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### Perception of Pine Trees Among Citizens of the Balearic Islands: Analysis and Description of Some Mistaken Ideas

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# Perception of Pine Trees Among Citizens of the Balearic Islands: Analysis and Description of Some Mistaken Ideas

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In this article, the authors analyze evidence regarding the dissemination of mistaken ideas concerning the presence and function of pine trees (*Pinus halepensis*) in a Mediterranean archipelago: the Balearic Islands (Spain). The main errors concerning the natural vegetation that are disseminated among citizens by the forest management sector are explored. Second, the authors analyzed how this issue is addressed in the principle textbooks of the Balearic Islands' secondary education, and they conclude that the messages transmitted by these educational resources could contribute to promoting erroneous beliefs about the nature and significance of pine trees in the Balearics.

## INTRODUCTION

This study was initiated by a concern, expressed by the Forest Management Service in the Balearic Islands,<sup>1</sup> that was based on a con-

viction that the understanding by local people of the plant communities of this Mediterranean archipelago are false, and that those beliefs are now lodged securely in the citizens' way of thinking. This was considered particularly true in relation to pine trees. Forest managers thought that these ideas, adopted by the community as a part of their ecological culture, could shape behavior toward the region's physical environment and have a negative effect on the management of forested areas going forward. They believed, for instance, that local people consider that pine trees (*Pinus halepensis*, the most numerous of the natural forest vegetation in the Balearics) are intruders among the tree species of the archipelago. The trees are thought to be nonautochthonous, and,

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<sup>1</sup>The Balearic archipelago is situated off the eastern coasts of the Iberian Peninsula. It is made up of five main islands (Mallorca, Menorca, Eivissa, Formentera, and Cabrera) with their respective adjacent islets. It has a total surface area of around 4,800 km<sup>2</sup> and a population of 1,030,650 people.

as happens on occasion with allochthonous species in relation to autochthonous ones, people believe that they invade forests and kill Holm Oaks (*Quercus ilex*), a species natural to the region. Pine trees are also blamed for forest fires and that, mistakenly, Holm Oaks do not burn. These confused perceptions could affect forest management in a negative way, in that it is difficult to find the necessary social and cultural commitment from the population to protect a species when it is undervalued by the ecological value base of the community. The research question therefore that drove this study was whether this was a misunderstanding of the public perception by the forest management service or whether there truly was an ecological misunderstanding by the public driven by the educational texts and discourses that were provided by the State and other educational decision-making bodies to guide learners. Was it only a question of a false perception by those who are directly involved with forestry management or something much more significant and potentially damaging?

## Evidence of a Wrong Perception Concerning Pine Trees

A previous study carried out in the Balearic Islands (Sureda, Morey, Pastor & Llabrés, 1997) found that pine trees were undervalued by peasant farmers of the island of Mallorca. The study investigated the causes of forest fires in the Balearics and interviewed farmers in the area most affected. It concluded that the view these farmers have of the forest is exclusively limited to the utility of the trees in terms of commercial return on timber. They reported only negative views of the usefulness of the pine trees referring to them as follows: "to blame" and "useless except for a few goldfinches."

The evidence suggests that the undervaluing of the pine tree is not limited to peasant farmers. There is also evidence that other sources support this position. A vote organized through the Internet in December 2008 by a

Balearic Islands<sup>2</sup> newspaper asked their readers to indicate the tree that should be considered to be most representative of the Balearics. The Holm Oak (*Quercus ilex*) won by far (218 votes), followed by the wild olive tree (*Olea europaea* v. *sylvestris*; 111 votes). The pine, the most abundant tree, came third (87 votes). In July and August 2008, on the Web site of the most powerful and prestigious ecological group in the islands (the Grup d'Ornitologia Balear i de Defensa de la Naturalesa), an Internet forum<sup>3</sup> dialogue was carried out that also highlighted the existence of a negative, ecological 'cultural bias' toward pine trees.

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## OBJECTIVES

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In gathering evidence for this article, we aimed to measure the negative ecological culture and social perception toward pine trees in the Balearics. Specifically, we had two objectives: (a) collect and analyze evidence concerning the potential existence and dissemination of negative information about the natural vegetation of the Balearics, particularly pine trees; and (b) to analyze whether the most commonly used textbooks by pupils in the Balearic<sup>4</sup> secondary education system contributed to the misunderstanding of the relative importance of pine trees in the archipelago.

