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Incidence of Bombus ephippiatus (Hymenoptera, Apidae) in the Agua del Sauco community

Incidência de Bombus ephippiatus (Hymenoptera, Apidae) na comunidade Agua del Sauco

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Resumen

En el presente trabajo de investigación se determinó la incidencia poblacional del abejorro *Bombus ephippiatus* en la comunidad de Agua del Sauco, en el municipio de Techaluta de Montenegro. Para ello, se colectaron 392 insectos, de los cuales 372 son abejorros de la especie *Bombus ephippiatus* y 20 corresponden a otros insectos. Todas las poblaciones de abejorros se encontraron pecoreando. La incidencia poblacional de reinas de abejorros aumentó en el mes de julio, con el mayor pico en los meses de agosto y marzo, lo que nos da una ventana más amplia para la reproducción de abejorros en cautiverio.

Palabras claves: Abejorros, insectos, reproducción, incidencia, *Bombus ephippiatus*.

Abstract

In the present research work, the population incidence of the bumblebee *Bombus ephippiatus* in the community of Agua del Sauco was determined in the Municipality of Techaluta de Montenegro. 392 insects were collected, of which 372 are bumblebees of the species *Bombus ephippiatus* and 20 correspond to another insect. All bumblebee populations collected were found foraging. The population incidence of bumblebee queens increased in the month of July with the highest peak in the months of August and March. Which gives us a wider window for bumblebee breeding in captivity.

Keywords: Bumblebees, insects, reproduction, incidence, *Bombus ephippiatus*.

Resumo

No presente trabalho de pesquisa foi determinada a incidência populacional do zangão Bombus ephippiatus na comunidade de Agua del Sauco, no município de Techaluta em Montenegro. Para isso foram coletados 392 insetos, dos quais 372 são abelhas da espécie Bombus ephippiatus e 20 correspondem a outro inseto. Todas as populações de abelhas foram encontradas forrageando. A incidência populacional de abelhas rainhas aumentou no mês de julho, com maior pico nos meses de agosto e março, o que nos dá uma janela mais ampla para a reprodução de abelhas em cativeiro.

Palavras-chave: Zangões, insetos, reprodução, incidência, *Bombus ephippiatus*.

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Introduction

The demand for food is constantly increasing due to population growth. To meet this growing demand in the future, it is imperative to produce food sustainably. In this context, agrosystems are in the need to have pollinators since they play a fundamental role in food production. Furthermore, most major crops consumed worldwide depend, to some extent, on pollination by insects, especially by bumblebees (Bayer Bee Care Center, 2018).

Bombus *ephippiatus* (bumblebees) are distributed throughout Mexico (Dunnes *et al*., 2012), and are found above 800 m asl (Vergara, 2016). In total, 25 species have been reported throughout Mexico, of which the most common is the bumblebee *Bombus ephippiatus* .

According to the ecological characteristics of the bumblebee *B. ephippiatus* reported by Morales (2007), this species is an alternative for mass reproduction and commercial use, which would avoid the introduction of non-native bumblebee species that could considerably affect pollinators. native people. However, mass rearing methods of *B. ephippiatus* have not yet been reported, despite their need to ensure natural pollination and, consequently, the quality and health of the nests, as well as to reduce possible pressure for breeding. the unregulated collection of this species (Torres, 2013).

Some studies mention that great risk can arise when exotic bumblebee species are introduced (Freitas *et al*., 2009; Goulson, 2003a, 2010; Morales, 2007), such as disease transmission, competition for space, food and establishment, and hybridization.

The technique of capturing bumblebees is a simple activity: once carried out, they are placed in boxes near where the nests are located and the waiting time is at least one day to capture them, which normally happens when they are carrying out the foraging activity (Salvarrey, 2012).

Therefore, the objective of this research is to know the population incidence of the bumblebee *Bombus ephippiatus* in the community at Agua del Sauco in the municipality of Techaluta of Montenegro, where the highest incidence of bumblebees is expected to be found in spring and summer.

Materials and methods

The research was carried out in the community at Agua del Sauco of Techaluta of Montenegro, which represents 0.11% of the territory of the state of Jalisco (CUSur, 2020). This community is located at 2790 m asl, at 7.4 kilometers west of the town of Techaluta de Montenegro (Pueblos América, 2020).

