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**ABELISAURUS COMAHUENSIS, N. G., N. SP., CARNOSAURIA
FROM THE LATE CRETACEOUS OF PATAGONIA.***

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ABSTRACT: A nearly complete skull pertaining to a carnosaur from the Allen Formation (Maastrichtian, Río Negro Province) is described as the holotype of *Abelisaurus comahuensis*. The skull is tall, with a broad interorbital roof, extensive antorbital fenestra, squamosal nearly horizontal with the quadratojugal process ventrally directed, very wide lower temporal fenestra, very long quadrate, large orbital fenestra with the orbit almost closed. The differences with Tyrannosauridae and other Cretaceous carnosaur families appear significant enough to propose a new family, Abelisauridae, probably of Gondwanan distribution.

INTRODUCTION

Knowledge of South American Cretaceous carnosaur is quite fragmentary, indeed nearly nonexistent, as only *Genyodectes serus* has been reported (Smith Woodward, 1901), represented by cranial and mandibular fragments with teeth, and whose provenance is so doubtful that it is not even known with any certainty if it was found in Cretaceous beds. Other records of this group consist of isolated dental pieces (Del Corro, 1966, 1974). Powell (1979) discovered the carnosaur *Unquillosaurus*, based on an isolated pubis from the Campanian-Maastrichtian of northern Argentina, which serves to document the presence of this group, although not to clarify the basic relationships of South American carnosaur.

Curiously, the many Argentine, and even South American, Cretaceous localities that have produced so many frequent and significant remains of sauropods do not produce any illustrative or diagnostic evidence of the large predators that must have accompanied them.

Knowledge of Cretaceous carnosaur is fundamentally based on evidence from North America (Osborn, 1905, 1912; Ostrom, 1969; Russell, 1970; and others) and Asia (Kurzanov, 1976; Maleev, 1955, 1964; Rozhdestvensky, 1965); this knowledge has been strengthened in recent years by the works of Barsbold (1976, 1977), Barsbold and Perle (1980)

and Osmólska and Roniewicz (1970). The discoveries from Gondwana (Chatterjee, 1978; Molnar *et al.*, 1980, 1981; Stromer, 1915) are hardly clear, to the point that, even with *Spinosaurus*, we are not provided with an elemental picture of the characteristics of this group in the Southern Hemisphere. Regarding this, the recent discovery of the large part of a skull in Maastrichtian beds of northern Patagonia (carried out by the Director of the Museo de Cipolletti, Prof. Roberto Abel) has permitted us to recognize the existence of a lineage of large Carnosauria, whose anatomy suggests adaptive characters distinct from those recognized in Laurasia.

This discovery, besides enabling a major understanding of the evolution of Cretaceous carnosaur, gives us the opportunity to better understand the character of the associations of large tetrapods in the South American Cretaceous.

SYSTEMATICS AND DESCRIPTION

Order SAURISCHIA Seeley, 1888
Suborder THEROPODA Marsh, 1881
Infraorder CARNOSAURIA von Huene, 1920
Family ABELISAURIDAE nov.

Abelisaurus gen. nov.

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DERIVATIO NOMINIS: in honor of Prof. Roberto Abel, Director of the Museo de Cipolleti and author of the discovery.

TYPE SPECIES: *Abelisaurus comahuensis* sp. nov.

KNOWN DISTRIBUTION: Lower part of the Allen Formation, early Maastrichtian of Río Negro, Argentina.

DIAGNOSIS: Large Carnosauria, with high, narrow, widely fenestrated skull with prominent nasal rugosities. With antorbital fenestra proportionally larger than in Tyrannosauridae and the remaining Cretaceous and even Jurassic carnosaurs; small accessory antorbital fenestra located on the anterior border of the antorbital fossa. Interorbital region wider than in other carnosaurs, and with lateral external contact of the lacrimal and postorbitals forming a type of orbital overhang. Orbital fenestra very tall, with a low jugal, and with the orbit as mentioned very marked by the postorbital and lacrimal, forming a circumference barely open ventrally, partly recalling the condition seen in *Tyrannosaurus rex*. Squamosal projecting nearly backward, almost horizontally, with its quadratojugal process directed ventrally and not as anteriorly as in Tyrannosauridae, recalling the condition of *Ceratosaurus* and to a lesser degree that of *Allosaurus*. Quadrate notably longer than in Tyrannosauridae, comparable to *Ceratosaurus*. Lower temporal fenestra very wide in both directions, notably larger than in Tyrannosauridae, recalling that in *Ceratosaurus*. Upper temporal fenestrae shorter axially. Horizontal ramus of the maxilla extended, provided with short teeth, very laterally compressed. Braincase comparable to that of *Piatnitzkysaurus* in the conspicuous aliform processes of the laterosphenoids and the marked transverse constriction of the basisphenoids.

