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Ecosystem Services at the Archipelago Sea Biosphere Reserve in Finland: A Visitor Perspective

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Abstract: The United Nations Educational, Scientific and Cultural Organization's (UNESCO's) Biosphere Reserves aim to be flagships of sustainable landscapes. Many of them are important locations for tourism and leisure activities. We explored the perceptions of short-term visitors and summer residents on ecosystem services (ESs) tied to characteristic habitats of the Archipelago Sea Biosphere Reserve in Finland. During holiday season, we conducted structured on-field interviews with 74 Biosphere Reserve visitors. From these data, we gained information on the visitors' appreciation of different ESs and the selected habitats. We also derived habitat-specific ES profiles. Excluding the reedbeds, most habitats were both highly valued and considered as important producers of the listed ESs. The derived ES profiles were partially overlapping and inclined towards appreciation of cultural services, and the importance of scenery was highlighted. Provisioning services were not particularly appreciated. We discovered several linkages among biodiversity, ESs, and recreational land uses. Certain habitats were found to be in need of protection under high recreational land-use pressure, but also potential synergies were found. Our method introduces an important socio-cultural perspective into the region's land management that aims to find a balance between the protection of the Biosphere Reserve's unique biodiversity and the need to support sustainable local livelihoods and tourism.

Keywords: Baltic Sea; biodiversity; conservation; habitat type; ecosystem service; landscape; recreation; UNESCO Biosphere Reserve

1. Introduction

Sustainable land use planning and management of natural capital is dependent on sound knowledge of both spatially explicit information on the environment and user-defined preferences and values [1,2]. One of the current challenges in integrated ecosystem assessments is to combine the biophysical and biological characteristics of an ecosystem with ecosystem services (ESs), i.e., the benefits and values they deliver to contribute to human wellbeing [3–5]. Ecosystem services of the coastal ecosystems in the Nordic countries were recently assessed by Belgrano et al. [5]. How ecosystems produce ESs is commonly defined through the so-called cascade model [3]. The model describes the role of ecosystem structure, functions in ecosystems, harvested benefits, and monetary, societal, health, and intrinsic values and costs related to those benefits [3,6]. However, there is diversity in how different ecosystem functions become realized as services, depending at least on whose benefits

we refer to, which geographical area the assessments concern, and the scale at which the benefits are addressed [7,8].

Habitats, as ecological communities with distinct biotic and abiotic characteristics, are practical units that provide ESs [9]. Habitats are also relevant to land-use planning, and often form the basis of biodiversity conservation practices (e.g., [10]). The recent assessment of threatened habitats in Finland paralleled habitat types with ecosystems [11]. The assessment was conducted using the International Union for Conservation of Nature (IUCN) Red List of Ecosystems method [12]. As the distinct character of the habitat influences its land use, habitats have also been used as study units in economic analyses that reveal monetary valuations of non-marketed functions and services of ecosystems [13,14].

Habitat conservation efforts rely on concrete arguments and justification of the protection needs and actions, but such straightforward conclusions often are hard to achieve due to complex local contexts. For example, as Braat and ten Brink [15] propose, ES supply is linked to land-use intensity and the degree of modification of the native species pool. They suggest that ES supply, in general, peaks somewhere in the moderate land-use intensity, whereas the cultural service supply is usually highest if the land-use intensity is light and native biodiversity level is high [15]. The linkages among land uses, biodiversity, habitats, ecosystems, and ESs are deeply intertwined (e.g., [16–18]).

Biodiversity is the basis for a variety of ecosystem functions, while it also plays an important role in the supply of cultural services, which people enjoy in their everyday life and leisure time activities [4,19–21]. Their perceptions, and not just objective scientific evidence of effectiveness, enable the long-term success of conservation [22]. Thus, it is necessary to know how various habitats with unique species combinations are perceived and valued by different people who use and enjoy them. Increased knowledge is needed both on the contribution of habitats to ES supplies and on people's views about these linkages where biodiversity and ESs can and should be considered at the same time [23–25]. As a result, land-use planning targeting sustainable ecosystem management and conservation should take into account biodiversity, land-use intensity, local social-ecological characteristics, and the provision of ESs, together with their potential trade-offs. If conservation needs and the management of ESs are integrated, it may be possible to battle biodiversity loss, which is currently one of the greatest threats to the ecosystems and human well-being [19,26,27].

Provision and usage of ESs can be assessed through biophysical and economic to socio-cultural approaches [28]. ES mapping and assessment methods have been based, for instance, on models and indicators [25,29,30], or spatial land-cover data, which are used as a proxy and assessed by a panel or groups of experts [10,24]. However, these methods have lacked detailed information on habitat-specific benefits that people perceive when observing and visiting different sites. Few assessments of habitat types have yet been done in relation to sociocultural benefits [31,32] due to the challenges in measuring socio-cultural values [33]. The variety in subjective experiences of different people makes it impossible to identify cultural ESs solely from proxy data and expert opinions [24,34–37]. Different actors give different values to habitats and ESs perceived in relation to them [38,39]. Therefore, participation of local actors and stakeholders is needed for planning and management processes, and preferably in a way that ESs are identified and linked with different habitats and ecosystems by the participants themselves [40–42]. Participatory methods are increasingly used in recent ES-assessment case studies (e.g., [36,41,43–45]), but more knowledge is needed to analyze local stakeholders' preferences in relation to multiple ESs across service categories (see review by [43]). If these stakeholder-driven assessments of the valuation and usage of specific ESs could be more concretely linked with biophysical habitat types, they could be used for constructing more realistic argumentations for habitat protection schemes and management actions (e.g., [46]).

Although the importance of local people's perceptions on ecosystem management has been acknowledged [22,42], there is more to learn from tourists' and other visitors' experiences. Many recreational values and activities are founded on diverse and unique landscapes that are rich in biodiversity [47,48]. The visitor point of view has become increasingly important, since many biodiverse

landscapes are important to tourism and other leisure-time uses. The visitors' perceptions have an important impact on conservation of such landscapes and the associated local economies [48–50].

The United Nations Educational, Scientific and Cultural Organization's, or UNESCO's, Biosphere Reserves provide excellent case study systems for research on the linkages among biodiversity, ESs, and land uses by different actor groups. The Biosphere Reserves aim at being living examples of sustainable development [51]. Establishment of a scientific basis for the improvement of relationships between people and their environments was the main agenda in 1971, when UNESCO launched the Man and the Biosphere Program, of which these special places for people and nature belong [51]. As many of the Biosphere Reserves are valued tourist attractions (e.g., [52,53]), including their visitors' perceptions in reserve management planning is crucial.

