Ethnomusicological perspective on plant derived musical instruments among the Koch Rajbongshi community of Assam, India

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Research

Abstract

Background: Traditional knowledge forms an important part of the cultural heritage of indigenous communities. The Koch Rajbongshi community have rich traditional knowledge of making and use of various musical instruments. These instruments are deeply associated with the social, cultural and religious life of the community and are widely used during different festivals, rituals and traditional performances. Thus, the primary aim of this study is to explore and document the traditional knowledge of musical instruments used by the Koch Rajbongshi community.

Methods: Qualitative research work was conducted through using formal semi-structured questionnaires and interviews with local knowledgeable persons, craftsmen, and village elders. Ethnomusicological information on plants parts used, methods and cultural significance of musical instruments was documented and analyzed. Plant specimens were collected and identified following standard protocols accordingly.

Results: A total of 25 plant species belonging to the families Poaceae, Meliaceae, Anacardiaceae, Arecaceae, Moraceae, Bignoniaceae, Asparagaceae, Simaroubaceae, Fabaceae, Cucurbitaceae, Rhamnaceae, Apocynaceae, Lamiaceae and Rutaceae were documented to be used in the manufacture of musical instruments. Sixteen musical instruments i.e., Dotora, Bena, Aar bashi, Dhol, Sarinda, Rashamadhuri, Dhak, Shanai, Mukhabanshi, Korka, Akhrai, Ghuglung, Khapi, Tarap- tarap, Khunjuri and Khol were identified as important instruments used during various cultural and social events by the Koch Rajbongshi community in Assam. In addition to plant materials, several other natural resources including animal skin and plant-based fibres were found to play a significant role in the construction of these traditional musical instruments.

Conclusions: The study describes the co-relationship between the community and natural resources in the preparation of these musical instruments. Documentation of this traditional knowledge on use of plant-based materials has immense importance in preserving the cultural legacy of the Koch Rajbongshi community.

Keywords: Ethnomusic; Indigenous communities; musical instruments; natural resources

Background

Traditional knowledge is a cumulative body of beliefs, practices, and skills developed by indigenous communities through long-term interactions with their environment and transmitted across generations (Ulman & Singh, 2024). Such knowledge forms an integral part of cultural identity and reflects the ecological, social, and spiritual relationships between people and nature (Suresh, 2023; Sewell, 2004). Among various cultural expressions, music serves as a powerful medium for preserving traditions, communicating social values, and maintaining community cohesion (Merriam & Merriam, 1964). Folk music, in particular, acts as a repository of collective memory and cultural heritage, linking generations through rituals, festivals, and oral traditions (Choudhury & Neogi, 2013; Liu *et al*., 2024). Traditional musical instruments are essential components of indigenous music systems that play significant roles in religious ceremonies, agricultural festivals, and social gatherings (Syiem, 2013). Plant-derived musical instruments are therefore more than functional objects that represent a distinctive interface between biological diversity, traditional craftsmanship, and cultural expression.

The northeastern state, Assam is one of the most culturally diverse and is a home to several indigenous communities with rich musical traditions (Boruah & Srivastava, 2024). Among them, the Koch Rajbongshi community possesses a vibrant cultural heritage expressed through folk songs, rituals, festivals, and traditional musical instruments (Hoque, 2025). Instruments such as Dotora, Sarinda, Dhak, Dhol, Khamak, and Shanai primarily constructed from plant and animal-based materials are widely used during cultural and religious festivities of Bash puja, Hudum Deo puja, Marai puja, Doul jatra, Kati puja and Sonarai puja. Similarly, Akhrai, Korka, Khol, Bena, Ghuglung, Sarinda, Rashamadhuri, Aar Bashi, Mukha Bashi, Khunjuri and Tarap-tarap are widely used in performing devotional songs besides marriage ceremonies, other auspicious occasions related with deity worship, agricultural and ritualistic ceremonies. The knowledge associated with these instruments encompasses not only their musical functions but also the identification and sustainable use of locally available plant resources, selection of appropriate plant parts, traditional processing methods, craftsmanship, and culturally specific modes of use. Mature woods of plants such as *Dalbergia sissoo, Gmelina arborea, Artocarpus heterophyllus, Mangifera indica, Azadirachta indica, Alstonia scholaris*, shells and fruits of *Aegle marmelos, Lagenaria siceraria, Cocos nucifera, Crescentia cujete*, fibres of *Dracaena trifaciata, Areca catechu, Caryota urens*, culms or stalks of *Bambusa vulgaris, B. balcooa, Arundo donax* etc. are basically used in making musical instruments. Selection of these plants are primarily guided by their seasonal availability, resistance to wood decay, durability, mechanical strength, wood texture, ease of processing and traditional preferences of the instrument makers. Such knowledge represents a dynamic knowledge-practice-belief system developed through long-term interactions between communities and their surrounding environments (Constant & Tshisikhawe, 2018). In many indigenous and local communities, knowledge of biological resources is transmitted through family, apprenticeship, community practices, and direct interaction with the environment, and may therefore remain largely oral and localized (O'Neill *et al*., 2017; Constant & Tshisikhawe, 2018). Thus, knowledge associated with instrument making represents an important yet often overlooked aspect of ethnobotanical heritage.

Despite the recognized cultural importance of Koch Rajbongshi music and their traditional musical instruments, systematic ethnobotanical documentation of the plant species and plant parts employed in their manufacture remains limited, particularly in the lower Brahmaputra valley of Assam. Existing literature has largely emphasized the musical, folkloric, or broader cultural dimensions of the Koch Rajbongshi tradition, while comparatively limited attention has been given to the biological resources used in traditional musical instrument construction and the indigenous knowledge associated with their identification, selection, harvesting, processing, and preparation. This constitutes an important research gap because ethnobiological knowledge is frequently fragmented, orally transmitted, and unevenly documented, with substantial portions of such knowledge remaining within specific communities or groups of knowledge holders (O'Neill *et al*., 2017; Constant & Tshisikhawe, 2018). The continuity of these knowledge systems may further be affected by changing socio-economic conditions, modernization, and transformations in traditional modes of knowledge transmission (Constant & Tshisikhawe, 2018).

Ethnobiological research has also demonstrated that documenting species-use relationships and engaging local knowledge holders can provide valuable information for identifying biocultural priorities, supporting context-specific conservation strategies (O'Neill *et al*., 2017). Furthermore, documenting traditional knowledge and its modes of transmission is important for maintaining cultural continuity, particularly where changing social and economic conditions may weaken intergenerational transmission (Constant & Tshisikhawe, 2018). In view of the limited scientific documentation and the growing threats posed by cultural change and loss of traditional knowledge, the present study was undertaken to document the plant species and plant parts used in the manufacture of traditional musical instruments by the Koch Rajbongshi community of lower Brahmaputra valley of Assam, and to explore their cultural significance and traditional uses. Thus, the

study aims to contribute to the conservation of indigenous knowledge systems and the preservation of rich musical heritage of the community.

Materials and Methods

Study area and rationale for site selection

The present study was conducted in selected Koch Rajbongshi inhabited villages of Kokrajhar, Bongaigaon, and Dhubri districts of Lower Assam, northeastern India. Geographically, the study area falls within the Lower Brahmaputra Valley and extends approximately between 25°28′-26°54′ N latitude and 89°40′-90°38′ E longitude (Fig.1). The three districts were purposively selected because of their geographical continuity within Lower Assam, the established presence of Koch Rajbongshi communities, and the persistence of traditional knowledge relating to plant resources and folk musical instruments. Census 2011 demographic and mother-tongue datasets were consulted to characterize the demographic and linguistic context of the selected districts and sub-districts. The Census provides district, sub-district and sex-specific population information and mother-tongue distributions for Assam, including Kokrajhar, Bongaigaon and Dhubri (Census, 2011). Because Koch Rajbongshi is not represented as a single directly comparable category in the relevant Census tables, village-level identification was additionally based on preliminary field reconnaissance, local administrative information and consultation with community elders, Gaon Burahs (village headmen), traditional artisans and other knowledgeable residents. The selection was therefore purposive rather than statistically random. Ten villages were selected to provide geographical and ecological representation of Koch Rajbongshi settlements and to encompass variation in the availability of plant resources used for traditional musical instruments. The selected villages were Bhotgaon, Chandrapara, Dimalgaon and Falakata in Kokrajhar District; Boitamari and Dangtol in Bongaigaon District; and Tamarhat, Gauripur, Golakganj and Agomoni in Dhubri District. The selected sites represent a range of ecological settings, including riverine areas, forest-associated habitats and hillocks such as Alokjhari, Chakrashila and Nakkati Hills, which are locally important sources of raw materials for traditional musical instruments.

