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He who hesitates is lost: Why conservation in the Mediterranean Sea is necessary and possible now

Michelle E. Portman [a,*], Giuseppe Notarbartolo-di-Sciara [b], Tundi Agardy [c], Stelios Katsanevakis [d], Hugh P. Possingham [e], Giuseppe Di-Carlo [f]

[a] Technion — Israel Institute of Technology, Haifa 32000, Israel
[b] Tethys Research Institute, Viale G.B. Gadio 2, 20121 Milano, Italy
[c] Sound Seas, 6620 Broad Street, Bethesda, MD 20816, USA
[d] European Commission, Joint Research Centre, Institute for Environment and Sustainability, Water Resources Unit, Via E. Fermi 2749, Building 46 (TP 460), Ispra (VA) I-21027, Italy
[e] ARC Centre of Excellence for Environmental Decisions, School of Biological Sciences, The University of Queensland, Brisbane, Queensland 4072, Australia
[f] World Wide Fund for Nature (or WWF), Mediterranean Programme Office, Via Po 25/C, 00198 Rome, Italy

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ABSTRACT

Although significant advancements on protecting marine biodiversity and ecosystems of the Mediterranean Sea have been made, much remains to be done to achieve the targets set by the Convention for Biological Diversity (and the Barcelona Convention) and ratified by the 21 Mediterranean governments. Particularly, these targets require the design and implementation of an ecologically representative network of marine protected areas that covers 10% of the Mediterranean surface by 2020. Despite the many efforts to gather spatial information about threats to the Mediterranean and conservation planning initiatives that identify sensitive areas for conservation, we are far from achieving this target. In this paper, we briefly review existing and proposed conservation initiatives at various scales throughout the Mediterranean to recognise those that have political endorsement and those that serve more as lobbying tools. We then propose a model process that can be applied to advance marine spatial planning within the eleven ecologically and biologically significant areas (EBSAs) through a multi-step process designed for moving conservation forward in this particularly complex region. The proposed process combines tenets of professional urban/regional planning and systematic conservation planning. As shown with two specific examples, despite some conventional wisdom, there is enough information on the Mediterranean Sea to move forward with ecosystem-based marine spatial management for conservation purposes using the EBSAs as a starting point - and the time is right to do so.

1. Introduction

Much has been written about the challenges of marine conservation planning and the design of marine protected areas [1], including the process of identifying conservation priorities and implementing them. In this context, the Mediterranean Sea can be compared to many areas of the world, since robust marine conservation planning efforts exist. However, in this area of the world, perhaps more than others, many challenges remain for the implementation of these efforts.

The Mediterranean Sea is one of the world's priority conservation areas, for its relatively large amount of endemic species and high habitat diversity [2,3], and due to increasing levels of human threats that affect all levels of biodiversity [4,5]. Given the current shortfalls in achieving effective marine resource management in

Abbreviations: ACCOBAMS, Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area; CBD, Convention on Biological Diversity; CIESM, Commission Internationale pour l'Exploration Scientifique de la Mer Méditerranée (International Commission for the Scientific Exploration of the Mediterranean Sea); EBM, ecosystem-based management; EBSA, ecologically or biologically significant area; ECAP, ecosystem approach process; FRAs, fisheries restricted areas; ICZM, integrated coastal zone management; IUCN, International Union for Conservation of Nature; MESMA, monitoring and evaluation of spatially managed areas; MPA, marine protected area; MSP, marine spatial planning; RAC/SPA;, Regional Activity Centre for Specially Protected Areas; SPA/BD, specially protected areas and biological diversity; SPAMI, Specially Protected Areas of Mediterranean Importance; UNEP-MAP, United Nations Environment Programme's Mediterranean Action Plan; WWF, World Wildlife Fund.

* Corresponding author. Tel.: +972 48294067.
E-mail addresses: michellep@cc.technion.ac.il (M.E. Portman), disciara@gmail.com (G. Notarbartolo-di-Sciara), tundiagardy@earthlink.net (T. Agardy), stelios@katsanevakis.com (S. Katsanevakis), h.possingham@uq.edu.au (H.P. Possingham), gdicarlo@wwfmedpo.org (G. Di-Carlo).

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Table 1
A compilation of systematic advocacy planning initiatives[a] that have taken place on a regional level in the Mediterranean in the last decade.

Organisation	Year	Objectives	Details	References
IUCN—WWF	2004	Conservation of Mediterranean deep-sea ecosystems	Protection of unique deep-sea biocenoses in the Mediterranean and adjacent Atlantic waters	Tudela S., et al. 2004. The Mediterranean deep-sea ecosystems. IUCN, Málaga and WWF, Rome, pp. 39–64
Greenpeace	2006	Creation of a network of MPAs	Network of 32 large-scale high seas and coastal areas (territorial and EEZs). 40% of each noted habitat is covered	Greenpeace 2006. Marine reserves for the Mediterranean Sea. Greenpeace International, Amsterdam. 58 pp.
ACCOBAMS	2007	Conservation of cetacean critical habitats	Identification of 18 areas of special importance for cetaceans in the Mediterranean and Black Seas	ACCOBAMS, 2007. MPAs for cetaceans. Resolution 3.22 adopted at the 3rd Meeting of the Contracting Parties to the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and Contiguous Atlantic Area (ACCOBAMS), Dubrovnik, Croatia, 22–25 October 2007
CIESM	2010	Creation of a network of MPAs	Identification of 8 trans-boundary protected areas to enhance biodiversity, peace and cooperation	CIESM. 2011. Marine peace parks in the Mediterranean—a CIESM proposal. Siracusa, 18–20 November 2011. CIESM Workshop Monograph no 41. F. Briand, (Ed), Monaco. 128 pp.
Oceana	2011	Creation of a network of MPAs	MEDNET network of MPAs that comply with the CBD recommendation to protect at least 10% of the world's marine eco-regions	Oceana, 2011. Oceana MEDNET: MPA network proposal for the Mediterranean Sea. Oceana, Madrid, 100 pp.

[a] Advocacy planning is further defined in Section 3.

the Mediterranean, securing acceptance – scientific and political – of priority conservation areas and fast-tracked implementation of strategic marine protected areas (MPAs) is imperative.

