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Negotiations to implement area-based management tools beyond national jurisdiction: the scientific community's view

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A new international legally-binding instrument, under the United Nations Convention on the Law of the Seas (UNCLOS), for the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction has recently been agreed on– the BBNJ agreement. Area-based management tools (ABMTs), including marine protected areas (MPAs) have an important role in maintaining biodiversity and ecosystem services in the current context of multiple threats to the ocean and are one of central elements of new instrument. In this work, we assessed the perspective of the scientific community, throughout the period of negotiations, on the potential of the BBNJ treaty to promote the creation of new area-based management tools, including MPAs, and fulfil acknowledged gaps in ocean governance. A systematic literature review was conducted, resulting in 80 publications then analysed in detail. From these, a total of 608 key messages were retrieved and classified into: 1) Strengths (S), Weaknesses (W), Opportunities (O) or Threats (T) for a SWOT analysis and 2) one of six categories that cover crucial aspects for the successful implementation of the ABMTs in areas beyond national jurisdiction. A Sentiment Analysis (SA) to these key messages shows that the instrument has been perceived by the scientific community as an opportunity for conserving and achieving sustainable use of biodiversity. However, the scientific community also feels that agreement needs stronger provisions to ensure effective measures, which is reflected by the small number of identified strengths. An overall decrease in sentiment score over the negotiations period, i.e. a growing pessimism, was also observed, which is supported by an increase of weaknesses and threats identified in the final stages of the negotiations. Our results suggest that despite its potential to promote conservation in areas beyond national jurisdiction, the instrument should include a unified definition of MPA, address fishing activities and clarify conflicting terms in its provisions, such as the term “not undermine”. Further, we show that sentiment analysis is a useful tool to evaluate opinion trends and facilitate the integration of different and subjective perspectives into final provisions of complex social-political-environmental agreements, identifying positive and negative attitudes that can enable better solutions to address existing governance challenges in international waters.

KEYWORDS

ABMTs, ocean governance, BBNJ treaty, MPAs, UNCLOS, sentiment analysis

1 Introduction

Almost two-thirds of the world's ocean are in areas beyond national jurisdiction (ABNJ), of which a vast majority is below 200 m depth and, as such, still poorly explored and understood (Gjerde et al., 2021). According to the United Nations Convention on the Law of the Sea (UNCLOS) (UN General Assembly, 1982), areas beyond national jurisdiction are classified as: 1) the water column beyond the Exclusive Economic Zone (EEZ), or beyond the Territorial Sea where no EEZ has been declared, called “the high seas” (UNCLOS, art. 86); and 2) the seabed which lies beyond the limits of the continental shelf, established in conformity with Article 76 of the Convention, designated as “the Area” (UNCLOS, art. 1). Although the high seas and the Area are both defined as ABNJ, they are regulated by different principles – The Common Heritage of Mankind (CHM) – regulates activities undertaken in the Area, and the Freedom of the High Seas (FHS) – guarantees that activities in the high seas are conducted with few or no restrictions, such as the case of navigation, overflight, and exploitation of resources, including fishing (Wright et al., 2021).

Human activities are increasingly damaging areas beyond national jurisdiction; for example, fishing in high seas represents the greatest threat for marine biodiversity in ABNJ (Lascelles et al., 2014; Barnes, 2019; O’Leary et al., 2020; Qu and Liu, 2022) impacting whole ecosystems and their functions (Clark et al., 2016). Other threats include maritime shipping (O’Leary et al., 2020) and the increased interest in exploiting deep-sea mineral resources (Van Dover et al., 2017). These activities are managed under UNCLOS in a sectorial framework with rules, institution and agreements formulated based on which activities are undertaken (Wales, 2014), an approach that has led to recognized gaps in ocean governance (Houghton, 2014). To address these gaps, and to prevent marine ecosystems and biodiversity from a continuous decline, a new legally binding instrument on the conservation and sustainable use of marine biological diversity in ABNJ was drafted under UNCLOS – the BBNJ agreement (UN General Assembly, 2023).

The need for a new instrument was identified in early 2000s when an Informal Working Group was established by the United Nations General Assembly to evaluate the conservation status and sustainable use of biodiversity beyond national jurisdiction (UN General Assembly, 2005). The first meeting of the UN BBNJ Working Group occurred in 2006, and in 2011 it was agreed to establish a four-package deal comprising marine genetic resources, environmental impact assessment, capacity-building and technology transfer, and area-based management tools (ABMTs), including marine protected areas (MPAs). In 2015, a Preparatory Committee (PrepCom) was established, and relevant elements of a draft text were discussed (Wright et al., 2018), including the guiding principles of the new instrument, its scope and possible institutional elements. After a series of PrepComs, the UN General Assembly adopted a resolution convening an Intergovernmental Conference (IGC) to elaborate the text of the international legally binding instrument under UNCLOS (UN General Assembly, 2017). A variety of themes have been debated since then, including the

establishment of a coherent process for ABMTs and multi-purposes MPAs; the opportunity for the BBNJ agreement to act as a global-level decision-making instrument to establish cooperation and coordination; and the creation of collaboration mechanisms to support existing bodies (IISD ENB, 2022). During the last IGC, convened in August 2023 and resumed in February 2023, contrasting views among parties were still prevalent, for example regarding the concept and purpose of ABMTs. However, delegates agreed on a draft agreement (UN General Assembly, 2023) that states that parties should collaborate and consult with the relevant stakeholders, including the scientific community, to propose the establishment of ABMTs, including MPAs (Part III, Article 17).

Area-based management tools have been widely applied, in regional and global agreements helping to achieve an integrated approach to sustainable development and marine conservation (Muraki-Gottlieb et al., 2018; Reimer et al., 2021). Marine protected areas, a type of ABMTs, are of paramount importance for conserving, preserving and restoring marine ecosystems diversity and productivity (Sala et al., 2021), as well as to manage resources and other cultural, socio-economic, spiritual, aesthetic, historic and intrinsic values, including protecting the environment quality for future generations (Gjerde et al., 2016; Sala et al., 2021). Among MPAs, the most effective for biodiversity conservation are marine reserves or no-take areas (Sala and Giakoumi, 2018), benefiting many species, including those targeted by fisheries, increasing their diversity, density, biomass, body size, and reproductive potential not only within their boundaries (Lester et al., 2009) but also in adjacent areas (Roberts et al., 2001; Russ et al., 2004; Halpern et al., 2009). To understand the perspective of the scientific community on the potential of the new BBNJ treaty to achieve its conservation goals, namely through the implementation of ABMTs, we used a Natural Language Processing technique – sentiment analysis – to analyze the scientific publications referring to the package deal “area-based management tools, including marine protected areas”.

Natural Language Processing is a fast-developing interdisciplinary field of research focused on the understanding of human language by computers using the detection and classification of sentiments in texts (Balahur, 2013). It has been widely applied to analyze large pools of human language content such as legislation, social media or administrative documents for a wide range of purposes, from ruling out corruption (Zhao et al., 2018) to detect fake news (de Oliveira et al., 2021). The application of Natural Language Processing methods in conservation and management science is not common but it is seen as a potential tool to extract useful information from written content to assess the relationship between humans and nature, to support the monitoring of species and to obtain information regarding species and protected areas (Toivonen et al., 2019). Also, these methods may contribute to collaborative policy-making, providing information regarding the public opinion (Osimo and Mureddu, 2012). For example, the use of data mining on social media can help understand the sentiments of people towards conservation of species or protection of areas, being a relevant strategy to develop conservation plan (Ladle et al., 2016; Becken et al., 2017; Toivonen et al., 2019). The language and style used in scientific publications

may not express sentiment as strongly as other media. However, our study allows to recognise a decreasing optimism throughout the negotiation phases of the BBNJ agreement and to identify positive and negative aspects that provide insightful considerations to the successful implementation of the agreement.

2 Methods

A systematic literature search, using specific keywords (Table 1) was conducted in February 2021 on the “Web of Science” database (www.webofscience.com). The time frame set for this search was from 2006, when the first pre-negotiations of the BBNJ treaty started, until 2021, which allowed to analyze the progress since the beginning of the negotiations. The search was conducted only for “Journals” and “Series” in English and retrieved 364 unique publications after the exclusion of duplicates. At the time of the search, only one publication from 2021 was available and this was included in the year 2020, since the work it refers to was performed in that year.

All abstracts were screened and the publications with abstracts clearly mentioning the BBNJ treaty and/or the package deal of ABMTs, including MPAs were kept and fully read. Of these, the publications examining general provisions of the BBNJ treaty and/or specifically referring to the ABMTs package were retained for further analyses, resulting in a final sample of 80 publications. From each of these publications key messages were extracted and classified according to a SWOT (Strength, Weaknesses, Opportunities and Threats) framework. A total of 608 key messages were identified and further classified into six different categories (I-Knowledge, II-Cooperation/Conflicts, III-Coherence, IV-Monitoring, V-Decision-making, VI-Capacity). These categories were created to evaluate important aspects, identified from the literature, of the BBNJ treaty when considering ABMTs,

TABLE 1 Number of publications obtained with the different sets of keywords used for the literature search in the “Web of Science” database (duplicates included in the numbers presented).

Keywords	Publications
“Areas Beyond National Jurisdiction”	296
“Biodiversity Beyond National Jurisdiction”	158
“Marine Protected Areas” & “High Seas” & “governance”	82
“Area-based Management Tool”	32
“Marine Protected Areas” & “Areas Beyond National Jurisdiction” & “network”	19
“BBNJ” & “Marine Protected Areas”	16
“International legally binding instrument” & “UNCLOS”	14
“Marine Protected Areas” & “ABNJ” & “International legally binding instrument”	10
“Marine Protected Areas” & “High Seas” & “BBNJ treaty”	9
“Marine conservation planning” & “Areas Beyond National Jurisdiction” & “connectivity”	5

including MPAs (Table 2). A database containing the metadata exported from the Web of Science, as well as the SWOT components and categorization of each message was systematized into a database (Supplementary Material 1) that was curated for errors and missing information.

2.1 Bibliometric analysis

A bibliometric analysis was conducted to obtain a general overview of the characteristics of the publications regarding the BBNJ treaty and its provisions. Periods of BBNJ negotiation were defined as: I) BBNJ Working Group (BBNJ WG) until 2015; II) Preparatory Committee (PrepCom), from 2016 until 2018, when the elements of agreement started to be discussed; and III) Intergovernmental Conferences (IGC), from 2019 to 2020. Because the first IGC was only held in the second semester of 2018 and the publications from the end of that year refer to the previous events of the BBNJ treaty, we considered in our analyses that the IGC period started in 2019.

To address the dynamics and equity in nations’ contribution towards the scientific debate around the BBNJ treaty we investigated geographic patterns of publication. For that, the country of the affiliation of each author was extracted and classified as developed, small island developing states (SIDS) or developing states. The contribution of countries was counted only once per publication, i.e., no weight was attributed to authors from the same country in the same publication. The scientific effort (measured as number of publications) over time regarding publications was also investigated.

2.2 SWOT analysis

A SWOT analysis was conducted to identify the provisions (internal factors) of the BBNJ treaty that may affect the designation of ABMTs, including MPAs, and classify them as strengths (S) or weaknesses (W). Simultaneously, external factors that may influence the implementation of ABMTs, including MPAs, in areas beyond national jurisdiction were analysed and classified as threats (T) and opportunities (O). All extracted key messages (n=608) were classified into strengths (S), weaknesses (W), opportunities (O) and threats (T), in accordance with implementing and management objectives of ABMTs, including MPAs, and in one of the categories described in Table 2. The SWOT components (S, W, O, T) and the categories expressed in the key messages were quantified in the different periods of the BBNJ negotiations.