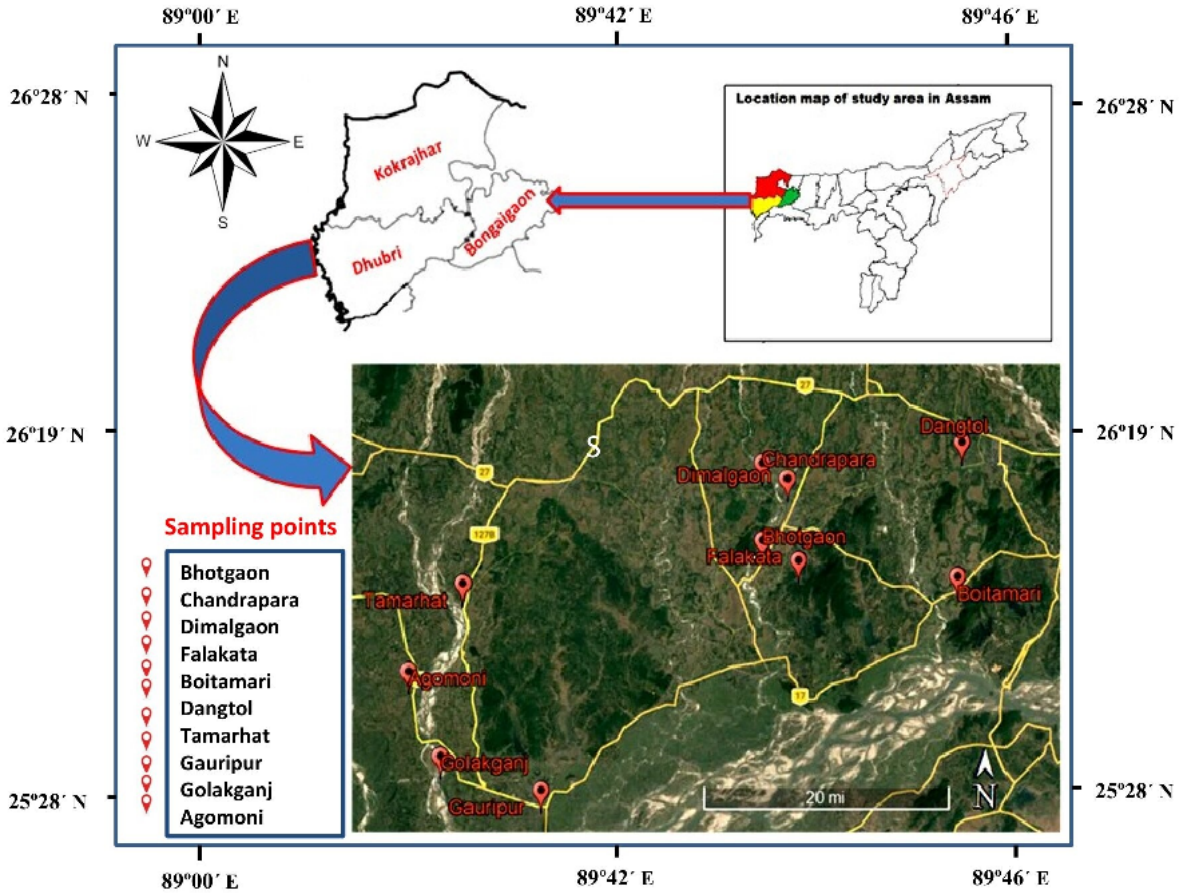


Figure 1. Map of Lower Brahmaputra valley, Assam, India, showing the study area

Ethnobotanical and Ethnomusicological Data Collection and Documentation

Field investigations were conducted from February 2025 to March 2026 following established ethnobotanical approaches (Jain & Rao, 1987; Martin, 1995). Preliminary phytogeographical and phytosociological reconnaissance was undertaken to identify representative study locations and assess the availability of plant resources used in traditional musical-instrument manufacture. A purposive sampling strategy was adopted to identify information-rich participants possessing knowledge of traditional musical instruments and associated plant resources. Primary data were collected from 83 respondents (46 male and 37 female) across ten villages, including village elders, traditional instrument craftsmen, musicians, Gaon Burahs, folk artists, priests, festival organizers and regular users of forest and other plant resources.

Table 1. Location of the selected study villages

Districts	Sub-Districts	Name of Villages	Locations	No. of respondents
Kokrajhar	Parbatjhora	Bhotgaon	Lat 26.357738 Long 90.241493	11
		Chandrapara	Lat 26.445043 Long 90.239233	7
		Dimalgaon	Lat 26.427787 Long 90.273028	14
		Falakata	Lat 26.245194 Long 90.115038	7
Bongaigaon	Bongaigaon	Boitamari	Lat 26.321666 Long 90.499638	8
		Dangtol	Lat 26.473411 Long 90.502629	2
Dhubri	Golakganj	Tamarhat	Lat 26.301376 Long 89.848591	5
		Gauripur	Lat 26.070202 Long 89.956993	10
		Golakganj	Lat 26.105794 Long 89.823516	12
		Agomoni	Lat 26.200597 Long 89.779180	7

A semi-structured questionnaire was developed based on the objectives of the study and relevant ethnobotanical and ethnomusicological literature. The questionnaire addressed vernacular plant names, plant parts utilized, sources and availability of raw materials, harvesting and processing practices, instrument-construction techniques, instrument types and classification, sound-production mechanisms, cultural and ritual significance, occasions of use, and changes in resource availability and traditional manufacturing practices. The questionnaire was pre-tested with five knowledgeable respondents in Bhotgaon village, Kokrajhar district, and subsequently revised to improve clarity and cultural relevance. The final questionnaire was administered through face-to-face semi-structured interviews, generally lasting 30-45 min. Informal interviews and unstructured conversations were additionally conducted during field walks and visits to households, workshops, forests, markets and festival sites to obtain contextual information. Focus-group discussions involving community elders, artisans, musicians and festival organizers were conducted to document collective perceptions of the cultural significance and use of musical instruments. Information obtained through individual interviews, informal interactions, focus-group discussions and direct observations was triangulated and cross-checked with other knowledgeable participants before inclusion in the final dataset. Prior informed consent was obtained from all participants before interviews and documentation. Participants were informed about the objectives of the study, the nature of the information sought and its intended academic use. Participation was voluntary, and participants were free to decline questions or withdraw at any stage.

Individual informants were purposively selected based on their demonstrated knowledge, experience, and active or previous involvement in traditional musical-instrument making, playing, cultural practices, and the use of associated plant resources. The number of respondents varied among villages (2-14) because of differences in the availability of knowledgeable individuals, their willingness to participate, and the distribution of traditional knowledge within the communities. Interviews were conducted in regional languages specifically Assamese, Rajbongshi, or in Bengali depending on the participants' linguistic preferences. With participants' consent, interviews were documented through field notes, organized and coded thematically according to plant resources, instrument types, manufacturing techniques, sound-production mechanisms, and cultural uses. Ethical approval for ethnomusicological studies has been approved from Departmental Research Committee, Department of Botany via Ref. no. BOT/DRC-Misc/3 on 24/01/2025. The study was conducted in accordance with the ethical guidelines of the International Society of Ethnobotany (ISE Code of Ethics) and it adhered to the principles and provisions of Nagoya Protocol applicable throughout national and state- level regulations governing access to biological resources and associated traditional knowledge.

Plant resources used in the construction of traditional musical instruments were documented through field observations and information provided by local informants. Specimens were collected from natural and cultivated habitats, and the collection and preservation procedures followed Jain and Rao (1977). For each specimen, information on habit, habitat, distribution, vernacular name, plant part utilized and ethnobotanical use was recorded. Voucher specimens were prepared and deposited

in the Department of Botany, Science College, Kokrajhar, under Bodoland University. The majority of the collected specimens were examined and taxonomically verified through consultation with the herbarium records of Botanical Survey of India (BSI), Shillong along with online herbarium databases and digital botanical resources. The nomenclature of the recorded species was further cross-checked using authoritative taxonomic databases, including Plants of the World Online (POWO), as well as regional and national floras and standard taxonomic literature, including Hooker (1885), Kanjilal *et al*. (1934-1940) and The Wealth of India (1992).

Instruments were categorized by their structural features, sound-production mechanisms, and functional and socio-cultural uses. The pattern and context of instrument use were documented through interviews, focus-group discussions and direct observations during festivals, ceremonies and community events. They were further classified according to their use in religious or spiritual practices, traditional ceremonies, folk performances, agricultural festivals, community gatherings and recreational or entertainment activities. Reported uses were compared across villages and respondent categories to identify both common and village-specific patterns, with particular emphasis on distinctions between instruments primarily associated with ritual contexts and those used for secular performances and entertainment.

The village-wise distribution of respondents is presented in Table 1. The demographic profile of respondents was also recorded, including age, sex, occupation and role in traditional musical-instrument knowledge and practice.

Ethnobotanical indices

Descriptive statistics were done to quantify most frequently utilized plant materials and quantitative statistics were done to calculate Frequency of Citation (FC) and Use Value (UV) (Phillips *et al*., 1994) of plants by using the following formula:

$$\text{Frequency of citation (FC) (\%)} = \frac{\text{Number of informants citing a species}}{\text{Total number of informants interviewed}} \times 100$$

$$\text{Use value (UV)} = \frac{\text{Number of use reports for species provided by the informant}}{\text{Total number of informants interviewed}}$$

Calculation of ethnobotanical indices were done on Microsoft Excel using FC and UV data collected from 83 respondents.