In this paper, we study visitors' perceptions on a set of distinctive habitats that are characteristic to the Archipelago Sea Biosphere Reserve (ABR) in southwestern Finland. Through structured interviews and visual interpretation of habitat photographs we explore the subjective favorability of each of the habitats to the ABR landscape. We also analyze how perceived ESs coincide and differ among the habitats. We use this information to detect possible habitat-specific unique combinations of perceived ESs and call these "visitor-based ES profiles". ES profiles are similar as those ES assessments done for habitat complexes or biotopes [54] and resemble the results of the ES bundle analyses [55,56].

Our interest is to create a general understanding of the ABR visitors' appreciation of a set of habitats and ESs in the Biosphere Reserve. By identifying which ESs visitors relate to the selected key habitats, we establish the visitor-based ES profiles for each habitat type in order to explore the multifunctional character of the habitats. Summer tourism and leisure-time residence are characteristic and increasingly important land-use practices and sources of livelihood within the ABR landscape. Our results are informative to regional planning, which aims to protect the Biosphere Reserve's unique biodiversity, safeguards the cultural heritage tied to the local land-use traditions, and guides sustainable use of the ABR's natural resources.

2. Materials and Methods

2.1. Study Area

The Archipelago Sea Biosphere Reserve (ABR) is located in Southwestern Finland in the Baltic Sea. It hosts rich biodiversity with a variety of culturally valuable environments and has been part of UNESCO's Man and Biosphere program since 1994 [52,57]. For planning and conservation purposes, the ABR is divided into three zones with differing land-use aims. The core area of the ABR is conserved: it consists of islands belonging to state-owned Archipelago Sea National Park, which includes both traditionally managed cultural landscapes and strictly protected areas with low human impact [48]. The core area is surrounded by a buffer zone with mainly privately-owned land with moderate human impact (Figure 1). The largest islands with the most significant human impacts and land-use pressure are categorized into a collaboration zone [48,57]. The whole ABR is relatively sparsely populated with around 3800 year-round permanent residents [57]. The ABR offers easy accessibility to a broad range of recreational activities and is of significant recreational importance not only to its residents, but also to tourists, summer residents, and seafarers [47]. During the holiday season, the ABR population increases considerably due to short-term visitors and summer residents, with a regular peak in their numbers in July [47,48]. In 2017, the total number of visitors in the Archipelago Sea National Park was 83,400, positioning it among the most popular national parks in Finland [58].

The geological, climatic, and biogeographical diversity of the region creates the foundation of the archipelago landscape. Habitat patches that occur on islands are surrounded by sea and thus are located as scattered fragments, which are sensitive to sudden changes [59]. Resulting from long-term cultural influences and traditional land-use practices, there are several unique and biodiversity-rich habitat types in the transition zone from inland areas to the sea [60]. Maintenance of cultural values, which largely stem from the visual landscape and recreational opportunities, are among the priorities

in the management of the National Park and the ABR [48,57,59]. The ABR sustains a long history of cultural activities and traditional lifestyle, including practicing farming and fishing, in the remote island villages [52]. This unique combination of heterogeneous landscape, rich biodiversity, and various land uses creates an ideal study area for piloting the visitor-based ES-profiling method.

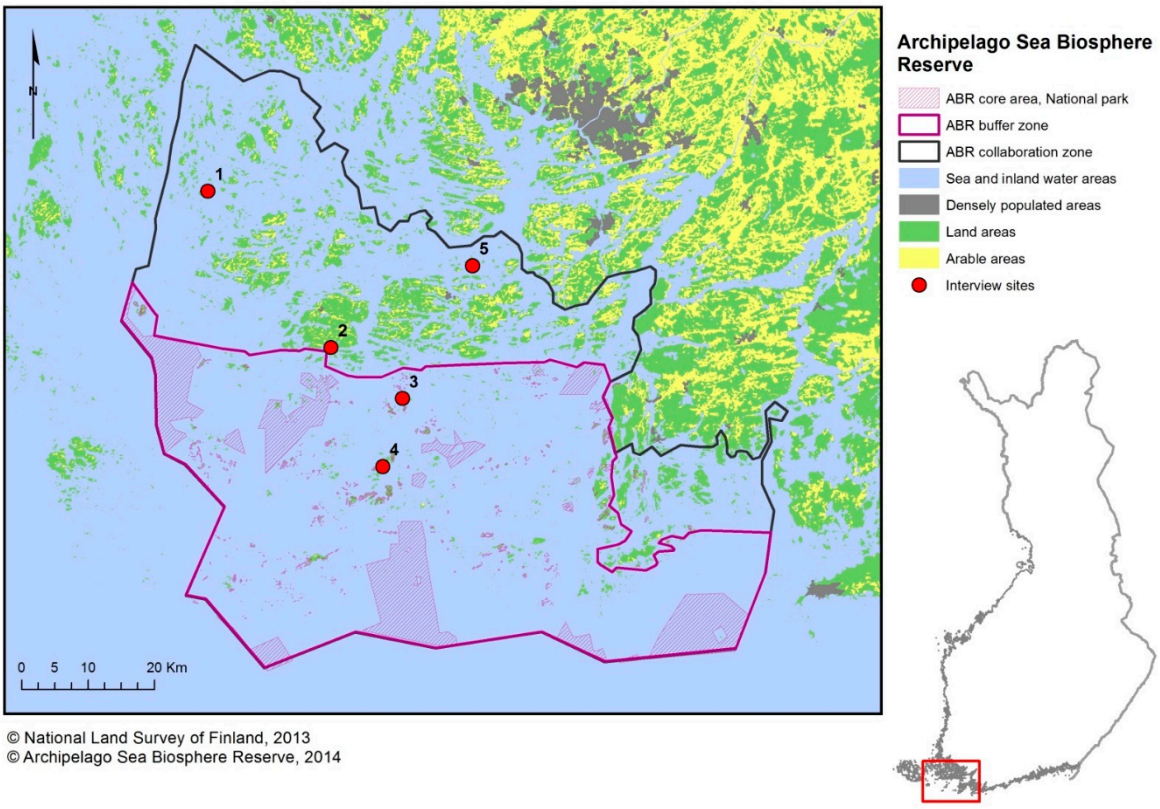

Figure 1. The study region. The Archipelago Sea Biosphere Reserve (ABR) covers an area of 5400 km^2, of which 4580 km^2 is sea. The red dots on the map refer to the sites where the visitor interviews took place.

