Check for updates

STUDY PROTOCOL

Current practices in marine systematic conservation planning: protocol for a global scoping review

[version 1; peer review: 2 approved]

Erika Fabbrizzi[1], Sylvaine Giakoumi[2], Dimitra Petza[3], Stelios Katsanevakis[3], Esther Domínguez Crisóstomo[1,4], Francesco Colloca[5], Michael Elliot[6], Wesley Flannery[7], Ibon Galparsoro[8], Maren Kruse[9], Emna Ben Lamine[10], Ben McAteer[7], Vanessa Stelzenmüller[9], Simonetta Fraschetti[1]

[1]Department of Biology, University of Naples Federico II, Naples, Campania, Italy
[2]Sicily Marine Centre, Stazione Zoologica Anton Dohrn, Palermo, Sicily, 90149, Italy
[3]Department of Marine Sciences, The University of the Aegean, Mytilene, 81100, Greece
[4]Department of Biology, University of Algarve, Faro, Faro District, Portugal
[5]Integrative Marine Ecology Department, Stazione Zoologica Anton Dohrn, Rome, 00198, Italy
[6]Institute for Estuarine and Coastal Studies, University of Hull, Hull, England, UK
[7]Queen's University Belfast, Belfast, Northern Ireland, UK
[8]Marine Research Division, AZTI Foundation, Pasaia, Euskadi, 20110, Spain
[9]Thünen Institute of Sea Fisheries, Bremerhaven, 27572, Germany
[10]Universite Cote d'Azur, Nice, Provence-Alpes-Côte d'Azur, France

v1 **First published:** 05 Sep 2023, **3**:136
https://doi.org/10.12688/openreseurope.16300.1
Latest published: 05 Sep 2023, **3**:136
https://doi.org/10.12688/openreseurope.16300.1

Abstract

Background: Systematic Conservation Planning (SCP) involves a series of steps to identify conservation areas and develop management strategies, incorporating feedbacks, revisions, and iterations at any stage. It is a valuable tool in facilitating the effective implementation of Ecosystem-Based Marine Spatial Planning (EB-MSP). However, few efforts have been carried out to summarize information on methods, trends, and progress in SCP in the designation of Marine Protected Areas (MPAs). The present work aims at providing the protocol to perform a scoping review (ScR) to assess the contribution of SCP to the design of effective MPA networks, identifying both the development of good practices and the presence of gaps of knowledge in terms of criteria for their implementation.
Protocol: The ScR will follow the Joanna Briggs Institute (JBI) methodology. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extension for ScRs supported the definition of this protocol. The three databases Web of Science, Scopus, and Google Scholar will be used for the bibliographic search. Inclusion criteria will be as follows: studies applying SCP in the marine realms worldwide, assessing its contribution to the design of MPA networks. Both peer-reviewed and grey literature will be considered for eligibility. No search limitations will be applied regarding

Open Peer Review

Approval Status ✓ ✓

	1	2
version 1 05 Sep 2023	✓ view	✓ view

1. **Hong Ching Goh**, University of Malaya, Kuala Lumpur, Malaysia

2. **Cinzia Podda**, International Marine Centre, Oristano, Italy

Any reports and responses or comments on the article can be found at the end of the article.

publications' year, stage, subject area and source type. Studies in English, French, German, Greek, Italian, and Spanish will be reviewed. Grey literature will be sourced from pre-print archives, institutional websites and other web-based search engines. The Covidence software will be used for the process of documents selection and data extraction. The findings of the ScR will be presented through tables, graphs, and maps, accompanied by a narrative summary of the outcomes.
Conclusions: This comprehensive approach will provide a visual representation of the data, enhancing the understanding and interpretation of the results.

Keywords
Systematic Conservation Planning, Marine Protected Area networks, Ecosystem-Based Marine Spatial Management, climate change, connectivity, restoration, trade-offs analysis, conservation targets, scoping review protocol, JBI methodology, PRISMA statement



This article is included in the Horizon Europe gateway.

