



E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2016; 4(5): 159-165
© 2016 JEZS
Received: 23-07-2016
Accepted: 24-08-2016

Jose Lopez-Collado
Colegio de Postgraduados,
Campus Veracruz, km 88.5
carretera federal Xalapa-
Veracruz, Código Postal 91690,
México

Lluvia Lissette Cruz-Salas
Colegio de Postgraduados,
Campus Veracruz, km 88.5
carretera federal Xalapa-
Veracruz, Código Postal 91690,
México

J Cruz García-Albarado
Colegio de Postgraduados,
Campus Córdoba, km 348
carretera federal Córdoba-
Veracruz, Código Postal 94946,
México

Diego Esteban Platas-Rosado
Colegio de Postgraduados,
Campus Veracruz, km 88.5
carretera federal Xalapa-
Veracruz, Código Postal 91690,
México

Humberta Gloria Calyecac-Cortero
Universidad Autónoma
Chapingo, km 38.5 carretera
México-Texcoco. Código Postal
56230, México

Correspondence
Jose Lopez-Collado
Colegio de Postgraduados,
Campus Veracruz, km 88.5
carretera federal Xalapa-
Veracruz, Código Postal 91690,
México

Size doesn't matter but color does: preference of neotropical butterfly species to make souvenirs

Jose Lopez-Collado, Lluvia Lissette Cruz-Salas, J Cruz García-Albarado, Diego Esteban Platas-Rosado and Humberta Gloria Calyecac-Cortero

Abstract

The state of Veracruz, México has a high diversity of tropical butterflies, which other countries transform into handicrafts. To select butterflies as components of souvenirs, butterfly specimens were collected by convenience sampling. Forty four butterfly species were identified, belonging to Nymphalidae, Pieridae, Papilionidae and Lycaenidae. The preferred butterflies were selected from a survey applied to visitors on the boardwalks of Veracruz City piers. *Morpho helenor*, *Heliconius charithonia* and *Danaus gilippus* were the most liked species. Most respondents (76%) said they would like to see the chosen butterflies into souvenirs, and 74% were willing to buy these butterfly based items. The most important factor driving likeness and rejection of butterflies was color (81.9% and 71.9% respectively). We conclude that because of the great species diversity and acceptance of these insects, there is a potential for using butterflies to make souvenirs in this location.

Keywords: Lepidoptera, butterfly biodiversity, natural resource management, entomotourism

Introduction

Butterflies, because of their great diversity and beauty, represent a natural resource that can be managed in different ways. One is through the sustainable management of high diversity locations aimed to provide eco-tourists with additional visual attractions to contemplate, watch or take pictures of insects and their surroundings [1]. Other uses are collecting pupae and rearing adult butterflies to sell to insectariums, collectors or to make handicrafts. These activities serve local inhabitants to generate additional revenues to improve life quality [2, 3]. In some Latin American countries, there is a tradition in using butterflies in different ways; for example, in Perú [4], Colombia [5] and Costa Rica [6] butterflies are traded either dissected or alive [7]. Some of the preferred butterfly species are *Danaus gilippus*, *Siproeta stelenes* and *Morpho helenor*. These species are present in the state of Veracruz, Mexico, as well [8, 9]. From a marketing point of view, butterflies of the families Nymphalidae, Papilionidae and Pieridae have the highest economic value, due to their visual attractiveness and wide distribution; other groups are Lycaenidae, Riodinidae and Hesperiidae [4]. Most of the research on butterflies in Mexico has focused in determining their diversity [10, 11]. In the state of Veracruz, the first research began with Godman and Salvini (1878-1901) [12] and later on different aspects of their biology, ecology and diversity have been explored [13, 14]. This state ranks third in butterfly species diversity, while Oaxaca being second and Chiapas first [15]. There are near 2940 species of Lepidoptera, from which 952 (32.4%) correspond to diurnal habits, and the rest have nocturnal activities [16, 17]. In spite of the species richness, there are no studies about which butterfly species may be attracted to people and if they are interested in buying local handicrafts made with butterflies. Veracruz is one of the top five national tourist destinations [18]. Tourists spend near US\$ 61.2 on average to buy souvenirs [19]. Therefore, the purpose of this research was to find out which butterfly species are preferred by visitors and to explore their attitude toward using these species to make souvenirs.

Materials and Methods

This research was divided in two steps, the first was to collect and identify the butterfly species and the second to select and rank the species most liked to make souvenirs.

