First report of *Biecheleriopsis adriatica* in Bolinao, Northwestern Philippines and its wide distribution in Southeast Asia and adjacent waters

Garry A. Benico[1], Kazuya Takahashi[2], Wai Mun Lum[1], Aletta T. Yñiguez[3], Rhodora V. Azanza[3], Sandric Chee Yew Leong[4], Po Teen Lim[5], Mitsunori Iwataki[2]

[1] Graduate School of Agricultural and Life Sciences, University of Tokyo, Tokyo, Japan

[2] Asian Natural Environmental Science Center, University of Tokyo, Tokyo, Japan

[3] Marine Science Institute, University of the Philippines Diliman, Quezon City, Philippines

[4] St. John's Island National Marine Laboratory, Tropical Marine Science Institute, National University of Singapore, Singapore

[5] Bachok Marine Station, IOES, University of Malaya, Bachok, Malaysia

ABSTRACT

Morphology and phylogeny of the marine woloszynskioid dinoflagellate *Biecheleriopsis adriatica*, collected from Philippines, Singapore, Palau and Japan, were examined by using light and scanning electron microscopy (SEM), and molecular phylogeny based on rDNA sequences. Cells of these cultures were ovoid to spherical, measured 11.5–17.3 µm in length, with a displaced cingulum, a sigmoid sulcus and an eyespot. Cells have an elongate apical vesicle (EAV) mostly 3.1–3.8 µm in length with globular knobs up to 32, and straight lower cingular margin in the dorsal side. These morphological characters were identical to those of *B. adriatica* previously reported from the Adriatic Sea, China, Japan and Korea. Molecular phylogeny based on sequences of ITS and LSU rDNA revealed that the culture isolated from Bolinao, Philippines positioned in a clade with *B. adriatica*. Cultures isolated from Japan, Palau and Singapore had the identical morphological characters under light microscopy, and cultures investigated were positioned in *B. adriatica* clade in the phylogenetic tree of ITS and LSU rDNA. *B. adriatica* co-occurred with a bloom of *Takayama* sp. associated with mass mortality of farmed milkfish in May 2016 in Bolinao, Philippines. Based on existing data, this species is unlikely the culprit responsible for the massive fish kill event but the results suggest the need for further study to clarify its role in the overall dynamics of algal blooms in Bolinao. The results also show the wide distribution of *B. adriatica* in Southeast Asia and adjacent waters.

KEYWORDS

Biecheleriopsis adriatica, dinoflagellate, distribution, harmful algal blooms, Southeast Asia, Suessiaceae

INTRODUCTION

The genus *Biecheleriopsis* Moestrup, Lindberg et Daugbjerg is a woloszynskioid dinoflagellate first described from the Adriatic Sea, with the type species *Biecheleriopsis adriatica* Moestrup, Lindberg et Daugbjerg (Moestrup et al. 2009b). Woloszynskioid dinoflagellates have intermediate numbers of amphiesmal vesicles between unarmored and armored dinoflagellates and usually possess thin thecal plates, and are thus often referred to as thin-walled dinoflagellates (Fensome et al. 1993). *Biecheleriopsis* is assigned to the family Suessiaceae, characterized by having a single elongate apical vesicle (EAV) and type E eyespot, which distinguish them from the other woloszynskioid families Borghiellaceae and Tovelliaceae (Moestrup and Daugbjerg 2007; Moestrup et al. 2009a, b). In the Suessiaceae, *B. adriatica* has the superficial resemblance with marine species of other genera, especially *Ansanella* and *Biecheleria*, because of similar cell length and number of latitudinal amphiesmal vesicle (AV) series (Moestrup et al. 2009a, b; Siano et al. 2010; Jang et al. 2017). The diagnostic character of *B. adriatica* from other suessiaceans observed in the original material is the presence of nuclear connective in the flagellar apparatus (Moestrup et al. 2009b). Another feature to identify *B. adriatica* is the straight lower margin of the cingulum, which has been observed as zig-zag shaped in other genera of the family (Takahashi et al. 2014).

Since the first description of *B. adriatica* from the Adriatic Sea, it has so far been isolated from at least thirteen sampling locations in Japan, Korea and China (Takahashi et al. 2014; Jang et al. 2015; Luo et

Corresponding Author:
Mitsunori Iwataki, Asian Natural Environmental Science Center, University of Tokyo, Tokyo, Japan ; *Email:* iwataki@anesc.u-tokyo.ac.jp