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A NEW SPECIES OF ALLIGATOR FROM THE SNAKE CREEK BEDS[1]

By Charles C. Mook

The material here described was found near Agate, Nebraska, by Mr. Albert Thomson, who has been for a number of years in charge of the American Museum's field work in this locality. It occurred in the Lower Snake Creek beds, which have been determined by Dr. W. D. Matthew to be of Middle Miocene age. The material indicates a new species of *Alligator*, which may be named *A. thomsoni* in honor of the discoverer. The skull and most of the remaining material was collected in 1921, the small well-preserved mandibular ramus in 1922. The collection includes, besides the specimens chosen as type and paratypes, several fragmentary skulls and jaws, teeth and dermal plates.

Alligator thomsoni, new species

Type.—A well-preserved skull of moderately large size. A. M. N. H. No. 1736.
Paratypes.—Three mandibular rami. A. M. N. H. Nos. 1737, 1738, 1739.

General Form

The skull is excessively short; snout about one and one-ninth times as long as its breadth at the base. The anterior border of the snout is very broad, much as in both of the living species of *Alligator*. The lateral borders immediately posterior to its anterior extremity diverge sharply in relatively straight lines, so that the muzzle at the level of the fourth maxillary teeth is one and one-fifth times as broad as in a Florida alligator of the same length. The borders of the snout are less smooth, both in the superior and lateral aspects than in the southern alligator. There is a marked constriction at the level of the spaces between the sixth and seventh maxillary teeth. The breadth at the articular extremities of the quadrates is about five-fourths of that of a Florida alligator of the same length. The cranial table is relatively much larger, both in lateral and longitudinal directions, than in the common living species; also the lateral borders of the cranial table converge more sharply forward.

There is a rapid descent in the anterior direction from the level of the interorbital plate to that of the base of the snout and there are two

[1]Contributions to the Osteology, Affinities and Distribution of the Crocodilia, No. 11.

small ridges extending forward from the anterior ends of the orbits. In these characters the skull resembles that of the living Chinese alligator and the three species of the South American *Jacare*, rather than the Florida alligator. The pitting is very rough.

The Cavities of the Skull

Supratemporal Fenestræ.—These fenestræ resemble closely those of *A. mississippiensis* in form but are relatively larger in size. They resemble very closely those of *A. sinense* in both size and shape, and also in the fact that the small accessory fenestræ are visible when the skull is viewed from above. Each fenestra is only slightly shorter than the corresponding half of the narial aperture in the longitudinal direction but is considerably broader in the transverse direction, on the whole, occupying much less space. The two fenestræ are widely separated from each other.

Infratemporal Fenestræ.—These cavities are very similar to the corresponding cavities in *A. sinense*. They are relatively somewhat larger than those of *A. mississippiensis*.

Orbits.—The orbits are large. They are slightly shorter than in a southern alligator of the same length but are considerably broader. In form they approach closer to the normal crocodilian orbits than to the rather abnormal orbits of *A. mississippiensis*.

External Narial Aperture.—This cavity is small, especially in the transverse direction, compared with the nares of both species of living alligators. At its anterior end it is considerably narrower than in a Florida alligator of the same length and its length is slightly less. Its lateral borders converge less sharply backward than in the living species, consequently it is relatively broader at its posterior end.

The nasals penetrate far forward into the aperture but do not completely divide it. The anterior ends of these nasal processes appear to be little, if at all, injured, but the premaxillaries along the anterior border of the aperture exhibit a broken border; evidently a process extended backward from this border to meet the nasals.

Premaxillary Foramen.—The small foramen on the palatal surface of the premaxillary is very broad and short. Its length is only slightly greater than its breadth. Its posterior border is rounded as in *A. mississippiensis;* its lateral borders are not rounded as in either of the living alligators but are characterized by slightly angular outlines.

Palatine Fenestræ.—Only the anterior ends of the palatine fenestræ are known, the posterior borders not being preserved. The

anterior borders, which are situated at the level of the anterior edges of the tenth maxillary alveoli, are broadly rounded. The internal borders of the two fenestræ converge sharply in the posterior direction and the fenestræ were much broader than in the skull of a Florida alligator of the same length.

