncture of jaws. Seven longitudinal lines on top of head between posterior blotches. These lines interrupted above orbit by a pattern of three transverse lines.

Horny edges of both upper and lower jaws light in color. A longitudinal, black-bordered light line extends from beneath the nostrils along upper jaw and terminates beneath eye. Ventral surface of lower jaw marked with wide, transverse bands of yellow bordered by black.

Anterior surface of forelegs with eight light lines alternating with black lines. Light lines originating on second and fourth digits widest.

DESCRIPTION OF PARATYPES.—The paratotypic series has been selected to demonstrate variation in both the young and the adults. The major difficulties in the taxonomy of turtles have developed from the fact that many species typically show extreme local and ontogenetic

variability. Furthermore, describers have often failed to report the variation in size series.

HATCHLINGS

Six hatchlings are included in the paratypic series. All were hatched from eggs dissected from females collected at the type locality. One (Tulane 13564-2) is without eyes, a frequent deformity in hatchling turtles. All have the egg tooth present. The variation in measurements (in cm.) is as follows: Cl. 3.30-3.50; Cw. 3.07-3.35; Pl. 2.81-3.16; Hw. 0.77-0.84.

These differ from the turtles in their first season of growth (described below) in that the spines of the second and third vertebrae are broad and flattened. A pattern made up of a small, black-bordered circle or oval spot surrounded by a pattern of concentric yellow lines is evident on each costal and on the third and fourth vertebrae. This pattern becomes obscured in most individuals during the first five years of life.

JUVENILES

Forty-nine juveniles, selected from a sample of 111, represent the entire size range from the first season to the time of sexual maturity in males. The measurements (in cm.) of the smallest and of the largest are: Cl. 4.30 (8.13); Cw. 4.03 (6.92); Ht. 2.12 (3.77); Pl. 3.58 (7.07); Hw. 0.92 (1.26).

The head, neck, and legs are marked with distinct, narrow yellow lines, totaling 45-52 around the neck, 10-11 on the anterior surface of the front leg (Fig. 3,E) and 10-12 on the upper surface of the rear leg. Five to eight lines of the lateral neck region extend forward to enter the orbit (Fig. 1,A,C,D); the lowest of these is the widest and is interrupted at the juncture of the jaws in some individuals. The most characteristic feature of the head pattern is the postorbital marking which may be circular, oval, or elongated (Fig. 1,C). In most specimens this marking is surrounded by two or three concentric lines of which the outermost is the widest (as wide as the lowest stripe entering the orbit). The pattern of these concentric lines is extremely variable and may be interrupted to form a J-shaped line or a set of elongated spots encircling the postorbital marking. The markings of the interorbital area are variable, but typically there is a wide yellow line extending from just above the nostrils to a point above the middle of the orbit. Usually, this line is bounded laterally by two narrower lines of yellow, but they are not present in some individuals and may be interrupted in others (Fig. 1,A-D).

The ventral surface of the lower jaw has 5–9 well-defined, wide, (wider than any of the lateral neck lines) transverse, yellow lines alternating with black lines (Fig. 1,C,D). The most posterior light line usually sends a branch upward to the juncture of the jaws and joins laterally with one of the longitudinal neck lines.

The general color of the carapace is light olive. A variable pattern of fine yellow lines, evident only on those individuals that have recently shed their scutes (Tulane 13121, 13160, CNHM 67111), consists essentially of concentric series surrounding a black-bordered, oval spot in the posterior lower corner of each costal (Fig. 1,A,C). Each marginal has a reticulum of fine yellow lines. The vertebral spines are tipped with black which, in some individuals, forms a vertebral line.

The plastron and bridge of all specimens are marked with a longitudinal pattern of black lines (Fig. 3,A).

The carapace of the smaller turtles is almost circular, but the maximum width is always less than the maximum carapace length (Fig. 1,A). Individuals less than 7.5 cm. in carapace length (Pl. 6.6 cm.) have conspicuous spines on both the second and third vertebrals, and some have a distinct ridge on the fourth. The spines of the third and fourth are reduced in all larger turtles; the ninth to twelfth marginals are deeply emarginate in those less than 6.7 cm. in carapace length (Pl. 5.9 cm.; Fig. 1,A–C).