Specimen collection and identification

Adult specimens were collected in gardens, open fields, and roads in the campus of Colegio de Postgraduados, located in the state of Veracruz,

México. The geographic coordinates of the main facilities are $19^{\circ}11'44''N$ and $96^{\circ}20'29''W$ with an elevation of 16 meters above the sea level (Fig.1).

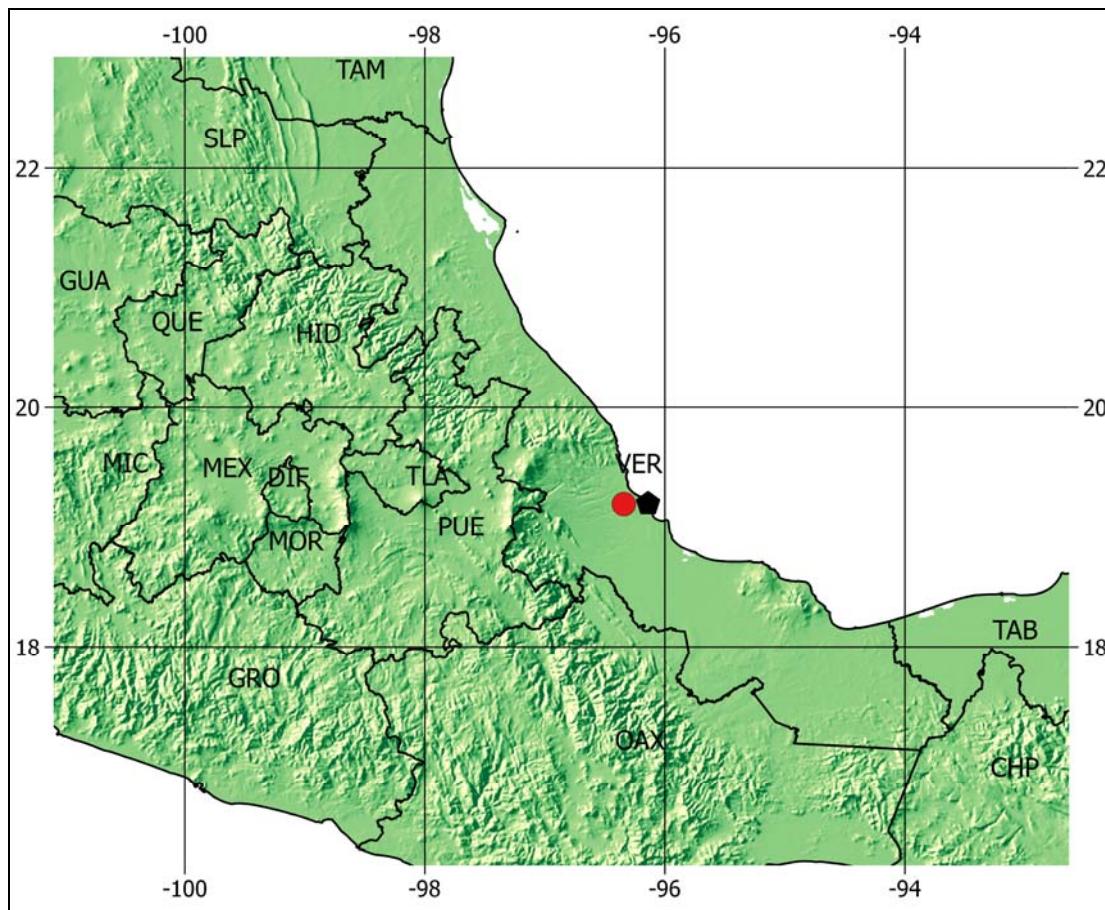


Fig 1: Sampling site of butterfly specimens (red circle) and survey location (Veracruz City, black pentagon) where questionnaires were applied to visitors.

The study area receives an annual rainfall from 1050 to 1200 mm, near 90% is received from May to October. The mean annual temperature is 27.8°C and the average relative humidity is 82%. The climate is Aw, corresponding to a warm sub humid type [20]. The collecting equipment were a 30 cm diameter collecting net, forceps, folding magnifiers, paper envelopes, and a digital camera to take high resolution pictures. Butterfly specimens were collected during diurnal walks from 10 to 12 h, and from 15 to 17 h, from August 2009 to January 2010. The specimens were identified using published species descriptions [12, 21, 22]. Once the species were identified, picture and mounted specimen catalogs was prepared. These catalogs were used as supporting material during the interviews.

