



A State-of-the-Art Review of Marine Ecosystem Services in the Rías Baixas Natura 2000 Network (Galicia, NW Spain)

Ana Tubío^{1*}, Pablo Pita^{1,2}, Carlota Barañano³ and Sebastián Villasante^{1,2}

¹ Cross-Research in Environmental Technologies (CRETUS), University of Santiago de Compostela, Santiago de Compostela, Spain, ² Campus Do Mar, International Campus of Excellence, Vigo, Spain, ³ Instituto para el Crecimiento Sostenible de la Empresa, Vigo, Spain

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*Correspondence:

Ana Tubío
ana.tubio.gomez@usc.es

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Humans are deeply connected to the oceans, who provide us vital ecosystem services (ES) (climate regulation, control of natural threats, wealth of its biodiversity, etc.), but the oceans are the first to suffer from human activity (climate change, destruction of ecosystems, overexploitation of marine resources, pollution, endangered species, etc.). Marine biodiversity is a fundamental natural capital in the generation of marine ecosystem services (MES), fundamental elements for the maintenance of human wellbeing. The objective of this article is to empirically demonstrate the role of marine ES in natural protected areas in Nature 2000 Rías Baixas (N2RB) (Galicia, NW Spain) in order to (1) to improve the knowledge on natural capital and ES associated to conserved coastal areas, (2) to analyze the contribution of these conserved coastal areas to the provision of sustainable business opportunities, and (3) to analyze if green-oriented policies can revert the current unsustainable exploitation model by providing real opportunities for business development. By creating an inventory, we gathered detailed information collected up to October 2020 of scientific literature, research projects, press releases, information on business initiatives and public policies regulations on ES and conservation of marine biodiversity in the N2RB (Cíes Islands and Island of Ons, including the Ons–O Grove Complex). Better protection of marine natural capital needs coordinated efforts among all sectors of government, business, and international institutions. It is a priority to generate a greater degree of social and business commitment that promotes the conservation of marine biodiversity, through the design of social and business participation strategies in the planning and use of ES in the N2RB areas.

Keywords: marine ecosystem services, Natura 2000 Network, Rías Baixas (Galicia, NW Spain), conservation, marine biodiversity, public policies, business

INTRODUCTION

Ecosystem services (ES) are the conditions and processes through which natural ecosystems and the species that inhabit them support the survival of the human species (Daily, 1997; Duarte, 2000). These conditions and processes maintain, at the global level, biodiversity and the production of goods and services that contribute to human wellbeing (Costanza et al., 1997; Naidoo et al., 2008).

Ecosystem services are defined as contributions of ecosystem structure and function (in combination with other manufactured, social, and financial inputs) to human wellbeing (Burkhard et al., 2012; Burkhard and Maes, 2017). And human wellbeing is understood as the state of a person in which, once the most essential material requirements that lead to the proper functioning of his or her somatic and psychic activity are covered, a good, quiet, decent life is achieved without exceeding the biophysical limits of the ecosystems (Santos-Martín et al., 2015).

Humans are deeply connected to the oceans (Ruiz-Frau et al., 2020). Marine ecosystem services (MES), such as food supply, climate regulation or the creation of leisure and recreational opportunities, are fundamental elements for the maintenance of human wellbeing (McMichael et al., 2005; Selig et al., 2019; Ruiz-Frau et al., 2020). Health benefits linked to life on the coast and the practice of tourism at sea, is also one of the main benefits provided by marine ecosystems to the health and wellbeing of people (Lloret, 2010).

Marine biodiversity is a fundamental natural capital in the generation of MES, understood as the benefits that the human population obtains from marine ecosystems (Rodríguez and Reul, 2010). Marine ecosystems have a crucial role to support the economic prosperity and social wellbeing of adjacent human communities (de Groot et al., 2012). However, the impacts of human activities are altering the structure and functioning of these ecosystems (Vitousek et al., 1997), reducing their capacity to generate ES (Balmford et al., 2002), and threatening human wellbeing (Steffen et al., 2015). Therefore, it is necessary to establish research priorities for MES that allow for the establishment of appropriate policies (Rivero and Villasante, 2016).

Increasing global attention is being paid to the role of the oceans as a source of food and water (Duarte et al., 2009), clean energy [The Organisation for Economic Co-operation and Development [OECD], 2016] and as a means to mitigate climate change (Roberts et al., 2017; Gattuso et al., 2018). However, numerous marine species, habitats, and ecosystems have suffered generalized declines in recent decades [Lotze and Worm, 2009; McCauley et al., 2015; The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES], 2019]. Climate change is further weakening the oceans' productivity and biodiversity (Gattuso et al., 2015; Hoegh-Guldberg et al., 2018; Hughes et al., 2018; Lotze et al., 2019). Climate change and environmental degradation are an existential threat to Europe and the world. Despite international commitments, human actions are damaging the Earth's ecosystems at an alarming rate, potentially crossing safe planetary boundaries (Rockström et al., 2009). In fact, Humanity has entered the so-called Anthropocene era (Crutzen, 2002), the most recent period in Earth's history when human activity started to have a significant impact on the planet's climate and ecosystems (Westley et al., 2011; Gibbard and Walker, 2013; Jouffray et al., 2020).

