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ARTICLES

Ambivalence in Environmental Care: Marine Care Ethics and More-Than-Human Relations in the Conservation of Seagrass *Posidonia oceanica*

Jose A. Cañada[1,2]

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Abstract

Posidonia oceanica is an endemic seagrass from the mediterranean that provides key ecosystem services. A protected species, its presence is regressing due to anthropogenic pressures, some associated to the tourism economy that much of the Mediterranean coast depends on. In 1992, the European Union declared it a priority habitat, and since the early 2000s, it has occupied a central space in marine conservation debates in the Balearic Islands. Popularly known as Posidonia, this seagrass went from being considered *dirt* that ruined *virgin* Balearic beaches to become an emblematic species. This article takes this U-turn in policy and public perception as a study case to think of knowledge-making practices and restoration initiatives as a form of environmental care. The relational, situated and affective character of care ethics helps to understand the human and ecological labour embedded in knowledge-making and restoration practices and its inevitable engagement with the Balearic tourism industry. Drawing on those engagements, I reflect on environmental care practices of knowledge-making and restoration, arguing that they emerge ambivalently: they challenge management logics based on economic rationales while forced to develop and coexist inside those same rationales. I conclude by arguing that developing care-centric narratives for environmental conservation and restoration is essential to continue promoting more-than-human aquatic relations in which the needs of others are the ethical basis for action.

Keywords Care ethics · Restoration · Conservation · Seagrass · Environment

✉ Jose A. Cañada

[1] Centre for the Social Study of Microbes, Department of Sociology, Faculty of Social Sciences, University of Helsinki, PO18, 00014 Helsinki, Finland

[2] EGENIS, Department of Social and Political Sciences, Philosophy, and Anthropology, University of Exeter, Exeter, United Kingdom

Introduction

Posidonia oceanica (popularly known just as *Posidonia*) is an endemic seagrass from the Mediterranean that performs key ecological functions, supporting the flourishing of its surrounding species and ecosystems. Its meadows produce oxygen, capture carbon, offer refuge to juvenile fish and other species, act as wave breakers preventing coastal erosion, and contribute to sand regeneration (Vaquer-Sunyer et al., 2021). Posidonia meadows have been in decline during the last 50 years (Marbà et al., 2014), a trend most evident in areas of high human impact, with the Balearic Sea as a prominent example of that regression (Telesca et al., 2015). The Balearic Sea surrounds the islands of Mallorca, Menorca, Ibiza and Formentera, and contains 50% of all the Posidonia in Spain. Being one of the main touristic destinations in Europe, the pressures on Posidonia meadows are linked to the mass tourism industry that the archipelago's economy depends on, for example nautical tourism, beach replenishment practices, and the effects of waste discharges to the sea (Ruiz et al., 2015). While tourism-related activities represent a significant pressure, the industry also relies on the benefits of Posidonia for Balearic environments since it depends on sea-sun-sand tourism and clean waters as key assets attracting visitors (Balearic Islands Tourism Board, 2017).

This ecological and socioeconomic role of Posidonia in the Balearics is recognised by stakeholders such as public administration, fishing industry, sailors, environmental NGOs or marine leisure (Ruiz-Frau et al., 2019). Given the broad range of stakeholders and its role for the dominant industry, it is not surprising that conversations about Posidonia conservation have been highly politicised (Roig-Munar et al., 2004) since measures to protect the seagrass inevitably alter the use of coastal and marine environments. Until recently, Posidonia was known to most of the population due to its presence in beaches, where dead leaves accumulate contributing to sediment regeneration and erosion protection. For decades, those Posidonia leaves were regarded as *dirt* that needed *cleaning* (Roig-Munar, 2001) since it broke with the false image of white sandy beaches promoted in advertisements to attract tourists. However, expansive knowledge about its socioeconomic and environmental relevance has turned Balearic Posidonia meadows into a favoured site for marine conservation but also the recipient of significant anthropogenic pressures.

