ON THREE EXISTING SPECIES OF SEA-TURTLES, ONE OF THEM (CARETTA REMIVAGA) NEW.

By Oliver P. Hay,

Of Washington, District of Columbia.

To the authorities of the United States National Museum the writer is indebted for the privilege of examining and describing most of the specimens mentioned in the following paper. It is hoped that this communication will throw some light on the bastard-turtle, *Colpochelys kempi* Garman, until recently supposed to be a rare animal of the western side of the Atlantic and on the new species described from the Pacific coast of Mexico.

COLPOCHELYS KEMPI AND CARETTA CARETTA.

Plates VI–IX, Plate XI, figs. 1–4.

The bastard-turtle, *Colpochelys kempi* Garman, appears to be a rather common reptile on the coasts of the Gulf States east of the mouth of the Mississippi River and of the South Atlantic States as far north as Beaufort, North Carolina. It is also known to come as far north as Atlantic City, New Jersey, and it will probably be found to be dispersed throughout the Gulf of Mexico.

Garman was the first naturalist to recognize the species as distinct from the loggerhead, *Caretta caretta*. His description [a] dealt almost wholly with the external characters, no osteological features being mentioned except the union of many of the hinder peripheral bones with the costals. The species is said by him to be distinguished from the loggerhead by the short round body, the low humps over the shoulder and the pelvis, the marginal plates, the narrowness of the occiput, and the swollen jaws. The hooked beaks are noted.

Dr. George Baur was the next who mentioned the species.[b] Being interested in establishing his views of the relationships of *Dermochelys* he noted the presence of an unusual number of neural bones, 13 or 14, the freedom of most of these from the vertebræ, the presence

[a] Bull. Mus. Comp. Zool., VI, 1880, p. 123.

[b] Zool. Anzeiger, XI, 1888, p. 423.

of two large suprapygals, and 13 or 14 peripherals. Baur again referred to this species in 1890,[a] and assigned it to the genus *Lepidochelys;* but it fails to meet the requirements of this genus, as he defines it, in having the frontals entering the rim of the orbit and in having the descending processes of the prefrontals in contact with the palatines.

Dr. G. A. Boulenger[b] recognized the species, relying not on the characters given by Doctor Garman in his original description, but on information furnished him by Garman and Baur to the effect that there is present on each alveolar surface of the upper jaw a ridge of bone and that the inner nostrils are not covered by the alveolar borders.

Up to 1906 no figures of the species had been published since it had been recognized as distinct from the loggerhead. In that year Dr. R. E. Coker furnished[c] views reproduced from photographs, of a specimen as seen from above and from below. His description, limited to external characters, was based on four specimens, the largest of which had a carapace 15 inches long; the smallest, a carapace 12.5 inches long. The latter furnished the photographs, and is now in the herpetological division of the U. S. National Museum as a stuffed specimen, having the Catalogue Number 36108.

From Coker's description it appears that the fishermen in the region about Beaufort distinguish this species from the loggerhead by means of the more hooked jaws, miscalling it therefrom the "hawksbill turtle." From Garman we learn that the Florida fishermen give it the name "bastard-turtle." It is interesting to note that the latter name has been applied to probably this turtle for more than a hundred years, it having been mentioned by Lacépède as long ago as 1788.[d]

The writer has had the opportunity to study various specimens of this species, most of them in the U. S. National Museum. These specimens are as follows: (1) The skull of the specimen Cat. No. 29244, U.S.N.M., which furnished the figures published by the writer,[e] and which was taken off Cape Hatteras, by Dr. F. W. True in 1888; (2) a complete skeleton, with carapace 278 mm. long, Cat. No. 29015, U.S.N.M., locality unknown; (3) the skull, limb bones, and shell of a specimen having the carapace 680 mm. long, Cat. No. 29323, U.S.N.M., of unknown locality; (4) the stuffed and dried specimen sent from Beaufort by Doctor Coker, Cat. No. 36108, U.S.N.M.; (5) a similarly prepared specimen taken at Atlantic City,

[a] Amer. Naturalist, XXIV, p. 487.

[b] Cat. Chelonians, 1889, p. 186.

[c] Bull. No. 14, North Carolina Geol. Surv., p. 57, pl. XVIII.

[d] Hist. Nat. Quad. Ovipares, I, p. 104.

[e] Fossil turtles of N. Amer., p. 9, pl. I, figs. 1, 2; pl. II, fig. 1.

New Jersey, Cat. No. 29699, U.S.N.M.; (6) a second similarly prepared specimen of unknown origin, Cat. No. 36085, U.S.N.M., with carapace 260 mm. long; (7) a carapace and plastron of medium size at the American Musuem of Natural History, New York. There is no doubt that all these specimens were secured somewhere along the eastern or southern coasts of the United States.

A result of the writer's investigations is the conviction that externally this species resembles closely the loggerhead, while it is very different in its osteology.

It seems doubtful whether any of the external characters that have been mentioned by Garman and Coker as distinguishing this species from the loggerhead are applicable in all cases. The width of the carapace of the bastard-turtle doubtless is usually greater than that of the loggerhead, but there appear to be exceptions. A bastard-turtle may have the carapace as wide as it is long, or even wider; but No. 29699, with carapace 240 mm. long, has the width only 92% of this; while the loggerhead, No. 29013, with carapace 855 mm. long, has the width 94% of the length.

