DESIGNING A NETWORK OF MARINE RESERVES SUBJECTED TO DIFFERENT HUMAN CONSTRAINTS: THE CYCLADES ARCHIPELAGO CASE STUDY

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Abstract
Best practice dictates that the design of networks of marine reserves follows the principles of systematic conservation planning which includes information about cost of making a reserve. Our study, which has taken place in the Cyclades archipelago (Greece), aims at detecting the sensitivity of reserve network configuration with respect to different ways of calculating cost. We discovered that the choice of priority areas for protection is greatly influenced by the cost definition and components.
Keywords: Cyclades Islands, Eastern Mediterranean, Marine Parks, Coastal Waters

Worldwide, marine reserves have been increasingly used as management and conservation tools for the protection of marine ecosystems from rapid and radical degradation. Marine reserves cover only the 0.01% of the total surface of the Mediterranean Sea [1]. At the same time, most marine protected areas in the region have been established in an *ad hoc* way with little or no scientific information [2]. Systematic conservation planning provides an efficient and transparent approach, guiding the location, configuration and management of conservation areas [3]. A crucial element of this procedure is the integration of socioeconomic costs [4].

Our study area covers the coastal area of 26 Kyklades islands in the Central Aegean Sea, North – Eastern Mediterranean Sea. Our conservation objectives are to protect: a) enough critical habitats for endangered and vulnerable species b) places with higher fish biomass to replenish adjacent areas. To identify priority areas for conservation we used the latest version of Marxan [5]. This software aims at achieving explicitly a set of conservation targets while minimizing the cost and the boundary length of the reserve system. Our aim was to create a reserve system from amongst 223 planning units. Each contains a stretch of the coastline and extents 1 km into the sea. We set high targets (50%) for priority habitats and species *(Posidonia oceanica*, *Cystoseira* spp., breeding caves for the Mediterranean monk seal *Monachus monachus*) and lower targets for other conservation features (abundance of 60 fish species and other habitat types). We produced 3 different scenarios considering different cost aspects: 1. fishing pressure, 2. fishing pressure and exposure to prevailing winds, 3. fishing pressure and exposure to winds reduced by expected benefits from tourism.

As we expected, the priority areas, which should be included in a network of marine reserves, vary according to different ways of including cost in the analysis (fig.1 & 2). In this study, we incorporate, for the first time in the relevant literature, the level of physical exposure to the cost of our planning units. We consider that planning units with high levels of wind and wave exposure have less opportunity cost regarding competitive uses of the coastal area (coastal fisheries, tourism).The results of our study are consistent with the current literature; all available information that affects the distribution of economic activities in a region should be included in marine conservation planning.

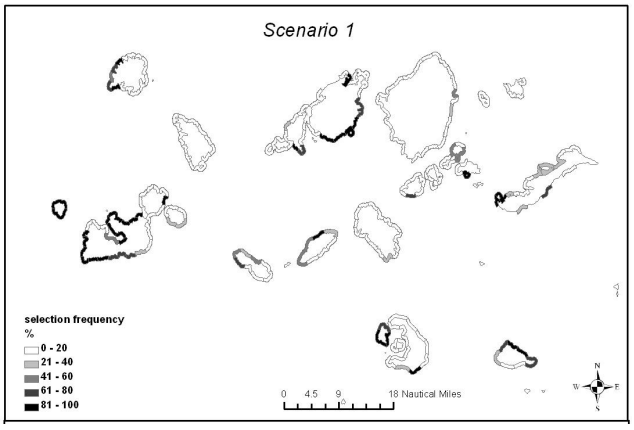

Fig. 1. Priority areas (darker colours) under cost scenario 1: fishing pressure

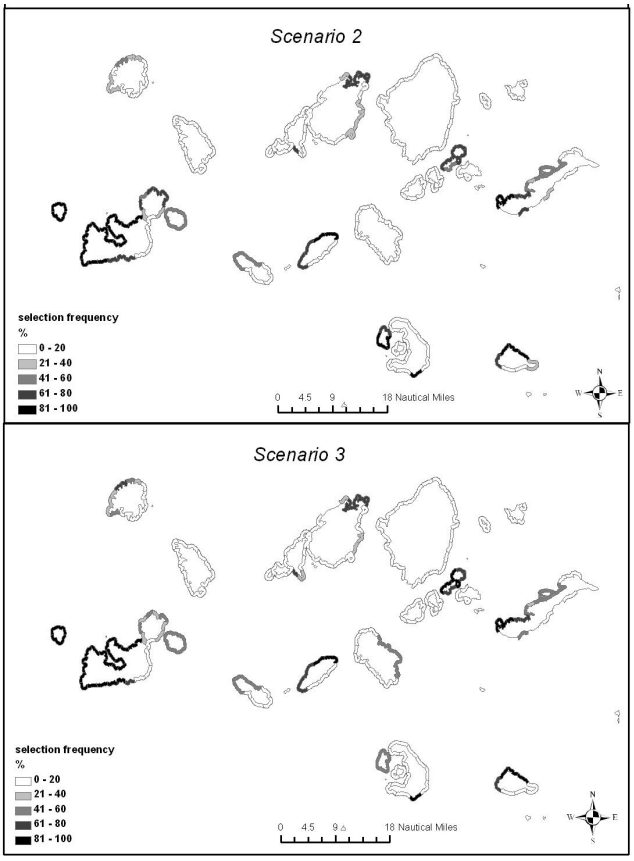

Fig. 2. Priority areas for cost scenario 2: fishing pressure and wind exposure and scenario 3: same as second scenario but reduced by tourism benefits

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