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# Conservation Issues for Endangered Wildlife Species in the UNESCO World Heritage Site of the Nimba Mountains-Republic of Guinea

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***Abstract*—***The general objective of this work is to study the constraints linked to the conservation of threatened wildlife species in the UNESCO World Heritage site of the Nimba Mountains. Thus, the Accelerated Participatory Research Method (MARP) was used to collect data from resource persons, through semi-structured interviews based on survey sheets. Word and Sphinx Plus V5 software allowed us to process the data collected. 33 wildlife species are threatened in the RBMN with the main causes being poaching and illegal trade (30%), habitat loss, overexploitation of resources and population pressure are also worrying factors, with respective high threat levels (20%), on the other hand, insufficient awareness of a moderate threat level (10%). Among these species, ten (10) are threatened with extinction, or 30.30% of the animal population. Furthermore, surveillance and monitoring, restoration of degraded areas, participation of local communities, scientific research, international collaboration, village development groups are the measures for sustainable conservation of the biodiversity of the RBMN.*

***Keywords*—** *Problem, conservation, wildlife species, site, Nimba Mountains.*

## I. INTRODUCTION

Environmental impacts are today the fundamental concerns of government policies around the world. At the Rio de Janeiro conference in 1992 in Johannesburg in 2002, the environmental question gave rise to a lot of reflection and recommendations relating to its conservation, because the planet has never experienced ecological impoverishment of such magnitude [1-6 ].

Most recently, a long period of abundance and low food prices have diverted policymakers' attention from the many underlying problems facing agriculture, the impacts of which on natural resources are not the least [7-11].

Since 1944, the Nimba Mountains have enjoyed a strictly protected status in their northern part, today shared between Guinea and Ivory Coast.

The Nimba Mountains in the Republic of Guinea is a UNESCO World Heritage site of great importance for biodiversity conservation. They are home to a wide variety of threatened wildlife species, making them a crucial research subject for understanding conservation issues in the region [12,13].

The reserve is clearly circumscribed by natural boundaries (watercourses) known and respected by the local populations. The massif is threatened by increased pressures near the limits of the site, exerted by local populations due to population growth. If the natural forests that still support the slopes of Nimba have been little damaged, the fauna on the other hand has been the subject of very intense poaching [14].

Research carried out on the conservation of wildlife species in the Nimba Mountains site dates back several years. In 1980, the Nimba Mountains were inscribed on the UNESCO World Heritage List due to its exceptional ecological value and its importance as a refuge for many endangered animal species. Since then, numerous studies have been conducted to assess the population status of specific wildlife species and to understand the challenges they face [15].

Over the years, several key dates have marked the history of research on conservation issues in the Nimba Mountains. For example, in 1992, a comprehensive avifauna survey was carried out to assess bird diversity and identify endemic and threatened species present in the region. In 2005, a team of researchers carried out a study on the primates of the Nimba Mountains in order to better understand their distribution, their ecology and the threats they face [16].

More recently, in 2017, a study was carried out to assess the impact of poaching and illegal trade on mammal populations in the region. This study highlighted the pressures exerted on emblematic species such as the chimpanzee. These results contributed to strengthening protection and anti-poaching measures in the Nimba Mountains site (USA/USFS-IP/AUDER 2017).

All of this research carried out over the years shows a growing threat to already endangered wildlife species. In a context where the environment and processes that respect ecosystems take a more important place in citizen life every day, environmental health and the viability of economic activity zones must be preserved in order to promote sustainable development [17]. Thus, a better understanding of the challenges faced by threatened wildlife species in the Nimba Mountains site would be an asset for developing approaches for better human-wildlife cohabitation and an effective means for their sustainable conservation. Hence the choice of this internship theme entitled "Problem of conservation of endangered wildlife species in the UNESCO world heritage site of the Nimba Mountains, Rural Commune of N'Zoo, Prefecture of Lola".

*Objectives*

*General objective*



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Study the constraints linked to the conservation of threatened wildlife species in the UNESCO World Heritage site of the Nimba Mountains.

