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Research Article

Tourists' Perceptions of Insects as the Determinants of Insect Conservation through Entomological Ecotourism

Fiffy Hanisdah Saikim[1,2]*, Gao Le[1], Mahadimenakbar Mohamed Dawood[1], Kalsum M. Yusah[1], Asfarina Ismail[1], Muhammad Shafiq Hamdin[3], Aqilah Awg. Abd. Rahman[3], Norradihah Ismail[3], Noor Izwan Anas[3], Mohammad Zulhusni Zakaria[3], Nordiana Mohd. Nordin[4], Zulhazman Hamzah[5]

[1]*Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah*
[2]*Borneo Tourism Research Centre, Level 2, South Block, Faculty of Business, Economics and Accountancy, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia*
[3]*Centre of Research for Sustainable Uses of Natural Resources, Faculty of Applied Sciences and Technology, Universiti Tun Hussien Onn Malaysia, Kampus Pagoh, KM 1, Jalan Panchor, 84000 Muar, Johor, Malaysia*
[4]*Faculty of Information Management, Campus Puncak Perdana, Universiti Teknologi MARA, 40150 Shah Alam Selangor*
[5]*Faculty of Earth Science, Universiti Malaysia Kelantan, Locked Bag 100, 17600 Jeli, Kelantan, Malaysia*

*Corresponding author: fiffy@ums.edu.my

Abstract

Insects are commonly featured in recreation and tourism around the world, despite the generally negative public perception surrounding them. Many people enjoy watching butterflies in insectarium gardens, observing and collecting dragonflies, and admiring the light displays of fireflies. In many cases, activities like these are becoming increasingly popular and these positive interactions with insects encourage public appreciation of insects, but vary acuities in their forms and approaches. Thus, understanding the pattern of insect appearances in recreation and tourism activities in a variety of discernments can provide important insights into effective ways of promoting insect conservation through ecotourism, which is often overlooked in biodiversity conservation strategies. However, these types of interdisciplinary studies are relatively new and remain limited in both entomology and tourism sciences. A field survey was carried out at Kangkawat Research Station, Imbak Canyon Conservation Area, where a 1 kilometre entomological ecotourism trail was designed and developed to incorporate insects in enhancing ecotourism at the reserve. Insects that can be found along the 1 kilometre trail were recorded and the collection was conducted using baited traps and sweep netting. Based on the insects survey, the Shannon Diversity Index (H') of Kangkawat is 4.60 while Simpson Index is 176.72 with Fisher Alpha Index at 313.3 that concludes Kangkawat Research Station insect richness to be the second highest after the Crocker Range.

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In adressing the knowledge gaps between insect conservation and ecotourism, a survey on attitudes towards insects was designed and then completed by 384 tourists around Kota Kinabalu City. The standardized questionnaire known as the Personal Meaning of Insects Map (PMIM) was administered to tourists and their responses were elicited prior to and after observing insect photos. The results shows that "spider" had the 100% connectivity in response to the most detested insect based on their previous encounters with insects. This result shows that there is an existing entomology knowledge gap among the respondents, indicating the need for further interventions in terms of nature interpretation. Therefore a quality guided nature interpretation as an educational tool should take into account how the general public understands (or misunderstands) insects further and where interpretive information could be better applied if we are to develop management and educational tools that address human-insect encounters.

Keywords: entomological ecotourism, insect-human interaction, Personal Meaning of Insects Map, conservation, knowledge gaps.

Introduction

Nature-based tourism that incorporates insects, herewith termed by the authors as 'entomological ecotourism' or 'entotourism' promotes the values of ecotourism in new ways through several discrete models developed on whether an entomological eco-tour focuses on a single phenomenon, is paired with another eco-tour focus, or is primarily research-based, entomological ecotourism (Lemelin & Williams, 2012). In short, the presence of 'entotourism' is evident in the ecotourism industry. However, in order for insects to be accepted into general ecotourism, interpretation and guide training should focus on the most charismatic insects in the world to capture the interest of more than just dedicated entomological eco-tourists. Hence, for entotourism to be successful, it needs to appeal to a broader audience (Cardoso et al., 2011; Whelan, 2012).