In this paper, existing conservation planning efforts for the Mediterranean are reviewed and three critical issues are addressed: (1) the existence of scientifically sound and politically endorsed priority areas for conservation action; (2) the level of knowledge and available data that can be used to begin implementing a functional MPA network; and (3) the type of planning process needed to generate the political support and commitment for science-based and effective implementation of a network of MPAs. This network would allow countries to meet key conservation obligations, such as targets set by the Convention on Biological Diversity (CBD). Models used for urban and environmental planning with principles of conservation planning have been considered for the development of the proposed process.

In the next section, initiatives that have identified priority marine areas for conservation in the Mediterranean are reviewed, focusing on the assessment and identification process for EBSAs (Ecologically or Biologically Significant Areas). In Section 3, a framework for moving EBSAs from a planning to an implementation stage is proposed and justified, while the institutional (legal) background and issues of scale are discussed. In Section 4, a process for designating and managing MPAs within an ecosystem-based management (EBM) context that could work in the Mediterranean is suggested. In the last section, the role of knowledge gaps is discussed and the kind of information that is both relevant and available for moving conservation forward is described, with examples of where the process can be applied.

2. Conservation planning initiatives

Up to now, MPAs in the Mediterranean have been declared by the coastal states on the basis of national initiatives [6] disconnected from a need to construct an ecologically representative network of MPAs [5]. The Protocol on Specially Protected Areas and Biological Diversity (the “SPA/BD Protocol”) of the Barcelona Convention provides for the designation by the Mediterranean countries of Specially Protected Areas of Mediterranean Importance (SPAMIs), which can also be designated in areas beyond national jurisdiction. However, SPAMIs are accrued to the list on a case-by-case basis and they do not function together as a network. Therefore, they are not synergistic, do not properly account for connectivity issues, nor do they achieve representativity of the full range of ecosystems in all biogeographical subdivisions, or replication of ecological features. As such, their designation is largely inconsistent with best conservation planning practices [7,8]. Also, due to the lack of monitoring systems for these protected areas, little is known about whether the declared SPAMIs actually achieve their designated level of protection [9].

Several spatial conservation planning initiatives for the Mediterranean Sea have been proposed in the last decade (Table 1), some recognising and attempting to address the above-mentioned challenges. These include proposals by intergovernmental organisations (ACCOBAMS, CIESM) as well as by NGOs (WWF/IUCN, Greenpeace, Oceana) and scientific consortia (for a more in-depth review of existing initiatives see Micheli et al. [4]). None, however, are embedded in any legally binding framework.

There are also several studies aiming to identify priority areas for conservation and to assess the effectiveness of the approximately 170 marine-coastal protected areas (accounting for 4.56% of the total sea surface area) established in the Mediterranean Sea (Table 2). In addition to serving as inventories, these studies have identified conservation gaps and ‘hotspots’ of biodiversity or threats. For example, Coll et al. [10] quantified the areas of conservation concern for biodiversity by looking at the spatial overlap between high biodiversity and high cumulative human threats, whereas Mouillot et al. [5] examined the spatial match of various diversity traits and the distribution of MPA and fishing efforts (using total catch allocated spatially as a proxy for effort). Portman et al. [9] examined the spatial distribution of Mediterranean MPAs in relation to areas of high human impact and activity in the near-shore marine and terrestrial environment. However, these scientific initiatives fall short of guiding conservation planning efforts and informing governance processes. Although they include ecological considerations, they miss important elements to take into account when planning conservation initiatives, particularly designating SPAMI areas as interconnected nodes within the larger EBSA areas.

For marine areas within the jurisdiction of the European Union (EU), the Habitats Directive [11] and the Birds Directive [12] (collectively the Natura-2000 network) serve as a legally binding basis for the establishment of a set of terrestrial and marine protected areas,. This network, despite its drawbacks [13,14], is an important binding framework for conservation planning in the EU (see http://ec.europa.eu/environment/nature/natura2000/). However, the Natura-2000 initiative covers only the territorial waters of EU member states and thus fails to consider the myriad of ecosystem concerns throughout the Mediterranean Sea [15]. The more recent Marine Strategy Framework Directive (MFSD) [31] requires riparian EU Member States to implement national strategies for the

Table 2
Recent research efforts to identify areas for marine conservation for the Mediterranean at a whole-basin scale.

Authors	Year	Objective	Methodology
Abdulla et al.	2008	Assess progress towards the goal of 10% protection	Inventory and manager questionnaire/interviewing
Mouillot et al.	2011	Identify mismatches	Overlays of fish diversity traits, fishing pressure and existing MPAs
Micheli et al.	2011	Hotspots of human activities and other stressors	Cumulative impact assessment based on the methods developed by Halpern et al. [20]
Coll et al.	2012	Identify mismatches and areas of conservation concern	Spatial overlap between high biodiversity, high cumulative threats, and MPAs
Portman et al.	2012	Inventory; typology; spatial distribution analysis	Spatial overlap of between coastal human impact and activity, and MPAs; statistical spatial analysis

