FACTORS OF TOURISTS' PERSPECTIVE AND AWARENESS OF INSECTS BASED ON DEMOGRAPHICS DISTRIBUTION IN THE TROPICAL ECOSYSTEM

Gao Le[1], Fiffy Hanisdah Saikim[1*], Kalsum M. Yusah[1], Mahadimenakbar Mohamed Dawood[1], Homathevi Rahman[1], Nazirah Mustaffa[1], Nordiana Mohd Nordin[2] & Nor Akmar Abdul Aziz[3]

[1]Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia

[2] Faculty of Information Management, Campus Puncak Perdana, Universiti Teknologi MARA, 40150 Shah Alam, Selangor, Malaysia

[3]Department of Nature Parks and Recreation, Faculty of Forestry and Environment, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

*Corresponding author: *fiffy@ums.edu.my*

ABSTRACT

Entomological ecotourism has developed into a modern-day definition. The promotion of entomological ecotourism makes people gaining a better understanding of insects when they participated such activity. Depending on the eco-tour context, one may learn about a particular insects' role in the ecosystem, insects' connections with other wildlife, or the plants they depend on. Several studies reported the general preference of insects. However, there is still a lack of research for understanding the reason for similarities and differences in insects' perceptions as a tourism product from a cultural aspect. This research aimed to study the key factors that affect tourists' awareness and perception of insects based on their demographic profiles. The researcher used questionnaires, surveys, and interviews for data collection. The outcomes are illustrated in the form of conceptual map, quadrant report, spider-web configuration as well as tables. This cross-cultural study shows that there is little difference in perception and awareness between Malaysian and Non-Malaysian respondents. Respondents also show three main factors, such as 'Knowledge', 'Experience' and 'Appearance' that may cause different perceptions of insects other than their cultural background. Even though there are no significant differences between the respondents' perceptions of insects, there are still some items among the respondents' perceptions need to be considered. These items include the respondents' perspective on diversity, behaviors, life cycle, and insects' appearance. Therefore, getting people to participate in entomological ecotourism, insects that fit tourists' requirements such as beautiful, rare, and attractive, needs to be focused on. Hence, the findings are significant to share to ensure proper management of insects through entomological ecotourism or entotourism.

Keywords: Entotourism, insect-human interaction, conservation, Borneo, awareness, perception

ABSTRAK

Pelancongan entomologi semakin berkembang seiring dengan proses modenisasi. Promosi eko-pelancongan berasaskan entomologi mendedahkan orang ramai kepada serangga sekaligus memberikan pemahaman yang lebih baik berkenaan serangga apabila mereka menyertai aktiviti eko-pelancongan berasaskan entomologi ini. Dalam konteks eko-pelancongan, peranan serangga di dalam ekosistem seperti hubungan antara serangga serta hidupan liar dan tumbuhan dapat dipelajari. Berdasarkan kajian lepas yang dilaksanakan berkaitan serangga dan pelancongan, kajian lepas hanya tertumpu kepada jenis-jenis serangga yang menjadi kegemaran dan disukai masyarakat sahaja. Masih terdapat kekurangan dari segi penyelidikan yang berkaitan seperti faktor persamaan dan perbezaan dari segi aspek kebudayaan terhadap serangga sebagai suatu produk eko-pelancongan. Justeru, kajian ini dilakukan untuk meneliti faktor utama yang mempengaruhi kesedaraan dan persepsi masyarakat terhadap serangga berdasarkan profil demografi mereka. Pengumpulan data adalah melalui borang kaji selidik, tinjauan serta temu ramah. Hasil kajian dipersembahkan dalam bentuk peta konsep, laporan kuadran, konfigurasi lelabah dan dalam bentuk jadual deskriptif. Hasil daripada kajian silang budaya ini, menunjukkan terdapat perbezaan dari segi persepsi dan kesedaran antara responden warga Malaysia dan bukan warga Malaysia. Analisis juga menunjukkan tiga faktor utama iaitu ilmu pengetahuan, pengalaman dan penampilan yang mewujudkan perbezaan dari segi persepsi responden terhadap serangga. Selain itu, aspek latar belakang serta kebudayaan masing-masing turut memberikan impak perbezaannya. Walaupun wujudnya perbezaan perspektif responden terhadap serangga, namun masih terdapat kesamaan ditunjukkan dari segi kesedaran dan persepsi responden terhadap serangga. Antaranya adalah pandangan responden terhadap kepelbagaian, tingkah laku, kitaran kehidupan serta penampilan seranggga. Oleh yang demikian, bagi menarik perhatian masyarakat terhadap pelancongan entomologi ini, kriteria serangga seperti kecantikan, keunikan, serta unsur-unsur estetika lain yang ditunjukkan oleh serangga harus dijadikan sebagai fokus utama dalam eko-pelancongan entomologi. Melalui kajian ini, kelestarian produk eko-pelancongan entomologi dapat ditentukan dengan jayanya.

Kata Kunci: Ento-pelancongan, interaksi manusia-serangga, pemuliharaan, Borneo, kesedaran, persepsi

INTRODUCTION

Insects have contributed to many ecosystem fields. Human relationships to insects are historical and global; people utilize insects, such as food, industry, and entertainment by different regions and ethnic groups (Chung et al. 2002; Johnson 2010; Stewart & New 2007; Yen et al. 2013; Yi et al. 2010). However, the decrease in insects' biodiversity has become a significant problem all over the world. Many insects' species are extinct due to habitat loss and conversion to intensive agriculture and urbanization, pollution; biological factors; and climate change. The

declines of insects negatively affected the health of the ecosystem and human activity; for example, pollinator decreasing would cause human food security and health and ecosystem function issues. Hence, insects' conservation is urgent and imperative to society (Cardoso et al. 2020; Sánchez-Bayo & Wyckhuys 2019; Vanbergen & Initiative 2013).

However, many people think that most insects are not beneficial and only a nuisance, only a limited number of insects such as silkworm and bees can benefit human (Chen et al. 2009). Moreover, many people dislike and scared some insects due to their ugly appearance (Hunter & Hunter 2008; Woods 2000; Yi et al. 2010). It is also one of the reasons that edible insect at present is only famous in distributing areas such as and Thailand and China, since the culture and people there are used to live with insects for long time and not fear of it (Yi et al. 2010).

Insects comprise the most diverse and successful group of multicellular organisms on the planet. They contribute significantly to vital ecological functions such as pollination, pest control, decomposition, and wildlife species (Losey & Vaughan 2006). Their resources can benefit in many aspects, especially food and medicine. For example, insect foods, such as a bamboo insect, have reappeared at each travelling festival banquet in Yunnan Province, China. While for Cultural and Ornamental value, it may depend on self-experience and the environment they live.

Insects are essential for recycling the nutrients from detritus. They also beneficial in medicine and environmental health. For example, the flesh-eating fly larvae *Phaenicia* (*Lucilia*) *sericata* able to clean wounds and ulcers (Sun et al. 2014). The insect is also one of the most successful biological control projects in the world, such as the biological control wasp, *Aphidius ervi* (Hymenoptera: Braconidae) attacking pea aphids, *Acyrthosiphon pisum* (Hemiptera: Aphididae) (Gullan & Cranston 2014).

