（学位第３号様式）

学　位　論　文　要　旨

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題　目	The photosynthetic response of a few Japanese species of *Pyropia* (Bangiales, Rhodophyta) to an environmental gradient （日本産紅藻アマノリ属藻類（ウシケノリ目）数種の光合成に対する環境要因の影響）

The photosynthetic responses of some naturally occurring and maricultured species of Japanese *Pyropia* (Bangiales, Rhodophyta) to environmental variable, which include temperature, irradiance, and desiccation were determined by using optical dissolved oxygen sensors and pulse-amplitude modulated (PAM) fluorometry.

The oxygenic gross photosynthesis (*GP*) and maximum quantum yield (F_v/F_m) of the macroscopic gametophytes of cultivated *Pyropia tenera* (collected from Izumi, Kagoshima Prefecture) were determined over a temperature range of 8–36°C. The highest values were observedat relatively low temperatures (9.3 ºC for *GP* and 12.6 ºC for F_v/F_m) then decreased with increasing temperature. However, the highest F_v/F_m value for the microscopic sporophytes occurred at 22.7 ºC. The saturation irradiance (E_k) was 46 µmol photons m^{-2} s^{-1}, and there was no evidence of photoinhibition at the highest irradiance examined. For cultivated *Pyropia yezoensis* f. *narawaensis* from Ogi, Saga Prefecture, F_v/F_m of the gametophytes also showed a characteristic peak at 14.7 ºC. In contrast, its sporophytes were not sensitive to temperature, although the highest value occurred at 16.7 ºC. However, the highest value of *GP* of the gametophytes and sporophytes occurred at and 14.4 ºC and 30.7 ºC, respectively.

For naturally occurring gametophytes of *Pyropia dentata* from Bonotsu, Kagoshima Prefecture and *Pyropia seriata* from Amakusa, Kumamoto Prefecture, the highest value of F_v/F_m of these two species occurred at 11.9 ºC and 12.2 ºC, respectively, and decreased with increasing temperature. Additionally, the highest oxygenic rate of *GP* also occurred at 26.3 ºC and 20.7 ºC, respectively. Therefore among the two species, the response of oxygenic photosynthesis to PAR was dissimilar.

Chronological changes in the photosynthetic efficiency of *P. yezoensis* f. *narawaensis* during a frozen storage treatment of the cultivation process was also examined using PAM fluorometry. After the nursery cultivation season of the young gametophytes in November and during the dehydration process of the *Nori*-net with gametophytes, F_v/F_m decreased linearly with decreasing absolute water content (AWC), and was around 0.1 at 20 % AWC. During the *Nori*-net frozen storage, F_v/F_m of the frozen gametophytes were low but stable, and ranged between 0.10 ± 0.02 SD and 0.14 ± 0.05 SD. The value of F_v/F_m of the gametophytes recovered quickly after the frozen storage treatment, especially after 10 minutes and 3 hours of immersion in the seawater. The F_v/F_m after 10 minutes and 3 hours of immersion was 0.29 ± 0.12 SD and 0.47 ± 0.05 SD during the 14th day of frozen treatment, and was 0.15 ± 0.02 SD and 0.29 ± 0.04 SD after 71 days of frozen treatment, suggesting that the ability to recover gradually decreased as the frozen storage duration increased. The response of the F_v/F_m of the gametophytes from general cultivation (directly cultivated from the nursery cultivation season) and those after 47 days of freezing to temperature were almost identical, suggesting that the current *Nori*-net frozen storage period (6 or 7 weeks) was not detrimental to the gametophytes.