MALES

This series includes 70 male paratopotypes, all of which are mature except the smallest (Pl. 6.13 cm.). The measurements (in cm.) of the smallest and of the largest mature males are as follows: Cl. 7.73 (10.57); Cw. 6.22 (8.18); Ht. 3.42 (4.92); Pl. 6.40 (9.47); Hw. 1.17 (1.36). The mean plastral length of the 70 specimens is 7.45 cm.

All the males retain the distinct head and leg markings of the juveniles, but the markings of the carapace and usually of the plastron are less conspicuous. There is no definite correlation of size and stage in the loss of such marks. Thus, in one specimen (Tulane 13740–8, Pl. 7.43 cm.) the plastral markings are almost obliterated, and the carapace markings, exclusive of the black smudges, are very faint. On the other hand, a larger individual (CNHM 67107, Pl. 8.20 cm.) retains distinct plastral and carapacial patterns. All the males retain the plastral pattern to some extent. An occasional male (Tulane 13203, 13746–7, 13177, UMMZ 104363) has the plastron heavily suffused with black pigment. The black vertebral line of juveniles and young males is confined to the first vertebral and the spines of the second and third vertebrals.

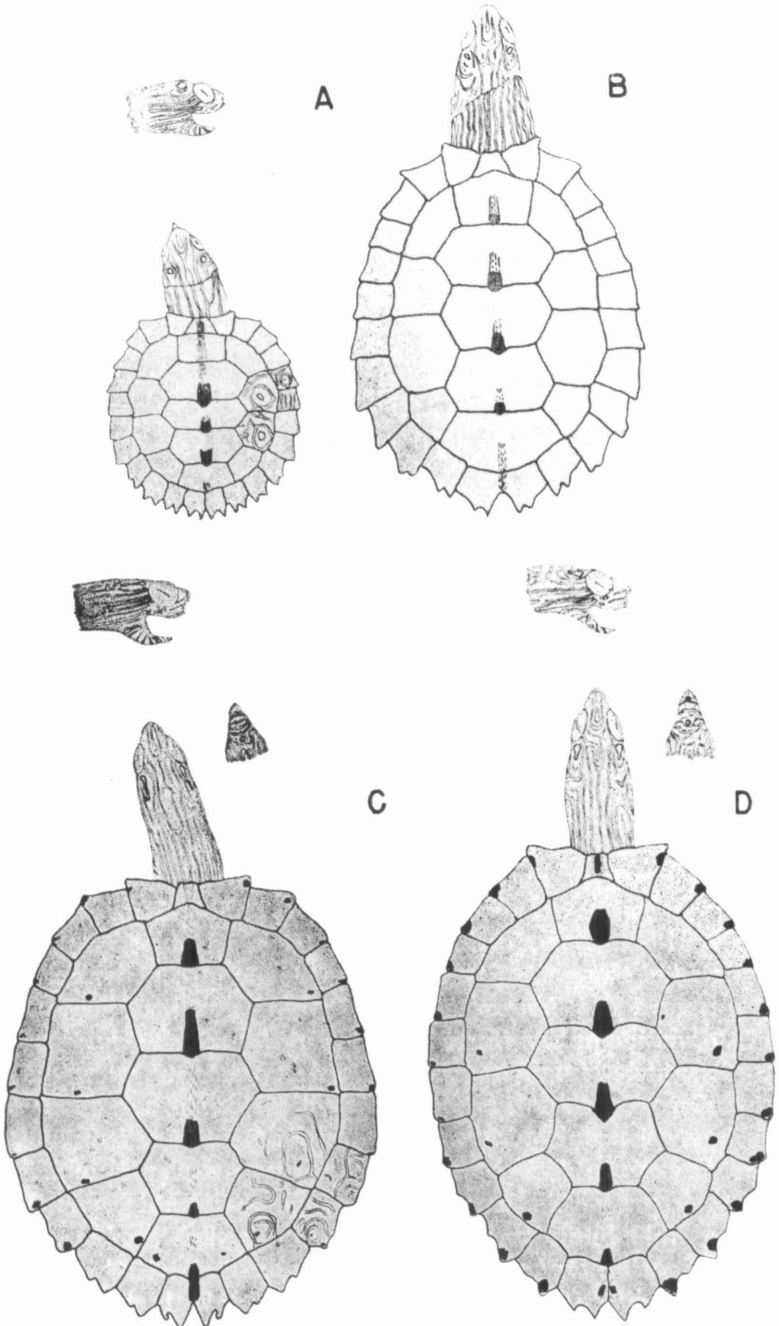


FIG. 1. *Graptemys p. sabinensis*: A. Hatchling (Tulane 13510); B. Juvenile (Tulane 13748-3); C. Subadult female (Tulane 13206); D. Male (Tulane 13209).

