



THE UNIVERSITY
OF ILLINOIS
LIBRARY

590.5
F1
v.12

BIOLOG

Re
La
ch:
bo

ok on or before the
stamped below. A
le on all overdue

I. Library

DEC

[Handwritten mark]

AP

4

Vertical line

FIELD MUSEUM OF NATURAL HISTORY

FOUNDED BY MARSHALL FIELD, 1893

PUBLICATION 252

ZOOLOGICAL SERIES

VOL. XII, No. 17

NOTES ON SOUTH AMERICAN CAIMANS

BY

KARL P. SCHMIDT

Assistant Curator of Reptiles and Amphibians

REPORTS ON RESULTS OF
THE CAPTAIN MARSHALL FIELD EXPEDITIONS

WILFRED H. OSGOOD

Curator, Department of Zoology

EDITOR

THE LIBRARY OF THE
DEPT. OF ZOOLOGY
UNIVERSITY OF CHICAGO



CHICAGO, U. S. A.

November 21, 1928

PRINTED IN THE UNITED STATES OF AMERICA
BY FIELD MUSEUM PRESS

5715
F. I.
V. 12

NOTES ON SOUTH AMERICAN CAIMANS

BY KARL P. SCHMIDT

1927
Jan. 25
M. B. K.

The Captain Marshall Field Brazilian Expedition of 1926-1927 made extensive collections of vertebrates in southern Brazil and in adjoining territory in Paraguay, Argentina and Uruguay. The zoological party was led by Mr. George K. Cherrie of New York. With him were associated Mrs. Marshall Field III¹, and Mr. Curzon Taylor of New York, Mrs. Grace G. Seton of Greenwich, Connecticut, and Mr. Colin C. Sanborn and the writer, of the zoological staff of Field Museum of Natural History. The expedition had unusual facilities, and preserved a large series of the Paraguay Caiman as well as a few specimens of the very different Broad-snouted Caiman. This material provides a basis for a more thorough understanding of the caiman group than has been possible heretofore.

Crocodylians are difficult to preserve as alcoholic specimens because of their large size, and a relative neglect of these animals in museum collections has resulted, except notably in the case of the Thayer Expedition material from the Amazon, secured by Louis Agassiz. It is now evident that satisfactory discrimination of the species in this group depends on examination of osteological characters, especially those of the skull. Series of skulls, accompanied by preserved juvenile specimens and a few skins of adults, make the most satisfactory study material for crocodylians. Unfortunately, such series are not as yet available for most of the species.

The abundance and importance of fossils representing extinct crocodylians make it especially desirable to illustrate and define the skeletal characters of the living species, as has been recognized by Mook (1921, 1921a) and by Müller (1924 and 1927).

Examination of the expedition's material began with the simple and satisfactory identification of specimens from Misiones as *Caiman latirostris* (Daudin). Difficulties then arose with the abundant species of the Paraguay River which, according to accepted lists, should belong to the wide-ranging *Caiman sclerops*. In the light of the expedition's specimens from Paraguay and Matto Grosso, this view appears untenable; and although some temerity is required, reexamination of the relations of the forms lumped together under

¹A popular account of this expedition by Mrs. Field appeared in the Saturday Evening Post, March 5, 1927.

"*sclerops*" by Boulenger and subsequent authors has been attempted. Brief notes on the synonymy and distribution of the remaining species have been added in the hope that at least a useful preliminary may be provided for an adequate future revision.

Most of the caimans preserved in North American museums have been examined in the course of the study. I am especially indebted to Dr. Leonhard Stejneger and Miss Doris Cochran of the U. S. National Museum, to Dr. G. K. Noble and Dr. Charles C. Mook of the American Museum of Natural History, to Dr. A. G. Ruthven and Mrs. H. T. Gaige of the Museum of Zoology of the University of Michigan, and to Dr. Thomas Barbour and Mr. Arthur Loveridge of the Museum of Comparative Zoology, for permission to examine collections in their charge. Dr. Otto Wettstein of the Naturhistorisches Museum, Vienna, has kindly verified data for me.

The application of the International Rules of Zoological Nomenclature to the genera and species of crocodylians results in an extraordinarily complex and unsatisfactory situation. Without special rulings, there seems to be no escape from transferring the name *Crocodylus*, hitherto appropriately applied to the true crocodiles, to the more obscure of the two genera of South American caimans. This change would be accompanied by the equally unsatisfactory transfer of the specific name "*niloticus*" to one of these caimans. The existence of typical material (referable to *Caiman sclerops*) of the Linnaean species *Lacerta crocodilus* appears to necessitate the combination *Caiman crocodilus* for this species. Finally, great confusion has reigned with regard to the generic name of the spectacled caimans, with *Caiman*, *Jacaretinga*, and *Jacare* all used in recent papers.

The genus *Crocodylus*, instituted by Laurenti in 1768, contains four species, *niloticus*, *americanus*, *africanus*, and *terrestris*. Of these, *africanus* and *terrestris* have been ignored by all subsequent authors as unidentifiable. *C. americanus* has been employed in the sense of the American crocodile by numerous authors, including Gray and Boulenger. It is rejected as unidentifiable by Stejneger and Barbour (1917), who employ *C. acutus* Cuvier for the American species and cite *niloticus* Laurenti as the type of *Crocodylus*. They also cite *Lacerta crocodilus* Linnaeus as referring in part to *niloticus*. Müller (1923) has now brought forward the fact that Laurenti's *niloticus* is exclusively based on Seba's figure which is identified as *Caiman trigonatus* (Schneider) not only by Schneider but by all

subsequent authors. This leaves no course open, under the rules, but to transfer the generic name *Crocodylus* to the smooth-fronted South American caimans which, being generically distinct from the spectacled caimans would, otherwise be called *Paleosuchus trigonatus* and *P. palpebrosus*, *Crocodylus niloticus* Laurenti being identical with *Paleosuchus trigonatus* (Schneider). *Crocodylus*, of authors subsequent to Laurenti, is unavailable under the provisions of Article 35a, of the International Rules, being a homonym of *Crocodylus*. The true crocodiles are left without a name (unless *Champse Merrem* is available) earlier than the four suggested by Gray in 1844.

The spectacled caimans have received a superfluity of generic names. They were first distinguished from *Alligator* by Spix, who proposed two names, *Jacaretinga* and *Caiman*. Gray appears to be the first subsequent author to recognize either of these names, but misapplies *Caiman* by employing it for the above mentioned *Paleosuchus trigonatus* and *P. palpebrosus*, neither of which was included in Spix's description. The next use of *Caiman*, in a sense including the original species, is by Boulenger (1889), who combines the spectacled caimans with the smooth-fronted caimans. *Jacaretinga* was not reemployed by any author until Vaillant proposed to replace *Caiman* by *Jacaretinga* on the ground of page priority. Boulenger's use of *Caiman* Spix, in a sense differing from that of Gray and including the original species, appears to constitute a clear preference for *Caiman* over *Jacaretinga*, and such choice of *Caiman* holds under the rules, Vaillant, Stejneger, and Müller to the contrary notwithstanding. Mook's employment of *Jacare* Gray for the spectacled caimans and of *Caiman* Gray, (not of Spix) for the smooth-fronted species, merely perpetuates Gray's confusion of the taxonomy.

Gray (1862) proposed two generic names for the species included by Spix in *Caiman*, so that his action cannot be taken as a selection of type by elimination. Since there is no clear choice of a type-species for *Caiman*, I hereby designate *Caiman fissipes* Spix as the type of this genus, preferring *fissipes* (= *latirostris*) to *niger* as it is certain that some authors will regard *Caiman niger* as the type a distinct monotypic genus.

Müller's detailed discussion of the nomenclature of the caimans should be read in this connection. I am unable to find any loophole in his argument with reference to the application of the name

Crocodylus. If my argument with reference to *Caiman* be accepted, the species of caimans in Boulenger's list would be:

- Caiman latirostris* (Daudin)
Caiman niger Spix
Caiman crocodilus (Linnaeus)
Crocodylus niloticus Laurenti
Crocodylus palpebrosus (Cuvier)

The above nomenclatorial outcome is a very unsatisfactory one. It is evident that this is one of the cases in which "a strict application of the rules will clearly result in greater confusion than uniformity," and that, consequently, the whole matter should be reviewed by the International Commission on Zoological Nomenclature with a view to a suspension of the rules. Pending such a review, I disregard the replacement of *trigonatus* by *niloticus* (and hence of *Paleosuchus* by *Crocodylus*) and as *crocodilus* Linnaeus comes into question as a composite species, in part equal to *niloticus* auct., I employ *sclerops* Schneider for the common spectacled caiman.

The two genera of caimans are distinguished as follows:

- I. Upper eyelid incompletely bony; supratemporal fossae present; five teeth in each premaxilla; 17-20 mandibular teeth on each side, a bony ridge uniting the orbits anteriorly; parietal not reaching the posterior border of the cranial table; iris greenish-yellow. *Caiman* Spix.
- II. Upper eyelid completely bony; supratemporal fossae absent; four teeth in each premaxilla; 20-22 mandibular teeth on each side, no bony ridge between the orbits; parietal reaching the posterior border of the cranial table on each side of the supra-occipital; iris dark chestnut brown. *Paleosuchus* Gray.

Paleosuchus Gray. Smooth-fronted Caimans.

? *Crocodylus* LAURENTI, Syn. Rept., p. 53, 1768.

Crocodilus SCHNEIDER, Hist. Amphib., 2, p. 1, 1801—part.

Alligator CUVIER, Ann. Mus. Hist. Nat. Paris, 10, p. 30, 1807—part.

Jacaretinga SPIX, Species Novae Lacertarum, p. 1, 1825—part.

Caiman GRAY (not of Spix), Cat. Tortoises, p. 66, 1844; MOOK, Bull. Amer. Mus. Nat. Hist., 44, p. 244, 1921.

Paleosuchus GRAY, Ann. Mag. Nat. Hist., (3) 10, p. 330, 1862;
MÜLLER, Zool. Anz., 58, p. 316, 1923.

Aromosuchus GRAY, loc. cit., p. 330.

Synopsis of the Species of *Paleosuchus*

- A. Some or all of the scutes between the hind limbs in two or three longitudinal series; a single row of enlarged occipitals; caudal crest double to the ninth or tenth verticil inclusive; central series on each side sharply keeled——*P. trigonatus*.
- AA. Shields between the hind limbs in four series; two rows of enlarged occipitals; dorsal keels all subequal; caudal crest double to the eleventh or twelfth verticil inclusive——*P. palpebrosus*.

Paleosuchus trigonatus (Schneider). Schneider's Smooth-fronted Caiman.