It is true that the jaws of the bastard-turtle are arched outward, or swollen in the larger specimens, while those of the loggerhead are straight; but these differences are hardly to be observed in the smaller individuals. While the upper jaw of the bastard-turtle is usually more hooked than that of the loggerhead, this appears not always to be the case, as shown by the specimen of the former from Atlantic City and by the horny upper beak of No. 29013, a loggerhead. In the former the cutting-edge of the jaw is very little excavated on each side behind the tip, so that this descends little below the rest of the border; in the latter specimen the border is considerably excavated. Plate VIII, fig. 4, represents the buccal surface of the horny sheath of the upper jaw of the specimen last mentioned. It will be seen that the outline of the front is broad and rounded. Fig. 4, Plate VII, shows the sheath of the upper jaw of the large specimen of the bastard-turtle, No. 29323. In this the tip of the snout is more contracted from side to side and a sort of keel descends along the midline. In younger specimens of the two species these differences are less obvious.

The size of the anterior and posterior humps is subject almost certainly to great variations in the loggerhead. The horny ridges in the roof of the mouth of well-developed specimens of the two species appear to be greatly different. In the large individual of the bastard-turtle, No. 29323 (Plate VII, fig. 4, there is seen to be a prominent ridge on each side, and this runs nearly parallel with the cutting-edge of the jaw. The ridges converge forward, but each diminishes in height as it approaches the other, so that there is a deep notch between them. Each ridge diminishes in height also backward. Each is really a long-based horny tooth. These teeth show

no wear in the large specimen mentioned. In a loggerhead, No. 29372, the horny ridges grow broader forward and join along the midline, there being hardly any notch between them. A smaller specimen shows similar ridges. In the older individuals of the loggerhead the ridges are often strongly worn, as is seen in No. 29013 (Plate VIII, fig. 4). In the smaller specimens of the bastard-turtle the anterior ends of the ridges may not be so well defined as in the larger ones.

On the buccal surface of the lower horny jaw-sheath there is, in the bastard-turtle, a broad groove, bounded in front and at the sides, by the cutting edges of the jaw, posteriorly by a sharp ridge which, starting from a prominent triangular tooth, runs backward and outward on each side (Plate VII, fig. 3). Its hinder slope is very short. In the loggerhead (Plate VIII, fig. 3) there is a corresponding ridge, but the median tooth is wanting, the groove in front is not so deep, and the hinder slope is longer.

It is believed that specimens of the two species may be distinguished by differences in the form of the lateral borders of the carapace. If we will examine this border below the third costal scute (counting the small anterior one) of the loggerhead we shall find that the upper face makes about a right angle with the lower, or outer, face and that the latter is quite narrow, about one-third the length of the marginal scutes of that region. In the bastard-turtle the upper and the lower faces make an angle of about 45° between them and the width of the lower face is from one-half to two-thirds the length of the neighboring marginal scutes.

It appears, further, that the bastard-turtle has four inframarginal scutes on each bridge (Plate VI, fig. 2), while the loggerhead has only three. In the figure cited these scutes show most distinctly on the left side.

Mention has been made above of the relation between the length and the width of a specimen of the bastard-turtle. Another individual, No. 29015, has the carapace 278 mm. long and as many millimeters wide. The largest individual in the U. S. National Museum, No. 29323 (Plate VI), has the carapace 680 mm. long and 664 mm. wide. One of Garman's specimens had the length and the width nearly equal, about 652 mm. The other was 703 mm. long and 728 mm. wide.

The carapace of the bastard-turtle appears to differ constantly from that of the loggerhead in having several supernumerary neural bones. In the latter species there are normally 7 or 8. No. 15259 has an imperfect extra neural behind the first, while No. 29013 has a complete one in the same place. In the bastard-turtle the number of neurals may vary from 11 to 14. Doctor Baur, as cited, noted the presence of 13 and 14 neurals. No. 29015 has 13 and the specimen in the American Museum of Natural History has the same number.

No. 29323 has only 11 (Plate VI, fig. 1). The sizes and the forms of the various neurals are extremely variable and it is often impossible to determine whether any particular bone belongs to the regular series or whether it is intercalated.

The costal bones are, of course, the same in number as in the loggerhead—8 pairs. On account of the large number of neurals, several of the costals articulate proximally with three of the former bones. In the smaller individuals there are extensive fontanels between the outer ends of the costal plates and the projecting ribs, quite as in the loggerhead. These disappear wholly or almost wholly in the largest individuals.