Results

Age-wise distribution of respondents

A total of 83 respondents participated in the study. Respondents were classified into three distinct age groups: 18-34 years, 35-50 years, and 51-70 years. Age wise distribution of the respondents revealed that majority belonged to the older age groups. Out of the total 83 respondents, 41 (49.4%) were in the age group of 51-70 years representing the largest proportion of the study. This was followed by 31 respondents (37.5%) belonging to 35-50 years age group while only 11 respondents (13.25%) belonged to the younger age group of 18-34 years. Regarding gender distribution among respondents aged 18-34, males constituted 63.64% (n=7), while females accounted for 36.36% (n=4). Similarly, in the 35-50 years of age group, males represented 58.06% (n=180) compared to 41.94% (n=13) females. In the older age group (51-70) years, the gender distribution was relatively balanced with males accounting for 51.22% (n=21) and females representing 48.78% (n=20). Overall, of the total respondents, males constituted 55.42% (n=46) whereas females accounted for 44.58% (n= 37). These findings indicate that the study population was predominantly composed of middle aged and older respondents representing the largest segment (Table 2).

Table 2. Number and Percentage of Respondents Across Different Age Groups

Age group	Male (n)	Female (n)	Total (n)	Male (%)	Female (%)	Total (%)
18-34 years	7	4	11	63.64	36.36	13.25
35-50 years	18	13	31	58.06	41.94	37.35
51-70 years	21	20	41	51.22	48.78	49.4
Total	46	37	83	55.42	44.58	100

The demographic data overall indicated that knowledge associated with the identification, collection, processing and utilization of plant materials for musical instruments were more extensive among the middle aged and older age groups which indicated high risk of traditional knowledge erosion among the younger ages due to their unwillingness to learn, low participation and lack of knowledge transfer. Relatively uniform distribution of traditional knowledge among male and

female respondents suggested that ethnobotanical knowledge associated with traditional musical instrument making was not exclusively gender- specific which may reflect collective nature of traditional knowledge transmission and cultural participation within the community.

Documentation and diversity of plants species used in traditional musical instruments

Field surveys and interviews documented 25 plant species belonging to 14 families that are traditionally utilized by the Koch Rajbongshi community. Among the recorded species, five species belong to the family Poaceae (Gramineae), five species to Arecaceae and two species each to Moraceae, Fabaceae (Leguminosae) and Lamiaceae (Labiatae) with the remaining one species each belonging to Rutaceae, Simaroubaceae, Meliaceae, Rhamnaceae, Anacardiaceae, Cucurbitaceae, Apocynaceae, Bignoniaceae and Asparagaceae respectively. Among the recorded species *Aegle marmelos*, *Azadirachta indica*, *Butea monosperma*, *Tectona grandis* and *Ziziphus mauritiana* are found to grow in terrestrial habitats, whereas *Areca catechu*, *Arundo donax*, *Bambusa balcooa*, *B. vulgaris*, *Caryota urens*, *Cocos nucifera*, *Calamus tenuis, Crescentia cujete, Dracaena trifasciata, Lagenaria siceraria*, *Melocanna baccifera* and *Saccharum officinarum* are found to occur in moist places. Species such as *Ailanthus excelsa, Artocarpus heterophyllus*, *Alstonia scholaris*, *Borassus flabellifer*, *Dalbergia sissoo*, *Ficus benghalensis*, *Gmelina arborea* and *Mangifera indica* are found to grow in semi moist habitats. Majority of them are dicotyledonous with a few been monocotyledonous. Most species are common and widely distributed in homesteads, village surroundings, roadsides, and wastelands. Species such as *Bambusa vulgaris, Cocos nucifera*, and *Areca catechu* are commonly cultivated, whereas *Ficus benghalensis, Azadirachta indica, Mangifera indica*, and *Gmelina arborea* occur in open and semi-marginalized habitats (Table 3). *Alstonia scholaris* and *Ailanthus excelsa* are mainly found in wild or semi-wild areas. Majority of species occur in open and homestead habitats (60-70%), followed by forest and semi-forest areas (20-30%) and cultivated lands (10-15%). Trees shows dominant growth form (16 species), followed by woody grasses (3 species), shrubs (1 species), herbs (1 species), climbers (2 species) and other tall grasses (2 species). Dominance of tree species highlights their importance as the primary source of raw materials for traditional musical instruments used by the Koch Rajbongshi community indicating moderate plant diversity in the study area.

Ethnomusicological knowledge of traditional musical instruments

Different plant parts including wood, fibres, leaves, barks and fruits are selectively used depending on the type and structural requirements of the musical instrument. Wood obtained from the trunks of trees *Dalbergia sissoo, Gmelina arborea, Artocarpus heterophyllus, Mangifera indica, Azadirachta indica, Alstonia scholaris, Butea monosperma, Tectona grandis, Ficus benghalensis* etc. are associated in the construction of wooden drum bodies for several musical instruments. According to the reported traditional practices, suitable timber based on their availability, durability, suitability and resistant to decay are selected, with outer bark being removed and shaped in required dimensions and design. Central portion of the wood is hollowed to form drum shell or resonating chamber with inner and outer surfaces of wooden shell smoothed for desirable shape. Animal skin is then used as the vibrating membrane which is attached to the openings of the wooden shell using bamboo strips. Similarly, chordophone instruments particularly Dotora, Sarinda, Ghuglung, Rashamadhuri and Bena are prepared from woods of *Dalbergia sissoo, Artocarpus heterophyllus, Mangifera indica* and *Bambusa vulgaris* that are associated with the construction of necks and other supporting components whereas plant species like *Lagenaria siceraria, Aegle marmelos, Cocos nucifera, Caryota urens, Butea monosperma* and *Crescentia cujete* are involved in making resonating chambers. Construction of traditional idiophone instrument by Koch Rajbongshi community involves utilization of plant derived materials particularly bamboo culms, trunk wood and other woody plant parts of *Tectona grandis, Dalbergia sissoo*, *Artocarpus heterophyllus, Mangifera indica, Bambusa vulgaris* and *B. balcooa*. The instrument makers assess the sound production by striking, shaking or by other appropriate techniques and make necessary adjustments. Likewise, aerophones such as Aar Bashi, Shanai and Mukha Bashi are wind musical instruments where sound is produced through vibration of an air column. These instruments are mostly enjoyed by and are often associated with childhood entertainment and folk plays. Traditionally it is made from different plant parts particularly bamboo, hollow stems, reeds and wood materials of *Bambusa vulgaris, B. balcooa, Arundo donax, Melocanna baccifera, Ziziphus mauritiana, Borassus flabellifer* and *Cocos nucifera.* All of these musical instruments are played in bamboo dance, goyalani dance, weddings, religious ceremonies, festivals and traditional cultural practices. In addition to plant-derived materials, animal products were also employed in the manufacture of certain traditional musical instruments (Table 6). Materials such as animal hides, horns, hairs and threads are utilized to serve as membranes in percussion instruments, sound production, enhance elasticity and longevity. Animal hides or skin of *Varanus bengalensis*, *Capra hircus* and *Bubalus bubalis* is basically used in making drum membranes. Horns of *Bubalus bubalis* are used in making wind instrument components, horse tail hairs and threads of *Equus feruscaballus* and *Antheraea assamensis* are used in making strings and bows of certain chordophone instruments. However, historical accounts from the older respondents indicate the use of *Varanus bengalensis* in traditional musical instruments. However, this practice is no longer prevalent now among the present generation of instrument makers due to its conservation and legal status. The

ethnomusicological study documenting different types of traditional musical instruments used by the Koch Rajbongshi community, their associated plant species, plant parts utilized, traditional processing techniques with their functional and ceremonial significance in community's cultural practices are presented in Table 4.

Table 3. List of plants used in making musical instruments by the Koch Rajbongshi community in Lower Assam, India along with collection number and species examined at BSI (Shillong) and through online e-herbarium resources

