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Public Attitudes towards Insect Pollinators in Morocco: Insights from a Pilot Study with Broader Applications

Rachid Sabbahi [1,*], Insafe El Abdouni [2], Patrick Lhomme [2,3], Omar Boubker [4], Khalil Azzaoui [5,6], Belkheir Hammouti [6], Mounsef Neffa [7] and Virginia Hock [8]

1 Research Team in Science and Technology, Higher School of Technology, University of Ibn Zohr, Laayoune 70000, Morocco
2 Laboratory of Zoology, Research Institute for Biosciences, University of Mons, 7000 Mons, Belgium; elabdouni.insafe@gmail.com (I.E.A.); patrick_lhomme@hotmail.fr (P.L.)
3 International Center for Agricultural Research in the Dry Areas, Rabat 10000, Morocco
4 Department of Economics and Management, Polydisciplinary Faculty of Larache, Abdelmalek Essaadi University, Tetouan 93030, Morocco; o.boubker@uae.ac.ma
5 Engineering Laboratory of Organometallic, Molecular Materials and Environment, Faculty of Sciences, Sidi Mohammed Ben Abdellah University, Fez 30000, Morocco; k.azzaoui@yahoo.com
6 Euro-Mediterranean University of Fes, Fez 30100, Morocco; hammoutib@gmail.com
7 Laboratory of Bioresources, Biotechnology, Ethnopharmacology, and Health, Faculty of Sciences, Mohammed First University, BV Mohammed VI, Oujda 60000, Morocco; m.neffa@ump.ac.ma
8 Department of Biology, Dawson College, 3040 Sherbrooke St. W, Montreal, QC H3Z 1A4, Canada; vhbioresearch@gmail.com
* Correspondence: r.sabbahi@uiz.ac.ma

Abstract: This pilot study provides insights into the Moroccan public's understanding and willingness to engage in insect pollinator preservation, highlighting widespread awareness alongside significant knowledge gaps. The success of biodiversity conservation efforts, especially those aimed at insect pollinators, is greatly enhanced by an informed and committed populace. Understanding public perceptions of insect pollinators is important as it shapes the effectiveness of conservation strategies and their implementation. Although our pilot study does not include every demographic of Moroccan society, it does include an important portion of the populace: educated urban youth. This is a key portion of the population that will be crucial in developing future conservation strategies, especially given the tendency towards increasing urbanization putting cities at the forefront of sustainable development. Our study aimed to assess opinions on insect pollinators, their services, and their declining population numbers in Morocco. We conducted a survey distributed mainly through the media over four months, receiving responses from 301 individuals. The results indicate that the public is aware of decreasing insect pollinator populations and their main threats, and shows a willingness to participate in conservation strategies. However, gaps persist in understanding the roles and ecology of pollinators. While honey bees and bumble bees are well-recognized for their role in pollinating agricultural and wild plants, there is less awareness about other common pollinators such as solitary bees and flies. Additionally, the essential contributions of non-bee pollinators remain widely overlooked. To address these findings, we recommend implementing specialized educational initiatives to increase public understanding of the vital functions of non-bee pollinators in supporting ecosystem services. In order to adopt a more encompassing strategy for the conservation of insect pollinators, upcoming outreach efforts within the national biodiversity strategy should emphasize the contributions made by lesser-known non-bee insect pollinators and strive to engage sectors of the population currently less involved in pollinator conservation. However, while this pilot study provides valuable insights, the sample size limits the generalizability of these conclusions. Future research with larger and more diverse samples would be beneficial to validate and expand upon these findings in order to provide a more comprehensive understanding of all areas of public perception and engagement in pollinator conservation in Morocco. Expanding sampling to include older, less educated, and less urban demographics would strengthen these initial insights and broaden their application, especially beyond urban attitudes.

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1. Introduction

The Maghreb region, which spans the northwest of Africa and includes nations such as Morocco, Algeria, Libya, Mauritania, and Tunisia, has experienced significant ecological shifts due to agricultural intensification and land use changes over the past five decades. These shifts have profound implications for agriculture and wild plant conservation given the pivotal role of insect pollination in these ecosystems. Recent studies indicate a concerning trend of pollinator decline, highlighting the urgency of addressing this problem [1–3].

Insect pollinators play a pivotal role in the pollination of both wild and cultivated plants, providing critical ecosystem services to agriculture and natural habitats. It is estimated that a staggering 87.5% of all flowering plant species globally rely on animal-mediated pollination, encompassing a diverse range of plants that are vital for food and medicine. Specifically, crops yielding fruits, seeds, and nuts depend heavily on the services of insect pollinators, which in turn have a substantial impact on the overall value of global crop production [4–6].

The ecological services rendered by animal pollinators are indispensable, supporting about 75% of the world's primary food crops. The estimated economic value of crop pollination, using data from 2009 and adjusted to 2015 dollars, is between USD 235 B and 577 B annually [7]. When accounting for inflation up to March 2020, the global economic significance of pollination services is anticipated to be in the range of USD 195 B to 387 B each year [8]. The reasons for this wide range include variations in research methodologies, data used, and the increasing costs associated with growing crops that depend on pollinators [7,8]. In Morocco, insect pollinators impact 68.57% of the nation's primary crops, which span 10.31% of the total agricultural land, contribute to 27.28% of the total crop yield, and account for 39.08% of the total crop value. The contribution of insect pollination to Morocco's major crop production is valued at about USD 1235.06 M, representing 8.52% of the country's total agricultural GDP [9].

The global decline of insect pollinators, driven by human activities such as habitat destruction, pesticide application, disease, pollution, and climate change, has raised significant conservation concerns. For effective biodiversity conservation, a holistic approach is essential, requiring the involvement and action of individuals, businesses, and all levels of government. The availability of scientific data and the backing of the public are critical for evidence-based environmental policies and the success of conservation initiatives [10–17]. Achieving public support necessitates collaboration among scientists, the public, and policymakers, with targeted engagement efforts that address diverse concerns and priorities at the national, regional, and political levels [18,19].

Public engagement in insect pollinator conservation faces unique challenges. Research reveals a significant gap in the public's recognition of the importance of pollinators as well as the various types of pollinators that exist, especially with regard to those that are not honey bees. For instance, investigations in Ireland and the USA have found that despite a general awareness of the decline in insect pollinator populations and a willingness to engage in conservation activities, substantial knowledge gaps persist regarding the diversity of pollinators, their functions, and their ecological interactions [20,21]. While most survey respondents were able to recognize well-known pollinators such as honey bees and bumble bees and understood their role in pollination, there was a lower level of recognition for other common pollinators such as flies and solitary bees. Additionally, the significance of non-bee pollinators in the pollination process was not widely appreciated. Influenced by media narratives, this narrow focus may direct community efforts towards honeybee hive installation rather than comprehensive conservation actions [22,23].

The rising public interest in the decline of pollinators and their conservation is evident. Surveys in Europe and the USA indicate a willingness to support pollinator services, notably in wildflower cultivation and crop production that depend on insect pollination. Enhancing public awareness of pollinators' ecological and economic contributions can foster greater involvement in conservation efforts, thereby improving the effectiveness of management strategies and research endeavors. It is crucial to delve deeper into sociocultural perspectives on the decline of pollinators to identify knowledge gaps and involve underrepresented sectors in conservation and policymaking [24–29].

The present pilot study focuses on Morocco, where the status of insect pollinators is poorly documented. Our objective is to evaluate the Moroccan public's knowledge and attitudes towards insect pollinators, their recognition of the services these pollinators provide, and their willingness to participate in conservation efforts. Specifically, we aim to: (i) gauge public awareness of the diversity of insect pollinators and the threats they face; (ii) identify knowledge gaps and misconceptions through analysis of survey data; and (iii) propose educational and conservation strategies to bolster public engagement and support for the preservation of pollinators in Morocco. This research seeks to offer initial insights that can inform policy and community-based conservation initiatives, especially in crucial urban areas, thereby contributing to the sustainability of pollinator populations and the ecosystem services they provide. It can serve as a basis from which broader studies can be conducted in order to achieve valuable insights on the perception of sustainability of all corners of the Moroccan populace.