Sampling was carried out once a month, during the period from July 2019 to August 2022, while captures were carried out by direct collection, when the queens went out to forage (Hernández, 2004). The captured bumblebees were placed in 250 ml plastic jars that were filled with 70% Zuum brand ethanol. The collected bumblebees were moved to the University Center of the South Coast, University of Guadalajara, in the laboratory area (Laboratorio de Abejorros), located in Autlán de Navarro, Jalisco, Mexico (Cauas, 2015). The counting of all captured insects was carried out with the help of a four-digit manual counter.

Results

This research was carried out during a year in which there were collections once a month and in the same study area. Only in the summer (August) and spring (March) were queens captured more frequently than in the rest of the months of the summer and spring season, which shows the population incidence of collections of *Bombus ephippiatus* and some other *insects.*

collected over 12 months, among which queens, workers and bumblebees were captured (table 1).

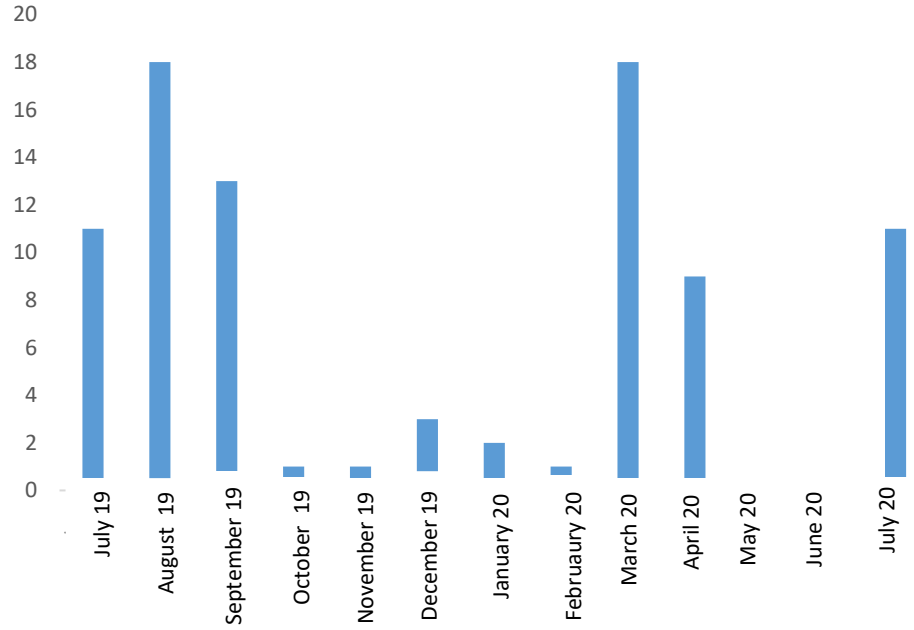
Table 1. Collection of bumblebees and other insects at Agua del Sauco de Techaluta, Montenegro

Month 2019-2020	Queens	workers	Bumblebees	Others
July	11	23	1	0
August	18	12	9	0
September	13	3. 4	3	1
October	1	75	10	7
November	1	10	2	0
December	3	18	1	2
January	2	1	2	0
February	1	1	0	0
March	18	11	9	4
April	9	18	2	5
May	0	7	0	0
June	0	10	1	1
July	11	23	1	0
Totals	88	243	41	20

Source: self made

The following figure shows a higher incidence of *Bombus ephippiatus* queens in March and April (spring) and July, August, September (summer), which gives us a broader window for the capture and reproduction of bumblebees in captivity. Due to its nature, this species is potentially a pollinator of several crops and is distributed throughout the Mexican territory (figure 1).