Family	Scientific name	Collection No.	Species examined	Vernacular name	Habit	Habitat	Part used
Arecaceae	*Areca catechu* L.	Barman 13	K & J Hills, G. K. Deka: 030861, Jul. 1940, BSI (Shillong)	Gua	Tree	M	Fiber Fibre
Arecaceae	*Borassus flabellifer* L.	Barman 06	Ankarafantsika National Park, R.P. Baytan: 0049, Apr. 2003, Heb. Kewense	Taal	Tree	SM	Leaves
Arecaceae	*Caryota urens* L.	Barman 15	Gosaikathani, Garmurh, Sibsagar district, Assam, S.K. Kataki 044561, Nov.1964, BSI (Shillong)	Chagua	Tree	M	Fibre
Arecaceae	*Cocos nucifera* L.	Barman 08	Palm House, R.B, G. Kew, W.J. Baker: 1969-4480, April 2006, Kew	Narikol	Tree	M	Fruit Shell, leaves
Arecaceae	*Calamus tenui* Roxb.	Barman 25	Longai Forest, Sylhet, R.N. De: 030946, Feb. 1941, BSI (Shillong)	Bet	Climber	M	Stems
Anacardiaceae	*Mangifera indica* L.	Barman 09	Tripura, Dr. B Deb: 28133, Jan. 1962, BSI (Shillong)	Aam	Tree	SM	Trunk
Apocynaceae	*Alstonia scholaris* (L.) R.Br.	Barman 11	Kamrup District, Assam, A.S. Rao: 041935, Oct. 1965, BSI (Shillong)	Shaitan	Tree	SM	Trunk
Asparagaceae	*Dracaena trifasciata* (Prain) Mabb.	Barman 14	Kew Gardens, N.E. Brown: 01891, Sept. 1909, Kew	Sarpajiva	Herb	M	Fibre
Bignoniaceae	*Crescentia cujete* L.	Barman 12	Flora of Assam, Sylhet, R.N. De: 021035, Mar. 1941, BSI (Shillong)	Tamal	Tree	M	Fruit
Cucurbitaceae	*Lagenaria siceraria* (Molina) Standl.	Barman 10	K & J Hills, Assam, G.K. Deka: 12004, Aug. 1940, BSI (Shillong)	Pani Lau	Climber	M	Fruit
Fabaceae	*Butea monosperma* (Lam.) Kuntze	Barman 17	N.C. Hills, Umrangso, R.S Baruah:72003, June 2007, BSI (Shillong)	Polash	Tree	Ter	Trunk
Fabaceae	*Dalbergia sissoo* Roxb. ExDC.	Barman 18	Kosi Island, Flora of Kosi Catchment, C.R Rao: 58080, Mar. 1963, BSI (Shillong)	Shishob	Tree	SM	Trunk
Lamiaceae	*Gmelina arborea* Roxb.ex Sm.	Barman 21	Khao Chong Gardens, S. Gardner: 1857, Dec. 2006, Kew	Gamari	Tree	SM	Trunk
Lamiaceae	*Tectona grandis* L.f.	Barman 23	Gandehatta R.F., C. Saldanha, S. J.: 2586241, Sept. 1964, Kew.	Segun	Tree	Ter	Trunk
Meliaceae	*Azadirachta indica* A.Juss.	Barman 07	South Garo Hills, Meghalaya, D.K Roy: 095253, June 2014, BSI (Shillong)	Neem	Tree	Ter	Trunk
Moraceae	*Artocarpus heterophyllus* Lam.	Barman 01	Kakoi R.F, Lakhimpur, N. Odyuo Duhoy: 89773, Feb. 2011, BSI (Shillong)	Kathol	Tree	SM	Trunk
Moraceae	*Ficus benghalensis* L.	Barman 19	Bonradi Wildlife Sanctuary, S.R. Talukdar: 83312, Sept. 2011, BSI (Shillong)	Bot	Tree	SM	Trunk
Poaceae	*Arundo donax* L.	Barman 03	North of Cruickshank Scrub Preserve, T. MacClendon:	Nolbash	Tall grass	M	Whole tree

			239405, Jun. 2004, University of South Florida Herbarium.				
Poaceae	*Bambusa balcooa* Roxb.	Barman 05	Ko Surin Nat. Park. Phangnga, C. Niyomdham W. Ueachirakam, P. Phuteha: 3608, Apr. 1994, Kew.	Borobash/ Bhuluka bash	Woody grasses	M	Whole tree
Poaceae	*Bambusa vulgaris* Schrad. ex J.C.Wendl.	Barman 02	Chiithukhe, Madras, Chennai, Kreni Lokho: 097104, Nov. 2017, BSI (Shillong)	Maflabash	Woody grasses	M	Whole tree
Poaceae	*Melocanna baccifera* (Roxb.) Kurz	Barman 04	Valley district of Manipur, India, K. Tilotoma Devi: 094049, Mar. 2015, BSI (Shillong)	Tarai bash	Woody grasses	M	Whole tree
Poaceae	*Saccharum officinarum* L.	Barman 24	Haelaelinja Settlement, Was River valley, P & J.A. Sillitoe: 01942, Dec. 1945, Manchester Museum Herbarium	Kuchar	Tall grass	M	Fibre
Rhamnaceae	*Ziziphus mauritiana* Lam.	Barman 20	Borio to Dharampur, Bihar, G.Panigrahi: 10791, Dec. 1957, BSI (Shillong)	Borai	Shrub	Ter	Trunk and branches
Rutaceae	*Aegle marmelos* (L.) Correa	Barman 22	Tura Forest, Nokrek Biosphere RF, Vivek. N. Singh & Bikarma Singh: 074486, Feb. 2009, BSI (Shillong)	Bel	Tree	Ter	Fruit
Simaroubaceae	*Ailanthus excelsa* Roxb.	Barman 16	New Forest, Dehradun, Culpiv., M.B. Raizada: 04333, Apr. 1939, BSI (Shillong)	Mohaneem	Tree	SM	Trunk

Note: Where, M= Moist; SM= Semi moist; Ter= Terrestrial

Table 4. Different types of traditional musical instrument, its components, plant species, processing techniques and ceremonial uses documented among the Koch Rajbongshi community in Lower Assam

Hornbostel-Sachs class		**Instrument components**	**Plant species**	**Processing techniques**	**Ceremonial use**
Membranophones	Akhrai (Figure 2)	Wooden body	*Dalbergia sissoo* Roxb. Ex DC., *Azadirachta indica* A. Juss., *Ficus benghalensis* L., *Alstonia scholaris* (L.) R.Br.	Traditional hollow wooden and leather percussion, crafted from single wood piece hollowed into a cylindrical body 63.5 - 66.0 cm long with a circumference of about 102 cm; both hollow ends covered with animal skin, leather drumheads tightened using bamboo rings, bamboo hoops and leather straps.	Jatra, Holi, Kirtan, religious ceremonies and Koch Rajbongshi folk gatherings
		Drum shell	*Artocarpus heterophyllus* Lam., *Mangifera indica* L.		
		Rings and hoops	*Bambusa vulgaris* Schrad. ex J.C.Wendl.		
		Drumheads	*Areca catechu* L. *and Caryota urens* L.		
		Structural support	*Bambusa vulgaris* Schrad. ex J.C.Wendl.		
	Dhol (Figure 3)	Wooden body	*Gmelina arborea* Roxb. ex Sm.	Hollowed log, 48.3-50.8 cm long, wooden body dried in sunlight to reduce weight and for sound resonance; larger end called Paka taal with	Folk music and rhythmic performances; produces bass and treble tones
		Drumheads	Animal hides		
		Rings, hoops and playing sticks (Dhol bari)	*Bambusa vulgaris* Schrad. ex J.C.Wendl. and *Ziziphus mauritiana* Lam.		

		Drum shell	*Artocarpus heterophyllus* Lam. and *Mangifera indica* L.	circumference 86.4-88.9 cm function as bass side, smaller end called Kacha taal, circumference approximately 76.2 cm function as treble side; both openings covered with animal skin, small hole made at Paka taal for sound regulation, drumheads secured with rings and straps; playing stick approximately 30.5 cm long.	
	Dhak (Figure 4)	Wooden body	*Gmelina arborea* Roxb. ex Sm., *Alstonia scholaris* (L.) R.Br., *Ficus benghalensis* L., *Mangifera indica* L. and *Ailanthus excelsa* Roxb.	Wooden body, 61.0-63.5 cm long, hollowed into a cylindrical or slightly conical shape; hollow body heated over fire to enhance sound resonance; larger end called Kacha taal with circumference 154.9-157.5 cm, smaller end called Pakka taal with 152.4-154.9 cm circumference, middle section with circumference of 160.0-162.6 cm; small aperture made in the smaller membrane to regulate sound vibration, both drumheads covered by animal hides and secured by bamboo rings and animal hide straps.	Goyalani dance, Kartika dance, worship, festivals and ceremonies
		Drumheads	Animal hides		
		Rings, hoops and playing sticks	*Bambusa vulgaris* Schrad. ex J.C.Wendl. and *Calamus tenuis* Roxb.		
		Drum shell	*Butea monosperma* (Lam.) Kuntze		
	Korka (Figure 5)	Wooden body	*Artocarpus heterophyllus* Lam., *Alstonia scholaris* (L.) R.Br., *Dalbergia sissoo* Roxb. Ex DC.	Truncated- conical wooden body made from single wood piece hollowed to a height of 20.3-22.9 cm; with wider opening circumference 124.5-127.0 cm called Paka taal and narrower opening 99.1-101.6 cm called Kacha taal; both openings covered with animal hide, both sides	Traditional folk performances and ceremonial practices
		Drumheads	Animal hides		
		Rings, hoops and playing sticks	*Bambusa vulgaris* Schrad. ex J.C.Wendl.		
		Neck strap	Leather strips		

