

Mode of occurrence and taphonomy of the heteromorph ammonite *Pravitoceras sigmoidale* Yabe from the Upper Cretaceous Izumi Group, Japan



Kohei Yoshino ^{a, b, *}, Atsushi Matsuoka ^c

^a Graduate School of Science and Technology, Niigata University, Niigata 950-2181, Japan

^b State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences, Beijing 100083, China

^c Department of Geology, Faculty of Science, Niigata University, Niigata 950-2181, Japan

ARTICLE INFO

Article history:

Received 30 July 2015

Received in revised form

2 February 2016

Accepted in revised form 5 February 2016

Available online 2 March 2016

Keywords:

Campanian

Ammonoidea

Nostoceratidae

Turbidity currents

Transportation

ABSTRACT

The heteromorph ammonite *Pravitoceras sigmoidale* Yabe, of the family Nostoceratidae, is the zonal marker of the upper Campanian *P. sigmoidale* Zone in southwest Japan, and is the main component of ammonite assemblages in this zone. We explain the taphonomic processes underlying the occurrence of *P. sigmoidale* in the Izumi Group, specifically in the Minato (Awaji Island), Anaga (Awaji Island), Koike–Omoizaki (Shikoku), and Hidonodani sections (Shikoku). The first two sections consist mainly of the non-turbiditic Northern Marginal Facies (NMF), while the latter two sections comprise the Main Facies (MF), a turbiditic facies deposited in waters deeper than those of the NMF. We recognise three modes of occurrence of *P. sigmoidale*, as follows: (1) In nodules crowded with *P. sigmoidale* (NCP); this mode occurs only in the NMF, and includes juvenile and adult specimens, together with other ammonites such as *Solenoceras* (*Oxybeloceras*) aff. *humei* (Douvillé), (2) In mudstone with isolated *P. sigmoidale* (MIP), which is found in all of the sections studied, (3) In sandstone with isolated *P. sigmoidale* (SIP), which occurs only in the MF. Adult individuals of *P. sigmoidale* are dominant in most of the sections, while juveniles were observed only in the Minato section, which originally was closer to land areas. The number of specimens of *P. sigmoidale* and *Solenoceras* spp. tends to increase in sections representing depositional environments proximal to terrestrial areas. Ammonite assemblages could have been transported from shallow- to deep-water settings by turbidity currents. The sorting of components by transport processes likely contributed to the formation of these fossil assemblages in different areas. This is an important clue to understanding the habitat of heteromorph ammonite life assemblages consisting mainly of *P. sigmoidale*.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

The whorl shell of the nostoceratid *Pravitoceras sigmoidale* Yabe (see Matsumoto et al., 1981) consists of a nearly planispiral phragmocone and a subsequent S-shaped hook. Most specimens of *P. sigmoidale* have been found in the Izumi Group on Awaji Island and in Shikoku (Fig. 1). Moreover, one specimen is known from the Yezo Supergroup in the Hidaka area, Hokkaido (Matsunaga et al., 2008).

* Corresponding author. Graduate School of Science and Technology, Niigata University, Niigata 950-2181, Japan. Tel.: +81 25 262 6197; fax: +81 25 262 6194.
E-mail address: tom.srt.km@gmail.com (K. Yoshino).

Yabe (1902) gave the first description of *P. sigmoidale* obtained from the Anaga area on Awaji Island. Matsumoto et al. (1981) redescribed this species on the basis of better-preserved specimens discovered in the Minato area on the same island. They discussed its taxonomic position, geological age, habitat, and the helical coiling of juveniles. Morozumi (1985) utilised *P. sigmoidale* in defining ammonite zones in the Izumi Group (Figs. 1, 2). The species is a useful zonal marker in the Izumi Group, because it is the most abundant late Campanian ammonite. Its stratigraphic range is restricted to a very narrow interval within this stage.

The lifestyle of *P. sigmoidale* has been discussed by previous works. Matsumoto et al. (1981) argued that the species probably had a benthic mode of life, judging from its peculiar shell form. On the other hand, Misaki et al. (2014) observed that anomiid bivalves

