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Is the Spanish Population Pro-Conservation or Pro-Utilitarian towards Threatened Flora? Social Analysis on the Willingness to Protect Biodiversity

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Abstract: Conserving biodiversity in the context of global change is a challenge for the sustainability of life as we know it. Scientific protection work, particularly for flora, often lacks interdisciplinary approaches that consider human dynamics. The main objective is to evaluate the level of commitment of Spanish society toward the conservation of biodiversity in general and vascular flora in particular. As a secondary objective, it aims to contribute to the transfer between management and the general population. Methodologically, the survey has been used to estimate the willingness to protect threatened flora. The surveyed population is structured on the basis of its commitment to biodiversity conservation into: pro-conservation or pro-utilitarian group. The results are conclusive and indicate a high commitment of the Spanish society to conservation in aspects such as fees or legislative limitations on owners. It also reveals a deficiency in the transfer of the efforts made, from management, to society. It can be concluded that the survey, as a tool, allows us to know the starting social reality, detect weaknesses and deficiencies that allow management to be adapted to that reality, replicate work longitudinally to know the evolution of the measures and, indirectly, bring reality closer, of conservation to the people surveyed (science transfer).

Keywords: biodiversity conservation; adaptive management; flora; natural capital; social capital; pro-environmental; pro-conservation; pro-utilitarian; science transfer; management transfer

1. Introduction

1.1. The Social Context and Adaptive Management for Biodiversity Sustainability

Climate variability modifies its forms of expression as a consequence of global change. This causes new uncertainties related to the environment to appear [1–4], which can intervene in processes at different levels (social, economic, environmental, political, security, human or health [5]). The social sciences have addressed the issue of natural threats derived from climate change in a huge amount of the literature. This literature focuses mainly on social vulnerability, resilience and adaptation (SVRA) [6]. We must pay attention to the risk to society [7,8], documented in relation to the environment since the end of the last century [9,10]. This is known as the "mitigation" stage [11]. From this approach, it is clear that global change influences social dimensions such as the distribution of power, equity, relationships, or the impact of protected areas (PA) on human well-being [12], with a combination of exposure to risk and, at the same time, insufficient capacity to confront and manage sudden and unpredictable changes in nature (droughts, floods, etc.) by social structures such as the State or local entities.

Among its consequences is the loss of biodiversity, which is related to the fragility or vulnerability of the system [13]. Biodiversity consists of a variety of life on Earth at all levels, from genes to ecosystems, and includes all ecological, evolutionary, and cultural processes that fuel life [14–16]. Sociologically speaking, its loss implies violence, poverty, inequality, displacement, and environmental and political degradation. These dimensions have direct implications on people's health and life expectancy [17–20]. Biodiversity loss and poverty are linked problems and conservation and poverty reduction should be addressed together [21]. Climate change and its processes of exclusion pose a challenge to equality, justice, and human security, especially for the most vulnerable groups [22–25]. Due to global change, displacement and migration occur, causing demographic imbalances [26,27]. As happens in other dynamics of inequality, social exclusion can be considered a state reached through the process of vulnerability [28]. It is during the process of fragility or vulnerability that it is appropriate to conduct interventions to avoid exclusion from the adaptive management strategy for the protection of biodiversity. This strategy must provide interdisciplinary solutions and responses that involve the population [29–33] and are based on social innovation and the capacity of individuals or communities to participate collectively. In addition to relying on learning and risk management to find governance solutions that focus on social and ecological benefits that contribute to the sustainability of social–ecological systems [34].

Strategies must allow the introduction of economic, political and social changes that help cushion these risks. Therefore, it is time to approach from the social sciences a stage of analysis of the implications for management, thus initiating a stage that could be called social responsibility or symbiotic commitment to nature. The population must be involved in the adaptive management of environmental protection. In such a way, to carry out biodiversity protection tasks, the social group that is in contact with each natural space where intervention is carried out is thoroughly characterized. That is, to create an academic space in which the objective is to know the background of a community to implement managed strategies. It is necessary to focus research efforts because social dimensions are crucial *a priori* to actively protect biodiversity [35–37] and implement 30 × 30 (30% protected land by 2030) global conservation target of the established Sustainable Development Goals [38,39].

1.2. Natural Capital and Social Capital

The COVID-19 pandemic has highlighted the human interconnection with nature and how health, economic, and climate crises must be resolved together [23,40]. In promoting a context of interdisciplinarity where sociology and other social sciences address the loss of biodiversity together with the more experimental sciences, the concepts natural capital [3,41–46] and social capital [47–51] allow establishing bridges for analysis. Both terms can generate synergies in adaptation to climate change and in attempts to mitigate its effects. Valuing natural capital helps society become aware of the need to conserve nature. Analyzing some dimensions of social capital, such as norms and its micro-level dimension for individual behavior, can allow making decisions for adaptive management despite transformations in nature and their consequences in social life [52].

Natural capital is part of the wealth of each nation, and interrelates biodiversity, ecosystem services, and economic systems [53–57]. It is the stock or set of goods and services that ecosystems provide us and that, in addition, underpin the economy and social well-being. Natural capital "is part of society's productive base, producing flows of market and non-market benefits" [41] (p. 727). It offers monetary and community value and therefore sustainability [58] and can be quantified from forest resources, crop and pasture land, energy resources, metallic minerals, and PAs [59,60]. Natural capital includes flora and is capable of hindering global change by itself and, paradoxically, is defenseless against it.

The concept of social capital was adopted by the World Bank in the mid-1990s to address Sustainable Development [61,62]. Its various dimensions [63,64] allow legitimizing

and promoting the general interest or the common good. It is constituted by the types of social relations that establish the foundations of democracy [65,66]. It implies the civic commitment that promotes the reciprocity necessary for subjects to feel integrated and linked in a social group and with the State [67] and, therefore, whether or not they want to participate actively in social processes, as well as in the policies that are adopted. Social capital is made up of elements such as norms of reciprocity and exchange, values, social networks, common sanctions, cooperation between institutions [52] and relationships of trust [64,68,69].

Its scope is profound because social capital is related to a durable network of institutionalized knowledge [70,71] and to the socio-structural resources that promote concrete actions of the individuals within that structure [68,72]. It contributes to social cohesion, development, or well-being and intervenes in the ability of its members to act and satisfy needs coordinatively for mutual benefit. Knowing participation and whether pro-environment, pro-conservation or pro-utilitarian values govern the regulatory system of a human group is important to analyze part of the social capital for the development of biodiversity conservation policies. In this work, questions are posed based on two ways: one from a "conservation" point of view, which emphasized the need to conserve species; and the other from a "utilitarian" point of view, which emphasized the rights of landowners and industry to use resources.

In this way, one can measure how strong Spanish support for necessary actions remains in the face of rhetoric that frames the issue as a matter of competing priorities, such as between the conservation of endangered species and economic development.

Therefore, social capital is closely involved in the management of natural capital and the acceptability of environmental policies [45,50]. These ideas are central in adaptive management to global change because when the population considers that the protection of biodiversity, its natural capital and ecosystem services, and social, economic, and cultural capital are related, the population's involvement in protection increases [73,74]. For conservation and resilience strategies to be implemented effectively and management resources not to be wasted, social structures must be part of the process. Involve local governments, civil society, each individual, and the private sector [75]. In short, the measures adopted by management must be legitimized by the society itself (Figure 1) where they are implemented [15].
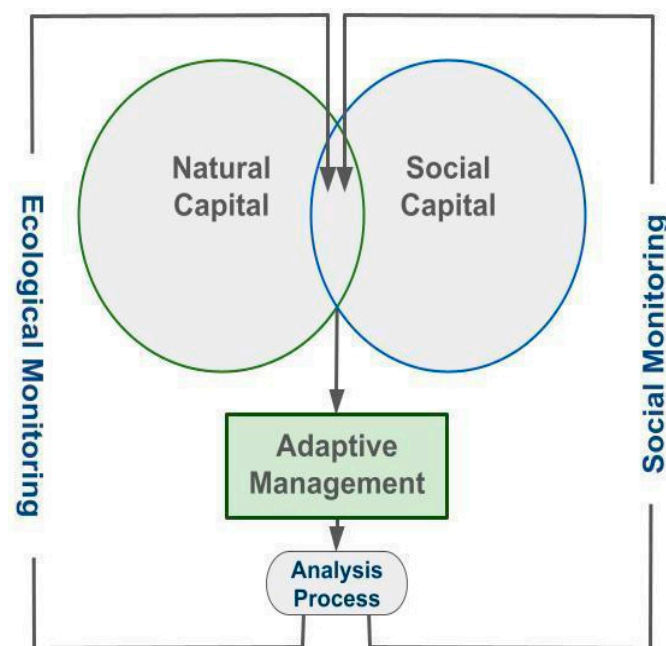
Figure 1. Scheme of idealized information flow that feeds adaptive management for the conservation of floristic biodiversity.

Thus, with increasing intensity, there is a need to integrate norms and values related to nature into management models, in addition to strengthening the links between biodiversity, human action and quality of life [76]. Making the protection of biodiversity and the economic development of the populations where nature care occurs compatible is a *sine qua non* requirement for any natural environment management activity to obtain the results proposed by the management objectives. Pro-environmental synergy is generated when the economic and ecosystem needs of the population are met and, simultaneously, biodiversity is protected. When the conservation strategy takes place in social contexts of co-management, empowerment of local people, a reduction in economic inequalities and maintenance of cultural and livelihood benefits, conservation implies value for the community [77]. This is demonstrated by studies on protected areas in which biodiversity is greater and legislation is tougher to preserve it [12]. In the rural world, initiatives that try to create social capital related to biodiversity among the agricultural population allow the development of new norms and institutions. Community relations improve by creating a social fabric based on agreements that promote reciprocity, norms and local sanctions [45].

In short, the relationship between societies and nature goes beyond the use of water, land or their involvement in administrative decisions or the rights of the population. "It is about [. . .] defining the meaning and measure of biodiversity. It is about the recognition of the dynamic interplay of biological, cultural, and linguistic diversity" [78] (p. 2). In the logic of conservation, it is essential for management to contemplate the human groups that coexist with diversity, and even integrate their traditions into that coexistence.

1.3. Social Construction to Protect Biodiversity in Europe and Spain

In the context of biodiversity protection, there are numerous organizations involved around the world at international, European, national and local level. Under the motto "bringing nature back into our lives", the European Union promotes the EU Biodiversity Strategy for 2030 [79,80]. It is the pillar of the so-called European Green Deal, which is based on the Habitats Directive (92/43/EEC). It provides for economic and social efforts to protect the environment from the consequences of global change that destroy biodiversity. It is an attempt to recover and integrate it into economic growth strategies. An example is the expansion of the protection of PAs in Red Natura 2000 [80,81]. As islands of biodiversity, PAs are home to flora and fauna at risk of disappearing and have a positive correlation with the social well-being and livelihoods of the population.

There is already a legislative history regarding the protection of biodiversity in Spain and more specifically, the protection of its flora. The most recently approved and current laws that protect biodiversity at the national level in Spain are: Law 42/2007 on Natural Heritage and Biodiversity, Royal Decree 1057/2022 State strategic plan for natural heritage and biodiversity to 2030, and Law 7/2021 on climate change and ecological transition to guarantee the rational and supportive use of resources.