The number of peripheral bones in the bastard-turtle varies between 12 and 13 pairs. There may be 12 on one side and 13 on the other. Baur states that there are 13 peripherals, in one case 14; but it seems probable that there is some error here. In the small individual mentioned above, No. 29015, there are 12 peripherals on the right side, 13 on the left. The large specimen, No. 29323, has 12 on each side (Plate VI, fig. 1). A stuffed specimen, No. 29699, possesses 14 marginal scutes on each side, from which it is inferred that there are 13 peripherals. When there are 12 peripherals the rib of the first costal bone enters a pit in the fourth peripheral, as in the loggerhead; when there are 13 peripherals the rib enters a pit in the fifth. The extra peripheral, therefore, probably results from a division of the normal fourth. As in the loggerhead, all the peripherals succeeding the normal fourth have shallow pits for the rib-ends, except the tenth, the rib of the seventh and eighth costals having swung back so as to enter respectively the eleventh and twelfth peripherals.

In the smaller specimens of the bastard-turtle, as in the loggerhead, none of the peripherals are suturally articulated to the outer ends of the costal plates. In the large individual, No. 29323 (Plate VI, figs. 1, 2), all the peripherals have come into close sutural contact with the outer ends of the costal plates, and the fontanels are closed up as completely as in most Emydidæ. Garman states that in his large specimens 8 or 10 of the posterior peripherals are joined by suture to the costals, making for the hinder half of the carapace nearly solid bone. On the other hand, the carapace of the loggerhead No. 29013 is larger than any of the specimens just described and there are in it no unions between the costals and the peripherals, and considerable fontanels still occupy the borders of the carapace. It appears probable that the bastard-turtle does not reach the large size attained by the loggerhead in its old age.

Mention has been made above of differences in the lateral peripherals of the bastard-turtle and corresponding ones of the loggerhead. It may be said that all the peripherals of the one species differ

from corresponding ones of the other. In general, those of the loggerhead are thicker and have a greater angle between the upper and the lower faces, when these faces are distinguishable. A fair comparison may be made between those of the large specimen of the bastard-turtle and the large loggerhead, No. 29013. The latter is a disarticulated skeleton, the carapace of which is about 855 mm. long and 810 mm. wide. The bastard-turtle has therefore about four-fifths the length of the loggerhead. The second peripheral of the loggerhead is 18 mm. thick; that of the bastard-turtle is 12.5 mm. In both species there is, from the fourth peripheral backward, a sharp edge which separates the upper face of each peripheral from the lower face. The rib-pits are in the inner, or visceral, face. Let us compare the sixth peripheral of each species, that one which receives the rib of the third costal bone. In the loggerhead (Plate XI, fig. 1) the upper face is slightly convex. The lower face, here more properly the outer, makes a right angle with the upper and is only 27 mm. wide. In the bastard-turtle (Plate XI, fig. 2) the upper face is concave, the angle between the two faces is about 45°, and the width of the lower face is as much as 45 mm. The eighth peripheral of the loggerhead has the upper face nearly plane, the angle between the two faces is about 75°, and the width of the lower face is about 27 mm. In the bastard-turtle the upper face is somewhat concave, the angle between the two faces is less than 30°, and the width of the lower is 60 mm. The upper face of the eleventh peripheral of the loggerhead is convex above, the lower more strongly so, the angle between the two about 45° at the border, still less at some distance from it, and the lower is about 50 mm. wide. In the bastard-turtle the upper face is decidedly concave, the lower convex, the angle between the two about 40°, and the lower is 63 mm. wide.

There appear to be in all specimens of the bastard-turtle two suprapygal bones. In the large individuals the anterior is bifurcate, as in most species of *Testudo*, receiving the hinder suprapygal and sending a branch on each side to the eleventh peripheral. The hinder suprapygal becomes suturally joined to the pygal in the smallest known specimens, and it is crossed near the middle of its length by the sulcus between the fifth vertebral scute and the two hindermost marginals.

The second suprapygal of the loggerhead does not so early join the pygal. However, in the large loggerhead mentioned, it has become as completely sutured to the pygal and twelfth peripherals as it is in the bastard-turtle. The posterior hump mentioned by Garman is on this bone. The first suprapygal is bifurcate, as in the bastard-turtle, but it has not contracted sutural union with any peripheral. If later it should do so, it would be with the twelfth peripheral, not with the eleventh, as in the bastard-turtle. The pygal

is a thicker bone than in the bastard-turtle, being 34 mm., instead of 23 mm., where it joins the twelfth peripheral.

As regards the horny scutes of the carapace of the bastard-turtle, we find that they differ not greatly from those of the loggerhead. There are nearly always five vertebrals. In the specimen figured by Coker there is a small extra one behind the fourth. Irregularities in the scutes of the carapace are common in the loggerhead, as has been noted by several writers. The length of the sulcus between the marginal scutes of the hindermost pair is usually longer in the bastard-turtle than in the loggerhead. In the former it is usually about two-thirds as long as the fifth vertebral, and the sulcus between the two marginals mentioned and the vertebral runs in a straight line across the second suprapygal. In the loggerhead the sulcus between the marginals in question may be only about one-half as long as the fifth vertebral, and the sulcus between the marginals and the vertebral makes an angle backward at the midline. However, the large loggerhead, No. 29013, does not differ in the respects named from the bastard-turtles.