? *Crocodylus niloticus* LAURENTI, Syn. Rept., p. 53, 1768.

Paleosuchus niloticus MÜLLER, Zool. Anz., 58, p. 319, 1923;
Zeitschr. Morph. Ökol. Tiere, 2, p. 433, pl. 5, figs. 17, 32
and 33, 1924.

Crocodylus trigonatus SCHNEIDER, Hist. Amphib., fasc. 2, p. 161,
1801; CUVIER, Ann. Mus. Hist. Nat. Paris, 10, p. 64,
1807; TIEDEMANN, OPPEL and LIBOSCHÜTZ, Naturg. Amphib., p. 66, pl. 7, 1817.

Champsia trigonata, WAGLER, Syst. Amphib., p. 140, 1830; NAT-
TERER, Ann. Wien Mus. Naturg., 2, p. 323, pl. 26, 1840.

Caiman trigonatus GRAY, Cat. Tortoises, p. 66, 1844; Ann.
Mag. Nat. Hist., (3), 10, p. 330, 1862; Cat. Shield Rept.,
2, p. 28, 1872; BOULENGER, Cat. Chelon., p. 296, 1889;
LIDTH DE JEUDE, Notes Leyden Mus., 25, p. 84, 1904;
BEEBE, Zoologica, 2, p. 211, 1919; MOOK, Bull. Amer. Mus.
Nat. Hist., 44, p. 244, fig. 13, 1921; LUEDERWALDT, Rev.
Mus. Paulista, 14, pp. 389, 391, 1926.

Alligator trigonatus MERREM, Syst. Amphib., p. 35, 1820;
STRAUCH, Mém. Acad. Sci. St. Pétersb., (7) 10, No. 13, p.
27, 1866.

Jacaretinga trigonatus VAILLANT, Nouv. Arch. Mus. Hist. Nat.
Paris, (3) 10, p. 171, fig. 1, 1898.

Crocodylus palpebrosus, var. 2, CUVIER, Ann. Mus. Hist. Nat.
Paris, 10, p. 38, pl. 2, fig. 1, 1807.

Alligator palebrosus var. b. GRAY, Syn. Rept., p. 63, 1831;
DUMÉRIL and BIBRON, Erpét. Gén., 3, p. 72, 1836.

It is remarkable that this species exhibits no distinction in range from its congener, *palpebrosus*. Goeldi and Hagmann fail to record either of the species of *Paleosuchus* from the lower Amazon region, and it is possible that their occurrence there depends on the flotation of casual specimens from the upper Amazon. This is, however, purely a speculation, and it is possible that *trigonatus* and *palpebrosus* are everywhere rare. Absolutely nothing seems to be on record with regard to their habits.

The only trustworthy locality records in the literature are as follows: Angostura, Orinoco River, Venezuela; Demerara Falls, British Guiana; Coppename River, Dutch Guiana; Huallaga River, Peru; Moyobamba, Peru; Rio Negro, near Mt. Cucui, Brazil; and Rio Tocantins, state of Pará, Brazil.

To these may be added the following: Demerara River, British Guiana (Univ. Mich. No. 46113); Rio Abuna, Bolivia (Univ. Mich. No. 56903); Kartabo, British Guiana (A.M.N.H. No. 16048); Vigia, near Obydos, Brazil (M.C.Z. No. 2957); and Pará, Brazil (M.C.Z. No. 3785).

***Paleosuchus palpebrosus* (Cuvier).** Cuvier's Smooth-fronted Caiman.

Crocodylus palpebrosus, var. 1, CUVIER, Ann. Mus. Hist. Nat. Paris, 10, p. 35, pl. 1, figs. 6, 17, pl. 2, fig. 2, 1807; TIEDEMANN, OPPEL, and LIBOSCHÜTZ, Naturg. Amphib., p. 64, pl. 6, 1817.

Alligator palpebrosus MERREM, Tent. Syst. Amphib., p. 35, 1920; GRAY, Syn. Rept., p. 63, 1831; DUMÉRIL and BIBRON, Erpét. Gén., 3, p. 69, 1836; STRAUCH, Mém. Acad. Sci. St. Pétersb., (7), 10, No. 13, p. 25, 1866.

Champsia palpebrosa WAGLER, Syst. Amphib., p. 140, 1830; NATTERER, Ann. Wien. Mus. Naturg., 2, p. 324, pl. 27, 1840.

Caiman palpebrosus GRAY, Cat. Tortoises, p. 67, 1844; Ann. Mag. Nat. Hist., (3), 10, p. 330, 1862; Cat. Shield Rept., 2, p. 28, 1872; BOULENGER, Cat. Chelon., p. 296, 1889; PERACCA, Boll. Mus. Torino, 19, No. 460, p. 2, 1904; WERNER, Zool. Jahrb. Syst., 28, p. 266, 1909; BEEBE,



Reproduced by permission from the Goode Series of Base Maps. University of Chicago Press

Fig. 1. Distribution of *Paleosuchus*

○ *Paleosuchus trigonatus*

△ *Paleosuchus palpebrosus*

Zoologica, 2, p. 211, 1919; FERREIRA, Journ. Sci. Acad. Sci. Lisboa, 23, p. 82, 1924; MOOK, Bull. Amer. Mus. Nat. Hist., 44, p. 252, 1921; LUEDERWALDT, Revista Mus. Paulista, 14, pp. 389, 391, 1926.

Jacaretinga palpebrosus VAILLANT, Nouv. Arch. Mus. Hist. Nat. Paris, (3), 10, p. 171, 1898.

Paleosuchus palpebrosus MÜLLER, Zeitschr. Morph. Ökol. Tiere, 2, p. 441, pl. 5, fig. 31, 1923.

Jacaretinga moschifer, SPIX, Species Novae Lacertarum, p. 1, pl. 1, 1825.

Champsia gibbiceps NATTERER, Ann. Wien. Mus. Naturg., 2, p. 324, pl. 28, 1840; GRAY, Cat. Tortoises, p. 67, 1844.

The Mexican record for this species is plainly erroneous, and Spix's record from Bahia is doubted by Natterer, also on what appear to be good grounds (Strauch, 1866, p. 26). More recently this species is recorded from Ituverava, São Paulo, by Luederwaldt. This is also an outlying record and requires confirmation. The only other occurrences in the Paraguay-Paraná basin are (1) the record as *P. gibbiceps* Natterer from Villa Maria (=São Luiz de Cáceres.) and (2) that of Peracca from Urucúm de Corumbá, Matto Grosso. If this species occurs in the upper Paraguay, it certainly is extremely rare in comparison with the common *Caiman yacare*.

The only additional localities derivable from the literature are the following: Cayenne, French Guiana; Rio Branco (of Rio Negro), Rio Tocantins, Pará, Brazil.

To these may be added: Demerara River, British Guiana (Univ. Mich. No. 46110); Cucuhy, Amazonas, Brazil (A.M.N.H. No. 16574); Taparinha, Pará, Brazil (M.C.Z. No. 2928).

It is one of the curiosities of zoological collecting that so little is known about the habits and distribution of these species. In almost all the crocodylians mutual exclusiveness of range is the rule. The species of *Paleosuchus* appear to form an exception not only with regard to each other but with regard to the species of *Caiman* as well. Their ecologic relations with the spectacled caimans offer one of the most interesting field problems in South American zoology.

Caiman Spix. Spectacled Caimans.

Lacerta LINNAEUS, Syst. Nat., ed. 10, p. 200, 1758—part.

Crocodylus SCHNEIDER, Hist. Amphib. 2, p. 1, 1801—part.

Alligator CUVIER, Ann. Mus. Hist. Nat. Paris, 10, p. 30, 1807
—part.

Jacaretinga SPIX, Species Novae Lacertarum, p. 1, 1825—part.

Caiman SPIX, idem, p. 3, 1825.

Champsia WAGLER, Syst. Amphib., p. 140, 1830—part.

Jacare GRAY, Cat. Tortoises, p. 64, 1844.

Melanosuchus GRAY, Ann. Mag. Nat. Hist., (3), 10, p. 328,
1862.

Cynosuchus GRAY, idem, p. 328, 1862.

Synopsis of the Species of *Caiman*

- A. Orbit produced anteriorly to the vertical of the ninth or tenth maxillary tooth; upper eyelid flat; caudal crest double for 17-18 verticils; 4-5 transverse series of small occipital shields; vomer exposed on the palate (in skull).....*Caiman niger*.
- AA. Orbit not produced anteriorly; upper eyelid strongly rugose; caudal crests double to the 11th-16th verticils; occipitals in less than 4 rows; vomer (in skull) not exposed on palate.
- B. Width of snout at the anterior border of the orbits equaling or exceeding its length from the same line; none of the mandibular teeth pierce the upper jaw at any age.
.....*C. latirostris*.
- BB. Width of snout less than its length; 1st and 4th mandibular teeth normally pierce the upper jaw in the adult; 4 or 5 transverse rows of nuchals, strongly imbricate, boxlike.
- C. Pterygoids usually excluded from the palatal fossae, exceptionally entering them by a narrow process; basal caudal verticils 14-16; teeth usually $\frac{1}{8}$ - $\frac{3}{8}$*C. jacare*.
- CC. Pterygoids enter palatal fossae; teeth usually $\frac{2}{9}$ - $\frac{3}{9}$.
- D. Pterygoids broadly entering palatal fossae; snout broad; 12-15 basal caudal verticils (usually 13-14); palatines expanded anteriorly.....*C. fuscus*.
- DD. Pterygoids narrowly entering palatal fossae; snout narrow, straight-sided, palatines slender; 11-13 caudal verticils double crested, (usually 12).....*C. sclerops*.

Caiman niger Spix. Black Caiman.

