



Cypridea species (Crustacea, Ostracoda) from the Lower Cretaceous Jinju Formation of the Gyeongsang Basin, South Korea

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Abstract

Based on a large quantity of fossil material and more detailed description of the morphological features, two *Cypridea* species are recognized from the Jinju Formation of the Gyeongsang Basin: *Cypridea jinjuria* Choi, 1990 and *Cypridea samesi* n. sp. These two species do not co-occur and are endemic to South Korea. However, they share the same morphological feature, a swelling/node-like swelling at the anterior cardinal angle area, with some other *Cypridea* species from the Lower Cretaceous sediments of China and Mongolia. This may suggest a close relationship between these species. Paleobiologically, we infer a parthenogenetic reproduction mode for *Cypridea jinjuria* Choi, 1990 and *Cypridea samesi* n. sp., and suggest that the Jinju Formation was deposited under conditions with long hydroperiods.

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1. Introduction

Ostracods, small crustacean arthropods characterized by a bivalved carapace that can totally enclosed their soft body, have an excellent fossil record by virtue of their small size and calcite shells (valves) (e.g., Horne, 2004). *Cypridea* Bosquet, 1852 is a well-known Late Mesozoic non-marine ostracod genus (Kimmeridgian to Eocene) of the superfamily Cypridoidea, and the extinct family Cyprideidae (Sames, 2011a). It is globally distributed except in Antarctica and Australia (Horne and Colin, 2005; Sames, 2011a). Recently, several studies of the genus *Cypridea* have recognized morphologic variants, which either represent sexual dimorphs, ontogenetic stages or ecophenotypes (e.g., Nye et al., 2008; Sames, 2011a; Wang et al., 2013, 2017).

Non-marine ostracods from the Jinju Formation of the Gyeongsang Basin have been studied by several authors (e.g., Paik et al., 1988; Choi, 1990; Seo, 1996; Choi and Huh, 2016). Many typical Mesozoic genera were recorded by previous studies; however, neither cytheroidean nor darwinuloidean ostracods were found in this formation. Paik et al. (1988) concluded that the ostracod fauna from the Jinju Formation was dominated by species of *Cypridea* and is very closely related to the Cretaceous ostracod fauna of China. However, Paik et al. (1988) could not produce more detailed taxonomic and biostratigraphic results, because of the lack of well-preserved specimens. Two years later, Choi (1990) described some non-marine fossils (charophytes, clam shrimps, and ostracods) from the Gyeongsang Basin, including a new ostracod species from the Jinju Formation, *Cypridea (Pseudocypridina) jinjuria*.

Here, we restudy original material of *Cypridea jinjuria* Choi, 1990. In addition, on the basis of newly collected samples from the Jinju Formation, we also describe the new species *Cypridea samesi* n. sp.

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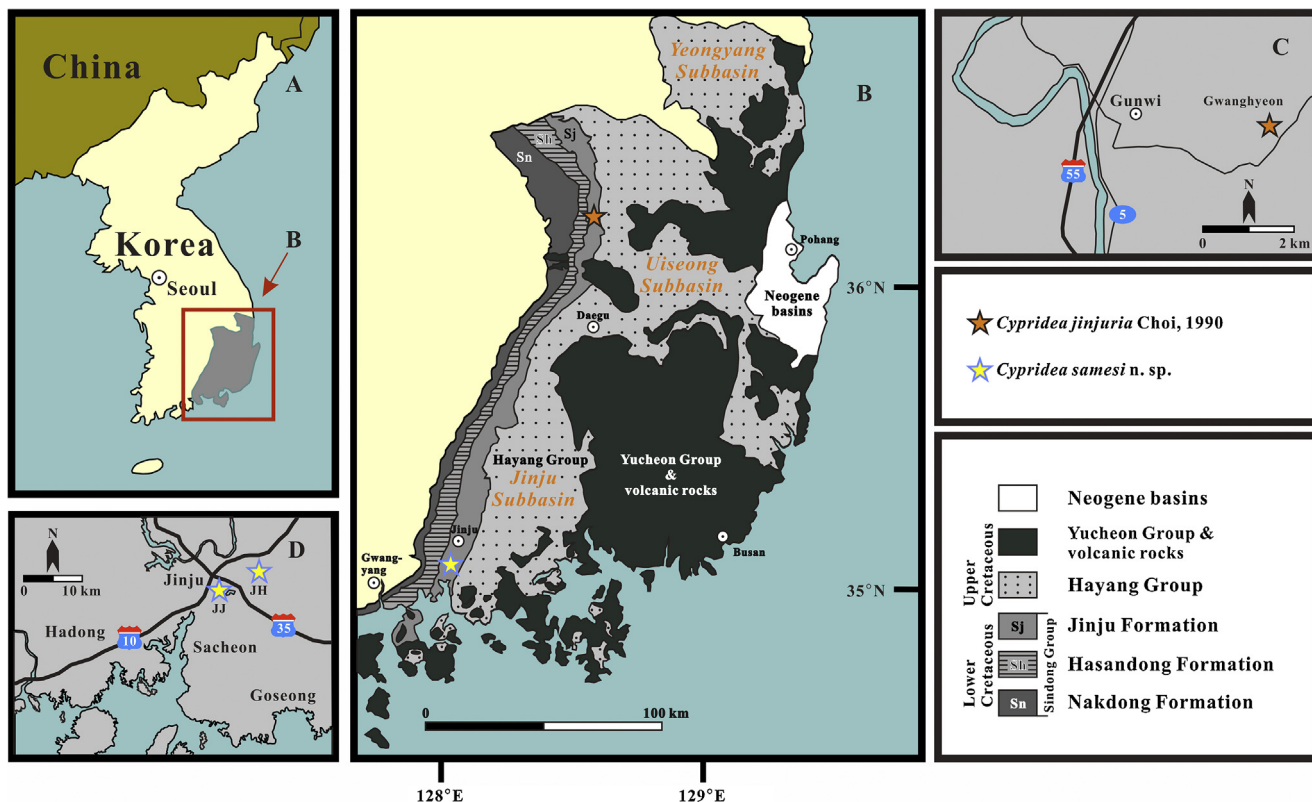


