Taking the conservation buzz beyond research: Involving local farmers for habitat restoration and monitoring of non-*Apis* bees in Doon valley, India

## Preeti Virkar\*

North-Eastern Hill University, India

Dr. V P Uniyal Scientist F, Wildlife Institute of India



## Climate-driven declines in arthropod abundance restructure a rainforest food web

Bradford C. Lister<sup>a,1</sup> and Andres Garcia<sup>b</sup>

<sup>a</sup>Department of Biological Sciences, Rensselaer Polytechnic University, Troy, NY 12180; and <sup>b</sup>Estación de Biología Chamela, Instituto de Biología, Universidad Nacional Autónoma de México, 47152 Chamela, Jalisco, Mexico

Edited by Nils Christian Stenseth, University of Oslo, Oslo, Norway, and approved September 10, 2018 (received for review January 8, 2018)

A number of studies indicate that tropical arthropods should be particularly superable to climate warming. If these predictions are on tropical forests include reductions in plant diversity (14) changes

nature
COMMUNICATIONS
COMMENT
https://doi.org/10.1038/s41467-018-07916-1 OPEN
Recognizing the aujet extinction of
invertebrates
Invertebrates
Nico Eisenhauer (5) <sup>1,2</sup> , Aletta Bonn <sup>1,3,4</sup> & Carlos A. Guerra (5) <sup>1,5</sup>

## Land-use land cover change in India



(Tian et al. 2014)

## Doon Valley, India





Created using Natural Earth Data in QGIS





### (203 sub sampling plots)

### Sampling of bees (Westphal et al., 2008)

### Water Pan Traps

### Observation

Benefits of natural habitat on bee communities in agroecosystems (linear regression model;  $R^2 = 0.782$ , SE = 0.148, P = 0.004).



RESULTS

 6.3% bees - Indian subcontinent: 43 species, 5 families

 Compositions of agroecosystems overlap greatly with forests

Species composition & Similarity of bees in different habitats in Doon Valley constructed using nonmetric Multidimensional



> 50% rare bees
species, Forest
specialists (26%),
Generalists (9%), no
agro-eco. Specialists

 Agro-eco. bees prefer polycultures Species classification into specialists (agricultural and forest habitats) and generalists in Doon Valley (Specialization threshold K = 2/3, Alpha level = 0.005).

**Species Classification** 



Comparison of bee species richness between forest (36), polyculture (24) and monoculture (20) farming systems (Kruskal-Wallis test; p < 0.001).









https://www.facebook.com/PreetiSVirkarPitulee/vid eos/vb.100001267281709/2479191038799781/



### How do we conserve pollinators?

Practice biodiversity

based organic farming.



with organic alternatives.



Encourage kitchen gardens.
Grow flowering and aromatic plants on bunds.

**Bees: Myths & Facts** 





Ges attack to protect their nests.

11.7220.0

Bees do not sting unless you disturb them.







#### Conservation of Non-Apis Bees in Doon Valley, Uttarakhand, India

Pollinator Habitat Assessment Sheet for Urbanscapes

January 2019



#### Acknowledgments

Support for the 'Conservation of Non-Apis Bees in Doon Valley, Uttarakhand, India' is provided by Rufford Small Grant. Navdanya Trust readily agreed to collaborate. This document was prepared with reference to the Pollinator Habitat Assessment Form and Guide. The Xerces Society for Invertebrate Conservation, 2015.

Thanks to Dr Eric Lee-Mäder, Xerces Society for Invertebrate Conservation, the farmers of Doon Valley and the staff at Navdanya Trust. Thanks to intern Ashu Tomar, for working on the habitat assessment sheet for urban areas.

Photographs Preeti S. Virkar, North Eastern Hill University, Shillong, Meghalaya, India. Navdanya





4879 PROJECTS IN 150 COUNTRIES HOME PROJECTS V ABOUT US V

Date

#### Preeti Virkar

Conservation of Non-Apis Bees and their Habitat in Doon Valley. Uttarakhand, India

Human population growth has caused the habitats of species diversity to shrink and deteriorate, increasing their vulnerability to extinction. Pollinators, especially bees too are affected by land use changes. Bees are essential for the production of approximately 70% of the most commonly consumed crops in the world. Historically, managed honeybees provided the bulk of pollination in Europe and North America, but have declined by half. Honeybees are a tiny fraction of the vast majority of non-Apis bees globally.

