PROCEEDINGS OF

CAPACITY BUILDING PROGRAMME ON CLIMATE CHANGE AND WILDLIFE

Date: 27th January 2022 (Thursday), 11:00 AM to 1:00 PM

Mode: Zoom Online Meeting

Organized by: Mizoram State Climate Change Cell, Mizoram Science, Technology & Innovation Council (MISTIC), Directorate of Science & Technology, Govt. of Mizoram.

BACKGROUND AND OBJECTIVE

The programme was conducted as a part of the activities for the proposed project based on the objectives which aims to meet the requirements of the underlying objectives of the National Mission for Sustaining the Himalayan Ecosystem (NMSHE), with an aim to sensitize and build the capacity of research and academic circle of the state institutions with regard to the scope and prospects of research in climate change. The capacity building programme emphasize on Climate change and wildlife.

Faculties, students, research scholars of concerned departments from different institutions, colleges, Mizoram University were invited to participate in the programme. A total 36 participants from such institutions attended the programme. E-certificates were issued to participants who completed the programme.

Detail programme/agenda and screenshots of the programme is attached at the annexure.

INAUGRAL PROGRAMME

Dr. H. Laldinpuii, Project Scientist-I, State Climate Change Cell was the host for the webinar. Er. H. Lalsawmliana, CSO & Member Secy. MISTIC, gave the welcome address where he welcomed all the participants and gave a brief introduction about the State Climate Change Cell and the main objectives of organizing the webinar.

TECHNICAL SESSION

During the technical session of the webinar, two distinguished speakers made their presentations. A brief record of presentations and discussions are summarized as below:

1. **New Data and Directions for Climate Change: What we need to be studying –** Dr. David Bickford, Professor (Associate), National University of Taiwan.

The presentation by Dr David Bickford can be summarized in the following points:

i) Human-induced climate change is a major threat for both biodiversity and humans. It affects abiotic determinants of biodiversity like temperature, UV-radiation and moisture. Biodiversity is sensitive to fluctuations in all of these climate variables.

ii) To assess the vulnerabilities of different species to climate change, a new approach in laying out some of the abiotic pressure, biotic pressure and human response pressure was taken.

iii) Temperature will get warmer with high certainty while precipitation is more variable with greater uncertainty.

iv) Early predictions where globally 18-35% of species predicted to be highly vulnerable to extinction due to climate change (Thomas et al., 2004). Early predictions have come true in many parts of the world and hopefully not as much in India.

v) Many tropical species have narrow temperature tolerances and are already close to their physiological limits.

vi) Other climate change predictions that have come true-a)Distribution: Moving to higher latitude/altitude. b) Phenologies: Timing of events shifting ecologically. Things are happening earlier in seasonal habitats when things warm up faster for example. The most important factor is the interaction of different species and that timing of intreraction becomes offset.

vii) Case study in Papua New Guinea Frogs started in 1995 before ENSO drought 1997-98. Important to monitor projects before impact (before an event happens) to be able to determine the impact of that event.

viii) Opportunity to survey works done in frogs back in 1929 in Borneo for his post doc where they resurveyed 6 sites that they were highly confident that they have selected back in the day. There was a difference in the distribution of frogs in 1929 and during the study period.

ix) As temperature increase metabolic rate of plants/ectotherms increase exponentially.

x) Physiological energy budgets-organisms have a certain amount of calories they can spend in a certain way. There is only three ways they do this. They survive and next most important is reproduction while they can easily choose to give up is the capacity not to pour as many calories into growth. This is at the bases of the universal response to climate change and that is why it is thought that a majority of organisms are shrinking. A study was done on fossils, experimental and comparative studies as well as recent evidences and all kinds of paper were cited. Shrinking body size seems to be a really important response to climate change and is one of the aspect that can be easily studied.

xi) A framework outline of the different things happening with climate change was given. Precipitation is highly variable and can go upwards or downwards. Temperature in general going upwards with certainty. The direct and indirect effects were also explained.

