English

| Technical Report |

CITES MODULE

# Illegal Wildlife Trade of Five Prioritized Species of Appendix I of CITES Emblematic for the Amazon Region

ARO
AMAZON REGIONAL OBSERVATORY

ACTO
Amazon Cooperation Treaty Organization

## Permanent Secretariat / Amazon Cooperation Treaty Organization (PS/ACTO)

General Secretary
María Alexandra Moreira López

Executive Director
Ambassador Carlos Alfredo Lazary Teixeira

Administrative Director
Carlos Armando Salinas Montes

## Amazon Regional Observatory (ARO)

Coordinator
Mauro Luis Ruffino

Data Specialist
Isaac Ocampo Yahuarcani

CITES MODULE

ARO
AMAZON REGIONAL OBSERVATORY

| Technical Report |

# Illegal Wildlife Trade of Five Prioritized Species of Appendix I of CITES Emblematic for the Amazon Region

Consultancy for the Systematization and Visualization of Information on CITES Species Emblematic for the Amazon Region and Susceptible to Illegal Trafficking

***Natalia Méndez Ruiz-Tagle***

Brasilia | Brazil | 2022

**Illegal Wildlife Trade of Five Prioritized Species of Appendix I of CITES Emblematic for the Amazon Region**

Consultancy for the systematization and analysis of the information on CITES species susceptible to illegal trafficking and emblematic for the Amazon Region


Consultant

**Natalia Méndez Ruiz-Tagle, MSc.**

Contributors

Statistical Processing - Modus Operandi and Drivers of the Illegal Wildlife Trade

**Monique Sosnowski, MSc.**

Cartography Processing

**Gohar A. Petrossian, Ph.D.**

Statistical Processing - Network Graph

**Bryce Barthuly, MSc.**

Revision

**Vicente Guadalupe**


Original language

**Spanish**

Photographs

**Cover Photo - Courtesy of IBAMA/Brazil**
**ACTO Photo Gallery, iStock and IBAMA/Brazil**


This technical study and publication have been prepared with the support of the Regional Project for the Management, Monitoring and Control of Species of Wild Fauna and Flora Threatened by Trade (Bioamazon), development project of the ACTO, co-financed by the Federal Republic of Germany to through KfW.


The names and information used in this ACTO technical publication, and the manner in which the data, maps, images, and tables containing geographic information about the Member Countries are represented, do not constitute a judgment on any International Treaties or Acts in force between the Parties, nor concerning any disputes with regard to borders or territorial rights which may exist between the Parties, nor shall this document be interpreted or invoked to imply acceptance or waiver, affirmation, or modification, directly or indirectly, expressly or tacitly, of the position or interpretation that each Party may hold on these matters. Additionally, the results of the analysis carried out represent the opinion of the authors and are not necessarily shared by the ACTO.


**How to cite:** Ruiz-Tagle, M.N., Sosnowski, M., Barthuly, B., Petrossian, G.A. 2022. Technical report prepared for the Bioamazon Project. Amazon Cooperation Treaty Organization, Brazil.




ARO AMAZON REGIONAL OBSERVATORY

ACTO Amazon Cooperation Treaty Organization

BIOAMAZON PROJECT Conservation of species threatened by unsustainable trade

german Cooperation DEUTSCHE ZUSAMMENARBEIT

Implemented by: KFW


**R934i RUIZ-TAGLE, Natalia Méndez (consultancy). Illegal Wildlife Trade of Five Prioritized Species of Appendix I of CITES Emblematic for the Amazon Region. l. CITES Module 2. Amazon Regional Observatory (ARO). ACTO-ARO (Technical Report). Brasilia, 2022.**

**102p.; il; color.**

**1. Wild Animal 2. CITES 3. Adverse Impact 4. Bioamazon Project 5. Illegal Trafficking**

**I. ACTO II. ARO**

**CDU 502.743 (81)**

**ISBN 978-85-61873-37-0**

## ACKNOWLEDGEMENTS

We thank the government entities of the Member Countries of the Amazon Cooperation Treaty Organization (ACTO), as well as other national entities, international and intergovernmental organizations that provided key data and/or facilitated access to databases, in order to have a better understanding and knowledge about the illegal trade of CITES Appendix I species in the Amazon Region.

### National Entities

Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) - Brazil
Ministry of Environment and Water (MMAyA) - Bolivia
Ministry of the Environment, Water and Ecological Transition (MAATE) - Ecuador
Ministry of Land Policy and Forest Management - Suriname
Agency for the Supervision of Forest Resources and Wildlife (OSINFOR) - Peru
National Forestry and Wildlife Service (SERFOR) - Peru
United States Department of the Interior - Fish and Wildlife Service - United States of America

### Intergovernmental Organizations

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
World Customs Organization (WCO) Environment Programme

### International Organizations

*Robin Des Bois*
TRAFFIC International

Special thanks to the National Museum of Natural History of Bolivia, the Ministry of the Environment, Water and Ecological Transition of Ecuador, and the Panthera Organization for reviewing and commenting on this report.

# Presentation

The illegal trafficking of species generates a billionaire[1] market worldwide and unfortunately, these types of activities are carried out in the Amazon, reflecting the importance to strengthen the investigation and generate up-to-date and accurate information, in order to implement more effective measures to combat this transnational illicit activity.

The eight countries that are part of the Amazon Cooperation Treaty Organization (ACTO)[2] work jointly under the mandates of the Amazon Cooperation Treaty (ACT, 1978) for a better sustainable management of their natural resources in its Amazonian territories.

Accordingly, ACTO, through the **"Regional Project for the Management, Monitoring and Control of Wild Fauna and Flora Species Threatened by Trade (Bioamazon Project)"**, is strengthening the institutional and technical capacity of the Amazonian countries in the management, monitoring and control of wild fauna and flora species threatened by illegal trade, particularly, species listed in the different Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The Bioamazon Project works with three intervention components: i) the development or improvement of national information systems on biodiversity and CITES species, the interoperability among other national systems and with the Amazon Regional Observatory (ARO); ii) the development or improvement of CITES electronic permit mechanisms/systems/processes aligned with CITES tools and operating through the Single Window for Foreign Trade; and iii) support the development of sustainable management systems and traceability of endangered Amazonian species.

The actions that ACTO is developing and implementing have strengthened the institutional capacities of the Amazon countries to a greater and more effective compliance with CITES, through the development and/or enhancement of the national information systems on biodiversity and CITES species; the development and/or enhancement of national electronic CITES permit systems; and the development of a sustainable management and/or traceability system for threatened species.

In November 2021, ACTO launched the ARO, which aims to be a *Reference Center for Information on the Amazon, promoting the flow and exchange of information among the institutions, governmental authorities, scientific community, academia and civil*

1 Illegal trade of species is the fourth most lucrative illicit industry worldwide, generating around $23 trillion annually [3].
2 Are part of ACTO Bolivia, Brazil, Colombia, Guyana, Ecuador Peru, Suriname and Venezuela.

*society of the Amazonian countries*. Among its different thematics, ARO has the CITES module, which possesses key information related to Amazonian flora and fauna species presented by Appendices, such as: *permits, imports, exports and also on the illegal trade of emblematic Amazonian wildlife*.

In addition to the aforementioned actions, ACTO aims to contribute to the generation of up-to-date and specific information regarding the status of the illegal trade of five Amazonian species listed in CITES Appendix I, by presenting this report. This information will contribute to decision-making processes of CITES Authorities, managers of controlling institutions, and other public managers with decision-making capacity.

This report is a compilation of systematized and analyzed information on the illegal trafficking of CITES Appendix I species, the scarlet macaw (*Ara macao*), the ocelot (*Leopardus pardalis*), the jaguar (*Panthera onca*), the harpy eagle (*Harpia harpyja*) and the margay cat (*Leopardus wiedii*), which were prioritized and selected using a methodology combining three variables: (i) the geographical distribution; (ii) the total number of illegally traded specimens in confiscations; and (iii) the population status.

The results of the analysis conducted show that between the years 2009-2020, about 1,833 specimens of these five species were confiscated in the eight Amazonian countries. Likewise, the outcomes have revealed the existence of trafficking routes to different countries of America, Europe, Asia and Oceania; as well as concentration areas (hotspots) of illegal trade of these species.

These results are a reflection of the importance of developing accessible tools to communicate and disseminate information on illegal trafficking of species in the Amazon Region. Additionally, it was identified that a coordinated regional management among countries is needed, specifically with regards to planning between control entities for adequate and effective action *in-situ*, in order to break the chain of illegal wildlife trade.

From the Permanent Secretariat of ACTO, it is our intention that this first report on illegal trafficking of CITES Appendix I species, emblematic for the Amazon Region, serves as a useful resource for the different stakeholders, that it contributes to knowledge, that it raises public awareness and finally, to contribute as a tool for decision-making aimed to the conservation of the biodiversity in our Amazon Region.