The decline of honeybees and rising costs to manage them have increased reliance on non-Apis bees for pollination. Research shows that non-Apis bees can provide all the pollination services required for crops when enough habitats are available. However, their community status remains ambiguous in the tropics due to habitat destruction and mismanagement. Considering the need for baseline information, distribution, habitat requirements and lack of awareness towards non-Anis bees, the present study was designed in the subtropical-temperate Doon Valley, the fragile landscape in the Indian Himalayas that is under increasing anthropogenic pressures

The study will identify the habitats of bees in Doon Valley landscape. Comprehending the effects of disturbances on native bee communities and their habitat will help conserve their ecological functions in the natural as well as the agricultural ecosystems. The status of bees and their habitats will be assessed and monitored by involving stakeholders. Restoration of disturbed habitats of bees will be carried out through the involvement of farmers, forest authorities, rural and urban communities. Social media platforms will be

own/Region Country Continent Categories



2

### https://www.rufford.org/projects /preeti virkar

## Future Projections

- 1. Involving more farmers, forest managers and citizens
- 2. Preparing short documentaries on pollinators, their role and conservation
- 3. Assessment based habitat restoration measures involving farmers
- 4. Monitoring tools for long-term conservationseasonal and annual
- 5. Establishing a database repository on social media
- 6. Replication of the model









# Acknowledgement

- Intern, volunteers
- Farmers of Doon Valley, India
- Friends and colleagues
- Rufford Small Grant, Navdnaya Trust, ICCB and HCMF
- Dr. Eric Mader, Xerces Society, USA
- Mr. SS Rasaily, Uttarakhand State Biodiveristy Board, India
- Dr. Debjani Dey, Indian Agriculture Research Institute, New Delhi, India

# THANK YOU

### **Contributed Session Abstracts**

#### ABSTRACT SUBMISSION-2542

Taking the conservation buzz beyond research: Involving local farmers for habitat restoration and monitoring of non-Apis bees in Doon valley, India

Preeti S. Virkar<sup>\*</sup><sup>1</sup>, Virendra P Uniyal<sup>2</sup> <sup>1</sup>North Eastern Hill University, <sup>2</sup>Wildlife Institute of India, India

Please choose one of the ICCB themes from the menu to assist us in selecting an appropriate session for your presentation.: Making an impact by mobilizing local community participation in conservation efforts Sub-theme first choice: Disciplines: Category first choice: Community-driven conservation Sub-theme second choice: Ecosystems Category second choice: Sustainable agriculture Sub-theme third choice: Methods Category third choice: Conservation capacity building Please indicate your presentation preference: Oral Presentation Alternate presentation format: If your preferred format cannot be accommodated, would you wish to have your abstract considered for another presentation format? : Speed Presentation Are you an SCB member? : No Are you a student?: No Do you plan to request travel support from SCB? : Yes Are you comfortable presenting in English? : Yes Do you have any accessibility accommodation requests? Please list them below:: No Is your abstract part of a symposium?: No I am willing to review abstracts: Yes Abstract: Non-Apis bees form the vast majority of insect pollinators, however neglected due to no direct human interactions and

monetary befits similar to Apis bees. We studied the bee diversity in agroecosystems and natural areas in Doon valley, India. Doon is a subtropical-temperate landscape situated at the foothills of the outer Himalayas, a global biodiversity hotspot. Observations and pantrap sampling were used to collect data. We recorded 43 bee species and 91% of those were non-Apis. Doon valley harboured 25 rare non-*Apis* species of bees and 11 species were habitat specialist to the natural areas (clamtest; Specialization threshold K= 2/3, alpha= 0.005). We found that natural habitats around Doon valley supported bee communities in nearby agroecosystems ( $R^2 = 0.782$ , SE = 0.148, P = 0.004). Polyculture farms mimic natural habitats and support more non-Apis species compared to monocultures (Kruskal Wallis test; p < 0.001). Thus, diversity of crops/plants and bee species is interrelated and depend on each other. Conservation of non-Apis bee requires enhancement of farmers' knowledge and their active participation. Therefore, we have started a follow-up project on assessment and enhancement of non-Apis bee habitats in agroecosystems of Doon valley. The project involves long term capacity building programs for stakeholders such as farmers and managers and involving them in the identification of habitats, possible threats, habitat restoration and diversity monitoring.

**Social Media Summary - to be used in promoting ICCB :** Non-Apis bees depend on natural habitats and polyculture farms. Hence, farmers are roped-in for their conservation in Doon valley, India.