2.2. Selection of the Studied Habitats

The characteristic features of the ABR landscape are represented in various habitat types that differ in their biodiversity value. For the purposes of this study, we selected an array of key habitats that host specific biodiversity values and are distinguishable in the ABR landscape. Here an important motivation was an analogy to species groups, whose perceived charisma influences the level of reported ES benefits [18]. Thus, we selected habitats that are typical to the ABR but rare elsewhere in Finland. To highlight the distinctiveness, we excluded the most common habitat types, i.e., open water, cliffs and rock surfaces, and coniferous forests [47,48,52]. To incorporate a range of ESs and to encompass biodiversity dependent on aquatic, semiaquatic, and terrestrial conditions, we included nine different habitat types. These occur either as distinct habitats (bladder wrack, bird islet, sand beach, reedbed, and juniper thicket) or are complexes of co-occurring habitat types (seaside meadow, dry meadow, wood-pasture or wooded meadow, and broadleaf forest; hereby all collectively referred to as habitats) (Table 1). The habitats were identified based on the descriptions from the Assessment of Threatened Habitat Types in Finland [60].

Table 1. Descriptions of the habitats as well as the common and official names and national red list statuses (according to [60]) are listed.

Commonly Used Name	Official Name Used by Environmental Administration	Red List Status [1]	Description
Bladder wrack	*Fucus* spp. communities on rocky and stony bottoms (habitat type)	VU	Continuous *Fucus* vegetation from 0.5 to 5 (10) meters deep in salty waters (3–4‰).
Bird islet	Coastal islets and cliffs with bird colonies (habitat type)	NT	Small islets and open parts of larger islands colonized by seabird species. Nesting places on rock or moraine; species' preferences range from open rocks to steep slopes and scattered, woody islands. Bird islets sustain characteristic communities of calcareous vascular plants, lichens, and mosses.
Sand beach	Coastal sand beaches (habitat type)	EN	Baltic Sea beaches consisting of fine and coarse-grained sand and gravel. Sand beaches are characterized by unsettled soil, low nutrient level, water level fluctuation, wind, heat and salinity. Vegetation is mosaic-like and zoned. Invertebrate diversity is high, as sand beaches sustain a variety of specialist species.
Reedbed	Coastal reedbeds with *Phragmites australis* (habitat type)	LC	Common reed (*Phragmites australis*) vegetation on seashores and in open and sheltered habitats further from the waterfront. Based on soft (clay and silt) soils. Reedbeds have increased in coverage due to Baltic Sea eutrophication and decrease in seashore pasturage.
Seaside meadow	Coastal meadow (habitat type complex)	CR	Habitat mosaic consisting of open meadows with relatively low, continuous herbaceous plant and grass coverage. Seaside meadows are located between the highest and the lowest waterfront and characterized by flooding and continuous water level fluctuation. Vegetation is zoned according to moisture condition. Seaside meadows provide important habitat for several bird species.
Dry meadow	Dry meadow (habitat type complex)	CR	Open, nutrient-poor seminatural grasslands with herbaceous vegetation on dry sand, gravel, or moraine soil. Species richness of vascular plants and invertebrates is typically high. Dry meadows are dependent on grazing or mowing and have decreased in coverage after cessation of traditional domestic animal pasturage.
Wood-pastures and wooded meadows	Wood-pastures and wooded meadows (two habitat type complexes with rather similar visual appearance)	CR	Seminatural grasslands and pastures with sparsely scattered tree cover and park-like appearance. The structural diversity and general species richness of wood-pastures and wooded meadows is high. Ground cover is a mosaic of patches of grass and herbaceous plant vegetation. Wood-pastures often occur on stony soils in slopes or other rugged terrains. Crowns of pollarded trees in wooded meadows are densely branched due to foliage harvesting. Wood-pastures and wooded meadows have become rare as a result of ceased management (typically grazing of domestic animals, but wooded meadows are also mown).
Broadleaf forest	Herb-rich forests with broadleaved deciduous trees (habitat type complex)	EN	Mixed-species deciduous forests on eutrophic soils. Forest floor is dominated by bryophytes and ground cover by herbaceous plants and grasses. Biodiversity is high as there is great variety in tree age and species composition. Broadleaf forests are important habitats for deadwood-dependent species.
Juniper thicket	Coastal *Juniperus communis* thickets (habitat type)	LC	Dense juniper (*Juniperus communis*) shrubberies on open moraine islands and on top of rocks and moraine hillocks. Ground cover is insubstantial, species adjusted to dry and nutrient-poor soil. Shrub layer has become denser after decline in pasturage and controlled burning. Harsh winter conditions protect the juniper thickets from overgrowth of trees.

[1] LC = least concern, NT = near threatened, VU = vulnerable, EN = endangered, CR = critically endangered.

2.3. Selection of the Studied Ecosystem Services

Seven ESs relevant in the ABR context—and specific to the studied habitats—were chosen based on the Common International Classification of Ecosystem Services (CICES; [20]) and published studies addressing local actors and stakeholders' perceptions on ESs [44,45,61] (Table 2). Provisioning ESs included food-related services (hunting, fishing, and different harvesting activities) as well as energy production. Majority of hunting and fishing activities in the ABR are for artisanal or recreational purposes and have a strong cultural importance. Thus, they are rather separate compared with commercial fishing, for instance. A typical regulation and maintenance service associated with the ABR is regulation of soil and water quality. Scenery, cultural value, and recreational value are distinctive cultural services of the region. In addition, biodiversity was included as a separate intrinsic value that underlies the ESs and could be directly linked to the studied habitats.

Table 2. Descriptions of studied ecosystem services (ESs) and their division into ES categories. Categories are indicative since some of the ESs may have multiple service roles. For example, hunting and fishing or quality of water, are cultural services apart from provisioning or regulating services [6,20]. In addition, biodiversity was included as an intrinsic value reflecting the region's underlying fundamental capacity to deliver any of the listed ESs.