*Specific Objectives*

The specific objectives are, among others:

- ✓ *Identify endangered wildlife species in the UNESCO World Heritage Site of the Nimba Mountains;*
- ✓ *Evaluate threat factors for wildlife species;*
- ✓ *Analyze the conservation measures in place;*
- ✓ *Propose innovative approaches to strengthen the conservation of threatened wildlife species.*

## II. Materials and Methods

*Materials*

*Presentation of the Study Area*

The Nimba Mountains Biosphere Reserve (RBMN) is heir to the Nimba Mountains Strict Nature Reserve (RNIMN) created in 1944. It is the result of numerous scientific research works and successful approaches by eminent researchers such as Roger Heims, M. Lamotte, R. Schnel, J.C. Leclerck, R. Roy etc. from 1939 to 1944. This integral nature reserve became a Biosphere Reserve in 1980 and its first central area became a UNESCO World Heritage Site in 1981, following the progressive degradation observed in this reserve, the first part of the area central (world heritage site)) was included on the list of heritage in danger in 1992 by the UNESCO World Heritage Committee. The Monts Nimba Biosphere Reserve covers an area of 145,200ha and corresponds to the Guinean part of the Cavally river basin. It includes three (3) categories of protected areas including:

- ➢ A cluster of three (3) central areas of 21,780 ha strictly protected including:
  - ✓ The Guinean part of the Nimba Mountains range which constitutes the UNESCO world heritage site of 12,540 ha is our main area of investigation;
  - ✓ The Bossou chimpanzee hills of 320 ha and,
  - ✓ The Déré forest of 8920 ha.
- ➢ A buffer zone of 35,140 ha where activities are strictly controlled and,
- ➢ A transition area of 88,280 ha where activities are monitored [18] (P. MOLOUMOU and al, 2011).

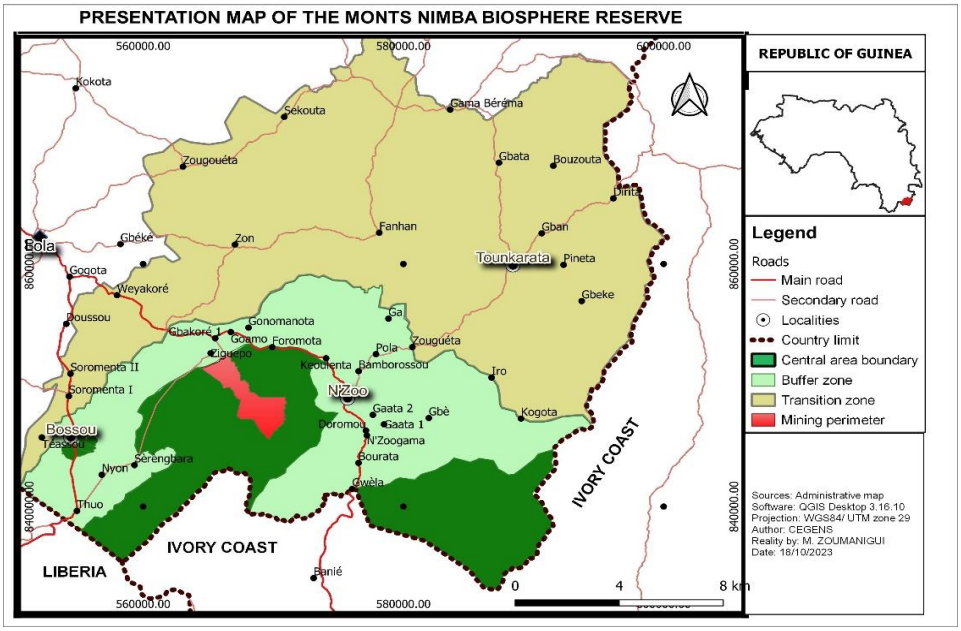


Figure 1. *Map of the Nimba Mountains Biosphere Reserve (RBMN)*

*Methods*

To achieve our objectives, the research team carried out bibliographic consultations and used the Active or (Accelerated) Participatory Research Method (MARP) through semi-structured interviews based on the survey sheets.

*Treatment methods*

Using Word software, Sphinx Plus V5., we processed the various data collected in the field, the results of which are mentioned below.

## III. Results And Interpretation

Following the processing of the data collected, we present to you the results we have achieved.

*Identification of endangered wildlife species in the UNESCO World Heritage Site of the Nimba Mountains*

The surveys carried out among the local populations of the Rural Commune of N'Zoo allowed us to identify 33 endangered faunal species in the UNESCO world heritage site of the Monts Nimba Biosphere Reserve, the general physiognomy of which is recorded in Table 1.

The causes, consequences and solutions to problems that adversely affect the RBMN are recorded in Table 2.

This table highlights the problems, causes, consequences and some solutions related to the conservation of wildlife species. By adopting these solutions, it is possible to effectively protect threatened wildlife species in the Nimba



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Mountains site and preserve this unique world heritage for future generations as confirmed by the authors [19, 20].

