

Humans, Insects and Their Interaction: A Multi-faceted Analysis

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***Abstract:** By administering Personal Meaning of Insects Maps (PMIM) to participants from eastern Canada and northeastern United States, we examine how people's perceptions of insects are often determined by childhood encounters, corporeal cues, and influenced by environmental preference during recreational activities, often resulting in inconsistencies, inaccuracies, and bias. While the purpose of this study was to acquire a greater understanding of these entanglements through visual maps, the goal of this paper is to disentangle these morasses by highlighting the various positive, negative, dialectic, and ambivalent aspects of how insects are perceived.*

***Keywords:** insects, interactions, perceptions, qualitative research, visual maps*

Introduction

Insects are the most numerous animal on the planet and impact humans in many ways (Cardos et al., 2011). According to studies conducted by Bart (1972), Kellert (1993) and Woods (2000), invertebrates tend to be, apart from a few exceptions, universally disliked. This near universal dislike is explained by the fact that preferred animals tend to be aesthetically pleasing or human-like, considered intelligent, and largely ‘beneficial to humans’ (Woods 32). These perceptions in-turn largely influence our understanding, interactions and management of these creatures. Recent studies, however, have noted that human encounters with insects can also be positive (Evans, 2008; Hogue, 1987; Lorimer, 2007; Lemelin, *The role of insects* and ‘To bee or not to bee’; Raffles, 2010) as well as indifferent (Franklin, 1999; Lorimer, 2007).

Whether negative, positive or ambivalent, studies demonstrate that human interactions with insects are dictated by a myriad of factors. Some of these factors include corporeal cues (visual, auditory, olfactory) (Estren, 2012), early childhood experiences (see Bixler, Floyd, & Hammitt, 2002; Chawla, 1999; Ewert, Place, & Sibthorp, 2005; Kals, Schumacher, & Montada, 1999; Tunnicliffe & Reiss, 1999), the portrayal of insects in popular culture, education, and scientific literature (see Barua et al., 2012; Lemelin, 2009; Rule & Zhbanova, 2012; Zoldosova & Prokop, 2006), and the entanglement of these multispecies interactions in various activities and locales (Lemelin 2013b; Moore and Kosut, 2014, 2013). What these studies reveal is that we should be cautious of animal studies which are largely dependent on a researcher-generated list that often promote simplistic dichotomies based on love or hate, while discounting ambiguities or inconsistencies in these interactions. We should instead seek to understand human-insect encounters through approaches that acknowledge the nuances and inconsistencies that constitute human values of nature in general (Norton, 2000), and insects specifically (Lemelin, *The role of insects*).

An inductive visual research approach, such as the one used in this study, was particularly useful in illustrating the various contradictions and nuances influencing human entanglements with insects. While the purpose of this study was to acquire a greater understanding of these entanglements, the goal of this paper is also to disentangle these morasses by acknowledging the

various dialectic, and ambivalent aspects of these encounters while also increasing our understanding of these encounters, perhaps resulting in more positive, or at least tolerant interactions in the future.

Methods

Considering some of the challenges highlighted in previous insect studies (i.e., where the negative aspects of insects are often sought out), the research team employed an inductive research approach consisting of visual maps. Extensively used in education, visual mapping exercises like mind maps, concept maps, and personal meaning maps (PMM) (Eppler, 2006; Kalof et al., 2011; Wheeldon & Faubert, 2009), provide an opportunity for participants to supply various opinions on a topic like animals and planets, without fear of judgement or correction. These opinions are often used to assess communication and education strategies provided by such establishments as museums, zoos and planetariums.

Because the study was conducted in locations without butterfly pavilions, insectariums and museums, the visit to one of these establishments was replaced with a video depicting several types of insects and lasting approximately 6 minutes. Not only did this approach allow us to standardize the methodology, but it also provided an opportunity to survey individuals in areas that would have traditionally been overlooked by researchers while also highlighting how human encounters with insects are determined by corporeal cues, social mores, and recreational activities.

A research team composed of 7 data collectors from Canada and the U.S. who had previously worked with each other on other projects, administered 325 PMIMs to university students (graduate and undergraduate), gardeners, fishers, recreationists, and other targeted individuals located throughout eastern Canada and the northeastern United States from 2011 to 2013. Various sampling strategies were developed in-order to recruit as many participants as possible. First, a convenience sampling strategy was used to recruit undergraduate and graduate students at a Canadian university. Second, a purposeful sampling strategy was used to recruit gardeners, horticulturalists, recreationists and fishers. A third sampling strategy was used to recruit

individuals interested in participating in the study. Recruitment of these different groups included presentations at a university campus, contacting members of community and/or leisure groups and requesting their cooperation, writing articles in local newspapers, and placing posters throughout various communities.