Currently, knowledge about Posidonia is still limited among the general population and stakeholders, especially when it comes to its ecosystemic functions (Ruiz-Frau et al., 2018) but it is clear from comparing studies at different moments in time that knowledge about its existence and general relevance has grown (Medina-Pons et al., 2004; Ruiz-Frau et al., 2018). In fact, Posidonia has become an emblematic species for the local population and ecologist movements, featuring regularly in the news, especially during the summer. This is in great part due to the cross-sectoral work stemming from the declaration of Posidonia as a priority habitat by the European Union (EU) in 1992 (Díaz-Almela & Duarte, 2008). Although this first protective push is internationally situated at EU level, member states are responsible for policy implementation and, in Spain,

responsibility is further devolved to regional governments. Advances in EU policy contributed to boost research in Balearic academia and fund cross-sectoral projects for policy development, including key initiatives like monitoring, awareness, surveillance, mapping, and regulation. This work gained wider visibility when in the 2010s Posidonia starts occupying a central space in debates about marine conservation in the Balearics, culminating in the so-called *Posidonia Decree* (*Decret 25/2018,* de 27 de Juliol, Sobre La Conservació de La Posidonia Oceanica a Les Illes Balears, 2018), a pioneering regulation—the first of its type in Spain—to protect Posidonia as a species. Initiatives during the last three decades have contributed to an expansion of the field of marine conservation in the Balearics, leading to changes in discourse and attracting both private and public funding.

This article focuses on how these changes in awareness and regulation have led to initiatives that I conceptualize as "practices of care" (Puig de la Bellacasa, 2017). These practices enable societal actors to engage with Posidonia in new ways. Framing Posidonia initiatives as care practices evidences a tension with emerging blue economic rationales, which are becoming dominant in conservation rhetoric. To explore the intricacies of what happens when care practices are embedded in economic rationales, I focus on examples from monitoring and restoration practices. These areas are key for the future of Posidonia and its ecological functions. Monitoring efforts to follow regression and growth trends help design seagrass management in the Balearics. Restoration, on the other hand, is still largely experimental but already contributes to management decision-making and is hyped as potentially helping to undo the damage done. Using these examples I argue that practices of care emerge ambivalently in Balearic marine conservation: they aim to address anthropogenic pressures connected to the tourism economy while their implementation is unavoidably linked to that same industry. This ambivalence is key to understand who is able to engage in environmental care, in what conditions and under which rationale.

Methodologically, the article combines documentary analysis of materials related to Posidonia and marine conservation; interviews with actors in academia, public administration and civil society[1]; and a 3-month ethnography in the Balearics between March and June 2022. The project focused on knowledge production practices and cross-sectoral collaboration. Fieldwork took place in Catalan and Spanish and excerpts used in this article have been translated by the author.

The article proceeds by introducing Posidonia as both agent and object of care to demonstrate the connection between care, marine ecosystems and the tourism economy. "Environmental Care Ethics for the Sea" section presents a framework for marine care ethics that relies on feminist approaches to environmental care. The article then uses this framework to analyse two initiatives: monitoring and restoration as environmental care practices that enable different forms of labour and

[1] Civil society includes societal actors that promote marine conservation and lobby for environmental policy development. These are legal entities with diverse status such as associations, foundations and NGOs, categories that are not always clear cut.

value production. Expanding on the discussion of these two examples, I reflect on the ambivalence of environmental care that characterise conservation initiatives by reflecting on the discourses and rationales behind them. The articles concludes that developing care-centric narratives for environmental conservation and restoration is essential to challenge economic rationales based on the value of ecosystem services (ES).

Posidonia as Object and Agent of Care

The 1992 EU Habitats directive mentioned above provides an institutional framework for the first significant cross-sectoral collaboration in the Balearics regarding Posidonia. The project LIFE Posidonia (2001–2006) consisted of a broad collaboration among mostly academic and governmental actors to generate knowledge about the state of Posidonia meadows, of which there was very little information at the time. The aim of the project was "to guarantee the viability and biological richness of [Posidonia] habitats in Balearic waters" preventing endangering activities, guaranteeing species conservation, and to acquire and publicize new knowledge on the habitat, ecology and influence they have on coastline dynamics (Govern de les Illes Balears, 2004). The final report presented as its main lesson the work done with the general population:

> "The main lesson we have learnt is how to work with the population who live in, around and near the [Sites of Community Importance]. As examples of [the kind] of work we have done we must mention as the most important ones:
>
> - The monitoring network for the observation and detection of *Caulerpa taxifolia*.
> - Improve of the IT systems of the fishers.
> - Implementation of the education at schools about the *Posidonia oceanica*.
> - Distribution of pamphlets with information about the project and *Posidonia oceanica* [to] groups who can possibly affect [living] Posidonia.
>
> The environmental education program allowed us to [reach] around 500,000 people, with the [exhibitions], the website and the set of informative material" (Conselleria de Medi Ambient del Govern de les Illes Balears, 2006, p. 87)