TABLE 1: List of some endangered wildlife species in the UNESCO World Heritage site of the Nimba Mountains Biosphere Reserve

| N° | **Name in French** | **Name Scientists** | **Name in Konon** | **Family** |
|---|---|---|---|---|
| 1 | Crapaud vivipare | Nimbaphynoïdès occidentalis | Lapo | Amphibiens |
| 2 | Chimpanzé | Pan troglodytes verus | Woro | Hominidés |
| 3 | Singe | Macasylvanus | Koula | Cercopithecidae |
| 4 | Pangolin géant | Manistetra dactyla | Balawolo | Manidae |
| 5 | Pangolin a écaille tricuspides | Manistricuspis | Balawolo | Manidae |
| 6 | Céphalophe à dos jaune | Cephalophus sylvicultor | Toua hignakpoa | Bovidae |
| 7 | Céphalophe à dos noir | Cephalophus niger | Toua hignatè | Bovidae |
| 8 | Panthère | Panthera pardus | Kolu | Felidae |
| 9 | Potamochère à pinceaux | Potamochoerus porcus | Logo boye | Suidae |
| 10 | Pintade à poitrine blanche | Angelastes meleagrides | Hongo | Numididea |
| 11 | Guib harnaché | Traguelaphus scriptus | Bèrè | Bovidae |
| 12 | Aulacode (agouti) | Tryonomis swinderianum | Homon | Thryonomyidés |
| 13 | Escargot | Acchatina fulica | Koulén | Gastéropodes |
| 14 | Antilope | Cervi capra | Loumo | Bovidés |
| 15 | Phacochère | Phacochoerus aethiopicus | Logobé | Suidés |
| 16 | Vipère | Bitis arietans | Toumou | Vipéridés |
| 17 | Chat doré | Profelis aurata | Lokognalé | Felidae |
| 18 | Chacal | Canis aureus | Guebey | Canidae |
| 19 | Porc-épic | Celtis australis | Pii | Cannabaceae |
| 20 | Tortue | Testudo sp | Hamou | Testudinidae |
| 21 | Ecureille | Sciurus sp | Kwlaboo | Sciuridae |
| 22 | Rat palmiste | Pteropus sp | Kpégué | Pteropodidae |
| 23 | Renard | Vulpes vulpes | Kèlèn | Canidae |
| 24 | Hérisson | Erinaceus europacus | Teli | Erinaceidae |
| 25 | Lapin | Orytolagus cuniculus | Kwigninè | Leporidae |
| 26 | Lion | Panthera lion | Yara | Fenideaes |
| 27 | Gazelle | Gazella dama | Lomon | Bovidae |
| 28 | Guépard du Nimba | Acinonyxjubatus soemmeringii | Kolycloma | Felidae |
| 29 | Serpent bois | Elaphe longissima | Yirén | Golubridae |
| 30 | Lièvre | Lepuseuropacus | Howoro | Leporidae |
| 31 | Buffle | Syncerus caffer | Lan | Bovidae |
| 32 | Varan | Varanus niloticus | Paan | Varanidae |
| 33 | Léopard | Panthera pardusroosevetti | Koli | Felidae |

TABLE 2: Summary of some problems affecting the UNESCO World Heritage Site of the Nimba Mountains

| **N°** | **Problems** | **Causes** | **Consequences** | **Solutions** |
|---|---|---|---|---|
| 1 | Loss of habitat | -Excessive and illegal exploitation of forest resources;<br>-Presence of mining companies;<br>-Bushfires | -Reduction in populations of wildlife species due to the destruction of their natural habitat;<br>-Loss of areas crucial for wildlife due to the extraction of mineral resources;<br>-Loss of biodiversity;<br>-Risk of extinction for certain species. | -Implement reforestation programs in areas affected by anthropogenic activities;<br>-Establish protection zones around the reserve;<br>-Involve local communities in conservation activities; |
| 2 | Poaching and illegal trade | -Demand for animal products (skins, horns, ivory etc.)<br>-Poverty and weak enforcement of environmental laws. | -Decrease in the animal population;<br>-Imbalance of ecosystems; | -Strengthen surveillance patrols<br>-Raise awareness among the local population about the consequences of poaching;<br>-Implement severe sanctions for offenders; |
| 3 | Demographic pressure | -Increase in the human population;<br>-Increased need for agricultural land and natural resources; | -Degradation of the ecosystem due to the expansion of human activities;<br>-Destabilization of the habitat, isolating animal populations;<br>-Increase in poaching and illegal species trade. | - Raise awareness among local populations about family planning;<br>-Develop sustainable agricultural methods to minimize the impact on wildlife;<br>-Carry out regular patrols to combat poaching;<br>-Increase corridors to facilitate migration and genetic exchange between animal populations. |
| 4 | Overexploitation of fauna and flora resources | -Unregulated hunting and fishing;<br>-Development of traditional methods of treating diseases. | -Decrease in species populations;<br>-Ecological imbalance;<br>-Disruption of the food chain. | -Strengthen anti-poaching laws and patrols;<br>-Raise awareness among local communities;<br>-Involve local communities in taking conservation measures. |
| 5 | Climate change | -Degradation of the forest ecosystem;<br>-Increase in temperatures;<br>-Disruption of rainfall in the locality; | -Considerable reduction of certain animal species adapted to specific conditions;<br>-Alteration of animal reproduction and migration cycles;<br>-Reduction in the availability of | -Implement reforestation projects in degraded areas;<br>-Strengthen surveillance capacity in the reserve;<br>-Make the local population aware of the importance of species conservation in the |