The plastron of the bastard-turtle resembles closely that of the loggerhead. The large individual mentioned above, No. 29323 (Plate VI, fig. 2), has the anterior and the posterior lobes broader and more rounded than those of the loggerhead, but such differences do not seem to exist in the smaller specimens of the two species. In the large individual the fontanels usually found on each side between the outer end of the hyoplastron and of the hypoplastron are filled up. The median fontanels also are much reduced. In this specimen the plastron is 515 mm. long. The anterior lobe is 230 mm. wide at the base; the posterior 220 mm. The bridge has a width of 165 mm., of which the hyoplastron occupies 90 mm.

The scutes of the plastron of the bastard-turtle are, in general, like those of the loggerhead. Both have small intergulars. As already stated, there are, on each bridge, four inframarginals, of which the hindermost is the shortest, fore and aft (Plate VI, fig. 2). In such loggerheads as the writer has examined there are only three inframarginals and the hindermost is the largest.

Striking differences are found when we compare skulls of the bastard-turtle with those of the loggerhead. For comparison there are presented below three sets of measurements, one from the skull of the large specimen of the bastard-turtle, No. 29323 (Plate VII, fig. 2; Plate VIII, fig. 2; Plate IX, fig. 1; Plate XI, fig. 4), another from the loggerhead skull No. 13822, and a third from the loggerhead skull No. 29206. The length of the skull of the bastard-turtle, from the snout to the occipital condyle (cranial axis), is 147 mm.; that of No. 13822 is 182 mm.; that of No. 29206 is 175 mm. In the table there are presented under each of these specimens two columns of figures. In

the first column are given the actual distances between the points indicated, as obtained by calipers. In the second column under each specimen, opposite each dimension, there is given the percentage which this dimension is of the cranial axis, whose length stands at the head of the first column under each specimen.

Table of measurements.

Part measured.	*Colpochelys kempi.*		*Caretta caretta.*			
	No. 29323.		No. 13822.		No. 29206.	
	Dimensions.	Percentage of cranial axis.	Dimensions.	Percentage of cranial axis.	Dimensions.	Percentage of cranial axis.
	mm.		*mm.*		*mm.*	
Snout to occipital condyle	147	100	182	100	175	100
Width from outside to outside of quadrates	120	82	152	84	150	87
Snout to end of supraoccipital process	207	141	260	142	239	132
Snout to extremity of squamosal	192	130	240	121	212	123
Front of tympanic cavity to extremity of squamosal	62	42	67	37	81	47
Snout to line joining hinder borders of articulation for lower jaw	123	84	182	100	161	92
Length of orbit	55	37	67	37	61	35
Height of orbit	41	28	64	35	55	32
Depth of cutting-edge of maxilla below orbit	32	22	23	13	23	13
Interorbital space	50	34	64	35	55	32
Height of roof of skull above articulation with lower jaw	103	70	135	74	135	78
Height of front of prefrontals above cutting-edge of maxilla	62	42	53	29	55	32
Least width of combined pterygoids	16	11	37	20	38	22
Distance of choanæ behind snout	56	38	67	37	64	37
Width of choanal opening behind	36	26	30	16	37	21
Distance between hinder ends of maxillæ	100	68	110	60	118	68
Length of ramus of lower jaw	115	78	----------	----------	161	92
From tip of lower jaw to coronoid process	----------	----------	----------	----------	102	60
Length of symphysis	----------	----------	----------	----------	50	29
Tip of lower jaw to mental foramen	65	37	----------	----------	56	32
Thickness of ramus below coronoid process	15	10	----------	----------	13	7.5

Attention may be directed to some of the above comparative measurements. The first of these pertain to the form of the skulls seen in profile. The skull of the loggerhead (Plate VII, fig. 1; Plate VIII, fig. 1; Plate IX, fig. 2; Plate XI, fig. 3) starts with a greater posterior elevation and descends rapidly, so that the height at the rear of the nasal opening is considerably less than in the bastard-turtle. From rear to front, but especially from side to side, the skull of the loggerhead is much more convex than that of the other species. As seen from above, the outlines of the upper jaws are straighter in the loggerhead than in the bastard-turtle, those of the latter being arcuate. In the loggerhead there is a rather abrupt widening of the outlines just behind the maxillæ; in the bastard-turtle the curves are continuous from near the snout backward.

It will be observed that the line joining the posterior borders of the articulations of the quadrates for the lower jaw is considerably

farther from the snout in the loggerhead than in the other turtle. The pedicels of the quadrates of the loggerhead are swung backward from 15 to 25 mm. farther than in the bastard-turtle. One result of this is to bring the occipital condyle of the loggerhead on a line with the hinder faces of the pedicels in the loggerhead, while in the bastard-turtle it projects considerably behind the pedicels. Another result is to make the upper anterior end of the quadrate, at its union with the proötic (Plate VIII, fig. 1), project much farther in front of the pedicels in the loggerhead than they do in the bastard-turtle (Plate VIII, fig. 2). This advanced position of the quadrate and proötic appears to become accentuated with age in the loggerhead.

The greater breadth of the maxillæ of the bastard-turtle below the orbit is to be noted.

