

Understanding Human-Wildlife Relationships in Northern Italy

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Abstract

There is an abundant of interdisciplinary research regarding connections between humans and nature aimed at mobilizing Local Ecological Knowledge and perspectives within conservation efforts. Additionally, despite an abundance of research concerning pollinator declines, there is very little research exploring local knowledge of pollinators within connections between humans and nature.

To address this gap, we conducted interviews with thirty-five local people in communities surrounding Monte Grappa in the northern region of Veneto, Italy to explore generational differences in relationships between people, plants, and pollinators. Our study aimed to understand Local Ecological Knowledge (LEK) that exists in this area regarding local plant use, whether such knowledge extends to local pollinator species of which those plants depend on, as well as the perception of threats to local ecosystems and wildlife. We focused on three local, native species of plants (*Stachys recta*, *Taraxacum officinale*, and *Hypericum perforatum*) and insects (*Vespa crabro*, *Apis mellifera*, various species from genus *Bombus*, various bee species from family *Apoidea*, various wasp species from family *Vespidae*, various fly species from family *Syrphidae*) to prompt discussion and to grasp the LEK that exists in the area regarding key species. Semi-structured interviews including questions regarding participants' general relationships and awareness of the surrounding natural areas and local pollinator species. Participants were also shown photos of local plants and insects and asked if they could identify the species, knew any local names, noticed any pollinators visiting (for the plants), knew of any uses (for the plants), if they noted any behaviours (for the insects) and any other natural history observations

Overall, we found that LEK regarding local plants, for the majority of participants, did not extend to local pollinator species. For plant species, LEK was most notable regarding culinary uses of *Taraxacum officinale* that has been foraged in the area over many generations and recognized for several health benefits. *Stachys recta* and *Hypericum perforatum* were recognized by some participants as being used by previous generations for medicinal remedies. For insects, *Apis mellifera* was the most mentioned and recognized species among participants, while other ubiquitous local, native pollinators were less likely to be identified.

Our results also found that vineyards and pesticides were the biggest concerns of participants regarding threats to both the surrounding natural area and pollinator species, of which we discuss could be attributed to participants' personal connection to land-use change.

Foreword

This paper was written to fulfill the requirements of the Master of Environmental Studies (MES) degree at York University, contributing to fulfill the student's mastery and knowledge in their area of concentration in Community Engagement for Increasing Protected Areas. Further, this paper is informed by the learning objectives and strategies of the student during their academic pursuit including the exploration of human connections to nature, as well as place-based conservation.

Under the supervision of Dr. Sheila Colla, the paper explores human-nature relationships and Local Ecological Knowledge regarding connections between people, plants, and pollinators in Northern Italy to investigate the ways in which LEK can contribute to effective methods of conservation.

The author has experience working with conservation organizations and advocacy groups focused on various climate change issues. The author is passionate about engaging with communities to explore ways of informing and mobilizing people to participate in conservation and climate action concerning their local natural spaces.

The author has Italian heritage from southern Italy and has grown up surrounded by Italian traditions and languages. The author was fortunate to conduct interviews with local people in Veneto, Italy allowing her to immerse herself in the local culture that was simultaneously familiar and unprecedented. The author is grateful for the chance to participate in such a unique research experience, for the guidance, support, and gelato breaks from Dr. Sheila Colla, and the multi-disciplinary and encouraging opportunities of the MES program.

Dedication

I dedicate my Major Research Paper to both my maternal and paternal grandparents who immigrated from Italy to build prosperous lives for their families while raising us to celebrate the beauty of the Italian culture.

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1. Introduction

Global concern about pollinator decline has gained public attention due to potential consequences to food security and overall ecosystem sustainability. In Europe, almost 10% of wild bees are threatened by extinction, despite only 57% of conservation statuses of bees having been assessed (European Commission, 2019; Stout and Vicks, 2022). Data are specifically scarce in the Mediterranean region, which is considered a global hot spot for biodiversity. Several countries in this area have not participated in formal conservation efforts regarding wild pollinators (European Commission, 2019). On a global scale, 75% of food crops benefit from animal pollination, which annually attributes to €153 billion of global agricultural production (Ollerton et al, 2011). Additionally, approximately 90% of flowering plants worldwide are animal-pollinated (Stout and Vicks, 2022). Because of this, the United Nations Convention on Biodiversity has supported many pollinator initiatives related to the protection and conservation of pollinators in many countries. However, in Italy the lack of general awareness and limited conservation effort is particularly concerning as the country is greatly dependent on the economic value of many pollinator-dependent crops (Zulian et al., 2013).

In 2018, the European Commission launched its first EU Pollinator Initiative aimed at improving public knowledge and reducing the decline of pollinators (European Commission, 2023). Italy has yet to develop a national strategy on wild pollinators relative to the initiative (IEEP, 2019). There have been some efforts by local groups, as well as research projects by non-government and academic institutions that monitor wild pollinators (IEEP, 2019), however the results and contributions remain preliminary or unpublished. Many research efforts have mostly resulted in knowledge of managed pollinator species, primarily the European honey bee (*Apis mellifera*), though native to Italy, are prone to transmitting diseases to other species, can disrupt pollination systems, and outcompete other native bees, among other native ecosystem-related concerns (Stout and Vicks, 2022; Colla and MacIvor, 2016).

Traditional foraging has been an important practice throughout human history, ensuring food security, especially in rural or disadvantaged communities (Aziz et al., 2022). Italians have historically used native plant species in a variety of practices including food, traditional medicine, personal hygiene, and cultural rituals (Monari et al., 2022). Though foraging historically began as a means for food security (Aziz et al., 2022), the practice provides an opportunity for people to learn about and engage with local wild spaces. While interest has been increasing in younger generations, knowledge regarding foraging practices and plant species has mostly been preserved by elders (Monari et al., 2022).

Continuing foraging practices within rural communities provides opportunities to develop awareness and connect with local wildlife species, both flora and fauna, which promotes preservation of Local Ecological Knowledge (LEK). LEK considers knowledge about “ecological relationships that are

gained through extensive personal observation and interaction with local ecosystems and shared among local resource users” (Joa et al, 2018, p. 522). LEK can also be described as “experience-based, practical or experiential,” as it is typically obtained through land-based activities (Joa et al, 2018) or shared through generations orally or by observation (Reyes-González et al., 2020).

LEK has the potential to inform effective conservation strategies to strengthen protection of endangered species and ecosystems, including pollinator species (Reyes-González et al., 2020). Communities that forage develop relational values through nature exposure which often influences their behaviours, attitudes and actions that support the well-being of natural environments (Knapp et al., 2020). As individuals gain knowledge about their surrounding environment through lived experiences, their perception and connection to nature strengthens and extends to their community through knowledge sharing.

Our study takes place in Veneto, Italy, where 80% of land has low ecosystem capacity to support crop pollination, causing a high pollination deficit in a mostly agricultural region (Zulian et al., 2013). There are few research and pollinator conservation initiatives in Italy that include the fundamental connection between people, plants and pollinators despite the economic success of the country depending on the long-term sustainability of this relationship. The connection of Italians, culturally and economically, to both crop and wild plants should inspire greater conservation initiatives to protect wild pollinator species.

Here we explore whether human-plant relationships and local knowledge in rural communities extend to pollinator species. We hypothesize that individuals who have close connections with wild spaces and plant species will have greater preserved LEK regarding wild pollinators. This research aims to highlight the potential of LEK to contribute to effective pollinator conservation methods. Further, the goal of this study was to understand locals’ a) relationships with surrounding natural areas and three chosen flowering plant species, b) perceptions of threats to pollinators and local ecosystems, and c) existing LEK regarding wild pollinator and plant species.

2. Materials and Methods

2.1. Study Area: Monte Grappa and Surrounding Region

The study took place between April and May 2023 in the Northern Italian communities of Bassano del Grappa, Asolo, Cavaso del Tomba, Possagno, Trevignano, Paderno del Grappa, Marostica, Pederobba and Borso del Grappa (Figure 1). The communities are within the Treviso and Vicenza provinces of the Veneto region, in the surrounding area of Monte Grappa, the highest mountain part of the Venetian Prealps (*Monte Grappa*, 2013). The mountain intersects the provinces of Treviso, Vicenza, and Belluno and stands between the Brenta and Piave Rivers (*Monte Grappa*, 2013). The communities are generally at the foot of

Monte Grappa (Pedemontana) and are dominated by pastures, meadows, and ravine forest landscapes (*Monte Grappa*, 2013).

In terms of agricultural land-use, many acres of this region are used for vineyards as well as other, lesser, agricultural uses. As of 2022, the Veneto region has 97,000 hectares of vineyards with a wine export value over €2.8 billion euros (Regione Del Veneto, 2022). The province of Treviso, along with Verona, contributed to 74% of Veneto's production of wine and grapes, making Veneto the leader in Italy's Protected Designation of Origin (PDO) economy with a value over €4.3 billion (Regione Del Veneto, 2022). The Veneto region also includes the prosecco winegrowing hills of Conegliano Valdobbiadene, recognized as a UNESCO World Heritage Site, a region just a few kilometres east of the Montegrappa study area (Figure 1).