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|---|---|---|---|---|
| | | | food resources for wildlife | reserve;<br>-Create a climate of collaboration between the State, NGOs and the villages surrounding the reserve. |
| 6 | Lack of awareness | -Reliance of local populations regarding the profitability of the Nimba Mountains Biosphere Reserve;<br>-Lack of community participation in conservation projects. | -Low support from the local community for conservation initiatives;<br>-Lack of adequate knowledge on sustainable management of natural resources. | -Organize education and awareness programs to inform the local community about the importance of preserving endangered species;<br>-Involve local communities in the planning and implementation of conservation initiatives. |

*Assessment of threat factors on wildlife species in the UNESCO World Heritage site of the Nimba Mountains, see figure 1.*

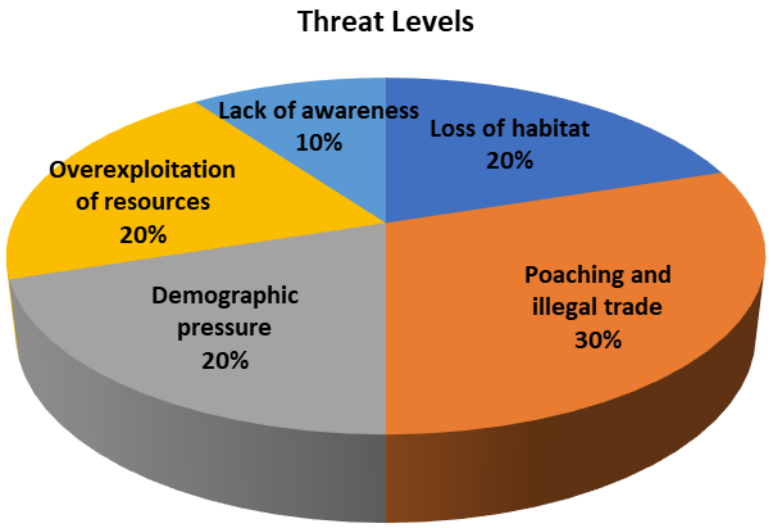


Figure 1. Assessment of threat factors by degree of impact

From this figure, we see that several factors contribute to the threat to wildlife species in the UNESCO World Heritage Site of the Nimba Mountains, CR N'Zoo, Lola Prefecture as confirmed by the authors of [20]. Among these factors, we note poaching and illegal trade are the most serious threats, with a very high percentage level (30%), highlighting the scale of the problem and the need for strict enforcement of laws to fight against these illegal activities.

Habitat loss, overexploitation of resources and population pressure are also factors of concern, with respective high threat levels (20%), indicating that deforestation and unregulated hunting are major problems affecting local biodiversity. Tan disc the insufficient awareness at a moderate threat level (10%), is another major concern, as it indicates that conservation efforts could be compromised due to lack of understanding of local people and policy makers about the importance of protecting these endangered species.

Species threatened with extinction are listed in the table below.