Corresponding author: Erika Fabbrizzi (erika.fabbrizzi@unina.it)

Author roles: Fabbrizzi E: Conceptualization, Investigation, Methodology, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing; **Giakoumi S**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Petza D**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Katsanevakis S**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Domínguez Crisóstomo E**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Colloca F**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Elliot M**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Flannery W**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Galparsoro I**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Kruse M**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Ben Lamine E**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **McAteer B**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Stelzenmüller V**: Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Fraschetti S**: Conceptualization, Funding Acquisition, Investigation, Methodology, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No [101059407](Improved transdisciplinary science for effective ecosystem-based maritime spatial planning and conservation in European Seas [MarinePlan]) and UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee grant Nos [10038951 and 10050537].
The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Copyright: © 2023 Fabbrizzi E *et al*. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Fabbrizzi E, Giakoumi S, Petza D *et al.* **Current practices in marine systematic conservation planning: protocol for a global scoping review [version 1; peer review: 2 approved]** Open Research Europe 2023, **3**:136 https://doi.org/10.12688/openreseurope.16300.1

First published: 05 Sep 2023, **3**:136 https://doi.org/10.12688/openreseurope.16300.1

Introduction

Systematic Conservation Planning (SCP) is an approach involving a series of steps to identify conservation areas and develop management strategies, incorporating feedbacks, revisions, and iterations at any stage (Kukkala & Moilanen, 2013). Previous experiences in terrestrial and coastal regions have shown that adopting a systematic approach to conservation planning and management can contribute to the preservation of ecosystem health and productivity (Ban *et al.*, 2014). SCP enables effective and equitable management, aligning with various regional and global agreements focused on sustainable marine environment usage (*e.g.*, CBD Aichi Target 11, SDGs, EU Biodiversity Strategy). There are several distinctive features associated with SCP. It requires a clear definition of the conservation target, including the selection of ecological features to protect or use as proxies for overall biodiversity within the planning process. It is built upon explicit operational objectives and assessing the progress made towards conservation goals through existing Marine Protected Areas (MPAs). SCP employs explicit methods for locating and designing new MPAs that complement existing ones to achieve the predefined goals, employing specific criteria for implementing conservation actions. Another important aspect of SCP is the principle of efficiency, *i.e.*, the explicit consideration of socioeconomic variables to minimize conflicts between conservation and existing (or planned) socioeconomic activities. Lastly, SCP adopts explicit objectives and mechanisms for maintaining conditions within MPAs that support the persistence of vital natural features, while also including monitoring these features for an adaptive management (Margules & Pressey, 2000).

SCP can serve as a valuable tool in facilitating the effective implementation of Ecosystem-Based Marine Spatial Planning (EB-MSP). This management approach takes into account the complex interactions among ecosystem components and human activities at various spatial scales, rather than isolating individual sectors, species, or ecosystem services (Halpern *et al.*, 2008; Leslie & McLeod, 2007). However, in this context, the designation of MPA networks is often based on structural characteristics of habitats and iconic species, rarely including the consideration of the ecological processes, thus disregarding the key SCP principles: connectivity, adequacy, representativeness, and efficiency. To address these issues, Katsanevakis *et al.* (2020) recommended SCP principles to ensure that MSP initiatives meet conservation requirements, establishing ecologically coherent networks of MPAs, and simultaneously address socioeconomic objectives (*e.g.*, sustainable fisheries). Yet, only limited efforts have been made to consolidate information on methods, trends, and progress in SCP (Álvarez-Romero *et al.*, 2018).

Here, we present a scoping review (ScR) protocol, aiming at assessing the contribution of SCP for designing MPA networks, providing an indication of the existence of successfully implemented marine plans, their impact on protecting biodiversity and identifying knowledge gaps.

The objectives of the ScR are as follows:

- Identify and critically evaluate the various methods and tools proposed for addressing key issues, such as (i) creating MPA networks resilient to climate change; (ii) securing marine functional connectivity; (iii) integrating terrestrial-freshwater-marine planning; (iv) embedding cumulative effects assessments in the planning process; (iv) assessing the potential Other Effective Conservation Measures (OECMs) for contributing to conservation targets; (v) including prioritization of habitats/species/areas for restoration, (vi) assessing synergies and trade-offs between passive and active restoration; (vii) addressing biological invasions; (viii) balancing conservation, socio-economic, and cultural objectives, and analysing trade-offs of planning options.
- Identify the gaps in current practices of SCPs for addressing these topics.
- Explore existing guidelines for improved conservation planning.

Review question

The overall research question that will guide this ScR is: What is the current knowledge about Marine Systematic Conservation Planning approaches at a global scale? The ScR will attempt to answer the following sub-questions:

1. What is the geographical distribution of the case studies adopting SCPs?
2. Which are the criteria/methodologies/tools for implementing SCP, in particular, to address climatic resilience, functional connectivity, integrated land-freshwater-sea planning, cumulative effects, the contribution of OECMs, restoration site prioritization and actions, biological invasions, ecological-socioeconomic trade-offs?
3. What is the spatial contribution (% of the area covered) by case studies implementing SCP?
4. What are the limits in the adoption of good practices in SCP?
5. What are the success stories and failures acknowledged by the literature?
6. Which are the gaps of knowledge and policy recommendations provided by case studies implementing SCP?
7. What is the actual stage of implementation of SCPs?

