BIODIVERSITY CONSERVATION VERSUS THE REALITY OF WILDLIFE MANAGEMENT UNITS IN ECUADOR.

SHIRLEY PATRICIA MURRIAGUI LOMBARDI
MÓNICA JACQUELINE VITERI GORDILLO
HIPATIA DEL ROCIO PAZMIÑO

UNIVERSITY CENTRAL OF ECUADOR

Traducción : Henry Franco Yanez
Revisión: Olga Lucia Portilla Patiño
Departamento linguistica e Idiomas - Facultad de Cienciass Humanas - Universidad de Nariño

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Resumen

Zoos number over 10,000 worldwide and are visited by millions of people each year. Their primary focus remains on exhibition and recreation, with limited knowledge about their specific roles in wildlife management and the crucial role of environmental education in biodiversity conservation. This research aimed to assess the current state of Environmental Education in wildlife management units in Ecuador. It was conducted from 2017 to 2020 using a qualitative-quantitative, non-experimental, cross-sectional, descriptive, bibliographic, and documentary approach. Information interviews and surveys were used, with the sample size determined from the records provided by the Ministry of the Environment (MATE). Participants included owners, administrators, and supervisors of 49 out of the 75 registered centers in that year. Cross-tabulated tables and complex data graphs were created. The findings revealed that zoos are positioned as centers for wildlife protection, conservation, education, and research, with a focus on recreation. Other units have limited involvement in environmental education, indicating the need for more work to establish secure habitats for species, respect their rights, and raise awareness among visitors about the importance of preserving habitats, territories, and wild species' living areas without human intervention through educational activities and programs.

Keywords: Environmental Education, Research, Recreation, Exhibition.

Abstract

Los zoos superan los 10000 centros en el mundo y son visitados por millones de personas al año, todavía sus propósitos se centran en la exhibición y la recreación, y poco se conoce sobre las funciones específicas en el manejo de la fauna silvestre y en especial, el papel que desempeña la educación ambiental como aporte en la conservación de la biodiversidad, sobre todo en estos momentos que se ha radicalizado la crítica sobre la permanencia de estos en el mundo. Esta investigación tuvo como propósito determinar el estado actual de la Educación Ambiental en las unidades de manejo de la fauna silvestre del Ecuador, se realizó desde el 2017 hasta el 2020, con el enfoque cuali-cuantitativo no experimental, de corte transversal descriptivo, bibliográfico y documental, utilizando la entrevista de información y la encuesta, cuyo tamaño muestral se estimó a partir del registro proporcionado por la Secretaría de Ambiente del MATE, aplicada a los propietarios, administradores y /o encargados de 49 de los 75 centros registrados durante ese año. Se crearon tablas y gráficas cruzadas

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con data compleja, cuyos hallazgos determinan que los zoológicos se posicionan como los centros de protección y conservación de la fauna, la educación y la investigación, sin dejar de lado la recreación; el resto de unidades tiene escasa participación en la educación ambiental y todavía se debe trabajar mucho en disponer de hábitats seguros para que las especies vivan, se respeten sus derechos y se trabaje en concienciar a los visitantes sobre la importancia de mantener los hábitats, territorios y zonas de vida de las especies silvestres sin intervención humana a través de actividades y programas educativos.

Palabras Claves: educación ambiental, investigación, recreación y exhibición.

I. INTRODUCTION

When talking about animals in captivity we often think of zoos (WASA, World Association of Zoos and Aquariums, 2015), whose purposes are focused on exhibition and recreation with a limited understanding of the specific functions, they fulfill in wildlife management according to (SINC, 2011) Zoos house 15% of endangered species of this 25% corresponds to threatened mammals, 9% to endangered birds, and 3% to amphibians, for Conde et al. They constitute "a bank that ensures the survival of endangered species" and zoos may be "the only practical option for the conservation of species whose habitats are disappearing". With one in seven endangered species found in a zoo, zoos are playing an increasingly active role in biodiversity conservation.