The second objective is more specific and located than the first and focuses on schools, and particularly textbooks within schools. This is justified by the belief that schools are disseminating information, perhaps inadvertently, which may be misleading about pine forests. Although we focus on textbooks, it is understood that books are only one means by

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<sup>2</sup><http://dbalears.cat/elsdeu/arbre-silvestre.html>

<sup>3</sup><http://gobmallorca.com/forum/viewtopic.php?id=648>

<sup>4</sup>The Compulsory Secondary Education stage, structured in 4 years, includes students between 12 and 16 years of age and is arranged following the principles of requirement for all pupils and attention to diversity.

which knowledge is transmitted and acquired at school. The insecurities of relying singularly and exclusively on the analysis of textbooks as a teaching resource (Lenoir, Rey, Roy, & Lebrun, 2001) are well known and we are aware that it is impossible to isolate their effect. We acknowledge therefore the primary importance of textbooks—but recognize also other school guides and teaching resources—and do not assume that teachers strictly confine themselves to a textbook as their only sources of teaching material. Textbooks are learning resources that each teacher uses to differing degrees of depth depending on many contextual variables.

However, textbooks have a considerable effect on the person teaching and on what is taught (McCrorry, 2006). Their content constitutes a good indicator of what is transmitted in the classroom, as they are designed to help pupils learn and teachers to structure their teaching activities (Dubois & Carette, 2010). They are an excellent indicator of the knowledge discourse being subscribed to at any one moment of time and within which young people are being moulded. Recognizing these limitations, we began to analyze the content and discourse of leading ecological textbooks. Our work in this field complements the many studies that have already analyzed how these textbooks portray the natural environment: Korfiatis, Stamou, and Paraskevopoulos (2004) in Greece; Martínez (2006) in Mexico; *Ecologistas en Acción* (2006) in Spain; Tracana et al. (2007) in Portugal; and Berthou-Gueydan, Clément, and Clément (2008) in France, among others.

## METHODS

A survey was used to gather, compile, and analyze the facts regarding the dissemination of misleading information concerning the natural vegetation of the Balearics, and pine trees in particular. This survey was conducted by col-

lecting the most extensive information possible from the people involved in forest management in the Balearics. We sent a short, self-administered questionnaire by e-mail to the members of the Balearic forest network. This network is made up of a large group of people (around 400) who come from different academic and professional fields and from different sectors, such as agriculture, tourism, and teaching, and all of whom share a common interest in maintaining the value of the forested area in the Balearics. In the questionnaire, we asked whether they were aware of dissemination, by any means, of misleading information concerning the characteristics and workings of the forests in the Balearics. Two open questions were posed: One asked them to explain the evidence they were aware of, and the other asked them to state the means by which this information was disseminated. The survey was circulated on March 16, 2009, and was answered by 25 people. From an analysis of the returns, we created a list of the information that was considered by the respondents to be misleading. Following analysis, we were able to extract the way in which these ideas were disseminated.

To approach the second objective (analysing whether the primary textbooks of Balearic compulsory secondary education contribute to the dissemination of misleading information concerning pine trees), we used content-based, discourse analysis. Both qualitative and quantitative methods of analysis were applied and, we withdrew the explicit and implicit messages concerning the natural vegetation of the Balearics that were presented in the textbooks. To determine the analysis units, it was necessary to select which books to study. To achieve this, we analyzed the curriculum of compulsory secondary education<sup>5</sup> and focused on the years and areas that, in the curriculum of the Balearic Islands, include forestry issues: social sciences in the first year, natural sciences in the second, and natural

<sup>5</sup>Decree 73/2008, of 27 June, by which the curriculum of compulsory secondary education in the Balearic Islands is established (BOIB 2 July).

sciences and social sciences in the third year. We then consulted the main textbook supplier in the Balearics to find out which publishers were used by the schooling system the most. We limited the analysis to three publishers: Anaya, Santillana, and Vicens Vives. Taken together, they covered practically the whole market. The next step consisted of making an even closer profile of the units of analysis. Each textbook, therefore, was filtered to determine the issues that referred to vegetation, and, once completed, all of the references to pine trees and Holm oaks were harvested from the data and analyzed.