Methodology

The ScR will follow the methodology outlined by Arksey and O'Malley (2005), as further developed by Levac *et al.* (2010) and enhanced by the Joanna Briggs Institute (JBI). In particular, the methodology as defined Peters *et al.* (2020) for scoping reviews will be adopted.

The Preferred Reporting for Systematic Reviews and Meta-Analyses extension for scoping reviews, PRISMA-ScR (Tricco *et al.*, 2018) supported the definition of this ScR protocol and will guide the final review paper. The PRISMA-ScR checklist, for a better understanding of relevant terminology, core

concepts, and key items for scoping reviews, is available in the Open Science Framework repository at osf.io/e8h64.

The SUMARI Protocol Template for Scoping Reviews in Word format (JBI SUMARI, 2021) has been used for the reporting of this ScR protocol.

Inclusion/exclusion criteria

The development of the inclusion criteria for the ScR determining which sources will be considered for inclusion in the ScR, will be aligned with the mnemonic "Participants, Concept, and Context (PCC)" (Table 1).

Participants. The ScR will consider all studies applying SCP (documenting specific implementation case studies or prioritization approaches/criteria/tools or including guidelines for SCP implementation or informing SCP approaches by providing software, scripts, and algorithms). Studies applying other non-systematic approaches for the selection of sites for protection or restoration will not be taken into account.

Concept. The concept adopted by the ScR will be the assessment of how the contribution of SCP to the design of MPAs has been addressed, so far in the scientific literature. Studies that do not provide sufficient methodological details but simply mention the use of a specific SCP tool, *e.g.*, Marxan, will not be taken into account.

Context. Spatially explicit case studies in the marine realms worldwide will be considered by the ScR. Studies without a marine component (primarily terrestrial or freshwater) or where the marine component includes only transitional systems will not be taken into account.

Types of sources. This ScR will encompass peer-reviewed literature (such as research articles, reviews, book chapters, letters, editorials, books, and data papers) obtained from ISI (International Scientific Indexing) journal databases. Additionally, grey literature (including unpublished academic research, theses, policy papers and reports, conference abstracts and papers) will be sourced from pre-print archives, institutional websites and other web-based search engines. References suggested from topic experts and NGOs will also be taken into account. There will be no restrictions imposed regarding the publication year (the only cut-off will be set according to the date in which the literature searching is performed, see Table 2), publication stage (final or in press), subject area, or source type. All document types will be considered. Language restrictions will be implemented to reflect the language proficiency of the authors, including in the ScR only studies published in English, French, German, Greek, Italian, and Spanish.

Search strategy

The search strategy will apply a combination of keywords within documents' title, abstract, and keywords using three different databases: The bibliographic search will be performed in three databases/ platforms, *i.e.*, 1) Web of Science – Core Collection, 2) Scopus and 3) Google Scholar (see Table 2 for the detailed combination used for each database). The total of the

Table 1. Inclusion and exclusion criteria for the scoping review in correspondence with the "Participants, Concept and Context, PCC" mnemonic and evidence types and sources.

PCC and evidence types and sources	Inclusion criteria	Exclusion criteria
PARTICIPANTS *Systematic conservation Planning (SCPs)*	Studies applying SCP (documenting specific implementation case studies or prioritization approaches/criteria/tools or including guidelines for SCP implementation or informing SCP approaches by providing software, scripts, and algorithms)	Studies that do not apply systematic conservation planning but other non-systematic approaches for selection of sites for protection
CONCEPT ***Methods and tools used for SCP***	All studies using SCP for designing Marine Protected Areas (MPAs), clearly describing the applied methods/ tools.	Studies that do not provide sufficient methodological details but simply mention the use of a specific SCP tool, *e.g.,* MARXAN.
CONTEXT *Global, marine realm*	Studies in: - Marine realm - Globally	Studies where the marine component includes only transitional systems. Studies without a marine component (primarily terrestrial or freshwater)
Evidence types & sources	- Peer-review literature - Grey literature - All years of publication - All publication stages, subject areas, and source types - Experimental and observational studies - Case studies, reviews, framework/synthesis - Studies published in languages competent to the researchers' team (*e.g.,* English, French, German, Greek, Italian, Spanish according to the team's language competency)	---

Table 2. Details of scoping review search strategy per database, *i.e.*, name of database, date of search, search query, and results (as the number of documents returned by the search).