The measurements show that the posterior nares of the loggerhead are much narrower than in the bastard-turtle. The pterygoids of the two species differ greatly. Where the palate is most constricted the pterygoids of the bastard-turtle (Plate VIII, fig. 2) are much narrower than in the loggerhead (Plate VIII, fig. 1), while in front they broaden greatly. Moreover, in the loggerhead there are only vestigial ectopterygoid processes, while in the bastard-turtle these are strongly developed.

As might be expected from the backward position of the pedicels of the quadrates, the rami of the lower jaw of the loggerhead (Plate XI, fig. 3) are considerably longer than those of the bastard-turtle (Plate XI, fig. 4); the coronoid processes are likewise thrown farther backward. The rami are less arcuate, and thinner. On the other hand, the mental foramina lie considerably nearer the tip of the jaw.

Returning to the upper surface of the skull, we find that the frontal bones of the bastard-turtle (Plate VII, fig. 2) enter the rim of the orbit for a short distance, while in the loggerhead (Plate VII, fig. 1) they are normally widely excluded therefrom. Boulenger has noted the fact that occasionally in the loggerhead the frontal on one side or the other enters the rim of the orbit.[a] Doubtless it will be found that sometimes the frontals of the bastard-turtle are excluded from the orbit; but such variations hardly affect the specific value of the character.

The roof of the mouth of the bastard-turtle (Plate VIII, fig. 2) presents on each side a prominent, rounded, bony ridge, which runs along the suture between the maxilla and the palatine. This ridge supports the ridge of the horny alveolar surface which has been described above. Only occasionally and in the smaller individuals of the loggerhead is there seen any trace of a similar ridge. Masticatory ridges

[a] Proc. Zool. Soc. Lond., 1890, p. 618.

corresponding to these are found in many turtles of several families. Among the Cheloniidæ they are found in *Eretmochelys* and *Chelonia;* among the Emydidæ, in *Trachemys*, *Pseudemys*, and *Batagur;* all the species of the genus *Testudo* are provided with similar ridges; and the writer has found a well-developed masticatory ridge in an extinct trionychid genus from the Bridger Eocene of Wyoming. Such ridges, often strongly tuberculated, appear to have been developed as substitutes for teeth, lost probably by the ancestors of the earliest turtles; and these ridges probably mark modifications of food-getting and food-preparation somewhat as do the variations in the teeth of other reptiles.

The structure of the roof of the mouth in front of the choanæ is quite different in the two species here discussed. In the loggerhead (Plate VIII, fig. 1) the maxillæ meet each other on the midline, below the vomer; in the bastard-turtle (Plate VIII, fig. 2) the maxillæ are wholly separated by the vomer.

Some statements regarding the lower jaw have already been made. To these it may be added that the lower jaw of the bastard-turtle (Plate IX, fig. 1; Plate XI, fig. 4) is shorter, heavier, more strongly upturned toward the tip and more bent outward at the sides than in the loggerhead. The bony alveolar surface (Plate IX, fig. 1; Plate XI, fig. 4) is more deeply channeled on each side, and there is, at the hinder end of the symphysis, a triangular elevation, corresponding to that already mentioned as occurring on the horny sheath of the jaw.

The scutes which cover the upper surface of the skull of the bastard-turtle appear to differ somewhat from those of the loggerhead. The frontal scute and those which join it at the sides and in front are alike in the two species. The fronto-parietal of the loggerhead is much larger, nearly twice as long as the frontal, while the parietals are short, little, if any, more than half as long as the fronto-parietal. On the contrary, the fronto-parietal of the bastard-turtle is not much longer than either the frontal or the parietals. These scutes are not shown on the figures presented here.

It appears that, in the case of the bastard-turtle, the head becomes relatively smaller as age comes on. In No. 29015 the length of the head is contained in the length of the carapace 3.6 times; in the large individual, No. 29323, the head is contained in the length of the carapace 4.6 times. The same statement is true regarding the loggerhead. In No. 29372, with carapace 453 mm. long, the length of the skull is 108 mm.; therefore it enters the length of the carapace 4.2 times. In the large individual, No. 29013, the length of the skull is contained in the length of the carapace 4.75 times.

As to the size attained by the skull of the loggerhead, the largest known to the writer is in the U. S. National Museum. The length

from the snout to the occipital condyle is 232 mm. It came from Swan Island, in the Caribbean Sea. The next largest is in the American Museum of Natural History, New York, and was found on the coast of New Jersey. The length from the snout to the occipital condyle is 230 mm. Neither of these specimens is accompanied by the shell.

The shoulder girdle and the fore limb of the bastard-turtle are not greatly different from the same structure in the loggerhead. It is found, however, that the distal end of the coracoid of the bastard-turtle is distinctly broader than that of the loggerhead, the breadth being in the former 0.43 of the length, in the latter 0.32.

The following table presents the length of the whole fore limb and of various parts of it in two specimens each of the bastard-turtle and of the loggerhead.

Measurements of the fore limb.

