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Ethnobotany of rattan as a binding material for the traditional Kaki Seribu house among the Sougb subethnic group in Awaigau Village, Arfak Mountains, West Papua, Indonesia

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Abstract

Rattan is an important biological binding material in the traditional construction of Kaki Seribu houses in the Arfak Mountains, yet the relationships among species selection, resource access, processing, and construction technology remain poorly documented. This study examined the ethnobotany of rattan among the Sougb subethnic group in Awaigau Village, Taige District, West Papua, Indonesia. Twenty-five informants were purposively selected, including five key informants, and data were collected through interviews, direct observation, and guided walks; ten houses were documented. Two rattan taxa were directly associated with house lashing: *Calamus depauperatus* (humogo) and *Calamus aff. depauperatus* (imini). Humogo was reported by 25/25 informants (RFC = 1.00) and imini by 20/25 (RFC = 0.80), while 80% reported using both. Fidelity Level was 100% for both taxa within the single-use dataset, and the Informant Consensus Factor was 0.977. Informants regarded both taxa as strong, but imini was considered more practical when available because its smaller diameter allowed it to be used whole, whereas humogo generally had to be split into 2-4 strips. Mature, harvestable humogo was perceived to have become less available around Awaigau, prompting sourcing from Anggi Gida through kinship and reciprocal exchange, whereas imini was reported mainly from Catubouw to the upper Wariori River. More than 500 lashing points were directly recorded across house components. Rattan selection is therefore shaped jointly by spatial access, material properties, processing requirements, and local technological knowledge, supporting its interpretation as a biocultural construction material.

Keywords: Arfak Mountains; *Calamus*; Quantitative ethnobotany; Rattan lashing; Sougb; Traditional architecture

1. Introduction

New Guinea is one of the world's most important biocultural regions, characterized by exceptionally rich relationships among Indigenous communities, forests, and useful plants. A regional review of New Guinea plant knowledge compiled tens of thousands of use reports and revealed major documentation gaps across regions, communities, and use categories [1]. Similar gaps have implications for policy assessment because poorly documented local knowledge may be underrepresented in scientific syntheses and conservation planning [2].

Palms, including rattans, occupy an important place in the material cultures of New Guinea because their stems are used for a wide range of purposes. A quantitative analysis of palms in New Guinea demonstrated the extensive use of the family Arecaceae across multiple domains of life [3]. At the material level, rattan properties are not uniform: anatomy,

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diameter, stem position, physical properties, and durability may vary among species and diameter classes [4]. Such variation provides a scientific basis for understanding why communities may distinguish rattan types through functional experience rather than morphology alone.

In traditional building systems, flexible binding materials allow wooden or other natural structural elements to be joined without relying entirely on industrial connectors. Studies of connections in structures made from natural culms or stems show that lashing systems rely on combinations of wrapping, clamping force, and friction, although their actual behavior depends on the material and joint configuration [5]. Experimental studies of bamboo culm joints have also shown that lashed joints exhibit slip and rotational behavior that differ from those of rigid connections [6]. In the present study, this literature is used only as a material-mechanics analogy; Sougb techniques must be described on the basis of local evidence and emic terminology.

The Kaki Seribu house is a traditional architectural form of the Arfak Mountains. A specific study of Kaki Seribu knots documented variation in knot patterns associated with floor and wall functions [7]. However, that study did not address key ethnobotanical questions: which rattan taxa are selected, how local people evaluate their quality, how geographic access influences use, how rattan is processed before being used as a lashing material, and how changes in material availability relate to the sustainability of house-building technology.

The Sougb context is particularly relevant because other ethnobotanical research among Sougb communities has shown that plant use may be closely linked to skills, social division of roles, cultural identity, and the conservation of habitats that provide raw materials [8]. At the broader Arfak Mountains scale, traditional knowledge also remains important in natural-resource management [9]. Nevertheless, evidence from the Noken domain or from other Arfak groups should not automatically be transferred as fact to the use of rattan for lashing Sougb Kaki Seribu houses; local verification remains essential.