2.3 Key messages content analysis

The content of the 608 key messages that were extracted from the scientific literature was analyzed through the search for specific terms and the examination of the context in which they were used. These terms were: 1) “not undermine” (or “not undermining”) to

TABLE 2 Categories designed to perform the SWOT Analysis.

Categories	Description
I. Knowledge	The knowledge and contents of the agreement, including concepts and guidelines that are necessary to design, implement and manage ABMTs in Areas Beyond National Jurisdiction. This comprises Scientific Knowledge on ecosystems, impacts of new and existing human activities in the high seas and the deep seabed; principles that will guide the new instrument, such as the Precautionary Approach, Intrinsic Value and Traditional Knowledge; and the available information regarding obligations and benefits (socio-ecological knowledge) of involved Parties.
II. Cooperation/Conflicts	Different aspects related to cooperation among involved Parties and stakeholders involving ABMTs, including existing coordinated actions at the regional, national, and international levels. This category also encompasses different interests from different sectors and stakeholders regarding BBNJ provisions and implementation of ABMTs.
III. Coherence	The coherence in the design of ABMTs, including MPAs, and the consistency of actions and decisions taken to be implemented in the BBNJ to achieve its main objectives.
IV. Monitoring	Provisions regarding monitoring and reporting activities. These include regular reports about the ABMT's situation, with a summary of all current activities and impacts; and the power of flexibilization to analyse the effectiveness of the implemented monitoring and management plans, and to implement adaptative measures.
V. Decision-making	All decisions that need to be taken while designing and implementing ABMTs, including decisions on the evaluation of effectiveness. This category also refers to a central power of decision-making, as a neutral Party, to guarantee that the principles stated by the agreement are being conducted, and to enforce the duties applied to all Parties under the agreement.
VI. Capacity	The capacity of all Parties to cooperate equally and implement the necessary actions to achieve the sustainable use and conservation of BBNJ. It also refers to access to scientific knowledge/technologic/political/diplomatic capacity, access to resources in ABNJ and equal opportunities for Least Developed Countries, Landlocked Developed Countries and Small Island Developing States to benefit from marine resources in ABNJ.

assess the perception on how the BBNJ treaty is prompt to act with existing organizations. The term “not undermine” has been highly debated (e.g. Scanlon and Scanlon, 2018; Mendenhall et al., 2019; De Santo et al., 2020), and has been used by member States to refer to the commitment of the treaty to not overlap existing mandates and instruments that manage activities in ABNJ; 2) economic activities and their respective management organizations (“fishing” and “Regional Fisheries Management Organizations (RFMOs)”, “mining” and “International Seabed Authority (ISA)”, “shipping” and “International Maritime Organization (IMO)”) to assess how scientists apprehended the provisions regarding economic activities; 3) “adjacency”, “network”, “connectivity” and “transboundary” to understand the scientific community’s view on provisions to ensure the implementation of coherent networks of MPAs, present and future; 4) the guiding principles “freedom of the high seas” and “common heritage of mankind” to understand if the scientific community positively or negatively associated these principles with the objectives of the new treaty. To this end, the SWOT components were used as benchmark: strengths and opportunities were taken as positive, and weaknesses and threats as negative associations.

2.4 Linguistic and sentiment analysis

The tidytext package (Silge and Robinson, 2017) from software R was used to apply a lexicon-based method (Pang and Lee, 2008; Taboada et al., 2011) to evaluate the polarity among the key messages extracted from all publications. This method is based on a list of lexical features classified as either positive or negative aspect (Vashishtha and Susan, 2019), strength of those positive and negative connotations and even emotions classification (Bravo-Marquez et al., 2014).

To structure the data for analysis, each variable is a column (category, period of negotiation, message number and message), each sample (word) is a row and each type of observation unit is a table (according to the period, the SWOT Analysis or category). The preparation of the data for analysis consisted on a process known as tokenization, that converts messages into a list of individual tokens: the smallest part that is intended to be analysed in a text (Mishra et al., 2021). In this study a token was set to a word, resulting in a sum of 5972 words for the three periods of the BBNJ treaty. Default classification of tokens, i.e., individual parts of sentences with semantic value, attributed during the tokenization process (Supplementary Material II) was revised and some tokens were modified in our data prior to the Linguistic Analysis. Two main types of modifications were done: a) in *lemma*, to generate token without affixes (e.g., “approaches” to “approach”) and b) in *upos* (Universal Part of the Speech), which classifies the tokens into class words such as adjective (ADJ), adverb (ADV), verb (VERB), noun (NOUN), proper noun (PROPN).

Stopwords, or more frequent words that appear in data and that do not have meaning for the sentence, e.g., prepositions, articles and connectors, were removed. Removing stopwords prevents these from being identified and classified, consequently reducing the noise introduced by highly abundant words that do not convey relevant information. For that, three different lexicon sets: onix, SMART (Lewis et al., 2004) and Snowball (Porter, 2001) contained in the “stop_words” dataset from the tidytext R package were used, eliminating 1149 stopwords from our data. The usage of existing lexicon lists is acceptable, and sometimes advisable in small-scale studies, as they are based on a wide corpus of documents without a specific context and therefore not biased. The three stopword lists used are all considered general purpose and not domain-specific and differ, for example, on the length of their word list (174, 404, 571 words respectively), some include contractions (Snowball and

SMART) and, although there is some overlap of stopwords, complement each other. For the quantification of the most frequent terms only nouns (NOUN) and proper nouns (PROPN) were considered and, to avoid masking important contents, the tokens “agreement”, “ABNJ”, “BBNJ”, “ABMT”, “MPA”, “marine”, “ocean” and “scientific” were added as stopwords (n=519). For the sentiment analysis, only the terms “agreement” (n=113) and “BBNJ” (n=96) were additionally included as stopwords.

From the tidytext package, two lexicons were chosen for the analysis of sentiment: Bing (Hu and Liu, 2010) and AFINN (Nielsen, 2011). The Bing lexicon is based on 6789 English words, in which 2006 are positive and 4783 are negative (Naldi, 2019), and categorizes words according to a binary system of positive/negative sentiment (Hossain et al., 2021). Results found for Bing lexicon are expressed by the number of positive words minus the number of negative words in a key message. In this study, scores based on the Bing lexicon ranged between -3 and 5 and could be attributed to 389 key messages. The AFINN lexicon is characterized by a list of 2447 English words, in which 878 words are positive and 1598 words are negative (Naldi, 2019). Each word in the AFINN lexicon is evaluated and scored from -5 to +5 in which a word is considered a positive word if scored above 0 or negative if scored below 0 (Vashishtha and Susan, 2019). The scores are calculated through scoring individual words and sum them for each key message (Sonkin, 2021). In this work, 335 messages could be scored using the AFINN lexicon, and the scores for each message ranged from -6 to +7. Because the two lexicons' scores are represented on different scales, we calculated the standardized z-score [value observed in lexicon score (X) – mean (μ)/standard deviation (σ)] for each of them to allow comparison of scores on different scales and increase the overall number of scored key messages (n= 451). The number of key messages with duplicate scores, i.e., analyzed by both lexicons was 273 while 157 key messages could not be scored by any of the lexicons used. Pearson Correlation was used to compare standardized scores of key messages classified by both lexicons. For further analyses, we used the standardized z-scores and for those key messages which had been classified by both lexicons, i.e., possessed two z-scores, the mean of both z-scores.

2.5 Statistical analysis

A word cloud, a content mining methodology to illustrate the most frequent keywords and the association with positive and negative polarity (based on the Bing lexicon), was used to assess the words from the key messages most related to positive and negative aspects (Silge et al., 2021). This methodology was applied using the wordcloud v2.6 package (Saini et al., 2019) in the software R.

In addition, to investigate if statistical differences in sentiment were found as negotiations moved forward, the standardized sentiment z-scores from each period of negotiation (BBNJ WG, PrepCom and IGC) were compared. Data of z-scores were tested for normality, using the Shapiro-Wilk normality test. Since the assumption of normality was not met, the Kruskal-Wallis non-parametric test was used, followed by the Dwass-Steel-Critchlow-Fligner comparison test with Jamovi software version 0.9.6.9 (The jamovi project, 2021).

3 Results

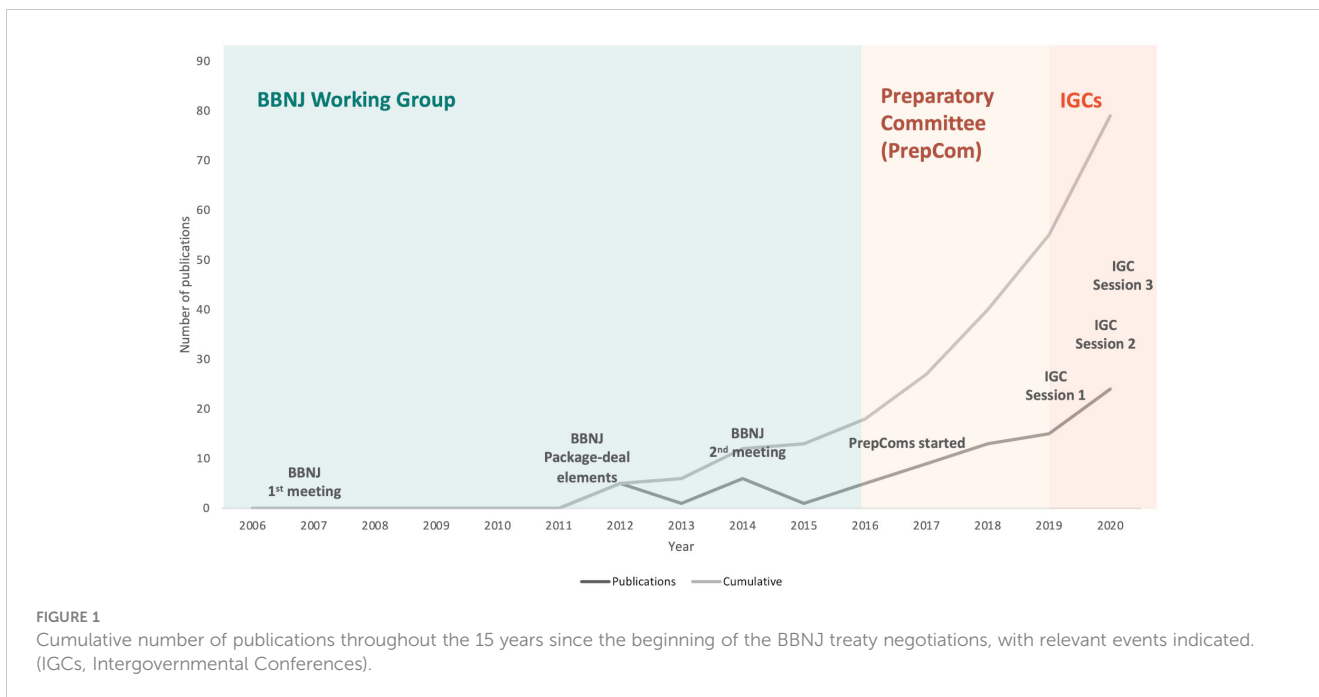
During the fifteen years of ongoing negotiations of the BBNJ agreement there was an increased interest of the scientific community to debate the agreement's provisions and its tools for conservation, namely ABMT, as MPAs. As demonstrated by the number of publications on the subject, this growing interest was particularly evident during the Preparatory Committee (PrepCom) and Intergovernmental Conferences (IGCs) periods of the negotiations (Figure 1), with 65% of the total number of articles published during the IGCs period. For the 80 publications included in our review, a total of 212 authors, affiliated with more than 130 organizations, were found. Over 50% of the organizations are universities and only less than 10% non-governmental organizations (NGOs). The remaining 40% are mostly research centres, governmental and global organizations.

