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Birds as Bioindicators of Traditional Weather Forecasting among the Sumi Tribe of Nagaland, India

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Short Research Article

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ABSTRACT

Aims: This study was undertaken to document the birds that act as bioindicators of weather forecasting among the Sumi tribe of Nagaland, India.
Study Design: The study was carried out using a qualitative design.
Place and Duration of Study: The study was carried out in 4 villages of the Zunheboto district-Shiyepu, Sukhalu, Natha old and Natha new. It was conducted for a period of 2 years, i.e., 2016-2018.
Methodology: Convenient and snowball sampling were used. Information was gathered from 200 respondents, through In-depth interviews and focus group discussions, targeting elders (women and men) above 40 years of age. The respondents included elders, farmers, hunters, folk tellers and bards who also shared their stories from different events of observation and decades of experience. Questionnaires were prepared and administered by the researcher while a topic guide was also used for the focus group discussions.
Results: The study listed few birds and their significance in weather prediction by the Sumi tribe of Nagaland, India. The singing of cuckoo (*Cuculidae)* means it is time to start sowing seeds in the fields; possibility of rainfall through the singing of partridge (*Perdix perdix*); flight of yellow-throated

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laughing thrust (*Garrulax galbanus*) indicating fair weather or rain/storm; migration of Amur Falcon (*Falco amurensis)* to Nagaland indicating the coming of colder season; prediction of floods through the height of birds' nest- long-tailed wren babbler (*Spelaeornis chocolatinus*) and rusty-capped fulvetta (*Alcippe dubia*) and onset of warmer season (rainy season) through the abundance of sparrows (Passeridae); the perching behaviour of grey-crowned warbler (*Seicercus tephrocephalus*) and bamboo partridge (Bambusicola fytchii) predicting fair or adverse weather and the behaviour of domesticated chickens (Gallus gallus) searching for food during rain means the rainfall will continue.

Keywords: Birds; bioindicators; traditional weather forecasting; Sumi; Nagaland.

1. INTRODUCTION

The Sumi tribe is one of the major tribes in Nagaland, India. They mainly inhabit the Zunheboto district, also known as 'the land of warriors', with a total area of 1225 km^2. They are closely associated with nature, and one such association worth mentioning is the use of their environment in traditional weather prediction.

Ethnic tribes and local people are experts in their own environment and are well versed with its ways. One such knowledge they possess is to forecast weather through the environment. Tribal people are very astute weather watchers and are quick to recognise weather conditions [1]. Local weather forecasting often combines empirical observations and weather predictions through the phenological patterns of plants and the behaviour of birds and other animals [2]. It is very probable that a meteorological- sensibility allows certain animals to react to atmospheric variations and then indicate important weather phenomena [3].

Birds can sense changes in barometric pressure as weather front approaches [4] and may alter migratory behaviour to avoid poor weather conditions [5,6]. A study conducted in Swaziland found that if the nesting of yellow weaver bird (*Ploceus flavipes*) is done high up in the trees next to the river, floods are anticipated and vice versa [7]. Bird indicators in Tanzania such as the singing of Malachite sun bird (*Nectarinia farmosa*), the white- browed coucal (*Centropus superciliosus*) and the red-winged starling (*Onychognathus morio*) after a prolonged drought would indicate the imminent onset of rains and a good rainy season [8]. It was further reported that when chickens move around picking food during rain, people regard that as an indicator of plentiful rain for that season [9].

Furthermore, the onset of rainy season in Tripura, India is also predicted by the chirping of birds such as black-throated sunbird (*Aethopyga saturate*), orange bellied leaf bird (*Chloropsis hardwickii*) and grey headed canary fly catcher (*Culicicapa ceylonensis*) [10].

Farmers in Malawi and Botswana highlighted that indigenous forecasts tend to be more accurate and simple to understand as opposed to the complex nature of scientific forecasts that require sophisticated equipment and formal education and training and financial investment [11] and also the simplicity and timeliness of traditional weather forecast is commendable [12].

All these studies have been of vital help to many communities who are dependent on local information for their agricultural activities. There is a need for research in traditional methods to compliment modern weather forecasting so as to produce more reliable and valid information for end users [13].

The present study is an attempt to list and document birds and their behaviour, activity, nest structure, flight, appearance and abundance which helps in traditional weather forecasting.

