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Biomimicry in Apatani Textile Designs: Faunal Inspirations from the Ziro Valley, Arunachal Pradesh

Misso Anu[1], Dr. Bengia Papi[2], Prof. Ashan Riddi[3], Dr. Akanksha[4], Abhinav Kumar[5]

[1]Research Scholar, Department of History, Rajiv Gandhi University (RGU), Doimukh – 791112, Arunachal Pradesh

[2]Research Scholar, Department of Sociology, Rajiv Gandhi University (RGU), Doimukh – 791112, Arunachal Pradesh

[3]Professor, Department of History, Rajiv Gandhi University (RGU), Doimukh – 791112, Arunachal Pradesh

[4]Assistant Professor, Department of Science and Humanities, CHRIST University, Kengeri, Bengaluru – 560074, Karnataka

[5]Divisional Forest Officer, Seppa Forest Division, Seppa – 790102, Arunachal Pradesh

Abstract:

The traditional textiles of the Apatani tribe from Ziro Valley, Arunachal Pradesh, reflect a deep connection with the local environment. This study examines how elements of local wildlife - particularly species from the families Lepidoptera, Phasianidae, and Elapidae - have influenced textile patterns and motifs. Based on fieldwork in selected villages and interviews with weavers, elders, and priests, the study identifies several species, including Gallus gallus and Bungarus caeruleus, as likely sources of design inspiration. The limited range of colours available from locally sourced plant-based dyes also shaped the choice of faunal forms reproduced in textile work. Among the textiles studied, the Zillang Pulye and Zikhe Tarii show strong symbolic and visual associations with these species. This paper attempts to document such traditional knowledge, grounded in ecological familiarity and expressed through textile design. The study also suggests that similar investigations could be undertaken across other indigenous communities in Northeast India.

Keywords: Arunachal Pradesh, Indigenous community, Apatani tribe, Ziro valley, Ethnic tribal designs, Biomimicry.

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Introduction

Indigenous communities across the world have historically maintained a close relationship with their natural environment, especially in ecologically rich and geographically remote areas. In such contexts, survival has often depended on a deep understanding of local biodiversity and the development of resource-use practices that ensured long-term sustainability. These practices are frequently embedded in cultural, spiritual, and material traditions, including textile design. (Berkes 1993)

The Apatani tribe, residing in the Ziro Valley of Lower Subansiri district in Arunachal Pradesh, presents a compelling example of this ecological-cultural interdependence. With a rich oral tradition and a deep historical association with their landscape, the Apatanis have developed a sophisticated knowledge system that informs both daily practices and ritual life. Among these, textile weaving—predominantly undertaken by women—reflects a blend of aesthetic choice and cultural symbolism rooted in the local environment. (WIPO Report 2012)

Early post-independence ethnographers, notably Verrier Elwin, observed that textile motifs among hill tribes in the region often mirrored the natural forms around them. In his study of the Idu Mishmi tribe, Elwin described woven designs that resembled the wings of butterflies, the markings of fish, and the skins of snakes. These patterns were not merely decorative but carried symbolic meanings, rooted in cultural memory and lived experiences. (Elwin 1961)

This form of design imitation aligns with the modern concept of biomimicry—defined as the adaptation or derivation of patterns and strategies from biological systems for human use. In the context of Apatani weaving, biomimicry is seen not only in the motifs but also in the constraints imposed by the limited availability of naturally derived dyes from local flora. (Vincent 2006)

Despite these early insights, there has been little systematic inquiry into how specific faunal species have influenced the textile patterns of Arunachal Pradesh's tribes. While extensive documentation exists on both wildlife diversity and textile heritage in the region, few studies have attempted to synthesize these domains. For the Apatani tribe in particular, motifs suggest visual parallels with species from families such as Lepidoptera, Phasianidae, and Elapidae, yet these associations have not been studied in detail.

This study addresses that gap by examining how traditional Apatani textiles reflect ecological familiarity with local wildlife. Based on field interviews, photographic comparisons, and secondary ecological data, the research identifies species embedded in textile design, and shows how available natural dyes helped shape colour choices. It is a first attempt to systematically document this convergence of traditional knowledge and material culture in the Ziro Valley.

