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Optimizing the STB/BBNJ arrangements: based on comparing three STB operational modalities

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A Scientific and Technical Body (STB) is to be established under the BBNJ Agreement to provide high-quality assessments to support policy decisions. However, its terms of reference and modalities yet to be determined. Based on the three effectiveness factors of saliency, credibility and legitimacy, we classify the existing STB operational modalities into evaluation-oriented modality, recommendation-oriented modality, and decision-oriented modality. After comparing the three STB operational modalities, we conclude that the STB/BBNJ should be designed mainly based on a decision-oriented modality. Under this modality, the STB/BBNJ terms of reference may follow the principles of maintaining STB independence and preventing excessive powers. In accordance with the principles and to realise the conservation and sustainable use of marine biodiversity, we suggest that the STB/BBNJ institutional arrangements should consider to include (1) a multidisciplinary expert involvement mechanism; (2) a transparent oversight mechanism; (3) dynamic adjustment mechanism; and (4) cooperation and coordination mechanism.

KEYWORDS

scientific and technical body (STB), BBNJ agreement, marine biodiversity, operational modalities, effectiveness factors, decision-oriented modality, terms of reference, institutional arrangements

1 Introduction

The 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 (BBNJ) was adopted by consensus at the Intergovernmental Conference on June 19, 2023^[1]. This agreement provides that a Scientific and Technical Body (STB/BBNJ)

1 United Nations. "Arrangements to Sign the 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." United Nations, 9 Oct. 2023, <https://www.un.org/bbnjagreement/en>. Accessed 26 March 2025.

is hereby established, with its terms of reference and modalities for the operation, including the selection process and the terms of members' mandates, yet to be determined by the Conference of the Parties (COP) at its first meeting

The BBNJ Agreement is expected to not only contribute to maintaining the health and integrity of high seas ecosystems but also provide robust support for the global transition to a green economy and long-term prosperity (Houghton, 2014; Blasiak et al., 2016; De Santo, 2018; De Santo et al., 2019; Clark, 2020; Mayer et al., 2021; Vadrot et al., 2022). STB/BBNJ links scientific research and decision-making by providing scientific advice and recommendations to the COPs. Scientific research provides data support to help understand the complexity of marine ecosystems, and guide rational decision-making. Thus, it is essential to establish an effective STB/BBNJ with reasonable terms of reference, appropriate modalities of operation, and well-designed arrangements.

Existing research on STBs has explored their institutional arrangements and operational efficiency (Miller, 2011; Blanchard et al., 2019; Tang et al., 2021; Christiansen et al., 2022), some of which has reached a consensus on the effectiveness elements (Cash et al., 2003; Heink et al., 2015; Heink et al., 2015; Hoffman Steven et al., 2018). Regarding the STB/BBNJ, most studies focused on discussing whether to establish a STB under the BBNJ agreement (Ban et al., 2014; De Santo, 2018; Blanchard et al., 2019; De Santo et al., 2019; Gjerde et al., 2019; Tessnow-von Wysocki and Vadrot, 2020), as a result that the BBNJ agreement went through a lengthy negotiation process, and it was not until the further resumed the fifth session that the Conference determined the preliminary institutional arrangements of the STB/BBNJ. Although the importance and necessity of STB/BBNJ have been recognized (Mendenhall and Helm (2024); Gaebel et al., 2024), there is a dearth of literature on its modality positioning, institutional setting and terms of reference. To fill this gap, we innovatively select the most suitable modality for STB/BBNJ after categorizing the institutional modalities of the existing STBs based on three effectiveness elements, and then discuss the STB/BBNJ terms of reference and institutional arrangements.

We raise the question of how to optimize the STB/BBNJ arrangements based on comparing the existing STB operational modalities. To this end, we divide the discussion into three parts. We begin in Section 4.1 by identifying the problems in STB provisions under the BBNJ Agreement. Section 4.2 focuses on the existing STBs. We analyze the elements of institutional effectiveness, based on which, we categorize three operational modalities of the existing STBs. Section 4.3 focuses on the STB/BBNJ. We select the most suitable modality for STB/BBNJ, and respectively discuss how to determine the guiding principles for the terms of reference of STB/BBNJ and the specific institutional arrangements under this modality.