This study therefore focused on the Sougb subethnic group in Awaigau Village, Taige District, with four objectives: (1) to document the two rattan taxa used directly as lashing materials in Kaki Seribu houses; (2) to analyze quantitative use patterns while distinguishing frequency of use from technological preference; (3) to document access, harvesting, processing, construction functions, and locally perceived changes in availability; and (4) to assess the implications of these findings for the conservation of biological materials and the sustainability of construction knowledge. As a conceptual contribution, the study evaluates the usefulness of the term biocultural construction material for describing a biological material whose technological value cannot be separated from knowledge, socio-ecological access, and architectural practice.

2. Materials and Methods

2.1. Study area

The study was conducted in Awaigau Village, Taige District, Arfak Mountains Regency, West Papua Province, Indonesia. The recorded field location was approximately 01°16'35.1" S and 133°51'12.5" E, at an elevation of about 1,893 m above sea level according to field GPS measurements. Field research was conducted for one month (May 2026), following a long-term rattan specimen-collection effort initiated in 2014 in the Arfak Mountains.

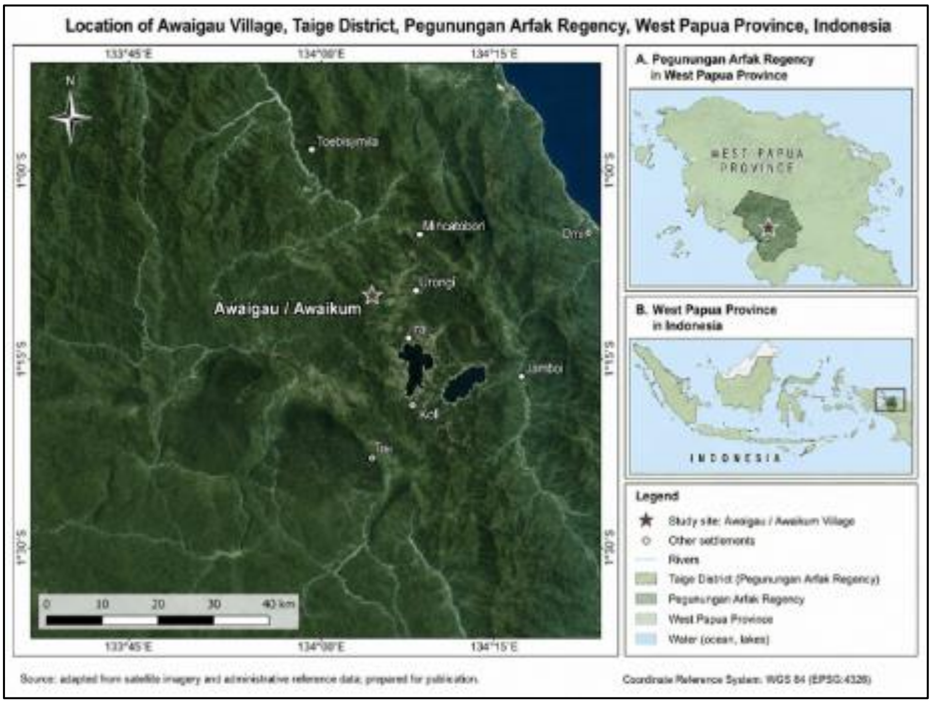

Figure 1 Location of the study area in Awaigau Village, Taige District, Arfak Mountains Regency, West Papua Province, Indonesia

Awaigau Village lies within a montane landscape where community-forest relationships are important for obtaining construction materials and non-timber forest products. Regional research in New Guinea emphasizes that locations, linguistic or ethnic groups, and plant sources should be documented as precisely as possible because plant knowledge is highly heterogeneous across regions and communities [1]. Accordingly, the findings of this study are explicitly limited to the Sougb context in Awaigau/Taige and to the material-access networks reported by informants.