## RESULTS

In the past, the relation of citizens to the forest has been determined by the multiple characteristics of individual and group aspirations concerning those forests (Schmizüsen, Kazemi, & Seeland, 1998). As Vallejo and Alloza (2004) asserted, because the second half of the 20th century, there has been a change in the perception of forests in the Mediterranean region. It has shifted from the image of the forest as a resource for the rural population, on the basis of the economic principles of subsistence, to a view characterized by leisure and recreational use, mostly by populations from urban settings. However, we collected evidence showing that in the case of the Balearics, this perception has been distorted by several factors.

### Evidence Collected by Survey

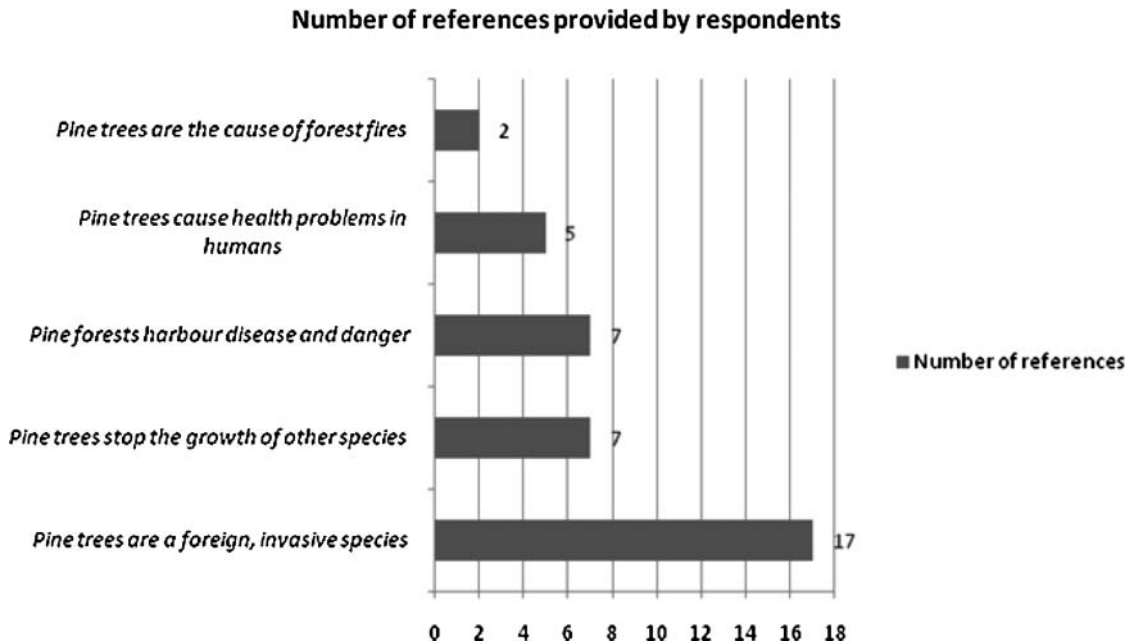
A little more than 80% (21 of 25 people; 84%) of the members of the Balearic forestry network who answered the survey said they had evidence of the dissemination of wrong or distorted information regarding the natural vegetation in the Balearics, particularly concerning pine trees. A content analysis of this

evidence led to the identification of five main mistaken beliefs: (a) pine trees are a foreign, invasive species; (b) pine trees stop the growth of other species, especially Holm Oaks; (c) pine forests harbor disease; (d) pine trees are the cause of forest fires; and (e) pine trees cause health problems in humans (see Figure 1).

The largest number of reports (17 in total) provided evidence of the dissemination of the belief that pine trees are an invasive species, or a species that would not be natural to the Balearics. It is worth noting that two of the respondents offered an explanation of this interpretation suggesting that Holm Oak (*Quercion ilicis*) forests legitimately make up the primary vegetation in a large part of the territory with other species only there as a result of the degradation processes (see Table A1 in Appendix). The second misguided belief reported by the respondents (seven responses) was that pine trees impede the growth of other species, especially Holm Oaks. The assumption that “nothing grows under a pine tree, pines give off a toxic substance at their roots which means the surrounding soil is poisoned” is, again, entirely incorrect.