There are around 5.5 million different types of insects in the world (Stork et al. 2015). Averaging these estimates suggests there might be 1.5 million species of beetles, 5.5 million species of insects, and an additional 1.3–1.5 million other terrestrial arthropods. Finally, with indications that 80–90% of species are yet to need description, questions of where these undescribed species their location and which groups they may belong to are essential (Stork 2018). They may guide future taxonomic research to be focused. Some of the most popular ones are butterflies, moths, fireflies, and stick insects.

With the fast development of tourism especially ecotourism, forest and insects gradually being valued, cultural insects have been shown in many regions. Moreover, Insects has many special characters such as quickly reproductive ability, high adaptability, large individual numbers, and colossal biomass, which are a giant resource treasure, need to be further developed in tourism.

Enhancing the publics' knowledge and attention to insects was an important strategy to ensure that this group receives equal protection (Oberhauser & Guiney 2009). Gaining a better

understanding of the role of insects in ES distribution is critical (Noriega et al. 2018). Without sound ecological knowledge about insects' role in ecosystem maintenance and protection, conservation efforts will not be successful. Hence, understanding their taxonomy, ecology, behaviors, ethology, or relationship helps decrease humans' threats (Basset & Lamarre 2019).

Appearance affects peoples' opinions (Gurung 2003). Animals are usually referred to vertebrates such as mammals and birds excluding insects. Insects are not as attractive as vertebrates. They lack protection measures, protection strategies, and peoples' attention, evaluation, and protection support. Protection of insects has been seriously adversely affected by people's misleading perceptions. However, desperately looking for insects' charm may not be the way to achieve insect protection (Leandro & Jay-Robert 2019).

Changing the public's perception, increasing their awareness of insects' diversity, functions, and conservation needs is an issue for insect conservation. Perceptions can affect peoples' understanding, interactions, and management of it (Fiffy et al. 2020; Lemelin et al. 2016). Ecotourism is a medium that can effectively increase public awareness and change common negative perceptions of insects (Huntly et al. 2005). As a rapidly growing industry, insect tourism, its novelty, beneficial experience, and socio-economic benefits will support and provide a robust forum for insect protection and conservation (Lemelin 2013). Understanding the publics' perspective of insects is important to manager and educator promoting entotourism. Boileau & Russell (2020), Gao et al. (2021) and Vodouhe et al. (2010) mentioned that peoples' perceptions of ecosystem services are also affected due to their demographics. Many studies have shown that many factors affect people's perception of ecosystem services, including gender, wealth, education, cultural traditions and age. (Daw et al. 2011; Fortnam et al. 2019; Iniesta-Arandia et al. 2014; Yang et al. 2018; Zoderer et al. 2016). Ecosystem services in many types of research are high. The perception, knowledge and awareness are also different. Oteros-Rozas et al. (2014) indicated that socio-cultural valuation is necessary to identify a diverse flow of ecosystem services. However, only a few researchers studied insects' perception between demographics, and the factor of people's perspective in ecosystem services in terms of insects is a different situation. This research aims to find the demographics differences between nationalities in terms of ecosystem services and the critical factor that affect people's perception of insects. The study highlights the importance of ecotourism to the conservation of insects and brings insight to the manager and decision-makers.

MATERIALS AND METHOD

Study Site and Method Design

This study was conducted in Kota Kinabalu City Centre (KKCC), Sabah a hotspot for ecotourism. Personal Meaning of Insects Map (PMIM) was administered to assess respondents' perception without fear of judgment or correction (Lemelin et al. 2016; Saikim et al. 2020). In this research, a mixed method design was used, which included both quantitative and qualitative methods for data collection and analysis. The explanatory sequential mixed method model was used, in which quantitative data were collected first, and the results were then used to illustrate and address the study's goals and hypotheses with the help of qualitative findings

(Creswell & Creswell 2017). The questionnaire has 31 questions divided into two parts, a structured five-point likert scaled survey of tourist perceptions and awareness, and an open-ended question interview section. Three hundred eighty-four tourists were interviewed from September 2018 to January 2019. The participants were interviewed randomly during the daytime.

Data Analysis

Statistical Package for the Social Sciences (SPSS) for data analysis and interpreted using Spider-web configuration were implemented. The Spider Web configuration is the most successfully used visual representation and is highly recommended for specific community function models (Laverack 2006). It also provides a quick picture of the difference between variables. The research tested tourists' understanding, perception and awareness of insects based on three main factors: "Value," "Knowledge," and "Appearance" of insects. These three themes determined whether tourists can accept insects in their natural trip and what kind of insects will get more attention. Independent Samples T-test ($p=0.05$) compared means of perceptions and awareness between demographics.

Lemelin et al. (2017) mentioned that insects' perceptions are contextualized, suitable for Leximancer to analyze those qualitative data. We used the Leximancer software version 4.5 to analyze the survey. It utilizes Content Analysis, which can break down the material into manageable categories and relationships to quantify and display the text's conceptual structure. Content analysis is divided into two major categories: (1) Conceptual Analysis and documents analysis for the presence and frequency of concepts; (2) Relational Analysis, which estimates how such identified concepts are related to each other within the documents. We conducted the Leximancer analysis based on the guideline of Leximancer manual version 4.5 (Leximancer 2018).

Participants' responses were collected and saved as .doc, .docx documents. Leximancer then processes those co-occurrence terms according to how frequently they occur in sentences containing the concept, compared to how frequently they occur elsewhere. If found sufficiently accumulated proof, the sentence is marked as containing the definition. In Leximancer, a set of weighted terms form a concept extracted from the text itself. The concept seed word represents the starting point of the definition. For such concepts, each concept definition contains one or more seeds. The learning process will be updated on the words highly related to the seed continuously. Finally, a thesaurus is formed for each concept. Once Leximancer runs the learning process and develops a list of concepts in the text, the relationships between them are displayed through the concept maps.

The concept map is into two parts: the left side is a visual display of the concepts and their relationships, and the right report tab used to interact with the concept map. The first opened is the top 50% of the concept is visible on the map. These are concepts that show the most frequent words in the text and the words most related to other concepts. When we generated the map, it is grouped into higher-level "themes." The themes are heat-mapped to indicate importance, the "hottest" or most crucial topic showed in red, the next hottest topic

showed in orange, and so on according to the colour wheel. The concept map contains the text's main concepts' names, which showed as grey labels on the map. The concept points' size indicates how often coded in the text and other concepts in the map. The connection and distance between themes represent the closeness of the semantic meaning of two concepts or themes (Lin et al. 2019).

Insight Dashboard is an independent report generated in Leximancer project. Dashboard reports are more quantitative than concept maps and are designed to understand project results quickly. It demonstrates one of five overviews of ranked concepts within themes that are contained within the Insight Dashboard. On the left, the first column represents the identified concept within the themes. The second column demonstrates the relative frequency of the concept within the theme, followed by that concept's strength in the third column. Finally, the last column represents the identified concept's prominence, resulting in a ranked bar chart format. The Quadrant Report for the perception of insect's concepts of this study (see Figure 3) consists of four parts, the concepts in Quadrant 1 are weak and less prevalent or likely within the category. Concepts in Quadrant 2 were often mentioned and unique to tag. Quadrant 3 indicates that those concepts were often occurred but not unique to tag. Concepts in Quadrant 4 are strong, prominent, and more likely to co-occur with the category (Leximancer 2018).

RESULT AND DISCUSSION

Demographic Data

This study indicated that people have a slightly different perception of insects and awareness based on their nationality. Demographics will affect peoples' perspective on ecosystem services and conservation, but its influence on insects still need to be concerned more. Thus, it is significant to share to ensure proper management of insects through entomological or entotourism.