xii) Assessing the vulnerabilities of species and the framework used was explained. The assessment of vulnerabilities enable sensible prioritization of research effort and allocation of resources.

xiii) Climate change challenges were discussed. In monitoring projects, baseline (i.e., timing) is important. To know why the biophysical changes are happening, it is important to study the thermal ecology, importance of moisture vs temperature for different kind of organisms. These data are also useful to know what the deviation is from the norm.

xiv) The best time to start research monitoring projects in climate change is to start now. To identify the species that are to be the target species and to have expertise on the ground so that if changes occur, some of the reasons for that changes can be understood.

2. **Impacts of climate on Biodiversity: Insights from Sikkim-Darjeeling Himalaya**- Dr. Bhoj Kumar Acharya, Associate Professor, Department of Zoology, Sikkim University.

   i) The presentation started with a report of assessment of climate change by IPCC in which he highlighted some of the important points like:

      a. The recent changes in climate change are widespread, rapid and intensifying, and unprecedented in thousand of years.
      b. Unless there are immediate, rapid and large scale reductions in greenhouse gas emissions, limiting warming to 1.50C will be beyond reach.

   ii) Future cumulative CO_2 emissions differ across scenarios and determine how much warming we will experience. A graph of historical and projections cumulative CO_2 emissions was presented which showed that CO_2 emissions might crossed 4500 GT in 2050.

   iii) With every increase in global warming, changes get larger in regional mean temperature. Annual mean temperature change(^oC) at 1^oC warming, annual mean temperature change (^oC) relative to 1850-1990, annual mean precipitation change (%) relative to 1850-1990 and annual mean total column soil moisture change (standard deviation) was explained with figures as given by IPCC AR6 (2021).

   iv) Projected changes in extremes are larger in frequency and intensity. Frequency and increase in intensity of extreme temperature event that occurred once in 10 years on average as well as once in 50 years on average in a climate without human influence with graphs was explained.

   v) Mountains are more vulnerable to climate change as climate change is expected to have greatest impact in high latitude/ elevation.

   vi) Impacts to the biological world like modifications in species assemblages, spatial and temporal mismatches in nutrient dynamics, alteration of species' phenologies, shifts of species' ranges and niches, evolutionary changes, increased intensity of diseases and pests and coral bleaching was highlighted.

   vii) Three times (approx.) higher rate of warming (0.06^oC) than the global average was reported for the Himalaya region. Temperature in the Himalaya is rising at twice the average rate of warming in the northern hemisphere. A

warming of generally 0.01-0.04^{o}C per year are being experienced in the Eastern Himalaya. There is a shift in 250-300m in the distribution range with an increase in 1^{o}C.

viii) Species found in the Himalaya tend to undergo range shifts, range expansion, range contraction, upward shifts of tree lines and tree limits, changes in community structure and composition, changes in phenology, increase competition and invasive species.

ix) Case study of Sikkim- Darjeeling Himalaya on plants was discussed, endemic plant species of the region showed a mean upward displacement of 27.53 m/decade during the period 1849-2010. There was an upward shift of tree lines by 67m and tree limits by 45m during 1923-2003. It was highlighted that 16% and 18% of endemic angiosperm species are likely to lose their potential habitat by 2050 and 2070, respectively. Meadows may likely lose about 1 and 3% of their current geographical spread to shrublands by 2050 and 2070 respectively. Herbaceous communities are expected to lose approximately 71-213 km^2 of their current geographic area within 70 years.

x) Case study of Sikkim- Darjeeling Himalaya on mammal was discussed. It was highlighted that species like argali, gazelle, kiang, blue sheep are most vulnerable group as their population dynamics will be affected by climate change.

xi) A Case study of birds in Sikkim- Darjeeling Himalaya showed that there was an elevational range shift, delayed breeding activities, reduction in clutch size, low reproductive success in some bird species.