It appears from this table that among the thirty-three (33) animal species recorded in the Nimba Mountains Biosphere Reserve, ten (10) are threatened with extinction, i.e. 30.30 % of the animal population is in real danger and deserves to be 'to be protected

TABLE 3: List of some endangered wildlife species in the UNESCO World Heritage Site of the Nimba Mountains

| N° | Name in French | Name Scientists | Name in Konon | Family |
|---|---|---|---|---|
| 1 | Chimpanzé | Pan troglodytes verus | Woro | Hominidés |
| 2 | Pangolin géant | Manistetra dactyla | Baala | Manidae |
| 3 | Lapin | Orytolagus cuniculus | Kwinyinè | Leporidae |
| 4 | Lion | Panthera lion | Yara | Fenideaes |
| 5 | Gazelle | Gazella dama | Lomon | Bovidae |
| 6 | Panthère | Panthera pardus | Korlu | Felidae |
| 7 | Tortue | Testudo sp | Hamou | Testudinidae |
| 8 | Antilope | Cervi capra | Loumo | Bovidés |
| 9 | Phacochère | Phacochoerus aethiopicus | Logobé | Suidés |
| 10 | Buffle | Syncerus caffer | Lan | Bovidae |

*Conservation measures in place*

Conservation measures in place include:

- ✓ Surveillance and monitoring;
- ✓ Restoration of degraded areas;
- ✓ Participation of local communities;
- ✓ Scientific research;
- ✓ International collaboration;
- ✓ Village development groups.

These conservation measures for threatened wildlife species are necessary to protect biodiversity. However, they



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face constraints such as insufficient financial resources, difficult access, awareness and education needs, difficulties in international collaboration, costs of purchasing, maintaining and managing cameras. can be high and the capacities of village development groups limited. However, continued engagement, effective cooperation between stakeholders and an adaptive approach to ensure that conservation measures are implemented sustainably and effectively are necessary.

*Proposals for some innovative approaches to strengthen the conservation of threatened wildlife species in the UNESCO World Heritage site of the Nimba Mountains*

The conservation of endangered wildlife species in the UNESCO World Heritage site of the Nimba Mountains in Guinea, particularly in the CR N'zoo of the Prefecture of Lola, is a complex issue requiring innovative approaches to ensure long-term success. Here are some innovative approaches that could strengthen the conservation of species in this reserve:

*Monitoring and use of technology:*

- ✓ Use of drones for aerial surveillance of the territory, allowing more regular data collection and rapid detection of illegal activities such as poaching and deforestation.
- ✓ Using telemetry and GPS collars to track the movements and behavior of endangered species, providing essential information to better understand their needs and habitats.

*Involve local communities:*

- ✓ Establish awareness and environmental education programs for communities living around the site, in order to make them aware of the importance of conservation and the positive impact that this can have on their quality of life .
- ✓ Encourage the active participation of local communities in the management of protected areas by offering them employment opportunities in the field of ecotourism or scientific research.

*International collaboration:*

- ✓ Work in partnership with international organizations specializing in biodiversity conservation, NGOs and academic institutions to benefit from their expertise and financial support.
- ✓ Participate in knowledge and good practice exchange programs with other UNESCO World Heritage sites facing similar challenges.

*Use of sustainable ecotourism:*

- ✓ Promote responsible and environmentally friendly tourism in the region, ensuring that it does not disrupt fragile ecosystems and using a portion of revenue to support local conservation initiatives.
- ✓ Implement strict rules to limit the number of visitors and control tourism activities, while providing educational experiences to educate visitors about the importance of conservation.

*Restoration of ecosystems:*

- ✓ Implement restoration programs for degraded ecosystems to allow wildlife species to return to their natural habitats.
- ✓ Support projects to rehabilitate and protect water source heads to preserve ecosystems, which are essential for many species.

*Scientific research and monitoring:*

- ✓ Promote and fund scientific research to better understand the species and ecosystems present in the region, which can help guide conservation measures more effectively.
- ✓ Implement regular monitoring of biodiversity and populations of wildlife species to evaluate the effectiveness of the conservation measures put in place and make adjustments if necessary.

These innovative approaches, combined with close cooperation between local, national and international stakeholders, can significantly contribute to the conservation of threatened wildlife species in the Nimba Mountains World Heritage site in Guinea. However, it is important to note that each approach must be adapted according to the specificities of the region and its unique challenges.

## IV. CONCLUSION

- ✓ At the end of this research work, we reached the following results: ⁾ 33 wildlife species are threatened in the RBMN;
- ✓ Poaching and illegal trade are the most serious threats, with a very high percentage level (30%);
- ✓ Habitat loss, overexploitation of resources and demographic pressure are also worrying factors, with respective high threat levels (20%);
- ✓ Insufficient awareness at a moderate threat level (10%);
- ✓ Ten (10) wildlife species are threatened with extinction, i.e. 30.30% of the animal population is in real danger;
- ✓ Surveillance and monitoring, restoration of degraded areas, participation of local communities, scientific research, international collaboration, village development groups are the biodiversity conservation measures of the RBMN.

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