Concurrent with the changes in the priorities of the functions, there is an important aspect that determines its evolution for the WAZA. It is no longer intended to show individual animals (XIX century), nor the animal in its habitat (XX century) but to show the complete ecosystems. This redefinition raises a new concept called "zoo-immersion", where visitors feel transported to the world of animals, understand their ecological relationships, and are educated through thematic techniques to reconstruct as best as possible, natural elements from where they come from.

There are countless criticisms about the permanence of these captivity centers associated with feeding, behavior and adaptation in an artificial environment can be detrimental to the physical and psychological health of the animals; Furthermore, it is questioned whether it really contributes to the conservation of endangered species with a focus on the protection of natural habitats and the prevention of biodiversity loss, considering the educational value as a fundamental part of the care of species and a driving force for conservation, epicenter of feedback, The educational value as a fundamental part of species care and a driving force for conservation, an epicenter of feedback, motivation and generation of ideas that contribute to the pedagogical expectations to promote a sense of belonging to the care of nature in children and adolescents, who are currently more immersed in the inherent rights that animals have, debating whether keeping them in captivity for our enjoyment and entertainment is ethical or not.

Zoos are positioned as centers for the protection and conservation of fauna, with the hard work of education and research, without neglecting recreation (Collados, 1997), as long as they comply with the objectives as stated by the Association of Zoos and Aquariums (2006):
a) Collaborate with ex situ conservation programs through technical support, visitor education and research.
b) To work in conjunction with other organizations in conservation programs.

c) Support discussions with public and private institutions on the conservation of flora and fauna species.

d) Increase their income through conservation projects and programs.

WASA has established four parameters to measure the success of conservation programs and projects, as follows:

1. Increasing healthy populations in their natural habitats, through programs that stimulate the conservation of species worldwide.

2. Availability of safer habitats for species to live in by raising awareness among visitors of the importance of maintaining the habitats, territories, and life zones of wild species without human intervention through environmental education.

3. Improved knowledge of the ecology, biology, and conservation of species, through zoo research on specific species.

4. Improved environmental policies and increased conservation programs and projects at the governmental level (World Association of Zoos and Aquarium, 2005).
Progress in wildlife conservation depends largely on social awareness of the relationships between species, the environment, and human actions, according to the World Zoo and Aquarium Strategy (WAZA). Education plays a key role in the long-term success of conservation strategies such as ex-situ population management, reintroduction, and habitat protection.

According to (Ojasti, 2000), unlike zoos, wildlife management units include areas such as municipalities, farms, reserves, and national parks, managed with specific research, conservation, exhibition, and marketing objectives. These areas vary in size and apply intensive and extensive methods to promote the reproduction of native or exotic species, using aviaries, zoos, and rescue centers, and considering biological, social, and cultural aspects of the ecosystems.

Zoos are changing their approach and operation due to concerns about the treatment of animals, (Iannacone & Alvariño, 2017, p. 37), as well as the need to evaluate the fulfillment of their objectives. However, in some cases, the exhibition of animals is considered crucial to finance conservation, education, and research activities in zoos, which poses challenges in their transformation. They must play an important role in the conservation and protection of endangered species, despite the criticism they generate. According to Fernández-López (2012), over time they have evolved to include conservation, research, captive breeding programs, and education, providing people with the opportunity to learn about the animals from multiple perspectives. These modern centers have clear conservation, research, education, and recreation goals, with a direct focus on involving the public, as expressed by Harris (1995).

For (Alvear, 2016), the reasons that justify the existence of zoos derive mainly from the functions they fulfill in society which he classifies into:

1. Entertainment
2. Profit
3. Education
4. Conservation
5. Research

The first two share a scarce development; they are not the main ones, but they allow for sustainability and are the basis for self-financing, while education, conservation, and research are the pillars that justify their permanence, as stated in the 2005 World Zoo and Aquarium Strategy for Conservation, which is "to integrate all aspects of their work with conservation activities".

