Supplementary Information

Lizards ran bipedally 110 million years ago

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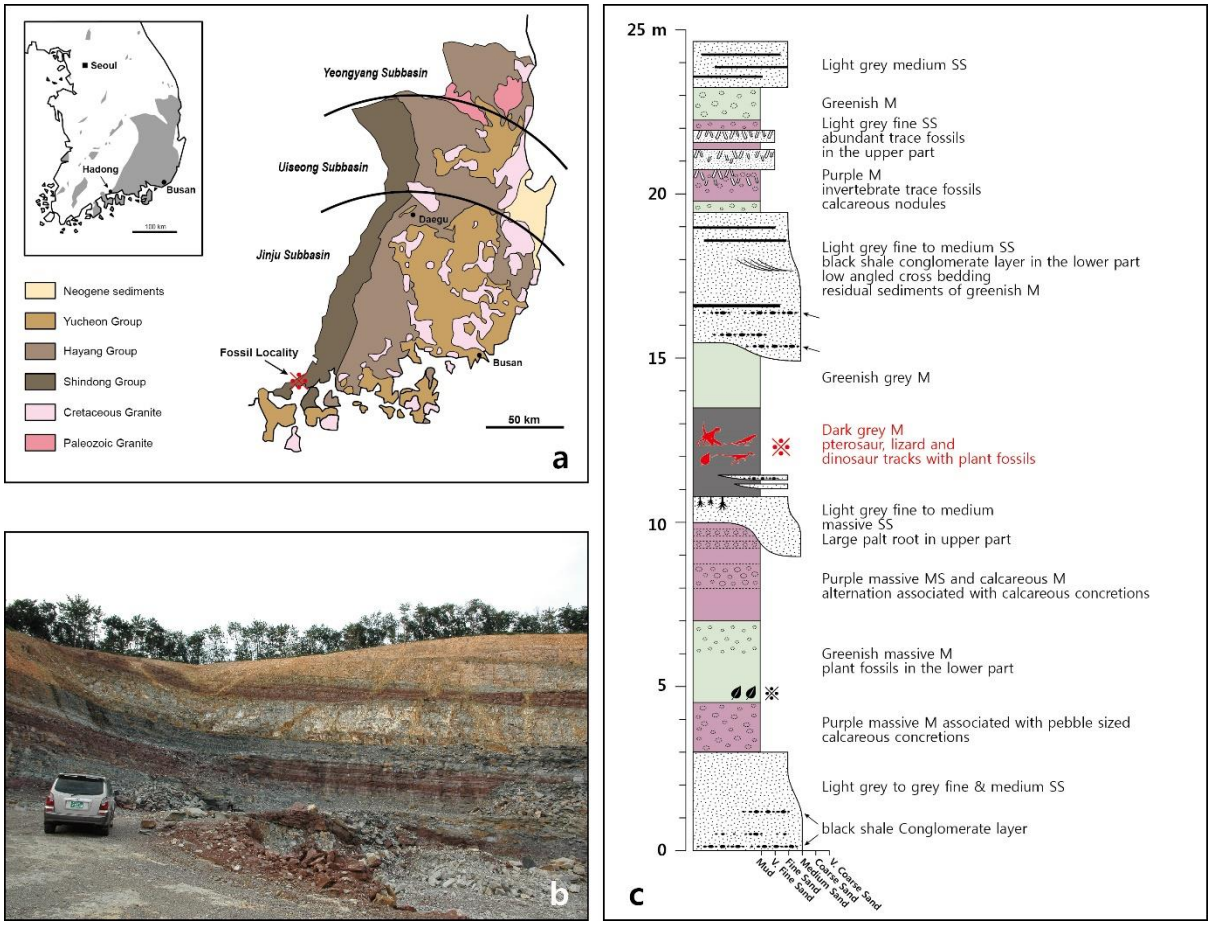
Remarks on ichnotaxonomy of "lizards"

Rhynchosauroides from the Late Permian to the earliest Jurassic and *Ganasauripus* from the Late Permian are the only well-known ichnotaxa attributed to a "lacertoid" track [1-3]. However, most characteristics of the ichnogenus *Rhynchosauroides* are not seen in the walking tracks of any modern lizards [4]. Since the ichnogenus *Rhynchosauroides* was first named for the Early Triassic footprints from the Helsby Sandstone, United Kingdom [5], it has been reported in Europe, North America, and South America from Late Permian [1] to Late Jurassic [3]. The diagnosis of this ichnite has been emended by different authors [1,2,6-8]. The ichnogenus *Ganasauripus* was proposed for pentadactyl footprints of a quadrupedal reptile from Upper Permian Arenaria di Val Gardena Formation, Italy [1]. Valentini and others distinguished *Ganasauripus* from *Rhynchosauroides* because the latter shows a mesaxonic pes and an ectaxonic manus, while in *Ganasauripus* the pes is ectaxonic and the manus is mesaxonic [1]. However, a new morphological phylogenetic study on early saurian evolution indicates that there is no valid Permian record for Lepidosauromorpha [9]. The molecules and fossil data also support a Triassic origin for Lepidosauria [10]. If it is true, Permian *Rhynchosauroides* and *Ganasauripus* could have been made by primitive saurians rather than lepidosauromorphs. *Rhynchosauroides* is the most abundant and common in Triassic formations. The *Rhynchosauroides* trackmakers have been suggested to be lepidosauromorphs (Rhynchocephalia) or primitive archosauromorphs (Prolacertiformes), but no general agreement about its zoological affinity yet [7,11]. Rhynchocephalia, a sister clade of Squamata (lizards, amphisbaenians, snakes), became increasingly restricted to southern continents from the Middle Jurassic [12]. It is hypothesized that most major subclades within Squamata originated in the Cretaceous postdating major continental fragmentation [10].

Recently, a new ichnotaxon, *Neosauroides koreanensis*, was named for a lacertiform trackway from the Upper Cretaceous Haman Formation from Korea [13]. It was diagnosed by mesaxonic pentadactyl manus prints (N=4) smaller than the ectaxonic pes prints (N=3). However, all pes traces of *N. koreanensis* are incomplete consisting only of the distal traces of digits II, III, and IV, so that there is no whole pes print information. Though these tracks are incomplete, comparison of

these tracks with the tracks described in this study show significant differences. For example, the difference between the lengths of the five digits and digit divarication between digits of *N. koreanensis* are different from those of *Sauripes handongensis*.



Supplementary Figure S1. Geological information of the fossil site**.** (**a)** Location map for the Lower Cretaceous lizard track locality in the Hasandong Formation, showing the position of the Cretaceous basins including the Gyeongsang Supergroup (modified from Lee et al., 2008) [14]. (**b)** Outcrop photograph of the fossil locality. (**c)** Geological section of the site indicating the lizard track-bearing level associated with pterosaur (*Pteraichnus koreanensis*) and theropod footprints, invertebrate traces, and plant fossils.

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