Material and Methods

Study Area

The present study was conducted in the Ziro Valley of Lower Subansiri district in Arunachal Pradesh during the year 2021–2022. The valley lies within the Eastern Himalayan biodiversity hotspot and is characterised by a temperate climate, with an elevation ranging from approximately 1,500 to 1,750 metres above sea level. The Tale Wildlife Sanctuary, one of the important protected areas of Arunachal Pradesh, is also located in Lower Subansiri district. The sanctuary contains numerous important species of flora and fauna, some of which are endemic to the region.

The Apatanis have traditionally identified themselves settled in seven villages located in the Ziro valley. In the study, field data has been collected from the following four of these

villages: Hari (27.38°N, 93.84°E), Bulla (27.40°N, 93.84°E), Hong (27.32°N, 93.85°E), and Tajang (27.38°N, 93.84°E).

Data Collection

The present study has used a mixed-methods approach, combining primary and secondary sources. Primary data has been collected through field visits, structured interviews, and group discussions. In each village, more than 15 individuals—including weavers, village elders, and priests—were randomly selected as respondents. Women weavers have been taken as the core response group, as weaving has been traditionally carried out by the female members of the Apatani community.

The questions in the interviews mainly focussed on the design elements of traditional fabrics, the symbolic meanings of motifs therein, and any known connections between textile patterns and local fauna as per the oral tradition. To help in this identification, respondents were shown both photographs of selected faunal species—selected by the authors—and samples of actual Apatani fabrics were actually carried during the interviews. This simultaneous comparison enabled better visual mapping between specific textile designs and corresponding species as recalled by the respondents.

Secondary Sources

Secondary data for the present study included official records from the District Industries Centre, historical accounts present at the district library, and selected publications from the Department of Environment, Forests and Climate Change, Government of Arunachal Pradesh. In particular, the 'Wildlife Management Plan of Tale Wildlife Sanctuary' and the book 'Butterflies of Tale Wildlife Sanctuary' by Sondhi et al. (2021) were used to provide a comprehensive list of wildlife species.

Results and Discussion

Dye Sources and Colour Limitations

The cold climate of Ziro Valley has historically made woollen clothing essential for survival, particularly shawls, among the Apatani tribe. Shawls (*Pulye*) are a quintessential aspect in the tribe's cultural identity and are used also for ritualistic purposes like marriage, ritual of passing etc. Further, the colour combinations used in these shawls have been limited by the availability of natural dyes derived from local plant species. Prominent among these are *Pyrus pashia* for black, *Rubia cordifolia* for red/orange, *Clitoria mariana* for blue, and *Magnolia montana* for yellow (Mahanta 2005). These sources restricted the options of colours to be used in fabrics to black, red/orange, white, yellow, and blue, which in turn influenced the various species that could be used as inspirations in textile design.

Faunal Inspirations in Textile Motifs

***Zillang Pulye* – Priestly Shawl**

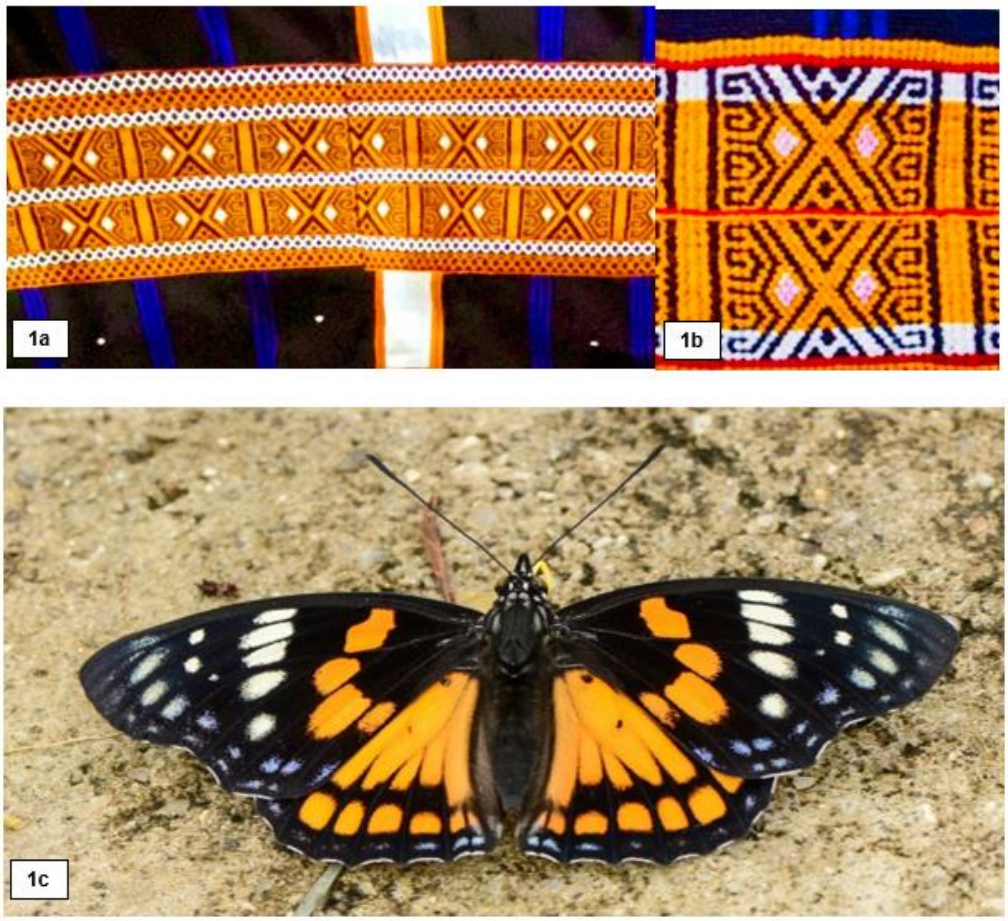
The *Zillang Pulye* is the most important of the Apatani shawls, traditionally worn only by priests (*Nyibos*) during major festivals of the tribe such as Myoko, Murung, Dree, and Supung. Its central motif, *Ami Agung*, contains two main elements:

a) *Paro Ami* – Translates as "eye of the chicken", symbolically linked to *Gallus gallus*, which is a species commonly used in sacrifices.

b) *Buyu Kejang* – Refers to the "intestine of a tadpole", evoking themes of metamorphosis and spiritual regeneration.

Interview data and visual pattern analysis suggest that the complex symmetry, spiral eyespots, and colour segmentation found in the *Zillang Pulye* share a striking resemblance with *Lexias dirtea* or the Eastern Courtier butterfly (family Nymphalidae). The butterfly's

black wings with distinct orange and white spots align closely with the shawl's colour scheme and banded structure.



Figures 1a: The *Zillang Pulye* shawl showing central Ami Agung band; 1b: Close-up of *Ami Agung* motif: X-form and spiral eyespots; 1c: *Lexias dirtea* (Eastern Courtier butterfly)

***Pyaming Pulye* – Ceremonial and Funerary Shawl**

The *Pyaming Pulye* is used by men during ceremonies and rituals of transition, such as *Mabo Inchi* (marriage) and funerals. Respondents offered an evocative description: "It's a butterfly with fire-tipped wings that fly high and bright." This aligns with *Hebomoia glaucippe*, or the Great Orange Tip butterfly (family Pieridae), commonly seen in Arunachal Pradesh. The butterfly's bright orange forewing tips, black borders, and white hindwings are visually echoed in the shawl's colour arrangement of alternating orange, white, and black bands on a white background. These colours are achieved using *Rubia cordifolia* (orange), undyed yarn (white), and *Clitoria mariana* (black), enabling natural replication of the butterfly's palette.

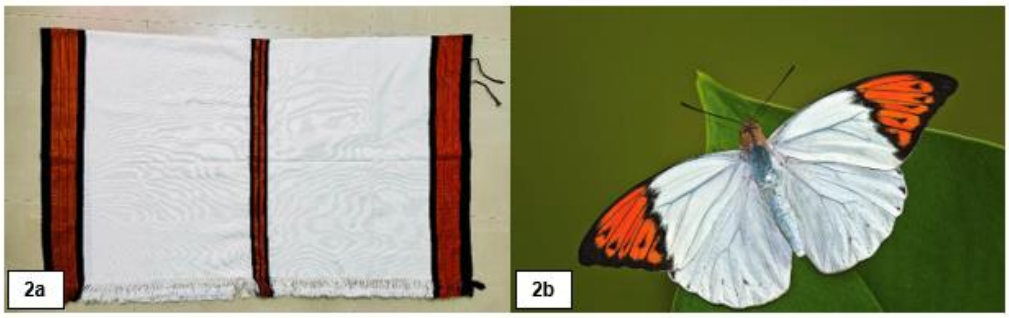


Figure 2a: The *Pyaming Pulye* shawl; 2b: *Hebomoia glaucippe* (Great Orange Tip butterfly)

***Zikhe Tarii* – Snake-Inspired Coat**

The *Zikhe Tarii* is a festival coat worn by Apatani men, notable for its black background, interlinked white diamond motifs, and red-orange highlights. Folklore attributes its design to mimicry of *Bungarus caeruleus* (Bengal Krait), a snake whose patterned skin is feared and respected. The design serves a protective and symbolic role: men traversing forests traditionally believed that wearing the pattern of the krait would deter the snake itself. This belief is reinforced by oral histories of the mythical *Buru*, a feared reptilian figure. The visual overlap between the coat and the snake's markings is unmistakable.

