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Giant Serpents in Ancient Indian Literature: A Study of Vasuki, Shesh and Other Serpent Traditions

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ABSTRACT

Serpents occupy an important place in ancient Indian literature, mythology, religion and cultural traditions. Sanskrit texts describe several extraordinary serpents, including Vasuki, Shesh, Takshaka, Karkotaka and Kaliya. These beings are variously presented as powerful, enormous, poisonous, water-associated, divine and cosmically significant. Traditionally, such descriptions have generally been understood within the framework of mythology and religious literature. Modern palaeontological research, however, has demonstrated that snakes of extraordinary size did exist in the geological past. Particularly significant is the discovery of *Vasuki indicus* from the Eocene deposits of Kutch, India, whose body length has been estimated at approximately 11–15 metres (Datta & Bajpai, 2024). Earlier fossil evidence, including *Madtsoia pisdurensis* from the Upper Cretaceous of central India, also demonstrates the existence of large prehistoric snakes on the Indian subcontinent (Mohabey et al., 2011).

The present study examines descriptions of extraordinary serpents in selected ancient Indian Sanskrit texts and compares them with modern scholarly literature on prehistoric giant snakes. The study is entirely based on secondary data and follows a qualitative, descriptive and comparative approach. Ancient texts are treated as literary and cultural evidence, while modern palaeontological and zoological publications are treated as scientific evidence. The study does not attempt to prove that any particular mythological Naga was a fossil species. Instead, it investigates whether the general idea of extraordinarily large serpents found in ancient Indian literature is scientifically possible. The study finds that the existence of giant snakes is scientifically established through fossil evidence, including evidence from India. At the same time, the supernatural and cosmological characteristics attributed to individual Nagas remain within the domain of mythology and religious tradition. The study therefore argues that ancient Indian serpent traditions can be meaningfully examined through an Indian Knowledge Systems perspective while maintaining a clear distinction between cultural tradition and scientific evidence. This research investigates whether extraordinary serpents described in ancient Indian literature may reflect biological realities rather than being exclusively products of mythological imagination. By examining Sanskrit texts alongside living snake species and prehistoric fossil discoveries, the study establishes that giant serpents were a biological reality on Earth, while critically evaluating the possible natural foundations of ancient Indian serpent traditions.

Keywords: Naga, Vasuki, Shesh, Takshaka, Kaliya, Mahabharata, Indian Knowledge Systems, Giant Snakes, Palaeontology, Sanskrit Literature

1. Introduction

The serpent has a remarkable place in Indian cultural history. From ancient Sanskrit literature to temple traditions and popular religious practices, serpents have been associated with power, protection, fertility, water, poison, mystery and divine forces. Among the most prominent serpent figures are Ananta or Shesh, Vasuki, Takshaka, Karkotaka and Kaliya. The Sanskrit literary tradition does not present all Nagas in the same manner. Some are closely connected with the natural world, while others possess clearly supernatural or cosmic characteristics. This mixture of natural and supernatural elements makes the Naga tradition an interesting subject for Social Science and Indian Knowledge Systems research.

A traditional Naga Stuti invokes several prominent Nagas:

अनन्तं वासुकिं शेषं पद्मनाभं च कम्बलम् ।

शङ्खपालं धृतराष्ट्रं तक्षकं कालियं तथा ॥

एतानि नव नामानि नागानां च महात्मनाम् ।

सायंकाले पठेत्रित्यं प्रातःकाले विशेषतः ॥

This traditional prayer remembers Ananta, Vasuki, Shesh, Padmanābha, Kambala, Śaṅkhaṭpālā, Dhṛtarāṣṭra, Takshaka and Kaliya. It reflects the continuing cultural memory of Naga traditions. For academic purposes, the stuti is treated here as a traditional devotional text and is not assigned to a specific ancient text without establishing its textual provenance.

The question of giant serpents becomes particularly interesting in the light of modern palaeontology. Datta and Bajpai (2024) described *Vasuki indicus*, a giant fossil snake from the Eocene deposits of Kutch in western India, with an estimated length of approximately 11–15 metres. The discovery demonstrates that snakes of extraordinary size once lived in prehistoric India.

The name Vasuki given to this fossil genus is especially interesting because Vasuki is one of the most prominent Nagas in Indian literature. However, the scientific discovery should not be interpreted as proof that the mythological Vasuki has been discovered. *Vasuki indicus* lived approximately 47 million years ago, whereas the literary tradition belongs to a different historical and cultural context (Datta & Bajpai, 2024). This distinction is central to the present study.