Caiman niger SPIX, Species Novae Lacertarum, p. 3, pl. 4,
1825; BOULENGER, Cat. Chelon., p. 292, 1889; HAGMANN,

- Zool. Jahrb., Syst., **16**, p. 405, 1902; SIEBENROCK, Denkschr. Akad. Wiss. Wien (math.—naturw. Kl.), **76**, p. 38, 1905; HAGMANN, Zool. Jahrb., Syst., **24**, p. 315, pl. 21, 1906; idem, **28**, p. 495, pl. 10, 1909; LAMPE, Jahrb. Ver. Naturk. Wiesbaden, **64**, p. 150, 1911; FERREIRA, Jorn. Sci. Acad. Sci. Lisboa, **23**, p. 81, 1924; COTT, Proc. Zool. Soc. London, **1926**, pp. 1161, 1171, 1926; LUEDERWALDT, Rev. Mus. Paulista, **14**, pp. 389, 390, 1926.
- Champsia nigra* WAGLER, Syst. Amphib., pl. 7, fig. 1, 1830; NATTERER, Ann. Wien. Mus. Naturg., **2**, p. 320, pl. 21, 1840.
- Jacare nigra* GRAY, Cat. Tortoises, p. 65, 1844; Ann. Mag. Nat. Hist., (3) **10**, p. 328, 1862; Trans. Zool. Soc. London, **6**, p. 162, 1867; Cat. Shield Rept., **2**, p. 25, 1872.
- Jacare niger* MOOK, Bull. Amer. Mus. Nat. Hist., **44**, p. 219, fig. 11, 1921.
- Alligator niger* STRAUCH, Mém. Acad. Sci. St. Pétersb., (7), **10**, No. 13, pp. 17, 71, 1866.
- Jacaretinga niger* VAILLANT, Nouv. Arch. Mus. Hist. Nat. Paris, (3), **10**, p. 182, 1898; MÜLLER, Zeitsch. Morph. Ökol. Tiere, **2**, p. 449, text figs. 1-3, 5, pl. 4, figs. 2, 4, 6, pl. 5, figs. 12, 30, 1924.

Caiman niger is so well characterized in coloration, scutellation, and osteology that no confusion with the other spectacled caimans is possible, as is reflected in the absence of synonyms. It thus occupies an isolated position in the genus, and the exposed vomer approaches the value of a generic character. To separate it from the remaining species, however, would lead logically to the separation of the almost equally distinct *C. latirostris*. It is evident that in the genus *Caiman*, as here understood, *niger*, *latirostris*, and *sclerops* in the Boulengerian sense, are of coördinate value. The necessity of subdivision in *sclerops* corresponds exactly to that in a polymorphic species, i.e. *sclerops*, *sens. lat.*, is a "Formenkreis." The occurrence of *niger* at Guayaquil or Darién, and in the Guianas appears to me extremely doubtful. These outlying records at least require confirmation. Its occurrence throughout the Amazon Basin is as certain as other records are dubious. It is recorded from the following localities: Santarém, Rio Tocantins, Pará, Marajó I., Mexiana I., Pará; Rio Branco, Rio Madeira, Rio Negro, Amazonas; eastern Ecuador and eastern Peru.



Reproduced by permission from the Goode Series of Base Maps. University of Chicago Press

Fig. 2. Distribution of *Caiman niger*

More definite locality records are afforded by the specimens collected in the Amazon Basin by the Thayer Expedition. These are: Tejapura, Pará (M.C.Z. No. 3731); Coary, Amazonas (M.C.Z. No. 2547); Manáos, Amazonas (M.C.Z. No. 3326); Villa Bella, Amazonas (M.C.Z. No. 3435); Teffé, Amazonas (M.C.Z. No. 3590); São Paulo, Amazonas (M.C.Z. No. 17726).

The occurrence of *C. niger* and *C. sclerops* in identically the same habitat in the Lower Amazon is discussed below, under *sclerops*.

Caiman latirostris (Daudin). Broad-snouted Caiman.

- Crocodylus latirostris* DAUDIN, Hist. Nat. Rept., 2, p. 417, 1802.
Jacare latirostris GRAY, Ann. Mag. Nat. Hist., (3), 10, p. 328, 1862; Trans. Zool. Soc. London, 6, p. 163, 1867; Cat. Shield Rept., 2, p. 25, 1872; MOOK, Bull. Amer. Mus. Nat. Hist., 44, p. 228, 1921.
- Alligator latirostris* STRAUCH, Mém. Acad. Sci. St. Pétersb., (7), 10, No. 13, pp. 19, 73, 1866; HENSEL, Arch. Naturg., 34, p. 384, 1868; BURMEISTER, Ann. Soc. Argent., 9, p. 244, 1880.
- Caiman latirostris* BOULENGER, Cat. Chelon., p. 294, 1889; BOETTGER, Kat. Rept. Senck. Mus., 1, p. 20, 1893; KOSLOWSKY, Rev. Mus. La Plata, 8, p. 199, 1898; IHERING, Proc. Acad. Nat. Sci. Phila., 1898, p. 101, 1898; SIEBENROCK, Denkschr. Akad. Wiss. Wien (math.—naturw. Kl.), 76, p. 29, figs. 2, 4, 5-7, 9, 1905; LAMPE, Jahrb. Nassau. Ver. Naturk., 64, p. 151, 1911. BERTONI, Descr. Fis. Econ. Paraguay, 59, No. 1, p. 23, 1914; Acad. Sci. Lisboa, 23, p. 81, 1924; LUEDERWALDT, Rev. Mus. Paulista, 14, pp. 389, 390, 1926.
- Caiman fissipes* SPIX, Species Novae Lacertarum, p. 4, pl. 3, 1825.
- Champsia fissipes* WAGLER, Descr. Icon. Amphib., pl. 17, 1828; Syst. Amphib., p. 140, 1830; NATTERER, Ann. Wien. Mus. Naturg., 2, p. 321, pl. 22, 1840.
- Jacare fissipes* GRAY, Cat. Tortoises, p. 64, 1844.
- Alligator cynocephalus* DUMÉRIL and BIBRON, Erpét. Gén., 3, p. 86, 1836.
- Crocodylus sclerops* WIED, Beiträge Naturg. Bras., 1, p. 69, 1825
 —not *C. sclerops* Schneider.

Jacaretinga latirostris VAILLANT, Nouv. Arch. Mus. Hist. Nat. Paris, (3), 10, p. 191, 1898; MÜLLER, Zeitschr. Morph. Ökol. Tiere, 2, p. 441, 1924.

This caiman is almost as well characterized as is *Caiman niger*. Siebenrock has shown that in the northern part of its range *Caiman latirostris* and the neighboring form of *Caiman sclerops* are mutually exclusive, the former confined to the basin of the Rio San Francisco, 'sclerops' to the Parnahyba. I find the same relation in the southern part of its range, where *latirostris* inhabits the Alto Paraná and a form of *sclerops* (i.e. *C. yacare*) the Paraguay. The Broad-snouted Caiman is rare and scattered in occurrence in Misiones Territory, in contrast with the Black Caiman which is very abundant in the Paraguay River.

Through the kind hospitality of Mr. Carlos H. Benson, of Caraguatay, Misiones, Mr. C. C. Sanborn and I were located in camp on the Rio Parana from September 16th to 22d, 1926. Our camp was at the first rapids of the river, at the head of the back-water of the Paraná, some three miles inland. In the course of jack-lighting for mammals from our rowboat, we twice saw a caiman's eyes. On the first occasion we lost sight of the specimen. The next night we encountered a caiman again, and Mr. Sanborn fired at it with the 30-30 Winchester. The ball struck the extreme corner of the skull and slightly stunned the animal, which we secured by much good fortune, with a fish spear. No sooner was our caiman hauled into the boat than he proved to be very much alive. A shot with the .22 pistol into the medulla apparently killed him, but this specimen proved to have unusual powers of resistance, for during the night he wandered about camp some thirty yards, and in the morning we feared that he was lost. We found him, dead at last, behind my tent.

This specimen differed notably from the caimans collected by the Captain Marshall Field Brazilian Expedition on the upper Paraguay, and proved to represent the very distinct *C. latirostris*. The relative weakness of dermal ossification, the light color slightly tinged with reddish, and the broad snout not pierced by the lower teeth, were notable characters in the flesh. The specimen measured 1365 mm., the tail 690 mm., the length of the head to occiput 155 mm. The stomach contents were the remains of a *Bufo marinus* and of a small bird, with a dozen small stones.

A juvenile specimen and a large skull of this species were subsequently obtained from Juan Haider, a resident taxidermist at

Monte Carlo, a few miles above Caraguatay. No trace of the Paraguay Caiman was found and this slight evidence supported by the usual relations between the ranges of crocodylians, leads me to suppose that *latirostris* is the caiman of the Alto Paraná as *yacare* is of the upper Paraguay. This leads to an interesting conclusion regarding the identity of the 'Red Jacare' of Azara, or rather of the Paraguayans, as Azara did not believe in the existence of a second species. Azara's species is evidently the common black Paraguayan caiman, and the Paraguayans are right in their belief that a second species of different color inhabits their country, for there can be no question that *latirostris* inhabits both sides of the Alto Paraná. In comparison with the black Paraguayan species, *latirostris*, might not improbably be distinguished as the red species, although it is evidently only faintly, if at all, reddish. The distinction of the Paraguayan caimans as two species is still current in Paraguay, and Bertoni (1914, p. 23) identifies them as *C. sclerops* and *C. latirostris*, which is substantially correct. The identity of the 'Red Jacare' is perhaps of no great importance, but it reflects light on the identity of Azara's common species, which appears to be amply distinct from *Caiman sclerops* of northern South America.

Krieg (1928) records this species from localities near the lower Pilcomayo, below Asunción. This indicates a slight overlap of the ranges of *latirostris* and *yacare* in this region.

The skull of this species has been described by Mook. The figures of a large skull from Misiones (pls. XVI-XVII) are intended to supplement his account. The measurements of this skull and of a second skull with no data in the Field Museum's collections, are as follows:

	F.M.N.H. No. 9713	No. 11009
Length from snout to occipital	286 mm.	214 mm.
Breadth at quadratojugals	236	187
Breadth at 9th upper tooth	147	113

Skull No 11009 differs in the shape of the palatines from the Misiones skull. In the latter they are notable for their square form anteriorly, while in the smaller skull they are somewhat narrowed in front, though still truncate anteriorly.

It is not unlikely that geographic variation will be found in the Broad-snouted Caiman when it is possible to examine series of specimens from different parts of its range. The species is so well characterized by the breadth and solidity of its skull that there

has been but little confusion as to its identity. Its occurrence in the coastal region of Brazil has made it one of the best known species, and the distribution map is accordingly offered with some confidence. Natterer's records from the Paraguay are omitted as requiring confirmation. Strauch's specimens from Surinam are obviously *sclerops*, as demonstrated by his account of the number of teeth and the breadth of snout. This species occasionally reaches the lower Paraná by flotation, and records from Buenos Aires are probably authentic but based on such transported specimens.

Locality records in the literature which unquestionably refer to this species, include the Brazilian states Pernambuco, Bahia, Minas Geraes, Espirito Santo, Rio de Janeiro, São Paulo, and Rio Grande do Sul, and the Argentine territories Misiones and Formosa. Specimens examined in the course of the present study do not amplify this distribution. As Krieg contrasts his Pilcomayo specimens of *latirostris* with the common species, I see no reason to doubt his records from the Chaco. The distributional and ecological relations of *latirostris* and *yacare* in the Paraguay above Corrientes offer a problem for further investigation.