Ecosystem Service [1]	Category	Description of Studied Ecosystem Service
Hunting and fishing	Provisioning service	Hunting and fishing for household or commercial use.
Collecting and harvesting	Provisioning service	Collecting or harvesting berries, mushrooms and/or plants for household or commercial use.
Energy production	Provisioning service	Biomass-based energy production for household or industrial use, including collecting firewood and mowing or clearing of vegetation with the aim of utilization for bioenergy.
Water and soil quality	Regulation and maintenance service	Ability of the habitat to maintain good soil or water quality. In terrestrial habitats, this refers to an ability to resist soil erosion or to maintain soil moisture and nutrient cycle. In aquatic or semiaquatic habitats, this refers to the ability to maintain or indicate good water quality (e.g., in terms of purity, clarity, and low nutrient load).
Scenery	Cultural service	Personal perception usually based on visual evaluation of the aesthetic appearance of the habitat.
Cultural value	Cultural service	Significance of the habitat as contributing to local heritage, such as traditional land uses and other cultural practices typical for the Archipelago Sea region.
Recreational value	Cultural service	Self- or professionally organized recreational use: hiking, travelling, boating, camping, or other leisure-time activities.
Biodiversity	All services	Including all levels of biotic diversity, ranging from genetic variation to species richness to habitat and ecosystem heterogeneity; to facilitate the interviews, a simplified and more concrete "plant and animal species richness" was used.

[1] Sections based on CICES classification [3,20].

2.4. Data Collection through Structured Interviews

Voluntary ABR visitors and summer residents assessed the appreciation of the habitats and their linkages to ES delivery through structured interviews. The interviews were arranged during the summer holiday season, in June and July 2013. The ABR visitors were surveyed using a theoretical sampling strategy [62] to represent different opinions. Here the aim was to collect a sample to cover maximum variety, rather than to achieve statistical representativeness. The interviews were situated in five popular recreational areas and market places within different zones of the ABR, in the Pargas (Parainen) municipality (see Figure 1). The interview questions focused on the respondents' personal

opinions and perceptions; i.e., they answered based on their experience and knowledge of the ABR habitat types and their functions.

All interviews were conducted in person by the same interviewers and took on average 20–30 min. The respondents were presented with multiple choice questions they could answer anonymously on paper, with the assistance of the interviewer. The interview form started with questions about the respondent's background and self-evaluated knowledge of the ABR (the form is available in Supplementary Materials). Next, respondents were asked to indicate their personal perception about each of the studied habitats in relation to their contribution to the ABR nature as a whole. The form utilized a four-step Likert scale ranging from negative to positive, and including a "cannot say" alternative. A positive answer to the question means that the respondent perceived the habitat as a favorable part of the ABR landscape. A negative answer indicates that there are unwanted or disadvantageous impacts stemming from the habitat in question.

To facilitate the interview process and the identification of the studied habitats we used specific text descriptions (see Table 1). Also, photographs have been found useful for exploring perceptions on ESs (e.g., [63]) and hence, we used reference photographs to ensure that respondents identified the studied habitats and their characteristics. Each habitat was represented by four photographs (see the interview form in Supplementary Materials for examples) taken from the ABR region. The respondents completed the form independently while the interviewer presented habitat photographs to aid with the identification of the habitats in question.

Similar questions were posed according to the perceived importance of each of the studied ESs. During the interviews we avoided using the term "ecosystem services". Instead, we used the words "benefits and values of nature to people", with the aim of making the terminology understandable to respondents from various backgrounds [43]. The same ESs were presented for all habitats to avoid prescriptivism. Finally, the respondents were asked to evaluate the importance of each studied habitat as a producer of each ES (using the same answer scale as in previous questions).

The interview form was specifically designed with regard to the studied habitats and ESs as well as the selection of non-expert respondents. The form was tested with a group of six people before the actual sampling. The form was available in Finnish and Swedish, as both languages are common among the ABR visitors.

2.5. Data Analysis

Data were saved to a database with answers coded according to respondent IDs. First, we explored the respondents' background information in order to obtain a better understanding of their association with the ABR. Then we analyzed the general appreciation of the habitats and the ESs among the respondents. The data on the perceived ESs of each habitat were used to extract visitor-based ES profiles for the nine habitats. We composed the habitat-specific profiles based on the average score of benefits and values perceived by the visitors (measured by the mode, or most frequent, value along the 1–4 Likert scale).

Data was analyzed using R version 3.5.0 [64]. Package "fmsb" [65] was used to produce graphical representations of the ES profiles. The data and the code used for the analysis and plotting are provided in Supplementary Materials.

3. Results

3.1. Respondent Characteristics

Seventy-eight persons participated in the study, of which four were excluded from the analysis as they turned out as year-round ABR residents. The remaining 74 respondents were either short-term visitors or summer residents of the region; nearly half (42.5%) had a summer cottage in the area. Most of the respondents (63.0%) travelled to the ABR only during the summer. Their visits to the ABR typically lasted for a month in maximum (61.1%): 24 persons stayed for one to four weeks, and

20 stayed for a week or less. The majority of the respondents (67.6%) had access to the ABR by boat. One-fourth (27.4%) of the visitors were familiar with the ABR, whereas 39.7% considered their personal knowledge of the region as weak or very weak.

3.2. *Visitors' Perceptions of the Habitats and the ESs*

Perceptions of the habitat types were generally positive, indicating that the habitats were seen as contributing favorably to the natural character and appearance of the ABR landscape (Figure 2). The lowest preference was given to the reedbed (mode: 2 or "somewhat negative", with eight missing responses). For all other habitats, negative responses were rare (mode: 4 or "positive" for all). Among these, dry meadows were highly preferred as 74.3% of the respondents saw them in a positive light.