2 Method

To explore our research question, we conducted a systematic review to gather literature relevant to STB/BBNJ. This method

ensures a clear and replicable process for identifying studies based on predefined search terms and specific inclusion criteria, facilitating comprehensive and unbiased data collection. We used literature research methods to identify validity elements of STB, on this basis, we conducted theoretical analysis, comparative analysis, empirical analysis and treaty analysis of the STB/BBNJ operational modality, remit, and institutional arrangements.

2.1 Literature collection

We used a series of terms to search for journal articles and book chapters related to STB/BBNJ in the Web of Science Core Collection database. The criteria were as follows: (1) the abstract, title, or keywords must include The Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction, BBNJ, Scientific and Technical Body, STB, or STB/BBNJ; (2) publications must be in English; (3) the publication date must fall between 2000 and 2024. Additionally, we searched the Scopus and Google Scholar databases but found no additional matches compared to Web of Science. As a result, we focused solely on the latter. By selecting the most relevant literature on STB/BBNJ, we identified 37 publications.

2.2 Analytical study

We synthesized the theoretical results from existing literature to construct an evaluation framework for the operational effectiveness of STB, encompassing three core elements: saliency, credibility, and legitimacy. These elements were used to assess the applicability and potential issues of different STB modalities (Figure 1). Subsequently, we conducted a comparative analysis of the operational modalities of existing institutions, categorizing STB operational modalities into evaluation-oriented, recommendation-oriented, and decision-oriented types, with detailed analysis of their respective advantages and disadvantages (Figure 2). Additionally, considering the specific needs of the BBNJ framework, we used theoretical, comparative, and empirical analyses to explore the appropriate modality choice, functional positioning, and improvement directions for the STB/BBNJ (Figure 3).

2.3 Limitations

This method, grounded in existing research, may require further empirical studies to address new questions that remain insufficiently explored, such as the operational specifics of the STB/BBNJ arrangements. Furthermore, the dynamic nature of marine governance and scientific policy, coupled with the emergence of new issues and technologies, could render existing studies quickly outdated, leading to a lack of adaptability in research methods. Lastly, subjective judgment during the selection process might impact the comprehensiveness of the results.



FIGURE 1
STB effectiveness factors summary.

3 Results

Through theoretical analysis, we conclude that the STB/BBNJ should be designed mainly based on a decision-oriented modality, because the relatively high policy impact, legal authority and quick responsiveness of this modality are better matched with the objective of the BBNJ Agreement. Under this modality, the terms of reference of the STB/BBNJ may be determined by following the principles of maintaining STB independence and preventing excessive powers. On this basis, supporting mechanisms may be put in place in the four areas of multidisciplinary expert participation, transparent oversight, dynamic adjustment and cooperation and coordination. These arrangements are expected to both remedy the shortcomings of the decision-oriented modality to the maximum extent and allow the STB/BBNJ to play a better role for marine biodiversity conservation and sustainable use.