Aside from the question as to the occurrence of this species at Cuyabá, i.e. in the Paraguay Basin proper, it would be of great interest to verify the identity of the caiman of the upper course of the Paraná above Guayra Falls. It seems obvious that the V-shaped valley of the Alto Paraná below the falls, with the extremely broad valley of the long upper course of the river, represents a case of stream capture on a very large scale. While distributional data supporting this hypothesis are not available, these topographic relations offer an extremely interesting problem for zoogeographic research.

Caiman yacare (Daudin). Paraguay Caiman.

Crocodylus yacare DAUDIN, Hist. Nat. Rept., 2, p. 399, 1802.

Champsia sclerops NATTERER, Ann. Wien. Mus. Naturg., 2, p. 321, pl. 23, 1840—not of Schneider.

Caiman sclerops BOULENGER, Cat. Chelon., p. 294, 1889—part; Ann. Mag. Nat. Hist., (6), 13, p. 347, 1894; Ann. Mus. Stor. Nat. Geneva, (2), 19, p. 128, 1898; KOSŁOWSKY, Rev. Mus. La Plata, 8, p. 199, 1898; SIEBENROCK, Denkschr. Akad. Wiss. Wien (math.—naturw. kl.), 76, figs. 1, 3; BERTONI, Descr. Fis. Econ. Paraguay, 59, No. 1, p. 23, 1914.

Jacare ocellata GRAY, Ann. Mag. Nat. Hist., (3), 10, p. 329, 1862; Trans. Zool. Soc. London, 6, p. 164, pl. 33, 1867; Cat. Shield Rept., 2, p. 26, 1872.

It will be difficult to disentangle the synonymy of this species from that of *sclerops*. Natterer seems to be the only author who has recognized the species in the Paraguay basin as distinct from the Amazonian forms, and his synonymy is already confusing in 1840.

The Captain Marshall Field Brazilian Expedition was hospitably entertained by Mr. Jack Ramsey at Descalvados, Matto Grosso, where a great cattle ranch of the Brazil Land and Cattle Company extends from the upper Paraguay to the Bolivian border. During the stay at Descalvados, July 30 to August 8, 1926, numerous specimens of caimans were collected, and a few additional ones were taken at various points on the river between Corumbá and Descalvados. Numerous specimens of the same caiman, mounted as souvenirs, are to be seen in Asunción, and two live juvenile specimens purchased there are indistinguishable from the four collected in Matto Grosso.

My conclusions are, briefly, that the caiman abundant throughout the course of the Paraguay above its confluence with the Paraná, or perhaps above the Pilcomayo, represents a distinct species, distinguished from the Amazonian *sclerops* by its large size and black coloration, as well as by more technical characters; and that Daudin's name *jacare*, founded exclusively on Azara's account of the Paraguayan Caiman, must be applied to it.

In the Paraguayan species, the pterygoid bones enter the palatal fenestrae by a narrow zigzag process, often so slender that the palatines and ectopterygoids appear at first glance to meet. This is very different from the broad entry of the pterygoid into the palatal fenestra in specimens from the lower Amazon and Venezuela. The form of the palatine bones is also very different, much expanded anteriorly in the Paraguay River species, narrow and slender in the northern form. The development of the quadratojugal spine is variable in the caimans, but it appears to be uniformly present in the southern species, and indistinct or absent in the northern. The mandibular suture extends to the posterior border of the fifth tooth in eight specimens, midway between the fourth and fifth in four, in the Paraguay form. I believe that this suture is usually distinctly shorter in the northern species, normally reaching only to the posterior border of the fourth tooth.



Reproduced by permission from the Goode Series of Base Maps. University of Chicago Press

Fig. 3. Distribution of the two southernmost species of *Caiman*
 ○ *Caiman latirostris*
 △ *Caiman yacare*

For the study of the Paraguay River form, a series of eleven skulls, two skins of adult specimens, and six juvenile alcoholics has been available.

In the table of measurements of ten skulls, the length is the length from snout to the posterior border of the occipital, the breadth is the greatest breadth at the quadratojugals, and the maxillary breadth is the breadth at the ninth tooth.

Museum No.	Length a	Breadth b	Maxillary Breadth c	b/a	c/a
<i>Caiman yacare</i>					
11011	173.0mm.	100.6mm.	62.4mm.	.58	.36
9147	202.1	118.4	72.0	.58	.36
9138	220.5	133.8	77.9	.60	.35
9145	239.4	143.0	82.5	.60	.35
12366	272.0	174.7	105.0	.64	.39
9142	280.6	171.6	105.6	.61	.37
9144	292.9	183.1	108.4	.63	.37
9143	293.0	191.0	108.8	.65	.37
9136	298.5	196.0	111.0	.66	.37
9149	297.5	198.5	109.3	.67	.37
<i>Caiman sclerops</i>					
13062	167.1	90.1	47.7	.56	.29

The length of snout is subject to some variation, and four of the larger specimens have the anterior portion of the snout almost parallel sided, rather sharply narrowed in front of the ninth upper tooth.

A notable variation is to be seen in F.M.N.H. No. 9140, in which the supratemporal fenestrae are greatly reduced in size. The specimens figured by Mook, A.M.N.H. Nos. 15184 and 15183, in which the supratemporal openings are respectively reduced and completely closed, appear to belong to *Caiman yacare* (they bear no data in the catalogue). These specimens almost certainly come from the Paraguay River, through the Roosevelt-Rondon Expedition, which is known to have collected caimans, while none are credited to the expedition in the Museum's list. Mook (1921) suspected 'geographic variation' in his series of skulls, and this suspicion is amply substantiated by the material now at hand.

The number of teeth in the Paraguay River series approaches the constant formula $\frac{1}{3}-\frac{1}{3}$. This number occurs in thirteen out

of twenty-two specimens; counting each of the jaws separately, the upper jaws have twenty teeth in three, nineteen in forty, eighteen in one; the lower jaws have twenty teeth in one, nineteen in thirteen, eighteen in twenty-nine, and seventeen in one. Caimans from the Amazon and Guianas tend to have the formula $\frac{20}{19}$ - $\frac{20}{19}$ or $\frac{20}{20}$ - $\frac{20}{20}$.

The first and fourth lower teeth tend to pierce the upper jaw, and while this is an age character in the sense that juvenile specimens do not exhibit it, the degree of development of these tooth fossae is not especially correlated with size in the larger specimens. Two specimens have the premaxillary border broken away at one of these holes for the fourth tooth, and in one it is broken completely away from both. Similarly, two specimens have the border of the maxillary-premaxillary suture broken away at this weakened spot; in one specimens it is broken away on both sides and the borders of the hole rounded to produce a pseudo-crocodilian dentition. The first pair of teeth are the first to pierce the skull. In the eleven clean skulls before me, the fourth pair fails to pierce the jaw in two of the moderate sized specimens. Müller has given an account of similar variation in this respect in Amazonian specimens, and I fully agree with him as to its unimportance from a taxonomic standpoint. It must be added, however, that this one of the most obvious differences between *Caiman latirostris* and the species allied to *sclerops*

When the available specimens of *Caiman* related to *sclerops* are assorted geographically and examined for the number of caudal verticils with double crest, they fall into three series, as shown below.

Number of caudal verticils	11—12—13—14—15—16
Number of specimens, Central America to Colombia	0—13— 9— 1— 1— 0
Number of specimens, British Guiana and Brazil	2—12— 0— 2— 0— 0
Number of specimens, Paraguay and Matto Grosso	0— 0— 0— 4— 3— 2

Additional counts are needed to substantiate the value of this character.

In twenty-one specimens from the Paraguay River, ranging in size from juvenile specimens to a maximum of 2380 mm., five specimens are more than two meters in length. It seems likely that this species does not reach three meters in length, but that adults normally exceed two meters.

Thirteen stomachs contained food; eight of these contained fish or fish remains; six contained crabs or crab fragments; five contained large river snails or snail opercula; and one the remains of a snake. Remains of vegetation were present in almost every stomach, probably swallowed accidentally. Not a single stomach contained stones or gravel of any kind. This is quite at variance with the usual presence of stomach stones in greater or less quantity in crocodilian stomachs.

The application of Daudin's name *yacare* to this species seems fully justified. Daudin refers exclusively to Azara's account. Azara, in turn, describes the Paraguayan caiman as abundant, dark in color, and with lower teeth piercing the upper jaw. There is no possible confusion therefore, with the only other caiman in Paraguay, *latirostris*. Natterer refers Azara's species to *Caiman niger* Spix. This is obviously a 'sight record' based on the black color of adult *yacare*, a species which must have been very familiar to Natterer in Matto Grosso. Strauch's reference of *yacare* to *latirostris* is based on his erroneous belief that the Broad-snouted Caiman is the only species in the Paraná system, or at least in the lower part of the basin. Natterer's evident conviction that the black Paraguay caiman has nothing to do with the Amazonian species falls in line with my own contention. It is now evident that the very distinct *niger* does not occur in the Paraguay River. Natterer's taxonomy, however, contributes nothing to clarify the situation, for his *sclerops* is also given a wide distribution in Matto Grosso.

My first conviction that the caiman of the Paraguay Basin is a distinct form, probably confined to that river system, is rudely shaken by examination of Siebenrock's figure of a skull from the Parnahyba River, Piahy, northeastern Brazil. This figure agrees in every essential with the skulls from the upper Paraguay. The distribution of the allies of *Caiman sclerops* is, therefore, complex, and can only be cleared up by accurate identification of series of South American caimans from selected localities. The occurrence of *yacare* in northeastern Brazil suggests a distribution along the western border of the east-Brazilian land mass corresponding to that of *latirostris* in the rivers of the southeastern coast.

The 'pantanales' of the upper Paraguay form one of the richest areas in the world for freshwater life. The vast mats of floating grass and water hyacinth, the 'camelotte' constitute a biocaenosis of unusual interest. The camelotte affords shelter to the juvenile

caimans, as is shown by the capture of two small specimens in this situation. Adult caimans, however, are more closely confined to the solid banks, where they are to be seen during midday, sunning themselves, usually in somewhat open spaces. The importance of the camelotte as an agent of dispersal has frequently been commented upon. Floating islands of this vegetation of varying extent are of frequent occurrence in the lower Paraná, and often reach Buenos Aires and even Montevideo. During exceptionally high water, the camelotte forms the last available refuge for many land forms, and the rafts sent down river at such times carry tropical lizards and snakes, as well as both small and large caimans, to the mouth of the La Plata. On the voyage upstream, the black caimans are first seen in abundance above Corrientes. It would be interesting to know more about the establishment of both this species and the broad-snouted one in the lower reaches of the river. In Matto Grosso, and doubtless throughout the Chaco region, the Paraguay Caiman is to be found in the marshy areas in the savanna as well as along the water courses.