2.2. Informants, sampling, and data collection

A total of 25 informants were recruited using purposive and snowball sampling, including five key informants. Participants included house builders, house owners, rattan collectors, young community members, and local officials or leaders relevant to the research context. Data were collected through interviews, direct observation, and guided walks. Ten Kaki Seribu houses were documented to obtain information on house dimensions, construction components, observed lashing points, and material changes.

Prior to fieldwork, the research team approached the Head of Awaigau Village and explained the objectives, scope, and planned research activities. Permission to conduct the study in the village was subsequently granted by the Village Head in accordance with locally accepted community procedures. Sensitive data concerning traditional knowledge and informant identities were handled with due regard to confidentiality and community sensitivities. Most informant statements were recorded in paraphrased form. Because informant codes, interview dates, and verbatim transcripts were not available for all interviews, paraphrased statements are not presented in quotation marks as direct quotations.

2.3. Taxonomic identification and voucher specimens

For the rattan taxa directly associated with lashing functions in Kaki Seribu houses, specimens were collected, preferably in a fertile condition, and diagnostic characters were recorded. Taxonomic delimitation within the genus *Calamus* is complex, and rattan diversity in New Guinea is high; species-level claims should therefore be supported by diagnostic voucher specimens and taxonomic verification [10,11].

Collected rattan specimens are deposited in the Herbarium Manokwariense, Universitas Papua, Manokwari. The specimens were identified by an experienced rattan specialist using diagnostic characters and with reference to *Palms of New Guinea* (2024) [12].

2.4. Ethnobotanical and technological variables

For each taxon, the study recorded the local name, reported access or harvesting location, plant part used, harvest maturity, cutting technique, splitting or whole-stem use, coil form, function in house components, reasons for selection, perceived strength and practicality, and changes in access or availability. At the house level, recorded variables included house dimensions, number of houses observed, observed lashing points, estimated range of coil requirements, division of roles in construction, and visible material substitution.

2.5. Quantitative ethnobotanical analysis

The quantitative analysis was based on 25 informants and one strictly defined use category: rattan used as a lashing material for Kaki Seribu houses. The indices calculated were Frequency of Citation (FC), Relative Frequency of Citation (RFC), Species Use Value (UVs), Cultural Importance Index (CI), Fidelity Level (FL), and Informant Consensus Factor (ICF). The basic formulae followed established quantitative ethnobotanical methods [13-16], while interpretation of the indices was undertaken cautiously in accordance with the structure of the dataset [17].

The quantitative ethnobotanical indices were calculated using the following formulae:

2.5.1. Frequency of Citation (FC)

FC_s = number of informants who mentioned or used taxon s.
FC represents the number of informants who reported a given taxon for the use investigated.

2.5.2. Relative Frequency of Citation (RFC)

$$\mathbf{RFC_s = FC_s / N}$$

Where FC_s = number of informants who mentioned or used taxon s, and N = total number of informants. RFC ranges from 0 to 1 and describes the breadth of citation or use of a taxon within the sample.

2.5.3. Species Use Value (UVs)

$$\mathbf{UV_s = (\Sigma\, U_{is}) / N}$$

Where U_{is} = number of use reports provided by informant i for taxon s, and N = total number of informants. In this study, UVs are given a restricted interpretation because the dataset records only one use category: rattan as a lashing material for Kaki Seribu houses.

2.5.4. Cultural Importance Index (CI)

$$\mathbf{CI_s = \Sigma_u\, (UR_{su} / N)}$$

Where UR_{su} = number of informants reporting taxon s in use category u, N = total number of informants, and u = use category. Because this study includes only one use category, CI is reported as a restricted CI and is not interpreted as the species' total cultural importance.

2.5.5. Fidelity Level (FL)

$$\mathbf{FL_s\,(\%) = (N_p / N_s) \times 100}$$

Where N_p = number of informants who mentioned taxon s specifically for lashing Kaki Seribu houses, and N_s = total number of informants who mentioned taxon s for all uses recorded in the dataset. In a single-use dataset, FL may reach 100% structurally; it must therefore be interpreted alongside FC/RFC and qualitative evidence.

