A NEW RHYNCHOCEPHALIAN REPTILE FROM THE JURASSIC OF WYOMING, WITH NOTES ON THE FAUNA OF "QUARRY 9."

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The specimens upon which the present paper is based were collected by parties of the U. S. Geological Survey, working under the direction of the late Prof. O. C. Marsh. Although fragmentary, several of the forms discussed have not hitherto been recognized in the Morrison fauna, and are of additional interest from the fact that they were found in association with the mammal remains from these beds.

All of the specimens considered in this article are from "Quarry 9," Como Bluff, Albany County, Wyoming, and are now preserved in the vertebrate paleontological collections of the U. S. National Museum.

OPISTHIAS, new genus.

The characters of this genus are included in the description that follows of *Opisthias rarus*, the type-species.

OPISTHIAS RARUS, new species.

Plate 11.

Holotype.—The nearly complete left dentary with teeth. Cat. No. 2860, U.S.N.M.

Paratype.—A second dentary from the left side of a somewhat smaller and apparently younger individual. Cat. No. 2858, U.S.N.M.

In the collection there are parts of seven other dentaries pertaining to this form, but the description to follow is based upon the two specimens mentioned above.

Description.—The left dentary of the holotype measures 34.5 mm. in length, and appears to be complete with the exception of a small part of the coronoid process. Although somewhat smaller in size, its great resemblance to the dentary of the living *Sphenodon* is most striking.

Viewed from above, the tooth border is straight, but there is a twist in the lower part of the dentary which throws the anterior ventral border in toward the median line. The anterior end presents a sudden incurvature toward the symphysis, and, as in *Sphenodon*, the rami of the mandible appear to have been united by ligament at their anterior extremities only.

The inner and superior angle of the symphysial end of each ramus appears to have been separated from its fellow by a slight interspace above the symphysis. On the superior surface of the dentary at this part there is a well-developed subconical incisor, the base of which appears to be embedded in the substance of the dentary. The ventral border of the dentary is sinuous. Just posterior to the symphysial end it has a vertical depth of 5 mm. Posteriorly the bone gradually widens, reaching its maximum depth below the second tooth from the last of the dental series. There is a well-developed coronoid process, as shown in fig. 1. The dorsal portion of this process is missing from the specimen, but its outline is indicated from the impression left in the matrix which originally inclosed the specimen.

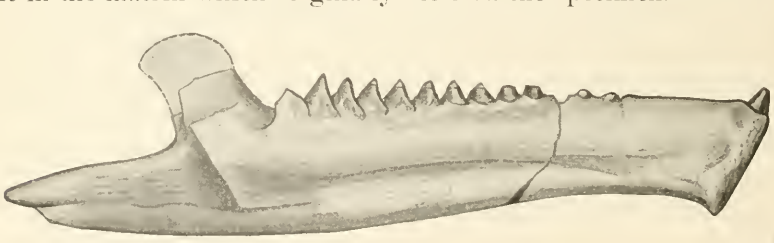

FIG. 1.—LEFT DENTARY OF OPISTHIAS RARUS. CAT. NO. 2860 U.S.N.M. ×3 VIEWED FROM THE INTERNAL SIDE.

Posterior to the coronoid process the dentary tapers to a thin pointed end, which articulated with the posterior elements of the mandible. The external surface of the dentary is gently rounded from above downward. Below the dental border, on this side, runs a low, curved, longitudinal ridge (fig. 1, pl. 11), probably for the attachment of the lip.

On the internal side (fig. 1) is a pronounced mandibular groove extending forward from below the coronoid process nearly to the symphysis, where it fades out.

The teeth are acrodont (i. e., ankylosed to the summit of the jaw), as in *Sphenodon*.

In the holotype there are, besides the incisor mentioned, 12 teeth, preserved. A fracture of the bone appears to have destroyed one tooth, so that in this individual there were 14 teeth present in the mandible. In the paratype (Cat. No. 2858) the complete dental series appears to be present, and I am able to distinguish 19 teeth in all. Günther has found an equal number in the dentary of *Sphenodon*.

The position of the incisor in *Opisthias rarus* at the extreme anterior angle of the alveolar border, aside from other differences, would at once distinguish this form from *Sphenodon*.

For a distance of 5.5 mm. the incisor is followed by a sharp alveolar border without teeth. Following this edentulous portion, the preserved teeth are regular, and steadily increase in height from the front toward the back, reaching their maximum size in the tooth next to the last, which again diminishes. Viewed from above, the unworn teeth are pyramidal in shape, the anterior face being slightly concave, transversely.

The larger of the posterior teeth of the series have a single faint, median, vertical depression on both the outer and inner surfaces. Those on the outer surface reach nearly to the apex of the teeth.

