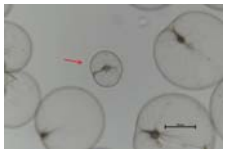
The Optimal Culture Time for Measuring The Growth Rate of *Noctiluca scintillans*

National Taiwan Ocean University
Institute of Marine Environment and Ecology
Jeffery Lee, Kuo-Ping Chiang, Sheng-Fang Tsai

Introduction



Noctiluca scintillans, commonly known as Noctiluca, is part of Dinoflagellate. It is between 200-2000μm in size, a single-celled creature with a kidney shape or balloon shape, and has a flagella and a tentacle for feeding. Noctiluca are widely distributed around the world and are often found in temperate, subtropical and tropical coastal regions. Noctiluca are Heterotrophic beings, themselves cannot undergo photosynthesis, but some groups of it have a symbiotic effect with endosymbiosis algae which can and will provide nutrients for the host. These are commonly known as Green Noctiluca. The ones that do not have symbiotic algae, rely entirely on feeding to maintain energy demand are called Red Noctiluca. *Noctiluca scintillans* can feed a wide variety of prey, including bacteria, dinoflagellates, diatom, ciliates, copepodite, and small fish eggs.

Since *Noctiluca scintillans* are heterogeneous Dinoflagellate, the amount of prey in surrounding water regulates the population size. Therefore, studying the feeding rate of Noctiluca under different concentrations of prey is the first step to understand the changes in population size of Noctiluca. However, in this study, the feeding rate, growth rate and the concentration of the prey may have a certain correlation. When in culture, the concentration of the prey will gradually decrease due to feeding, and the feeding rate will also decrease, if it exceeds the prey' s growth rate due to the decrease in prey population. Therefore, when conducting experiment related to growth rate or feeding rate, understanding the relationship between culture time and feeding rate, and finding the most representative culture time as the basis for the experiment of feeding rate is crucial.

Past Research

Long-term observations conducted on the island of Helgoland, Germany, showed that *Noctiluca scintillans* does not prefer any specific prey.

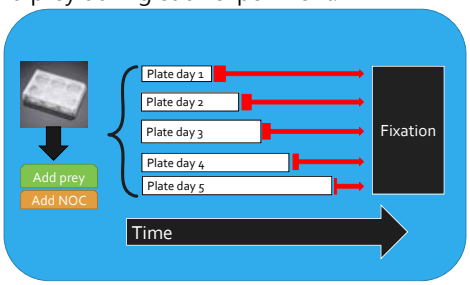
However, in 1998, a study in the western Swedish waters (Gullmarsfjorden) found that Noctiluca has a higher feeding rate on diatom than dinoflagellates. The article also suggested that the main reason for the different growth rates of Noctiluca was the result of the difference in the ability of catching prey in different types (mobile and immobile).

Another study conducted in the Seto Inland Sea using Autotroph flagellates as food supply, discovered that the size of the prey affected the feeding rate of Noctiluca. Prey with a ESD greater than 10um is a suitable food supple for *Noctiluca scintillans*.

Comparing these past studies on *Noctiluca scintillans* points out that in different regions *Noctiluca scintillans* tend to have drastically different feeding habits. So far, no research has been done on the feeding habits and behaviors of *Noctiluca scintillans* in the surrounding water of Matsu.

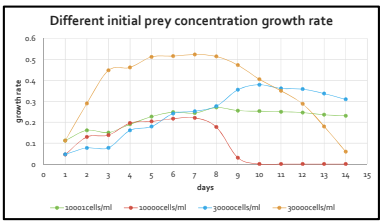
Material and Method

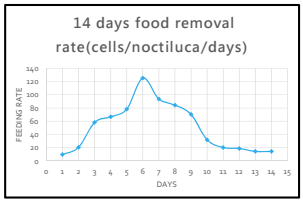
In this study, Thalassisira weissflogii (TW), Tetraselmis chui (PLY) and Isochrysis galbana (T-iso) were used as prey for Noctiluca. A preliminary experiment was conducted to understand the optimum culture time of the *Noctiluca scintillans* at Matsu. Using pure cultured *Noctiluca scintillans* that were collected from Jie-Shou dock, Matsu, Taiwan. Noctiluca were placed in Multiwell Cell Culture Plate with different initial prey concentrations for cultivation, and the samples in the culture palate were sequentially fixed with Lugol`s solution at the expected incubation time interval to observe the amount of *Noctiluca scintillans* and prey during each experiment.

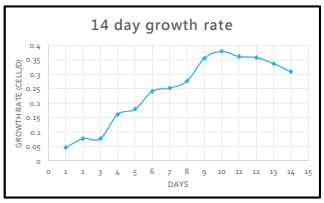


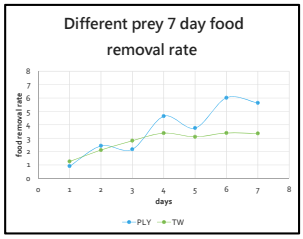
All of the six-well plates were filled with f/2 medium, and 10 *Noctiluca scintillans* cell were add to the upper three wells (A, B, C) and then the same initial prey concentration were given to all wells. The lower three wells (D, E, F) were placed with only the prey (PLY) with the same concentration as the initial concentration, acting as a control group.

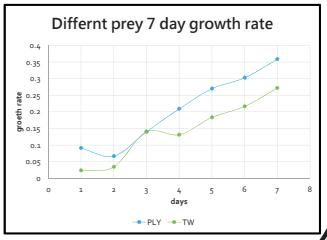
Resault











Conclusion

1. According to the change of growth rate of the *Noctiluca scintillans* for 14 days cultivation experiment, the index growth period (optimal culture time) was about 7-9 days, which is caused by the feeding rate of *Noctiluca* overcoming the growth rate of the prey. The maximum growth rate of *Noctiluca* in this experiment is 0.38 d-1, and the maximum feeding rate is 125 cells / noctiluca-1 /day.

2. The difference in initial prey concentration only affects the maximum growth rate and the rate at which the growth rate decreases when it came close to the environmental carrying capacity.

This study was supported by The Ministry of Science and Technology College Student Research Scholarship (106-2813-C-019-020-M) and (MOST107-2611-M-019-002-MY3)