The conflicts between increasing human demand for marine resources and the decline of marine life under human pressure is focusing attention on the connection between ocean conservation and human wellbeing (Lubchenco and Grorud-Colvert, 2015; Lubchenco and Gaines, 2019). This progressive

and worrying loss of productivity and biodiversity in marine ecosystems (WWF, 2014) has a direct effect on the levels of human wellbeing of the world's population, as already evidenced by international initiatives [The Economics of Ecosystem and Biodiversity (TEEB), 2010; Millennium Ecosystem Assessment [MEA], 2005; The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES], 2019]. These marine ecosystems provide 20% of the average per capita ingest of animal protein to 3.3 billion people, and fisheries support the economy of many coastal areas of the world, employing more than 59.5 million people in fisheries and aquaculture [Food and Agriculture Organization of the United Nations (FAO), 2020].

Recognizing the urgent need for action, the EU Green Deal (COM/2019/640) sets at its core "to protect, conserve and enhance the EU's natural capital, and protect the health and wellbeing of citizens from environment-related risks and impacts" (European Commission, 2019). Restoring biodiversity and ecosystem structures, functions and their benefits to people plays a key role in the Green Deal, also through the new EU Biodiversity Strategy to 2030 (European Commission, 2020) that foresees that all EU countries will need to increase their efforts in order to halt the loss of biodiversity and increase adaptation to climate change.

Based on this context and on the need to couple EU objectives with local challenges, the objective of this article is to empirically demonstrate the role of MES in natural protected areas in Nature 2000 Rías Baixas (N2RB) (Galicia, NW Spain) in order to (1) to improve the knowledge on natural capital and ES associated to conserved coastal areas, (2) to analyze the contribution of these conserved coastal areas to the provision of sustainable business opportunities, and (3) to analyze if green-oriented policies can revert the current unsustainable exploitation model by providing real opportunities for business development.

Based on this context and on the need to couple EU objectives with local challenges, the aim of this article is to empirically demonstrate the key role of marine natural capital and MES derived from conserved coastal areas. We selected part of natural protected areas in Nature 2000 Rías Baixas (N2RB) (Galicia, NW Spain) to (1) to analyze the contribution of these conserved coastal areas to the provision of sustainable business opportunities, and (3) to analyze if green-oriented policies can revert the current unsustainable exploitation model by providing real opportunities for business development.

MATERIALS AND METHODS

Area of Study

In Europe, the human population and the demand for ES are constantly growing, particularly in the coastal areas (Liquete et al., 2013), such as the Natura 2000 Network of the Rías Baixas (Galicia)—hereinafter N2RB—. These areas contain a great diversity of ecosystems with some of the most valuable natural habitats in Europe, and are especially relevant from the point of view of management and conservation of marine biodiversity.

The Natura 2000 is a European ecological network of biodiversity conservation areas, which aims to ensure the long-term survival of species and habitat types in Europe, contributing to halting the loss of biodiversity, being the main instrument for nature conservation in the European Union. In Spain, the Natura 2000 currently comprises more than 222,000 km², including some 84,000 km² of marine areas (37.8%).

The Natura 2000 in the marine area is an integral part of the Natura 2000 European ecological Network and constitutes the application of the Habitat Directive (Directive 92/43/EEC) and the Birds Directive (Directive 2009/147/EC) in the marine environment. The marine Natura 2000 is a fundamental element of Spain's natural capital as it provides a large number of ES that are essential to ensure our wellbeing (Santos-Martín et al., 2020). This marine area is composed of the Sites of Community Importance (SCIs) and the Special Areas of Conservation (SACs) with a marine surface –both protection figures created in the Habitat Directive–, as well as the Special Protection Areas for Birds (SPABs) with a marine surface –a figure created through the Birds Directive–.

Marine SCI are areas of national territory or maritime waters under national sovereignty or jurisdiction, including the Exclusive Economic Zone and the continental shelf, approved as such (the updated list of SCIs for the Atlantic biogeographical region, see Commission Implementing Decision (EU) 2016/2335, notified under document C(2016) 8193). These areas contribute significantly to the maintenance or, where appropriate, the restoration of the favorable conservation status of natural habitat types and habitats of species of community interest listed, respectively, in Annexes I and II of Law 42/2007, in their natural distribution area. Once the lists of SCIs have been approved or extended by the European Commission, they are designated as SAC, together with the approval of the corresponding management plan or instrument.

Spanish marine SPAB are the areas of national territory and maritime waters under national sovereignty or jurisdiction, including the Exclusive Economic Zone and the continental shelf, which are the most suitable in number and surface area for the conservation of the bird species included in Annex IV of Law 42/2007 and for migratory birds regularly present in Spain. In these areas, measures must be established to avoid disturbances and special conservation measures regarding their habitat that guarantees their survival and reproduction.

The marine space of the Rías Baixas of Galicia (2,218 m²) of Natura 2000 includes the external part of the Rías de Arousa, Pontevedra, and Vigo (**Figure 1**). Our area of study comprises two areas within this marine space: (1) the Cíes Islands (SCI, SAC, and SPAB) in the Ría de Vigo, and (2) the Island of Ons (SCI, SAC, and SPAB) in the Ría de Pontevedra, including the Ons-O Grove Complex (SCI and SAC). Both the Cíes Islands and the Island of Ons belong to the Maritime-Terrestrial National Park (MTNP) of the Atlantic Islands of Galicia, considered one of the best conserved native ecosystems of the Spanish Atlantic coasts, including rocky reefs and other sea beds (for example, Villegas-Ríos et al., 2013; Guerra et al., 2015, 2016; Piñeiro-Corbeira et al., 2020; Planas et al., 2021). These islands have just been included in the

UNESCO Tentative List¹ and the Council of Ministers has authorized its inclusion in the Ramsar List of Wetlands of International Importance². The Sálvora Archipelago and the Cortegada Archipelago, as well as Illa de Arousa, have not been included in this study.