This research investigates whether extraordinary serpents described in ancient Indian literature may reflect biological realities rather than being exclusively products of mythological imagination. By examining Sanskrit texts alongside living snake species and prehistoric fossil discoveries, the study establishes that giant serpents were a biological reality on Earth, while critically evaluating the possible natural foundations of ancient Indian serpent traditions. The comparison maintains a clear distinction between literary and cultural accounts and independently verifiable zoological and palaeontological evidence; it does not identify particular mythological Nagas with known species.

2. Research Problem

Ancient Indian literature contains numerous descriptions of extraordinary serpents. Vasuki is portrayed as a powerful Naga; Shesh is associated with cosmic functions; Takshaka is connected with poison and death; Kaliya is associated with poisonous waters; and Karkotaka appears in narratives involving supernatural abilities. These descriptions are often approached primarily as mythology. Yet the fossil record establishes that exceptionally large snakes lived on Earth, including in prehistoric India. The research problem is therefore whether some aspects of ancient serpent traditions may reflect biological realities or observations of the natural world, rather than being understood exclusively as mythological creations. This possibility must be investigated without assuming that any named Naga has been scientifically identified.

The discovery of *Madtsoia pisdurensis* from central India and *Vasuki indicus* from Kutch raises an important interdisciplinary question: if giant snakes actually existed in prehistoric India, can the ancient Indian tradition of extraordinarily large serpents be viewed as biologically possible, even though the individual mythological beings cannot be scientifically identified? The research problem therefore lies in understanding the relationship between ancient literary descriptions and modern scientific evidence without confusing the two.

3. Research Questions

1. What evidence do ancient Indian Sanskrit texts provide for the literary tradition of extraordinarily large and powerful serpents, and to what extent is the existence of such giant serpents scientifically plausible in light of modern palaeontological and zoological evidence?
2. How do the characteristics attributed to Vasuki, Shesh, Takshaka, Karkotaka and Kaliya compare with what is known about prehistoric giant snakes, without equating mythological beings with particular fossil species?

4. Objectives of the Study

Objective 1: To examine the descriptions of Vasuki, Shesh, Takshaka, Karkotaka, Kaliya and other extraordinary serpents in selected ancient Indian Sanskrit texts using original Sanskrit shlokas as textual evidence.

Objective 2: To investigate the biological possibility and scientifically established prehistoric existence of giant serpents, particularly in the Indian subcontinent, through a comparison of ancient Indian literary descriptions and modern palaeontological evidence.

5. Hypotheses of the Study

H₀₁ – Null Hypothesis: The selected ancient Indian Sanskrit texts do not provide sufficiently consistent descriptions of Vasuki, Shesh, Takshaka, Karkotaka, Kaliya and other extraordinary serpents to establish a significant tradition of extraordinarily large and powerful serpents.

H₁₁ – Alternative Hypothesis: The selected ancient Indian Sanskrit texts provide consistent descriptions of Vasuki, Shesh, Takshaka, Karkotaka, Kaliya and other extraordinary serpents, establishing a significant literary and cultural tradition of extraordinarily large and powerful serpents.

H₀₂ – Null Hypothesis: Modern palaeontological and zoological evidence does not provide sufficient support for the scientific possibility of giant serpents comparable in general scale to the extraordinary serpents described in ancient Indian literature.

H₁₂ – Alternative Hypothesis: Modern palaeontological and zoological evidence supports the scientific possibility of giant serpents comparable in general scale to the extraordinary serpents described in ancient Indian literature.

Because the study is qualitative and descriptive, these hypotheses are assessed through interpretation of textual and scientific evidence rather than statistical testing. The terms supported and not supported are therefore used in the discussion.

6. Scope of the Study

The study focuses on selected ancient Indian Sanskrit texts containing significant serpent traditions:

Mahabharata

Valmiki Ramayana

Shrimad Bhagavata Mahāpurāṇa

Vishnu Purana

Garuda Purana

Shiva Purana

The principal serpent figures considered are Vasuki, Shesh/Ananta, Takshaka, Karkotaka, Kaliya and other Maha Nagas. The scientific discussion focuses on prehistoric giant snakes, particularly fossil evidence from India and selected evidence from other parts of the world.

7. Research Methodology

7.1 Research Approach

The study follows a qualitative, descriptive and comparative research approach. It examines ancient literary descriptions of extraordinary serpents and discusses them in relation to modern knowledge about prehistoric snakes. The study is interdisciplinary, bringing together Indian literature, cultural studies, Indian Knowledge Systems and palaeontological research. The purpose is not to establish that a particular Naga was a particular prehistoric species. The purpose is to examine whether the general idea of very large serpents found in ancient Indian traditions is scientifically possible.

7.2 Research Design

The study uses a descriptive and comparative research design. First, selected Sanskrit texts are examined to understand how extraordinary serpents are described. Second, modern scholarly literature concerning prehistoric giant snakes is examined. Finally, the two sets of information are compared to identify similarities, differences and possible areas of understanding.

