

A xiphisternal from the Dinosaur Park Formation (Campanian, Upper Cretaceous) of Alberta, Canada

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Xiphisternal elements of dinosaurs are only rarely recovered, probably because they seldom ossified and those that did were fragile and easily destroyed. An isolated but relatively complete, right xiphisternal element was collected from the Dinosaur Park Formation of Dinosaur Provincial Park, Alberta. It apparently contacted the left xiphisternal, the sternum, and at least three costal cartilages. Similar in overall morphology to xiphisternals of *Edmontonia*, *Nodosaurus*, and *Panoplosaurus*, it can be referred to the ankylosaur family Nodosauridae.

Les éléments du xiphisternum des dinosaures sont rarement récupérés, probablement parce qu'ils ne sont qu'exceptionnellement ossifiés, et le cas échéant ils sont fragiles et facilement détruits. Un élément d'un xiphisternum droit, isolé et relativement complet a été récupéré dans la Formation de Dinosaur Park, dans le Parc provincial des Dinosaures, Alberta. Apparemment, il devait être lié par contact au xiphisternum gauche, au sternum, et à au moins trois cartilages des côtes. Sa forme générale ressemble aux xiphisternums de *Edmontonia*, *Nodosaurus* et *Panoplosaurus*, il peut être assigné à la famille Nodosauridae des ankylosaures.

[Traduit par la rédaction]

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Introduction

Fossilized vertebrate remains from Dinosaur Provincial Park are numerous and remarkably diverse taxonomically. Approximately 130 species, of which 35 are dinosaur, have been described from the Dinosaur Park Formation (middle Campanian, Upper Cretaceous) of the Judith River Group within the park. During the 1990 field season, an isolated but virtually complete xiphisternal (Figs. 1, 2) was collected. Although dinosaur sterna are relatively common, xiphisternals are exceedingly rare. The preservational quality of this element and the general paucity of such fossilized remains prompted this note.

Abbreviations

ROM, Royal Ontario Museum, Toronto; RTMP, Royal Tyrrell Museum of Palaeontology, Drumheller.

Description

The sandstone in which the bone was encased was removed mechanically and no restoration was performed (Figs. 1, 2). RTMP 90.119.5 is a nearly complete right half of a xiphisternal (315 mm long), lacking only the anteromedial margin and perhaps a small segment posteriorly. Its medial margin is gently curved, whereas its lateral margin is broadly convex in dorsal view (Fig. 1A). Although the element was broken post-mortem, the lengthwise curvature (dextral spiral from back to front) appears to be natural and would approximate the curvature of the chest of the living animal (Fig. 1B). The medial margin of the plate is relatively robust and thickened dorsoventrally. Relative to its length, the bone is thin dorsoventrally, especially throughout its central area and along the perimeters of the fenestrations where the bone thins to sharp

edges. The surface of the bone indicates that a cartilaginous zone was present between this and the left xiphisternal, or between it and the intersternal plate, whichever it abutted with. The entire surface of the bone is evenly textured with shallow pits.

The anterolateral third of the bone presents a dorsoventrally rounded and slightly swollen margin that probably abutted with the sternum. Between the posterolateral margin of the sternal articulation and the first costal cartilage scallop, the sternal plate curves gently ventrally and thins to a sharp edge.

A roughly linear series of five fenestrations are positioned lengthwise along the bone. The centres of these fenestrations, except the posteriormost, lie close to the bone's medial margin. In life, a sixth fenestration may have been present caudally, and although its posterolateral margin is incomplete, it may have been closed in life by cartilaginous extensions from the posterior and lateral prongs.

The posterolateral margin of the plate is scalloped, presumably for the attachment of at least three costal cartilages (Fig. 1A, Nos. 1–3). The crests of the three prominent undulations are separated by about 45 mm. If perpendicular lines are drawn from the medial margin of the bone to the crests of each of the three prominent scallops, they approximately bisect the bar between adjacent fenestrations.

In ventral view, an inverted V-shaped depression (Fig. 1C) on the anterior margin of the incomplete fenestra may mark the site of insertion of a cartilaginous mesosternum, or a cluster of several costal cartilages.