Reflecting the international nature of the new instrument, a total of 32 countries were associated to the reviewed publications: Australia, Austria, Canada, China, Costa Rica, Fiji, France, French Polynesia, Germany, Indonesia, Italy, Japan, Kenya, Mexico, Netherlands, New Caledonia, New Zealand, Norway, Philippines, Poland, Portugal, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Trinidad & Tobago, Tunisia, Turkey, United Kingdom and United States of America (Figure 2). Although the number of developed (17) and developing (15) countries was approximately the same, developed states contributed in a much higher proportion: authors affiliated to organizations based on developed countries contributed to 90% of the total number of publications. Australia, United States of America, United Kingdom, Canada, France, Germany and New Zealand were the countries that contributed the most, with co-authorships in more than 70% of all publications. If the European Union was considered as one party, representing the political and economic interests of its Member States, it becomes the greatest contributor for publications. China is the developing country with the highest proportion of publications, 5%, among others developing countries. Five small island developing states (SIDS) were identified in the reviewed publications (New Caledonia, Singapore, Trinidad & Tobago, French Polynesia, and Fiji), representing a contribution of only 6% of all publications.

The reviewed publications covered aspects of the BBNJ treaty related to 11 main research fields (Supp. Mat. 1) of which “Environmental Sciences & Ecology” (56%), “International Relations” (36%), “Government & Law” (27%) and “Marine and Freshwater Biology” (21%) were the most relevant. Over 60% of publications combined more than one research field, often bringing together “Environmental Sciences & Ecology” and “International Relations” (36%); and “Environmental Sciences & Ecology” and “Marine & Freshwater Biology” (20%).

3.1 SWOT analysis of key messages

The analysis of the 608 key messages (Supp. Mat. 1) extracted from the reviewed literature indicates that the scientific community has primarily identified the opportunities (n= 352) that the new UN

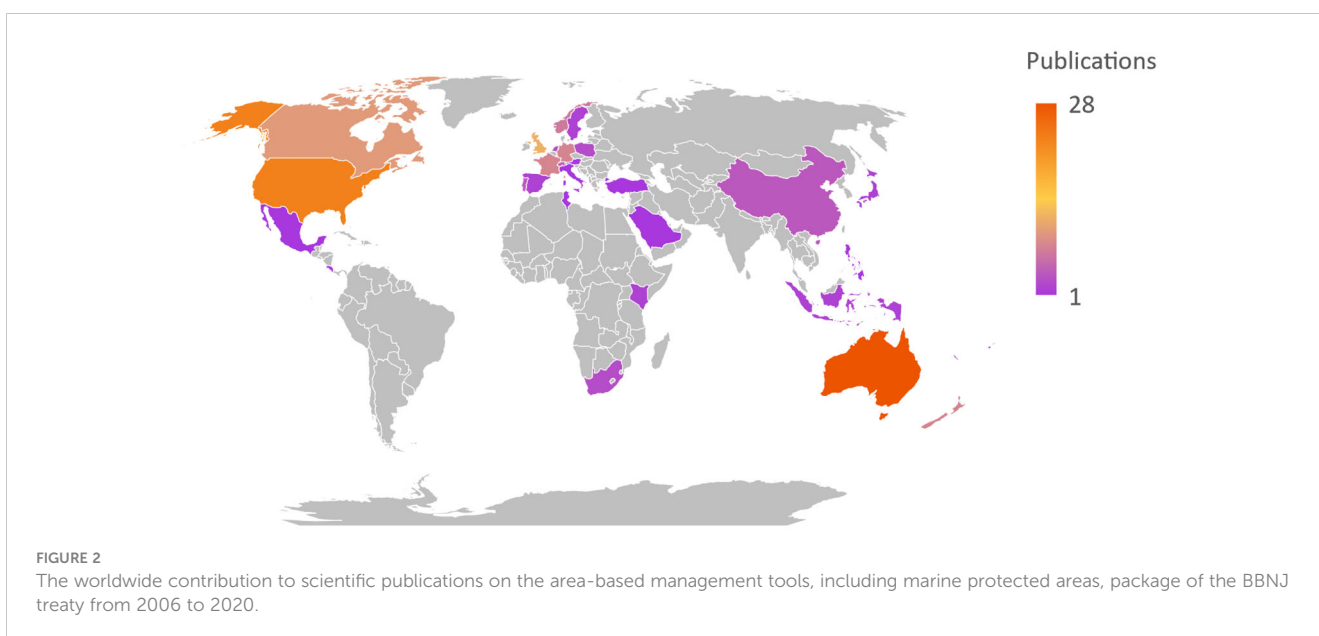


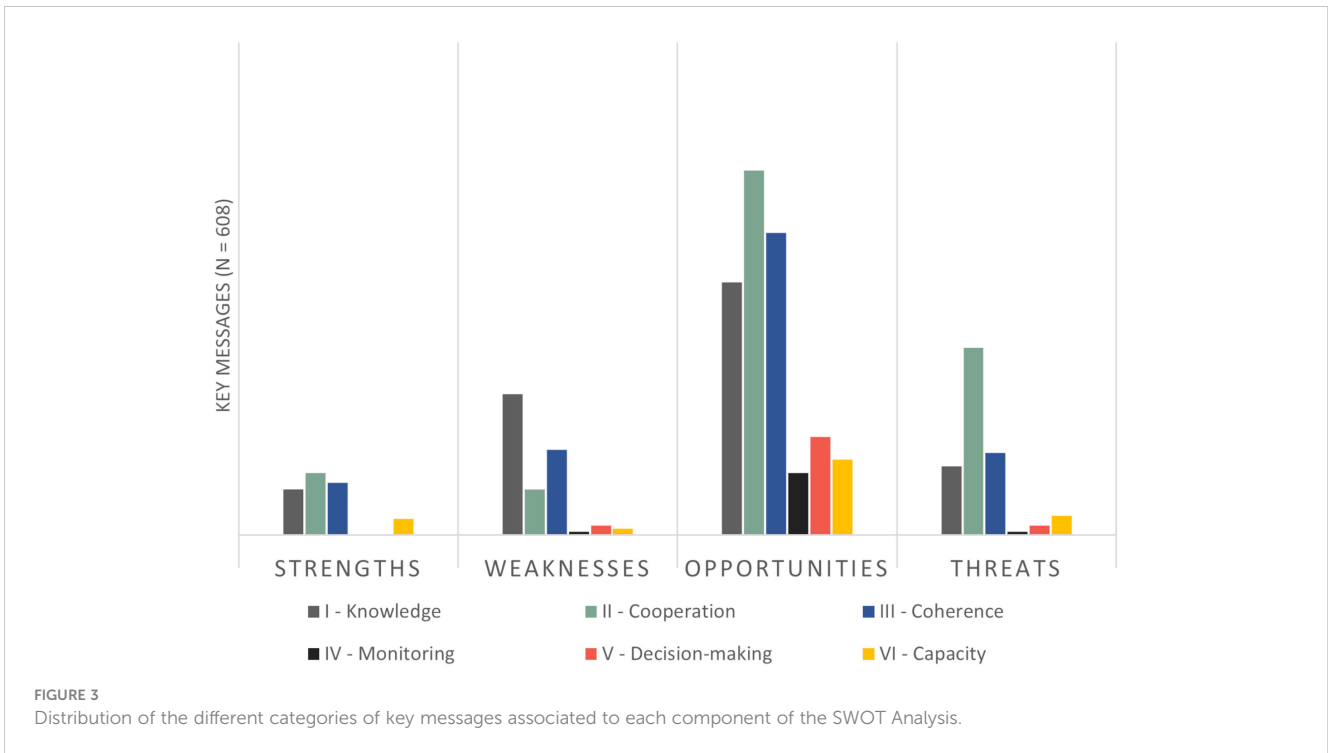
instrument offers for provisions on area-based management tools. The strengths (n= 54) and weaknesses (n= 89) of the BBNJ treaty, as well as threats (n= 113) to reach the proposed objectives, are also discussed but to a lesser extent (Figure 3).

Knowledge when taking decisions (I), cooperation involving different stakeholders and parties for a common objective (II) as well as coherence for the establishment of new MPAs (III) were the aspects most frequently highlighted as strengths of the BBNJ treaty in the key messages. In contrast, monitoring (IV) and decision-making (V) aspects are not recognized as strengths. Nonetheless, several weaknesses are recognised in relation to some of the previous strong aspects, in particular “knowledge” (I) and

“coherence” (III). Weaknesses related to “knowledge” (I) refer to the lack of a unified concept of marine protected areas and poor guidelines when implementing decisions towards conservation, while weaknesses in “coherence” (III) are mainly associated with the exclusion of frameworks for fishing activities from the new treaty.

Opportunities were identified to all defined categories (Figure 3). Most of the identified opportunities are linked to solutions for a better management of ABNJ, including guidelines and information regarding the implementation of area-based management tools (I); the establishment of cooperation among existing organizations (II); and the design of provisions that





enhance the power of conservation actions, e.g. by providing a network including conservation tools and existing frameworks (III). Also, aspects related with monitoring the implemented tools for conservation (IV); decision-making when designing and maintaining a protected area (V); and capacity for all involved parties to implement actions for conservation and sustainable use of ABNJ (VI) are identified as highlighted prospects of the new BBNJ treaty.

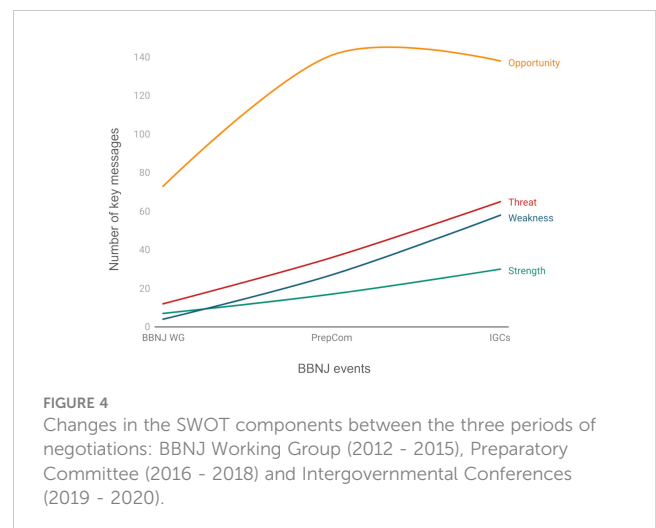
Despite the possibility of the agreement to solve current gaps in ocean governance, aspects found as opportunities were also observed as threats. Threats were associated to the challenge to find cooperation involving different stakeholders and parties (II) and to establish coherent MPAs and plan of actions towards conservation, while threatening commercial activities were not addressed in the agreement (III). Also, the lack of information and guidelines to guarantee the implementation of tools for conservation added to the ambiguity and vagueness of some provisions are considered threats for achieving targets for conservation and sustainable use (I).