Database 1	**Web of Science**
Date of search:	January 26, 2023
Query:	TS - "Systematic Conservation Plan*" **OR** "Marine Spatial Plan*" **OR** "Marine Zon*" **OR** Zoning **OR** "Marine Protected Area*" **OR** "Marine Reserve*" **OR** "Marine priorit*" **OR** "Marine planning" **OR** "Conservation priorit*" **OR** "Spatial optim*" **OR** "structured decision making" **OR** "Multi Criteria Decision Analysis" **OR** "multi criteria method" **OR** "cost effective* prioritization" **OR**"cost effective* prioritisation" **OR** "cost effective* analysis" **OR** "Spatial analysis" **AND** Marxan* **OR** MarCon* **OR** MarZone **OR** Spexan **OR** Spot **OR** Sites **OR** Zonation **OR** C-Plan **OR** CPLAN **OR** ResNet **OR** BioRap **OR** CREDOS **OR** MultCSync **OR** TARGET **OR** TRADER **OR** WorldMap **OR** prioritizR **OR** "Maritime Use Conflicts (MUC) Analysis" **OR** "Maritime Use Conflicts Analysis" **OR** "MarineMap" **OR** OceanMap **OR** CCRES **OR** CLUZ **OR** MinPatch **OR** "Zonae Cogito" **OR** "NatureServe Vista" **OR** PANDA **OR** SeaSketch **OR** PPGIS **OR** "Public Participation GIS" **OR** "Participatory GIS" **OR** PGIS **OR** GAMS **OR** CPLEX **OR** Gurobi **OR** "Integer Linear Program*" **OR** "integer programming" **OR** "multi-criteria" **OR** "multi-action" **OR** portfolio* **OR** "Decision Support System" **OR** DSS **OR** "decision support tools" **OR** DST **AND** "Protected area" **OR** "marine protected area" **OR** MPA **OR** "priority area" **OR** "area-based conservation" **OR** "conservation priorit*" **OR** "Management Area" **OR** "Nature Reserve" **OR** "Marine reserve" **OR** "National Park" **OR** Sanctuary **OR** "Marine Park" **AND** "Planning Unit*" **OR** "Analysis Unit*" **OR** cell **OR** hexagon* **OR** grid **OR** square* **OR** subcatchment* **OR** micro-catchment* **OR** "line segments" **OR** "linear segments" **OR** "linear units" **AND** marine **OR** sea* **OR** ocean* **OR** bay **OR** gulf **OR** coastal
Results:	**134** documents
Database 2	**Scopus**
Date of search:	January 26, 2023
Query:	TITLE-ABS-KEY - "Systematic Conservation Plan*" **OR** "Marine Spatial Plan*" **OR** "Marine Zon*" **OR** Zoning **OR** "Marine Protected Area*" **OR** "Marine Reserve*" **OR** "Marine priorit*" **OR** "Marine planning" **OR** "Conservation priorit*" **OR** "Spatial optim*" **OR** "structured decision making" **OR** "Multi Criteria Decision Analysis" **OR** "multi criteria method" **OR** "cost effective* prioritization" **OR** "cost effective* prioritisation" **OR**"cost effective* analysis" **OR** "Spatial analysis" **AND** Marxan* **OR** MarCon* **OR** MarZone **OR** Spexan **OR** Spot **OR** Sites **OR** Zonation **OR** C-Plan **OR** CPLAN **OR** ResNet **OR** BioRap **OR** CREDOS **OR** MultCSync **OR** TARGET **OR** TRADER **OR** WorldMap **OR** prioritizR **OR** "Maritime Use Conflicts (MUC) Analysis" **OR** "Maritime Use Conflicts Analysis" **OR** "MarineMap" **OR** OceanMap **OR** CCRES **OR** CLUZ **OR** MinPatch **OR** "Zonae Cogito" **OR** "NatureServe Vista" **OR** PANDA **OR** SeaSketch **OR** PPGIS **OR** "Public Participation GIS" **OR** "Participatory GIS" **OR** PGIS **OR** GAMS **OR** CPLEX **OR** Gurobi **OR** "Integer Linear Program*" **OR** "integer programming" **OR** "multi-criteria" **OR** "multi-action" **OR** portfolio* **OR** "Decision Support System" **OR** DSS **OR** "decision support tools" **OR** DST **AND** "Protected area" **OR** "marine protected area" **OR** MPA **OR** "priority area" **OR** "area-based conservation" **OR** "conservation priorit*" **OR** "Management Area" **OR** "Nature Reserve" **OR** "Marine reserve" **OR** "National Park" **OR** Sanctuary **OR** "Marine Park" **AND** "Planning Unit*" **OR** "Analysis Unit*" **OR** cell **OR** hexagon* **OR** grid **OR** square* **OR** subcatchment* **OR** micro-catchment* **OR** "line segments" **OR** "linear segments" **OR** "linear units" **AND** marine **OR** sea* **OR** ocean* **OR** bay **OR** gulf **OR** coastal
Results:	142 documents
Database 3	**Scholar google**
Date of search:	January 26, 2023
Query:	"systematic conservation plan*" (marine OR sea* OR ocean* OR bay OR gulf)
Results:	8000 results (only the first 200 will be included)

documents resulted from the search in Web of Science and Scopus will be considered for eligibility. Regarding Google Scholar database, only the first 200 hits will be considered (Haddaway *et al.*, 2015).