2. Materials and Methods

2.1. Survey Design

To assess the Moroccan public's awareness and perceptions of insect pollinators, an online survey entitled "Public Knowledge and Perceptions of Pollinating Insects: A Case Study from Morocco" was designed (refer to Supplementary Information S1—Survey). The survey encompassed questions on (i) the identification of insect pollinators, (ii) the significance of pollinators, and (iii) conservation efforts for pollinators. Additionally, we collected demographic data from participants, including gender, age, occupation, education level, community, and region of residence. The survey also included questions designed to assess the participants' enthusiasm for nature and their self-perceived understanding of pollinators, contributing to a detailed profile of each respondent.

The survey began with a friendly greeting and provided succinct and unbiased introductory information to inform participants who might not have been previously aware of pollinators. It ended with a thank-you note and offered additional resources on pollinators for those who wished to learn more (Supplementary Information S1—Survey). Before being released to the public, the survey was tested in a preliminary phase with around fifteen people to ensure its clarity, user-friendliness, and precision.

2.2. Sample Size Calculation

We initially calculated the survey's sample size using Calculator.net (https://www.calculator.net/sample-size-calculator.html, accessed on 10 February 2023), aiming for a 95% confidence level and a 5% margin of error based on an estimated 50% level of awareness regarding insect pollinator conservation among the Moroccan public. The target population included individuals across Morocco who are active on social media platforms. The calculated sample size necessary for a statistically representative outcome was 385 participants. However, our cross-sectional survey garnered 301 respondents. While the sample size is smaller than initially calculated, it may still provide valuable initial insights, especially among urban youth, a critical component of any conservation strategy given the increasing propensity towards urbanization [30,31].

2.3. Survey Distribution

The pilot survey was open for participation over four months, from the start of January to the end of April in 2024. It was distributed among the Moroccan public mainly via social media channels like LinkedIn, Facebook, Instagram, and Twitter, utilizing a variety of hashtags (for example, "Morocco", "Community", etc.) and tagging local Moroccan community organizations and media outlets with significant outreach. The survey also reached the authors' contacts, including relatives, friends, and students, via email, WhatsApp, and personal recommendations. Respondents were invited to fill out an anonymous self-guided questionnaire hosted on Google Form (an external web-based platform) available in both Arabic and French.

The goal of this preliminary study was to reach as broad of a cross-section of Moroccan society as possible, including those not involved in academia or particularly interested in nature, though we recognize that some segments of the population may still be underrepresented. To address this, the survey incorporated demographic questions and inquiries about interests in nature to help identify and measure potential biases.

Despite these efforts, the sample primarily consisted of individuals who are young, educated, and urban. This demographic is often more active on social media and more likely to engage in online surveys, leading to a potential sampling bias. The young, educated, and urban population is particularly relevant for our initial pilot study because they are more likely to influence policy-making authorities and be involved in community and conservation initiatives, especially given that urban areas are expanding and are on the front lines of sustainability challenges. However, this focus limits the generalizability of our findings to the broader Moroccan population.

Despite the pivotal role played by urban youth in shaping future conservation initiatives, in order to improve the representativeness of future research we recognize the need to also include older, less educated, and less urban segments of the population. These groups may have different perceptions and levels of engagement with insect pollinator conservation. Consideration of alternative distribution methods, such as in-person interviews or phone and/or paper surveys, particularly in rural areas or among populations with limited internet access, would contribute to a more comprehensive understanding of public attitudes.

This research adhered to the ethical standards set by the Moroccan Research Ethics Committee, including safeguards against collecting personal identification information or presenting content that could cause distress. Participation in the survey was entirely voluntary, with participants providing anonymous responses.

2.4. Statistical Analysis

The collected survey data were processed and examined through SPSS software version 25.0. Descriptive statistics provided a summary of participant profiles, pollinator identification, and perceptions of pollinator importance and conservation actions. The chi-square test of independence was utilized to investigate the relationship between participants' affinity for nature and their knowledge of insect pollinators. This test was also applied to evaluate the recognition of different pollinator species and the perceived importance of various pollinators for Moroccan crops and wild plants.

A log-linear model was conducted to assess the influence of demographic variables such as gender, age, education, profession, and region on pollinator knowledge. Participants' awareness of threats to pollinator populations and their willingness to engage in conservation actions were examined using descriptive statistics and chi-square tests to assess the level of concern and proactive behaviors.

The significance level was set at $p < 0.05$ for all statistical tests. Findings are presented in figures and tables, illustrating the distribution of responses and the statistical significance of the observed patterns.

3. Results

3.1. Participant Profiles

Before presenting the detailed outcomes of our survey, it is essential to describe the demographic composition of our respondents. Our survey engaged a diverse group of 301 individuals, reflecting a near-equal gender distribution with 53.2% female and 46.8% male participants (Table 1) and no significant gender bias ($\chi^2(1) = 1.199$, $p > 0.273$). Young adults formed the majority, with 42.5% under 25 years and 23.3% between 26 and 35 years, yet age did not significantly impact knowledge scores ($\chi^2(5) = 2.645$, $p = 0.755$). Educational levels varied, with 22.6% holding a master's degree and 21.6% holding a bachelor's degree, but did not correlate with pollinator knowledge. Students, the largest professional group (45.5%), were significantly overrepresented ($\chi^2(7) = 366.774$, $p < 0.001$). The majority resided in urban areas (84.7%), particularly in Laayoune–Sakia El Hamra (23.6%) and Tangier–Tetouan–Al Hoceima (20.9%). This diversity underscores the potential for customized educational and conservation initiatives to enhance pollinator awareness across different societal segments.

Table 1. Profile of the study participants.

	Category	Frequency	Percent
Gender	Man	141	46.8
	Woman	160	53.2
Age	<25	128	42.5
	26–35	70	23.3
	36–45	53	17.6
	46–55	19	6.3
	56–65	20	6.6
	>65	11	3.7
Education	Secondary Education Certificate	9	3.0
	High School Diploma	51	16.9
	General University Diploma	27	9.0
	Higher Technician Certificate	27	9.0
	Bachelor's	65	21.6
	Engineering diploma	12	4.0
	Master's	68	22.6
	Doctorate (PhD)	42	14.0
Profession	Agriculture	27	9.0
	Business	11	3.7
	Education	30	10.0
	Gardening/Landscaping/Grounds Management	1	0.3
	Healthcare	5	1.7
	Public servant	65	21.6
	Retired	16	5.3
	Student	137	45.5
	Unemployed	9	3.0
Community	Rural	28	9.3
	Suburban	18	6.0
	Urban	255	84.7
Region	Béni Mellal-Khénifra	8	2.7
	Casablanca-Settat	25	8.3
	Dakhla-Oued Eddahab	5	1.7
	Draa-Tafilalt	7	2.3
	Fez-Meknes	21	7.0
	Guelmim-Oued Noun	6	2.0

Laayoune-Sakia El Hamra	71	23.6
Marrakech-Safi	10	3.3
Oriental	14	4.7
Rabat-Salé-Kénitra	49	16.3
Souss-Massa	22	7.3
Tangier-Tetouan-Al Hoceima	63	20.9

This demographic diversity is crucial, as it provides a broad perspective on the public's engagement with nature and knowledge of insect pollinators. Our analysis revealed a strong affinity for nature among the participants ($\chi^2(3) = 251.093$, $p < 0.001$), with 56% expressing very high interest and 38% being somewhat interested (Figure 1). This indicates a robust engagement with natural environments. Despite this, a significant knowledge gap about insect pollinators was identified, presenting an opportunity for targeted educational programs. Log-linear model analysis showed that gender, age, education, profession, and region did not significantly influence pollinator knowledge ($\chi^2(33) = 20.758$, $p = 0.952$).