The dental series of the paratype shows but slight evidence of wear, and the anterior edentulous portion is much shorter than in the type specimen. The apices of the anterior teeth of the holotype are much worn, only the two next to the last having the acutely pointed apices of the teeth of the younger individual (Cat. No. 2858), all of which are sharp. The most anterior of the dental series in the paratype are mere denticles barely distinguishable to the naked eye.

As in *Sphenodon*, it appears that as the anterior teeth are worn down, their function is performed by the sharp border of the dentary, and also, as in that genus, the teeth wear down more rapidly in front than behind.

Discussion.—It is impossible, from so little of the skeleton, to say much of the animal's relationships, but the close resemblance of the specimens just described to the living *Sphenodon* (compare fig. 1 with fig. 2, pl. 11) would indicate without question their rhynchocephalian nature, and therefore they may be very properly assigned to the family Sphenodontidæ until more is known of the skeleton.

On account of the meagerness of the evidence, and wishing to avail myself of his wide knowledge of the reptilia, the specimens were submitted to Dr. S. W. Williston, who was generous enough to give me an opinion on them. In part he writes me as follows:

> Your rhynchocephalian comes the nearest, I think, of any described form to that described by H. v. Meyer long ago as *Homœsaurus* from the Solenhoefn beds and the Kimeridge, but no closer than it does to the living *Sphenodon*. There can be no doubt, I believe, but that you have in these jaws the first representative in America of a true terrestrial rhynchocephalian.

Geological horizon.—The deposit from which the specimens discussed in the preceding pages were obtained, was designated by Marsh's collectors as "Quarry 9." It was from this quarry that most of the Jurassic mammals described by Professor Marsh were found, and on that account the contemporaneous reptilian fauna is of added interest. In 1901 Dr. F. B. Loomis published a[a] stratigraphic sec-

[a] Bull. Amer. Mus. Nat. Hist., vol. 14, 1901, pl. 27, fig. 2.

tion of Como Bluff, and the bed containing the fossils discussed in this paper is described as follows:[a]

In the Como Bluff, this layer [No. 24 of his section] has sandwiched into it a 4-foot bed of sandstone (24b). The sandstone is of interest as marking the horizon at which the few Jurassic mammals were found. The mammal layer is the 6 inches of clay underlying this sandstone. Most of the American Jurassic mammal remains thus far found have come from one quarry, worked most successfully by Marsh and later by the American Museum. This pocket seems to be exhausted.

The mammal layer, as measured by Loomis, is 80 feet below the overlying Dakota, and 22 feet below the level where the American Museum parties collected skeletons of *Brontosaurus* and *Diplodocus*.

While the mammal remains are distinctive of this layer, it is evident that the reptilian forms found associated with them are also important as horizon indicators.

NOTES ON THE FAUNA OF "QUARRY 9."

Although large collections of fossil remains have been made from the Jurassic of this country, the meagerness of our knowledge concerning the stratigraphic succession of the forms found has often been a subject of comment. That as our knowledge of the fauna grows it will be found to be sufficiently diversified to separate the formation into well-defined faunal zones appears quite certain, and any evidence obtainable toward that end is most important.

It is with that idea in mind that the following list of fossils from this one layer in Quarry 9 has been compiled:

List of type specimens from Quarry 9, Como Bluff, Albany County, Wyoming.

Mammals.—*Allodon fortis* Marsh.
luticeps Marsh.
Asthenodon segnis Marsh.
Ctenacodon nanus Marsh.
potens Marsh.
serratus Marsh.
Diplocynodon victor Marsh.
Docodon striatus Marsh.
Dryolestes arcuatus Marsh.
gracilis Marsh.
obtusus Marsh.
priscus Marsh.
* *rorax* Marsh.
* *Ennacodon affinis* (Marsh.)
* *crassus* (Marsh.)

[a] Bull. Amer. Mus. Nat. Hist., vol. 14, 1901, p. 194.

* Those marked with an asterisk indicate type-specimens in the paleontological collections of the U. S. National Museum. All others, unless otherwise designated, are now preserved in the Yale Museum.

* *Laodon venustus* Marsh.
* *Menacodon rarus* Marsh.
* *Paurodon valens* Marsh.
Priacondon ferox Marsh.
* *Stylacodon gracilis* Marsh.
validus Marsh.
Tinodon bellus Marsh.
ferox Marsh.
lepidus Marsh.
robustus Marsh.
Triconodon bisulcus Marsh.

Reptiles.—*Glyptops ornatus* Marsh=*Glyptops plicatulus* (Cope).
Macelognathus vagans Marsh.
Pterodactylus montanus=*Dermodactylus montanus* (Marsh).
* *Opisthias rarus* Gilmore.
† *Laosaurus gracilis* Marsh.
† *Coelurus fragilis* Marsh.
† *Goniopholis*, sp. undet.