Education in zoos is fundamental to promote environmental awareness and conservation, but there have also been questions about the deprivation of freedom of animals, although these facilitate research, some critics argue about the study of the behavior of animals in captivity. This research was born precisely from the need to determine the current state of Environmental Education in wildlife management units in Ecuador as an important element that contributes to the conservation of biodiversity through education, whose specific objectives focused on: providing limited information compared to the study in their natural habitat.

This research was born precisely from the need to determine the current state of Environmental Education in wildlife management units in Ecuador as an important element that contributes to the conservation of biodiversity through education, whose specific objectives focused on:

- Determine the number of wildlife management units that meet the minimum parameters to qualify as such in the Ministry of Environment of Ecuador.

- Establish the contribution of wildlife management units in environmental education programs, research, species conservation, and scientific studies that provide updated information on ecological, ethological, reproductive, and adaptive aspects of wild species managed in captivity.

- To value the sustainability of wildlife centers certified by the Ministry of the Environment of Ecuador (current MATE).

The research work began in 2017 and ended in 2020 in the wildlife management units considered by the Ministry of Environment, today known as the Ministry of Environment, Water and Ecological Transition (MATE) for this purpose 49 of the 75 centers recognized by the Ministry of Environment (current MATE) were taken into account.

II. METHODOLOGY

The research was conducted throughout Ecuador from March 2017 to January 2020, 75 centers were included considering that, for the Ministry of Environment of Ecuador, two categories highlight the spaces where animals are in captivity, among them are:

Wildlife holding and management centers: any infrastructure that houses individuals of wild fauna for conservation, education, and production, among others, and that have been legally constituted, among which are: zoos, wildlife rescue centers, commercial production zoos, and medical and pharmaceutical research zoos.

Wildlife rescue center: a place for the reception of trafficked animals and their maintenance in technically approved conditions. Rescue centers must allow for research tending to the development of adequate management techniques, in addition, they become sites for raising awareness about the problem of species trafficking (Registro Oficial, 2016, p. 16).

The approach was qualitative-quantitative, non-experimental, descriptive cross-sectional (Hernández, 2014). In the first stage, bibliographic and documentary information was collected on the study variables: Biodiversity Conservation: and ex situ wildlife management strategies; in the second stage, information on the current situation of the Wildlife Management Units in Ecuador was collected through an information interview and a survey, for which the sample size was estimated based on the registry provided by the Secretariat of Environment, applied to the owners, administrators and/or managers of 49 of the 75 centers according to the calculation of the sample Eq 1.

$$n = \frac{NPQ}{(N-1)\frac{E^2}{K^2} + PQ}$$

The interview was suggested and approved by the MAE (MATE) and collected the information taking into account in its first phase the general data of the centers, location and access, facilities and infrastructure, number of visitors, information, and exhibition, while in the second phase, the survey was used with 35 items divided into blocks whose indicators were related to topics such as strategic aspects, technical aspects, education, and research and actions; The statistical analysis was carried out with SPSS software, crossing the data of the category of the centers with the rest of the indicators of the survey, and anecdotal records were filled out according to the specific situations of each center.

III. RESULTS AND DISCUSSION

A total of 31 zoos, 5 zoo farms, and 13 rescue centers were studied. The findings from the first phase determined that the centers located in the urban periphery correspond to 55% of zoos and 7.7% of rescue centers, while there are no zoos in these areas. However, 25.5% of zoos, 80% of zoo farms, and 77% of rescue centers are located in rural areas; 6.5% of zoos, 20% of zoo farms, and 15.3% of rescue centers are concentrated in intra-urban areas, which are generally the most remote and difficult to access. The remaining centers are reached by dirt roads or trails, and the type of construction they present is generally mixed, using materials typical of the area.