As negotiations moved forward, negative aspects have increased at a higher rate than positive aspects. Still, the temporal analysis of the scientific publications shows that opportunities remained higher than any other SWOT component over the three periods of the BBNJ discussions (BBNJ Working Group: 2006 - 2015; Preparatory Committee: 2016 - 2018; Intergovernmental Conferences: 2019 - 2020) (Figure 4).

3.2 The prevalence of structuring and guiding principles in the key messages

To understand the power of the BBNJ treaty to establish ABMTs, including MPAs, and protect the biodiversity beyond

national jurisdiction, one of the aspects assessed in this study was how the scientific community perceives the role that the BBNJ treaty will have upon existing organizations and frameworks. The search for the controversial term “not undermine” (or “not undermining”) retrieved 30 key messages of which more than 35% indicated that the BBNJ agreement does not have enough provisions to guarantee the mutual collaboration of existing instruments, or that interests of existing organizations may differ from the objective of the new instrument. Further, 30% of the key messages associated with the term “not undermine” were seen as threats, suggesting that finding consensus and collaboration with existing instruments may be a challenging aspect for the implementation of the treaty. Less than 25% of the key messages represented opportunities related with the support of the



agreement's provisions by existing organizations, or vice-versa; and strengths were only observed in 10% of the messages, showing that the overall perspective of the scientific community is that the instrument may not have sufficient power to ensure that confronting interests will not hinder its goals.

Economic activities and their respective managing organizations: “fishing” and “RFMOs”, “navigation” and “shipping” and “IMO”, and “mining” and “ISA”, were identified in 84 key messages of which 40% were classified as opportunities, 10% as strengths and approximately 30% as threats. These results suggest that the scientific community recognizes the potential of the BBNJ treaty to cope with economic interests but also that there is concern that the provisions will not be able to stop the economic activities to be seen as a risk for the establishment of effective conservation measures. Weaknesses, mainly related to the undefinition of the term “not undermine” when linked to existing organizations, were identified in 17% of the key messages. Because fisheries are not directly mentioned in the draft agreement due to the commitment to “not undermine”, the scientific community also points this as a weakness towards the objectives of conservation and sustainable use of biodiversity in ABNJ.

The search for terms related to the implementation of coherent networks of MPAs (“adjacency”, “network”, “connectivity” and “transboundary”) resulted in 25 key messages that were mainly classified as opportunities (60%). Showing that the scientific community recognizes the potential of the new instrument to create relevant networks of MPAs, building ecosystem corridors and promoting the resilience of ocean. However, only one key message was classified as a strength, i.e., as a consolidated provision of the agreement, that ensures that activities conducted under national jurisdiction should not cause adverse impacts to biodiversity beyond national jurisdiction. Weaknesses and threats represented 25% and approximately 15%, respectively, of the key messages.

Twenty-one key messages referring to “Freedom of the high seas” and the “Common Heritage of Mankind” (CHM) were found in our data. From those, almost 50% were identified as threats, while approximately 30% were seen as weaknesses. These results are related to the difficulty among States to accept a principle that differs from “*mare liberum*”, resulting in conflict among parties and stakeholders. Opportunities to limit the freedom of the high seas were identified in 25% of the key messages. Only 10% of the messages were classified as strengths, referring that it would be positive if the agreement would be guided by the CHM principle.

3.3 Changes in opinion throughout the BBNJ negotiations

A total of 451 key messages were analyzed by at least one of the lexicons (Bing and AFINN), representing more than 70% of all extracted messages from the three periods of negotiations of the BBNJ treaty (BBNJ Working Group, Preparatory Committee, and Intergovernmental Conference). Sentiment scores ranged from -3 to 5 ($mean = 0.38, SD = 1.32$) for the Bing lexicon and from -6 to 7 ($mean = 0.77, SD = 2.03$) for the AFINN lexicon. A strong positive relationship was found between the standardized sentiment scores of key messages classified by both lexicons ($r(271) = 0.71, p < 0.001$) (Figure 5), indicating a high concordance between the two lexicons in the classification of the messages' sentiment.

The mean sentiment scores of the key messages varied as the negotiations move forward (Table 3). These differences are statistically significant for messages analyzed by the Bing lexicon and by both lexicons (Kruskal-Wallis, $X^2_{Bing} = 7.23, p < 0.05$; $X^2_{both\ lexicons} = 8.60, p < 0.05$). Key messages extracted from the last phase of the negotiations (IGC) showed a significant less optimistic view of the agreement when compared to the beginning of the negotiations (BBNJ WG) ($W_{Bing} = -3.57, p = 0.03$;

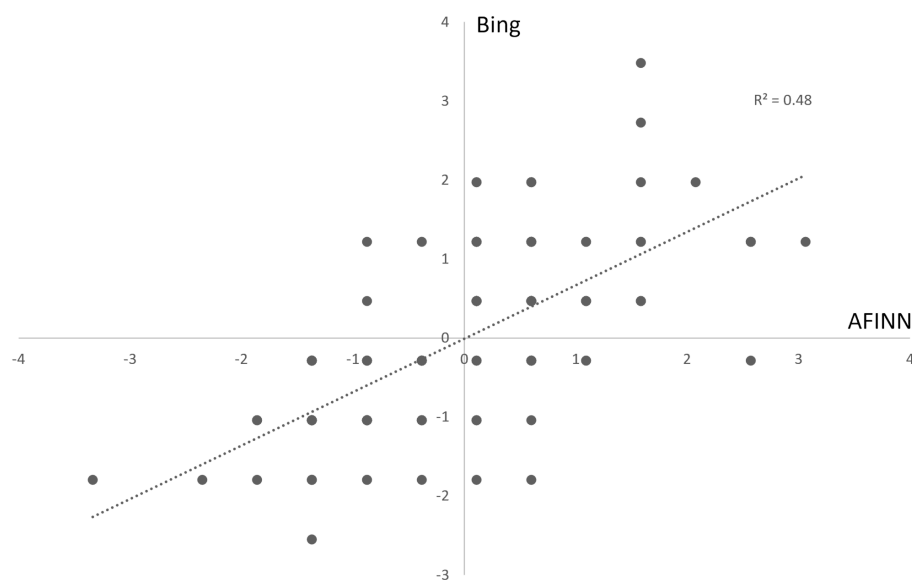


FIGURE 5
Correlation between Bing and AFINN lexicons' standardized scores ($n = 273$).

TABLE 3 Number of messages analysed by AFINN (n=335) and Bing (n=389) and by the combination of both lexicons (n=451) in each period (BBNJ, WG, PrepCom and IGC) with the respective mean standardised sentiment score and standard deviation (sd).

Lexicon	BBNJ events	Number of messages	Z-score	
			mean	sd
Bing	BBNJ WG	61	0.269	0.269
	PrepCom	129	0.052	0.052
	IGC	199	-0.116	-0.116
AFINN	BBNJ WG	54	0.199	0.845
	PrepCom	118	0.087	0.929
	IGC	163	-0.129	1.082
Both lexicons	BBNJ WG	73	0.198	0.198
	PrepCom	155	0.102	0.102
	IGC	223	-0.111	-0.111

$W_{\text{both lexicons}} = -3.52, p = 0.03$, Figure 6). Although this difference was not statistically significant when using the AFINN lexicon a decrease in the sentiment score across periods was also present (Table 3).

The most frequent, positive and negative, words extracted from scientific works published during the three periods of negotiations are shown in Figure 7. Whereas the work cloud of the first phase of negotiations (BBNJ WG) indicates an optimistic perspective by the scientific community, with a dominance of positive words, this changed as the negotiations proceeded.

During BBNJ WG period, positive aspects were associated to the protection of the marine biodiversity in ABNJ by providing obligations, and to an integrated and modern approach to achieve an effective ocean governance. Negative words at this stage were related to the dimension of the governance of ABNJ and concerns on the lack of consensus that could delay the negotiations. In the second phase of

negotiations (PrepCom) scientific publications discussed the potential of the agreement to promote the sustainable use of the high seas and to enhance the effectiveness of existing organizations. The establishment of an effective and integrated framework to properly regulate activities conducted in ABNJ, including a funding mechanism and institutional arrangements to support conservation were also debated. In this phase, the term “not undermine” was firstly highlighted as a concern that the new BBNJ treaty should not interfere in existing organizations and frameworks. The lack of consensus among States, especially related to guiding principles such as the Common Heritage of Mankind and the Freedom of the High Seas, were seen as controversial and damaging the negotiations during this period. During the final stage of negotiations (IGCs) the key messages of the scientific community are dominated by negative words with the term “not undermine” still under strong debate, particularly regarding the exclusion of fisheries from the agreement. At this stage, concerns over evaluating damage to biodiversity in ABNJ and an explicit mention by the agreement on environmental damage were also discussed.

The sentiment analysis here applied shows important elements that were of concern of the scientific community. However, it is important to note that this sentiment is only represented by the scientific community, excluding other relevant actors and stakeholders for these negotiations. The language and style used by the scientists might also have a tendency on the results displayed in this work, which may be biased. Despite this, the sentiment analysis as a tool for scrutinizing opinions and sentiments has shown great outcomes for this work.

4 Discussion

4.1 The growing interest on promoting the conservation of biodiversity in ABNJ

The scientific community has actively discussed the BBNJ treaty, in particular the mechanisms to implement ABMTs and MPAs. (Tessnow-von Wysocki and Vadrot, 2020). With this study we show that the interest of the scientific community has grown