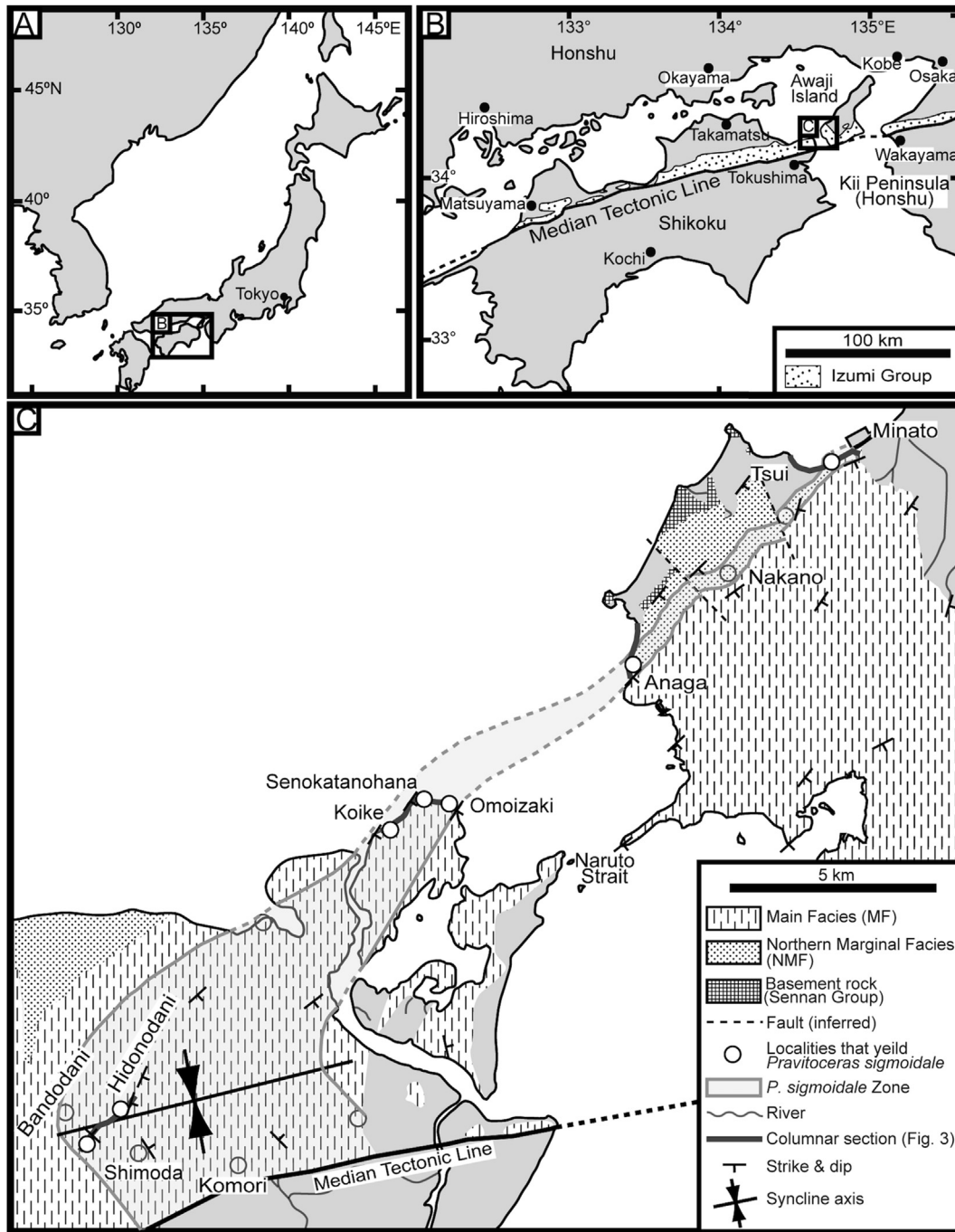


Fig. 1. Location of the Izumi Group. (A) Map of Japan showing the outcrop region of the Izumi Group. (B) Distribution of the Izumi Group on Awaji Island and in Shikoku. The location of the study area is indicated by the rectangle. (C) Distribution of the Northern Marginal Facies (NMF) and the Main Facies (MF) from eastern Shikoku to southwestern Awaji Island. Except for data from sections obtained in the present work, the lithofacies, geological structures, and localities yielding *Praviticeras sigmoidale* are based on [Matsumoto et al. \(1981\)](#), [Bando and Hashimoto \(1984\)](#), [Kikuchi and Kotake \(2013\)](#) and [Hashimoto et al. \(2015\)](#). The *P. sigmoidale* Zone continues into the NMF on Awaji Island and the MF on Shikoku.

adhere to both sides of *P. sigmoidale* from mudstone beds and that there were no signs of strong current- or wave-induced reorientation of shells. Based on the modes of occurrences, [Misaki et al. \(2014\)](#) suggested that the ammonites were buoyant, with the bivalves attaching to the ammonite during life.

Praviticeras sigmoidale dominates late Campanian ammonite assemblages in part of the Izumi Group on Awaji Island and in Shikoku ([Fig. 1](#)); planispiral ammonites are rare in *P. sigmoidale*-bearing horizons. Thus, the Izumi Group is favourable for studies of the taphonomy of this species. Here, we describe fossil

assemblages composed of *P. sigmoidale* and other ammonite species, co-occurring anomiid bivalves, and host rocks in four studied sections on Awaji Island and in Shikoku to discuss the taphonomic processes affecting ammonite assemblages. Our main conclusion is that ammonite life assemblages probably existed closer to land areas, and that fossil assemblages originated from there. The latter, which consist mainly of adult individuals, were formed by sorting of components by transport processes from shallow- to deep-water environments by turbidity currents.

Download English Version:

<https://daneshyari.com/en/article/4746640>

Download Persian Version:

<https://daneshyari.com/article/4746640>

[Daneshyari.com](https://daneshyari.com)