Study/source of evidence selection

Following the search, all identified citations will be collated, uploaded to the software Covidence and duplicates removed. Covidence is an online collaboration software platform designed to facilitate the process underpinning systematic and other literature reviews. Following the "team approach" recommended by Levac *et al.* (2010), titles and abstracts of each document will be initially screened by two independent reviewers for assessment against the inclusion criteria reported in the Table 1. Potentially relevant sources selected will be subsequently retrieved and uploaded in full. Thus, two independent reviewers will assess against the inclusion criteria the full-text of each document. Reasons for exclusion of sources at full-text that do not meet the inclusion criteria will be explicitly stated and reported in the ScR. Any disagreements that arise between the reviewers at each stage of the selection process will be resolved through the intervention of a third reviewer. The overall process with results about the excluded/included documents will be reported in the final ScR paper and presented using the PRISMA-ScR flow diagram (Tricco *et al.*, 2018).

Covidence is a web-based collaboration software platform that streamlines the production of systematic and other literature reviews.

Studies already present in the systematic review by Álvarez-Romero *et al.* (2018) will be directly included and considered for the data extraction since it shares the same inclusion criteria with the present ScR.

Data extraction

Two independent reviewers will extract data from the documents included in the ScR using a data extraction tool provided by Covidence and modified accordingly to the specific objectives of the ScR. Table 3 shows fields and information

Table 3. Data extraction tool of the scoping review (ScR).

Field	Title	Answer	Question	Remarks/ guidance to reviewers (format, definitions, examples, etc.)
F1	**Author(s)**	free text	*Who are the authors of the document?*	Last name, first name
F2	**Title**	free text	*Which is the title of the document?*	Full title
F3	**Year of publication**	free text	*Which is the year of publication of the document?*	YYYY (4 digits) e.g., 2021
F4	**Journal**	free text	*Which is the title of the journal?*	Full-title (not abbreviated)
F5	**Keywords**	free text	*Which are the keywords of the document?*	-
F6	**DOI**	free text	*Which is the DOI of the document (if available)?*	Add DOI in the cases of peer-reviewed articles. E.g. 10.11124/JBISRIR-D-19-00434
F7	**URL**	free text	*Which is the URL of the document (if available)?*	Add URL in the cases of grey literature retrieved via the internet (mandatory when DOI is not available).
F8	**Literature category**	peer-reviewed literature; grey literature	*Which is the literature category of the document?*	-
F9	**Literature type**	article; conference paper; organizational paper; report	*Which is the literature type of document?*	-
F10	**Literature source**	Scopus & Web of Science; Google Scholar; other	*Which is the source of literature?*	If the source of literature is not included in the predefined answers add "other".
F11	**Language**	English; Spanish; German; Italian; Greek; French	*Which is the language of the document?*	-
F12	**Continent**	Africa; Antarctica; Asia; Europe; North America; Oceania/Australia; South America; more than one continent; global	*Which is the continent where the study takes place?*	-