Data Collection

In order to know the state of the art of research on MES in our area of study, we performed a bibliographic search of scientific literature, research projects, press releases, information on business initiatives and public policies regulations. Documents on the study area published up to October 2020 were identified and collected (in the case of press releases, only from 2015).

In the case of scientific literature, we used the search tools of *ISI Web of Science* and *Scopus*. The keywords used were “Cíes Islands,” “Ons Island,” “Maritime-Terrestrial National Park of the Atlantic Islands,” “Rías Baixas,” “ecosystem services,” “Natura 2000 Network,” “conservation,” and “marine biodiversity.” Moreover, the references of interest cited in these scientific articles were also included in the review. In the case of scientific literature not published in indexed journals, a similar procedure was followed, using open search engines like *Google* and *Google Scholar*, and the same keywords. In the case of gray literature, technical publications of projects carried out by the organism National Parks of Spain, responsible for the management and conservation of the MTNP, were specifically consulted.

Press releases and business initiatives were collected by using *Google*, including *Google News* using keywords (the same for scientific literature). Finally, we used the search engine of the *Official State Bulletin*³ and *EUR-Lex*⁴ to retrieve regulations, using the same keywords.

Data Analysis

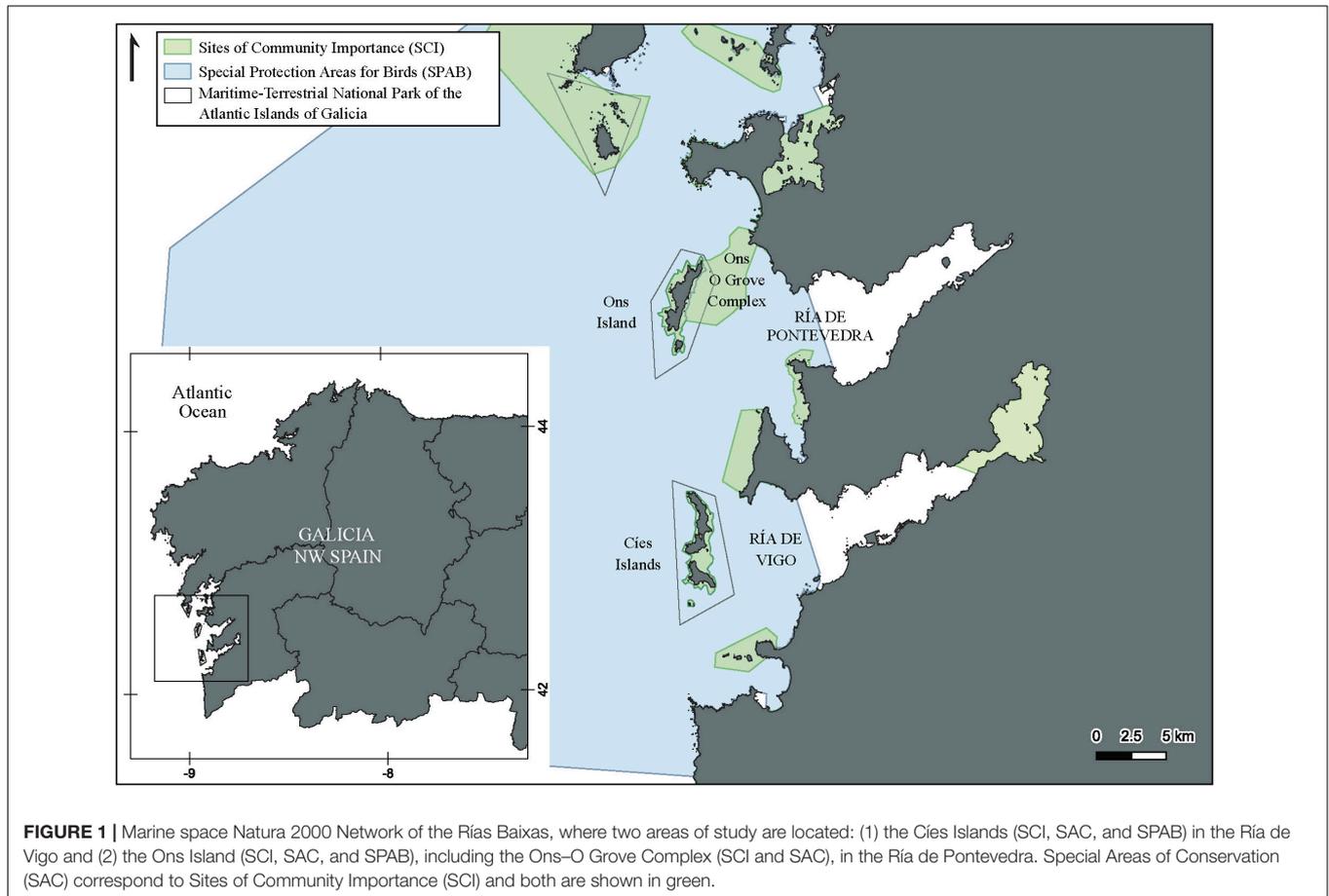
We elaborated a database with information included in the documents collected through the different searches. In the case of scientific papers, we obtained basic details of the publication: author/s, year of publication, title, journal, volume, pages, and doi or ISBN. We also gathered for the contributions to congresses (author/s, year of publication, type of contribution, title, and congress), academic documents (author/s, year of publication, title, institution, and pages), gray literature (author/s, year of publication, title, and resource), research projects (principal investigator, start and final year, institution, type of funding, amount in euros, title, and financing entity), press releases (title, date of publication, and media), business initiatives (name of company, title, and type of financing), and public policies (year of publication, status, title, bulletin, or journal, range, department, number, and reference). See the summary tables by categories in the **Supplementary Material** for more details (**Supplementary Table 1** for scientific publications, 2 for research projects, 3 for press releases, 4 for business initiatives, and 5 for public policies).