INTERNAL NARIAL APERTURE.—The region of the internal narial aperture is not preserved.

THE BONES OF THE SKULL

PREMAXILLARIES.—The premaxillaries are very short and broad. Their posterior processes extend back to the level of the fourth maxillary teeth. The external narial aperture extends back to the level of the second maxillary teeth. A process evidently extended back from the anterior border of the aperture to meet the nasals but it is not preserved; its broken base is noticeable on the anterior border of the aperture.

On the palate the premaxillo-maxillary suture is more pronouncedly undulating than in *A. mississippiensis*. It resembles *A. sinense* in this respect, except that the details of the sutural outline are different. It extends back to the level of the second maxillary teeth about midway between the external border of the skull and the median line. At its intersection with the latter it is opposite the first maxillary teeth.

There are five teeth in each premaxillary. The first and second are the smallest in size, the third and fifth are slightly larger and the fourth is considerably larger. The first four teeth are very close together; the fifth is only slightly removed from the fourth. The teeth are very stout, much more so than in the Florida alligator. The pits which lodged the first and fourth mandibular teeth are very deep but do not pierce the bone. There are very faint depressions which probably lodged the second and third mandibular teeth but these are much less distinct than in the living alligators. The depressions are all internal to the line of premaxillary teeth themselves.

MAXILLARIES.—These bones are very short and broad. The sutures with the nasals are especially short. The sutures with the prefrontals, lacrymals and jugals are very irregular, even more so than in the Florida alligator, resembling more the corresponding sutures in *A. sinense*. As in both species of living alligators, the maxillaries have contact with the prefrontals, excluding the lacrymals from contact with the nasals.

When viewed from above, the maxillaries appear to extend little, if at all, back of the level of the anterior ends of the orbits. Seen from the side, however, they extend back as far as the level of the centers of the