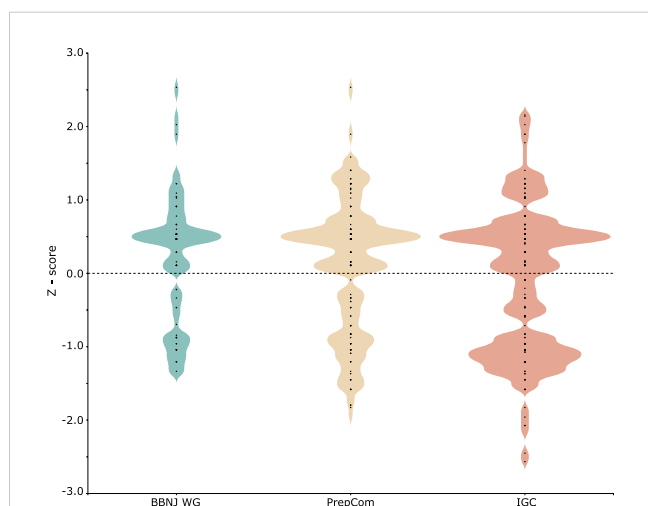
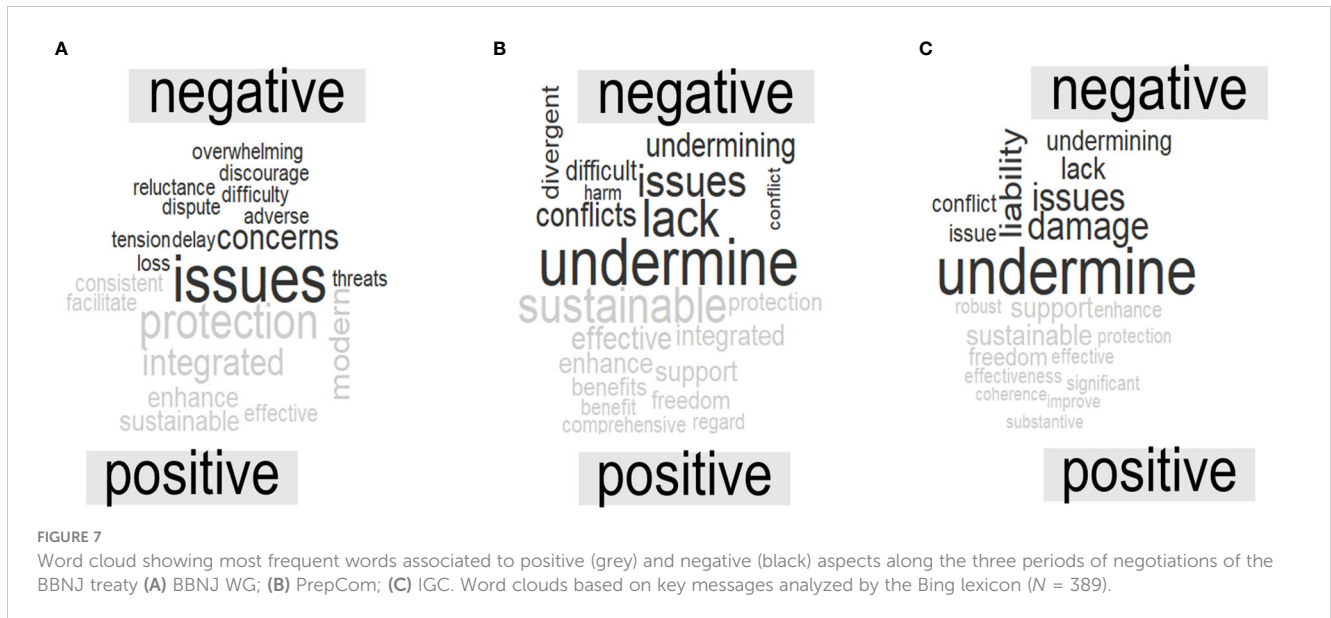


FIGURE 6 Sentiment score for messages analyzed by both lexicons (AFINN + Bing; N = 451) in each period of negotiation of the BBNJ treaty, with significant statistical differences observed between the beginning (BBNJ WG) and the final (IGC) periods of negotiations ($W_{\text{both lexicons}} = -3.52, p = 0.03$).



over the last 15 years of negotiations but was intensified by the beginning of Intergovernmental Conferences (IGCs), in 2018, in which the implementation of tools for conservation and sustainable use have been debated. This growing interest is also mirrored by a rising concern of the society about environmental degradation and the relationship between human wellbeing and environmental health (Harden-Davies et al., 2020).

Solutions to complex issues such as the biodiversity decline in ABNJ and the proper use of these areas and resources must be based on the integration of ecological, socioeconomic, and political knowledge (Dick et al., 2017), resulting in holistic approaches (Adger et al., 2003). In the case of ABMTs, including MPAs, in order to meet conservation requirements and still meet stakeholder interests, a multidisciplinary approach is essential to balance social and ecological factors (Ruiz-Frau et al., 2015). The multitude of research fields identified in our data indicates that the same applies to the BBNJ agreement, i.e., a successful implementation must consider a multidisciplinary approach in which international governmental cooperation, solid laws, and the exchange of scientific knowledge regarding environmental and ecological aspects are equally relevant, as previously discussed by Gjerde et al. (2022).

Despite being a highly discussed topic, the vast majority (90%) of the scientific publications on the ABMT package were authored by scientists working in developed states, showing an extremely unequitable participation of the scientific community. It is important to notice that the scientific contribution may not reflect the active participation of these Member States in BBNJ debates but may indicate that their contribution and impact are insufficient. The underrepresentation of the perspectives of less-developed countries results in an agreement scoped by interests of a small number of States and therefore less effective (Shi, 2020). Nonetheless, in comparison with a study from 2016 (Blasiak et al., 2016), there is an increase on the participation of authors working in developing countries, from 2 to 10%, and SIDS, from zero to 6% of the publications. The improved participation of authors from

these countries may be a consequence of the effort established by the Capacity Building and Technology Transfer package that highlights the need of building scientific and technological capacity for less-developed countries (Rodríguez-Santiago, 2018; Harden-Davies et al., 2022), and the efforts from UN funds to promote a higher participation of the developing States 'delegations' in the negotiations (Hammond and Jones, 2021).

Up to 2020, authors based on academic institutions have contributed the most to scientific literature regarding the package deal on ABMTs, while authors from the NGOs contributed the least. This piece of evidence may reflect the reduced participation of NGOs on BBNJ negotiations and consequent lower attention to their expectations when contemplating provisions for the agreement. It is necessary to not restrict science to academia, as NGOs can play an important role in international politics by offering expertise in existing issues and improving the capacity to solve governance problems (Blasiak et al., 2017). Their active participation may also promote a more diverse environment in the negotiations table, acting as a bridge between the civil society and decision-makers that may result in a more integrative process (Gereke and Brühl, 2019). Moreover, it is recognized that the perspectives of all stakeholders must be incorporated into decision-making process to achieve management goals (Gornish and Roche, 2018).

4.2 External and internal factors acting upon the new agreement

The SWOT analyses performed to the key messages revealed a great potential of the new agreement to promote the conservation and sustainable use of marine diversity in ABNJ, as most of the messages were classified as "Opportunities". The external factors identified by the scientific community that may influence the agreement, are associated with the coordinated cooperation taken by involved Parties based on successful examples, such as the

OSPAR commission (Tang et al., 2021), coherent actions between existing organizations to implement networks of ABMTs (Haas et al., 2021), and the use of the best available science and traditional knowledge when planning decisions. Nonetheless, serious threats to achieve the agreement's goal have also been identified in 18% of the extracted key messages. Although cooperation among existing frameworks has been seen as an opportunity, it has also been considered a threat as the agreement cannot overstep existing frameworks or bodies.

Another aspect identified as a threat to the evolution of the agreement was the challenging mission of finding consensus among States, resulting in a time-consuming process that may prioritize economic aspects rather than ecological ones. One of the aspects causing controversies was the role of the Common Heritage of Mankind (CHM) versus the Freedom of the High Seas, with some countries, e.g., G77, Indonesia and Papua New Guinea supporting the CHM principle while others e.g., United States of America, Australia and EU defending the Freedom of the High Seas (De Santo et al., 2020; Vadrot et al., 2021). In the newly drafted agreement (UN General Assembly, 2023), the Common Heritage of Mankind, appears as one of the guiding principles, recognizing the critical importance to conserve the BBNJ as a matter of common concern to humanity (Lothian, 2021) and establishing the high importance of the intrinsic value of the ocean. However, “the freedom of marine scientific research, together with other freedoms of the high seas” is also stated as a guiding principle of the agreement. These contradictory principles raised during the negotiations, alternating between concerns of maintaining individual freedom and promoting collective resource management (Hammond and Jones, 2021; Nguyen, 2022), and will certainly pose challenges during the implementation of the agreement.

The lack of coherence of the agreement was another aspect identified as a threat. This is due to the exclusion of fisheries from the BBNJ debates and the ambiguity and lack of information found in some provisions. One of the major challenges for the conservation and sustainable use of ABNJ is fishing. While resources from the Area “shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States”, the same is not applied to high seas resources, including fisheries (Hammond and Jones, 2021). In the agreed text (UN General Assembly, 2023), fisheries have been included with a statement that treaty provisions shall not apply to these activities (Part II, Article 8). Excluding fisheries from the BBNJ agreement may limit the application of a holistic and integrated approach, reducing the power of the new instrument to adopt measures that build resilience for the ocean ecosystem (Scott, 2017). As stated in publications, certain aspects of the agreement lack clarity, such as the term “not undermine” (Gjerde et al., 2019; Mendenhall et al., 2019; Shi, 2020). In the agreed text, the term appears three times and remains unclear, except in the provisions for the establishment of area-based management tools. In this provision (Part III, Article 19), the term “not undermine” is followed by “the effectiveness of measures adopted in respect of areas within national jurisdiction”, showing that the agreement can act as a contributor and in accordance with measures adopted nationally. Another aspect stressed by the scientific community was the absence of a unique

definition for MPA, which could affect the implementation of this tool (Becker-Weinberg, 2017; Wang, 2019). The concept of marine protected areas has been agreed between states as a geographically defined area that is designed to achieve long-term biodiversity conservation objectives and may allow, where appropriate, sustainable use provide it is consistent with the conservation objectives” (UN General Assembly, 2023: Part I, Article 1). This differs from previous definitions where only conservation objectives, and not the use of marine resources, was considered (e.g. Secretariat of the Convention on Biological Diversity, 2005).

Weaknesses and strengths, the internal factors of the agreement, represented only 14% and 8% of the messages, respectively. Over the three periods of negotiations, weaknesses, described as the aspects of the agreement that may jeopardize the goals for the conservation of ABNJ, have reached higher values than strengths (provisions of the agreement and its power to deal with issues relating to conservation), revealing that even after 15 years of debate, there were unresolved questions that are crucial for the success of the BBNJ agreement. The consistently lower number of strengths identified by the scientific community suggests a scarce power of the agreement to provide solutions and resolve existing issues to ensure that the gaps in ocean conservation are filled. Nonetheless, as our study was performed before the conclusion of agreement, it is expected that more strengths will be found when the agreed text is examined in detail.

Weaknesses of the BBNJ treaty were mostly associated to “knowledge” and related to unclear information that leads to varied interpretation. As mentioned before, the ambiguity of the term “not undermine” example of that. The lack of coherence was also indicated as a weak aspect, due to the missing consistency for implementing decisions, as in the case of not addressing fishing activities. Likewise, as the agreement had the intention to implement cooperation among existing organizations, filling the gaps in ocean governance, and creating networks among ABMTs, clarified provisions are needed to promote cooperation among institutions and to provide guidelines for the establishment and criteria for these ABMTs.

Strengths, fell under the categories “knowledge”, “cooperation” and “coherence”. Strengths related to “knowledge” refer to the commitment of the new agreement with the best available science, the application of Traditional Knowledge for decision-making and the commitment to the precautionary principle and the Common Heritage of Mankind. The inclusion of the best available science in addition to Traditional Knowledge may favor a solid duty of the agreement with the best possible standards for the conservation. If the commitment is only applied to the best available science, there is a risk of only acting upon justification of clear scientific evidence (Harden-Davies et al., 2020), delaying urgent actions in emergency cases. The application of Traditional Knowledge in the decision process can be a powerful mechanism, especially in countries where indigenous culture is largely present. Traditional Knowledge can be a vehicle to build fair involvement among States, offering an opportunity for a more equitable contribution of knowledge by least developed countries and enhance their participation on negotiations on the BBNJ treaty, enabling compliance and long-term results in conservation and

management actions. “Cooperation”, seen as the duty of involved Parties and existing organizations to find consensus regarding provisions of the agreement is viewed as a strength of the treaty. Within “coherence”, because the interests of adjacent coastal States must be taken into consideration, the concern with activities conducted under national jurisdiction (that should not affect ABNJ) were considered as strengths of the agreement to achieve conservation and sustainable use of marine biodiversity. However, no publication referred to the power of the agreement in decision-making when implementing ABMTs, nor to specific duties and rights of Parties. In fact, there are diverging opinions regarding the implementation of ABMTs: some States defend the creation of a new body responsible for the implementation of ABMTs in areas beyond national jurisdiction, and others support that this should be made by existing regional bodies (Mendenhall et al., 2019). With this dispute it remains questionable if the agreement will be able to change the status quo in ocean governance and implement tools for conservation in ABNJ.