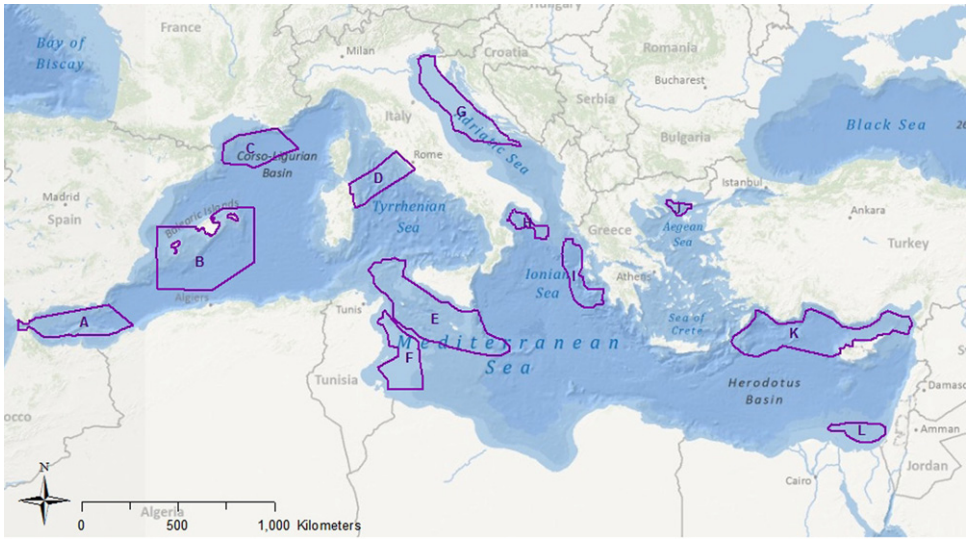

Fig. 1. Priority conservation areas in the open seas, including the deep sea, containing sites that could be candidates for the SPAMI list (adapted from UNEP-MAP RAC/SPA 2011). A, Alborán Seamounts; B, Southern Balearic; C, Gulf of Lions shelf and slope; Central Tyrrhenian; E, Northern Strait of Sicily (including Adventure and nearby banks); F, Southern Strait of Sicily; G, Northern and Central Adriatic; H, Gulf of Taranto to Santa Maria di Leuca; I, North-eastern Ionian; J, Thracian Sea; K, North-eastern Levantine Sea and Rhodes Gyre; L, Nile Delta Region. (The Pelagos Sanctuary declared between C and D a SPAMI in 2001 is shown in Fig. 5.)

attainment of the Good Environmental Status of their seas, including the establishment of MPAs. The MSFD encourages cooperation with third States to that effect. Furthermore, the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), which commits parties to protect endangered terrestrial and aquatic natural habitats and species, also engaging non-European Mediterranean nations such as Morocco, Tunisia and Turkey.

The only formal regional process for the organised identification of sites to construct an ecologically representative network of MPAs in the Mediterranean is an effort led by the United Nations Environment Programme's Mediterranean Action Plan (hereafter UNEP/MAP). This process began in 2009 in cooperation with the European Commission. The effort consisted of a three-stage hierarchical planning approach [16] that led to the identification of a set of large EBSAs distributed throughout the basin.

Over the course of three years, the EBSAs have been discussed, amended, and ultimately endorsed by all the contracting parties to the Barcelona Convention (21 Mediterranean countries and the European Union). In 2012, the 17th Ordinary Meeting of the Contracting Parties (COP 17) to the Barcelona Convention adopted the Paris Declaration. In this declaration, the parties reaffirmed their commitment to the development of a coherent, well-managed network of MPAs. They formally endorsed the EBSAs Map (Fig. 1), rendering it the first official document adopted at the regional scale to identify priority conservation areas in the Mediterranean open seas. The EBSA Map currently has 11 areas, one less than what was initially approved in 2010.[1]

To identify EBSAs, the Mediterranean was first divided into eight sub-regions having some ecological homogeneity (Fig. 2) (UNEP-MAP RAC/SPA 2010). Subsequently, expert oceanographers, marine biologists and ecologists identified EBSAs within each sub-region using the Convention of Biological Diversity (CBD) criteria. A parallel process involved maximising overlap between thematic polygons. UNEP-MAP then drew boundaries excluding the territorial seas components. The decision to concentrate EBSAs in the pelagic environment beyond the 12 nautical mile limit of the territorial seas was taken to compensate previous practice that resulted in almost all Mediterranean MPAs being designated in near-shore coastal waters [6,9].[2] The third stage, currently being implemented, aims to identify MPA sites within the EBSAs and the socio-economic, legal, administrative and political actions necessary for the formal establishment of the MPAs. The MPA sites could become the building blocks of a regional ecologically representative network of protected areas, a stated priority of the 22 signatories to the Barcelona Convention.

The EBSAs map sets the baseline for the implementation of the SPA/BD Protocol. Neighbouring countries are expected to develop

[1] The Eratosthenes Seamount EBSA was removed due to the objection of Cyprus.

[2] However, for any future MPA network to more effectively ensure adequate representation and connectivity of all ecological components, a more balanced inshore/offshore regional selection of areas to be protected will have to be considered, such as extending, where appropriate, the limits of EBSAs shown in Fig. 1 to the coastal zone, particularly where coastal MPAs or Natura-2000 sites already exist.

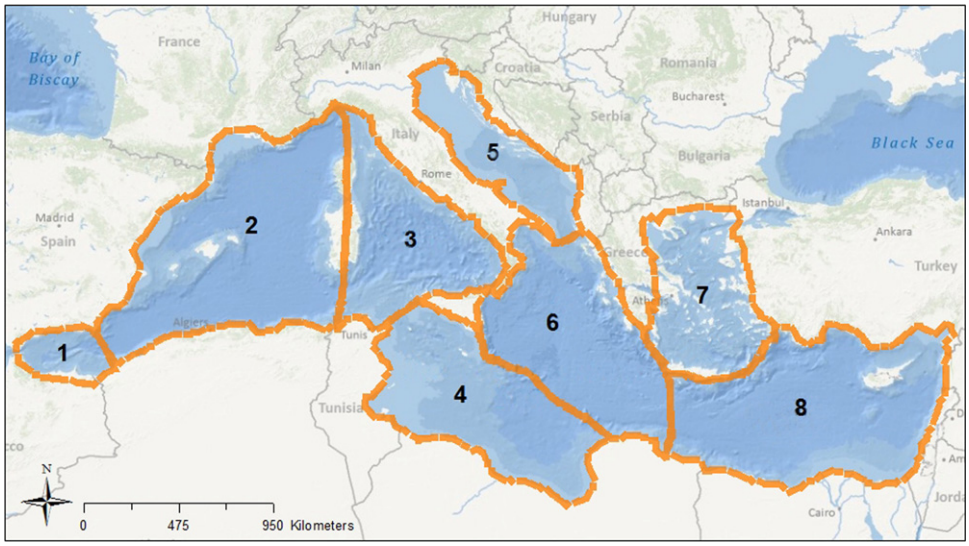

Fig. 2. Mediterranean sub-regions as proposed in Notarbartolo di Sciara and Agardy 2010. 1, Alborán Sea; 2, Algero-Provencal Basin; 3, Tyrrhenian Sea; 4, Tunisian Plateau/Gulf of Sidra; 5, Adriatic Sea; 6, Ionian Sea; 7, Aegean Sea; 8, Levantine Sea.

joint proposals on where to establish SPAMIs within the EBSAs. In addition, they are expected to design appropriate national and trans-boundary governance systems and effective management plans that will ensure that protection is increased from the current ~4% [6] to the 10% protection target by 2020 set by the CBD.