Species selection by visitors

The rating of butterfly species regarding their potential to make handicrafts was carried on in the walkways of the Veracruz City piers, a popular place for visitors to walk and sightseeing. The piers are located on $19^{\circ}12'3.77''N$ and $96^{\circ}8'9.52''W$ (Fig. 1). A stand was prepared to show the pinned butterflies and picture catalogs to people stopping by, then, some were interviewed at random. A survey was conducted by applying a questionnaire containing structured and semi-structures questions. The questions were aimed to know which species were the most preferred to make

handicrafts, their knowledge about the butterflies and their willingness to buy such handicrafts. The survey was conducted during Easter time in 2010.

Statistical Analysis

A table was prepared with the results of the interviews and frequency charts and chi square tests were applied to the data using R v3.3.1 [23].

Results and Discussion

Species diversity

During the sampling period from August to November, a relatively high abundance of butterflies was observed, collecting near 30 specimens per day. In this period there were high daylight hours, high temperatures, and flowering host plants to feed the adults; most of the specimens were collected during the morning hours. The high number of catches agreed with other researchers [24], whom found the greatest butterfly species richness during the rainy season, where the environmental conditions are better suited for the butterflies to thrive. Also, the butterflies are more active during the morning hours because they are searching for food and oviposition sites [25]. On the other hand, the populations started to decline in November to reach the lowest levels in December and January, where few specimens were collected. A total of 44 species were collected, belonging to four

families (Fig. 2). The families Nymphalidae and Pieridae had most of the collected specimens while Papilionidae and Lycaenidae were the less abundant. This result agrees with Hernandez *et al.* [12]; they collected species belonging to the Nymphalidae family as the most frequent group, ranking first in the number of species in the state of Veracruz.

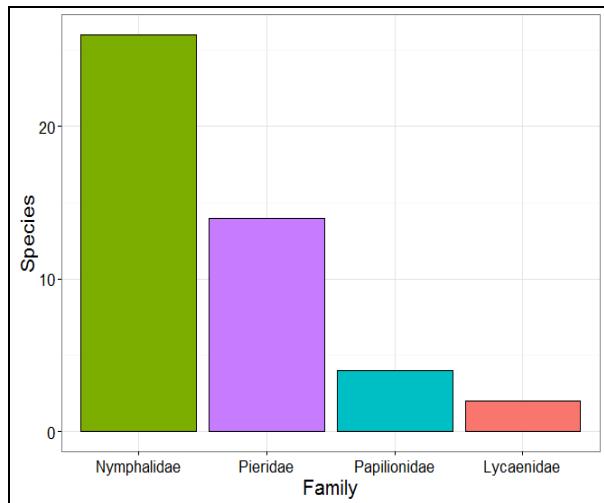


Fig 2: Number of species collected by family in Central Veracruz, 2009-2010.

Attractive butterfly species

The questionnaires were applied to 70 persons visiting the piers in Veracruz City. The results from the survey showed *M. helenor* is the most appealing species as the first choice by the visitors; *Heliconius charithonia* and *D. gilippus* follow in second and third place (Fig. 3). As the second choice, *Anteos maerula*, *Pyrisitia proterpia* and *M. helenor* were the most liked species, while as the third choice *Heliconius erato*, *Myscelia ethusa*, and *Archaeoprepona demophon* were the most outstanding. Overall, Fig. 3 shows that *M. helenor*, *D. gilippus*, and *H. erato* were the species more liked by the visitors in Veracruz; these preferences were significant ($\chi^2 = 248.6$, $df = 16$, $p < 0.01$, first choice). The Common Blue Morpho (*M. helenor*) has been recognized worldwide as a butterfly of great beauty due to its relatively large size and distinctive blue color, which turn this species into one of the most traded insect [26]. Also, this species is found across most of the Veracruz state except in cold zones [12]. The three species are also found in the southern parts of the state [8]. Further, Fagua *et al.* [27] reported that these species have a commercial value, along with butterflies of the genus *Agrias*, *Heliconius*, *Antirrhea*, *Dryas*, *Eunica*, *Pierella*, *Callicore*, *Adelpha*, *Papilio*, *Heracles*, *Catonephele* y *Danaus*, some of them collected here. These species are used as base material to make handicrafts and souvenirs. Also, it is important to remark that none of these species are listed as endangered or at extinction risk in this country [28].