---

**María Alexandra Moreira López**

General Secretary
Amazon Cooperation Treaty Organization (ACTO)

*Panthera onca*
Photo: © iStock

CITES MODULE

ARO
AMAZON REGIONAL OBSERVATORY

# Table of Contents

## List of Figures



## List of Maps

## List of Tables



## Annex

### List of Figures



### List of Tables

# Acronyms

| | |
|---|---|
| **CITES** | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| **EIA Intelligence** | Environmental Investigation Agency Intelligence |
| **EU-TWIX** | European Union Trade in Wildlife Information Exchange |
| **ACTO / OTCA** | Amazon Cooperation Treaty Organization |
| **MC** | ACTO Member Countries - Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, Venezuela |
| **UN** | United Nations |
| **UNODC** | United Nations Office on Drugs and Crime |
| **UNTOC** | United Nations Convention against Transnational Organized Crime |
| **USFWS** | U.S Fish and Wildlife Service |
| **USFWS-LEMIS** | U.S Fish and Wildlife Service Law Enforcement Management Information System Database |
| **WCO** | World Customs Organization |

CITES MODULE

ARO

AMAZON REGIONAL OBSERVATORY

# Introduction

***Harpia harpyja***
Photo: ©iStock

***Amazona aestiva***
Photo:© iStock

# Introduction

**The Bioamazon Regional Project whose objective is to increase the efficiency and effectiveness of management, monitoring and control of species of wild fauna and flora threatened by trade in the Member Countries (MC) of the Amazon Cooperation Treaty Organization (ACTO), in order to contribute to the conservation of Amazonian biodiversity, especially of listed species in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), arises as part of the regional vision of ACTO, which consists of "Achieving the sustainable development of the Amazon region through a balance between the use of its resources, its protection and conservation, respecting an equity that ensures its sustainable integral development, with the effective presence of the State at its different levels of government and Amazonian populations with the full exercise of their rights and obligations within the framework of the Convention, its protection and conservation, respecting an equity that ensures its integral sustainable development, with the effective presence of the State at its different levels of government and Amazonian populations with full exercise of their rights and obligations within the framework of the national regulations in force and international agreements". Thus, a consultancy was developed to collect, analyze and disseminate information on priority CITES Appendix I species which are susceptible to illegal trade and emblematic for the Amazon Region. It is in this context that a report on illegal wildlife trade of five prioritized species of Appendix I of CITES, emblematic for the Amazon Region, is developed.**

CITES is an agreement between governments that protect a variety of species from excessive exploitation for international trade, with the purpose of ensuring their survival. Through the incorporation of Appendices I, II and III, CITES categorizes wild species of animals and plants according to the protection they need. The species in this report are included in CITES Appendix I, which categorizes them with the highest degree of danger, as threatened with extinction and where their commercialization is prohibited, except for imports in particular cases, such as for scientific research purposes. In this sense, although CITES

does not directly participate in national legislation with respect to illegal wildlife trafficking, it does have a considerable influence on it and promotes international cooperation against illegal wildlife trafficking, through the obligation to penalize illegal trade.

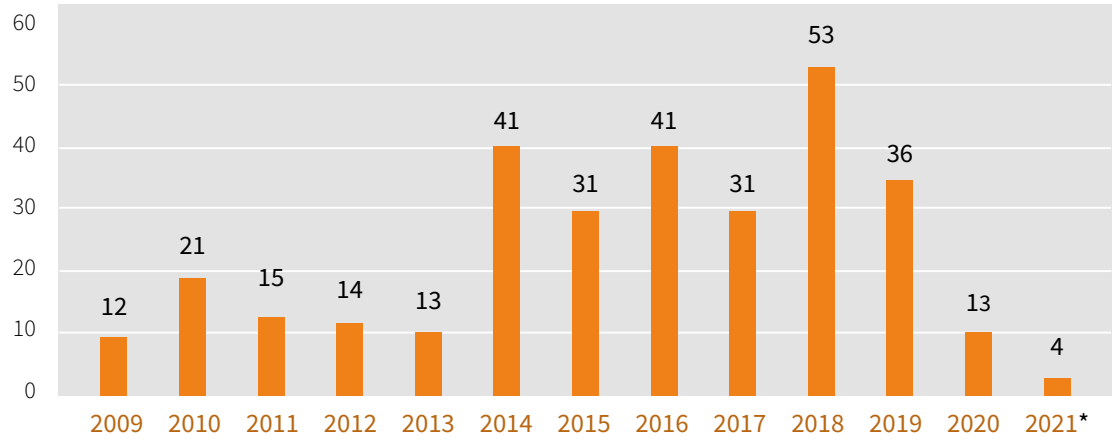
Five Amazonian animal species were selected using a Selection Index (**IS = $V_1$*$K_1$ + $V_2$*$K_2$ + $V_3$*$K_3$**) with three variables: geographic distribution in the Amazon Region, amount of pressure from illegal trafficking, and population status (see Annex for more information). These species were selected from a universe, which corresponds to all the animal species of the Amazon Region of CITES Appendix I. In this sense, the jaguar (*Panthera onca*), scarlet macaw *(Ara macao*), ocelot (*Leopardus pardalis*), harpy eagle (*Harpia harpyja*) and margay cat (*Leopardus wiedii*) were selected (see Context for more information).

Information was collected at a national and international level, through the eight MCs, and access to the databases of international entities (Table 1). Although USFWS-LEMIS is a governmental entity and works in data collection at a national level in the United States, in this report it will be considered within the international level group. Information was requested to different sources of national and international origin and data was obtained from a total of nine extraction sources, five of them belong to international sources, and four are national sources, meaning the MCs. Within the international entities, information was used from: USFWS-LEMIS Database; CITES Trade Database; WCO-ENVIRONET; TRAFFIC Wildlife Trade Portal; and the illegal traffic bulletins of the French entity *Robin des Bois*. Despite requesting information from other databases, access was not obtained from the following organizations: WorldWISE Database for the United Nations on Drugs and Crime; EU-TWIX Database for the European Union; and the TRAFFIC database.

A database was built to store the information provided by the aforementioned entities. This database has information from the last 12 years (2009-2021) for five animal species in the eight MCs, with a total of 335 incidents of confiscations/seizures, poaching, and other related events. Additionally, the incidents were used and selected according to the analysis that was intended to be carried out to obtained the different results presented in this report and the availability of the specific data in the incident, e.g. to analyze and obtain the trafficking routes, incidents with only origin and destination information available were used (see Annex: Methodology for more information).

Quantitative and qualitative statistical methods were used to analyze the data in the different sections of this report. However, for the section on Potential Environmental and Social Impacts due to the Illegal Wildlife Trade, statistics were not used due to the lack of data for species population, which would have allowed the development of predictive models of population abundance. For this reason, it was decided to carry out an analysis in a general hypothetical context, of the possible impacts that could be caused by illegal trafficking of the species, supported by results obtained in different scientific

**Figure 1.**
**Total Number of Incidents per Year**




10 Incidents are not considered since we do not have data for the year.
* Data collection for incidents in the year 2021 will last until January due to the start of the systematization of the information.

investigations. As previously mentioned, the data used to obtain the different results, come from international entities and the MCs. In this sense, it is crucial to consider that those Amazonian countries that provided the most information are not necessarily those that have the greatest activity in the trafficking of species. Listed below, the general results of this report regarding the illegal wildlife trade of the five species are presented.

According to the general results, there has been an increase of incidents of illegal trafficking since 2014, however, this decreased considerably in 2020 (Figure 1). The recent COVID-19 pandemic may be a possible reason, since it caused a worldwide paralysis, resulting in a decrease of personnel in charge of detecting animals that were being illegally trafficked, or possibly, a suspension in animal trafficking due to a lack of commercial flights. Nonetheless, EIA Intelligence recently concluded that this decrease in incidents is due to a change in the *modus operandi* of traffickers, reflecting consequently, a decrease in the detection of cases [53].

The results reflect the jaguar with the highest number of incidents of illegal trafficking in the Amazon Region (Figure 2). Even the confiscated specimens of this feline turned out to be the most varied and greater in quantity than the other species in this report. The ocelot was the second species in registering the highest percentage of illegal trafficking incidents, while the margay cat is positioned with the lowest number of incidents. Birds, on the other hand, show different data. The scarlet macaw is positioned with the third highest percentage of incidents of illegal trafficking, while the harpy eagle, like the margay cat, shows low values (Figure 2).

The percentage of incidents in each country of the Amazon Region was analyzed as the country of origin, i.e. place (country) and therefore local demand, from where the five species and their specimens were extracted due to illegal trade. Although Peru, Brazil, Bolivia and Ecuador are the countries with the highest percentages regarding the number of incidents of illegal trade of the five species in this report (Figure 3), it is important to mention that more data implemented in this database, will better reflect a projection of the reality.

