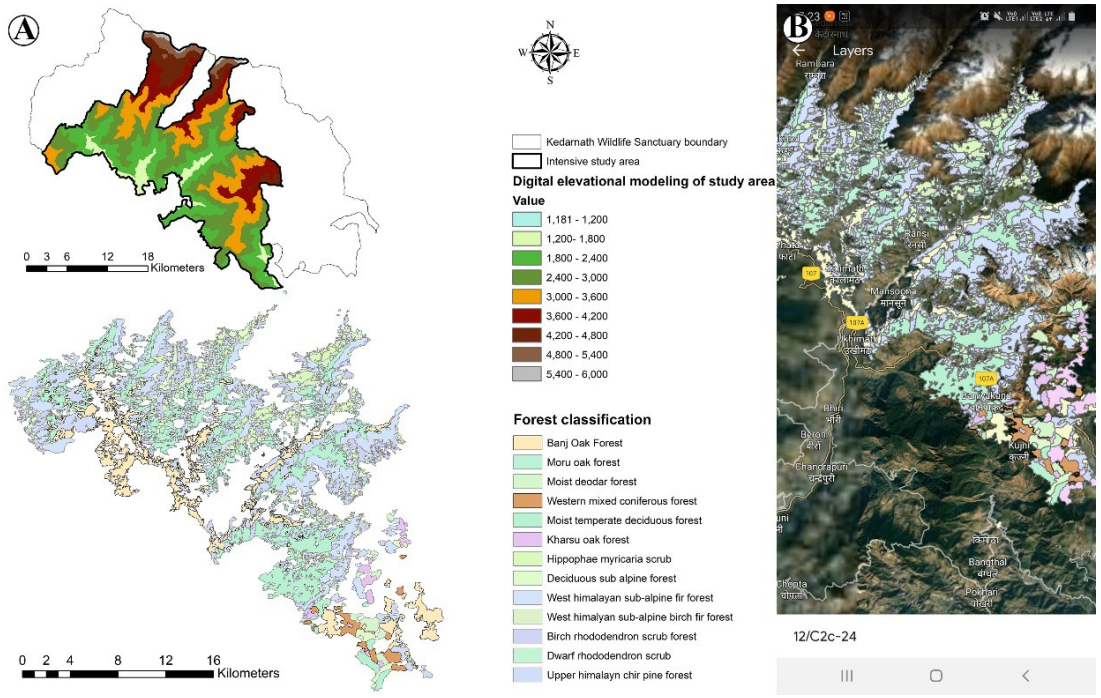
Project Update: March 2022

Work Progress

Preparation for fieldwork:
In the preparatory phase we planned and organised our study so that work can be carried out smoothly. To aid on-ground sampling, we prepared maps with the help of Digital Elevational Modelling (DEM) and forest type classifications in ArcMap software and then used these digital layer files in Google earth pro mobile phone application (Figure 1A and Figure 1B).

Figure 1 (A.) Digital elevational modelling and (B.) forest classification of the study area.



Since scientific tools and instruments are either unavailable or expensive, we had to design and assemble a few. The plastic crockery works as a great alternative to pan traps for collecting bees and is widely used by entomologists. But as they are heavy, it was challenging to carry them on long treks (>18km). So, we came up with a solution by preparing coloured pan traps from plastic disposable bowls. We painted plastic bowls with yellow, white and blue, fluorescent colours (ABRO spray paint cans). Figure 2 shows the plastic bowl pan traps.

We prepared a few instruments for the processing and preparation of museum specimens. We designed a bee drying setup that includes a drying chamber and a dryer–we used a hairdryer. Drying the pan trap sample requires a drying chamber to put the sample and pass the high-speed hot wind. We designed and built the drying chamber from the scratch by using some PVC pipe, mesh sieve, some plastic lids.

We ran troubleshoots for the development of CHDK in Canon Powershot G7X mark2. We used the motion detect plus script for enabling it as a point-focused camera trap that can produce quality images for the identification process. Despite numerous challenges, we managed to improve and also efficiently use the

set-up.

Figure 2: Preparation of Pan traps by painting disposable plastic bowls.

Fieldwork

In our fieldwork surveys, on each sampling site, we obtained data on (1) environmental parameters: heat stress index, relative humidity, temperature, etc., using kestrel professional weather meter; (2) diversity and abundance of wild bees using sweep nets (Figure 3A) and pan traps (Figure 3B and 3C); (3) pollination interactions using observations and CHDK enabled Canon Powershot as point focused camera traps (Figure 3D to Figure 3F); and (4) plant diversity using quadrats of 10X10 m (for tree), 5X5 m (for shrubs) and 1X1m (for herbs) as shown in Figure 3G and Figure 3H.

In February 2021, we started our fieldwork. We covered eight sampling locations covering Mandal Valley, low altitude Ukhimath forests and Chopta valley– chosen for the seasonal sampling based on accessibility and elevation gradient. But from April to June, the government implemented a national lockdown as a precautionary measure against the spread of COVID.