Field	Title	Answer	Question	Remarks/ guidance to reviewers (format, definitions, examples, etc.)
F13	**Marine realm (sensu Spalding *et al.*, 2007)**	Arctic; temperate northern Atlantic; temperate northern Pacific; tropical Atlantic; western Indo-Pacific; central Indo-Pacific; eastern Indo-Pacific; tropical eastern Pacific; temperate South America; temperate southern Africa; temperate Australasia; southern Ocean; more than one realm; global	*Which is the marine realm where the study takes place?*	-
F14	**Scale**	Global, Multi-national, National, Sub-national	*Which is the scale where the study takes place?*	-
F15	**Country**	Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, ...	*Which is the country where the study is located?*	-
F16	**Rationale**	Arbitrary	*Which is the rationale for the Systematic Conservation Planning implementation?*	Mention (copy-paste from the manuscript) the specific rationale for the SCP implementation.
		Expert advice		
		Ecological requirements		
		Socioeconomic considerations		
		Legal mandate		
		National/international goals		
		Previous plan/study		
		Other (specify)		
F17	**Systematic Conservation Planning (SCP) extent**	free text (number)	*Which is the area of the potential SCP (in km^2)?*	Provide the area (in km^2) of the SCP
F18	**SCP contribution**	percentage	*What is the % contribution of the SCP in the country/study area*	Provide the % contribution that counts for the attainment of spatial targets
F19	**Methodology 1**	optimization algorithm; multi-criteria analysis; ranking; cost-benefit analysis; consensus; other	*Which is the DST used by the study? If other is selected it should be specified in the 'comments' field*	-
F20	**Methodology 2**	optimization algorithm; multi-criteria analysis; ranking; cost-benefit analysis; consensus; other	*Which is the DST used by the study? If other is selected it should be specified in the 'comments' field (if more than one DST was used)*	-
F21	**Optimization algorithm**	Marxan; Marxan with Zones; Marxan Connect (or Marxan with Connectivity); Zonation; C-Plan; Multi-Link; Prioritize-R; other; none	*Which is the optimisation algorithm applied?*	-
F22	**Climate Change (CC) resilience**	Yes/no	*Does the study aim to create MPA networks resilient to CC?*	-
F23	**CC refugia identification**	Yes/no	*Were climatic refugia identified?*	-

Field	Title	Answer	Question	Remarks/ guidance to reviewers (format, definitions, examples, etc.)
F24	**CC refugia method**		*If yes, how were CC refugia identified?*	-
F25	**CC in Decision Support Tool (DST)**	None (climate change was not incorporated)	*How was CC incorporated into the DST?*	-
		Design /size, spacing and replication)		
		Location (include/exclude sites)		
		Representation (adjusted)		
		Analyses of dynamics		
		Adaptive management		
		Other (please specify)		
F26	**Habitat types**	Habitat types (Benthic)	*Which marine species / habitats were targeted in the SCP?*	-
		Habitat types (Pelagic)		
F27	**Connectivity of sp./ habitats**	Yes/no	*Was connectivity of species (sp.) or habitats accounted for?*	-
F28	**Type of connectivity for sp./habitats**	Behaviour - adults	*What type of connectivity for species/habitats was included in the analysis?*	-
		Behaviour - larvae		
		Dispersal - adults		
		Dispersal - larvae		
		Genetics		
		Habitat quality		
		Ocean currents		
		Network topology		
		Other (please specify)		
F29	**Threats included**	Yes/no	*Were any type of threats included in the analysis (e.g., fishing pressure, human footprint)?*	-
F30	**Connectivity of threats**	Yes/no	*Was connectivity of threats accounted for?*	-
F31	**Type of connectivity for threats**	Structural; ONLY basic lateral	*What type of connectivity for threats was included in the analysis?*	-
F32	**Land-sea planning**	Yes/no	*Was this case study an integration of land-freshwater-marine planning?*	Marine-freshwater OR marine-terrestrial OR all three realms
F33	**Inter-realm connectivity**	Yes/no	*Was inter-realm connectivity accounted for?*	-
F34	**Cumulative Effects Assessments (CEA)**	Yes/no	*Were CEA accounted for in the analysis?*	-
F35	**CEA method**		*If yes, what method was used to account for CEA in SCP?*	-
F36	**Other Effective Conservation Measures (OECMs)**	Yes/no	*Were OECMs included in the planning?*	-

Field	Title	Answer	Question	Remarks/ guidance to reviewers (format, definitions, examples, etc.)
F37	**Type of OECMs**		*If yes, what types of OECMs were accounted for?*	e.g., FRAs, archaeological sites
F38	**OECMs method**		*What method was used to include OECMs in SCP?*	-
F39	**Restoration prioritization**	Yes/no	*Were sites for restoration (besides protection) prioritized?*	-
F40	**Restoration method**		*What method was used to prioritize restoration sites?*	-
F41	**Invasive Alien Species (IAS) of concern**	Yes/no	*Were IAS considered?*	-
F42	**IAS in planning**	Ignore/do not care; avoid; protect	*Which approach for IAS in planning was applied?*	-
F43	**IAS planning method**	free text	*If avoid or protect, what specific method was used to include them in SCP?*	-
F44	**Socioeconomic and cultural objectives**	Yes/no	*Were socioeconomic or cultural objectives included in SCP?*	-
F45	**Socioeconomic and cultural objectives - methods**	free text	*How were socioeconomic and cultural objectives included in SCP?*	-
F46	**Tradeoffs**	Yes/no	*Were ecological and socioeconomic/ cultural tradeoffs accounted for?*	-
F47	**Tradeoffs methods**	free text	*What methods were applied to account for ecological and socioeconomic/cultural tradeoffs?*	-
F48	**Gaps of knowledge**	free text	*Which are the gaps of knowledge identified by the study (if any)?*	Briefly describe the gaps of knowledge identified by the study.
F49	**Policy recommendations**	free text	*Which are the policy recommendations proposed by the study (if any)?*	Briefly describe the policy recommendations proposed by the study.
F50	**Stage of SCP**	proposed, committed, designated, implemented, target reached	*At which stage the SCP is?*	