Measurements.	*Colpochelys kempi.*		*Caretta caretta.*	
	No. 29323.	No. 29015.	No. 15259.	No. 29372.
	mm.	*mm.*	*mm.*	*mm.*
Whole limb from head of humerus to end of third digit	467	214	352	344
Humerus from head to radial articulation	136	60	105	100
Ulna	78	33	52	52
Carpus from ulna to base of third digit	47	22	35	32
Third digit	206	99	160	160

Judging from the figures presented, the humerus and the ulna of the young of the bastard-turtle are shorter in comparison with the whole limb than in the adult; while the third digit is longer. The head of the humerus of the bastard-turtle is more flattened in section than is that of the loggerhead, the short axis being nearly 0.6 that of the longer, while in the loggerhead the short axis is 0.8 the length of the longer.

In the bastard-turtle the thumb and the fifth digit are relatively slightly longer than those of the loggerhead. In the former the ungual phalanx is more acuminate in outline.

The pelves of the two species are greatly alike. However, the ischiopubic foramen of the bastard-turtle is more pointed in front, being thus more heart-shaped.

Measurements of the hinder limb.

Measurements.	*Colpochelys kempi.*		*Caretta caretta.*	
	No. 29323.	No. 29015.	No. 15259.	No. 29372.
	mm.	*mm.*	*mm.*	*mm.*
Length of whole limb to tip of third digit	416	153	262	246
Length of femur	141	50	90	81
Length of tibia	105	39	57	56
Length of tarsus to base of third digit	33	11	20	18
Length of third digit	127	53	95	91

An examination of the figures presented above shows that the various segments of the hinder limb of the bastard-turtle undergo little change in relative length during growth.

It appears that all naturalists, who have had occasion to write of the sea-turtles of America, from the earliest times down to the time of Garman's description of *Colpochelys kempi*, have confounded the species with the loggerhead, *Caretta caretta*. However, the first author who figured a supposed loggerhead, after *Linnæus* had bestowed the specific name, gave figures of the bastard-turtle. This was the German naturalist Schoepff. His figure of the plastron [a] shows that there were present four inframarginals, a character betraying the bastard-turtle. Holbrook's figure [b] is that of the true loggerhead.

The writer wishes to make note that on pages 8, 9, and 10 of his Fossil Turtles of North America, he has referred the bastard-turtle to the genus *Lepidochelys*. He was influenced to do this by Dr. George Baur, but there now appears to be no sufficient reasons for this disposition of the species.

CARETTA REMIVAGA, new species.

Plate X, figs. 1–3; Plate XI, fig. 5.

The supposed new species, *Caretta remivaga*, is based on a skull which is in the U. S. National Museum and has the catalogue number 9973. It is labeled as having been collected by Prof. F. Sumichrast, in Ventosa Bay, Mexico. The record shows that it was received by the museum in 1870. Ventosa Bay is on the western coast of Mexico, and is a part of the Gulf of Tehuantepec.

This species, apparently, belongs to the genus *Caretta*, inasmuch as the skull has essentially the structure found in *C. caretta* of the Atlantic Ocean. It differs from the latter species, however, in many important respects. The skull (Plate X) is flatter and the snout more pointed. The frontal bones enter the rim of the orbit. The maxillæ are widely separated by the vomer. The pterygoids possess conspicuous ectopterygoid processes. The free border of the pterygoid, when followed backward, becomes a ridge which disappears before it reaches the pedicel of the quadrate; while the ridge which ascends from the inner end of the articulation for the lower jaw passes forward and upward to join a ridge which ascends on the descending plate of the parietal. The occipital condyle stands distinctly behind the pedicels of the quadrates. Also the proötic bones project but little in front of the pedicels. The horny scutes overlying the occiput are much different from those of *Caretta caretta*, especially

[a] Historia Testudinum, pl. XVI, lower figure.

[b] N. Amer. Herpetology, II, 1842, pl. IV.

the median ones. The frontal scute is about as long as the fronto-parietal; the latter is not so long as are the parietals. In *C. caretta* the fronto-parietal is long, and the parietals very short. *Chelonia olivacea* Eschscholtz has been, by some authors, referred to the genus *Lepidochelys*. The type of the species was found in Manila Bay and it possessed six pairs of costal scutes. If this number of costals shall be found to be constant it may serve to establish the genus mentioned. Possibly when the carapace of *Caretta remivaga* shall have been secured it will be found to have a like number of costal scutes. Baur[a] places this skull in the genus *Lepidochelys;* but it does not conform to his definition of the genus, inasmuch as the frontals enter the orbits and the descending processes of the prefrontals connect with the palatines.

The following measurements and percentages are given in order that comparisons may be made with the skulls of *Caretta caretta* and *Colpochelys kempi*, whose dimensions and percentages are given on page 190.

Table of measurements.