Respondents were made aware that the research had received approval from the university's research and ethics board, and that the data collected could be used in future publications, presentations, and assignments. All respondents were informed that they would remain anonymous. The role of the data collectors was to administer the PMIMs and seek additional information throughout the various phases (I, II and III) of the study. Throughout each of these phases, the participants were given as much time as they needed to write what came to mind. However, to remain true to the inductive process, the data collectors did not correct mistakes that were made by participants nor did they describe any of the insects that were featured on the video during phase II. In the last phase of the study, the data collectors encouraged participants to provide socio-demographic data and include management and/or educational strategies that participants deemed relevant to increasing insect awareness and/or the conservation of these animals (the findings from phase III are presented in another article).

Although some participants did draw images of insects and these images were categorized, most participants opted to describe their perceptions of insects through words or short phrases; however, 27 participants elaborated considerably and required several pages of blank paper to describe their perceptions of insects. Each completed PMIM was digitally scanned (for back-up purposes), transcribed into Excel, assigned a participant number (P number), and then imported into NVivo 10 (QSR, 2012).

To understand the various aspects of human perceptions of insects, we first conducted a content analysis examining the frequency of words used and comparing the transformation (or not) of these perceptions across the various phases of the study (see Lemelin et al., in-press). Although the content analysis did reveal some general trends, it generally tended to overlook the nuances, contradictions and dichotomies in certain responses. Thus, to acquire greater insight into these perceptions, we decided to remove any non-insect responses (e.g., spiders, ticks, worms), and re-examine the data through a Dionysian coding approach (Heron & Reason, 2006; Lemelin, 2009).

A Dionysian coding approach takes a more imaginative, expressive, spiralling, diffused, impromptu, and tacit approach to understanding the interplay between knowledge and perceptions (Heron & Reason, 2006; Lemelin, 2009). As stated earlier, by using such an approach we were able to note general patterns, the general descriptions of insects, preferences and dislikes, inconsistencies and inaccuracies, perceptions of usefulness and worthlessness, desired and undesired interactions with, and in some cases, changing perceptions due to recreational activities like gardening, or educational strategies. Each PMIM was reviewed (i.e., read) several times by two members of the research team to allow for themes and patterns to emerge. The final codes presented in this paper were agreed upon by all members of the research team.

The findings presented next highlight a subset of participants who generally had a general positive view of affection toward insects, a subset of participants who had a general negative view and aversion to insects, and probably most striking, a subset of participants who held both negative and positive views toward insects, and in some instances, ambivalent perceptions. Following this discussion is an examination of how likes and dislikes are often determined by corporeal, childhood experiences and cognitive cues, and how human-insect interactions are largely predicated by the context of where and when they occur.

Findings

After several reviews of the PMIM data, approximately 22 participants provided dominantly positive statements, and could be coded as individuals who profess a deep admiration of insects. 'I love and appreciate bugs' (P025); they perform 'incredible functions' (P016). One participant expanded upon these positive feelings:

Well, insects are invertebrates which have no backbones; they are really very tiny living creatures which play an important role in the ecosystem; some people like insects but some people don't; but whenever I think about insects, I feel the same way like the other people thinking about insects are little tiny creatures which can walk, fly, etc.;

they look really beautiful and amazing; we can find them everywhere like grass, trees, soil, etc. [...] I think these words and ideas came to mind because I just like tiny insects and I have seen various kinds of insects from the beginning of my childhood (P193).

Ten participants expressed a dominantly negative attitude towards insects by stating that these animals are ‘creepy, frightening, and irritating’ (P002), and that ‘they are destructive, vectors of disease’ (P206) and even ‘useless’ (P206). Two participants expressed largely ambivalent statements ‘I don’t have strong feelings positive or negative about insects in general’ (P040), and ‘try to let alone outside if not damaging something’ (P045). These findings, which do not involve a majority of respondents, suggest that the love-hate dichotomies created to illustrate human interactions with insects are somewhat limited in providing an understanding of these encounters, nor do they capture those who are ambivalent.