In all males the posterior corners of the eighth and ninth marginals project beyond the one next posterior (Fig. 1,D). The eleventh and twelfth marginals are deeply emarginate except in specimens greater than 8 cm. in plastron length.

All the males retain a distinct central ridge on the second and third vertebrae which is less steep than in the smaller turtles. The height of the spine of the second vertebral of the largest male is 3.3 mm. The length of the nails of the larger males is equal to or less than the length of the interpectoral suture. The largest male has elongated nails on the forefeet (length of nail of third toe, 1.0 cm.; length of nail of a juvenile female of the same size, 0.56 cm.). The nails of smaller males are not conspicuously elongated.

The head is not broadened in relation to carapace width (Cw./Hw. =5.31 in smallest, 6.01 in largest), and the only evidence of heterogonic growth is a slight increase in the width of the alveolar surface of the upper jaw in relation to head width (Hw./Aw.=7.31 in the smallest, 4.69 in the largest).

Two males, one just becoming mature and the other apparently in its second season of maturity, are in their third season of growth. None of the other specimens has growth rings indicating the complete growth history, and none shows evidence of recent rapid growth.

SUBADULT FEMALES

This series includes 17 individuals. The measurements (in cm.) of the smallest and of the largest are as follows: Cl. 8.50 (10.90); Cw. 7.23 (8.83); Ht. 4.01 (4.78); Pl. 7.42 (9.78); Hw. 1.28 (1.57).

All retain the same pattern of head and leg markings found in the hatchlings and have a reduction of the markings of the carapace and plastron similar to that in the males. The plastral pattern of the larger specimens is partly obscured by melanistic development. The spines of the second and third vertebrae become progressively reduced in height but tend to retain the black midvertebral stripe. The proportional reduction of the height of the vertebral spines appears to be correlated with the slowing of growth. In one female (Tulane 13760-24; Pl. 9.23 cm.), that has no distinct growth rings and grew very little during the season in which it was collected, the spine of the second vertebral is only 1.6 mm. in height. In another (Tulane 13120; Pl. 9.03 cm.), that has distinct growth rings and increased 7 mm. in plastron length during the season in which it was collected, the spine of the second vertebral is 3.6 mm. in height. The retention of the higher

spine is correlated with the tendency to retain the typical juvenile markings of the carapace and plastron. The loss of the juvenile shape and pattern is probably correlated with age rather than with size.

The subadult females have broader carapaces than do males of similar size (compare Fig. 1,C and D). In this series the relation of Cl. to Cw. is 1.18 to 1.27. The head width is not increased in relation to carapace width (Cw./Hw.=5.0-5.3).

One of the subadults having a complete group of plastral rings was 1.72 cm. in plastral length at hatching, 3.63 cm. at end of first season, 5.13 cm. at end of the second, 5.96 cm. at end of the third, and 7.45 cm. at end of the fifth. It had grown 57 mm. during the season in which it was collected.

ADULT FEMALES

This series includes 16 adult females. The measurements (in cm.) of the smallest and of the largest are as follows: Cl. 13.01 (15.53); Cw. 10.20 (12.42); Ht. 6.22 (7.10); Pl. 12.55 (14.04); Hw. 1.80 (2.07).

The color pattern and intensity of markings may be retained or reduced as in the males except that the larger females retain the original linear markings of the plastron only on the humeral plates (Tulane 13760-12, UMMZ 104354). Some have the plastron suffused with black (Tulane 13760-29, 13261, CNHM 67115). The carapace in the larger females becomes a dark olive-green and loses the distinctive markings of the juveniles.