¹<https://whc.unesco.org/en/tentativelists/6286/>

²https://www.miteco.gob.es/es/prensa/210420cm inclusionislasatlanticasramsar_tcm30-525113.pdf

³https://www.boe.es/buscar/legislacion_ava.php

⁴<https://eur-lex.europa.eu/advanced-search-form.html>



For simplicity, scientific papers, contributions to congresses (oral communications and/or posters), academic documents (doctoral theses, master's degree, and final degree project) and other gray literature (reports, guides, information sheets, good practices, books and/or book chapters, catalogs, etc.) have been included in a single category called scientific publications. Therefore, five categories were established: (A) Scientific publications; (B) Research projects; (C) Press releases; (D) Business initiatives; and (E) Public policies.

For all categories, the context of the study was identified (year/s, discipline of the first author's affiliation, and geographical location), the scale (local, regional, national or international), the dimension (governance, social, ecological, economic, and/or legal) and the MES analyzed. In this study we follow the *Spanish Millennium Ecosystem Assessment* definitions of MES [Evaluation of the Millennium Ecosystems of Spain [EME], 2011; Santos-Martín et al., 2015]: (1) *Provision services* or direct contributions to human wellbeing from the biotic and geological structure of ecosystems (food, water supply, raw materials, natural medicines, etc.); (2) *Regulation services* that are indirect contributions to human wellbeing from the functioning of ecosystems (climate and water regulation, fertility, etc.); and (3) *Cultural services* that people obtain through their direct experience with ecosystems (cultural identity, recreational activities, environmental education, etc.)

(**Supplementary Table 6** shows the classification of MES used in this study).

In addition, in the case of scientific publications and research projects, the method used to evaluate MES was analyzed. This methodology was categorized according to the type of MES: *Provision* (review, surveys or interviews, species monitoring and tracking, collection of samples, and others); *Regulation* (species monitoring and tracking, collection of samples, spatial distribution, genetic characterization, review, observation, sample analysis, surveys or interviews, and others); and *Cultural* (scientific publications, material and/or activities for dissemination and communication, and others).

Each of the registered documents (scientific publications, research projects, press releases, business initiatives or public policies) has analyzed one or several MES, and consequently, the methods used to evaluate this/these service(s) may be more than one. Therefore, the sum of percentages of MES and methods of evaluation analyzed may exceed values of 100%.

RESULTS

Until October 2020, a total of 129 press releases (31.5% of the total items reported) were published –only since 2015–, 114 scientific papers (27.9%), 44 business initiatives (10.8%),

43 research projects (10.5%), 31 public policies (7.6%), 28 gray literature documents (6.8%), 15 academic documents (3.7%), and five contributions to congresses (1.2%), in relation to ES and the conservation of marine biodiversity in the N2RB.

The results obtained for the five main categories studied are analyzed below: scientific publications (including scientific papers, contributions to conferences, academic documents and other gray literature), research projects, press releases, business initiatives, and public policies.

Scientific Publications

Most of the scientific publications (162) related to MES and marine conservation in the sector of the N2RB considered here were scientific papers (70.3%), followed by gray literature (17.3%), academic documents (9.3%), and contributions to congresses (3.1%) (**Figure 2A**). The number of papers tended to increase over time, reaching a maximum in 2014, with a total of 10 papers published. The general trend of gray literature, academic documents, and contributions to congresses also increased over time, highlighting the seven publications of gray literature in 2018, five of them belonging to the same research project.

Ecology (31.7%) and *biology* (18.5%) were the priority disciplines of the first author's affiliation in the publications analyzed on MES and marine conservation in the area of study.

The scale of the study was mostly local (54.9%), followed by regional (27.8%), while the focus of the publications was mainly ecological (89.5%), but also social (19.8%) and economic (15.4%) (**Supplementary Table 7**). Marine birds (40.0%) were the most studied species, followed by fishes (15.27%, 8.6% were syngnathid fishes), flora (10.5%), cephalopods (8.6%), and amphibians and reptiles (6.67%). In addition, *maërl* seabeds⁵ and *Zostera* meadows⁶ (2.86% each) were also studied.

Cultural (96.9%) and regulation (82.2%) were the most assessed MES (158 and 134 publications, respectively), while only 19.0% of them (31) studied provisioning MES. *Traditional food services* (provision), *biodiversity habitat maintenance* (regulation), and *local ecological knowledge* (cultural) were the most evaluated MES in the publications analyzed for each type of ES (**Figure 3A** and **Supplementary Table 7**).

As expected, the method of assessing MES in the publications reviewed was different depending on the type of service analyzed (provision, regulation, or cultural). Thus, the *review* was the most used method (56.8%) for assessing provision MES, *collection of samples* (36.4%) and *species monitoring and tracking* (25.3%) was for regulation MES, while for cultural MES the main method was *scientific publications* (99.4%) (**Figure 4A** and **Supplementary Table 7**).

Research Projects

In the last 15 years, a total of 43 research projects related to MES and marine conservation were carried out in N2RB areas, in which nearly three million euros from public funds were invested. The number of projects has increased over time (**Figure 2B**) with

a maximum of 12 projects in 2019, which were developed by 11 different institutions.