Although several efforts exist identifying areas of conservation interest at different scales for the Mediterranean, they are merely intended as lobbying tools aimed at European and Mediterranean governments for the creation of new MPAs and MPA networks. Although these proposals contribute significantly to the identification of priority conservation areas in the Mediterranean Sea, none of them is embedded in any binding legal framework, resulting in rather limited outcomes. By contrast, the EBSAs are already endorsed and ratified by the COP to the Barcelona Convention. A major effort needs to be invested by all conservation actors and national governments in moving the EBSA process from assessment and identification to planning and implementation of protected areas (SPAMIs) or conservation zones. In the next sections, a brief overview of appropriate planning frameworks is provided and a step-by-step planning process to move the EBSA process forward is proposed.

3. Choosing the appropriate planning framework

3.1. Eco-regional approach and boundaries

The regional scale of the EBSAs is appropriate considering both political and ecological concerns. Administratively, most EBSAs cross the territorial waters of 3–5 Mediterranean countries. It is known from planning and environmental management literature that the likelihood of responsible stewardship can be increased by matching political incentives and management initiatives to the appropriate scale, particularly when there is a need for trans-boundary action [17,18].

Ecological 'boundaries' are in fact artifice since ecosystems are open systems — marine ecosystems especially so. However, at the basin level, the physical topography and large-scale ecosystem identification processes used in the past (such as Spalding et al. [19]), help to define sub-regions with at least some degree of homogeneous ecological identity. There is general consensus that there are up to 8 sub-regions in the Mediterranean Sea that can be considered discrete [6,16,20]. Fig. 2 shows the eight, generally accepted sub-region divisions with boundaries – though these boundaries are neither precise, immutable, nor politically sanctioned.

Considerable ecological heterogeneity still exists within each of these sub-regions [21] and threats and impacts are heterogeneous as well [9,10]. For this reason, it makes sense to identify sub-areas within the sub-regions, moving down one step in a nested hierarchy. Then, within each EBSA, data on species, processes, pressures, and threats can be analysed (e.g., [4]). This facilitates the identification of priority areas for conservation, which may eventually then become SPAMIs, MPAs, fisheries restricted areas, or zones of various levels of protection within a marine spatial plan. Together the area within the EBSAs exceeds the 10% target set by the CBD to achieve representativity [22].

When bringing political and ecological concerns together for marine spatial planning (MSP), scale differences are common between assessed areas and planning boundaries, with the latter often being limited to jurisdictional extents and usually the more restrictive of the two [23]. Boundaries of protection in legislation and regulatory programs can typically be characterised on a spectrum from arbitrary limits (e.g., territorial sea limits of 12 nm or Exclusive Economic Zone limits) to those determined completely on the basis of physical characteristics (e.g., watershed boundaries) [24].

In any case, boundaries should reflect the problem being addressed as this will have repercussions on both the scope and scale of protection, with scope referring to the uses regulated within an area and scale the extent or reach of planning units [25,26]. Undertaking MSP within the large regional scale of EBSAs means that various degrees of protection will likely be used within them (e.g., [18]). Therefore, a process of priority setting for zoning is needed. Zoning designed for spatially and temporally-varied management is particularly suited to the application of conceptual planning models [27]. In the next section it is proposed to synthesise conservation prioritising methods with principles of urban, regional and environmental spatial planning for specific planning within the EBSAs.

3.2. The interface: planning theory and conservation

The planning profession emerged out of series of crises starting in the mid-19th century, such as health crises that led to epidemics, social crises that led to riots and strikes and other crises resulting from man-made and natural hazards such as fire and floods [28].

Table 3
Summary of conceptual planning models with level of relevance to the use of marine spatial planning within EBSAs.

Planning Theory	Main tenets	Environmental planning source	Relevance to EBSA planning
Comprehensive-Rational	Science-technology based; planner is technician; dominant model used in professional planning	Banfield, E.C. 1959. Ends and means in planning. *International Social Science Journal* 11, 3:361–68	High
Incremental	Used for crisis management; highly political; environmental problems handled individually	Lindblom, C. 1965. *The intelligence of democracy: decision making through mutual adjustment*. New York: Free Press	Low
Adaptive	Reliance on modelling; anticipatory, predicts future events; recognises dynamic character of ecosystem	ESSA Environmental and Social Consultants Ltd. 1982. *Review and evaluation of adaptive environmental assessment and management*. Vancouver: Environment Canada	High
Contingency	Risk assessment based; used for natural and man-made hazards; alternative course of action produced to adverse consequences	Christiansen, K. S. 1985. Coping with uncertainty in planning. *Journal of the American Planning Association* 51: 63–73	Low
Advocacy	Planner cannot be neutral; planning congruent with client values/goals; relates to conflict	Marris, P. 1994. Advocacy planning as a bridge between the professional and the political. *Journal of the American Planning Association* 60: 143–46	Low
Participatory	Focus on process, not outcomes; often bottom-up	Arnstein, Sherry R. 1969. A ladder of citizen participation. *Journal of the American Institute of Planners* 34: 216–24	High

Adapted from Hostovsky C. Integrating planning theory and waste management—an annotated bibliography. Journal of Planning Literature. 2000;15:305–32 and Briassoulis H. Theoretical orientations in environmental planning: an inquiry into alternative approaches. Environmental Management 1989;13:381–92.

Progressive intellectuals envisioned healthy cities much as environmentalists today envision healthy ecosystems. Among the first city parks were those planned around areas of ecological importance that served as urban wilds for bird habitat or served to improve urban air quality [29]. Similarly today, due to competition for space on land and sea, practitioners of systematic conservation planning look for strategies that account for various measures of feasibility such as the opportunity costs of conservation and uncertainty about achieving objectives. These pragmatic concerns are weighed in addition to measures taken from traditional conservation theory such as irreplaceability and threats to biodiversity resources [30].