The females have the eighth and ninth marginals with the rear corners projecting as in the males, but the eleventh and twelfth marginals are not deeply emarginate as in the juveniles and young males. All the females retain the distinct spine of the second vertebral although it becomes reduced and rounded; in the largest female the spine is 3 mm. in height. The head is not broadened in relation to carapace width (Cw./Hw.=5.66 in smallest, 5.99 in largest) nor is there any appreciable broadening of the alveolar surfaces (Hw./Aw.=5.45 in smallest, 5.59 in largest). The carapace is proportionately broader than in males. In this series the relation of Cl. to Cw. ranges from 1.2 to 1.3. There is no correlation with size.

None of the mature females has distinct growth rings and only the smaller ones have indications of some growth during the season in which they were collected.

Two dried specimens in the Tulane collections taken near Mermen-tau, Louisiana, in 1893 and 1894 (Tulane 7634, 7940), have plastral lengths of 16.8 cm. and 16.4 cm., respectively (greater than any females

in the paratype series), and narrow heads (Hw. 2.23, 2.20 cm.). The markings of the head are conspicuous, but those of the legs and the carapace are partly obscured. This is probably in part due to the method of preparation; nevertheless, black pigment covers large areas of the costals and marginals and is concentrated on the first and third costals and the adjacent marginals. The juvenile plastral pattern is still evident on the gular and humeral plates. The carapace is high and steep-sided and retains prominent spines on the second and third vertebrae.

SKULL

The skulls of an adult female (Tulane 13760-12) and of two males (Tulane 13760-22, 13747-9) differ from the skulls of *G. kohni*, *G. pulchra*, and *G. barbouri* in several respects: they are long and narrow without broadened alveolar surfaces; the frontals are extended anteriorly and meet at a point between the nasals; the basisphenoid (as exposed on the palate) is longer than the interpterygoid suture; and the prootics are in broad contact with the opisthotics (Fig. 3,G). The skull is of light structure and, in general appearance, resembles that of *G. oculifera* and *G. p. versa*.

RANGE.—Specimens are available from only three localities: the Sabine River at Negreet and at Mermentau and the Calcasieu River at Lake Charles, Louisiana. The last locality is represented by a single individual (Tulane 3473). Although the populations of the Red and Mississippi rivers have not been sampled adequately, the locality data given for 16 specimens of this form in the U.S. National Museum are tentatively questioned: four (USNM 100213-16) from False River near New Roads, Louisiana, June 17, 1935, collected by C. E. Burt; 12 (USNM 100064-66; 100072-78; 100080-81) from the Red River near Shaw, Louisiana, collected (possibly purchased) by C. E. Burt in 1935. Collecting by Tulane University crews in rivers associated with the Red River and in False River has not produced members of this subspecies, nor has any been found among the catches made in the vicinity of Shaw by collectors of turtles for the novelty market. Large numbers of *Graptemys* were collected in the Ouachita River and Bartholomew Bayou of central Louisiana, but none was of the present subspecies.

There are no records of serious attempts to collect members of this genus in the rivers to the west (Neches, Trinity, Brazos, Colorado). The relation of *G. p. sabinensis* to *G. p. versa* cannot be clarified until material from these rivers is studied.

Extensive collecting from the Sabine eastward by Tulane University

crews has not revealed this form east of the Calcasieu River, although specimens collected in 1893 and 1894 were recorded from Mermentau, Louisiana.

Graptemys pseudogeographica ouachitensis, new subspecies

HOLOTYPE.—UMMZ 104345, mature female, containing oviducal eggs, collected from the Ouachita River, four miles northeast of Harrisonburg, Louisiana, on June 10, 1950, by A. H. Chaney and Clarence L. Smith.

PARATYPES.—Tulane 12536; 12545; 12631; 12643; 12655; 12658; 12664-67; 12670-71; 12686; 12695; 12701; 12705; 12710; 12783; 12975 (3). CNHM 67101-4; UMMZ 104346-50; UIMNH 26716-17; 14 juveniles, 16 males, 2 females collected at the type locality, June 10-19, 1950, by a Tulane University field group.

DIAGNOSIS.—*Graptemys p. ouachitensis* differs from *G. p. pseudogeographica* in that the yellow postorbital marking is square or rectangular, only 1-3 longitudinal lines enter the orbit, there is a large oval yellow suborbital spot, there is an oval spot at the symphysis and an elongate yellow spot on the lateral surface of the lower jaw, individuals of both sexes retain the spines of the second and third vertebrae; it differs from *G. p. versa* in all the characters listed above; and from *G. p. sabinensis* in all these characters except that *sabinensis* also retains the spines of the second and third vertebrae.