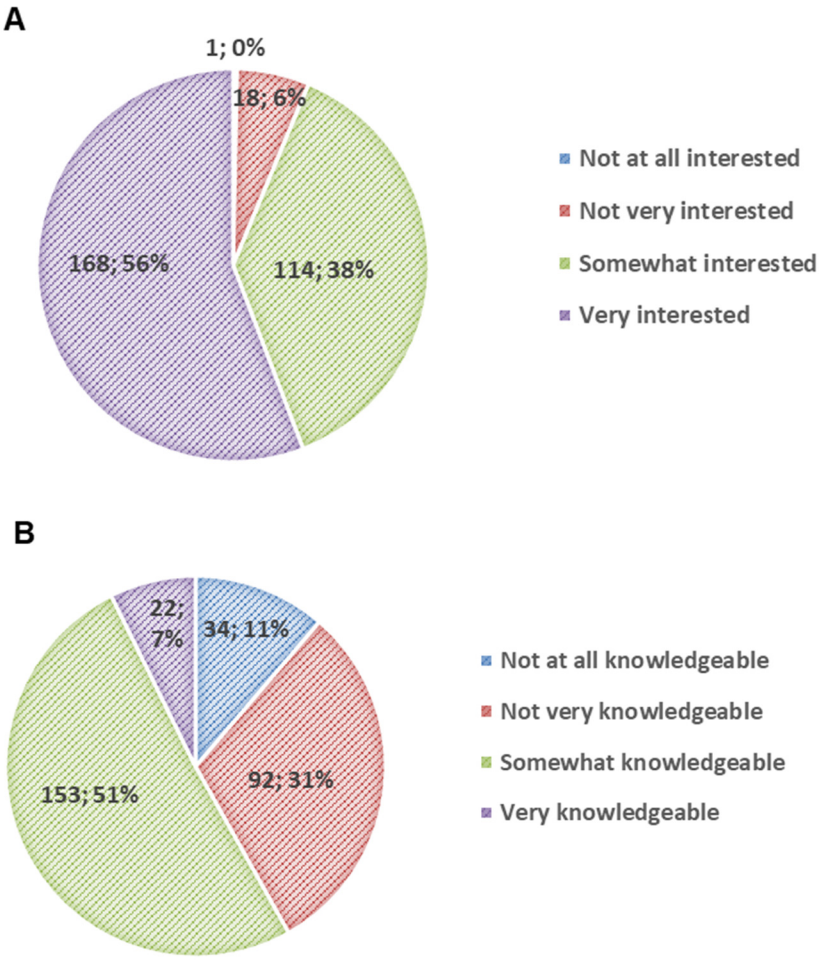

Figure 1. Public interest in nature conservation (**A**) and awareness and understanding of insect pollinator roles (**B**).

3.2. Pollinator Identification

Our survey assessing public recognition of pollinators found significant gaps in identification. Honey bees were correctly identified by 82.72% of respondents (Figure 2), showing a high level of recognition ($\chi^2(1) = 128.934$, $p < 0.001$). Bumble bees followed with 60.80% correct identifications, which was also statistically significant ($\chi^2(1) = 14{,}037$, $p < 0.001$). The recognition of solitary bees was lower, with only 26.91% identifying the pale white and black species and 27.91% recognizing the orange and black species, both significantly lower than for honey bees and bumble bees ($\chi^2(1) = 64.189$, $p < 0.001$ and $\chi^2(1) = 58.767$, $p < 0.001$, respectively). Wasps were correctly identified by 70.43% of participants, which is statistically significant ($\chi^2(1) = 50.262$, $p < 0.001$). Only 8.64% of participants correctly identified flies, a statistically significant shortfall ($\chi^2(1) = 205.983$, $p < 0.001$).

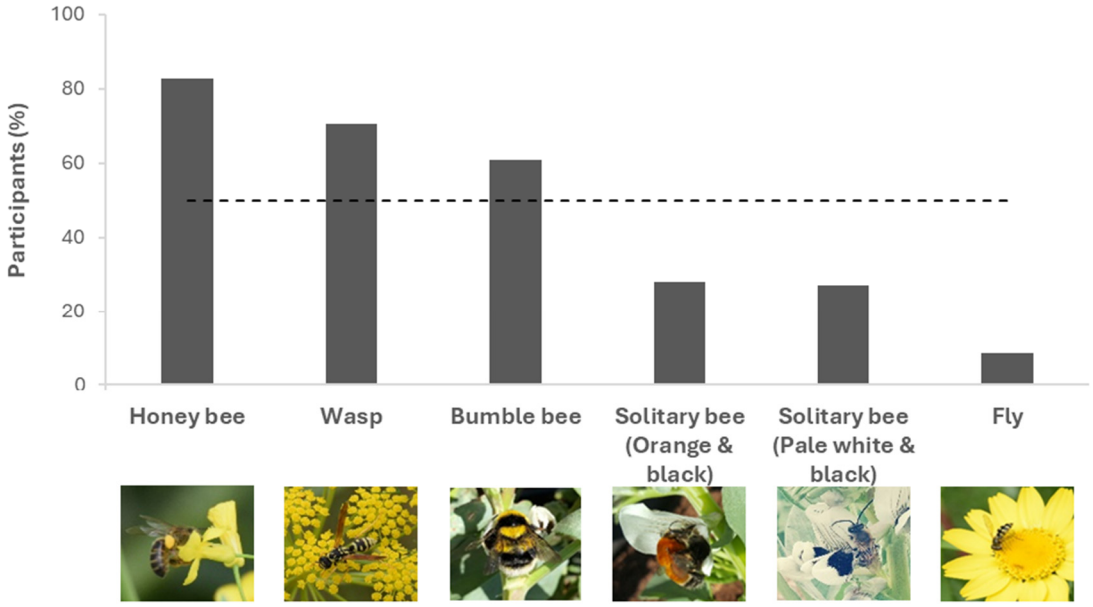

Figure 2. Percentage of survey respondents accurately identifying an insect in an image. The dashed line indicates the 50% benchmark.

3.3. Pollinator Importance

Close to half of the survey respondents (46.2%) correctly recognized that between 75–100% of flowering plants benefit from insect pollination, which is consistent with studies showing that 88% of such plants are pollinated by animals [32]. Additionally, 28.6% of participants accurately judged that insect-pollinated crops contribute to 25–50% of our food, while 20.0% overestimated this figure, thinking it was between 75–100%, even though research suggests it is around 35% [33].

Regarding the perceived significance of pollinators for Moroccan agriculture and wild flora, 58.8% of those surveyed rated honey bees as highly crucial and 38.5% rated other bee species as important, with these groups receiving scores of 5 and 4 out of 5, respectively. In contrast, butterflies, moths, and wasps were generally considered of moderate to slight importance. Flies, ants, and ladybugs were not viewed as important for pollinating crops in Morocco by a significant portion of participants (48.2, 42.2, and 34.6%, respectively), as depicted in Figure 3. The results from the chi-square test showed a marked difference in the perceived importance of various pollinators ($\chi^2(6) = 795.854$, $p < 0.001$), underscoring the view that honey bees and other bees are seen as much more vital than pollinators such as flies, ants, and ladybugs for the pollination of Moroccan wild plants and crops.

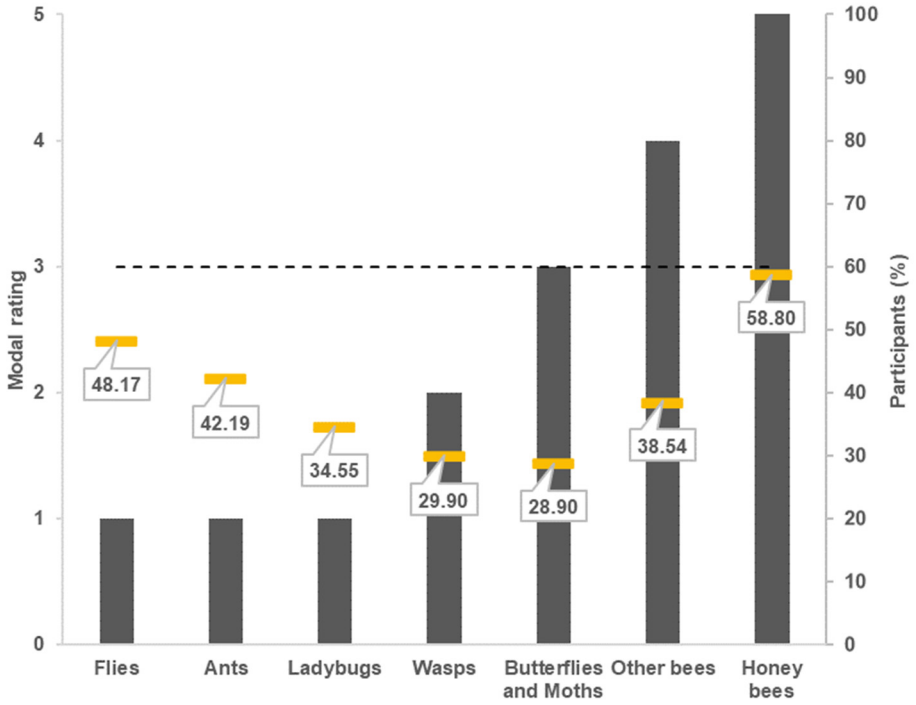

Figure 3. Survey participants' consensus on the pollination significance of various insect groups for crops and wild vegetation (rated on a 1–5 scale, 1 being 'insignificant' and 5 'extremely significant'). The dotted line marks the median importance level.