A total of 384 tourists from 22 different countries and regions have responded to the questionnaire. There is 132 males, and 252 were females; 182 Malaysian and 202 Non-Malaysian tourists participated. One hundred seventy-four people age from 13 to 28 as young teenagers were the domain parts and 80 people from 29 to 34 years old, 89 people 35 to 50 years old, 33 people from 51 to 65 years old, and eight beyond 66 years old. Tourists' profile in terms of gender, nationality, age, education level, and residence place (n = 384) (See Table 1).

Table 2 shows the results of the independent sample test results. Levene's value greater than .05 indicates that the variability under the two conditions is approximately the same. There is no significant difference in variability between the Malaysian and Non-Malaysian in terms of their perception of insect's knowledge, understanding of insect's value, and insects' appearance.

Table 1. Tourists' profile in terms of gender, nationality, age, education level, and place of residence (n = 384)

Group	**Category**	**Frequency (n)**	**Percentage (%)**
Gender	Male	132	34.4
	Female	252	65.6
Nationality	Malaysian	182	47.4
	Non-Malaysian	202	52.6
Age	13-28 years	174	45.3
	29-34 years	80	20.8
	35-50 years	89	23.2
	51-65 years	33	8.6
	>66 years	8	2.1
Education	Primary School	9	2.3
	Secondary School	44	11.5
	High School	56	14.6
	Vocational	9	2.3
	Bachelor	208	54.2
	Master	39	10.2
	Doctorate	6	1.6
	Other	13	3.4
Total		**384**	**100**

Table 2. Independent sample test

Category		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	**Upper**
Value	Equal variances assumed	3.220	.074	-2.143	382	.033	-.18884	.08813	-.36213	-.01555
	Equal variances not assumed			-2.156	381.857	.032	-.18884	.08757	-.36101	-.01666
Knowledge	Equal variances assumed	7.884	.005	1.570	382	.117	.14005	.08919	-.03532	.31542
	Equal variances not assumed			1.586	378.595	.113	.14005	.08828	-.03353	.31362
Appearance	Equal variances assumed	1.537	.216	-2.751	382	.006	-.23271	.08459	-.39903	-.06639
	Equal variances not assumed			-2.762	381.753	.006	-.23271	.08424	-.39834	-.06707

Differences of Perceptions Between Malaysian and Non-Malaysian

Based on figure 1, non-Malaysians have slightly more perception of value ($\bar{x}$=4.1205) and appearance ($\bar{x}$=4.1624) in terms of insects. However, both Malaysian and Non-Malaysian have low cognition in knowledge compare to the other two factors, where Malaysian tourists seem to have more perspectives on insect's knowledge ($\bar{x}$=3.0599).

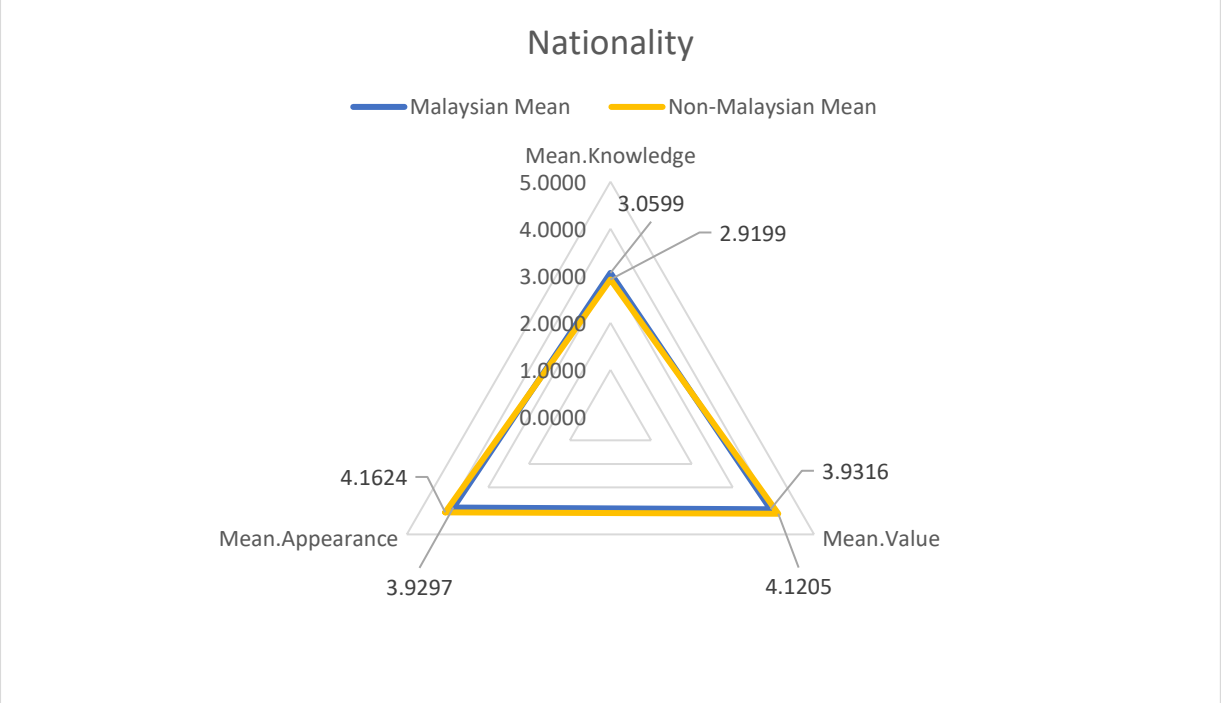

Figure 1. Spider web configuration between nationality

Table 3 indicates the means between nations in detail. From understanding of insect's value, Non-Malaysian tourists have the highest thinking in the importance of the Food Web ($\bar{x}$=4.29) and the lowest thinking in Cultural value ($\bar{x}$=3.95). In Malaysian opinion, the economic industry of insects is the most important ($\bar{x}$=4.14), and decomposer is the least ($\bar{x}$=3.68), which has the most significant divergence. Regarding Appearance, both Non-Malaysian ($\bar{x}$=4.26) and Malaysian ($\bar{x}$=3.99) participants think more of various shapes of insects, which also vary from each other. The lowest thinking of appearance both are 'like other things' (e.g. mimicry) sector, only 3.95 to non- Malaysian and 3.84 to Malaysian. When asking about understanding of the insect's knowledge, both respondents value more on their relationship to nature sector, Malaysian ($\bar{x}$=3.36) are slightly bigger than non- Malaysian ($\bar{x}$=3.28), and the largest gap between two group is the Growth of insects, Malaysian are 0.3 higher than non-Malaysian. In addition, non-Malaysian showed the lowest mean in the knowledge of social behavior ($\bar{x}$=2.73), whereas Malaysian showed the lowest mean in the knowledge of breeding ($\bar{x}$=2.93).