The fine figure given by Krieg (1928, fig. 2) of Paraguay Caimans sunning themselves in considerable concentrations of individuals, was not matched in our experience. The greatest number seen together by us was four, and most specimens were isolated individuals. The continuous high water during our stay in Matto Grosso was doubtless the explanation of this difference in abundance.

Caiman sclerops (Schneider). Common Spectacled Caiman.

Lacerta crocodilus LINNAEUS, Syst. Nat., Ed. 10, p. 200, 1758.

Caiman crocodilus ANDERSSON, Bih. Svenska Vet. Akad. Handl., 26, pt. 4, No. 1, p. 5, 1900.

Jacaretinga crocodilus STEJNEGER, Science (2), 13, p. 394, 1901; MÜLLER, Zeitschr. Morph. Ökol. Tiere, 2, p. 428, 1924.

Crocodilus sclerops SCHNEIDER, Hist. Amphib., 2, p. 162, 1901; CUVIER, Ann. Mus. Hist. Nat. Paris, 10, p. 1, pl. 31, figs. 7, 16, pl. 2, fig. 3, 1807; TIEDEMANN, OPPEL, and LIBOSCHÜTZ, Naturg. Amphib., p. 60, pl. 5, 1817.

Champsia sclerops WAGLER, Syst. Amphib., p. 140, pl. 7, figs. 1, 42, 1830.

Alligator sclerops GRAY, Syn. Rept., p. 62, 1831; DUMÉRIL and BIBRON, Erpét. Gén., 3, p. 79, 1836; STRAUCH, Mém. Acad. Sci. St. Pétersb., (7), 10, pp. 21, 76, 1866.

- Jacare sclerops* GRAY, Cat. Tortoises, p. 64, 1844; MOOK, Bull. Amer. Mus. Nat. Hist., **44**, p. 233, 1921—part.
- Caiman sclerops* BOULENGER, Cat. Chelon, p. 294, 1889—part; BOETTGER, Kat. Rept. Senck. Mus., **1**, p. 20, 1893; GOELDI, Zool. Jahrb. Syst., **10**, p. 653, fig. 19, 1897; LAMPE, Jahrb. Nassau. Ver. Naturk., **54**, p. 198, 1901; HAGMANN, Zool. Jahrb. Syst., **24**, p. 313, pl. 21, fig. 4, 1906; idem, **28**, p. 495, 1909; LAMPE, Jahrb. Nassau. Ver. Naturk., **64**, p. 151, 1911; BEEBE, Zoologica, **2**, p. 211, 1919; REESE, Nat. Hist., **20**, p. 424, 1920; FERREIRA, Journ. Sci. Acad. Sci. Lisboa, **23**, p. 82, 1924; ROUX, Rev. Suisse Zool., **23**, p. 292, 1926; COTT, Proc. Zool. Soc. London, 1926, pp. 1161, 1171, 1926; LUEDERWALDT, Rev. Mus. Paulista, **14**, p. 5, 1926—part.
- Jacaretinga sclerops* VAILLANT, Nouv. Arch. Mus. Hist. Nat. Paris, (3), **10**, p. 1823, 1898—part; Bull. Mus. Hist. Nat. Paris, **11**, p. 221, figs. 2, 3, 1905—part; FOWLER, Proc. Acad. Nat. Sci. Phila. 1913, p. 173, 1913.
- Crocodylus caiman* DAUDIN, Hist. Nat. Rept. **2**, p. 399, 1802.
- Jacaretinga punctulatus* SPIX, Species Novae Lacertarum, p. 2, pl. 2, 1825.
- Alligator punctulatus* DUMÉRIL and BIBRON, Erpét. Gén., **3**, p. 91, 1836; STRAUCH, Mém. Acad. Sci. St. Pétersb., (7), **10**, pp. 24, 79, 1866.
- Champsia punctulata* NATTERER, Ann. Wien. Mus. Naturg., **2**, p. 322, pl. 24, 1840.
- Jacare punctulata* GRAY, Cat. Tortoises, p. 65, 1844; Ann. Mag. Nat. Hist. (3), **10**, p. 329, 1862; Cat. Shield Rept., **2**, p. 26, 1872.
- Champsia vallifrons* NATTERER, Ann. Wien. Mus. Naturg., **2**, p. 322, pl. 24, 1840.
- Jacare vallifrons* GRAY, Cat. Tortoises, p. 65, 1844.
- Jacare hirticollis* GRAY, Trans. Zool. Soc. London, **6**, p. 165, 1867; Cat. Shield Rept., **2**, p. 27, 1872.

It is tentatively proposed to restrict the name *sclerops* to the small Spectacled Caiman of northern South America, especially of the lower Amazon, the Guianas, and Venezuela. The caiman of

northwestern South America and Central America is certainly distinguishable from *sclerops* in this sense. The identity of the Guiana caiman with the one from the lower Amazon remains to be investigated. A single Venezuelan skull in Field Museum of Natural History, has been compared with two Venezuelan skulls in the Museum of Zoology of the University of Michigan and with Vaillant's figure of a "Guiana" specimen. These skulls agree in their slender form, with nearly straight sides, and especially in the very characteristic form of the palatine bones, which are slender and gracefully arched.

The examination of alcoholic specimens from British Guiana and Trinidad supports the view that they are identical with the Venezuelan form. A detailed comparison with the Amazonian *sclerops* remains to be made, but there is little doubt that the small caiman described by Spix, Natterer, and Hagemann will be found to be essentially in agreement with the form of the Guianas.

The number of verticils in the basal portion of the tail affords a useful external character which can be applied to the study of juvenile specimens. These apparently can be distinguished from *Caiman yacare* by the absence of the conspicuous black spots on the lower jaw.

It is evident that the crux of the caiman problem lies in an adequate study of this form, for which the primary requirements are (1) series of skulls from British Guiana, the Orinoco basin, the lower Amazon, and selected localities in the upper Amazon basin; (2) series of juvenile specimens from the same localities; (3) a few adult specimens with notes on the coloration in life and on adult size.

According to Hagemann, this species occurs in peaceful association with the much larger *Caiman niger*. It is notable, however, that the breeding seasons of the two species are widely separated. The association of closely allied animals of different adult size is one of the simplest forms of ecological isolation.

Caiman fuscus (Cope). Central American Caiman.

Perosuchus fuscus COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 203, 1868.

Alligator (Jacare) chiapasius BOCOURT, Journ. Zool., 5, p. 00, 1876; SUMICHRAST, Bull. Soc. Zool. France, 5, p. 170, 1880.

Caiman sclerops BOULENGER, Cat. Chelon., p. 294, 1889—part; FOWLER, Proc. New England Zool. Club, 5, p. 103, 1915;

RUTHVEN, Misc. Publ. Mus. Zool. Univ. Mich., **8**, p. 69, 1922.

Jacaretinga sclerops VAILLANT, Bull. Mus. Hist. Nat. Paris, **11**, p. 221, figs. 2-3, 1905—part.

Jacare sclerops MOOK, Bull. Amer. Mus. Nat. Hist., **44**, p. 233, fig. 12, 1921.

The very skulls adduced by Vaillant to prove that *chiapasius* is a synonym of *sclerops* exhibit the specific differences between the Central American Caiman and the common *sclerops* of Venezuela in their typical form. His two specimens can be matched exactly by one from Venezuela and one from Panama in Field Museum of Natural History; and these differences have been constant in all of the material examined. I have alluded to the caudal scutes above, under *C. yacare*, and will return to the discussion of the Central American Caiman and its nomenclature in another paper. The caimans of the Magdalena basin appear to belong with the Panamanian and Central American form, whose range in eastern Colombia is probably coextensive with that of *Crocodilus acutus*.

SUMMARY

The nomenclature of the genera of crocodylians is in an involved state, requiring special action of the International Commission on Nomenclature for any satisfactory stabilization.

The caimans fall into two sharply defined genera, the smooth-fronted *Paleosuchus* and the "spectacled" *Caiman*. The species of *Paleosuchus* are well defined and have an overlapping distribution. They are very imperfectly known, with few specimens in museums and no information as to life history. Among the spectacled caimans, *C. niger* and *C. latirostris* are well distinguished by morphological characters, and have well defined geographic ranges.

The forms lumped with *Caiman sclerops* by Boulenger and subsequent authors constitute a "Formenkreis" in which three geographic forms may be distinguished. There is no good evidence of intergradation between these three forms, which are consequently ranked as species in the present paper. They are apparently distinguished by differences in coloration, in adult size, and in number of basal caudal segments, as well as by skull characters. The requirements for adequate study of the taxonomy of the *sclerops* group are (1) series of skulls, (2) series of juvenile alcoholic specimens, (3) a few skins of adults and notes on adults.

The mutually exclusive ranges usual among crocodylians are found in the caimans only in *C. latirostris* of southeastern Brazil and *C. yacare* of the Paraguay and Parnahyba systems. The range of *C. fuscus* in Colombia and Central America is nearly coextensive with that of the American Crocodile, *Crocodylus acutus*. The range of *Crocodylus intermedius* is probably exclusive of and adjoining that of *acutus*, but it occurs with *Caiman sclerops* in Venezuela. *Caiman sclerops*, *C. niger*, and both species of *Paleosuchus* have a broadly overlapping distribution in the Amazon basin. Their ecological relations offer an interesting subject for field observation. South and east of the Amazon, the only caimans, with the possible exception of sporadic *Paleosuchus palpebrosus*, are *Caiman yacare* of the Paraguay and *C. latirostris* of southeastern Brazil.

