

## COMMENT

### Mediterranean marine protected areas: some prominent traits and promising trends

Mediterranean marine protected areas (MPAs) are very diverse in their intrinsic, jurisdictional, management and enforcement features (e.g. Ramos Esplá & McNeill 1994; Batisse & Jeudy de Grissac 1995). They offer a wide array of situations, ranging from relatively large multiple-use marine areas (*sensu* Agardy 1997), with active management and strong social interactions, to small sanctuaries that are theoretically totally closed to any human activity. This variety may illustrate a good adaptation to local needs, but often results from economic and political compromises which put the ecological considerations in the background.

However, a common feature of many Mediterranean MPAs is their siting in shallow rocky areas. The occurrence of seascapes of high aesthetic value and the wish to promote them as national natural monuments seem to have been in many cases the strongest motivation to the decision of establishing a marine reserve. The possibility of directly appraising the value of the shallow submerged natural heritage involved by diving, and of popularizing it through the media have probably been the main driving forces behind this choice. It seems obvious that the rise in popularity of MPAs in the Mediterranean, as in other temperate and tropical seas, has grown with the spread of diving activities. Areas with less accessible underwater seascapes such as those in deep water, or where the bottom is devoid of spectacular features such as on sand or mud, have too often been neglected by conservation plans despite evident threats, for example impacts of trawling. Considering the difficulties of efficiently enforcing the existing fishing regulations and the resulting dramatic decimation which affects species with low dynamics such as rays (Aldebert 1997), Mediterranean MPAs should include broader soft-bottom areas. The use of anti-trawling reefs (Bombace 1997; Ramos Esplá *et al.* 2000) at the border of several French, Italian and Spanish MPAs has proved to be an effective way of excluding non-selective towed fishing gears which are so destructive of the benthic habitat.

The general consequences of protecting sensitive components of communities (see review by Bohnsack 1996) are clear in the Mediterranean MPAs when they are endowed with sufficient habitat and food resources, well managed and sufficiently old for effective ecological restoration. Common species such as the red coral (*Corallium rubrum*, Cnidaria) and sea-breams (sparid fish), which are impacted by professional and recreational fishing and collecting (Harmelin 1999) benefit greatly from protection. However, the most spectacular outcome appears to be in rarer fish species, such as the brown meagre (*Sciaena umbra*) and the dusky grouper (*Epinephelus marginatus*), which are particularly targeted by spear fishing. Large populations of these species in MPAs such as those of Medes Islands, Port-Cros and Lavezzi, have become popular subjects of the media and lures for underwater visitors. Divers attracted by the abundance of large fish in MPAs may damage fragile sessile organisms (Garrahou *et al.* 1998), but otherwise they can become the most enthusiastic advocates of marine conservation. This is not a vain wish if one considers striking changes in behaviour such as the decline of specimen collecting amongst sport divers since the 1950s. In a cost-benefit analysis of visitor use, one should consider that MPAs are almost the only places where education of users can be planned and routinely delivered through such means as guided trails, meetings, exhibitions, and hire by diving clubs as in Port-Cros National Park and Ustica Marine Reserve. The protection-induced recovery of populations of sensitive species has given a strong impetus to their scientific study (e.g. GEM-IOPR 1999), and MPAs can play a prominent role in the long-term collection of data on those species and their environment. The worldwide concern for the biotic and economic effects of global warming (Hughes 2000) and the recent changes observed in the dynamics of several indicator species (Francour *et al.* 1994; Zabala *et al.* 1997; Harmelin 1999; La Mesa & Vacchi 1999) highlight the necessity of having a network of such reference places.

One of the most interesting lessons learnt from several Mediterranean multiple-use MPAs (Port-Cros, Cabrera, Tabarca, Ustica) is that small-scale artisanal fishing by trammel nets can persist at moderate level without affecting the spectacular replenishment of fish populations in shallow rocky areas when other fishing methods such as trawling and spear fishing are controlled

or banned. This result has a particular social and cultural interest in the Mediterranean context, considering the slow decline of this traditional fishery and argues for a more active integration of professional fishers in the preparation of new MPA projects.

The rise of marine tourism and recreational activities is a worldwide phenomenon which is particularly acute along the highly urbanized shores of the Mediterranean. Analyses of existing situations (Boudouresque & Ribera 1995; IRAP 1999) indicate that multiple-use MPAs may play a prominent role in regional economic life, but the respect of conservation aims under such economic pressure demands management regimes that are very cautious.

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