

琉球大学学術リポジトリ

Nanipora 属 (Lithotelestidae: アオサンゴ目 :
八放サンゴ亜綱: 花虫綱) の八重山諸島初記録

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First record of *Nanipora* (Lithotelestidae: Helioporacea: Octocorallia: Anthozoa) from the Yaeyama Islands

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Abstract. During recent ecological surveys of Haemida Reef on Iriomotejima Island in the Yaeyama Islands of the southern Ryukyu Islands, Japan, two colonies of *Nanipora* were found in the inner reef lagoon. Although *Nanipora* was originally discovered and formally described based on specimens from Zamami Island in Okinawa, until recently there had been no subsequent findings of the genus in Japan. The current colonies represents the third record from Japan, and the first from the Yaeyama Islands. Combined with other recent findings from coral reefs in Thailand, seagrass beds in the South China Sea, and an acidified reef around Iotorishima, Okinawa, we suspect that *Nanipora* may be common in shallow tropical waters of the western Pacific Ocean, and has been overlooked until now due to its small size and somewhat cryptic habitats. We also discuss the species identity of these specimens in relation to the original description of *N. kamurai*, particularly concerning the issue of whether or not specimens are zooxanthellate or not.

Introduction

The Helioporacea Bock, 1938 is a unique order of octocorals, including species that secrete massive aragonite calcium-carbonate skeletons, unlike other octocorals. Until recently, the order was thought to be represented in shallow water tropical and subtropical ecosystems by a single zooxanthellate species of the blue coral, *Heliopora coerulea* (Pallas, 1766). However, recent research has indicated *Heliopora* de Blainville, 1830 encompasses multiple species (Yasuda et al. 2014; Saito et al. 2015; Villanueva 2016; Richards et al. 2018; Iguchi et al. 2019). In addition, the monotypic genus *Nanipora* Miyazaki & Reimer, 2015 was recently described from shallow coral reefs of Zamami Island in Okinawa, Japan, and placed within the Helioporacea family

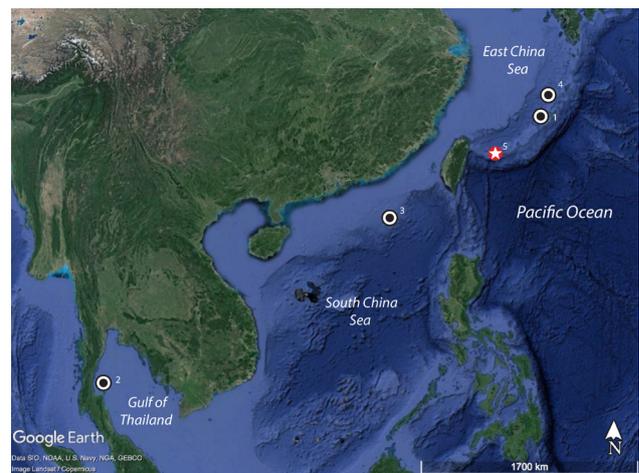


Fig. 1. Map of records of *Nanipora*, including past reports from 1) Zamami Island, Okinawa (Miyazaki & Reimer 2015; Miyazaki et al. 2016), 2) Koh Tao, Thailand (Plaza et al. 2018), 3) Dongsha Atoll (Reimer et al. 2018), 4) Iotorishima, Okinawa (Reimer et al. 2021) (all black circles), and 5) the current study from Iriomotejima Island, Okinawa (red star).

図 1. *Nanipora* の記録地 (過去の記録を含む)。1) 沖縄・座間味島 (Miyazaki & Reimer 2015; Miyazaki et al. 2016), 2) タイ・タオ島 (Plaza et al. 2018), 3) 東沙環礁 (Reimer et al. 2018), 4) 沖縄・硫黄鳥島 (Reimer et al. 2021) (ここまですべて黒丸), 5) 沖縄・西表島 (本研究, 赤星)。

Lithotelestidae Bayer & Muzik, 1977. Although reported as locally abundant in three locations (Plaza et al. 2018; Reimer et al. 2018; Reimer et al. 2021), until now *Nanipora* has only been reported from four locations in the western Pacific (Fig. 1). In Okinawa, the only records are from the type locality at Ama Beach, Zamami Island, where it is very rare (Miyazaki et al. 2016), and from the acidified reefs of Iotorishima, where it is common (Reimer et al. 2021).

In October 2020 and July 2021, we had opportunities to perform ecological surveys of the shallow waters of Haemida Reef on the southern

coast of Iriomotejima Island. During our shallow water surveys, we discovered two colonies of *Nanipora*, and report on these new records and their identity here.