Figure 1. Locations of interviews noted in red squares: Bassano del Grappa, Asolo, Cavaso del Tomba, Possagno, Trevignano, Paderno del Grappa, Marostica, Pederobba and Borso del Grappa. Monte Grappa (white diamond), the Piave River (blue diamond), the Brenta River (yellow diamond) and UNESCO World Heritage site 'Le Colline del Prosecco di Conegliano e Valdobbiadene' (white square).

2.2. Interviews

Thirty face-to-face semi-structured interviews with thirty-five individuals were conducted in the months of April and May 2023. Interviews took place in nine communities around the Monte Grappa region. Participants were selected using a snowball sampling technique and were categorized into two age groups: under 60 years old and over 60 years old. Upon completion, interviewees included fourteen

people over 60 years of age, and twenty-one people under 60 years of age. In terms of gender balance, 51% self-identified as women and 49% as men.

Verbal consent was obtained before conducting each interview and the researcher adhered to the ethical guidelines of York University's Major Research Protocol for Research Involving Human Participants delegated by the HPRC. Interviews were conducted in Italian language and were transcribed in both Italian and English and stored in an encrypted York University Outlook server.

Interview questions were divided into three major parts. 1) Human-nature relationships: Participants were asked to describe their relationship with nature, the ways in which they occupy the surrounding natural areas, and what they thought were major threats to the Monte Grappa region. 2) Human-pollinator relationships: Participants were asked about flower-visiting insects they knew or have seen in the region and any general threats they thought pollinators currently face. 3) Photo prompts: Participants were shown photos of plants (Table 1) and pollinators (Table 2) and asked if they recognize the species, knew any local names, noticed any pollinators visiting (for the plants), knew of any uses (for the plants), if they noted any behaviours (for the insects) and any other natural history observations. Plants were selected for their medicinal and culinary use based on preliminary research of the area. The insects shown are a variety of pollinator and non-pollinator species native to the area that are found visiting plants. Some species such as the wasp and European hornet are non-pollinating insects common to the area. These species were chosen to prompt discussion and comparison between pollinator and non-pollinator species. The European Honey Bee is a native species to the area and is commonly domesticated for their honey production or perceived benefits on crop pollination (Klein et al., 2006). Because of many public misconceptions regarding pollination success of honey bees, and the popularity of this species in media and conservation efforts (Colla and MacIvor, 2016) we wanted to explore the perceptions of participants in identifying honey bees versus other native pollinators that are wild and not typically domesticated.

Table 1. Plant photos shown during interviews. The photos were labelled solely as letters, e.g. A, B, C and no additional text was included. Names shown here were found based on literature and online research.

Latin Name	Family	Common Name (s)	Italian Common Name(s)
<i>Stachys recta</i> L.	Lamiaceae	Hedge nettle or Perennial Yellow-Woundwort	Stachide retta or Stregona gialla, Erba di San Giovanni
<i>Taraxacum officinale</i> F.H.Wigg.	Asteraceae	Common Dandelion	Tarassaco
<i>Hypericum perforatum</i> L.	Hypericaceae	St. John's Wort	Iperico, Erba di San Giovanni

Table 2. Photos of insects shown during interviews. Photos were only labelled with a letter, e.g. A,b, c and no other text was included. Names shown here were found based on literature and online research.

Species Latin Name	Common Name	Italian Common Name
<i>Vespa crabro</i>	European Hornet	Calabrone
<i>Apis mellifera</i>	European or Western Honey Bee	Ape
Various local species from genus <i>Bombus</i>	Bumble Bee	Bombi
Various local species from family <i>Hymenoptera</i> and superfamily <i>Apoidea</i> (e.g. <i>Osmia</i> sp., <i>Megachile</i> sp.)	Wild, solitary Bee	Ape selvatiche, Ape muratrice
Various local species from family <i>Vespidae</i>	Wasp Species	Vespe
Various local species from - family <i>Syrphidae</i>	Hoverfly, Flower flies, syrphid flies	Sirfide

2.3. Selected Study Plants

In this study we explore the general relationship between people, plants and pollinators while focusing on three plants native to the Veneto region: *Stachys recta* (Figure 2), *Taraxacum officinale* (Figure 3), and *Hypericum perforatum* (Figure 4). These three plant species were chosen because they are ubiquitous in the chosen study region, have close studied relationships with insect pollinators and have food or medicinal value based on preliminary research.

The genus *Stachys* (Family *Lamiaceae*) includes approximately 300 species found throughout temperate and tropical Mediterranean, Asian, American and Southern African regions (Tomou et al., 2020). *Stachys* species are made up of annuals, perennials and shrubs with wooly leaves, often flowering into a spike-like shape (Tomou et al., 2020). Some common *Stachys* species include various hedge nettles and big sage. *Stachys recta* is made up of numerous branched or unbranched stems with 6-15 bell-shaped pale yellow flowers (Kanjevac et al., 2022). *Stachys recta* grows in dry forests, rocky slopes, meadows and pastures (Kanjevac et al., 2022). Many species in the *Lamiaceae* family, including *Stachys*, are listed on the European Red List of Medicinal Plants and are among the main species visited by bees for nectar (Durazzo et al, 2021). Observed in plant and bee surveys from the BienABest-project in Germany, *Stachys recta* was identified among the most attractive herbaceous plants species for wild bees (Kuppler et al., 2023).

Stachys species have been studied for their cultural uses in medicine, food, cosmetics, and other traditional practices (Tomou et al., 2020). *Stachys* species have been used to treat skin, stomach, ulcer and asthma disorders, and have anti-inflammatory, anti-anxiety and antioxidant properties (Gören, 2014). In many regions in Italy, *Stachys* species have been used in folk medicine to treat disorders including skin inflammations, stomach disorders, genital tumors, stress and depression (Tomou et al., 2020). *Stachys recta* has a high content of tannins in its dried aerial parts and has been used in traditional medicine of most European nations to treat epilepsy and hysteria (Chalchat et al., 2000). *Stachys recta* has also been used to

treat nasal infections, burns and body pains (Kanjevac et al., 2022). The aerial part of the plants are often prepared as essential oils or tea concoctions (Gören, 2014).



Figure 2. Photos of *Stachys recta* in bloom in the Monte Grappa region. Photos by Sheila Colla

Taraxacum officinale (Figure 3), known as the common dandelion, is native to Europe and Asia but has been widely established across the entire northern hemisphere (Sharifi-Rad et al., 2018). In many areas, dandelions are considered a weed, growing in abundance across meadows, parks, agricultural areas, pastures, and other human disturbed areas (Valenzuela et al., 2018). The plant grows a long taproot with milky sap, irregular lobed leaves, and a yellow flower head that eventually resembles a puffball made up of many white hairs as the flower matures (Mitich, 1989, p. 538).

Although common dandelions reproduce through apomixes and do not depend on pollinators for reproduction, the abundance of pollen and nectar in their yellow flowers attracts many generalist pollinator species including solitary bees, flies, and butterflies (Lázaro and Totland, 2010). Their abundance has also been found to provide a food source to some specialized or threatened oligolectic wild bees and rare polylectic bees (Kuppler et al., 2023).

Taraxacum species have been recognized across many cultures for their medicinal and general health benefits. Though the leaves are the most popularly used part, there is evidence of the flowers, roots, and shoots used for various ailments (Sharifi-Rad et al, 2018). The plant can be prepared as pastes, powders, infusions, and oils to be used orally or topically for various gastrointestinal, skin, and respiratory disorders (Sharifi-Rad et al, 2018). Dandelion is known as a nutritious plant in the Italian diet with anti-inflammatory benefits and liver detoxification support (Mattalia et al., 2019, p. 20). Italians mostly include dandelion in their diet, boiling the roots and leaves or leaving them raw (Mattalia et al., 2019, p. 20).



Figure 3. Photos of *Taraxacum officinale* in bloom in the Monte Grappa region. Photo by Sheila Colla

Hypericum perforatum (Figure 4), commonly known as St. John's Wort, is a perennial, grassland plant native to Europe, West Asia, North Africa, Maderia and Azores, and has been naturalized in parts of North America and Australia (Saddiqe et al., 2010). Documented habitat for this plant differs by geographic region but generally grows in sub-humid temperate regions and in semi-shaded areas like forest edges (Popay, 2015). Plants typically grow between 1 to 3 feet tall and have a woody stem with a leafy upper half and numerous small clusters of yellow flowers (U.S. Department of Agriculture - Forest Service, 2004). *Hypericum perforatum* is 97% apomictic and can be both self-pollinated and pollinated by a variety of insects (U.S. Department of Agriculture - Forest Service, 2004).

With a wide range of medicinal uses, *Hypericum perforatum* is a popular plant in both folk remedies and western products (Saddiqe et al., 2010). In English, the common name of *Hypericum perforatum* (St. John's wort) is associated with St. John the Baptist's day, June 24th, supposedly the day he was beheaded and the day the flower of St. John's wort reaches full bloom (Upton, 1981, p. 3). When crushed or soaked, the flowers release a deep red pigmented oil said to represent the blood of St. John (Upton, 1981, p. 3). The aerial parts of the plant are macerated or preserved in olive oil and can be applied topically or taken orally (Mattalia et al., 2019). The plant has been used in folk medicine against depression, anxiety, arthritis, pain and skin issues (Monari et al., 2022). There is evidence of *Hypericum perforatum* used in infusions with other flowers to treat Parkinson's disease in Italy (Monari et al., 2022). *Hypericum perforatum* can also be used with olive oil, and a combination of other medicinal plants and applied topically to treat bruises, sores, rashes and burns (Monari et al., 2022). The flowers can also be boiled and consumed as a tea against gallbladder stones, gastrointestinal issues and menstrual pain (Monari et al., 2022; Saddiqe et al., 2010).



