

Diversity of dinoflagellate blooms in reef flat tide pools at Okinawa, Japan

Md. Mahfuzur Rahman SHAH¹, James Davis REIMER^{2,3}, Takeo HORIGUCHI⁴, and Shoichiro SUDA^{5,*}

¹ Graduate School of Engineering and Science, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa 903-0213, Japan

² Rising Star Program, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa 903-0213, Japan

³ Marine Biodiversity Research Program, Institute of Biogeosciences, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), 2-15 Natsushima, Yokosuka, Kanagawa 237-0061, Japan

⁴ Department of Natural History Sciences, Faculty of Science, Hokkaido University, Sapporo 060-0810 Japan

⁵ Department of Chemistry, Biology and Marine Science, Faculty of Science, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa 903-0213, Japan

* Corresponding author: S. Suda

E-mail: sudas@sci.u-ryukyu.ac.jp

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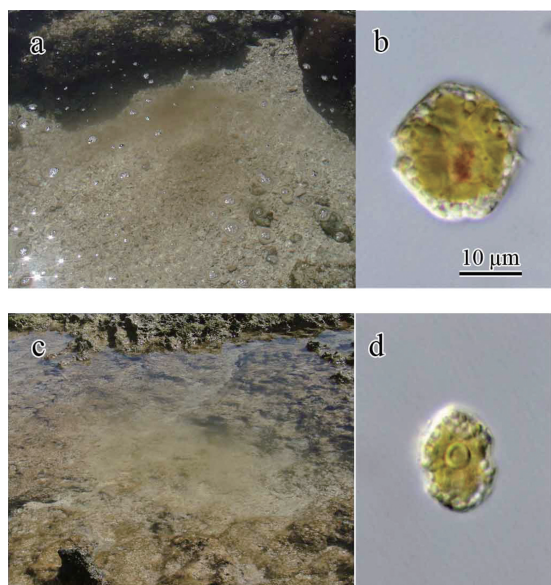


Fig. 1 a) a bloom in a tide pool with sandy bottom. b) bloom forming dinoflagellate; *Bysmatrum* sp. c) a bloom in a tide pool with hard reef bottom. d) bloom forming dinoflagellate; *Gymnodinium pyrenoidosum*

During low tides, tide pools often appear in coral reef flats. These pools are mostly shallow and exposed to strong sunlight. At Okinawa Island, Japan, photon flux density in clear summer weather is approximately $2,000 \mu\text{mol photons m}^{-2} \text{ s}^{-1}$ and tide pool water temperatures can reach over 37°C . Small scale red tides (water blooms) are sometimes observed in such severe environments (Fig. 1a, c). Our examinations showed the blooms were mainly monospecific. Blooms in different micro-environments consisted of different dinoflagellate species, a bloom of *Bysmatrum* spp. from tide pools with sandy bottoms (Fig. 1a, b) and another bloom of *Gymnodinium pyrenoidosum* (Horiguchi and Chihara 1988) from tide pools with hard reef bottoms (Fig. 1c, d). The blooms of *Bysmatrum* spp. form a characteristic cloud-like mass consisting of many motile cells that are entangled together by an excreted mucilage matrix, while *G. pyrenoidosum* does not form masses. Although the blooms of the former species look brownish, those of the latter are greenish in color. When the blooms were stimulated by collecting sample, the *Bysmatrum* bloom disappeared and cells attached to sand grains on the bottom of the tide pool within one minute. *G. pyrenoidosum* blooms did not respond in such a manner. Similar blooms occurring in tide pool have also been recorded from temperate (e.g. a bloom of *Peridinium gregarium* at California coast, USA [Lombard and Capon 1971]). The dinoflagellates responsible for the blooms are permanent residents of the tide pools, exhibiting diurnal vertical migratory behavior and forming thick-walled cysts and settling on the bottom during high tides and at night. These preliminary results exemplify that the high levels of biodiversity in coral reefs extend even to dinoflagellates within the severe environments of individual tide pools. Future examinations of such tide pool biodiversity may uncover further surprising results that will further demonstrate ecological significance of tide pool organisms such as dinoflagellates and allow a better understanding of the biodiversity of coral reefs.

References

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