Additionally, these results may be partially affected by the sources of extraction, i.e., the data provided by each country and international organization. Some 72.54% of the total data came from international sources, while 27.46% from national sources provided by ACTO MCs (Figure 4). When reflecting the Amazonian countries as countries of origin from where these species are being demanded for illegal trade, Colombia, Guyana, Suriname, and

**Figure 2.**
**Percentage by Species of Total Incidents 2009 - 2021**

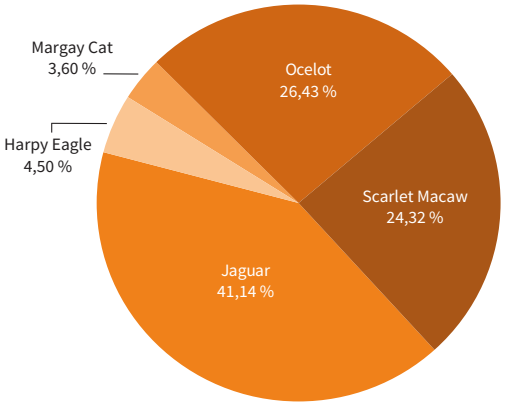
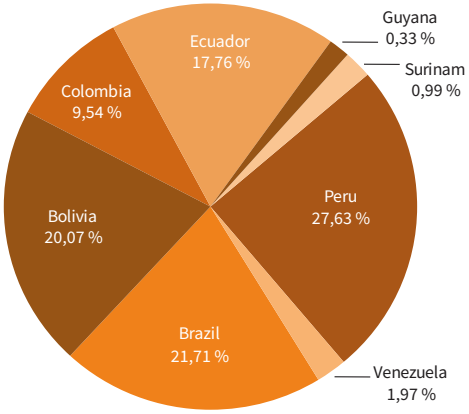


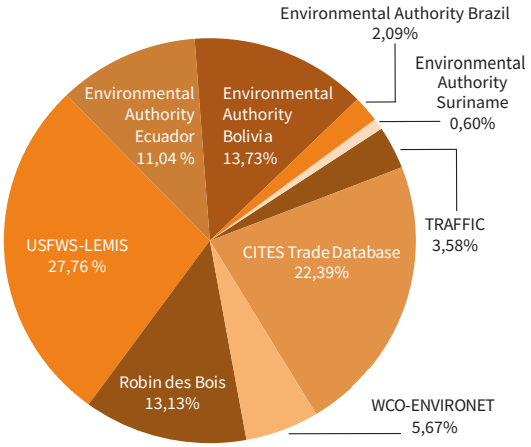

**Figure 3.**
**Percentage of Country of Origin of Total Incidents 2009 - 2020***




* 2021 - incidents were not considered due to lack of data in the country of origin.

Venezuela are the countries that did not contribute data on trafficking incidents to the database created for this consultancy. However, although Brazil contributed a total of seven incidents (Table 1), it is the country with the second highest

**Figure 4.**
**Sources of Extraction 2009 - 2021**




percentage of illegal trade records, while Peru has the highest percentage of incidents (Figure 3) and did not provide official national data (Table 1). This reflects the importance of providing information on illegal wildlife trade.

This report also identifies: the hotspots of illegal trafficking of the five species in the eight ACTO MCs; illegal trafficking flows at national and international level; the main demands and specimens of the five species; other species trafficked along with the five main species; the *modus operandi*; the main factors that drive this illegal trade; the possible environmental and social impacts that may be generated due to the illegal trafficking of the five species; and finally, conclusions and recommendations are presented. In this sense, the following report is a preliminary presentation of the results obtained on the illegal trade of the five species, with the purpose of showing the importance and degree of illegal trade that occurs in the Amazon Region, as well as the possible environmental and social impacts that can be generated by illegal trade.

**Table 1.**
**Number of Incidents Granted by Entity | 2009-2021**

| Entity | N. of Incidents |
|---|---|
| Environmental Authority Ecuador | 37 |
| Environmental Authority Brazil | 7 |
| Environmental Authority Bolivia | 46 |
| Environmental Authority Suriname | 2 |
| USFWS-LEMIS | 93 |
| CITES | 75 |
| WCO-ENVIRONET | 18 |
| TRAFFIC | 13 |
| *Robin des Bois* | 44 |

Prepared by: Natalia Méndez Ruiz-Tagle

## Context

The Amazon is a tropical rainforest characterized by its great extension (approximately 7,413,827 km$^2$) and by the fundamental roles it plays [1]. It contributes to the global climate balance; it has 420 different indigenous and tribal peoples, making it a multicultural territory; its water cycle and water balance feed aquifers and groundwater in about four million km$^2$ and provides with approximately 20% of the planet's freshwater; finally, it is the habitat for a wide range of flora and fauna which represents approximately a quarter of all the world's species [1]. The Amazon extends across eight Member Countries (MC) Bolivia, Brazil, Colombia, Ecuador, Guyana, Suriname, Peru and Venezuela, members of the Amazon Cooperation Treaty Organization (ACTO) and the French overseas department, French Guiana.[1]

Today, the Amazon continues to face a problem that increases exponentially over the years, the illegal trafficking of wild animals [2]. The United Nations Environmental Programme (UNEP) estimates that the illegal wildlife trafficking industry generates around 23 billion United States dollars (USD) annually, generating international flows with points of origin, transit and destination in almost all continents of the world [3] [4]. The Brazilian Institute of Environment and Renewable Natural Resources, estimates that in Brazil alone, around 12 million animals are illegally trapped each year [2]. This not only has an impact on biodiversity and ecosystems, but also on human health [3]. There is evidence which suggests that the pandemic caused by the current outbreak of the SARS-CoV-2 virus (causing the disease COVID-19), may have originally been transmitted, in the wet markets of wild animals in China, or en route to these markets where illegal wildlife may be sold, dramatically illustrating the risk to public health when illicit trade in species is not controlled [5] [6].

Illegal trafficking of biodiversity is also linked to other types of illegal activities such as drugs, arms, alcohol and even precious stones, among others [7], making it an international security problem [4]. In addition, this industry exploits not only wild animals, but also vulnerable low-income people, who are encouraged to hunt illegally [8]. In *Rurrenabaque*, Bolivia, a foreign citizen placed an advertisement offering to pay USD 120-150 per jaguar (*Panthera onca*) fang [9]. In Ecuador, a canoe driver tells a journalist that a scarlet macaw (*Ara macao*) can be sold for USD 150, more money than the local people produce in a month [10]. In Peruvian markets, a jaguar fang can be sold for up to USD 300 to a foreign buyer [11]. In Bolivia, a hunter reports killing jaguars in self-defense; however, he

1 French Guiana is a French overseas territory that hosts Amazonian ecosystems, and as it is not part of ACTO it will not be considered in this report.

is now also motivated by the demand and high purchase value of jaguar fangs, a situation that aggravates as he lacks knowledge the existence of laws that punish the hunting of this feline and the vulnerable status of its populations [12]. Therefore, the importance of generating and disseminating information to effectively educate and sensitize the population regarding the repercussions that arise from illegal wildlife trafficking is urgent, and it is of utmost importance that they are complemented with projects and programs aimed for communities to also work on the conservation of species.

There are also other fundamental causes that facilitate the growth of the illegal wildlife trade industry. Increasing industrialization leads to the invasion and occupation of natural areas, which facilitates accessibility and contact with intact natural habitats of species demanded by illegal trafficking. The lack of clarity in the regulations that protect wild species and their application opens the way to corruption, falsification, and fraud [4] [13]. In addition, the lack of information does not allow for monitoring and control of this activity, which prevents an accurate picture of the situation. Those responsible for recording acts of illegal wildlife

Photo: ©IBAMA/Brasil

*Wild animal rescued from trafficking by IBAMA/Brazil.*

trafficking face difficulties in maintaining data that quantify and reflect the real problem [4]. Despite the difficulty of identifying illegal acts in an extensive and inaccessible territory such as the Amazon Region, it is important to mention the difficulty of accessing this type of data in the possession of the different countries. On occasions, this information does not exist or is incomplete to the point of being useless [14] [15] [13]. This not only aggravates the lack of data, but also leads to concealing the magnitude of the problem, making it difficult to identify key factors of illegal wildlife trade and by weakening the elaboration of necessary solutions in the regulatory, financial and social areas.

A first step to mitigate the problem of illegal wildlife trafficking is the strengthening of information [16] and its dissemination through education [14]. In this context, the following report is elaborated, showing in a preliminary way, the illegal trafficking of five animal species, emblematic for the Amazon Region and susceptible to illegal trade: The ocelot (*Leopardus pardalis*), the scarlet macaw (*Ara macao*), the jaguar (*Panthera onca*), the harpy eagle (*Harpia harpyja*) and the margay cat (*Leopardus wiedii*). This was done through the systematization and analysis of information extracted from a historical database (2009-2021), of confiscations, poaching and other related incidents elaborated for this consultancy. This database has information collected at the national and international levels. At the national level, the respective focal points of the eight ACTO MCs were contacted, requesting data on illegal trafficking of the mentioned species. Illegal trade data was obtained from four MCs through their focal points. At the international level, the information was collected through requests for access to the different databases. In this way, data was extracted from the following organizations: ENVIRONET Platform of WCO, USFWS-LEMIS Database of the United States government, CITES Trade Database, *Robin des Bois* 'On The Trail' Illegal Trafficking Bulletins, and TRAFFIC's Wildlife Trade Portal.

The following is a general description of the species that will be analyzed in this report.