Decision-making and capacity were rarely debated but were mostly perceived as an opportunity of the new agreement rather than a consolidated provision of it. Because no strengths relative to decision-making were identified, it appears that scientific community expects the agreement to act as a soft law, instead of a legally binding instrument. (Mendenhall et al., 2019). The least debated topic in scientific literature was related to monitoring. The BBNJ treaty should have the capacity to implement actions to guarantee the establishment and monitor area-based management tools, including MPAs. However, as no strengths related to monitoring activities were observed, it seems that the debates have left aside the relevance of monitoring ABMTs and MPAs. Effective management goes beyond implementation, and monitoring activities serve as guiding tools to evaluate the strategies set and to identify the factors influencing conservation targets, providing information to an adaptive management (Stem et al., 2005). An important aspect to be considered is that monitoring depends on the capacity of the countries to conduct these activities and many obstacles are present to develop monitoring capacity at a global level (Schmeller et al., 2017). To tackle this issue, the implementation of the new BBNJ treaty should also focus on how to help least developed countries to have access to specialized knowledge, new technologies as well as funding mechanisms.

4.3 A reality check on scientists’ optimism towards the BBNJ treaty

The sentiment analysis conducted in this study, represented by the opinion of the scientific community and the sentiment contained in the scientific literature review, showed a decreasing optimism regarding the potential of the agreement to implement ABMTs, including MPAs, and to guarantee the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. This can be explained by the undetermined role of the agreement to tackle existing issues, contrasting ideas among States regarding aspects such as the inclusion of fisheries and the lack of a unique definition of MPAs.

4.3.1 ‘Not undermining’ - The glass as half full?

The controversy around the term “not undermine” is built on the fact that the new instrument must simultaneously 1) articulate with and complement existing relevant legal instruments and frameworks and global and regional sectoral bodies, and 2) be applied in accordance with the statement: “undermine relevant legal instruments and frameworks and relevant global, regional, subregional and sectoral bodies” (UN General Assembly, 2023: Part I, Article 4).

For some authors the BBNJ treaty could strengthen existing global, regional, and sectoral bodies and instruments in fulfilling their responsibilities under UNCLOS (Gjerde et al., 2019; Haas et al., 2020) by promoting action through new global regulations, standards and practical guides to be implemented by States parties. In this context, the BBNJ treaty would support, instead of undermine existing instruments, frameworks, and bodies. Our results, however, show that “not undermine” is often associated to a negative context, particularly related to the exclusion of fisheries from the BBNJ discussions, to avoid compromising existing fisheries organizations. In the United Nations Fish Stocks Agreement, the term is used in reference to not jeopardize the effectiveness of existing organizations and regulations (Gjerde et al., 2019; Haas et al., 2021), however this definition must not be applied to the new instrument. If “not undermine” is interpreted as a gap filler, there is a risk of the agreement to impose duties to an existing organization, as the case of RFMOs (Barnes, 2019).

Despite the efforts to find a consensus over the real definition of the term “not undermine”, the lack of clarity and the flexibility of its uses may hinder the potential of the BBNJ treaty to repair the current fragmented nature of oceans’ governance (Barnes, 2019; Mendenhall et al., 2019; Hammond and Jones, 2021). Moreover, if not properly clarified, the term “not undermine” will result in an agreement that is most likely to be “soft” in terms of the level of precision, obligation, and delegation (Mendenhall et al., 2019).

4.3.2 Set the agreement and exclude fisheries: better sorry than safe?

As previously mentioned, fisheries, the most impacting activity for the marine biodiversity in ABNJ (Barnes, 2010; Barnes, 2019) are excluded from the agreement’s draft. The science community understands this as a means to prevent undermining existing fisheries management organizations and as a limitation to the agreement to implement solid provisions towards the conservation of biodiversity (Quirk and Harden-Davies, 2017; Haas et al., 2021).

Despite the existence of 20 regional fisheries management bodies, they have a specific mandate to manage impacts on target species, leaving gaps in species and geographic coverage (Warner, 2014; Crespo et al., 2019) - approximately 95% of fish biodiversity in ABNJ are not addressed. The effectiveness of RFMOs is questionable, with several aspects limiting their power to implement conservation and management measures, including the absence of environmental protection principles in RFMOs Conventions, ineffective decision-making frameworks, the absence of a formal global coordination mechanism, the lack of resources and capacity in developing States to apply their duties in an effective

manner, failure to cope with non-Parties and lack of binding conservation and management measures to address non-target species (Warner, 2014; Barnes, 2019). The new instrument, under UNCLOS, could provide common principles, including a precautionary and an ecosystem-based approach, through coordinated actions at the global level, and enhance the capacity of developing States (Crespo et al., 2019). However, by excluding fisheries from the scope of the BBNJ treaty, a once in a lifetime opportunity to address the gaps in ocean governance and to prevent the massive loss in marine biodiversity caused by fishing activities will be lost. As mentioned by Hammond and Jones (2021), “any Agreement that omits fishing would be irredeemably weak” but, regardless of this omission, the new instrument will impact international fisheries management to one extent or another (Barnes, 2019).

The new instrument could highly contribute to the conservation of biodiversity beyond national jurisdiction by strengthening the ecological coherence in RFMOs through the implementation of new ABMTs in high seas, since these organizations have been failing to and halt the decline in fish stocks (Crespo et al., 2019; Haas et al., 2021). Complementary approaches to join regional seas organizations and global or regional observing systems to provide monitoring activities have been suggested, as well as mechanisms to increase the cooperation among sectors and existing frameworks, as these can be critical to achieve an ecosystem approach (Crespo et al., 2019). Also, the BBNJ agreement could have established a framework to safeguard all fish species that are not assessed by fisheries management organizations, creating mechanisms to evaluate and monitor their stocks (Crespo et al., 2019). The solution, to be safe rather than sorry, is to have a transparent process of implementation in which all the aspects impacting the marine biodiversity and sustainable use of ABNJ, including fisheries and the relevant stakeholders are considered.

4.3.3 Providing guidance for the implementation of ABMTs, including MPAs

Area-based management tools are crucial instruments of management and conservation and include marine protected areas, no-take zones, spatially enclosed gear restrictions, and zonal navigation controls (Barnes, 2019), all of which should have implementation criteria defined in the BBNJ treaty. Marine protected areas, responsible for conserving species, ecosystems, habitats, bioregions and biodiversity (Roberts et al., 2005) are often analogous to fishing reserves, leading to challenges in achieving conservation goals (Costello and Ballantine, 2015). Thus, despite the increasing number of MPAs in recent years, showing a greater interest in regulating marine resources, this does not necessarily mean a higher level of biodiversity conservation (Costello and Ballantine, 2015). Fisheries management should be combined with marine reserves or no-take MPAs (areas permanently closed to fishing), resulting in an integrated ecosystem approach. No-take MPAs areas are essential to protect habitats that require a long time to recover and to provide adequate refuge for highly vulnerable species (Roberts et al., 2005), such as

deep-sea species. As such, they offer a chance to safeguard a large portion of the marine diversity and habitats in ABNJ by preventing management failure and measures that may prioritize economic interests over the intrinsic value of nature.

As we reached the final phase of the new instrument with an agreed text that includes a unique definition for ABMTs, including MPAs, future steps for the implementation of the agreement should consider the importance of establishing no-take marine reserves. The new instrument should also explicitly define clear criteria, including scientific standards, prioritized areas, levels of biodiversity and connectivity to constitute the basis for the implementation of ABMTs in areas beyond national jurisdiction (Wang, 2019). Moreover, for its effective implementation, it is important that the new instrument provides guidelines for collaboration among existing organizations at national and international level, creating a coherent management framework.

4.4 The power and the limitations of sentiment analyses in conservation science

The use of sentiment analysis (SA) enabled us to perceive the authors' opinion and conception regarding the provisions of the new instrument. Both lexicons applied (Bing and AFINN) are lexicons that analyze general words without addressing the specific context they are inserted: the Bing lexicon was designed to scrutinize customer reviews and the AFINN lexicon was created to analyze the sentiment of “tweets” (Sonkin, 2021). In most lexicon-based systems a sentiment score is not assign to words that are not available on their dictionaries (Neviarouskaya et al., 2009) and therefore there were words in our data that were not analyzed while others, such as, “undermine”, “existing”, “fisheries” and “fishing” were assigned without a context that could determine their positive or negative affiliation.

For a precise analysis, a domain-specific sentiment lexicon should be created, and a corpus-based approach should be applied. This approach consists of the evaluation of patterns of co-occurrence of words to obtain the sentiment of words or phrases (Ding et al., 2008). The word “fishing”, for example, in the context of the agreement would be addressed as a word with a negative polarity, once it represents a threat to the conservation of the biodiversity beyond national jurisdiction. Another method that could be applied is the addition of new words and respective polarity (positive, negative or neutral) to the existing lexicons (Baccianella et al., 2010). This would enhance the capacity of the lexicon to identify and analyze a higher number of words from the extracted key messages.

Nonetheless, despite the lack of precision of the available lexicons, sentiment analysis proved to be reliable to assess the sentiment of authors over the periods of discussion of the BBNJ treaty and show a great potential to be used in finding patterns and trends in debates of international law, allowing to voice the perspective of scientists and other relevant stakeholders on conservation issues (Lennox et al., 2020), leading to a more collaborative process.

5 Conclusion

After fifteen years of debates, and after a draft text being recently agreed, it is still soon to conclude if the new BBNJ treaty will be capable of guaranteeing the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. The sentiment analysis of the scientific community has shown a less optimistic view of the agreement as it was reaching its final phases and has revealed fundamental issues that postponed consensus on the new instrument. Commercial activities, the model of governance and the absence of clear information regarding how the framework would be established were some aspects that concerned the scientific community during the negotiation phases and should now be taken in consideration while implementing the BBNJ treaty.

The Freedom of the High Seas and the Common Heritage of Mankind (ratified as Common Heritage of Humankind) were both included in the agreed text as guiding principles, leaving doubts about the role of each of them in the new instrument. Additionally, although fishing is one of the major threats for biodiversity and marine ecosystems, there is a clear statement to exclude it from the scope of the agreement, hindering the new instrument to tackle threats associated to loss of biodiversity and lack of effective resource management.

Despite consensus on finding a definition for area-based management tools and marine protected areas, the process of implementation and creation of networks of MPAs is still not clear. Provisions with concise and clear guidelines, including aspects related to biodiversity and connectivity are essential. With a definition of marine protected area that may allow sustainable use, the intention of having a tool for conservations purposes alone has failed. For future steps, including implementation actions, the inclusion of no-take reserves must be reviewed in order to guarantee coherent and long-term conservation for the biodiversity in ABNJ as well as monitoring practices to guarantee the effectiveness of those tools.

To not undermine existing instruments, the agreement should strengthen and complement existing mechanisms, but no guidance on how this will be established has yet been provided. The current text is ambiguous and lack detailed information not only on how the BBNJ treaty will cope with existing instruments, but also regarding economic activities. In the case of fisheries and RFMOs, the new BBNJ treaty could support these organizations by providing common and coherent frameworks for Parties to follow. However, the commitment of the new treaty to not address fishing activities may be a wasted opportunity to implement solid provisions to fill gaps in governance and to guarantee the conservation of biodiversity in ABNJ.