There is no universally accepted definition for entotourism. There is currently little-to-no reference in scientific or historical literature to entomological ecotourism. This is simply because the word was never really recorded before as a separate entity. A lack of precedent for the use of the word does not imply, however, that the definition is new. In fact, just as the pioneers of ecotourism would scour the planet in search of adventure and exploration, entomogical ecotourists also explore the globe for its rich and spectacular insect fauna. The same founders of ecotourism were also, serendipitously, the founders of entotourism (Lemelin & Williams, 2012). Suggesting that entotourism has grown from an ancestral notion to a modern-day concept as ecotourism. Entotourism

has become a multidimensional philosophy from the beginning of collecting insects for museums. Today, it is defined as nature-based tourism that combines insect education as a means of enhancing environmental and community welfare (Maryati et al., 2000; Whelan, 2012; Lemelin & Williams, 2012).

Insects are presently considered as an emerging industry in the field of ecotourism, such as the monarch butterfly (*Danaus plexippus*) watching tourism in Mexico (Whelan, 2012), fireflies (*Pteroptyx spp.*) watching in Sabah, Malaysia (Syazlina et al., 2016) and glow-worm tourism in Australia (*Arachnocampa spp.*) (Hall, 2012). Invertebrates appear, aside from a few exceptions, to be overwhelmingly hated, according to studies conducted by Bart (1972), Kellert (1993) and Woods (2000). The fact that favoured animals appear to be aesthetically appealing or human-like, considered intelligent, and largely 'beneficial to humans,' explains this almost universal aversion. In essence, these assumptions impact our comprehension, relationships and management of these creatures to a large degree. However, recent studies have shown that human interactions with insects can also be both optimistic and indifferent (Evans & Bellamy, 2000; Hogue, 1987; Lorimer, 2007; Lemelin, 2009; Franklin, 2005; Lorimer, 2007).

Whether negative, optimistic or ambivalent, studies show that a variety of factors determine human experiences with insects. Corporeal signals (visual, auditory, olfactory) (Estren, 2012), early childhood interactions (Bixler, 2002; Chawla, 1999; Ewert et al., 2005; Kals et al., 1999; Tunnicliffe & Reiss, 1999), insect depiction in popular culture, schooling, and scientific literature are some of these factors (Barua et al., 2012; Lemelin, 2009; Rule & Zhbanova, 2012; Zold et al., 2012; Zoldosova & Prokop, 2006), and the entanglement of these multispecies interactions in various activities and locales (Lemelin, 2013; Moore & Kosut, 2014). What these studies show is that we should be wary of animal studies that are largely dependent on a list created by a researcher that often promotes simplistic dichotomies based on love or hate, while discounting in these interactions ambiguities or inconsistencies. Instead, through approaches that consider the complexities and contradictions that constitute human values of nature in general (Norton, 2000), and insects in particular, we can strive to understand human-insect interactions (Lemelin & Williams, 2012).

In explaining the different inconsistencies and nuances surrounding human experiences with insects, an deductive visual analysis approach, such as the one used in this study, was especially useful. Although the aim of this study was to gain a greater understanding of these entanglements, the objective of this paper

is also to disentangle these morasses by identifying the various dialectics and ambivalent aspects of these encounters while also increasing our understanding of these encounters, probably leading to more constructive or at least accommodating experiences in entotourism and insect conservation.

