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RESEARCH ARTICLE

The governance of marine restoration: insights from three cases in two European seas

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This article analyses three different cases of assisted marine restoration in Europe to understand how governance and legal aspects enable or constrain marine restoration in practice. The aim of this article is to enhance understanding of the enabling and constraining conditions of the governance of marine ecological restoration. To understand the governance of marine restoration, we use the concepts of *governance arrangement* and *institutionalization*. A marine restoration governance arrangement consists of different coalitions of public and private actors, who—through their different ways of conceptualizing and understanding the problem (discourses)—try to influence and design the marine restoration activities and initiatives, the managing of often shared, limited resources, and defining rules of the game (on different levels). Institutionalization refers to the production and reproduction of governance arrangements. This article gives insight in the governance arrangements of three cases: artificial habitat as in the Rigs-to-Reefs debate, in the context of North Sea oil and gas decommissioning, and restoration of key sedimentary and hard natural habitats of the fan mussel (*Pinna nobilis*) and red coral (*Corallium rubrum*) cases in the Mediterranean. The analysis shows how discourses shape the arrangements that currently govern the decommissioning of obsolete oil and gas structures in the North Sea, and the protection and management of two emblematic and endangered species in the Mediterranean. Based on the analysis we formulated enabling and constraining conditions for the institutionalization of “active restoration” governance arrangements, resulting in recommendations for how to strengthen restoration in policies and legislation.

Key words: fan mussel, governance arrangements, marine restoration governance, red coral, rigs-to-reefs

Conceptual Implications

- Reaching the goals of reducing and reversing biodiversity loss would need “passive” (unassisted e.g. by marine protected areas) restoration to be complemented by “active” restoration (e.g. translocations). While “passive” restoration is institutionalized and embedded in, for example, EU regulation, “active” restoration requires uptake and institutionalization, especially at regional level.
- Instead of aiming for an EU Restoration Directive, it is important to acknowledge that marine restoration governance is context-specific, and strengthen the restoration element in existing legal measures—particularly by having binding targets and supporting bottom-up approaches.
- The institutionalization of more up-to-date restoration policy (reducing and reversing biodiversity loss) is dependent on how alternative governance arrangements are able to challenge the dominant ones and demonstrate the need for change.

policy now enshrined in international policy including the United Nations’ call for action under the “UN Decade on Ecosystem Restoration 2021–2030” (CBD 2010; EU 2011; Ockendon et al. 2018; Duarte et al. 2020; Waltham et al. 2020; Blignaut & Aronson 2020). Similarly, in the EU, there are various legal frameworks, strategies, and action plans that promote nature restoration and aim to put Europe back on the path to recovery by 2030 (EC 2011; EC 2020). Ecological restoration is understood as the process of assisting the recovery of ecosystems that have been degraded, damaged, or destroyed (SER 2004; Clewell & Aronson 2013). Restoration is not a

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Introduction

Reducing and reversing biodiversity loss through restoration is an increasingly important element of biodiversity conservation

substitute for protection and sustainable management of ecosystems but a solutions-based approach aiming to achieve substantial recovery of the native biota and ecosystem integrity that goes beyond remediation (e.g. pollution or litter clean-ups) or rehabilitation (e.g. a form of ecosystem repair reinstating some functionality) (Gann et al. 2019). Despite recent advances in restoration science and practice, restoration of “blue” coastal ecosystems and marine ecosystems is still lagging behind terrestrial restoration, and looking for insights from terrestrial restoration (Montseny et al. 2020; Layton et al. 2020; Ellison et al. 2020; Waltham et al. 2020; France 2016). In addition to the practice lagging behind for many regions (see, e.g. Duarte et al. 2020 world review), governance of marine restoration has been rarely discussed in the literature (France 2016) and presently in Europe conceptual, regulatory, and implementation gaps “prevent the existing legislation from achieving its objectives” related to ecosystem restoration (EC 2020: 6).

The aim of this article is to enhance understanding of the conditions that enable and constrain governance of marine ecological restoration, based on the specific insights of the institutionalization of marine restoration governance arrangements in three specific cases in European seas. Rather than perform a comparative analysis, this article uses three cases to illustrate and thus inform the present conditions for marine restoration governance. We position our analysis in governance debates and make use of the analytical framework of the policy arrangement approach developed by Van Tatenhove et al. (2000). In general, governance is about “the rules of collective decision making in settings where there are a plurality of actors or organisations and where no formal control system can dictate the terms of the relationship between these actors and organisations” (Chhotray & Stoker 2009). Marine governance is the capacity of governmental and non-governmental actors (organized in governance arrangements) to govern activities at sea and to control their consequences (Van Leeuwen & Van Tatenhove 2010; Van Tatenhove 2013).

