

The Contribution of Gastropods from Various Ecosystems to the Diet of Prehistoric Hunter-Gatherers in Sri Lanka

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Abstract

The Mesolithic era in Sri Lanka's prehistory is regarded as a pivotal epoch. The principal rationale for this is that it offers some of the oldest and most sustained evidence of the adaptation of anatomically modern humans (AMH) to tropical rainforests and diverse ecological circumstances in South Asia. From approximately 48,000 to 3,500 years ago (ca. 48 ka to ca. 3.5 ka), the prehistoric hunter-gatherers of this period, known as "*Balangoda Man*," employed a highly adaptable, broad-spectrum foraging strategy. The utilisation of diverse molluscan resources was significantly important within their overall faunal diet. Excavations at significant inland caves and rock shelters have uncovered

enormous habitation deposits rich in shell remains, demonstrating that these *gastropods* (snails) served as a primary dietary resource. Instead of authentic coastal shell middens, these concentrated cave assemblages represent the intentional and methodical collection of particular taxa from the adjacent environment. This encompasses the exploitation of arboreal species such as *Acavus* inhabiting the rainforest canopy, together with freshwater aquatic species like *Paludomus* sourced from adjacent streams. Thus, examining these snail remains offers essential information about the ecological adaptability, nutritional diversity, and resource management methods of the hunter-gatherer tribes in Sri Lanka during the late Pleistocene and Holocene periods.

Keywords: *Acavus species, Mesolithic period, Prehistoric cuisine, Snail consumption, Zooarchaeology*

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Introduction

The Mesolithic era of Sri Lanka is a significant epoch in South Asian prehistory, offering substantial evidence of Anatomically Modern Humans acclimatising to varied tropical ecosystems. From approximately 48,000 to 3,500 years ago (ca. 48 ka to ca. 3.5 ka) (Wedage et al., 2019; Langley et al., 2020; Siriwardana & Manusinghe, 2024; Sumangala, 2019), these prehistoric hunter-gatherers, historically designated in early literature as *Homo sapiens balangodensis* or "*Balangoda Man*," employed a highly versatile, broad-spectrum foraging strategy.

Their diet was varied, consisting of hunting small to medium-sized mammals such as macaques and giant squirrels, in addition to foraging for plant sources included wild kekuna (*Canarium*) nuts, wild breadfruit, and wild yams. The utilisation of molluscan resources was essential and complementary within this ecological dependence. Excavations at inland caves and rock shelters, such as *Fa-Hien Lena*, *Batadombalena*, *Kebelle Lena* and *Kitulgala Beli Lena*, have uncovered habitation deposits featuring a substantial assemblage of shell remnants. These assemblages signify the methodical collection of arboreal gastropods such as *Acavus* from the rainforest canopy, in addition to freshwater snails like *Paludomus* inhabiting adjacent streams.

These communities employed an advanced toolset for resource processing, comprising geometric

microliths crafted from quartz and chert, bone tools, and heavier implements. The precise use of specific tools, such as pitted stones, continues to be a matter of archaeological interpretation; however, the entire collection indicates a distinctive adaption to wet zone habitats.

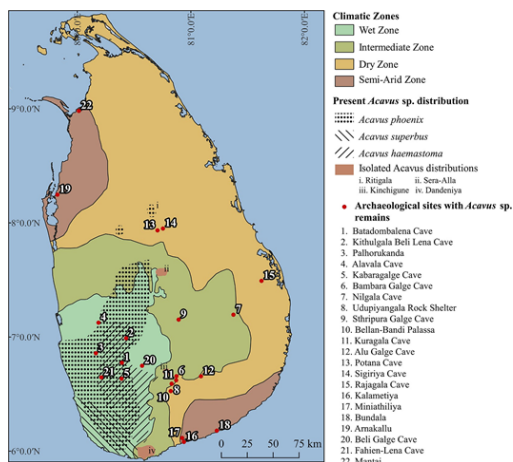


Fig.01 Distribution of *Acavus* species in Sri Lanka alongside the locations of archaeological sites where *Acavus* remains have been documented, along with ecological zones. Consult Table 1 for pertinent information regarding the numbered archaeological sites. The wet zone is defined by the 2500 mm isohyet, whereas the 1800 mm isohyet demarcates the boundary between the intermediate and dry zones.

Study Objectives

- To ascertain the particular gastropod taxa ingested by the prehistoric hunter-gatherers of Sri Lanka.
- To examine the correlation between mollusc exploitation and human habitat choices across several ecological zones.

- To analyse the current taphonomic and technological evidence concerning the techniques employed to process and ingest these gastropods.
- Performing a qualitative analysis of shell assemblages across various geographical and microclimatic regions to comprehend human migration and adaptive feeding methods.