Study Site and Methodology

Entotrail in Kangkawat

The 1 kilometre entomological ecotourism or entotourism trail was developed at the Kawang Trail and Nepenthes Trail in Kangkawat. Insects were collected using a standardized quadrat of 25m X 25m in the middle of the 200m each along the 1km line transect (see Figure 1 and Figure 2). Bait traps were also hung every 200m along the 1km line transect. Forty-three species of butterflies from 38 genera and six families are reported accounting for 4.6% of the 944 species reported in Borneo and evenly distributed with a Shannon Diversity Index (H') value of 3.64 and Species Evenness Index (E') value of 0.8819. Seven subfamilies of ants have been recorded consisting of 24 genera and 74 species with most of the species collected from subfamilies Myrmicinae, Ponerinae, Formicinae and Dorylinae. The most recorded genus was *Polyrhachis* with 19 species followed by *Dolichoderus*, *Crematogaster* and *Componatus* with eight, seven and five species respectively. A nocturnal survey was conducted by Razy et al. (2019) and based on their survey more than 100 insect species were recorded. The mean Shannon Diversity Index (H') is 4.60 while Simpson Index is 176.72 with Fisher Alpha Index at 313.3 that concludes Kangkawat Research Station insect richness to be the second highest after the Crocker Range.

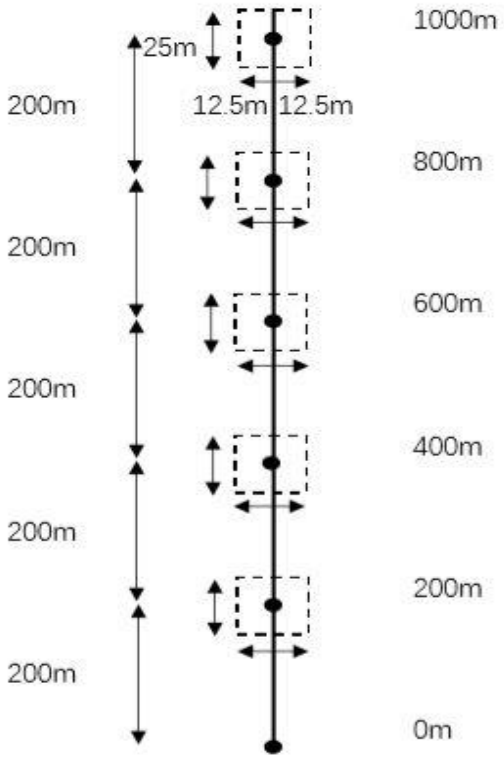

Figure 1. Diagram showing the entotrail design.