Different types of planning tools and approaches, such as incremental planning and participatory planning, can inform marine spatial planning to further marine conservation goals (See Table 3). Renewed efforts at coastal zone management through the Barcelona Convention with its relatively new ICZM and Offshore Protocols (both in force since 2011) and current efforts at MSP (at least among the northern Mediterranean countries [31]) suggest that it is time to advance the EBSAs using planning techniques similar to those used on land [23]. Although used extensively in other fields, conceptual planning models have only recently found their way into conservation project planning, management, monitoring, and evaluation [32]. Here the interface between different conceptual models of planning and systematic conservation planning is briefly reviewed.

Comprehensive rational (synoptic) planning was for a long time the predominant planning model [33]. It is based on instrumental rationality used for analysing and making decisions [34]. Its central assumption is that there is a right or wrong way of management, problem solving or development. In a positivistic view, this model assumes that it is possible to find this best way. Otherwise it is based on the notions that (1) scientific knowledge and modern technologies can control the environment based on a belief in progress; (2) common public interest is clear; and (3) change is engineered from the top [35].

Incremental planning is the most widely noted alternative to comprehensive rational planning (see [33]). It is based on 'bounded' instrumental (functional) rationality which considers the planner, or planning institution, as an actor who simplifies the complex world by finding the satisfactory solution, rather than the best one. For this model, planning is carried out in a decentralised manner and the focus is on what can be implemented. There is no clear determination of goals and objectives, only a few options are considered and evaluated [35], and the problem is defined at regular intervals [33]. Arguably this is what has happened so far in the Mediterranean, and is inadequate for achieving basin-wide conservation outcomes.

Participatory planning emphasises involving the entire community in the strategic management processes. In the conservation context the community would most likely include very diverse stakeholders. It contrasts starkly with the rational planning process in which there is little or no role designated for the people affected by planning [34]. While impossible for application at the Mediterranean basin-wide scale due to political complexities, the hierarchical approach used for planning the EBSAs makes them a more suitable scale for such participation in planning.

Contingency planning, suited particularly to dealing with crises and highly uncertain situation, is arguably less relevant for spatial planning within the EBSAs, even though the ecosystem health of the Mediterranean Sea is severely degraded and therefore facing a crisis. Due to the incremental nature of human impacts and ecosystem degradation the conditions are generally not viewed as a hazard (natural or man-made). Similarly *advocacy planning* is less relevant than other types of planning (Table 3) even though the role of marine spatial planners in developing zoning within the EBSAs will resemble that of an advocate for the marine environment if they adopt an EBM approach, since it considers the entire ecosystem including humans and their needs, particularly ecosystem services [36,37].

Adaptive planning has been emphasised frequently in the conservation planning literature, usually related to adaptive governance or management (see [38]). The notion of adaptive management is fundamental to any EBM framework and enables managers to be flexible, recognising that plans will be modified as more information becomes available and planners learn about the behaviour of the system, gain more experience, or as a result of external circumstances [37]. In the marine spatial planning context, adaptive management has been adopted to facilitate the use of an ecosystem-based approach [39] and also in a conservation context but with an emphasis on iterative evaluation [32]. The UNEP Manual on ecosystem-based management [40] also stresses the adaptive approach, with periodic revisiting of both visioning and operational aspects of planning. Indeed, the rapid degradation of the Mediterranean Sea ecosystems dictates the urgent necessity for spatial conservation planning and management measures that could be modified later with the acquisition of new information.

The region to be the focus for conservation planning of any type should ideally be bounded according to known ecological boundaries, or by considering ecological significance, value and use, and condition

of the different areas. Measures that emerge directing uses within the bounded areas (the EBSAs in the Mediterranean case) can be based on priorities and compromises between various objectives for ocean use, jurisdictional issues, as well as feasibility considerations (e.g. technical and financial capacity for conservation, research or management). Therefore, some combination of the comprehensive rational, adaptive and participatory models of planning are most appropriate for conducting marine spatial planning that lead to networks of MPAs established within the sub-regional EBSAs.

4. A recommended planning approach for EBSAs

Effective conservation planning combines important elements of classic planning theory approaches, particularly rational planning, with its emphasis on science [33] and participatory planning [41]. A conservation planning approach is proposed using an 8-step process, designed to seize opportunities for actions, such as those now existing in the Mediterranean [30]. The process includes rational decision-making based on empirical data, the involvement of stakeholders, and the adaptation of plans to deal with uncertainty and to incorporate the frequent addition of new information.

A modified version of Pressey and Bottrill [30] is herein proposed to suit the sub-regional EBSA scale and the politically complex situation. It incorporates aspects of the different planning approaches described and can serve as a useful guide on how to advance the EBSA process (Fig. 3). As mentioned, two advantages of the situation in the Mediterranean Sea are that: (1) sub-regional areas for conservation, the EBSAs, have been defined and accepted by governments; and (2) much data, especially regarding the physical oceanography and some aspects of species biology and ecology is available. These are already two important steps in the model process. The overall aim of this model is a framework that suits the complexities of large multinational planning problems and is harmonised with the Ecosystem Approach Process (ECAP) to which the 22 Mediterranean countries have already committed [42].

Step 1. *Define the planning regions*
The identification of the planning region is the first step in a scoping process; failure to define and discuss boundaries is one way interest groups inadvertently thwart conservation plans. The appropriate planning regions for the Mediterranean Sea were endorsed by the signatories to the Barcelona Convention with their endorsement of the EBSAs (Fig. 1).

