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Coniacian–Santonian stratigraphy in Japan: a review

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Abstract

The Coniacian–Santonian stratigraphy of Japan is briefly reviewed. The Coniacian is subdivided into three zones by inoceramids and ammonoids, respectively, and the Santonian consists of a single inoceramid zone, subdivided into two ammonoid zones. The boundary marker species of the Coniacian/Santonian, i.e., *Inoceramus* (*Platyceramus*) *undulatoplicatus*, proposed by the Subcommission on Cretaceous Stratigraphy, is still undiscovered in Japan. It is only possible to indicate the approximate location of the boundary between the two stages. Further research on macrofossils, microfossils and, additionally, carbon isotope stratigraphy are required in order to determine the precise location of Coniacian/Santonian boundary in Japan.

Keywords: Coniacian; Santonian; Cretaceous; Stage boundary; Inoceramids; Ammonoids; Foraminifera; Carbon isotope stratigraphy; Japan

1. Introduction

In 1995, the Subcommission on Cretaceous Stratigraphy (SCS) of the International Commission on Stratigraphy (ICS) of the International Union of Geological Sciences (IUGS) held the ''Second International Symposium on Cretaceous Stage Boundaries'' in Brussels. Unfortunately, the upper part of the Upper Cretaceous in Japan does not yield global basal marker fossils for each stage, as defined by the SCS at this symposium (Rawson et al., 1996). Since the symposium, our knowledge of Upper Turonian–lowest Campanian stratigraphy in Japan (Fig. 1) has been gradually increasing (e.g., Shibata and Uchiumi, 1995; Noda, 1996a,b; Noda and Matsumoto, 1998; Toshimitsu et al., 1998; Hasegawa and Hatsugai, 2000). However, the stage boundary problem of the Coniacian/Santonian is still unresolved, as in the Russian Far East (Yazykova and Zonova, 2002) because the marker species, *Inoceramus* (*Platyceramus*) *undulatoplicatus* Roemer (=''*Cladoceramus undulatoplicatus*''), proposed by the Santonian Working Group of the SCS (Lamolda and Hancock, 1996) has not been found. Here we briefly review the present state of Coniacian–Santonian stratigraphy in Japan.

2. Coniacian stratigraphy

The Japanese Coniacian is represented by the *Inoceramus uwajimensis–I. mihoensis* Zone, which is further subdivided into three subzones: *I. rotundatus*, *I. uwajimensis* (= the interval between the ranges of *I. rotundatus* Fiege and *I. mihoensis* Matsumoto in this case), *I. mihoensis* [or *I. mihoensis–I.* (*Cordiceramus*) *kawashitai*] in ascending order (Fig. 2; Toshimitsu et al., 1995). These three subzones are assigned to the *Forresteria petrocoriensis*, *Forresteria alluaudi* and *Paratexanites orientalis* ammonoid zones, respectively (e.g., Toshimitsu et al., 1995). Noda (1996a,b) cited five important species, *I.* (*Inoceramus*) *lusatiae* Andert, *I.* (*Volviceramus*) *koeneni* Müller, *I.* (*Cremnoceramus*) *deformis* Meek, *I.* (*Cr.*) *ernsti* Heinz, and *I.* (*Cr.*) *lueckendorfensis* Tröger, which are known in the Euro-American Lower–Middle Coniacian. Noda and