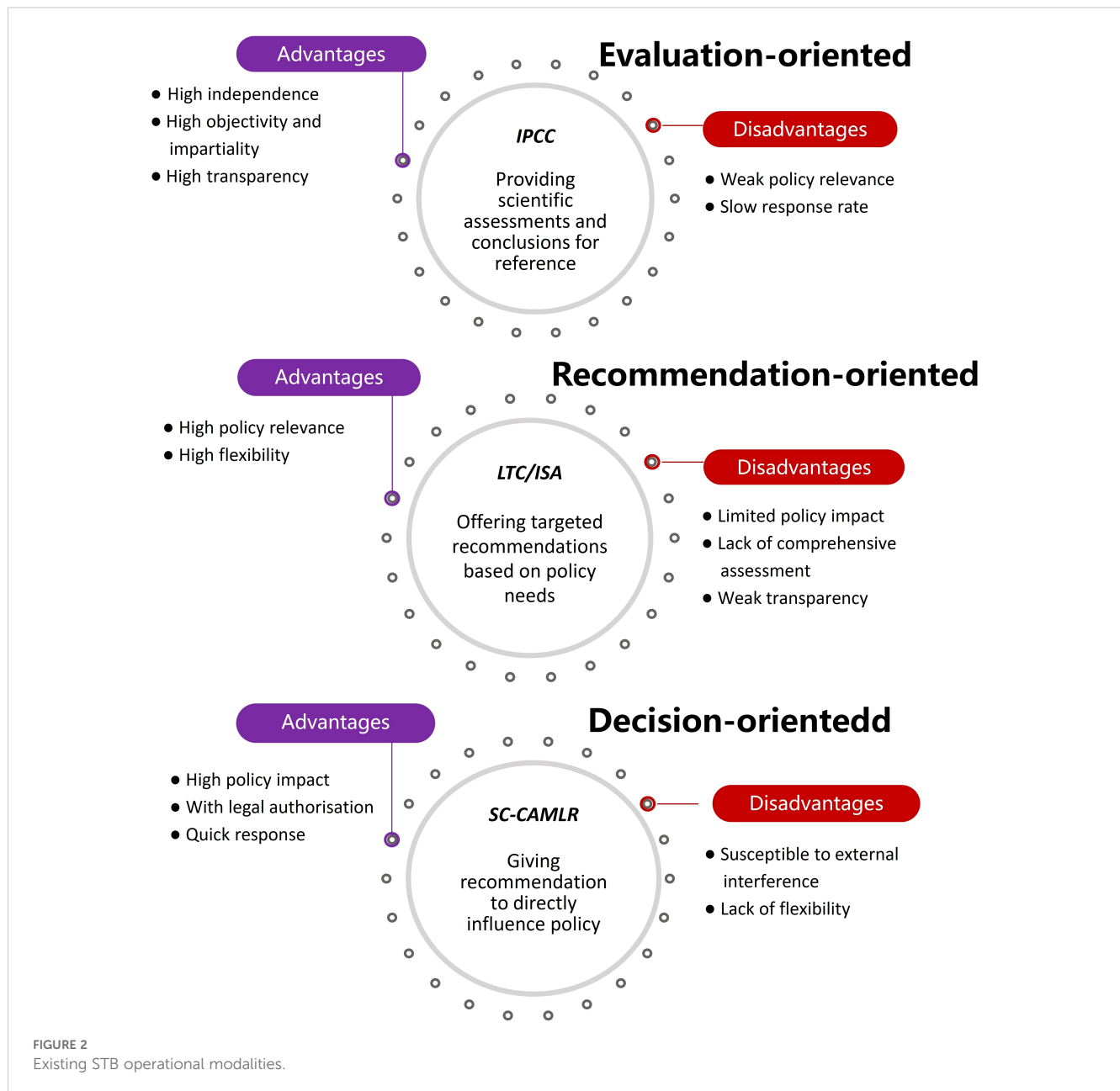
4 Discussion

4.1 Provisions on STB/BBNJ

Under the BBNJ Agreement, the STB/BBNJ is set to provide high-quality assessments to support policy decisions, and ensure that measures

are science-based and adaptive to environmental changes (Gjerde et al., 2021; Duan and Shen, 2024; Tanaka, 2024). To promote its performance and function on marine biodiversity conservation and sustainable use, the provisions on STB/BBNJ consist of the general provisions of Article 49 and a series of specific provisions. Article 49 provides the establishment, composition and basic functions of the STB/BBNJ. It also provides a legal basis for the COP to supplement and improve the operational modality of the STB in the future [2]. In addition to the general provisions, there are provisions providing the preliminary institutional arrangements of the STB, which are scattered in two parts about area-based management tools (ABMTs) and environmental

2 Article 49(2) of the BBNJ Agreement provides that "The Scientific and Technical Body shall be composed of members serving in their expert capacity and in the best interest of the Agreement, nominated by Parties and elected by the Conference of the Parties, with suitable qualifications, taking into account the need for multidisciplinary expertise, including relevant scientific and technical expertise and expertise in relevant traditional knowledge of Indigenous Peoples and local communities, gender balance and equitable geographical representation. The terms of reference and modalities for the operation of the Scientific and Technical Body, including its selection process and the terms of members' mandates, shall be determined by the Conference of the Parties at its first meeting".