***Abelisaurus comahuensis* sp. nov.**

ETYMOLOGY: *comahuensis*, referring to the Comahue region, where the material described here was discovered.

HOLOTYPE: Museo de Cipolleti, No. 11098, corresponding to a large part of the skull, lacking the right maxilla, jugal, quadratojugal, and squamosal, as well as most of the palate.

STRATIGRAPHIC AND GEOGRAPHIC OCCURRENCE: Lower part of the Allen Formation, Lago Pellegrini sandstone quarries, Department of General Rocas, Province of Río Negro.

DIAGNOSIS: the same as for the genus.

DESCRIPTION

Abelisaurus comahuensis has a large skull, 85 cm in maximum length, bearing wide lower temporal, antorbital, orbital and nasal fenestrae. With robust cranial roof in the interorbital region and profusely rugose nasals, even with irregular prominences in the form of small sharp points.

Premaxilla: the premaxillae are fused together: they are tall, strong, without anteroposterior reduction, and provided with four alveoli on each side. The nasal process of the premaxilla is stout, although its extent is not known due to fracture. In the symphyseal region the premaxillae have some rugosities of the type present on the nasals. The union between the premaxillae and maxillae is firm and could move with difficulty.

Maxilla: both maxillae were incomplete, although the left preserves its anterior region. This bone is provided with a small accessory antorbital fenestra, especially in the axial direction, located on the more anterior border of the antorbital fossa, and limited in back by a narrow bony bridge. The maxilla is tall in its anterior region, with a very steep suture between the nasal and maxilla, extending backward and upward via a narrow bony stylet that reaches far backward into the nasal passages. The anterior region of the maxilla possesses 7 alveoli and eventually would be completed by 5-6 alveoli more, totaling 12-13 alveoli in total.