Step 2. *Bring the decision-makers and stakeholders together*
The second step is to ensure participation of the organisations that have the power to implement a plan with all stakeholders. An important task for these actors is to jointly (whenever possible) establish conservation goals. However, the stakeholder identification process can be slow, time consuming and requires leadership from at least one of the key players in a region. The complexity and scale of this process is one reason why conservation planning based on participatory planning at the scale of the entire basin would be unrealistic. A sensible way forward is to start with one or two of the sub-regions in Fig. 2, possibly those politically less complex, and move forward with a demonstration model(s). In developing such a demonstration model, it will be necessary to identify all relevant stakeholders and decision-makers. Involving local communities early on in the planning processes is vital, as it may solve, or even prevent, severe conflicts. Exclusion of any important stakeholder group invariably unravels EBM [23]. A broad participation in working groups and public meetings, where all those whose interests are affected can meet, are the participatory forms that have the best potential to enhance legitimacy [43]. Once all the stakeholders are fully engaged the process is slow but straightforward. Operational objectives should be specific, clearly specifying the state to be achieved, as interpreted unambiguously by all stakeholders through a participatory planning approach.

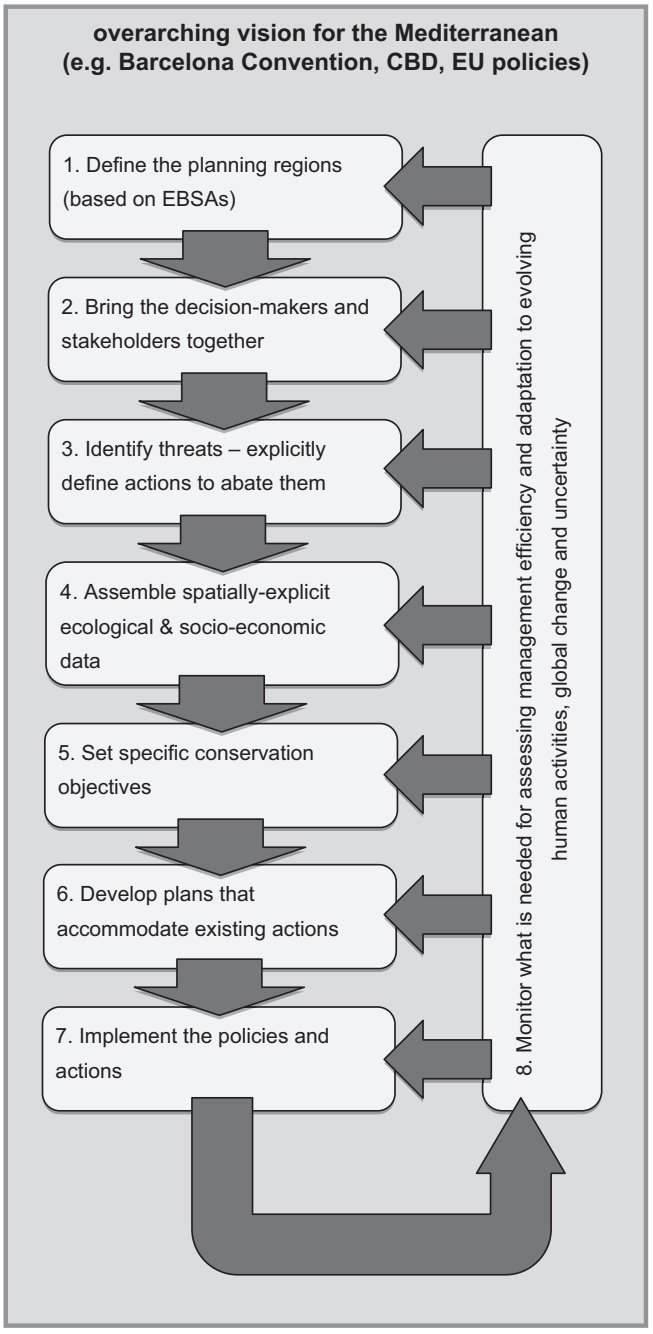

Fig. 3. Flowchart of the recommended process for MSP to advance Mediterranean Sea conservation.

Step 3. *Identify the threats and come to a consensus on what spatially explicit actions can be taken to abate them*
This step is the most time consuming but clearly has its foundations in participatory and adaptive planning because the identification of threats may depend on modelling using incomplete or evolving datasets and a consideration of the target audience for actions (e.g., usually stakeholders). It is important to prioritise threats based not only on existing information about

pressures but also on the impacts of these pressures; some high profile pressures cause less ecological impact than lower profile pressures, yet remain conservation priorities based on 'visibility'. For example, the pros and cons of actions to protect iconic species must be considered. Essential elements of the process will be reliance on ecological models updated from time to time based on new data, that can shed light on expected events (e.g., [4,10]) and can possibly help identify synergies between activities that could cause further degradation.

Step 4. *Assemble spatially-explicit ecological and socio-economic data*
Information on the spatial and temporal distribution of biodiversity features (e.g. species, habitats, ecosystems) and human activities within the EBSA is synthesised here. This step should include the identification of gaps as well, with special emphasis on data-poor areas (this would be the case of the southern and eastern Mediterranean Sea). Where a spatial or temporal overlap between biodiversity features and human activities can be identified, a detailed analysis on the pressures exerted by those activities and their combined impacts on ecosystem components should be performed [44].

Step 5. *Set specific conservation objectives*
Setting ecological conservation objectives can next be done based on the above information to reflect priorities coherent with an ecosystem approach to management. Determining conservation objectives involves interpreting goals to define quantitative conservation objectives for each spatial feature (e.g. 2000 hectares of habitat type or 16,500 individuals of a species) and, where necessary, qualitative objectives based on normative values (i.e., cultural, historical) and other criteria. In order to be consistent with the EBM approach, priorities should serve goals beyond those of the particular species or indicators.

Step 6. *Develop plans that accommodate existing conservation actions*
Marine plans for different regions of the Mediterranean will require different parts of the sea to be placed under different kinds of use regimes, ranging from complete no-take, multiple use areas, potential no-fishing or oil drilling-restricted areas, and finally, areas with no special restrictions. The areas most strictly protected will be those identified as meeting the criteria identified in previous steps.
Rational planning that relies heavily on scientific data and objective processes should give credence to this and the next step. Systematic conservation prioritisation schemes should implicitly take into account the spatial variability of anthropogenic uses and the associated cost of excluding these for the sake of protection [45]. Remote data, and frequently also field surveys, are used in this stage to estimate the extent to which objectives have already been achieved in areas considered to be adequately managed for conservation. This data should be continuously updated.