Figure 4. Photos of *Hypericum perforatum* in the Monte Grappa region. Photos by Sheila Colla

2.4 Data Analysis

A complete dataset was created by coding interview transcripts into Microsoft Excel using a thematic analysis approach (Burnard et al., 2008). Interviews were transcribed and translated into English, and were reviewed to identify common themes and reoccurring responses in each part of the interview (Burnard et al., 2008). Our only pre-set codes for transcripts was some demographic information regarding age, education, gender and occupation.

Themes were identified based on overall responses which were then separated into two age groups (over 60 years old and under 60 years old) to illustrate generational differences. The youngest participant was 20 years old and the oldest was 86 years old.

While analyzing interview data regarding threats to the area and pollinators, we identified common themes between responses and established final categories (Burnard et al., 2008) including: “agriculture”, “pollution”, “invasive species”, “climate change” and “other.” The percentages seen in figures corresponding to mentioned threats to Monte Grappa and pollinators in the Results and Discussion section correspond to the number of total responses rather than total participants.

Responses in Part 3 asking participants to identify plants were organized by: 1) primary response, 2) secondary response, 3) uses of plants, and 4) visiting pollinators. Participants identification of insect photos were organized by: 1) primary response, 2) secondary response, and 3) additional comments. Primary responses were then categorized into 1) common name, 2) Latin name, 3) Other, and 4) unknown. The “common name” includes direct and confirmed translations of species common names and other possible local or dialect names. Some participants knew the correct Latin names associated with

species. We chose not to categorize responses as incorrect where local knowledge did not align perfectly with our scientific interpretation. Therefore, the “other” category includes names participants used to identify plant photos that are not associated with the common name, species name, or other taxonomic identifiers of the photo that was shown. Responses we identified as “unknown” if participants replied that they could not identify the species. In most cases, participants provided additional names, often dialect names, that they associated with the species, of which we list as secondary responses (see appendix A and B)

3. Results and Discussion

3.1. Human Activities in Surrounding Natural Areas

Participants were first asked if they visit the natural spaces nearby for work or pleasure, and what specific activities they do there. This was an open-ended question and participants were encouraged to list multiple activities they took part in and provide details, as necessary. Twenty-five participants responded that they only visit the areas for pleasure, two participants for work, and eight participants for both work and pleasure. Physical activity, which includes leisure walks and running, as well as foraging were the most popular noted activities amongst both age groups (Figure 5).

Three participants, one over 60 years old and two under 60 years old, lead guided group walks in the region for locals of different ages. While conducting interviews in the study region, community-led hikes or activities in the surrounding areas are quite common, while 15% (5) of participants mentioned they attend community hikes as their main activity in the surrounding natural areas.

Overall, 94% (33) of participants visit the surrounding natural areas for pleasure, participating in various activities like walking, hiking, and taking photos. We understood these activities as connections with nature, where local people take time to explore and enjoy the vast natural areas. While LEK is often shared through generations, it is also attained through land-based and observational learning. One of the participants over 60 reflected on his role as a trail guide explaining:

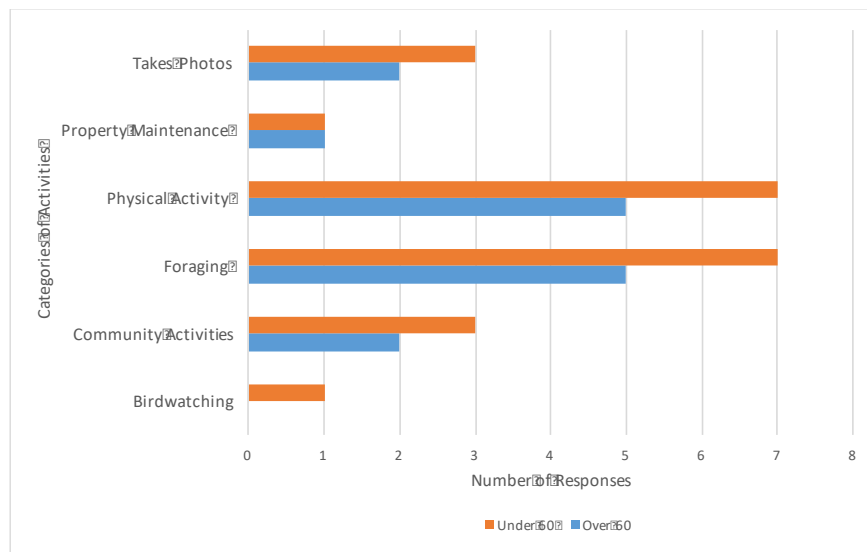


Figure 5. Interview responses of activities participants take part in their surrounding natural areas in the human-nature relationships part of the interview (n=35).

“Now [there is] more interest than it used to be, now people are more attentive and observing. We work a lot with schools to make people understand the importance of observing nature, seeing flowers and looking at plants. Because if you start from an early age to notice these things, people will then be more inclined to have a culture of biodiversity by learning to distinguish plants, flowers, animals and insects.”

Land-based learning opportunities, including community nature walks, offer opportunities for locals to learn and engage with their surrounding environment, fostering LEK. Holding spaces for people to learn about the ecosystems in their local natural areas promotes human-nature connections and can inspire environmentally focused knowledge and attitudes (Knapp et al., 2021).

3.2. Identifying Commonly Foraged Local Plants

Over 85% of participants tended a garden on their property, and 54% stated working regularly on the land, cultivating and maintaining either crops or gardens. Including the three selected study species, 22 plant species were mentioned as used for food, medicine, or both that were typically present on participants' property or observed or foraged in nearby areas. Overall, *Taraxacum officinale* was the most identified plant in both age groups by the species common name, “tarassaco” in the Italian language (Figure 6). *Hypericum perforatum* was the least recognized plant from both age groups with twenty-seven participants not able to identify photos using any name (Figure 6).

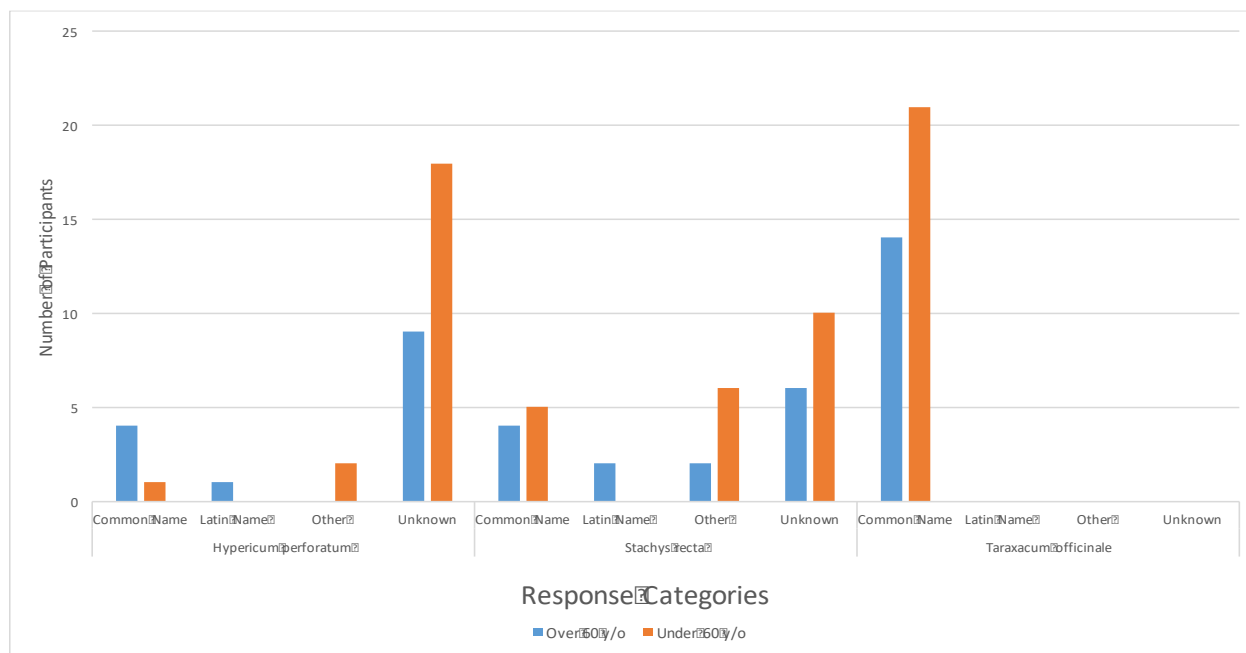


Figure 6. Interview responses identifying local plants in the photo prompts part of the interview (n=35). *Note:* “other” includes names participants used to identify plant photos that are not associated with the common name, species name, or other taxonomic identifiers.