DESCRIPTION OF HOLOTYPE.—Maximum carapace length, 15.20 cm.; carapace width at juncture of fourth and fifth marginals, 11.53 cm.; carapace width at juncture of seventh and eighth marginals, 12.04 cm.; maximum width of posterior lobe of plastron, 7.02 cm.; maximum height (measured in vertical line through spine of second vertebral), 6.80 cm.; height at spine of third vertebral, 6.50 cm.; maximum head width (measured at anterior edge of tympanum), 1.92 cm.; length of symphysis of lower jaw, 0.80 cm.; alveolar width of upper jaw, 0.47 cm.

Carapace width greatest at seventh marginal and height greatest at spine of second vertebral. First marginal projecting but slightly (1.8 mm.) beyond second marginal; rear corner of eighth to eleventh marginals projecting beyond next posterior marginal; eleventh and twelfth marginals shallowly emarginate. Black smudgelike spots evident on seventh to twelfth marginals and third, fourth, and fifth costals. A well-defined black middorsal line traversing nuchal and posterior parts of each vertebral. A network of narrow yellow lines faintly visible on the costals and marginals. General color of carapace dark olive.

Plane of plastron 2 cm. below a plane through edges of fourth to seventh marginals; ventral surface of fourth to seventh marginals, axillary and inguinal plates, and bridge section of pectoral and abdominal plates visible in lateral view. Plastron with only faint indications of black pattern extending longitudinally across central part of each scute. Two distinct black lines extend across humeral plates. Posterior margin of each plastral plate black.

Bridge marked with 4–5 longitudinal black lines which enclose three wide, light stripes. Lower surface of marginals marked with concentric pattern of three black lines.

Neck with 27–29 longitudinal light lines alternating with black lines. Only one light line extending onto region above tympanum, this joining rectangular postorbital blotch. Region above tympanum black, marked with faintly defined yellow crescent. Postorbital blotch higher than height of eye; its maximum width (anterior-posterior) equal to three-fourths maximum diameter of eye.

Single narrow line leaving orbit ventral to postorbital blotch extending posteriorly across tympanum, bending abruptly downward at its rear margin. A single large, oval, yellow blotch beneath eye.

Ventral surface of lower jaw with large, oval, black-bordered spot at symphysis; a similar spot on lateral surface.

Anterior surface of forelegs with four wide, light lines alternating with black lines. Light line extending from base of second digit widest.

DESCRIPTION OF PARATYPES.—This series is composed of juveniles (one to four years of age, no hatchlings are available from the type locality), males, and females.

JUVENILES

Fourteen juveniles (ten in the first season of growth, one in the second season, two in the third season, and one of indeterminate age) are included in the paratypic series.

The measurements (in cm.) of the smallest and of the largest are as follows: Cl. 3.90 (8.43); Cw. 3.85 (7.17); Ht. 1.92 (3.73); Pl. 3.36 (7.35); Hw. 0.92 (1.28).

The head, neck, and legs are marked with broad yellow lines distinct against a black background. There are 23–31 longitudinal lines on the neck, 4 on the anterior surface of the front leg (Fig. 3,F), and 6–7 on the upper surface of the rear leg.

The head markings (Fig. 2,A–D) are yellow on a black background. There is a rectangular postorbital spot equal to or greater than the height of the orbit (in one specimen, Tulane 12701, the height of the

blotch equals only three-fourths that of the orbit). In Tulane 12783 the postorbital mark is joined to the suborbital spot. A crescent-shaped line posterior to the large blotch may be interrupted (Tulane 12701) or but faintly visible. Only one of the neck lines extends forward to enter the orbit. Beneath the eye there is an enlarged oval spot. The horny edges of the upper and lower jaws are clear and unmarked. On the ventral surface of the lower jaw there are three enlarged oval, yellow, black-bordered spots (Fig. 2,B,C), separated by longitudinal lines of yellow, except in one specimen (Tulane 12658) in which the oval marks are joined.

The dark olive carapace is marked with a network of light lines which tend to form circular patterns, exceedingly variable, on the costals and marginals (Fig. 2,A,C,D). The vertebral spines are tipped with black.