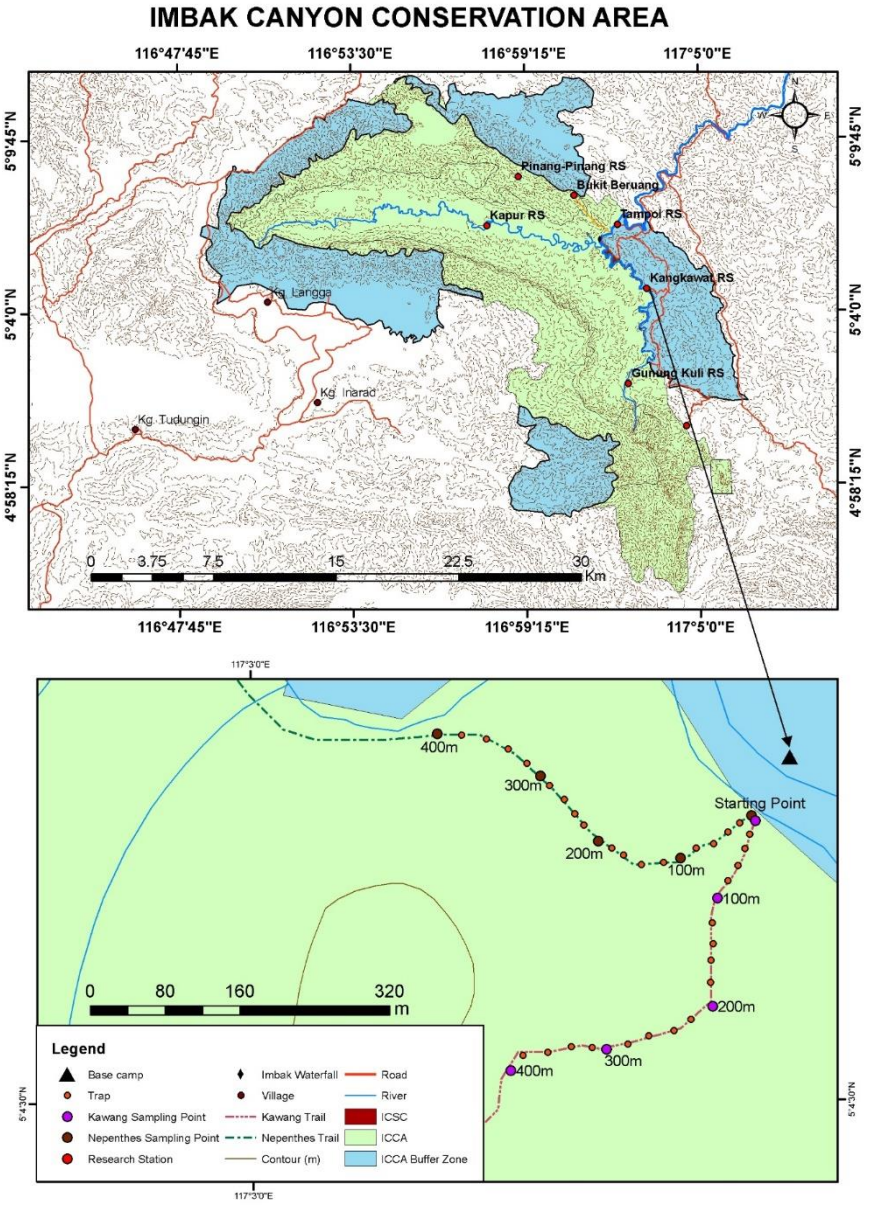

Figure 2. Map showing the location of the two selected trails for entotourism trail.

Personal Meaning of Insects Map (PMIM)

As for tourists perceptions, the study team used a deductive analysis approach consisting of visual charts, recognising some of the problems identified in previous insect studies (i.e., where the negative aspects of insects are frequently searched out) (Fiffy et al, 2015; Lemelin & Williams, 2012; Whelan, 2012). Visual mapping activities such as mind maps, idea maps, and personal meaning of insect maps (PMIM) are commonly used in education (Eppler, 2006; Kalof et al., 2011; Wheeldon & Faubert, 2009), offering an opportunity for participants to have different viewpoints without fear of judgement or correction on a subject such as animals and planets. These views are also used to test methods for communication and education offered by organisations such as museums, zoos and planetariums.

Because this study was conducted in locations without butterfly pavilions, insectariums and museums, the visit to one of these establishments was replaced with photos depicting several types of insects. 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 or physical indications, social mores, and recreational activities. The outcome of this study will also assist in the development of outreach programming that will demystify and educate the public about insects.

The PMIM consisted of three phases including a pre-viewing phase, where respondents were asked to provide their impressions of insects based on their past experiences, a phase where respondents are asked to view insect images, and a post-viewing phase, where respondents were asked to provide any additional information regarding insects that may have come up from the viewing phase.

Using Leximancer software (Loosemore & Galea, 2008), the data sets were analysed using thematic content analysis. It provides the context for addressing the themes, concepts and trends found that are the basis for all qualitative analysis of study (Berg, 2001). The software is a proprietary text mining and text analytical method based on mathematics that can be used to determine the correct meaning of text and visually display the extracted information. Leximancer helps to construct a thesaurus of words around a collection of initial seed words in addition to quantifying and coding text fragments, and shows the data in a 'concept diagram' (Loosemore & Galea, 2008) by integrating the proximity of the words in the transcripts. The qualitative data analysis shifts

from the general concepts and themes to text transcripts and codes (Creswell, 2005). Before analysis of data, the transcripts are formatted and transfered to Microsoft Word document. Result derived from the analysis are in the form of conceptual map.