## OCELOTE
## *(Leopardus pardalis)*

Photo: ©iStock

The ocelot is the second largest feline in the Amazon Region, weighing between 6.6-18.6 kg, measuring 50-101 cm in length (without considering the tail), and 40-50 cm in height. The geographic distribution of this neotropical carnivore begins at the north in southern Texas in the United States, expanding through and covering all of Central and South America as far as northeastern Argentina, southern Brazil and occasionally northwestern Uruguay. It is a feline which has the ability to adapt to different natural habitats, from alluvial plains, dry coniferous forests, tropical rainforests, whether fragmented or located in proximity to cities and towns [17] [18] [19] [20].

The role of the ocelot in its natural environment is distinguished mainly by the fact that it is a solitary and nocturnal predator. Ocelots are opportunistic hunters and in some areas, they take advantage of seasonally available resources such as fish and crabs; however, these felines also feed on a wide variety of species of different sizes [21]. Their diet is composed of opossums (Didelphimorphia), large rodents such as agoutis or pacas (Rodentia: Dasyproctidae, Cuniculidae) to small rodents (Rodentia: Echimydae, Cricetidae), armadillos (Cingulata), sloths (Pilosa), primates and even deer (Cetartiodactyla) [22]. Small and medium-sized birds and reptiles are also included in their diet [21].

In tropical habitats, reproduction of this felid is reported year-round. Males are distributed in areas of 4-90 $km^2$, while females are distributed in areas of 1-75 $km^2$, where male areas overlap with that of several females but not between males [21]. After 70-80 days of gestation, the female may have one to three cubs which become independent after approximately two years of training with the mother [21].

## JAGUAR
## *(Panthera onca)*

Photo: ©iStock

The jaguar is the largest feline in the Americas and the third largest in the world. It can weigh up to 105 kg and measure 130-156 cm in length [23]. Its distribution covered extensive geographical areas, from the extreme south in the state of Arizona in the United States, covering the tropical zone of Central America and extending into South America as far as northern Argentina. However, today it is estimated that their fragmented distribution is reduced to 50% [24], confined to fragmented areas of Central America, the Amazon rainforest and surrounding marshes. They usually live in proximity to bodies of water such as rivers, lakes and wetlands, as they are known to be excellent swimmers [25] [26].

Being an apex predator, the jaguar feeds on a wide variety of animals, from 1 kg rabbits to large prey such as tapirs (Tapiridae), capybaras (Rodentia), deer (Cetartiodactyla) and even lizards, caimans or alligators (Crocodilia), thanks to the strength of their jaws and fangs capable of crushing turtle shells (Testudines) and skulls of large reptiles [27].

Jaguars reproduce throughout the year, since females are polyestrous, having the ability to come into estrus repeatedly, however, their reproduction rate is slow because once the cubs are born, they remain with their mother for up to two years before becoming independent [28]. Depending on sex, location and seasonality, males and females move in areas of 5-321 km² and 20-1,359 km², respectively, where in some cases, the areas of males and females overlap [29] [24]. Females can produce one to four offspring after 91-101 days of gestation in captivity [24] [26].

## HARPY EAGLE
## *(Harpia harpyja)*

Photo: ©iStock

The harpy eagle is one of the largest eagle species in the world. Its talons can reach the size of a grizzly bear's claw (*Ursus arctos horribilis*) [30], being capable of snatching an adult sloth (Pilosa) from a tree. A female can weigh up to 11 kg, making it the heaviest of all eagle species and reach 213 cm in wingspan [31]. Its geographic distribution used to be quite extensive, starting from the north in southern Mexico and descending through Central and South America until reaching northeastern Argentina [32], however, this distribution has been reduced to more than 40%, being completely extinct in El Salvador [33] and confined to a regional Amazonian distribution [31].

The diet of this aerial apex predator of the Amazon Region is based mainly on arboreal mammal species such as sloths, different species of primates, porcupines (Rodentia), as well as opossums (Didelphimorphia), kinkajous (Carnivora), macaws (Psittaciformes), reptiles [34], and this bird has even been recorded hunting a baby collared peccary (Artiodactyla) [35].

Being a predatory bird, the harpy eagle has a low reproductive rate, where every 2.5-3 years only one eaglet fledges per pair [36] [37] [38]. This young remains in the nest under biparental care for approximately two years until it fledges and leaves the nest [36] [39] [37].

## *MARGAY CAT (Leopardus wiedii)*

The margay cat is a solitary nocturnal and crepuscular feline [40], weighing up to 2.3-4.9 kg and measuring 46-69 cm in length. It is distributed over a wide area beginning in central Mexico and extending through Central and South America, as far as Uruguay and northern Argentina [41]. The habitat of the margay cat, unlike other felids, is predominantly associated with tropical dry forests, humid forests, premontane humid forests and montane cloud forests [42]. In biomes such as savannas and swampy savannas, it is generally found in areas with tree cover. Rarely its presence was reported outside forested areas. Because the ocelot is the dominant small felid species, the margay cat avoids areas occupied by ocelots to evade predation and competition for food [43].

The margay cat, unlike other felines, is adapted to dominate the treetops with unique characteristics. Their long 52 cm tail, wide legs and movable toes allow the margay cat to balance and hang from tree branches with a hind leg, thanks to the flexibility of their ankles, achieving a 180 degree outward leg rotation [43]. They are extremely fast and in case of a fall, they manage to grab a branch with a front or hind leg and climb again. In

Photo: ©iStock

some areas, margays hunt, sleep and even have their young in the treetops [42] [43]. Unlike other felids, the margay is highly susceptible to disease outbreaks [43].

They move and hunt predominantly on the ground, however, they also take opportunities to hunt prey in trees. They feed on small mammals such as rodents, birds and reptiles, as well as small mammals such as squirrels, agoutis (Rodentia: Sciuridae and Dasyproctidae), rabbits (Lagomorpha), and small primates [43].

Margay cats have a low reproductive rate, where once a year the mother after 76-85 days of gestation usually has one cub, in exceptional circumstances they may have two. Unlike other felids, the female margay has only one pair of mammary glands and can ovulate spontaneously [43].

## SCARLET MACAW
## *(Ara macao)*

Photo: ©iStock

The scarlet macaw is monochromatic, both females and males have the same plumage coloration, covering their entire body except for the facial area. The colors scarlet red, yellow and blue stand out in their feathers; however, in terms of size, the female is larger, reaching 66-77 cm in height [44] [45].

The geographic distribution of this parrot used to cover an extensive area, from northeastern Mexico covering all of Central America and part of South America until southern Brazil [44] [45] [46], and it is considered threatened throughout most of its geographic distribution [47] [48]. This species inhabits remnant forests, tropical riparian and lowland evergreen forests, as well as landscapes with agricultural fields [49] [45] [50].

The scarlet macaw is a gregarious and monogamous bird. It locates its nest inside tree trunks, sometimes dead trees, creating a cavity with the help of its beak and legs [47]. Reproduction occurs every 1-2 years and in the Amazon Region, begins in the dry season (August-October) and ends in the rainy season (April-May), having an average of 1-3 young, which leave the nest after approximately four months of being under biparental care, [47] [46] [51] if they have not been preyed upon by species such as hawks (Falconiformes) and owls (Strigiformes) [47].

The scarlet macaw feeds mainly on fruits, seeds, nuts, vegetables and occasionally flowers and nectar [45]. This bird consumes fruits before they become ripe because of the strength and ability of their beak to consume them and as an advantageous mechanism to access them and reduce competition with other species [52].

CITES MODULE

ARO

AMAZON REGIONAL OBSERVATORY

# Illegal Traffic Analysis Areas

*Leopardus pardalis*
Photo: ©iStock

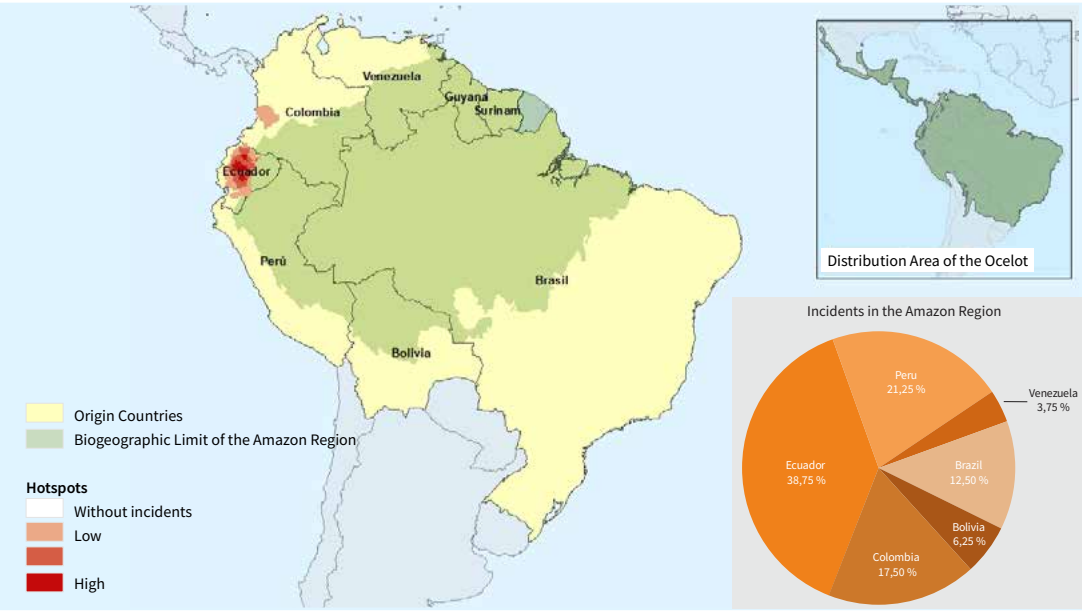
***Caiman crocodilus***
Photo: ©iStock

# Illegal Traffic Analysis Areas

## Illegal Wildlife Trade Hotspots

**To obtain the hotspots of illegal trafficking of species, only the coordinates of the places of origin of each incident were used, which indicate the possible areas where illegal animal trafficking is concentrated. CITES and USFWS-LEMIS data are not projected on the hotspot maps, as these were provided at the country level and without further specification. However, these data are shown together with the rest of the data used to obtain the hotspots in the pie charts located in the lower right margin of every hotspot map (for more information see Annex: Methodology).**