REFERENCES¹

- ANDERSSON, LARS GABRIEL
1900. Catalogue of Linnaean Type-specimens of Linnaeus's Reptilia. Bih. Svenska. Vet.- Akad. Handl., 26, part IV, No. 1, pp. 1-29.
- AZARA, FELIX D'
1801. Essais sur l'histoire naturelle des quadrupèdes de la Province du Paraguay. Paris: Charles Pougens, 12 mo., Vol. II, 499pp.
- BOULENGER, GEORGE ALBERT
1889. Catalogue of the Chelonians, Rhynchocephalians and Crocodiles in the British Museum (Natural History). London: Printed by order of the Trustees. 8vo., 298pp., pls. 1-6, text figs. 1-73.
- CUVIER, G.L.C.F.D.
1807. Sur les différentes espèces de crocodiles vivans et sur leurs caractères distinctifs. Ann. Mus. Hist. Nat. Paris, 10, pp. 8-66, pls. 1-2.
- DAUDIN, F. M.
1802. Histoire naturelle, générale et particulière, des reptiles. Paris: de l'imprimerie de F. Dufort., 2, 402pp., pls. 16-28.
- DUMÉRIL, A. M. C., and BIBRON G.
1836. Erpétologie générale ou histoire naturelle complète des reptiles. Paris: Librairie Encyclopédique de de Roret, 8 vo., 3, iv + 517 pp.
- FOWLER HENRY W.
1915. On the identity of *Perosuchus* Cope with *Caiman* Spix. Proc. New England Zool. Club, 5, pp. 103-106, pl. 3.
- GOELDI, E. A.
1897. Die Eier von 13 brasilianischen Reptilien, nebst Bemerkungen über Lebens- und Fortpflanzungsweise letzterer. Zool. Jahrb., Syst., 10, pp. 640-676, one text fig., pls. 26-27.
- GRAY, J. E.
1844. Catalogue of the Tortoises, Crocodiles, and Amphisbaenians in the collection of the British Museum. London: Printed by order of the Trustees. viii + 80 pp.
1862. A synopsis of the species of alligators. Ann. Mag. Nat. Hist., (3) 10, pp. 327-331.

¹Including only the most complete accounts of the caimans and papers specifically referred to in the text.

1867. Synopsis of the species of recent crocodylians or emydosaurians, chiefly founded on the specimens in the British Museum and the Royal College of Surgeons. *Trans. Zool. Soc. Lond*, 6, pp. 125-169, pls. 31-34.
- HAGMANN, G.
 1902. Die Eier von *Caiman niger*, Zweiter Beitrag zur Kenntniss der Lebens- und Fortpflanzungsweise der brasilianischen Reptilien. *Zool. Jahrb., Syst.*, 16, pp. 405-410, pls. 19-20.
 1906. Die Eier von *Gonatodes humeralis*, *Tupinambis nigropunctatus*, and *Caiman sclerops*. Dritter Beitrag zur Kenntniss der Lebens- und Fortpflanzungsweise der brasilianischen Reptilien. *Idem.* 24, pp. 307-316, 3 pls.
 1909. Die Reptilien der Insel Mexiana, Amazonenstrom. *Idem.* 28, pp. 273-504, 1 pl.
- KRIEG, HANS
 1928. Biologische Reisestudien in Südamerika. VIII. *Caiman sclerops* (Schmalschnautziger Brillenkaiman). *Zeitschr. Wiss. Biol., Abt. A.*, 10, pp. 162-173, 9 figs.
- LAURENTI JOSEPH NICOLAI
 1768. Specimen medicum, exhibens synopsis reptilium . . . Vienna: Typis Doan Thomae, 12 mo, iv, 214, pp., pls. 1-5.
- LUEDERWALDT, HERMANN
 1926. Chava para a determinação dos crocodilideos brasileiros com una list a de especies do Museu Paulista. *Rev. Mus. Paulista*, 14, pp. 387-392, 2 figs.
- MOOK, CHARLES C.
 1921. Individual and age variations in the skulls of recent crocodilia. *Bull. Amer. Mus. Nat. Hist.*, 44, pp. 51-66, pls. 10-12, text figs. 1-2.
 1921a. Skull characters of recent crocodilia with notes on the affinities of the recent genera. *Idem.*, pp. 123-268, text figs. 1-14.
- MÜLLER, LORENZ
 1923. Zur Nomenklatur der südamerikanischen Kaiman-Arten. *Zool. Anz.*, 58, pp. 315-320.
 1924. Beiträge zur Osteologie der rezenten Krokodilier. *Zeitschr. Morph. Ökol. Tiere*, 2, pp. 427-460, pls. 4-5.
- NATTERER, JOHANN
 1840. Beitrag zur näheren Kenntniss der südamerikanischen Alligatoren, nach gemeinschaftlichen Untersuchungen mit L. J. Fitzinger. *Ann. Wien. Mus. Naturg.*, 2, pp. 311-324, pls. 21-28.
- REESE, ALBERT M.
 1915. *The Alligator and its Allies*. New York and London: G. P. Putnam's Sons. 8vo., xi+358 pp., 62 text figs., 28 pls.
- SCHNEIDER, JOHANN GOTTLÖB
 1801. *Historiae Amphibiorum naturalis et literariae*. Fasc. 2, pp. 1-364, pls. 1-2.
- SIEBENROCK, FRIEDRICH
 1905. Die Brillenkaimane von Brasilien. *Denkschr. Akad. Wiss. Wien (math.-natur. Kl.)*, 76, pp. 29-39, text figs. 1-9.
- SPIX, J. W. DE
 1825. *Animalia nova sive species novae lacertarum, quas in itinere per Brasiliam annis MDCCCXVII—MDCCCXX jussu et auspiciis Maximiliani Josephi I. Bavariae Regis suscepto collegit et descripsit*. Monachii: Typis Franc. Seraph. Hübschmanni. 4to, pp. 1-26, pls. 1-28.
- STRAUCH, ALEXANDER
 1866. Synopsis der gegenwärtig lebenden Crocodiliden nebst Bemerkungen über die im Zoologischen Museum der Kaiserlichen Akademie der Wissenschaften vorhandenen Repräsentanten dieser Familie. *Mém. Acad. Sci. St. Pétersb.*, (7), 10, No. 13, pp. 1-120, one pl., one map.

VAILLANT, LEON

1893. Du nom générique des caimans à plastron osseux. Bull. Soc. Zool. France, 18, pp. 217-219.

1898. Contribution à l'étude des Emydosauriens catalogue raisonné des Jacaretinga et Alligator de la collection du Muséum. Nouv. Arch. Mus. Hist. Nat. Paris, (3), 10, pp. 143-212. pls. 13.

1905. Variations observées sur le crâne chez le *Testudo radiata* Shaw, et chez le *Jacaretinga sclerops* Schneider. Bull. Mus. Hist. Nat. Paris, 11 pp. 219-223, text figs. 1-3.

WAGLER, JOHN

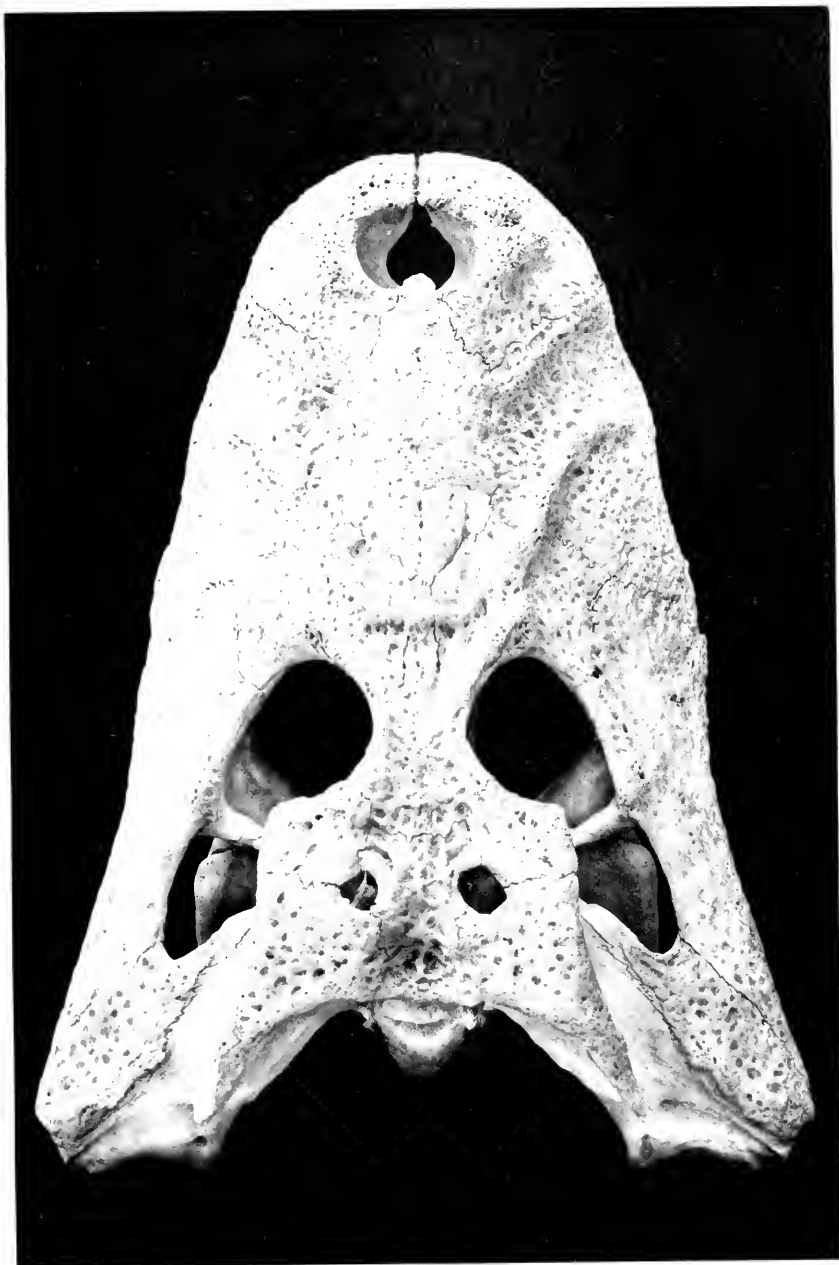
1830. Natürliches System der Amphibien . . . München, Stuttgart und Tübingen: In der S. G. Cotta'schen Buchhandlung, 8vo., v+354 pp., 2 pls.

WERNER, FRANZ

1912. Die Lurche und Kriechtiere von Alfred Brehm. Erster Band: Lurche und Kriechtiere (Brückenechse, Schildkröten, Panzerechsen). Brehms Tierleben, 4th ed., 4, xvi+572 pp., 127 text figs. 49 pls.