2.5.6. Informant Consensus Factor (ICF)

$$\mathbf{ICF = (N_{ur} - N_t) / (N_{ur} - 1)}$$

Where N_{ur} = total number of use reports in the use category, and N_t = number of taxa used in that category. An ICF value approaching 1 indicates that use reports are concentrated among relatively few taxa and suggests high internal consensus; however, in a single-category dataset, this value must be interpreted cautiously.

Application to the study dataset: humogo (*Calamus depauperatus*) had FC = 25 and RFC = 25/25 = 1.00; imini (*Calamus aff. depauperatus*) had FC = 20 and RFC = 20/25 = 0.80. Restricted UVs and restricted CI were 1.00 for humogo and 0.80 for imini. FL for house lashing was 100% for humogo (25/25) and 100% for imini (20/20). For the Kaki Seribu house-lashing category, N_{ur} = 45 and N_t = 2, giving ICF = (45 - 2)/(45 - 1) = 0.977.

The indices were not treated as single composite scores of cultural value or preference. Leonti [17] showed that ethnobotanical indices are often assigned interpretations that exceed the structure of the underlying data. Accordingly, RFC, UVs, restricted CI, FL, and ICF in this study were always interpreted in relation to geographic access, stem diameter, and material processing, as well as informants' explanations of practical choice.

2.6. Qualitative analysis and evidence status

Interview and observational data were synthesized into four dimensions: (1) taxon identity and ecological-spatial access; (2) material and construction technology; (3) knowledge and the social organization of use; and (4) changes in access and conservation implications. Each claim was classified as observed or reported primary evidence, analytical interpretation based on data-literature integration, or a data gap. This distinction was used to prevent local evidence from being substituted with information derived from other groups or locations.

3. Results and Discussion

3.1. Rattan taxa and material-functional knowledge

The integrated data consistently documented two taxa directly associated with lashing Kaki Seribu houses: *Calamus depauperatus* Ridl. (Sougb local name: humogo) and *Calamus aff. depauperatus* (imini). Field vouchers representing *C. depauperatus* were recorded as RAM 738 and RAM 739, whereas RAM 742 and RAM 744 represented *C. aff. depauperatus*. The abbreviation aff. for imini indicates taxonomic affinity rather than a final species identification. The identity of imini therefore remains provisional pending final taxonomic examination.

Figure 2 Humogo rattan (*C. depauperatus* Ridl.) (left) and imini rattan (*C. aff. depauperatus*) (right)

Informants distinguished the two taxa primarily through use-related characteristics. Humogo has a larger diameter and generally must be split before use, whereas imini has a smaller diameter and can be used whole. Key informants considered both taxa equally strong as lashing materials. Local classification, therefore, operates as material-functional knowledge: stem diameter, processing requirements, access location, and suitability for lashing influence decisions about use jointly.

Table 1 Ethnobotanical and technological characteristics of the two rattan taxa used for Kaki Seribu house lashing

Dimension	**Humogo - *C. depauperatus***	**Imini - *C. aff. depauperatus***
Local name/voucher	Humogo / RAM 738, RAM 739	Imini / RAM 742, RAM 744
Taxonomic status	Identified as *C. depauperatus*; voucher verification remains necessary for final publication	Provisional identification (aff.); requires final taxonomic verification
Access/distribution according to informants	More widely used; availability of mature stems around Awaigau is perceived to have declined; important current sources were reported from Anggi Gida, including Mount Saru and Mount Ayau	Not evenly available in Taige; reported mainly from Catubouw District to the upper Wariori River
Form of use	Stems are generally split into 2-4 sections before use	Smaller-diameter stems can be used whole
Construction function	Lashing for support posts, main posts, floors, walls, and roof frames	The same lashing functions when available
Informant assessment	Strong and widely used because access and realized use are more widespread	Considered equally strong and more practical because less preparation is required

Note: Information on access is based on interview data and should not be equated with population-abundance data. The taxonomic status of imini remains provisional.