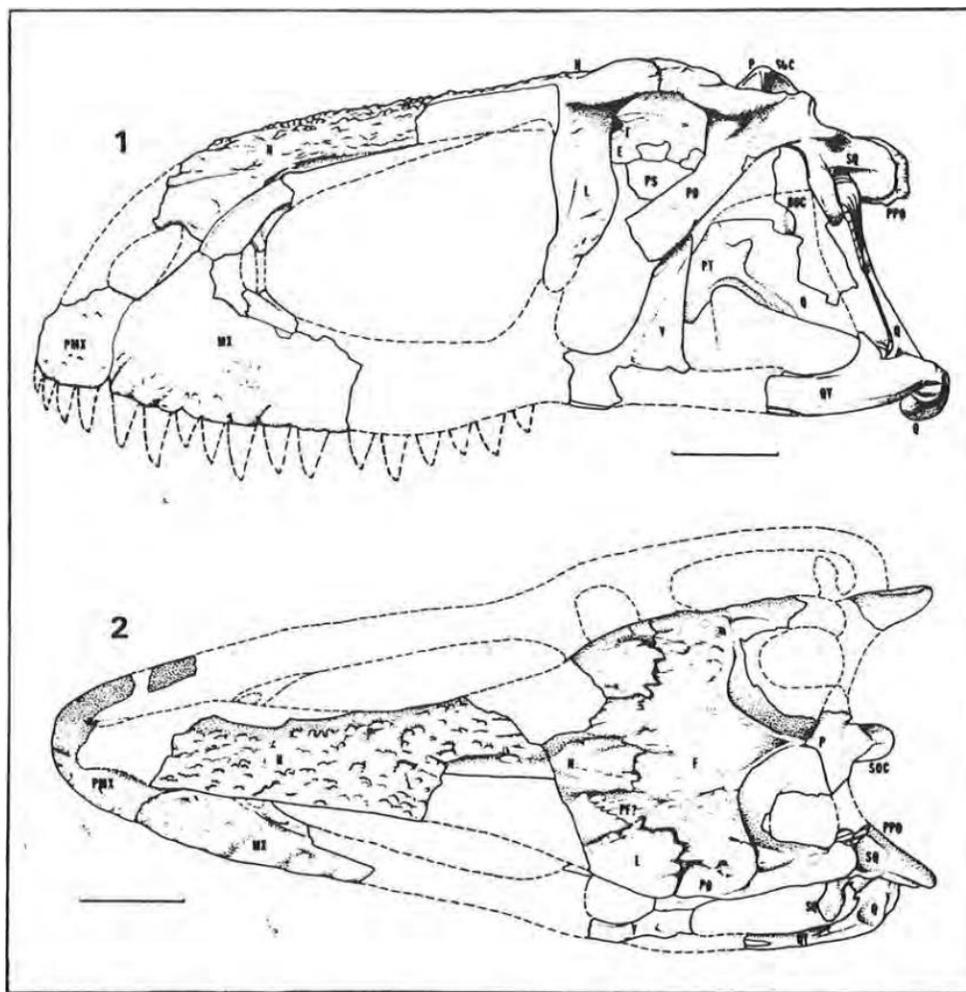


FIG. 1: – *Abelisaurus comahuensis*. 1: skull in lateral view; 2: dorsal view. Restored portions indicated by dotted lines and broken areas indicated by hatching. BOC: occipital condyle; E: ethmoids-sphenethmoids; F: frontal; L: lacrimal; MX: maxilla; N: nasal; P: parietal; PF?: prefrontal (possibly); PPO: paroccipital process; PS: parasphenoids; PT: pterygoids; Q: quadrate; QY: quadratojugal; SOC: supraoccipital; SQ: squamosal; Y: jugal; I: exit for the optic nerve. The scale represents 10 cm.

Nasals: have a wide, firm contact with the maxillae; they are very convex transversely, expanded backward toward the lacrimals. The contact with the frontals is roughly interdigitating and located toward the anterior third of the orbit. Dorsally it has two deep grooves, axially directed, from the frontals forward, bordered by rugosities and separated from one another by 4 cm, and about 16 cm long. They show a marked constriction toward the accessory antorbital fenestra. The nasals are the only bones that show prominent rugosities.

Lacrimals: have a wide dorsal expression, convex in both directions, sutured roughly from the external border to the frontals. The ventral expression of the lacrimals consists of an anteriorly and posteriorly convex extended rod, which is united with the jugal in the lower third of the orbital fenestra. The posterior border of this rod is convex, thus

differentiating it from the character seen in Tyrannosauridae. The anterior projection of the lacrimal which is connected to the nasals is not preserved.

Prefrontals: the evidence of the prefrontal is not clear, although apparently it constitutes a small ossification delimited by the nasals, lacrimals, and frontals.

Postorbitals: present a wide, transversely convex dorsal manifestation, and which is integrated with the lacrimal and frontal to form a wide, rugose prominence that eventually had some major expression in the life of the animal.

The overhang formed by the postorbital and lacrimal has a clearly more external position than the origin of the ventral processes of both bones. The ventral process is wide, laminar at its anteroventral

end, thick along the rest, and forms a well-marked semicircle posterior to the orbit proper. The posterior projection of the postorbital covers the squamosal laterally, although without recognizing clear sutures between them.

Squamosal: the squamosal is triradiate, with an anterior projection covered laterally by the posterior ramus of the postorbital, a ventral projection directed below and partially backward to contact the quadratojugal, and finally the posterior projection which forms a definite otic surface ventrally where the quadrate condyle articulates. There is a dorsomedial process in the dorsal region of the squamosal that eventually would have united with the occipital crest. Behind this process it has a step that affects the posterior projection of the squamosal and the lateral region of the paroccipital process.

Quadratopterygoids: a large part of the left quadrate is preserved, with articular marks for the squamosal and basiptyergoid process, which indicates its approximate original position. The quadrate is proportionally long, rather more than in Tyrannosauridae, with a transversely wide distal articular region, with the internal border rather lower than the external. The pterygoid ramus of the quadrate is extended, it is strongly fused to the pterygoids because sutures cannot be recognized. The contact of the quadratopterygoid with the basiptyergoid process is wide, with a notch that forms a very clear concave region.