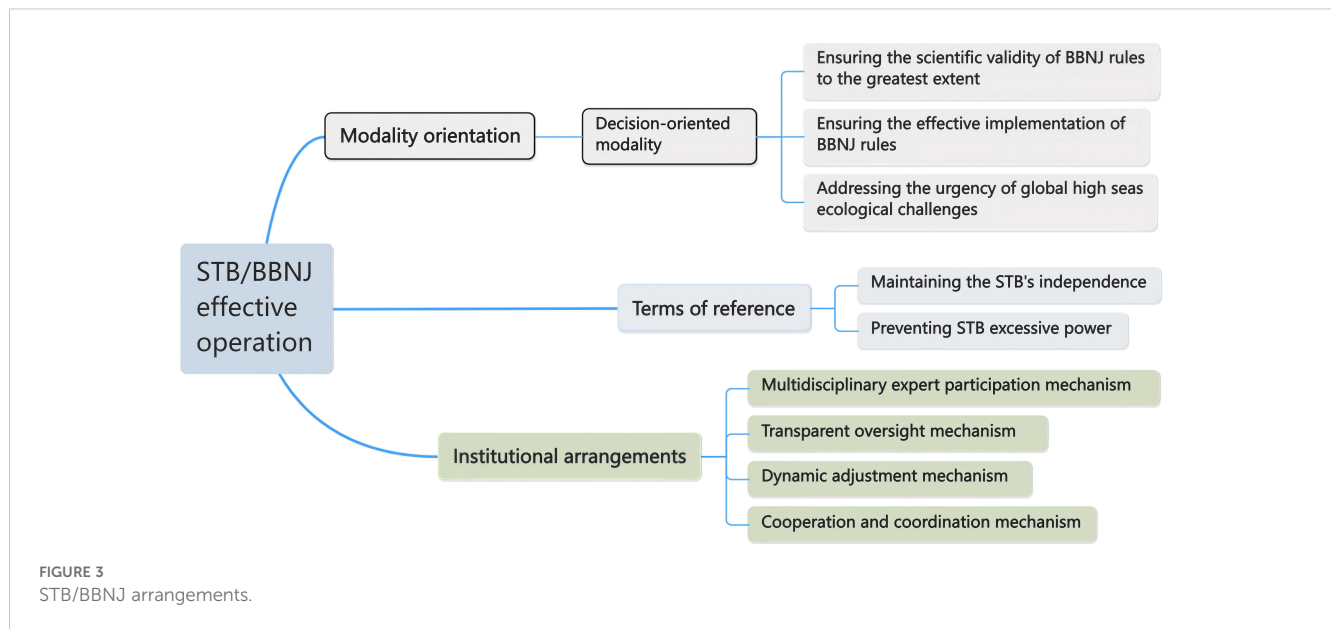


impact assessments (EIA). The specific provisions are concerned with the terms of reference of the STB, which can be classified into the power of enacting rules, and the power of reviewing and advising.

However, there are two problems in the provisions on the STB/BBNJ, including ambiguous provisions on the terms of reference, and the lack of detailed provisions concerning the institutional arrangements. First, the provisions on the terms of reference of the STB/BBNJ and the effect of its decisions are ambiguous, which may lead to potential disputes. Furthermore, the BBNJ Agreement provides relatively fragmented provisions on the functions of the STB in ABMTs and EIA parts. For instance, in terms of the provisions on reviewing the proposals of ABMTs, the existing provisions indicate neither the process of consideration nor the specific standards for approval. Besides, it is challenging to clarify the legal effect of the STB's decisions through textual interpretation.

These situations may make the parties fall in an arbitrariness in understanding and interpreting the relevant provisions on the STB, thus leading to disputes and obstacles to application.

Second, since the parties were controversial over the specific institutional design of the STB during the negotiation, the BBNJ Agreement provides only basic and general provisions to reach a consensus among the parties. In this connection, many specific provisions, such as related to the selection process, specific assessment procedures, standard of review, are left to be determined by the COP at its first meeting. The lack of detailed provisions on institutional arrangements represents that the STB/BBNJ is likely to become another piece of paperwork. Even when the COPs discuss the operational modality and institutional arrangements of the STB, those issues inherent in the contracting process are still inevitable.