Research Issue

The prehistoric people of Sri Lanka are well-documented for their proficiency in hunting small mammals, although the specific nutritional significance of gastropods within their overall subsistence strategy is intricate. The primary research issue is to assess the significance of mollusc consumption in meeting daily nutritional and protein needs.

Approach

This study utilises a mixed-method approach, incorporating both quantitative and qualitative evaluations of available zooarchaeological data to tackle the research challenge.

- This entails analysing quantitative taxonomic data (including the Number of Identified Specimens [NISP] and Minimum Number of Individuals [MNI]) from published excavation reports of significant cave sites (e.g., Batadombalena, Beli Lena) to assess the relative abundance of *Acavus* and *Paludomus species*.
- Examining recorded alterations on shell fragments, including puncture marks, localised burn evidence, and distinct fracture patterns, to deduce preparation and consuming methods.

Review of Literature

The examination of Sri Lanka's prehistoric diet and ecological adaption relies significantly on the analysis of faunal remains within habitation deposits. The groundwork for these zooarchaeological research was established by Dr. P.E.P. Deraniyagala (1953/1958). He disclosed preliminary insights into early subsistence practices. He was among the pioneers to objectively ascertain that the dense shell accumulations at locations such as Beli Lena and Bellan-bandi Palassa were manmade kitchen refuse rather than natural deposits, hence emphasising the incorporation of aquatic and terrestrial resources in the prehistoric diet.

Dr. Siran Deraniyagala's seminal study (1992) established a thorough ecological viewpoint on the prehistory of Sri Lanka, building upon this basis. He carefully categorised the integration of arboreal *Acavus* species and freshwater *Paludomus* species into a wet-zone rainforest adaption plan, detailing the exploitation of various biological zones.

In recent years, contemporary multidisciplinary research has substantially enhanced these core models. Perera (2010), Wedage et al. (2019), and Langley et al. (2020) have contextualised human behaviour in relation to late Pleistocene

climate variations through advanced stratigraphic and taxonomic analyses. Moreover, new site-specific investigations and isotopic analyses (e.g., Kulatilake et al., 2018; Roberts et al., 2022; Siriwardana & Manusinghe, 2024) consistently enhance our comprehension of how these hunter-gatherers adeptly balanced mammalian hunting with focused snail collection.

Outcomes

To deliver a thorough synthesis of the role of gastropods in the prehistoric diet, the empirical data obtained from prior zooarchaeological publications can be classified into taxonomic distribution across ecosystems, taphonomic alterations, and non-dietary shell assemblages.

The zooarchaeological data reveal that mollusc intake fluctuated considerably according to the biological zone of the settlement locations. In humid cave sites such as Fa-Hien Lena, Batadombalena, and Kitulgala Beli Lena, habitation deposits are largely characterised by arboreal land snails, chiefly *Acavus superbus* and *Acavus phoenix*, alongside freshwater species such as *Paludomus loricatus* and *Paludomus neritoides*. Stratigraphic data from Fa-Hien Lena (about 48,000 years ago) and Batadombalena (approximately 28,500 years ago) indicates the persistent accumulation of these particular taxa (Perera et al., 2011; Wedage et al., 2019). In contrast, the open-air location of Bellan-bandi Palassa, situated in intermediate and semi-arid regions, produced substantial

quantities of *Acavus* and *Paludomus* species, as well as minor terrestrial snails such as *Cyclophorus*. Recent ecological evaluations suggest that *Acavus* species were able to endure in semi-arid to intermediate regions throughout Holocene micro-climatic transitions, offering a localised supply for these populations (Siriwardana & Manusinghe, 2024). Moreover, coastal and dry regions exhibit a unique adaptive strategy. Evidence from the Mini-athiliya shell midden and the Godavaya coastal camp indicates the significant use of marine and lagoonal molluscs, such as *Telescopium telescopium*, oysters, and clams. This stands in stark contrast to the terrestrial emphasis of inland wet-zone locations (Kulatilake et al., 2018; Roberts et al., 2022; Karunaratne et al., 2024; Siriwardana, 2020).



Figure. 02 The topography of the areas encompassing *Acavus* reporting locations. (a) *Kalametiya* lagoon and sea linked to coastal shell midden (KM/Ex 1) and shell beds (semi-arid zone); (b) The *Udu-piyan-Galge* Cave mountain range (intermediate zone); (c) The undulating landscape featuring humid tropical rainforests (wet zone);

(d) Batadomba-Lena Cave and a living *Acavus* snail (wet zone); (e) The southern slopes of the central highlands, *Kaltota* escarpment, and the Walawe basin (intermediate and dry zones) (photos by Thilanka M. Siriwardana).