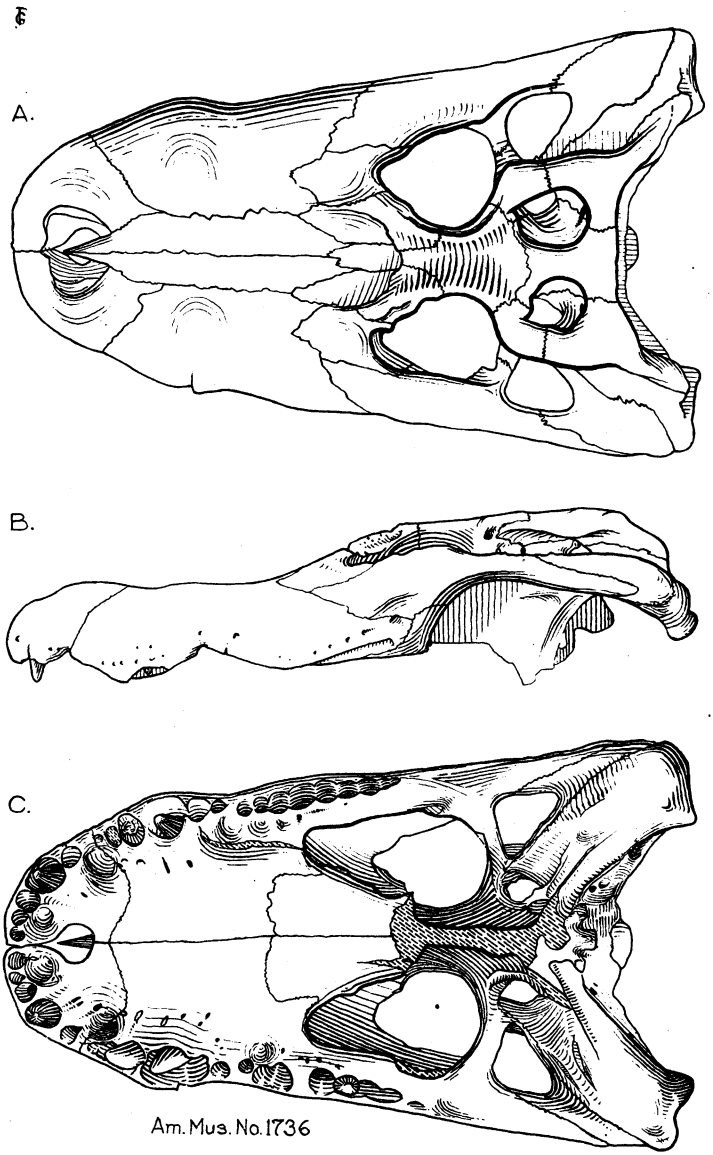

Fig. 1. *Alligator thomsoni*, new species. Type specimen, skull (A. M. N. H. No. 1736).

One-fourth natural size. A, superior view; B, lateral view, left side; C, inferior view.

orbits; the jugals project slightly and partly conceal the posterior processes of the maxillaries from above.

On the palatal surface of the skull the maxillaries are excessively short. The distance from the anterior ends of the palatines to the premaxillaries along the median line is about seventy-three per cent of the distance from the anterior ends of the palatines to the level of the posterior ends of the posterior processes of the maxillaries on the lateral borders of the skull. In a Florida alligator of the same skull-length the length of the maxillaries along the palatal surface is one hundred and seventeen per cent of the length of the posterior processes. In a medium-sized skull of *A. sinense* (A. M. N. H. No. 23898), however, the median palatal diameter of the maxillaries is only fifty-eight per cent of the length of the posterior processes. In the Florida alligator the median maxillary suture lies opposite ten maxillary teeth; in the species described it lies opposite eight, and in the skull of *A. sinense* mentioned above, it lies opposite five. The small number in the latter, however, may be due partly to immaturity of the specimen.

The premaxillo-maxillary suture has been described above. The sutures with the palatines resemble closely those of *A. mississippiensis* except that the proportions of various components are different. The longitudinal portions are shorter and the transverse portions are longer in the skull described. The resemblance to *A. sinense* in this respect is not so close.

The left maxillary contains alveoli for fourteen teeth, of which the third and eleventh are preserved, as well as rudiments of the first and fourth. The alveoli of this maxillary are all close together except the sixth and seventh, which are slightly separated, and the ninth and tenth, which are widely separated. The first and second, the fourth and fifth, the eighth and ninth, and the tenth to the fourteenth alveoli, inclusive, are all confluent.

The right maxillary differs somewhat from the left. It contains alveoli for fifteen teeth. The fourth of these contains a rudimentary tooth. There is a space between the sixth and seventh alveoli, as in the left maxillary, but there is none between the ninth and tenth. The eighth to the fifteenth alveoli, inclusive, are confluent. In both maxillaries the first aveoli are very small. There is a progressive increase in size in the posterior direction to the fourth, which is far larger than any other alveolus in the jaw. The fifth is much smaller than the fourth. In the Florida alligator the third maxillary alveolus is only slightly greater than the fifth. In *A. sinense* the difference in size between the third and

fifth maxillary alveoli is only slightly greater. In the skull described the third alveolus has nearly twice the diameter of the fifth. In general, the alveoli are relatively larger than in either of the living species of *Alligator*, and the teeth preserved are much stouter. There are deep pits, which received mandibular teeth, at the premaxillo-maxillary sutures and slightly internal to the spaces between the sixth and seventh maxillary teeth. In this character the skull resembles that of *A. mississippiensis* more than that of *A. sinense*. In the latter there are pits at the premaxillo-maxillary suture and slightly internal to the spaces between the fifth and sixth teeth.

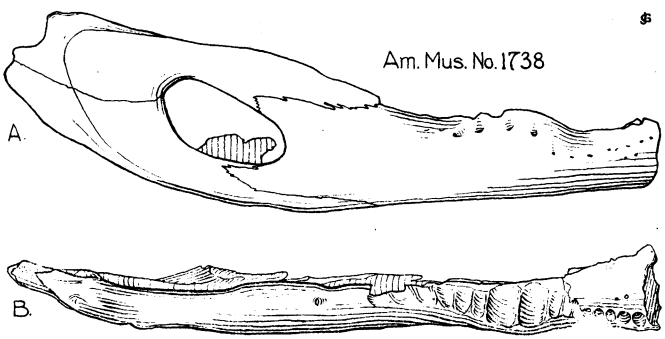

Fig. 2. *Alligator thomsoni*, new species. Paratype specimen, right mandibular ramus (A. M. N. H. No. 1738).
One-fourth natural size. A, external view; B, superior view.