However, at the same time that a discourse on the positive value of environmental protection is developed from institutions, further analysis is necessary to gather scientific evidence that allows managing and implementing the 2030 Biodiversity Strategy, both in terms of PA [12] and in other dimensions of biodiversity [82].

When we approach the social construction of the need for nature for human life, we see that European citizens equate, in their assessments of life satisfaction, the richness of the biodiversity of bird species, for example, with the level of income [83]. A change in social values toward flora is also evident in the legislative framework [84]. A transformation is occurring that moves away from the traditional focus exclusively on human benefit and the regulation of its exploitation. The treatment of flora is currently shifting toward a different status due to its contribution to the achievement of objectives in ecosystem services, the configuration of social spaces, and its influence on individual and collective human behavior. Recognition of the roles that plants play at a societal level helps transform society's relationship with flora and the natural world in general. Work in the area of plant neurobiology by Professor Mancuso and collaborators has addressed the implications

of their discoveries for the social sciences and their potential for the enrichment and transformation of human organization, proposing a model that surpasses the instrumental vision of flora (as does natural capital) and even proposing a new economic and social structure paradigm based on the plant world: "Vegetable Economics" [85].

1.4. Spanish Vulnerability of Flora Biodiversity

Both plants and fungi are essential for the future of food, clean air and water, as well as for medicine, pharmacy and other important ecosystem services. Simultaneously, they are highly sensitive to global change and essential for human life. The role of plants in hydrological dynamics is imminent, reducing the risk of flooding, and fostering groundwater water infiltration or removal of pollutants from water and air [86]. For this study, the term "flora" will be understood as the set of vascular plants native or introduced from a geographic region.

According to the latest IUCN data, the total number of known plants is estimated at 415,625 different species. Of these, 45% of the flowering plants cataloged worldwide are on the verge of extinction [87]. More than half (54.2%) of tree species, some 32,090, are threatened. Furthermore, approximately 17,000 tree species are at serious risk of extinction because of global change [88].

In Spain, the value of natural resources per inhabitant is 34% higher than the EU-27 average. Natural capital endowments per capita are around EUR 9000/per capita [59]. Simultaneously, in the European context, it is possibly the country with the highest risk of biodiversity loss, which has resulted in it also being the European country where the most threatened PA and flora species exist, reaching 25.33% of the total European. As an example, the IUCN Red List of Threatened Species lists 291 threatened plant taxa in Spain. But the latest revision of the red list points to a total of 1145 threatened taxa (10.92% of the country's total vascular flora), of which only 234 would be protected by Spanish national and/or regional legislation (20.44% of all threatened flora) [81,89]. In a context of climate change in a very vulnerable region such as the Mediterranean, in addition to hosting numerous species at its distribution limit with the fragility that this entails.

The spaces declared protected areas until December 2022 in Spain reach 1842, which translates into a land area of 7,492,375.22 m^2 (14.80% of the Spanish territory) [90]. The weight of protected areas in the country as a whole (terrestrial and marine) has quadrupled from 3.9% in 1995 to 16.5% in 2018 [59].

The vulnerability of biodiversity to climate threats is accentuated if the population is not involved in the protection of protected species. Therefore, from the point of view of adaptive management, knowledge of vulnerable flora by the population and their active involvement are a starting point for protection.

1.5. Why Conduct a Survey to Protect Floristic Biodiversity and Ensure Its Sustainability?

Knowledge allows economic and human efforts to be more beneficial in protecting biodiversity [91]. In terms of conservation management, one of the main scientific shortcomings is the lack of knowledge about the social impact of the measures adopted. This is the case, although as indicated, numerous analyses have shown the importance of local societies in achieving conservation achievements [75]. In the same way that global change requires continuous analysis from experimental sciences, it is necessary to assume that the social impact of the measures adopted to address it requires longitudinal studies. The human consequences of the measures are not static, as is not global change; therefore, requires cumulative, quantitative and qualitative analyzes from the social sciences with a long-term perspective [43,92–94]. Plans and projects to mitigate global change or protect biodiversity allow nearly exhaustive monitoring from experimental sciences, but they suffer from the same systematicity and development in social analyses. Social effectiveness is often neglected or abstained in PA planning and management [95]. To achieve any objective regarding global change and biodiversity management in an adaptive management model, efforts from different disciplines are necessary [43]. This statement implies that

each strategic intervention must measure its impact (positive or negative) and its social acceptance over time [96].

In this sense, this study focuses on the starting point of social capital for the protection and citizen involvement in the conservation of its natural capital, with an emphasis on flora. Its objective is to provide the necessary information that allows biodiversity conservation management, involving the population in the process. It deepens the knowledge of the Spanish population and its relationship with the conservation of flora, in such a way that it allows the implementation of a strategy that articulates synergy of knowledge between experimental sciences, social sciences, management and society in the context of adaptive management [97–99] and through participatory and democratic evaluation involved in public policies [100].

The survey is a methodological tool that allows us to understand the human dimensions of biodiversity conservation through participation [43]. In this study, this technique is used as a strategy to approach the social contract of the Spanish population in the conservation of flora. One of the objectives of the survey is to answer the following question: What is the citizen commitment to the measures adopted institutionally regarding threatened flora in Spain? Without the commitment of the population, it is difficult to make effective management decisions that protect flora and fauna in the medium and long term. Running the risk of all these conservation efforts being unnecessarily confined to the scientific and/or managerial sphere. The article focuses mainly on the perspective of flora because of the scarcity of previous studies, its structural role in the biodiversity of ecosystems and aforementioned relationship with water, which is increasingly scarce in Spain [101,102]. The adaptive management of these natural capital resources demands synergistic and holistic actions that consider new social values and involve society in protective transformations [103], in a context of responsibility and symbiotic commitment between the social and natural world.

Ultimately, to manage the protection of biodiversity, including flora, it is important to understand the local profile of the community where the intervention will be carried out. This includes social assessment and understanding in relation to social capital in the form of values, norms, trust, networks, knowledge, social norms, or socioeconomic characteristics that influence social behaviors and attitudes in relation to biodiversity. In this sense, there are studies related to the opinion that societies have about environmental protection. Although, specifically aimed at flowering plants, studies remain almost nonexistent.

1.6. Objectives

This study was intended to evaluate the level of commitment of Spanish society toward the conservation of biodiversity in general and vascular flora in particular, and to determine the inclination toward the positions of the Spanish population regarding pro-conservation and pro-utilitarian. In addition, possible relationships between demographic variables are investigated to determine whether they could condition any of the responses. The results seek to generate a social background that contributes to the design of more effective future management strategies adapted to the current social reality, in addition to laying a basis for its long-term longitudinal study.

As a secondary objective, citizens will be exposed to aspects of the work context that is being developed in environmental matters, in relation to some conservation measures and some specific plants. This dimension fulfills the function of knowledge transfer between management and the general population by bringing flora conservation work closer to the population through questionnaire questions.

2. Materials and Methods

2.1. Questions, Data Collected and Study Area

The population under study is the Spanish population between 15 and 74 years old. The use of the survey has been chosen as a quantitative data production technique, considering into account in its interpretation the small deviation caused by the differences

between declared and revealed preferences [104,105]. Although the questionnaire was developed in-house, it is based on previous polls on this subject [106–108] and consists of a battery of questions divided into three main blocks. Each main block previously established shows three different scenarios where the respondent is gradually proposing measures more committed to the conservation of each threatened species and the legislation that protects them. Each block allows the analysis to determine whether the responses are determined by any of the main aspects included in each block. These are: individual encounters, private property and industrial development. According to the allowed answer, the type of survey is closed, in almost all cases except for the questions related to an unrestricted economic amount (Q20.Investment in protection) and Age, with an open response, aimed at obtaining a figure. The complete data pool comprises 21 questions (Table S1) and 11 sociodemographic questions (Table 1). In addition to the three blocks already mentioned, other issues related to the environment, the conservation of biodiversity and threatened flora are added. Most of the questions are categorical variables with 2–7 levels.

Online surveys (by Internet) are a robust way to collect data and have been shown to generate findings that are as accurate as traditional telephone-based surveys. It takes less time to fill out compared to using the telephone and, in addition, the response rate is significantly higher. It is true that there is no exact location where the answer comes from [109]. The surveys were distributed mainly via e-mail (personal emails and distribution lists) and social networks (Whatsapp, Telegram and Twitter groups). This mode of access to the population under study has been used for other analyzes in biodiversity conservation [110]. In addition, the Chambers of Commerce of the provincial capitals of Spain and national agricultural and livestock associations were contacted as a group directly involved in the conservation of biodiversity in their professional activity. Scientific societies and universities throughout the country were also contacted, seeking to obtain as large and representative a sample as possible. The snowball technique was used, which begins with a basic core of direct and indirect networks and progressively contacts more individuals until significant sampling is achieved [111].

The study was conducted in accordance with the Declaration of Helsinki, signed and established as an ethical protocol by the Institutional Review Board of University of Granada since 2003 (IRB approval: 3274/CEIH/2023, date of approval: 7 February 2023).

2.2. Statistical Analysis

2.2.1. Representativeness of the Sample

To assess the consistency of this survey as an efficient estimator of the total population, representativeness is calculated using the equation of the sample size of proportions. This is obtained by setting the maximum admissible error and the confidence level associated with the estimate [112]. A comparison is also made of the demographic variables collected (Table 1) with respect to the last census of the Spanish population on 1 January 2022 [113].

$$n = \frac{Z_{\alpha/2}^2 \, Npq}{e^2(N-1) + Z_{\alpha/2}^2 \, pq}$$

Formula 1. Formula for calculating the representative sample size of the population, where *n* is the sample size, *N* is the population size, $Z_{\alpha/2}$ is a constant that depends on the chosen confidekeence coefficient. The product *pq* is the variance of the proportions, the e^2 is the maximum admissible error (0.4 in this case).

Then, as an exploratory test, a normality test is carried out on the variables in the sample using the Chi-square test since they are categorized samples.

Table 1. Demographic factors and the proportion of respondents in each group, compared with the last confirmed data from Spain. Font: Own elaboration based on Eurostat (2023) and the Spanish census from [113]. Factor: demographic variable; Group: different groups included in each variable; % sample: proportion in the survey the sample; Ns: total counts in sample; % Spain (2021): proportion in the Spanish population (2021); N: total counts in Spain [113].