The BBNJ framework only provides the general principles and functions of the STB, leaving the specific terms of reference and institutional arrangements to be determined. Under this circumstance, many challenges need to be dealt with in the institutional design of the STB. In fact, a number of scientific bodies have been in operation for many years, such as the Intergovernmental Panel on Climate Change (IPCC), the Council of the International Seabed Authority (ISA), and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). Their operational modalities, main features, advantages, and disadvantages can be references for STB/BBNJ.

4.2 STB operational modalities

4.2.1 STB operational effectiveness factors

We have analysed and summarised the existing STB-related research, and found STB effectiveness criteria include three factors: (1) saliency; (2) credibility; (3) legitimacy, which are usually specifically reflected in their institutional designs (Figure 1).

In the context of STB, saliency means the relevance of the recommendation to the policy need, and reflects the extent to which scientific assessment contributes to policy change and policy impact. Credibility means science, accuracy and reliability, and indicates whether the recommendations can earn the trust of policymakers and the public. Legitimacy refers to lawfulness by being authorized or by law, which represents the perceived fairness and autonomy of the assessment process conducted by the scientific bodies (Cash et al., 2002; Hoffman Steven et al., 2018). Generally, saliency is the direct determinant of policymaking and policy change, which best reflects the primary features of various operational modalities. Credibility is the basis of the operational effectiveness of scientific bodies, which ensures the reliability of scientific policies through rules and procedures. Legitimacy

represents the legal basis provided for establishing a scientific body and its operation.

The relationship between three elements is dialectical, and designing scientific bodies involves balancing trade-offs between saliency, credibility, and legitimacy (Gopinathan et al., 2018). We believe that institutional design is never about raising the three elements to the maximum but coordinating them reasonably by the goals, purposes and functions of the specific scientific bodies. The three elements are interdependent in STB's operation and together determine the impact and effectiveness of scientific advice.

Firstly, saliency relies on credibility and legitimacy. To have sufficient policy influence, scientific recommendations must possess high credibility, ensuring accurate data and scientific analysis to gain the trust of policymakers. Meanwhile, saliency requires legitimacy, as a STB must operate within a legal framework and obtain international or domestic legal authorization for its recommendations to be widely accepted. Secondly, legitimacy also depends on saliency and credibility. The policy relevance of scientific recommendations enhances the authority of the STB in policymaking, establishing its legitimacy. Moreover, the credibility of scientific recommendations, particularly their accuracy and transparent evaluation, forms the foundation of legitimacy, ensuring the impartiality and transparency of the STB. Thirdly, credibility also relies on saliency and legitimacy. Saliency ensures that scientific recommendations align with policy objectives, increasing policymakers' trust and enhancing the credibility of the recommendations. Legitimacy, by guaranteeing the independence and neutrality of the scientific institution, provides safeguards for the evaluation process, further strengthening credibility.

4.2.2 Existing STB operational modalities

We classify the existing STB operational modalities into the following three types: (1) evaluation-oriented modality; (2) recommendation-oriented modality; and (3) decision-oriented

modality based on the effectiveness factors. Specifically, this classification depends on how STBs provide scientific and technical advice, how they conduct scientific assessments and interact with the decision-making process, and the extent to which their recommendations influence decision-making. The three modalities comparatively have their own features, advantages and disadvantages (Figure 2).

The evaluation-oriented modality of STBs provides scientific assessments and conclusions for reference. They emphasize scientific independence and objectivity, focusing on comprehensive data analysis and assessments. A typical example is the IPCC. The IPCC provides policy recommendations through its periodic climate change assessment reports. These reports are compiled after expert groups conduct detailed analysis and evaluation of climate change-related issues, and they undergo peer review to ensure scientific rigor. Its reports don't directly influence policies but serve as scientific references for policymakers.

We have analyzed this modality and found that it has the following advantages: (1) it is relatively independent. Under this modality, a STB conducts scientific assessments based on objective data and empirical research, without directly engaging in policy decisions, thus utmost avoiding political interference. (2) It can provide high objective and impartial conclusions. The assessments are based on known data rather than policy preferences, making fair and comprehensive analyses. (3) It has greater transparency. It tends to adopt transparent processes and methods, ensuring openness in the evaluation process. The advantages contribute to the accuracy and reliability of the recommendations, thus enhancing their credibility. Besides, the disadvantages include: (1) the policy relevance is low. As STB recommendations in this modality is not aimed to directly influence or drive policy, leading to weak saliency. (2) it has a long evaluation cycle. Scientific assessments and literature review often need considerable time and expertise, making it less adaptable to rapidly changing policy demands.