Table 3. Means between Malaysian and non-Malaysian

Category	Items	Mean Malaysian	Mean Non-Malaysian
Value	Economy Industry	4.14	4.22
	Food Web	4.04	4.29
	Food& Medicine	3.87	4.08
	Pollinator	4.03	4.19
	Ornamental value	3.88	4.02
	Cultural	3.85	3.95
	Research	3.92	4.09
	Decomposer	3.68	4.1
	Part of Biodiversity	3.96	4.14
Appearance	Various Shape	3.99	4.26
	Dark Color	3.92	4.18
	Colorful	3.93	4.2
	Special Structure	3.98	4.23
	Like other things	3.84	3.95
Knowledge	Breeding	2.93	2.78
	Growth	3.09	2.79
	Life Cycle	2.98	2.8
	Habitat	2.94	2.94
	Pollination	2.98	2.89
	Self -Protection	3.08	2.95
	Social Behavior	2.95	2.73
	Relationship to human	3.04	2.97
	Basic Feature	3.13	3.05
	Category of insects	3.03	2.95
	Relationship to nature	3.36	3.28

Concept Map and Insight Dashboard of Leximancer

Perception of insects

Figure 2 shows the concept map contained nine themes and 31 concepts. Themes on a Leximancer Concept Map are heat-mapped, hot colors (red, orange) such as bubble include beautiful. It is interesting to denote the most important themes, and cool colors (blue, green) such as mosquito bite denote those less important (Leximancer 2018). The concept such as unique, colorful and beautiful have high similarity and frequency in the text is clustered on the map.

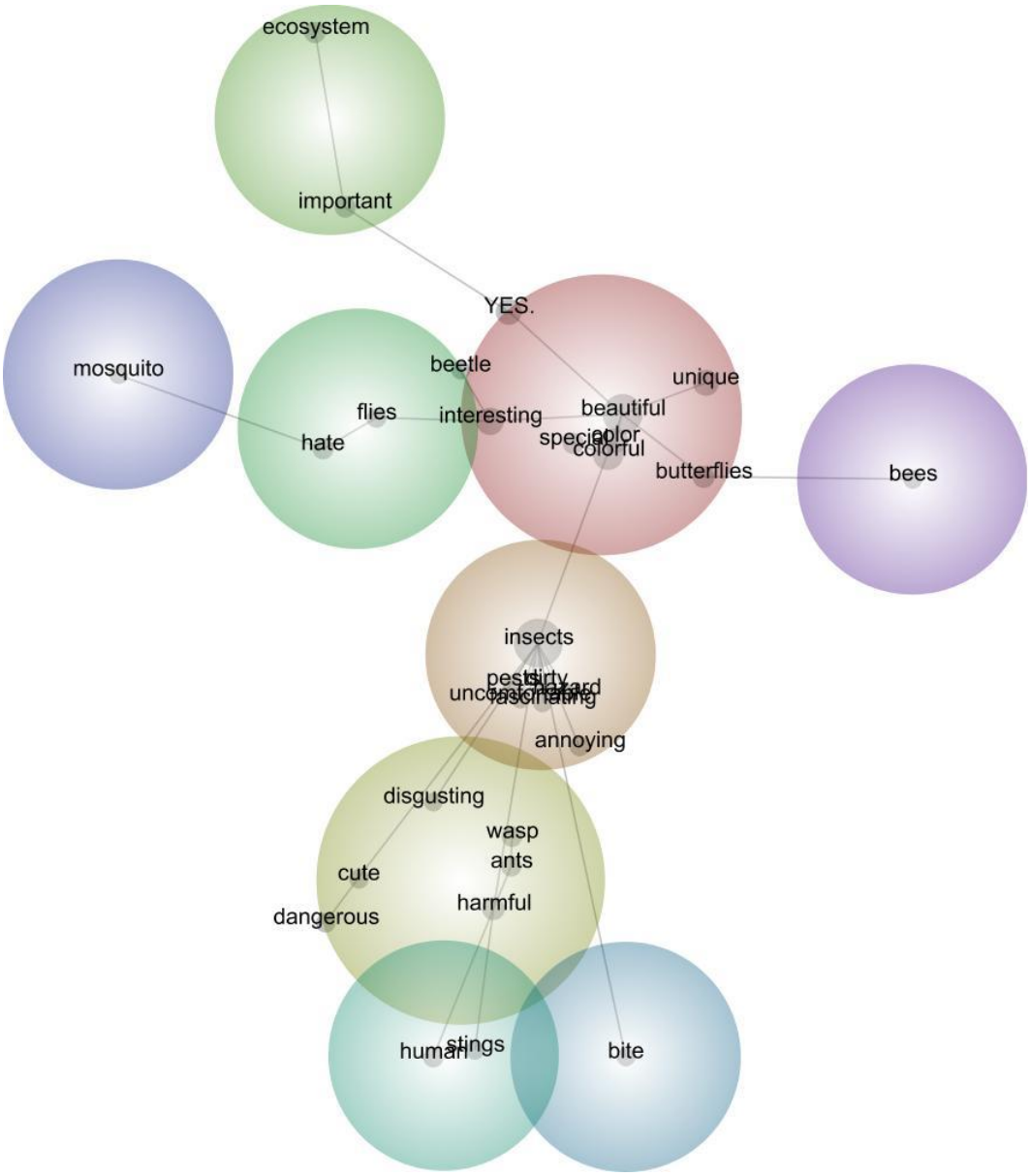

Figure 2. Concept map of perception of insects

Table 4 shows the relevance of the ranked concepts. The Thematic Summary includes a connectivity score to indicate the relative importance of the themes (the most important is the top theme at 100%). The most prominent theme is “Beautiful” has 100% relevance. The second theme is “Insects” with 50%, “Harmful” (18%), and “Ecosystem” has 9%. Themes such as "hate", "human", "bite", "mosquito", "bee" showed low connectivity and less significant relevance. It shows people are more attracted and had positive perceptions of insects, whereby insects are tagged with beautiful, special, colorful, unique, and interesting butterflies, beetles, and bees.

Table 4. Relevance table of perception of insects

Theme	Connectivity	Relevance
beautiful	100%	
insects	50%	
harmful	18%	
ecosystem	09%	
hate	07%	
human	04%	
bite	01%	
mosquito	01%	
bees	01%	

Meanwhile, people think insects are essential because of their role in the ecosystem. On the other hand, insects quickly reminded respondents of the words hate, pest, annoying, hazard, dirty, and uncomfortable related to flies and mosquitoes. People think insects are disgusting, harmful, and dangerous because they sting and bite, for example, wasp and ants.

The Quadrant Report (see Fig. 3) below shows a high-level, visual chart displayed in a 'magic quadrant' format formed by relative frequency and strength of concept, based on the Leximancers dashboard output Bayesian methods to analyze the main concepts. It consists of four parts: the concepts in Quadrant 1, such as colorful, important, and unique, seldom and not unique to the category. Concepts in Quadrant 2 illustrated that concepts such as beautiful, insects, favorable, and ecosystem often occurred but not unique to the category. The concept of special in Quadrant 3 indicates that the text was seldom occurred and was the unique text towards the perception that people like insects (Leximancer 2018).

