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Vertebrate ichnites from the Boulder Creek Formation (Lower Cretaceous: middle to ?upper Albian) of northeastern British Columbia, with a description of a new avian ichnotaxon, *Paxavipes babcockensis* ichnogen. et isp. nov.

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ABSTRACT

This is the first detailed report of vertebrate tracks from alluvial plain deposits of the Boulder Creek Formation (Lower Cretaceous: middle to ?upper Albian) from outcrop exposures in northeastern British Columbia. Several *in situ* dinosaur tracks observed in vertical section are described, as well as the recovery and description of an isolated track slab discovered in the Boulder Gardens recreation area south of Tumbler Ridge, British Columbia. The vertebrate ichnites consist of three small tridactyl theropod dinosaur prints, one tetradactyl ornithopod print, and 72 small tridactyl tracks of avian affinity which are described as a new ichnotaxon herein. The avian prints are small (under 30 mm length) and are characterised by a large divarication between digits II and III and comparatively lesser divarication between digits III and IV. The pace and stride are short and the pace angulation is high. The tracks are similar to those produced by extant shorebirds and the track-maker likely occupied a similar niche. The avian prints are described herein as a new ichnotaxon, *Paxavipes babcockensis* ichnogen. et isp. nov. Two of the theropod footprints are identified as *Irenichnites gracilis, an ichnotaxon* described in 1932 by C.M. Sternberg from the Lower Cretaceous (Aptian) Gething Formation near Hudson's Hope, British Columbia. One of the *Irenichnites gracilis* prints displays skin impressions associated with the digital pads of digit III and the metatarsal pad. This is the first record of skin impressions from prints of *Irenichnites gracilis*. The ornithopod track is partial and unidentifiable to a particular ichnotaxon, but displays skin impressions on the metatarsal pad and at the base of the second digit impression. The skin impressions from the ornithopod track differ from the *Irenichnites gracilis* skin impressions.

1. Introduction

The first fossil footprints recovered from the Boulder Creek Formation were discovered in August, 2005 by Curtis Lettely (then a Ph.D. student of the Ichnology Research Group at the University of Alberta) during the course of a preliminary geological investigation in the Boulder Gardens recreational area south of Tumbler Ridge, British Columbia (Fig. 1). This area is within the boundaries of the

Institutional abbreviations: BCPM, Royal British Columbia Museum, Victoria, British Columbia, Canada; CVM, Cowan Vertebrate Museum, University of British Columbia, Department of Zoology, Vancouver, British Columbia, Canada; MCF, Museo Municipal "Carmen Funes"; PRPRC, Peace Region Palaeontology Research Centre, Tumbler Ridge, British Columbia, Canada; TMP, Royal Tyrrell Museum of Palaeontology, Drumheller, Alberta, Canada; UAMZ, University of Alberta Museum of Zoology, University of Alberta, Department of Biological Sciences, Edmonton, Alberta, Canada.

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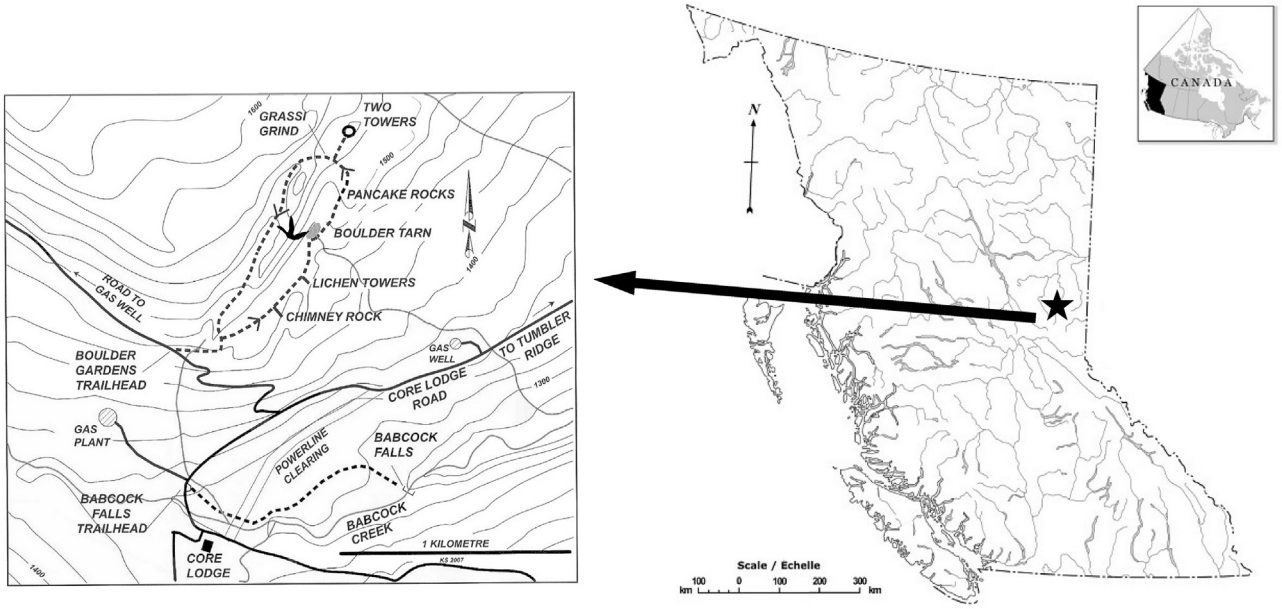

Fig. 1. Map showing the locality (bird track symbol) where the PRPRC 2005.15.001 slab was discovered. Provincial map modified from The Atlas of Canada website (http://atlas.gc.ca/site/html) made freely available via open government licence (http://open.canada.ca/en/open-government-licence-canada). The Boulder Garden trail map was modified from Helm (2008) with written permission of the author.

recently established Tumbler Ridge Global Geopark which is part of the Global Geoparks Network, supported by UNESCO. The slab was discovered embedded vertically and partially buried in the talus and soil at the base of a short, steep cliff. Most of the rocks in the Boulder Gardens recreational area are covered with lichen colonies as was also the case for a portion of the track face of this slab. At the time of discovery only the most distinct avian tracks and two theropod tracks were visible (see Fig. 2 of Buckley and McCrea, 2009).

The track slab was removed to the PRPRC via helicopter on October 4, 2005 and accessioned into the collections (PRPRC 2005.15.001). However, before the tracks could be studied a considerable growth of lichen on the track surface first had to be removed (see 2. Methods below). From observations of the replica cast and the original trackslab (Fig. 2) a trackway map was prepared (Fig. 3). Seventy-two avian prints, three theropod, and one small ornithopod dinosaur prints were mapped. Five avian trackways were discernable with between three to six footprints per trackway (Figs. 3 and 4). The avian prints are unusual in that digit II–III impressions exhibit higher divarications than that observed for digits III–IV, a characteristic that is also found in *Barrosopus slobodai* from Argentina (Coria et al., 2002).

The dinosaur footprints are small and at least two of them (Fig. 5) are identified as *Irenichnites gracilis*, originally described

Fig. 2. A view of a portion of PRPRC 2005.15.001, after cleaning, showing two small, tridactyl theropod tracks (*Irenichnites gracilis* PRPRC 2015.001.073 & 074) and many small tridactyl prints of avian affinity. Scale bar = 10 cm. Numbers correlate to those in the trackway map (Fig. 3).