that have to be extracted from each paper. Any disagreements that arise between the reviewers will be resolved through the intervention of a third reviewer. If necessary, authors of papers will be contacted to request missing or additional data.

Data analysis and presentation

The evidence synthesised by the ScR will address all the review objectives and questions. Data will be presented graphically and in a diagrammatic/tabular form. A narrative summary will accompany the tabulated and charted results and will describe how the results relate to the review's objective and questions. In particular, the following outputs, based on a quantitative synthesis of the data, will be presented: i) A global map showing the amount of case studies for each country; ii) plots showing the criteria used in performing SCP across all the case studies; iii) meta-analyses to assess the correlation between the criteria used and the SCP outcomes/implementation stage across case studies; iv) meta-analyses to assess the correlation between the SCP spatial contribution and the SCP outcomes/ implementation stage across case studies; and v) mapping of network for keywords, data gaps, policy recommendations, and good practices across case studies.

Study status

The study is currently at the end of the data extraction step. The next stages will be as follows: i) the integration of data with those coming from the dataset published by Álvarez-Romero *et al.* (2018); ii) data analysis and presentation; and iii) ScR preparation and submission for publication.

Ethics and consent

Ethical approval and consent were not required.

Data availability

No data are associated with this article.

Acknowledgements

Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect those of the authors' affiliated institutions or the European Union. Neither the European Union nor the granting authority can be held responsible for them.

References

Álvarez-Romero JG, Mills M, Adams VM, *et al.*: **Research advances and gaps in marine planning: towards a global database in systematic conservation planning.** *Biol Conserv.* 2018; **227**: 369–382.
Publisher Full Text

Arksey H, O'Malley L: **Scoping studies: towards a methodological framework.** *Int J Soc Res Methodol.* 2005; **8**(1): 19–32.
Publisher Full Text

Ban NC, Bax NJ, Gjerde KM, *et al.*: **Systematic conservation planning: A better recipe for managing the high seas for biodiversity conservation and sustainable use.** *Conserv Lett.* 2014; **7**(1): 41–54.
Publisher Full Text

Haddaway NR, Collins AM, Coughlin D, *et al.*: **The role of Google Scholar in evidence reviews and its applicability to grey literature searching.** *PLoS One.* 2015; **10**(9): e0138237.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Halpern BS, Walbridge S, Selkoe KA, *et al.*: **A global map of human impact on marine ecosystems.** *Science.* 2008; **319**(5865): 948–52.
PubMed Abstract | **Publisher Full Text**

JBI SUMARI: **JBI SUMARI Scoping Reviews Protocol Template.** 2021; Accessed on: 2021-4-25.
Reference Source

Katsanevakis S, Coll M, Fraschetti S, *et al.*: **Twelve recommendations for advancing marine conservation in European and contiguous seas.** *Front Mar Sci.* 2020; **7**: 879.
Publisher Full Text

Kukkala AS, Moilanen A: **Core concepts of spatial prioritisation in systematic conservation planning.** *Biol Rev Camb Philos Soc.* 2013; **88**(2): 443–464.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Leslie HM, McLeod KL: **Confronting the challenges of implementing marine ecosystem-based management.** *Front Ecol Environ.* 2007; **5**(10): 540–548.
Publisher Full Text

Levac D, Colquhoun H, O'Brien KK: **Scoping studies: Advancing the methodology.** *Implement Sci.* 2010; **5**(1): 69.
PubMed Abstract | **Publisher Full Text** | **Free Full Text**

Margules CR, Pressey RL: **Systematic conservation planning.** *Nature.* 2000; **405**(6783): 243–253.
Publisher Full Text

Peters M, Godfrey C, McInerney P, *et al.*: **Chapter 11: Scoping Reviews.** In: Aromataris E, Munn Z (Eds) *JBI Manual for Evidence Synthesis.* JBI, 2020.
Publisher Full Text

Spalding MD, Fox HE, Allen GR, *et al.*: **Marine ecoregions of the world: a bioregionalization of coastal and shelf areas.** *BioScience.* 2007; **57**(7): 573–583.
Publisher Full Text