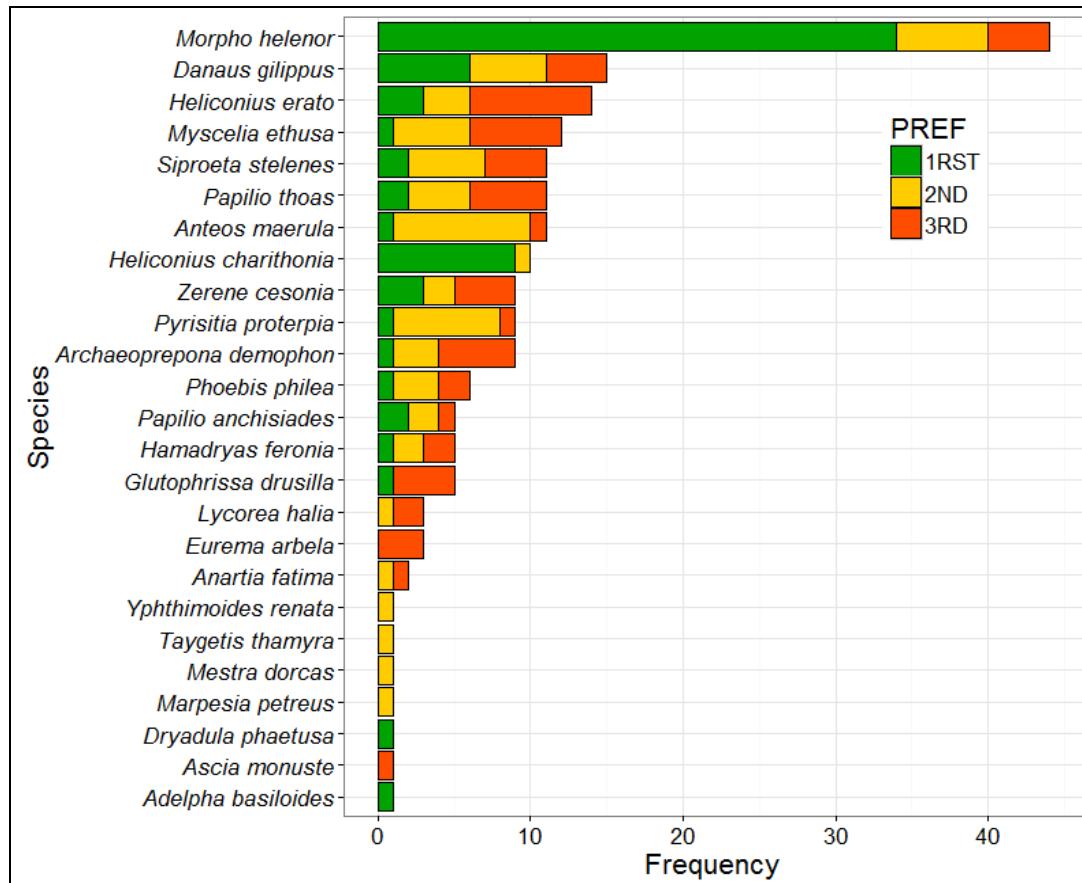


Fig 3: Frequency distribution of the most preferred butterfly species. PREF refers to the preference order: first choice 1RST, second choice 2ND, and third choice 3RD.

People were asked as to why they like a given butterfly and the distribution of responses are presented in Fig. 4 across all the choices. Most of the visitors (81.9%) preferred butterflies

because of their color, followed by shape (14.8%) while only 2.8% considered size as relevant; these preferences are significant ($\chi^2 = 145.5$, $df = 3$, $p < 0.01$, first choice).

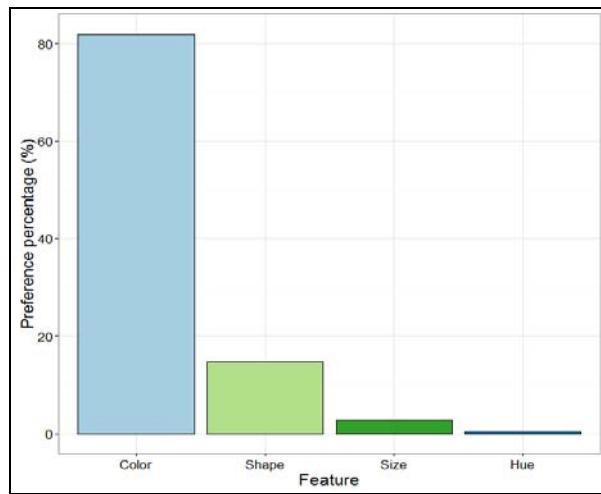


Fig 4: Preference of feature types that prompted people to like butterflies.