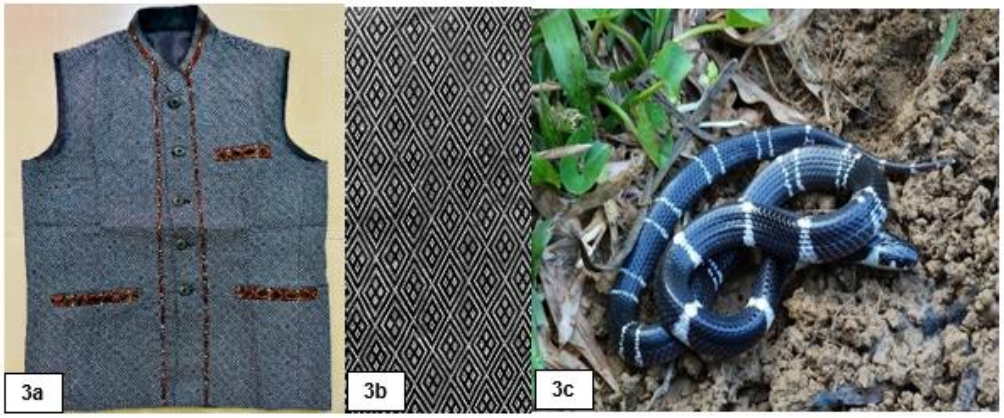


Figure 3a: The Zikhe Tarii coat; 3b: Close up of the main motif; 3c: Bungarus caeruleus (Bengal Krait)

Fabric Type / Garment	Primary Dye Sources	Faunal Inspirations
Zillang Pulye (Priestly Shawl)	*Pyrus pashia* (black), *Rubia cordifolia* (orange/red), *Clitoria mariana* (blue), *Magnolia montana* (yellow)	*Lexias dirtea* (Eastern Courtier butterfly), *Gallus gallus* (domestic chicken), Tadpole intestine (symbolic)
Pyaming Pulye (Ceremonial/Funerary Shawl)	*Rubia cordifolia* (orange), Undyed yarn (white), *Clitoria mariana* (black)	*Hebomoia glaucippe* (Great Orange Tip butterfly)
Zikhe Tarii (Festival Coat)	*Pyrus pashia* (black), *Rubia cordifolia* (orange/red)	*Bungarus caeruleus* (Bengal Krait snake)

Table 1: Summary of fabrics with corresponding dye sources and faunal inspirations

Conclusion

This study demonstrates that the traditional fabrics of the Apatani tribe of Ziro Valley are not only products of artistic skill but also repositories of ecological knowledge and symbolic interpretation. By linking specific design motifs with locally known faunal

species, such as *Lexias dirtea*, *Hebomoia glaucippe*, and *Bungarus caeruleus*, the research shows the conscious or intuitive use of biomimicry in Apatani weaving traditions that have been present since centuries without the . These motifs are shaped not only by visual familiarity with wildlife but also by the practical constraints and possibilities of locally available plant-based dyes.

The findings underscore how indigenous textile design is guided by a triadic relationship between cultural symbolism, ecological surroundings, and material resource use. The textiles serve as living records of biodiversity, encoded in patterns that continue to be woven, worn, and passed on through generations. Documenting such knowledge systems is especially important today, as traditional practices face the dual pressures of cultural homogenization and ecological loss. This study not only adds to the ethnographic understanding of tribal weaving in Northeast India but also offers a model for interdisciplinary inquiry—one that connects wildlife conservation, cultural heritage, and sustainable livelihoods.

Future research could extend this approach to other tribal groups in Arunachal Pradesh, exploring how their unique ecological settings similarly shape material culture. The integration of scientific identification with indigenous narratives offers a promising path forward for both conservation and cultural documentation.

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