The plastron (Fig. 3,B) has a central pattern composed basically of two or four longitudinal black lines which may be interrupted on the abdominal and pectoral scutes. This pattern is reduced and barely visible on the larger specimens (UMMZ 104346, Tulane 12670). The bridge is marked with one or two longitudinal black lines (Fig. 3,B).

The carapace of the smaller individual is nearly circular; in individuals greater than 5 cm. in plastral length the carapace is more elongate (Fig. 2,A-D).

MALES

There are 16 mature males in the paratopotypic series. The measurements (in cm.) of the smallest and of the largest are: Cl. 9.04 (10.80); Cw. 7.14 (8.63); Ht. 3.73 (4.12); Pl. 7.83 (9.23); Hw. 1.30 (1.43).

These males retain the distinctive head and leg markings of the juveniles, but two specimens show head patterns not evident in the series of juveniles or females. One (UIMNH 26716) has three lines leaving the orbit, the upper joining the crescent-shaped mark posterior to the eye and the lower extending downward onto the neck region. The other (CNHM 67104) has an increased number of marks on the lateral surface of the head and in the interorbital space. Five narrow lines enter the orbit, but only one of these passes rearward onto the neck.

The markings of the plastron are barely visible in the larger specimens, but some retain distinct patterns. There is a scant development of unevenly distributed supplementary black pigment in one individual. The black vertebral stripe is reduced to poorly delimited smudges in the largest specimen.

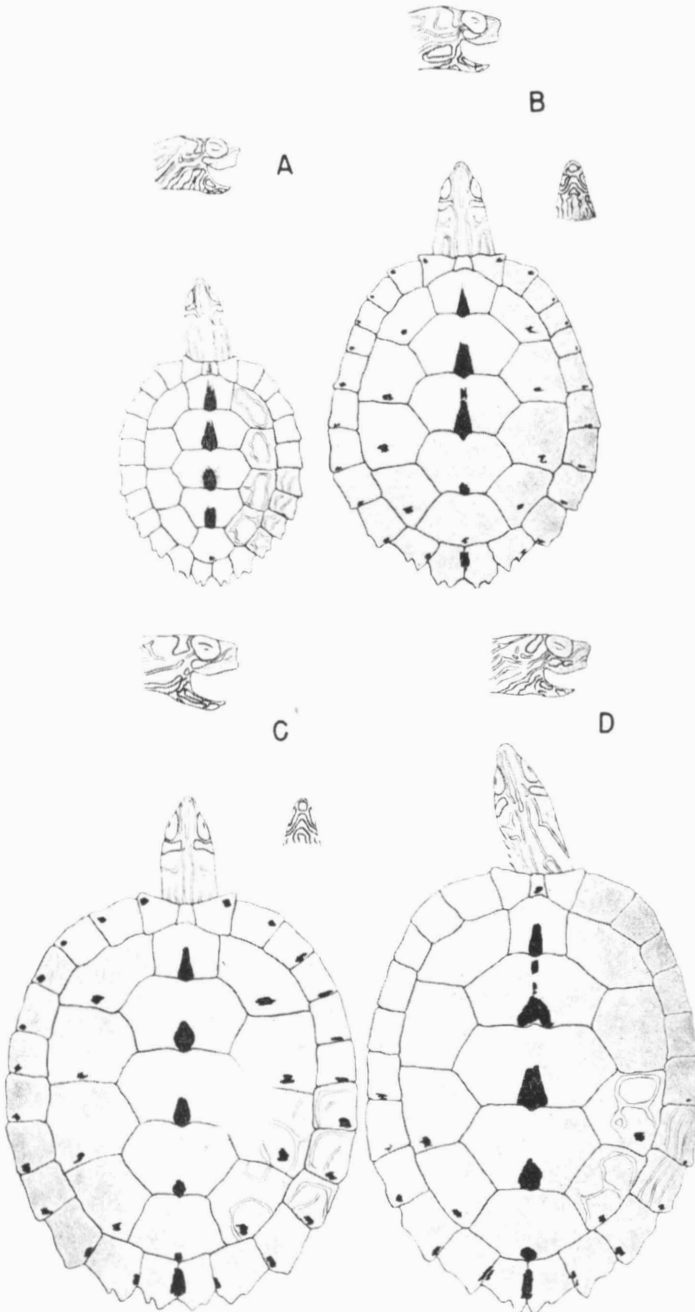


FIG. 2. *Graptemys p. ouachitensis*: A. Hatchling (Tulane 12667); B. Juvenile (UMMZ 104348); C. Juvenile female (Tulane 12670); D. Male (Tulane 12655).