3.2.1. *Taraxacum officinale*

The most frequently mentioned and recognized plant was *Taraxacum officinale* (Figure 6). All participants identified dandelions by the common name using the provided photos in part 3 of the interviews. When shown images of *Taraxacum officinale*, many different local names other than the Italian common name “tarassaco” were used that do not translate specifically to *Taraxacum officinale*, but to other plants in the *Taraxacum* genus or others which may look similar. However, six participants that responded with the common name dandelion (“tarassaco”), reported other local names associated with dandelion beginning with “radicchio.” Therefore, we included names beginning with “radicchio” under “common name” for *Taraxacum officinale* (Figure 6). Similarly, four participants identified *Taraxacum* using the Italian common name “Dente di Leone,” which directly translated to “lion’s teeth.” Because four participants used “Dente di Leone” to respond to the *Taraxacum* images, and two participants mentioned it as a local name for dandelion, we included those four participants under “common name” (Figure 6).

Most participants reported either using dandelions themselves, knowing someone who does, or having seen a family member use them. Participants reported that dandelion stems and leaves can be prepared similar to other leafy greens like spinach. Leaves and stems have a bitter taste and can be eaten

raw in salads mixed with other vegetables like onions, or boiled, blanched or fried in dishes like frittata, risotto, and pasta, with leaves picked earlier in the season being less bitter. Some participants explained that dandelion is known to have health benefits such as digestion and liver support and are high sources of iron. The raw yellow flowers of the dandelion can also be used to make honey, syrup or jam as a remedy for coughs and colds. Most participants reported seeing various insects visiting dandelion plants, mostly bees, bumblebees, and flies. One participant observed the importance of dandelions for bees as they bloom in early March before most flowers, providing pollinators with an early source of food.

3.2.2. *Stachys recta*

Photos of *Stachys recta* both in early growth stages (pre-bloom) and in full bloom were shown during part three of the interview. Thirteen participants identified *Stachys recta* by the photo using either the scientific name, common name or as a type of mint (i.e. in the *Lamiaceae* family) (Figure 6). About 45% of participants did not recognize the plant at all (Figure 6). Four different local names were reported for *Stachys recta*: erba di San Giovanni, sanduani, Erba Santoane, and finte ortiche (fake nettles). Multiple participants confirmed that the local name erba di San Giovanni, comes from the Christian celebration of St. John the Baptist's Day on June 24th which occurs shortly after the summer solstice. Some people noted foragers collected *Stachys recta* on St. John the Baptist Day (evening of June 23rd to June 24th) to ensure it is blessed by the saint so that the medicinal benefits are received. None of the participants reported collecting erba di San Giovanni themselves, but rather having seen older family members (I.e. mothers and grandmothers) collecting the plant for medicinal use in the past. Two participants under 60 years old, and five participants over 60 years old recalled their grandmothers or mothers hanging the plant to dry in the summer for winter use, boiling it in water, then preparing a hot compress for the neck or face to cure respiratory illnesses. Another participant remembers their grandmother boiling the plant in water until it became a dark liquid, then breathing in the water vapour to relieve colds. One participant that was 61 years old explained that this remedy is an example of how elderly people resorted to using herbal infusions and compresses for various sicknesses because of poverty and lack of access to medical care in the past. Some participants have seen the plant in the hills and grasslands around their home and noticed bees, bumblebees and beetles visiting. One participant explained that the plant thrives in dry areas but can also be found in areas of the mountain that have high sun exposure.

3.2.3. *Hypericum perforatum*

Four participants identified *Hypericum perforatum* using the common name “erba di San Giovanni” or “iperico”, and two participants identified it using the Latin name. Similar to *Stachys recta*, *Hypericum perforatum* is locally known as erba di San Giovanni which is a direct translation to “herb of St. John” with the same foraging traditions taking place on John the Baptist day. Participants explained the flowers are stored in olive oil for over one month and change to a red color. The oil contains a sedative substance called hypericin and is used in traditional medicine to treat pain, wounds and anxiety. The oil is put either directly on the skin, or on a rag to rest on painful body parts like the neck or on burns. Three of the participants recalled seeing bees and beetles visiting the plant.

3.3. Threats to the Monte Grappa region

Participants were asked what they thought the major threats were to the natural areas of the Monte Grappa region. A total of 20 unique threats were reported, with 74 total responses. Overall, majority of responses from both age groups corresponded to the “agriculture” category, which included eleven of fourteen participants over 60, and ten of twenty-one participants under 60. Of total responses, “vineyards” was the most common with 16 responses, including ten of fourteen among the above 60 age group, and six of twenty-one among the under 60 age group.

Responses were only slightly different between age groups as one participant under 60 years old mentioned “declining biodiversity,” four participants under 60 years old mentioned “industrial pollution”, and eight under 60 years old mentioned “litter”. These topics might have been discussed briefly with those 60 years and older but were not identified as significant threats.

3.3.1. Agriculture: Vineyards and Pesticides

Threats within the “agriculture” category received the most responses. Agricultural threats were associated with the surrounding agricultural land including vineyards, pesticides, and other harmful practices (Figure 7). “Vineyards” was the most commonly mentioned threat overall in this category as discussed above. “Pesticides” (or “chemicals”), within the agricultural category, was another popular response, with five of fourteen participants over 60 years old and eight of twenty-one participants under 60 years old (Figure 7). There were more participants who mentioned issues of vineyards in other parts of the interviews, but we did not include them in these totals if it was not mentioned while discussing major threats.

The impacts of vineyards and pesticides were often discussed in tandem as many participants expressed their concerns over the growth of viticulture in the region and the sprays used to treat grapevines. Participants shared their frustration of seeing and smelling pesticides on or near their

properties, one participant having seen a nearby farmer spraying pesticides on their grapes three times per day, which violates local restrictions on agricultural chemical use. He explained:

“when they do the treatments you have to pass with the mask and stay at least 500 meters away. They [use] these substances in the evening so people don't notice, but you can smell it anyway...then we eat it. That's why we never buy products from the supermarket.”

The region is known as an agricultural area but has now shifted from growing a diverse landscape of crops and grazing lands, to mainly growing grapes for wine. Another participant shared that he purchased a plot of land near his home that was rumored to become a vineyard to protect his own property from being impacted.

Seven participants mentioned the Conegliano and Valdobbiadene hills of Prosecco in their statements, despite the region being outside, but close to, our region of interest (Figure 1). They expressed concern that the impacts of the prosecco and wine production will continue to spread into the Monte Grappa region and significantly change the already shifting landscape.

Between 2007-2012, land used for wine growing in the Conegliano and Valdobbiadene hills increased by 12.3%, adding 1,063.88 hectares of new vineyards over only a 5-year period (Basso and Vettoretto, 2020). Of those added hectares, 63.1% were converted from growing other crops like corn; 32.9% from grassland and 2.6% from woodland (Basso and Vettoretto, 2020). Further, the Denomination of Controlled Origin (DOC) consortium recommends vineyards to be treated twelve times with agro-chemical applications over the growing season, and more during heavy rainfall (Ponte, 2021).

With increasing vineyards in a hilly area, the region can become more susceptible to landslides from soil erosion (Ponte, 2021). There are also major concerns in the area over pesticides impacting local people's health, time spent outdoors, and even the value of their homes due to proximity of chemical applications (Basso and Vettoretto, 2020). Participants identified environmental issues associated with the intensification of viticulture such as soil degradation, water pollution, biodiversity loss, deforestation and air pollution and smog from both machinery and pesticides.