2. MATERIALS AND METHODS

The study was carried out in 4 villages of Zunheboto district- Shiyepu, Sukhalu, Natha old and Natha new. Zunheboto is situated at an elevation of 1800 m above sea level and enjoys a moderate version of a humid subtropical climate and semi-evergreen forests. The Sumi tribe has inhabited these villages for more than 150 years. The study was conducted for a period of 2 years, i.e., 2016-2018. In this study, Convenient and snow ball sampling [14] were used and information was gathered through in-depth interviews and focus group discussions, targeting elders (women and men) above 40 years of age as the elders were known to be experienced and were the real custodians of traditional knowledge. Information was gathered

from 200 respondents (50 respondents from each villages respectively) - elders, farmers, hunters, folk tellers and bards who also shared their stories from different events of observation and decades of experience. The respondents per village was equally divided, i.e., 10 elders, 10 farmers, 10 hunters, 10 folk tellers and 10 bards. Questionnaires were prepared and administered by the researcher while a topic guide was also used for the focus group discussions. The issues questioned were on- if there is any traditional knowledge related to weather forecasting; how it helps them to know about the weather beforehand; if they still rely on these indicators in present times and the challenges faced in preserving this precious community knowledge. All villages reported variant species which were used as indicators of weather prediction, however, only those species which were common and still reliable were generalised and reported in this study.

3. RESULTS

10 species were reported in this study.

1. Common name: Cuckoo
   Local name: Khashopapu
   Scientific name: *Cuculidae*
   When this particular bird sings, it meant that it is time to start sowing seeds in the field. People still follow this indicator.

2. Common name: Sparrow
   Local name: Shoqheti/ Tughashoqhe
   Scientific name: Passeridae
   The appearance of sparrows and their availability is an indicator that winter had ended and warmer season has begun.

3. Common name: Domesticated chickens
   Local name: Awu
   Scientific name: *Gallus gallus*
   Amidst the rainfall, if chickens move around and pick food, it is understood that rain is going to last the entire day. However, if the chickens rest, then it is understood that rain will stop after a while. The villagers then decide their daily chores and activities.

4. Common name: Amur falcon
   Local name: Inami laqu
   Scientific name: *Falco amurensis*
   This bird migrates from Siberia to Nagaland en-route to their final destination-Somalia, Kenya and South Africa every year. Their arrival marks the beginning of the colder season.

5. Common name: Partridge
   Local name: Agili
   Scientific name: *Perdix perdix*
   When this bird sings after sunrise, it is concluded that rain in imminent. However, if it sings while raining, then it is an indication that rain will stop for that day in that particular location.

6. Common name: Long-tailed wren babbler
   Local name: Ashomi kushowu ghau
   Scientific name: *Spelaeornis chocolatinus*

   Common name: Rusty-capped fulvetta
   Local name: Marutsa Kutsuqho ghau
   Scientific name: *Alcippe dubia*
   The villagers predict floods from the height of these birds' nests near water bodies. If the nest is built at the crown of the tree, it indicates flooding. On the other hand, if the nest is built lower to the ground, it indicates less or no rainfall.

7. Common name: Yellow-throated laughing thrust
   Local name: Akunu ghau
   Scientific name: *Garrulax galbanus*
   Clear weather is expected if birds fly high in the sky. However, if birds' flight is comparatively lower than normal, then adverse weather is anticipated.

8. Common name: Grey-crowned warbler
   Local name: Kutsuqho ghau
   Scientific name: *Seicercus tephrocephalus*

   Common name: Bamboo partridge
   Local name: Akhawu agili
   Scientific name: Bambusicola fytchii
   If birds are seen continuously perching on lower branches of trees, then it is an indication that strong winds or storm is approaching.

9. Common name: Sparrows
   Local name: Shoqheti/ Tughashoqhe
   Scientific name: Passeridae
   If sparrows dip in water and chirps, then rainfall is imminent.