Quadratojugal: very incomplete, with its posteroventral region strongly fused to the quadrate. The dorsal projection of this bone is not known. The anteroventral projection of the quadratojugal is complete enough, preserving a vestige of the jugal sutured to it.

Jugal: the incomplete left jugal was preserved, including the ascending ramus that contacts the postorbital. The anterior extension of the jugal is broken and there is no contact with the maxillae. The preserved part of the jugal indicates that it was dorsoventrally low.

Frontals: the axial region of the frontals form a depressed area, with good sutures with the nasals, although poorly defined with the parietals. The suture with the postorbital, seen on the left side, indicates that the lateral projection of the frontals is wide and participated in the supraorbital protuberance cited above. The frontals demarcate the anterior fossa of the upper temporal fenestra.

Parietals: are axially short. In the posterior region they include an elevated area that bifurcates on both sides into the rudimentary occipital crest.

Supraoccipital: the supraoccipital projects backward in the axial plane, forming a projection that surpasses the position of the occipital condyle. In posterior view note a thin, axially directed crest, and a minor crest in the lateral plane on each side.

Paroccipital processes: directed backward and outward, culminating in a lateral expression that surrounds the squamosal, and contributing in the formation of the otic surface. Toward the axial plane the ventral border of these processes merges into the basioccipital tuberae.

Basioccipital: has well separated tubera and forms a wide concave surface exposed in posterior view. The condyle is subhemispherical, more defined in its ventral region than in the dorsal plane, where there is notch of the foramen magnum. The condyle shows a well-defined neck in the ventral sector and part of the sides, a character that disappears near the region of the exoccipitals.

Basiptyergoid processes: widely separated from each other and relatively near the tuberae. The articular surface with the pterygoids is convex, and its major axis is directed downward, outward, and backward. They form a body curved backward and downward.

Laterosphenoids: the braincase shows wide aliform processes in the laterosphenoids, with rugosities on their surface, constituting probable insertion sites for the mandibular muscles, of the same type as those of *Piatnitzkysaurus floresi* (Bonaparte, 1979) from the Middle Jurassic of Patagonia.

Ethmoids-sphenethmoids-parasphenoids: a medial ossification, broadly united to the ventral face of the frontals, passes ventrally to an axial lamina. In the posterodorsal region it presents a cavity for nerve I that has even exits later, at the end of the ossification, of the type present in