Fig. 1. (A) Location map of the Gyeongsang Basin, southeastern Korean Peninsula. (B) Geological map of the Gyeongsang Basin and fossil localities. (C) Location map of Gwanghyeon section in Gunwi County. (D) Location map of Jeongchon (JJ) and Hotan (JH) sections in Jinju City (modified from Lee et al., 2010).

2. Geological setting

Non-marine Cretaceous (Barremian–Campanian) sedimentary rocks are widely distributed in the Gyeongsang Basin (e.g., Chang, 1975; Kang and Paik, 2013), located in the southeastern part of the Korean Peninsula (Fig. 1). According to Chough and Sohn (2010), the Gyeongsang Basin is divided into the three subbasins (Jinju, Uiseong, and Yeongyang). The sedimentary successions of the Jinju Subbasin are subdivided into the Nakdong, Hasandong, Jinju, Chilgok, Silla, Haman, and Jindong formations (in ascending order). The sedimentary sequence of the Uiseong Subbasin consists of ten formations (in ascending order): the Nakdong, Hasandong, Jinju, Iljik, Gumidong, Gugyedong, Jeomgok, Sagok, Chunsan, and Shinyangdong formations (Chough and Sohn, 2010). The studied material was collected from the Jinju Formation of the Jinju and Uiseong subbasins.

The Jinju Formation is the upper part of the Sindong Group (Fig. 1), which is composed mainly of gray to black shale, mudstone and gray to dark gray coarse or pebbly sandstone (Chough and Sohn, 2010). This formation was deposited in a fluvio-lacustrine environment (see Choi, 1986; Paik, 2005; Chough and Sohn, 2010; Lee et al., 2010). Palynological studies suggest a “Neocomian” (in the sense of pre-Aptian Early Cretaceous including all four stages from the Berriasian to Barremian (Sames et al., 2010)) (Choi, 1985; Choi and Park, 1987) or Barremian (Yi et al., 1994) or Aptian–Albian (Yi et al., 1993) age of the Jinju Formation. According to radiometric dates, the

Jinju Formation is Albian (Lee et al., 2010; Kim et al., 2011; Kang and Paik, 2013). The Jinju Formation yields many vertebrate (dinosaurs, pterosaurs and fishes), invertebrate (insects, crustaceans and molluscs), plant, and trace fossils (Choi, 1990; Yun and Yang, 2001, 2004; Baek and Yang, 2004; Kim et al., 2012; Park et al., 2012, 2013; Selden et al., 2012; Kim et al., 2014; Lee, 2017).

3. Localities and material

The reference material of *C. jinjuria* of Choi (1990), hitherto unfigured, has been restudied herein by kind permission of Dr. Sung-Ja Choi (Korea Institute of Geoscience and Mineral Resources (= KIGAM)). Choi (1990) discovered *C. jinjuria* from the Gwanghyeon section of the Jinju Formation located in Gunwi County, Gyeongsangbuk-do Province, South Korea (Fig. 1). However, details of the Gwanghyeon section remain uncertain, because only the locality was given in Choi (1990). Although the type section has been visited by the first author, it was very difficult to identify the outcrop (BDC pers. observ., March 2015). Specimens of *Cypridea samesi* n. sp. were collected from two sections several kilometers apart (Hotan section [JH], sample number Hotan-1, N35°09'36", E128°07'26" and Jeongchon section [JJ], sample number JJ-1-2, N35°07'–35°08', E128°05'–128°06'). Both sections are located in Jinju City, Gyeongsangnam-do Province, South Korea (Figs. 1 and 2; see Ha et al., 2015; Choi and Huh, 2016).

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