Discussion

Within the Dinosauria, xiphisternals are currently known only from nodosaurids (Carpenter 1990) and possibly ornithomimid

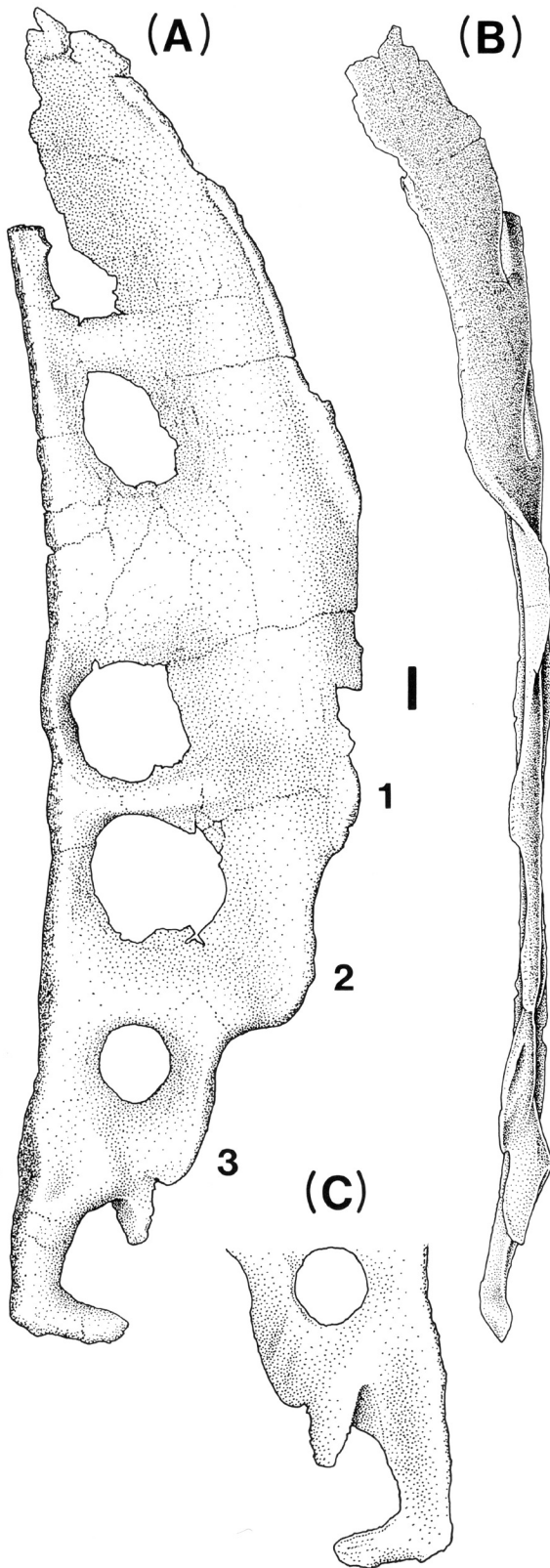


FIG. 1. Specimen drawing of a right xiphisternal (RTMP 90.119.5): (A) dorsal (visceral) view; (B) right lateral view; (C) ventral view. For explanation of numbered parts, please see text. Scale bar = 10 mm.



FIG. 2. RTMP 90.119.5, right xiphisternal of a nodosaurid ankylosaur in ventral (A) and dorsal (B) aspects. Scale bar = 10 mm.

thomimosaur (Nicholls and Russell 1981). RTMP 90.119.5 most closely resembles the xiphisternals of nodosaurids like ROM 1215 (Russell 1940), which was identified as *Panoplosaurus mirus* by Carpenter (1990). Xiphisternals are also known from *Edmontonia* (Carpenter 1990), and the first author has seen xiphisternals in an as yet undescribed *Nodosaurus* sp. specimen within the collections of the Hayashibara Museum of Natural Sciences (Japan). Both *Panoplosaurus* and *Edmontonia* are known from the Dinosaur Park Formation of Alberta. In *Panoplosaurus*, there is an ossified intersternal plate as well as the paired xiphisternals, all of which lay behind the hatchet-shaped sternal plates. These xiphisternals are similar to RTMP 90.119.5 in that they are thin and plate-like, anteroposteriorly elongate, and semielliptical in outline. In addition, the inner margin of each is only gently curved and slightly thickened; the outer margin is broadly convex, and a linear series of fenestrations lie adjacent to the mesial margin of the bone. RTMP 90.119.5 differs from ROM 1215 in its greater length, larger number of fenestrations, and more evenly undulating posterolateral margin.

The nodosaurid xiphisternals that we have seen are rather

variable in overall configuration. Without a larger sample size, it is difficult to know how much variability is simply phenotypic. As a result, we tentatively identify this xiphisternal as nodosaurid incertae sedis.

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