

Spiritual and Social Strategies of the Matsés Ethnic Group: Application of the Poisonous Secretion Kambo (Acaté), Diet, the Snuff Mixture nē-nē, and Gender Flexibility as Natural Adaptations

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ABSTRACT

The negative impacts of environmental changes, the introduction of new diseases, and disputes over land and resources require natural adaptations that enable optimal survival and reproductive success in an ever-changing environment. This article focuses on the social and spiritual strategies developed by the indigenous people of the Peruvian Amazon, the Matsés, to adapt to the challenging conditions of the rainforest. The methodology is based on ethnographic research conducted in the Matsés Reservation in 2018, 2023, and 2024. Participant observation and semi-structured interviews were conducted among the residents of the town of Angamos and the community of San Roque. Key strategies identified with spiritual elements include the application of Kambo (in the Matsés language “Acaté”), the poisonous secretion from the frog species *Phyllomedusa bicolor*; the practice of a diet involving the snuffing of the psychotropic mixture nē-nē; and gender flexibility that supports adaptation. These strategies have helped increase the socio-ecological resilience of the Matsés people at various levels and, along with an enhanced spiritual relationship with nature, have increased their adaptability and the psychological support available to them.

Keywords: Matsés; Kambo; frog; spirituality; *Phyllomedusa bicolor*; Amazon

The Amazon rainforest, known primarily for its tropical climate and extraordinary biodiversity, is one of the main eco-regions of the American continent. Although it is an environment rich in nutrients, it is also an in-

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hospitable refuge. The instability of food resources, high diversity of pathogens, and low light penetration pose obstacles to the long-term existence of indigenous peoples. These conditions create strong selective pressures on survival and reproduction, forcing jungle inhabitants to continually adapt.¹ Adaptive problems such as effectively managing risks and threats, efficiently obtaining and processing food and other vital resources, and regulating population density and distribution within the community are challenges that require complex strategies and practices to allow the population to survive and thrive. In a region as vast, diverse, and complex as the Amazon, it is unlikely that any limiting factor would manifest itself consistently and uniformly. Instead, various hierarchies of limiting factors act in different combinations that vary depending on the specific culture, local ecosystem, and history of the area.² Although it may not be immediately apparent, practical tools for survival in the inhospitable rainforest include spiritual adaptations. These involve beliefs, rituals, and practices that enable communication with natural forces, ensuring protection, providing sufficient natural resources, and offering guidance. These practices go hand in hand with social adaptations that concern the organization of society, mutual relationships, and the division of labor, all aiming for the efficient use of available resources and to meet community needs and spread knowledge. Although it may seem that belief in spirituality primarily concerns the psychological aspect of personality, in the Matsés conception, spiritual adaptation is crucial for maintaining traditional lifestyles and for survival and reproduction in a challenging and changing environment. How significant a role do spirituality, traditional medicine, shamanic practices, and the fluidity of gender roles play in the natural adaptation of one of the last living hunter-gatherer groups on Earth?

Theoretical Framework

To better anchor the research analysis and connect the findings with broader patterns of adaptive strategies, this text partially draws upon the classical works of Roy A. Rappaport, who focused on the interrelationship between rituals, ecological adaptations, and the sustainability of indigenous cultures. To understand this article, it is first necessary to define the concept of adaptation, which refers to a process or a set of processes common to all forms of life. Adaptation can be observed in both simple organ-

1 Cainã M. Couto-Silva et al., "Indigenous People from the Amazon Show Genetic Signatures of Pathogen-Driven Selection," *Science Advances* 9, no. 10 (2023), <https://doi.org/10.1126/sciadv.abo0234>.