Results and Discussion

Demographic Background of the Respondents for Pre-Viewing Phase of the PMIM

A total of 384 tourists were interviewed for 20 to 30 minutes each during the data collection period between the end of September 2018 to January 2019. Most of the interviews were carried out at the departure hall of Kota Kinabalu International Airport and around a 20km radius of Kota Kinabalu City including tourists at islands. The respondents were approached while they were waiting for flights, mostly during one hour and half prior to their departure time and during their resting time such as after lunch and while sun bathing in the field. Respondents' demographics were summarized in Figure 3 below.

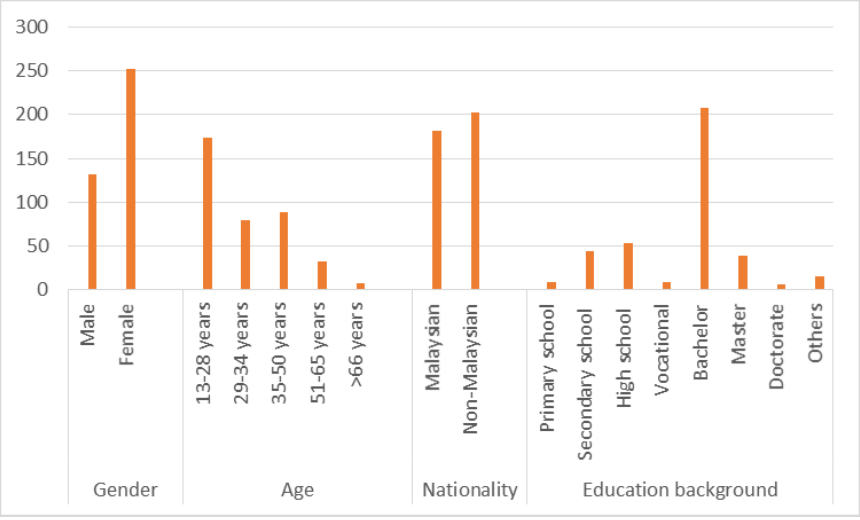

Figure 3. Demographic background of respondents for pre-viewing phase of the PMIM.

Past Experiences with Insects

In order to elicit the respondents' past experience with insects, the question posted was, "Recall a time when you felt exceptionally good about your experience with insects?". There were a few responses obtained from the

respondents from “There’s no good experience, to a “happy feeling”, “beautiful view”, or their “best moment”. However, the most prevalent responses were, “… no good experience, except for that …” and the respondent would go on to describe their experience. Good dimensions are defined in this study as the dimensions that lead to participants’ happy experiential conditions with insects contributing to a positive experience. In obtaining the respondents’ bad experience, they were prompted with the question, “Recall a time when you felt exceptionally bad about your experience with insects”. Responses were wide ranging. Apart from that, bad experience could be defined as the dimension leading to “worse moment”, “bad feeling”, “angry feeling”, “disgusting feeling”, “sad feeling” or “fear feeling” with insects contributing to their negative experience. In analysing the respondents experience regarding their psychological dimensions, all accounts about their good and bad experiences, or even ‘not so bad’ experience were analysed (see Table 1).

Table 1. Emotional aspects related to psychological dimensions of respondents on experience with insects.

Psychological Dimensions on Experience	Emotional Aspects
Disgusting	“disgusting”, “make me sick”, “stop eating”
Fear	“scream out load”, “scared”, “insecure”, “painful effect”, “frightening”, “creepy sound”, “poisonous”
Happy	“happy”, “excited”, “beautiful”, “enjoy”, “colorful”, “attractive”, “interesting”, “unique”, “delicious”, “best”, “mesmerized”
Anger	“stressed”, “bothered”, “noisy”
Sad	“sad”, “guilty”

Some of the indicative comments made by the respondents that signify their good and bad experiences with insects include:

- “… cockroaches (ah, so disgusting!) crawled under my skirt and I was so shocked. Eww!”
- “.. during that time my younger sister and I went to the museum. Out of nowhere, I felt something crawling on my hand. I was shocked realizing that was a weird spider. We both screamed and ran away to get our parents .. ”
- “.. cicadas, oh my God! I just can’t describe the moment. They fly into my room and make weird sound. Like so creepy and it was big in size. So noisy!”
- “..when I visited butterfly farm somewhere in Peninsular Malaysia. .. they are beautifully created by God. It’s a good thing to be an attraction towards tourist”