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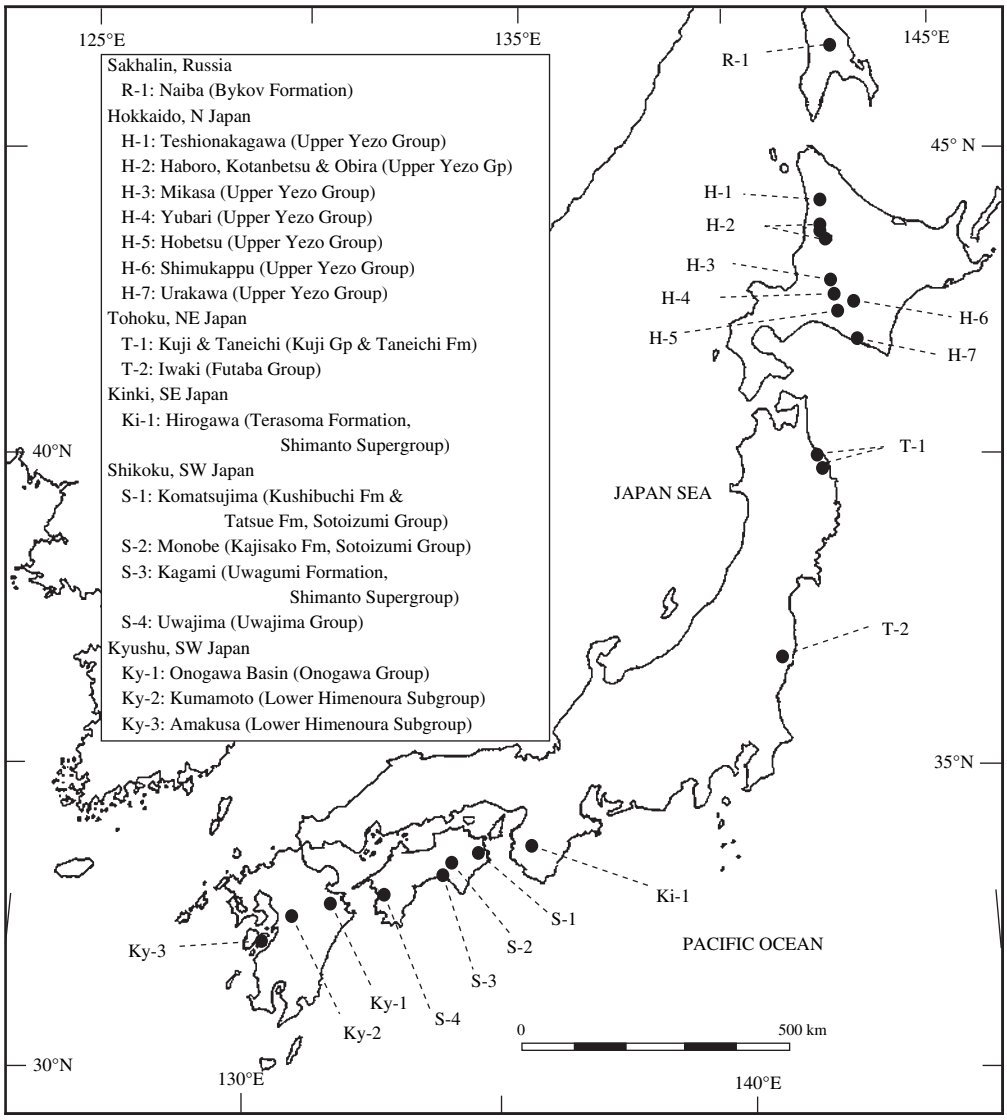

Fig. 1. Distribution of the selected areas (solid circles) of Coniacian–Santonian (and lower Campanian) marine strata in Japan and adjacent Sakhalin.

Matsumoto (1998) described the Lower–Middle Coniacian inoceramid biostratigraphy of the Japanese Cretaceous in detail (see Fig. 2).

Inoceramus (*Magadiceramus*) cf. *subquadratus* Schlüter occurs in the Onogawa Group in Kyushu (Teraoka et al., 1992; Noda, 1994), and *I.* (*Ma.*) aff. *subquadratus* in the Terasoma Formation of the Hirogawa area in Kinki (Matsumoto and Yoshimatsu, 1982), southwest Japan (Fig. 1), but they are not found in Hokkaido, northeast Japan. *I.* (*Ma.*) *subquadratus* has been considered to indicate the uppermost part of the Coniacian (e.g., Seitz, 1970). Tröger (2002), however, preferred not to regard its zone as topmost Coniacian.

3. Santonian–Lower Campanian stratigraphy

The Coniacian/Santonian stage boundary in Japan is situated at the boundary between the *Inoceramus uwajimensis-I. mihoensis* Zone and the *I. amakusensis* Zone, which is assigned to the base of the *Texanites collignoni–T. quinquenodosus* Zone (e.g., Toshimitsu et al., 1995), although there is some disagreement about this (Lamolda and Hancock, 1996). As *Inoceramus* (*Platyceramus*) *undulatoplicatus* does not occur in Japan, we are unable to determine the precise location of the Coniacian/Santonian boundary at present. In the inoceramid biostratigraphy, the Santonian consists of a single zone, whereas two ammonite zones are recognized in the stage: *Texanites collignoni* Kennedy and Klinger–*T. quinquenodosus* (Redtenbacher) below and *Plesiotexanites kawasakii* (Kawada)–*P. pacificus* (Matsumoto) above (Fig. 2; Toshimitsu, 1988). The Santonian/Campanian boundary is defined by the boundary between the zones of *Inoceramus amakusensis* Nagao and Matsumoto and *I.* (*Platyceramus*) *japonicus* Nagao and Matsumoto, although the index species of the latter resembles Santonian *I.* (*P.*) *undulatoplicatus*. The base of the *I.* (*P.*) *japonicus* Zone is at almost the same level as that of the *Submortoniceras* cf. *Condemyi–Menabites mazenoti* Zone and the first occurrence of typical *Globotruncana arca* (Cushman) in northwest Hokkaido. This is regarded as the base of the Campanian in Japan