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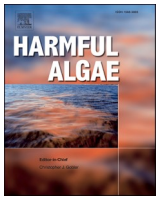

Original Article

Two toxigenic *Ostreopsis* species, *O.* cf. *ovata* and *O. siamensis* (Dinophyceae), from the South China Sea, tropical Western Pacific

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ABSTRACT

In the dinophyte genus *Ostreopsis*, seven out of 11 described species are known to produce various toxic compounds that were characterized in the palytoxins family. Species in the genus shared identical thecal plate patterns but differed in size, shape, and thecal plate ornamentation. Two species, *O.* cf. *ovata* and *O. siamensis*, have been reported from the Western Pacific, but information on toxin production is scarce. Here, we established nine strains of *Ostreopsis* from six localities in the South China Sea (SCS), covering the Gulf of Thailand, northern SCS (Hainan Island, Beibu Bay), and southern SCS (Peninsular Malaysia). Their morphology was examined by light and electron microscopy and the molecular phylogeny was inferred based on the LSU rDNA (D1-D3) and ITS rDNA sequences using maximum likelihood and Bayesian inference. Both *O.* cf. *ovata* and *O. siamensis*, albeit morphologically closely related, can be distinguished by a feature of the thecal pores with pronounced ridges in the latter. Molecular data further supported their species identity. Toxin production in the strains was examined by LC-MS/MS. *O.* cf. *ovata* strain T5PRBost02 was observed to produce Ovatoxin-k and Ovatoxin-j2 only; while Ostreocin-B and Ostreocin-D was produced by *O. siamensis* strain T10PRBost04. This is the first report confirming the production of palytoxins analogs in *Ostreopsis* species from the region.

1. Introduction

Some species in the genus *Ostreopsis* Johs. Schmidt are known to produce toxic compounds which are chemical analogues of palytoxin (PlTX), the most potent marine biotoxins (Ciminiello et al., 2010; Ramos and Vasconcelos, 2010; García-Altares et al., 2015; Gladan et al., 2019). In the Mediterranean coasts, different ovatoxins (OVTXs) and isobaric PlTX have been reported in mussels, sea urchins and omnivorous or herbivorous fish (Alligizaki et al., 2008; Tubaro et al., 2011; Amzil et al., 2012; Bire et al., 2013; 2015), and ovatoxins can be aerosolized and dispersed in the air (Ciminiello et al., 2014; Medina-Pérez et al., 2020). For the past two decades, *Ostreopsis* species have been reported to form massive high-biomass blooms in some coastal areas, particularly in the Mediterranean and Brazilian beaches, causing deleterious impacts to the marine ecosystems, human health, and the socio-economy (Pavaux et al., 2020 and references there in).

The dinophyte genus *Ostreopsis* was established a century ago (Schmidt, 1901), with the type species *O. siamensis* Johs. Schmidt described from plankton samples collected using a fine silk net near the Chang Islands, the Gulf of Thailand (Schmidt, 1901). However, in the recent past, many of the species have been described as epiphytes that inhabited benthic substrates such as sands and macroalgae (e.g., Faust et al., 1996; Leaw et al., 2001). The genus currently consists of 11 formally accepted species (Guiry and Guiry, 2021). They were delimited based on the subtle morphological distinction in cell size, shape, and the ornamentation of thecal plates (Fukuyo, 1981; Quod 1994; Faust and Morton, 1995; Faust et al., 1996; Faust, 1999), while some recently described species were delineated with the inclusion of molecular genetic information (Accoroni et al., 2016; Verma et al., 2016). Nonetheless, the taxonomy of some species in the genus remains elusive, as

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