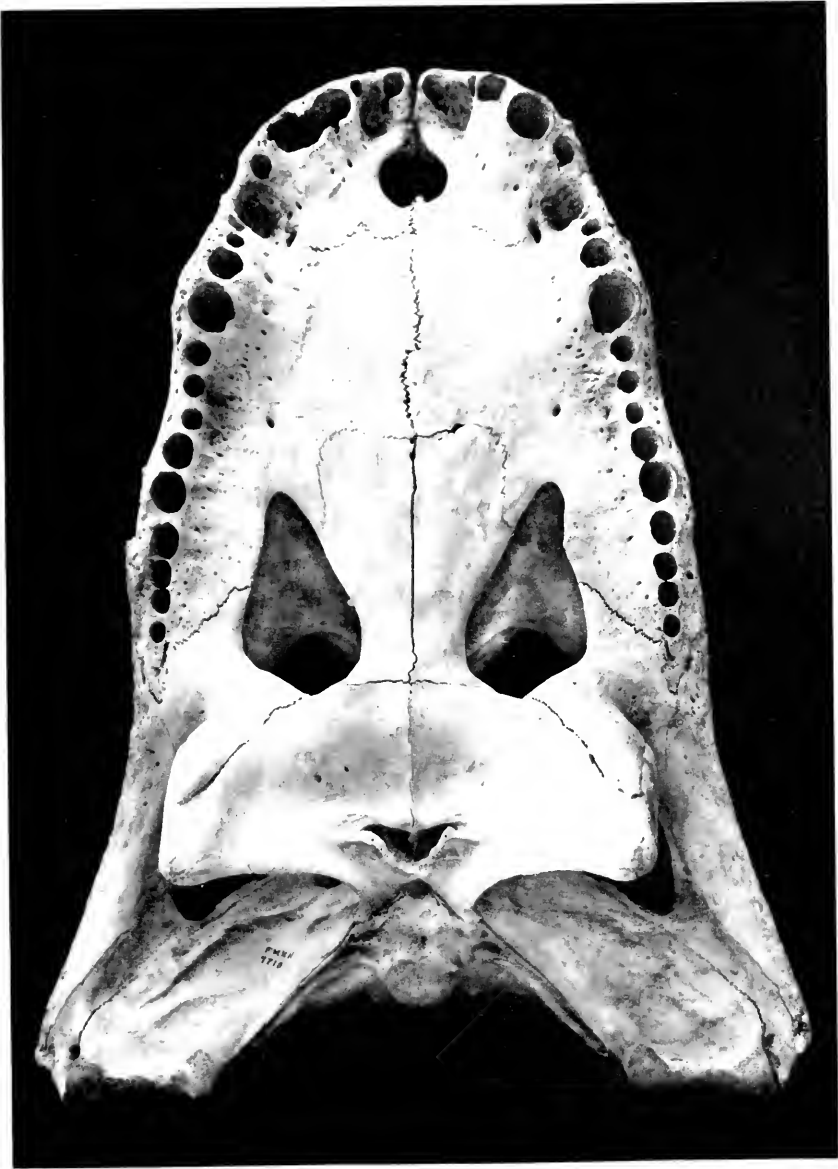
THE LIBRARY OF THE
DEC 14 1928
UNIVERSITY OF ILLINOIS





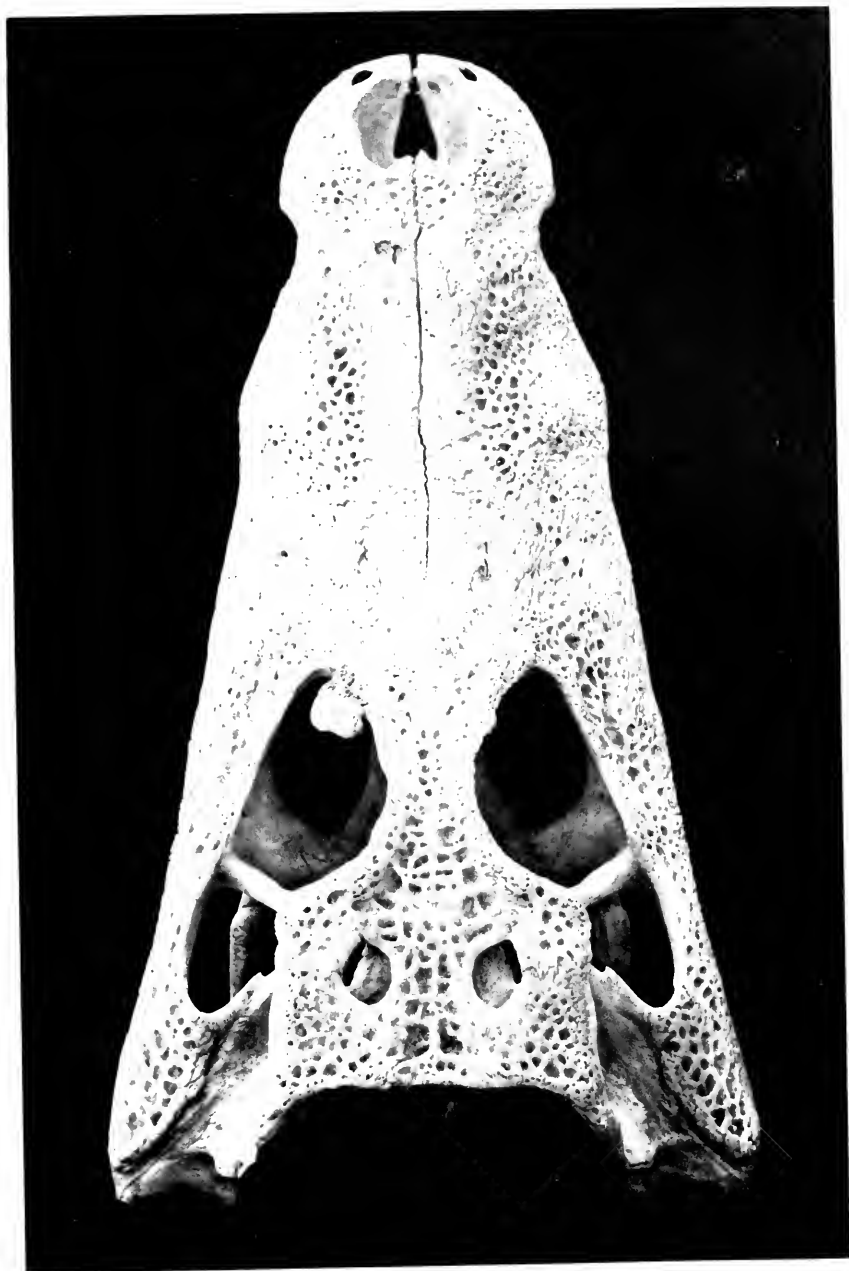
DORSAL VIEW OF SKULL OF ADULT *Caiman latirostris*, F.M.N.H. NO. 9713, MONTE CARLO, MISIONES TERRITORY, ARGENTINA, X.4

THE LIBRARY
OF THE
UNIVERSITY OF ILLINOIS



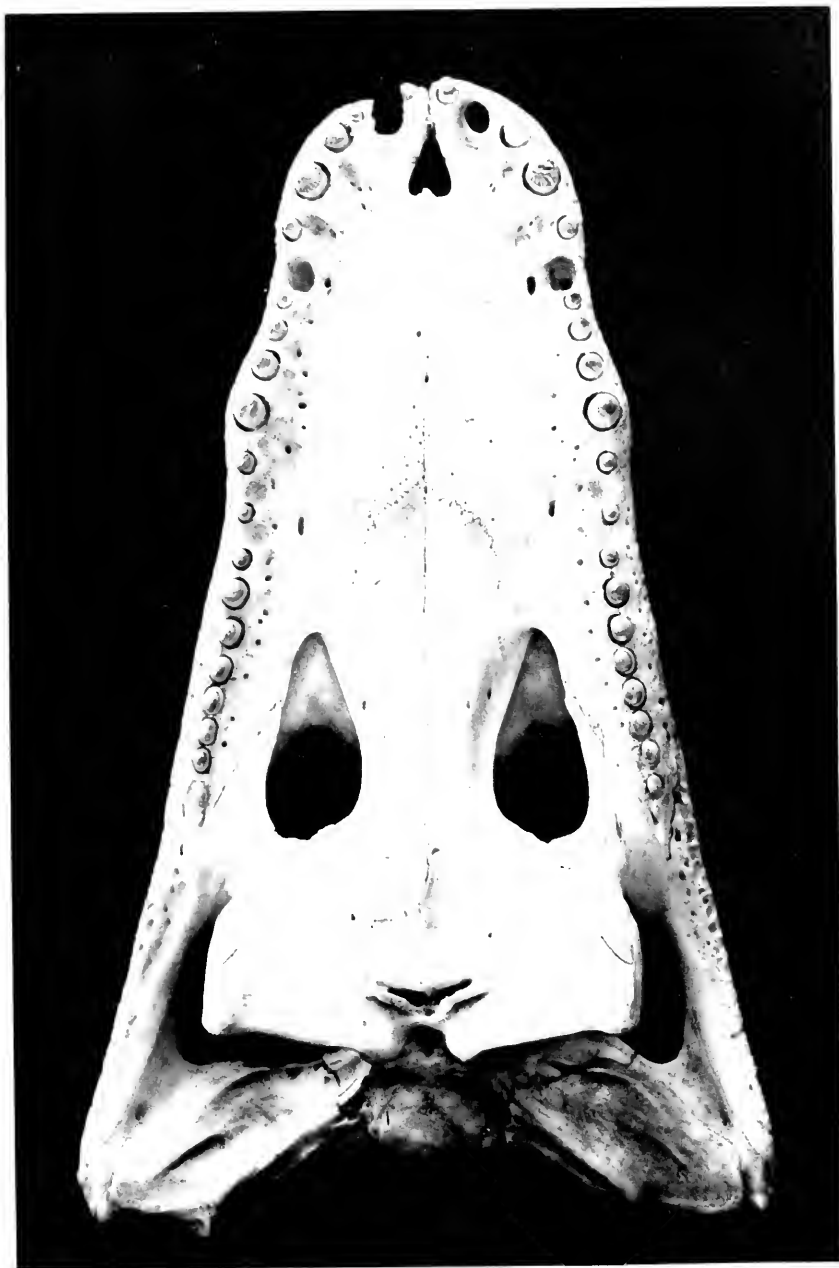
PALATAL VIEW OF SKULL OF *Caiman latirostris*, F.M.N.H., NO. 9713. X .4