2 Leslie E. Sponsel, "Amazon Ecology and Adaptation," *Annual Review of Anthropology* 15, no. 1 (1986): 67-97, <https://doi.org/10.1146/annurev.an.15.100186.000435>.

isms and complex social structures. A fundamental element of adaptation is the flexibility of a system—the ability to respond to disruptions in a way that maintains equilibrium, even though the scope and nature of these disruptions are generally unpredictable due to the complexity of the world. Given the constant evolution of the world, there is a need for ongoing adjustments in the system's state, as well as occasional major structural changes to preserve balance.³

According to Rappaport, several key types of adaptation can be identified, focusing on different aspects of how human societies adjust to their environmental, social, and cultural conditions. Among these types of adaptations is ritual behavior, which not only serves as a mechanism for maintaining balance between the individual and their social or natural environment but also helps manage unpredictable changes and stressors that could destabilize the system. Many rituals, for instance, aim to ensure a good harvest or reconcile with natural forces, enabling communities to better cope with change and adverse conditions.⁴

This article is based on the concept of rituals, symbolic practices, and flexibility as strategies that help human communities adapt to their environmental and social contexts. The Matsés people provide a fitting example for analyzing these adaptations, as their ritual practices involve a variety of strategies for adjusting to their surroundings. The text specifically examines the social, behavioral, and symbolic adaptations of this ethnic group, emphasizing their capacity for gender flexibility. The spiritual practices that the Matsés have performed for decades—including the use of snuff mixtures, Kambo secretion, and dietary restrictions—are not merely cultural phenomena but may serve as key adaptive tools that help communities respond to environmental and social challenges. In this way, they contribute to long-term ecological and social stability, as well as maintaining homeostasis between the ethnic group and nature.

The Matsés are not the only group in the region that uses psychoactive substances as an adaptive strategy; their practices are part of a broader cultural pattern observed throughout the Amazon rainforest. Many ethnic groups in the region use psychedelic substances not only for spiritual connection with nature but also to enhance physical and mental abilities, treat illnesses, and gain knowledge through visions. This analysis expands the existing body of literature on adaptive strategies of indigenous groups in the Amazon and opens a discussion on their sustainability.

3 Roy A. Rappaport, *Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People*, new ed. (Yale University Press, 1984).

4 Roy A. Rappaport, *Ritual and Religion in the Making of Humanity* (Cambridge University Press, 1999).

Research Methodology

The research was conducted using ethnographic methods, particularly participant observation and semi-structured interviews. Data collection took place in three stages: in 2018 and then again in 2023 and 2024. Fieldwork was conducted in the town of Angamos and the community of San Roque, both located within the Matsés Reservation. These locations were selected due to the local inhabitants' willingness to participate in the research. During the fieldwork, the author engaged in daily activities with the Matsés people, participated in their rituals, and conducted interviews with various community members, including elders, "masters of Kambo", and women. This approach provided a comprehensive understanding of the spiritual and social practices of the Matsés and their role in natural adaptation.

The Matsés Reservation spans a vast area along the Peru-Brazil border, encompassing a portion of the dense Amazon rainforest. The region is remote and accessible primarily by river or small aircraft, this preserving its relative isolation from broader urban and industrial influences. Communities within the reservation are key cultural hubs where traditional practices and knowledge systems are maintained, often serving as focal points for anthropological research.

Brief History and Spirituality of the Matsés People

The Matsés people inhabit their own reservation that stretches around the Yavari, Yaquerana, Chobayacu, and Gálvez rivers in the Peruvian-Brazilian border area. The population, significantly influenced by missionary activities, previously unknown diseases, the rubber boom, and external societal pressures promoting modern bureaucracy, now comprises approximately 3,200 individuals. During the rubber boom, the Matsés were oppressed, enslaved, and forced to hide, leading to conflicts with the outside world. Peaceful contact, which continues to this day, was established only in 1969, when the group began cooperating with the missionary organization Summer Institute of Linguistics (SIL), which provided the group primarily with medicines, medical care, and tools such as machetes and pots. In times of fear of attack by outsiders, the missionary organization primarily served as an intermediary between the Matsés and the outside world, playing a key role in negotiations with oil companies keen to construct roads in their territory.⁵

⁵ Steven Romanoff, *Matses Adaptations in the Peruvian Amazon* (PhD diss., 1984).

Matsés spirituality is based on a belief in nature spirits, animism, and traditional healing practices. They believe that various spiritual beings inhabit the nature around them and consider them protectors and guides in everyday life.⁶ Spirituality, as an integral part of culture, plays a crucial role in the adaptation of Amazonian ethnic groups to their natural environment. Spiritual practices, belief in nature spirits, and animism provide not only moral and psychological support but also practical advice and guidance that help ethnic groups secure resources, survive, reproduce, and live in harmony with the surrounding environment.