Although support for, and opposition to, certain insects was expressed throughout the PMIM data, it was noted upon closer examination, that when participants did express feelings of veneration they did so by mentioning ‘beautiful insects like butterflies, dragonflies, and brightly coloured beetles’ (P096) as well ‘[...] as bumble bees’ (P233). Disdain, on the other hand, was directed at biting and stinging insects like mosquitoes and wasps.

Though one participant specifically stated that they love butterflies (P251), most responses commented on the butterfly’s beauty (P013, P024, P089, P091, P107, P110, P167, P220, P230, P246, 254), and how much they enjoyed watching these ‘graceful animals’ (P081), sometimes ‘for hours’ (P104). Some of this attraction was related to metamorphosis (P092, P251), the monarch migrations in the spring and fall seasons (P090, P244), and symbolism: ‘butterflies are [...] very special to me as they symbolize palliative care (re-growth into another life)’ (P081).

While some participants expressed love (P124, P159, P321), like (P220; P22, P257), and admiration (P181, P092, P170) toward dragonflies, most of this appreciation was more specifically directed toward its predatory nature (P092, P178, P181): ‘I [...] take pleasure when they arrive in swarms to eat mosquitoes’ (P182), ‘I love that they get mosquitoes’ (P079), ‘I like [that] they leave me alone and eat insects that bite us’ (P145).

Although one of the largest order of the insect world, only three types of beetle received favourable mention in this study, they are: tiger beetles (P015), fireflies (P072), ‘I love watching fireflies!! Find them fascinating’ (P145), and ladybugs (P111, P228, P267). ‘The ladybug was cute. I like ladybugs!’ (P259), ‘Ladybugs are pretty [...]. Really pretty’ (P246). ‘Ladybird beetles are my favourite insect! Loved finding them as a kid and getting them to crawl on my finger and watching them fly away’ (P114). Even a perceived negative encounter with a ladybug could not deter one particular participant from disliking these animals: ‘like ladybird beetle – but have been bitten by them’ (P222).

Bees were described as being amazing (P244), awesome (P115), cool (P090, P264, P280, P318, P321), and ‘interesting to watch’ (P025, P152, P233). However, much like dragonflies, it was their utilitarian contribution (i.e., pollination, pest control) that drew the most praise (P032, P047, P048, P052, P055, P063, P067, P076, P092, P094, P096, P101, P109, P130, P133, P145, P147, P149, P154, P157, P162, P170, P176, P180, P209, P219, P226, P238, P245). One participant expressed his/her appreciation of bees and the work that they carry out, but noted that they are ‘sensitive to their venom so try not to annoy them’ (P178). Concerns for the decline in honeybees and pollinators in general were expressed by a number of participants (P141, P142, P144, P177, P180, P212, P214, P216): ‘Pollinators have been dying. If they die, so do we’ (P244). Praying mantis and leaf bugs were the only other insects that were deemed worthy of praise (P220, P260): ‘Love the praying mantis’ (P254) and ‘leaf bugs and other camouflage insects are awesome’ (P108).

Other participants preferred to recognize the utilitarian aspects and ecological contributions of insects: ‘I appreciate the value of insects’ (P052), insects ‘are very connected to their environment’ (P319), they ‘serve an ecological purpose’ (P253), without insects ‘life on earth couldn’t exist’ (P149). A novice beekeeper explained that beekeeping had:

awakened interest in insects of all kinds. I feel more tolerant of the ‘ick factor’ and I am curious to know how they contribute to the natural environment. Studying insects and diseases in my MG training had an impact too. I know now that many insects are benevolent and essential to healthy soil, healthy gardens. I also feel concern about the loss of important insects such as honeybees and other pollinators and that insect health is an indicator of the overall health of our environment (P224).