The basic principle followed throughout the research is: Ancient literature provides literary and cultural evidence, while modern scientific literature provides scientific evidence. Both are studied separately before being compared.

7.3 Sources of Data

The study is entirely based on secondary data. Ancient sources include the Mahabharata, Valmiki Rāmāyaṇa, Shrimad Bhagavata Mahāpurāṇa, Vishnu Purāṇa, Garuda Purana and Shiva Purana. Modern information is obtained from peer-reviewed research papers, palaeontological studies, zoological literature, academic books, scholarly studies on Naga traditions, and research on snakebite and traditional knowledge. Only identifiable and academically traceable sources are used as evidence.

7.4 Method of Analysis

The analysis is conducted in three simple stages. First, relevant stories and Sanskrit verses concerning Vasuki, Shesh, Takshaka, Karkotaka, Kaliya and other serpents are examined for descriptions relating to size, strength, poison, habitat, behaviour, cultural importance and religious or symbolic meaning. These descriptions are first understood within their own literary context.

Second, modern research is examined to determine what is known about prehistoric giant snakes, with particular attention to *Madtsoia pisdurensis*, *Vasuki indicus*, *Titanoboa* and other scientifically documented large snakes. Third, the literary and scientific findings are compared to identify reasonable similarities and clear differences.

The central interpretive principle is: Similarity does not mean identity. A literary description is not treated as a fossil record, and a fossil discovery is not treated as proof of a literary character.

7.5 Conceptual Research Model

The conceptual research model presented in Figure 1 illustrates the comparative approach adopted in the present study. It brings together two independent sources of evidence: ancient Indian Sanskrit literature and modern palaeontological and zoological research.

The first component focuses on the literary and cultural descriptions of extraordinary serpents such as Vasuki, Shesh, Takshaka, Karkotaka and Kaliya. These descriptions are examined through selected ancient Indian texts, including the Mahabharata, Ramayana and Puranic literature. Particular attention is given to characteristics such as extraordinary size, strength, poison, association with water, supernatural abilities and religious significance.

The second component examines modern scientific evidence concerning prehistoric giant snakes, particularly *Vasuki indicus*, *Madtsoia pisdurensis*, *Titanoboa* and *Gigantophis*. These findings provide evidence that exceptionally large snakes existed during different geological periods, including in the Indian subcontinent.

The third component involves comparative analysis of the two sources of evidence. Similarities and differences are examined in relation to physical characteristics, biological possibilities and cultural interpretations. However, literary descriptions are not treated as direct scientific observations, and similarities do not establish that mythological Nagas belonged to particular prehistoric species.

The model ultimately leads to an integrated interpretation within the Indian Knowledge Systems (IKS) perspective. It demonstrates how traditional literature, cultural knowledge and modern scientific discoveries can be studied together while maintaining their distinct evidentiary foundations.

Thus, the conceptual research model supports both objectives of the study by providing a structured framework for examining ancient serpent traditions and assessing the biological possibility of giant serpents through modern scientific evidence.

8. Ancient Literature Review

8.1 Vasuki in the Mahabharata

The Mahabharata provides one of the richest sources for the study of Naga traditions. Vasuki is presented as a powerful serpent king and plays an important role in the famous churning of the ocean. The text states:

The Mahabharata narrates Vasuki's participation in the churning of the ocean (Adi Parva, Samudra Manthan episode). For a directly checked Sanskrit passage, see Śrīmad Bhāgavatam 8.7.1, which describes Vasuki encircling Mandara as the churning rope. The precise Mahabharata verse varies by edition and is not quoted here.

The account depicts Vasuki on a monumental narrative scale. Its cosmological setting does not provide a literal zoological body-length measurement.

8.2 Shesh and the Cosmic Serpent

The Mahabharata also presents Shesh as an extraordinary serpent associated with the support of the Earth. Here the serpent becomes part of the larger structure of the universe. The description is clearly cosmological rather than a simple zoological account. Shesh therefore represents an important feature of Indian serpent traditions: the serpent form can be used to express both the natural world and larger philosophical or cosmic ideas. Such a description cannot be scientifically measured in terms of body length; its importance lies in the cultural imagination of the serpent as a being of immense power and scale. A directly verified parallel is Śrīmad Bhāgavatam 5.25.2, which describes Ananta supporting the universe; this is a theological-cosmological statement, not zoological evidence.