With a newly agreed text, upcoming efforts should focus on the definition of the role of the agreement in terms of decision-making, the guideline for the establishment of marine protected areas, the recognition of the need of no-take marine reserves in ABNJ, addressing fishing activities and the strong commitment with conservation, endorsed by the CHM principle and supported

by the combination of best information available: best available science and traditional knowledge. Those aspects have all been considered by the scientific community as basilar to reach conservation and sustainable development targets in marine ecosystems, and should be incorporated into the implementation of the new agreement to achieve an effective framework capable of providing meaningful change for the actual scenario of ocean governance.

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary Material](#). Further inquiries can be directed to the corresponding author.

Author contributions

MC, HT and AH conceived and designed the study; MC collected the data; MC and HT performed the analysis; MC wrote the manuscript; HT and AH contributed to the writing and discussion. All authors approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fmars.2023.1173682/full#supplementary-material>

References

- Adger, W. N., Brown, K., Fairbrass, J., Jordan, A., Paavola, J., Rosendo, S., et al. (2003). Governance for sustainability: towards a “thick” analysis of environmental decisionmaking. *Environ. Plann. A* 35 (6), 1095–1110. doi: 10.1068/a35289
- Baccianella, S., Esuli, A., and Sebastiani, F. (2010). “SENTIWORDNET 3.0: an enhanced lexical resource for sentiment analysis and opinion mining,” in *Proceedings of the 7th International Conference on Language Resources and Evaluation*, 2200–2204.
- Balahur, A. (2013). *Sentiment analysis in social media texts*. Available at: <http://www.urbandictionary.com/>.
- Barnes, R. (2010). Fisheries and marine biodiversity. *Res. Handb. Int. Environ. Law*, 542–563. doi: 10.4337/9781849807265.00038
- Barnes, R. A. (2019). “Fisheries and ABNJ: Advancing and enhancing cooperation”, in *New knowledge and changing circumstances in the Law of the Sea*. Ed. T. Heidar (Leiden: Brill), 124–153. doi: 10.1163/9789004437753_009
- Becken, S., Stantic, B., Chen, J., Alaei, A. R., and Connolly, R. M. (2017). Monitoring the environment and human sentiment on the great barrier reef: assessing the potential of collective sensing. *J. Environ. Manage.* 203, 87–97. doi: 10.1016/J.JENVMAN.2017.07.007
- Becker-Weinberg, V. (2017). Preliminary thoughts on marine spatial planning in areas beyond national jurisdiction. *Int. J. Mar. Coast. Law* 32 (3), 570–588. doi: 10.1163/15718085-12323029
- Blasiak, R., Durussel, C., Pittman, J., S nit, C. A., Petersson, M., and Yagi, N. (2017). The role of NGOs in negotiating the use of biodiversity in marine areas beyond national jurisdiction. *Mar. Policy* 81 (NOV), 1–8. doi: 10.1016/j.marpol.2017.03.004
- Blasiak, R., Pittman, J., Yagi, N., and Sugino, H. (2016). Negotiating the use of biodiversity in marine areas beyond national jurisdiction. *Front. Mar. Sci.* 3 (NOV). doi: 10.3389/fmars.2016.00224
- Bravo-Marquez, F., Mendoza, M., and Poblete, B. (2014). Meta-level sentiment models for big social data analysis. *Knowledge-Based Syst.* 69 (1), 86–99. doi: 10.1016/J.KNSYS.2014.05.016
- Clark, M. R., Althaus, F., Schlacher, T. A., Williams, A., Bowden, D. A., and Rowden, A. A. (2016). The impacts of deep-sea fisheries on benthic communities: a review. *ICES J. Mar. Sci.* 73 (suppl_1), i51–i69. doi: 10.1093/ICESJMS/FSV123
- Costello, M. J., and Ballantine, B. (2015). Biodiversity conservation should focus on no-take marine reserves: 94% of marine protected areas allow fishing. *Trends Ecol. Evol.* 30, 507–509. doi: 10.1016/j.tree.2015.06.011
- Crespo, G. O., Dunn, D. C., Gianni, M., Gjerde, K., Wright, G., and Halpin, P. N. (2019). High-seas fish biodiversity is slipping through the governance net. *Nat. Ecol. Evol.* 3, 1273–1276. doi: 10.1038/s41559-019-0981-4
- de Oliveira, N. R., Pisa, P. S., Lopez, M. A., de Medeiros, D. S. V., and Mattos, D. M. F. (2021). Identifying fake news on social networks based on natural language processing: trends and challenges. *Information* 12, 38. doi: 10.3390/info12010038
- De Santo, E. M., Mendenhall, E., Nyman, E., and Tiller, R. (2020). Stuck in the middle with you (and not much time left): the third intergovernmental conference on biodiversity beyond national jurisdiction. *Mar. Policy* 117, 103957. doi: 10.1016/J.MARPOL.2020.103957
- Dick, M., Rous, A. M., Nguyen, V. M., and Cooke, S. J. (2017). Necessary but challenging: multiple disciplinary approaches to solving conservation problems. *FACETS* 1 (1), 67–82. doi: 10.1139/facets-2016-0003
- Ding, X., Liu, B., and Yu, P. S. (2008). *A holistic lexicon-based approach to opinion mining*. Available at: <http://wordnet.princeton.edu/>.
- Gereke, M., and Br hl, T. (2019). Unpacking the unequal representation of northern and southern NGOs in international climate change politics. *Third World Q.* 40 (5), 870–889. doi: 10.1080/01436597.2019.1596023
- Gjerde, K. M., Clark, N. A., Chazot, C., Cremers, K., Harden-Davies, H., Kachelriess, D., et al. (2022). Getting beyond yes: fast-tracking implementation of the united nations agreement for marine biodiversity beyond national jurisdiction. *NPJ Ocean Sustain* 1, 6. doi: 10.1038/s44183-022-00006-2
- Gjerde, K. M., Clark, N. A., and Harden-Davies, H. R. (2019). Building a platform for the future: the relationship of the expected new instrument for marine biodiversity in areas beyond national jurisdiction and the UN convention on the law of the Sea. *Ocean Yearbook Online* 33 (1), 1–44. doi: 10.1163/9789004395633_002
- Gjerde, K., Payne, C., Freestone, D., Pasquero, J., Ortuno Crespo, G., Epps, M., et al. (2021). *Area-based management tools in marine areas beyond national jurisdiction* (Gland, Switzerland: IUCN).
- Gjerde, K. M., Reeve, L. L. N., Harden-Davies, H., Ardron, J., Dolan, R., Durussel, C., et al. (2016). Protecting earth’s last conservation frontier: scientific, management and legal priorities for MPAs beyond national boundaries. *Aquat. Conservation: Mar. Freshw. Ecosyst.* 26, 45–60. doi: 10.1002/aqc.2646
- Gornish, E. S., and Roche, L. M. (2018). The value of cooperative extension for involving society in restoration and conservation. *Restor. Ecol.* 26 (6), 1051–1054. doi: 10.1111/REC.12861
- Haas, B., Haward, M., McGee, J., and Fleming, A. (2021). Regional fisheries management organizations and the new biodiversity agreement: challenge or opportunity? *Fish Fisheries* 22 (1), 226–231. doi: 10.1111/FAF.12511
- Haas, B., McGee, J., Fleming, A., and Haward, M. (2020). Factors influencing the performance of regional fisheries management organizations. *Mar. Policy* 113, 103787. doi: 10.1016/J.MARPOL.2019.103787
- Halpern, B. S., Lester, S. E., and Kellner, J. B. (2009). Spillover from marine reserves and the replenishment of fished stocks. *Environ. Conserv.* 36 (4), 268–276. doi: 10.1017/S0376892910000032
- Hammond, A., and Jones, P. J. (2021). Protecting the “blue heart of the planet”: strengthening the governance framework for marine protected areas beyond national jurisdiction. *Mar. Policy* 127, 104260. doi: 10.1016/j.marpol.2020.104260
- Harden-Davies, H., Amon, D. J., Chung, T.-R., Gobin, J., Hanich, Q., Hassanali, K., et al. (2022). How can a new UN ocean treaty change the course of capacity building? *Aquat. Conserv.* 32, 907–912. doi: 10.1002/aqc.3796
- Harden-Davies, H., Humphries, F., Maloney, M., Wright, G., Gjerde, K., and Vierros, M. (2020). Rights of nature: perspectives for global ocean stewardship. *Mar. Policy* 122, 104059. doi: 10.1016/J.MARPOL.2020.104059
- Hossain, A., Karimuzzaman, M., Hossain, M. M., and Rahman, A. (2021). Text mining and sentiment analysis of newspaper headlines. *Inf. 2021* 12 (10), 414. doi: 10.3390/INFO12100414
- Houghton, K. (2014). Identifying new pathways for ocean governance: the role of legal principles in areas beyond national jurisdiction. *Mar. Policy* 49, 118–126. doi: 10.1016/J.MARPOL.2014.04.007
- Hu, and Liu, (2010). *Opinion mining, sentiment analysis, opinion extraction*. Available at: <https://www.cs.uic.edu/~liub/FBS/sentiment-analysis.html>.
- IISD ENB. (2022). *Summary of the fourth session of the intergovernmental conference on an international legally binding instrument under the UN convention on the law of the Sea on the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction*. Available at: <http://enb.iisd.org/vol25/enb25171e.html>.
- Ladle, R. J., Correia, R. A., Do, Y., Joo, G. J., Malhado, A. C. M., Proulx, R., et al. (2016). Conservation culturomics. *Front. Ecol. Environ.* 14 (5), 269–275. doi: 10.1002/FEE.1260
- Lascelles, B., Sciara, G. N., Agardy, T., Cuttelod, A., Eckert, S., Glowka, L., et al. (2014). Migratory marine species: their status, threats and conservation management needs. *Aquat. Conservation: Mar. Freshw. Ecosyst.* 24 (S2), 111–127. doi: 10.1002/AQC.2512
- Lennox, R. J., Verissimo, D., Twardek, W. M., Davis, C. R., and Jari , I. (2020). Sentiment analysis as a measure of conservation culture in scientific literature. *Conserv. Biol.* 34 (2), 462–471. doi: 10.1111/COBI.13404
- Lester, S. E., Halpern, B. S., Grorud-Colvert, K., Lubchenco, J., Ruttenberg, B. I., Gaines, S. D., et al. (2009). Biological effects within no-take marine reserves: a global synthesis. *Mar. Ecol. Prog. Ser.* 384, 33–46. doi: 10.3354/meps08029
- Lewis, D. D., Yang, Y., Rose, T. G., and Li, F. (2004). Rcv1: a new benchmark collection for text categorization research. *J. Mach. Learn. Res.* 5, 361–397. Available at: <https://www.jmlr.org/papers/volume5/lewis04a/lewis04a.pdf>.
- Lothian, S. (2021). Forget me not: revisiting the common concern of humankind concept in the BBNJ context. *Environ. Plan. Law J.* 38 (3), 189–203. Available at: <https://ro.uow.edu.au/balpapers/122/>.
- Mendenhall, E., De Santo, E., Nyman, E., and Tiller, R. (2019). A soft treaty, hard to reach: the second inter-governmental conference for biodiversity beyond national jurisdiction. *Mar. Policy* 108, 103664. doi: 10.1016/J.MARPOL.2019.103664
- Mishra, R. K., Urolagin, S., Jothi, J. A. A., Neogi, A. S., and Nawaz, N. (2021). Deep learning-based sentiment analysis and topic modeling on tourism during covid-19 pandemic. *Front. Comput. Sci.* 3. doi: 10.3389/fcomp.2021.775368
- Muraki-Gottlieb, H., Laffoley, D., Gjerde, K., and Spadone, A. (2018). *Area based management tools, including marine protected areas in areas beyond national jurisdiction: a report of the workshop on area based management tools, including marine protected areas in areas beyond national jurisdiction*. Available at: https://www.iucn.org/sites/dev/files/content/documents/iucn_oct2018_abmt_in_abnj_workshop_report_corr.pdf.
- Naldi, M. (2019). A review of sentiment computation methods with r packages. *ArXiv*, 1901.08319. doi: 10.48550/arXiv.1901.08319
- Neviarouskaya, A., Prendinger, H., and Ishizuka, M. (2009). “SentiFul: generating a reliable lexicon for sentiment analysis,” in *Proceedings - 2009 3rd International Conference on Affective Computing and Intelligent Interaction and Workshops, ACII 2009*. doi: 10.1109/ACII.2009.5349575
- Nguyen, L. N. (2022). “Principled challenges,” in *International law and marine areas beyond national jurisdiction*. Eds. V. De Lucia, A. O. Elferink and L. N. Nguyen (Leiden: Brill), 114–147. doi: 10.1163/9789004506367_006
- Nielsen, F. . (2011). A new ANEW: evaluation of a word list for sentiment analysis in microblogs. *CEUR Workshop Proc.* 718, 93–98. doi: 10.48550/arXiv.1103.2903
- O’Leary, B. C., Hoppit, G., Townley, A., Allen, H. L., McIntyre, C. J., and Roberts, C. M. (2020). Options for managing human threats to high seas biodiversity. *Ocean Coast. Manage.* 187, 105110. doi: 10.1016/j.ocecoaman.2020.105110
- Osimo, D., and Mureddu, F. (2012). “Research challenge on opinion mining and sentiment analysis”, *World Wide Web Consortium*. Available at: <https://www.w3.org/2012/06/pmod/opinionmining.pdf>.