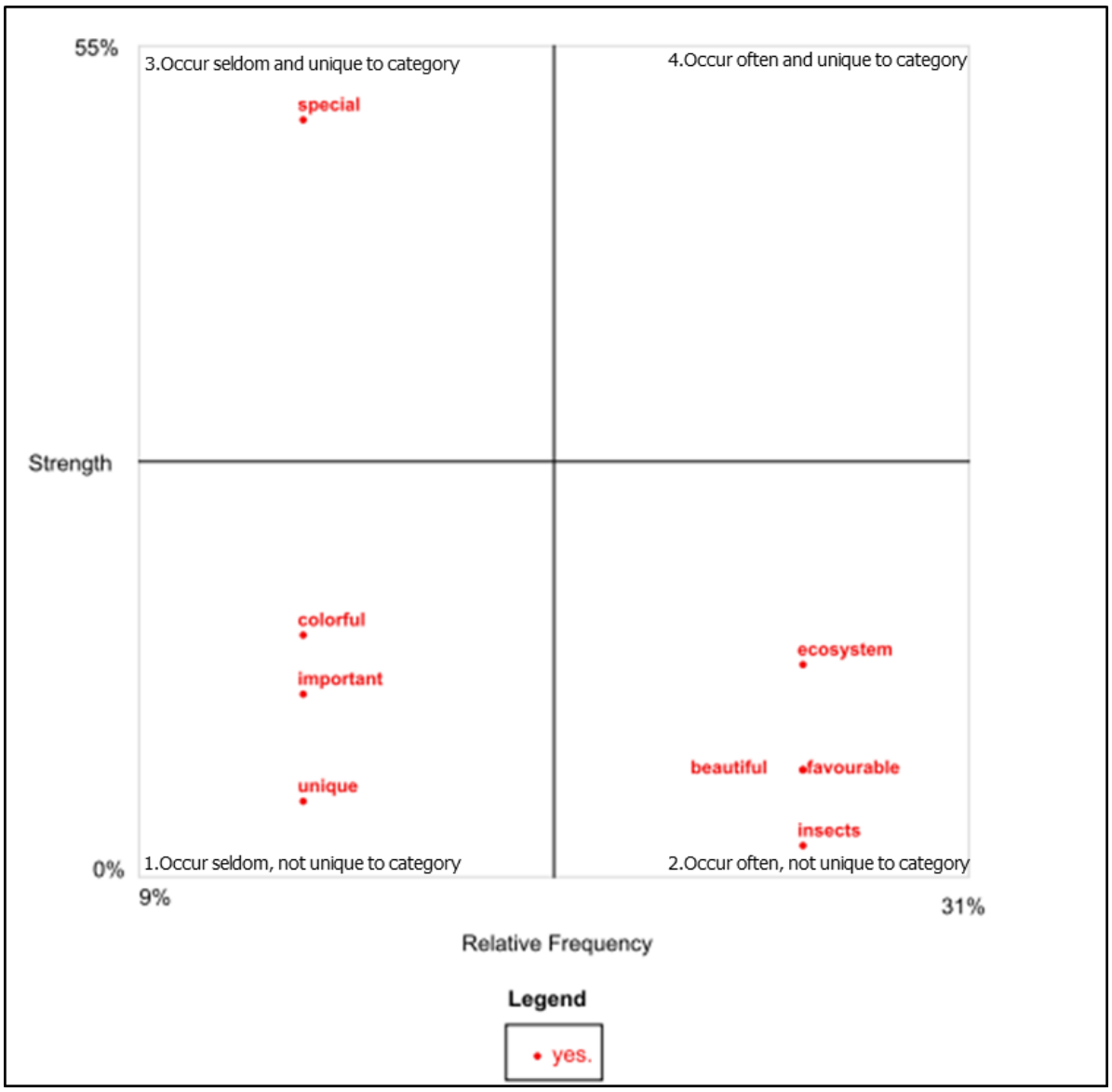

Figure 3. Quadrant report of perception of insects

People are more attracted to insects tagged with beautiful, special, colorful, unique, and exciting butterflies, beetles, and bees. Meanwhile, people think insects are essential because of their role in the ecosystem. On the other hand, insects have quickly reminded respondents of words like hate, pest, annoying, hazard, dirty, and uncomfortable, such as flies and mosquitoes. People think that insects are disgusting, harmful, and dangerous because they sting and bite, such as wasp and ants.

Table 5 shows the ranking order of the concepts generated. Items such as special, colorful, ecosystem, important, beautiful, favorable, and unique were in the prior prominence. Special was strongly correlated with (prominence score = 15.7) and colorful (prominence score = 5.2). While the ecosystem was less likely to appear (prominence score = 4.5). The other concepts were less mentioned and not unique (prominence score of less than 4).

Table 5. Ranked concepts for the perception of insects

Category: yes.

Concept	Rel Freq (%)	Strength (%)	Prominence
special	13	50	15.7
colorful	13	16	5.2
ecosystem	25	14	4.5
important	13	12	3.9
beautiful	25	7	2.3
favourable	25	7	2.2
unique	13	5	1.8
insects	25	2	0.9
hate	< 1	< 1	0.0
fascinating	< 1	< 1	0.0

Table 6 shows when providing a ranked list of the highest-ranked concept pairs for the category, special & colorful were the most correlated (prominence score= 656.3), following by special & beautiful (prominence score= 145.8) and special & favorable (prominence score= 140.6).

Table 6. Ranked compound concepts for perception of insects

Category: yes.

Concept	Rel Freq (%)	Strength (%)	Prominence
special & colorful	13	100	656.3
special & beautiful	13	100	145.8
special & favourable	13	100	140.6
ecosystem & important	13	100	70.3
special & insects	13	100	56.3
colorful & beautiful	13	20	48.6
colorful & favourable	13	20	46.9
beautiful & favourable	25	7	20.8
colorful & insects	13	33	18.8
beautiful & unique	13	20	17.2
favourable & unique	13	20	16.5
beautiful & insects	13	17	4.2
favourable & insects	13	17	4.0

The cultural background about insects has little effect on participants' perspective of insects. The public's perception of insects differs by area, but this does not play a significant role. Previous studies explained that many factors affect how people view animals, including gender, age, educational level, and cultural factors (Borgi & Cirulli 2015). Lau et al. (2018) illustrated that people's ecosystems' perspectives also do not affect cultural aspects in the western Indian Ocean area. Differences in some demographic dimensions are not the only key causing the relative importance of the ecosystem.

On the other hand, the publics' knowledge about insects, their experience, and their aesthetic value perspective might be the key factors that influence their perceptions. One single dimension cannot change what people think about insects. Cultural background is one of the aspects to promote education and enhance their knowledge of insects. A person's knowledge acquisition and perception are greatly affected by their interest, motivation, skill, opportunity, prior knowledge, and experience (Gurung 2003). Woods (2000) adds a public perspective on

insects is related to their experience and education. Studies indicated that older people have more attention to ecosystem services such as local ecological knowledge, nature recreation activities, and pollination (Oteros-Rozas et al. 2014), where age differences are also associated with experience and education. Moreover, human's different preferences for animals are connected to aesthetically pleasing, human-oriented, and safe animals more (Woods 2000). These conditions also have effects on insects.

Knowledge

The public awareness of insects' diversity is an essential first step toward their conservation (Snaddon & Turner 2007). While awareness alone does not result in conservation security, the public is unlikely to allocate conservation importance to a community if they are unaware of its existing knowledge (Balmford et al. 2002). Knowledge plays a vital role in changing the public's perceptions, and it will define how people view insects. Having a better understanding of insect biology and ecology will reduce people's fear of insects, making it easier to encourage insects (Shahriari-Namadi et al. 2018). Paying attention to insects, and insect-related knowledge can enable people to understand the worlds' changing nature (Beisel et al. 2013). The quality and quantity of people's insect knowledge vary depending on their interest in the subject, their environment, and insects' importance in their lives (Gurung 2003). Negative perceptions associated with insects often develop from a lack of understanding about insects (Kawahara 2007). Educate knowledge to the public can reduce the likelihood of funding bodies allocating resources to their defense. To inspire young people to pursue a career in entomology and, eventually, to introduce insect conservation procedures in the future, raising insects' profile is also necessary (Snaddon & Turner 2007).