The recommendation-oriented modality of STBs offers targeted recommendations based on policy needs. In this regard, they align closely with policy needs, offering flexible and targeted advice to support decision-making. A typical example is the Legal and Technical Commission (LTC), a subsidiary body of the ISA. The LTC/ISA was established in 1994 under the United Nations Convention on the Law of the Sea (UNCLOS) with the aim of providing advice to the ISA to ensure effective protection of the marine environment from the potential harmful impacts of seabed-related activities. The LTC typically engages in preliminary communication with policymakers or relevant stakeholders to understand policy needs. By scientific assessment, it drafts specific recommendations to submit to the ISA Council. However, its recommendations only serve as guidance for the ISA's policymaking, and the concrete implementation and enforceability of policies still require negotiation and consensus among the ISA and its member states.

This modality has the following advantages: (1) the policy relevance is higher. In this modality, STBs directly connect with the policymaking process, enhancing the operability and policy relevance of the recommendations, and ensuring their saliency. Furthermore, as the recommendations are closely aligned with policy needs, they are more likely to gain the trust of decision-makers, thus enhancing credibility. (2) It can provide recommendations in a flexible way. This modality allows STBs to flexibly provide targeted and actionable recommendations in response to different policy demands. Its disadvantages include: (1) the policy impact is limited. The recommendations provided by STBs in this modality are merely for decision-makers' reference, so their policy impact is limited and lacks enforceability. (2) It lacks comprehensive assessment. Since the recommendations are usually targeted at specific policy needs, they may overly focus on particular issues while neglecting other factors. (3) Its transparency is easy to be affected. Since focusing on providing targeted recommendations for policy needs, the development of scientific advice may be influenced by specific interests, making it difficult to ensure fair participation of all relevant stakeholders.

In the decision-oriented modality, STBs give recommendation to directly influence policy. With legal authority, they provide high-impact recommendations to drive policy formation. A representative of this modality is the Scientific Committee (SC) established in 1982 under the Convention for the Conservation of Antarctic Marine Living Resources (CAMLR Convention). Its goal is to provide the best available scientific information on harvesting levels and other management issues to the CCAMLR. The SC-CAMLR's primary focus is to assess the status of fishery resources in the Antarctic. The SC-CAMLR's recommendations carry higher legal authority, as the Commission is obligated by the CAMLR Convention to take full account of the recommendations and advice of the SC in making its decisions. Once these recommendations are approved by the CCAMLR, they are converted into legally binding measures for implementation.

This modality has the following advantages: (1) the policy impact is high. Its recommendations have quasi-binding authority, directly influencing policy formulation and implementation, thereby increasing the saliency. (2) There is legal authorization. In this modality, STB usually operate under explicit legal mandates, and the support of a legal framework makes these recommendations more easily recognized and widely accepted, ensuring high legitimacy. (3) It can respond quickly. As STB recommendations in this modality are converted into policies with enforceable power, policy implementation is typically faster, allowing for quick responses to emerging global environmental challenges. The disadvantages of this modality are as follows: (1) it is easy to be subject to external interference. Since STB recommendations in this modality can directly translate into policy actions, the work of STBs is vulnerable to political interference or influence from stakeholders, which can undermine the institution's credibility and even lead to agency

capture³]. (2) It lacks flexibility. Because scientific advice in this modality can directly influence the revision of policies or rules, the translation of such advice is subject to a more rigorous and accountable process, leading to a certain loss of flexibility.

4.3 STB/BBNJ arrangements

4.3.1 STB/BBNJ modality orientation

We have compared the three STB operation modalities and found that the decision-oriented operation modality is most suitable for STB/BBNJ. Although the modality has shortcomings, we could reduce its inherent shortcomings and make it better integrated with STB/BBNJ through setting guidelines for it and improving its institutional arrangements. The decision-oriented modality is expected to promote the effectiveness of STB's operation under BBNJ. There are three reasons for concern.

