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Overview on the biogeography of photosymbiotic ascidians in Japan with new records from some islands in the Ryukyu Archipelago, Japan

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populations, this is especially true for broadcast spawners such as most scleractinian corals. Knowledge of the intricate processes of reef dynamics and connectivity, which can be identified using hydrodynamic-advection and individual-based models, is important for reef management decisions.

A two-dimensional hydrodynamic, flexible mesh model (MIKE 21) coupled with a Lagrangian particle tracking module was used to simulate larvae distribution within the Singapore Straits and the South Channel after known coral mass spawning events in Singapore, and predicted spawn times on the northern coasts of Pulau Batam and Pulau Bintan in Indonesia. In each simulation, neutrally buoyant, passive particles representing the generally passive coral planulae were released during the mass spawn times in years 2003, 2005 and 2007. Findings indicate that most of the coral larvae released from Singapore are carried away during the peak settlement competency periods, and therefore do not contribute to seeding the local reefs, while larvae from Pulau Batam are brought towards Singapore. This means that, in order to effectively protect Singapore's reefs, conservation strategies need consider external source reefs which may necessitate reef management collaborations with Indonesia.

Oral -7

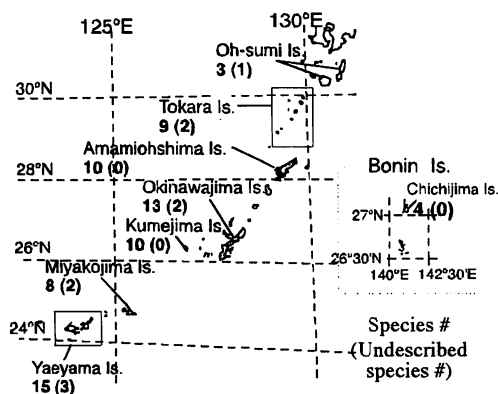
## Overview on the biogeography of photosymbiotic ascidians in Japan with new records from some islands in the Ryukyu Archipelago, Japan

Euichi Hirose

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

Obligate photosymbioses have been known in some colonial ascidians of the family Didemnidae. The photosymbionts are always prokaryotic algae; *Prochloron* in many of the host species, *Synechocystis* in some *Trididemnum* spp., and/or unknown cyanophytes. The host ascidians are exclusively distributed in tropical and subtropical waters, probably due to the susceptibility to low temperature of the photosymbionts. Recently, we started the biogeographic survey of the photosymbiotic didemnids in the Ryukyus to record the current status of their distribution, because they would be potential indicators for the increase of seawater temperature due to the global warming.

In the 20th century, only five photosymbiotic species were recognized mainly in the Ryukyu Archipelago, probably because not many taxonomical surveys had been carried out in Japan. To date, we surveyed the distribution of the photosymbiotic ascidians in the several continental islands belonging to the Ryukyu Archipelago and Chichijima Island, an oceanic island, belonging to the Bonin Island, and 15 or more photosymbiotic species are so far known to be distributed in Japan. In the present study, we reported the new records of the photosymbiotic ascidians from Miyakojima Is., Kurimajima Is., Kumejima Is., Yakushima Is., and Tanegashima Is., and reviewed the biogeography and taxonomy of the photosymbiotic didemnids in the Ryukyus.



In the Ryukyu Archipelago ranging from about 24°N to 31°N, the species number of the photosymbiotic species tended to be larger in the islands of lower latitude, and gradually decreased toward north: 15 species and three potentially undescribed species were recorded from Yaeyama Islands, the south-most island group in the Ryukyus, as three species and one undescribed species were recorded from Oh-sumi Islands, the north-most island group. Therefore, for many photosymbiotic species, the north limit of the distribution range lies within the archipelago, suggesting that the photosymbiotic didemnids can be a potential indicator for the warming of seawater. On the other hand, only 4 species were recorded from Chichijima Island, whereas the latitude is rather

lower than that of Amamiyoshima Island where 10 species were recorded. It would have been difficult for the ascidian larvae to reach the oceanic islands from other areas, causing the fewer numbers of the photosymbiotic species. The survey should be extended to the mainland of Japan in future study.