Table 1. Bird indicators, their significances and citation frequency

Common name	Local name	Scientific name	Behaviour	Prediction	Citation Frequency
Cuckoo	Khashopapu	Cuculidae	Singing	Sowing of seeds	50
Sparrow	Shoqheti/ Tughashoqhe	Passeridae	Appearance/ Abundance	Warm season	30
Domesticated Chickens	Awudu/ Awuli	Gallus gallus	Pick food during rain	Rain will continue	48
			Rests during rain	Rain will stop	
Amur falcon	Inami laqu	Falco amurensis	Migration	Cold season	50
Partridge	Agili	Perdix perdix	Singing	Rainfall	28
Long-tailed Wren babbler	Ashomi kushowu ghau	Spelaeornis chocolatinus	Height of their nests	Flooding	45
Rusty-capped fulvetta	Marutsa kutsuqho ghau	Alcippe dubia			
Yellow-throated laughing thrust	Akunu ghau	Garrulax galbanus	Flight	Fair or adverse weather	35
Grey-crowned warbler	Kutsuqho ghau	Seicercus tephrocephalus	Perching behaviour	Strong winds/ storm	28
Bamboo partridge	Akhawu agili	Bambusicola			
Sparrow	Shoqheti/ Tughashoqhe	Passeridae	Dipping in water and chirping	Rainfall is imminent	22

4. DISCUSSION AND CONCLUSION

The relationship between the Sumi tribe and their environment is highlighted through these ingenious ways of predicting weather with birds as indicators. Table 1 shows the different birds and its significances in weather prediction along with the citation frequency, the highest being the prediction of Cuckoo (Cuculidae) - 50, Amur falcon (Falco amurensis) - 50 and Domestic chickens (Gallus gallus) - 48, while the lowest citation was of the dipping behaviour of sparrows (Passeridae) - 22.

The study reported the singing of cuckoo (*Cuculidae*) to aware the farmers that it is time to sow seeds in their field as it is the beginning of spring [15]. The abundance of birds such as sparrows (Passeridae) is an indication of warmer season [16]. The Sumi tribe also predicted weather through the flight of bird such as yellow-throated laughing thrust (*Garrulax galbanus*),i.e., if they fly high, then clear weather is expected, however, if they fly low, then rain/storm is expected. Some birds fly low because they chase insects at a level near the ground as the rain clouds approach, the downward current of air blows insects down and birds that originally catch insects high in the air have to follow them close to the ground [17]. Another possibility of rainfall is through the singing of partridge (Perdix perdix) [18] In addition, in October every year [19], huge population of Amur falcons (Falco amurensis) arrive in Northeast India from Siberia enroute to the final destination- Somalia, Kenya and South Africa. Their temporary settlement in Nagaland to fatten up themselves before embarking on the latter stage of the migration indicates the coming of colder season [20,21].

Not only rainfall, but storm is also predicted through the perching behaviour of grey-crowned warbler (*Seicercus tephrocephalus*) and bamboo partridge (*Bambusicola fytchii*) - if these birds are seen perching on the lower branches of trees, then it is understood that strong winds or storm is approaching [22]. It was also found out that if birds like sparrows (Passeridae) dip themselves in water and chirp loudly, then it is an indication that rain is on its way [23,24].

Flood is also predicted by the height of the birds' nests -tailed wren babbler (*Spelaeornis chocolatinus*) and rusty-capped fulvetta (*Alcippe dubia*) - if the nest is built at the crown of the tree near water bodies, then flood is expected, however, if the nest is built closer to the ground, then there will be less or no rainfall for the season [25]. Another common indicator of predicting rainfall is the domesticated chickens- if they move around picking food even whilst rain, then rain will continue, however, if it takes shelter from the rain, then rain will stop in sometime [26].

These age-old practices cater to the need of the community to ascertain the weather beforehand. The Sumi tribe of Nagaland takes pride in showcasing their traditional wisdom through their manifestations of age-old practices. They are still dependent on these indicators for forecasting the weather till today. The community also revealed that these indicators do not betray their prediction and has been accurate. However, the depressing fact is the deteriorating value of traditional knowledge. The custodians of these wisdoms are passing away and the younger generations are ignorant about their traditions and under value it. This calls for a dire need for documentation of traditional knowledge before it vanishes forever.

5. RECOMMENDATION

The study does not deal with the comparison of scientific weather forecasting with indigenous forecasting or their integration in future to help diverse communities and hence, possible integration of both the knowledge could be essential for the further study.

CONSENT

Prior Informed Consent was first taken from the village heads and after the permission was sought and approved, the informants were also asked for their consent, prior to the interview and discussion. There was a good rapport between the researcher and the informants and information was collected accordingly through In-depth Interviews and Focus Group Discussions.

ETHICAL APPROVAL

The villagers were made aware that the information sought was for mere academic purpose and not for profit-oriented project. The researcher assured the respondents that they have every right to withdraw from the discussion and conversation anytime they felt like and no compulsion and force will be exerted on them if they refuse to participate. They can question the objectives of the study and the researcher will answer to it without any secrecy and hesitation.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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