Figure 3: (A) Bee collection using sweep net, (B) Pan trap sample collection, (C) a yellow pan trap (D) CHDK enabled camera pointing paeonia emodi flower (E) Setting CHDK enabled camera on tripod in high altitude, (F) image output of CHDK enabled camera with motion detect plus script (G) measurement of tree girth for vegetation inventory, (H) 1mX1m quadrate for measuring herbaceous diversity.

This hampered our fieldwork during these months. Continuing the fieldwork, we again started sampling in July at seven locations and covered Ukhimath forests and Chopta valley (seasonal sampling). In August and September were avoided fieldwork due to heavy rainfall and thunderstorms. Finally, in October and November, we conducted fieldwork in 14 sampling sites covering Mahadeshwar valley, Mandal valley, riverine area Guptkashi and Chopta valley. The fieldwork and sampling have been summarised in the form of a map in Figure 4.

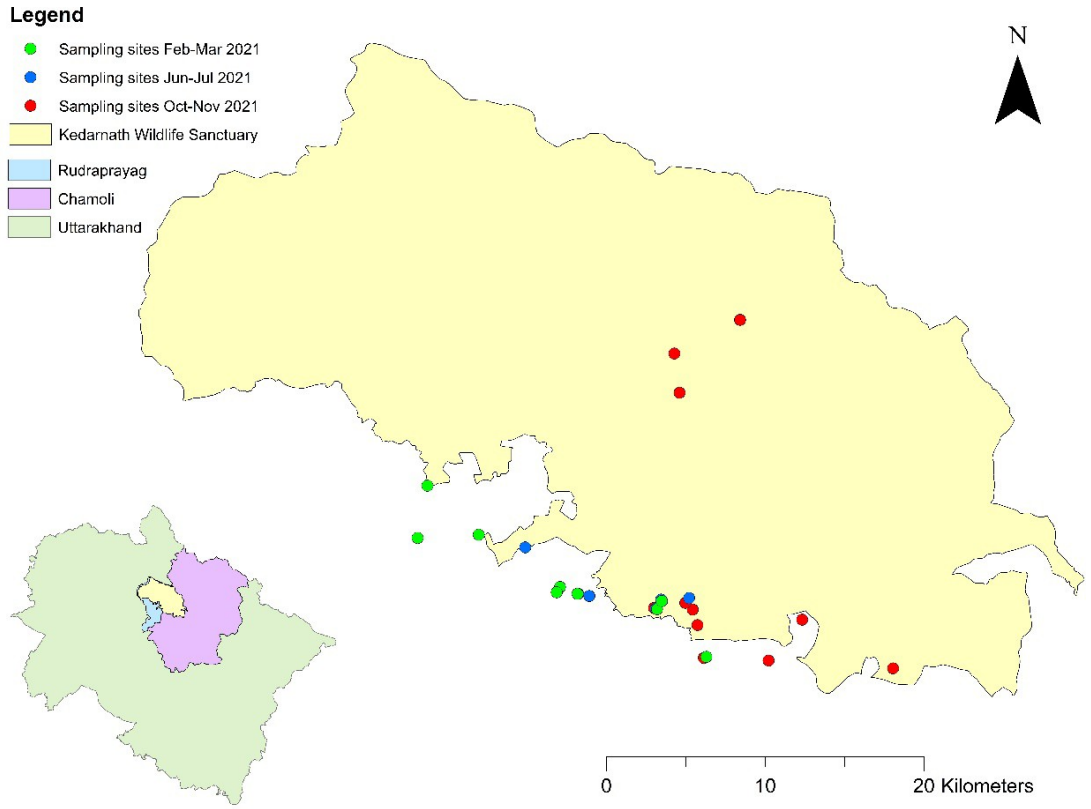


Figure 4: Sampling sites and the study area.

Lab work

Our lab work wasn't limited to the Wildlife Biology Laboratory of Wildlife Institute of India, we have also extensively administered our lab work in the field basecamp. Since the fieldwork was impossible during rainy and cloudy days, we utilised that time to process and pin the bee specimens. We have prepared and curated more than 800 bee specimens (Figure 5) in the basecamp. For curation and organisation of the specimens, we have made a bee database where all of the details about specimens are catalogued. A few essential elements from the database are also used on the specimen tag.

Figure 5: Preparation of bee specimen.

The digitalisation of the specimen is the utmost fundamental process so that the scientific community can access information right at their fingertips. We aimed to produce high-quality images of our bee specimen exploiting cost-effective lighting and other needed gears. We tried different automated multi-focus stack digital remote software on Sony and Nikon cameras and managed to achieve the image shown in Figure 6.