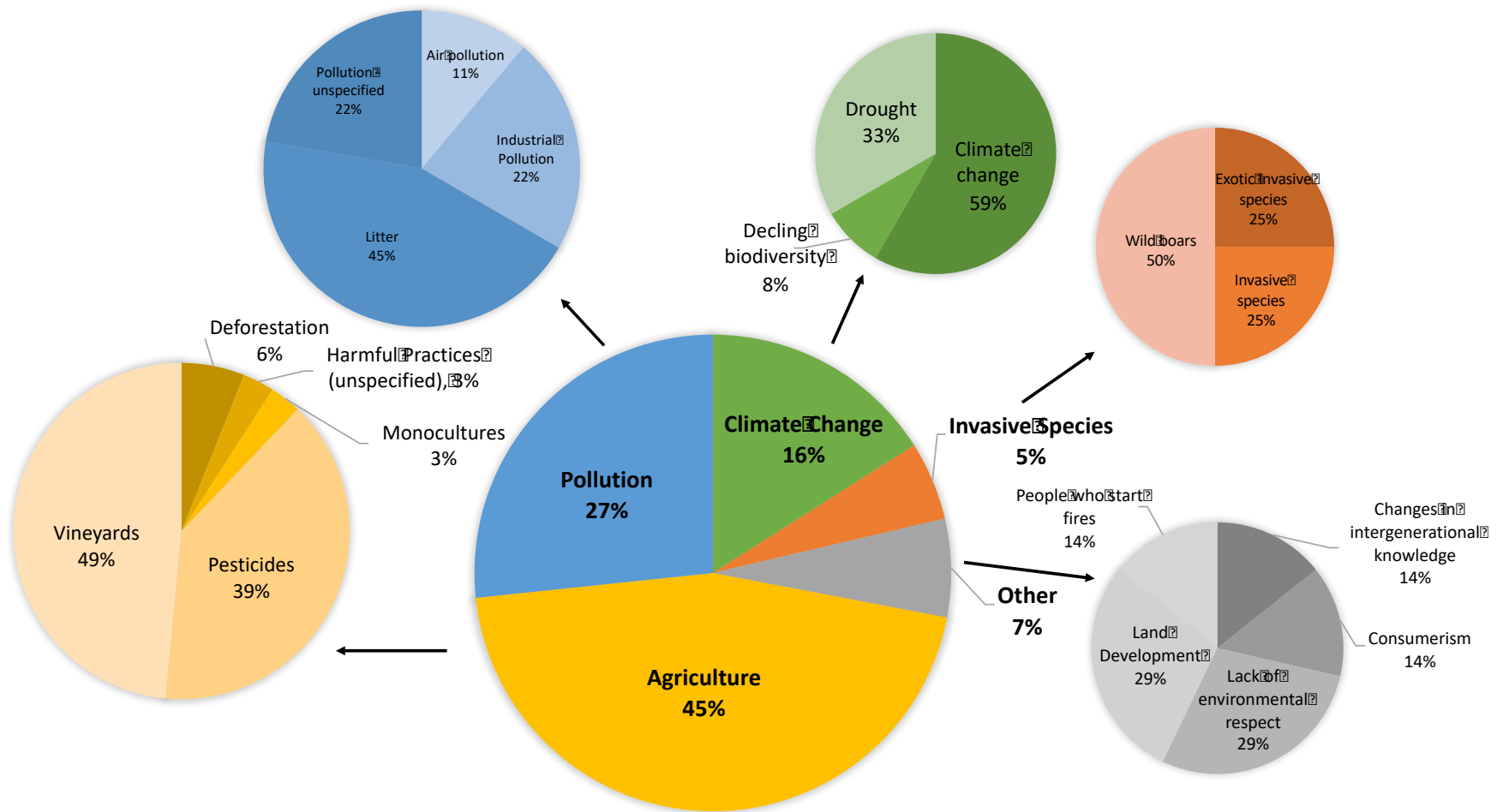


Figure 7. Threats to the Monte Grappa region as mentioned by participants during the human-nature relationships part of the interview (N=35). *Note:* Percentages (%) correspond to the total number of responses not number of total participants (N=35) as some participants provided more than one response.

The implementation of vineyards is perceived by many as mistreatment and destruction of the environment and responsible for the noted reduction of biodiversity in the area. Participants acknowledged that although the Monte Grappa region is visibly abundant with greenery, the area has lost much of its forests and wildlife. Despite the Conegliano and Valdobbiadene hills being promoted as a preserving natural heritage, and the economic benefit to the country's wine exports, participants expressed distaste for the spread of vineyards and clearly recognized the environmental impacts.

3.3.2. Pollution

Eighteen total responses corresponded to "pollution" which included litter, air pollution, and industrial pollution (Figure 7). Thirteen of twenty-one participants under 60 years old and two out of fourteen from the above 60 age group responded in the pollution category. General litter was the most popular answer in this category, of which all responses were from participants under 60 years old; eight of twenty-one participants. Participants mentioned seeing garbage left by hikers while visiting the surrounding area.

3.3.3. Climate Change

The climate change category received twelve total responses which included participants that mentioned climate change as a broad threat, as well as declining biodiversity and drought which were associated with climactic changes in the region (Figure 7). Three of fourteen participants over 60 discussed climate change, only one participant mentioning "drought." Seven of twenty-one participants under 60 years old answered in this category, three mentioning "drought" and one mentioning "declining biodiversity".

Apart from identifying major threats to the area eleven participants mentioned noticeable changes in snowfall patterns in the area. Five participants were under 60 years old and six were over 60 years old. Participants over 60 recalled varying amounts of snowfall in the past. One participants recalled getting up to 6 meters of snow in the 1960s, another recalling up to 1 meter. Now, the area gets much less snow that does not stay for long due to warmer temperatures. With eleven of thirty five of participants having mentioned the changes in snowfall, it was surprising that climate change was not a more commonly mentioned threat to the region.

3.3.4. Other Threats to Monte Grappa

Only four participants identified threats associated with invasive species such as wild boars or other introduced species. Two participants were under 60 years old, and the other two were over 60 years old.

Responses in the “other” category included those that did not fit into agricultural, pollution, invasive species, or climate change threats. Consumerism, changes in intergenerational knowledge, and people who start fires each received one response from participants over 60 years old. Two participants under 60 responded with lack of environmental respect. One participant over 60, and one under 60 years old responded with land development as the biggest threat to the Monte Grappa region. These participants discussed sprawl and industrial land development rather than vineyards or agricultural land changes.

3.4. Identifying Pollinators

In the second part of the interview, participants were encouraged to explain what they knew about pollinators. For threats to pollinators, a total of seventeen unique threats were reported, with sixty-eight total responses. Of the thirty-five participants, nine mentioned having kept honey bees on their property for harvesting honey either presently or in the past. All but one of these respondents were in the younger age category. Of the nine participants that have kept bees on their property, six acknowledged that most flowers develop because of insect pollination. Twenty-one participants were able to explain that most flowers develop because of insect pollination, while the remaining fourteen did not respond or provided unclear descriptions.

In part two of the interview, participants were asked to list any insects they knew that visit plants (Figure 8). Thirty-three of thirty-five participants mentioned bees. Bees, followed by wasps were also the most recognized species from part three of the interview (Figure 9). Most participants identified the photo of the honey bee using the term “ape” which is a direct translation of “bee.” We assumed participants were referring to the honey bee, as other mentioned bee species were specified, such as solitary bees and carpenter bees. The second highest response when listing insects was bumblebees; nine respondents were over 60 years old and sixteen were under 60 years old (Figure 8). Bumblebees were also the third most recognized insect in part three of the interviews (Figure 9.c). Other important pollinators like solitary bees, carpenter bees, mason bees, hoverflies, and bee flies were each mentioned by only one or two participants, primarily from the younger age group (Figure 9). In the under 60 years old group, one mentioned hoverflies, two people mentioned bee flies/syrphids, and one mentioned solitary bees. In the over 60 years old age group one person mentioned solitary bees, one person mentioned mason bees, and one person mentioned carpenter bees (Figure 8).

3.4.1. Honey Bees and Beekeeping

In discussion of pollinator species with participants, our findings were similar to others such as Ollerton *et al.* (2011) in the United Kingdom and van Vierssen Trip *et al.* (2020), in Canada, whose interviews resulted in European honey bees being much more recognized than any other local pollinators, despite these ecosystems having 100s or 1000s of other species.

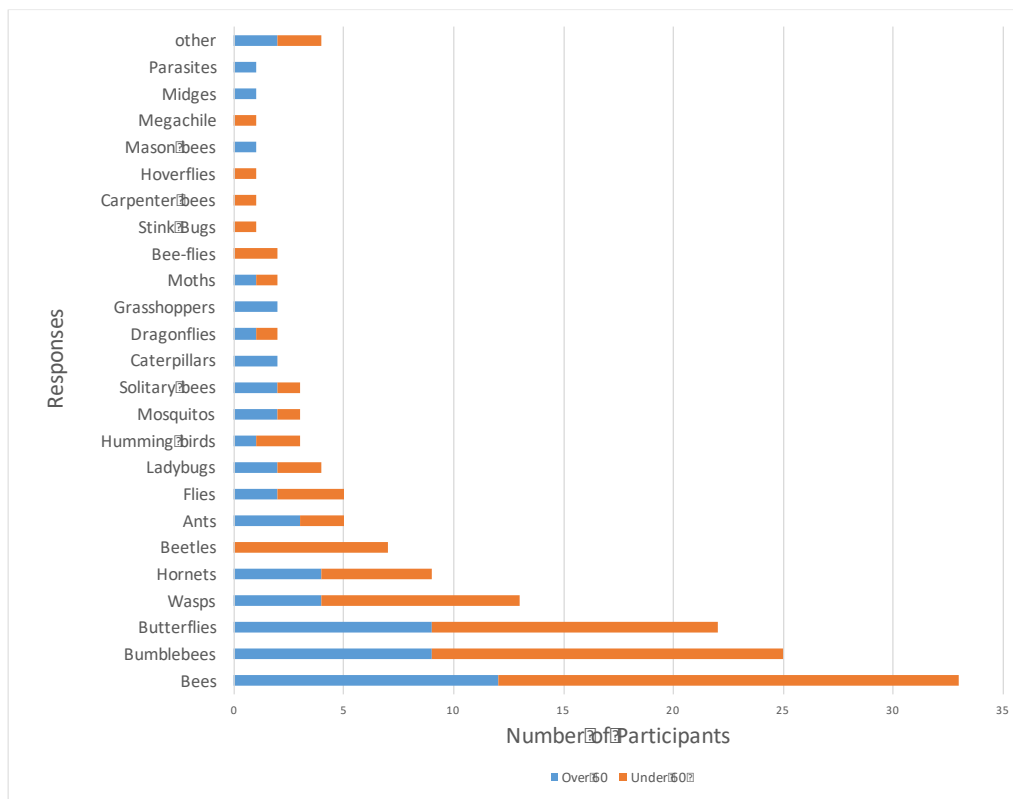


Figure 8. Responses during the human-pollinator relationships part of the interview when asked to freely list the species participants knew that visit plants and flowers (N=35).

Pollinator research and initiatives, especially in Europe, have primarily focused on the impacts of pollinator decline on human food systems (Stout and Dicks, 2022). This has led to an abundance of literature regarding generalist, managed pollinators like the European honeybee, minimizing the role of other, more effective wild pollinator species (Stout and Dicks, 2022). The EU's Pollinator Initiative report for Italy vaguely highlights projects and research centered around wild pollinator conservation such as proposed monitoring projects, digitization of bee collections, and graduate level pollinator surveys. However, sections regarding initiatives for honey bee conservation are much more detailed and directly

supported by the European Commission. With the focus on honey bee conservation coming from reliable sources such as the EU Commission and environmental NGOs, there is bound to be bias from local communities towards particular pollinator species and threats. However, it is important that wild bees and other pollinators are at the forefront of conservation efforts and recognized as fundamental local species.