The analysis of the physical state of the retrieved shell remnants indicates uniform morphological alterations. The predominant number of *Acavus* shells retrieved from locations such as Batadombalena and Alawala display anthropogenic alterations, particularly a deliberate perforation commonly found in the body whorl or adjacent to the apex of the shell. A considerable proportion of the shell collection has localised charring and blackening, signifying direct exposure to fire. In addition to sustenance, non-dietary artefacts like as sea shells (e.g., *Bullia* spp.) and shark teeth have been excavated from remote inland locations like Fa-Hien Lena and Batadombalena. Several of these marine shells exhibit intentional holes, signifying their conversion into beads or adornments.

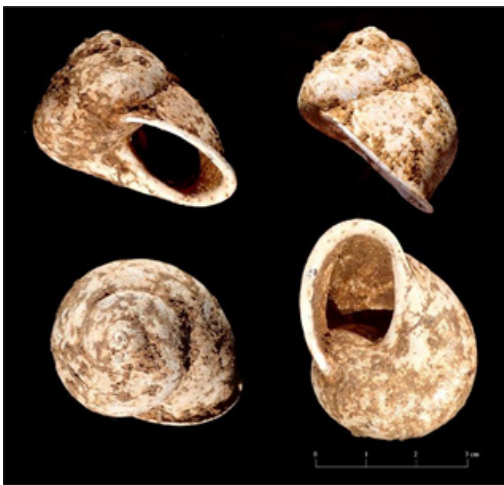


Fig.03.Specimen of *Acavus haemastoma*

identified from *Kalametiya* (KM/Ex 01)

Discussion

The synthesised findings offer essential insights into the nutritional practices, cognitive abilities, and mobility patterns of Sri Lanka's prehistoric hunter-gatherers across several environments. The systematic identification of snail remains across several climatic regions substantiates that molluscs were not solely a food source during famines but a fundamental element of the prehistoric diet. The shift from dependence on wet-zone *Acavus* to the exploitation of coastal *Telescopium* and marine bivalves highlights the significant ecological adaptability of these populations (Roberts et al., 2022; Karunaratne et al., 2024; Sumangala, 2025b; Sumangala, 2019). This behaviour corresponds with the concept of the "Broad-Spectrum Revolution." Foragers deliberately diversified their diet by incorporating low-risk, readily available protein sources such as snails to mitigate the unpredictability of hunting swift arboreal species like macaques and giant squirrels.

The particular taphonomic alterations observed on the shells indicate sophisticated food processing abilities. Initial hypotheses indicated that the apex was simply crushed; however, comprehensive experimental and taphonomic investigations reveal that an intentional perforation was routinely created in the body whorl of *Acavus* shells (Weliange et al., 2009; Weliange, 2010; Sumangala et al., 2025a). This was probably a practical method

employed to alleviate the internal vacuum, facilitating the extraction of the meat following the roasting of the snail over a fire. This particular, standardised processing technique demonstrates a significant degree of cognitive energy efficiency and intergenerational knowledge transmission.

The spatial distribution of shell remnants offers compelling evidence for regional adaptation, movement, and symbolism. A comparative synthesis of mollusc exploitation per ecological zone reveals this comprehensively. In humid tropical rainforests, communities employed body whorl puncturing and roasting techniques to ingest arboreal *Acavus* and freshwater *Paludomus* species. In intermediate and semi-arid regions such as Bellan-bandi Palassa, human populations used particular micro-climatic niches for terrestrial foraging. Simultaneously, inhabitants in coastal and arid regions utilised substantial stone implements to procure *Telescopium* and bivalves from mangrove and lagoon ecosystems. The incorporation of coastal locations with inland caverns demonstrates a thorough exploitation of the island's many ecological zones. The presence of perforated marine shells at inland sites 30-40 kilometres from the coast indicates that these hunter-gatherer groups had significant territorial mobility, extending from the rainforests to the coast, or participated in intricate long-distance exchange networks. The utilisation of these shells as adornments underscores the

development of aesthetic and symbolic cognition within these communities.