THE LIBRARY
OF THE
UNIVERSITY OF ILLINOIS

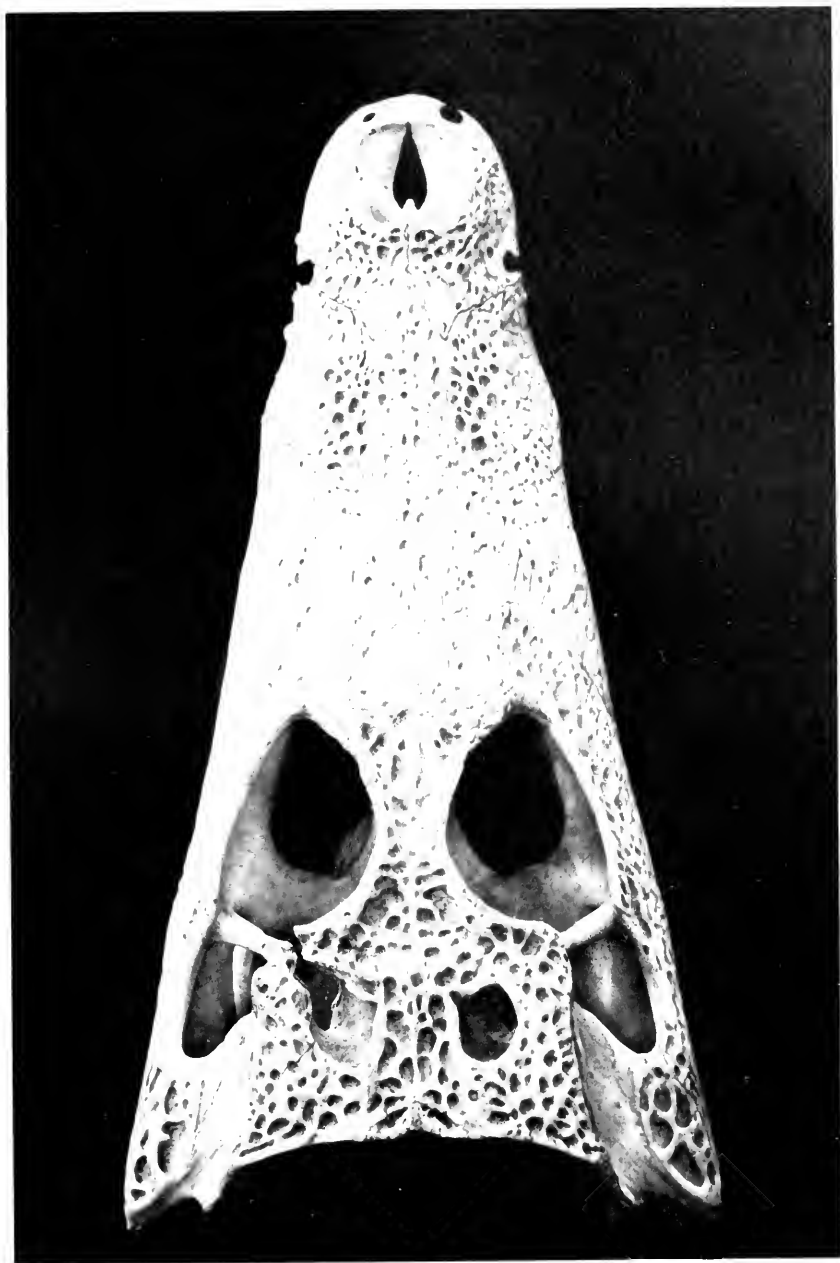


DORSAL VIEW OF SKULL OF *Caiman yacare*, F.M.N.H. NO. 9145

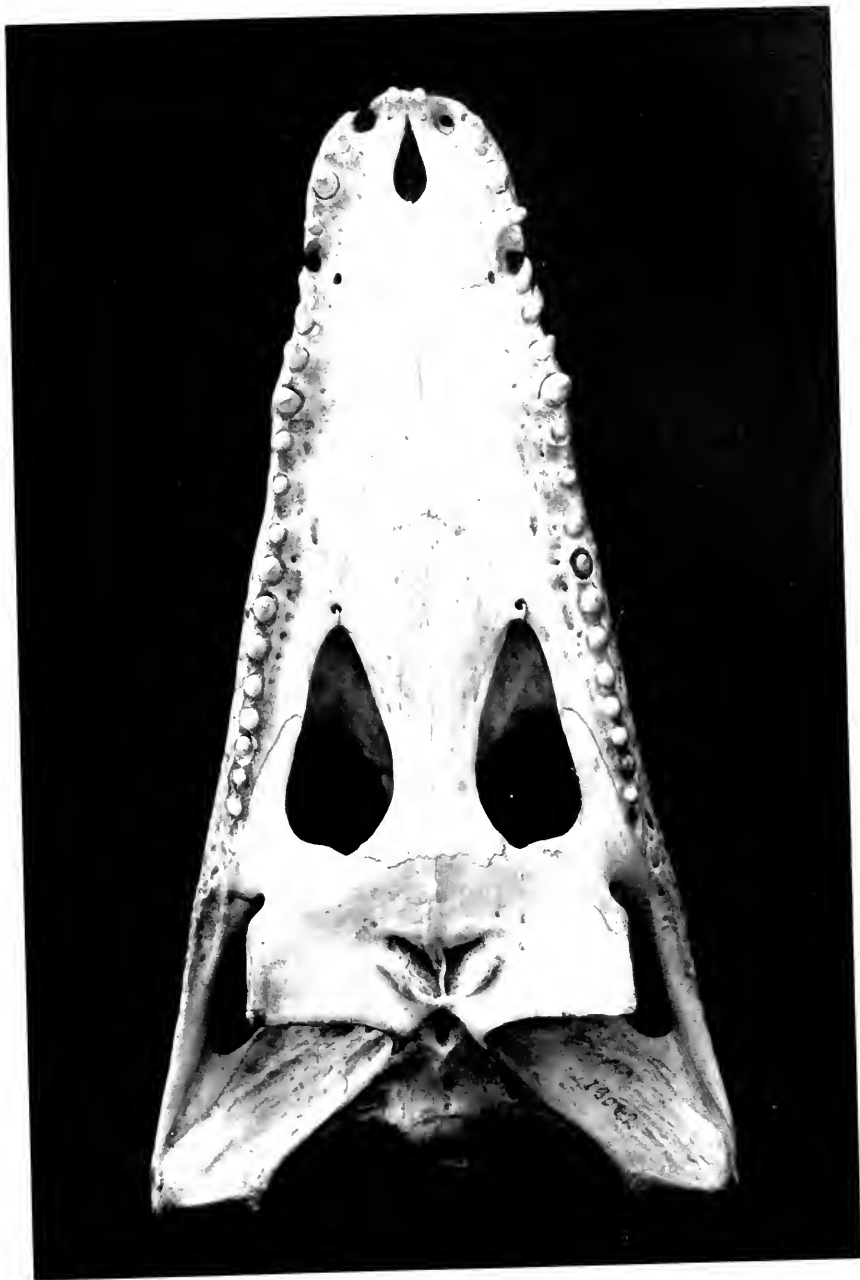
UNIVERSITY OF ILLINOIS



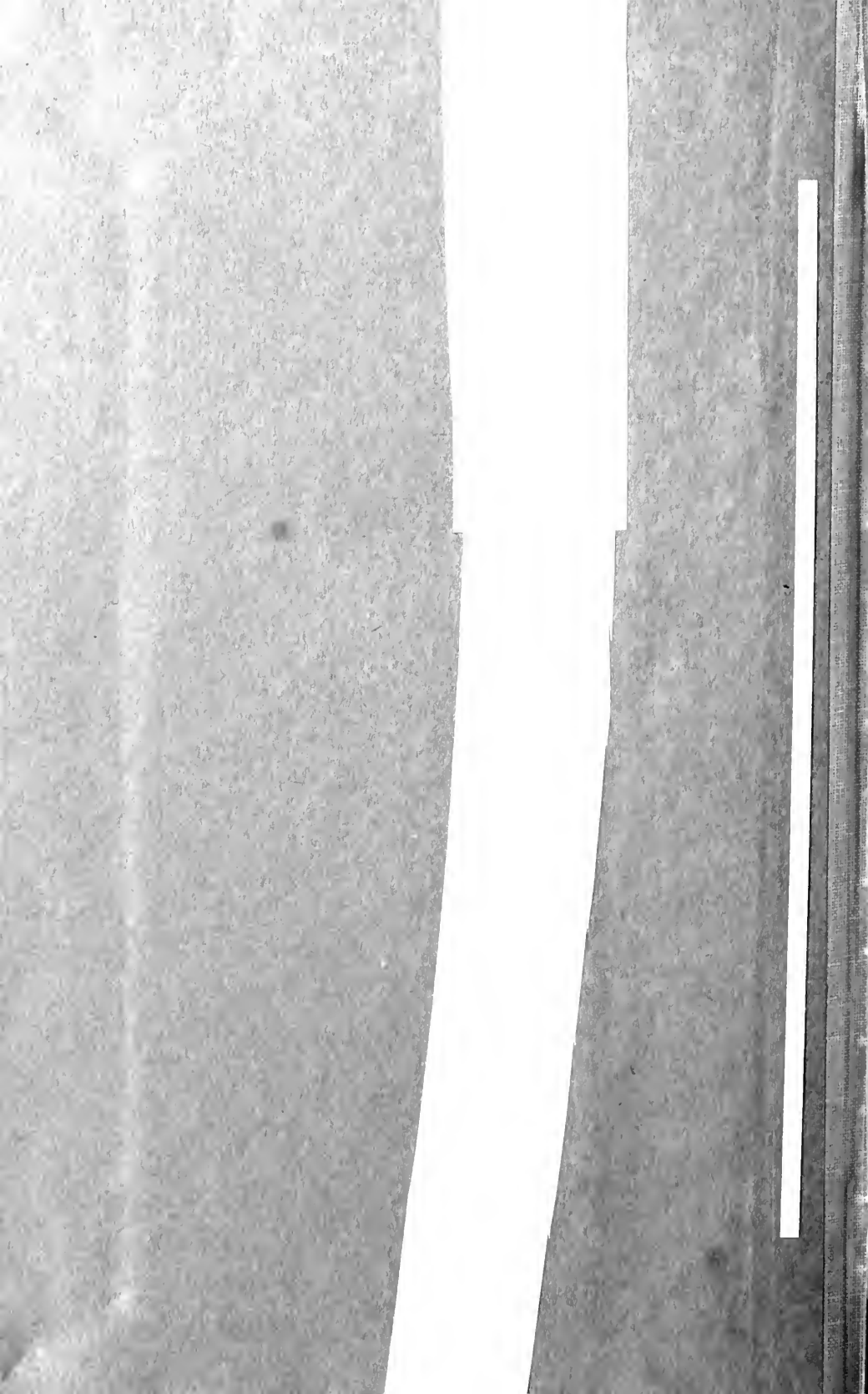
PALATAL VIEW OF SKULL OF *Caiman yacare*, F.M.N.H. NO. 9146



DORSAL VIEW OF SKULL OF *Caiman sclerops*, F.M.N.H. NO. 13062 (VENEZUELA)



PALATAL VIEW OF SKULL OF *Caiman scleroptis*, F.M.N.H. NO. 13062





UNIVERSITY OF ILLINOIS-URBANA

590.5FI C001
FIELDIANA, ZOOLOGY\$CHGO
12 1917-29



3 0112 009379261