Factor	Group	% Sample	Ns	% Spain	N
Gender	Male	45.50%	283	49.83%	15,910,201
	Female	53.22%	331	50.17%	16,019,842
	Non-binary gender	1.29%	8	-	-
Age	15–19	10.37%	64	7.02%	2,242,826
	20–24	23.01%	142	6.46%	2,064,208
	25–29	9.08%	56	6.28%	2,003,898
	30–34	6.32%	39	6.74%	2,151,375
	35–39	8.10%	50	7.87%	2,513,379
	40–44	10.70%	66	10.08%	3,218,258
	45–49	8.59%	53	11.00%	3,513,603
	50–54	5.83%	36	10.52%	3,357,893
	55–59	8.91%	55	10.95%	3,494,844
	60–64	5.83%	36	9.01%	2,877,650
	65–69	2.59%	16	7.48%	2,387,202
	70–74	0.65%	4	6.59%	2,104,907
Civil status	Couple	6.68%	42	-	-
	Single	29.89%	188	36.02%	14,321
	Married	56.12%	353	49.69%	19,758
	Separated/Divorced	6.36%	40	7.04%	2799
	Widower/Widow	0.95%	6	7.25%	2883
Have children	Children	36.23%	225	50.80%	16,220,462
	No children	63.77%	396	49.20%	15,709,581
Education level	High school or less	7.27%	45	35.80%	8919
	University/College/Trades certificate	12.60%	78	23.10%	13,823
	Bachelor's degree or Graduate degree (master´s, PhD, medical)	39.74%	246	41.10%	7769
Household income	Less than EUR 25,600/year	39.27%	194	-	-
	EUR 25,600–EUR 30,552	18.42%	91	-	-
	EUR 30,552–EUR 35,000	12.75%	63	-	-
	EUR 35,000–EUR 74,000	26.11%	129	-	-
	EUR 75,000–EUR 149,999	3.24%	16	-	-
	More than EUR 150,000	0.20%	1	-	-
Own > 2 ha of land	Yes	9.06%	51	-	-
	No	90.94%	512	-	-
First residence in rural area	Yes	26.95%	166	-	-
	No	73.05%	450	-	-
Second residence	Yes	56.23%	289	-	-
	No	43.77%	225	-	-
Second residence & Nature	Nature	39.11%	201	-	-
	Urban	17.12%	88	-	-
	No	43.77%	225	-	-

2.2.2. Correlation between All Variables

The intercorrelation (independence) between all the sampling variables is examined to check the degree of redundancy in the formulation of the different questions, to interpret the results. It can also be useful to identify possible relationships between variables that may imply predictability (demographic variables regarding the answers to the questions).

2.2.3. Independence from Demographic Variables

Similarly, the independence of the responses with respect to the demographic variables was tested. Depending on the type of data available, the Fisher's exact test or Pearson's Chi-square test is used to determine if any of these categories could be associated with demographic factors [114]. The results of this test could reveal whether some demographic variables can be used as predictors of certain responses.

2.2.4. Commitment to Conservation

To assess the level of commitment to biodiversity conservation shown by respondents, a series of questions are asked that progressively lead to greater involvement. Therefore, it entails a greater "cost", whether for personal, economic, emotional or ideological reasons. To measure this possible change in responses, respondents were aggregated into two opposing groups: pro-conservation and pro-utilitarian. The construction of these groups is performed on the basis of the questions that imply a commitment (Table 1), from those that are more generic and with little involvement (Q9 or Q12) to those others where the level of involvement increases gradually and in different aspects (Q13, Q14, Q15 and Q16). The intent is to involve personal interaction, limit private property rights, and limits on industrial development. In such a way that both groups are defined as follows: (1) Pro-conservation, those who maintain their level of commitment in a coherent way in absolutely all their responses; (2) Pro-utilitarian, those who modify their level of commitment or change to non-committal (does not know/does not answer) in some of them.

In this way, a very restrictive criterion is assumed. The reason is due to the social acceptance of environmental protection in general and, thus, avoiding ambiguous and intermediate positions that could yield a poorly defined and/or confusing result. With both groups, a Chi-square test is performed to determine if there are significant differences between these two groups in relation to each of the blocks and their questions posed (non-demographic variables).

2.2.5. Tools and Software Used

The survey was administered through Google Forms, a platform accessible from smartphones and computers, with the only requirement of a Gmail email account for each survey answered. The coding of the questions and subsequent programming for the analysis was performed using the R Core Team software version 4.3.1 (2023), and the processing of texts and tables was performed using LibreOffice version 6.4.2.2 and Google Docs version 2024.

3. Results

3.1. Descriptive Results

### 3.1.1. Data Collected and Sample Representation

The sample size, once filtered and processed, included 632 validated respondents. The survey remained open for three months (23 November 2022 to 24 February 2023) although 80% of the surveys were registered in the first two weeks of sampling (24 November 2022 to 9 December 2022) (Figure A1). After applying the Kolmogorov–Smirnov test, the initial hypothesis of absence of normality in the variables was confirmed (Table A1), not even in those more random variables such as age, gender or income. This figure exceeds the 600 observations necessary to ensure a confidence level of 95%, considering a maximum admissible error of 4%, and maximizing the variance because it is unknown [112]. To calculate this threshold, the last national census [113] of 31,989,577 inhabitants (from 15 to

74 years old) was considered, filtered by age and nationality (Spanish) to have the most approximate comparison possible with the study sample. Regarding the geographical representativeness of the sample, Spain is divided into 19 provincial governments (17 autonomous communities and 2 autonomous cities). Of all of them, 16 were represented in the survey, respectively.

3.1.2. Responses

- Vacation preferences and affinity for nature

When interviewees plan their vacations (Figure 2; Q1: plan vacation), nature is the top priority (strongly agree) as a destination in almost half of the cases (49%, 309). Followed by the somewhat more moderate option (somehow agree, 31%, 194). Only 15% (neutral) and 3% (somehow disagree) of those interviewed do not give importance to nature when choosing their rest destination.
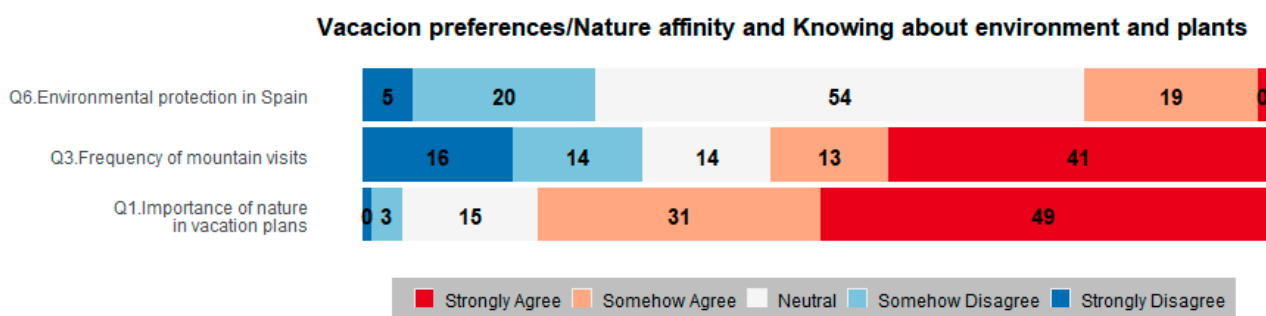
Figure 2. Stacked bar chart de las preguntas Q1, Q3 y Q6 (in %).

When asked if they dedicate any vacation time (including weekends or days off) to visiting the mountains (Q2. Mountain choice), it is found that 82.68% of those surveyed (525) choose the mountains, compared to 15.51% (98) who prefer other options. Only nine respondents of the total indicate do not know do not answer. Also in relation to the mountains, the survey shows a high frequency of declared visits (41%) by the respondents (Figure 1; Q3. Frequency of mountain visits). The rest of the options receive very balanced responses around 13–16%.

When asked if it is considered that pathologies improve in contact with nature, almost all of the respondents (99%, 627) consider this to be the case (Table 1; Q4. Pathologies and nature).

The majority of people surveyed show that a large part of the population lives with animals and/or plants in their home (Figure 3; Q21.Plants & pets) reaching 95.25% (602 respondents). Only 4.75% (30) have declared that they do not have any. The values are high, especially in those who own plants (77.85%, 492), although it also stands out that around half of the respondents have one or more pets (54.11%, 342).

- Social Permeability

Considering which social networks are most effective in disseminating news about the environment (Figure 4; Q5. Social media) is an indirect way of asking respondents which ones they consult most frequently. The survey results show Instagram (60.28%, 381) and Twitter [now %, 248) and YouTube (34.34%, 217). Other less popular media such as e-mail (14.08%, 89) or Telegram (12.50%, 79) are relegated to less favorable positions. The rest of the values are very insignificant (<5% for Google Maps, LinkedIn, Pinterest, Tiktok and others). Respondents could choose between several options and even propose others not previously listed.
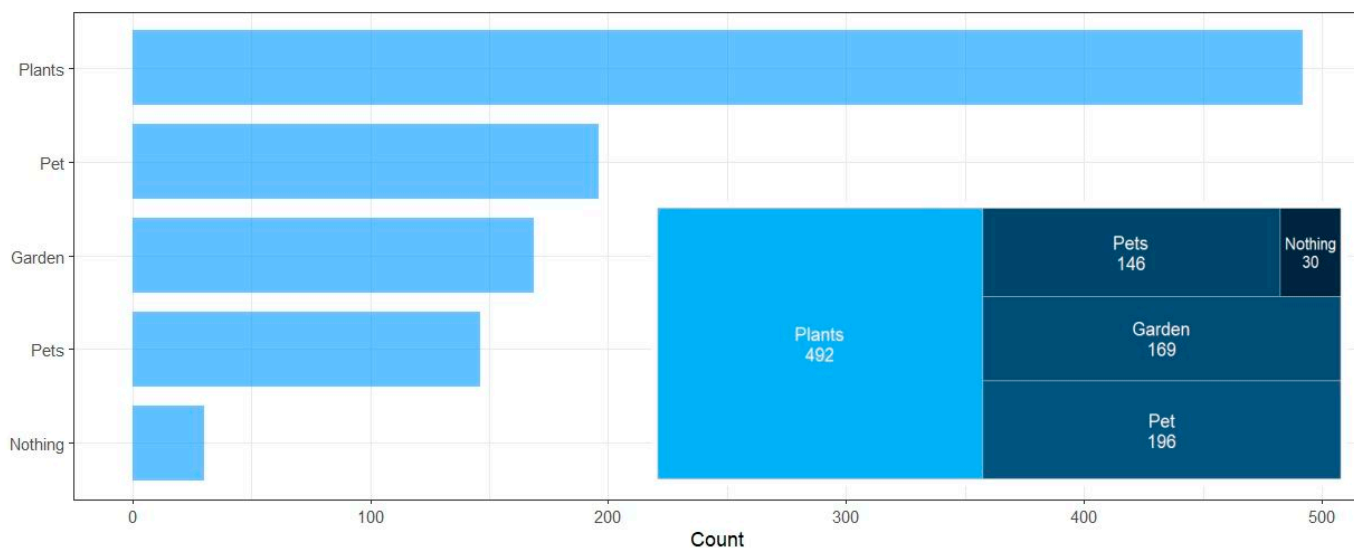
Figure 3. Count total coincidences in question Q21. The difference between "pet" and "pets" is the number of domestic animals at home, one or more than two, respectively.
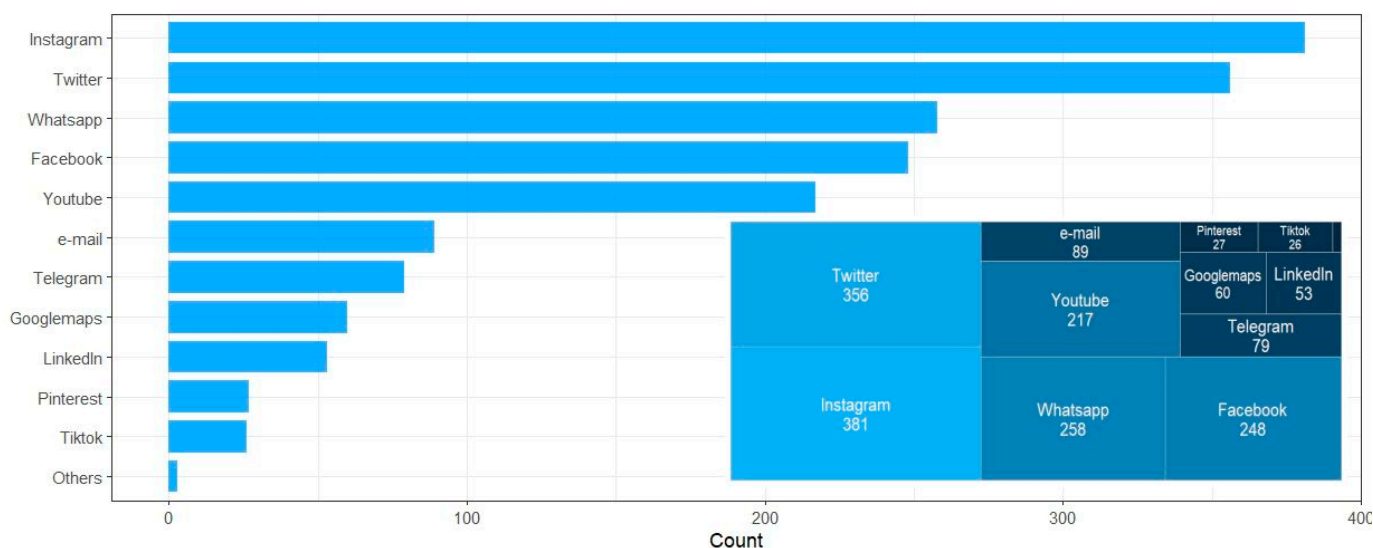
Figure 4. Count total matches in question Q5. Social Permeability, the most effective social networks for disseminating news about the environment according to those surveyed.