As stated earlier, hate and annoyance was often directly associated with certain insects like mosquitoes (P143, P206, P220, P230, P240, P246, P256, P278, P280, P281, P284, P302, P321), ‘mosquitoes suck big time. I hate them’ (P251); some participants even questioned the function of these animals: ‘I have often wondered about the purpose of mosquitoes’ (P217). Much of the dislike of these animals was associated with the fact that they are perceived as nuisance: ‘mosquitos are a huge nuisance! They determine my outdoor activity i.e. what time of day I can work in the flower beds in my backyard which is very shady. I don’t like that I have to be concerned about leaving water around (a source of breeding grounds)’ (P081). Another participant noted that mosquitoes do ‘carry the West Nile Virus’ (P055),

Other participants despised biting and stinging insects including wasps (P143, P206, P256 P277), and hornets (P009, P219), ‘wasps scare me [...] hurts to get stung’ (P245), ‘kill hornets [...] took steps to get rid of them [...] set up a false nest’ (P219), deerflies and horseflies ‘Hate deerflies & horseflies, hurt when they bite, buzz loudly around people's heads - hard to kill - too fast (also really bother our cows & horses)’ (P145). Other unpopular insects included ants ‘I hate red ants’ (P115), fleas – ‘I hate fleas’ (P178), beetles – ‘beetles are still gross’ (P256), moths – ‘I strongly dislike moths’ (P256), earwigs – ‘I especially hate earwigs, they’re the ugliest things ever and we get a lot of them inside and outside the house in the summer’ (P322), fruit flies (P233), and flies in general (P041, P322) – ‘flies are disgusting’ (P009). Other participants were less specific and noted their annoyance with a number of insects: ‘flies, ants, may flies, mosquitoes are just a pain’ (P41), ‘I hate them – black flies, horse flies, mosquitoes, deer flies – they invade my space, why do they exist? They take chunks out of me, drive me indoors or to wear big shirts; some insects like the Emerald Ash Borer cause serious damage to trees’ (P186).

Even popular species like butterflies, ladybugs and bees were not beyond reproach with three participants (P077, P256, P316) specifically expressing their dislike: ‘I hate butterflies and moths, insects with big wings’ (P077), ‘I do not like butterflies, and a lot of people do. I am not sure why I don't.’ (P256). ‘Many people find ladybugs cute but I hate any insect that crawls on me’ (P118), ‘I am terrified of ladybugs. Infestation at grandparents when I was ten. Will not touch one’ (P256). Others explained that their negativity towards bees were due to ‘bad

experiences with bees' (P033), being stung (P045, P104, P174, P324) and/or an allergic reaction: 'know bees are important to the enjoyment of my garden due to pollination, [...] aware of danger of bee stings' (P219).

Although these comments appear to support the love-hate dichotomy, most participants often expressed their likes and dislikes through inter-species and intra-species dichotomy. 'I love dragonflies, butterflies, and bumble bees. I hate hornets, fruit flies and black flies' (P233). 'I like dragonflies, I dislike mosquitoes' (P257). 'I appreciate tiger beetles in my garden. I do not appreciate Japanese beetles' (P015). One participant expressed his/her disdain of mosquitoes and ants but then went on to state that 'the rest are useful and can stay' (P251). Another participant stated that 'I kinda like bees; not too fond of ants' (P217). While another participant had no problem poisoning an ant-hill but still 'appreciated bees' (P138).

As Lemelin (2013) and Kellert (1993) noted, human-insect interactions are often dictated by geography, recreational activity, and locale. To varying degrees, most participants indicated a strong dislike of insects in their homes (P009, P121, P130), yet a tolerance for some degree of population in their garden and backyards (P209). Even those participants expressing an appreciation of insects did not want them in their home 'I love bugs but not when inside my home' (P025), 'I know insects are important in our environment but I don't want them in mine!' (P027), 'outside they are okay, inside it is not okay' (P140).

Individuals responded to these intruders in various fashions from removing them and relocating them outside (P015, P025): 'I save bugs and put them outside – all types' (P024), 'will use a cup to put them outside' (P111), 'I don't like them around house, will use preventative measures like pushing them out door, keeping screens shut' (P220). Other participants were less tolerant stating that 'in my space - killed it instantly. Cockroaches in my space = death. Earwigs killed if enter house - ants too. They take over, could build a colony in my kitchen' (P145), 'All insects will be killed if in the house, I do not want any insects in the house [...] all must go away' (P175), 'ants in my house are not appreciated, I stomp them and also put out poison, please stay outside!' (P178), 'kill kill' (P219).

