

Geotourism: The Tourism of Geology and Landscape



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Design and setting by P.K. McBride

10 The Cretaceous fossil sites of South Korea: identifying geosites, science and geotourism

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Introduction

There are a range of natural resources for geotourism in Korea, including scenic mountains with variable geological histories, hot springs, and coastline environments. Many of the national and provincial parks and natural monuments in Korea have been designated because of their geological values. Three sites on Jeju Island have been inscribed on the World Heritage list largely for geological values such as volcanic features and landscape and associated scenic values. Furthermore, there are many geological heritage sites designated as natural monuments in Cretaceous sedimentary basins in Korea. They include dinosaur fossil sites and geologically scenic sites. The former are of great scientific importance and many have the potential to be developed into geotourism destinations of global significance. Five sites, on the Korean Cretaceous Dinosaur Coast which have been very important for regional tourism, are currently being nominated as World Heritage for their highly significant fossil trackways and dinosaur eggs.

The full gambit of geotourism potential for Korean geological heritage has rarely been studied (Jeong, 2000; Heo *et al.*, 2006a; Heo *et al.*, 2006b; Heo, 2007). In this chapter the Cretaceous geosites in Korea are summarized in respect to their importance as globally significant geotourism resources.

Cretaceous geological setting in South Korea

Since the late Paleozoic the eastern margin of the Asian continent, including the Korean Peninsula, was an Andean-type continental margin (Choi, 1986; Watson *et al.*, 1987). During the Early Cretaceous, northward subduction of the Paleo-Pacific (Izanagi) Plate located in the oceanside of Asia resulted in sinistral strike-slip movement on the continental margin (Watson *et al.*, 1987; Okada and Sakai, 1993), and generated a number of Cretaceous non-marine pull-apart basins in South Korea (Lee, 1999; Chough *et al.*, 2000). These basins consist of alluvial fans, fluvial plains, lacustrine deposits, and volcanic rocks. The Gyeongsang Basin located in the southeastern part of Korean

Peninsula is the largest, comprising about one fourth of South Korea and a 9000-metre-thick sequence of deposits assigned to the Gyeongsang Supergroup. It is divided into the Sindong, Hayang, and Yucheon groups, in ascending stratigraphical order (Chang, 1975).

To the north and west of the Gyeongsang Basin, more than 10 isolated, small and exclusively non-marine Cretaceous sedimentary basins occur along two to three north-east-southwest-trending megafaults. They are filled with tuffs, lava flows, and epiclastic deposits. The frequent intercalation of volcanic rocks in these basins indicate that they are time-correlated with the upper part of the Hayang Group to Yucheon Group in the Gyeongsang Basin.

The geological age of these Cretaceous deposits in South Korea ranges from Aptian to Maastrichtian (Paik *et al.*, 2001a; Jwa *et al.*, 2004; Kim *et al.*, 2005; Paik *et al.*, 2006; Lee *et al.*, 2008). During the Cretaceous, the Korean Peninsula was situated in mid-latitudes as it is today (Lee *et al.*, 1987; Kim *et al.*, 1993), and the general palaeoclimatic regime has been interpreted to have been warm and dry (Paik and Kim, 1997; Paik and Lee, 1998; Paik and Kim, 2006; Paik *et al.*, 2007). In these Cretaceous continental deposits, diverse paleontological and sedimentological records are preserved and are a rich source of Korean geoheritage for our understanding of the Cretaceous terrestrial environments of South Korea. Sites include fossils of dinosaurs, crocodiles, turtles, fishes, molluscs, insects, and wood and a variety of paleosols and sedimentary features.

Cretaceous geosites

The Cretaceous sites stand out amongst the geological heritage sites in South Korea. These include dinosaur, invertebrate, and plant fossil sites, inorganic sedimentary structure sites, unique geological feature sites, and scenic view sites (Figure 10.1).

Dinosaur sites include bone sites, egg sites, and footprint sites, with the dinosaur footprint sites being the most common. Eleven of the nation's Natural Monuments are designated as such for the unique and world-class scale of preservation of dinosaur footprints. Some of the dinosaur footprint sites are associated with bird-footprints. Gajinri is the largest of these sites (Figure 10.1). Most of the Cretaceous bird footprint taxa have been identified in Korea. At the Uhangri site, the largest pterosaur footprints and webbed bird-foot prints are associated in the same horizons (Hwang *et al.*, 2002). The representative dinosaur egg site is Bibongri site at Boseong County, in which dinosaur egg clutches are repeatedly preserved in several horizons and in association with turtle and dinosaur bones. Very extensive dinosaur trackways and egg sites exist mainly along the southern coast of the peninsula in Jeollanam-do and Gyeongsangnam-do provinces over a distance of about 180 kilometres. Some of the sites are protected as National Monuments and have been developed for public education.