NASALS.—The nasals are short and broad. Their length is about four-fifths of that in a Florida alligator of the same total skull-length. The sutures with the prefrontals are considerably shorter than in either of the living species of *Alligator*. The sutures with the frontal are much longer than in either of the modern species, and each nasal sends back a conspicuous wedge-shaped process between the frontal and the corresponding prefrontal.

The maximum breadth of the nasals is only very slightly anterior to the maxillo-nasal-prefrontal contacts, contrasting with the living alligators, in which it is far forward.

From the level of their greatest breadth backward the nasals narrow rapidly and regularly, in contrast with the irregular outlines of the posterior portions of the nasals in the Florida alligator, but agreeing with the Chinese alligators. The anterior processes of the nasals project forward into the external narial aperture for a distance equal to three-

fourths the length of the latter. Their tips appear to be complete and not broken off, but they probably were in contact with processes of the premaxillaries which extended backward from the anterior border of the aperture. The anterior nasal processes are broad where they enter the aperture.

LACRYMALS.—These bones are relatively short and broad, as in the living *A. sinense*. Their breadth is about one and one-third times that in a Florida alligator of the same skull-length, whose lacrymals are also equal in length. In form they differ from those of either of the living alligators. Their lateral boundaries converge sharply forward in symmetrical patterns (which differ slightly on the two sides of the skull), contrasting with the subquadrangular outlines in the modern alligators.

PREFRONTALS.—The prefrontals resemble those of *A. mississippiensis* in many respects. Their lateral borders converge regularly forward, however, instead of joining a very irregular transverse anterior border. Their sharp anterior extremities resemble similar structures in *A. sinense*. Their posterior portions are elevated above the level of their anterior portions, consequently their surface profile is somewhat irregular, as in *A. sinense* but not as in *A. mississippiensis*.

FRONTAL.—The frontal is relatively large, both in the longitudinal and transverse diameters. The interorbital plate is about one and one-third times as broad as in a Florida alligator skull of the same length.

The anterior process is large; it extends forward as a prominent wedge between the posterior processes of the nasals, contrasting with rather small processes in the living alligators. The process ends considerably further forward than the level of the anterior ends of the orbits; the anterior frontal process in the living alligators ends very slightly in front of this level.

The interorbital plate is concave in transverse profile as in *A. mississippiensis* and *A. sinense*. This plate is situated at a distinctly higher level than the base of the snout and there is an abrupt drop from the higher level to the lower, in fact a slight overhang. The longitudinal profile therefore differs considerably from that in the Florida alligator, but resembles somewhat that of the Chinese form.

The posterior plate is relatively broader than in the Florida species and the suture with the parietal is not so nearly transverse but swings backward and is more wavy in outline; in these characters there is a resemblance to *A. sinense*. Two deep pits, extending below the general level of the skull-top, are situated along this suture immediately in front of the supratemporal fenestræ. The sutures with the postorbitals are

longer than in the Florida alligator and they converge more in the posterior direction. In this character also the skull resembles that of *A. sinense*. These sutures, with the intervening fronto-parietal suture, form a broadly rounded curve instead of three sides of a rectangle. The surficial pits of the frontal are very coarse-textured and deep.