First, the high policy impact of the decision-oriented modality ensures the scientific validity of BBNJ rules to the greatest extent. BBNJ emphasizes global collaboration and consensus (Blanchard, 2022; Lothian, 2024), and the high policy impact can encourage states, international organizations, and stakeholders to actively participate in decision-making, fostering the formation of scientific consensus to better support biodiversity management in the high seas. Furthermore, high policy impact is often accompanied by concentrated resource allocation, providing strong support for scientific research and technological development. This enables STB/BBNJ to generate comprehensive data and evaluations, laying a solid foundation for dynamically addressing the complex challenges of the high sea environment.

Second, the legal authority inherent in the decision-oriented modality grants the recommendations of STB a relatively high degree of binding force, ensuring the effective implementation of BBNJ rules. This advantage can clearly define the obligations and responsibilities of BBNJ parties, strengthens accountability mechanisms, and ensures transparency and fairness in rules implementation. It also promotes consistency and coordination among countries in rule enforcement, especially in critical areas such as ABMTs, benefit-sharing of marine genetic resources (MGR), EIA, capacity building, and the transfer of marine technology. This ensures that rules are implemented according to unified standards, thereby achieving BBNJ's dual objectives of protecting ecosystems and equitably distributing resources.

Third, the quick response of this modality is of benefit to address the urgency of global high seas ecological challenges. The high seas ecosystem is complex and dynamic, affected by multiple threats such as climate change, ocean acidification, and overfishing

(Gibson et al., 2007; Guinotte and Fabry, 2008; Laura et al., 2008; Hélias et al., 2018). Rapid response capabilities can promptly address sudden ecological crises, mitigate damage, and maintain ecological balance. Additionally, BBNJ requires extensive collaboration, and the efficiency of the decision-oriented modality can reduce coordination cycles, and facilitate the implementation of rules. This minimizes delays in execution and enables timely responses to activities that threaten high-seas biodiversity. Ultimately, it supports BBNJ's long-term goal of establishing a fair, science-based, and efficient governance framework for the high seas.

Comparatively, evaluation-oriented or recommendation-oriented modalities are unsuitable for STB/BBNJ. Evaluation-oriented modality, while providing scientific data and comprehensive assessments, has less impact on policy. Rather, high seas ecosystems face multiple challenges that require rapid decision-making and effective governance. Therefore, its periodic assessment mechanisms and lengthy data collection processes make it difficult to translate scientific advice into policy in a timely manner. While more policy-relevant than evaluation-oriented modality, the policy impact of recommendation-oriented approach remains limited. Moreover, with less comprehensive and scientific assessment, this modality targets providing specific recommendations for policy needs, and thus fails to meet the broader needs of global governance of the high seas (Figure 3).

4.3.2 Guiding principles for the terms of reference of STB/BBNJ

We choose decision-oriented as the main reference modality for STB/BBNJ, but the modality still has drawbacks. Therefore, guiding principles may be put in place to compensate for the weaknesses of the modality. Under this modality, the STB terms of reference could follow the principles of maintaining independence and preventing excessive powers, which are expected to both remedy the drawbacks of the decision-oriented modality to certain extent and allow the STB/BBNJ to play a better role to realize the objective of the BBNJ Agreement.

On the one hand, it is critical to maintain the STB independence. The goal of the BBNJ Agreement is to promote global, collective management of marine resources. By ensuring the scientific independence of the STB/BBNJ can better make the relevant parties trust that the recommendations are fair and objective, thereby enhancing cooperation among countries. Moreover, under the decision-oriented modality, once STB/BBNJ recommendations are formed, they will directly influence rules, which further requires that STB/BBNJ recommendations be based on independent, scientific assessments to avoid external political or interest group interference. Therefore, when setting the STB/BBNJ terms of reference, it is important to provide clear legal authorization for its powers and the effectiveness of its recommendations, enabling it to effectively resist external interference and maintain its independence under legal support.

³ Also known as regulatory capture, this concept originates from political science and public administration and refers to the situation, in which a regulatory body is 'captured' by those it regulates, within the scope of its functions, thereby benefiting those it regulates.