Like the mammals, the reptilian remains from "Quarry 9" consist of scattered and disassociated bones. The great variety and

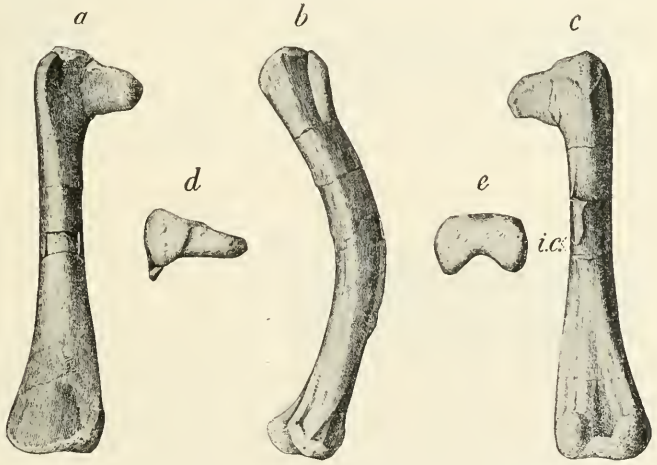

FIG. 2.—RIGHT FEMUR OF LAOSAURUS GRACILIS MARSH. CAT. NO. 5808 U.S.N.M. NAT. SIZE. *a*, FRONT VIEW; *b*, SIDE VIEW; *c*, BACK VIEW; *d*, VIEW OF PROXIMAL END; *e*, VIEW OF DISTAL END; *i. c.*, INNER TROCHANTER.

abundance (particularly of the smaller forms) show there was a big fauna of which at this time we know only a small part.

Among the fossils from this quarry was the small femur from the right side shown in fig. 2. The curved shaft and the positions of

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† The type-specimens of these forms are from other quarries.

the inner and lesser trochanters show at once that the femur pertains to a member of the Orthopoda. The situation of the inner trochanter wholly upon the proximal half of the shaft at once separates it from the Camptosauridæ. On account of its small size and the fact that no specimen of *Dryosaurus* of these dimensions has been described, it is unhesitatingly referred to the genus *Laosaurus*, and provisionally to *L. gracilis*, the most diminutive species of that genus. Except it differs in a few minor details and is much smaller in size, this bone closely resembles the femur figured[a] by Professor Marsh as *Nanosaurus rex*, and which he says "may perhaps belong to the genus *Laosaurus*." That this was the proper disposition of the specimen has been recently pointed out by von Huene and Lull.[b]

The chief interest in the above specimen is its occurrence in the mammal layer, a discovery considered worthy of record.

Measurements.

	mm.
Greatest length of femur	55
Greatest width of proximal end of femur	13.5
Greatest width of distal end of femur	12
Height of lower edge of inner trochanter above distal end of femur	29

The femur is Cat. No. 5808, U.S.N.M., and was collected by Mr. Ed. Kennedy in "Quarry 9," Como Bluff, Albany County, Wyoming, in 1884.

Several isolated caudal vertebræ I am unable to distinguish from *Coelurus fragilis* Marsh, and Mr. Barnum Brown writes me that he "remembers finding *Coelurus* vertebræ in this layer, although none were saved."

While two other American species of this genus have been described, *C. gracilis* is only known from the Potomac of Maryland, and *C. agilis* from the Morrison of Colorado.

I find among old drawings made for Professor Marsh unpublished figures of the caudal vertebræ which are here reproduced as further elucidating the characters displayed by these bones. (See fig. 3). The type specimen of *Coelurus fragilis* is from Quarry 13, which has been tentatively correlated with beds from 20 to 25 feet higher in the formation than those of "Quarry 9."

Figs. 3 and 4, pl. 11, are presented as illustrating forms new to the Morrison fauna, but too fragmentary for satisfactory types, and on that account I have deferred naming them.

Fig. 4, pl. 11, is a portion of the left ramus of a small reptile. The slender jaw is thickly studded with delicate, round, pointed teeth placed in a single row on the dentary. The anterior teeth are

[a] 16th Ann. Rept. U. S. Geological Survey, for 1894–95, pt. 1, 1896, p. 200, figs. 44 to 48.

[b] Neuen Jahrbuch, 1908, p. 142.

slightly smaller than the posterior. The fragment, which is incomplete at both ends, is 21 mm. long and at the deepest part measures 3 mm. in width.

A portion of the upper mandible of an animal doubtfully reptilian is shown in pl. 11, fig. 3. The dentigerous border is thickly studded with minute, sharply pointed teeth. The preserved fragment measures 13 mm. in length.