3.4. Pollinator Conservation

Pollinator conservation is a critical environmental issue. The survey data indicate that a significant majority of participants (93%) were aware of the threats to pollinator populations ($\chi^2(5) = 461.883$, $p < 0.001$). Specifically, habitat loss (32.89%), invasive species (33.55%), disease (38.21%), climate change (42.19%), and insecticides (61.79%) were rated as being very harmful to pollinator populations, with average ratings close to or at 5 out of 5. In contrast, cell phones were seen as the least harmful, with an average rating indicating they are not harmful to pollinators. This reflects a strong public perception of the adverse effects of environmental and anthropogenic factors on pollinators, underscoring the need for conservation efforts (Figure 4).

The survey findings reveal a discernible preference among participants for specific actions to support pollinator health ($\chi^2(4) = 143.004$, $p < 0.001$), along with varying degrees of willingness to carry out these measures ($\chi^2(4) = 122.976$, $p < 0.001$). The action of planting nectar- and pollen-rich trees, shrubs, and flowers is highly esteemed, receiving an importance score of 5 and the highest willingness score of 55.81%. This reflects the proactive stance of most participants, with 49.17% reporting the implementation of this action on their properties (Figure 5). Equally important, but with a slightly lower willingness score of 41.86%, was seeing the action to minimize or even eliminate the deployment of pesticides and fertilizers as critical.

In contrast, the creation of wild pollinator nesting habitats, while deemed important with an importance score of 5, had a lesser willingness score of 29.57%, indicating a lower level of current engagement among participants. Similarly, actions such as maintaining or creating good-quality hedgerows and reducing the frequency of mowing to allow wildflowers to grow were recognized as valuable, with importance scores of 4 and willingness scores of 25.91 and 25.58%, respectively, suggesting these actions are considered less urgent.

Overall, the data indicate that most participants were engaged in at least one action to protect pollinators, with a pronounced emphasis on reducing chemical usage and fostering plant diversity. These actions are acknowledged as crucial, and demonstrate the participants' willingness to adopt practices that are deemed most advantageous for pollinator conservation. Additionally, subsequent surveys might explore any fears or allergies to bees, wasps, etc., which might impact the public's willingness to install pollinator nests near their homes.

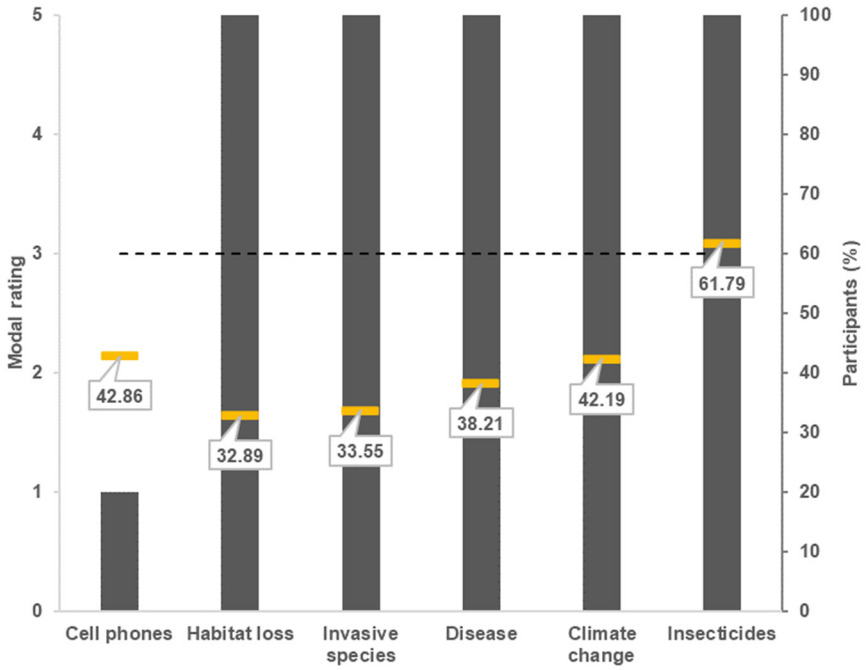

Figure 4. Collective rating of environmental threats to pollinator populations (scale from 1–5; 1 signifies 'non-damaging', 5 indicates 'highly damaging'). The dashed line represents a neutral perspective.

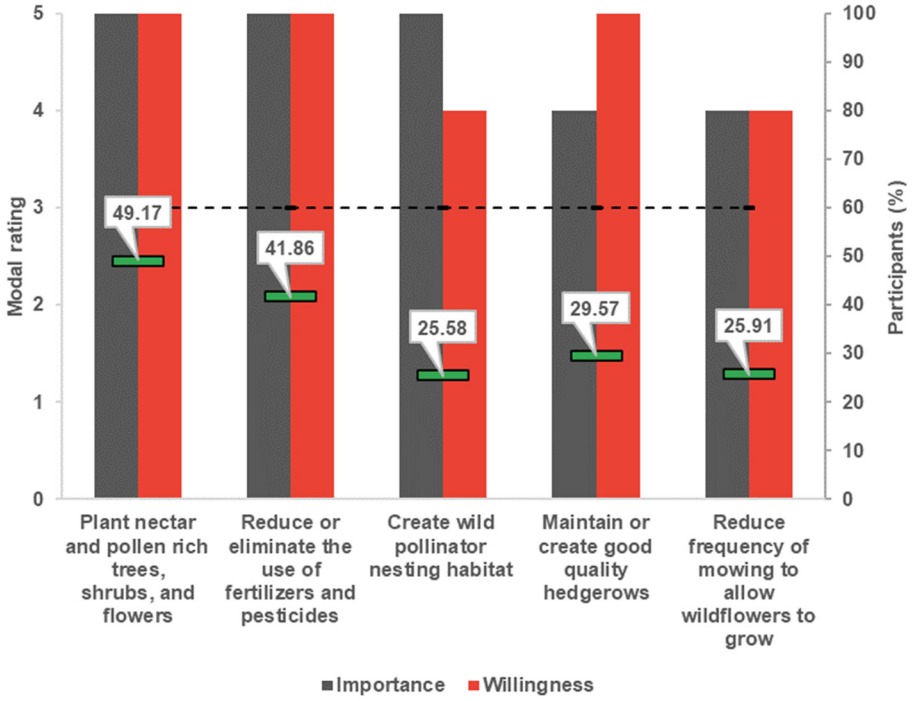

Figure 5. Representation of the rated importance and participant willingness for pollinator conservation efforts (scale from 1–5, ranging from 'minimally essential/reluctant' to 'extremely essential/keen'). The percentage of participants ready to engage in each conservation activity is illustrated with dark green dashes on the alternate axis. The dashed line traverses the chart, signifying a neutral position on the importance scale.

4. Discussion

4.1. Participant Profiles

The data reveal a strong interest in natural ecosystems among the participants. Yet, a significant gap in understanding pollinators among the urbanized public is highlighted as well, and this gap may be even wider among the broader population, especially in less educated and rural segments. This finding emphasizes the need for customized educational and conservation initiatives to increase pollinator awareness across diverse social segments. Although our pilot study's outcomes are somewhat conservative owing to the inherent biases of survey-based research, they nonetheless signal the critical need to bridge these knowledge gaps. Doing so can cultivate a more informed public that actively supports pollinator conservation [21].

Our research sought to gauge the Moroccan public's awareness and engagement in insect pollinator preservation. Despite the respondent count (301) not meeting our initial target (385), the data we gathered can still offer a valuable foundation for analysis. However, the study's focus on a narrow, albeit important demographic segment within Morocco limits a broader application of our findings. The higher education levels of our respondents could potentially restrict our ability to identify a correlation between education and knowledge or attitudes towards pollinators. The predominance of educated younger urban respondents might not fully represent the broader Moroccan population's perspectives, possibly leading to an overestimation of environmental awareness. However, given this population segment's pivotal role in conservation efforts and determining environmental policy, this pilot study can still provide valuable insights into how to address the public's perception and participation regarding current and future conservation efforts in Morocco.