3.2. Quantitative use patterns: realized use versus technological preference

All 25 informants used or mentioned humogo in the house-lashing category, whereas 20 used or mentioned imini. Five informants (20%) used only humogo, none used only imini, and 20 informants (80%) used both. This pattern indicates predominant co-use while also demonstrating the broader realized use of humogo.

Humogo had FC = 25 and RFC = 1.00, whereas imini had FC = 20 and RFC = 0.80. However, the difference in RFC cannot be interpreted directly as a difference in preference. Interview data indicate that access to imini is more spatially restricted; when available, informants considered it practical because it does not require splitting. Thus, the higher frequency of humogo reflects a combination of availability or access and realized use.

The principal quantitative finding is the contrast between the dominance of humogo in realized use and the technological practicality of imini when available. An RFC of 1.00 for humogo indicates that this taxon occurred across all recorded use experiences, but it does not demonstrate that the community intrinsically prefers it. Leonti [17] cautioned that indices such as RFC, UV, CI, and FL should not be assigned causal or cultural meanings that are not contained in the design of the dataset.

Interview data provide a mechanism for interpreting these values: imini is constrained by geographic access, whereas humogo is more widely used in practice. Imini was regarded as equally strong and more practical because it does not need to be split. Ecological-spatial access therefore mediates the relationship between preference and realized use. This is an important analytical point because ethnobotanical studies risk equating the most frequently cited plant with the most preferred plant.

Table 2 Quantitative ethnobotanical indices for humogo and imini in the house-lashing use category

Index	Humogo	Imini	Appropriate interpretation
FC	25	20	Number of informants who mentioned/used the taxon for house lashing
RFC	1.00	0.80	Breadth of realized use in the sample; not a measure of pure preference
Restricted UVs	1.00	0.80	Restricted to one use category; not the total species use value
Restricted single-category CI	1.00	0.80	Should not be treated as total cultural importance
FL for house lashing	100% (25/25)	100% (20/20)	All citations in the dataset relate to lashing; this does not imply equal access or preference
Category ICF	0.977 (N_{ur} = 45; N_t = 2)	0.977 (shared category)	High internal consensus within one category, but structurally likely to be high because only one category was analyzed

Methodological note: The quantitative indices above should be interpreted together with the qualitative context and should not be used as single scores of cultural value [17].

3.3. Spatial access, perceived availability, and kinship-mediated sourcing

Key informants reported that imini is not evenly available among villages in Taige District and is found mainly from Catubouw District to the upper Wariori River. This pattern helps explain why no informant reported using imini alone. Where it is accessible, imini continues to be used as a lashing material and is regarded as more practical because of its smaller stem diameter.

By contrast, humogo has a broader range of realized use, but field data also indicate changes in access. Informants stated that mature, harvestable humogo stems were formerly common around the village, whereas mature stems ready for harvest are now perceived to be much less available and seedlings or young rattan are encountered more frequently. Because no vegetation plots or time-series data were available, this finding is reported as a perceived decline in the availability of mature harvestable stems rather than as an estimate of population decline.

To obtain humogo for house construction, informants reported traveling to Anggi Gida District, specifically to Mount Saru and Mount Ayau. Rattan was reported to be obtained through relatives, gifts, or reciprocal exchanges involving food or other goods. These findings show that access to construction materials is not determined solely by plant distribution but also by kinship relationships and social resource networks.

The community perception that mature, harvestable humogo is becoming more difficult to find around Awaigau is an important conservation signal, but it is not equivalent to ecological evidence of population decline. Without vegetation plots, clump-density data, age-class structure, regeneration data, or time series, this study cannot calculate a rate of decline. Distinguishing among access, availability of harvestable mature stems, and population abundance is essential to avoid overstating conservation claims.