The scale of the registered research projects on MES and marine conservation was mostly national (46.5%) or local (34.9%) (**Supplementary Table 7**). Among the national projects (20), the Atlantic Islands MTNP was one of the case studies in 80.0% of the projects. The focus of most of the projects analyzed was ecological (72.1%), while the economic (41.9%) and social (34.9%) focus was also notable (**Supplementary Table 7**). In the research projects, the most studied species were birds (16.3%) and fishes (14.0%, 9.3% were syngnathid fishes), but also marine benthic organisms (7.0%) were studied, as well as plants, macroalgae, or marine mammals (4.7% each). On the other hand, 25% of the projects (11) had a business partner or a collaborating company.

Regulation (81.4%) and cultural (76.7%) services were the most evaluated in the projects reviewed, only 2.1% of the projects analyzed a MES provision. *Traditional food services* (provision), *maintenance of biodiversity habitat* (regulation) and *cultural identity and sense of place* (cultural) were the most evaluated MES in the projects analyzed for each type of ES (**Figure 3B** and **Supplementary Table 7**).

In the research projects studied, *surveys/interviews* (37.2%) and *review* (27.9%) were the most widely used methods to evaluate provision MES, *species monitoring and tracking* (53.5%) was for regulation services, and *scientific publications* (74.4%) and *material and/or activities for dissemination and communication* (46.5%) for cultural services (**Figure 4B** and **Supplementary Table 7**).

Press Releases

Since 2015 (**Figure 2C**), a total of 129 news items (press releases, radio and/or television) have been published about MES and marine conservation in the N2RB areas, in 40 different media (27 newspapers—print and digital—, eight television channels, three magazines, and one radio channel). In 2017, a maximum of 30 news were released, after some public controversy generated by the failure of the shipping companies to comply with the quotas for visitors to the Atlantic Islands MTNP.

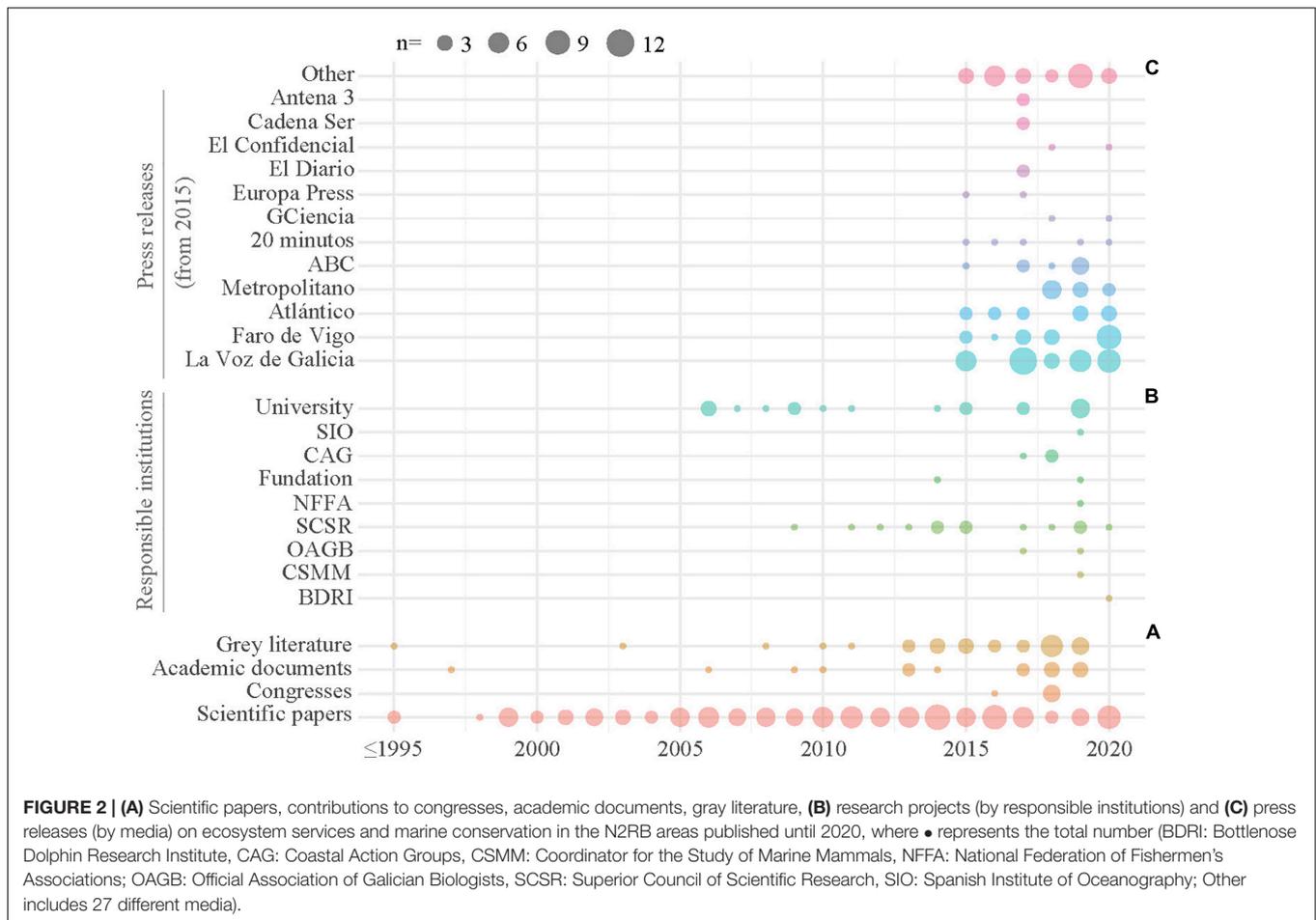
By associating these news with the different services provided by marine ecosystems (**Figure 3C**), it is clear that most of them are related with the cultural service of *non-extractive recreational activities* (62.8%), and to a lesser extent, with the *aesthetic enjoyment of the landscape* and *environmental education* (15.5% in both services). On the contrary, provision and regulation services have much less relevance in the news analyzed about MES and marine conservation in the N2RB areas (**Supplementary Table 7**).