Tricco AC, Lillie E, Zarin W, *et al.*: **PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation.** *Ann Intern Med.* 2018; **169**(7): 467–473.
PubMed Abstract | **Publisher Full Text**

Open Peer Review

Current Peer Review Status: ✔ ✔

Version 1

Reviewer Report 09 February 2024

https://doi.org/10.21956/openreseurope.17597.r37979

© **2024 Podda C.** This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

✔ **Cinzia Podda**
International Marine Centre, Oristano, Italy

A protocol for a global scoping review of marine systematic conservation planning for designing MPAs networks is here described.
The protocol is presented in a linear and readable manner and I recognize the importance of the effort of such work as an attempt to standardize and aggregate all existing global information in the context of systematic marine conservation planning.

I also recognize the ambition of this work, above all in wanting to investigate very complex and crucial questions (connectivity, alien species, among others), all issues still little addressed with an integrated planning approach. I presume that this is the reason why a limited number of works has been obtained in the scoping review in Scopus and WoS.

I would further emphasize the importance of having dealt critical points (such us ecological processes, balancing conservation, socio-economic, and cultural objectives, existing guidelines for improved conservation planning) that are rarely considered or otherwise treated in a disgregated way.

Tables are very useful and well summarized, despite the amount of content. Just a small specific comment relating to table 3, Field28 Type of connectivity, it might be appropriate, for better clarity of the outputs, to consider adult movements or migration (rather than dispersal). I also suggest considering the vertical connectivity between the typologies of connectivity for a more detailed suite of options.
About marine connectivity I bring to your attention the following review:
https://www.frontiersin.org/articles/10.3389/fmars.2023.1271397/full

I agree with the fact that often the tools for identifying and prioritizing areas to be protected are only mentioned but not expressly rigorously described, this in some way tends to limit the application of shared approaches on a global scale.

Finally, for future implications of this research, from a planning perspective, it would be

interesting to quantify (in %, in km^2 or in hectares) the extension of the areas currently subjected to SCP as well as their mapping.

References

1. Podda C, Porporato E: Marine spatial planning for connectivity and conservation through ecological corridors between marine protected areas and other effective area-based conservation measures. *Frontiers in Marine Science*. 2023; **10**. Publisher Full Text

Is the rationale for, and objectives of, the study clearly described?

Yes

Is the study design appropriate for the research question?

Yes

Are sufficient details of the methods provided to allow replication by others?

Yes

Are the datasets clearly presented in a useable and accessible format?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Aquatic ecology and maritime spatial planning, focusing on ecological modeling and ecological connectivity

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 27 November 2023

https://doi.org/10.21956/openreseurope.17597.r35477

© 2023 Goh H. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Hong Ching Goh
Department of Urban and Regional Planning, Faculty of Built Environment, University of Malaya, Kuala Lumpur, Malaysia

This is an easy reading piece, and the manuscript has been arranged with straightforward points in logical sequence and easy to follow. I recognize that this is an ambitious attempt and is possibly embedded within a larger research program and the exercise will be very much dependent on the resources made available. Couples of suggestions/comments that I have for this manuscript are as follows. Although some suggestions refer to specific tables, it is meant to draw a larger attention to the overall consideration of the protocol.

- In Table 2 which spell out the details of scoping review search strategy per database, *i.e.*, name of database, date of search, search query, and results (as the number of documents returned by the search), in the category of Marine Park, Marine Management Plan, whether transboundary MPA are considered. If applicable, suggest including the term transboundary conservation.

- In Table 3 Data extraction tool of the scoping review (ScR), I would like to suggest the authors to include Southeast Asia as a separate (sub)category considering its geographical uniqueness (and the diversities) especially the oceans, the length of coastlines and the number of islands that this region covers.

- As one of the outputs will be 'A global map showing the amount of case studies for each country', one concern I have is the language barrier for countries such as China and Indonesia, where policy documents and 'blue papers' might be available only in the national language, which could lead to exclusion from this scoping.

- The consideration of having cultural and/or intangible values either within the context of ecosystem services or beyond, can be more explicitly mentioned in the review question #2 since cultural objective is highlighted.

- It is also worth considering whether SCPs include provisions for monitoring, evaluation and potential revision to existing planning.

- A reference that may be deemed useful is linked.

Is the rationale for, and objectives of, the study clearly described?
Yes

Is the study design appropriate for the research question?
Yes

Are sufficient details of the methods provided to allow replication by others?
Yes

Are the datasets clearly presented in a useable and accessible format?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Coastal planning with social science perspective focusing on human-environment interaction

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.