Materials and Methods

Snorkeling and SCUBA diving in the shallow Haemida Reef area of the southeastern coast of Iriomotejima Island were conducted on October 8, 2020, and on July 17, 2021 (centered around 24°16'16.9"N, 123°49'51.1"E). Our survey spanned from the inner lagoon to the outer edge of the reef crest. We utilized the roving search technique, which has been shown to have comparatively good utility when searching for small or hard to find species (Schmidt et al. 2002). The single observed colony in 2020 was photographed in situ (Fig. 2A, B). The additional colony observed in 2021 was also photographed in situ (Fig. 2C), and then a small part of the colony was collected, and a single polyp was observed under an optical microscope (Nikon Eclipse i80) at 10X magnification to check for the presence of Symbiodiniaceae endosymbionts. Specimens were identified as belonging to the genus *Nanipora* following Miyazaki and Reimer (2015) based on external morphological features, particularly the hard rigid polyp skeleton (see Figs. 1A and 3 in Miyazaki and Reimer 2015) combined with the octocoral polyp. The specimen collected in 2021 was then subsequently preserved in 99% ethanol and deposited in the Fujukan Museum at the University of the Ryukyus (RUMF-ZG-04467).

Results and Discussion

During our snorkeling surveys, we observed two colonies of *Nanipora*, which were in waters of approximately 1.5 m depths during high tides of approximately 1.30 m, placing the colonies at approximately the level of extreme low tide lines. The colony observed in 2020 was attached to hard coral reef substrate within the inner lagoon, primarily on the downward-facing surfaces of the substrate, with *Clavularia* sp., turf algae, and foraminifers close by (Fig. 2A, B). The colony observed in 2021 was growing on coral rubble among seagrass, surrounded by rubble and sand (Fig. 2C). Both colonies were located at the outer (=oceanside) edge of a large expanse of seagrass, and just inside of an expanse of *Sargassum* macroalgae growing on the

reef crest.

The specimens were identified as *Nanipora* aff. *kamurai*, as they agreed well with the original description of *Nanipora kamurai* Miyazaki & Reimer, 2015 from Zamami Island, Okinawa, in almost all respects. The only notable difference between the original description and the current specimens was that the current (2021) specimen was confirmed via microscopic observations to harbor Symbiodiniaceae, while the original description clearly states colonies as azooxanthellate (Miyazaki and Reimer 2015). Other recently reported *Nanipora* from coral reefs in Thailand (Plaza et al. 2018) and seagrass beds around Dongsha Atoll in the South China Sea (Reimer et al. 2018) also appear to be zooxanthellate, and thus a reexamination of the *Nanipora kamurai* colonies at Zamami and the type specimen are warranted to clarify if this species is zooxanthellate or azooxanthellate. In Miyazaki and Reimer (2015), Fig 1B and to a lesser extent Fig. 2B show polyps with brownish coloration typical of zooxanthellate anthozoan species, while Fig. 2A shows white colonies that could be azooxanthellate or bleached. Until this issue is clarified, the Haemida specimens are designated as *Nanipora* aff. *kamurai*. These specimens represent the first records of the genus *Nanipora* and family Lithotelestidae from the Yaeyama Islands.

We suspect that *Nanipora* may occur somewhat commonly in shallow tropical waters of the western Pacific Ocean, and it has been overlooked until now due to its small polyp size and somewhat cryptic habitats in cracks or on downward-facing substrates. The *Nanipora* records from Thailand (Plaza et al. 2018), Dongsha Atoll (Reimer et al. 2018), and Iotorishima (Reimer et al. 2021) documented cases of comparatively abundant *Nanipora* colonies. On the other hand, *N. kamurai* has been shown to be very rare at its type locality on Zamami Island (Miyazaki et al. 2016), and similarly here we found only a single *N. aff. kamurai* colony in each survey at Haemida. In Okinawa, at Zamami and Haemida, colonies were on coral rubble, and located out of direct sunlight. Although hard to initially notice without careful searching, *Nanipora* colonies were always visible without the need to move rocks, and were also never found on the bottoms of rocks. We recommend that researchers utilize the roving search technique (Schmidt et al. 2002) while searching shallow seagrass and rubble areas within inner lagoons of reefs that border the open ocean, such