In Section 2, we present the conceptual framework built upon the concepts of marine restoration governance arrangements and institutionalization. Section 3 details the methodology. Section 4 presents and analyses three cases of (potential) marine ecological restoration. The cases include the governance arrangements around red coral restoration (*Corallium rubrum*) in the Mediterranean, and those related to the restoration of the fan mussel (*Pinna nobilis*) in the Mediterranean and arrangements pertaining to the decommissioning of oil and gas-related structures and the Rigs-to-Reefs (RtR) debate in the North Sea. Based on the distinct governance arrangements identified, Section 5 presents insights into enabling and constraining conditions for active marine restoration, and will discuss how changes in, and the co-existence of, governance arrangements in the cases affect the institutionalization of marine restoration.

Theory

To understand the enabling and constraining conditions of marine ecological restoration governance, we use the concepts of governance arrangement and institutionalization. A

Table 1. Definitions of dimensions of a marine restoration arrangement.

Actors and their coalitions	The <i>actors</i> who are involved in the development of marine restoration projects—and related policymaking and decision-making processes—as well as how these actors are selected.
Resources and Power	The unequal division of <i>resources</i> among these actors leads to differences in power and influence. Resources refer e.g. to money, information, permits, knowledge, or expertise. <i>Power</i> refers to the mobilization and deployment of the available resources, while influence refers to who is able to change policy outcomes and how.
Rules of the game	In marine restoration policies and politics, these <i>rules</i> refer both to the formal procedures of decision-making and to the implementation of restoration projects, as well as the informal rules and “routines” of interaction within these restoration projects and the institutions (in which these projects are embedded).
Discourses	The <i>restoration discourses</i> , entailing the norms and values, as well as the definitions of problems and approaches to solutions by the actors involved. A discourse is the specific ensemble of ideas, concepts and categorizations through which meaning is given to physical and social realities (Hajer 1995). In this article, discourses refer to ideas about the character and definitions of marine restoration problems, their causes, and possible, legitimate solutions.

governance arrangement refers to the way a policy domain, in this case, marine ecological restoration, is temporarily shaped in terms of substance and organization (Arts et al. 2006; Liefferink 2006; Van Tatenhove 2013). Substance refers to discourses, resulting in distinct policy and regulatory goals, whereas organization refers to the types of actors involved, the rules of the game (instruments, procedures, division of tasks), and the available resources. In a governance arrangement, different (more or less stable) coalitions of public and private actors try to influence the marine restoration activities and developments, define marine restoration activities, find solutions based on shared discourses, manage resources, and define rules of the game at different levels (van Tatenhove 2019). The structure of a marine restoration arrangement can be analyzed along four dimensions: actors and their coalitions, resources, rules of the game, and discourses (see Table 1) (Van Tatenhove et al. 2000; Liefferink 2006).

Governance arrangements are characterized by periods of stability of various duration, but this stability is always temporary, because changes in one of the dimensions result in instability and will change the governance arrangement as a whole. For example, the introduction of new ideas about restoration could change the dominant restoration discourse or how a marine activity is governed, which may involve new actors, mobilize new types of expertise, knowledge, or funding (resources), or

result in new rules and regulations. However, the development of governance arrangements and changes within arrangements do not happen in isolation but occur in an institutional setting and in a context of other governance arrangements. Such a dynamic illustrates institutionalization, which is the ongoing process of patterning, preservation, construction, organization, and deconstruction of day-to-day activities and interactions in institutions (van Tatenhove & Leroy 2000). Daily interactions between actors gradually develop into more or less stable patterns, which may include the substantive delineation of the problem at stake and of possible solutions, but also the processes of give-and-take between the actors and the formal and informal rules according to which these processes take place (Liefferink 2006). Institutionalization is the process of production and reproduction of governance arrangements, in which the rules of the game are (re)produced in interactions within the context of long-term processes of societal and political transformation (van Tatenhove et al. 2000; Arts et al. 2006; Liefferink 2006). In other words, the institutionalization of governance arrangements can be the result of structural changes in the institutional (political and legal) setting, or as the outcome of interactions, or are the results of shock events.