In all males except the largest the eighth to twelfth marginals project beyond the outer margin of the next posterior marginal, and the eleventh and twelfth marginals are shallowly emarginate (Fig. 2,D).

The vertebral spines of the largest male are reduced (height of spines, 1 mm.) and flattened. The vertebrals form a steep-sided central ridge (Fig. 3,C,D). The greatest height of the vertebral spine in the series is 4 mm.

In all the mature males the much elongated nails on the forefeet are equal in length to about three-fourths or more of the interpectoral suture (largest male has nails 1.3 cm. in length; Fig. 3,F).

The head is not broadened in relation to carapace width (Cw./Hw. =5.41 in smallest; 6.03 in largest) and there is no broadening of the alveolar surface in relation to head width (Hw./Aw.=3.7-5.2, no correlation with size of individual).

FEMALES

Two mature females are designated paratypes, Tulane 12705 and 12710. Their measurements (in cm.) are, respectively, Cl. 17.60 (18.0); Cw. 13.31 (13.75); Ht. 7.22 (7.46); Pl. 15.37 (15.51); Hw. 2.16. (The skull of Tulane 12710 has been removed and prepared for study.)

The pattern of the head, neck, and legs is similar to that of the juveniles. The plastral pattern is evident only on the gular and humeral plates, but the bridge markings are as distinct as in juveniles.

The shape of the carapace is strikingly different in these two specimens. One has the sides of the carapace nearly parallel; the other has the sides diverging so that the carapace appears pear-shaped from a dorsal view. The spines of the second and third vertebrals remain distinct (height of second is 3 mm.) in one turtle but are flattened and broadened in the other.

The head is not broadened in relation to carapace width (Cw./Hw. =5.4 in Tulane 12705).

RANGE.—In addition to occurrence in the Ouachita River in Louisiana, *G. p. ouachitensis* is found in northern Texas, Oklahoma, Arkansas, and Kansas.

Specimens referable to this race have been examined from the following localities: Texas, UIMNH 20058, 20059, Lake Texoma, Grayson Co.; Oklahoma, UMMZ 89625, Noble Co., AMNH 65522-26, Comanche Co., UOMZ 25173, Pottawatomie Co., UOMZ 15708, Le Flore Co., UOMZ 26912, 27338, 27175, Marshall Co.; Arkansas, MCZ 29087, Lawrence Co., KU 3806, 3808, Prairie Co.; Kansas, KU 3288, Coffey Co., KU 3297-99, Montgomery Co.

Specimens from Oklahoma and Kansas have, generally, more lines entering the orbit and a smaller postorbital blotch. The marks on the legs and neck are more numerous in some individuals. Northward in the Mississippi Valley the typical head markings of *ouachitensis* are