Microbiome Differences and *Phyllomedusa bicolor* as a Hunting Vaccine

Despite living a simple traditional lifestyle based on hunting, fishing, agriculture, and gathering, the group is characterized by certain differences from other indigenous cultures and urbanized populations. The microbiome of this group shows distinct diversity, including ancestral bacteria not found in the microbiome of modern Euro-American populations. This difference is influenced not only by geographic location, culture, and genetic background but also by diet, which plays a key role in microbiome variability. According to current research on microbiotic diversity, a significant difference from modern populations is that natural communities like the Matsés have less exposure to antibiotics, a factor that greatly affects the microbiome's characteristics. Their traditional ways of life and less sterile environment support various microorganisms not often present in modern urban environments due to stricter hygiene standards and more sterile conditions.⁷

However, the Matsés do undergo specific dietary restrictions and frequently come into contact with antibiotics (albeit in a different form than we know), facts typically overlooked. For centuries, they have used Kambo, a substance with antibiotic properties. Kambo is the poisonous secretion from the frog species *Phyllomedusa bicolor*. The ritual involves applying this substance to burned, exposed skin. To obtain the poisonous secretion, *Phyllomedusa bicolor* is caught, its limbs are tied, and the substance is scraped from its body with a spatula and applied to a flat piece

6 Carine Fabius, *Jagua: A Journey into Body Art from the Amazon* (Kouraj press, 2009).

7 Jelissa Reynoso-García et al., "Mycobiome-Host Coevolution? The Mycobiome of Ancestral Human Populations Seems to Be Different and Less Diverse than Those of Extant Native and Urban-Industrialized Populations," *Microorganisms* 10, no. 2 (2022): 459, <https://doi.org/10.3390/microorganisms10020459>.

of wood, where it is then dried and stored for later use.⁸ The animal is then released, and if the extraction is done gently, it is not harmed.

When the secretion is applied to exposed skin, acute effects occur, including strong physiological reactions (vomiting, heat flashes, nausea, heart palpitations, sweating, facial swelling, diarrhea). These effects last about 15-60 minutes and then subside.⁹ The acute somatic reactions are mainly caused by bioactive peptides contained in the poisonous mixture. After these reactions, a parasympathetic state occurs, comprising various physiological and emotional responses. Each peptide in the poisonous secretion has different properties: some act antibacterially and antimicrobially;¹⁰ others help against pain, support the immune system, or help fight certain types of cancer cells.¹¹ The cleansing effect of Kambo is one reason why the substance is sought after.¹²

According to a recent online study focusing on the subjective effects of Kambo in 386 participants,¹³ exposure to Kambo was marked as a spiritually significant event, with 25.65 % of participants stating that such exposure was among the top five most spiritual experiences of their lives, and 4.15 % stating that Kambo was the most spiritually significant experience of their lives. Finally, 87.31 % of participants reported that Kambo improved their current sense of personal well-being or life satisfaction. To what extent this remarkable substance plays a role in the development and adaptation of the Matsés in the inhospitable environment of the Amazon