On the other hand, it is of necessity to prevent the STB from having excessive power. The recommendations of the STB/BBNJ should reflect global interests, not the needs of a single country or industry. In the decision-oriented modality, an excessive concentration of power would lead to the STB/BBNJ being manipulated by interest groups. Limiting the STB/BBNJ's power ensures the participation of different stakeholders and the diversification of demands, which in turn ensures the comprehensiveness and sustainability of high seas resource protection rules. Therefore, while setting the STB/BBNJ terms of reference, it is essential to ensure transparency so that its power can be effectively supervised, thus balancing the conflict between scientific independence and excessive power.

4.3.3 STB/BBNJ institutional arrangements

Under the principles of maintaining independence and preventing excessive powers, we suggest that the STB/BBNJ institutional arrangements consider to include (1) a multidisciplinary expert involvement mechanism; (2) a transparent oversight mechanism; (3) dynamic adjustment mechanism; and (4) cooperation and coordination mechanism.

Set up a multidisciplinary expert involvement mechanism to ensure the scientific quality and independence of the STB/BBNJ. The BBNJ agreement addresses issues that are highly interdisciplinary in nature (Qu and Liu, 2022; Wang and Wu, 2025). However, in the decision-oriented modality, scientific advice tends to be subject to external interference. Involving multiple experts in joint assessments can ensure the comprehensiveness and scientific accuracy of the recommendations. Therefore, following the example of SC-CAMLR, it is advisable to establish specialized working groups for different issues and adopt a cross-review operation model. Equitable geographical representation needs to be emphasized, which helps different regions to have a fair voice in marine biodiversity governance, and thus achieving a balance of global interests.

Set up a transparent oversight mechanism to prevent abuse of STB/BBNJ power. The BBNJ Agreement emphasizes global cooperation, and thus ensuring the transparency is a key to increasing the credibility and to facilitating effective cooperation. In the decision-oriented modality, as STB recommendations may in large degree influence the policy implementation, the lack of oversight would detract the effectiveness of the BBNJ Agreement. Therefore, an independent oversight body should be established to conduct regular reviews of the work of the STB/BBNJ. Furthermore, the STB/BBNJ should establish a transparent operational mechanism and a multi-channel feedback system, by which the public and various stakeholders can understand the scientific evaluation process and provide feedback and suggestions.

Set up a dynamic adjustment mechanism to ensure the flexibility of the STB/BBNJ. The protection of high seas biodiversity is a dynamically changing issue, but in the decision-oriented modality, the flexibility of rule adjustment may be limited by legal procedures, making it difficult to respond flexibly to emerging environmental challenges. Facing this situation, an

evaluation, adjustment, and emergency response mechanism should be established. This mechanism may include a regular review system to periodically assess the enforcement of existing rules, analyze their effectiveness in biodiversity conservation and resource management, and submit adjustment recommendations to the COP. Meanwhile, when new scientific discoveries or unexpected environmental incidents occur, STB/BBNJ should promptly put forward new scientific recommendations and, relying on the existing legal framework, promote urgent response measures by all countries to ensure scientific and time-sensitive governance of the high seas.

Set up a cooperation and coordination mechanism to enhance the impact of STB/BBNJ's recommendations. As Article 5(2) of the BBNJ Agreement states, this Agreement shall be interpreted and applied that does not undermine relevant global, regional, subregional and sectoral bodies and that promotes coherence and coordination with them. STB/BBNJ need to handle the relationship of the existing bodies to fit BBNJ's purpose. Additionally, since the BBNJ Agreement is in its early stage, STB/BBNJ recommendations need to be based on internationally recognized scientific methods in order to be widely accepted. This also requires effective cooperation and coordination between STB/BBNJ and the other relevant STBs to enhance the impact of their recommendations on rules. Therefore, the STB/BBNJ should establish a formal information exchange mechanism with relevant international and regional scientific bodies, such as the International Council for the Exploration of the Sea (ICES), and the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) ^[4].

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

YL: Writing – original draft. XJ: Conceptualization, Writing – original draft, Writing – review & editing.

⁴ ICES was established in 1902 with the aim of promoting marine scientific research and providing scientific advice for the management of marine resources. ICES offers a data-sharing platform through which member countries exchange data related to fisheries resources, ecosystem assessments, and marine environmental changes. OSPAR, established in 1992 through the merger of the Oslo-Paris Convention, aims to protect the marine environment of the North-East Atlantic. It also emphasizes data sharing and information exchange.

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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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