A third incorrect belief, (seven respondents) is that “the forests in the Balearics are unhealthy.” Nature is neither healthy nor unhealthy; these are concepts that cannot be applied to vegetation, but not everyone understands this. It is most likely, as one of the respondents stated, that this view is the consequence of the abandonment of the traditional use of the forest resources (e.g., wood, coal, lime production, hunting) in the Balearics in recent decades. This has caused the physiognomy of the forest ecosystem to be very different from before and has allowed the growth of an understory that forests are unhealthy places.

The belief that pine trees negatively affect people’s health was reported by five of the respondents. This misunderstanding may stem from the fact that Pine trees in the Balearics are the victims of the pine recessionary moth (*Thaummatopoea pityocampa*), an insect which in its caterpillar stage is covered in



**Fig. 1.** The Five Most Extended Mistaken Social Beliefs About Pine Trees, for Which Evidence of Their Dissemination Was Provided (in Total Number of References Made by Respondents)

poisonous hairs that can affect humans, producing asthma, conjunctivitis, skin rash, and so forth. It would seem that this relatively minor hazard has influenced the entire perception of the forest and has encouraged a view that has moved from forests as being healthy, vital, and useful to one that is unhealthy, dangerous, and risky.

Last, two respondents provided evidence that pine trees are believed to be the cause of forest fires. The fact that they are a fire-adapted species is misinterpreted to not only associate them with forest fires but to accuse them of being the cause; “pine trees are like gunpowder ... they are the cause of forest fires.”

The means, by which these ideas are disseminated, is worth consideration. Of the 11 respondents, 10 said that it was through word of mouth that wrong ideas about vegetation were passed on. Peasant farmers appear to be the group most responsible for disseminating these ideas (with six attributions), followed by hunters and ramblers. In addition to oral tradi-

tion, the respondents also mentioned the media (three attributions) and the education system, including the university (three attributions), as means for dissemination.

### Textbooks Analysis

The issue of forests is rarely dealt with, if at all, in the principle textbooks of the Balearic compulsory secondary education. Of the 13 books analyzed, two devote four pages to this issue and 2 do not devote any pages; the other books ranged from between half a page and two pages. A second observation is that there was no discourse that could be considered erroneous; however, the literature does overflow with bias, which was not well explained or clarified. This could lead pupils to make erroneous conclusions as to the function and importance of pine trees because the explanations associated with pine trees, contrary to

Holm Oaks, contains mostly negative connotations. That is, the texts referring to pine trees relate this species to five facts that have negative connotations: “displacement, alteration, imposition, risk and drought.” Meanwhile, the facts referring to Holm Oaks showed positive connotations: “importance, adaptation, natural, humidity, powerful...” Thus, Holm Oaks are presented as “the typical tree in Mediterranean forests”; “Holm Oaks are the most important vegetation.” Holm Oaks, which are also “resistant to cold and drought” have the advantage that “they offer more resistance to fires” and constitute the most important vegetation, as Holm Oaks are “very well adapted to the climate of the islands” and are “often displaced by pine trees.” Pines, on the other hand, “are a forest typical of the Mediterranean landscape; they are a species that has imposed itself.” They appear in places where “human beings have altered the vegetation a lot” as an effect “of reforestation.” While “they are trees that are very resistant to heat and drought,” their proliferation “raises the risk of forest fires” and “they are especially combustible.” The semantics associated with both species— pines and Holm Oaks—are complete opposites: one is white and the other black; one is good and the other bad.

From the texts, we can deduce data that confirm the distortion of the image of pine trees. For instance, in two of the books analyzed, the same importance is attributed to pine trees as carob trees and wild olive trees. In the map of the natural landscape of the Balearics, which is shown in the geography book of the third course of secondary education by the publisher Santillana, five landscapes are shown: Holm Oak forests, rope grass and other shrubs, dune vegetation, vegetation in humid areas, and cultivated and urban areas; the books do not mention pine trees (see Table 1).

From the evidence collected and an analysis of the books, it can be concluded that, in addition to rigorous ideas based on scientific knowledge, study and/or contrasted experience, there are also incorrect beliefs related

to the vegetation of the Balearic Islands and its management being transmitted through our schools and the texts that they use in teaching. This is particularly true of pine trees and pine forests, which are generally considered to cause or create problems. They are recognized only as intruders and invaders or as indicators of a state of degradation of the original vegetation of the islands.