- “Good thing is insects can be a bait for fishing. My father used grasshopper or bugs to be the bait”
- “.. you might see this as silly behaviour. But every time I kill an insect I feel really sad and guilty. Their lifespan is not long like us, and they will die soon even if we don’t kill them”

Viewing Images of Insects

As part of the interviews, respondents were asked to view images of insects. Figure 4 shows the results of a content analysis of the respondents’ perceptions of insects after viewing the images. Based on the analysis, all respondents stated that their most unpleasant experiences were with spiders, followed by mosquitoes, with agreement that it was because of these insects are the most annoying and they are afraid of these invertebrates. The content anaysis was conducted with Leximancer and the results show that, while there is an overall unpleasantness in relation to the insects, the primary motivation for respondents who “like” insects was found to be related to characteristics of the insects’ that are charismatic, unique and beautiful such that even during a creepy situation may produce magical moments, awe and happiness. In a comparison of results from Table 1 and Figure 4, it was revealed that respondents’ personal connection with insects is very important. This finding indicates that it would be beneficial to understand how encounters with insects through entotourism are shaped by experiences, memories, and feelings and suggests ways in which the entotourism trails can be designed to better engage and inform visitors.

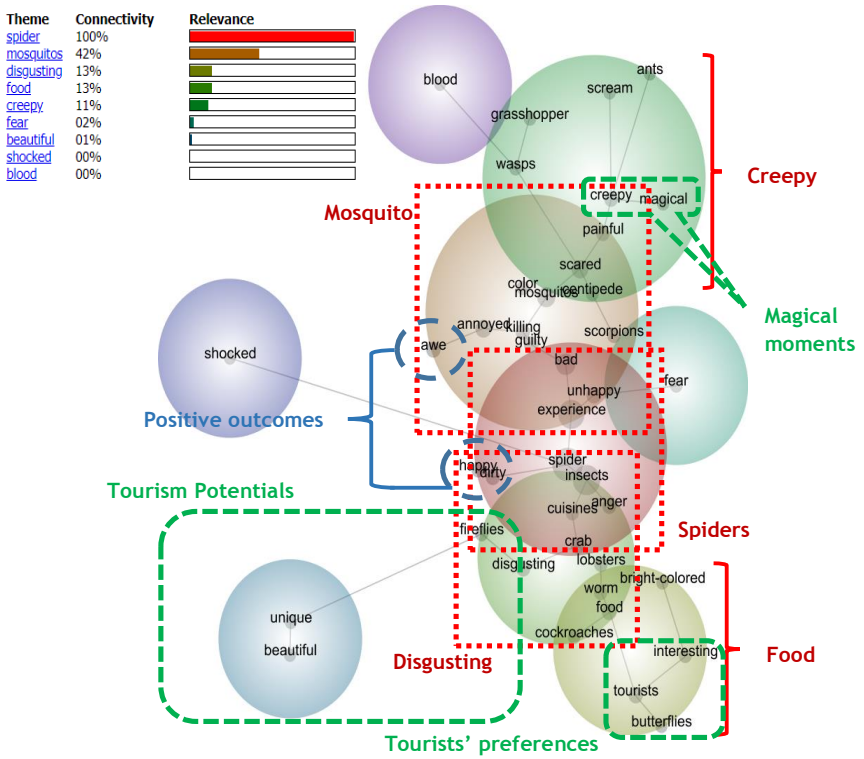

Figure 4. Respondents' view of Insects.