The presence in this fauna of the larger members of the dinosauria, both carnivorous and herbivorous (*Opisthocœlia*), is indicated by a few teeth, vertebræ, and foot bones. Fragmentary parts of turtle

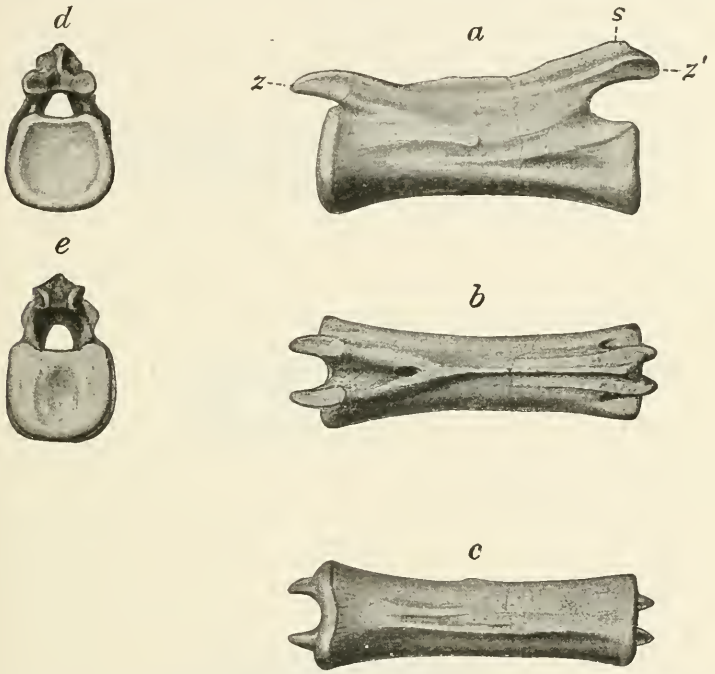

FIG. 3.—CAUDAL VERTEBRA OF CŒLURUS FRAGILIS MARSH. CAT. NO. 1992, YALE MUSEUM. NAT. SIZE. *a*, SIDE VIEW; *b*, TOP VIEW; *c*, VENTRAL VIEW; *d*, FRONT VIEW; *e*, BACK VIEW; *s*, NEUTRAL SPINE; *z*, ANTERIOR ZYGAPOPHYSIS; *z'*, POSTERIOR ZYGAPOPHYSIS. AFTER MARSH OR DRAWN UNDER HIS DIRECTION.

and crocodile skeletons are common, and all are probably referable to the genera *Glyptops* (*Compsemys*) and *Goniophilus* (*Diplosaurus*), respectively.

There are a few fragments that Professor Marsh apparently believed to represent amphibians, as shown by a label in his handwriting, found in one of the trays, which reads as follows: "Amphibians from Quarry 9 (almost everything, but not everything.)" I fail to find remains sufficiently characteristic to verify their presence.

A large number of fish vertebræ were found intermingled with the other specimens, but were too fragmentary to admit of identification.

It will be observed that of the seven identified species of reptiles, only two (*Glyptops ornatus* and *Cœlurus fragilis*) have been recognized as occurring at other levels.

In this paper, which may be considered preliminary, I only wish to call attention to what appears to be a most interesting Morrison fauna. In a later communication, however, I hope to be able to present a more detailed account of this fauna.

EXPLANATION OF PLATE 11.

Fig. 1. Left dentary of *Opisthias rarus*. Cat. No. 2860 U.S.N.M. ×2. External view. From a photograph.

2. Left dentary of *Sphenodon punctatum*. Cat. No. 29429 U.S.N.M.. Nat. size. Viewed from the outer side.

3. Anterior portion of right upper mandible of undetermined animal from Quarry 9, Como, Wyo. Cat. No. 6133 U.S.N.M. ×2. Oblique external view.

4. Portion of left dentary of undetermined reptile?. Cat. No. 6134 U.S.N.M. ×2. External view.

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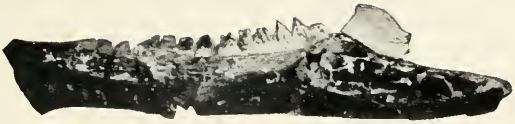

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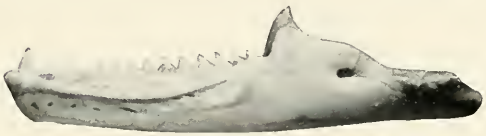

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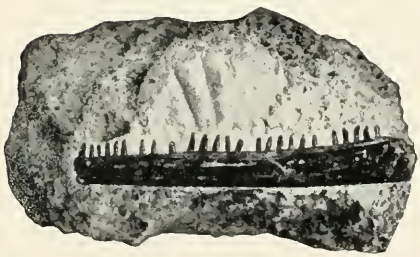

JAWS OF RHYNOCHOCEPHALIAN AND UNDETERMINED FORMS.

FOR EXPLANATION OF PLATE SEE PAGE 42.