- Knowing about environment protection and plants

In this dimension, (Figure 2; Q6. Environmental protection), the majority of those surveyed could not say whether environmental protection is good or bad (54%, 339), leaving the rest practically divided between somewhat opposed good (20%, 126) and somewhat bad (19%, 120). Only 5% (35) and 1% (6) consider the protection very bad or very good, respectively.

When asking the direct question about whether it is considered necessary to prevent the extinction of wild plants and animals in Spain (Q9. Prevent of extinction), the highest result is affirmative answers (97.94%, 619). Only 1.58% (10 responses) are negative. Only three (0.47%) did not answer (NA).

Almost unanimously among those surveyed (98.73%,624) consider that plants are essential for other living beings to exist (Q7. Plants in the ecosystem). A non-representative 0.32% (2) does not agree with this statement. The rest do not know or do not answer (0.95%, six NA).

When asked about documents or NGOs directly linked to plant conservation (Figure 5; Q8. Documents) it is observed that, except for 16.93% of the total (107 respondents), the rest have recognized -at least- one of the items exposed. The least known are those directly linked to associations of flora in general (SEBOT) and threatened flora in particular (SEBiCoP), both closely linked to the scientific field of botany.
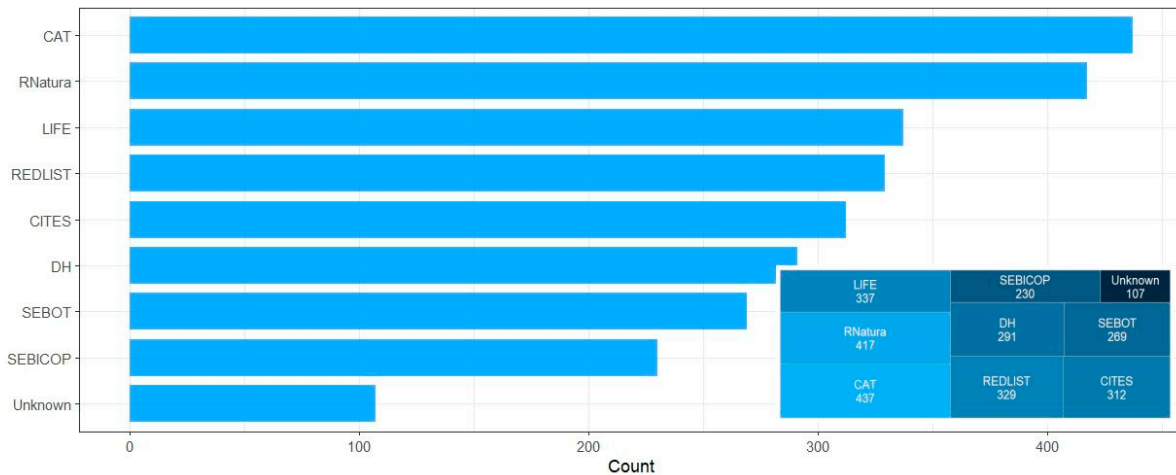

Figure 5. Total counts in each document and ONGs are related with the conservation of flora in Spain. CAT, National Catalogue of Threatened Species; RNatura, Red Natura 2000; LIFE, European Program LIFE; REDLIST, Red List of Threatened Vascular Plant in Spain; CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora; DH, European Council Directive on the conservation of natural habitats and of wild fauna and flora (Council Directive 92/43/EEC); SEBOT, Spanish Botanical Society; SEBICOP, Spanish Society Of Conservation Biology Of Plants.

Along the same lines, only the logos without explanatory text are displayed (Figure 6; Q10.Logos) related to the items presented in question Q8. A total of 77.53% of those surveyed (490 respondents) recognize at least one of them. However, 22.47% of the total (142) cannot recognize even one. The most popular among the population are the logo of the Natura 2000 Network (58.23%, 368) and that of LIFE projects (51.42%, 325). The least known are those more specific scientific symbols related to flora and its conservation (SEBOT and SEBiCoP), as occurs in question Q8.
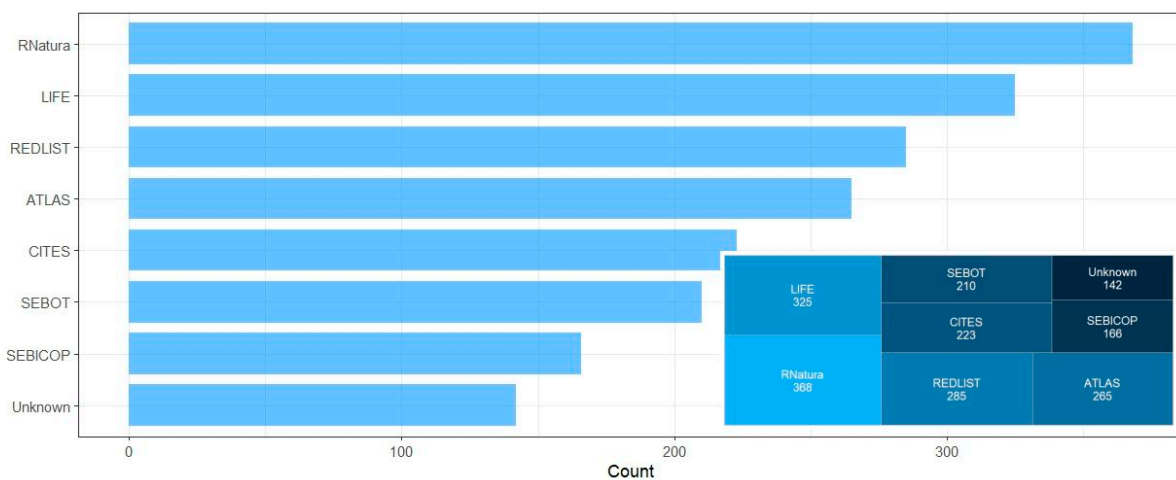
Figure 6. Total counts in the recognition of the logos of programs, documents and NGOs involved in plant conservation (Q10. Logos). RNatura, Red Natura 2000; LIFE, European Program LIFE; REDLIST, Red List of Threatened Vascular Plant in Spain; ATLAS, Red list of the Spanish vascular flora; CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora; SEBOT, Spanish Botanical Society; SEBICOP, Spanish Society Of Conservation Biology Of Plants.

When plant recognition is addressed (Figure 7; Q11. Plant recognition), the survey shows the degree of familiarity of the population with the threatened flora of Spain. The result shows a high percentage of respondents (90.98%, 575), who seem to know at least one of the plants on the exposed list, compared to a small proportion that none of them have been able to recognize (9.02%, 57). Those with arboreal shape stand out as the most recognized (*Abies pinsapo* with 71.99%, 455 and *Taxus baccata* with 64.40%, 407) over the herbaceous and smaller ones. This last group sometimes does not reach even half of those surveyed who recognize some.
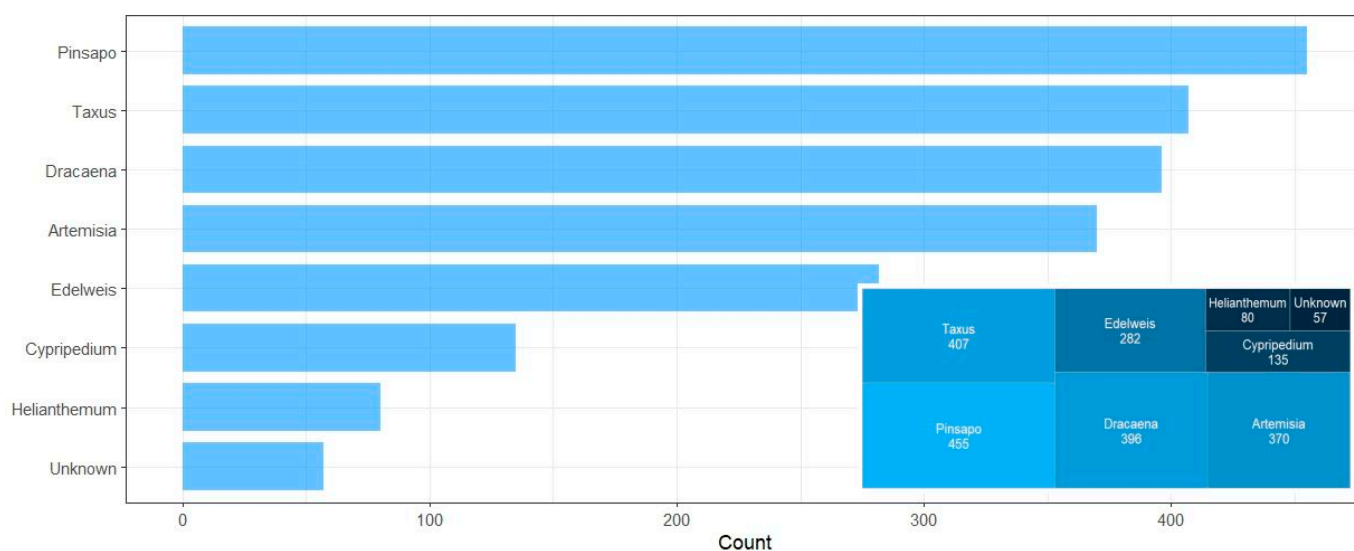
Figure 7. Recognition of threatened flora species solely by name. Pinsapo: *Abies pinsapo*; Taxus: *Taxus baccata*; Dracaena: *Dracaena draco*; Artemisia: *Artemisia granatensis*; Edelweis: *Leontopodium alpinum*; Cypripedium: *Cypripedium calceolus*; Helianthemum: *Helianthemum guerrae*; Unknown: respondents who did not recognize any of the above.