**Map 1.**
Illegal Trafficking Hotspots Ocelot (*Leopardus pardalis*) | 2009 – 2020




Prepared by: Gohar Petrossian
Sources: IGIS Map, UICN, ACTO & CIIFEN

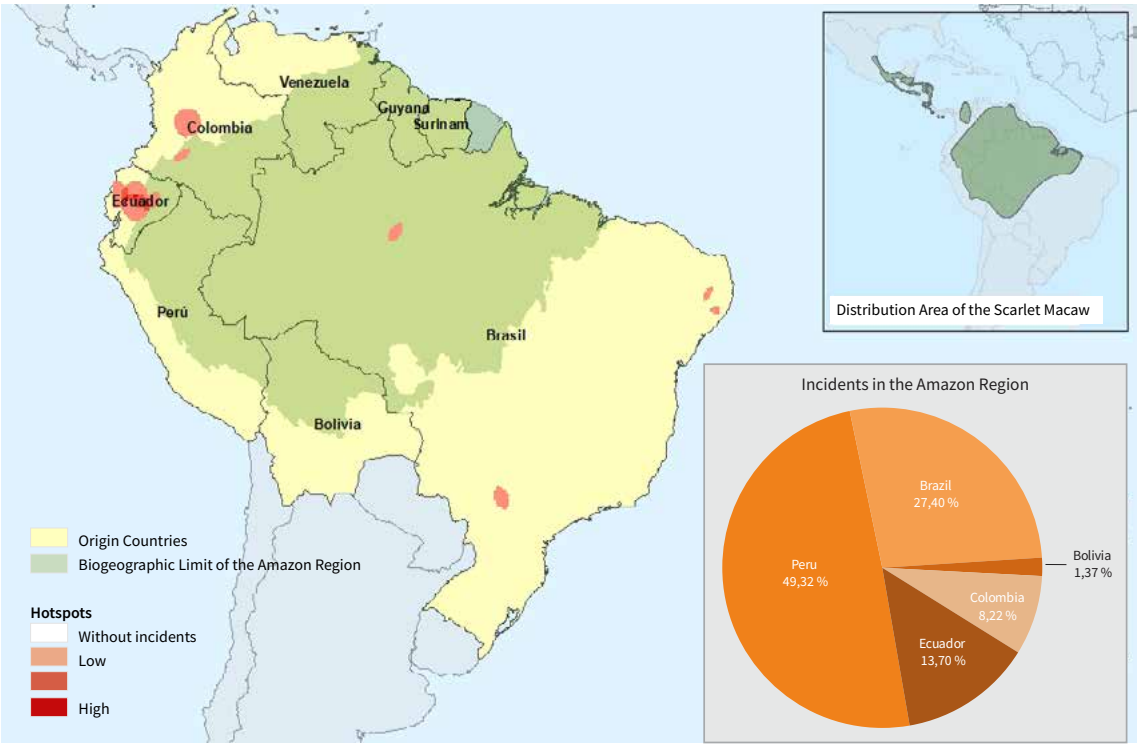
Illegal trafficking hotspots for the ocelot were detected in Ecuador and Colombia. In Ecuador, this hotspot is located along the Amazon Region and is within the geographic distribution of the ocelot. It is bordered on its right margin by five national parks, which could be ocelot extraction points. Additionally, this hotspot is also located in different urbanized areas, including the capital city *Quito*.

One of the reasons may be related to the fact that these felines are moved to urbanized areas to facilitate their sale, as a considerable number of incidents have been reported in different cities, predominantly in *Pichincha*, the province where Quito and other nearby cities are located. The province of Bolivar also stands out, but although it is not as highly urbanized as *Pichincha*, it is located between *Quito* and *Guayaquil* (the latter is considered the country's financial city), so there may possibly be a preference for a rural province to reduce the degree of detection and to be close to urban cities to facilitate sales.

Although the hotspot in Colombia is outside the Amazon Region, it is located within a national park and an urbanized area, which could show a similar picture to that of Ecuador, but on a smaller scale due to its low density.

Finally, although no hotspots of illegal trafficking were detected in other countries, incidents of ocelot trafficking were reported in all Amazonian countries, with the exception of Guyana and Suriname.

**Map 2.**
**Illegal Trafficking Hotspots Scarlet Macaw (*Ara macao*) | 2009 - 2020**




Prepared by: Gohar Petrossian
Sources: IGIS Map, Birdlife International, ACTO & CIIFEN

A greater number of hotspots of illegal trafficking for the scarlet macaw were identified in the northwest of the Amazon Region, specifically in Ecuador and Colombia. Additionally, one hotspot was detected in Brazil in the central Amazon Region and others outside the region and the geographic distribution of this parrot, to the east and south of Brazil.

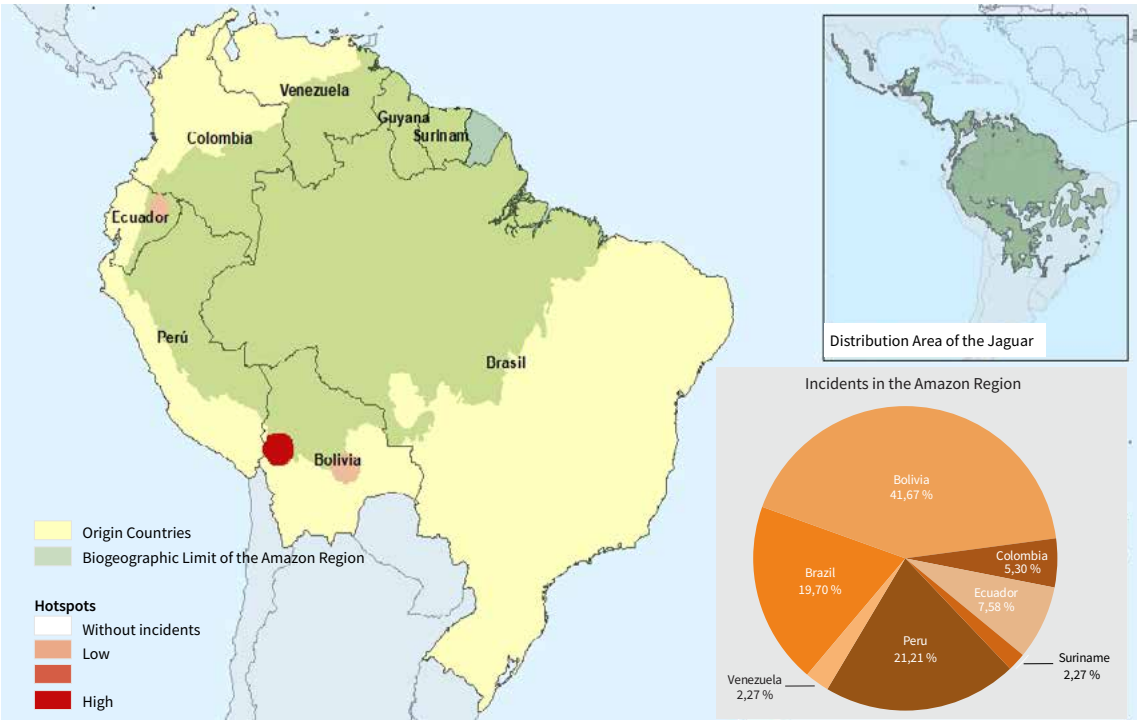
In Ecuador there are hotspots with low and medium densities that cover a part of the Amazon Region and part of the geographical distribution of this bird, but also, a part that is outside its distribution and the Amazon. It covers the coast of Ecuador, specifically the rural province of *Manabí* to the west, urban areas in the center of the country and a variety of national parks to the east and within the Amazon Region. The presence of national parks in the hotspot could reflect that different macaws are being extracted from these areas. Consequently, these animals are usually moved to urban areas to increase the chances of sale, which is why urbanized areas are identified in the center of the hotspot and of Ecuador. However, this hotspot extends to the coast in *Manabí*, a rural province, where the city of *Manta*, a coastal city with the second largest port in the country, stands out.

This port has previously been used for illegal international trafficking of other animal species [56], so there could be a connection of illegal trade of macaws through this port.