xii) An upward migration of herpetofauna was observed in Sikkim. There was an advance breeding in amphibians where their breeding season was advanced by a month or so.

xiii) A biased sex ratio- a case of snake in Sikkim. The sex determination by temperature where warmer temperature favors females. Trachischium guentheri showed skewd sex ratio (M:F=1:1.6).

xiv) Butterflies in Sikkim also showed elevational range shift. Some of these species include Yellow Swallowtail, Knight, Red Lemon Pansy and Lacewing (female).

xv) The distribution of Ophiocordyceps sinensis has been impacted by climate change. A reduction in suitability of habitat is observed for future projections.

xvi) The perception of climate change by local community in the Khanchendzonga landscape was also discussed.

xvii) Vulnerability index of administrative units and PA's within Kanchendzonga Landscape was shown in tabular manner.

xviii) The presentation concluded with the following points:

a. A clear trend of rise in temperature and variability along the elevational range in Darjeeling-Sikkim Himalaya was observed.
b. There is a reduction in the amount of precipitation where rainfall months decreased but the intensity increased. Winter became warmer and drier with the decline in winter rain.
c. A 90% loss of endemic species from the Himalaya has been reported,
d. Habitat is shifting towards higher latitude and altitude.
e. Alpine habitat will be encroached by woody shrubs altering the communities.
f. High elevation species can be trapped in mountain summit due to low adaptive capacity and highest sensitivity.
g. In context of climate change protected areas will not be adequate to enhance the adaptive capacity of species and ecosystems.

INTERACTION SESSION

An interaction session was opened by the host Dr. H. Laldinpuii where the participants actively asked the resource persons questions related to their presentations and research work.

CONCLUDING SESSION

The session ended with a vote of thanks given by Mr. Lalthanpuia, Project Scientist-II, State Climate Change Cell, MISTIC. He thanked the resource persons for making time out of their busy schedule and all the participants of the webinar.

Annexure I

CAPACITY BUILDING PROGRAMME ON CLIMATE CHANGE AND WILDLIFE

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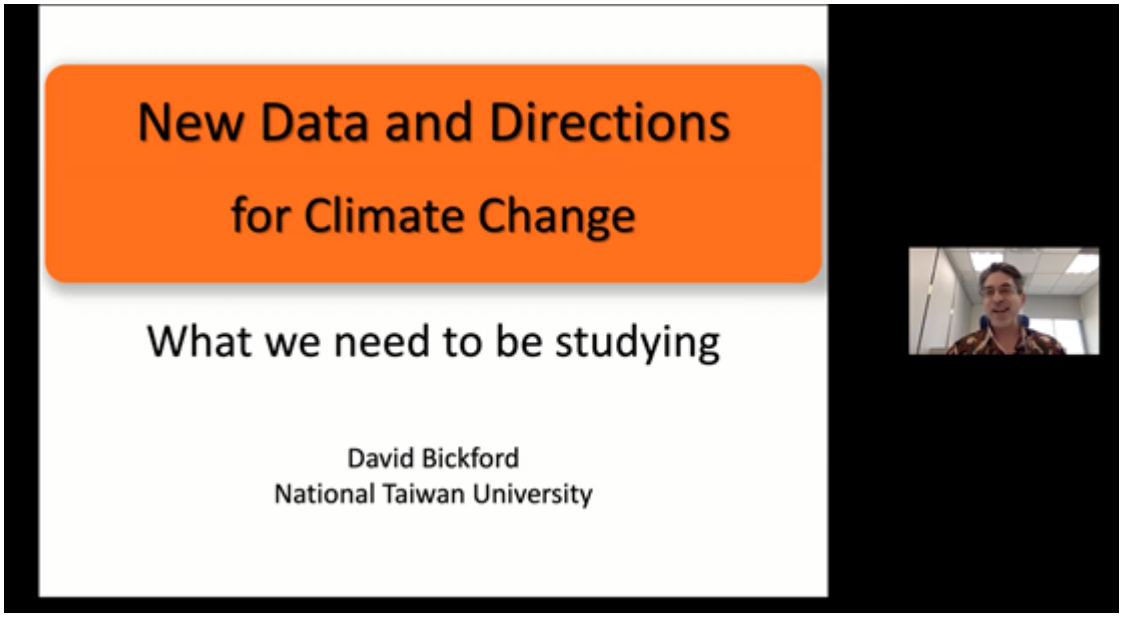
TIME	PROGRAMME DETAILS
Host	Dr. H. Laldinpuii, Project Scientist-I, SCCC
11:00 AM to 11:10 AM	Welcome Address: Pu H. Lalsawmliana, Chief Scientific Officer & Member Secretary, MISTIC, DST, Govt. of Mizoram.
11:10 AM to 11:50 PM	**Presentation:** David Bickford, Ph.D., Professor (Associate), National Taiwan University, Taipei
12:00 PM to 12:40 PM	**Presentation:** Dr. Bhoj Kumar Acharya, Associate Professor, Department of Zoology, Sikkim University.
12:40 PM to 1:00 PM	Interaction
1:00 PM to 1:10 PM	Concluding Remarks by Pu Samuel Lalmalsawma, Senior Scientific Officer, MISTIC