- Individual encounters

This set of questions, along with the next two, includes questions that limit or obligate the respondent in some way. These are the blocks of questions where the level of commitment of the respondent increases. The answers involve positioning ourselves more or less close to a certain degree of involvement and social responsibility with biodiversity. When asked if "Landowners have a moral obligation to not harm endangered plants and animals on their property" (Q12.Landowners moral obligation), although there is a clear inclination of the majority towards the affirmative answer (94.46%, 597), the answer 'on the contrary', although very scarce, had a little more weight than in other previous issues (1.90%, 12). A total of 3.64% (23) of those surveyed are not committed in their answers.

In one question (Q13. Protect *Artemisia granatensis*), respondents were informed about the current status of a particular plant at risk of extinction that only exists in a few locations in Spain: *Artemisia granatensis*. After describing the vital situation of the plant, the question requires positioning oneself regarding a particular situation. "If a landowner finds this chamomile on his or her property: they should leave it alone and not harm it or they should have the right to capture, move or remove even if this could result in destroying the plant or animal in the process?" The result obtained shows a clear pro-conservation inclination (97.63%, 617) when responding that the plant must be respected even if it appears on private property. And a very few pro-utilitarian responses (1.74%, 11). Only 0.62% (4) have not taken sides.

- Private property and conservation values

Continuing with the questions that imply involvement and social responsibility in the answers, the first question in this block refers to whether it is necessary for the government

to establish limits on private property rights in favor of the conservation of threatened flora (Q14. Limits on private property). And, although this question is more controversial because it implies the limitation of rights, the pro-conservationist position continues to predominate (86.71%, 548). Only 3.4% declare themselves opposed to these measures. 9.81% (62) avoid taking sides in their response. Which represents a slightly lower percentage in the pro-conservation group compared to the pro-utilitarian group, although it remains the majority.

The next question advances the degree of commitment, increasing the degree of involvement in protection (Q15. Protect *Abies pinsapo*). On this occasion, referring to a threatened tree species, the Spanish fir (*Abies pinsapo*). There is also a brief introduction of its threat status prior to the issue. And here the answers are similar to the previous question. A large majority leans towards a pro-conservation position (93.83%, 593) while the pro-utilitarian perspective is chosen exclusively by 4.43% (28 cases). Unlike the previous case, the percentage of respondents who did not fully commit to their response decreased (1.74%, 11).

- Industrial development and conservation

As involvement progresses and the limitation of industrial development by the government is introduced into the survey (Q16. Industrial development control), the pro-conservation response continues to predominate (95.09%, 601). The pro-utilitarian response does not reach 1% (0.79%, 5). On the other hand, the proportion of respondents who prefer not to opt for a pro-conservation or pro-utilitarian prism increases (4.11%, 26), although it is still a low value compared to the first option.

- Government expenditures to protect flora

In this block a series of issues arise related to government responsibility in the field of protecting biodiversity in general and threatened flora in particular. When asked about financial aspects such as taxes and whether tax expenditure would be supported to protect plants and animals at risk of extinction (Q17. Taxes), most respondents opt for the option of supporting protection with their taxes (89.56%, 566). Only 2.22% (14) declare themselves contrary and 8.23% (52) prefer not to commit themselves in their response.

Regarding which organization should be in charge of managing the protection of plants and animals at risk of extinction (Figure 8, Q18. Responsible organization), the majority response, by far, has been the central government (43.51%, 275). In second place, at a great distance, was the provincial government (21.36%, 135), almost at the same level as the European Union (18.83%, 119). Some respondents preferred not to answer (5.70%, 36). The proportion is small, although if compared with other issues it is a considerable value. The options proposed were fixed, but in addition to the three mentioned, local government (6.65%, 42), environmental non-governmental organizations (0.95%, 6), private businesses (0.32%, 2) and land owners (2.69%, 17) were considered. All of these have obtained insignificant values.

To find out the opinion of the respondents on spending on protection, the data offered by the central government on its investment in 2020 was presented, EUR 18 per Spaniard per year (EUR 861.4 million in total) (Q19. Right investment in protection). Based on these data, most of those surveyed believe that not enough is invested in conservation (83.78%, 434). A scant 15.25% (79) think that the amount is approximately correct, while those surveyed who consider it to be too much barely reach 1% (0.97%, 5). Next, they were asked about the exact amount that should be invested (Figure 9, Q20 Taxes) and were given the opportunity to respond freely, only taking into account that the data indicated the last investment per citizen and year (EUR 18). The most general opinion is to invest more than EUR 18. The most chosen ranges in order from highest to lowest choice in the response are EUR 25–EUR 49; EUR 50–EUR 74; and EUR 100–EUR 200. All these ranges add up to 51.27% of the entire sample. That is, more than half of those surveyed are in favor of investing a greater amount.
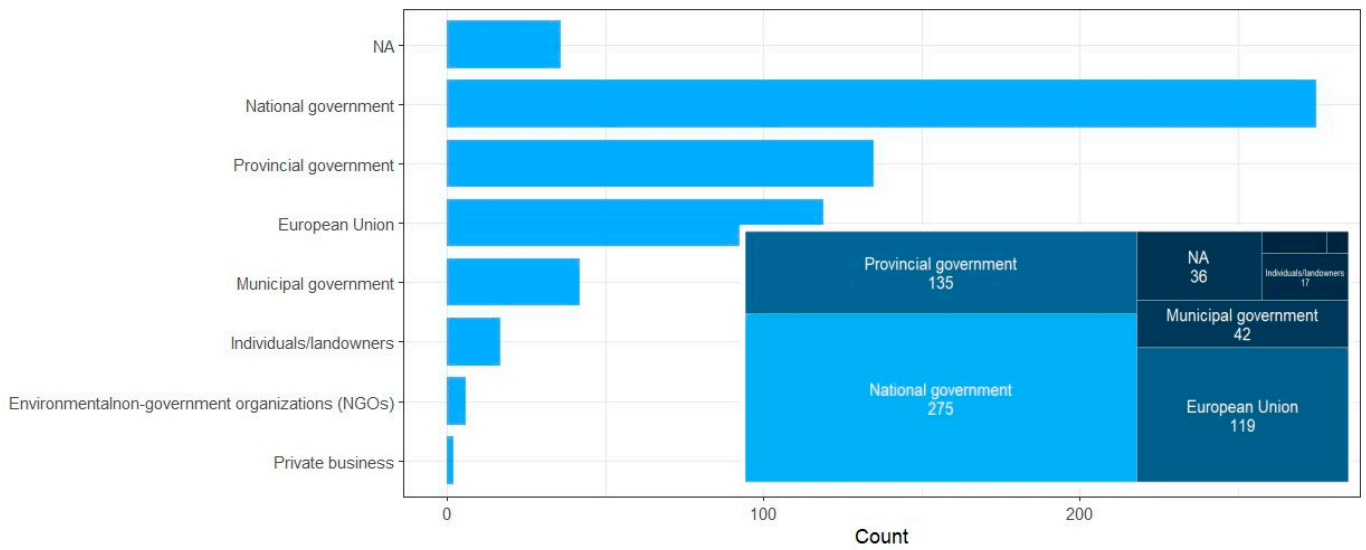
Figure 8. Election of government agencies in charge of managing the prevention of the extinction of plants and animals.
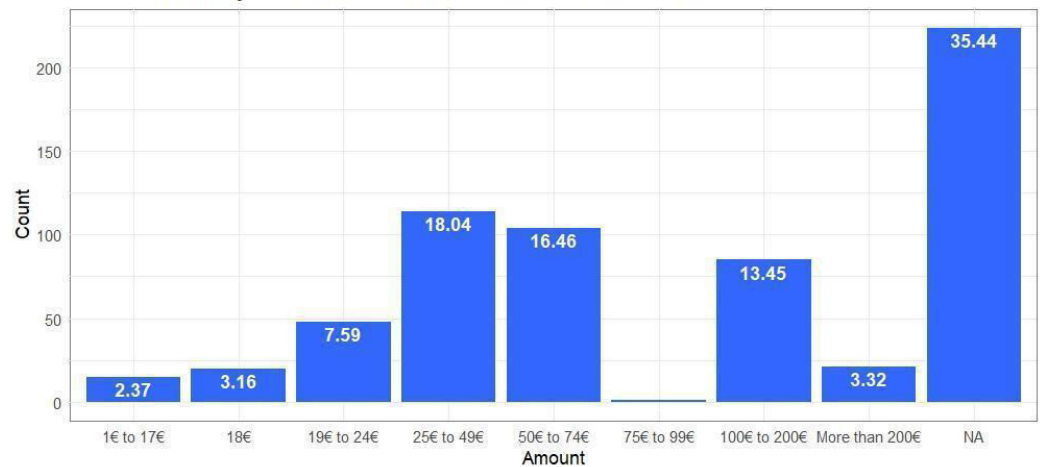

Figure 9. Histogram with simplified responses grouping them into intervals. The EUR 18 interval is considered unique as it is the reference value for state spending in 2020 established in the question. The percentage of the total is indicated in each bar, while on the x–axis the total number of interviewees who have chosen each option is indicated.