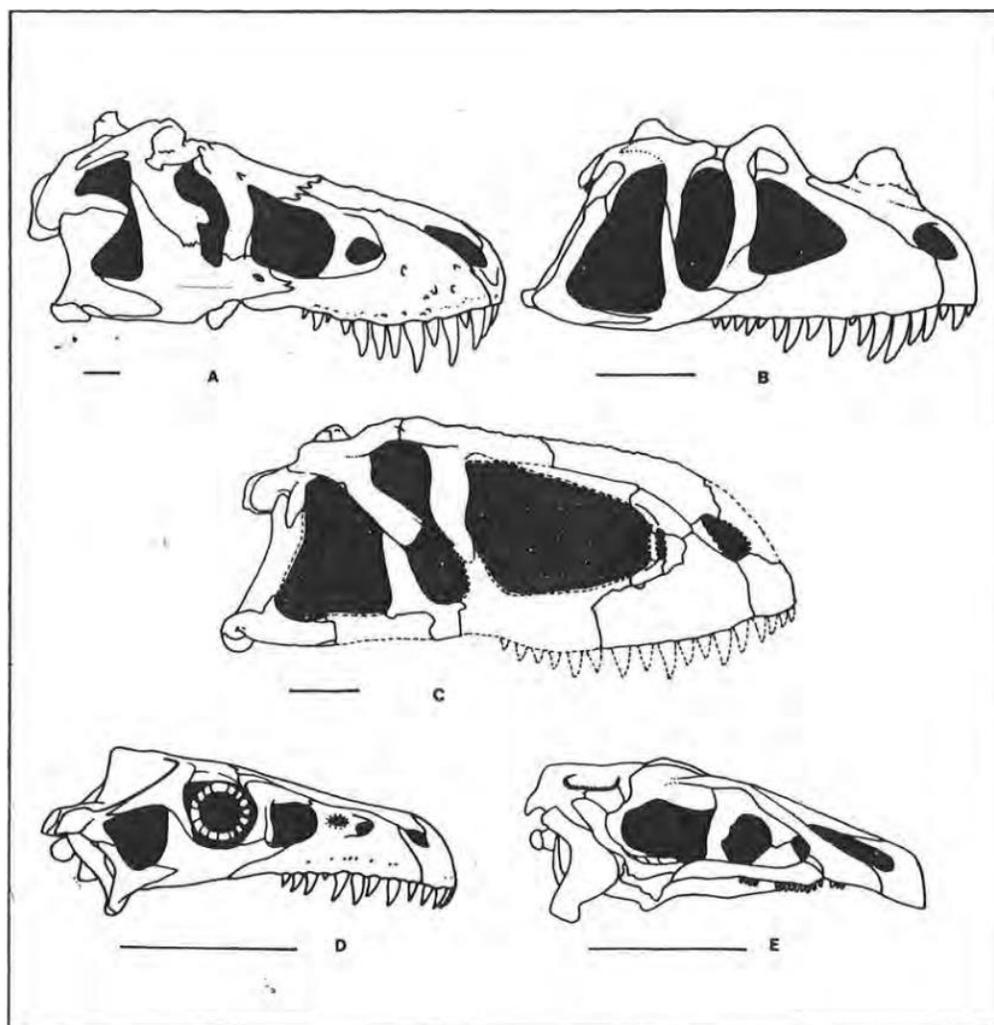


FIG. 2: Skull of *Abelisaurus* (C) compared with various genera of carnosaurs to show their principal differences. (A) *Tyrannosaurus rex*; (B) *Ceratosaurus nasicornis*; (D) *Dromaeosaurus albertensis*; (E) *Erlikosaurus andrewsi*. The scale represents 10 cm.

Tyrannosaurus (Osborn, 1912, fig. 8). There are other, incomplete, structures in the basicranium that will be studied in a more detailed work.

COMPARISONS

The good understanding we have of *Tyrannosaurus*, *Albertosaurus*, *Daspletosaurus* and other genera that form the family Tyrannosauridae is important for comparisons of this form from the Upper Cretaceous of Patagonia, which we make first with this family, so widely distributed in the Upper Cretaceous.

In the first place, the general adaptive type of cranial morphology is at first glance comparable to that of Tyrannosauridae. So we note that the extended antorbital region and the rugosities of the nasals are

common characters. Nevertheless, a comparative analysis of the cranial anatomy of *Abelisaurus* reveals components that differentiate it radically from Tyrannosauridae.

A) Interorbital region: The wide interorbital space of *Abelisaurus* is the result of the lateral contact of the lacrimal and postorbital, forming an orbital overhang, whereas in the distinct genera of Tyrannosauridae, such as *Albertosaurus* and *Daspletosaurus*, there is a notch that reduces the interorbital width. This same character is present in more primitive forms such as *Ceratosaurus* (Gilmore, 1920) and *Allosaurus* (Madsen, 1976) from the Upper Jurassic, and probably *Acrocanthosaurus* (Stovall and Langston, 1950) from the Lower Cretaceous.

B) Lower temporal region: Another notable difference with Tyrannosauridae refers to the characteristics of the lower temporal fenestra and in particular to the bones that border the posterior region of this fenestra, especially the squamosal, quadrate and quadratojugal. Thus this fenestra in *Abelisaurus* is extremely wide, with a notable extension of the horizontal bar of the jugal and quadratojugal, which notably exceeds the same character in Tyrannosauridae. Although the proximal region of the quadratojugal is lacking, the characteristics of the ventral process of the squamosal, which unites with the quadratojugal, shows that the lower temporal fenestra of *Abelisaurus* did not show the marked indentation that in Tyrannosauridae unites the squamosal and quadratojugal. In such manner the difference in proportions and form of this fenestra between *Abelisaurus* and Tyrannosauridae is more marked and implies a distinct morphology of the bones that encircle it in the posterior region. On the contrary, and obviously, note the similarities with *Ceratosaurus* (Gilmore, 1920) in the general aspects of the temporal region of the skull.