We recognize the importance of obtaining a comprehensive understanding of public knowledge and attitudes towards pollinators. Therefore, future studies should broaden the respondent pool to encompass a more varied demographic, thereby enhancing the representativeness of the results. Furthermore, employing a mixed-methods approach integrating qualitative and quantitative research could yield a deeper comprehension of the public's attitudes and knowledge regarding insect pollinators. Considering alternative survey techniques beyond online systems or social media, together with the inclusion of telephone interviews, could help to interact with older demographics, who are more likely to have personal belongings and have the time to actively engage in pollinator support and who may not be as acquainted with the virtual generation.

4.2. Pollinator Identification

Most survey participants easily recognized well-known pollinators such as honey bees and bumble bees; however, wasps were not as frequently identified. This may be due more to a desire to avoid wasps than to a lack of awareness. The media's frequent portrayal of honey bees in the context of beekeeping might have also influenced the unexpectedly low recognition rates of wasps as pollinators. These findings underscore the critical need for educational initiatives to raise public awareness, especially regarding lesser-known pollinators such as wasps, flies, and solitary bees.

The marked recognition of honey bees and bumble bees, as opposed to the minimal identification of other pollinators, indicates that specialized educational programs could greatly enhance public knowledge and support for pollinator conservation. As a biodiversity hotspot in the Mediterranean, Morocco boasts an impressive array of bee species.

With 961 documented bee species, it stands as the fifth-most diverse country in the Mediterranean and second-most diverse in Africa [34]. This biodiversity is critical for the pollination of both agricultural crops and wild flora, highlighting the necessity of conserving these species.

Given the crucial role of pollinator diversity in Morocco's ecosystems, these insights are particularly pertinent for devising strategies to bolster public knowledge and foster conservation efforts. To meet these educational needs, resources such as the Pollinator Partnership's educational tools and the US Environmental Protection Agency's guidelines for pollinator protection provide solid foundations for creating comprehensive educational programs. Moreover, research emphasizes the significance of pollinator diversity in boosting ecosystem services and agricultural productivity, further stressing the importance of public education on this subject [35].

Implementing strategies to enhance the public's understanding of pollinators is vital. These strategies include establishing pollinator habitats, managing pests responsibly, and involving youth in conservation efforts. Such measures are imperative for maintaining healthy pollinator populations and the myriad benefits they offer to both ecosystems and human well-being [36,37].

4.3. Pollinator Importance

This pilot study reveals that the public, especially urbanized youth, is aware of pollinators' crucial roles in agriculture and natural ecosystems. However, there is an apparent overestimation of their contribution to our diets, possibly due to the interchangeable use of statistics in public discourse. The survey results also indicate that the importance attributed to different pollinators varies, with honey bees and other bees perceived as more critical than flies, ants, and ladybugs in the pollination process. These insights underscore the public's awareness of the importance of pollinators, but also point to the necessity of addressing misconceptions about their contribution to our food system and enhancing the recognition of less familiar pollinator species [38–40].

Insects such as wasps and flies, which typically receive less attention in scientific studies and media coverage, are frequently misidentified as nuisances instead of being acknowledged for their essential contributions to pollination. The findings from our pilot study indicate that close to one-third of the individuals surveyed did not regard flies as important to the pollination of Morocco's wild flora and agricultural crops, even though there is proof of their effectiveness as pollinators in both settings [41,42]. Similarly, wasps, despite their pollination role, were frequently underrated by participants. These misinformed perceptions may hinder conservation efforts for these species [43]. While some evidence suggests that conservation efforts could concentrate on a number of common species responsible for the majority of crop pollination, a holistic approach that includes lesser-known beneficial insects is crucial for maintaining ecosystem health [44].

The findings of this pilot study indicate that while there is widespread interest and awareness regarding the decline and conservation of insect pollinators, especially in metropolitan areas, it is essential to recognize that the public's perception of pollinators and their pollinating activities may be influenced by the limited nature of our sample. Focusing research and media attention on a broader range of species beyond charismatic insects such as honey bees and bumble bees is essential [39,40,45]. Additionally, addressing misconceptions about solitary bees and flies can enhance public understanding and engagement in pollinator conservation [46]. While progress has been made, continued efforts are needed to bridge knowledge gaps, promote informed conservation actions, and safeguard pollinator habitats. By fostering collaboration and expanding public knowledge, we can work toward a more sustainable future for pollinators and the ecosystems they support.

4.4. Pollinator Conservation

The decline of pollinator populations, notably honey bees and bumble bees, is a pressing global issue, with various factors such as parasites, habitat loss, and pesticide

utilization contributing to this trend [43,47]. Public awareness is particularly high for honey bees, as they are recognized for their significant economic and ecological roles [48]. However, it is crucial to expand this concern to encompass other pollinators such as solitary bees and to address the complex nature of their decline [49].

Our pilot study acknowledges that it does not evaluate the effectiveness of self-reported conservation actions, which may not always align with their actual impact. For example, participants might not realize that herbicides and fungicides could indirectly affect pollinator health as well as pesticides [50]. Misconceptions about the benefits of certain pollinator-friendly plants could also lead to adverse outcomes, as some ornamental plants may not offer sufficient resources for pollinators despite their labels [51,52].

In terms of public actions, our findings suggest that while Moroccan citizens are conscious of the decline in pollinator populations and willing to engage in conservation efforts, there remains a gap in understanding the diversity of pollinator species and the value of conserving them. A significant majority of our survey participants expressed a willingness to take conservation actions. Notably, the actions most mentioned include planting pollinator-friendly flora and reducing pesticide utilization.

The perception of beekeeping as a primary conservation measure may be influenced by media portrayals of honey bees as the main pollinators at risk. However, while honey bees are important for crop pollination, beekeeping alone may not benefit wild pollinator populations and could lead to competition and disease spread [53,54]. Thus, beekeeping is not a standalone solution for pollinator conservation.

Less reported actions include maintaining or creating hedgerows and wild pollinator nesting habitats, possibly due to limited public awareness or perceived impracticality [55,56]. Research consistently shows the crucial importance of nesting habitats in maintaining pollinator populations and the need for their conservation [57,58]. In particular, forests are highlighted as important for worldwide pollinator richness and pollination enhancement in neighboring crops [57]. Wildflower plantings are also found to significantly increase the nest density and species diversity of ground-nesting bees [58]. However, the quality of these habitats can degrade over time, emphasizing the need for regular upkeep and maintenance. These results underline the significance of preserving and enhancing nesting habitats for the conservation of pollinator populations.

4.5. Future Directions and Conservation Strategies

The heightened media focus and scientific inquiry into insect pollinators has raised public consciousness about their dwindling numbers and the urgency of conservation initiatives [20,59]. Nonetheless, a comprehensive grasp of the diverse array of pollinator species and their ecological roles remains elusive, potentially impeding the effectiveness of conservation measures [20]. Despite these challenges, conservation efforts enjoy strong public support, particularly where bees and pollination services are concerned [59]. To harness this support effectively, it is imperative to formulate evidence-based policies that prioritize indigenous species and tackle the myriad threats faced by vulnerable pollinators [59]. Advancing scientific knowledge is essential in critical areas such as the current state and patterns of insect pollinator populations, the factors driving their decline, and the advantages of conservation to communities and societies at large [17]. Moreover, adept communication is crucial given that public interest tends to be more pronounced regarding certain perils such as climate change and regarding specific groups of animal species [60]. Consequently, inclusive engagement strategies that underscore the significance of lesser-known pollinators and cater to particular demographic segments are advisable [20].

Morocco's engagement with the 'Coalition of the Willing on Pollinators' and the creation of a national strategy and action plan for pollinators represent commendable initiatives [9]. Nonetheless, there is still a significant lack of data regarding the continuous and long-term shifts in pollinator populations. Accurate data on the decline of pollinators is crucial in order for decision-makers to effectively prepare for the impending challenges

posed by climate change [61]. The implementation of systematic insect surveillance programs akin to the 'European Butterfly Monitoring Scheme' is vital for the adaptive management of natural habitats [9]. Initiating monitoring of the abundance and diversity of wild pollinators within agricultural landscapes constitutes a preliminary measure in formulating evidence-based strategies for pollinator conservation [16]. It is imperative to fill the gaps in our knowledge, expand research to encompass a broader spectrum of pollinators, and foster cooperative endeavors at the local, national, and global levels to ensure effective preservation efforts [16].