8.3 Takshaka and Poison

The Mahabharata gives considerable importance to Takshaka. His story is closely associated with King Parikshit and the subsequent serpent sacrifice. Takshaka therefore represents one of the important themes associated with snakes in Indian literature: venom and danger. The literary fear of snakebite also has a natural basis. Modern research confirms that venomous snakebite has been an important public-health problem in South Asia (Alirol et al., 2010; Warrell, 2010). Thus, although the narrative of Takshaka is mythological, the association between snakes and potentially deadly venom has a clear biological basis.

8.4 Kaliya in the Bhagavata Purana

The Śrīmad Bhāgavata Mahāpurāṇa presents the well-known story of Kaliya. It states:

श्रीशुक उवाच । कालिन्ध्यां कालियस्यासीद् हृदः कश्चिद् विषाग्निना । श्रप्यमाणपया यस्मिन् पतन्त्युपरिगाः खगाः ॥ ४ ॥ (Śrīmad Bhāgavatam 10.16.4; checked against Vedabase Sanskrit text; orthographic punctuation normalized.)

This passage describes Kaliya's poisonous pool in the Yamuna. The following verse from the same episode is not reproduced because its precise wording was not independently checked for this edition.

The narrative associates Kaliya with poisonous waters and environmental harm. The story should not be treated as a modern scientific description of water pollution. Nevertheless, it is significant that the narrative connects a serpent, water and poisonous effects.

8.5 Kaliya in the Vishnu Purana

The Vishnu Purana also preserves the Kaliya tradition:

The Vishnu Purana, Book 5, also recounts Krishna's encounter with Kaliya. An edition-specific Sanskrit quotation is withheld here pending collation against a named critical or published edition.

The passage refers to Kaliya being subdued in the waters. The appearance of the tradition in more than one Puranic source demonstrates the continuing importance of the Kaliya narrative in Indian cultural memory.

8.6 Karkotaka

Karkotaka appears in traditional narratives, particularly in connection with King Nala. His story contains supernatural elements, including transformation and unusual powers. Karkotaka therefore illustrates an important limitation of the present research: not every characteristic attributed to a Naga can be compared with zoology. Some descriptions clearly belong to mythology and religious storytelling.

8.7 Serpent Imagery in the Valmiki Ramayana

The Valmiki Ramayana also uses serpent imagery. In the Yuddha Kanda, the weapons used by Indrajit are described through serpent imagery:

The Yuddha Kanda of the Valmiki Ramayana employs serpent imagery in the depiction of Indrajit's weapons. The previously reproduced Sanskrit quotation has been replaced with a paraphrase because its exact verse and edition have not been independently established.

The passage demonstrates that serpents also function as powerful literary symbols. This is important because it prevents the researcher from treating every mention of a serpent as evidence for a real biological animal.

8.8 Maha Nagas in the Shiva Purana

The Shiva Purana associates serpents with Shiva and religious symbolism. Exact claims about the wording or list of named Maha Nagas require an identified edition and passage.

The Shiva Purana contains serpent-associated religious imagery. The previously reproduced Sanskrit quotation has been omitted because its precise chapter and verse could not be verified against an identified edition.

The word maha Naga conveys the idea of a great or extraordinary Naga. It is important, however, not to convert the word directly into a modern scientific measurement. The expression belongs to the literary and religious vocabulary of the text.

8.9 Garuda Purana and Snakebite Knowledge

The Garuda Purana preserves traditional material concerning snakes, poison and snakebite. The following interpretive statement concerns historical medical knowledge, not verified clinical effectiveness.

The Garuda Purana discusses poison and traditional snakebite remedies in portions of its medical material. An unverified Sanskrit quotation has been removed; no historical remedy described here is recommended as a substitute for evidence-based emergency treatment.

Such passages demonstrate that snakebite and poison were subjects of traditional Indian knowledge. The treatments described in such texts are historically important, but they should not automatically be regarded as scientifically validated modern medical treatments.

9. Modern Literature Review

The modern understanding of serpents begins with an important distinction between the snake as a real animal and the Naga as a cultural and religious figure. Early scholarly work attempted to understand how these two ideas developed together. Vogel (1926) examined Naga traditions through Indian literature, mythology, religious traditions and art, discussing figures such as Shesh, Vasuki, Takshaka, Karkotaka and Kaliya. His work shows that serpents occupied a special position in Indian imagination, where they could appear both as powerful animals and as supernatural beings.

As the study of Indian religions developed, scholars began to look more carefully at the unusual nature of the Naga. Lange (2019) explains that Nagas occupy an ambiguous position between animality and divinity. They may appear in the form of snakes, but Indian traditions also describe them as intelligent, powerful, shape-shifting and extraordinary beings. This is important for the present study because unusual physical characteristics may contain both natural observations and symbolic religious meanings.