				joined by bamboo rings and leather straps; two canes measuring 38.1-40.64 cm known as Hat khati used as drum sticks.	
	Khol (Figure 6)	Wooden body	*Artocarpus heterophyllus* Lam., *Gmelina arborea* Roxb. ex Sm. and *Mangifera indica* L.	Elongated barrel-shaped wooden body, 55.9-61.0 cm long, hollowed and dried; both ends covered with goat skin and secured with bamboo rings and leather straps. Mostly played by striking with both hands.	Naam-Kirtan, devotional music, religious processions, Bhakti songs and cultural performances
		Drumheads	Animal hides		
		Rings, hoops and strips	*Bambusa vulgaris* Schrad. ex J.C.Wendl.		
Chordophones	Bena (Figure 7)	Resonator	*Lagenaria siceraria* (Molina) Standl., *Aegle marmelos* (L.) Correa, *Cocos nucifera* L.	Single stringed musical instrument; made from dried gourd hollowed and circularly shaped, traditionally covered with monitor-lizard skin, presently goat skin; 3 small holes made for bridge installation and sound resonance, tuning key made of wooden piece attached to the upper end of the bamboo neck; single string made from triple-twisted Muga silk; bamboo bow (Hata or Char) fitted with horsehair or plant fibres for playing music.	Folk music and melodic performances
		Wooden neck or bridge	Woods of *Azadirachta indica* A. Juss. or *Gmelina arborea* Roxb. ex Sm.		
		Single string	*Dracaena trifasciata* (Prain) Mabb., *Areca catechu* L. and *Caryota urens* L. or Muga silk		
		Bridge	*Bambusa vulgaris* Schrad. ex J.C.Wendl.		
		Tuning peg	*Artocarpus heterophyllus* Lam.		
		Bow (Hata/Char)	Horse hair		
	Dotora (Figure 8)	Wooden body	*Artocarpus heterophyllus* Lam.	Single wood piece shaped to approximately 91.4 cm long; lower portion carved to form rounded resonating chamber, 30.5-33.0 cm long and approximately 7.6 cm deep; hollow resonator covered with animal hide; membrane perforated at seven points to enhance sound resonance; wooden bridge fixed near lower section; four strings	Folk music and dance accompaniment
		Resonating chamber	*Artocarpus heterophyllus* Lam.		
		Membrane	Buffalo skin		
		Four strings	Muga silk thread		
		Bridge	*Artocarpus heterophyllus* Lam.		
		Tuning pegs	*Bambusa vulgaris* Schrad. ex J.C.Wendl.		
		Horn plectrum (Chutki)	Buffalo horn		

				stretched and attached between lower bridge and upper tuning pegs and aligned; plectrum prepared for plucking strings.	
	Ghuglung/ Khamak (Figure 9)	Conical wooden resonator (Khamak thuri)	*Butea monosperma* (Lam.) Kuntze, *Ailanthus excelsa* Roxb.	Hollow open ended conical wooden body resonator, 27.9-30.5 cm long, lower opening covered with hide with small central hole made and circular leather piece (Tali) fixed over it; additional leather disc fixed to upper body; secured with animal and bamboo strips; instrument body, reinforced with a leather disc; bamboo handle attached to instrument body, triple-twisted Muga silk string stretched between the handle and instrument body; played by a plectrum.	Kushan Gaan, Bhawaiya, Dehatattva and Chatka songs, folk music and Naam-Kirtan
		Membrane	*Caryota urens* L.		
		Leather disc (Tali)	Buffalo skin		
		Plectrum (Chuthi)	Buffalo horn		
		Handle and strings	*Bambusa vulgaris* Schrad. ex J.C.Wendl., Muga silk,		
	Sarinda (Figure 10)	Resonator	*Dalbergia sissoo* Roxb. Ex DC., *Mangifera indica* L.	Single wood piece approximately 71.1 cm long; hollow resonating portion approximately 20.3-22.9 cm; lower chamber covered with hide; six small holes made over skin covering, wooden bridge fixed near lower section; three strings attached between lower bridge and upper tuning pegs; bow shaped and strung to facilitate playing.	Folk songs, Kushan songs, Naam-Kirtan, devotional music and traditional performances
		Membrane covering	Animal hides (Goat or Buffalo)		
		Strings	One Muga silk thread and two metal string		
		Bridge	*Artocarpus heterophyllus* Lam.		
		Tuning pegs and bow	*Bambusa balcooa* Roxb., *Bambusa vulgaris* Schrad. ex J.C.Wendl.		
	Rashamadhuri/Ektara (Figure 11)	Resonator (Tali)	*Crescentia cujete* L., *Lagenaria siceraria* (Molina) Standl., *Cocos nucifera* L.	Gourd or coconut shell hollowed into a resonator, covered with animal skin and secured with plant fibres; a small hole made at center of the skin to attach additional small	Folk songs, Kirtan, devotional music and traditional performances
		Membrane	Animal skin (Goat or Buffalo)		
		Bamboo neck (Thaka)	*Bambusa vulgaris* Schrad. ex J.C.Wendl.		
		Single string	Metal string		

		Binding fibre	*Saccharum officinarum* L.	circular leather piece (Tali); connected with lower end of the bamboo neck (Tali); tuning points made at upper end of bamboo neck to attach a single string or metal string upto the resonator; special ring (Rash Angthi) is worn over the fingernail to pluck the string stretched across the body and play.	
		Finger-ring pick (Rash Angthi)	Buffalo-horn		
Aerophones	Aar Bashi/Dukh Bashi (Figure 12)	Main body	*Bambusa vulgaris* Schrad., *Bambusa balcooa* Schrad. ex J.C.Wendl., *Arundo donax* L., *Melocanna baccifera* (Roxb.) Kurz	Mature, straight bamboo hollowed to 33.0-35.6 cm long; one end open and the other fitted with a blowing device made from reed, cane strip or plant stem to allow air passage; square mouth hole and four finger holes made over the open side to control pitch and sound.	Recreation, children's entertainment and folk play
		Blowing device	*Calamus tenuis* Roxb.		
	Shanai (Figure 13)	Main body	*Ziziphus mauritiana* Lam.	Consist of wooden melody pipe (Sur Chunga), seven finger holes (Sur Futa), brass sections, mouthpiece holder (Mukhura), air tube (Batas Chunga), copper tube and disc, reed (Pat). Wood shaped into a conical pipe with seven holes; brass sections fitted at the ends; copper tube approximately 5.1-7.6 cm long connected to a disc, with a palm-leaf reed secured by thread.	Produces penetrating melodic tones in traditional musical performances
		Disc (Pat nala)	*Borassus flabellifer* L. and *Cocos nucifera* L.		
	Mukha Bashi (Figure 14)	Main body	*Bambusa vulgaris* Schrad. ex J.C.Wendl. and *Bambusa balcooa* Roxb.	Hollow bamboo tube 43.2-45.7 cm long and 7.6-10.2 cm in circumference; one end open and the other closed by a natural node; mouthpiece 5.1-7.6 cm	Marai songs, Banshi Puran, Sonarai songs and folk performances

				high and 12.7-15.2 cm in circumference with detachable mouth piece (Mukha), seven finger holes (Sur Futa) and blowing hole (Mukha Futa).	
Idiophones	Khunjuri (Figure 15)	Main body	*Dalbergia sissoo* Roxb. Ex DC., *Tectona grandis* L.f., *Artocarpus heterophyllus* Lam., *Mangifera indica* L., *Azadirachta indica* A. Juss., *Bambusa vulgaris* Schrad. ex J.C.Wendl.	Wood or bamboo cut, shaped and smoothed into pieces, 20.3-30.5 cm long; holes made in wooden body to insert brass or iron cymbals for rhythmic vibration; sometimes metal discs or jingles may be additionally fitted to enhance rhythmic sound	Folk songs, Naam-Kirtan, Bhajans, Kushan songs, religious gatherings and cultural festivals
	Tarap-tarap (Figure 16)	Main body	*Bambusa vulgaris* Schrad. ex J.C.Wendl. and *Bambusa balcooa* Roxb.	Mature bamboo cut to 25.4-30.5 cm; one end retained intact while the other is split longitudinally into thin, flexible strips, trimmed and smoothed	Folk music, devotional performances, dance and cultural events

Quantitative ethnobotanical Indices

Of the 25 different plant species documented for the utilization in the preparation of traditional musical instruments, frequency of citation (FC) varied considerably ranging from 2.41% to 16.87% which indicates differences in the report of individual plant species by the respondents. Among the documented species *Bambusa vulgaris* exhibited the highest frequency of citation (16.87%) followed by *Alstonia scholaris* and *Mangifera indica* each accounting for 14.46% with other relatively frequently cited species of *Gmelina arborea* (12.05%), *Butea monosperma* (10.84%) and *Bambusa balcooa* (8.43%). In contrast, lowest frequency of citation (2.41%) was recorded for *Aegle marmelos, Areca catechu, Azadirachta indica, Borassus flabellifer, Dracaena trifasciata, Ficus benghalensis* and *Melocanna baccifera*. These findings indicate variations in the reported utilization and recognition of different plant species in traditional musical instrument preparation.

Use value (UV) of the recorded plant species ranged from 0.06 to 2.61 reflecting differences in their degree of utilization. *Mangifera indica* exhibited the highest use value of 2.61 followed closely by *Artocarpus heterophyllus* (2.59), *Azadirachta indica* (2.28), *Ziziphus mauritiana* (2.16) and *Gmelina arborea* (2.12) followed by *Aegle marmelos* (1.99), *Lagenaria siceraria* (1.8), *Saccharum officinarum* (1.72) and *Cocos nucifera* (1.53) which may be due to its multiple usage categories like food, medicines, fodder etc. apart from traditional instruments (Table 5). On the other hand, species such as *Crescentia cujete* (0.53), *Dracaena trifasciata* (0.52), *Melocanna baccifera* (0.07) and *Arundo donax* (0.06) exhibited lowest use value indices which may be due to their less usage categories.

