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First Record of Marine Dinoflagellate, *Alexandrium Tamutum* (Dinophyceae) from Malaysia

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ABSTRACT Several species of dinoflagellates in the genus *Alexandrium* are known to be toxic, and have been associated with paralytic shellfish poisoning (PSP) in Malaysia. These *Alexandrium* species showed high morphological similarity among the toxic and non-toxic species, and detailed observation of the thecal plate's arrangement is required for precise species identification. Co-occurrence of the toxic and non-toxic species has complicated the plankton monitoring of PSP. In this study, a clone of *Alexandrium* species was established from plankton samples collected from Kota Belud, Sabah. The specimen was observed under epi-fluorescence microscope, and nucleotide sequences of the nuclear-encoded ribosomal RNA gene obtained. Morphologically, the clone showed relatively wide and large sixth precingular plate (6′′) compared to that of *A. minutum*. The sulcal posterior plate (Sp) is similar to that of *A. minutum*, which is wider than long. The first apical plate (1′) is irregularly rhomboidal with a small ventral pore (vp) present on its right margin. The morphological characters resembled to the species description of *A. tamutum*. Phylogenetic analysis of the ITS rDNA region also revealed a monophyly of this clone with other strains of *A. tamutum*, and separating them from the *A. minutum* clade. Species-specific sequence signatures of *A. tamutum* were obtained *in silico*, which could be as potential oligonucleotide probe regions for species detection by using molecular tool. This represents the first report of *A. tamutum* found in Malaysian waters.

(*Alexandrium tamutum*, *A. minutum*, Sabah, Malaysia, thecal plates)

INTRODUCTION

Harmful algal bloom (HABs) is a natural phenomenon due to increase in density of phytoplankton resulted in adverse effect to the ecosystem. Contamination of biotoxins from the phytoplankton may lead to shellfish poisoning when the toxins are transferred to human via the shellfish vectors. In Malaysia, the most frequently reported seafood intoxication associated with algal toxins is paralytic shellfish poisoning (PSP) [1]. PSP is caused by the consumption of contaminated shellfish such as mussels, clams, oyster, scallop or other filter feeders [2, 3]. The PSP toxin, collectively called Saxitoxins (STXs), is a group of toxin family that blocks the voltage gated sodium channels in mammalian nerve cells and inhibits nerve conduction, which may lead to paralysis of the neuromuscular system [4].

Bloom of the marine dinoflagellate, *Pyrodinium bahamense* var. *compressum*, in Brunei Bay and the subsequent PSP incidence in Sabah [5], was the first record of HABs and PSP in Malaysia. Whilst in Peninsular Malaysia, poisoning case was first reported in 1991 when people consumed the green mussel, *Perna viridis,* cultured at a mussel farm in Sebatu, Malacca. In September 2001, poisoning case including one fatality was reported from Tumpat, Kelantan, a coastal lagoon of the east coast of Peninsular Malaysia. The intoxication was due to the consumption of contaminated benthic bivalve, *Polymesoda* sp. (local name, '*lokan'*) [6].

In this study, a marine dinoflagellate from the genus *Alexandrium* was morphologically and molecularly characterized. Samples were obtained from Kota Belud, Sabah, Malaysia, and clonal cultures of the dinoflagellate species were established. Both preserved and field samples were observed under an epi-fluorescence microscope. Clonal cultures were further analyzed based on the nucleotide sequences of ribosomal RNA genes (rDNA). Genomic DNA was extracted, and the