POSTORBITALS.—The postorbitals are considerably larger in every respect than those of the living alligators. The inferior bar, which de-

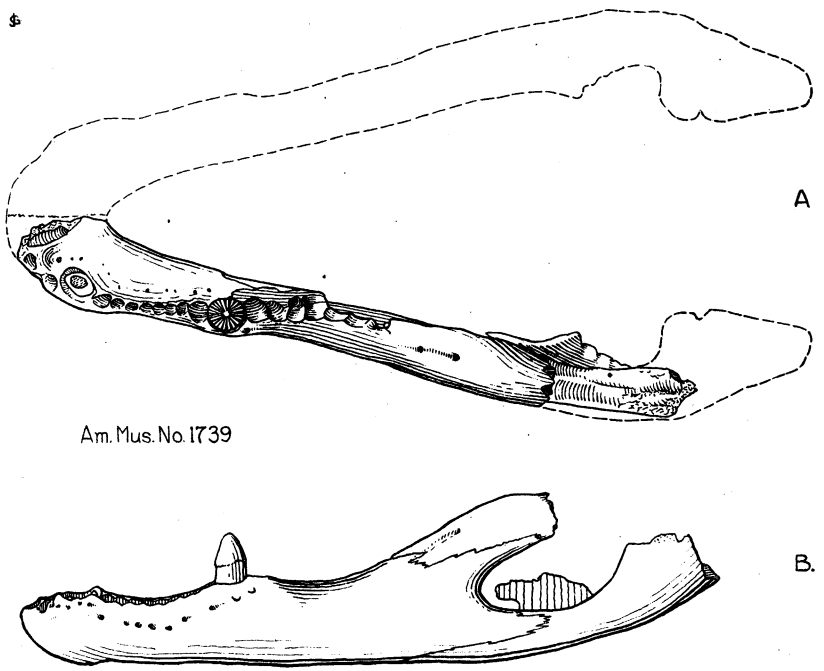

Fig. 3. *Alligator thomsoni*, new species. Paratype specimen, left mandibular ramus (A. M. N. H. No. 1739).

One-fourth natural size. A, superior view, with reconstruction of missing portions to indicate degree of divergence of the two rami; B, external view.

cends to unite with the ascending process of the jugal and separate the infratemporal fenestra from the orbit, is unusually stout.

SQUAMOSALS.—These bones are large. They occupy a relatively greater percentage of the lateral borders of the cranial table than in the living Florida species. They occupy about the same percentage as in *A. sinense*. Their postero-external processes are unusually stout and the transverse distance between their extremities is unusually great.

PARIETAL.—The parietal is considerably larger than in *A. mississippiensis* both in longitudinal and transverse directions and appears to correspond in size with that of *A. sinense.*

The antero-lateral bars are long, giving a great breadth to the anterior end of the bone, as in the Chinese alligator. The interfenestral plate is broad, contrasting with a relatively narrow plate in the Florida alligator and with the very much narrower plates in the species of *Crocodilus.* It is comparable in breadth with that of *A. sinense* but lacks the uprolled edges of the latter. The parietal occupies slightly less than one-third of the posterior border of the cranial table, as in the living *A. sinense.* The parietal lacks the slight depression on the surface between the interfenestral plate and the posterior border of the cranial table, which is present in the living alligators.

SUPRAOCCIPITAL.—The supraoccipital is large. It occupies no part of the superior surface, or posterior border of the cranial table. It occupies a larger area on the posterior surface of the skull than in the Florida species. Its diameters, both transverse and vertical, are greater than in the latter species. It extends unusually far down toward the foramen magnum. The small depressions above the main body of the supraoccipital and lateral to the parieto-supraoccipital sutures are broad transversely and shallow vertically. This may be due partly to the effects of pressure.

QUADRATES.—These bones are short and broad. The breadth of their articular surfaces is about one and one-fifth times as broad as in a Florida alligator of the same skull-length. The quadrato-jugal-quadrate suture is very similar to that in *A. mississippiensis* or *A. sinense.*

EXOCCIPITALS, BASIOCCIPITAL AND BASISPHENOID.—The transverse diameters of the exoccipitals is relatively very large. The condyle of the basioccipital is very stout and the remainder of the basioccipital is broad. The basisphenoid presents no character of any significance except that it is broad.

QUADRATO-JUGALS.—These bones are not especially distinctive.

JUGALS.—The jugals resemble those of the living alligators, except that the sutures with the maxillaries are more irregular.

