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EFFECTS OF TEMPERATURE AND IRRADIANCE ON PHOTOSYNTHESIS AND BIOMASS OF A GREEN-TIDE FORMING SPECIES (*Ulva procera*) IN THE YELLOW SEA

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Drifting green algal mats across the Yellow Sea appeared again in early summer of 2009. Green-tide has possibility of invasive attacks to coastal region and often threatens coastal habitats and food webs. Free floating 'green-tide' forming species (*Ulva procera*) were collected from the Yellow Sea in July 2009. Experiments were conducted to understand the physiological traits of temperature and irradiance at the late vegetative (wild thalli) and at the early vegetative stages (laboratory-grown progenies). The maximum O_2 production rate (P_{max}) at each temperature, there were no significant differences between experimental temperatures during 1 h of acclimation, except at 10°C. The early vegetative samples showed higher P_{max} than late vegetative stages. After 6 d of each temperature acclimation, Chl-*a* and O_2 production of both stages decreased at higher temperatures. The amount of late vegetative biomass decreases at high temperatures, and this alga could not grow even low temperatures. However, the growth rate of early vegetative thalli increased at low temperatures. After 6 d of exposure to various irradiances, while the late vegetative biomass decreased under all irradiances, the early vegetative biomass increased 19-79% at various irradiances. Our results suggest that increasing temperature and deteriorating irradiance on green mats result in cellular senescence of late stage green algae. In contrast, early stage green algae have potential possibility of extend their biomass under low temperature and irradiance conditions quickly. These results provide valuable information on invasion by this green alga with eco-physiological evaluation of response to temperature and irradiance.

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FATE OF INVASION BY GREEN-TIDE FORMING SPECIES (*Ulva compressa* and *U. procera*) OFF THE SOUTHWEST COAST OF KOREA

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The occurrence of an ulvoid algal bloom resulting from anthropogenic activities is one of the annual events in the Yellow Sea. The *rbc*L tree shows that the identity of bloom consists of two *Ulva* species (*U. compress* and *U. procera*). Our phylogenetic trees based on *rbc*L gene sequences from drifting samples do not coincide with previous reports that a green-tide forms a clade with representatives of the *Ulva linza-procera-prolifera* (LPP) complex or *U. prolifera*. Although there was a large year-to-year variability, green algal bloom in the Yellow Sea have occurred in the past few years (2006-2009). The images of high spatial-resolution optic satellites, MODIS, Landsat, ALOS and Kompsat-2 data in spring/early summer show the extensive stripes of the green algae that cover approximately 900 – 23,000 square kilometers. We collected thalli of floating *U. procera* from the middle of Yellow Sea in July 2009. Laboratory experiments were conducted to investigate the physiological effects of temperature (five levels), irradiance (ten levels) and salinity (five levels) on these wild thalli and their laboratory-grown progeny as well. From short-term acclimation experiments, we found that temperature did not significant impact maximum O_2 production rates (P^B_{max}) or photosynthesis efficiency (α), and nor did irradiance impact photosynthetic saturation irradiance (E_k). Changes in photosynthetic rate of *U. procera* were observed at various salinities, showing higher rates within the salinity range of 10 and 30 psu. These results are important to understand and increase the knowledge on drift green-tide processes in the Yellow Sea.