Though honey bees are native to Italy, other wild bees are much more effective pollinators that ensure pollination of local plant species and crops (Kuppler et al., 2023). In regions where honey bees are managed for honey production or pollination, densities might be much higher than natural levels, which may negatively impact wild bee populations (Colla and MacIvor, 2016). Honey bees can also forage over large areas and collect nectar and pollen from diverse plant species and intensify food competition for wild bees (Colla and MacIvor, 2016). Further, studies have shown repercussions on local ecosystems from increased honey bee species. For example, Cilia et al. (2022) conducted a study in Italy and found that pathogens from honey bees can be spread to multiple other host species by way of contaminated pollen or flowers.

3.5. Identifying Pollinator Threats

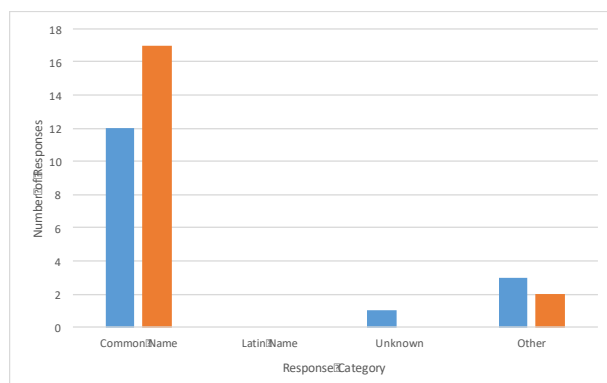
Participants were asked what they thought were the major threats impacting pollinators in the region. Responses in the “agriculture” category were most common among both age groups with twenty-nine total participants, eleven over 60 years old and eighteen under 60 years old.

3.5.1. Agriculture

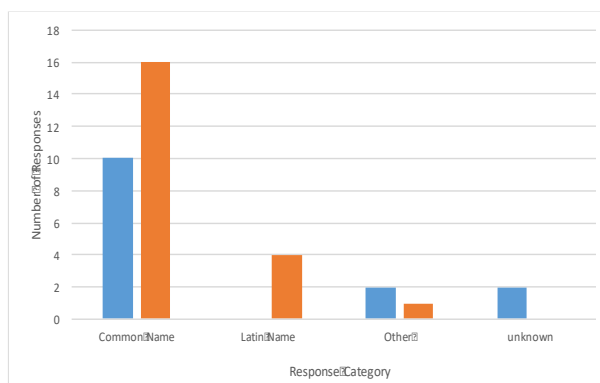
In the “agriculture” category, twenty-eight participants mentioned “pesticides” which was the most common response overall (Figure 10). Eleven participants were over 60 years old and seventeen were under 60 years old. One participant recalled an incident of a local honey beekeeper having lost all their bees due to the neighbouring farmer treating their crops with a harmful pesticide. With the popularity of the honey bee, it seems that participants are under the impression that the use of pesticides directly impacts European honey bees, managed hives and crop yields.

Changes in land cover, land management and pesticides, associated with habitat loss and toxin exposure are among the biggest drivers of pollinator decline worldwide (Stout and Vicks, 2022). Yet, the Environmental Code of Italy’s Presidential Decree allows land use conversion plans of natural or semi-natural areas that are less than 10-hectares to proceed without an environmental assessment (Basso and Vettoretto, 2020). Therefore, the prioritization of wine and prosecco production is seemingly proceeding without concern for pollinator declines with lenient land use regulations. The paradox of removing habitat

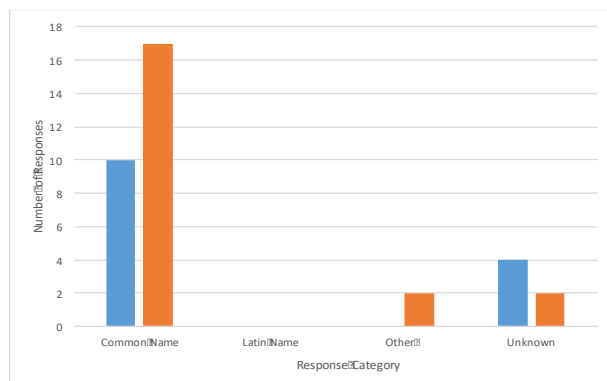
a.



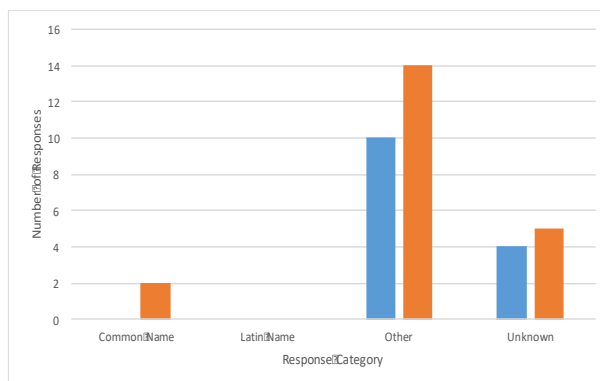
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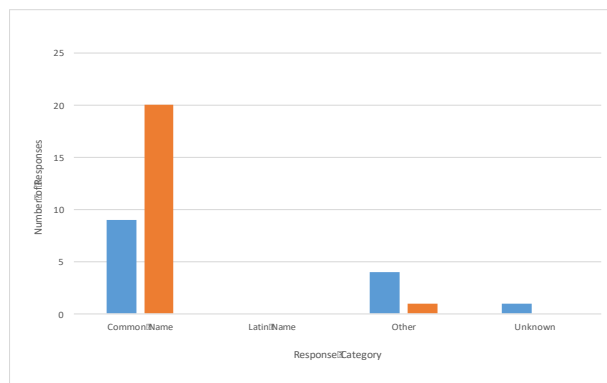
c.



d.



e.



f.

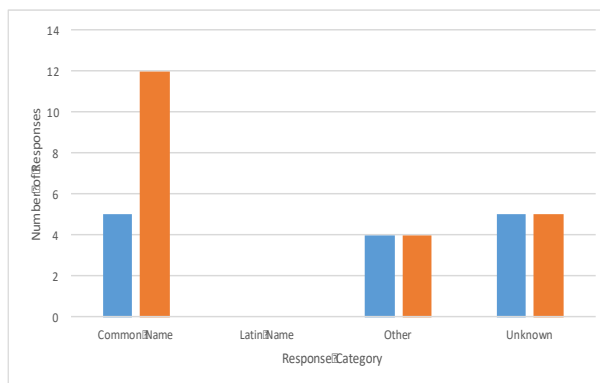


Figure 9. Responses when asked if participants could identify species in photos of insects during the photo prompts part of the interview (N=35). a) *Vespa crabro*, b) *Apis mellifera*, c) Various local species from genus *Bombus*, d) Various local solitary bee species from family *Hymenoptera: Apoidea*, e) Various local wasp species from family *Vespidae*, f) Various local fly species from family *Syrph*

for wild pollinators to intensify agricultural land use, which ultimately relies on pollination services for successful crop yield is concerning. Further, land use changes also have cultural effects on the surrounding communities that have safely used wild plants for generations by reducing the abundance and quality of foraging areas.

3.5.2. Climate Change

Only seven participant responses deemed climate change a threat to local pollinators, with six of twenty-one participants under 60 years old, and only one of fourteen over 60 years old (Figure 10). One participant connected the impacts of vineyards and pesticides to climate change as intense viticulture has accelerated the loss of biodiversity in the area that has noticeably experienced changes in seasons, thus exacerbating stress on local pollinator species.

3.5.3. Other threats to pollinators

Seven participants responded in the invasive species category which included introduced or native increasing predator and parasite species (Figure 10). Four participants were under 60 years old and three participants were over 60 years old. One participant identified the increase of hornet species in the area that prey on local bee species. Another participant mentioned an invasive species of stink bugs.

Air pollution was mentioned by three participants who were all under 60 years old, who mostly discussed industries and factories in surrounding areas. The two responses under unspecified pollution were those where participants did not elaborate. One participant agreed with the interviewer that the smog seen in the area was pollution, and another participant simply mentioned pollution from humans.

The "other" category includes mobile phone waves which both respondents referred to as a type of pollution that impacts pollinators. One of the participants over 60 years old explained that bees are very sensitive and can easily be stunned or stressed if they encountered mobile waves which would impact how they move in and out of hives to pollinate. Two participants identified mowing pollinator plants as a threat (Figure 10). One participant explained that typically farmers cut their grass in March, while he waits until the end of April to allow dandelions and other pollinator plants to grow and feed bees. He expressed that this should be a government regulated practice for all farms.