Business Initiatives

Up to 44 business initiatives related to the MES and marine conservation have been registered in the N2RB areas, involving almost 50 different companies. These initiatives were mainly funded with private funds (71.4%), locally (90.9%) and, with an ecological (100.0%) and/or social (27.3%) focus. *Non-extractive recreational activities* (79.5%), *environmental education* (61.4%), *cultural identity and sense of place* (38.6%), and *spiritual and religious enjoyment* (36.4%) were the cultural service that

⁵ Composed of coralline algae that grow in nodules in the sublittoral zone.

⁶ Seagrass that forms submersed meadows.



predominated in the registered business initiatives (**Figure 3D** and **Supplementary Table 7**).

Most of the companies analyzed (93.2%) belong to the service sector. The economic activities of these small local companies are, i.e., nautical activities (sailing, kayaking, etc.), underwater activities (snorkeling, scuba diving, etc.), bird watching, whale watching, scientific dissemination, starlight, tourism (scientific, cultural, adventure, nature, and/or marine), and/or volunteering. All of them carry out their activity totally or partly in the N2RB areas.

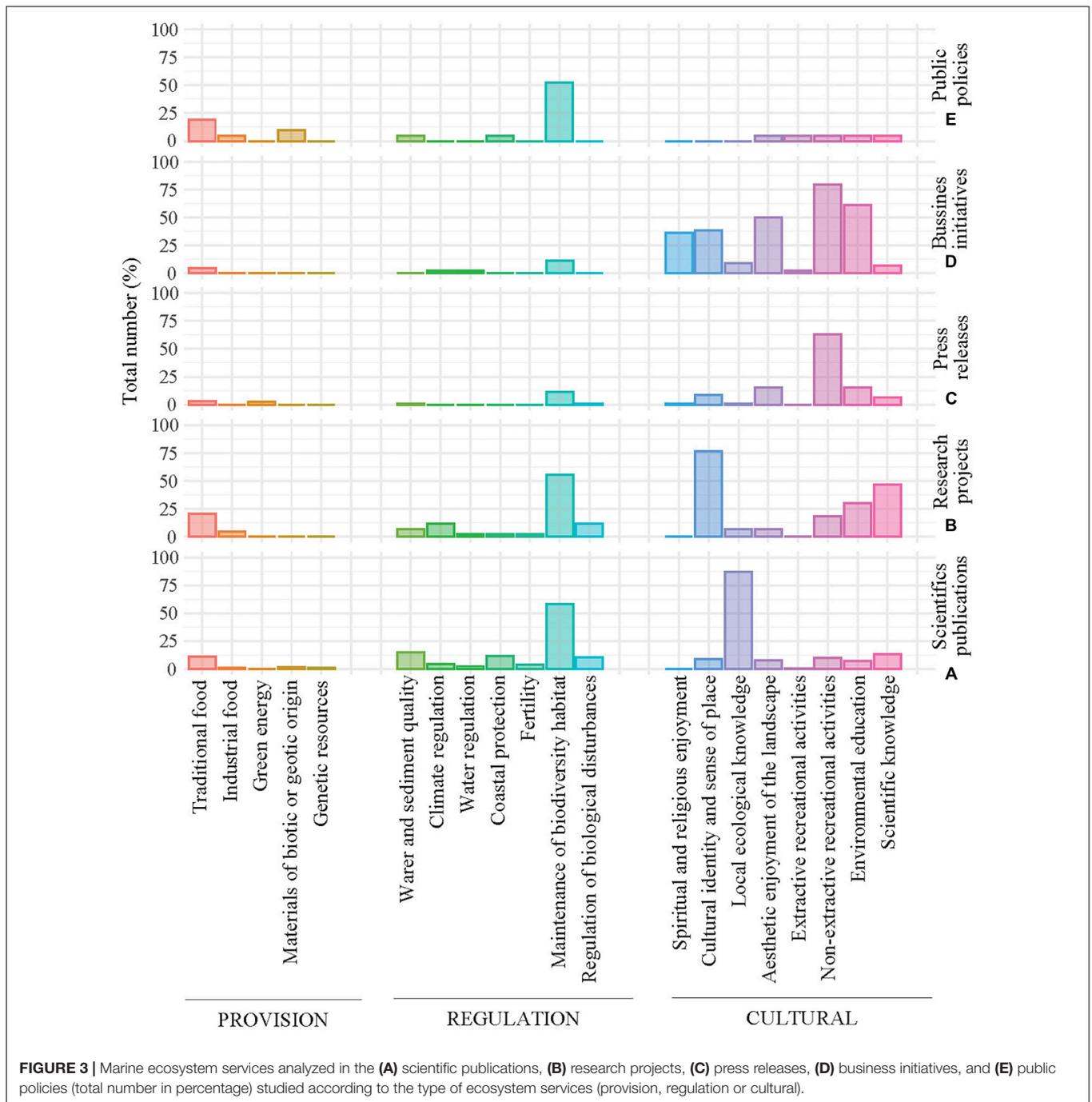
On the other hand, 72.7% of the inventoried activities are green businesses. Most of these activities were tourism (9), environmental education (8), nautical and/or underwater (6), bird and whale watching (3), scientific dissemination (3), but we also recorded cultural activities (1), starlight (1), and volunteering (1). 25% of the inventoried activities were organized by “non-green” businesses, including three public administrations, two canneries, two shipping companies, one port, one bank, and one supermarket.