Thus, there seems to be a widespread belief, such as in the models proposed by stigmatism phytosociology, that the important ecosystems in the Balearic Islands are the garrigue shrublands and Holm Oak forests and that the presence of pine trees is secondary to the island ecosystems. The idea that pine trees are intrusive, a foreign species and introduced by man is reiterated. This idea clashes with historic testimonies and scientific research about the presence of pine trees in the Balearic Islands, which show a very old, relevant presence (Gil, Manuel, & Díaz Fernández, 2003; López de Heredia, Valbuena, Fuentes-Utrilla, Robledo-Arnuncio, & Gil, 2005).

Pine trees are also ascribed the responsibility (direct or indirect) of several ills, such as forest fires, the presence of the pine processionary moth, the destruction of infrastructures (dry stone walls, streets) and a negative effect on the rest of the vegetation. Alternatively, Holm Oaks are extolled as noble trees that were supposedly widespread in the past but are currently depleted and in evident retreat because of the invasive pine trees.

The crucial role of pine trees in the regeneration process of the Holm Oak forests is widely doubted. Nevertheless, forests in general are diminishing, and the role—functions and services—of the vegetation itself in the degree of regeneration of the supposed principle vegetation, (the Holm Oak forests), is underrated despite the evidence provided by academics and technicians.

The lasting understory of the pine forest is one underpinned by unhealthiness. This dominant and inaccurate understory is the result of the abandonment of traditional activities, and

**Table 1**  
**References to Pine Trees and Holm Oaks in the Textbooks Analyzed**

Publisher	Classification of the references sequenced by course
Anaya	<p>Social sciences, geography and history. First year</p> <p>The natural vegetation is very degraded, because of human intervention.</p> <p>Holm Oak forests are limited to the most humid areas of the Tramuntana mountain range, in Mallorca, and a small sector in the north of Menorca.</p> <p>In the other islands the pine has imposed itself, which raises the risk of forest fires</p> <p>And garrigue, which varies according to the island: wild olive trees (Menorca and Mallorca) and Mastich trees, Mediterranean fan palm and Kermes Oak (Pine Islands)</p>
Anaya	<p>Natural sciences. First year</p> <p>(pines) make up a forest typical of the Mediterranean landscape and are very resistant to drought</p> <p>Resins and edible seeds (pine nuts) are extracted from pine trees</p> <p>(Holm Oaks) a typical tree found in Mediterranean forests, is very resistant to cold and drought</p>
Santillana	<p>Geography and history. First year.</p> <p>The most typical vegetation is evergreen Holm Oak and pine tree forests</p> <p>Holm Oak forests are located in mountainous areas, where the temperatures are cooler and there is greater humidity. The main Holm Oak forests are in the Tramuntana mountain range in Mallorca.</p> <p>Pine trees are found in dry, low-lying areas in Mallorca and Eivissa. In some areas, above all coastal areas, small juniper forests can also be found.</p> <p>Garrigues are a formation made up of low, rather dense bushes and shrubs. They appear in dry areas and in places with more unfavourable natural conditions. The most prominent species are: matorral, wild olive trees, rosemary, Mediterranean heather, steppe, rope grass and Mediterranean fan palm. Garrigues are the most predominant vegetation in Menorca and the Pine Islands, even though they have a large representation in Mallorca and Cabrera.</p> <p>The forest fires periodically suffered by the islands, on average over 110 are recorded every year, and 40% are provoked by human causes. The effects of these catastrophes are very damaging for the environment: deforestation, loss and impoverishing of the soil, and difficulties for plants to grow again</p>
Santillana	<p>Natural sciences. First year</p> <p>Garrigues develop in the driest areas of mountains and the plain, where low rainfall does not allow the installation of Holm Oak forests. We must mention Aleppo pine trees, carob trees, rosemary, Mediterranean heather and white steppe.</p> <p>What is the typical forest in the Balearics? (proposed activity)</p>
Vicens Vives	<p>Social sciences. Geography and history. First year.</p> <p>The natural vegetation in the Balearics is distributed according to the climate in each island.</p> <p>Holm Oaks are mainly found in Mallorca, in the Tramuntana mountain range and in coastal areas, and in Menorca. In these islands we also find garrigues. However, human beings have altered the vegetation a lot and nowadays there are pine trees from reforestation. In Eivissa and Formentera we find, above all, Mediterranean pine trees and shrubs such as Mastich trees and Mediterranean fan palms</p> <p>Holm Oak forests are the most important vegetation in the Balearics because Holm Oaks are very well adapted to our climate (...) Pine forests are frequently found in the Balearics. Pine trees, as they are very resistant to heat and drought, are very well adapted to the Balearic climate</p>
Vicens Vives	<p>Natural sciences. First year.</p> <p>Biodiversity in the Balearic Islands: flora and fauna (...) Holm Oak forests are the most important vegetation as they are trees that are very well adapted to the climate in the islands (...) We also find garrigues or seepweeds in the driest areas (...) The main species there are wild olive trees (...) and Aleppo pine trees.</p> <p>(...) Nevertheless, human beings have altered the vegetation a lot and nowadays pine forests, many from reforestation plantations, occupy 80% of the mountain terrain in the islands. (...) in Eivissa and Formentera we find, above all, Mediterranean pines and shrubs made up of Mastich trees and Mediterranean fan palms</p> <p>1.- What is the most typical vegetation in the Balearic Islands? 2.- How does human influence affect the vegetation of the islands? (Activities)</p>

