**OBJECTIVE**

Assessment of historical trends in plant-pollinator phenological alignment in alpine and lowland habitats using herbarium and museum specimen collection data.

**BACKGROUND**

- **Phenology** (timing of life history events) is often cued by climate.
- Plant and animal **phenology shifts with climate change** (Figures 1 & 2).
- Many important **species interactions** are dependent on phenological alignment (Figure 3).
- Alpine habitats are sensitive to climate change; therefore, climate-related changes may be more pronounced in alpine communities.

**MOTIVATION**

- Similar trends have been observed in other taxa (Fitter & Morse, 1866).
- Alpine communities experience greater plant-pollinator phenological mismatch than lowland habitats.

**PROPOSED METHODS**

- **Species selection.** Target plants with brief flowering periods, conspicuous flowers, and extensive collection history, and bee species with brief activity periods and extensive collection history.
- **Collection data.** Collection records from online databases (CCOH and entomological databases) sorted by annual collection dates as approximations for flowering and flight periods.
- **Analysis.** Slope of linear regressions between collection date and year will estimate phenological shifts (Fig. 1). Significantly different slopes between plants and pollinators will indicate differential rates of phenological change and potential for phenological mismatch.
- **Alpine-lowland comparisons.** The magnitude of difference in regression slopes between plant and pollinators is expected to be greater in alpine species.
- **Field verification.** Model predictions will be tested by field observation of at least 50% open flowers in plant populations.

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**REFERENCES**


**CONTACT**

Please direct all inquiries to lampe@mail.csuchico.edu.