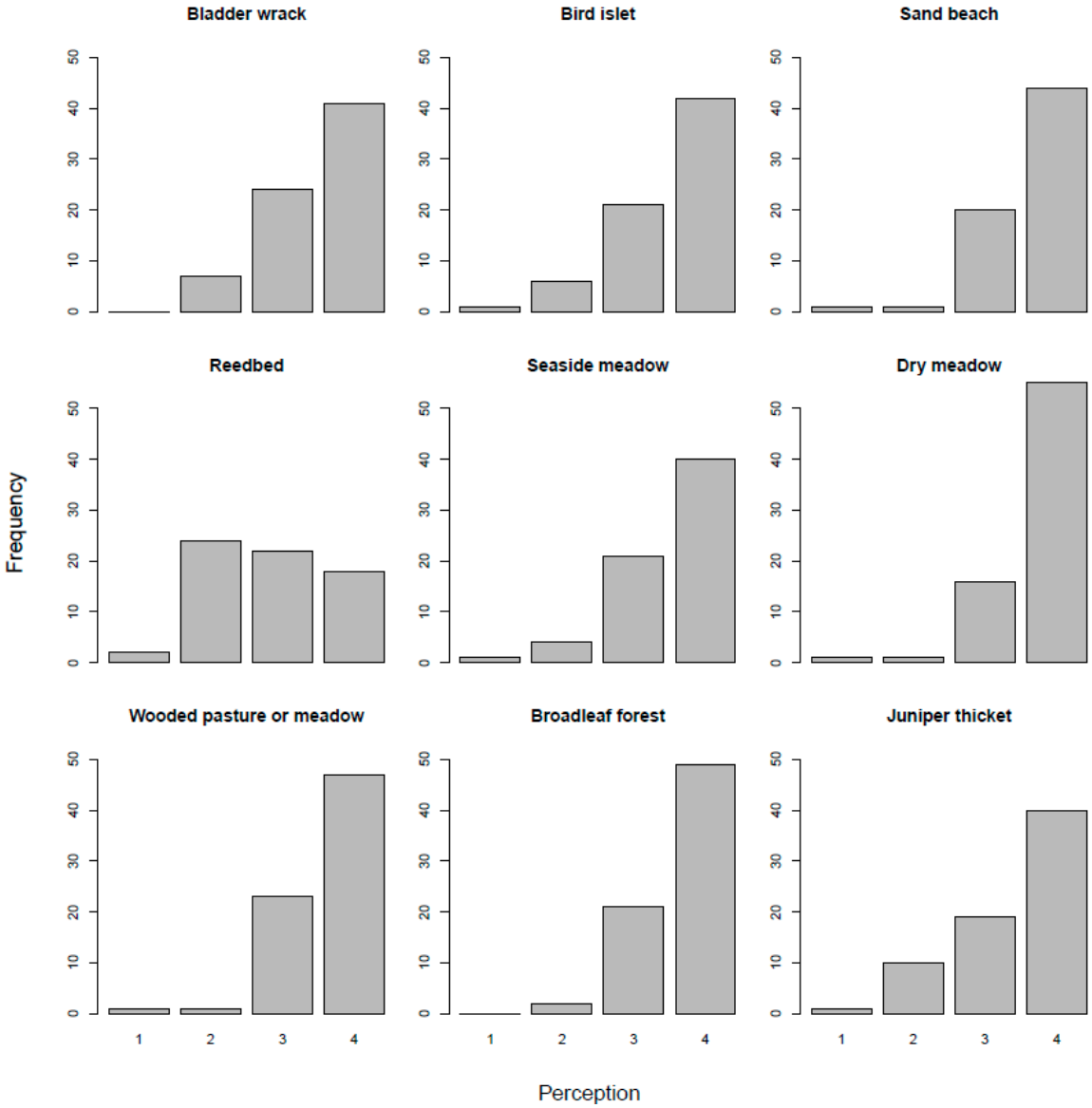

Figure 2. Respondents' perceptions on the studied habitat types. The x-axis shows a Likert scale: negative (1) somewhat negative (2) somewhat positive (3) positive (4).

Out of the studied ESs, cultural services and regulation and maintenance services were perceived as very important (Figure 3). The respondents expressed lower preferences for provisioning services. They pinpointed the regulation of water and soil quality, and the cultural service of landscape scenery as being the most important ESs of the area (modes: 4 or "very important", both with one missing

response). A clear majority of the respondents ranked cultural and recreational values as important. Hunting and fishing were perceived as the least important among the ESs (mode: 2 or "slightly important", with 4 missing responses). The respondents had difficulties in assessing the importance of energy production, as there was an exceptionally high number of missing responses (15), and the rest gave the service a mediocre importance (mode: 3 or "somewhat important"). The respondents clearly perceived biodiversity as a key value (mode: 4 or "very important", no missing responses).

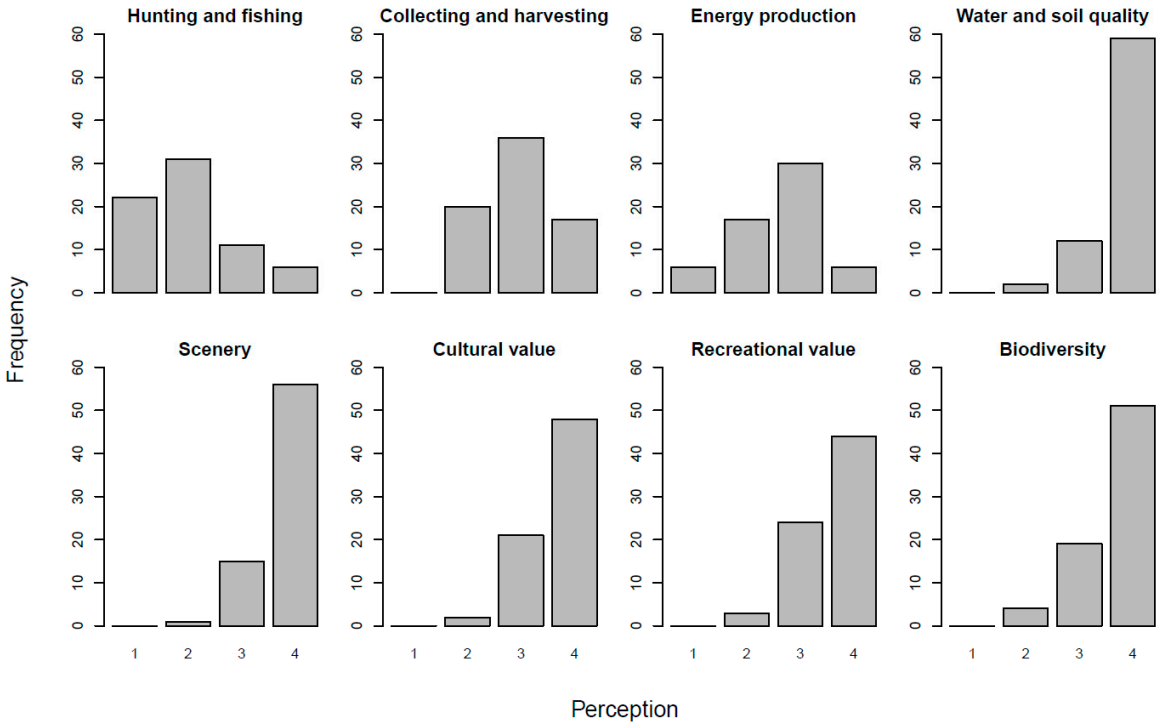

Figure 3. Respondents' perceptions of the importance of the selected ecosystem services (ESs) and biodiversity. The x-axis is according to an increase in importance: not important (1) slightly important (2) somewhat important (3) very important (4).

