Abstract: Phlorotannins are polyphenolic compounds found exclusively in brown algae. Fucoids (Fucales) generally contain high levels (up to 20% of algal wet weight) of these polyphenolic metabolites. The concentrations, however, can vary considerably.

One objective of this thesis was to examine how environmental factors will affect phlorotannin concentrations in fucoids. The results from an experiment with the gastropod grazer *Littorina obtusata* and the fucoid *Ascophyllum nodosum* showed, for the first time, that natural grazing can induce increased phlorotannin production in brown algae. *Fucus vesiculosus* and *Ascophyllum nodosum* grow intertidally on the Swedish west coast, and these algae are subjected to highly variable environmental conditions. At low sea water levels, they can naturally become emerged for several days, with increased exposure to elevated irradiance and harmful UV radiation as a consequence. The results of studies in this thesis showed that UV-B radiation increased the amount of phlorotannins within the algal tissue. Furthermore, algae that had been exposed to emersion had lower concentrations of tissue phlorotannins, than those that were constantly submerged. However, phlorotannins are also known to exude into the seawater, and the results from studies of the effects of emersion on exudation of phlorotannins showed that previously desiccated algae exuded significantly more phlorotannins when re-immersed, compared to non-desiccated algae. Overall, the results suggest that there is a re-location of metabolites to the surface of the algal thallus when the plants are emerged at low water levels. Since phlorotannins have UV-absorbing properties, this re-distribution of phlorotannins could possibly generate an added shield against harmful radiation.

A second objective of this thesis was to examine the role of phlorotannin as an antifouling agent, by testing their settlement deterrence on larvae of the barnacle *Balanus improvisus*. Phlorotannins were shown to inhibit larval settlement, both as algal tissue extracts and as exudates in seawater. The deterrent effect was demonstrated both quantitatively, for different concentrations of phlorotannins, and qualitatively, for two different molecular size-fractions of tissue phlorotannins. Furthermore, natural field sampling of seawater close to recently emerged algae, showed that phlorotannin levels were close to settlement inhibiting concentrations. Altogether, the results imply that phlorotannins may function as inhibiting compounds against fouling on intertidal fucoids. This could possibly explain the observed settlement preference of barnacle larvae for rock, rather than algae, and also the greater natural abundance of adult *B. improvisus* on rock, compared to algae.

Through a combination of manipulative experiments and field observations, the studies of this thesis have assessed natural patterns of variation in phlorotannin levels, both as algal tissue content and as exudates. The thesis has furthermore demonstrated that phlorotannins in fucoids can vary in response to both abiotic and biotic factors, and that the compounds can affect the settlement of fouling organism. Overall, the combined results from the experiments of this thesis strengthen the notion that phlorotannins are ecologically important metabolites in the intertidal rocky shore community.

Keywords: Phlorotannins, *Fucus vesiculosus*, *Ascophyllum nodosum*, inducing factors, herbivory, *Littorina obtusata*, emersion, desiccation, UV-radiation, algal tissue, exudation, molecular size-fraction, fouling, *Balanus improvisus*, settlement.