The home however is not the only locale where insects are not tolerated; many participants indicated they dislike encounters with insects in their own yard: insects are ‘annoying outside while [...] eating on the deck’ (P154). One participant expressed intolerance of these animals in the following fashion:

I feel no guilt with killing them and their habitats (P080), Earwigs = unsafe; termites destroy valuable structures; live in an older house – termites worry me, have not seen any; ... can exterminate [...] – DEET, mosquitoes really piss me off – don’t like listening to them, use clothing as a prevention ‘not some freakazoid like at my house’; no distinct separation between inside and outside – all is my space – use Raid inside and outside, only use in areas that dogs/pets can’t get to, ant traps; have 4 cans of Raid – 1 foam, 2 sprays, 1 dust, for every situation, I often over-dust, spray until they are squirming; sheer numbers freak me out, multiplication; dirty = bugs, swamps; always in death or horror movies never in happy cuddly movies; recently noticed wasps flying in a hole of house around outside top, sprayed it and 3 others came and left, will spray again tonight (P172).

Since gardening is an important leisure activity often occurring in backyards, a number of participants (some professional gardeners) also discussed these interactions: ‘they are fascinating creatures but some of them are bad for my garden because they eat my plants’ (P001), ‘I am unable to squish bugs that are pests in my garden – I drown them in soapy water instead’ (P178).

Others discussed the positive aspects of these interactions, ‘they are useful in the garden and forest to each other insects and help decomposition’ (P009), ‘looking closely at bugs reveals how marvellous and diverse they are, even when they sting and bite and destroy tomatoes and eggplant’ (P022), ‘as a gardener, we must allow for some interference from the insect world. Perfection cannot always be achieved’ (P050), ‘I don’t like insects on me but realize they are very beneficial to the garden and planet’ (P135).

According to a number of participants, education and awareness was heralded as essential to increasing tolerance towards these animals: ‘Was afraid of bees but through education and experience working with the land, I appreciate them’ (P106), ‘I used to think all insects were pests. Over the years, I have learned that some are good for us and the environment’ (P035).

One participant indicated that ‘as a suburban child mostly I was exposed to biting insects in the summer and bugs that invaded and did damage to the house or the garden. But as I grew and I became interested in ecology and then became a nurse, I began to realize that insects are an essential part of the environment and are interesting and beautiful’ (P042). In some cases, these changing perceptions were quite profound, with one participant stating that ‘I also think of how some are good such as bees and [...] ladybugs – since these are beneficial, I don’t think of them as creepy’ (P026).

In certain instances, statements like ‘I hate insects’ or ‘I love butterflies’ could appear to support previous findings using a love-hate dichotomy. However, upon closer examination what was noted in a majority of cases, that participants liked certain types of insects and disliked others, some of these affections (or lack thereof) were attributed to childhood experiences, corporeal cues, and educational strategies, thereby suggesting that these scales may be insufficient at capturing the various nuances and influences that are involved in human encounters with insects. In other instances participants noted how their perceptions had been transformed for the better through such recreational activities as gardening activities or education. Thereby, demonstrating the malleability of these encounters. These findings are expanded upon next.

Discussion and Conclusions

Participants in this study represented specific geographical areas of Canada and the U.S., and the analysis reveals findings that are similar to other studies. For example, similar to conclusions presented by Lemelin (‘Goodwill hunting?’; ‘To bee or not to bee’) and Moore and Kosut (2013, 2014), participants here tended to recognize and appreciate aesthetically pleasing animals such as butterflies and dragonflies. They also tended to appreciate insects like bees, ants, dragonflies and ladybugs (P027, P144) that provide ecological or utilitarian functions like pollination, decomposition and predation. However, these appreciated insects were not without their detractors, as some participants expressed dislike toward butterflies and ladybugs. These dislikes were largely driven by the insects’ ability to cause pain (biting, stinging), the impacts of some pest insect species on flora, the disruption of leisure activities, and the negative interactions occurring during one’s childhood. Although participants expressed their dislike of

stinging and biting insects like mosquitoes and deer flies, others insects like ants and flies, were not without supporters as some participants did express an appreciation for the complexity of ant colonies and the flying abilities of flies. The entanglement of multispecies interaction are also dictated by the setting where these encounters occurred; certain encounters appeared to be tolerated outdoors, while encounters in the home appeared to be the less tolerable, usually resulting in the forceful relocation or death for the animals.

The goal of this study was to enhance our understanding of human encounters with insects by demonstrating how the PMIMs provided participants from various locales with an opportunity to discuss and reflect upon their perceptions of insects in an environment free of judgement or evaluation. As the research community gains a better grasp of the complexities associated with humans' view towards insects, researchers in animal studies and proponents of insect conservation can apply these insights into their research approach and outreach strategies (Cardoso et al., 2011; Lemelin, *The role of insects*).

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