3.3. Ecosystem Service Profiles of the Habitats

In general, the studied habitats were evaluated as important producers of ESs. An exception here was the reedbed, which was not considered as equally important in producing of any of the listed services when compared to the other habitats (Figure 4). At the other end was the broadleaf forest, which had the broadest profile in terms of perceived ES provision. The assignment of ESs was connected to the habitat preferences: those habitats that were perceived positively by the respondents were generally valued as important producers of the listed services. The most positively evaluated habitat types—the dry meadow, broadleaf forest, and wood-pasture or wooded meadow—had the highest service values (Figure 4). On the other hand, the least positively valued habitat—the reedbed—had the most restricted ES profile among all habitat types.

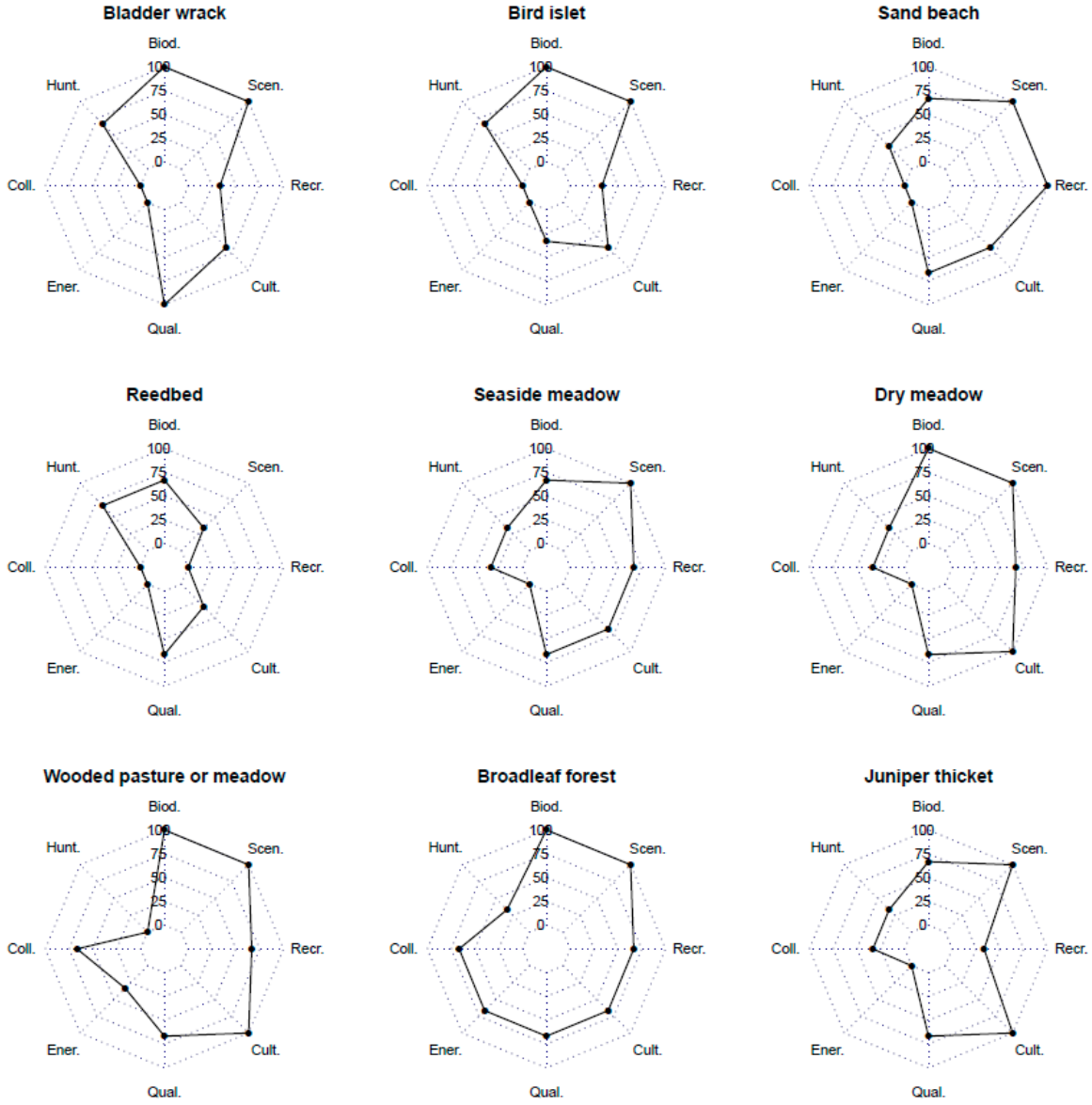

Figure 4. Ecosystem service (ES) profiles of the habitats according to visitors' preferences. The evaluation of ES importance ranged from 1 to 4 (not important . . . very important). The graphs are scaled according to the most frequently perceived level of importance. Complete names of ESs are given in Table 2.

The visitors considered the studied habitat types as least important producers of provisioning ESs. This was particularly clear in the case of energy production, where "not important" and "slightly important" were common evaluations when the contribution of a specific habitat to the service was asked for. Only broadleaf forests were considered as somewhat important in providing energy resources. On the other hand, some of the habitats were considered to provide grounds for hunting and fishing (bladder wrack, bird islet, and reedbed) or for berry, mushroom, and plant collecting and harvesting (wood-pasture and wooded meadow, and broadleaf forest). These all are provision-related recreational activities, which many visitors are likely to engage in while visiting the ABR. Recreational values were perceived to be very important in the case of sand beaches, and somewhat important for all types of meadows and pastures, and broadleaf forests.