The story becomes more interesting when we turn from mythology to the practical relationship between people and snakes. Snakes were not only characters in religious stories; they were also real animals that posed a serious danger to human life. Slouber (2012), in his study of Garuda Medicine,

examined Sanskrit and related traditions dealing with snakebite, poison, healing practices and religious remedies. His work demonstrates that the cultural importance of snakes was connected with actual human experiences of snakebite and attempts to understand and treat envenomation.

This connection between traditional knowledge and real snakes can also be seen in ethnomedicinal research. Dey and De (2012) reviewed the traditional use of plants against snakebite across the Indian subcontinent, while Upasani et al. (2017) documented the use of medicinal plants in Indian traditions for snakebite. These studies do not establish the scientific effectiveness of every traditional remedy, but they demonstrate the depth of traditional knowledge associated with snakes and snakebite.

Modern medical research has also changed the way snakebite is understood. Alirol et al. (2010) described snakebite as an important public-health problem in South Asia, while Warrell (2010) explained the medical importance of snake envenomation. In India, Punde (2005) documented a decade of experience in the management of snakebite in rural Maharashtra. These studies provide a practical background for understanding why poisonous and powerful serpents became significant figures in Indian cultural traditions.

The modern study of Indian snakes has also moved beyond mythology and medicine into zoology and ecology. Ganesh et al. (2019) examined marine snakes of the Indian coast and brought together historical, systematic and toxinological information. Such research helps establish that traditional descriptions of snakes existed alongside a rich and varied real-world snake population.

The most important development for the present study, however, comes from palaeontology. Mohabey et al. (2011) reported a new species of *Madtsoia* from the Upper Cretaceous of India and showed that large snakes were present in prehistoric India. Their work provided evidence that India's geological past included snakes considerably larger than most living species.

The discovery of *Vasuki indicus* provided an even more remarkable piece of evidence. Datta and Bajpai (2024) described fossil vertebrae from the Eocene deposits of Kutch in western India and estimated that the snake may have reached approximately 11–15 meters in length. The fossil was dated to around 47 million years ago and represents one of the largest snakes known to science. The researchers named the genus *Vasuki* in reference to the well-known serpent of Indian tradition. Importantly, however, the scientific discovery does not claim that the fossil snake was the mythological *Vasuki*. The connection is therefore cultural and symbolic rather than an identification of the fossil with the literary figure.

Research published subsequently has continued to expand knowledge about India's prehistoric snakes. Datta and Bajpai (2025) examined additional fossil snakes from the Eocene of India and discussed their diversity, evolutionary relationships and palaeoecological significance. Their work adds to the evidence that prehistoric India supported a diverse snake fauna, including large-bodied forms.

The Indian evidence becomes even more meaningful when viewed alongside discoveries from other parts of the world. Head et al. (2009) described *Titanoboa*, a giant snake from the Palaeocene of Colombia, with an estimated length of around 13 metres. The discovery demonstrated that exceptionally large snakes existed in the prehistoric world. Rio and Mannion (2017) examined *Gigantophis garstini*, another exceptionally large prehistoric snake from North Africa. Together, these discoveries demonstrate that very large snakes existed in different regions of the prehistoric world.

Scientists have also investigated how some prehistoric snakes could attain extraordinary sizes. Head and Polly (2007) discussed the relationship between growth and segmentation in snakes and the evolutionary processes associated with gigantism. Such studies provide a biological context for understanding how exceptionally large snakes could exist without requiring a supernatural interpretation.

Stothers (2004) examined the possible natural foundations of historical reports of enormous serpents, considering how encounters with large living snakes and the interpretation of ancient testimony may have contributed to great-serpent traditions. This historical approach is particularly relevant to the present study because it demonstrates how serpent narratives can be investigated critically without treating every account as a literal zoological record.

Alfonso-Rojas et al. (2025) examined Miocene fossils of anacondas (*Eunectes*) from Venezuela and inferred large body sizes by approximately 12.4 million years ago. The publisher reports that the online article has been corrected; this study is cited using its corrected online record. It supports evolutionary continuity of large anacondas, not the existence of a named literary serpent.

The literature reveals an interdisciplinary research gap. Stothers (2004) investigated natural explanations for historical great-serpent accounts, while Lange (2019) explored the relationship between animality and divinity in Naga traditions. Datta and Bajpai (2024) documented a giant prehistoric snake from India, and Alfonso-Rojas et al. (2025) examined fossil evidence for gigantism in anaconda evolution. Nevertheless, the studies reviewed here provide limited integrated comparison of Sanskrit descriptions of Shesh, *Vasuki*, *Kaliya* and *Karkotaka* with living Indian snakes, other giant constrictors and prehistoric fossil discoveries within an Indian Knowledge Systems framework. The present study addresses this comparative gap while distinguishing literary testimony from independently verifiable zoological and palaeontological evidence.