Many studies have shown that educational achievement is one of the most important factors affecting people's attitudes and understanding of the environment and conservation. According to Snaddon & Turner (2007), insect groups' portrayal in modern culture and scientific literature is associated with children's preferences for insect groups. And lack of education may lead to a negative attitude toward conservation (Lemelin et al. 2016; Vodouhê et al. 2010). Education is a standard to measure the knowledge that people acquired. People with little knowledge of the subject would prefer the morphological portion.

Furthermore, not everyone with a high degree of education and the wealthy is well-versed in insects' diversity (Boster & Johnson 1989). Educational opportunities involving insects engage youth, provide a tangible link to more formal science training and inquiry, and provide students and researchers with benefits (Ernst et al. 2013). The common view of insects as primarily providers of disservices to humanity by pest and parasite outbreaks is part of the reason for this lack of information about insect ES (Noriega et al. 2018). Educate knowledge of insects would also reduce a broad statement like "I hate bugs" to a more specific statement like "I hate spiders," which may even allow for the acceptance of some harmless animals (Lemelin et al. 2017). Shahriari-Namadi et al. (2018) indicated that people's problem with insects is with flying insects. Their most significant concern is learning about real, dangerous insects and how to defend themselves from them. It is possible to reduce anxiety and phobia against people with adequate information about insects.

Experience

Experience of insects can also affect people's perception of insects. According to various reports, early childhood experiences are critical in promoting pro-active environmental support (Bixler et al. 2002; Bögeholz 2006; Ewert et al. 2005). We believe that understanding is vital for recruiting the next generation of naturalists and conservationists. Whether it comes from early childhood experiences, experiential education, or a combination of the two. (Balmford et al. 2002; Kawahara & Pyle 2012; Snaddon et al. 2008; Sodhi et al. 2004), for people rarely protect that which they do not know. According to studies, children and teenagers are more afraid of insects than adults, possibly because they have a poor understanding of actual dangerous insects and how to defend themselves (Shahriari-Namadi et al. 2018). Participants usually mentioned words like annoying, uncomfortable, dirty, disgusting, dangerous, and harmful because they do not like insects. People dislike insects always related to pests because their negative impacts on humans have changed the publics' view (Hunter & Hunter 2008). People hate Insects: fly, mosquitoes, wasp, and ants because some insects will sting and bite. Lacking a clear concept of pests and beneficial insect of public will easily pass the wrong message (Gurung 2003). Mosquitoes, blackflies, and horseflies bites and stings can spread disease. The bites and stings are significantly disruptive to outdoor recreational activities, whether in urban, rural, or wilderness settings (Lemelin et al. 2017; Schutze & Jacobs 2009). Humans contact with them in many aspects of life.

These dislikes were primarily motivated by the insects' ability to inflict pain (biting, stinging), the impacts of certain pest insect species on flora, the disturbance of leisure activities, and negative interactions that occurred during one's childhood (Lemelin et al. 2016). Furthermore, experience in nature and exposure to certain insects may help deal with this issue (Shahriari-Namadi et al. 2018). Wildlife experiences, explanations on the theme of protected areas, and specific guidelines for engaging with wildlife and participants have a lot of potential in enhancing people's learning abilities and affecting their long-term actions (Ballantyne et al. 2008). The public can learn about insects in several ways, but visitors expect personal knowledge because direct observation and exposure are the best ways to learn about insects and natural history (Kawahara 2007).

Appearance

Studies before showed that insects' popularity would affect peoples' perception (Lemelin et al. 2017), correspond to beautiful insects were the first option when they say like insects. Flagship insects like butterflies and dragonflies are on the wish list of participants joining insects' activities. It is because flagship and beautiful insects and humanoid animals can help attract peoples' attention more efficiently, and it always favours tourists for animal viewing activities (Agrawal 2017; Lemelin 2013). Participants think the most prominent feature of insects is because they are unique, which because of their unique characteristics that attracts people attention e.g. Firefly and glow worm insects that can produce light or stick insects that can camouflage or mimics its surrounding (Baker 2003). Some people like insects also because of their ecological importance as pollinators, decomposers, and role in wildlife.

Moreover, insects' experience is also the main reason for public hatred, which determines peoples' judgments on insects (Hayati & Minaei 2015; Shahriari-Namadi et al. 2018; Tan et al. 2015). Having enough knowledge about insects can effectively decrease entomophobia (Shahriari-Namadi et al. 2018).

The public's perception of insects is not as strong as other animals since people are more attracted to human-like animals, have aesthetic, and are flagship species (Boileau & Russell 2020; Gurung 2003; Lemelin et al. 2016; Woods 2000). Lemelin et al (2017) illustrated the visuals engaged respondents and reminded them of the popularity of some species like bees and butterflies and the aesthetic appeal of dragonflies, praying mantises, and ladybugs.

Flagship insects may have a wide range of conservation and education impacts (Oberhauser & Guiney 2009). People like beautiful insects the most when they talk about the preference of insects. Butterflies are among the popular flagship insects because of their beautiful colouration, easy to observe when flying around, and not bite or sting. They are familiar to many people because they are quite common, existing in various habitat types, and this familiarity can be an essential protection tool (Oberhauser & Guiney 2009). Dragonflies are also one of the flagship insects. They are large in size, conspicuous, colourful, diurnal, and aerial (Lemelin 2007). They can help promote conservation, as dragonflies are beneficial insects, and their presence are environmental indicators for a healthy aquatic ecosystem.

Insects integrated into the culture

Insects integrated into culture can help to reduce the public's bias and negative perceptions of insects. Culture and education are tools to increase people's knowledge about insects; promote insects aesthetic value of insects, and change their past negative experience of insets. Human has been utilizing insects in many aspects over a thousand years in many regions (Yi et al. 2010; Feng et al. 2018). People consume insects as food in some parts of the world, such as central and southern Africa, Asia, Australia, and Latin America. Some cultures used insects for entertainment, such as singing insects such as bush cricket and cicada (Yi et al. 2010).

Moreover, insects have become a popular topic for nature poems, arts, literature, and music to see the diverse nature from a different angle. For example, in ancient Mexico, butterflies observed in detail, and lepidopterans were well represented in mythology, including poems and songs. These cultural activities of insects interacted with people for centuries. It helps to reduce people's negative perception of insects. Muhamad et al. (2014) mentioned that people who lived near the remnant forest perceived higher levels of ecosystem services due to their culture. However, in Malaysia, the culture of using traditional knowledge of insects are eroding by modernization and urbanization (Ismail & Mohamed 2014). It is necessary to keep the insects culture passing through generations in the society.

Another example, Kawahara (2007) illustrated how insects are integrated into Japanese culture successfully today. Which discussed 1) Japanese children and entomological education; 2) entomological supply stores and the unique equipment used by Japanese entomologists; 3) the plethora of insect collectors and personal insect collections in Japan; 4) the recent popularity of breeding and selling live beetles.

Firstly, the insect theme is on children's video games, comics, convenience store candies, department store pet beetles all over Japan, and direct observation of live insects are popular ways for Japanese children to learn about insects. The education focuses mainly on the life histories of charismatic insects such as butterflies, cicadas, and giant beetles. Meanwhile, Japanese animations containing insects such as Pokemon also educate people about insects; Caterpie, for example, was influenced by the life cycle of a butterfly. Moreover, very few Japanese books that include insects portray them negatively. Most to teach kids insect facts, and many entomological books focus on exciting features of insects. Nearly all entomological children's picture book includes a section that teaches them how to collect insects and make an insect collection.

