REVISTA DE AGROECOLOGIA NO SEMIÁRIDO
ISSN: 2595-0045
IFPB | Campus Sousa

REVISÃO DE LITERATURA

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Effects of habitat loss in the comunity of wild bees

Abstract: The habitat loss show a notable impact in some of the structural properties of the plant–flower visitor network. One of the main causes of habitat loss is the deforestation, and besides of these which is not yet known how it can affect bee populations a direct and obvious problem is the reduction of available nesting sites, this is a major driver of bee declines worldwide. Recent declines in bee species, and their importance as ecosystem service providers, have brought bees to the forefront of conservation efforts. However, according to the problem showed, we intented to know more about the correlation of habitat loss in the comunities of wild bees, through the examination of the most relevant bibliography on this subeject.

Key words: Biodiversity, Impacts, Pollination

Efeitos da perda de habitat na comunidade de abelhas selvagens

Resumo: A perda de habitat mostra um impacto notável em algumas das propriedades estruturais da rede de visitantes de plantas e flores. Uma das principais causas da perda de habitat é o desmatamento, e, além disso, ainda não se sabe como isso pode afetar as populações de abelhas. Um problema direto e óbvio é a redução dos locais de nidificação disponíveis, este é um dos principais determinantes do declínio de abelhas em todo o mundo. Recentes declínios nas espécies de abelhas e sua importância como provedores de serviços ecossistêmicos trouxeram as abelhas para a linha de frente dos esforços de conservação. No entanto, de acordo com o problema apresentado, pretendemos conhecer mais sobre a correlação da perda de habitat nas comunidades de abelhas silvestres, através do exame da bibliografia mais relevante sobre este tema.

Palavras-chaves: Biodiversidade, Impactos, Polinização

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Recebido para publicação em 12/011/2018; aprovado em 01/11/2019
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INTRODUCÃO

Pollination is a very important ecosystem service sustaining the functioning of the ecosystem and the productivity of many food crops. The effect of climate change such as increased temperature, elevated carbon dioxide, droughts, flooding, and other extreme events are negatively impacting plant-pollinator interactions (Ramirez e Kallarackal, 2018). In some areas, forests are being affected in diverse aspects such as structure, composition and biodiversity showing a decrease in the growth rates (De Linares *et al.*, 2017).

The habitat loss show a notable impact in some of the structural properties of the plant–flower visitor network. Although most metrics varied across years, the number of flower visitors and the number of links in the network decreased much more after the disturbance (Traveset *et al*., 2017). This is a major driver of bee declines worldwide, and is of key relevance in the tropics given high deforestation rates, but we continue to have a poor understanding of the impact of land-cover change on tropical bee communities (Botsch *et al.*, 2017).

Pollinator conservation is of increasing interest in the light of managed honeybee declines, and declines in some species of wild bees. Overall, ecological restoration had a positive effect on wild bee abundance and richness across multiple studies, habitat types and geographic regions. Therefore, the effects of ecological restoration targeting "natural" ecological endpoints (e.g. restoring former agricultural fields to historic vegetation types or improving degraded natural lands) on wild bees have received relatively little attention, despite their potential importance for countering habitat loss (Tonietto e Larkin, 2017).

However, according to the problem showed, we intented to know more about the correlation between habitat loss and the comunities of wild bees, through the examination of the most relevant bibliography on this subeject.

METHODOLOGY

The search of the papers was realized on 11 to 25 march 2018. To identify relevant studies, was used the Web of Science by the site of university of Aveiro using the following term combinations "wild bee AND (pollination* natural forest*)", "wild bees* AND (habitat loss*)", "wild bees AND (biodiversity* ecology* pollination*)" with topic filters "last five years of publication", these searches yielded 157 papers.

From this point, we individually examined studies and excluded those that took place within production agricultural settings or focused on urban areas. We included studies that evaluated the effects of restoration overall, main impacts of deforestation, climate changes and habitat loss in the interaction among plants and pollinators. After identifying a total of 17 papers that met our criteria and read them, was selected 10 papers more related with the thematic.

DEVELOPMENT

The importance of pollination and wild bee.

Pollinating, is a process that is of the upmost importance in terrestrial environments and one which provides vital ecosystem services for human wellbeing. Over 85% of described flowering plant species are dependent, to some degree, on animal pollination, with mobile foraging insects accounting for the vast majority of this activity (Carpenter et al., 2006; Garibaldi et al., 2011a, 2014; Ollerton et al., 2011; Kremen et al., 2007 in Gill *et al.*, 2016 p.7).

Figure 1: *Apis melífera* pollinating a *Coriandrum sativum* flower. (Autor, 2017.)

Insect pollination maintains genetic diversity in plant populations, and provides advantages such as increased fruit quality and quantity, and seed production and fertility, leading to greater vigour of the next generation. Thus, ecologically, insect pollination is crucial in sustaining diverse and healthy populations of wild plants and this in turn underpins trophic networks (Kearns et al.,

1998; Albrecht et al., 2012; Barrett, 2003 in Gill *et al.*, 2016; Memmott, 1999 in Gill *et al.*, 2016 p.7).