These two stories should not be merged without caution. A fossil snake provides biological evidence for an animal that lived millions of years ago, while an ancient literary account provides evidence about cultural memory, religious imagination and traditional knowledge. The two forms of evidence answer different questions. Nevertheless, when ancient literature repeatedly describes extraordinary serpents and modern palaeontology independently demonstrates that giant snakes were biologically possible, a meaningful area of comparison emerges.

The literature also reveals a research gap. Existing studies have generally moved in separate directions: scholars of Indian literature and religion have focused on Naga traditions, scholars of ethnomedicine have studied snakebite and traditional healing, and palaeontologists have investigated fossil snakes. Comparatively less attention has been given to bringing these perspectives together within a simple Indian Knowledge Systems framework.

The present study therefore builds upon this existing literature without claiming that mythology and palaeontology are the same form of evidence. It asks whether modern scientific discoveries can provide a context of biological possibility for understanding the extraordinary size attributed to serpents in ancient Indian literature. At the same time, it recognises that Vasuki, Shesh, Takshaka, Karkotaka and Kaliya remain literary, religious and cultural figures whose specific identities cannot be established through fossil evidence.

Thus, the modern literature takes the discussion from myth to culture, from culture to lived experience, and from lived experience to science. The existence of prehistoric giant snakes provides a scientific context in which the general biological possibility of giant serpents can be discussed. It does not, however, establish the historical identity of any particular Naga.

9.1 Additional Scriptural Descriptions and Their Interpretive Limits

The Samudra Manthan episode describes Vasuki being employed as the churning rope around Mount Mandara (Mahabharata, Adi Parva, Samudra Manthan narrative; Vishnu Purana, Book 1, Chapter 9; Bhagavata Purana, 8.7.1). The narrative indicates extraordinary length and strength, but supplies no empirically measurable dimensions. The Bhagavata Purana (5.25.2) depicts Adi Shesh in a cosmological form, while its Kaliya narrative (10.16) emphasises venom, water and unusual anatomy. Karkotaka appears in the Nalopakhyaṇa of the Mahabharata as a figure associated with a transformative bite. These passages should be analysed as distinct literary representations; precise Sanskrit readings must be checked against the editions actually cited. Sanskrit text for Śrīmad Bhāgavatam 8.7.1 was checked against the cited online edition.

The terms “great”, “immense”, “many-headed” and “cosmic” cannot be translated into zoological measurements. This study therefore distinguishes a text’s narrative claim from a biological observation and avoids interpreting the age of a fossil as the date of a Sanskrit narrative.

9.2 Living Snakes: A Zoological Comparison

Living snake species provide observable parallels for selected characteristics attributed to serpents in Indian literature. King cobras (*Ophiophagus* species) are exceptionally long venomous snakes, capable of exceeding five metres in exceptional cases. The Indian cobra (*Naja naja*) possesses an expandable defensive hood and medically important venom. The Indian rock python (*Python molurus*) is a large non-venomous constrictor, while the reticulated python (*Malayopython reticulatus*) is the longest living snake species and demonstrates the biological feasibility of lengths exceeding six metres. Green anacondas (*Eunectes* species) are exceptionally heavy-bodied, semi-aquatic constrictors of tropical South America; they are comparative examples, not historical evidence of Indian snake fauna (Whitaker & Captain, 2004).

Hood expansion, multiple anatomical heads, venom production, constriction and aquatic adaptation are separate characteristics. They should not be conflated. A modern cobra hood is not evidence for the literal existence of the numerous heads described in some religious narratives. Similarly, no living snake has been demonstrated to possess the supernatural or cosmological powers attributed to individual Nagas.

9.3 Contributions of P. Gowri Shankar to King Cobra Research

Gowri Shankar et al. (2021) combined multilocus DNA analyses with morphology to investigate species boundaries across the king cobra complex. Their study identified four geographically differentiated evolutionary lineages, including a Western Ghats lineage. The result is relevant to this paper because it demonstrates substantial biological diversity among large venomous snakes, even where outward forms appear similar.

Das et al. (2024), with P. Gowri Shankar among the authors, subsequently revised king cobra taxonomy using morphological and molecular evidence. They recognised four species, including the Western Ghats king cobra, *Ophiophagus kaalinga*. This is modern evidence about living snake evolution and classification; it does not establish a historical link to Vasuki, Shesh, Kaliya or Karkotaka.

Field-based studies also provide ecological context. Bhaisare et al. (2010) reported observations on king cobra foraging and diet, while Rao et al. (2013) studied habitat use in the Western Ghats. Such research helps differentiate observable feeding, movement and habitat patterns from the extraordinary powers described in Sanskrit narratives.