Table 5: Quantitative analysis for frequency of citation and use value of plant species used in traditional instrument making practices

Scientific Name	Frequency of citation (%)	Use Value (UV)
Aegle marmelos (L.) Correa	2.41	1.99
Ailanthus excelsa Roxb.	7.23	1.24
Alstonia scholaris (L.) R.Br.	14.46	1.14
Areca catechu L.	2.41	1.45
Artocarpus heterophyllus Lam.	3.61	2.59
Arundo donax L.	6.02	0.06
Azadirachta indica A.Juss.	2.41	2.28

Bambusa balcooa Roxb.	8.43	0.78
Bambusa vulgaris Schrad. ex J.C.Wendl.	16.87	0.98
Borassus flabellifer L.	2.41	1.24
Butea monosperma (Lam.) Kuntze	10.84	1.23
Calamus tenuis Roxb.	3.61	0.34
Caryota urens L.	4.82	0.99
Cocos nucifera L.	6.02	1.53
Crescentia cujete L.	3.61	0.53
Dalbergia sissoo Roxb. ExDC.	6.02	1.06
Dracaena trifasciata (Prain) Mabb.	2.41	0.52
Ficus benghalensis L.	2.41	1.42
Gmelina arborea Roxb.ex Sm.	12.05	2.12
Lagenaria siceraria (Molina) Standl.	3.61	1.8
Mangifera indica L.	14.46	2.61
Melocanna baccifera (Roxb.) Kurz	2.41	0.07
Saccharum officinarum L.	3.61	1.72
Tectona grandis L.f.	4.82	1.2
Ziziphus mauritiana Lam.	6.02	2.16

Table 6 List of animals used in preparation of musical instruments

Scientific name	Vernacular name	Family	Parts used	Conservation status
Capra hircus L.	Sagol	Bovidae	Skin	Domestic livestock
Bubalus bubalis L.	Bhois	Bovidae	Skin, Horn	Domestic livestock
*Equus ferus*caballus L.	Ghora	Equidae	Tail hair	Domestic livestock
Varanus bengalensis Daudin	Guisaap	Varanidae	Skin	Schedule I species under wildlife (Protection) Act, 1972
Antheraea assamensis Helfer	Muga palu	Saturniidae	Cocoon	Muga silkworm associated with traditional sericulture

Note: The use of *Varanus bengalensis* in traditional musical instruments represents a historically reported practice and does not indicate its current utilization or collection in manufacturing traditional musical instruments.



Figure 2 Akhrai, a traditional wooden percussion instrument



Figure 3. Dhol, a double- headed percussion instrument



Figure 4. Dhak, a traditional membranophone drum widely used in folk and ritual music



Figure 5. Karka, truncated conical wooden instrument



Figure 6. Khol, a traditional double-headed membranophone



Figure 7. Bena, a traditional bow string instrument



Figure 8. Dotora, a traditional plucked lute-type instrument



Figure 9. Ghuglung, a traditional single string percussion instrument

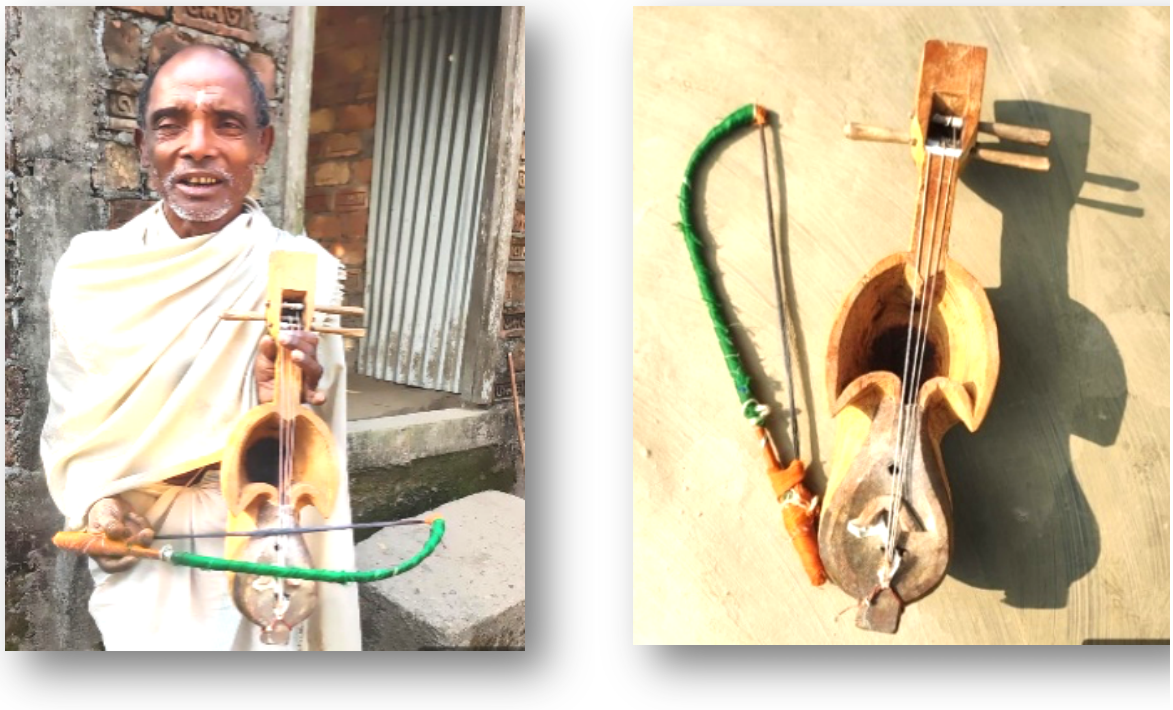


Figure 10. Sarinda, a traditional instrument played using a bow



Figure 11. Rashamaduri, a traditional instrument connected with Rash or Vaishnavite cultural performance

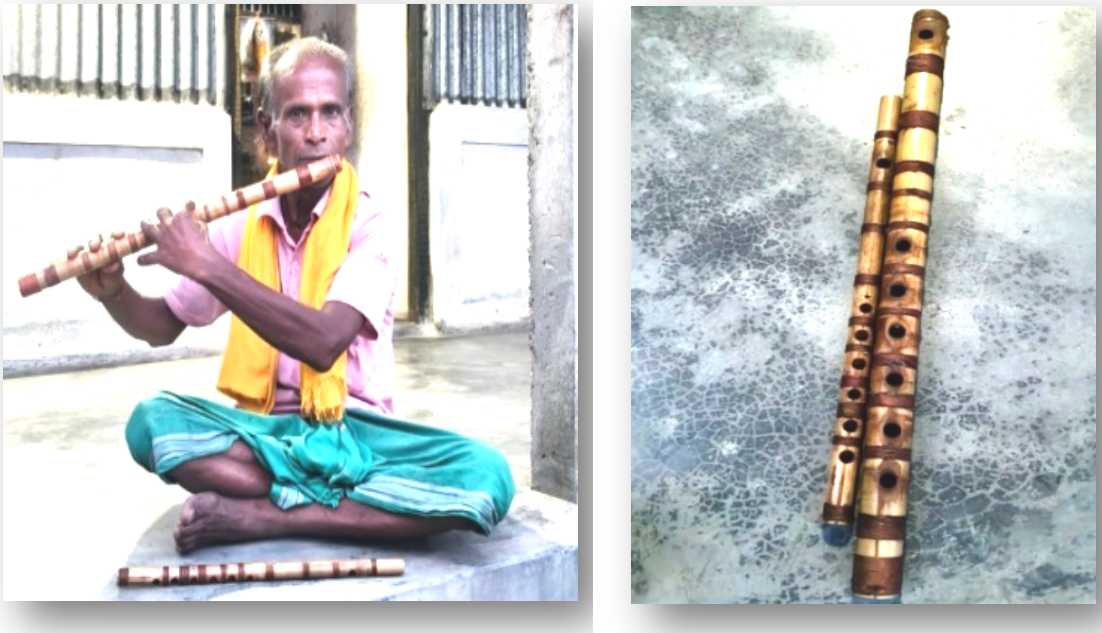


Figure 12. Aar bashi, a traditional bamboo flute





Figure 13. Sanai, a traditional double-reed wind instrument





Figure 14. Mukh Bashi, a traditional bamboo wind instrument



Figure 15. Khunjuri, a traditional small percussion hand instrument



Figure 16. Tarap- tarap, a traditional hand instrument made of single piece of bamboo

Socio cultural events

Some important socio-cultural events associated with these traditional musical instruments among the Koch Rajbongshi community are:

1. **Agricultural Festivals:** The Koch Rajbongshi community observes several agricultural festivals during sowing, irrigation and harvesting periods to seek prosperity, ensure good yields and protect crops from natural calamities. Traditional musical instruments such as dhol, dotora, and flute play an important role in these celebrations. Before sowing, a ritual known as *Muthi Neowam* is performed, during which prayers are offered to nature and local deities, accompanied by folk songs and traditional music. This practice highlights the close association between agriculture, spirituality and music in the community. Some festivals associated with agriculture are:

a) Bash puja: Also known as bamboo dance festival, is an important agricultural festival celebrated in the month of April, particularly among the Koch Rajbongshi people of erstwhile Goalpara district of Assam (Fig. 17). During the festival, bamboo poles are cut, decorated with colored cloth and artificial hairs locally called sowrs or suli and worshipped as representations of local deities. According to local belief "Bura Madar", the chief bamboo deity is symbolically dressed in white cloth and white hair. The decorated bamboo poles are carried throughout the village in a ritual procession led by a priest (Deuri or Deu) who performs purification rites. At night the poles are erected in the temple courtyard, where the bamboo dance is performed by a spiritually inspired individual believed to act as a medium of divine power. Deities worshipped during the festival include Maa Kali, Bura baba (Lord Shiva), Maa kasakhai, Maa Sithela and Maa Mahamaya. After this puja comes to an end, all the bamboos poles are immersed in the nearby ponds or rivers.