In Colombia the hotspots are linked to areas near national parks and urban areas such as Bogota city, where the same case as in Ecuador may be occurring. In Brazil, three hotspots are located outside the macaw's distribution, which could be specific points for keeping the parrot in captivity.

Finally, Peru has no illegal trafficking hotspots, however, it has the highest number of incidents originated in this country, detected mainly in the United States. Bolivia reports one incident, while Venezuela, Guyana and Suriname report no incidents.

**Map 3.**
**Illegal Trafficking Hotspots Jaguar (*Panthera onca*) | 2009-2020**




Prepared by: Gohar Petrossian
Sources: IGIS Map, UICN, ACTO & CIIFEN

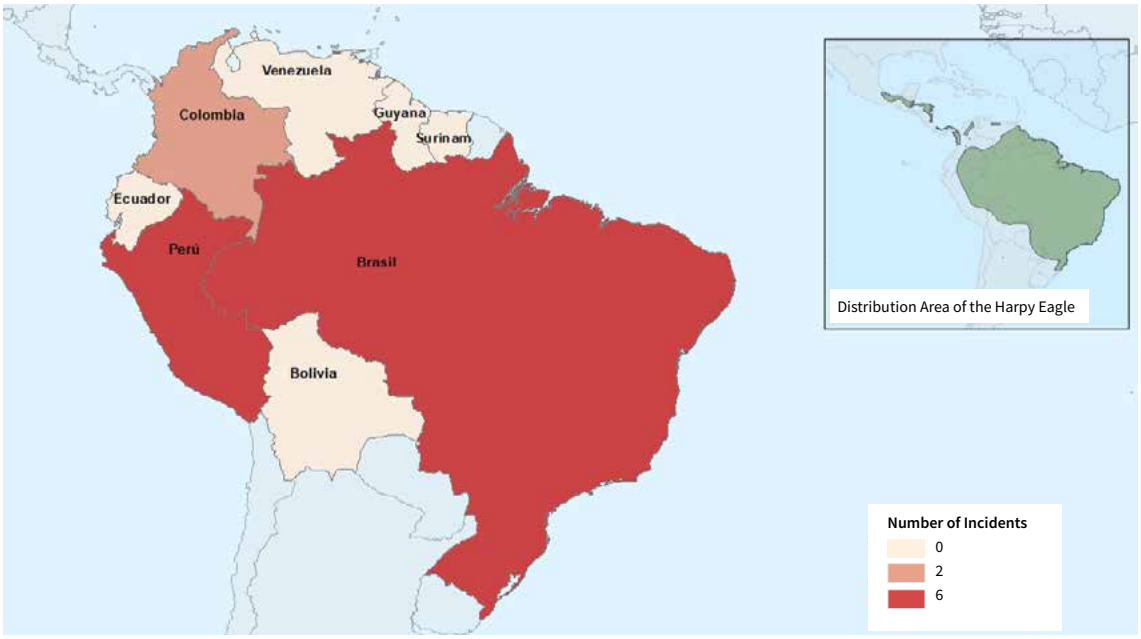
Illegal jaguar trafficking hotspots were detected in the northwestern and southern Amazon Region, specifically, two hotspots (with high and low densities) in Bolivia, and a third low density hotspot in Ecuador.

In Bolivia, a high density hotspot is located in the city of *La Paz* and part of the *Madidi* National Park. This park is known to have high densities of jaguar populations [57], so one possible reason for the location of this hotspot is linked to its location as a source of jaguars and its specimens. However, this point also includes the city of *La Paz*, which according to the data, is used as an international exit point for illegal trafficking of jaguar parts. Again, as with the other species, a hotspot related to an urbanized area is identified, which could make sale and shipment possible, and with proximity to an extraction/supply area such as a national park with jaguar population. Other hotspot in Bolivia encompasses the nation's largest industrial city, *Santa Cruz de la Sierra*. One of the possible reasons for detecting this hotspot of illegal trafficking in an urban area may be related to the convenience of selling these specimens in cities, as some seizures took place in public markets. This possibly shows that illegal trafficking of jaguars is detected when these felines have already been hunted in their natural habitat and their specimens and/or animals transported to urban areas.

The third hotspot of illegal trafficking is located in Ecuador, specifically in the province of *Orellana*. This province is characterized by being rural and with small towns close to the *Yasuní* National Park, a park with a high presence of jaguars [57]. Again, these hotspots are detected in populated areas, where it is highly possible that hunting was previously carried out successfully and undetected.

Finally, although no hotspots were detected within the Amazon Region in Brazil and Peru, two incidents were reported in the states of *Pará*, one in Amazonas and another in *Acre* , while for Peru, four incidents were reported in the department of *Loreto* and one in *Junín*. Guyana is the only country where no incidents of illegal jaguar trafficking have been reported

**Map 4.**
**Trafficking Incidents by Country of Origin Harpy Eagle (*Harpia harpyja*) | 2009 - 2020**




Prepared by: Gohar Petrossian
Sources: IGIS Map, Birdlife International, ACTO & CIIFEN

The harpy eagle is the species with the lowest number of illegal trafficking incidents of the five selected, which is why there was not enough data to create a map with illegal trafficking hotspots. However as an alternative, a map is presented with the concentrations of incidents for this bird by country of origin. The reason is based on the fact that the seizures for the harpy eagle come from CITES and USFWS-LEMIS, which do not detail places of origin beyond the country, which is why an analysis of this information at the country level is presented.

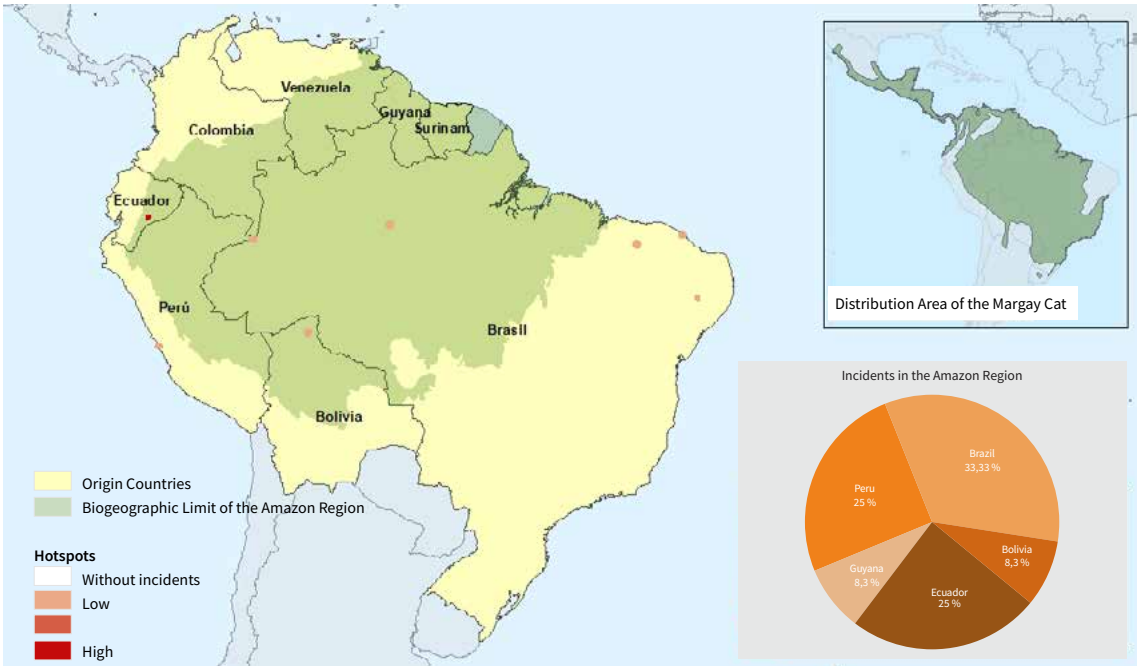
Brazil and Peru are the countries with the highest number of traffic incidents, each one with six. Colombia is the third country with a total of two incidents. Since most of the seizures for this bird of prey were detected in the United States according to the results, it shows that these specimens manage to leave the country of origin and are only detected in foreign countries, making possible the idea of a weakened control at customs points of countries of origin with international departures.

Among the aforementioned incidents, it is important to mention that the only one with a specific location of origin occurred in Brazil, in the city of *São Felix do Xingu*, located in the state of *Pará* and characterized for deforesting the Amazon Region and at the national level [58]. In this context and considering that deforestation is a factor which facilitates illegal trafficking of species through

accessibility to intact natural areas [59], this incident probably supports it, since the description of the confiscation revealed that the person in possession of illegal harpy eagle specimens deforested the area.

Finally, in Bolivia, Ecuador, Guyana, Suriname and Venezuela, there are no reports of illegal trafficking for the harpy eagle.