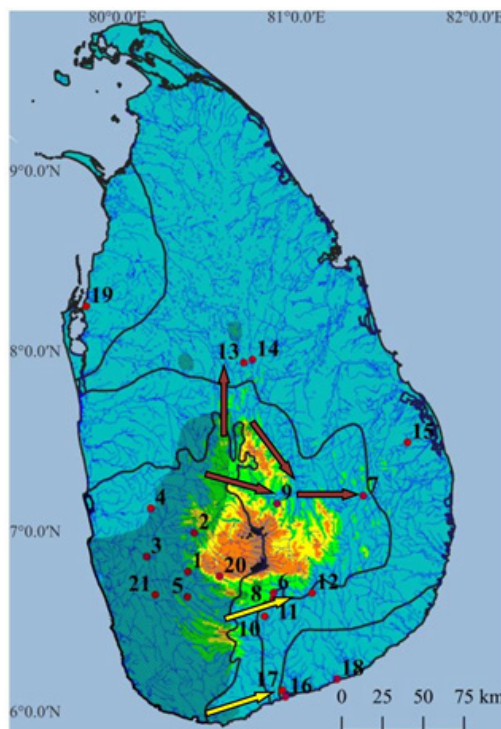


Figure 03: Hypothetical expansion ranges of terrestrial gastropods under optimal conditions. Red corresponds to *A. Phoenix*, Yellow = All three *Acavus* species (Siriwardana, and Manusinghe, (2024))

Table 01. Analysis of Fa-Hien Lena Snails

Snails Category	Percentage	Description for Legend
<i>Acavus</i>	60%	Large snails living on trees in the rainforest (Main food).
Freshwater Snails (<i>Paludomus</i>)	30%	Snails obtained from streams and canals around the cave.
Small Land Snails (<i>Cyclophorus</i> / <i>Oligospira</i>)	8%	Small-sized snails found on the forest floor.
Marine Shells	2%	Shells brought from the sea, often used as ornaments (e.g., <i>Bullia</i>).

Fa-Hien Lena Snails Analysis

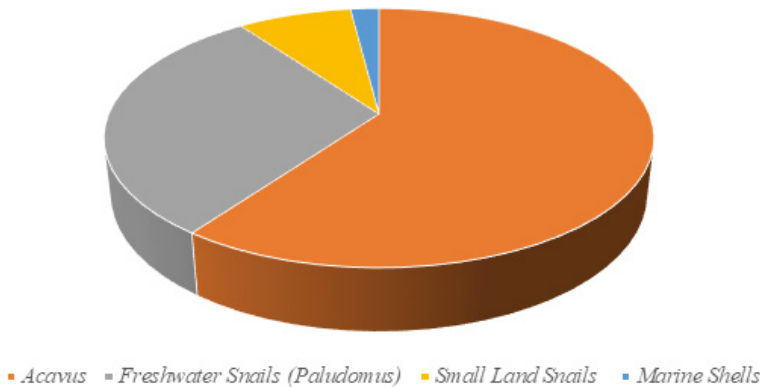
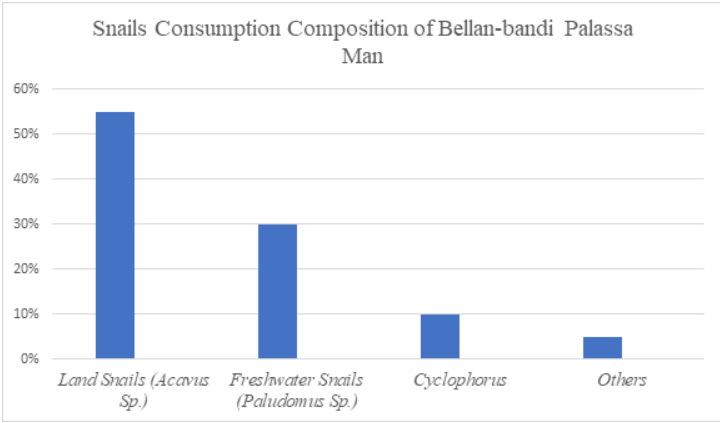


Table 02: Representation of Consumption Composition of Snails by *Bellan-bandi Palassa Man*

Snails Category	Percentage	Description
Land Snails (<i>Acavus</i> Sp.)	55%	The main food found abundantly in forests.
Freshwater Snails (<i>Paludomus</i> Sp.)	30%	Obtained from nearby streams and rivers.
<i>Cyclophorus</i>	10%	A small-sized land snail species.
Others	5%	Other types are found very rarely, and marine shell parts.



Conclusion

This comprehensive examination of bio-archaeological evidence establishes that the intake of gastropods (snails) by prehistoric inhabitants in Sri Lanka constituted a highly structured and adapted subsistence strategy. An analysis of data from wet-zone caves (Fa-Hien Lena, Batadombalena), intermediate open-air sites (Bellan-bandi Palassa), and coastal shell middens (Mini-athiliya, Godavaya) reveals that these inhabitants demonstrated remarkable ecological adaptability. They effectively modified their foraging methods to utilise the particular molluscan resources present in their surrounding settings. Moreover, specific taphonomic alterations, such as perforating the body whorl for optimal meat extraction, illustrate sophisticated cognitive processing methods. The incorporation of gastropods into a varied diet established a dependable nutritional base that allowed anatomically modern people to persistently inhabit the diverse habitats of Sri Lanka from the late Pleistocene to the Holocene epoch.

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