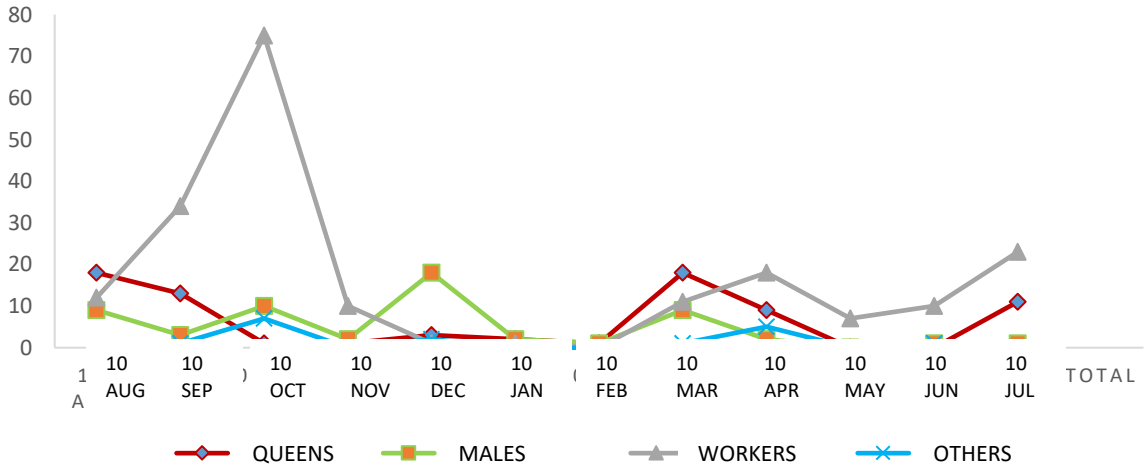
Figure 1. Spatial distribution of *Bombus ephippiatus* queens



Source: self made

After capturing every month for a year, and in the same study area, it should be mentioned that there was a change in soil, which could have been a trigger for the reduction of bumblebees, since the flowering where they emerge was reduced. to forage, so the catches were minimal; Even so, the best months (summer season) to capture *Bombus ephippiatus bumblebees are shown* (figure 2).

Figure 2. Bumblebee population fluctuation



Source: self made

Discussion

Evans' studies *et al.*, (2007) and Velthuis and van Doorn (2006), the capture of queens (bumblebees) in the spring season is more abundant, since in this period the greatest diversity of flowering for foraging occurs. However, in the present investigation they were not found in large quantities due to the low natural flowering of the collection site due to the change in land use.

Other researchers such as Goulson (2003 b) and Heinrich (2004), mention that the largest capture of bumblebees were workers in the spring season. Likewise, Santamaría *et al.*, (2011) collected 51 specimens belonging to 12 species of *Bombus* in the summer season during 2008 and 2010. However, in the captures that were made in this investigation, queens were only captured in the spring season (March). more frequently than in the rest of the months of the spring season. This shows that the captures were during an entire year, as well as the population incidence of collections of *Bombus ephippiatus* and some other insects collected over 12 months, such as queens, workers, and bumblebees.

On the other hand, in the research by Salvarrey *et al.* (2013) explains that when queens are collected while foraging, they are normally already fertilized after emerging from their hibernation period, which gives a window of between 20% and 50% assurance for the reproduction of nests under laboratory conditions. In the present investigation, a partial coincidence was found, since we found the highest incidence of *Bombus ephippiatus queens* in March (spring) and August (summer), which gives us a broader window for the capture and reproduction of bumblebees in captivity.

According to the studies of DiTrani (2006), the first capture of queen *Bombus pennsylvanicus sonorus*, it was in mid-April 2007 on the UDLA campus, which represents a month with a low percentage of queens, since at the end of May the percentage dropped to zero; and the second collection began from February 25 to May 19, 2008 on the same campus located at Cholula Puebla. On the other hand, this research shows that the best time to capture bumblebees is the summer season.

As mentioned by Montemayor -Fuentes and Madrid-Cuevas (2003), in Mexico queens of *Bombus ephippiatus* have been found during almost all months of the year, which may be an indicator that this species does not have diapause, as is the case. for most *Bombus species* from cold climates. In this aspect, this research coincides, since *Bombus ephippiatus bees were found* almost all year round, with a minimum number of bees in the months of January, February, May and June.

Conclusion

In the present study, it was determined that the best month to capture bumblebees (*Bombus ephippiatus*) in the community at Agua of Sauco is July, with the highest peak in the months of August and March, which gives us a broader window for the reproduction of bumblebees in captivity.

Future lines of research

- Captures of bumblebees for reproduction in laboratory conditions.

