

Belonostomus (Teleostei: Aspidorhynchidae)
from the Late Paleocene of North Dakota

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ABSTRACT

A jaw fragment of *Belonostomus* from the Tongue River Formation (Tiffanian, late Paleocene) of Morton County, North Dakota, extends the known range of this genus some 8 million years into the Cenozoic. Like the Late Cretaceous *Belonostomus longirostris* from the Western Interior of North America, this specimen was collected from fresh water deposits.

INTRODUCTION

Belonostomus is a cosmopolitan genus from the Jurassic and Cretaceous. The Aspidorhynchidae (Order Aspidorhynchiformes) are usually considered holosteans. More recently, Patterson and Rosen (1977) included the Aspidorhynchidae in the Teleostei as a plesion (non-ranked group).

Holtzman (1978) described the mammalian faunas from several late Paleocene (Tiffanian) localities in the Tongue River Formation, central North Dakota, among them the Judson site in Morton County. He noted the occurrence of *Belonostomus* sp. and other lower vertebrate taxa indicative of fluvial-deltaic depositional conditions (Holtzman, 1978, p. 20). His specimen is a fragment of a presymphyseal (pre-dentary) bone (SMM P77.6.107) including the anterior portion of the presymphyseal-dentary suture (Figure 1). The presence of this specimen in the Judson local fauna extends the range of *Belonostomus* into the Tiffanian of North Dakota, long beyond its presumed extinction at the end of the Cretaceous.

ABBREVIATIONS: SMM=Science Museum of Minnesota, St. Paul; UCMP=University of California Museum of Paleontology, Berkeley, California.

SYSTEMATIC PALEONTOLOGY

Infraclass Teleostei
Muller, 1846

Family Aspidorhynchidae
Woodward 1896

Belonostomus Agassiz 1833

Belonostomus sp.

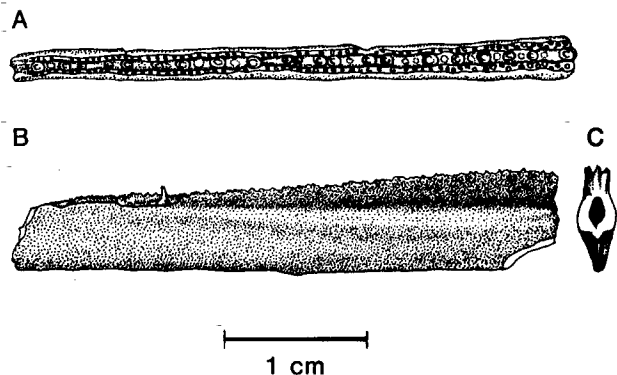


Figure 1. *Belonostomus* sp. (SMM P77.6.107) presymphyseal bone. A. Dorsal, B. Left lateral, C. Posterior view. Scale bar= 1 cm.

DESCRIPTION

The presymphyseal fragment is deep and laterally compressed. The posterior two-thirds of the fragment is distinctly "pinched in" along its dorsal edge (see Figure 1). Ganoine is absent. The profile of the presymphyseal-dentary suture is slightly arcuate anteriorly, but in general is angled dorso-posteriorly from the ventral margin. The dorsal margin is a narrow trough occupied by a median row of relatively uncrowded, regularly spaced tooth bases, about 9 per cm near the anterior end and about 12 per cm near the posterior end. A crowded row (about 43 teeth per cm) of much smaller tooth bases flanks the median tooth row on each side. Posteriorly, the teeth in the lateral rows become so crowded that two or even three rows are present. A small median vacuity extends the length of the fragment. No complete teeth are preserved; those in the median row appear to have been conical and sharp. Tooth bases are neither serrated nor buttressed by bone. The surface of the suture between presymphyseal and dentary is smooth, with a well defined median keel.

DISCUSSION

Lambe (1902) described *Diphyodus longirostris*, a fish of uncertain affinities, from the Belly River (=Judith River) Formation of Alberta, Canada. Estes (1964) recognized it as an aspidorhynchid and transferred it to *Belonostomus*, referring to it specimens from the Lance Formation of Wyoming. Since then, specimens from the Judith River Formation of Montana (Sahni, 1972) and the Hell Creek Formation of South Dakota (Greenwald, 1971) and Montana (Bryant, in press) have also been referred to this species.

Fragmentary specimens of *Belonostomus* are very difficult to differentiate at the specific level. Bardack (1968), Thurmond (1974), and Whetstone (1978) referred single specimens to *Belonostomus* sp. Part of the difficulty in classifying fragmentary specimens results from a lack of information on intraspecific variation in *Belonostomus*. Most studies of North American species (Felix, 1891; Bardack, 1968; Thurmond, 1974; Whetstone, 1978) reported only single specimens (Table 1). Estes (1964) was fortunate (by these standards) to have a relatively large sample of *Belonostomus longirostris* from the Late Cretaceous Lance Formation of Wyoming. Five specimens from the Lance Formation (UCMP 53985, 53986, 53990, 53993, 54000) are presymphyseal fragments with part or all of the presymphyseal-dentary suture. A sixth specimen, UCMP 130673, from the Late Cretaceous Hell Creek Formation of Montana, is comparable.