PALATINES.—The palatine bones are exceedingly short and broad. Their anterior processes occupy about two-fifths of the breadth of the palate. These processes extend forward to the level of the eighth maxillary teeth. The suture between the anterior processes and the maxillaries is a nearly straight transverse line. The lateral borders of the central portion converge rapidly in the posterior direction. The posterior portions are not preserved.

PTERYGOIDS.—The pterygoids are not preserved.

ECTOPTERYGOIDS.—These are partly preserved but are not especially characteristic.

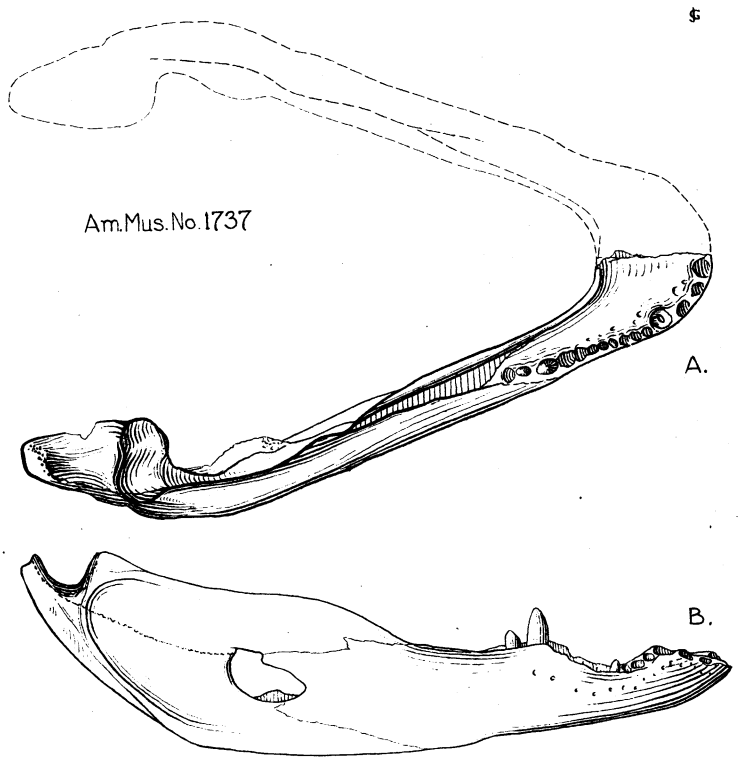

Fig. 4. *Alligator thomsoni*, new species. Paratype specimen, right mandibular ramus (A. M. N. H. No. 1737).

One-half natural size. A, superior view, with outline of opposite ramus to indicate degree of divergence of rami; B, external view.

THE MANDIBLE

Several mandibular rami are preserved which may be considered as paratype specimens. One of these, a left (A. M. N. H. No. 1739), may possibly belong to the same individual as the skull but this is not at all certain. Another is a right of nearly the same size, and a third, a right and the most complete, is smaller. The following description is based chiefly upon this smaller specimen.

In its general form the mandible differs greatly from that of the Florida alligator and resembles more closely that of *A. sinense*. It bears

a very close resemblance to the mandibles of some of the Eocene crocodilians, especially *Allognathosuchus polyodon* (Cope) and *A. heterodon* Cope.

Considerably more than half the length of the mandible lies posterior to the last alveolus, presenting the appearance of having the teeth crowded forward. This character is probably largely emphasized by the youthful stage of the specimen, but in several Chinese alligators of smaller size the length of the dental series is less than that of the edentulous portion of the mandible.

In the small perfect specimen (No. 1737) the symphysis extends back to the level of the eighth maxillary teeth; in the large left ramus (No. 1739) it extends only to the level of the fifth. In young and old Florida alligators there is no difference in this respect. This suggests the possibility that the two rami may not belong to the same species. Other characters, however, are sufficient to warrant their being considered together as paratypes. The teeth in the region of the symphysis are very small.