The objective was not just to spread knowledge among the public but to engage relevant communities and address the future generations through the production of pamphlets, the establishment of a marine education program in schools, and the publication of a children's book titled "The Treasure of Poseidon" (Morgan, 2003). The work to pursue broad engagement in relation to marine conservation did not take place in a vacuum. It capitalised on the work of local grassroots ecologist groups that had helped since the 1970s to create social awareness about environmental conservation, especially focused on the massive urbanization of coastal areas, establishing a link between native identities and the protection of the territory

Fig. 1 Visual branding at the service for species protection website to promote the protection Posidonia

(Valdivielso Navarro, 2010). Civil society work with a focus on marine conservation has quickly grown since the early 2010s contributing to promote knowledge about marine conservation among the general population. Marilles Foundation, for example, organises marine photography contests to encourage the production of audiovisual imagery that can visibilize the Balearic Sea to those who do not have access to it. Other foundations like MedGardens and Arrels Marines combine restoration efforts with environmental education.

In that step towards including the sea in environmental concerns by linking them to a regional identity there is an effort to produce affective and caring relations between humans and the sea. When Posidonia becomes knowledgeable and loveable for non-marine actors, it becomes "more than a name—no longer an abstract Latin bionomial on a long list of threatened species, but a complex and precious *way of life*" (van Dooren, 2014; emphasis in the original). This contrasts with the absent cultural fleshing out of other seagrass species also key for Balearic marine ecosystems (Cañada, 2024), something that fits what van Dooren (2014, p. 92) has called "regimes of violent care", here performed as a sort of abandonment towards less ubiquitous species that are also ecologically very significant but have not received the same attention in campaigns by the public administration. Such campaigns promote the protection of Posidonia under the slogan "we take care of Posidonia" (Fig. 1; Conselleria de Medi Ambient i Territori & Institut Balear de la Natura, 2023).

The language of this campaign does not only establish a caring relationship from humans towards Posidonia but also, in a more-than-human sense, establishes Posidonia as a caring agent, putting it at the centre of more-than-marine ecologies and establishing a caring network that is not just crucial for the health of marine ecosystems, but also for the health of the elements that sustain Balearic sea-sun-beach tourism on which much of the population depends. Caring for Posidonia ensures a healthy environment but also the continuity of an economic sector by preserving the quality of the spaces that attract tourists. Initiatives to protect Posidonia make evident the network of dependences established between humans and the environment they inhabit.

In her review of the broad field of critical plant studies Lawrence (2022) discusses the conceptualisation of plant labour within capitalist economies through the

notion of ES, rethinking plants as 'docile workers' and highlighting their "metabolic capacity to change the form of matter" (Lawrence, 2022, p. 639). Plants are here part of larger-scale processes. Posidonia is often depicted in public campaigns and policy documents as an active agent, rather than passive. It does things for the environment and, in extension, it does things for humans. In the Balearics, Posidonia emerges ambivalently as a caring agent towards which humans have responsibility and is part of a bigger ecological network, but also as a manageable "worker" that performs ecological labour (DiNovelli-Lang & Hébert, 2018). Thus, although more-than-human care can offer a good interpretation of some of the processes at the core of Posidonia protection in the Balearics, this is not an abandonment of capitalist and exploitative logics by any means. Rather, these two logics fold unto one another. The examples that I analyse offer hybrid ways in which that ambivalence emerges: humans interact with Posidonia and marine environments both through care and through regimented, exploitative, and instrumental logics (Puig de la Bellacasa, 2017).

This ambivalence makes of Posidonia and its habitat a contentious space for decision-making. Given the central role of care in the articulation of a discourse of protection towards Posidonia, I believe that a framework drawing on feminist ethics of care offers an important resource for understanding how a care relation can emerge in a capitalist context dominated by tourism.

Environmental Care Ethics for the Sea

A notion of care useful for the analysis of seagrass protection in the Balearic context requires a marine-environmental focus that incorporates an economic critique. The environmental element is already present in classic definitions of care. For Fisher and Tronto (1991, p. 40) caring can be viewed as a "species activity that includes everything that we do to maintain, continue, and repair our world so that we can live in it as well as possible", world being defined in a broad sense, including our bodies, selves and the environment with which we are interwoven. Fisher's and Tronto's notion of care relies on a long history of feminist scholarship that defends the moral and political value of labour traditionally and socially identified to women's work and that has since the 80s expanded onto numerous other territories, including the production of scientific knowledge and more-than-human relations (Puig de la Bellacasa, 2017). While recognising this long history and its broad focus, here I follow it towards the work of three authors: Puig de la Bellacasa (2017), who has developed a more-than-human focus on knowledge practices and interconnected living webs; Lynch's (2022) and her critique on capitalism from a care perspective; and Martin (2022) who, despite not being a care theorist, has applied the notion in her study of ecological restoration as a form of environmental care. These approaches are fleshed out in direct conversation with the empirical material but, since care has not featured prominently in marine ethics discussions, it is worth discussing its potential in thinking about marine conservation.