Parts measured.	Dimensions.	Percentage of cranial axis.
	mm.	
Snout to occipital condyle	144	100
Width from outside to outside of quadrates	117	81
Snout to end of supraoccipital process	187	129
Snout to extremity of squamosal	176	122
Front of tympanic cavity to extremity of squamosal	43	30
Snout to line joining hinder borders of articulations for lower jaw	125	87
Length of orbit	58	40
Height of orbit	45	31
Cutting-edge of maxilla below orbit	23	16
Interorbital space	45	31
Height of roof of skull above articulations for lower jaw	100	69
Front of prefrontals above cutting-edge of maxilla	52	36
Least width of combined pterygoids	25	17
Distance of choanæ behind snout	47	32
Width of choanal opening behind	37	26
Distance between hinder ends of maxillæ	95	66
Length of ramus of lower jaw	122	85
From tip of lower jaw to coronoid process	82	57
Length of symphysis	32	22
Breadth of hinder end of ramus of lower jaw	26	18
From tip of lower jaw to mental foramen	56	39
Thickness of ramus below coronoid process	16	11

From the foregoing measurements it will be seen that the end of the supraoccipital process and the extremity of the squamosal extend a considerably less distance behind the occipital condyle than they do in *Caretta caretta*. The slope of the skull (Plate X, fig. 1) from rear to front is about as in the Atlantic loggerhead, but it is less convex. The pterygoids are narrower behind the ectopterygoid processes. The choanæ are placed farther forward and they are much wider behind. The rami of the lower jaw are shorter and likewise their symphysis. The hinder end of the ramus, measured across the articulation for the

[a] Amer. Naturalist, XXIV, 1890, p. 487.

lower jaw is not nearly so wide. As compared with the lower jaw of *C. caretta*, the rami (Plate X, fig. 1; Plate XI, fig. 5), seen from below are not so straight and are thicker. The tip is more upturned and more pointed. The alveolar surface is more concave; it is divided by a low ridge along the symphysis, and a larger part of it lies behind the symphysis, and the symphysis is shorter. The hinder portion of the prearticular bone extends much farther backward than it does in the Atlantic loggerhead. The horny sheaths of the jaws of this species are unknown.

The horny scutes of the upper surface of the skull (Plate X, fig. 2) appear to differ somewhat from those of *C. caretta*. The frontal scute, lying between the orbits, is bounded on each side by two scutes. Of these the anterior pair are widely separated from each other in advance of the frontal scute. In *C. caretta* the anterior pair meet before the frontal. As in *C. caretta*, there is a large parietal shield and behind it two occipitals. In *C. caretta* the occipitals are much shorter than the parietal; in *C. remivaga* they are fully as long as the parietal.

No. 29354 of the U. S. National Museum is a skull of unknown origin. It is undoubtedly cospecific with the type of *C. remivaga*. It differs in having the frontal bone of the left side excluded from the rim of the orbit.

The type of this species was mentioned by Dr. George Baur in the American Naturalist,[a] where he speaks of having examined a skull of *Lepidochelys olivacea* from West Africa and says that the skull from Ventosa Bay belongs to the same genus; but he does not give any specific name. That it does not belong to *L. olivacea* seems evident. We have at present for comparison of the latter with our new species only Eschscholtz's figure and his description.[b] A reproduction of this figure is to be found in Stejneger's Herpetology of Japan, 1907, Plate XXXIV.

The head, and especially the snout, of the type of *L. olivacea* are more elongated than those of *C. remivaga*. Eschscholtz says that the head of his figured specimen was $2\frac{1}{4}$ inches long and $1\frac{1}{2}$ inches wide. The width, then, was just two-thirds the length. In our species the width is close to 80 per cent of the length. In *L. olivacea* the snout, back to the orbit, is one-third the length of the head and one-half its width. In *C. remivaga* the length of the snout enters into the length of the head 4.7 times; into the width, 4 times. In *L. olivacea* the interorbital space is included in the length of the head $2\frac{1}{2}$ times; in *C. remivaga*, $3\frac{1}{3}$ times. The frontal scute of *L. olivacea* extends much behind the orbits; in *C. remivaga* hardly at all behind them.

[a] Volume XXIV, 1890, p. 487.

[b] Zool. Atlas, 1829, p. 3, pl. III.

Besides his type, Eschscholtz had a larger specimen, which differed in many respects from the type. Its head was 6 inches long and $5\frac{3}{4}$ inches wide, the greatest width being just behind the eyes. The width, then, was 96 per cent of the length. In these measurements the length of the head is taken to, or nearly to, the end of the supraoccipital process. The skull of *C. remivaga*, being larger than the one just described, ought, if it belonged to the same species, to have a width of at least 150 mm., instead of about 125 mm.

A consideration of Eschscholtz's descriptions leads to the conclusion that either his specimens belonged to two distinct species or that during growth there occurs a remarkable increase in the width. The skull of a specimen of *C. caretta*, No. 29204, has a length, from the snout to the supraocciptal process, of 155 mm.; the greatest width is 117 mm., 75 per cent of the length. An aged specimen, No. 29234, from Swan Island, Caribbean Sea, has the length of the skull, as measured above, 317 mm.; the width, 260. The percentage is therefore 82. The increase in the width during growth is then far less than in the supposed specimen of *L. olivacea*.

DESCRIPTION OF PLATES.

PLATE VI.

Colpochelys kempi, No. 29323, $\times\frac{1}{8}$.

FIG. 1. Carapace.
2. Plastron.

PLATE VII.

Caretta caretta, No. 29013, $\times\frac{3}{8}$.

FIG. 1. Skull seen from above.

Colpochelys kempi, No. 29323, $\times\frac{3}{8}$.

2. Skull seen from above.
3. Horny sheath of lower jaw.
4. Horny sheath of upper jaw.

PLATE VIII.

