

Phylogenetic relationship of *Alexandrium tamiyavanichii* (Dinophyceae) to other *Alexandrium* species based on ribosomal RNA gene sequences

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Received 2 December 2001; received in revised form 12 January 2002; accepted 5 February 2002

Abstract

The phylogenetic relationship of the thecate PSP-toxin producing dinoflagellate *Alexandrium tamiyavanichii* Balech to other species of *Alexandrium* was studied based on nucleotide sequences of the ITS1, ITS2, 5.8S, 18S and 28S subunits of the ribosomal RNA gene. These are the first such sequences available for *A. tamiyavanichii*, which is one of the producers of paralytic shellfish poisoning toxins in tropical waters. Based on the nucleotide sequences of the 28S, 18S and 5.8S subunits of the rRNA gene, *A. tamiyavanichii* grouped together with *A. tamarensense*, *A. catenella* and *A. fundyense*. More interestingly, *A. tamiyavanichii* was most closely affiliated to *A. tamarensense* isolates from Thailand. This result reaffirmed conclusions from previous studies that, for the *A. tamarensense/fundyense/catenella* species complex, geographical origin rather than morphology seems to determine genetic relatedness. Results of this study also suggest that *A. tamiyavanichii* most probably belongs to the same species complex. Ribosomal RNA gene sequences do not separate the PSP toxin producing from the non-producing species of *Alexandrium*. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: *Alexandrium tamiyavanichii*; Phylogenetic relationship; Ribosomal RNA gene; Paralytic shellfish poisoning

1. Introduction

Several marine dinoflagellate species are known to produce toxins that cause paralytic shellfish poisoning (PSP). Most of these species belong to the thecate genus *Alexandrium* Halim. *Pyrodinium bahamense* Plate var. *compressum* Böhm is currently the only other thecate genus known to produce PSP

toxins, while of the athecate dinoflagellates only *Gymnodinium catenatum* Graham is currently known to cause PSP. In Malaysia and several other tropical Pacific countries, the most important PSP-toxin producing species is *Pyrodinium bahamense* var. *compressum* (Usup and Azanza, 1998). In the Straits of Malacca, however, there is evidence that PSP events there are due primarily to *A. tamiyavanichii*. Kodama et al. (1988) also previously reported the presence of *A. tamiyavanichii* in Thailand waters.

Alexandrium is arguably the most important harmful algal bloom (HAB) species, based on the number of species involved and their extensive geographical distribution. It is, thus, not surprising that many studies

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