All these specimens have similar presymphyseal-dentary sutures, regularly spaced median teeth that are (when preserved) tall, sharp, and conical, and lateral tooth rows that become more crowded posteriorly. However, among these specimens there is considerable variation in size, proportions, and ganoine coating (see Table 2). Only the two largest specimens have ganoine on the ventral surface; this may be a function of ontogeny or sex. The same two specimens are also relatively wider than the smaller ones. UCMP 131677 (from the Hell Creek Formation of Montana) has the pinched dorsal margin seen in SMM P77.6.106; no other specimen among the 31 presymphyseal fragments in the UCMP collections has this character. Although only the dorsal portion of UCMP 131766 is preserved, its proportions are very similar to those of SMM P77.6.107 and the tooth rows are essentially identical. Although it is possible that SMM P77.6.106 and UCMP 131677 represent an undescribed species, with so little material available a conservative approach seems preferable, and I refer both specimens only to *Belonostomus* sp.

Table 1. Occurrences of *Belonostomus* in North America

AGE	UNIT	AREA	REFERENCE
Aptian/ Albian	Trinity	Texas	Thurmond, 1974
Santonian	Austin Gp.	Texas	Bardack, 1968
Santonian/ Campanian	Tombigbee	Alabama	Whetstone, 1978
Campanian	Judith R.	Alberta	Lambe, 1902
Campanian	Judith R.	Montana	Sahni, 1972
Maastrichtian	Hell Cr.	Montana	Bryant, in press
Maastrichtian	Hell Cr.	S. Dakota	Greenwald, 1971
Maastrichtian	Lance Fm.	Wyoming	Estes, 1964
Tiffanian	Tongue R.	N. Dakota	this paper

Table 2. Measurements (in mm) of *Belonostomus* sp. (SMM P77.6.107), and specimens (UCMP numbers) of *Belonostomus longirostris* from the Late Cretaceous of Wyoming and Montana.

Specimen number	max. width	max. depth	width/depth	ganoine
P77.6.107	2.9	6.85	.42	
UCMP 53993	3.9	6.3	.61	
UCMP 54000	3.55	4.3	.83	
UCMP 53990	2.0	3.4	.59	
UCMP 53986	1.7	1.85	.92	
UCMP 53985	1.7	2.8	.60	
UCMP 130673	1.7	2.95	.58	

COMPARISON

For all practical purposes, the only species of *Belonostomus* identified in North America is *B. longirostris*. *Belonostomus ornatus* Felix 1891, from the Neocomian of Mexico, was inadequately described and figured; the whereabouts of the type specimen, originally in the private collection of the author in Leipzig, are unknown.

Belonostomus cinctus Agassiz 1837-1844 from the Late Cretaceous of England has widely spaced median teeth in the presymphyseal, and the bone is broadly triangular in cross section. *B. crassirostris* Costa 1853-1856 from the Neocomian of Italy and Morocco (Arambourg, 1954) has a deep presymphyseal but is in need of redescription. No published details of the presymphyseal-dentary suture are available.

PALEOECOLOGY

Relatively abundant and well preserved specimens of terrestrial mammals at the Judson site, and the presence of other fresh water forms (*Lepisosteus*, *Opisthotriton*, *Champsosaurus*, crocodylians) suggested to Holtzman (1978, p. 20) that conditions at the time of burial were fluvial to deltaic. *Belonostomus longirostris* occurs in fluvial and perhaps estuarine deposits elsewhere (Estes, 1964; Greenwald, 1971; Bryant, in press). *Odontaspis* also occurs at the Judson site, perhaps indicating nearby marine habitats, although some species of the genus are found in fresh water (Holtzman, 1978). All other described specimens of *Belonostomus* occur in marine rocks; apparently only in the Western Interior of North America did this fish invade non-marine habitats.

CONCLUSIONS

The aspidorhynchid *Belonostomus*, once known only from the Cretaceous, occurs in the Tiffanian (late Paleocene) of North Dakota. The unexpected find of this genus in the Tongue River Formation, near the shoreline of the Paleocene Cannonball Sea, suggests that some fish, and perhaps other organisms thought to have become extinct at the end of the Mesozoic, survived in refugia for at least 8 million years where environmental conditions were suitable. Additional field work in the Late Cretaceous and Paleocene of North Dakota can be expected to reveal other surprises about the Cretaceous-Tertiary faunal transition in North America.

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