

Hypothesis

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Posted Date: 30 April 2023

doi: 10.20944/preprints202304.1246.v1

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Hypothesis

Butterflies as Indicator of Climate Change in Thimphu

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Abstract: The study aims to investigate the impacts of climate change on butterfly populations Thimphu district of Bhutan. Butterflies are indicators of environmental factors and can act as an early warning of impending changes in local flora and fauna. The study will involve citizen science with participants using iNaturalist and Seek applications to capture butterfly data in various habitat areas in the Thimphu district. The data collected will be analyzed using Statistics Kit for Social Sciences (SPSS), Nvivo, and Geographical Information System (GIS) programs. The results of the research will be disseminated through awareness campaigns to increase public understanding of the value of butterfly protection in the conservation of healthy environments. The study's findings will be used to develop conservation initiatives to maintain biodiversity and assess the impacts of climate change.

Keywords: climate change; butterfly; thimphu; bhutan

1. Introduction

Nature is constantly evolving and can be interpreted from a multidimensional perspective. In recent years, human activities have triggered drastic climate change that has impacted the wildlife ecosystem. As an ectothermic species, butterflies can be used as models to investigate the anticipated impacts of climate change. Majority of future population models for butterflies are based on an annual population growth rate, without the implementation and calculation of significant climate change scenarios, where climate change happens mainly or differently during certain seasons. The transformation in butterfly habitat can be seen as an indicator of climate change.

The aim of this research is to access the richness and variety of butterfly fauna data in the Thimphu district. According to a Citizen Science project which was launched by the National Biodiversity Center through the Bhutan Biodiversity Portal, states to have collected data on 533 butterfly species from all parts of Bhutan (Sbordoni et al. 2015). However, there are limited studies on butterflies conducted in the Thimphu districts. This project will disseminate knowledge and values on the importance and role of butterflies in the conservation of healthy environments through awareness campaigns. It will increase awareness among local residents, students and related groups about the value and need of butterfly protection. Citizen science projects are becoming prominent these days, and it's a great way to identify and collect data.

2. Literature review

Butterflies are increasingly regarded as important environmental markers, for their swift responses to subtle landscape or climate change. The ecologist used butterflies as model species to study the consequences of habitat loss, fragmentation, and climate change (Manzoor, B., Sadat, H. B., & H. 2013). Butterflies are the most taxonomically studied groups which have gained fair recognition worldwide (Ghazoul, 2002). Research claims that climate change has contributed to the decline of butterfly species (McLaughlin et al. 2002) and habitat destruction. Butterfly populations have a rapid effect on climate change and may serve as early warning of changes in the local flora and fauna (Batra, 2005). Butterflies are accurate markers of environmental factors (Thomas et al., 2004). With a relatively short life-cycle and host-plant reliance, butterfly communities show quick impact to climate change and can act as an early warning of portending shifts in the surrounding flora and fauna (Batra 2005).

3. Methodology

3.1. Study Area

Thimphu is the capital of Bhutan with an area of 1,745,868 sq. km in the western part of the country. Thimphu is situated at 27° 27' N latitude and 89° 38' E longitude at an altitude of 2330 meters above sea level. Thimphu district has eight gewogs¹ which are further split into forty chiwogs² with 196 villages and 1,930 households (Dzongkhag Administration, 2017). The district has 64% of its area under forest. In the year 2017, the annual average of maximum temperature was 23 degree Celsius and 7 degree Celsius as minimum temperature (National Statistics Bureau of Bhutan, 2017).

3.2. Sampling

Butterfly species can be caught and captured using butterfly nets and cameras (phone camera). iNaturalist and search should be used by the participants since it is user-friendly and now everybody has access to smartphones and the internet. Sampling sites will be chosen for various habitat areas during the research. The GPS coordinates with their altitudes can be registered using the iNaturalist and Seek applications. Butterflies can be found using both the search app and iNaturalist.

3.3. Data Collection Methods and Instruments

Butterflies can be directly or indirectly regulated by the local microclimate. Butterflies' surveillance will help researchers learn about climate change and its effect on the reproductive biology and survival of butterflies. The goal of this project is to record the butterflies in Thimphu in order to discover the variety and effects of climate change. Citizen science will be carried out by the general public and the student population to help the researcher gather a vast volume of data with minimal connections and funding. Project participants will submit their results to the iNaturalist program. In order to start a research project, I need to gather enough information on the subject. I will encourage the cooperation of the schools and the company involved by going to their location and inviting them to help me gather and analyze a vast volume of data, which would otherwise be a difficult job. I would illustrate to the participants the key purpose and goals of promoting their contribution.

3.4. Data Analysis Methods

The data collected from the participations would be analyzed using the SPSS program (Statistics Kit for Social Sciences) and the Nvivo software would be used for qualitative data analysis. I will also use GIS (Geographical Information System) to prepare maps to display the data. Pictures posted by participants will be used to encourage readers to interpret the result as pictures talk louder than other sentences. That can also encourage city councils, governments, and other related organizations to take timely steps to track climate change.

4. Conclusion

The research would show the richness of butterfly fauna and butterflies as an indication of data deficit in the Thimphu district of Bhutan. This research will show a rich diversity of butterflies in the region. The region needs more data on butterflies and known areas of possible butterfly occurrence. The findings of this research will be used to take steps to conserve the natural environment for lepidopteran diversity and to assess the changing climate. A detailed understanding of this initiative on the protection and maintenance of biodiversity should also be encouraged. In order to develop a deeper understanding of butterflies as markers, long-term research, along with awareness-raising campaigns, are required to educate and track their forests themselves in the long run.

Reference

¹ Gewog is an administrative division composing a group of villages in Bhutan.

² Chiwogs of Bhutan refer to the 1044 basic electoral precincts of Bhutan.

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