Methods

This article builds from case study research undertaken within the EU MERCES project from 2017 to 2020 (Carballo-Cárdenas et al. 2018; Ounanian et al. 2018). Document analysis and semi-structured, informational interviews with key informants were the primary data collection methods based on purposeful sampling and chain-referral techniques (Bernard 2006; Bryman 2012). The documents analyzed consisted of published scientific papers, legal and policy documents (e.g. EU directives), media coverage (e.g. newspaper articles, news transcripts), blog posts, NGO websites, factsheets, conference proceedings, project reports, and meeting reports (e.g. GFCM for red coral). Semi-structured interviews were conducted with NGO representatives, sector representatives (e.g. offshore oil and gas industry), public administrators (e.g. MPA manager facilitating Pinna restoration, regional ministry official for red coral), restoration practitioners and policymakers, public administrators, along with direct observations at MERCES project forums. In addition, semi-structured interviews were conducted with marine restoration practitioner-scientists specializing in the focal species; these interviews offered insights on unpublished aspects of the restoration of the species and funding, policy and governance challenges to instigate active restoration. Across the three cases, 19 interviews were conducted in total; the face-to-face (6) and Skype interviews (5) lasted between 45 and 90 minutes and were audio recorded, 8 interviews were performed by email. All primary data are archived at the researchers' institutes. The research in each case was oriented towards identifying the four dimensions of governance arrangements. Qualitative data analysis methods were applied, including open coding, utilizing an iterative inductive-deductive analytical process to identify key concepts, their interrelationships, and themes (Fereday & Muir-Cochrane 2006).

We applied a *case study approach*, because this is a suitable research design when “a ‘how’ and ‘why’ question is being asked about a contemporary set of events over which the investigator has little or no control” (Yin 2009: 13). Case selection was based on the following criteria: accessibility of data, a working area in the MERCES project, variation in habitat type, and geographical location. We selected three case studies: restoration of red coral and the fan mussel in the Mediterranean and re-use of manmade oil and gas structures in the North Sea (see Table 2). For each case, we constructed the governance arrangements, by first identifying the relevant discourses, followed by an analysis of what kind of coalitions are formed around these discourses, what kind of rules are defined, and the availability of resources. This resulted in different sub governance arrangements per case.

Results

Red Coral (*Corallium rubrum*) Restoration

The “Sustainable Harvesting” Governance Arrangement.

The central actor in the “sustainable harvesting” discourse coalition is the General Fisheries Commission for the Mediterranean (GFCM), which falls under the UN Food and Agricultural Organization (FAO). The GFCM’s main aim is “to ensure the conservation and the sustainable use, at the biological, social, economic and environmental level, of living marine resources.” This forum brings together the key actors who are engaged in the construction of meaning of the “sustainable harvesting” discourse for red coral, such as the national fisheries administrations, various industry stakeholders, as well as scientists and experts who provide technical and management advice to the GFCM.

To continue securing or expanding its catch potential to new grounds, over the years the industry has been moving from simple scuba diving to technical deep diving with re-breathers, to more recent requests for GFCM authorization to use remotely operated vehicles (ROV) for prospecting and harvesting (GFCM 2017, 2019). The industry-led coalition stresses social sustainability claiming that using ROVs would minimize safety and health risks to the divers currently harvesting. The expert-led coalition opposes the use of ROVs on grounds of ecological sustainability, claiming that their use would only lead to a quicker depletion of deep-sea red coral populations, as a diver can harvest for a few minutes only, while ROV harvest provides unlimited access to corals at deeper and currently unreachable depths (Tsounis et al. 2013; GFCM 2019).

This governance arrangement consists of a set of rules to sustainably harvest red coral, while moving towards more restrictive measures over the past three decades (Tsounis et al. 2013). Based on overexploitation concerns, red coral was included recently in the GFCM list of priority commercial species for which data should be reported and advice on conservation status should be produced. Other actions include the establishment of a regional adaptive management plan for the exploitation of red coral in the Mediterranean Sea, implementation of various catch limitations, as well as precautionary and permanent spatiotemporal closures to the red coral fishery (GFCM 2019). The GFCM

Table 2. Case studies.