Step 7. *Implement the policies and actions hierarchically*
Application of conservation actions requires a variety of institutional arrangements adjusted over time in an adaptive manner to ensure that selected areas remain subject to the most feasible and appropriate conservation and management. In this step, jurisdictional issues must be addressed and resolved, clear governance measures put into place and policy gaps filled. The area-specific management plans will be hierarchical in nature with SPAMIs serving the goals determined for the EBSA-level which will in turn serve the Mediterranean Sea level.

Step 8. *Monitor what is needed for assessing management efficiency and adaptation to evolving human activities, global change and uncertainty*
Regulations and incentives to maximise compliance will ensure that individual areas are managed to promote the long-term maintenance of the values for which they were established. This involves explicit management objectives and monitoring to ensure that management actions are effectively making progress towards ecosystem health, well-being and sustainability (continued successful functioning). Here again adaptive processes are needed to ensure that spatial planning performs correctly under evolving conditions in a context of global change and high uncertainty.

5. Overcoming (claims of) knowledge gaps

The mapping of ecosystem components and acknowledgement of their spatially-explicit attributes (Step 4 of the proposed planning framework and what perhaps best characterises rational planning) is often a bottleneck for conservation planning. The claim of insufficient information on the distribution, state, functioning, and interactions of ecological components is often used as a justification for not taking action [46]. Disparate examples of data availability are presented in the two case studies that follow.

In pan-Mediterranean assessments, some areas (especially in northwestern Mediterranean) appear very rich in available information, while for some others (e.g. in the southern and eastern regions of the basin) available data are limited [3,10]. However, even for parts of the Mediterranean considered data-poor, there is scattered information that can be successfully used for planning purposes. While some of this information exists only in the grey literature or in repositories of local institutes, NGOs, or of individual experts and therefore its access is limited, with coordinated and targeted efforts it may become available for conservation planning on the EBSAs scale.

An example is an initiative taken for the north-eastern Ionian Sea based on the work of Issaris et al. [47] and Giakoumi et al. [48]. This is a region typically thought of as data-poor. A coordinated effort was made through the European Union 7th Framework Programme project MESMA (Monitoring and Evaluation of Spatially Managed Areas; www.mesma.org) to collect spatial information on priority ecological features (including main habitat types and species such as cetaceans, monk seal, turtles, and selected fish, seabirds, invertebrates) and also human pressures (fisheries, tourism, coastal development, industry). MESMA brought together a large group of scientists from research institutes and NGOs and also resulted in thorough review of scientific and grey literature. Within less than a year, layers for many ecological features (Fig. 4) and human pressures were created, and priority areas for conservation were identified by applying the decision-support tool Marxan [48].

On the opposite end of the spectrum, data-rich areas exist where some planning has gone on but where more detailed planning, and implementation of a tailored management plan for the area, is needed. A good example is the Pelagos Sanctuary for Mediterranean Marine Mammals, established in 1999 by a treaty amongst France, Italy and Monaco [49]. The Sanctuary was created because it contains important habitats for all the cetacean species regularly occurring in the Mediterranean and provides umbrella protection to other marine species listed as endangered in the SPA Protocol to the Barcelona Convention. Since the establishment of the Pelagos Sanctuary, a considerable wealth of scientific information has been collected on the ecology and conservation status of its mammalian fauna (e.g., [50] and references therein). Creation

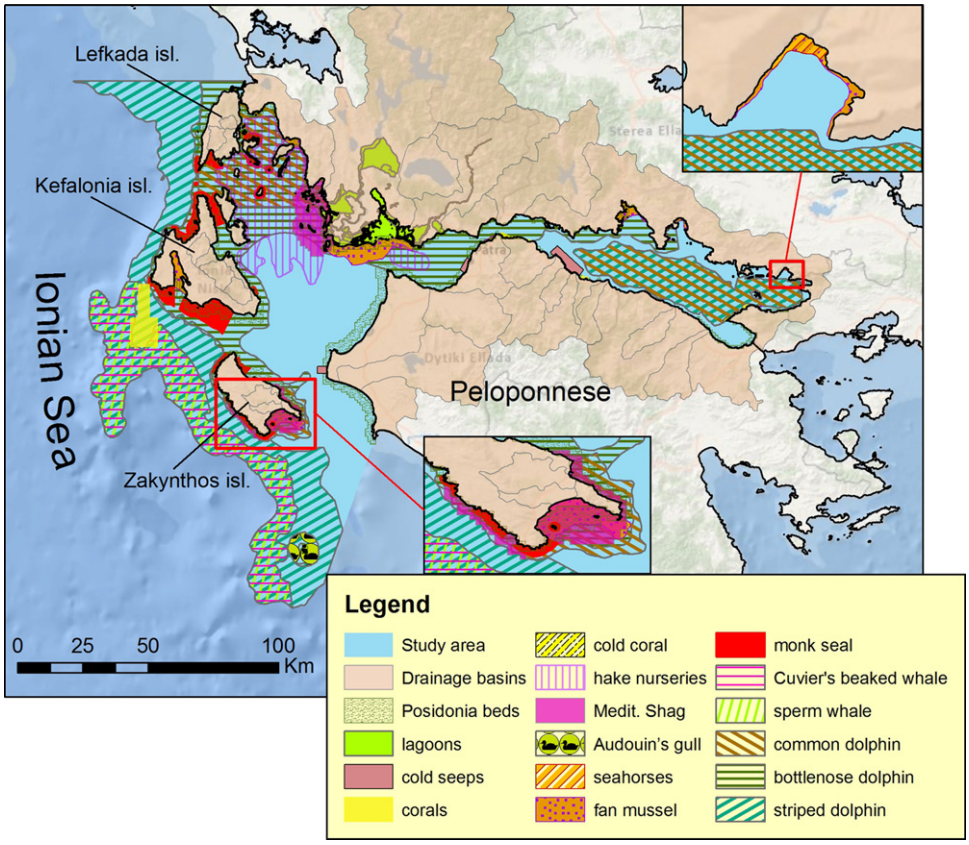

Fig. 4. Mapping of ecosystem components (habitats distribution or important areas for protected/endangered/key species) in the north-eastern Ionian Sea (modified from Ref. [47]).

of the Sanctuary resulted in the world's first High Seas MPA, and was thus met with much acclaim in the marine conservation community.