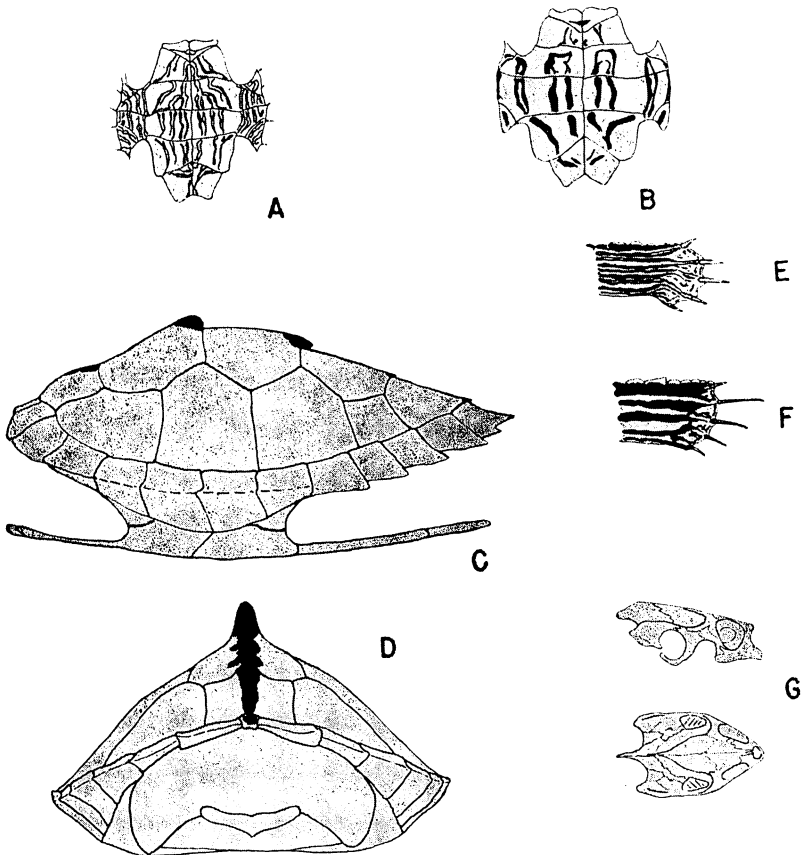


FIG. 3. A. Plastron and bridge of a hatching *G. p. sabinensis*; B. Plastron and bridge of a juvenile *G. p. ouachitensis*; C,D. Lateral and front view of carapace and plastron of male *G. p. ouachitensis* (Tulane 12671); E. Anterior surface of forelimb of male *G. p. sabinensis*; F. Anterior surface of forelimb of male *G. p. ouachitensis*; G. Skull of a female *G. p. sabinensis*.

retained, but there is an increase in the number of leg and neck lines, a slight proportionate broadening of the head, and an increase in the number of lines marking the plastron and bridge. Such individuals occur in Indiana (UMMZ 89742, Foot's Pond, Gibson Co.; USNM

14669, Wheatland), Iowa (UMMZ 92696, Lansing; UMMZ 92691, 92692, Allamakee Co.), and Tennessee (UMMZ 99230, Humphreys Co.). These latter specimens are tentatively identified as intergrades between *ouachitensis* and *pseudogeographica*.

RELATIONSHIPS.—The relation of these populations of the Sabine and Ouachita rivers to other forms in the genus cannot be defined clearly until additional materials are available. The present locality records and morphological similarities suggest several possibilities.

1. There is a wide-ranging species complex of narrow-headed animals extending from the Gulf Coast of Louisiana and Texas through Oklahoma and Kansas into Iowa and Minnesota, eastward to Indiana in the north, and to the Mississippi River in the south. This complex would include *G. p. pseudogeographica*, *G. p. ouachitensis*, *G. p. sabinensis*, and *G. p. versa*, occupying mutually exclusive ranges. *G. oculifera*, isolated in the Pearl River system is related to this group (Cagle, MS).

G. kohni, a wide-headed form found throughout the range of *G. p. sabinensis* and much of that of *G. p. ouachitensis*, is related to the wide-headed *G. pulchra* and *G. barbouri* of the east Gulf Coast (Cagle, 1952).

This arrangement might be easily justified by the similarity of the head patterns and skull characters and is the most acceptable alternative on the basis of the patterns of distribution. The occurrence of apparent intermediates between *kohni* and *pseudogeographica* complicates this interpretation.

2. *G. p. pseudogeographica* may be conspecific with *kohni* (Carr, 1949 and 1952) and *versa*, *sabinensis*, and *ouachitensis* associated in a second species group. The members of the second group occupy, in part, the same range as the former (*sabinensis* with *kohni* in western Louisiana and eastern Texas; *ouachitensis* with *kohni* in central and eastern Louisiana northward to central Illinois and west through Oklahoma and Kansas, and with *pseudogeographica* from central Illinois northward). This arrangement does not account for the apparent intergradation between *ouachitensis* and *pseudogeographica*.

3. *Graptemys pseudogeographica* may be a separate species. If so, "intermediates" mentioned above might be interspecific hybrids.

The weight of the evidence from the data available suggests that the forms under discussion be grouped in this fashion: *Graptemys kohni*, *Graptemys pseudogeographica pseudogeographica*, *Graptemys pseudogeographica ouachitensis*, *Graptemys pseudogeographica sabinensis*, *Graptemys pseudogeographica versa*.

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