Habitat Type	Example Case	European Regional Sea	Restoration Discourses
Natural hard biogenic habitat	Red coral <i>Corallium rubrum</i> , L. 1758 is an octocoral with a long harvesting history (Tsounis et al. 2013).	Mediterranean: Croatia, France, Italy, Spain, and Tunisia (GFCM 2019), are active in harvesting red coral by diving	<ul style="list-style-type: none"> • “<i>Sustainable harvesting</i>” refers to solutions that support the sustainability of the remaining red coral stocks and authorized legal fishing activities. • “<i>Preserving red coral</i>” refers to passive restoration activities that protect red coral from human interference (i.e. by spatial management measures). This discourse concerns a broader vision of marine habitat protection, where red coral is seen as an integral element in marine ecosystems and a ‘habitat engineer’ (Boavida et al. 2016). • “<i>Bringing back red coral</i>” is an emerging discourse focusing on active restoration, practiced at small, experimental scales.
Natural sedimentary habitat	The fan mussel <i>Pinna nobilis</i> is a threatened endemic species. Populations are in decline from both anthropogenic activities (physical impacts and loss of habitat) and natural phenomena acting slowly (warming) or as shock events (parasitic infections) (Vázquez-Luis et al. 2017). Due to recent massive mortalities, the species has been included on the Critically Endangered IUCN Red List (IUCN 2020)	Mediterranean: throughout the basin	<ul style="list-style-type: none"> • “<i>Preserving Pinna</i>” consists of low intervention spatial policies, mostly concerning legal protection of the species and establishment of MPAs limiting impacting activities. • “<i>Enhancing Pinna</i>” is driven by the increasing loss of <i>Pinna</i> populations caused by a recent outbreak and quickly spreading Mass Mortality Event (MME) (Vázquez-Luis et al. 2017; Cabanellas-Reboredo et al. 2019; IUCN 2020), caused by pathogens and exacerbated by high water temperatures. This discourse consists of different variants from simple translocation of threatened individuals to safe areas to exsitu conservation by full life cycle enhancement/interventions.
Resultant hard-substrate habitat on manmade constructions	<i>Use of decommissioned offshore oil and gas installations</i> as artificial reefs	North Sea	<ul style="list-style-type: none"> • “<i>Hands Off the Ocean</i>” requires the installations to be removed from the sea and dismantled on shore. This dominant discourse reflects OSPAR’s regulations, and centers on environmental protection and considers that leaving the structure is a form of dumping of waste at sea. • “<i>Rigs as Restoration</i>” discourse sees the possibility of converting the structures into artificial reefs (RtR). This discourse centers on ecological restoration and sees the structures as habitat that has allowed the recovery of degraded marine ecosystems during the time in which the structures were at sea. The expected amount of installations that need to be decommissioned (both oil and gas and wind turbines in the future), the growth of new energy actors, and the switch of focus from sea pollution (Techera & Chandler 2015) to biodiversity loss (EC 2011) have opened up debate around the need to update the existing decommissioning policy of the North Sea (Fowler et al. 2014; World Energy Council 2017; Harrabin 2018).

presents its management measures as supportive of the sustainability of the fishery, although the effectiveness of various, especially earlier, measures has been questioned (Tsounis et al. 2013; Bruckner 2014; Montero-Serra et al. 2015). Local management bodies may go beyond the legally binding GFCM measures and adopt more stringent conservation measures, as done by Sardinia (Tsounis et al. 2013), and Catalonia (Arafah-Dalmau et al. 2019).

The GFCM is also crucial in the availability and mobilization of resources (e.g. scientific and sectoral expertise) and funding contributed by its 24 members, including the EU which holds significant power supporting the GFCM's newly initiated regional research program on red coral (GFCM 2019).

The “Preserving Red Coral” Governance Arrangement. The dominant actors in the “preserving” discourse coalition are national governments and international intergovernmental actors, such as the Regional Activity Centre for Specially Protected Areas (RAC/SPA) under the Barcelona Convention. Ecologists like Linares et al. (2010) and Boavida et al. (2016) also play a crucial role in this coalition, focusing on the successful implementation of well-enforced MPAs for the conservation of red coral. Other key actors are NGOs such as IUCN and Oceana, who are pushing for change and more protection in the form of MPAs.

The international Convention on Biodiversity informs the rules and standards adopted through EU policies and regional policies in the Mediterranean. Typically, rules include different types of spatial and area-based conservation measures, namely: various closures and MPAs; national or regional Fishery Restricted Areas (FRAs) such as those by GFCM; Special Areas of Conservation and NATURA 2000 under the EU Habitats and Birds Directives. Red coral is present in several Mediterranean MPAs (including in a few MPAs linked to Mediterranean heritage) with varying level of protection and enforcement and in many Natura 2000 sites within the EU Member States (Garrahou et al. 2015). Another type of legally binding rule is through the proposed addition of red coral to CITES Appendix II for species that are not yet endangered but may become so unless their trade is regulated. Red coral is currently listed as a regulated harvested species in Annex III of the Specially Protected Areas and Biological Diversity Protocol of the Barcelona Convention (GFCM 2017).

Important resources in this governance arrangement are the instruments to implement and enforce MPAs in the long term, as it can take upwards of 30 years for red coral populations to recover from damage (Montero-Serra et al. 2015). Financing mechanisms and knowledge are also crucial resources in the establishment of spatial measures. Finally, a lack of resources to prevent illegal fishing affects the enactment of the red coral preservation (Cattaneo-Vietti et al. 2017; GFCM 2019).