Post-Viewing of Insects Images

A post-viewing phase was undertaken where respondents were asked to provide any additional information regarding insects that they may have thought of following the viewing phase. Figure 5 presents the Leximancer results and shows that insects can be the subject of viable ecotourism experiences. However as shown in Figure 5, respondents demonstrate specific preferences of insects characteristics that they would like to see when if by chance participating in any entotourism activities. These explicit preferences include, beautiful, unique, rare and interesting. When these preferences were matched with specific insects, the analysis shows that the most frequently occuring insects mentioned are fireflies, beetles, butterflies, dragonflies and stick insects.

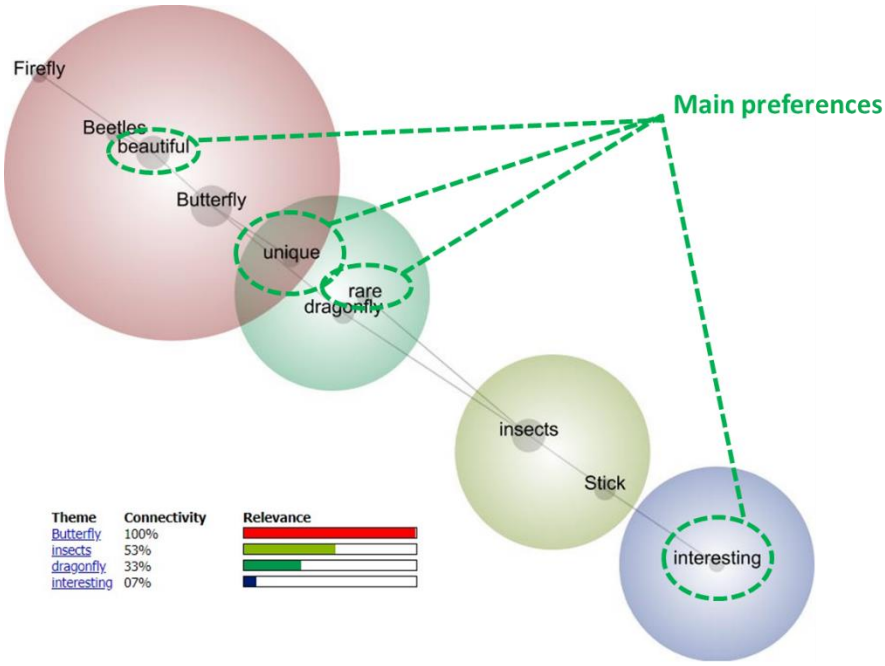

Figure 5. Respondents' main preferences of insects in terms of entotourism.

In the perceptual diagram outlined in Figure 6, it is apparent that the majority of the "insect enthusiasts" cluster was attracted to the concepts of learning about insects through entotourism. However, as indicated in Figure 6, entotourism needs to occur through a guided tour because nature interpretation adds information and awareness about insects. Together with quality interpretation within a natural settings, the primary motivation for respondents to learn and eventually to appreciate insects more widely can be attained.