**Map 5.**
**Illegal Trafficking Hotspots Margay Cat (*Leopardus wiedii*) | 2009 - 2020**




Prepared by: Gohar Petrossian
Sources: IGIS Map, UICN, ACTO & CIIFEN

A total of eight illegal traffic hotspots for the margay cat were identified, one with high density and the rest with low densities, inside and outside the Amazon Region. Four hotspots are located outside the geographic distribution of this feline, and three of them are relatively close to each other on the central coast of Brazil. One of the possible causes is that these hotspots reflect seizures of specific cases of trafficking, detected once these wild cats were already removed from their natural habitats, as these incidents are not only located outside their geographic distribution, but also occurred in public markets and in residences. The reasons could be linked to increased sales possibilities, or to keep them in captivity as pets.

Another hotspot has been identified close to the center of the Amazon Region in Brazil. This corresponds to a case where a police officer attempted to transport a margay cat skin from the cities of *Manaus* to *Rio de Janeiro*, which raises the probability that this feline was hunted in its habitat in the state of *Amazonas*, and with the intention of transporting the specimen nationally in Brazil.

The trafficking hotspot detected in Bolivia is located in the department of *Beni*, specifically, in an area characterized for being in the convergence of three geographic areas: Amazon, Savannah and the *Gran Chaco*. This area not only has a unique geography but it is also a natural habitat with a high occurrences of the margay cat and other felines [60].

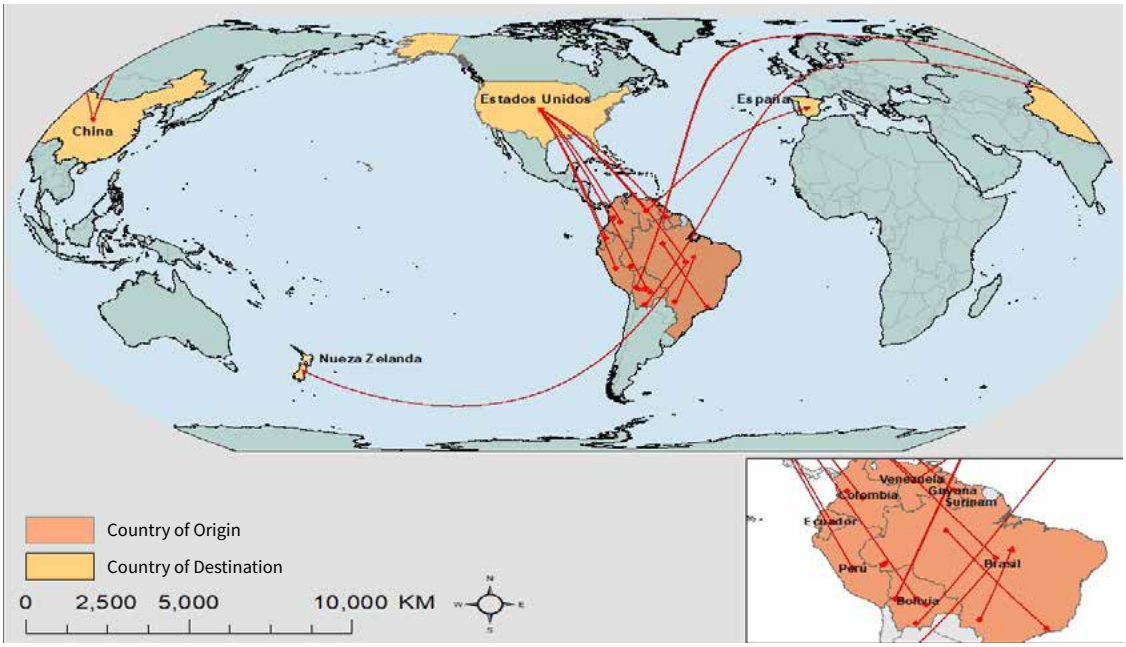
The hotspot with the highest density of illegal trafficking is located in Ecuador, specifically in the province of *Morona Santiago*. This place is characterized by being surrounded by national parks and reserves, known for its high biodiversity and also as the habitat of the margay cat [61], which could possibly reflect a point of capture/poaching of this feline.

Another hotspot of illegal trafficking in Peru is located in the department of *Loreto* near the border with Brazil and Colombia, where a variety of animals, including a margay cat, were reportedly confiscated as they were exploited for the tourism industry.

Finally, in Colombia, Suriname and Venezuela, no incidents of illegal trafficking of the margay cat have been reported.

# Illegal Wildlife Trade Routes

## Map 6.
## Illegal Trafficking Flow of the Five Species | 2009 - 2020




Prepared by: Gohar Petrossian
Source: IGIS Map

The coordinates of the countries of origin and destination were used to create the map of illegal trafficking flows. For the incidents without the aforementioned information, two scenarios created by United Nation Office on Drugs and Crime (UNODC) were used to generate additional information and thus create the illegal trafficking flows (see Annex Methodology for more information) [62].

Illegal trafficking routes were identified at the national and international level for the five selected species, involving all countries in the Amazon Region as countries of origin. The destinations for the international flows correspond to four countries (Map 6), with the United States and China being the destinations with the highest, registering 145 and 23 journeys, respectively. The remaining international destinations, such as Spain and New Zealand, recorded one occurrence each.

With regards to the United States, it was observed that there is a preference for arriving to the states of Florida, Texas and Georgia as destination airports, which registered 35, 30 and 12 incidents, respectively. In a lower quantity of occurrences, the states of New York,

California, Virginia, Tennessee, New Jersey and Kentucky were followed as destinations for the illegal trafficking of the five species selected in this report.

Within the Amazon Region, domestic internal flows were identified in Bolivia, Colombia and Brazil, with one, one and three incidents, respectively (Map 7). According to the preliminary data, it can be analyzed that the internal flow at the national level is greater in Brazil than in the rest of the Amazonian countries.

By analyzing the routes and their frequency, three of these were identified as having the greatest flow of routes through the count of occurrences (Table 2). It can be seen that Peru, Brazil and Bolivia are the countries with the highest number of international departures for the trafficking of the selected species. In addition, there is a greater flow of arrivals to the United States from Peru and Brazil (Table 2).

**Table 2.**
**Frequent Flow Routes | 2009 - 2020**

| N. of Incidents | Route |
|---|---|
| 76 | Peru - United States |
| 24 | Brazil - United States |
| 23 | Bolivia - China |

Prepared by: Natalia Méndez Ruiz-Tagle

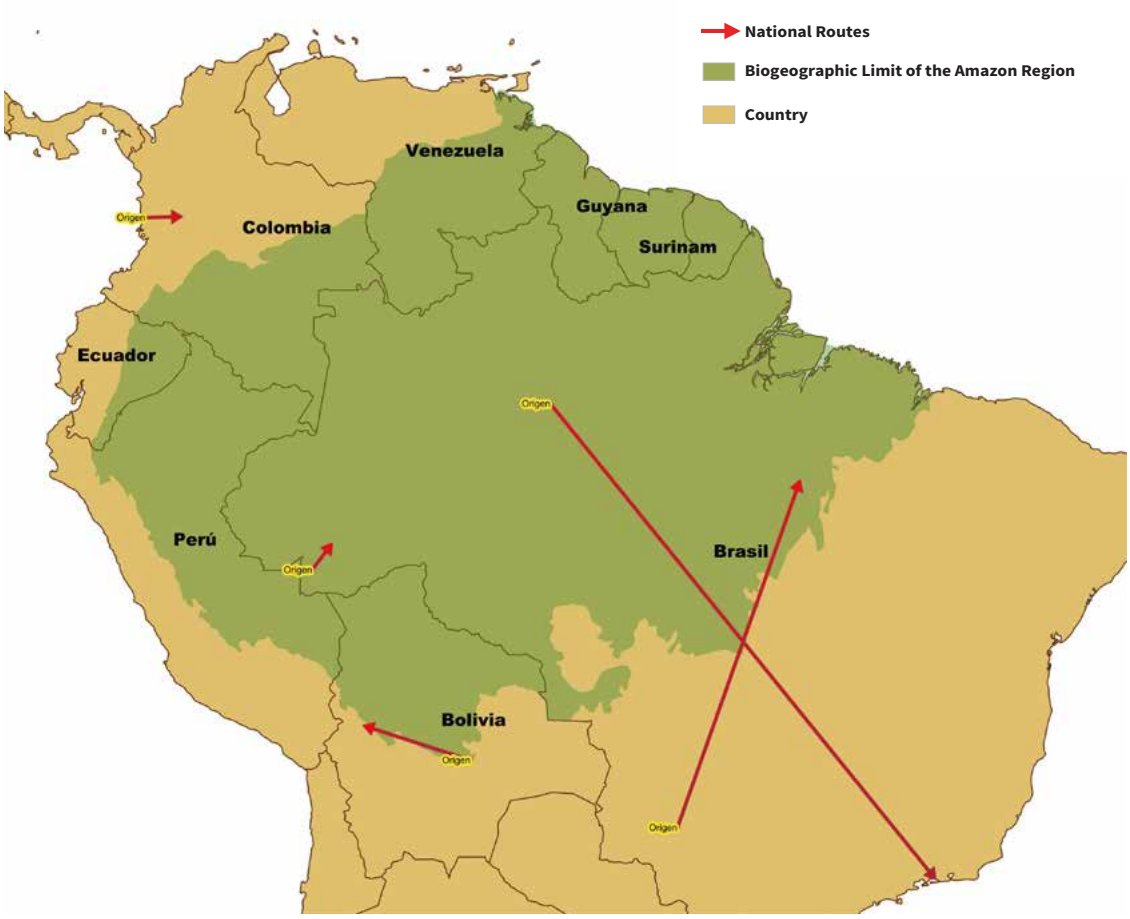
Next, an analysis of the most frequent routes by species was carried out. It was found that on the route from Peru to the United States, there is a high level of traffic of the scarlet macaw, jaguar and ocelot, where the macaw is in first place with 33 incidents (Table 3). However, from the point of view of the species, the jaguar would take first place considering only the sum of the incidents, registering a total of 44 occurrences. In this sense, the jaguar is the species most involved in these routes, this feline has two main points of origin and two international destinations, which indicates the high interest in jaguars and their specimens, registering China as the main international destination (Table 3). Finally, the ocelot is positioned as the third species with 15 incidents with the Peru - United States route.