A coalition within the “preserving” discourse views existing measures as insufficient to address ongoing and new threats to red coral populations. Therefore, this coalition, comprised of ecologists, partnering mostly with MPA managers and divers, is advocating through a bottom-up approach for active restoration activities in the form of coral transplantation. This reflects

the emergence of a new discourse “bringing back red coral” and the possible development of a discrete governance arrangement.

Restoration of the Fan Mussel (*Pinna nobilis*) in the Mediterranean

The “Preserving Pinna” Governance Arrangement. The discourse coalition of “preserving Pinna” consists of NGOs, scientists, governments at different levels, and divers. The main aim of this coalition is to preserve Pinna by developing protective regulation and to designate no-take areas. Marine scientists, interested actors, and prominent science journalists provide and disseminate knowledge on Pinna status, through reports, direct survey work (Marrocco et al. 2019), or articles in widely circulated newspapers (e.g. Becatoros 2018), facilitating actions and influencing public opinion. NGOs are also involved in the status assessments of Pinna (Basso et al. 2015); their involvement led to Pinna's IUCN Red List Assessment as a threatened critically endangered species (IUCN 2020). Other scientists and international and national NGOs (e.g. IUCN, MEDPAN, ARCHIPELAGOS) have picked up on the issue, which has led to various awareness and monitoring programs, including the involvement of the public through citizen science (Cabanellas-Reboredo et al. 2019; Marrocco et al. 2019). The IUCN has prominently recommended addressing the loss of Pinna (IUCN 2020). The discourse coalition consists of different governmental authorities, particularly local authorities which enforce laws on illegal catch/consumption or report on the presence of Pinna in Environmental Impact Assessments. Once a source of silk thread and food (<https://www.theguardian.com/fashion/2019/nov/12/sea-silk-byssus-auction-textile-mollusks>),

restaurants have until recently served Pinna despite both its prohibitions and its status (Katsanevakis et al. 2011). Regulatory frameworks have been applied both highlighting and protecting the species, directly through species protection designation measures. National governments, regional, or local authorities may also be involved indirectly through measures that incidentally cover Pinna, e.g. the designation of NATURA 2000 sites and the establishment of MPAs in which Pinna may reside.

To protect Pinna, the “preserving Pinna” discourse coalition is supported by an existing set of formal rules, the most important of which are the Habitats Directive (HD), the Barcelona Convention Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean, and the EU Marine Strategy Framework Directive in so far as Pinna has been proposed specifically as an indicator of GES (Vázquez-Luis et al. 2017). Additional mandatory assessments (e.g. EIA), as well as appropriate assessments under the HD, are important rules for protecting Pinna.

The primary resources concerning “preserving Pinna” are those focused around spatial protection measures, from limiting activities (e.g. through Fishery Protected Areas) to fully designated and enforced MPAs that ban all activities. These resources concern the availability of labor (both direct employees and indirectly through citizen involvement) and public and private

financing in the planning processes, and the implementation and enforcement of measures. In addition, scientific and public collaborations and media exposure are powerful enabling resources in the co-production of knowledge and the conservation of Pinna (Cabanellas-Reboredo et al. 2019).

The “Enhancing Pinna” Governance Arrangement. A strong driver for the “enhancing Pinna” discourse is the increasing loss of Pinna populations throughout the Mediterranean through acute, widespread stressors. This mainly bottom-up discourse coalition consists of scientists, often in cooperation with interested non-scientists including marine recreation users. The scientists are biologists or conservation specialists. Their involvement may be from monitoring or identifying degraded populations that need enhancing to physically translocating Pinna which requires specialists working in the marine environment handling Pinna and others supporting surface and underwater activities. In setting up holding aquaria or nurseries, scientists, and aquaculture technicians/aquariologists would be required. NGOs, local authorities, and MPA managers may also be involved in facilitating any activities (e.g. ARCHIPELAGOS 2018). Governmental actors are indirectly involved; the EU sets certain goals or frameworks that include restoration considerations, while national and local authorities are involved in the licensing and required EIAs or mitigation actions, triggered by the presence of Pinna in an area of proposed activities such as harbor extension (Rubino & Fanelli 2018; Bakran-Petricioli et al. 2019) or an accident at sea (<https://www.euronews.com/2012/11/06/protecting-the-giant-mussels-of-the-italian-coast>).

Rules to enhance Pinna are very non-specific with respect to restorative actions with no designation of “what,” “when,” “where,” “how” or “to what extent” (Carballo-Cárdenas et al. 2018). European Directives and international instruments are non-specific with respect to setting down precise restoration measures for Pinna, because the restoration science of benthic species is very new in most aspects, while every species has specific needs. Accordingly, the primary resources concerned with enhancing Pinna are people, finances, and knowledge. “People” are those who will undertake the restoration action, primarily scientists, technicians, and divers. NGOs may also be considered as a powerful resource, particularly if they coordinate actions (e.g. IUCN’s initiative to prepare an action program, IUCN 2020).