(b) Hudum Deo Puja: Hudum Puja is an important folk ritual of the Koch Rajbongshi practiced across western Assam, North Bengal, Bangladesh, Bhutan Duars, Nepal and Bihar (Fig. 18). The ritual is mainly performed by women to include rainfall during the periods of drought and agricultural hardship. According to the local folk belief, the term "Hudum" originates from the "Hudu" bird, whose calls are considered a sign of impending rainfall. Earlier people used to capture the wild Hudu bird and worship it, but at present a banana (*Musa balbisiana* Colla) plant known as the "Hudum Khuti" is symbolically used to represent Hudum Deo. Hudum Puja is regarded as a folk ritual connected with natural forces and fertility. It is a non-Vedic folk ritual conducted without a priest on dark nights in isolated agricultural fields mostly by women. A banana (*Musa balbisiana* Colla) sapling (Hudum Khuti) is planted following strict traditional rules accompanied by offerings such as rice, fruits, milk, curd, betel nut, incense and different grains. The most distinctive aspect of Hudum Puja is the singing and dancing performed throughout the night by women accompanied by musical instruments such as the dhol singing Hudum songs and praying to "Hudum Deo" for rainfall and agricultural prosperity. The songs are mainly associated with fertility, nature and the emotional appeal for rain. Traditionally, Hudum Puja remained confined to agricultural fields and village society, but in recent times it has also been performed on cultural stages and public programmes as a symbol of Rajbongshi identity and heritage. Its continued practice contributes significantly to the preservation of traditional culture and indigenous practices of the Rajbongshi community.



Figure 17. Bash puja**,** a traditional bamboo related ritual



Figure 18. Hudum Nitya, a traditional rain invoking folk ritual

2. Religious and Ritual Ceremonies

Instruments like Dhak, Dhol, Shanai, and Dotora, Khamak are played during temple rituals, such as Marai puja, Rakhal puja, Dol jatra etc. During these rituals they tell the story of different god and goddesses with the help of music. This includes:

a) Marai puja: This ritual involves the worship of clay idol of goddess Manasa, accompanied by Padmapuaran gaan, a traditional folk song based on Padma Purana (Fig. 19). This tradition is also locally known as Bishohari, Padya, Bhashan Jatra, Ajangar or Maroi. Maroi is the household deity of Koch-Rajbongshi and holds a special position among the social rituals for its unique way of worshiping with various forms of idols along with special folk songs, dances performed praising Manasha and describing various mythological incidents of Behula and Lakhindar. Marai puja is often performed during marriage ceremonies and other important social occasions to seek blessings, protection and prosperity. In some cases, the performance may continue for upto seven consecutive days and nights.

b) Doul jatra: Among the Koch Rajbongshi community of western Assam, Doul jatra is celebrated with music, dance, colours and ritualistic ceremonies (Fig. 20). Traditional musical instruments such as dhol and other folk instruments are played throughout the celebrations. The festival is closely associated with themes of fertility, agricultural prosperity and social harmony with folk songs, dance performances and devotional music forming an important part of the celebration. A distinctive pre-festival ritual is the burning of Bheraghar (ceremonial huts) on the eve of Doul. During this ritual, offerings such as fruits and grains are placed in the fire, and the resulting ashes are considered sacred and auspicious for agricultural fertility and household prosperity that are often preserved by community members as symbols of agricultural fertility, household prosperity and overall well-being. On the principal day of Doul festival, decorated swings or platforms known as Choudol are prepared to carry idols of Krishna or Radha-Krishna in ceremonial processions. Devotees participate in fairs, singing, dancing and spraying of coloured powders known as “Fagu". Bamboo poles known as “Boloramor Bash” are also carried ceremonially during the festival, reflecting the importance of bamboo in Rajbongshi cultural traditions.

c) Kati puja: Kati Puja (Katika Puja) is an important folk festival of the Koch Rajbongshi observed during Kati Sankranti (Fig. 21). This festival is predominantly women-centered, with ritual participation traditionally restricted to elderly women. Worship is conducted in a decorated mandap, where an idol of Lord Kartika or sacred ghot (pot) topped with coconut is installed. As part of traditional ritual arrangement, four banana (*Musa balbisiana* Colla) trees are placed at the four corners of the mandap. Folk songs and traditional dances constitute important components of the ceremony, and the ritual is mainly performed by childless women seeking offspring, although the puja is also associated with prayers for good harvest, prosperity and family wellbeing. The worship continues throughout the night accompanied by devotional performances. According to local belief, Lord Kartika is worshipped as a deity capable of granting fertility and fulfilling devotee’s wishes. A ritual form known as Ponga Kartika, is also practiced outside the Kati Sankranti observance. In Ponga Kartika, a branch of the Moyna tree (*Meyna laxiflora* Robyns) is installed in place of Kartika idol, while the ritual procedures, songs and dances remain largely unchanged.



Figure 19. Marai Puja, a traditional folk worship



Figure 20. Doul Puja, a traditional Vaishnavite festival associated with the worship of Radha and Krishna



Figure 21. Kati Puja, a traditional folk observance in the month of Kati (Kartik)

3. Cultural practices of the Koch Rajbongshi

(a) Sonarai puja: Also known as Bagh puja, it is one of the most significant traditional folk festivals of the Koch Rajbongshi community (Fig.22). This festival reflects the close relationship between humans, nature, and animals in ancient agrarian society. Historically, many villages of Assam and North Bengal were surrounded by dense forests inhibited by tigers (bagh) and other wild animals. Frequent attacks on livestock, such as cows and buffaloes, and occasional threats to human life created a sense of fear and insecurity among rural communities. In response to these challenges, tiger was symbolically deified and worshipped as Sonarai, a protective folk deity believed to safeguard people and their property from wild animals.

Sonarai is regarded as a non- Vedic folk deity representing the indigenous belief systems, traditions, and cultural practices of the Koch Rajbongshi people. The festival usually begins on Puh Sankranti, marking the end of the Assamese month of Puh. From this day onward, groups of participants, especially young boys and men, travel from house to house carrying a symbolic bamboo stick or "Dor," which represents Sonarai. During their visits, they sing traditional Sonarai folk songs and collect offerings such as rice, paddy, vegetables, money, or household other items from the villagers. This practice continues throughout the Puh month and creates a festive atmosphere in the villages.

The collected offerings are later used for communal worship ceremony conducted by elders or traditional ritual specialists with prayers offered for protection, peace, prosperity, and community well-being. Cultural feasts and community gatherings are also organized in some areas. Sonarai puja remains an important symbol of Koch Rajbongshi folk culture, collective identity and cultural heritage preserving traditional beliefs and practices across generations.



Figure 22. Sonari puja, a traditional folk worship associated with protective deity

(b) Marriage and Social Ceremonies

Traditional Koch Rajbongshi weddings incorporate indigenous musical instruments such as Dotora, Dhol, Korka, Shanai and wind instruments. These instruments are played during marriage processions, rituals and community celebration. A traditional music troupe known as Bhuimali Bajna is commonly invited to perform during wedding ceremonies with women

singing traditional marriage songs Namati Gaan at different stages of marriage ritual strengthening social cohesion, cultural identity and community participation.

(c) Folk Dance and Cultural Performances

Popular performances include Bhawaiya Gaan, Baag-Bhaluknaach, Chongor Naach, Kushan Gaan, Palatia Gaan, Dotora Danga Gan, Goalini Nritya, Kartika Nritya, Hudum Nritya, Baas Nritya, Sonari Nritya, Baaho Nritya, Chandi Nritya, Namati Gaan, Gupini Naam, Jhali Matir Gaan, Madankamer Gaan, Euri Maga Gaan, Holi Gaan, Boron Nritya, Hari Sankirtan, Chor-Chunni Gaan, Mechinikhelar Gaan, Nindali Gaan and Bhawiya Gaan. All these folk dances and cultural performances are related to the social life, rituals and festivals of the common folks.

Discussion

The present study demonstrates that selection of plant resources for traditional musical instrument construction among the Koch Rajbongshi community reflects the accumulated knowledge and practical experiences of the local instrument makers representing biocultural knowledge system. Documentation of 25 plant species belonging to 14 families, along with materials such as hide, horn, and horsehair, highlights the community's dependence on locally available biological resources. This finding supports the broader ethnobiological view that traditional knowledge develops through long-term interactions between people and their environment and is expressed through technological, social, spiritual, and cultural practices (Berkes *et al*., 2000; Albuquerque *et al*., 2013).