The preference for colorful butterflies supports previous reports that wing color is the distinguishing feature of this order [29]. Also, Moreno [30], reported that handicrafts like jewels and art deco objects require wings because of their

bright and beauty. It is interesting to note that, despite butterflies are traded and processed in different ways, few studies address why people felt attracted to them; for example, Manesi *et al.* [31] explored the effect of butterfly eyespots on aesthetic preference and conservation attitudes; they found that eyespots increase the likelihood of likeness and positive views to species conservation. Thus, our study, despite considering a segment of the population visiting a tourist site, provides initial clues as to which butterfly features attract people. Further studies are required to generalize these findings and explore in more depth the interactions between people and this insect group.

Unattractive butterfly species

In this case, Fig. 5 shows 22 species that were not attracted to people. The least liked species were *Taygetis thamyra*, *Dryadula phaetusa* and *Phoebe philea*; these ordering is significant ($\chi^2= 158$, $df= 18$, $p<0.01$, first choice). However, it is important to note that 19% of the visitors mentioned that no butterfly species was the least accepted, in other words, they did not consider the butterflies as unattractive. Similar, significant results were obtained for the second and third choices.

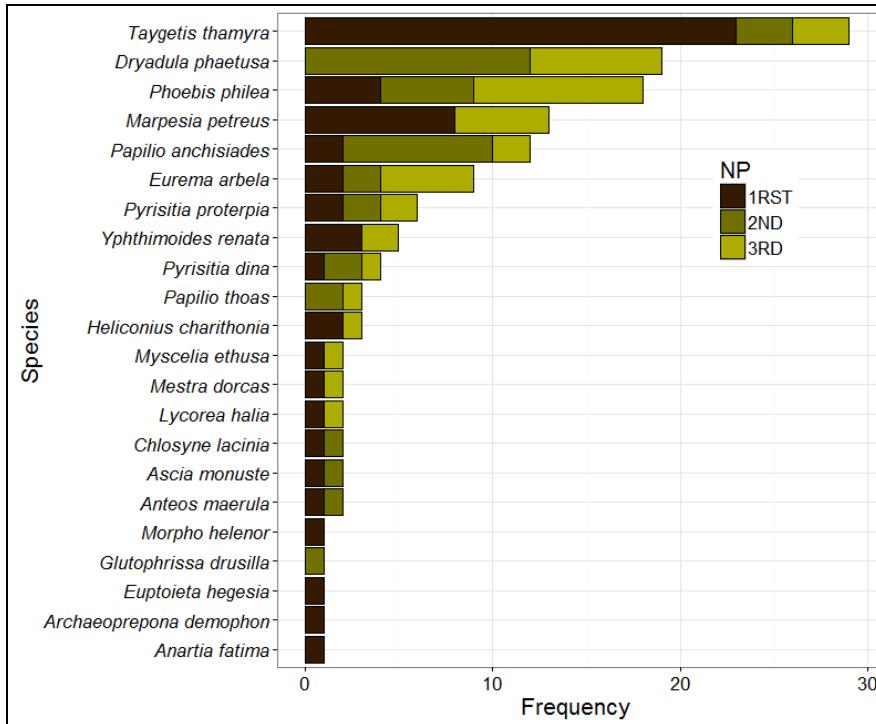


Fig 5: Frequency distribution on non-preferred butterfly species (NP) according to choice round: first choice (1RST), second choice (2ND), and third choice (3RD).

Regarding this group of unattractive butterflies, visitors considered again color as the most important feature (71.9%), others considered shape (22.8%) and only 3.5% considered size as a key feature ($\chi^2= 73.2$, $df= 3$, $p<0.01$, first choice), for the other choices we obtained similar results. Again, 19% did not grade the specimens as unattractive because they considered all the species as suitable to make souvenirs.

Acceptance of butterfly based souvenirs

In this section we explored the knowledge of visitors as related to butterflies and their willingness to buy butterfly

based handicrafts. The majority responded they did not know any use of butterflies (69%) but the rest knew butterflies are used to create frames and collections. Most of the interviewed people declared they would like to see the selected butterflies included into handicrafts (76%) while the remaining disagreed. Importantly, 74% declared intent to buy handicrafts made with these butterflies while 26% considered butterflies as living beings that should not be sacrificed, thus there is a segment of the target population concerned about species conservation. These results reinforce the findings of Gomez [32], that part of the butterfly supply is to make handicrafts and souvenirs, which requires only the wings to

create frames, table decorations, floral arrangements, keychains, ashtrays, earrings, pins, and necklaces. Also, the intent of buying butterfly based handicrafts is similar to the ratio of 7 out of 10 tourists desiring to buy souvenirs in Asia [33].