In the longerterm, regulatory frameworks are needed to facilitate transfer and transplantation, particularly if performed across regions. Important funding sources are grants including international (e.g. EU project financing through H2020, Interreg, Life), governments, private business through mitigation measures, or private (charitable) donations (see the Pinna SPOT project) (<https://en.gouv.mc/A-la-Une-du-Portail/Principality-of-Monaco-takes-action-on-noble-pen-shell-mortality-in-Mediterranean>). Future knowledge on methodologies (where to apply the work) and knowledge on likelihood of success is essential to successfully carry out enhancing activities (Katsanevakis 2016).

Oil and Gas Decommissioning and the RtR Narrative in the North Sea

The RtR case represents a situation of habitat restoration, or debate over whether a particular method, the RtR, is a legitimate mode of marine ecological restoration. In this situation, the two governance arrangements, “Hands Off the Oceans” and “Rigs as Restoration,” overlap in the rules of the game, but key differences in these two arrangements divide actors, discourses, and potential shifts in power. In both arrangements, OSPAR and the national governments of North Sea countries are major actors, but a divided group with Norway and the UK being more amenable to RtR. Most of the decommissioning policy and decision-making is left to the national governments with guidance from IMO, but the varying political and policy contexts in individual countries have great effect on how policies are put into practice (Kasoulides 1989; Beckman 2014; Roos 2019).

The “Hands Off the Oceans” Governance Arrangement.

The discourse coalition around the “Hands Off the Oceans” has its origin in the Brent Spar conflict (1995), where NGOs framed decommissioning as stories of decline and conspiracy (Livesey 2001; Jørgensen 2012; Stone 2012; Ounanian et al. 2019). The rules of this governance arrangement center on legal precedence for a complete removal of disused installations for navigational safety and to avoid the risk of marine pollution (UNCLOS 1982 [https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf];

IMO Guidelines 1989). Exempting certain structures, OSPAR has also set rules on the need to remove the disused installations (OSPAR 98/3 1998 [<https://cil.nus.edu.sg/wp-content/uploads/formidable/18/1998-OSPAR-Decision-98-3.pdf>]), and on their potential use as artificial reefs (OSPAR 2013). Key in the “Hands Off the Oceans” governance arrangement is the dominant discourse of conspiracy of the oil and gas industry looking for loopholes and using RtR as a means to avoid responsibility (Ounanian et al. 2019). Of the OSPAR national delegations, Germany, Spain, Sweden, and the Netherlands played a role in the exclusion of RtR in the North Sea (Jørgensen 2012). Important resources are the instruments to implement OSPAR decisions and guidelines, and the power—political and financial—of NGOs to mobilize public opinion (Roos 2019). In addition to this overarching call to limit human activities in the sea, some NGOs also consider hard substrates provided by the installations as unnatural.

The “Rigs as Restoration” Governance Arrangement.

Members of the offshore oil and gas industry, the marine research community, and some smaller NGOs form the “RtR as Restoration” discourse coalition. Smaller environmental organizations centered on the promotion of offshore renewable energy have recognized the impact that OSPAR 98/3 may have on the offshore energy transition and are thus an interesting actor in this space. The actors recognize both eco-centric and anthropocentric opportunities of leaving structures in place (Ounanian et al. 2019; Roos 2019). Opportunities are not only related to restoration but also repurposing of decommissioned offshore structures, where

evidence not only supports RtR's restoration aspects, but also mitigation of the environmental risks associated with removal.

In terms of rules, the international legal regime accommodates disused installations to be decommissioned in situ (to remain in place) (UNCLOS), especially if new uses have been identified for those structures (IMO 1989). Artificial reefs and RtR are not considered dumping, as long as placement on seabed is not for disposal or contrary to the Conventions' aims (London Convention 1972; London Protocol 1996). According to Fam et al. (2018), there is scope for national legislation to create RtR policies. Other rules which will favor the RtR discourse relate to policy objectives associated with the conservation and rehabilitation of marine ecosystems, as seen previously under EU and international instruments (EC 2011).

Resources associated to the RtR discourse refer to knowledge, that is, studies on the benefits of oil and gas installations to the benthic communities through provision of hard substrate—allowing e.g. endangered cold-water corals and blue mussels to colonize (Claisse et al. 2014). Proponents also frame the rigs as fisheries enhancement tools (Coghlan 2014; Baldwin 2018; Harrabin 2018), and attracting marine mammals (Delefosse et al. 2018). There is a growing recognition that complete removal may not provide the best environmental outcomes (Fowler et al. 2019).