9.4 Synthesis of Literary, Living and Fossil Evidence

The expanded comparison now distinguishes three independent evidentiary categories: (a) ancient Sanskrit narratives, which document representations of extraordinary serpents; (b) living zoological species, which demonstrate actual anatomical, ecological and behavioural diversity; and (c) palaeontological specimens, which demonstrate that snakes much larger than most living forms inhabited prehistoric environments. Fossils such as *Vasuki indicus*, *Madtsoia pisdurensis* and *Titanoboa* establish prehistoric gigantism, but not continuity between a named mythological Naga and a known fossil lineage. The comparison therefore concerns biological possibility, not identity.

10. Comparative Discussion

The ancient literary descriptions and modern scientific evidence can be compared through broad themes rather than direct identification.

Theme	Ancient Indian Literature	Modern Evidence	Academic Interpretation
Extraordinary size	Vasuki, Shesha and Maha Nagas	Vasuki indicus, Madtsoia, Titanoboa	Supports the general biological possibility of very large snakes
Strength	Vasuki and other powerful Nagas	Large-bodied fossil snakes	General comparison is possible; literary powers cannot be measured directly
Poison	Takshaka, Kaliya and other Nagas	Venomous snakes and snakebite research	Strong biological parallel for venom and danger
Water	Kaliya and the Yamuna	Aquatic and semi-aquatic snakes	General ecological parallel
Cosmic role	Shesha supporting the Earth	No scientific equivalent	Cosmological and religious symbolism
Transformation	Karkotaka and other Nagas	No scientific equivalent	Mythological feature
Cultural importance	Nagas as religious and cultural figures	Snakes studied as living and extinct animals	Different but complementary forms of knowledge

The comparison shows that some elements of the ancient serpent tradition have reasonable parallels in natural history, particularly the existence of large-bodied snakes, venom and water-associated snake habitats. Other elements, such as cosmic functions and transformation, remain within religious and mythological frameworks. The comparison is therefore useful only when the different nature of the evidence is respected.

11. Indian Knowledge Systems Perspective

The subject is particularly relevant to Indian Knowledge Systems because the Naga tradition illustrates how Indian thought connected human beings, animals, nature, environment, religion and cultural memory. The serpent appears in Indian traditions in several forms: as a real animal, a symbol, a guardian, a powerful Naga, a divine-associated being, a water-associated entity, a representation of poison and a cosmic figure.

This layered understanding should not be forced into a single modern category. An IKS approach allows researchers to study the knowledge contained within traditional narratives while also asking what modern disciplines can independently tell us about the natural world. The stories surrounding serpents can therefore be studied as cultural records of how communities understood danger, water, animals, protection and the unknown.

The association of Nagas with water is especially significant from an IKS perspective. The Kaliya narrative connects the serpent with a water body and harmful effects, while modern zoology confirms that several snake species are adapted to aquatic or semi-aquatic environments. This does not make the narrative a scientific report, but it provides a meaningful point for interdisciplinary discussion.

Traditional knowledge concerning snakebite provides another connection. Sanskrit traditions preserve extensive discussions of poison, remedies and religious healing, while modern medical research documents snakebite as a continuing public-health concern. The two traditions belong to different knowledge systems, but both demonstrate the importance of understanding the relationship between humans and snakes.

The discovery of *Vasuki indicus* is particularly interesting in this context because a modern scientific discovery from India carries the name of a well-known Indian serpent tradition. However, cultural association and scientific identity remain separate. The IKS perspective is therefore strongest when it encourages dialogue between knowledge traditions without forcing one tradition to prove the other.

12. Findings

- Living king cobras, cobras, pythons and anacondas demonstrate real biological diversity in body length, venom, constriction and aquatic adaptation, although no single species possesses all characteristics attributed to mythological Nagas.
- Genetic and morphological studies of king cobras by Gowri Shankar and colleagues establish distinct evolutionary lineages and strengthen the modern zoological component of the comparison.

Ancient Indian Sanskrit literature contains a rich and recurring tradition of extraordinary serpents.

The Mahabharata presents Vasuki as a powerful Naga associated with the churning of the ocean.

Shesh represents a highly developed symbolic and cosmological form of serpent imagery and cannot be understood simply as a zoological animal.

Takshaka and Kaliya demonstrate the recurring association of serpents with poison, danger and harmful effects.

The Kaliya narrative creates a recurring literary connection between serpents and water.

Fossil evidence of *Madtsoia pisdurensis* and *Vasuki indicus* establishes that large and exceptionally large snakes existed in prehistoric India.

The estimated 11–15-meter length of *Vasuki indicus* demonstrates that snakes could reach extraordinary sizes.

There is insufficient scientific evidence to identify Vasuki, Shesh, Takshaka, Kaliya or Karkotaka with particular fossil species.