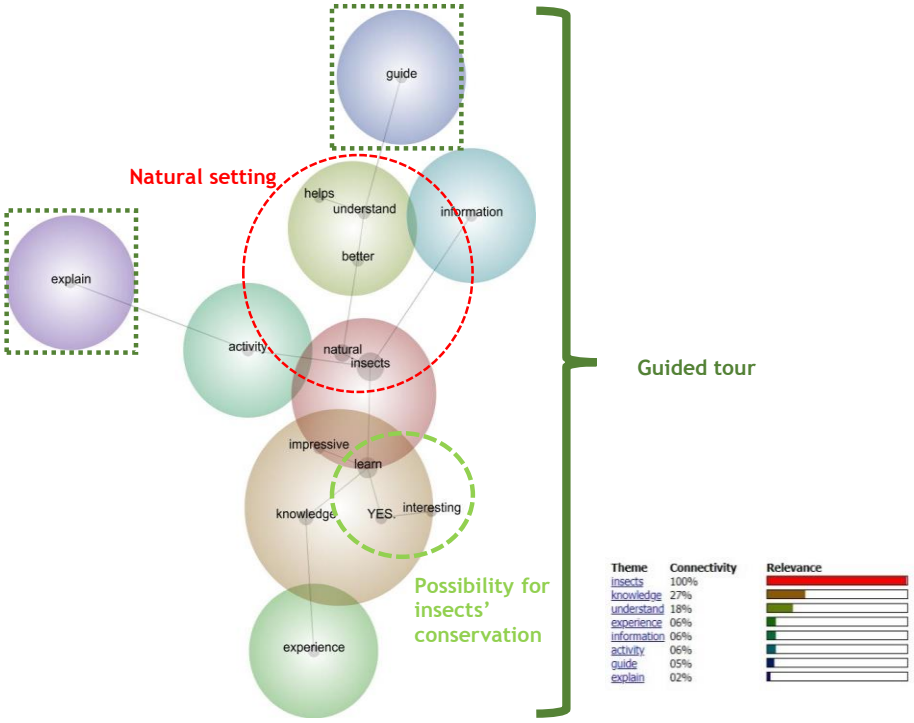

Figure 6. Respondents' concepts of entotourism activities.

Conclusion

The results of this deductive research largely support the findings of other studies that have acknowledged the contradictory aspects of human interactions with insects (Kellert, 1993), ambivalent (Lorimer, 2007) and optimistic (Lemelin, 2009; Moore & Kosut, 2014; Raffles, 2010). Similar to the conclusions drawn by Lemelin (2009, 2013) and Moore & Kosut (2013), participants appeared to note beautiful, unusual, uncommon and fascinating butterflies, beetles, fireflies, stick insects and dragonflies that then discriminate against other species / order such as ants, termites, bees, wasps and grasshoppers that could possibly be associated with adverse emotions. Thus, human interactions with insects can be accepted and even endured and not embraced in certain circumstances (i.e. during certain outdoor activities), but this will depend on how they are remembered to elicit emotional responses based on past experiences and today's perception of the world of insects.

As our study illustrates, the images engaged respondents and helped to remind them of the popularity of certain species like bees and butterflies, and the aesthetic appeal of dragonflies, praying mantises, and ladybugs. In some cases, the images were enough to remind certain respondents that they did indeed like certain types of insects. The aim of this study was to investigate the relationship between entotourism and respondents' views of insects. The overall results of the study indicate that the success of entotourism activities are very dependent on the charismatic appeal of insects. Results also show that respondents are convinced of what they want to experience and see during insects-based tourism activities. These findings suggest that the image of insects needs to be further investigated using strategies aimed at increasing tourists' acceptance of the insect realm. Importantly, the elements of psychology (emotions), philosophy (aesthetics), tourism and insects – and how these components interact to create a touristic experience must be fulfilled and achieved so as to ensure sustainable entomological ecotourism.

Whatever model of tourist motivation to experience entotourism one adopts, the importance of interpretation is vital. Knudson et al. (2003) assert that interpretation "translates or brings meaning to people about natural and cultural environments" (p. 3). While others have proposed that interpretation, "forges emotional and intellectual connections between the interests of the audience and the inherent meanings in the resources" (Brochu & Merriman, 2002, p. 20). In this light, it seems that it is possible to forge meaningful and connections with contrasting entomological phenomena.

The study does make a positive advance in the understanding of what constitutes tourist entomological knowledge, experiences and preferences. In conclusion, a relationship was identified that showed valuing insects through interpretation, could be a predictor of insects conservation awareness. Elements that can mediate this relationship include tourists' past experiences, knowledge of insects. and preferences for particular insects. The findings enhances understanding of human-insects relationship and how entotourism activities can be developed and designed. From a wider perspective, the findings of this study indicate that insects have a significant pull factor and present destinations with a unique marketing opportunity. According to Fiffy et al.'s (2015) study on tourists perspective - inclusion of entotourism concept in ecotourism activity, shows that the Structural Equation Modeling (SEM) of the study is 65% variance of all the independent variables that are "activity", "information", "interest" and "willingness" of insects watching tourism have described "ecotourism" well.

This shows that ecotourism is driven by independent variables, thus the conservation of insects through ecotourism may be increased.

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