Discussion

Enabling and Constraining Conditions for Active Restoration

In all three cases examined, a “driver of change” has been identified (Table 3), which has spurred the formation of actor coalitions that are (re)defining the problem and proposing alternative ways of understanding marine ecological restoration. In the red coral case, perceived species decline due to ongoing anthropogenic drivers—mainly historic overharvesting and illegal harvesting—has prompted transplantation efforts by scientists aided by non-scientists, mostly in MPAs (Cabanellas-Reboredo et al. 2019). In the Pinna case, the widespread mass mortality events have triggered a regional call for monitoring and measures by all affected countries that include larval collections, ex situ breeding, and translocations (IUCN 2020). At the local scale, expected habitat loss due to a planned harbor expansion has led to the first Pinna translocation effort as a mitigation measure saving nearly 200 Pinna (Bakran-Petricioli et al. 2019), also involving scientists and non-scientists. In the RtR case, the juncture at which the EU's (marine) restoration obligations intersect with the imminent decommissioning wave of thousands of obsolete structures—including wind turbines—in the North Sea has reignited the RtR debate.

Whereas the red coral and Pinna cases illustrate the shift from the traditional “hands off” paradigm of nature conservation, towards more active forms of intervention in nature through restoration (Schoukens 2017), the RtR case shows how differences in the perceptions of what constitutes “natural” in the context of the North Sea call into question the legitimacy of RtR as marine restoration instrument. While calls for active restoration of red coral and Pinna build on existing legal and policy provisions and governance arrangements for the protection of these species (by promoting the

addition of new tools and restoration approaches, and acting synergistically), the RtR case involves *challenging* the highly stable governance arrangement around OSPAR decision 98/3 on the Disposal of Disused Offshore Installations.

Our analysis showed enabling and constraining conditions for the institutionalization of “active restoration” governance arrangements (see Table 3). The three cases suggest that for governance arrangements where marine restoration is the main policy goal to be effective, “active restoration” discourses would require uptake and institutionalization at the regional level. To date, the red coral and Pinna cases show that active restoration efforts are small-scale, based on voluntary action by scientists and non-scientists, and lack the resources and framework to move beyond the experimental phase. There is very little published information on these translocation/transplantation experiments and very little uptake by key stakeholders (e.g. red coral case transplantation is not included as an option in the regional research program GFCM 2019). The RtR case, with the potential for a large-scale application, identified several actor coalitions adhering to a distinct discourse with several storylines, either for or against the use of decommissioned structures for restoration purposes in the North Sea. Nonetheless, the discourse is fractured into four identifiable storylines, some of which are counteracted by storylines and arguments from those in the “Hands Off the Oceans” coalition (Ounanian et al. 2019).

Does the Co-existence of Governance Arrangements Strengthen Marine Restoration in Policies and Legislation?

All three cases show a plurality of governance arrangements. In the red coral case, the “sustainable harvesting” and “preserving red coral” governance arrangements co-exist. Both are well institutionalized and embedded in international instruments and EU regulation, but emphasize different aspects of restoration: in the “sustainable harvesting” discourse different aspects of sustainability (social and ecological) are emphasized from an anthropocentric motivation (the exploitation of red coral), while the preserving governance arrangement aims at preserving and protecting by, e.g., designating well-enforced protected areas (Montero-Serra et al. 2019). Next to these governance arrangements, an active restoration discourse is emerging. This arrangement initiated by scientists aims to bring red coral back. However, relatively few studies have focused on developing restoration tools and techniques for Mediterranean coral populations (Benedetti et al. 2011), although recently a few small-scale red coral restoration projects have been conducted in the Mediterranean Sea (mostly within MPAs) (personal communication G. Tsounis, L. Bramanti, Carballo-Cárdenas et al. 2018). These latest efforts embody the idea that active intervention in nature is essential to cope with on-going coral reef degradation (Rinkevich 2008).

Although these types of initiatives have reached the political agenda at the international and EU level and very much complement the attainment of CBD's Aichi Target 15 and the EU's Biodiversity Strategy Target 2, implementation at Member State level has been slow and has focused on passive restoration measures (EC 2015). Crucially from a governance perspective, no specific institutional arrangement has been established for

Table 3. Summarizing Drivers of Change, emergent discourses, and enabling/constraining conditions.