You may join the programme by directly by using the following url
https://us02web.zoom.us/j/3095438501?pwd=K0ljWXVMZ1Q2U1JuMFNqQUdBUFFNQT09
or by entering the details: Meeting ID: 309 543 8501 Passcode: 123456

Annexure II


New Data and Directions
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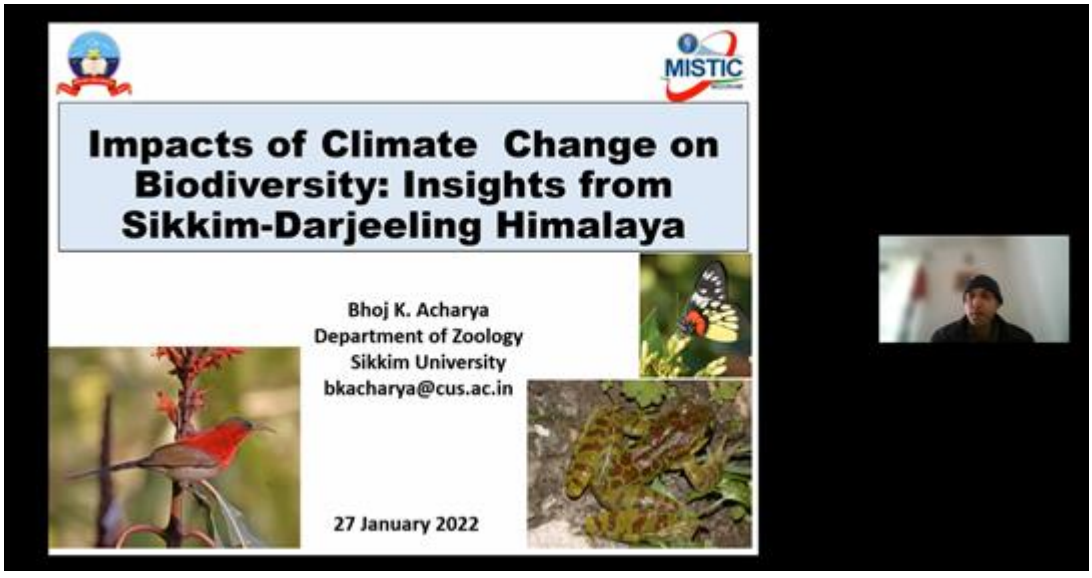
MISTIC
Impacts of Climate Change on Biodiversity: Insights from Sikkim-Darjeeling Himalaya
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