Visibility has historically presented a challenge in establishing caring relations between humans and the sea (Wolf, 2003), something that has for decades allowed

humans to wreak havoc under the sea with little attention (Owens, 2008). This boundary is being progressively overcome with the use of technology, making possible acquiring knowledge about marine communities and extending perceptions past the terrestrial plane, supporting the foundation of a marine ethical relationship (Bratton, 2004). This allows for the production scientific knowledge and its communication to the general population, establishing ethical and caring relationships without necessarily being in direct contact with marine environments. The way different communities come in contact with the sea in order to witness what happens below is therefore variable and situated: from the regular contact of marine biologists to the experiencing of sea through cultural audio-visual production. Furthermore, knowing and witnessing the sea transforms those who engage with it.

Witnessing becomes *with-nessing* altering the identity of knowledge-makers and the different actors involved through acts of thinking with and acting with (The Kilpisjärvi Collective, 2021). We can find examples in how it alters the identity of those who dedicate their careers to work with Posidonia. Several of the marine biologists that I interviewed referred to themselves and their colleagues as being "posidonic", describing themselves and others as more or less "posidonic" depending on how much of their work focuses on the seagrass. These engagements constitute agentic assemblages (Bennett, 2010) where human identity is configured through more-than-human attachments, encouraging simultaneously the flourishing of marine environments and the furthering of professional careers through the establishment of niche areas of expertise. Working with marine conservation in general, and Posidonia in particular, involves a history of attachment towards the seagrass that can go beyond the professional identity of those who do. Many of the marine biologists I interviewed described early attachment to the sea in their childhood or through their familial upbringing. They often dedicated their free time to engage in collaborations beyond their remunerated positions, using their free time to aid artists interested in marine issues or continuing conducting research beyond their contract when precarity and limited resources did not allow them to achieve the objectives they set for themselves.

This way, knowledge-making becomes not just a way to produce information about the world, but also a way to establish an ethico-political relation through affect and care with the nonhumans and the environment that surround us (Puig de la Bellacasa, 2017). When knowledge-making involves that sort of care, it becomes a kind of "labour of love" that compels us "to think with, and for, what we care about" (Puig de la Bellacasa, 2017, p. 78). Knowledge is no longer just produced for its own sake, but because of the effect it can have on nonhuman others. However, labours of love in knowledge-making entail a risk of invisibilisation. Historically, care labour has been invisibilised and undervalued, especially in contrast to paid labour (Lynch, 2022). Care for the environment through knowledge-making outside of paid labour is at risk of being perceived as altruistic, while it could be better described as a compensation for lacking resources and precarious employment. The examples below describe a well-funded project through a private–public partnership and a struggling public network reliant on volunteers, which brings the question of who does the caring and with what resources. There is indeed a variability in the positioning of initiatives for Posidonia conservation. The cross-sectoral character of

Posidonia initiatives means that these are located across spaces and scales, which entails a significant variability in terms of resources and access, encouraging different forms of collaboration.

In this approach, agency is therefore distributed. A webbed understanding of care and violence—humans care/destroy Posidonia, while Posidonia cares for the habitats it inhabits, which in turn contributes to thriving ecosystems that support certain types of human sociality and economies—challenges individualised notions of agency and help to "dis-objectify" nonhuman worlds (Puig de la Bellacasa, 2017). A distributed understanding of agency points to the emergent and complex character of ethical entanglements and, I would add, also enables the ambivalence that characterises existing tensions in marine conservation. But, as Puig de la Bellecasa (2017, p. 142) argues, "the ethical is complex and emerging", which "also involves chances to contribute to its shaping". In the space that emerges in that complexity, relying on Lynch's (2022) critique of capitalism, care offers a counter-narrative that does not simply critique the harms of capitalocentric modes of thought, but also challenge them. In this space, humans go beyond their role as economic and political agents to become cultural and relational actors "involved in nurturing, loving, hating, fighting, relating and co-creating each other" (Lynch, 2022, p. 3) and, I would add, nonhuman others. This offers a chance to challenge blue economic rationales, contributing to creating "a new language and a new set of values and priorities for politics" (Lynch, 2022, p. 4) that involves taking the needs of others as the ethical basis for action (Tronto, 1993).

