CYSTOSEIRA CRINITA COMMUNITY IN THE AEGEAN SEA

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Abstract
The algal community dominated by *Cystoseira crinita* was studied at 26 sites of the Hellenic "NATURA 2000" network in the Aegean Sea. The aim of the study was to give an overall aspect of the community structure, corresponding to its "typical" composition in unpolluted areas of the North-Eastern Mediterranean. A SIMPER analysis was carried out on 62 samples of phytobenthos from the Hellenic "NATURA 2000" data-base. From 113 species identified in total, 9 species contributed cumulatively by 90% in the community, while a group of 34 species contributed cumulatively by 99% in the community.

Keywords : Algae, Phytobenthos, Coastal Management, Aegean Sea, Eastern Mediterranean.

Introduction
In the pristine areas of the Mediterranean coastline, the species of the genus *Cystoseira* are usually the dominant benthic vegetation elements at the upper infralittoral zone (0-1 m depth). According to Pérès & Picard the *Cystoseira* algal community is considered as the final stage (climax) of the photophilic algal communities' succession, thus it can be considered as indicative of the environmental conditions ([1]).

In the Aegean Sea the *Cystoseira crinita* Duby community is one of the most common elements of the vegetation in undisturbed areas, with an extensive distribution from exposed to sheltered sites ([2]).

The present paper studies the *C. crinita* algal community at different putatively pristine Aegean Sea sites in order to develop an objective and statistically valid "virtual" list of the most common algal species in the Aegean under undisturbed conditions, and also to test the conceptual model and the biotic index EEI recently developed by Orfanidis *et al.* ([3]) for the implementation of Water Framework Directive (2000/60/EC) in Greek coasts.

Methodology
The data used in the present paper are part of the Hellenic "NATURA 2000" data-base build up by a scientific consortium (scientists in charge in Panayotidis *et al.*, [4]) in years 2000 to 2001. A selection of 62 *Cystoseira crinita* quantitative (20 x 20 cm or 25 x 25 cm) and destructive samples from 26 putatively pristine Aegean sites was undertaken (Fig. [1]). They were representatives of the photophilic algal community of the rocky upper infralittoral zone. In the laboratory formalin fixed samples were carefully analyzed by identifying species presence and by estimating their vertically projected coverage. The total coverage usually exceeded 100% due to the presence of different vegetation layers (canopy, bushy, crusts and epiphytes). Untransformed data were analyzed by SIMPER-analysis (PRIMER v. 5) to estimate algal species abundance and contribution (%). The species were classified in two Ecological State Groups (ESG), in accordance to Orfanidis *et al.* ([3]) approach.

Results and Discussion
In total 113 taxa (73 Rhodophyceae, 25 Phaeophyceae, 15 Chlorophyceae) were identified. Nine (9) major taxa contributed cumulatively by 90% in the community: *Haliptilon virgatum*, *Cystoseira compressa*, *Jania rubens*, *Padina pavonica*, *Herposiphonia secunda*, *Corallina elongata*, *Cladophora* spp., *Sphacelaria cirrosa* and *Titanoderma cystoseirae* (see also [5]). Moreover, 34 taxa contributed cumulatively by 99%. Bushy layer considerably dominated to the community with most common representatives the red coralligenous algae *Haliptilon virgatum*, *Corallina elongata* and *Jania rubens*, and the brown alga *Padina pavonica*. It was followed by *C. crinita* epiphytes distinguished in: 1) filamentous green (*Cladophora* spp.), brown (*Sphacelaria cirrosa*) and red (*Herposiphonia secunda*) algae, and 2) in encrusting red algae (*Titanoderma cystoseirae* and *Hydrolithon* spp.) . *Cystoseira compressa* contributed significantly (23.08%) to *C. crinita* community indicating that these species share common habitat resources in the Aegean Sea, a phenomenon also known, at least at the past ([1]), in the Albéres coasts of France.

Within the most common *Cystoseira crinita* taxa, 21 (62%) belong to opportunistic ESG II, whereas 13 (38%) taxa belong to late-successional ESG I (Table 1). By contrast, the ESG I taxa (87%) dominated quantitatively the ESG II (13%) taxa in the *C. crinita* community. This result is in accordance both: a) to the conceptual model of Orfanidis *et al.* ([3]) that "in less anthropogenic stressed coastal areas (pristine) the late-successional species dominate" and b) to the basic assumption of the Ecological Evaluation Index (EEI) that ESG II average contribution in undisturbed areas is less than 30%.

Fig. 1. Map of the sampling sites.

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