Figure 6: Multi focus stack image of *Apis laboriosa* prepared using field camera Sony RX10 mark 4

Awareness and Outreach programs

We divided our awareness about the significance of bees into three categories: (1) informal discussions, (2) social media campaigns, and (3) community outreach programmes. In informal discussions, we prepared a concise, informative speech for curious people who asked questions during the fieldwork. We asked counter questions to engage them and finally explained the significance of bees and requested them to spread the word to others. In the social media campaign, we focused on two major social media platforms, Instagram and Facebook. Here, we are consistently sharing engaging articles, fun-facts and photos of bees and native flora, our sampling techniques, and a glimpse of our community outreach programs. Finally, we conducted our community outreach programme with Anganwadi centers of various villages adjoining the forest areas of Kedarnath Wildlife Sanctuary which touched upon, training the youth and women on the significance of pollination services, bee habitat preferences, methods for conservation of wild bees in the forest region. In the Himalayas, women constitute the majority of stakeholders in apiculture, agriculture and NTFP collection from the forests. from the forests. Thus, our awareness programmes emphasised encouraging gender parity in the field of conservation.

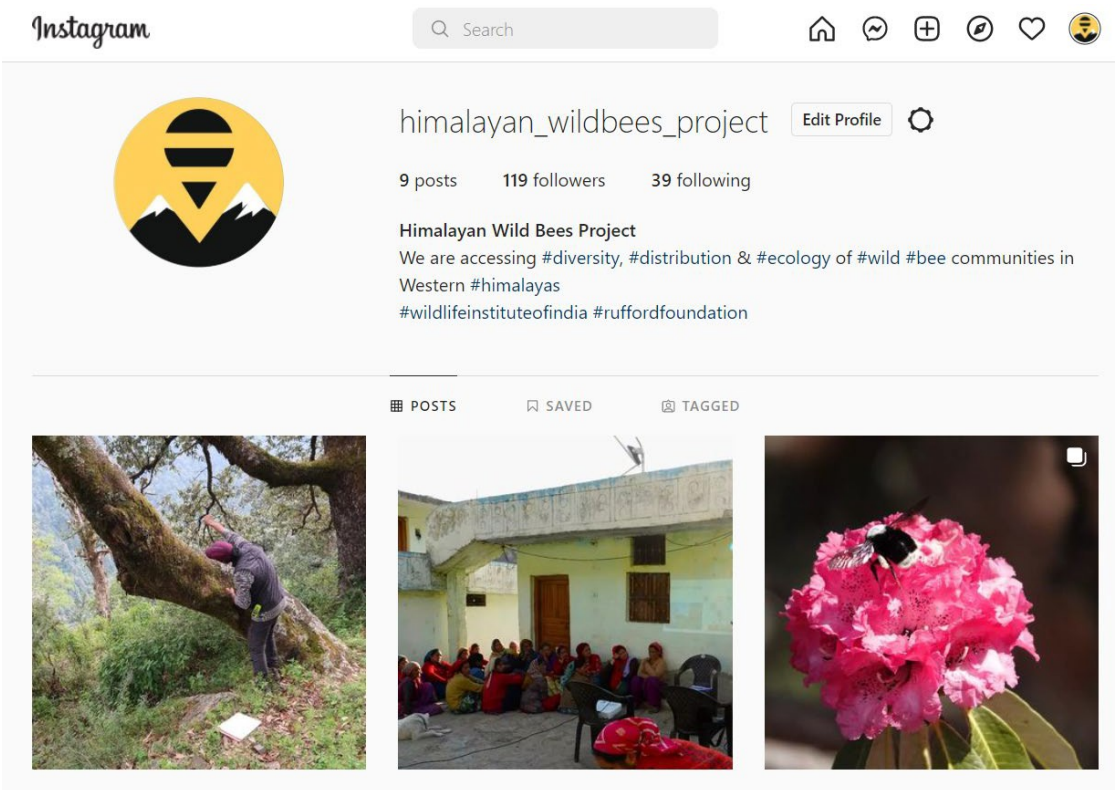


Figure 7: Screenshot of Instagram page.

Figure 8: Community outreach conducted in Anganwadi center.

Challenges

In the execution of the planned research, we encountered some expected and unexpected challenges. To start with, the feasibility of the planned sampling location is one of the expected challenges, we did tradeoffs in various aspects and conducted our sampling. Apart from that, we faced unforeseen challenges while deploying the pan traps. Cattle, goats, sheep, birds (Figure 9) and even passing-humans drank water out of our pan traps and trampled them. Six of our samples were demolished due to this and we didn't include them in our study.

The COVID outbreak has also tremendously affected our research work. The planned fieldwork for April to June 2021 couldn't be performed due to the outbreak. Furthermore, the lockdown also affected our lab work, instruments and chemical availability.

Figure 9: A Jungle crow destroying the yellow pan trap.

Future plan

- To conduct pre-monsoon seasonal sampling i.e., May to June.
- To conduct fieldwork in Kedarnath valley.
- Preparation of museum specimen of rest of the sample.
- Identification and photography of the specimen.
- Data analysis and interpretation.