Secondly, some Japanese companies have sold live beetles in vending machines to meet the increasing demand for beetles. Insects nursing activity such as the "Stag Beetle Foster Parent Program" let children raise their insects, this program not only aims to restore insects population, but it also helps to teach children about beetles and their conservation (Kawahara & Pyle 2012). Besides, there are also festivals in Japan that promote insect education. Those activities help insects integrating into Japanese culture very well, and some of the influences even spread to the world. As these children grow up, they teach their children about entomology, and the interest in the subject is inherited through the generations.

CONCLUSION

In conclusion, the cultural background may not be the critical factor affecting people's perception; tourists reflected minor differences in insects' perception and awareness. People focus more on importance and values of insects when talking about it. Knowledge is the most fundamental factor in educating people on insects' importance and their protection. The experience could enhance their perspective of knowledge, and value. Moreover, appearance and their aesthetic value are also vital to perceiving insects' appearance, potentially setting insects as flagship animals. However, many dimensions that may affect the publics' perspective on insects, such as age, gender, and wealth, require further studies. This study also indicated the perception and preference of insects by respondents, showing that more people have positive thinking about insects as pests. However, they also admit its importance to the ecosystem and humans. In promoting insects, more flagship insects should be created. Insects with beautiful and unique characteristics, such as butterflies, dragonflies are still on the top wish list of peoples' preferences. Other insects such as beetles and stick insects also attract attention by their uniqueness and flagship insects.

REFERENCES

Agrawal, A. 2017. *Monarchs and milkweed: A Migrating Butterfly, a Poisonous Plant, and Their Remarkable Story of Coevolution*. Princeton University Press.

Baker, C. 2003. Australian glow worms–managing an important biological resource. *Australasian Cave and Karst Management Association, INC Journal* 53: 13-16.

Ballantyne, R., Packer, J. & Hughes, K. 2008. Environmental awareness, interests and motives of botanic gardens visitors: Implications for interpretive practice. *Tourism Management* 29(3): 439-444.

Balmford, A., Clegg, L., Coulson, T. & Taylor, J. 2002. Why conservationists should heed Pokémon. *Science* 295(5564): 2367-2367.

Basset, Y. & Lamarre, G.P. 2019. Toward a world that values insects. *Science* 364(6447): 1230-1231.

Beisel, U., Kelly, A.H. & Tousignant, N. 2013. Knowing insects: Hosts, vectors and companions of science. *Science as Culture* 22(1): 1-15.

Bixler, R.D., Floyd, M.F. & Hammitt, W.E. 2002. Environmental socialisation: Quantitative tests of the childhood play hypothesis. *Environment and Behavior* 34(6): 795-818.

Bögeholz, S. 2006. Nature experience and its importance for environmental knowledge, values and action: Recent German empirical contributions. *Environmental Education Research* 12(1): 65-84.

Boileau, E.Y. & Russell, C. 2020. Insect and human flourishing in early childhood education: Learning and crawling together. *Research Handbook on Childhoodnature: Assemblages of Childhood and Nature Research* 1323-1338.

Boster, J.S. & Johnson, J.C. 1989. Form or function: A comparison of expert and novice judgments of similarity among fish. *American Anthropologist* 91(4): 866-889.

Borgi, M. & Cirulli, F. 2015. Attitudes toward animals among kindergarten children: species preferences. *Anthrozoös* 28(1): 45-59.

Cardoso, P., Barton, P. S., Birkhofer, K., Chichorro, F., Deacon, C., Fartmann, T., ... & Hill, M. J. 2020. Scientists' warning to humanity on insect extinctions. *Biological Conservation* 242: 108426.

Chen, X., Feng, Y. & Chen, Z. 2009. Common edible insects and their utilization in China. *Entomological Research* 39(5): 299-303.

Chung, A.Y.C., Khen, C.V., Unchi, S. & Binti, M. 2002. Edible insects and entomophagy in Sabah, Malaysia. *Malayan Nature Journal* 56(2): 131-144.

Creswell, J. W., & Creswell, J. D. 2017. *Research Design*. 5th Edition. Los Angeles: Sage Publication, Inc.

Daw, T. I. M., Brown, K., Rosendo, S. & Pomeroy, R. 2011. Applying the ecosystem services concept to poverty alleviation: the need to disaggregate human well-being. *Environmental Conservation* 38(4): 370-379.

Ernst, C., Vinke, K., Giberson, D. & Buddle, C.M. 2013. Insects in education: Creating tolerance for some of the world's smallest citizens. *The Management of Insects in Recreation and Tourism* 289-305.

Ewert, A., Place, G. & Sibthorp, J. 2005. Early-life outdoor experiences and an individual's environmental attitudes. *Leisure Sciences* 27(3): 225-239.

Feng, Y., Chen, X.M., Zhao, M., He, Z., Sun, L., Wang, C.Y. & Ding, W.F. 2018. Edible insects in China: Utilisation and prospects. *Insect Science* 25(2): 184-198.

Fiffy H.S., Le, G., Mahadimenakbar, M.D., Kalsum, M.Y., Asfarina, I., Muhammad Shafiq, H., Aqilah, A.A.R., Norradihah, I., Noor Izwan, A., Mohammad Zulhusni, Z., Nordiana, M. N. & Zulhazman, H. 2020. Tourists' perceptions of insects as the determinants of insect conservation through entomological ecotourism. *Journal for Tropical Biology and Conservation* 17: 79-95.

Fortnam, M., Brown, K., Chaigneau, T., Crona, B., Daw, T.M., Gonçalves, D., ... & Schulte-Herbruggen, B. 2019. The gendered nature of ecosystem services. *Ecological Economics* 159: 312-325.

Gao, L., Ak Mohd Rafiq, A.M., Kalsum, M.Y., Nor Akmar, A.A., Awangku Hassanal Bahar, P.B., Nordiana, M.N., Mahadimenakbar, M.D. & Fiffy, H.S. 2021. Entotourism potential in Sabah, Malaysia: A Tourists' perspective. *Cogent Social Sciences* 7:1.

Gullan, P.J. & Cranston, P.S. 2014. *The insects: an outline of entomology*. John Wiley & Sons.

Gurung, A.B. 2003. Insects–a mistake in God's creation? Tharu farmers' perception and knowledge of insects: A case study of Gobardiha Village Development Committee, Dang-Deukhuri, Nepal. *Agriculture and Human Values* 20(4): 337-370.

Hayati, D. & Minaei, K. 2015. Investigation of entomophobia among agricultural students: the case of Shiraz University, Iran. *Journal of Entomological and Acarological Research* 47(2): 43-45.

Hunter, M.R. & Hunter, M.D. 2008. Designing for conservation of insects in the built environment. *Insect Conservation and Diversity* 1(4): 189-196.

Huntly, P.M., Van Noort, S. & Hamer, M. 2005. Giving increased value to invertebrates through ecotourism. *South African Journal of Wildlife Research-24-month delayed open access* 35(1): 53-62.

Iniesta-Arandia, I., García-Llorente, M., Aguilera, P.A., Montes, C. & Martín-López, B. 2014. Socio-cultural valuation of ecosystem services: uncovering the links between values, drivers of change, and human well-being. *Ecological Economics* 108: 36-48.