Of the 49 CMFSE (Wildlife Management Centers) in Ecuador, the majority have the MATE operating approval patent; only one in each category is in the process of approval, and most of them record the profiles of the visitors who come to the centers. Regarding the type of visitors, 31% of zoos receive mostly students and 25% foreigners, while zoo farms receive all types of visitors, and rescue centers primarily receive students. In summary, the rest of the visitors are generally concentrated in groups of friends, families, specialists, scientists, and volunteers, among others.

The information that visitors receive, according to the category of the center, is technical-scientific, interpretive, and didactic, and to a lesser extent, curricular, despite the fact that students are the most frequent visitors to the centers. Regarding the inventory of incoming and outgoing species, all rescue centers maintain this record: 28 of the 31 zoos have it, and 4 of the 5 zoo farms have it; therefore, there is effective control over the entry and exit of fauna species.

According to the findings, most zoos have a variety of educational resources, especially guides, brochures, and posters, related to the type of visitor who comes to the center. These resources are moderately present in the zoos, while the rescue centers do not have them. Thus, 19% of the zoos use posters, and the lowest percentage corresponds to the zoos with 1% in the use of books and dioramas as educational resources.

Almost all of the species found in the centers have information tables that include taxonomic data, ecological and morphological information, and associated problems, among others; however, there is little motivational content to conserve and protect the habitat of the fauna exhibited, and in many cases, these information tables are in poor condition.

Most of the centers have rest areas, visitor centers with general information, but few dynamic and recreational activities that promote habitat conservation, and they are underutilized, especially for the sale of souvenirs or other items. Of the 31 zoos, 21 have an interpretation center, all of them in zoos, and 7 of the 13 rescue centers. The few services correspond to public telephones, infirmaries, libraries, and reading spaces. (Compiled Table 1, Information and Exhibit).

TABLA COMPILADA 1
INFORMACIÓN Y EXHIBICIÓN

	ZOO	ZOOCRIADERO	CENTRO DE RESCATE
Información proporcionada al visitante			
Técnica científica	18	2	9
Interpretativa	20	4	4
Didáctica	17	4	4
Curricular	4	2	3
Inventario de especies que ingresan y salen			
SI	28	4	13
NO		1	0
Recursos educativos			
Libros	8	1	8
Folletos	11	4	5
Guías	18	5	8
Carteles	17	4	7
Guiones	10	2	2
Afiches	19	2	2
Trípticos	13	4	4
Lúdicos	11	2	6
Dioramas	11	1	5
Otros	5	2	4
Información en los letreros			
N Científico	14	3	6
N común	14	3	7
Categoría	9	3	7
Orden	19	2	7
Familia	18	3	8
Mapa de distribución	16	2	7
Ecología	17	3	8
Morfología	17	3	6
Reproducción	14	2	7
Ilustración	15	3	6
Problemas asociados	11	2	6
Flora y fauna del centro			
Artificial	0	1	0
Introducida	7	2	0
Mixta	14	1	4
Nativa	11	2	10
Servicios			
Área de descanso	29	5	8
Centro de visitantes	21	5	1
Parqueadero	26	5	8
Área de picnic	19	4	4
Sanitaros	28	5	9
Vigilancia	25	4	5
Teléfonos públicos	14	1	2
Materiales educativos	18	5	8
Biblioteca	13	1	6
Enfermería	10	3	6
Guías naturalistas	18	5	5

Fuente: Entrevista a las UMFSE

In relation to research projects, 63% of the centers have records, while the existence of cubicles for animals in captivity is present in 25 zoos, 4 zoos and 11 rescue centers, with a percentage ranging between 70 and 80%, although with reduced spaces and little recreation of native flora, mostly mixed flora is used except in rescue centers where the predominant flora is native, precisely because the species that are rescued are close to the location of the centers. On the other hand, the same percentage has an inventory of species, quarantine zones and animal breeding stations; only 60% have animal recreation areas (it is not known what these areas are based on, since no information was provided).