The largest tooth in the jaw, judged from the alveolus, is the fourth; the first is only slightly smaller. The second and third are of moderate size. Immediately posterior to the large fourth alveolus are seven small alveoli. These decrease in size from the fifth alveolus to the eighth. The ninth is equal in size to the eighth; from this point back to the twelfth there is a steady increase in size, the twelfth being nearly as large as the first. Posterior to the twelfth are alveoli for six (the small jaw, No. 1737) or seven (the larger jaws, Nos. 1738, 1739).

All of the alveoli posterior to the third are close together, many of them being confluent.

The foramen on the external surface is smaller than in the living species. The vertical height of the jaw is relatively great. The profile of the mandible is very wavy.

The splenial is long and in the small specimen (No. 1737) curves inward and reaches within about one millimeter of the symphysis.

Summary of Characters

The characters of the species may be summarized as follows. Entire skull short and broad; base of snout at a lower level than that of the interorbital plate and sharply separated from it; two ridges extending forward from the anterior ends of the orbits; teeth very stout; nasals not extending entirely across external nares; lateral border of skull and mandible very wavy; mandibular symphysis long; great range in size in mandibular teeth.

Relationships

In most of its characters this species differs from the Florida alligator much more than from the Chinese alligator, *A. sinense*. The resemblance to the latter is remarkably close, so close that it evidently indicates direct descent. The resemblance to some of the Wasatch crocodilians is also very close and it may be considered as intermediate between these and the living alligators. According to this interpretation *A. sinense* is more primitive in structure than *A. mississippiensis*.

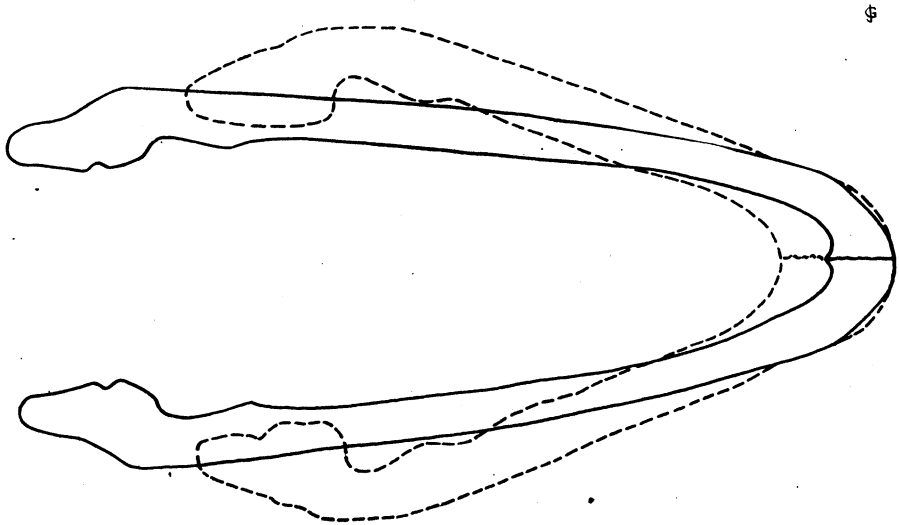

Fig. 5. *Alligator thomsoni*, new species and *A. mississippiensis* (Cuvier).

Outlines of mandibular rami, indicating relative degrees of convergence of rami. Solid lines: *A. mississippiensis* (A. M. N. H. No. 12572); dash lines: *A. thomsoni* (A. M. N. H. No. 1737). Both outlines one-half natural size.

Measurements

Skull (No. 1736)

Length, Ends of Quadrates to Tip of Snout	36.3cm.
" Occipital Condyle to Tip of Snout	33.0
Breadth across Quadrates	22.3
" at Base of Snout	17.4
" at Fourth Maxillary Teeth	16.0
" across Premaxillo-maxillary Suture	11.5
" of Cranial Table, Posterior	11.8
" of Plate between Supratemporal Fenestræ	1.6
" of Interorbital Plate	3.2
Length of Maxillaries along Medial Line of Palate	8.6

MANDIBLE

	No. 1737	No. 1738	No. 1739
Length, Total	15.9 cm.	....	....
Height, Maximum	4.0	7.9	8.2
Length, Dental Series	8.5	19.4	....
" Posterior to Dental Series	10.8	....	....
" Symphysis	3.0	....	....