Ismail, N.A. & Mohamed, M. 2014. Ethnoentomological knowledge documentation of indigenous people in Peninsular Malaysia. *Serangga* 19(1): 37-50.

Johnson, D.V. 2010. The contribution of edible forest insects to human nutrition and to forest management. *Forest insects as food: Humans bite back* pp 5.

Kawahara, A.Y. 2007. Thirty-foot telescopic nets, bug-collecting video games, and beetle pets: Entomology in modern Japan. *American Entomologist* 53(3): 160-172.

Kawahara, A.Y., & Pyle, R.M. 2012. Chapter 9: An appreciation for the natural world through collecting, owning and observing insects. In Lemelin, R.H. (ed.). *The Management of Insects in Recreation and Tourism,* pp. 138-152. Cambridge: Cambridge University Press.

Lau, J.D., Hicks, C.C., Gurney, G.G., & Cinner, J.E. 2018. Disaggregating ecosystem service values and priorities by wealth, age, and education. *Ecosystem Services* 29: 91-98.

Laverack, G. 2006. Evaluating community capacity: Visual representation and interpretation. *Community Development Journal* 41(3): 266-276.

Lemelin, R.H. 2007. Finding beauty in the dragon: the role of dragonflies in recreation and tourism. *Journal of Ecotourism* 6(2): 139-145.

Lemelin, R.H. 2013. *The management of insects in recreation and tourism*. Cambridge University Press.

Lemelin, R.H., Harper, R.W., Dampier, J., Bowles, R. & Balika, D. 2016. Humans, insects and their interaction: A multi-faceted analysis. *Animal Studies Journal* 5(1): 65-79.

Lemelin, R.H., Dampier, J., Harper, R., Bowles, R. & Balika, D. 2017. Perceptions of insects: A visual analysis. *Society & Animals* 25(6): 553-572.

Leandro, C. & Jay-Robert, P. 2019. Perceptions and representations of animal diversity: Where did the insects go? *Biological Conservation* 237: 400-408.

Leximancer. 2018. Leximancer user guide: Release 4.5.

Lin, X., McKenna, B., Ho, C.M. & Shen, G.Q. 2019. Stakeholders' influence strategies on social responsibility implementation in construction projects. *Journal of Cleaner Production* 235: 348-358.

Losey, J.E. & Vaughan, M. 2006. The economic value of ecological services provided by insects. *Bioscience* 56(4): 311-323.

Muhamad, D., Okubo, S., Harashina, K., Gunawan, B. & Takeuchi, K. 2014. Living close to forests enhances people′ s perception of ecosystem services in a forest–agricultural landscape of West Java, Indonesia. *Ecosystem Services* 8: 197-206.

Noriega, J.A., Hortal, J., Azcárate, F. M., Berg, M. P., Bonada, N., Briones, M. J., ... & Moretti, M. 2018. Research trends in ecosystem services provided by insects. *Basic and Applied Ecology* 26: 8-23.

Oberhauser, K., & Guiney, M. 2009. Insects as flagship conservation species. *Terrestrial Arthropod Reviews* 1(2): 111-123.

Oteros-Rozas, E., Martín-López, B., González, J.A., Plieninger, T., López, C. A., & Montes, C. 2014. Socio-cultural valuation of ecosystem services in a transhumance social-ecological network. *Regional Environmental Change* 14(4): 1269-1289.

Saikim, F.H., Nordin, N.M., Zakaria, M.Z., Anas, N.I., Ismail, N., Rahman, A.A.A……& Hamzah, Z. 2020. Tourists' Perceptions of Insects as the Determinants of Insect Conservation through Entomological Ecotourism. *Journal of Tropical Biology & Conservation (JTBC)* 17: 79-95.

Sánchez-Bayo, F. & Wyckhuys, K.A. 2019. Worldwide decline of the entomofauna: A review of its drivers. *Biological Conservation* 232: 8-27.

Schutze, G.E., & Jacobs, R.F. 2009. The camper's uninvited guest. In Schlossberg, D. (ed.), *Infections of Leisure*. 4th Edition, pp 97-110. Washington, DC: ASM Press.

Shahriari-Namadi, M., Tabatabaei, H.R. & Soltani, A. 2018. Entomophobia and Arachnophobia Among School-Age Children: A Psychological Approach. *Shiraz E-Medical Journal* 19(7): e64824.

Snaddon, J.L., & Turner, E.C. 2007. A child's eye view of the insect world: perceptions of insect diversity. *Environmental Conservation* 33-35.

Snaddon, J.L., Turner, E.C. & Foster, W.A. 2008. Children's perceptions of rainforest biodiversity: which animals have the lion's share of environmental awareness? *PLoS One* 3(7): e2579.

Sodhi, N.S., Koh, L.P., Brook, B.W. & Ng, P.K. 2004. Southeast Asian biodiversity: An impending disaster. *Trends in Ecology & Evolution* 19(12): 654-660.

Stewart, A.J. & New, T.R. 2007. Insect conservation in temperate biomes: Issues, progress and prospects. In. Stewart, A.J.A.; New, T.R. & Lewis, O.T. (eds.). *Insect Conservation Biology*, pp. 1-33. , Wallingford, UK: CABI Publishing.

Stork, N.E., McBroom, J., Gely, C. & Hamilton, A.J. 2015. New approaches narrow global species estimates for beetles, insects, and terrestrial arthropods. *Proceedings of the National Academy of Sciences* 112(24): 7519-7523.

Stork, N.E. 2018. How many species of insects and other terrestrial arthropods are there on Earth? *Annual Review of Entomology* 63: 31-45.

Sun, X., Jiang, K., Chen, J., Wu, L., Lu, H., Wang, A. & Wang, J. 2014. A systematic review of maggot debridement therapy for chronically infected wounds and ulcers. *International Journal of Infectious Diseases* 25: 32-37.

Tan, H.S.G., Fischer, A.R., Tinchan, P., Stieger, M., Steenbekkers, L.P.A. & van Trijp, H.C. 2015. Insects as food: Exploring cultural exposure and individual experience as determinants of acceptance. *Food Quality and Preference* 42: 78-89.

Vanbergen, A.J. & Initiative, T.I.P. 2013. Threats to an ecosystem service: Pressures on pollinators. *Frontiers in Ecology and the Environment* 11(5): 251-259.

Vodouhê, F.G., Coulibaly, O., Adégbidi, A. & Sinsin, B. 2010. Community perception of biodiversity conservation within protected areas in Benin. *Forest Policy and Economics* 12(7): 505-512.

Woods, B. 2000. Beauty and the beast: Preferences for animals in Australia. *Journal of Tourism Studies* 11: 25-35.

Yang, Y.E., Passarelli, S., Lovell, R.J. & Ringler, C. 2018. Gendered perspectives of ecosystem services: A systematic review. *Ecosystem Services* 31: 58-67.

Yen, A.L., Hanboonsong, Y. & Van Huis, A. 2013. The role of edible insects in human recreation and tourism. *The Management of Insects in Recreation and Tourism*, pp 169-185.

Yi, C., He, Q., Wang, L. & Kuang, R. 2010. The utilisation of insect resources in Chinese rural area. *Journal of Agriculture Science* 2(3):146-154.

Zoderer, B.M., Tasser, E., Erb, K.H., Stanghellini, P.S.L. & Tappeiner, U. 2016. Identifying and mapping the tourists perception of cultural ecosystem services: A case study from an Alpine region. *Land Use Policy* 56: 251-261.