Environmental interpretation is managed through informative panels in 25 zoos, 4 zoo farms and 4 rescue centers, personal interpretative means through guides or interpreters in 13 zoos, 4 zoo farms and 4 rescue centers, non-personal interpretative means, especially audiovisuals in 13 zoos, and self-guided trails in most zoos and moderately present in the other centers (Compiled chart 2, Areas of the Wildlife Management Units).

TABLA COMPILADA 2
ÁREAS DE LAS UNIDADES DE MANEJO DE LA FAUNA SILVESTRE

	ZOO	ZOOCRIADERO	CENTRO DE RESCATE
Registro de proyectos de investigación	19	4	8
Cubículos	25	4	11
Vigilancia	26	4	10
Asistencia veterinaria	28	5	13
Identificación de especies	29	5	11
Registro y herramientas de seguimiento	24	4	9
Inventario de colección faunística	25	5	12
Fichas de ingreso y egreso de animales	27	3	13
Zona de cuarentena	25	5	9
Recreación animal	20	5	9
Estación de reproducción animal	17	3	8
Estación de investigación	17	3	8
Señalética de orientación	23	5	7
Paneles informativos e interpretativos	25	4	4
Medios interpretativos personales	22	4	4
Medios interpretativos no personales	13	3	5
Senderos guiados	23	5	8
Senderos autoguiados	23	4	6
Mesas de información de la fauna	18	2	4

Fuente: Entrevista a las UMFSE

In the second phase of research (Compiled chart 3, Strategic Aspects), the results of the survey showed that between 60 and 70 % of the centers are aware of the functions of wildlife management units in Ecuador and inform their visitors about the importance of conserving and protecting ecosystems, generally with posters or brochures. These media do not fulfill conservationist purposes and little is motivated on the subject in benefit of the protection of individuals and animal populations to stop the process of extinction of species; on the other hand, the importance of knowing the specific functions of the centers does not mean that they should stop being promoted as places of exhibition, since for visitors they are the main purpose of the visit, perhaps due to the scarce didactic content presented in them. 75.5% of wildlife management units consider the center an environmental classroom, while 15% consider it sometimes and 14.5% never, especially rescue centers. Regarding strategic aspects to achieve conservation objectives, the majority of centers (93.87%) stated that they always, almost always or sometimes implement them, especially zoos. However, a small number of centers (6.12%) indicated that they never implement these efforts, mainly two zoos and one rescue center.

TABLA COMPILADA 3
ASPECTOS ESTRATÉGICOS

¿Se conoce la función de las UMFS?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Blanco	1	0	0
	Nunca	1	0	1
	Algunas veces	3	1	1
	Casi siempre	2	1	2
	Siempre	24	3	9
¿El centro informa sobre la importancia de conservar y proteger los ecosistemas?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Nunca	1	0	2
	Casi nunca	1	0	0
	Algunas veces	1	0	0
	Casi siempre	1	1	1
	Siempre	23	4	7
¿Métodos educativos para preservar los individuos y poblaciones de animales?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Blanco	1	0	0
	Nunca	0	0	1
	Casi nunca	1	0	0
	Algunas veces	2	0	2
	Casi siempre	4	1	1
	Siempre	23	4	9
¿Métodos y técnicas educativas que detienen el proceso de extinción de las especies?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Nunca	0	0	2
	Casi nunca	1	0	0
	Algunas veces	1	0	2
	Casi siempre	6	2	0
	Siempre	23	3	9
¿Se considera al centro como aula ambiental?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Nunca	0	0	1
	Casi nunca	1	0	1
	Algunas veces	4	0	6
	Casi siempre	2	1	4
	Siempre	24	4	7
¿Existen esfuerzos para lograr objetivos conservacionistas?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Nunca	2	0	1
	Algunas veces	2	1	1
	Casi siempre	7	1	2
	Siempre	20	3	9

Fuente: Encuesta a las UMFSE

During this phase, with the help of anecdotal records, significant problems were discovered in several wildlife management centers in the province of Guayas. Two of them were not located at addresses registered with MATE, and it is noted that they were set up as private exhibits rather than rescue centers. Two others belong to ex-politicians fugitives from justice and did not allow access to the surveyors despite having been created as rescue centers. A surprising case is mentioned of a primate located in a flower plantation at an altitude very different from its natural habitat and in adverse climatic conditions, and that despite requests for relocation by

the site, no response was obtained from MATE for its relocation.