Contributions from social scientists are vital to understanding the sociocultural factors influencing public perceptions and willingness to adopt pollinator-friendly practices [9]. Urban dwellers represent a vital demographic for pollinator conservation efforts. By engaging in informed actions within their limited spaces, they can significantly enhance local pollinator diversity and abundance. They can actively participate in conservation through various means: (i) supporting local green initiatives and participating in community garden; (ii) engaging in educational programs and advocating for policies that benefit pollinators; (iii) cultivating pollinator-friendly plants on balconies, windowsills, and in communal areas; and (iv) participating in citizen science projects to track and support urban pollinator populations. These contributions, which do not necessitate private outdoor space, can collectively make a substantial impact on pollinator conservation and heighten awareness of their crucial role in maintaining healthy urban ecosystems.

5. Conclusions and Recommendations for Future Action and Research

The intensification of media scrutiny and scientific exploration has markedly increased public engagement with insect pollinators and their essential ecological roles globally. Our pilot study has uncovered that despite the Moroccan public's awareness of the decline in pollinator populations and willingness to engage in conservation efforts, a substantial gap exists in understanding the diversity of pollinator species, their ecological roles, and the importance of their conservation and protection. While pollinators such as *A. mellifera* and *Bombus* spp. are widely recognized for their pollination services, there is a lack of awareness of the contributions of other pollinators, including those from the order Diptera (flies) and solitary bees.

In light of these findings, we propose the following recommendations for future action:

- There is a critical need to implement educational programs to enhance the public's understanding of the essential roles played by a diverse range of pollinators in ecosystem services.
- Conservation strategies should be broadened to include a wider spectrum of pollinator species, extending beyond the commonly recognized bees to encompass those less known but equally essential to pollination processes.
- Conservation guidelines should be tailored to the specific ecological contexts of different regions within Morocco to ensure their relevance and effectiveness.
- The development of resources and programs specifically designed for urban residents, especially those without access to private outdoor spaces, is essential to facilitate their active participation in pollinator conservation efforts.
- The creation of educational materials targeting younger demographics is recommended to instill early and lasting knowledge and commitment to pollinator conservation, regardless of their future educational paths.

While the decline of pollinator populations and their importance are widely acknowledged, public awareness often focuses on only a few pollinator species. The purposefulness and impact of reported conservation measures aimed at supporting pollinator populations remain uncertain. Despite gaps in knowledge, the overall national knowledge and reaction to the challenges faced by insect pollinators in Morocco are positive. Yet, the origins of this awareness are not well-defined, underscoring the necessity for more in-

depth research into the ways the public becomes informed about pollinators and the measures taken for their preservation. Given the dominance of global media and online resources, it may be necessary to further publicize local conservation guidelines to guarantee their pertinence and efficacy. To bridge these gaps, we propose the launch of broader fact-based initiatives intended to deepen the public's comprehension of the less familiar pollinators. These initiatives should aim to be comprehensive, catering to the diverse needs of various pollinator species and the environments they occupy.

Despite its limited sample size, our study represents a valuable pilot exploration of Moroccan attitudes and knowledge regarding pollinators. We recognize that our initial focus on the young, educated, and urban population does not fully encompass the broader Moroccan demographic. Nevertheless, urbanized youth represent an important population segment in determining environmental policy and can still provide valuable insights regarding the perceptions of the broader Moroccan populace. In addition, we have taken measures to validate our questionnaire and establish a general framework for future research. Moving forward, we recommend larger and more diverse samples to draw more robust conclusions. Methodologies in such studies can guide us in determining appropriate sample sizes based on statistical power and desired confidence levels. Additionally, it is crucial to sample the older, less educated, and less urban segments of the population in order to gain insights into their attitudes toward pollinators. While the young, educated, and urban population influences policymaking, broader representation can ensure comprehensive conservation strategies across all regions. In summary, our findings contribute to the growing awareness of pollinator conservation; by addressing these limitations, we can collectively work toward a more sustainable future for pollinators and the ecosystems they support.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/d16070383/s1, S1—Survey (online questionnaire).

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References

1. Hmimsa, Y.; Ramet, A.; Dubuisson, C.; El Fatehi, S.; Hossaert-McKey, M.; Kahi, H.; Munch, J.; Proffit, M.; Salpeteur, M.; Aumeeruddy-Thomas, Y. Pollination of the Mediterranean Fig Tree, *Ficus carica* L.: Caprification Practices and Social Networks of Exchange of Caprifigs among Jbala Farmers in Northern Morocco. *Hum. Ecol.* **2024**. https://doi.org/10.1007/s10745-024-00493-6.
2. Hu, G.; Stefanescu, C.; Oliver, T.H.; Roy, D.B.; Brereton, T.; Van Swaay, C.; Reynolds, D.R.; Chapman, J.W. Environmental Drivers of Annual Population Fluctuations in a Trans-Saharan Insect Migrant. *Proc. Natl. Acad. Sci. USA* **2021**, *118*, e2102762118. https://doi.org/10.1073/pnas.2102762118.
3. Shebl, M.A.; Ben Abdelkader, F.; Bendifallah, L.; Benachour, K.; Bataw, A.A.; Bufliga, E.M.; Osman, M.A.; Kamel, S.M. The Melittology Research in Northern Africa and the Middle East: Past and Present Situations. *JoBAZ* **2021**, *82*, 18. https://doi.org/10.1186/s41936-021-00217-y.