Ancient literary and modern scientific evidence can be studied together when their different purposes and forms of evidence are clearly recognized.

13. Discussion of Hypotheses

13.1 Objective 1: H_{01} and H_{11}

The examination of selected Sanskrit texts shows that extraordinary serpents occur repeatedly across different literary traditions. Vasuki is presented as a powerful Naga in the Mahabharata, Shesh is associated with cosmic functions, Takshaka is connected with poison and death, Kaliya is associated with poisonous waters, and Karkotaka appears in narratives containing supernatural characteristics. The repeated presence of these serpent traditions indicates a strong literary and cultural tradition of extraordinary Nagas.

The reviewed narratives establish a recurring literary tradition of extraordinary serpents, so the descriptive proposition represented by H_{11} is supported within the selected texts. This is an interpretive assessment, not a statistical hypothesis test and not evidence that the named beings existed as biological individuals.

13.2 Objective 2: H_{02} and H_{12}

Modern palaeontological research provides evidence that exceptionally large snakes existed in the geological past. Fossils of *Madtsoia pisdurensis* from India and *Vasuki indicus* from Kutch demonstrate that prehistoric India was home to large-bodied snakes. The estimated length of *Vasuki indicus*, approximately 11–15 metres, provides strong evidence for the biological possibility of giant snakes (Datta & Bajpai, 2024; Mohabey et al., 2011).

The fossil record supports the general biological reality of giant prehistoric snakes, consistent with H_{12} . No statistical hypothesis test was performed. The evidence does not establish that specific Sanskrit serpent figures correspond to fossil taxa or that human authors witnessed Eocene or Palaeocene animals.

14. Conclusion

This research investigated whether extraordinary serpents described in ancient Indian literature may reflect biological realities rather than being exclusively products of mythological imagination. By examining Sanskrit texts alongside living snake species and prehistoric fossil discoveries, it established that giant serpents were a biological reality on Earth, while critically evaluating the possible natural foundations of ancient Indian serpent traditions.

The study establishes that ancient Indian literature contains a rich tradition of extraordinary serpents, including Vasuki, Shesh, Takshaka, Karkotaka and Kaliya. These figures are associated with extraordinary size, strength, poison, water, supernatural abilities and religious significance.

Modern palaeontological discoveries provide independent scientific evidence that exceptionally large snakes existed in the geological past. The discovery of *Vasuki indicus* from Kutch, India, with an estimated length of approximately 11–15 metres, is particularly significant. Together with other fossil discoveries, including *Madtsoia pisdurensis* and *Titanoboa*, it establishes that giant snakes were biologically possible and actually existed in prehistoric environments.

These findings provide a scientific basis for considering the general possibility of extraordinarily large serpents in the ancient natural world. However, the fossil evidence does not establish that particular mythological Nagas existed as described, nor does it demonstrate a direct historical relationship between prehistoric snake species and ancient Sanskrit narratives.

The study therefore concludes that the existence of giant snakes in prehistoric times is scientifically established, while the historical identity of the extraordinary serpents described in ancient Indian literature remains unverified.

From an Indian Knowledge Systems perspective, the research highlights the value of examining ancient literary traditions alongside modern scientific discoveries. It demonstrates how cultural narratives and natural history can be studied comparatively without treating literary accounts as direct scientific evidence.

Thus, the study supports the biological possibility of giant serpents and establishes the relevance of further interdisciplinary research into the relationship between ancient Indian serpent traditions and the natural history of large snakes.

The newly added living-snake evidence establishes present-day biological analogies but cannot demonstrate that ancient narrators encountered prehistoric giant species. Contemporary popular literature and proposed epic chronologies are treated as interpretive context, not as direct zoological evidence.

15. Limitations of the Study

The study is entirely based on secondary data.

No original fossil specimens were examined.

Ancient literary descriptions cannot always be interpreted as literal scientific observations.

Geological and literary periods are separated by very large differences in time.

Mythological and supernatural characteristics cannot be scientifically tested.

The study cannot establish the historical identity of individual Nagas.

Fossil body-length estimates are scientific reconstructions and therefore involve some uncertainty.

16. Suggestions for Future Research

Naga traditions across a larger range of Sanskrit texts.

The development of serpent traditions from early literature to later religious practices.

The linguistic meanings of terms such as Naga, Sarpa, ahi, pannaga, bhujaga and maha Naga.

The relationship between Naga traditions and water bodies in Indian cultural history.

Serpent traditions in Indian temple architecture and iconography.

Comparative serpent traditions in India and other ancient civilisations.

The relationship between traditional knowledge concerning snakes and modern zoology.

Further palaeontological discoveries from the Indian subcontinent.

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