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- 8 John W. Daly et al., "Frog Secretions and Hunting Magic in the Upper Amazon: Identification of a Peptide That Interacts with an Adenosine Receptor," *Proceedings of the National Academy of Sciences of the United States of America* 89, no. 22 (1992): 10960-10963, <https://doi.org/10.1073/pnas.89.22.10960>.
 - 9 Jan M. Keppel Hesselink, "Kambô: A Shamanistic Ritual Arriving in the West - Description, Risks and Perception by the Users," *International Journal of Psychology and Psychoanalysis* 4, no. 2 (2018), <https://doi.org/10.23937/2572-4037.1510034>.
 - 10 Mohamed Amiche, Aurélia A. Seon, Henri Wroblewski, Pierre Nicolas, "Isolation of Dermatoxin from Frog Skin, an Antibacterial Peptide Encoded by a Novel Member of the Dermaseptin Genes Family," *European Journal of Biochemistry* 267, no. 14 (2000): 4583-4592, <https://doi.org/10.1046/j.1432-1327.2000.01514.x>.
 - 11 Jan M. Keppel Hesselink and Michael James Winkelman, "Vaccination with Kambo Against Bad Influences: Processes of Symbolic Healing and Ecotherapy," *The Journal of Transpersonal Psychology* 51, no. 1 (2019): 28-48.
 - 12 Matteo Politi, Fabio Friso and Jacques Mabit, "Plant-Based Assisted Therapy for the Treatment of Substance Use Disorders - Part 1. The Case of Takiwasi Center and Other Similar Experiences," *Cultura Y Droga* 23, no. 26 (2018), <https://doi.org/10.17151/culdr.2018.23.26.6>.
 - 13 Tomislav Majić et al., "Connected to the Spirit of the Frog: An Internet-Based Survey on Kambô, the Secretion of the Amazonian Giant Maki Frog (*Phyllomedusa bicolor*): Motivations for Use, Settings and Subjective Experiences," *Journal of Psychopharmacology* 35, no. 4 (2021): 421-436, <https://doi.org/10.1177/0269881121991554>.

jungle, and how many layers of their lives it touches, is a question that deserves more research.

However, Kambo carries both spiritual and practical aspects. Originally, it was used by indigenous ethnic groups as a hunting aid and as a remedy to cure “panema”.¹⁴ This term primarily referred to bad luck in hunting, but it later encompassed other negative states and external circumstances. Over the decades, Kambo has become a remedy for various mental and physical ailments, not only in a medical sense but also in a magical sense.¹⁵ There are stories of hunters who, after using Kambo, brought back so much meat from their hunting expeditions that they could not consume it all. Therefore, Kambo is considered a means of bringing luck and also serves as protection against harmful influences from the surroundings.¹⁶ It is clear that Kambo, as a hunting aid with spiritual overtones, is one fundamental natural adaptation of the Matsés. It not only helps fight diseases and provides energy and strength, but also ensures enough resources for sustenance.

Amazonian Diet and the Psychotropic Snuff Mixture Nē-nē

For indigenous groups in the Peruvian Amazon, a characteristic method of gaining strength, knowledge, healing, and guidance is a practice called “diet”.¹⁷ This method involves the application of psychoactive substances along with a form of retreat and social, behavioral, and alimentary restrictions.¹⁸ Best-known is the shamanic diet, which includes the consumption of so-called “teacher” plants often accompanied by the psychotropic drink ayahuasca, containing the plant *Banisteriopsis caapi*, along with the prac-

14 Timo Torsten Schmidt et al., “Acute and Subacute Psychoactive Effects of Kambô, the Secretion of the Amazonian Giant Maki Frog (*Phyllomedusa bicolor*): Retrospective Reports,” *Scientific Reports* 10, no. 1 (2020): <https://doi.org/10.1038/s41598-020-78527-4>.

15 Majić et al., “Connected to the Spirit of the Frog,” 421-436.

16 Thais A. C. Nogueira et al., “The Amazonian Kambô Frog *Phyllomedusa bicolor* (Amphibia: Phyllomedusidae): Current Knowledge on Biology, Phylogeography, Toxinology, Ethnopharmacology and Medical Aspects”, *Frontiers in Pharmacology* 13 (2022), <https://doi.org/10.3389/fphar.2022.997318>.

17 Jaume Sanz-Biset and Salvador Cañigueral, “Plant Use in the Medicinal Practices Known as ‘Strict Diets’ in Chazuta Valley (Peruvian Amazon)”, *Journal of Ethnopharmacology* 137, no. 1 (2011): 271-288, <https://doi.org/10.1016/j.jep.2011.05.021>.

18 Ilana Berlowitz et al., “Teacher Plants – Indigenous Peruvian-Amazonian Dietary Practices as a Method for Using Psychoactives”, *Journal of Ethnopharmacology* 286, no. 146 (2022): 114910, <https://doi.org/10.1016/j.jep.2021.114910>.

tice of floral baths.¹⁹ However, according to the Matsés, another diet associated with the use of Kambo secretion leads to the acquisition of spiritual energy and guidance from the Kambo frog.