3.2. Analytical Results

3.2.1. Correlation between Variables

In general, a poor correlation is observed between the variables (Figure 10). This result indicates low redundancy in the questions asked. The correlation test (tau–Kendall) is used for all questions except for those variables where less than three different answers have been obtained. The only two really significant correlations are these two: (1) As age increases, the presence of children in the family unit increases (Age and Child, 0.5). (2) The second case, with somewhat less correlation (negative) is between plant recognition and age (Q11.Plant recognition and Age, −0.44). Contrary to what might be expected, it would indicate that when age increases, the number of plants recognized in the sample decreases. The rest of the correlations have been moderate or very low.
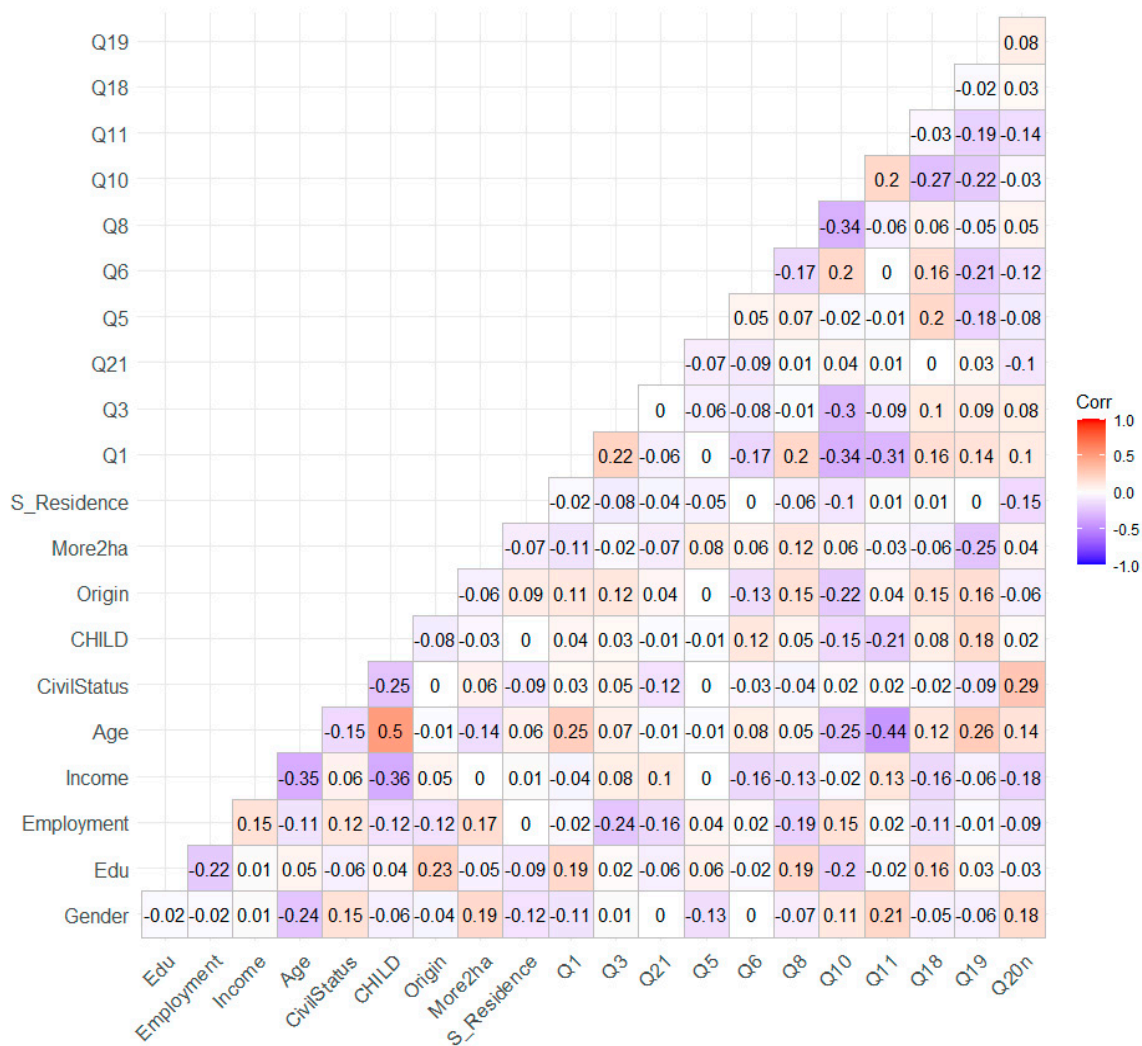
Figure 10. Correlation between variables (demographics and questions). Excluded are those with less than three different responses (not counting NAs; statistic: Tau–kendall). Edu: Education level; Employment: Type of employment; Income: Household income; Age: Age in years; CivilStatus: Civil status; CHILD: Have children; Origin: local origin from Spain; More2ha: Owners than more than two hectares of land; S_Residance: Possession of other residences in nature; Q1: Vacation plan; Q3: Frequency of mountain visits; Q21: Plant and pets in home; Q5: Social media preferred; Q6: Environmental protection; Q8: Documents and other NGOs linked to the protection of flora; Q10: Logo recognition; Q11: Plant recognition; Q18: Responsible organization; Q19: Right investment in protection; Q20n: Proposed investment in protection.

3.2.2. Independence from Demographic Variables

The result of the tests with significance is shown in Table 2, where the type of analysis is also indicated. Depending on the demographic variable, different questions have significance, with the only exception of Q1, which appears in all cases (with greater or lesser significance). Of the 21 questions (non–demographic) to which the interviewees have been exposed, 15 are subjected to analysis. Those with a unanimous response or where the type of response is multiple and could give a false significance are excluded (Q4, Q5, Q8, Q10, Q11 and Q20).

Table 2. Simplified results of the test of independence of demographic variables with respect to the answers to the questions. Only those with significance are represented. Significance level: ***, $p < 0.001$; **, $p < 0.01$; *, $p < 0.05$; · $p < 0.1$.

Demographic Variable	Questions		Test
Gender	Q1.Plan Vacation		Fisher's Exact Test
	Q21.Plants & pets	*	Fisher's Exact Test
	Q14.Limits on private property	*	Fisher's Exact Test
	Q18.Responsible organization	*	Pearson's Chi-squared test
Age	Q1.Plan Vacation	***	Pearson's Chi-squared test
	Q2.Mountain choice	***	Pearson's Chi-squared test
	Q3.Frequency of mountain visit	**	Pearson's Chi-squared test
	Q21.Plants and pets	*	Pearson's Chi-squared test
	Q6.Environmental protection	**	Pearson's Chi-squared test
	Q15.Protect *Abies pinsapo*	·	Pearson's Chi-squared test
	Q18.Responsible organization	***	Pearson's Chi-squared test
	Q19.Right investment in protection	***	Fisher's Exact Test
Education level	Q1.Plan Vacation	***	Pearson's Chi-squared test
	Q2.Mountain choice	***	Fisher's Exact Test
	Q3.Frequency of mountain visit	*	Pearson's Chi-squared test
	Q13.Protect *Artemisia granatensis*	*	Fisher's Exact Test
	Q17.Taxes	*	Fisher's Exact Test
	Q18.Responsible organization	***	Fisher's Exact Test
	Q19.Right investment in protection	***	Fisher's Exact Test
Origin	Q1.Plan Vacation	***	Pearson's Chi-squared test
	Q18.Responsible organization	*	Fisher's Exact Test
	Q19.Right investment in protection	***	Fisher's Exact Test
Income	Q1.Plan Vacation	**	Fisher's Exact Test
	Q2.Mountain choice	*	Fisher's Exact Test
	Q18.Responsible organization	***	Pearson's Chi-squared test
	Q19.Right investment in protection	**	Pearson's Chi-squared test
Child	Q1.Plan Vacation	**	Fisher's Exact Test
	Q2.Mountain choice	***	Fisher's Exact Test
	Q19.Right investment in protection	***	Fisher's Exact Test
Property	Q1.Plan Vacation	·	Fisher's Exact Test
	Q3.Frequency of mountain visit	**	Fisher's Exact Test
	Q21.Plants and pets	**	Fisher's Exact Test
	Q6.Environmental protection	·	Fisher's Exact Test
	Q14.Limits on private property	**	Fisher's Exact Test
	Q15.Protect *Abies pinsapo*	***	Fisher's Exact Test
	Q16.Industrial development control	**	Fisher's Exact Test
	Q17.Taxes	**	Fisher's Exact Test
	Q18.Responsible organization	**	Fisher's Exact Test
	Q19.Right investment in protection	***	Fisher's Exact Test

Among all the demographic variables, those that have shown the most some type of significance have been: Property (10 questions), Age (8) and Education Level (7). A priori, they seem to be the most determining variables in the field of conservation.

When the significant response is observed with respect to the thematic blocks (Table A1), both Vacation preferences/Nature affinity (19) and Government expenditures (16) are much more dependent.

On the other hand, the questions that have been most dependent on demographic variables are the following (ordered from highest to lowest frequency): Q1. Plan vacation (8), Q18. Responsible organization (7), Q19. Right investment in protection (7), Q2. Mountain choice (5). The rest show values with a frequency of less than 3.

Observing the result by questions, within the Vacation preferences/Nature affinity block, it can be seen that in vacation planning (Q1.Plan Vacation) the most determining factor seems to be Age, Education level and Origin. For Q2.Mountain choice, it is Age, Education Level and Child. While in relation to the frequency of visits to the mountain (Q3.Frequency of mountain visit), to a lesser degree of significance, Age and Property influences. And regarding the possession of plants and animals at home (Q21.Plants & pets) it is Property, Gender and Age.

In the Knowing about environment and plants block, only question Q6.Environmental protection shows significance, where the consideration of the state of environmental protection only seems to be decisively affected by the Age. In the question referring to respect for the Sierra chamomile (Q13. Protect *Artemisia granatensis*), within the Individual encounters block, only Education level is the variable that significantly affects it.

In the Private property block it turns out that when some limitation on the use of the land is introduced (Q14.Limits on private property and Q15.Protect *Abies pinsapo*), the responses appear significantly affected by the demographic variable Property. In Industrial development something similar to the previous block seems to happen. Given the approach of limitations to industrial development, question Q16.Industrial development control, significance is only observed with Property.

And, in the last block, Government expenditures show a greater significance of the variables Age, Education level, Property and Income in general. When asked if taxes invested in the protection of plants and animals are supported (Q17.Taxes), the only dependent variables turn out to be Property and Education level. The very similar result obtained in the questions about which organization they consider should be responsible for the management of threatened species (Q18.Responsible organization) and whether they agree with the current government investment (Q19.Right investment) is noteworthy. In both cases, the most significant demographic variables ($p < 0.001$) turn out to be Age, Education level and Property; others with high values although not exactly the same, such as Income ($p < 0.001$ in Q18 and $p < 0.01$ in Q19) or Origin ($p < 0.001$ in Q19 and $p < 0.05$ in Q18).

3.2.3. Commitment to Conservation

As an overall result of the survey, a total of 22.31% (141) pro-utilitarian respondents are obtained compared to 77.69% (491) pro-conservation. After performing the Chi-square test between both groups (pro-utilitarian and pro-conservation) along with all the questions, significance is observed in only some of the questions (Table 3). But despite not being numerous, the results show very strong or moderate evidence in all cases except for Q17. Taxes (suggestive evidence) and Q1. Plan vacation (little or no evidence).

Examining the results, the greatest significance is observed in all the questions of the blocks: Individual encounters, Private property and Industrial development. In the Knowing about environment and plants block, where only the question referring to whether prevention of the extinction of plants and animals is necessary (Q9.Prevent of extinction) shows significant differences, the following can be observed (Figure A2): the proportional part who voted against is clearly inferior. However, the pro-utilitarian group votes unanimously against (No). In the Individual encounters block, with two questions where

respondents are asked if they should have a moral obligation not to harm threatened plants or animals (Q12.Landowners moral obligation) and if they should respect the small Sierra Nevada chamomile (Q13.Protect *Artemisia granatensis*) in its fields, presents a very similar result to the previous one (Figure A2). The affirmative response is almost unanimous, but the difference between both groups in relation to these responses remains significant.

Table 3. Simplified results of Chi-square analysis of all questions vs. both groups (Pro-utilitarian and Pro-Conservation). Only results with $p > 0.05$. Significance level: ***, $p < 0.001$; **, $p < 0.01$; *, $p < 0.05$; · $p < 0.1$.