Nevertheless, the shift in sourcing toward the Anggi Gida District indicates a social response to changes in local resource availability. Kinship ties facilitate access to material through gifting and reciprocal exchange. Literature on Sougb communities emphasizes that plant-based practices are linked to social relationships and the conservation of habitats that supply raw materials [8]. At the broader Arfak Mountains scale, traditional knowledge also forms part of natural-resource governance [9]. In this study, the strongest evidence concerns kinship-based access networks that enable continuity of construction-material supply when local sources are difficult to obtain, rather than specific customary rules for rattan.

The term Igya Ser Hanjob is relevant to the broader context of environmental management and ethics in the Arfak/Sougb literature. However, this study did not document specific rules governing humogo or imini harvesting regarding permissions, zoning, seasons, quotas, rotation, taboos, or sanctions. These issues therefore require dedicated interviews and should not be inferred solely from the general context of customary law.

3.4. Harvesting, processing, and material properties

Rattan was harvested after the stem had developed and the section to be collected was relatively free of leaf sheaths. Informants cited a minimum stem length of approximately 5 m as one practical criterion, after which the stem was cut with a machete. This criterion represents field-based local knowledge and has not been tested as a biological standard for determining age or maturity.

Humogo was processed using a machete or knife and split into several sections; field documentation recorded splitting into 3-4 strips, whereas the interview synthesis indicated a range of 2-4 strips. To accommodate this variation, the study reports that humogo is generally split into 2-4 sections. The strips are then gathered and coiled; field documentation recorded a coil diameter of approximately 10-15 cm. Because imini has a smaller diameter, it can be used whole, requiring fewer preparation steps.

These processing differences are ethnobotanically relevant because rattan material properties may vary among species and diameter classes. Materials research has demonstrated variation in rattan anatomy and physical properties across species and diameter classes [4], while moisture content influences the physical and mechanical properties of lignocellulosic materials, including rattan [18]. The present study did not conduct mechanical testing; therefore, this literature supports the plausibility of community observations but does not demonstrate specific strength values for humogo or imini.

Differences in diameter and the need for splitting are central to material selection. Such knowledge may be understood as material ecological knowledge: people evaluate plants through characteristics that become apparent during harvesting, processing, bending, and installation. Ahmed et al. [4] showed that the anatomical, physical, and durability properties of rattan may vary among species and diameter classes. Although their study did not directly test humogo or imini, it supports the proposition that taxonomic and diameter differences may have genuine technological consequences.

Moisture should also be considered in future research. Yang et al. [18] showed that water status in rattan is associated with changes in physical and mechanical properties. Because traditional lashings undergo wet-dry cycles and aging, experimental research on humogo and imini should measure diameter, moisture content, tensile strength of split strips, flexibility, shrinkage, and retention of lashing force. Such testing would enable a direct dialogue between community knowledge and materials science without reducing local knowledge to mechanical data alone.

3.5. Rattan lashing in Kaki Seribu house construction

Ten houses were observed, ranging in size according to household needs from approximately 8 x 6 m to 12 x 8 m. Rattan was used to lash lower support posts, main posts, floors, walls, and roof frames. Because these functions span multiple construction zones, rattan serves as a connector, integrating numerous wooden or other stem elements into a single building system.

More than 500 lashing points were directly documented during field observations. A separate photographic analysis produced a preliminary visual estimate of approximately 3,500-5,500 lashing points for a large house, with a midpoint of about 4,500. This estimate was not derived from a census and is therefore not used as the primary figure for the total number of lashing points. Until a full-house lashing inventory is conducted, >500 is retained as the defensible observational minimum.

Photographic documentation enabled a provisional technical classification into three types: (1) major structural lashings at post-beam intersections, characterized by multiple or tightly spaced wraps; (2) intermediate lashings on frames or walls; and (3) repetitive light lashings on floor grids or small stems. A previous Arfak study likewise distinguished floor and wall knots according to function [7]. However, the local names, the sequence of knot formation, the standard number of wraps, and the rules for selecting lashing types have not yet been recorded through demonstrations by traditional builders.