Case	Driver of Change: (Re)defining the Problem	Emergent discourses: Proposing solutions	Enabling/constraining conditions for the institutionalization of 'active restoration' governance arrangements
Red coral	Perceived relentless anthropogenic drivers of species decline, namely overharvesting and illegal harvesting	Enhancing protection of red coral by existing measures and active transplantation	<i>Constraining:</i> lack of a prioritization framework and legal procedures that will prompt initiation of active restoration approaches <i>Enabling:</i> enthusiastic willingness of some science-MPA stakeholders (based on experimental successes)
Pinna	External, non-anthropogenic shock (MMEs) at regional level; anthropogenic driver (harbor expansion) at local level	Enhancing the protection of Pinna by existing measures, active translocation, and ex situ conservation	<i>Constraining:</i> lack of an institutional framework to respond to shocks and a regional plan that will prompt initiation of large-scale active restoration actions <i>Enabling:</i> currently, only mitigation requirements but the species is a Critically endangered species of Community Interest in need of strict protection by the European Habitats Directive (92/43/EEC)
Rigs-to-Reefs	The juncture of EU's (marine) restoration obligations and aspirations and upcoming decommissioning wave of thousands of obsolete structures in the North Sea	OSPAR 98/3 decision's rules are challenged by emergent discourses that propose RtR as a legitimate decommissioning option	<i>Constraining:</i> OSPAR's decision: Highly institutionalized government arrangement where the 'Hands Off the Oceans' discourse is dominant <i>Enabling:</i> growing recognition that complete removal may not provide the best environmental outcomes; potential to re-use the structures; new actors (offshore windmills) who would see these structures as opportunities for restoration)

sustained, large-scale red coral active restoration at the Mediterranean Sea level. Unless a national framework is developed (nested in a regional goals plan), restoration activities will be developed locally from different stakeholder perspectives and without overarching restoration goal setting and monitoring.

The Pinna case also shows two discourses co-existing. The preserving governance arrangement is well-institutionalized and embedded in, e.g., several EU regulations. The enhancing arrangement is a reaction to a shock event. This arrangement is formed ad-hoc and bottom-up by concerned scientists and is not guided by formal rules. Both arrangements are not in conflict with each other and could complement and strengthen each other in the longer term. Future Pinna restoration policies could be based on elements of both arrangements and both the severity of the shock event and the successful mitigation examples favor this (Bakran-Petricoli et al. 2019). One of the next tasks for marine biologists could be towards making the case for national regulations to include the relocation activities of benthic endangered species such as *Pinna nobilis* (Rubino & Fanelli 2018).

In the RtR case, the "Hands Off the Oceans" discourse is well-institutionalized and blocks emerging arrangements which see the "Rigs as Restoration" arrangement as an effective and legitimate form of ecological restoration. As Ounanian et al. (2019) showed, the current RtR governance arrangement is too fragmented to seriously challenge the "Hands Off the Oceans" arrangement. However, in the future, the development of windfarms and the implementation of the EU Biodiversity Strategy could put restoration (in the form of decommissioning as RtR conversion) on the policy and political agenda of

OSPAR. In addition, restoration is increasingly featuring in international dispute settlement and may be a feature in the BBNJ Agreement under negotiation at the UN (Long 2019). The possible institutionalization of restoration policy is dependent on how alternative governance arrangements are able to challenge the dominant arrangement.

An EU Restoration Directive as a Panacea?

EU directives lack a specific definition for restoration, while referring to restoration in many different ways and in most cases lack a specific prioritization framework for implementing conservation and restorative actions (Schoukens 2017). Schoukens presented the idea to develop an EU Restoration Directive, which would make it possible to develop an implementation strategy for all Member States. In theory, this would end a situation of fragmentation and implicit restoration objectives and targets in EU policies.

From the cases presented here, it can be concluded that the plurality and fragmentation of restoration legislation and practices will not automatically be solved with an EU Directive on ecological restoration. The different institutional settings, different restoration discourses, and the tension between legal frameworks and local/bottom-up initiatives will result in varying implementation of such a Directive in national regulation and restoration initiatives. The governance of restoration is context-specific and requires a case-by-case analysis of the effectiveness of existing and emerging governance arrangements. There is a wish to strengthen the restoration element in existing measures, instead of pushing for a new instrument. The aim is to make restoration

more inclusive, stronger within the existing frameworks, particularly by strengthening legal instruments and by supporting bottom-up approaches. The very recent EU Biodiversity Strategy 2030 addresses these issues by calling for legally binding restoration targets, adapting an EU Nature Restoration Plan, and putting in place a new European biodiversity governance framework to map obligations and set out a roadmap to guide their implementation (EC 2020). Terrestrial and marine conservation operates primarily by regulating human behavior rather than by physical interventions (Ockendon et al. 2018) despite ecological restoration being an essential part to system-wide healing (Blignaut & Aronson 2020). However, a recent surge and shift in focus towards active restoration seek to address key priority questions on the governance of restoration and institutional capacities for rebuilding nature (Duarte et al. 2020).

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