Visitor's purchasing behavior

The type of souvenirs most likely to buy by visitors were key chains (29%), earrings (18%) and T-shirts (15%) across both sexes ($\chi^2=112.1$, $df=16$, $p<0.01$) (Fig. 6). Some items were more preferred according to sex, for example, males liked wall clocks, sea based souvenirs, glasses and bells, while women liked earrings, ceramic figures, bracelets and bags. Few people chose to buy nothing and some to buy anything (Fig. 6). Therefore, the most preferred items might serve to be used as templates to create butterfly based souvenirs.

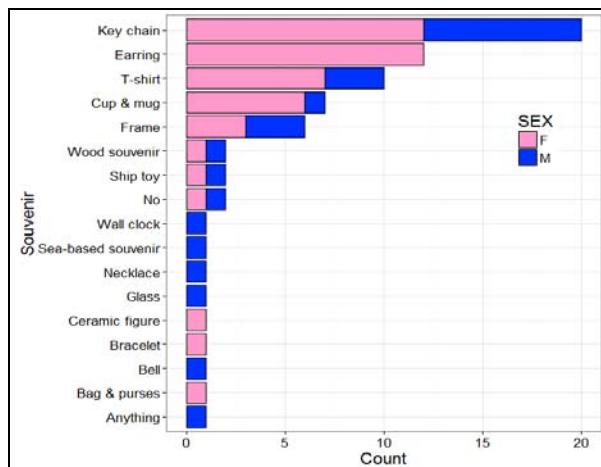


Fig 6: Intent of buying different types of souvenirs by visitors in Veracruz, Mexico.

Visitors also showed differences considering why they buy souvenirs; 40% considered buying items as gifts, 31% for personal use and 12% for home decoration (Fig. 7). In this case, the distribution by sex is similar. According to government sources, the production of souvenirs in Veracruz is diverse in their materials, design, ornamentations and techniques [34]. Most of the souvenirs sold in Veracruz City derive from sea based objects and themes, like seashells, seahorses, fishes and beaches. Therefore, these types of souvenirs would compete directly with butterfly based handicrafts and souvenirs. However, given the novelty in their composition, it is expected they could attract potential buyers.

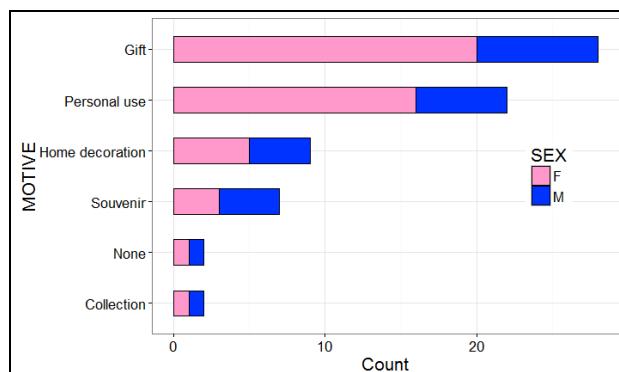


Fig 7: Distribution frequency of motives to buy souvenirs in Veracruz, Mexico.

The previous results point out that there are some butterfly species that can be used to make handicrafts and souvenirs; however, it is important to note that their processing should abide by current regulations on using wildlife and sustainable practices [35]. For example, permits allow the establishment of environmental management units to protect the species and promote eco-tourism and related activities [36]. In general, the extraction of butterflies in other regions is considered a safe practice, and complimentary management practices aimed to enhance and protect their habitat could minimize the risks [32, 37]. Despite some butterfly species have been commercialized in other countries, it is necessary to further gain knowledge and technology for the conditions of this state, for example, develop the know-how techniques to rear butterfly populations in their natural habitat through management practices [4].

Socio-demographic profile of potential souvenir consumers

The origin of the interviewed people was: local people (35%), Distrito Federal (12%), and the rest from different states and foreign visitors (53%). The female group comprised 66% because they were more prone to accept interviews. The average age was 34 years (± 1.7 S.E.) and attended school 11.2 years (± 0.5 S.E.). This description agrees that most of the tourists of the Veracruz state are nationals, with an average spending capacity and the priority of these visitors is to vacation in affordable places [38].