(Continued on next page)



**Table 1**  
**References to Pine Trees and Holm Oaks in the Textbooks Analyzed (Continued)**

Anaya	<p>Natural sciences. Second year.</p> <p>In the Balearic Islands the most important land ecosystems are garrigue shrubland and Holm Oak forests</p> <p>(Garrigue shrubland) Sometimes these communities are accompanied by trees such as pine and carob trees</p> <p>Part of the plants that abound most in the islands (so-called fire adapted), such as steppe and pine trees, are especially combustible due to the resins and oils that impregnate them.</p> <p>On the other hand, Holm Oaks offer more resistance to fires, thanks to the special temperature and humidity conditions that predominate in Holm Oak forests.</p>
Santillana	<p>Natural sciences. Second year.</p> <p>Holm Oak forests are the most characteristic of the Mediterranean landscape (...) the tree stratum is dominated by Holm Oaks, trees with a powerful appearance, with trunks covered in dark bark which can reach 10-15 m height, with dense layers of shiny, green coriaceous leaves. All the layers of leaves together form a sort of cover that provides shade and creates a fresh, quite humid environment. We have all felt this effect when we enter an area of Holm Oak forest on an excursion and we notice the difference in coolness and humidity with respect to the areas outside the Holm Oak forest.</p> <p>Aleppo pine trees are also found in the tree stratum</p> <p>What measures do you think should be adopted in order to protect Holm Oak forests in our islands? (activity)</p>
Anaya	<p>Geography. Third year</p> <p>In Mallorca and Menorca there are Holm Oaks, often displaced by pine trees. In Eivissa a vegetation of pine trees associated with junipers stands out.</p>
Santillana	<p>Geography. Third year.</p> <p>(...) Pine tree forests can be found in dry, low-lying areas, whereas Holm Oak forests are in mountainous areas / (...) (no pine trees appear in the maps)</p>
Santillana	<p>Natural sciences. Biology and Geology. Fourth year.</p> <p>There is a map that shows several errors in the definition and distribution of vegetation. Pine trees do not appear in any of the islands, even though they do in the photographs that accompany the map</p> <p>(Principal ecosystems in the Balearics) (...) Holm Oak forests are the most characteristic of the Mediterranean landscape. (...) Garrigue: in mountainous areas and on the plain where the climatic or water conditions are too scarce to allow the survival of Holm Oak forests, garrigue shrublands appear. Aleppo pine trees, carob trees or wild olive trees, ... stand out there</p>

a failure in the policies, plans, and activities of governments in their duty to manage and maintain the forests. There is also a widespread belief that any sort of intervention in natural systems would be negative.