The squamosal of *Abelisaurus* projects backward in an approximately horizontal plane, forming a pronounced otic surface via a wide opisthotic process. In this manner, the articular cavity for the quadrate head is at a very elevated plane, and the quadrate is notably long. The distinct genera of Tyrannosauridae, on the contrary, are uniform in showing that: a) the squamosal projects posteroventrally; b) the opisthotic process is very short; c) the process for the quadratojugal is approximately horizontal and directed forward; and e) the quadrate is visibly shorter than in *Abelisaurus*.

C) Orbital region: the orbital region in *Abelisaurus* is very tall, because the jugal is low in the corresponding region, and also because the skull of *Abelisaurus* in the temporal region is proportionally taller than in Tyrannosauridae. The configuration of the inferior postorbital region tends to demarcate the orbit proper in its lower sector, a character reminiscent of *Tyrannosaurus rex* (American Museum of Natural History no. 5027). The orbital fenestra continues broadly beneath this ventral postorbital process. The lacrimal of *Abelisaurus* has a convex posterior border that contributes to framing the orbit proper and the slightly concave anterior border, the inverse of Tyrannosauridae in which the lacrimal invariably shows concave posterior and convex anterior borders.

Another difference in the lacrimal is that its ventral projection is short and would require a dorsal

elongation of the jugal to contact it, a character not present in either Tyrannosauridae, *Ceratosaurus*, or *Allosaurus*.

D) Antorbital region: a notable difference between *Abelisaurus* and Tyrannosauridae is manifest in the magnitude of the antorbital fenestra. In the Patagonian form it is notably large, to the point that the space between the anterior end of this fenestra and the external naris is very reduced, whereas in the distinct forms of Tyrannosauridae there is invariably a distance as great as the anteroposterior diameter of the antorbital fenestra. The accessory antorbital fenestra is elliptical, with the major axis directed dorsoventrally, and separated from the antorbital fenestra by a narrow bar, characters not observed in Tyrannosauridae.

COMPARISON WITH OTHER CRETACEOUS FORMS

A group of carnivorous forms from the Late Cretaceous of Laurasia shows distinct evolutionary tendencies, which has motivated novel taxonomic insights (Barsbold, 1976a; Barsbold and Perle, 1980). Some of these forms are represented mainly by postcranial remains, such as *Segnosaurus* (Barsbold and Perle, 1980; Perle, 1979), *Deinocheirus* (Osmólska and Roniewicz, 1970) and *Therizinosaurus* (Barsbold, 1976b), which impede comparisons with the skull described in this work, except for *Erlikosaurus* (Barsbold and Perle, 1980), a segnosaur with very distinct specializations from those of *Abelisaurus*, to the point that they prevent supposing any close relationship between segnosauroids and the Patagonian form.

With respect to the Upper Cretaceous carnosauroids from India (von Huene and Matley, 1933; Chatterjee, 1978) which are based on very fragmentary materials, we can note that there are some indications of affinities with *Indosaurus*, with a wide interorbital region, and *Indosuchus*, with an antorbital region apparently comparable to that of *Abelisaurus*. These probable affinities cannot be supported systematically until such time as direct comparisons can be made with the fragmentary materials from India.

With respect to Dromaeosauria, taking *Dromaeosaurus albertensis* as a point of reference (Matthew and Brown, 1922; Colbert and Russell, 1969), besides the size very strong differences are noted in the interorbital, antorbital, and upper and lower temporal regions that prevent any possible close systematic relationship.

CONCLUSIONS

Comparison with *Erlikosaurus andrewsi* (Segnosauria) reveals that they are distinct adaptive types (compare C with E, fig. 3), whereas comparison with Dromaeosauria also reveals substantial differences that are expressed as distinct infraorders.

From comparison with Tyrannosauridae, a picture emerges of such marked differences as to justify the conclusion that *Abelisaurus* does not belong to this family.

In summary, we consider that *Abelisaurus* is a carnosaur of a particular family, representing an adaptive type comparable to Tyrannosauridae, yet with diverse characters that unite it with Jurassic forms such as *Piatnitzkysaurus* and *Ceratosauros*.

To highlight this, we propose to recognize the family Abelisauridae nov., probably of Gondwanan distribution, that paralleled Northern Hemisphere Tyrannosauridae.

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