We described two photosymbiotic *Diplosoma* species as new species in 2005: *D. ooru* Hirose et Suetsugu and *D. simileguwa* Oka et Hirose. Later, the two species were respectively recorded in Palau and Heron

Is. (GBR), and thus, they are supposed to be widely distributed at least in tropical West Pacific. This may indicate that many unknown species are yet to be described in tropics, and we recognized other three *Diplosoma* that are potentially undescribed species. The three *Diplosoma* species can be distinguishable with the unique pattern of the stigmatal numbers in the branchial sac. For instance, the stigmatal numbers are 6, 7, 6, and 5 from the top row to the bottom in one species. As for the three species, we unfortunately have not obtained the colonies laden embryos that would provide several taxonomical features. On the other hand, some described species should be carefully examined, because there are some arguments about synonyms; *Lissoclinum bistratum* – *L. timorensis*, *Trididemnum cyclops* – *T. paracyclops*, and *Trididemnum clinides* – *T. paraclinides*. There are several color-morph types and size-morph types in *Didemnum molle*, and we found differences in the contents of ultraviolet-absorbing substances, reproductive season, and commensal crustacean fauna between the two color-morph types, suggesting that this species may include one or several cryptic species. A taxonomic survey based on both detailed morphology and the molecular phylogeny of several potential synonyms or morph types from various sites is required to clarify this problem.

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### **New and interesting species of gobies from Singapore**

Zeehan Jaafar and Kelvin Lim

*Department of Biological Science, National University of Singapore, 14, Science Drive 4,  
Singapore 117543, Republic of Singapore*

The family Gobiidae comprises of some 2000 small teleost fishes commonly known as gobies. A recent faunistic survey of this group carried out in Singapore revealed that there are 149 species with about a quarter of them not recently found or reported from the island. The presentation discusses these dubious records and presents new and interesting finds.

Oral -9

### **Overview of the genus *Nephroselmis* from the Ryukyu Islands (Chlorophyta, Nephroselmidales)**

Shoichiro Suda<sup>1</sup> and Daphne Georgina Faria<sup>2</sup>

*<sup>1</sup>Department of Chemistry, Biology and Marine Science, Faculty of Science, and <sup>2</sup>Graduate School of Engineering and Science, University of the Ryukyus, Nishihara, Okinawa 903-0213, Japan*

*Nephroselmis* is a green flagellate genus and was established by Stein in 1878 based on a freshwater species, *N. olivacea*. It possesses compressed cells in the right-left axis, two unequal and heterodynamic flagella, and simple to complex scales forming the Golgi body covering the surface of body and flagella. The SSU rDNA tree suggests that the family Nephroselmidaceae, which contains only the type genus *Nephroselmis*, is closely related to the core chlorophytes (Chlorophyceae + Trebouxiophyceae + Ulvophyceae + Chlorodendrales). The genus *Nephroselmis* is therefore a key organism in the evolution of the Chlorophyta *sensu stricto* and the origin of the major part of green algae. Phylogenetic studies on various species of *Nephroselmis* using morphological and molecular characters are therefore important. At present, 12 *Nephroselmis* species have been described but for five out of the 12 species there is very limited information and their existence as valid species is doubtful. Aside from one freshwater species, the remaining six species have been reported from marine environments. *Nephroselmis* swims with the short flagellum beating ahead and a long flagellum trailing behind. Because of its unique swimming behavior, *Nephroselmis* cells can be easily identified and isolated under an inverted microscope in samples, and was collected from various localities of the Ryukyu Islands. Over five years, our laboratory established 122 strains of *Nephroselmis*. Consequently, the strains could be divided into eight