Conclusion

We found that *Morpho helenor*, *Heliconius charithonia* and *Danaus gilippus* were the most preferred butterfly species to make souvenirs in Veracruz, Mexico. The most unattractive species were *Taygetis thamyra*, *Marpesia petreus* and *Yphthimoides renata*. Color was the most highlighted butterfly feature; most of the visitors expressed their intention to buy butterfly based handicrafts and souvenirs. The types of handicrafts people were willing to buy were key chains, earrings, and T-shirts.

Acknowledgments

To the National Council of Science and Technology (CONACyT) for the M.Sc. scholarship granted to LLCS. This research was partially financed by Colegio de Postgraduados.

References

1. Hamdin MS, Mohamed M, Tokiman L. Potential of entomotourism at Taman Negara Johor Endau Rompin. International Journal of Administration and Governance. 2015; 1(4):92-97.
2. Claro CRA. Manual cría de mariposas: una actividad rentable. Cuidando la creación. San Pablo, Colombia, 2005; 3:112.
3. Monterrubio JC, Rodriguez-Muñoz G, Mendoza-Ontiveros MM. Social benefits of ecotourism: The monarch butterfly reserve in Mexico. Enlightening Tourism. A Pathmaking Journal. 2013; 3(2):105-124.
4. Mulanovich DAJ. Mariposas: guía para el manejo sustentable de las mariposas del Perú. Instituto de Investigaciones de la Amazonía Peruana, Perú, 2007, 101.
5. Martínez R. Estudio de factibilidad económica para la recolección-cría y comercialización de mariposas en la comunidad de Peña Roja de la Amazonía Colombiana.