IV. CONCLUSIONS

- The categorization of the 49 centers studied shows a significant geographic distribution: most zoos are located in the urban periphery, while zoos and rescue centers are more concentrated in rural areas, suggesting a relationship between location and the conservation function of these centers.

- The audience visiting the centers is varied, so the zoos are popular among students and foreigners, which could indicate their educational role and tourist attraction. On the other hand, zoos are more accessible to all types of visitors due to their focus on animal breeding and reproduction.

Rescue centers appear to be geared primarily toward students, possibly because of their focus on wildlife rehabilitation.

- Most of the centers have the MATE operating approval patent, which suggests that they are in compliance with regulatory requirements. However, it is important to consider those centers that are in process to avoid potential compliance problems. It is also relevant that these centers record the profile of visitors, to help in planning and adapting their activities and programs.

- Although most of the FMUs are aware of the functions of these units and promote the importance of conserving ecosystems, the media used, such as posters or brochures, do not seem to effectively fulfill these purposes, which indicates the need to develop more effective Environmental Education strategies that are related to the national curriculum.

In addition, there are no specific techniques or strategies that can be adapted to different types of audiences and more effectively promote the protection and conservation of ecosystems and their species. The lack of an educational approach may contribute to the fact that the centers are perceived primarily as places of exhibition and not as educational spaces for the conservation of habitats and their species.

- UMFSEs often collaborate with scientists and researchers who conduct studies on site, suggesting that this may include work that contributes to the ecology, behavior, reproduction and adaptation of species in captivity. The data obtained can contribute to the understanding of these species and help in their conservation.

- UMFSEs play an important role in the conservation of threatened and endangered species through captive breeding programs and the release of individuals bred in them, helping to increase the populations of endangered species.

- It is important to keep in mind that the effectiveness of UMFSEs may vary depending on the institution and its commitment to conservation and environmental education objectives. In addition, policies and regulations related to wildlife may change over time, which could influence the role and activities of these units.

- The creation of wildlife management units must comply with Ecuador's current environmental legislation. This may include laws related to biodiversity conservation, sustainable use of natural resources and protection of critical habitats, for which the following aspects should be taken into account:

- More rigorous processes should be established for obtaining the necessary permits and licenses to operate a wildlife management unit. This should include requirements for the import, export and possession of species, as well as the operation of specific facilities, with a Management Plan for those wishing to establish a wildlife management unit, including how species conservation, captive breeding, reproduction and other key aspects of management will be carried out.

- Clear criteria need to be established to determine which species are managed in these units. This could be based on species rarity, extinction risk, legal market demand and other factors.

- Implement regulations to ensure the welfare of animals in captivity, including minimum enclosure size, adequate food and access to veterinary care, as well as requiring the implementation of a regular monitoring system and the submission of periodic reports on the activities and status of managed wildlife populations.

- It is important to encourage the participation of local communities in the management of these units, since their support and knowledge are fundamental for

long-term success. This requires environmental education and outreach programs to inform the public about the importance of conservation and sustainable use of fauna, something that is currently very weak.

- It is essential that the process of creating the FMUs involves experts in conservation, biology and animal welfare, as well as local communities and other stakeholders, in order to promote the conservation of ecosystems and contribute to the protection of wildlife.

- Significant concerns have been identified in the management of wildlife management units in the province of Guayas and others, raising questions about compliance with regulations and ongoing supervision by the competent authorities to allow their permanence. Likewise, better supervision is suggested in the physical conditions in which the animals are kept in captivity in order to guarantee transparency, ethics and the well-being of the animals involved. The importance of effective enforcement of environmental regulations and adequate oversight by the competent authorities is also highlighted.

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