Unfortunately, Pelagos has failed to fulfil its main goal of significantly improving the conservation status of the area's marine mammal populations, which are threatened by intense human pressures [49]. The Pelagos Sanctuary (Fig. 5), today the only SPAMI designated beyond national (territorial waters) jurisdiction in the Mediterranean, provides a unique opportunity for management experimentation and for the development of future large protected areas in the region [49] according to the model proposed. On the one hand, the establishment of the SPAMI has been the impetus for much monitoring and data collection. For example, marine mammal ecology and distribution data, coupled with what is known about seabird distribution, fisheries productivity, and other features of the vast Pelagos area are sufficient to undertake significant conservation planning. But further review of what has transpired in terms of management is needed. This would correspond with Steps 6 and 7 in the process proposed above. An adaptive planning approach inferring an iterative process would review the functioning of existing institutions, thus providing appropriate adjustments.

For both the Pelagos Sanctuary case and for the case of the north-eastern Ionian Sea, the hierarchical conservation strategy proposed (Section 4) can be applied at this sub-regional scale, just as it can be at the larger, pan-Mediterranean scale, or at smaller, subnational scales. For example, in regards to the Pelagos Sanctuary, core or focal areas that support the wider ecosystem can now be identified for strict protection as recommended in Step 5 in the process outlined above. In general, enough is also known about the threats to the various species and habitats, and the wider ecology of the system, to warrant an integrated and systematic approach to management. Thus areas beyond these nodes of conservation importance could be managed for multiple uses such that priority management objectives are satisfied.

6. Conclusions

Existing efforts, some occurring in academe as applied research and some operationalised with an advocacy-oriented focus (i.e., to convince policy makers to certain conservation measures) have not yet reached their potential. What does exist for the Mediterranean Sea is a scientifically sound and politically endorsed set of priority areas for conservation action — the EBSAs. These priority areas can serve as a foundation to which the model process grounded in planning theory proposed here can be applied. The pan-Mediterranean planning that is proposed herein, starting from these existing priority areas, can have the best chance for generating the political support and commitment that is key to science-based and effective implementation of a network of MPAs.

With new efforts at MSP in the offing and renewed efforts at coastal zone management, at least among the northern Mediterranean countries but also through all the riparian states that are parties to the Barcelona Convention, the time is right to remedy shortfalls. Improved integration of science and policy will advance marine conservation; it can be achieved by taking advantage of the interest of countries to spatially plan the marine realm at this time or in the near future (see [51]). In any case marine conservation planners should make every effort to draw on existing modes of planning as appropriate together with existing data sets and studies.

Mediterranean eco-regions are proposed as the spatial unit for conservation planning, focusing on the already formally endorsed EBSAs. Sufficient information to initiate an adaptive conservation

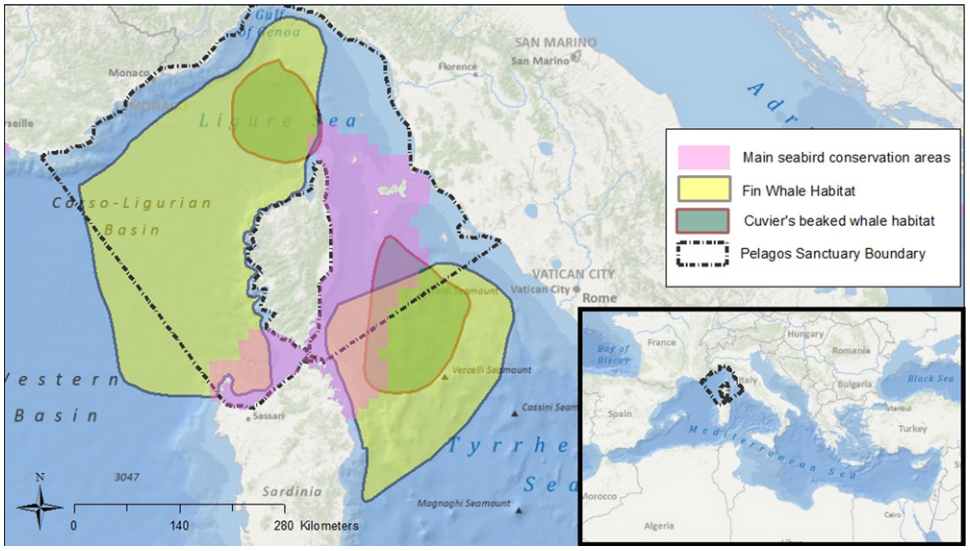

Fig. 5. Mapping of marine mammal and marine bird distributions that can be used for more detailed conservation planning within the Pelagos Sanctuary (modified from Ref. [16]).

planning process does exist (e.g. [4]). Methods for participatory planning at regional scales abound (e.g., [43]). Finally, adaptive management to modify the planning and adjust to changes as new and improved information becomes available and shortfalls in existing efforts become clear should be also incorporated.

Existing frameworks for doing systematic conservation planning that take advantage of appropriate methods and bring many of the on-going planning initiatives in the Mediterranean together include the Barcelona Convention, and the catalysing initiatives spearheaded by the Mediterranean Action Plan (MAP) and its Regional Activity Centres. Not only the 22 signatories (21 riparian countries together with the EU), but also key players in the NGO and academic communities, have seats at this table. MAP is also increasingly interested in working with stakeholder groups (such as the General Fisheries Commission of the Mediterranean) in order to integrate invaluable data (e.g., on fisheries and their impacts) with information on various facets of the regional ecosystems.

By reaching out to tap the various streams of research and planning taking place at various scales throughout the region, larger-scale efforts such as the MAP could leverage existing commitments under the Barcelona Convention and its protocols to support a systematic planning effort that could yield good conservation outcomes for all. As shown, there is no justification for inaction. While further research will definitely provide new insights on the pros and cons of different approaches, the time has come to act to systematically advance conservation in this important and unique region.

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