As well as provisioning services, also regulation services were associated with a lesser number of habitats. Only bladder wracks were seen as particularly important in regulating or reflecting water quality.

Aesthetic sceneries were found to be the key habitat-related ES among all listed services, being evaluated as very important in all other habitats except in reedbeds. Furthermore, in most studied habitats, scenery was evaluated as a very important ES together with some other ES. In juniper thickets, dry meadows, wooded meadows and wood-pastures aesthetic scenery was linked to cultural value. In sand beaches and bladder wracks, scenery was appreciated together with recreational value and water quality, respectively. In general, the habitats contributed to the provision of sceneries, cultural values, and regulation services. Therefore, the ESs that were evaluated most positively by the respondents (Figure 3) had the highest importance in the habitat-specific profiles (Figure 4).

As a general value underlying the provision of the ESs, the respondents gave high priority to biodiversity. They evaluated biodiversity as very important in bladder wracks, bird islets, broadleaf forests, dry meadows, and wooded meadows and wood-pastures (mode: 4). In all of these habitats, also scenery was seen as very important. In all other habitats, biodiversity was considered as a somewhat important value (mode: 3).

4. Discussion

The results of our study shed light on the visitors' perceptions on ESs related to characteristic habitat types, located within a socially and ecologically valuable UNESCO Biosphere Reserve. In general, the habitats were perceived as providing multiple important ESs. Three of the terrestrial habitats (dry meadow, wood-pasture and wooded meadow, and broadleaf forest) have broad and overlapping ES profiles, while the other types possess more divergent and restricted profiles. The most prevalent shared perception among all of the habitats was the general appreciation of biodiversity. It was often accompanied with high importance of scenery, indicating a linkage between biodiversity and an aesthetically pleasing landscape. The highly prioritized values of scenery and biodiversity were further connected to cultural heritage. As a result, the derived ES profiles are inclined towards appreciation of cultural services. In an earlier study, Maes et al. [66] demonstrated that habitats with a higher potential to supply regulating and cultural ESs also sustained more biodiversity. The findings of our study establish the latter connection, but we did not find a similar linkage between perceptions of regulating ESs and biodiversity.

We found differences among the perceived importance of different ESs. The visitors preferred cultural, regulation, and maintenance services. This is not surprising, as these ESs are likely to benefit short-term visitors the most. In our study, provisioning services were not particularly appreciated, although traditional land uses have created and are used to maintain some of the studied habitat types. Utilization of local provisioning services, e.g., cultivation, haymaking, cattle grazing, selective logging, pollarding, and fishing have contributed to the iconic, well-appreciated sceneries of the ABR [67]. For instance, cattle grazing is still an active way to manage seaside and dry meadows, wood-pastures and wooded meadows [67]. In a Finnish context, such low-intensity grazing of meadows and wood-pastures is increasingly seen as a conservational rather than agricultural management practice [68], and it is possible that our respondents perceived it similarly.

The observed disconnection between the habitats and the provisioning ESs is most likely since the visitors do not practice farming or any other traditional forms of agriculture in the area and thus do not necessarily perceive habitats' provisional values and benefits. Instead, the overall importance of habitat-specific recreational values was high. The situation would most likely change if more background information of the various land uses of the habitats would be given to the visitors of the ABR. In our study, the respondents were either short-term visitors or summer residents of the area. With our interview approach, we did not capture the voices of the local residents, whose viewpoints usually differ from the visitors' [38]. An additional survey targeted to other interest groups such as the private landowners and local year-around residents would most likely broaden the perception of ESs within the area. If our study had included additional respondents who either work in the ABR or commute from there, the role of provisioning services would unquestionably have been more profound.

An exception among the habitats were the reedbeds, which were not appreciated as highly as the other habitat types. Reedbeds have been spreading within the ABR due to higher nutrient load flowing to the Baltic Sea, and therefore have often been presented in negative light [60]. It might be due to this general inappreciation why the reedbeds were not perceived as important ES providers, although their potential in e.g., energy production is high [69], and they decrease the leakage of nutrients to the sea by binding them to the reed biomass [70]. Also, as the recreational value of other shore habitats (sand beaches and seaside meadows) was higher, it is possible that the respondents perceived reedbeds as hindering the recreational use of shores.

The overall perceptions of the other habitats were very positive, according to our initial expectations. All of these habitats were highly valued, which was independent of the differences in their biodiversity value or rarity in terms of red-list statuses [60]. This implies that the visitors perceive bladder wracks, bird islets, sand beaches, seaside and dry meadows, wooded pastures and meadows, broadleaf forests, and juniper thickets as equally important parts of the ABR landscape. However, the reedbeds seem not to belong to the ABR in their current extent, at least from the visitors' perspective. We found a general two-way connection between the appreciation of the habitats and the ESs: positively perceived habitats were also considered as important producers of ESs, and those ESs that were highly appreciated had the highest importance in the habitat-specific ES profiles. This is in line with the earlier findings that explored the connections between charismatic species groups and ES supply [18]. Therefore, the perceived importance of a specific habitat seems to affect in complex, positive ways to the ESs associated to it.

Also, a subjective connection to place can contribute to the positive perceptions amongst the visitors. Many respondents had summer residence in the ABR, and some of them usually stayed in the region for longer periods of time, claiming to have good knowledge of the area. These people are likely to have a close personal relationship to the ABR. For those respondents less familiar with the ABR, the restricted accessibility due to ABR infrastructure limitations likely has an effect on the results. Certain habitat types (e.g., bird islets and bladder wracks) are difficult to reach and others are extremely rare (e.g., wooded meadows); thus, respondents may have limited experience on the ESs these habitats sustain. Yet, high importance was given to generally well-known or otherwise distinct links between the habitats and the ESs. This might be the case, for example, with bladder wrack and water quality, as bladder wrack is an indicator of water purity [60]. Also, the scenic beauty, the significant cultural value, and the high biodiversity of meadows and wooded pastures is established [68], and our results confirm this from the ABR visitors' point of view.

We used photographs to facilitate the structured interview process and found them to be useful to depict the physical appearance of the key habitats, which would otherwise be verbally challenging to describe. Pictures helped participants to inspect and identify the habitats and then consider their ES associations. The usage of photographs allowed for visual interpretation of the habitats and mediated discussion on the linkages between the listed ESs and each habitat. Visual assessment can also be beneficial in providing context for the ESs and to avoid misunderstandings that arise with verbal abstractions, which are not always adequately understood [63]. On the other hand, we acknowledge that photographs can be problematic, since certain pictures can affect participant's perceptions and even change their existing opinions. We aimed to minimize this influence by using four different pictures for each habitat type description.