Monitoring, Meadow Health and Labour

Maintaining, continuing, and repairing our world requires knowing it in involved, proximal and intimate ways (Puig de la Bellacasa, 2017). In the Balearics, one of the earliest challenges in the early 2000s was to locate and know the state of existing meadows by creating a temporal series of data to monitor growth and regression trends. It is not uncommon to find references to a pristine state of seagrass meadows in literature, policy or monitoring documents (e.g., Burgos Juan, 2021; Díaz-Almela & Duarte, 2008; Holmer et al., 2004). However, when I asked marine biologists and monitoring professionals about what 'pristine' meant, they recognised that this was a hypothetical notion since it was not possible to know what meadows looked like before anthropogenic impacts. Making sure data is available moving forward was one of the first cross-sectoral initiatives around Posidonia. In this section, I analyse what are the tools and resources necessary for such endeavour and how care and labour play a role in achieving it.

According to Iris Hendriks, a marine biologist at the Mediterranean Institute for Advanced Studies (IMEDEA), the most sophisticated and precise way of measuring the state of Posidonia meadows is the "*Posidonia oceanica* multivariate index" or POMI (Romero et al., 2007). Although POMI was designed to assess the ecological status of coastal waters to conform to the EU Water Framework Directive (European Commission, 2000) and not to measure the state of Posidonia meadows, all interviewees made immediate reference to it when asked

about ways to measure meadow health. But even though the POMI can give a really precise account of a meadow's state, it presents shortcomings:

> the problem […] is that it needs […] 14 factors […], which is a lot of work and are sometimes expensive and difficult and destructive, because you need to measure the isotopes in the leaves and in the rhizomes, so you have to uproot the Posidonia. (Iris Hendriks, interview)

Widespread use of POMI is therefore not only prohibitive but also contrary to the goal of conservation. As an alternative, it is common in monitoring to focus on just two variables (also included in POMI): density and coverage. These measures are then combined to calculate the global density of the meadow. The result is interpreted using the *Pergent classification* (Pergent et al., 1995; Pergent-Martini & Pergent, 1996), to assign one of four different states of conservation: unfavourable-bad; unfavourable-inadequate; favourable-normal; favourable-high. This simplified approach allows to monitor growth and regression trends in a relatively inexpensive and non-destructive way while providing informative data:

> What happens is that one only looks at the density of the plant, which is the state that attracts the most attention. If there is a dense meadow it is healthy […]. With POMI you can fine-tune a little more […] while with density, […] if you see a degraded meadow, little dense, something has been happening and with POMI maybe you catch it a little earlier. (Iris Hendriks, interview)

Despite this simplified and cheaper approach, achieving continuity in monitoring has remained a challenge to this day.

The Posidonia Meadow Monitoring Network, founded by the regional government in 2002, is the longest continuous effort to produce a temporal series in the Balearics and is illustrative of those challenges. The Network' success has been threatened continuously by funding shortages and the precarity of hired workers without permanent positions to the point of being fully deactivated between 2012 and 2017 as a result of funding cuts and a change in regional government, with the incoming executive being more conservative and cutting environmental conservation funds. Nevertheless, workers of the network felt a commitment towards Posidonia and the data, with data processing happening, and derived publications appearing, well after the deactivation of the network (see Álvarez et al., 2015). Sometimes this happened while being employed on other projects that were not strictly defined as part of monitoring efforts. For example, marine biologists interviewed admitted they used access to marine stations and equipment funded by projects not having to do with monitoring in order to maintain temporal series for marine environments. This example exposes the precarity of knowledge-making and how affective relations to data (Pinel et al., 2020) and environment play a key role in providing continuity.

The Network also illustrates similar dynamics beyond the scientific community since it has relied from its outset on the enrolment of diving centres and volunteer divers to conduct measuring. The specific contribution of each diving

centre greatly varies but makes evident that material resources cannot be taken for granted. Some centres cover all costs, including boat, personnel, and equipment while others offer a reduced price for divers who join the field trip. Divers, on the other hand, always engage in unpaid labour since they give their time, expertise (diving training is expensive and participation requires experience), and sometimes they even pay the price asked by the diving centre. The necessary investment to become a recreational diver also makes manifest the barrier to volunteering in citizen science. While promoters of citizen science often talk about the democratization of science (Braverman, 2022), in practice, access continues to be limited to certain collectives. Having access enables participants to contribute to an initiative they care about and learn about Posidonia and measuring techniques through training offered by the public administration. These experiences are able to create long term engagement. The network's volunteering community survived the 5 years of inactivity, as the coordinator in charge of the reactivation in 2017 explained.