The selection of plant species is clearly functional rather than random. Bamboo and reed species such as *Bambusa balcooa*, *B. vulgaris*, *Melocanna baccifera*, and *Arundo donax* are mainly used for aerophones and small percussion instruments, while woods including *Gmelina arborea*, *Mangifera indica*, *Alstonia scholaris*, *Ailanthus excelsa*, *Butea monosperma*, and *Dalbergia sissoo* are used for drum bodies, resonators, and structural components. Gourds and coconut provide naturally hollow resonating chambers, whereas plant fibres are used for binding and stringing. Bamboo is particularly suitable because of its hollow structure, high strength-to-weight ratio, and favorable fibre architecture (Wegst, 2008; Cottingham, 2011). The use of *Lagenaria siceraria* and *Crescentia cujete* as resonators further demonstrates ecological adaptation and material ingenuity. Their naturally hollow fruits provide lightweight acoustic chambers with minimal processing. Such practices, together with the continued preference for particular woods and bamboo species, indicate a process of cumulative cultural selection based on generations of practical experience and trial-and-error (Wegst, 2006). The criteria articulated by the informants including seasonal availability of the plant materials, their durability, mechanical strength, wood texture, ease of processing and traditional preferences, represents their experimental understanding of material suitability. Moisture content and thermal treatment, reported in some instrument-making practices, may further influence material and acoustic properties (Ahmed & Adamopoulos, 2018). This informant derived explanations constitute emic dimensions of traditional knowledge whereas interpretation of material characteristics from a scientific perspective represents etic dimensions (Heinrich *et al*., 2018). Although instrument makers may associate certain plant materials with desirable sound characteristics, however the relationship between wood properties and acoustic performance requires further scientific investigation. Therefore, the reported preferences are interpreted here as expressions of traditional material knowledge rather than experimentally established acoustic properties. Thus, the traditional selection of materials suggests an empirically developed understanding of acoustic and mechanical properties, although these relationships require experimental verification.

Animal derived materials used in traditional musical instrument making among the Koch Rajbongshi community represent an important component of their biocultural knowledge system. Materials such as skin, horns and tail hair obtained from domesticated livestock including goats (*Capra hircus*), buffaloes (*Bubalus bubalis*) and horses (*Equus ferus caballus*), cocoon of Muga silkworm (*Antheraea assamensis*) represents an important insect derived resource associated with tradition. However, according to the information provided by the local knowledge holders, the use of Bengal monitor (*Varanus bengalensis*) was reportedly followed in the past and is no longer prevalent in the study area. The use of monitor lizard skins in traditional musical instruments has also been documented in other parts of India (Gautam *et al*., 2023) and in Assam (Borpatra & Borthakur, 2025). Hence its documentation should be understood as a record of historical cultural knowledge rather than an endorsement of contemporary utilization. This finding highlights the importance of documenting traditional knowledge while recognizing contemporary conservation priorities and legal restrictions.

Quantitative analysis of plant species also revealed considerable variation in their frequency of citation (FC) and use values (UV) among the documented plant resources. Relatively high FC values of *Bambusa vulgaris* (16.84%) followed by *Alstonia scholaris* and *Mangifera indica* (14.46%) with *Gmelina arborea* (12.05%) and *Butea monosperma* (10.84%) indicate their

comparatively greater recognition among the informants in traditional instrument making practices whereas species like *Aegle marmelos, Areca catechu, Azadirachta indica* and *Ficus benghalensis* exhibiting lower citation frequencies (2.41%) indicate that these species were reported by fewer informants, potentially reflecting their specialized applications or limited use in particular instrument components. Comparison of FC and UV revealed that the citation values do not always correspond to use value. *Artocarpus heterophyllus* recorded a relatively low FC (3.61%) but a high UV (2.59), *Bambusa vulgaris* exhibited the highest FC (16.87%) but a comparatively lower UV (0.98), which may indicate that the frequency with which a plant species is reported by informants does not necessarily correspond to its overall use value. This variation may reflect specialized knowledge among particular instrument makers, who reported multiple applications of these species despite their relatively limited citation frequency. Conversely, *Mangifera indica* demonstrated both relatively high FC (14.46%) and UV (2.61) value indicating its wider recognition and multiple reported applications in traditional instrument practices. Thus, the documented instruments reflect the wider cultural connections of the Brahmaputra Valley and adjoining North Bengal-Koch Bihar region. Instruments such as Dotora, Sarinda, Dhol, Dhak, Khol, flute, and Shanai occur in other regional traditions, including Goalpariya music (Sarma & Monteiro, 2019). Such similarities may reflect historical interaction, migration, trade, shared ecological conditions, or common technological solutions rather than direct cultural borrowing. Comparable use of bamboo, wood, plant fibres, and animal materials has also been reported among Bodo and Mising communities of Assam (Brahma *et al.*, 2015; Pegu, 2022). These similarities place Koch Rajbongshi instrument-making within a broader northeastern Indian biocultural tradition while retaining its distinctive cultural identity.

A particularly important aspect of the findings is the integration of music with ritual, ecology, and belief. In practices such as Hudum Puja, Bash Puja, Kati Puja, Marai Puja, Doul Jatra, and Sonarai Puja, musical instruments participate in ceremonies associated with rainfall, fertility, agriculture, protection, and social wellbeing. The use of banana and bamboo as ritual symbols demonstrates that plants may simultaneously function as biological resources, musical materials, and sacred cultural objects. Similar relationships between plants, ritual practices, and cultural values have been documented among other communities of Assam (Sharma & Pegu, 2011). Thus, Koch Rajbongshi instruments may be viewed not merely as sound-producing devices but as mediators connecting people, landscape, ritual, and cultural memory.

The study contributes to the understanding of the relationship between plant resources, traditional craftsmanship and cultural practices among the Koch Rajbongshi community. By documenting the plant species used in the construction of traditional musical instruments, their respective plant parts and the selection criteria described by local instrument makers, this study provides an ethnobotanical perspective on an important but relatively less explored aspect of traditional knowledge. The application of quantitative indices, including frequency of citation (FC) and use value (UV), further provides an overview of the relative importance of the documented plant species within the study area. In addition, the findings highlight the role of locally available biological resources in sustaining traditional musical practices and its cultural conservation. Therefore, the documented plant-instrument relationships provide a baseline for identifying culturally important species and developing community-based conservation strategies. Cultivation of commonly used bamboo, gourd, palm, and fibre-producing species could help maintain access to raw materials, while traditional craftsmen and musicians should be recognized as important knowledge holders. Conservation should therefore address both biological resources and the cultural practices through which these resources acquire meaning (Maffi, 2005; Pretty *et al*., 2009). Future research integrating ethnobotany, wood science, plant anatomy, and acoustics could examine whether the preferred species possess measurable properties that explain their traditional selection. Further investigation of knowledge transmission among different age groups would also help identify the factors influencing the continuity of this heritage (Hewlett *et al*., 2011). Overall, the study demonstrates that Koch Rajbongshi musical instruments represent a dynamic biocultural system linking biodiversity, material knowledge, craftsmanship, ritual, and identity. Their conservation therefore requires simultaneous attention to biological resources, traditional skills, cultural practices, and intergenerational knowledge transmission.

Conclusion

The findings demonstrate that Koch Rajbongshi musical instruments represent a distinctive expression of biocultural knowledge in which biodiversity, material technology, sound, ritual and identity are inseparable. The selection of bamboo, reeds, timber, gourds, palms and plant fibres reflects long-term experiential knowledge of material properties and local availability, while the incorporation of animal-derived membranes, horn, hair and silk demonstrates a broader multi-resource technological system. The presence of comparable instruments and construction materials among Bodo, Mising and other communities of Assam, as well as within Goalpariya and related North Bengal musical traditions, points to a wider regional zone of cultural interaction; however, the Koch Rajbongshi community has developed distinctive combinations of materials, craftsmanship, performance genres and ritual meanings. Most importantly, the study shows that music provides a particularly powerful lens through which to understand the relationship between people and their environment. Further

research can be conducted to undergo experimental measurements of the physical, anatomical, mechanical, or acoustic properties of the documented plant species. Research works incorporating quantitative acoustic analysis, material characterization, broader geographical sampling, and systematic investigation of intergenerational knowledge transmission should be further done to understand the relationships between biodiversity, instrument technology, and cultural continuity of the Koch Rajbongshi community.

Declarations

List of abbreviations: POWA-Plants of the World Online; **ITIS**- Integrated Taxonomic Information System; **Ter**- Terrestrial; **SM**- Semi moist**; M** - Moist

Ethics approval and consent to participate: The participants accepted to be interviewed and signed the free and Informed Consent Form

Consent for publication: The participants accepted to be interviewed and signed the free and Informed Consent Form, as appropriate in accordance with the ethical guidelines for ethnobiological research.

Availability of data and materials: Primary information was collected from traditional instrument makers and other knowledgeable community members. For taxonomic identification herbariums were prepared and further verified by BSI, Shillong.

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Author contributions: M.B collected the data, analyzed, and wrote the text, J.B participated in the theoretical background, monitoring data collection and analysis, helping with discussions, and wrote the final version of the text, R.S helped with map construction, herbarium consultations and literatures and S.B helped in providing ethical considerations.

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