Among these Cretaceous geosites, eight sites are particularly suitable for geoheritage status and geotourism development. The geological characteristics of each will now be considered in turn.

Haenam dinosaur site

The Haenam site is located along the Uhangri coast (Fossil site No. 9, Figure 10.1), and is renowned for the preservation of the first pterosaur tracks (*Haenamichnus uhangriensis*) ever discovered in Asia (Hwang *et al.*, 2002), the largest pterosaur tracks (about 30 cm long) ever found in Cretaceous rocks, the first discovery of web-footed bird tracks

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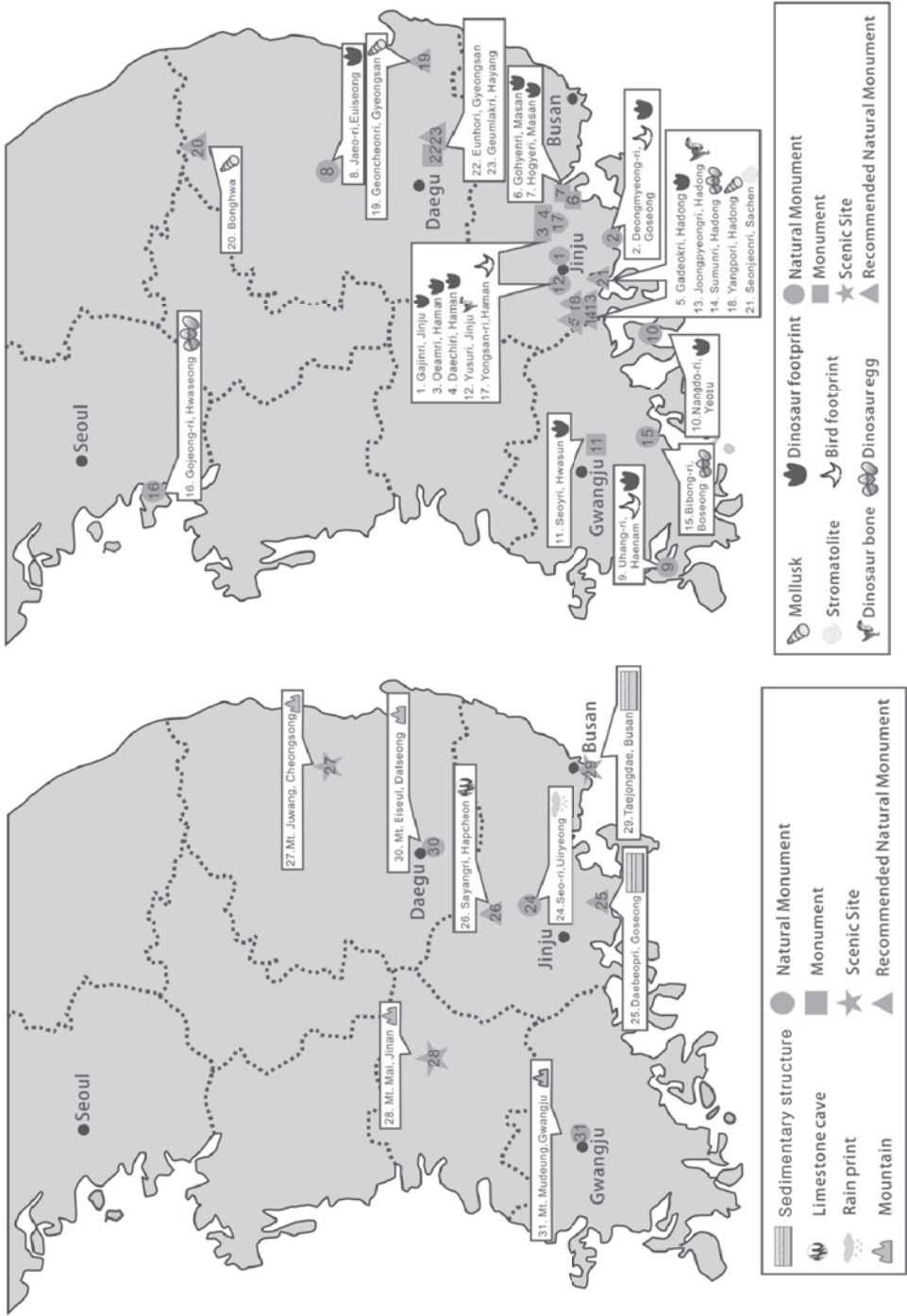


Figure 10.1: Cretaceous geology (left) and fossil (right) sites in South Korea for geotourism.

Chapter extract

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