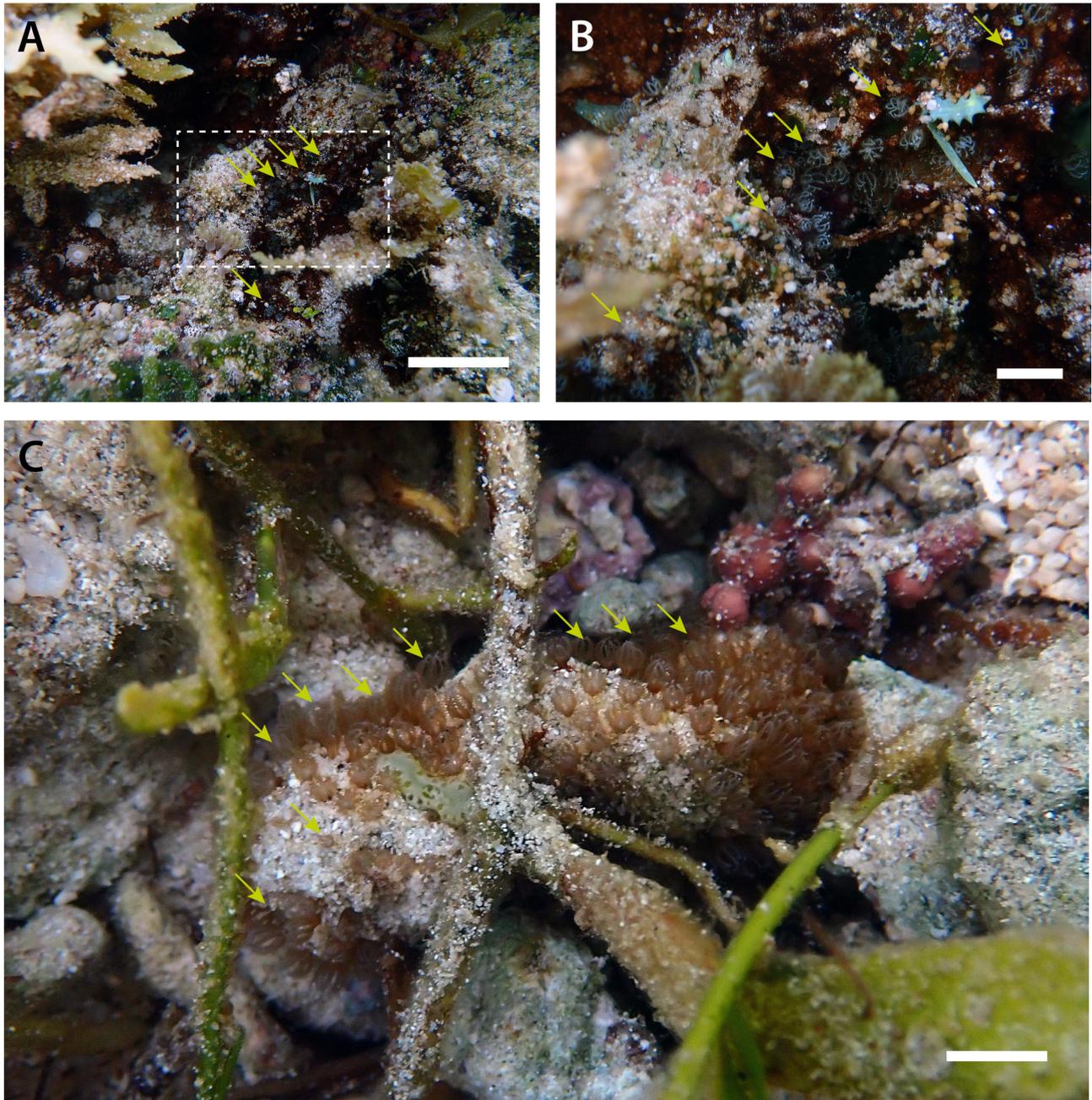


Fig. 2. Zooxanthellate *Nanipora* aff. *kamurai* in situ at Haemida Reef, Iriomotejima Island, Yaeyama Islands, Okinawa, Japan. A) The colony of *Nanipora* aff. *kamurai* with surrounding *Clavularia* sp. and algae also present, observed on October 8, 2020. B) A close-up of the same colony, with foraminifers also visible. C) The colony of *N. aff. kamurai* observed and collected on July 17, 2021 on rubble in a seagrass bed. Dotted line in A indicates approximate area of B. Scale bars: A = approximately 5 cm; B = approximately 1 cm; C = approximately 2 cm. Yellow arrows indicate locations of polyps.

図2. 沖縄県八重山諸島西表島南風見田の浜沖の、褐虫藻を有する *Nanipora* aff. *kamurai* . A) *Nanipora* aff. *kamurai* の群体 (*Clavularia* sp. と藻類も見える) 2020年10月8日観察. B) 同コロニーの拡大. 有孔虫も観察できる. C) 海草場の石の上の *Nanipora* aff. *kamurai* の群体. 2021年7月17日に観察・採集. スケールバー: A = 約5 cm; B = 約1 cm; C = 約2 cm. 黄色の矢印はポリプの場所を示す.

as are found at Dongsha, Zamami, Iotorishima, and Haemida. Such careful and methodological targeted surveys of shallow water coral reefs and seagrass beds in southern Japan and the western Pacific Ocean may find more *Nanipora* colonies in other localities.

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**Nanipora 属 (Lithotelestidae: アオサンゴ目 :
八放サンゴ亜綱 : 花虫綱) の八重山諸島初記録**

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要旨．西表島南風見田の浜で最近実施した生態学的な調査の際に，*Nanipora* 2 群体をイノーより発見した．*Nanipora* は座間味島より発見された標本を基に記載されたが，最近まで日本では他の分布報告はなかった．今回発見された群体が日本から3番目の記録であり，八重山諸島初記録である．これまで *Nanipora* がタイのサンゴ礁，南シナ海の海草場，そして硫黄島島の酸性化したリーフにおいて観察されていることを考慮すると，*Nanipora* は西太平洋の熱帯浅海域に多く生息しているが，その小ささと隠蔽的な生息環境のために見過ごされていたのではないかと考えられた．今回得られた *Nanipora* が属する種について，*N. kamurai* の原記載論文の特に褐虫藻の有無にも注目しつつ，議論した．

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