- Pang, B., and Lee, L. (2008). Opinion mining and sentiment analysis. *Foundations Trends[®] Inf. Retrieval* 2 (1–2), 1–135. doi: 10.1561/1500000011
- Porter, M. F. (2001). *Snowball: a language for stemming algorithms*. Available at: <https://snowballstem.org>.
- Qu, Y., and Liu, R. (2022). A sustainable approach towards fisheries management: incorporating the high-seas fisheries issues into the BBNJ treaty. *Fishes* 2022 7 (6), 389. doi: 10.3390/FISHES7060389
- Quirk, G. C., and Harden-Davies, H. R. (2017). Cooperation, competence and coherence: the role of regional ocean governance in the south West pacific for the conservation and sustainable use of biodiversity beyond national jurisdiction. *Int. J. Mar. Coast. Law* 32 (4), 672–708. doi: 10.1163/15718085-13204022
- Reimer, J. M., Devillers, R., and Claudet, J. (2021). Benefits and gaps in area-based management tools for the ocean sustainable development goal. *Nat. Sustainability* 4 (4), 349–357. doi: 10.1038/s41893-020-00659-2
- Roberts, C. M., Bohnsack, J. A., Gell, F., Hawkins, J. P., and Goodridge, R. (2001). Effects of marine reserves on adjacent fisheries. *Science* 294 (5548), 1920–1923. doi: 10.1126/SCIENCE.294.5548.1920
- Roberts, C. M., Hawkins, J. P., and Gell, F. R. (2005). The role of marine reserves in achieving sustainable fisheries. *Phil. Trans. R. Soc. B* 360, 123–132. doi: 10.1098/rstb.2004.1578
- Rodríguez-Santiago, E. (2018). The legal protection of marine biodiversity of areas beyond national jurisdiction: where do we stand? *SSRN Electronic J.* doi: 10.2139/ssrn.3177926
- Ruiz-Frau, A., Possingham, H. P., Edwards-Jones, G., Klein, C. J., Segan, D., and Kaiser, M. J. (2015). A multidisciplinary approach in the design of marine protected areas: integration of science and stakeholder based methods. *Ocean Coast. Manage.* 103, 86–93. doi: 10.1016/j.ocecoaman.2014.11.012
- Russ, G. R., Alcala, A. C., Maypa, A. P., Calumpong, H. P., and White, A. T. (2004). Marine reserve benefits local fisheries. *Ecol. Appl.* 14 (2), 597–606. doi: 10.1890/03-5076
- Saini, S., Punhani, R., Bathla, R., and Shukla, V. K. (2019). “Sentiment analysis on twitter data using r,” in *2019 International Conference on Automation, Computational and Technology Management, ICACTM 2019*. 68–72. doi: 10.1109/ICACTM.2019.8776685
- Sala, E., and Giakoumi, S. (2018). No-take marine reserves are the most effective protected areas in the ocean. *ICES J. Mar. Sci.* 75 (3), 1166–1168. doi: 10.1093/icesjms/fsx059
- Sala, E., Mayorga, J., Bradley, D., Cabral, R. B., Atwood, T. B., Auber, A., et al. (2021). Protecting the global ocean for biodiversity, food and climate 592, 7854, 397–402.
- Scanlon, Z., and Scanlon, Z. (2018). The art of “not undermining”: possibilities within existing architecture to improve environmental protections in areas beyond national jurisdiction. *ICES J. Mar. Sci.* 75 (1), 405–416. doi: 10.1093/ICESJMS/FSX209
- Schmeller, D. S., Böhm, M., Arvanitidis, C., Barber-Meyer, S., Brummitt, N., Chandler, M., Belnap, J., et al. (2017). Building capacity in biodiversity monitoring at the global scale. *Biodivers. Conserv.* 26, 2765–2790. doi: 10.1007/s10531-017-1388-7
- Scott, K. N. (2017) *The BBNJ treaty: strengthening the oceans-climate nexus? Karen n.* Scott. Available at: <https://www.ipcc.ch/sr15/>.
- Secretariat of the Convention on Biological Diversity. (2005). *Handbook of the convention on biological diversity including its cartagena protocol on biosafety. 3rd edition* (Montreal: The Secretariat of the Convention on Biological Diversity).
- Shi, Y. (2020). Settlement of disputes in a BBNJ treaty: options and analysis. *Mar. Policy* 122, 104156. doi: 10.1016/J.MARPOL.2020.104156
- Silge, J., Chirico, M., Dza, L., and Cheinin, I. (2021) *Sentiment analysis with tidy data | text mining with r*. Available at: <https://www.tidytextmining.com/sentiment.html?q=worldcloud#wordclouds>.
- Silge, J., and Robinson, D. (2017). Julia Silge, David Robinson - text mining with r. a tidy approach. *ICES J. Mar. Sci.* 75 (1), 417–425. doi: 10.1093/ICESJMS/FSX189
- Sonkin, P. (2021). *Sentiment analysis of 49 years of warren buffett's letters to shareholders of Berkshire Hathaway*. Available at: <https://bookdown.org/psokin18/berkshire/sentiment.html>.
- Stem, C., Margoluis, R., Salafsky, N., and Brown, M. (2005). Monitoring and evaluation in conservation: A review of trends and approaches. *Conserv. Biol.* 19 (2), 295–309. doi: 10.1111/J.1523-1739.2005.00594.X
- Taboada, M., Brooke, J., Tofloski, M., Voll, K., and Stede, M. (2011). Lexicon-based methods for sentiment analysis. *Comput. Linguist.* 37, 267–307. doi: 10.1162/COLI_a_00049
- Tang, Y., Chen, W., and Zhang, Y. (2021). International cooperation and coordination in the global legislation of high seas ABMTs including MPAs: taking OSPAR practice as reference. *Mar. Policy* 133, 104767. doi: 10.1016/J.MARPOL.2021.104767
- Tessnow-von Wysocki, I., and Vadrot, A. B. M. (2020). The voice of science on marine biodiversity negotiations: a systematic literature review. *Front. Mar. Sci.* 7, 614282. doi: 10.3389/FMARS.2020.614282
- The jamovi project. (2021). *Jamovi 2021*. Available at: <https://www.jamovi.org>.
- Toivonen, T., Heikinheimo, V., Fink, C., Hausmann, A., Hiiippala, T., Järvi, O., et al. (2019). Social media data for conservation science: a methodological overview. *Biol. Conserv.* 233, 298–315. doi: 10.1016/J.BIOCON.2019.01.023
- UN General Assembly. (1982). *Convention on the Law of the Sea (United Nations)*. Available at: https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf.
- UN General Assembly. (2005). *Resolution 59/24: Oceans and the law of the sea (United Nations)*. Available at: https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_59_24.pdf.
- UN General Assembly. (2017). *Resolution 72/249: International legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas (United Nations)*. Available at: <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N17/468/77/PDF/N1746877.pdf?OpenElement>.
- UN General Assembly. (2023). *Draft agreement under the united nations convention on the law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction*. Available at: https://www.un.org/bbni/sites/www.un.org/bbni/files/draft_agreement_advanced_unedited_for_posting_v1.pdf (Accessed 05 March 2023).
- Vadrot, A. B. M. B. M., Langlet, A., and Tessnow-von Wysocki, I. (2021). Who owns marine biodiversity? contesting the world order through the ‘common heritage of humankind’ principle. *Environ. Politics* 31 (2), 1–25. doi: 10.1080/09644016.2021.1911442
- Van Dover, C., Ardron, J., Escobar, E., Gjerde, K. M., Jaeckel, A., Jones, D. O. B., et al. (2017). Biodiversity loss from deep-sea mining. *Nat. Geosci* 10, 464–465. doi: 10.1038/ngeo2983
- Vashishtha, S., and Susan, S. (2019). Fuzzy rule based unsupervised sentiment analysis from social media posts. *Expert Syst. Appl.* 138, 112834. doi: 10.1016/j.eswa.2019.112834
- Wales, E. (2014). Marine genetic resources: the clash between patent law and marine law. *Natural Resour. Environ.* 29, 44.
- Wang, Y. (2019). Reasonable restrictions on freedom of high seas by “marine protected areas on the high seas”: an empirical research. *J. East Asia Int. Law* 12 (2), 245–268. doi: 10.14330/JEAIL.2019.12.2.01
- Warner, R. M. (2014). Conserving marine biodiversity in areas beyond national jurisdiction: Co-evolution and interaction with the law of the sea. *Front. Mar. Sci.* 1 (MAY). doi: 10.3389/FMARS.2014.00006/BIBTEX
- Wright, G., Gjerde, K. M., Johnson, D. E., Finkelstein, A., Ferreira, M. A., Dunn, D. C., et al. (2021). Marine spatial planning in areas beyond national jurisdiction. *Mar. Policy* 132, 103384. doi: 10.1016/J.MARPOL.2018.12.003
- Wright, G., Rochette, J., Gjerde, K., and Seeger, I. (2018) *The long and winding road: negotiating a treaty for the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction*. Available at: www.iddri.org.
- Zhao, Q., Chen, K., Li, T., Yang, Y., and Wang, X. F. (2018). Detecting telecommunication fraud by understanding the contents of a call. *Cybersecurity* 1 (1), 1–12. doi: 10.1186/S42400-018-0008-