The photographs used in our survey presented habitat types in a specific landscape, although their exact locations were not recognizable. This implies that we may not be able to derive direct information about habitat-specific ESs *per se*, but need to interpret the results while taking the surrounding landscape, including also other types of habitats, into account. The fact that scenery emerged as one of the most important ESs in the context of the ABR indicates that the co-occurrence of habitats within a landscape is important. Several previous studies have pointed out that it is the landscape as a whole that provides landscape values and is the basis for ES perception (e.g., [37,71,72]). Therefore, in addition to specific habitats, the ES profile approach could be extended to include landscape scale

assessments (cf. [56]). Landscape scale is in fact perceived as relevant for integrating ES in land-use planning [1,7]. Participatory ES information collected from the stakeholders is an important part of the ecosystem management puzzle, since it can be used to help policymakers to recognize locally important ESs and to find sustainable management practices [73,74]. Thus, it is important to conduct ES assessments with methodologies tailored according to the studied landscape, and with participation of multiple stakeholder groups. Local stakeholders are strongly affected by degradation of ecosystems and ESs [19] and therefore local-level preferences and dependencies are a significant field of study. Potential areas for conflicts of interests between stakeholders can be found by analyzing local priorities and scientifically assessed services [75]. This can also increase interest towards land-use planning and management policy and therefore enhance opportunities for public debate and consideration of different stakeholder interests.

Our study supports the previous findings that aesthetic sceneries and recreational opportunities are among the most important reasons for visiting the ABR region [47]. The connections between the ABR landscape, its biodiversity and ES supply, and the increasing seasonal tourism are important to take into account in the region's land-use planning. These include habitat protection schemes, management action plans, building infrastructure, and planning for sustainable tourism within the ABR. Despite their appeal to the visitors, some of the habitats are intolerant to high levels of recreational activities, including camping and hiking, and to their side effects (for example accumulation of trashes and environmental pollutants). The ABR region is a particularly sensitive environment for human-induced pressures, such as eutrophication, seafloor oxygen depletion, and oil leakages, to mention a few [59]. Frequent recreational activities and sea traffic pose considerable threats for highly sensitive habitat types, e.g., bladder wrack and sand and gravel beaches [60].

Information derived from the ES profiles can be used to inform recreational users about coinciding values, ESs, and conservation priorities. Overlapping appreciation of biodiversity and cultural heritage implies that visitors might benefit from targeted information about those values within the ABR. Our results indicate that scenery is crucial in mediating the perceived provision of several other ESs [68]. Therefore, forthcoming management actions should pay more attention to their impacts on the visual appearance of the ABR landscape. One suggestion is to reduce the amount of unwanted reedbeds near camping and swimming sites. Additional recreational activities could be directed to islands hosting habitats that can tolerate moderate human impacts and hold specific cultural values; different types of meadows and juniper thickets are examples of these. Thus, it would be crucial to emphasize the importance of various ESs in the management plans for different habitats. In case of those habitats that had the broadest ES profiles, multiple management goals need to be attained, as the habitats provide several complementary ESs.

Cultural ESs are particularly complex to assess, being highly culture-, scale-, and context-dependent (e.g., [33]). This difficulty further highlights the importance of adopting local participatory ES assessment methods. Further detailed information about the origin and maintenance of cultural ESs is needed to enable their consideration in land-use and habitat management planning. The supply of ESs in the context of recreation and tourism mandates some level of management [49]. This is also the case in the ABR, as some of the highlighted cultural services—such as the appreciated sceneries—require moderate land management. For example, seaside meadows, dry meadows, wood-pastures, and wooded meadows require continuous low-intensity management to maintain their distinctive appearance and biodiversity [60]. Such management appreciating multifunctional land use and values is also in line with the core principles of UNESCO's Man and Biosphere program.

In this study, we assessed habitat-specific ESs based on the perceptions of the Biosphere Reserve visitors. This methodology gives important information concerning the key habitats in the study area as a whole. Spatially explicit mapping of ESs could be an important extension of the current methodology and a practical way to improve the synergies in biodiversity and ES management in particular local sites [10]. These participatory GIS (PPGIS) approaches would be beneficial if there would be a need to explicitly link participatory ES valuation with the act of mapping key habitats, or

landscapes. Many studies have demonstrated the value of PPGIS especially for the identification of provisioning and cultural benefits, which usually are based on local knowledge (for a review, see [41]). The mapping of biodiversity and ESs is among the urgent needs for implementation of European biodiversity policy, such as European Union Biodiversity Strategy to 2020 [76].

5. Conclusions

This study investigated how short-term visitors and summer residents perceived the ecosystem services tied to the most distinctive and characteristic habitat types of the Archipelago Sea Biosphere Reserve. The landscape of the ABR is constantly changing. Some of its habitats need active management; others are influenced by people unintentionally. Our results inform the forthcoming land-use planning that aims to find a balance between the protection of the Biosphere Region's unique biodiversity, and the need to support sustainable local livelihoods and tourism. This same challenge applies to most Biosphere Reserves globally. We suggest that those sites, where the synergies between visitors' preferences and ES supply emerge, should receive the highest importance in land-use planning. Our methodology is practical also in targeting habitat and ecosystem protection, as it gives information on those habitats that are both sensitive to human influence and under high recreational land-use pressure. We offer an important dimension into ES assessment processes by highlighting the habitat-specific benefits that people perceive when observing and visiting different sites. The results show that the ES profiles of the different habitats do vary in this specific geographical context. Future research is needed to clarify how the habitats embedded in the larger landscape reflect the delivery and perceptions of ESs, and to map the locations of potential synergies and trade-offs. Furthermore, variation among the perceptions of different stakeholder groups such as permanent dwellers and conservation experts and practitioners should be studied so that a more comprehensive understanding on the ABR landscape and its ES supply could be formed.

Supplementary Materials: The following are available online at http://www.mdpi.com/2071-1050/11/2/421/s1, Interview_form.docx, Respondent_data.xlsx, ES_perceptions.txt, Habitat_perceptions.txt, Habitats_ESs.txt, R_script.r.

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