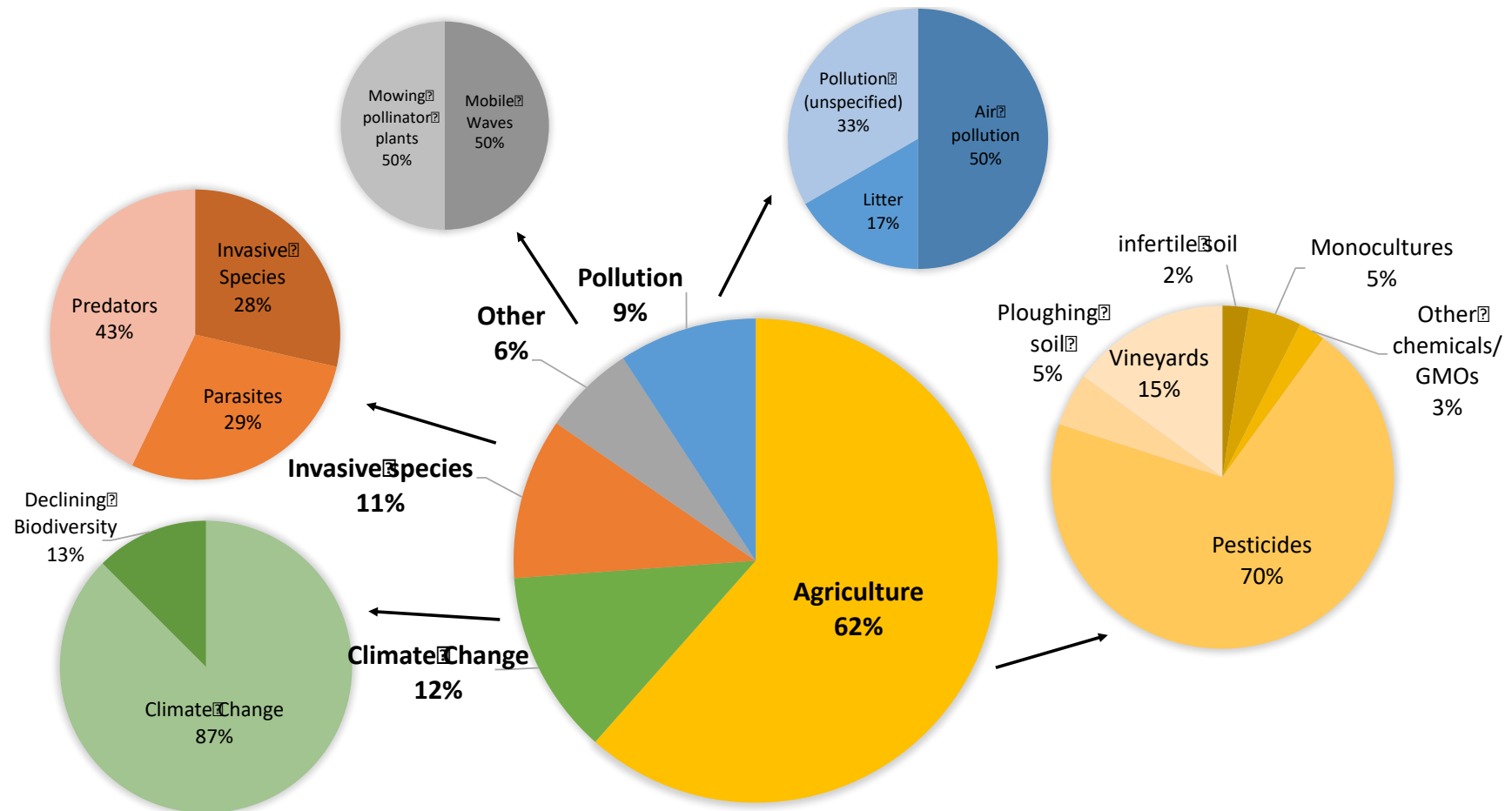


Figure 10. Threats to pollinators stated by participants during the human-pollinator relationships part of interviews (N=35).

Note: Percentages (%) correspond to the total number of responses not number of total participants (N=35) and some participants provided more than one response

3.6. Local Ecological Knowledge

Participants acknowledged the dependence of previous generations on local plant species for both food and medicine and mentioned persisting traditions, especially in culinary uses of local plants, but few discussed or acknowledged the relationship of these culturally important plants with pollinators. Participants illustrated intergenerational sharing of LEK by recalling primarily older family members or other community members using local plants for food or medicine, even if the participants themselves had never used them. Only four participants reported having formal education in environmental related subjects including natural science, permaculture and organic farming. Other participants explained having gained knowledge regarding nature and land from their parents or grandparents, through observations, or from media like documentaries and books.

In one interview, two participants under 60 years old shared the value of traditional knowledge in farming techniques. Both participants were farm workers and have taken courses in permaculture. They both shared their passion for organic and sustainable farming, emphasizing that there is only so much that can be taught in courses compared to learning from the land as previous generations had. There are currently very few individuals in the region who are knowledgeable about traditional, less intensive farming practices but are not valued by younger generations, as one of the interviewees explained:

“[you find] these old men...but only if you give them the opportunity to speak, if they feel at ease, then they tell you [what they know]. The typical Venetian is [tough] and is on the field from morning to night. But maybe many things that he knows he doesn't even know he knows. He is there all day, he sees things, he observes them, he is constantly observing. Once upon a time, farmers were always out on the fields. Now the world asks you for social media, this and that.”

LEK from observation and land-based activity regarding sustainable farming practices is valuable for environmental and pollinator conservations. Overall, there was a shared value for sustainable agricultural practices as many participants were proud of their farming practices and were concerned about other agricultural land in the area contributing to pollution from pesticides and land degradation.

Besides beekeeper participants, and those with formal education in environment-related subjects, only two participants demonstrated keen observations of wild pollinator species. One participant over 60 years old began the interview by explaining how important the surrounding forests were to him and his family, having lived in the same home where his parents also grew up his entire life. He had a variety of fruit trees, including two short rows of grape vines that he cultivates for homemade wine. Many of the plants were planted by his grandparents whose traditional organic gardening practices he has maintained.

Though he has learned a lot about farming from his parents and grandparents, he explained that his love for gardening, making wine, and the outdoors comes mostly from passion. He claimed he does not know much about pollinators because he has never practiced beekeeping, but when asked about pollinators in the area he explained:

“I plant fruit trees, pear trees, apple trees that clearly must be pollinated. I wait for the bees but this year very few have come, also because it was very hot in February when there was no flowering. Then came the cold and as far as I could observe and hearsay, below 15 ° C [the bees] remain in the hive. The other day it was 5°C here, bees clearly do not fly [when it is that cold]. That is why everything goes wrong: the flowers come but not the pollinators. I have been making very little fruit for two years, the other years pears, apples, plums, apricots and then my wife makes jams. For two years now we have been collecting little and nothing because [bloom times have been too] cold.”

This participant identified that pesticides from vineyards, and other pollution from the surrounding industries are exacerbating climate change and impacting ecosystems in the area. He observed how these threats have affected local pollinators and impacted the yield of his crops. His knowledge has come from his passion and observation in his own garden and the surrounding natural area, contributing to the LEK of the area. These narratives, though meaningful, do not substantially illustrate an overall connection between people and pollinators of this region. Perhaps further research that includes a larger sample size and inclusion of elder participants would show further connection between older generations and pollinators based on observational LEK.

4. Conclusions

Local Ecological Knowledge can be acquired through generational sharing and observations, but also includes human-nature connections created through exposure to natural areas and independent observations. Research comparing the relationships between people and pollinators, particularly between people that already hold close relationships to their natural surroundings is limited, especially in Italy. One of the major results we hoped to find was that if people could not identify common names for pollinators, they might have their own way of recognizing wild pollinators, understand habitat needs, or engage in some type of pollinator conservation practices. Based on species identification in part 3 of the interviews, this was not the case for most participants. The results of this study were not as expected, as most participants were knowledgeable about local plant species but were not as confident discussing pollinators.

Knowledge and uses of the three plant species demonstrated LEK through both observation and familial sharing of medicinal and culinary plant use. *Taraxacum officinale* was the most recognized plant, still foraged and used by younger generations for food that has many nutritional benefits. Medicinal plant use was reported as less common among current generations as even participants in the older age groups recalled elders using various plants for health remedies.

This study also contributes to literature discussing the global misconception of the honey bee as a key pollinator species in decline as few conservation initiatives, particularly in Europe, do not focus on wild pollinators. Participants were more likely to recognize honey bees as important pollinator species that are being threatened by local land-use changes. While most participants were unable to identify or describe local pollinator species beyond the honey bee, their capacity to recognize the impacts of land use changes demonstrates the potential of LEK to inform perceptions of environmental issues. It is unclear whether pesticide use is the biggest threat to pollinators in the study region, however, the overwhelming local concern of vineyards and pesticides indicates that further research is needed to investigate whether pesticides have caused an endemic issue for pollinators in the Monte Grappa region.

These findings highlight the need for European pollinator initiatives to increase opportunities for citizens to engage in land-based learning regarding wild pollinator species to foster LEK. Our suggestions include

- Incentives and access to resources for local farmers to plant pollinator gardens on their properties and monitor visiting insects
- Pollinator focused foraging events observing pollinators that visit food plants
- Community organized hikes to observe pollinators in Monte Grappa
- Creation of intergenerational network and mentorship between agricultural landowners of various size properties that include new and experienced farmers, pollinator experts, beekeepers, and other local organizations

It is important for learning opportunities to encourage local people to participate in conservation initiatives that match their interests. This paper, by exploring the trilateral relationship between people, plants, and pollinators creates a starting point to specify actions needed to strengthen LEK among communities to mobilize effective pollinator conservation strategies.

