Traditional knowledge, weather prediction and bioindicators: A case study in Mizoram, Northeastern India

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The tribal peoples of Mizoram formerly forecasted the weather through applications of long-standing Traditional Ecological Knowledge. In this study, 16 distinct bioindicators for weather forecasting based were documented working with tribal peoples. The bioindicators were based mainly on the recognition of unique situations, the behaviour of insects, birds and mammals, characteristics of plants, and location, timing and patterns of clouds, lightning, wind, moon, sun and stars. The successful application of the forecasting knowledge is based on comparison with past events, good prognosis, close observation and a thorough understanding of the local environment. Community members, cultural leaders and local elders have observed recent anomalies in the weather, with unusual rains and abrupt changes in temperature. Due to this phenomenon, some plant species are changing their growth patterns. This type of Traditional Knowledge has excellent potential for wider application, yet, in Mizoram, as elsewhere, there is a threat to people’s livelihoods and bicultural diversity. Today, more than ever, there is an urgent need to document all traditional knowledge and folklore among the diverse ethnic communities before the traditional cultures are completely lost.

Keywords: Biodiversity, Mizoram, Weather forecasting, Traditional Ecological Knowledge, Bioindicators

Traditional Ecological Knowledge is employed to mean knowledge, innovations and practices of Indigenous and local communities embodying traditional life-styles. It is wisdom developed over many generations of holistic traditional utilization of the lands, natural resources, and environment. This knowledge is generally passed down from generation to generation by experiential learning and by word of mouth and is, for the most part, undocumented in written form. Mizoram, the 23rd state of the Indian union, covers an area of 21,087sq.km and is situated between Myanmar (Burma) and Bangladesh (Fig. 1). There are a variety of forest types in the state which are of immense value to humankind. These forests are threatened by various anthropogenic disturbances, including shifting cultivation, industrial logging, extraction of fuel wood by local villagers, industrialization and urbanization in some parts of the state such as Aizawl. In NE India, where the economy is predominantly agrarian and rural, nearly 80 percent of the population depends on agriculture. Tribal peoples working in subsistence agriculture constitute about 27% of the population, and nearly 87% of the people reside in a depressed economic state in nearly 43,000 villages.

Fig. 1—Location of study areas
Materials and methods

The aim of this study was to document the traditional Indigenous knowledge of some bioindicators used for weather forecasting and assessing climate change, in order to assist cultural preservation and renewal, among different tribes of Mizoram, especially the Hmar, Paihte and Mara peoples.

The study is based solely on data collected from the primary sources: from scheduled interviews, group discussions with local elders; personal interaction; and telephone communications. Various discussions with five experienced local elders from each village were conducted. Three districts [Aizawl (Tanhril, Muthi and Seling villages), Champhai (Champhai, Ngaizawl, Hnahlan villages) and Saiha (Saiha, Theiva, Tuipang villages)] were covered during the study period of 2009-2010 (Fig. 1). Observations were made on site, wherever bioindicators were identified. [Although data collection was tedious one because the indigenous peoples are hesitant to transfer their indigenous knowledge acquired from their ancestors since the time immemorial. Besides, there was no literature and well documented data in the study area before].

Results

In all, 15 bioindicators related to weather forecasting were identified and documented from our interviews and discussions with Traditional Knowledge Holders. The indicators pertain to distinctive features of birds, insects, fish, plants, and clouds, relating to weather, drought, natural calamities, and we found them to be generally valid.

1. Bamboo Partridge, Vahlah (Bambusicola fytchii): If male bamboo partridges roar frequently during spring and summer in the morning after sunrise, rain is expected in the immediate future. Similarly, when it rains in the morning, the roaring of the bamboo partridge at this time indicates that the rain will soon stop for that day in that location.

2. Field cricket, Perhpawng (Gryllus pensylvanica); If a cricket brings new soil particles out of its hole during the dry season, it is thought that rain is coming soon (Fig. 2). If the same activity occurs during the rainy season, a heavy rain is expected during the season.

3. Winged termite, Phingphihlip (Reticulitermes sp.): When these insects come out of the soil in a group after a rainfall occurs, it is believed that rain will not come again for some time (Fig. 3). If there was no rain in the previous day or week but the insects are coming out of the soil, rain is expected to come soon.

4. Corn field ant, Fanghmir (Lasius alienus): When there are a number of ants moving along a path carrying their food items with them, a heavy rain is expected on the same day, or within one or two days.

5. Common Frog, Uchang (Rana temporaria): If the frogs croak in a water body in the afternoon until sunset, rain will be coming soon, even during winter and spring season.

6. Bird/Hen and cock, Arpuî/arpa [scientific name?]: If local domestic chickens search for food even during the rain, it is commonly thought that the rain will last for the whole day. But if the birds stop searching for food when it is raining and take shelter (in the morning or afternoon), the rain is expected to cease soon and to be minimal.

7. Location, pattern of clouds (blackish colour), Chhum dum: When the clouds are thick and black in colour, and are arranged perpendicular to the orbit of the sun in the morning, it is said that rain is approaching.