This diet is not well-documented in current research, and data are derived from my ethnographic research. The chief of the village of San Roque, also known as the “maestro de Kambo”, described the diet in the Matsés context as a disappearing practice that traditionally followed the application of Kambo. The diet involves certain alimentary restrictions: for ten days, food intake, the consumption of sweets, and the drinking of water are reduced. Instead of water, they consume “chapo”, a drink made from ground ripe green bananas. During the first five days, there is social separation - the individual must sleep alone, separated from others, and must also maintain sexual abstinence. After ten days of the diet, Kambo can be reapplied, and the entire traditional practice is supposed to enhance energy and guidance from the Kambo spirit to locations of animals to be hunted. The diet also increases accuracy with a bow and arrow, and results in lower fatigue and fewer illnesses, but the key aspect is guidance. According to the chief of the San Roque community, the current generation lacks spiritual guidance and good aim because most Matsés do not continue the original practices, in spite of the fact that this tradition embodies a deep relationship between culture and the natural elements of their environment, as well as an emphasis on spiritual and physical preparation, all of which are crucial for survival in the harsh conditions of the Amazon jungle.

It is evident that the spiritual sensibility of the Matsés people permeates their culture, touching all aspects of their activities. An equally remarkable phenomenon that enables communication with the spiritual world is the snuffing of the hallucinogenic plant mixture *në-në*. This mixture is applied to both nostrils using a blowpipe – a hollow curved piece of wood resembling a straw. The *në-në* mixture has psychotropic effects and can induce visions in high doses. The use of *në-në* enables hunters to better connect with the animals they intend to hunt, but there are various reasons why the snuff mixture is used. Elders blow the *në-në* mixture towards the clouds to prevent rain on their canoes or camps, as well as into animal traps to increase hunting success.²⁰ The substance induces an altered state of consciousness, not only fostering a connection with nature but also allegedly serving as a practical tool to ensure resources.

19 Evgenia Fotiou, “Technologies of the Body in Contemporary Ayahuasca Shamanism in the Peruvian Amazon: Implications for Future Research”, *Human Ecology* 47, no. 1 (2019): 145-151, <https://doi.org/10.1007/s10745-018-0043-6>.

20 Peter Gorman, *Sapo in My Soul: The Matses Frog Medicine* (Gorman Bench Press, 2015).

Gender Flexibility and Cooperation as an Advantage for Survival

Another key characteristic of the Matsés that aids in natural adaptation is gender flexibility. This is particularly visible in the division of labor, social roles, and cooperation between men and women. Matsés women often collaborate with men in hunting game, with their cooperation leading to more successful hunts. Additionally, women often gather fruit or other plant products during hunts. The Matsés practice polygyny, meaning that men are allowed more than one wife. A woman who goes to help a man hunt can leave her children with older siblings or co-wives and can expect to have meals prepared upon her return.²¹ Thus, competition is outweighed by cooperation, and flexible gender roles enhance the efficiency of acquiring resources. From an evolutionary perspective, this provides advantages for survival and reproduction. Kambo can also be obtained and applied by Matsés women, which is very unusual compared to other ethnic groups that follow this tradition. This flexibility has the key advantage of strengthening cohesion and equality between men and women. By women taking on some traditional male roles, men are freed to perform other necessary tasks. Some women work not only with Kambo but also with plants to heal others, increasing the availability of healing practices and improving the overall health and resilience of the community against diseases and infections. By spreading healing knowledge throughout the community, the risk of losing this knowledge decreases, and the likelihood of passing it on to future generations increases.

Discussion

In recent decades, some traditional spiritual practices of the Matsés people have spread far beyond the boundaries of the Amazon rainforest. In Euro-American countries, the use of snuff mixtures and especially the application of Kambo has gained prominence. Kambo now dominates as a popular element in self-development activities and alternative medicine. The demand for this natural substance has significantly increased, leading to a transformation of its meaning both for the Matsés themselves and for those who seek it outside its original cultural context.