4. Peixoto, P.G.; Martins, H.L.; Pinto, B.C.; Franco, A.L.; Amaral, L.S.; de Castro, C.V. The Significance of Pollination for Global Food Production and the Guarantee of Nutritional Security: A Literature Review. *Environ. Sci. Proc.* **2022**, *15*, 7. https://doi.org/10.3390/environsciproc2022015007.
5. Tong, Z.-Y.; Wu, L.-Y.; Feng, H.-H.; Zhang, M.; Armbruster, W.S.; Renner, S.S.; Huang, S.-Q. New Calculations Indicate That 90% of Flowering Plant Species Are Animal-Pollinated. *Natl. Sci. Rev.* **2023**, *10*, nwad219. https://doi.org/10.1093/nsr/nwad219.
6. Sabbahi, R.; Azzaoui, K.; Rhazi, L.; Ayerdi-Gotor, A.; Aussenac, T.; Depeint, F.; Taleb, M.; Hammouti, B. Factors Affecting the Quality of Canola Grains and Their Implications for Grain-Based Foods. *Foods* **2023**, *12*, 2219. https://doi.org/10.3390/foods12112219.
7. Potts, S.G.; Imperatriz-Fonseca, V.; Ngo, H.T.; Aizen, M.A.; Biesmeijer, J.C.; Breeze, T.D.; Dicks, L.V.; Garibaldi, L.A.; Hill, R.; Settele, J.; et al. Safeguarding Pollinators and Their Values to Human Well-Being. *Nature* **2016**, *540*, 220–229. https://doi.org/10.1038/nature20588.
8. Porto, R.G.; de Almeida, R.F.; Cruz-Neto, O.; Tabarelli, M.; Viana, B.F.; Peres, C.A.; Lopes, A.V. Pollination Ecosystem Services: A Comprehensive Review of Economic Values, Research Funding and Policy Actions. *Food Sec.* **2020**, *12*, 1425–1442. https://doi.org/10.1007/s12571-020-01043-w.
9. Sabbahi, R. Economic Value of Insect Pollination of Major Crops in Morocco. *Int. J. Trop. Insect Sci.* **2022**, *42*, 1275–1284. https://doi.org/10.1007/s42690-021-00645-x.
10. Agliardi, E.; Agliardi, R.; Spanjers, W. The Economic Value of Biodiversity Preservation. *Environ. Resour. Econ.* **2024**. https://doi.org/10.1007/s10640-024-00855-0.
11. Bateman, I.; Balmford, A. Current Conservation Policies Risk Accelerating Biodiversity Loss. *Nature* **2023**, *618*, 671–674. https://doi.org/10.1038/d41586-023-01979-x.
12. IPBES. *The Assessment Report of the Intergovernmental Sciencepolicy Platform on Biodiversity and Ecosystem Services on Pollinators, Pollination and Food Production*; Potts, S.G., Imperatriz-Fonseca, V.L., Ngo, H.T., Eds.; Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services: Bonn, Germany, 2016; 552p. https://doi.org/10.5281/Zenodo.3402857.
13. Lanzas, M.; Pou, N.; Bota, G.; Pla, M.; Villero, D.; Brotons, L.; de la Maza, P.S.; Bach, J.; Pont, S.; Anton, M.; et al. Detecting Management Gaps for Biodiversity Conservation: An Integrated Assessment. *J. Environ. Manag.* **2024**, *354*, 120247. https://doi.org/10.1016/j.jenvman.2024.120247.
14. Potts, S.G.; Biesmeijer, J.C.; Kremen, C.; Neumann, P.; Schweiger, O.; Kunin, W.E. Global Pollinator Declines: Trends, Impacts and Drivers. *Trends Ecol. Evol.* **2010**, *25*, 345–353. https://doi.org/10.1016/j.tree.2010.01.007.
15. Rose, D.C.; Amano, T.; González-Varo, J.P.; Mukherjee, N.; Robertson, R.J.; Simmons, B.I.; Wauchope, H.S.; Sutherland, W.J. Calling for a New Agenda for Conservation Science to Create Evidence-Informed Policy. *Biol. Conserv.* **2019**, *238*, 108222. https://doi.org/10.1016/j.biocon.2019.108222.
16. Sabbahi, R. Effects of Climate Change on Insect Pollinators and Implications for Food Security—Evidence and Recommended Actions. In *The Food Security, Biodiversity, and Climate Nexus*; Behnassi, M., Gupta, H., Baig, M.B., Noorka, I.R., Eds.; Springer International Publishing: Cham, Switzerland, 2022; pp. 143–163, ISBN 978-3-031-12586-7.
17. Stout, J.C.; Dicks, L.V. From Science to Society: Implementing Effective Strategies to Improve Wild Pollinator Health. *Philos. Trans. R. Soc. B Biol. Sci.* **2022**, *377*, 20210165. https://doi.org/10.1098/rstb.2021.0165.
18. Lavery, T.H.; Morgain, R.; Fitzsimons, J.A.; Fluin, J.; Macgregor, N.A.; Robinson, N.M.; Scheele, B.C.; Selwood, K.E.; Spindler, R.; Vuong, H.; et al. Impact Indicators for Biodiversity Conservation Research: Measuring Influence within and beyond Academia. *BioScience* **2021**, *71*, 383–395. https://doi.org/10.1093/biosci/biaa159.
19. Van Dyke, F.; Lamb, R.L. Biodiversity: Concept, Measurement, and Management. In *Conservation Biology: Foundations, Concepts, Applications*; Van Dyke, F., Lamb, R.L., Eds.; Springer International Publishing: Cham, Switzerland, 2020; pp. 35–79, ISBN 978-3-030-39534-6.
20. Burns, K.L.W.; Fitzpatrick, Ú.; Stanley, D.A. Public Perceptions of Ireland's Pollinators: A Case for More Inclusive Pollinator Conservation Initiatives. *J. Nat. Conserv.* **2021**, *61*, 125999. https://doi.org/10.1016/j.jnc.2021.125999.
21. Wilson, J.S.; Forister, M.L.; Carril, O.M. Interest Exceeds Understanding in Public Support of Bee Conservation. *Front. Ecol. Environ.* **2017**, *15*, 460–466. https://doi.org/10.1002/fee.1531.
22. Drossart, M.; Gérard, M. Beyond the Decline of Wild Bees: Optimizing Conservation Measures and Bringing Together the Actors. *Insects* **2020**, *11*, 649. https://doi.org/10.3390/insects11090649.
23. Schatz, B.; Maxime, D.; Mickael, H.; Benoît, G.; Fabrice, A.; Colette, S.; Maxence, G.; Denis, M. Pollinator Conservation in the Context of Global Changes with a Focus on France and Belgium. *Acta Oecologica* **2021**, *112*, 103765. https://doi.org/10.1016/j.actao.2021.103765.
24. Hall, D.M.; Martins, D.J. Human Dimensions of Insect Pollinator Conservation. *Curr. Opin. Insect Sci.* **2020**, *38*, 107–114. https://doi.org/10.1016/j.cois.2020.04.001.
25. Hoshide, A.K.; Drummond, F.A.; Stevens, T.H.; Venturini, E.M.; Hanes, S.P.; Sylvia, M.M.; Loftin, C.S.; Yarborough, D.E.; Averill, A.L. What Is the Value of Wild Bee Pollination for Wild Blueberries and Cranberries, and Who Values It? *Environments* **2018**, *5*, 98. https://doi.org/10.3390/environments5090098.
26. Isaacs, R.; Williams, N.; Ellis, J.; Pitts-Singer, T.L.; Bommarco, R.; Vaughan, M. Integrated Crop Pollination: Combining Strategies to Ensure Stable and Sustainable Yields of Pollination-Dependent Crops. *Basic Appl. Ecol.* **2017**, *22*, 44–60. https://doi.org/10.1016/j.baae.2017.07.003.
27. Mwebaze, P.; Marris, G.C.; Brown, M.; MacLeod, A.; Jones, G.; Budge, G.E. Measuring Public Perception and Preferences for Ecosystem Services: A Case Study of Bee Pollination in the UK. *Land Use Policy* **2018**, *71*, 355–362. https://doi.org/10.1016/j.landusepol.2017.11.045.