## DISCUSSION AND CONCLUSIONS

The data obtained throughout this study provided conclusive evidence of a propagation of

negative views of pine trees in the Balearic Islands and highlighted the fact that the principle textbooks in compulsory secondary education associated this species were riddled with misinformation and unfavorable interpretations. There would also seem to be a minimal level of information regarding pine trees in secondary school textbooks. This lack of accurate information has reinforced the need for environmental education to help modify the misunderstandings of the population concerning the natural vegetation and the presence, functions and services of the different communities and species present in the archipelago. It was clear also that there was a need to improve

the forests' management performance because "the most suitable solution to make maintenance of the multiple functions we recognise for forests compatible is not mere interventionism but rather a social commitment among all agents to attain management that is suitable for this purpose" (Terradas, 2004, p. 16).

There is a need to raise the value of pine trees and pine forests in the minds of local people across the archipelago by explaining that although Holm Oak forests constitute the dominant vegetation in a large part of the territory (Llorens, Gil & Tébar, 2007), this does not justify the disregard of pine trees.

It would seem important to us that basic, well-founded, and clear information is disseminated reflecting the true position to each of the misinformed issues outlined above regarding the presence, functions and usefulness of pine trees and pine forests in the Balearic Islands. We suggest that this information, in the form of pamphlets, posters, and multimedia formats, could constitute a primary resource for basic education and for training groups responsible for forest management. It is also crucial to make publishers and textbook authors aware of misconceptions that might arise from the materials they produce. Educational decision-makers, forest managers, and botanic experts could easily address the mistaken conceptions we identified in our study. Although we recommend disseminating this information to the entire population as being ideal, we suggest targeting, at first, technicians and managers related to forestry (e.g., forestry agents, guides and monitors, councilors for the environment), landowners who possess forested areas, peasant farmers, populations with forests in their municipalities, forest users (e.g., ramblers, hunters), and teachers and pupils from different educational levels as being the most immediate, effective, and cost-efficient dissemination pathway to enable a correct understanding of the true contribution of the pine forest to be built and internalized by local people in the Balearic Islands of Spain.

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**Table A1**  
**The Five Most Extended Mistaken Beliefs About Pine Trees, for Which Evidence of Their Dissemination Was Provided**

General ideas	References
Pine trees are foreign, they are an invasive species	<p>3a.- "Pine trees are not autochthonous"</p> <p>4a.- "when we had the storm in 2001, a lecturer at the UIB said if there had been so much damage it was because pine trees were invading the space of other species that are more "profitable to the ecosystem" such as the wild olive tree or Holm Oak. I have been able to hear this same statement repeated by representatives of ecological organizations, taking the word of these lecturers who defend wrong ideas"</p> <p>6a.- "Pine trees are not autochthonous. They are a sort of invading species"</p> <p>6c.- "There is quite a widespread, confusing idea as to the importance and types of plant masses in general and forests in particular (...) At a certain time the idea that there were two types of vegetation was put forward: the potential or climax vegetation and the existing one, resulting from man's intervention. There was a certain idea that the climax vegetation was the ideal one and the current one was lower quality or negative. Since the main climax forest on the islands (above all Mallorca) was the Holm Oak, this was the best main forest. The rest were practically degradation processes of the former. Pine trees are imported trees with very little value, from a point of view of plant quality."</p> <p>7a.- "I myself held some wrong concepts about the forests and trees in the Balearics and due to a seminar at my old school with a forestry agent called Patxi, I had to rectify some considerations. Since then I now know that pine trees have always existed in our environment and there is actually a much greater surface area of forests than before as in the past the forests were intensely exploited. I used to think Holm Oak ecosystems were biologically perfect, but I now know they are very poor from this point of view"</p> <p>10a.- "Pine trees are from outside. ICONA brought them in. Pine forests are invading Holm Oak forests. – Pine trees are invading olive groves. – We have to get rid of the pines because they don't let edible toadstools grow!!! – The landscape with pine trees is "degenerating".</p> <p>20a.- "Pine trees are an invasive species, They aren't autochthonous"</p> <p>11a.- "We have a feeling that the citizens of the Balearic Islands who use PIA, do not always know that the pine tree is an autochthonous species, as there seems to be some sort of popular rumour that lists it as an introduced species"</p> <p>12a.- "The pine tree is an invasive tree"</p> <p>13a.- "they are foreign"</p> <p>17a.- "the pine tree was brought in from outside due to a need for wood and has ended up becoming an invasive species"</p> <p>20c.- Holm Oaks come before pine trees because the Holm oak was the tree there before the pines (they believe pine trees have never existed)</p>
Pine trees stop the growth of Holm Oaks and other species.	<p>3b.- "Pine trees stop the growth of Holm Oaks. Actually, it's the other way round: Holm Oaks need pine trees in the first years to be able to grow in their shade (Holm Oaks have a temperament that needs half shade) and afterwards they are the ones that stop pines regenerating (the pine has a temperament that needs light)."</p> <p>7b.- "it's said that where there are pine trees nothing else grows"</p> <p>9a.- "Olive grove people: Holm Oaks will disappear if the pine trees are not taken away"</p> <p>12b.- "The pine will end up "taking over from" Holm Oak forests and will sweep the board. Pines stop the development of Holm Oaks"</p> <p>18a.- "Pine forests eat up Holm Oak forests"</p> <p>20b.- "Under a pine tree nothing grows, the pine emits a toxic substance through its roots which means the soil is poisoned and nothing can grow / pine trees should all be eliminated because otherwise the Holm Oaks under them die/ pines are displacing the Holm oak both physically and in time"</p> <p>20d.- "management ought to be based SOLELY on eliminating pine trees from Holm oak forests as they "compete" with Holm Oaks. ALL reforestations should be made with Holm Oaks or species other than pine trees"</p>