This example indicates a cross-sectoral synergy between knowledge production, care, and citizenship. One of the coordinators of the network explained that many of the recreational divers admitted to not have paid much attention to Posidonia in their dives before joining the network, given how ubiquitous the plant is. The initiative to involve volunteer divers, with its origins in the limited economic resources of the public administration, has enabled a relevant community to consider what Posidonia is and what it does. Citizen science initiatives are often regarded as "a step toward a more democratic and collaborative engagement and knowledge production" (Braverman, 2022, p. 140). Here, I would add that this sort of initiative also facilitates the emergence of a very material relationship with the plant since measuring requires direct interaction, for instance, separating and rearranging its long leaves, observing the substratum it is attached to, and differentiating it from other plants and algae. Through this direct engagement with the seagrass, diver identity expands beyond that of recreational diver towards scientist-diver, understanding first hand the characteristics of Posidonia meadows, another case of 'withnessing' (The Kilpisjärvi Collective, 2021). The change is not just in the way science stands in society as a more or less democratic or participatory initiative, but in the way that participants relate towards the environments they usually inhabit.

The monitoring network acts as a knowledge-producing machine that draws on a capitalistic "labour of love" (Puig de la Bellacasa, 2017, p. 78) while acting as awareness creator. The labour of the volunteer divers could not happen if the tourism industry of the islands had not motivated the emergence of an extensive web of diving centres. The same industry that puts pressure on meadows is the one that makes possible producing knowledge about it, making explicit a relation of interdependency in the environmental sustainability of Balearic marine environments. This enacts a type of cross-sectoral interconnectedness and interdependence characteristic of emerging forms of circular economy in ecological management where the enterprise is as educational as much as economic (Stojanovic, 2019). Knowledge-making as a care practice capitalises on the existing industry, enacting the ambivalence described in the previous sections, but also building collaborative care networks and knowledge databases that challenge it.

Restoration as Care and Management

While producing basic knowledge about Posidonia was the most prominent academic effort during the 1990s, soon the field would also enter the so-called "age of ecological restoration" (Richardson, 2016), contributing to a trend that has led the United Nations to declare the 2020s as the "Decade on Ecosystem Restoration" (United Nations General Assembly, 2019). Restoration emerges as a compensation for historical pressures and regression trends (Marbà et al., 2014; Telesca et al., 2015) but, also, for new damages that are considered unavoidable. However, restoration is a contentious matter among marine biologists. There was a noticeable tension between my interviewees who positioned themselves as being either pro-conservation or pro-restoration. At the centre of that debate is the question of how intensively should we intervene to help wild species recover from harms that humans have inflicted (Martin, 2022). Posidonia restoration work is mediated by its experimental stage and the associated variable rates of success after transplant (Castejón-Silvo & Terrados, 2021).

In the Balearics, the most visible project in this line of work is a cross-sectoral collaboration involving a semi-private company, a research institute and the public administration. Red Eléctrica, the Spanish national electric company, planned in 2013 a now operational submarine cable between the islands of Mallorca and Ibiza which would impact Posidonia meadows in the bays of Santa Ponça and Talamanca. As part of its program for environmental corporate responsibility, they approached the research group of Jorge Terrados at IMEDEA, who had been working on restoration techniques since the second half of the 2000s. The collaboration was meant to compensate for the damage done by the installation of the cable on Posidonia meadows. One of the restoration projects took place on the seafloor disturbed by the installation, with poor results due to altered substratum (Castejón-Silvo & Terrados, 2021). On the other hand, planting fragments on dead *matte* (former meadows where Posidonia was present in the past) are higher, which encouraged a follow-up collaboration under the name of "Marine Forest", focusing on recovering Posidonia meadows in the northern Majorcan coast.

The collaboration also produced a restoration guide (Castejón-Silvo et al., 2018), which allows other actors to experiment with restoration techniques. This has been the case of civil society organizations like MedGardens or Arrels Marines who have taken local action to conduct seagrass restoration programmes while involving local communities, partially challenging the typically top-down and technocratic character of restoration that tends "to sideline local customs, local land use practice and land tenure" (Martin, 2022, p. 233). Although in very different conditions, struggling to get permits, and with different resources than a private–public partnership with a national company, this helps to expand the care network, distributing the agency and ability to restore, instead of monopolizing the technique. Other actors are able to tinker with the technique, experimenting with different materials and tools, helping to collectively develop restoration as an environmental care practice.