References

Bayer Bee Care Center (2018). The importance of pollinating insects in agriculture. *Beeinformed* , (7). https://es.scribd.com/document/531756856/BEEINFOrmed-No7-La

Cauas, D. (2015). *Definition of the variables, approach and type of research* . https://doplayer.es/13058388-Definicion-de-las-variables-enfoque-y-tipo-de investigacion.html

CUSur (2020). CUSur Features . http://www.cusur.udg.mx/observatorioTurismo/archivos/Techaluta/OT_Techaluta_caracteristicas.html

DiTrani , J. (2006). Chapter 6. Materials and methods. http://catarina.udlap.mx/u_dl_a/tales/documentos/lbi/arriaga_j_a/capitulo6.pdf

Duennes , M. A. , Lozier, J. D., Hines, H. M., & Cameron, S. A. (2012). Geographical patterns of genetic divergence in the widespread Mesoamerican bumble bee Bombus ephippiatus (Hymenoptera: Apidae). *Molecular Phylogenetics and Evolution* , (64) 1, 219-231. https://doi.org/10.1016/j.ympev.2012.03.018

Evans, E., Burns, I. and Spivak M. (2007) . *Befriending bumble bees: A practical guide raising local bumble bees.* University of Minnesota Extension Service Publication. https://hdl.handle.net/11299/51331

Freitas, B., Imperatriz -Fonseca, V., Medina, L., Kleinert , A., Galetto , L., Nates-Parra, G., Quezada-Euán (2009). Diversity, threats and conservation of native bees in the Neotropics. *Apidologie* , *40* , 332-346. https://doi.org/10.1051/apido/2009012

Goulson , D. (2003a). Effects of introduced bee on native ecosystems. *Annu. Rev. Ecol. Syst* ., (34), 1-26.

Goulson , D. (2003b) . *Bumblebees: their behavior and ecology*. Oxford: Oxford University Press.

Goulson , D. (2010). Impacts of non-native bumblebees in Western Europe and North America. *Appl. Entomol . Zoll* ., (45), 7-12. https://doi.org/10.1303/aez.2010.7

Hernandez, M. (2004). *Chapter 7. Breeding techniques 7.1. Biology of Bombus ephippiatus* . http://catarina.udlap.mx/u_dl_a/tales/documentos/lbi/llorente_t_md/capitulo7.pdf

Heinrich, B. (2004) . *Bumblebee economics. Cambridge* . Harvard University Press.

Morales, C. (2007). Introduction of non-native bumblebees (Bombus): causes, ecological consequences and perspectives. *Argentine Ecology Association. Southern Ecology* , (17), 51-65.

Pueblos América (2020). Techaluta of Montenegro (Municipality). https://mexico.pueblosamerica.com/jalisco/techaluta-de-montenegro/

Santamaría, S., Castro, L., Garcia -Camacho, R., Giménez, L., Mendez , M., Milla, R., Teixido, A. and Torices, R. (2011). Bumblebees *(Bombus spp .: hymenoptera , apidae)* from Jou de los Cabrones (Picos de Europa National Park) and confirmation of the presence *of Bombus mendax gerstaecker* , 1869 in the Cantabrian Mountains (Spain). *Bulletin of the Aragonese Entomological Society , 48* , 143-146.

Save r ey, M. (2012). *Use of native bumblebees, Bombus atratus and Bombus bellicosus for red clover seed production* (master's thesis). University of the Republic. https://www.colibri.udelar.edu.uy/jspui/bitstream/20.500.12008/27906/1/SalvarreyMendozaSheenaMarie.pdf

Salvarrey, M., Arbulo, N., Santos, E. and Invernizzi , C. (2013). Artificial breeding of native bumblebees *Bombus atratus* and *Bombus bellicosus* (*Hymenoptera , Apidae*) . *Agroscience Uruguay , 17* (2), 75-82. https://www.researchgate.net/publication/317448179

Torres, R. A. (2013). *Native bees of Mexico as managed pollinators* (PhD thesis) . Autonomous University of Queretaro. https://doi.org/10.1051/apido:2006019

Vergara, C. (2016). Large-scale patterns of parasite distribution in Mexican bumblebees. University of the Americas Puebla.

Velthuis, H.H.W. and van Doorn, A (2006). A century of advances in bumblebee domestication and the economic and environmental aspects of its commercialization for pollination. *Apidologie* , *4* (37), 421–451. https://doi.org/10.1051/apido:2006019

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Formal Analysis	Main Nancy, Eva, Francisco and Ricardo
Investigation	Nancy
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Data curation	Nancy and Francisco
Writing - Preparation of the original draft	Nancy
Writing - Review and editing	Nancy and Eva Same
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Supervision	Nancy
Project management	Nancy
Fund acquisition	Nancy