(Continued on next page)

**Table A1**  
**The Five Most Extended Mistaken Beliefs About Pine Trees, for Which Evidence of Their Dissemination Was Provided (*Continued*)**

The forests are dirty	<p>2a.- "I can only say that most of the peasant farmers in Menorca feel that our forests have a lot of understory and they are not cleaned in a convenient way and that forests are growing on a daily basis due to neglect of the land by the owners"</p> <p>3c.- "The forests are dirty/clean. Nature is neither clean nor dirty; these are human concepts that can't be applied to vegetation. What happens is that until very recently there was very intense use of forest resources (wood, coal, lime, hunting...) and the physiognomy of the ecosystems used to be totally different.</p> <p>We aren't used to each species occupying their place in the ecosystem and we feel there is too much "dirtiness", that there are too many plants occupying the understory."</p> <p>3d.- "The Government ought to clean up forests. Following the thread of the previous point, many people blame the fact that there are forest fires or that aesthetically they are ugly on the Government not "cleaning up" the forests"</p> <p>8a.- "Pine trees are like gunpowder. The forests are very dirty (a lot of bushy vegetation) and it is the government's fault!!!"</p> <p>9b.- "Dirty" the forest is very dirty with vegetation. They mistake management for "cleaning up"</p> <p>14a.- "The bushy and herbaceous strata of forest areas should be "cleaned up" by the government"</p> <p>18b.- The understory is untouchable / the understory is "dirtiness" (Two opposing, simplistic ideas, widespread in different groups).</p>
Pine trees are the cause of forest fires	<p>8a.- "Pine trees are like gunpowder"</p> <p>15a.- "[peasant farmers and land owners] consider pine forests invaders of the space occupied by other species while they also associate them with forest fires, even to the point of defining them as causing the fires"</p>
Pine trees cause people health problems	<p>1a.- "A few weeks ago I heard on television (M or IB3) about a school near Palma in which the pine processionary caterpillars were affecting the pupils, and the parents were asking to have the pine trees around the school cut down"</p> <p>1b.- "In Cala d'Or there's a "green belt" where there are quite a lot of young pine trees, with a small building for the elderly, which they now want to extend. The opposition is using the possible cutting down of some pine trees to attack the governing party, saying, "Mr. Mayor, you also breathe"</p> <p>5b.- "Regarding the forest I can't say we have a wrong perception but it is different when they are pine trees on people's property or on roads. I have heard of a certain apprehension towards pine trees "as a means of breeding and spreading the pine processionary moth "by acquaintances who prefer to cut down trees rather than find a remedy. Besides, the roots break up the paving, etc."</p> <p>11b.- "The most negative perception of pine trees, is due to the irritation caused by the pine processionary moth, therefore people prefer to sacrifice the species so as not to suffer the consequences of the plague on people"</p> <p>13b.- "because of them we have the pine processionary moth"</p>