Questions	
Vacation Preferences/Nature Affinity (1/5)	
Q1.Plan Vacation	·
Knowing about environment and plants (1/6)	
Q9.Prevent of extinction	***
Individual encounters (2/2)	
Q12.Landowners moral obligation	***
Q13.Protect *Artemisia granatensis*	***
Private property (2/2)	
Q14.Limits on private property	***
Q15.Protect *Abies pinsapo*	***
Industrial development (1/1)	
Q16.Industrial development control	***
Government expenditures (2/4)	
Q17.Taxes	*
Q18.Responsible organization	**

The Private property block is the most controversial as can be seen (Figure A3), the proportion of the pro-utilitarian group is significantly higher in both questions. Both in the question regarding direct limitations on private property by the government (Q14.Limits on private property) and direct limitations if a specific species appears on your private land (Q15.Protect *Abies pinsapo*). In both, a greater number of responses from the pro-utilitarian group are observed compared to the rest of the questions with significance.

The Industrial development block refers to the limitation on industrial development on private land (Figure A4; Q16.Industrial development control) and, together with questions Q9, Q12, Q13, Q14 and Q15, shows maximum significance ($p < 0.001$) and shows a very significant difference when it comes to supporting or rejecting that limitation. The pro-utilitarian group, although a minority, shows a clear rejection of this aspect.

Perhaps the most surprising result obtained ($p < 0.01$) is in the question referring to the preference of the government responsible for the management of the conservation of threatened flora and fauna (Q18.Responsible organization), where clear differences in preferences are observed (Figure 11). While the pro-conservation group mostly chooses the central government, the pro-utilitarian group seems not to decide between the European Union, National government and Provincial government (in Spain, it is called "Autonomous Community" and has transfers in matters of biodiversity conservation).

Figure 11. Mosaic plot about the responsible organization in the Government expenditures group (Q18: Responsible organization).

4. Discussion

4.1. Data Collected

Regarding the comparison with the national census (Table 1), in this study, the age range is slightly narrower (17 to 74) than the national INE data with which it has been compared (15 to 74). This implies a slightly higher degree of demand for the representativeness of the sample; however, the total number of respondents reached a representativeness of 95%, which validates the generalization of its results. Therefore, an effective distribution of the survey is demonstrated and it seems to be an option for future longitudinal sampling.

Observing the thematic blocks of the questions asked, in the first group, oriented towards Vacation preferences/Nature affinity, results are obtained that show a clear affinity towards the natural environment in general and, in particular, very prominent towards mountain environments. If you look at questions Q1 and Q3 in more detail (Figure 1), both are closely related, with Q1 being more generalist and Q3 directed at mountain habitat. Respondents show a clear preference towards the mountains in particular, perhaps because they are more accessible than other environments or because they are identified as a genuine and isolated natural habitat. In any case, that seems to be the majority perception of the population. In other previous studies, it was found that the feedback from visitors is very positive in the majority [115] and this could be the reason behind these results in Spain.

In the question related to the health benefit from contact with the environment (Q4. Pathologies and nature), a practically unanimous response was obtained (99%) regarding its beneficial aspect. This massive response indicates the great importance that the environment has for citizens, since few topics are of as much interest as health itself, and it would also imply its justification as a recommended activity in illness or recovery processes. This sensitivity towards the healthy aspect also helps to increase the sensitivity of public

opinion regarding environmental conservation. These aspects have been evident in other works but even more prominently just after the pandemic [116].

Also striking is the large proportion of respondents with pets and/or plants in their care (95.25%) compared to the proportion of respondents with children (50.80%), and this result may be a reflection of how pet attachment was negatively associated with fertility intention. [117]. The high proportion of respondents with pets or plants in their care may also be linked to a high sensitivity of the surveyed group towards a pro-environmental stance [118].

In the aspect of conservation culturomics [119], it is essential to monitor human–nature relationships in relation to flora conservation. Even today, this medium is still not sufficiently exploited in conservation science [120–122]. In the study in question, it has been used both in the creation of the survey itself and in its dissemination, but in addition, respondents are asked about the most efficient way to reach the citizen with information, that is, maximize social permeability regarding the initiatives and state of biodiversity conservation. The result obtained shows a clear preference towards the Instagram and Twitter platforms (now X). Therefore, the use of these platforms is recommended for the dissemination of information. Since if management seeks to maximize the transfer to the general public, they seem to be the most profitable means. Without forgetting that it is advisable to take into consideration other media that fulfill the same function, even if a slightly lower preference is shown (Figure 4) such as Whatsapp, Facebook or YouTube. Since these media often complement the information suggested in the preferred networks, and they usually have formats that are much richer in information.

Regarding the knowledge about the environment and plants block, as well as the current social perception of its management, perhaps the most important thing may be the lack of knowledge about current management in terms of protection. Even despite having demonstrated a clear interest in the topic, as seen in the results of the previous block. This denotes the clear need to increase efforts in this regard in the country. The responses show a clear awareness of the importance of plants in the ecosystem and their need for conservation, which largely legitimizes the efforts invested in their management. A clear example of the above is seen in the first question of the block relating to the consideration of protection in Spain (Q6.Environmental protection), where a result is obtained with a high number of neutral responses and the rest practically symmetrical. It suggests that the general public is not clear about what environmental protection is like in Spain. It could be due to the similar process that occurs between science and management where a lack of knowledge is observed that appears to be due to an inefficient transfer of knowledge [123].

The recognition of key documents, entities or initiatives on biodiversity conservation has been relatively acceptable for the Natura Network or the LIFE projects. The rest, especially those referring to flora in particular, have been much less recognized. This is reflected in the recognition of a few emblematic species of flora, where those more modest (herbaceous or subshrub species) have barely been recognized by the general public. The exception among the herbaceous species is the Sierra Nevada Chamomile (*Artemisia granatensis*), whose fame can be attributed to an occasional appearance in the ordinary press and scientific press. It is worth noting the fact that the most recognized logos, documents and NGOs have been the most international ones promoted by the European Union (Red Natura and LIFE projects). The obligation to include these logos on posters when they are made with European funds (in whole or in part) may be another reason that has had weight in their recognition. The difference could also be a reflection of an unequal effort and dissemination strategy carried out by international entities compared to national ones. At the local and national level, there is no specific logo associated with the topic of conservation. Everything is included in the identifying logos of national or regional governments. This fact can also influence the perception and identification with respect to conservation efforts.

In the following blocks there is an increase in the personal involvement of the respondent, in order from lowest to highest involvement: Industrial development, Individual

encounters and Private property. This is reflected in the results of the surveys, practically doubling the respondents in the pro-utilitarian position in each block consecutively. The most sensitive has been the one referring to private property but, despite everything, a very low percentage of representation is reached in the sample (4.43% max.). On the other hand, the case of industrial development seems more due to the fact that most of the respondents feel alienated from this development factor. In short, the results show a very broad social support for the issue of conservation, despite the personal costs that it could cause in their private space.

The results of the Government expenditures block have been very interesting. Firstly, there is clear citizen support for the taxes that are dedicated to this management and beyond this point, they believe that they should be higher (Figure 9). When asked for opinions on who should have this responsibility, most of those surveyed preferred the Central Government (responsible for environmental powers prior to the transfer to Provincial Government in 1984). It should be taken into account that it could be affected by the coincidence in much of that time of a successive reduction in budgets in this area. In the last decade, due to successive economic crises suffered, national budgets in this area have been reduced.

4.2. Correlation between Variables

The low correlation between all the variables (Figure 11) is a consequence of the low redundancy in the questions. Which is consistent with the intention of carrying out a survey that would consume the minimum amount of time invested with the maximum amount of information collected. The most notable thing regarding the topic at hand seems to be the recognition of plants with respect to age. However, the data taken in the survey do not allow other conclusions.

4.3. Independence from Demographic Variables

The analysis shows that the most determining demographic variables in the field of conservation seem to be: Property (10 issues), Age (8) and Education Level (7). This correlation with educational level has already been observed in other previous works [124,125]. Of the three variables, the one that could be addressed from management would be Education level, so it seems evident that this is the aspect that must always be present in the design of any strategy or policy for the conservation of biodiversity. Also evident is the foreseeable conflict with the owners regarding measures to protect threatened plants and animals. The demographic variable Property seems to be a determining factor in all cases where the use of the land or property is limited. It seems to be perceived even when—indirectly—the limitation to industrial development is proposed.

4.4. Commitment to Conservation

The results of the survey show a clear inclination of Spanish society towards conservation (pro-conservation 77.69%) that is consistent with the latest Eurobarometer 2023 in which the third most important issues facing at the moment is "The environment and climate change". If compared to other countries in the European Union, when the Eurobarometer asks about the importance of biodiversity, although the European average is high (61%), it seems to be observed that the most Mediterranean countries (Portugal, Spain, Greece, Slovenia, Cyprus) present slightly higher values (>70%) higher than the rest of the countries. With the striking exception of Italy (54%) and, not so much, Croatia (62%) along with Malta (66%). This could be an indicator of a greater perception of the impact of climate change in the Mediterranean countries.

A significant difference is also observed in the responses to those questions with greater personal involvement between both groups (Table 3). The results on the questions shown in the aforementioned table confirm the most conflictive points between both positions (Q12, Q13, Q14, Q15, Q16, Q17 and Q18). Everything fits into a general acceptance of the importance for Spanish society of biodiversity in general and flora in particular. Where

interests begin to diverge is when it already involves a greater personal/social cost (issues from Q12 to Q16). Despite the evidence ($p < 0.001$), reviewing the results in detail shows that the rejection in the pro-utilitarian bloc is a minority (Figure A2 to Figure A4). This phenomenon could be related to what has been observed in other works aimed only at landowners, where the study shows a greater significance of the educational level, even above the size of the property [126]. In short, it could be interpreted that social awareness towards the protection of nature in Spain is very present and very high, regardless of personal interests. The results in the questions aimed at support (Q17.Taxes) and total amount (Q20.Investment in protection) support this same idea, since they present little or no significance in the analysis.

However, the significant result ($p < 0.01$) in relation to the entity responsible for the management of the conservation of threatened plants and animals (Q18.Responsible organization) is surprising. In this case, a priori, it does not seem linked to a direct personal cost, however, the pro-utilitarian group shows less confidence in the central government, trusting more in the European Union or the Provincial government. In any case, with the data collected it is difficult to find a clear explanation for these curious differences. More analysis would be necessary in this regard.

The preservation of biodiversity and the provision of ecosystem services increasingly depends on environmental conservation on private lands. These differences detected between the pro-utilitarian and pro-conservation groups, being such low percentages, seem perfectly acceptable to current Spanish society, even taking into account the expected deviation [104,105]. Furthermore, it is well known that conservation actions generally benefit some groups more than others. However, it must be taken into account because this inequity decreases the probability of achieving conservation objectives [127]. When local society as a whole (including each individual, the government and the private sector) are part of the conservation process and legitimize it, the options for achieving the objectives set [18,73–75] in adaptive management increase to protect biodiversity.

Participation in the survey by the population intervenes in their awareness of the protection of biodiversity as a consequence of climate change. As has been indicated, Spain and other southern European countries are in a process of vulnerability due to the consequences of long-term global change, as loss of biodiversity can lead to situations of social exclusion. For example, the problems resulting from water scarcity can even affect the Gross Domestic Product of Spain due to the expulsion of tourism.

