E - 14

A comparative study on phenology and survival strategy of *Neorhodomela aculeata* and *Ceramium kondoi*

Han Gil Choi, *Young Sik Kim, **Soon Jeong Lee, **Eunjeong Park, **Jina Ryu and **Ki Wan Nam

Faculty of Biological Science, Wonkwang University
*School of Marine Life Science, Kunsan National University
**Department of Marine Biology, Pukyong National University

Introduction

The growth, reproduction and abundance of seaweeds are determined by physical and biological stresses. Sessile seaweeds have species-specific survival strategy to endure for such environmental stresses. For instance, algae maintain their populations by vegetative proliferation rather than by sexual reproduction under stressful conditions. Under grazing pressure, opportunistic seaweeds escape predation by nature of their temporal and spatial unpredictability or by rapid growth whereas perennial species reduce palatability to predators by complex structural and chemical defences(Littler and Littler, 1980).

Neorhodomela aculeata and *Ceramium kondoi* grow both in tidepools or in humid upper intertidal zone at Padori, South Korea. The former is a perennial species with various chemicals(Phillips and Towers, 1982) and the latter is an annual alga. At the shore snails(*Littorina* sp.) are abundant on the fronds of *N. aculeata* but not on *C. kondoi* in the tidepools. It is so interesting that because grazers prefer annual seaweeds as their foodstuffs.

Thus, the aims of the present study were to examine the growth and reproductive phenology of *N. aculeata* and *C. kondoi*, and their survival strategy for the predation of snails.

Materials and Methods

Neorhodomela aculeata and *C. kondoi* were seasonally collected at Padori, west coast of Korea from 2003 to 2004. The plants were transported to the laboratory and fifty plants of each species were randomly chosen and measured length. Reproductive states for both species were also examined under a light microscope.

Palatability of seaweeds to grazers was determined by food preference of *Littorina* sp. in the laboratory. Experiments were carried out in no choice and choice experiments

after starving snails for 3 days before the experiments. In no choice experiment, vegetative thalli (500mg) of each species, 8 snails, and 200ml of seawater were put in each of five replicate beakers for 3 days and measured the amount of consumed algae by snails. In choice experiment, the protocol was the same as in no choice experiment, but vegetative thalli (250mg) of each species were placed together in a beaker.

Results and Summaries

Mean lengths of *C. kondoi* and *N. aculeata* varied from 1.58±0.07 to 7.87±0.51cm(n=50) for *C. kondoi* and from 4.77±0.35cm to 11.60±0.51cm (n=50) for *N. aculeata.* A rapid growth of both species occurred between winter and spring. A turf alga, *N. aculeata* produced new branches from the tips of broken branches, whereas the smaller plants of *C. kondoi* were found in Autumn. *C. kondoi* grew faster than *N. aculeata.* Average mean lengths of the two species were maximum in spring. Two cystocarpic plants and nine tetrasporophytes of *C. kondoi* were observed in Summer 2003, but no male plant was found throughout the year. In *N. aculeata,* cystocarpic, spermatangial and tetrasporic plants were dominant in Autumn and they were observed in all seasons.

Snails had food preference both in no-choice and choice experiments. Snails consumed 96±13.27mg (mean±SE, n=5) of *N. aculeata* fronds and 156±13.27mg of *C. kondoi* fronds in no choice experiment. Snails significantly preferred *C. kondoi* to *N. aculeata* ($F_{1,8}$ = 6.98, $p < 0.05$). In choice experiment, snails preferentially grazed *C. kondoi* rather than *N. aculeata* ($F_{1,8}$ = 5.48, $p < 0.05$).

In the present study, snails preferred the fronds of an annual *C. kondoi* to a perennial *N. aculeata.* In the field, however, snails mainly inhabit on the fronds of *N. aculeata.* Both species grow under humid condition to endure severe desiccation occurring in the upper intertidal zone. The survival strategies of *C. kondoi* are a rapid growth pattern, sexual reproduction and delicately branched morphology, whereas those of a slower-growing *N. aculeata* are chemical defence, sexual and vegetative reproduction pattern. In case of snails, they may inhabit on the fronds of *N. aculeata* to escape from severe desiccation in the upper intertidal zone and to consumed the epiphytic algae of *N. aceuleata* such as *Colpomenia sinuosa* and *Ceramium kondoi.*

References

Littler, M.M. and Littler, D.S. 1980. The evolution of thallus form and survival strategies in benthic marine macroalgae: field and laboratory tests of a functional form model. The American Naturalist, 116: 25-44.

Phillips, D.W. and Towers, G.H.N. 1982. Chemical ecology of red algal bromophenols. I. Temporal, interpopulational and within-thallus measurements of lanosol levels in *Rhodomela larix* (Turner) C. Agardh. J. Exp. Mar. Biol. Ecol., 58: 285-293.