Public Policies

The European, national and regional administrations have developed a complex legal framework to address the conservation of marine biodiversity in the study area, and to manage the

provision of marine ES. In this study, we have reviewed 31 European (29.0%), national (45.2%), and regional (25.8%) regulations (**Supplementary Table 7**).

In Europe, the Habitats Directive (Directive 92/43/EEC) and the Birds Directive (Directive 2009/147/EC) are aimed to ensure the conservation of biodiversity through the protection of natural habitats and the sustainable management of wild fauna and flora. The Marine Strategy Framework Directive (Directive 2008/56/EC) establishes the framework in which to adopt the necessary measures to achieve or maintain a good environmental status of the marine environment by 2020, and the Directive on Maritime Spatial Planning (2014/89/EU), sets the framework for maritime spatial planning, with a view to promoting sustainable growth of maritime economies, sustainable development of marine areas and sustainable use of marine resources. The current Common Fisheries Policy –CFP, Regulation (EU) 1380/2013– aims to apply the ecosystem approach to fisheries management, so that fishing activities have a minimal negative impact on marine ecosystems while at the same time generate economic, social and employment benefits. In 2014, the European Maritime and Fisheries Fund –Regulation (EU) 508/2014– established the financial measures for the implementation of the CFP, among others.



Spain, following the guidelines of the European Commission, has developed its planning instruments for the conservation of the biodiversity of marine ecosystems. These include Law 42/2007 on Natural Heritage and Biodiversity, Law 41/2010 on the protection of the marine environment, and Law 2/2013 (amended by Law 9/2018) on the protection and sustainable use of the coast. Law 42/2007 defines the Natura 2000 European ecological Network as a coherent ecological network. The development of projects in the Natura 2000 Network areas, depending on their typology, will be subject to ordinary

strategic environmental assessment or ordinary or simplified environmental impact assessment in accordance with the terms provided in Law 21/2013, of December 9, Environmental Assessment partially modified by Law 9/2018. These laws includes the assessment of repercussions on the Natura 2000 within the different assessment procedures, and functions as a basic tool for *ex ante* assessment of human impacts on all types of environments.

At the state level, Law 15/2002 declared the Atlantic Islands MTNP, while RD (Royal Decree) 1082/2008 expanded its

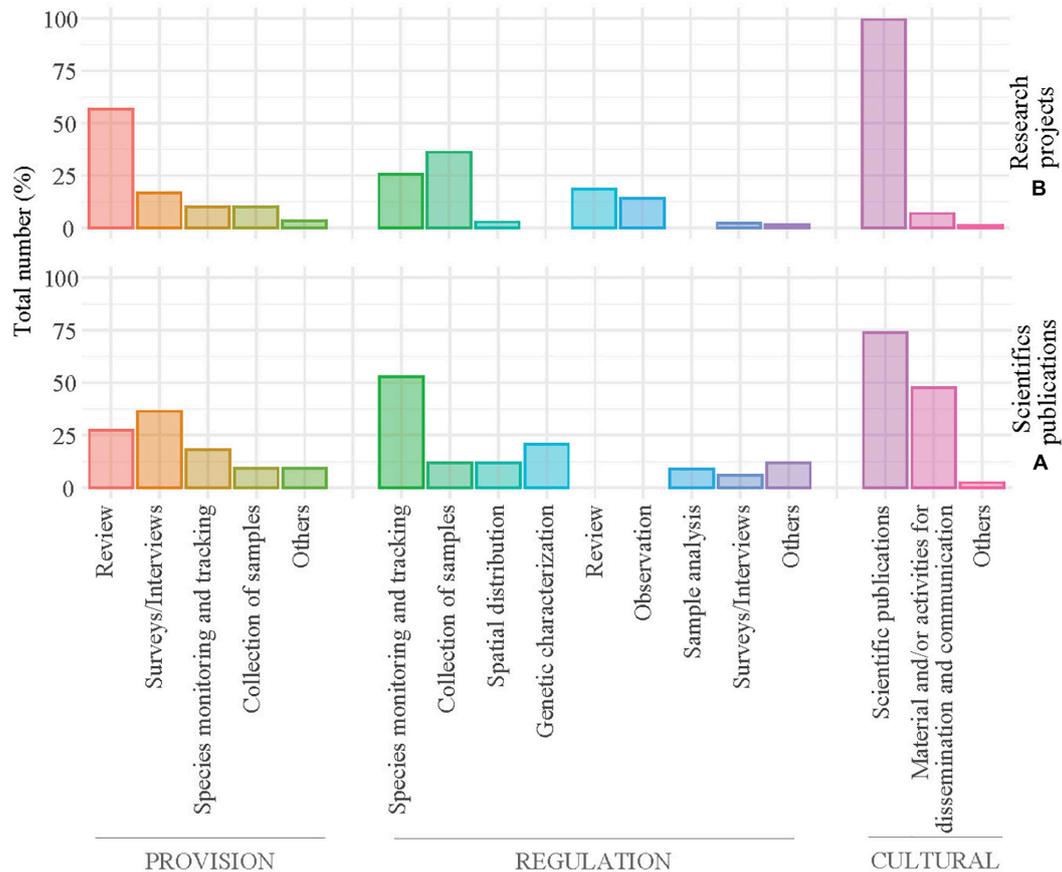


FIGURE 4 | Method of evaluation of the marine ecosystem services analyzed in the (A) scientific publications and (B) research projects (total number in percentage) studied according to the type of ecosystem services (provision, regulation or cultural).

functions and services in terms of nature conservation, and RD 389/2016 approved the Director Plan of the NP Network. The Autonomous Community of Galicia, via Decrees 274/1999 and 23/2006, regulated the planning and management of the natural resources of the Atlantic Islands MTNP, and in 2018, its Director Plan for use and management was approved (Decree 177/2018). As for the conservation of biodiversity in Galicia, in 2019, Law 5/2019 was published with the aim of establishing the legal regime for the conservation, sustainable use, improvement and restoration of natural heritage, biodiversity, and geodiversity.