Bees are frequent and effective pollinators of wildflowers and agricultural crops. Social bees (e.g. honeybees, bumblebees, stingless bees), in particular, have become a focus of insect pollinator studies, in which the numerical abundance of workers per colony make them a dominant 'pollination service provider' in many landscapes (Kleijn et al., 2015 in Gill *et al.*, 2016 p.18).

The predominance of bees as pollinators is attributable to the fact that all 20,000 species are obligate florivores and both larval and adult life stages feed on floral products. In contrast, in all other pollinator taxa, only a subset of species visit flowers, and florivory is confined to the adult stage (Michener 2007 in Winfree 2011 p.3).

Bees are present in a wide variety of terrestrial habitats worldwide (Winfree 2011 p.3), and your conservation is essential for the pollination services they provide to natural ecosystems and agricultural systems. Yet in order to implement conservation procedures, we must have a basic understanding of what species are present and in what habitat and functional role. And to conserve species diversity and richness it is necessary to understand the components and interactions within the ecosystem we aim to protect (Tucker, Rehan; 2016 p.11).

Recent declines in bee species, and their importance as ecosystem service providers, have brought bees to the forefront of conservation efforts. For bee species with documented losses and in geographic regions with historic bee community data available, habitat loss is a frequently cited factor in bee declines (Cameron et al., 2011; Grixti, Wong, Cameron, & Favret, 2009; Winfree, Aguilar, Vasquez, LeBuhn, & Aizen, 2009 in Tonietto e Larkin, 2017, p.2).

Impacts of habitat loss

Natural habitat loss at a regional scale (e.g. thousands of hectares) leads to reduction in overall habitat availability and, potentially, to increased patch isolation (Suni and Brosi 2012 in Ferreira *et al.*, 2015, p.2). On the other hand, habitat loss at the local scale (e.g. tens of hectares) causes increases in the average distance to the nearest forest fragments, which reduces the likelihood of multi-patch foraging strategies while withholding local resource availability (Garibaldi et al.,2014 in Ferreira *et al.*, 2015, p.2).

One of the main causes of habitat loss is the deforestation, and besides of these which is not yet known how it can affect bee populations a direct and obvious problem is the reduction of available nesting sites, since most species nest in tree cavities. For many species, the availability of

nesting sites may be a crucial factor limiting colonies reproduction (Inoue et al., 1993 in Pioker-Hara *et al.*,2014, p1).

Figure 2: Aerial photo shows illegal deforestation in the Jamanxim National Forest Fonte: http://amazonia.org.br/2017/11/monitoramento-do-desmatamento-da-amazonia-e-ameacado-por-corte-no-orcamento/, acedido em: 08/04/2018.

Second Traveset *et al.* (2018, p5), when analyzed how habitat loss influenced the pattern of interactions between plants and their flower visitors along four years of study, was found in 2011, plants' degree was significantly lower and selectiveness was significantly higher than the previous years; that is, the number of flower visitors per plant decreased after the disturbance (build of a golf course), and plants were visited by less abundant flower visitors.

Overall, these informations are corroborated by Botsch *et al.* (2018, p5-7) in your analyse about the impacts of forest fragmentation in orchid bee comunities (Hymenoptera: Apidae: Euglossini), in the Chocó biodiversity hotspot of northwest Ecuador and concluded that comparing fragmented to continuous sites, there are no differences in species richness or abundance, but continuous forest sites had significantly more even distribution of euglossine species relative to fragmented sites, as well as statistically distinct community composition.

To combat habitat loss, there has been considerable research evaluating the effectiveness of habitat enhancements for wild bees in otherwise developed landscapes, such as agricultural systems or cities. Overall, ecological restoration had a positive effect on wild bee abundance and richness across multiple studies, habitat types and geographic regions. Unlike small-scale enhancements of

otherwise developed sites, restoration of natural areas can also return larger areas of contiguous habitat for native bees, returning landscape-level and metacommunity processes (Montoya, Rogers, & Memmott, 2012 Dicks, Showler, & Sutherland, 2010; Grixti et al., 2009; Hall et al., 2016; MacIvor & Packer, 2015; Pawelek, Frankie, Thorp, & Przybyiski, 2009; Shepherd, Buchmann, Vaughn, & Black, 2003; Vaughan & Skinner, 2008 in Tonietto e Larkin, 2017, p.2).

FINAL CONSIDERATIONS

Habitat fragmentation generates loss in the genetic variability of plants and bees. Besides causing greater difficulties for the foraging of the same.

Bees can be divided into generalists and especialists as to the niche, and are not affected in the same way by habitat loss.

Bees develop a fundamental ecosystem service, pollination, and without it would not be possible to produce food in the world.

Any disturbance in the vegetation, however minimal, is capable of negatively affecting the bees' behavior in the region.

The richer the environment is in plant diversity and the less suffering from ecological disturbances, the greater the abundance and quality in the pollination service.

Therefore, it is necessary to have methods that prevent the constant deforestation, thus keeping a greater area of preservation and preserving the interaction between bees and plants.

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