8. A person having sciatica problem: Nowadays, a patient suffering from sciatica is said to be able to foretell weather phenomena according to their body temperature and the pain in the affected body part (One man, Mr. Ngawihkhonang (L) (1945-2006) was known to forecast weather (humidity, temperature and rainfall) three or four days ahead, through the temperature of his body part (foot, leg, ear or forehead) affected by sciatica. The people of Ngailzawl village were dependent on his weather forecasting ability.

9. Bug species (brown in colour, medium side, living both at the edge of the river and in the forest according to the weather conditions), Tiauhmi (consumed as curry): If this particular bug is found under a stone on the bank of the river after the monsoon season, it is said that the autumn season is over and winter is beginning. If this bug species is found in the forest during summer, it is expected that rainfall and flooding are about to begin.
10. Dried ripen chilli *Solanum frutescense* and dried tobacco leaves (*Hmarcha rep*): If dried chillis become moist except during the rainy season, it indicates high humidity and imminent rain.

11. Flowering pattern of peach species, *Theite par* (*Prunus* sp.): If peach or plum flowers grow from the basal region to the terminal of the tree in flowering season, it is predicted that there will be a good rain and higher crop production than in other years. This indicator has been accurate until today.

12. Fish species, *Nghavawk* (*Channa* spp.): When harsh climatic conditions (drought) prevail during the summer season, some local elders would go to the river to catch this particular fish species. They would take it up to a hilltop, open its mouth, put small quantity of salt in it, then turn it so that its head is pointing toward the east. This practice is said by the ancestors to call summer rains.

13. Soil moisture and ground water level: During the spring and summer seasons, the villagers might turn over any stone or border stone near a river or a hillside in an open space and or clearing within the tree canopy. If the soil under the rock or under the surface is moist it is thought that summer rain is approaching.

14. Water bubble formation, *Puakkau* (*Paihte dialect*): If water bubbles forms at any place on the surface of a flowing or stagnant waterbody, particularly during a morning rain shower, it is thought that the rain will last for whole day. My experience confirmed that this indicator was applicable.

15. Cloud colour, time, direction and location of appearance in the sky: *Chhum rawng, lan hun leh hmun, a hawidan*: If a reddish colour cloud is seen at sunset one western horizon (Fig. 4), rain is predicted to come within two to four days. If there is thick cloud toward the south or north, the rain will be more on that side within the region. If the sky is full of reddish coloured clouds appearing after a long rainfall, it is a sign that the rain will not come again in that particular season.

**Discussion and conclusion**

The bioindicators are carefully selected, since the tribes noticed that only these living organisms are able to indicate the coming weather condition through their keen observation and thorough understanding of the environment. Weather indicators are mostly of living organisms and is mainly based on the recognition of unique situation, assessed with the behaviour of insects, birds, animals, the location and pattern of cloud, wind, the Sun, the star, the moon, lightning, agriculture crops, etc. The tribe also gave specific names for each calendar month, based on particular expected conditions. For example, May is called *Tomir thla* after “Tothli”, a wind carrying rainfall that occurs during this month. Rain falling during spring and summer (January to February) is called *Khengpui zun*; rain during the second week of November is called *Ai-ruah*; and rain in December is called *Fawdelh Ruah* (*pawl* means paddy (rice) straw. As per the natural cycles of the monsoon rains, appearance of the full moon, and disappearance of the
Climate change represents probably the greatest human induced threat to our planet and its biodiversity of all time (Intergovernmental Panel on Climate Change). Globally, climate change and its effects on biocultural diversity are being recognized. However, climate change and its impact on Indigenous communities and local biodiversity are difficult to document systematically because they are so complex. It is seldom realized that cultural traditions help in preserving and continuing plant related practices and skills, which ultimately play a direct role in conservation of indigenous biodiversity. The experience and knowledge of generations of indigenous people have largely contributed to sustainability of the community in their day-to-day living and in their health-care systems and agricultural systems as well. These knowledge systems including bio-meteorological need to be explored, studied, characterized and documented before they are lost under the onslaught of ongoing and future developmental projects.

Realizing the importance of folklore in the lives of Mizo society, it can be concluded that the indigenous systems of knowledge represent a tri-confluence of knowledge, culture and development. Hence, there is an urgent need to record all the information among the diverse ethnic communities before the traditional culture is completely lost. Often, the tribe’s are exploited by the modern societies and they are forbidden to apply the traditional knowledge with which their lives are strongly interwoven with the natural ecosystem and local environment.

The knowledge on weather and climate held by local and tribal communities can play significant role in developing location package of practices for specially agriculture. Knowledge of weather and climate of local people could be integrated with local planning and strategies in mitigation and adaptation. However, the formal and informal knowledge systems of local and Indigenous peoples (often called TEK) need to be documented, and tuned after careful refinement and validation. N the other hand, local and tribal communities need to be trained and exposed towards the new development and research works in climate change science.

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