In modern engineering terminology, these configurations may be compared with lashing connections, but this analogy should not replace local terminology. Reviews of connections in natural-stem structures emphasize the roles of wrap number, friction, and joint configuration [5], whereas experimental tests show that lashed joints may exhibit characteristic slip and rotational behavior [6]. The present Sougb study did not measure tensile force, stiffness, or joint capacity.

In Kaki Seribu houses, rattan is not a primary load-bearing timber element, but its role as a connector is systemically important: without the lashings, numerous stem elements would not be integrated into floors, walls, frames, and joints. Haryanto et al. [7] documented the complexity of knots in Arfak Kaki Seribu houses, while Aniñon and Garciano [5] showed more generally that lashing systems constitute a class of connection technology whose performance depends on material, configuration, wrapping, and friction.

On this basis, the term biocultural construction material is used here as an analytical framework: the value of rattan emerges from the relationships among taxon identity, habitat and access, processing skills, lashing techniques, social sourcing networks, and the continuity of traditional architecture. This concept does not imply that rattan necessarily carries a specific ritual meaning. Rather, its analytical value lies in integrating the evidence actually available: a particular biological material becomes useful only through the knowledge and social practices that enable it to be harvested, processed, and installed.

Table 3 Main construction data for the documented Kaki Seribu houses

Construction variable	Main finding	Evidence status
Number of houses	10 houses	Primary data
Size	Approximately 8 x 6 m to 12 x 8 m	Observation + informants
Lashing points	>500 observed points; photographic estimate of 3,500-5,500 for large houses	>500 = primary data; 3,500-5,500 = preliminary visual estimate
Humogo requirement	Approximately 100-200 coils per house, depending on size	Key informants; standard coil length not yet measured
Imini requirement	Approximately 200-300 coils per house, depending on size	Key informants; should not be assumed to be additive to humogo in all cases
Division of roles	Almost all stages of construction were reported to be performed by men	Informant data; emic knowledge authority has not yet been mapped
Modern substitution	Some leaf/pandan roofing has been replaced with aluminum roofing sheets	Observation + informants; does not demonstrate that rattan has been replaced
Construction duration	No defensible data currently available	Data gap

3.6. Biocultural construction material and limits of cultural evidence

The data strongly support the functional and technological importance of rattan. Knowledge of taxon selection, material-source locations, criteria for harvestable stems, splitting or whole-stem use, coil preparation, and the application of lashings constitutes an integrated body of ecological and technological knowledge. In this context, rattan is not merely a consumable material; its availability enables traditional construction practices to continue.

However, the dataset does not specifically document symbolic, ritual, or cosmological meanings associated with rattan. Nor does it systematically record holders of knowledge authority, local titles for expert builders, each informant's learning history, the skill level of younger generations, or specific customary rules concerning rattan-harvest quotas, seasons, or taboos. These elements are therefore not reported as factual findings. Sougb research on Noken does demonstrate relationships among plants, cultural practice, and biocultural identity [8], but patterns from that domain should not automatically be assumed to apply identically to house construction.

Almost all stages of house construction in this dataset were reported to be carried out by men. This finding indicates a gendered distribution of roles in construction practice, but it is not sufficient to determine who is recognized emically as the principal holder of knowledge. Further verification should involve interviews with master builders, documentation of learning lineages, and observation of technical demonstrations.

3.7. Knowledge sustainability, conservation implications, and study limitations

The available data are insufficient to determine whether construction knowledge is transmitted directly through the participation of younger generations. Global studies show that local ecological knowledge may change, decline, or be transformed under socio-ecological pressures [19]. In Papua New Guinea, Kik et al. [20] found associations among traditional life experiences, skills, and ethnobiological knowledge among younger people, including links to other traditional skills. These regional findings support the urgency of further research but do not constitute direct evidence of conditions among the Sougb in Awaigau.

Future studies should explicitly measure knowledge transmission by comparing age groups, learning histories, frequency of participation in construction, ability to identify rattan, ability to process materials, and demonstrations of lashing or knotting techniques. Cámara-Leret and Dennehy [2] showed that gaps in the documentation of local knowledge can reduce the representation of community knowledge in science-policy assessments. Documentation of Sougb's construction skills should therefore proceed alongside the protection of knowledge rights and appropriate community engagement and permission.