Caretta caretta, No. 29013, $\times\frac{3}{8}$.

FIG. 1. Skull seen from below.

Colpochelys kempi, No. 29323, $\times\frac{3}{8}$.

2. Skull seen from below.

Caretta caretta, No. 29013, $\times\frac{3}{8}$.

3. Horny sheath of lower jaw.
4. Horny sheath of upper jaw.

PLATE IX.

Colpochelys kempi, No. 29323, $\times\frac{3}{8}$.

FIG. 1. Skull seen from right side.

Caretta caretta, No. 29013, $\times\frac{3}{8}$.

2. Skull seen from right side.

PLATE X.

Caretta remivaga, No. 9973, $\times\frac{3}{8}$.

FIG. 1. Skull seen from right side.
2. Skull seen from above.
3. Skull seen from below.

PLATE XI.

Caretta caretta, No. 29013, $\times\frac{3}{8}$.

FIG. 1. Section of right sixth peripheral.

Colpochelys kempi, No. 29323, $\times\frac{3}{8}$.

2. Section of right sixth peripheral.

Caretta caretta, No. 29013, $\times\frac{3}{8}$.

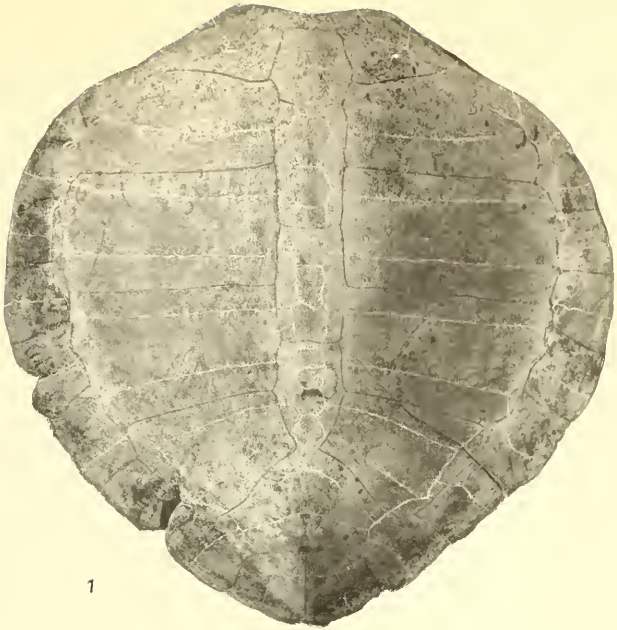
3. Lower jaw seen from above.

Colpochelys kempi, No. 29323, $\times\frac{3}{8}$.

4. Lower jaw seen from above.

Caretta remivaga, No. 9973, $\times\frac{3}{8}$.

5. Lower jaw seen from above.



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2

COLPOCHELYS KEMPI.

FOR EXPLANATION OF PLATE SEE PAGE 197.

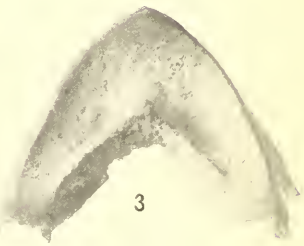

FIG. 1, CARETTA CARETTA; FIGS. 2-4, COLPOCHELYS KEMPI.

FOR EXPLANATION OF PLATE SEE PAGE 197.

FIGS. 1, 3, 4, CARETTA CARETTA; FIG. 2, COLPOCHELYS KEMPI.

FOR EXPLANATION OF PLATE SEE PAGE 197.

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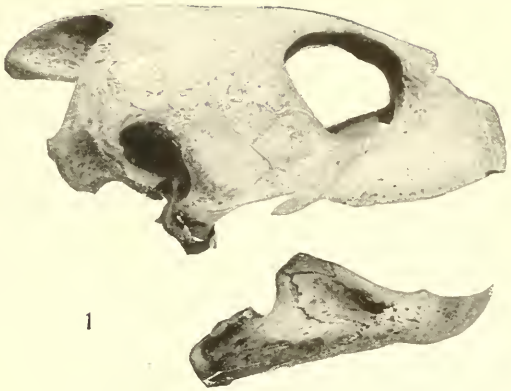
FIG. 1, COLPOCHELYS KEMPI; FIG. 2, CARETTA CARETTA.

FOR EXPLANATION OF PLATE SEE PAGE 198.



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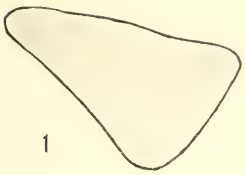
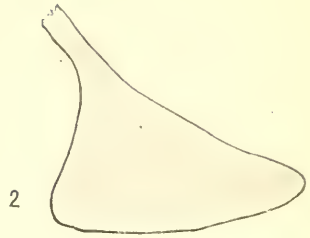
CARETTA REMIVAGA.

FOR EXPLANATION OF PLATE SEE PAGE 198.





FIGS. 1, 3, CARETTA CARETTA; FIGS. 2, 4, COLPOCHELYS KEMPI; FIG. 5, CARETTA REMIVAGA.

FOR EXPLANATION OF PLATE SEE PAGE 198.