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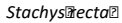
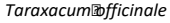
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Appendix A

Interview Responses to Plant Photos

Image	Primary Response	Secondary Response	Primary Response in English Translation	Category of Primary Response	Over 50	Under 50	Total Participants (N=35)
	Erba di San Giovanni		Hedge Nettle	Common Name	3		3
	Erba di San Giovanni	Salvia selvatica	Hedge Nettle	Common Name		1	1
	Stachys recta	Erba di San Giovanni	Hedge Nettle	Latin Name	0.5		0.5
	Stachys recta	Sanduani	Hedge Nettle	Latin Name	0.5		0.5
	Stachys recta	La Stregona Gialla	Hedge Nettle	Latin Name	1		1
	Finte Ortiche		Wild Nettle	Other		1	1
	Bocche di Leone		Snapdragons	Other		1	1
	Bocche di Lupo		Snapdragons	Other		1	1
	Dente di Leone		Snapdragons	Other		1	1
	Labiata, Menta di Salvia		Labiata Family (Lamiaceae) Mint, Sage	Common Name		1	1
	Menta		Mint	Common Name	1	2	3
	Salvia selvatica	Erba di San Giovanni	Wild Sage	Common Name		1	1
	Campanelle		Hedge bindweed	Other		1	1
	Orchidea		Orchid	Other	1	1	2
	Ortica selvatica		Wild Nettle	Other	1		1
	unknown			Unknown	6	10	16
	Dente di Leone		Dandelion	Common Name		2	2
	Dente di Leone	Radicea	Dandelion	Common Name		2	2
	*Radicchio selvatico		Dandelion	Common Name		1	1
	*Radicchio mat		Dandelion	Common Name		1	1
	*Radicchio di Campo		Dandelion	Common Name	1		1
	Tarassaco		Dandelion	Common Name	8	8	16
	Tarassaco	Dente di Leone	Dandelion	Common Name		1.5	1.5
	Tarassaco	La Bisacana	Dandelion	Common Name		1	1
	Tarassaco	Radicchio di Cane	Dandelion	Common Name		0.5	0.5
	Tarassaco	Radicchio Matto	Dandelion	Common Name	1	0.5	1.5
	Tarassaco	Radicea	Dandelion	Common Name	3	3.5	6.5
	Tarassaco	Radicchio di Campo	Dandelion	Common Name	1		1
	Erba di San Giovanni	Scacciadiavoli	St. John's Wort	Common Name	1		1
	Hypericum perforatum	Scacciadiavoli	St. John's Wort	Latin Name	0.5		0.5
	Hypericum perforatum	Erba di San Giovanni	St. John's Wort	Latin Name	0.5		0.5
	Iperico		St. John's Wort	Common Name	3	1	4
	Ornamentale		Ornamental Plant	Other		1	1
	Surfinia		Surfinia	Other		1	1
	unknown			Unknown	9	18	27

APPENDIX A: the “common name” category includes names that were other possible local or dialect names corresponding to the image
 *The Italian word "radicchio" (Radici pl.) directly translates to “radish”. However, participants confirmed this as a local name for dandelion (tarassaco). We included all possible local/dialect names in the “common name” category.

Appendix B

Interview Responses to Insect Photos

Image	Primary Response	Secondary Response	Primary Response English Translation	Category of Primary Response	Over 60	Under 60	Total Participants
Vespa crabro	Ape		Bee	Other	3	2	5
	Calabrone		Hornet	Common Name	3	6	9
	Calabrone	Esgivaròn	Hornet	Common Name	1	1	2
	Calabrone	sgevaron	Hornet	Common Name	2.5	3	5.5
	Calabrone	sete topaluno	Hornet	Common Name	0.5		0.5
	Sgevaròn	Martinello	Hornet	Common Name	1		1
	Vespa		Wasp	Common Name	2	2	4
	Vespa	ao	Wasp	Common Name	2		2
	Vespa	Sgevaròn	Wasp	Common Name		3	3
	Vespa	Brespa	Wasp	Common Name		1	1
	Vespa		Wasp	Common Name		1	1
	unknown		Unknown	Unknown	1		1
Apis mellifera	Ape		Bee	Common Name	4	9	13
	Ape	ao	Bee	Common Name	2	3	5
	Ape	ave	Bee	Common Name	1	2	3
	Ape	giavaron	Bee	Common Name	2		2
	Apis mellifera	ao	Western Honey Bee	Latin Name		2	2
	Apis mellifera	ave	Western Honey Bee	Latin Name		2	2
	Ape/hostrana		Local Bee	Common Name	1		1
	L'apetta		Bee	Common Name		1	1
	L'apetta	ao	Bee	Common Name		0.5	0.5
	L'apetta	ave	Bee	Common Name		0.5	0.5
	Vespa		Wasp	Other	2		2
	Vespa	ao	Wasp	Other		1	1
	unknown		Unknown	Unknown	2		2
Various local species from genus Bombus	Bombetto	ave	Bumblebee	Common Name		1	1
	Bombetto		Bumblebee	Common Name			0
	Bombo	giavaron	Bumblebee	Common Name	6	14	20
	Bombo	moscòn	Bumblebee	Common Name	2		2
	Bombo	sgevaron	Bumblebee	Common Name	1		1
	Bombo	sgialzaron	Bumblebee	Common Name		1	1
	Fuco		Male Bee	Common Name		1	1
	Vespa		Wasp	Other		2	2
	unknown		Unknown	Unknown	4	2	6
Various local species from family Hymenoptera: Apoidea	Ape		Bee	Other		4	4
	Ape	ao	Bee	Other	1		1
	Ape	ground bee	Bee	Other		1	1
	Ape/velvatica		Wild Bee	Other		1	1
	Api		Bee	Other	1		1
	Api/dell'legno		Carpenter Bee	Common Name		1	1
	Api/solitarie		Solitary Bee	Common Name		1	1
	Bombetto		Bumblebee	Other		1	1
	Bombo		Bumblebee	Other		1	1
	Bombo	fuco	Bumblebee	Other	1		1
	Calabrone	Sgevaròn	Hornet	Other	1		1
Various local species from family Syrphidae	Ibride		Hybrid	Other		1	1
	Mosca		Fly	Other	1	2	3
	Moscone		Fly	Other	3		3
	Vespa		Wasp	Other	1	3	4
	Vespette	Ao/velvareghe	Bee	Other	1		1
	unknown		Unknown	Unknown	4	5	9
	Ape		Bee	Other	3	1	4
	Calabrone		Hornet	Common Name		2	2
	Cavalletta		Grasshopper	Other	1		1
	Vespa		Wasp	Common Name	7	16	23
	Vespa	brespa	Wasp	Common Name	2	1	3
Various local species from family Syrphidae	Vespa	Fintel/Api	Wasp	Common Name		1	1
	Unknown		Unknown	Unknown	1		1
	Ape		Bee	Other	1	1	2
	Apine		Bees	Other		1	1
	Fintel/Api		Fake Bees	Common Name		1	1
	Insetto/colibri		Hummingbird Insect	Other	1		1
	Mosca	moscat	Fly	Common Name	1	6	7
	Mosca		Fly	Common Name	1		1
	Mosca-vespa		fly-wasp	Common Name		1	1
	Moscone		Fly	Common Name	2		2
	Sirfide		syrphid fly	Common Name	1	3	4
	Tafano		Gadfly	Common Name		1	1
	Vespa		Wasp	Other	2	2	4
	unknown		Unknown	Unknown	5	5	10

Appendix B: the “common name” category includes names that were other possible local or dialect names corresponding to the image that was show to participants.

Note: some participants provided two local names therefore we split their count by two so as to not double count participants.

Appendix C

Interview Questions

Part 1: Human-nature Relationships

1. Do you spend time/walk in the surrounding areas? Are such walks work-related or for pleasure/adventure?
2. Do you visit nearby forests, protected areas, or wild spaces? What do you do in those areas when you go? (for example, just walk around, take pictures, collect plants, etc.)
3. What do you think is the role those areas play in the life of local people and wildlife?
4. In your opinion, have there been any changes in the Monte Grappa, Colli Asolani region, to the plants or animals/insects that you have seen in your time living here??

Part 2: Human-pollinator Relationships

1. What do you call different insects that visit flowers? Please name all you have a name for (free list)
2. Are there flower visiting insects you remember or recognize but do not know the name for? Describe them the best you can (season, time of day, size, color, flowers they visit, etc)
3. Are you aware of the natural process needed for flowers to bear fruits?
4. Have you noticed if different plants attract different insects? Why so?
5. Do you do something to attract insects to your garden or on your meadow? Or instead to get rid of them?
6. Have you ever kept any bee species around your home, such as harvesting a bee hive for honey?
7. Are there any flower visiting insects that are less or more common now than they were in the past?
8. What do you think are the main threats to flower visiting insects in this region?

Part 3: Photo Prompts

Part 3.1: Show pictures of *Stachys*, *Taraxacum* and *Hypericum* plants

1. Do you recognize this species?
2. What is the plant used for?
3. When is the plant harvested?
4. What pollinates the plant?
5. Are there any local/dialect names for the plant?

Part 3.2: Show pictures of various insects

1. Do you recognize this species?
2. What plants does this species pollinate?
3. Where does this species live/habitat, special behaviors?