In Euro-American societies, Kambo is often presented as a tool for detoxifying the body, boosting the immune system, and improving mental and physical health. While it is traditionally used as a hunting aid and as a means of maintaining balance between humans and their natural environ-

21 Steven Romanoff, "Women as Hunters Among the Matsés of the Peruvian Amazon," *Human Ecology* 11, no. 3 (1983): 339-343, <https://doi.org/10.1007/bf00891379>.

ment, its original function is often overlooked and replaced by new interpretations in postmodern cultures. These interpretations typically emphasize its potential as a tool for personal growth, self-development, and addressing psychosomatic issues and physical ailments. As such, Kambo has become part of a broader trend in alternative medicine and self-cultivation practices, which frequently draw upon traditional cultures while reshaping their rituals to suit the needs of modern societies.

Rituals associated with Kambo application outside the Amazon are typically conducted by facilitators who lack direct ties to the original Matsés practices. These rituals often have a bricolage character, incorporating a variety of tools from different cultures, and placing emphasis on individual or group experiences. The practice of Kambo in the Euro-American context demonstrates how the traditional adaptive strategies of one ethnic group can be transformed under different cultural and social conditions. While Kambo serves as a tool for maintaining ecological and social stability for the Matsés, it has become a commodified product and a part of individual self-development practices in Western societies. This transformation highlights not only the flexibility of adaptive strategies but also the need for critical reflection on how traditional knowledge and practices are adopted and utilized outside their original context.

With the growing global demand for Kambo, this substance has also become a valuable commodity and an important source of income for the Matsés. Local communities now supply the secretion of the Amazonian tree frog *Phyllomedusa bicolor* to intermediaries, who distribute it worldwide. However, this change brings not only economic opportunities but also risks related to the sustainable use of natural resources and the preservation of traditional lifestyles, and raises numerous ethical questions. In the past, satisfying the needs of indigenous groups required only dozens of frogs, whereas today, demand necessitates thousands of individuals. This significant increase could lead to the erosion of Kambo's cultural significance as well as severe ecological impacts if sustainable methods for harvesting and commercializing the secretion are not implemented and support for indigenous communities is not ensured.

Conclusion

It is essential to recognize that the spirituality of the Matsés people of the Amazon, rooted in animism, not only represents a way of celebrating the spiritual world but also plays a crucial role in their daily life and survival. The spiritual practices of the Matsés serve as tools of communication with natural forces and a link to the magical world. They are also practical tools for securing resources, healing, and providing information

and guidance in the unpredictable environment of the Amazon rainforest. The fundamental practice of applying the toxic secretion Kambo (known as “Acaté” among the Matsés) connects the Matsés to the spiritual world. This versatile “vaccine” for hunters not only strengthens the human body and protects it from pathogens but also serves as a magical aid, allowing people to transcend the physical world and hunt more successfully. Their diet is an adaptive strategy to enhance and support the use of Kambo, with significant impacts on the health, resilience, and dispositions of the ethnic group. The diet aims to bring more energy and guidance from the spirit of the frog into the lives of the Matsés.

The snuff mixture *në-në* also holds deeply-rooted importance in the local culture. It is used not only to enhance hunting success and establish contact with the spiritual world but also to influence the weather, for example, by preventing rain. It is clear that hunting skills and the practical use of natural forces are crucial for survival.

Particularly significant is the active participation of women, which reflects the Matsés’ key cultural principles of cooperation, adaptation, and sustainability. Gender flexibility, as an adaptive strategy, enables the efficient use of resources and knowledge, contributing to the overall resilience and adaptability of their community.

However, some aspects of these practices are not sufficiently documented and require further research. For example, dietary restrictions and their impact on the physiological and psychological health of community members, as well as the long-term effects of using Kambo and *në-në*, remain underexplored. Future research should also focus on how modern influences and environmental changes affect these traditional practices and how they could be preserved in the context of a rapidly changing world.

Studying the spiritual practices and gender flexibility of the Matsés is crucial not only for understanding their culture and traditions but also for identifying adaptive strategies that can inspire further research and interventions in ethnology and sustainable development. Preserving this rich cultural heritage is therefore a matter of scientific interest as well as an ethical duty on the part of every anthropologist towards this unique community and its future generations.