5. Conclusions

Beyond the debate in which the acclaim about global change is almost unanimous among scientists and at the same time presents some skeptical social sectors, the reality is that) in the same way that the industrial revolution impacted nature (as a consequence of current economic model, major climate changes are occurring (drought, floods, high temperatures, etc.). And the consequences of these transformations require measures to confront them from the whole of society.

The analysis of the data collected from this survey allows us to know—before addressing management and transfer work—the dimensions related to the social capital that promotes pro-environmental values in sustainability and conservation of the biodiversity of flora among the Spanish population, with its associated values, norms, behaviors and attitudes. The results are an aggregate of real or potential resources linked to the possession of perspectives of a human group with respect to flora and environmental conservation that allow the development of adaptive management strategies. This option in favor of protection is more or less institutionalized and implies mutual recognition between individuals. For all these reasons, this analysis aims to be a useful management tool, to take the current pulse of Spanish society, and detect those aspects with greater gaps or less awareness in relation to the protection of biodiversity, in general, and threatened flora in particular. Showing the aspects that should be reinforced in awareness campaigns and

other transfer initiatives between management and society. This same survey can serve as a basis for a longitudinal study along the same line of analysis.

The current state of social awareness in Spain regarding the conservation of biodiversity in general and flora in particular has been very high. Broadly speaking, it can be stated that biodiversity conservation is a transversal value at the social level that allows establishing norms as part of social capital, which coheres and can provide identity [128]. It legitimizes and promotes the general interest or common good—in the form of support for the conservation of biodiversity, promoting civic commitment and allowing subjects to get involved in the policies that are adopted. The great presence in the lives of those surveyed is evident, not only in their interest in supporting it (directly or indirectly), with the desire to invest a greater amount of their taxes in this area being almost unanimous.

However, there are also some shadows in the results, since signs have been observed of a worrying lack of knowledge in society, in relation to the efforts currently being made for the benefit of conservation and its protagonists. This points to an urgent need to improve and expand the effort in transfer between the three main actors: researchers, managers and society.

It is also necessary to take into account that the experience during the coronavirus pandemic (impossibility of contact with nature and social, illness, etc.) may have affected the response of the respondents, perhaps still very sensitized.

It would be advisable to delve deeper into the organizations responsible for managing biodiversity. The results are not conclusive as to its possible cause, which could be due to lack of knowledge of the work carried out or, perhaps, due to possible discontent in the current management.

Although there are numerous qualitative and qualitative methodologies to approach the object of study—in this article—the survey shows that it is a multidimensional analysis tool that can cover the analysis needs of adaptive management to global change and biodiversity conservation. Firstly, it allows us to know the populations where strategies for the conservation of biodiversity in general and flora in particular are to be implemented. Secondly, it allows management to be adapted to that reality (adaptive management). Thirdly, it can be replicated and, therefore, observe the evolution over time of a population where conservation measures are implemented to check how it evolves. Even check the impact of the measures implemented on management. In such a way that it allows the effect of these measures to be assessed and the adaptive management cycle to be repeated. And, fourthly, asking about a particular topic is, in itself, an action of science transfer. Issues are presented that are present. They bring aspects closer to people's lives that probably remain foreign to their daily lives. For example, this analysis has brought relevant data on threatened flora (*Artemisia granatensis* or *Abies pinsapo*) to the Tansurveyed population, from its status to its own existence in Spain. Likewise, all logos and organizations or bodies that work on its conservation.
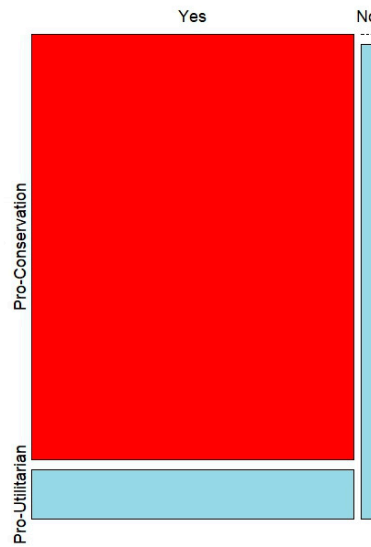
Appendix A

Figure A1. Evolution of data entry, from 23 November 2022 1:44:17 p.m. CET to 24 February 2023 6:35:33 p.m. CET. Note the data that appear before that date correspond to previous tests of the online survey.
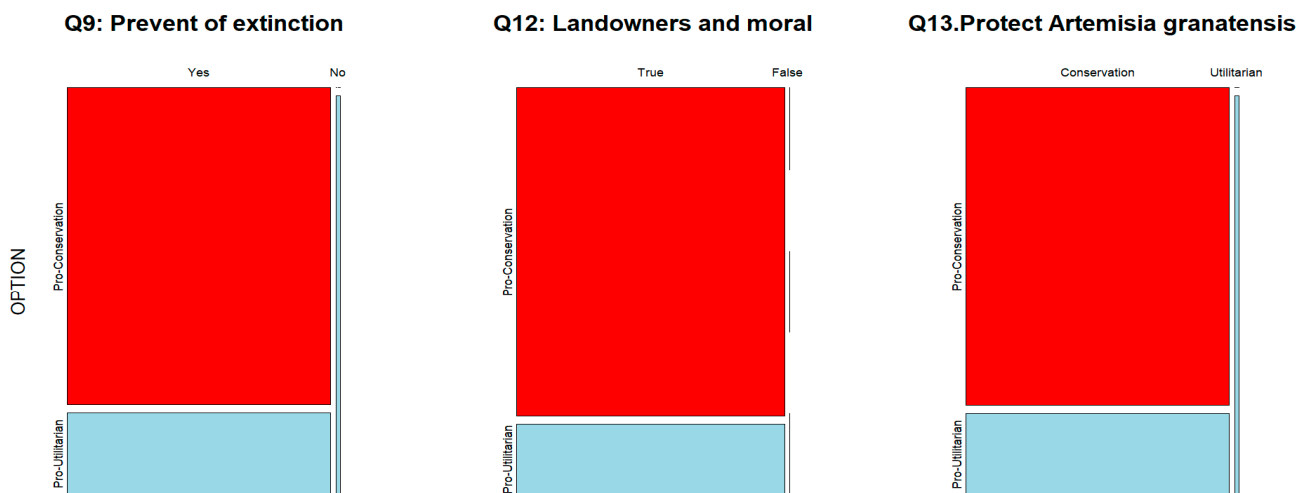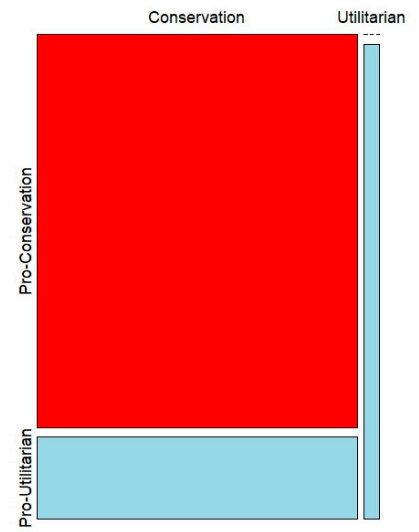

Figure A2. Mosaic plot of the questions in the individual encounters group. Light blue: Pro-utilitarian group; Red: Pro-conservation group.
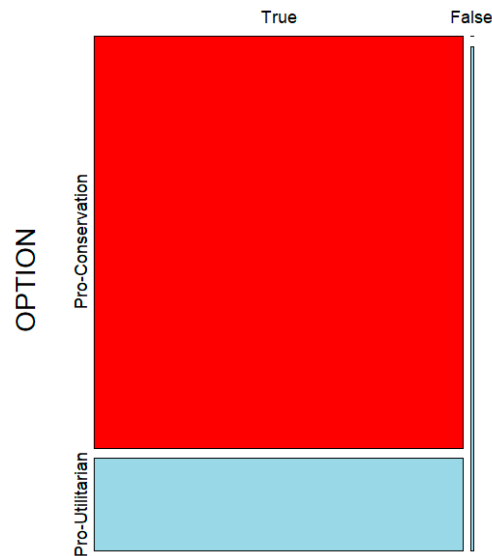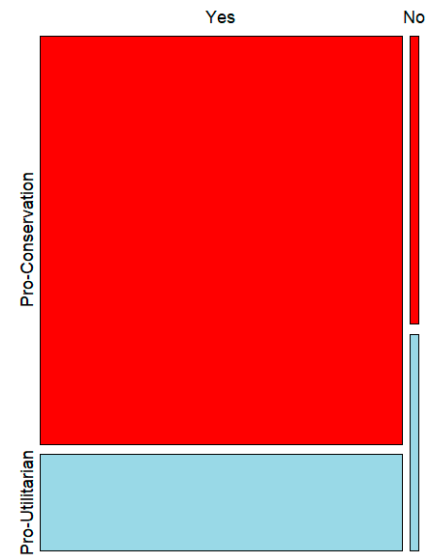
Figure A3. Mosaic plot of Private property group. Red: Pro-conservation group; Light blue: Pro-utilitarian group.

Figure A4. Mosaic plot of two questions of Industrial development and Government expenditures groups. Red: Pro-conservation group; Light blue: Pro-utilitarian group.

Appendix B

Table A1. Result of the normality test in all variables (categorized samples), grouped into thematic blocks. Significance level: ***, $p < 0.001$.

Variable	Statistic	
Demographics Variables		
Gender	P = 7737.3	***
Age	P = 1364.7	***
Civil status	P = 6359.5	***
Have children	P = 8398.2	***
Education level	P = 5119.5	***
Ocupación	P = 3816.5	***
Household income	P = 3034.7	***
Own > 2 ha of land	P = 11,663.0	***
First residence in rural area	P = 9467.6	***
Second residence	P = 8229.7	***
Second residence and Nature	P = 4290.0	***
Vacation preferences/Nature affinity		
Q1.Plan Vacation	P = 5518.1	***
Q2.Mountain choice	P = 11,738.0	***
Q3.Frequency of mountain visits	P = 2869.7	***
Q4.Pathologies and nature	P = 627.0	***
Q21.Plants & pets	P = 5359.0	***
Social Permeability		
Q5.Social media	P = 481.61	***
Knowing about environment and plants		
Q6.Environmental protection	P = 5690.9	***
Q7.Plants in the ecosystem	P = 16,172.0	***
Q8.Documents	P = 1040.9	***
Q9.Prevent of extinction	P = 15,823	***
Q10.Logos	P = 875.94	***
Q11.Plant recognition	P = 485.3	***
Individual encounters		
Q12.Landowners moral obligation	P = 14,613.0	***
Q13.Protect *Artemisia granatensis*	P = 15,744.0	***
Private property		
Q14.Limits on private property	P = 13,150.0	***
Q15.Protect *Abies pinsapo*	P = 14,702.0	***
Industrial development		
Q16.Industrial development control	P = 14,892.0	***
Government expenditures		
Q17.Taxes	P = 13,790.0	***
Q18.Responsible organization	P = 4207.2	***
Q19.Right investment in protection	P = 8875.0	***
Q20.Investment in protection	P = 1459.3	***

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