- Fundación Natura Colombia, Bogotá, Colombia, 2005, 140.
6. Monge-Nájera J, Gómez FP. Las mariposas tronadoras (*Hamadryas* spp.) y su distribución geográfica en Costa Rica. *Bioceanosis*. 2003; 17:22-26.
 7. Díaz J, Ávila LM. Sondeo del mercado mundial de mariposas. Instituto de investigación de recursos biológicos Alexander Von Humboldt, Colombia, 2002, 38.
 8. Raguso R, Llorente-Bousquets J. The butterflies (Lepidoptera) of the Tuxtlas Mts., Veracruz, Mexico, revisited: Species-richness and habitat disturbance. *Journal of Research on the Lepidoptera*. 1990; 29(1-2):105-133.
 9. Jacinto-Padilla J. Distribución de mariposas ornamentales en México: Un estudio de caso para Veracruz. M.Sc. Thesis. Veracruz, Mexico, 2016, 64.
 10. Llorente J, Luis A. A conservation-oriented analysis of mexican butterflies: Papilionidae (Lepidoptera: Papilionoidea). In: Ramamrathy T, Bye R, Lot A, Fa J. (Eds.), *Biological Diversity of México: origins and distribution*. Oxford University Press, New York, 1993, 147-177.
 11. Llorente-Bousquets J, Vargas-Fernandez I, Luis-Martinez A, Trujano-Ortega M, Hernandez-Mejia BC, Warren AD. Biodiversidad de Lepidoptera en Mexico. *Revista Mexicana de Biodiversidad*. 2014; 85:S353-S371. DOI: 10.7550/rmb.31830.
 12. Hernández BF, Llorente BJ, Luis MA, Vargas FI. Las mariposas de Veracruz (Guía ilustrada). Consejo veracruzano de investigación científica y desarrollo tecnológico. México, 2010, 159.
 13. Luis AM, Llorente JB, Vargas IF, Gutiérrez AL. Síntesis preliminar del Conocimiento de los Papilionoidea (Lepidoptera: Insecta) de México. In: Martin F, Morrone JJ, Melic A. (Eds.), m3m, Monografías Tercer Milenio 1. Zaragoza, Sociedad Entomológica Aragonesa, 2000, 275-85.
 14. Michán L, Llorente J, Martínez AL, Castro DJ. Breve historia de la taxonomía de lepidóptera en México durante el siglo XX. *Revista de la Academia Colombiana de Ciencias*. 2005; 29:101-132.
 15. Llorente A, Luis M, Vargas I. Apéndice general de Papilionoidea: Lista sistemática, distribución estatal y provincias biogeográficas, In: Morrone JJ, Llorente L. (Eds.), Componentes bióticos principales de la Entomofauna Mexicana, México. UNAM-Facultad de Ciencias, México, 2006; II:945-1009.
 16. Hernández BF, Iglesias AL. La diversidad del orden Lepidóptera en el estado de Veracruz, México: Una síntesis preliminar. *Cuadernos de Biodiversidad*. 2001; 7:7-10.
 17. Becker VU. Microlepidoptera. In: Llorente BJE, González SE, Papavero N. (Eds.), *Biodiversidad, taxonomía y biogeografía de artrópodos de México; Hacia una síntesis de su conocimiento*, UNAM, México, 2000; II:453-468.
 18. Propin FE, Sánchez CA. Tipología de los destinos turísticos preferenciales en México. *Cuadernos de Turismo* No. 19. Universidad Nacional Autónoma de México, México, 2007, 147-166.
 19. SECTUR. Secretaría de Turismo. Clave Veracruz para fortalecer la actividad turística del país: Guevara Manzo. Boletín 22. http://www.sectur.gob.mx/es/sectur/Boletin_22. 8 April 2011.
 20. Peel MC, Finlayson BL, McMahon TA. Updated world map of the Köppen-Geiger climate classification, *Hydrology and Earth System Sciences*. 2007; 11:1633-1644.
 21. Beutelspacher CR. Como hacer una colección de mariposas. Universidad Nacional Autónoma de México, México, 1972, 81.
 22. Beutelspacher CR. Mariposas diurnas del valle de México. Ediciones científicas LPMM, México, 1980, 33.
 23. Core Team R. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <http://www.R-project.org/>. January, 2016.
 24. Luis MA, Vargas FI, Llorente BJ. Lepidopterofauna de Oaxaca I: distribución y fenología de los Papilionoidea de la Sierra de Juárez. Publicaciones especiales del Museo de Zoología N°3. México, 1991, 119.
 25. Fraija FN, Fajardo MG. Caracterización de la fauna del orden Lepidoptera (Rhopalocera) en cinco diferentes localidades de los Llanos Orientales Colombianos. *Acta Biológica Colombiana*. 2006; 11:55-68.
 26. Penz CM, Devries PJ. Phylogenetic analysis of Morpho butterflies (Nymphalidae, Morphinae): Implications for classification and natural history. *American Museum Novitates*. No. 3374. New York, 2002, 33.
 27. Fagua G, Gómez R, Gómez MA. Estudio de viabilidad para la cría de mariposas y coleópteros como alternativa productiva para la regeneración del bosque en territorios dedicados a la siembra de cultivos ilícitos en San José del Guaviare (Colombia). *Boletín de la Sociedad Entomológica Aragonesa*. 2002; 30:223-224.
 28. SEMARNAT. Protección ambiental-Especies nativas de México de flora y fauna silvestres-Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-Lista de especies en riesgo. Norma Oficial Mexicana NOM-059-SEMARNAT-2010. Diario Oficial. México, 2010, 79.
 29. Anguita R. Mariposas: los insectos con más glamour. *Ambienta*. 2003; 23:30-35.
 30. Moreno R. Análisis económico de proyectos de fauna: Cria de mariposas. Instituto Alexander Von Humboldt. Colombia, 1998, 25.
 31. Manesi Z, Van Lange PAM, Pollet TV. Butterfly eyespots: Their potential influence on aesthetic preferences and conservation attitudes. *PLoS ONE*. 2015; 10(11):e0141433. doi:10.1371/journal.pone.0141433
 32. Gómez SR. Plan de manejo propuesto para la cría de mariposas promisorias como alternativa productiva para comunidades indígenas de la Amazonia colombiana. *Boletín de la Sociedad Entomológica Aragonesa*. 2006; 38:451-460.
 33. The who, what, where and why of souvenir buying. <http://asianjourneys.com.sg/travel-industry-news/16-Jul-2015/the-who-what-where-and-why-of-souvenir-buying>. 15 January, 2016.
 34. Las artes populares de Veracruz. http://portal.veracruz.gob.mx/portal/page?_pageid=54,3991858&_dad=portal&_schema=PORTAL. 24 March 2011.
 35. Veltman, K. How can zoos import and display butterflies for educational purposes in a sustainable way? *International Zoo Yearbook*. 2009; 43(1):124-130.

36. Gallina-Tessaro SA, Hernández-Huerta A, Delfín-Alonso CA, González-Gallina A. Unidades para la conservación, manejo y aprovechamiento sustentable de la vida silvestre en México (UMA). Retos para su correcto funcionamiento. Revista Ambiental. 2009; 1:143-152.
37. Romeu E. Mariposas mexicanas: Los insectos más hermosos. Biodiversitas. 2000; 28:7-10.
38. Gallegos JO. Estructura territorial del corredor turístico Veracruz-Boca del Río, México, al inicio del siglo XXI. Tesis de maestría en Geografía. Universidad Nacional Autónoma de México, México, 2006, 128.