Restoration also plays a role in the way economic value is assigned to marine environments. Ongoing projects have been used by the public administration to

assign a monetary value to Posidonia, helping to determine compensation values as Terrados explains:

> the government is also using the project's results in management decisions, for example, the Environment Commission of the Balearic Islands has used our results […] to estimate the economic costs of compensating damage to the meadows based on planting costs. I may or may not agree with that cost estimate, but at least they are making an estimate of the damage and an estimate of the compensatory measures […]. What money should I give to compensate for this damage, right? Or for example, in port projects of reorganization of berths of boat docks, they recommend in an area that the Posidonia is restored using our methodology […] 'You have to restore an area for this project to take place, you have to make a plantation of X square meters, following the methodology that has been used in the Marine Forest (Jorge Terrados, interview)

Restoration practices contribute in this way to value creation by equating the monetary value of Posidonia to the cost of implementing experimental restoration projects. The experimentality and complexity of restoration work are counterbalanced by the hope and potential value they provide, evoking in public administration and civil society organizations technofix imaginaries (Levidow & Raman, 2020) where meadow restoration is imagined as equivalent to terrestrial equivalents like seed banks, gardens or forest management. This way, restoration goes beyond being a practical implementation to also make available a more positive discourse on Posidonia than the one around restriction or prohibition (Jorge Terrados, interview).

Such imaginaries enact Posidonia as a manageable asset that can be valued, damaged, economically compensated, and later restored. Discourses of restoration and compensation engage ambivalently with discourses of environmental care while enacting a relationship whereby Posidonia becomes a manageable resource for ES, putting its value in terms of its economic productivity and ecological labour (DiNovelli-Lang & Hébert, 2018). Analysing Posidonia as a multispecies caring agent helps to point out the mismatch in monetary value mentioned in the excerpt above. Replanting a meadow has the potential to eventually reach the same contribution in terms of ES, but this is not guaranteed and would only happen once the meadow is fully developed. This way, the incorporation of Posidonia as a valuable asset into the blue economy remains partial: only part of its ecological value is economically accounted for.

This partial enrolment entails a risk as Raquel Vaquer-Sunyer, a marine biologist working in a civil society organization, explains challenging the notion of economic compensation:

> A Posidonia committee has been created, formed by scientists and NGOs, that […] makes decisions about whether certain actions are allowed or not, which is dangerous, because there is a part of the decree that allows you, if you destroy a part of a Posidonia meadow, there is a fund to which you can contribute money [for replantations]. I think this should be more restrictive because replanting is not really viable as a strategy and what should be done is

> conservation. Certain pressures continue and ideally they should remove pressures... It's like the lesser evil (Vaquer-Sunyer, interview)

Thus, while having a *Posidonia fund* connected to restoration represents an advancement, it entails the risk of not addressing ongoing anthropogenic pressures. Furthermore, having a fund, does not ensure that the money will be used to compensate the damaged area since altered substrata are unsuitable for restoration, a problem that is well known in the use of compensation funds that take place elsewhere than the damage being compensated (Martin, 2022).

While restoration offers the possibility of contributing to the growth of a regressing species, the way such activity is entangled with political economies brings forward a risk of decentring the priority of reducing existing anthropogenic pressures. The value of restoration is again ambivalent: it contributes to regenerate lost Posidonia meadows, but also provides a rationale to diminish the sense of urgency for stopping existing pressures posing a challenging ethical dilemma. Martin (2022, p. 234) has argued that "practices of restoration will continue to evolve as we change both how we care and what we know", and although it can perpetuate "injustices against people in the name of caring for nature, […] restoration remains a hopeful practice, endeavouring to undo harm and help to heal". Nevertheless, "ecological restoration will always be ethically complex, in the way that all care is". This ambivalence reveals again a relational tension between care, science, and value.

Ambivalence in Environmental Care

Monitoring and restoration help to illustrate the relation between environmental care and the political and economic priorities of Balearic tourism. To understand this relation better, it is important to realize the limits set by the economic power of the tourism industry and the complex dynamics of regional government. Several of my interviewees admitted that regulations included in the Posidonia decree in 2018 were very clear already in early 2000s. However, the actors that could push in that direction lacked the political momentum and courage to make them happen. Those initiatives would have been easily shut down by lobbies back then, something that was not anymore possible in 2018 given the social and political support, and the scientific evidence built over two decades of cross-sectoral collaboration.