If these national and regional policies are related to the classification of the MES proposed by Santos-Martín et al. (2015), most of them can be associated with the ES of regulation of *habitat maintenance of biodiversity* (51.6%) (Figure 3E and Supplementary Table 7).

DISCUSSION

To achieve the integration of biodiversity issues into broader policies, strategies, programs and actions, it is necessary to improve our understanding of the linkages between biodiversity,

ES, human wellbeing, and nature conservation (Bastian, 2013). In this sense, our analysis of the state of the art on the conservation of marine biodiversity in two marine areas (Cíes Islands and Island of Ons, including the Ons-O Grove Complex) of the Natura 2000 Network of the Rías Baixas (Galicia, Spain), increases the knowledge of marine natural capital, and the associated MES, and contributes to our better understanding of the socioeconomic interactions between human activities and marine ecosystems. This article also contributes to research into how organizations can manage their relationship with the natural environment so as not to destroy the very life supporting foundations provided by nature (Winn and Pogutz, 2013).

Human activities depend on biodiversity and ES, and business is not an exception (Del Río Murillo et al., 2012). In the context of the environment and competitiveness debate, biodiversity is often understood by companies as a new form of external environmental constraint. Nevertheless, businesses need to understand biodiversity is important, and be aware of the risks and opportunities associated with their dependence on healthy ecosystems and certain ES (Houdet et al., 2012). Most of the activities inventoried in this article are green businesses. Green business approaches could be one of the best instruments to mitigate the environmental, social, and economic effects of

climate change and environmental degradation, as they quantify environmental incorporation without compromising economic development (Sarkar et al., 2021).

The anthropogenic impacts (through individuals or businesses) made on the environment should be regulated by the institutions to take proper care of its use and abuse (Sardá, 2013). In most cases, this is not working properly due to a lack of priorities to protect public goods by the authorities. Nature brings us benefits through marine ecosystem goods and services, and, in a way, whoever benefits from those goods and services should have a responsibility for its deterioration. Solutions for these problems must foster greater collaboration between the public and private sector, and take all stakeholders to come up with new ideas to protect these natural resources in a sustainable way.

The concept of ES might be a useful lens through which to view environmental and social performance of businesses (Waage, 2014), and is being increasingly incorporated into environmental policy formulation and management approaches (Jorgensen et al., 2015). Assessing the dependence and impact that a business has on ES allows for adapting the decision making of local authorities, and systematically including the assessment of ES in existing regulatory frameworks for service use planning and integrated environmental management, either in a strategic application, at a broader spatial (municipal) scale or in a specific locale within the municipality (local).

Private companies and private managers should be aware of the status of ES on which they depend for its future taking part in its protection (Sardá, 2013). Public-private partnership alliances need to be developed to find the way to manage ES correctly. The 44 business initiatives identified in our study (72.7% of them are green businesses) show that a small part of the business community is recognizing the importance of ecosystem health and its ability to provide goods and services. These goods and services are necessary to maintain the competitiveness and sustainability of business operations and, as such, businesses must increase their involvement in the effort to ensure the proper functioning of natural systems (Sardá, 2013).

The business initiatives identified in our study can provide potential social-ecological benefits for people's health and wellbeing, and also, for the local economy. In this sense, Phelan et al. (2020) demonstrated the vital interactions between communities, local economies and coastal ecosystems, as well as the important role of community-based ecotourism in creating effective mechanisms to preserve natural and cultural heritage. According to Malinauskaite et al. (2021), activities such as marine mammal watching can play an important role in economic, social and cultural life, and are perceived as an important part of the ecosystem by both local residents and visitors. However, the underwater landscape of the Atlantic Islands MTNP is still unknown for many people (Piñeiro-Corbeira et al., 2020). Therefore, it is necessary to disentangle MES benefits to promote the potential of marine ecosystems for the development of local economies.

The transition toward a sustainable economy requires rethinking the relationship between the economic system and natural capital (Del Río Murillo et al., 2012). In this sense,

protected natural areas are a basic tool for protecting natural resources and a source of employment. The favorable legislative framework, through the Natura 2000 Network, means that the protected area can grow, thus creating new job opportunities. Measures that can, as far as possible, encourage conserving biodiversity or the sustainable use of its components are increasingly recognized as a key tool for the different economic sectors to join biodiversity considerations into their policies, strategies and actions.

According to the Evaluation of the Millennium Ecosystems [Evaluation of the Millennium Ecosystems of Spain [EME], 2011], measures to conserve natural resources are more likely to succeed if local communities are given ownership, take part in benefit sharing and are involved in decisions. We still need to work hard to better inform all parts of society. Better protection of natural capital will need coordinated efforts among all sectors of government, business and international institutions. It is a priority to generate a greater degree of social and business commitment that promotes the conservation of marine biodiversity, through the design of social and business participation strategies in the planning and use of ES in the N2RB areas.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

AT drafted the manuscript. PP, CB, and SV revised the manuscript. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fmars.2021.683866/full#supplementary-material>

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

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