Conservation of the Kaki Seribu house should not be understood solely as conservation of a building form. If mature rattan becomes increasingly difficult to access, kinship-based sourcing networks weaken, or processing and lashing skills are no longer practiced, the architecture's sustainability will also be affected. A more appropriate conservation approach links rattan-source habitats, harvesting practices, regeneration, social sourcing networks, taxonomic documentation, and construction learning.

The first priority is to obtain quantitative ecological data for humogo and imini through plots or transects at source locations identified by informants. The second is to standardize material units: the length and mass of one "coil" should be measured so that requirements of 100-200 or 200-300 coils can be translated into material demand and harvesting pressure. The third priority is a complete inventory of lashing points and rattan requirements by joint type. The fourth is taxonomic verification of imini, because conservation planning for biological material cannot be appropriately designed while its taxonomic identity remains provisional.

This study has several limitations that should be stated explicitly. First, purposive sampling of 25 informants in a single village was not intended to produce estimates representative of the entire Sougb subethnic group. Second, the quantitative dataset covered only one use category, giving UVs and CI very limited interpretive scope and making them largely redundant with citation frequency. Third, the identity of imini remains provisional as *C. aff. depauperatus*. Fourth, no vegetation-plot or population-census data were available to test perceptions of declining availability.

Fifth, the length and mass of a single coil have not been standardized. Sixth, the estimate of 3,500-5,500 lashing points was based on visual assessment rather than a complete census. Seventh, construction duration, coded verbatim quotations, emic knowledge authority, intergenerational transmission patterns, skills among younger generations, and specific customary rules for rattan harvesting have not been adequately documented. These limitations do not negate the value of the findings, but they define the boundaries of defensible claims and the agenda for future research.

4. Conclusion

This study shows that the use of rattan as a lashing material for Kaki Seribu houses among the Sougb subethnic group in Awaigau Village centers on two taxa, *Calamus depauperatus* (humogo) and *Calamus aff. depauperatus* (imini). Humogo had the broadest realized use (RFC = 1.00), while imini was used by 80% of informants (RFC = 0.80). The higher use frequency of humogo does not necessarily indicate a stronger inherent preference: informants considered both taxa equally strong, whereas imini was more practical when available because it could be used whole and required less processing.

Geographic access is a key variable. Imini was reported mainly from Catubouw District to the upper Wariori River, whereas the availability of mature, harvestable humogo around Awaigau was perceived to have declined, resulting in a shift in sourcing toward Anggi Gida District through kinship networks and reciprocal exchange. These findings show that continuity of Kaki Seribu construction technology is supported not only by the presence of the plant resources themselves but also by material knowledge and social relationships that enable access to them.

Rattan is used across multiple house components, and more than 500 lashing points were directly recorded; larger visual estimates still require validation. Within this framework, rattan can be understood as a biocultural construction material: a biological material whose construction function is realized through the integration of botanical knowledge, processing, lashing techniques, spatial access, and social practices. Future conservation efforts should integrate taxonomic verification, population monitoring, standardization of material requirements, documentation of lashing techniques, and research on skill transmission. Claims regarding symbolism, ritual, specific harvesting rules, and intergenerational knowledge erosion should await direct and measurable local evidence.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there are no conflicts of interest related to this research or the publication of this article.

Statement of ethical approval

Prior to fieldwork, the objectives, scope, and planned activities of the study were explained to the Head of Awaigau Village, and permission to conduct the research was granted by the Village Head in accordance with locally accepted community procedures.

Statement of informed consent

The study was conducted with respect for local authority, community practices, and the confidentiality of information provided by participants. Information considered sensitive or restricted by the community was treated as confidential and was not reported without permission.

Data Availability

The ethnobotanical data supporting the findings of this study are available from the corresponding author, subject to protection of traditional knowledge, informant confidentiality, and relevant community and ethical restrictions.

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