28. Sentil, A.; Lhomme, P.; Reverté, S.; El Abdouni, I.; Hamroud, L.; Ihsane, O.; Bencharki, Y.; Rollin, O.; Rasmont, P.; Smaili, M.C.; et al. The Pollinator Conservation Approach "Farming with Alternative Pollinators": Success and Drivers. *Agric. Ecosyst. Environ.* **2024**, *369*, 109029. https://doi.org/10.1016/j.agee.2024.109029.
29. Sidhu, C.S.; Joshi, N.K. Establishing Wildflower Pollinator Habitats in Agricultural Farmland to Provide Multiple Ecosystem Services. *Front. Plant Sci.* **2016**, *7*, 363. https://doi.org/10.3389/fpls.2016.00363.
30. Althubaiti, A. Sample Size Determination: A Practical Guide for Health Researchers. *J. Gen. Fam. Med.* **2023**, *24*, 72–78. https://doi.org/10.1002/jgf2.600.
31. Lakens, D. Sample Size Justification. *Collabra Psychol.* **2022**, *8*, 33267. https://doi.org/10.1525/collabra.33267.
32. Ollerton, J.; Winfree, R.; Tarrant, S. How Many Flowering Plants Are Pollinated by Animals? *Oikos* **2011**, *120*, 321–326. https://doi.org/10.1111/j.1600-0706.2010.18644.x.
33. Klein, A.-M.; Vaissière, B.E.; Cane, J.H.; Steffan-Dewenter, I.; Cunningham, S.A.; Kremen, C.; Tscharntke, T. Importance of Pollinators in Changing Landscapes for World Crops. *Proc. Biol. Sci.* **2007**, *274*, 303–313. https://doi.org/10.1098/rspb.2006.3721.
34. Lhomme, P.; Michez, D.; Christmann, S.; Scheuchl, E.; Abdouni, I.E.; Hamroud, L.; Ihsane, O.; Sentil, A.; Smaili, M.C.; Schwarz, M.; et al. The Wild Bees (Hymenoptera: Apoidea) of Morocco. *Zootaxa* **2020**, *4892*, 1–159. https://doi.org/10.11646/zootaxa.4892.1.1.
35. Katumo, D.M.; Liang, H.; Ochola, A.C.; Lv, M.; Wang, Q.-F.; Yang, C.-F. Pollinator Diversity Benefits Natural and Agricultural Ecosystems, Environmental Health, and Human Welfare. *Plant Divers.* **2022**, *44*, 429–435. https://doi.org/10.1016/j.pld.2022.01.005.
36. *Bureau of Land Management Strategic Plan for Pollinator Conservation*; U.S. Department of the Interior, Bureau of Land Management, Division of Wildlife Conservation, Aquatics, and Environmental Protection: Lakewood, CO, USA, 2022.
37. Duque-Trujillo, D.; Hincapié, C.A.; Osorio, M.; Zartha-Sossa, J.W. Strategies for the Attraction and Conservation of Natural Pollinators in Agroecosystems: A Systematic Review. *Int. J. Environ. Sci. Technol.* **2023**, *20*, 4499–4512. https://doi.org/10.1007/s13762-022-04634-6.
38. Colla, S.R.; MacIvor, J.S. Questioning Public Perception, Conservation Policy, and Recovery Actions for Honeybees in North America. *Conserv. Biol.* **2017**, *31*, 1202–1204. https://doi.org/10.1111/cobi.12839.
39. Ollerton, J. Pollinator Diversity: Distribution, Ecological Function, and Conservation. *Annu. Rev. Ecol. Evol. Syst.* **2017**, *48*, 353–376. https://doi.org/10.1146/annurev-ecolsys-110316-022919.
40. Varga-Szilay, Z. Jeff Ollerton: Pollinators & Pollination: Nature and Society. In *Community Ecology*; Springer: Berlin/Heidelberg, Germany, 2023; Volume 24, p. 135. https://doi.org/10.1007/s42974-022-00122-6.
41. Reynolds, V.A.; Cunningham, S.A.; Rader, R.; Mayfield, M.M. Adjacent Crop Type Impacts Potential Pollinator Communities and Their Pollination Services in Remnants of Natural Vegetation. *Divers. Distrib.* **2022**, *28*, 1269–1281. https://doi.org/10.1111/ddi.13537.
42. Stanley, D.A.; Gunning, D.; Stout, J.C. Pollinators and Pollination of Oilseed Rape Crops (*Brassica napus* L.) in Ireland: Ecological and Economic Incentives for Pollinator Conservation. *J. Insect Conserv.* **2013**, *17*, 1181–1189. https://doi.org/10.1007/s10841-013-9599-z.
43. Halvorson, K.; Baumung, R.; Leroy, G.; Chen, C.; Boettcher, P. Protection of Honeybees and Other Pollinators: One Global Study. *Apidologie* **2021**, *52*, 535–547. https://doi.org/10.1007/s13592-021-00841-1.
44. Kleijn, D.; Winfree, R.; Bartomeus, I.; Carvalheiro, L.G.; Henry, M.; Isaacs, R.; Klein, A.-M.; Kremen, C.; M'Gonigle, L.K.; Rader, R.; et al. Delivery of Crop Pollination Services Is an Insufficient Argument for Wild Pollinator Conservation. *Nat. Commun.* **2015**, *6*, 7414. https://doi.org/10.1038/ncomms8414.
45. Noriega, J.A.; Hortal, J.; Azcárate, F.M.; Berg, M.P.; Bonada, N.; Briones, M.J.I.; Del Toro, I.; Goulson, D.; Ibanez, S.; Landis, D.A.; et al. Research Trends in Ecosystem Services Provided by Insects. *Basic Appl. Ecol.* **2018**, *26*, 8–23. https://doi.org/10.1016/j.baae.2017.09.006.
46. Braman, S.K.; Griffin, B. Opportunities for and Impediments to Pollinator Conservation in Urban Settings: A Review. *J. Integr. Pest Manag.* **2022**, *13*, 6. https://doi.org/10.1093/jipm/pmac004.
47. Evison, S.E.F.; Roberts, K.E.; Laurenson, L.; Pietravalle, S.; Hui, J.; Biesmeijer, J.C.; Smith, J.E.; Budge, G.; Hughes, W.O.H. Pervasiveness of Parasites in Pollinators. *PLoS ONE* **2012**, *7*, e30641. https://doi.org/10.1371/journal.pone.0030641.
48. Penn, J.; Hu, W.; Penn, H.J. Support for Solitary Bee Conservation among the Public versus Beekeepers. *Am. J. Agric. Econ.* **2019**, *101*, 1386–1400. https://doi.org/10.1093/ajae/aaz050.
49. Barbosa, W.F.; Smagghe, G.; Guedes, R.N.C. Pesticides and Reduced-Risk Insecticides, Native Bees and Pantropical Stingless Bees: Pitfalls and Perspectives. *Pest Manag. Sci.* **2015**, *71*, 1049–1053. https://doi.org/10.1002/ps.4025.
50. Cullen, M.G.; Thompson, L.J.; Carolan, J.C.; Stout, J.C.; Stanley, D.A. Fungicides, Herbicides and Bees: A Systematic Review of Existing Research and Methods. *PLoS ONE* **2019**, *14*, e0225743. https://doi.org/10.1371/journal.pone.0225743.
51. Garbuzov, M.; Alton, K.; Ratnieks, F.L.W. Most Ornamental Plants on Sale in Garden Centres Are Unattractive to Flower-Visiting Insects. *PeerJ* **2017**, *5*, e3066. https://doi.org/10.7717/peerj.3066.
52. Lentola, A.; David, A.; Abdul-Sada, A.; Tapparo, A.; Goulson, D.; Hill, E.M. Ornamental Plants on Sale to the Public Are a Significant Source of Pesticide Residues with Implications for the Health of Pollinating Insects. *Environ. Pollut.* **2017**, *228*, 297–304. https://doi.org/10.1016/j.envpol.2017.03.084.
53. Lindström, S.A.M.; Herbertsson, L.; Rundlöf, M.; Smith, H.G.; Bommarco, R. Large-Scale Pollination Experiment Demonstrates the Importance of Insect Pollination in Winter Oilseed Rape. *Oecologia* **2016**, *180*, 759–769. https://doi.org/10.1007/s00442-015-3517-x.
54. Torné-Noguera, A.; Rodrigo, A.; Osorio, S.; Bosch, J. Collateral Effects of Beekeeping: Impacts on Pollen-Nectar Resources and Wild Bee Communities. *Basic Appl. Ecol.* **2016**, *17*, 199–209. https://doi.org/10.1016/j.baae.2015.11.004.
55. Fortel, L.; Henry, M.; Guilbaud, L.; Mouret, H.; Vaissière, B.E. Use of Human-Made Nesting Structures by Wild Bees in an Urban Environment. *J. Insect Conserv.* **2016**, *20*, 239–253. https://doi.org/10.1007/s10841-016-9857-y.
56. Lye, G.C.; Osborne, J.L.; Park, K.J.; Goulson, D. Using Citizen Science to Monitor Bombus Populations in the UK: Nesting Ecology and Relative Abundance in the Urban Environment. *J. Insect Conserv.* **2012**, *16*, 697–707. https://doi.org/10.1007/s10841-011-9450-3.

57. Ulyshen, M.; Urban-Mead, K.R.; Dorey, J.B.; Rivers, J.W. Forests Are Critically Important to Global Pollinator Diversity and Enhance Pollination in Adjacent Crops. *Biol. Rev.* **2023**, *98*, 1118–1141. https://doi.org/10.1111/brv.12947.
58. Williams, N.M.; Buderi, A.; Rowe, L.; Ward, K. Wildflower Plantings Enhance Nesting Opportunities for Soil-Nesting Bees. *Ecol. Appl.* **2024**, *34*, e2935. https://doi.org/10.1002/eap.2935.
59. Nicholls, A.A.; Epstein, G.B.; Colla, S.R. Understanding Public and Stakeholder Attitudes in Pollinator Conservation Policy Development. *Environ. Sci. Policy* **2020**, *111*, 27–34. https://doi.org/10.1016/j.envsci.2020.05.011.
60. Jarić, I.; Bellard, C.; Courchamp, F.; Kalinkat, G.; Meinard, Y.; Roberts, D.L.; Correia, R.A. Societal Attention toward Extinction Threats: A Comparison between Climate Change and Biological Invasions. *Sci. Rep.* **2020**, *10*, 11085. https://doi.org/10.1038/s41598-020-67931-5.
61. Warren, M.S.; Maes, D.; Swaay, C.A.M.; van Goffart, P.; Dyck, H.V.; Bourn, N.A.D.; Wynhoff, I.; Hoare, D.; Ellis, S. The Decline of Butterflies in Europe: Problems, Significance, and Possible Solutions. *Proc. Natl. Acad. Sci. USA* **2021**, *118*, e2002551117. https://doi.org/10.1073/pnas.2002551117.