In both examples, Posidonia emerges as an agent/object of care that mobilizes academic, regulatory, and citizen efforts, and as an ES provider that can potentially be managed. Posidonia becomes both an example and a challenge to the longstanding status of plants as technical machines able to provide goods and services measured by their monetary value that can be integrated into the economic market (Gerber & Hiernaux, 2022). This integration of ecological management in economic rationales contributes to the creation of new socio-economic structures that result in more efficient and ecological modes of life and production (Stojanovic, 2019). However, it is worth noticing that the shifts in Posidonia management have not yet significantly altered the logics of economic and touristic growth, which continue to represent the main source of pressures on Balearic marine environments. Indeed,

discussions about degrowth (Valdivielso & Moranta, 2019) continue to be marginal in Balearic politics.

Posidonia conservation inevitably falls under the impact of what is broadly referred to as the *Anthropocene*, a geological epoch where global change is marked by human activity (Malhi, 2017). Critiques on this concept suggest that the role played by capitalism as the economic system central to that change should be highlighted, rather than putting responsibility on all humans, suggesting the notion of *Capitalocene* instead (Moore, 2017). Pressures on Posidonia are inevitably integrated in the tourism industry as a capitalist enterprise focused on economic growth. From nautical tourism to the relentless building of infrastructure, or water discharges, much of the pressures are defined by the growing number of people visiting the archipelago each year. While marine care practices can emerge as acts of resistance to capitalist economies (Lynch, 2022), they are forced to coexist with tourism economies. Knowledge-making as care benefits from the presence of a diving sector that thrives in coastal touristic areas. Restoration as a care practice to regenerate regressed meadows emerges as a compensation for those damages while also finds collaboration in initiatives stemming from publicly approved initiatives to expand Balearic coastal infrastructure.

Furthermore, the rise in funding for Posidonia conservation is not isolated from global trends towards the monetization of ES, which are not just a rhetorical tool but actually facilitate the integration of conservation within the private sector (Fisher & Brown, 2014). This economic rhetoric was often featured in the opening statements of the stakeholder meetings I attended, which put forward the idea that investing in marine conservation was worthy because of the economic value the sea provides. The director of one of the biggest foundations regularly made the analogy that if the Balearic Sea was a start-up business, it would easily find an angel investor because of the potential return. This monetary rationale is able to appease to a certain extent the tension between the logics of conservation and economic growth since it rhetorically aligns their objectives. This results in the entanglement of environmental conservation with political economies, despite apparent contradictions. Posidonia is worth knowing, managing and protecting because of the ecological labour (DiNovelli-Lang & Hébert, 2018) that it performs.

Conclusion

Besides the incorporation of this economic rhetoric, the rise of marine conservation has also made explicit the connection between human prosperity and a healthy state of marine ecosystems. The status of Posidonia as agent/object of care involves recognizing the coastal areas as a "multispecies contact zone" (Bolender et al., 2022, p. 234), which forces us to think about the interconnected living webs that make possible caring for the environment and what nonhumans in those webs do for our livelihoods. Thinking about who and what does the caring brings up the question of whose lives matters, exposing the antagonisms and conflicts of multispecies worlds.

Historical damage to Posidonia exposes how, for the tourism industry to grow as it did since the 1950s, damage to the environment was unavoidable. Recent

actions to conserve and restore Posidonia are indicative of a will to redirect that path. However, as many of my informants affirmed, any conservation or restoration effort is futile if pre-existing pressures continue. It is important to provide ways in which those initiatives can carry even if they do not fulfil for-profit rationales (Owens, 2008), turning care practices into well-resourced initiatives rather than depend on affective relations that survive despite precarity and lack of resources. Although completely disentangling environmental care from capitalist initiatives in the Balearics seems a utopian task, developing care-centric narratives (Lynch, 2022) for environmental conservation and restoration is essential to continue promoting more-than-human aquatic relations in which the needs of others are the ethical basis for action (Tronto, 1993).

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Declarations

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Human and Animals Rights Ethical approval was sought and obtained from the Research Ethics Committee at the University of Exeter. Approval for research involving human participants was granted under ID 491528.

Informed Consent Informed consent, including request to use real names when quoting or giving individual views on a given topic, was obtained from all project informants in line with the ethical review of the Research Ethics Committee at the University of Exeter.

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