## Table 3.
## Most Frequent Routes by Species | 2009-2020

| N. of Incidents | Route | Trafficked Species |
|---|---|---|
| 33 | Peru - United States | Scarlet Macaw |
| 23 | Bolivia - China | Jaguar |
| 21 | Peru - United States | Jaguar |
| 15 | Peru - United States | Ocelot |

Prepared by: Natalia Méndez Ruiz-Tagle

## Map 7.
## National Illegal Trafficking Routes | 2009 - 2020



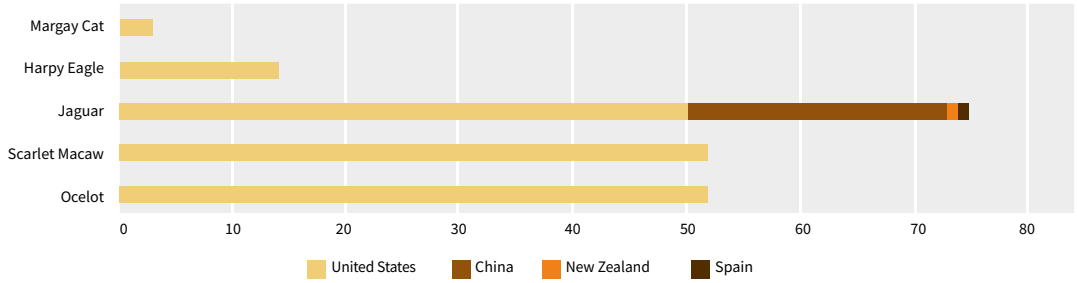

Prepared by: Natalia Méndez Ruiz-Tagle
Sources: ACTO & CIIFEN

Five routes were identified at the national level in Brazil, Bolivia and Colombia (Map 7). These incidents show different patterns. In some of them, points of origin were identified in rural territories near or within conservation areas and with destination points in more urbanized areas, as was the case of a confiscation where a person had hunted different species in a natural park and intended to transport them to the city where he lived for their sale.

In another internal route detected in Brazil, the place of origin was *Manaus* (capital of the state of *Amazonas*) and the place of destination was the city of *Rio de Janeiro*. Although both places are urbanized cities, unlike *Manaus*, *Rio de Janeiro* is a city with a greater international air traffic compared to *Manaus*, which could reflect a possible attempt to facilitate the transport of the specimen internationally, or nationally.

**Figure 5.**

**International Destinations of the Five Species by Number of Occurrences | 2009 – 2020**




Prepared by: Natalia Méndez Ruiz-Tagle

The main international destinations for the five species analyzed in this report were preliminarily identified through the incidents of illegal trafficking, registering in total, destinations in four continents: America, Europe, Asia and Oceania (Figure 5).

The United States has the highest number of occurrences for all five species, and is also the only destination country for four of the five species (Figure 5). However, it is necessary to consider the sources of extraction of these results, since USFWS-LEMIS provided approximately 28% of the total confiscations, which could reflect the United States as the main destination country, or as an efficient country in detecting illegal trafficking incidents.

In this context, for the scarlet macaw and harpy eagle, mainly feathers were reported as a type of product destined

for the United States. Felines, on the other hand, mainly record the following specimens: whole body skins and pieces of skin for the ocelot; whole body skins for the margay cat; and finally, teeth and whole body skins for the jaguar.

China emerges as the second destination country, where a total of 23 seizures were reported exclusively for the trafficking of jaguar specimens (Figure 5). In addition, it is important to note that these 23 cases were all reported in Bolivia as the country of origin, mainly using the courier and parcel service ECOBOL to transport jaguar teeth.

Finally, the incidents with international destinations to New Zealand and Spain both record the transportation of jaguar specimens. In the case of Spain, the intended export was a whole body skin and skull of a jaguar using courier services, which was detected in Germany. In the case of New Zealand, jaguar teeth were recorded as specimens.

## Main Demands and Specimens

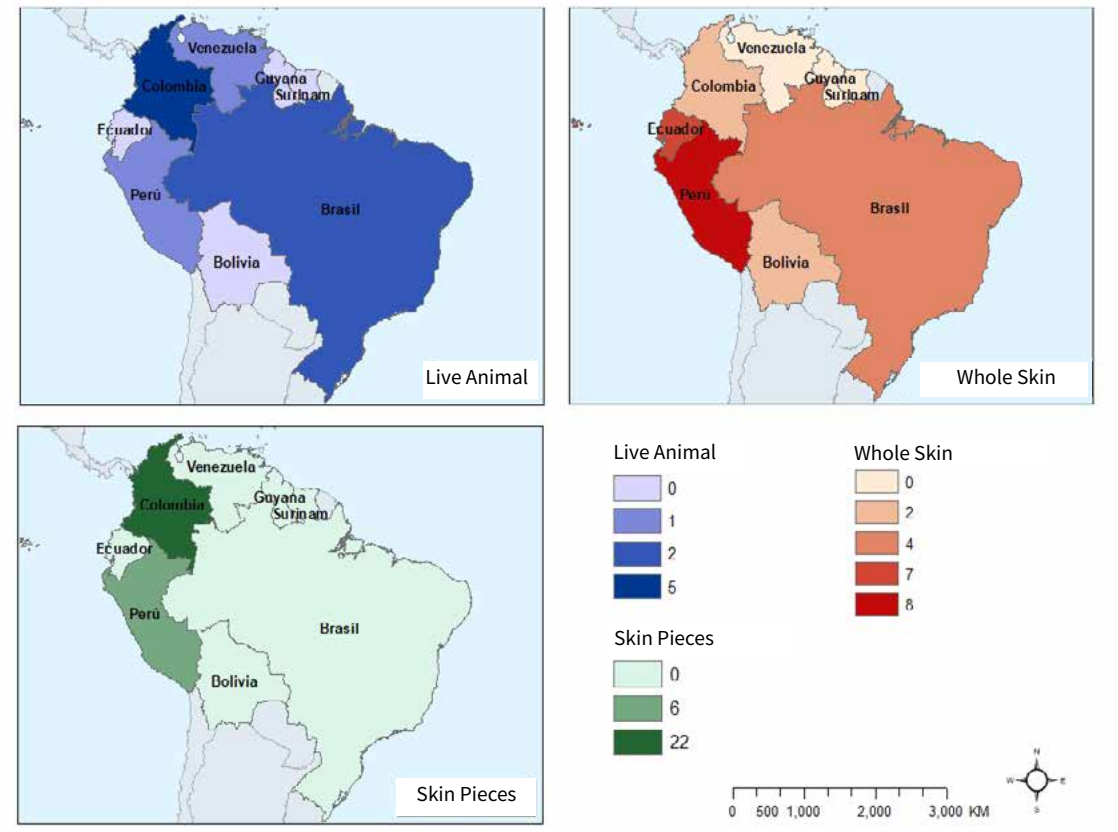
The identification and analysis of the main demands according to specimens in each country of origin in the Amazon Region was carried out for each of the five species in this report. Since the incidents collected to generate the results of this report were mostly classified as confiscations and illegal poaching by the sources of extraction, we proceed to consider them as illegal acts, unless otherwise specified. In this context, the following preliminary findings are presented.

In the case of the ocelot, the three most trafficked specimens were identified and are presented: live animal, whole body skin, and skin pieces (Map 8).

It is recorded that there is a high demand for types of ocelot products related to skins, since two of the main specimens are whole ocelot skins as well as pieces of the same (Map 8). A third specimen corresponds to a live animal. The majority of incidents that record confiscations of live ocelots, correspond to cubs and juveniles. Although ocelots are highly demanded for their skins, another threat in the trafficking of this species is the demand for ocelots as pets [21]. The data shows that of the total number of live ocelots registered in the incidents, four were cubs or juveniles, which indicate the possibility that the objective of their capture was for the illegal pet trade.

A second analysis could point to the main interest in capturing ocelots for their skins, given that the demand for their skin is much higher than for live young ones. In this context, the capture of cub/juvenile ocelots could be linked to a main objective, which is the capture of ocelots for their skins, and an extra profit and opportunity to hunt female ocelots with their offspring.

## Map 8.
## Illegal Trafficking by Specimens - Ocelot (*Leopardus pardalis*) | 2009 - 2020

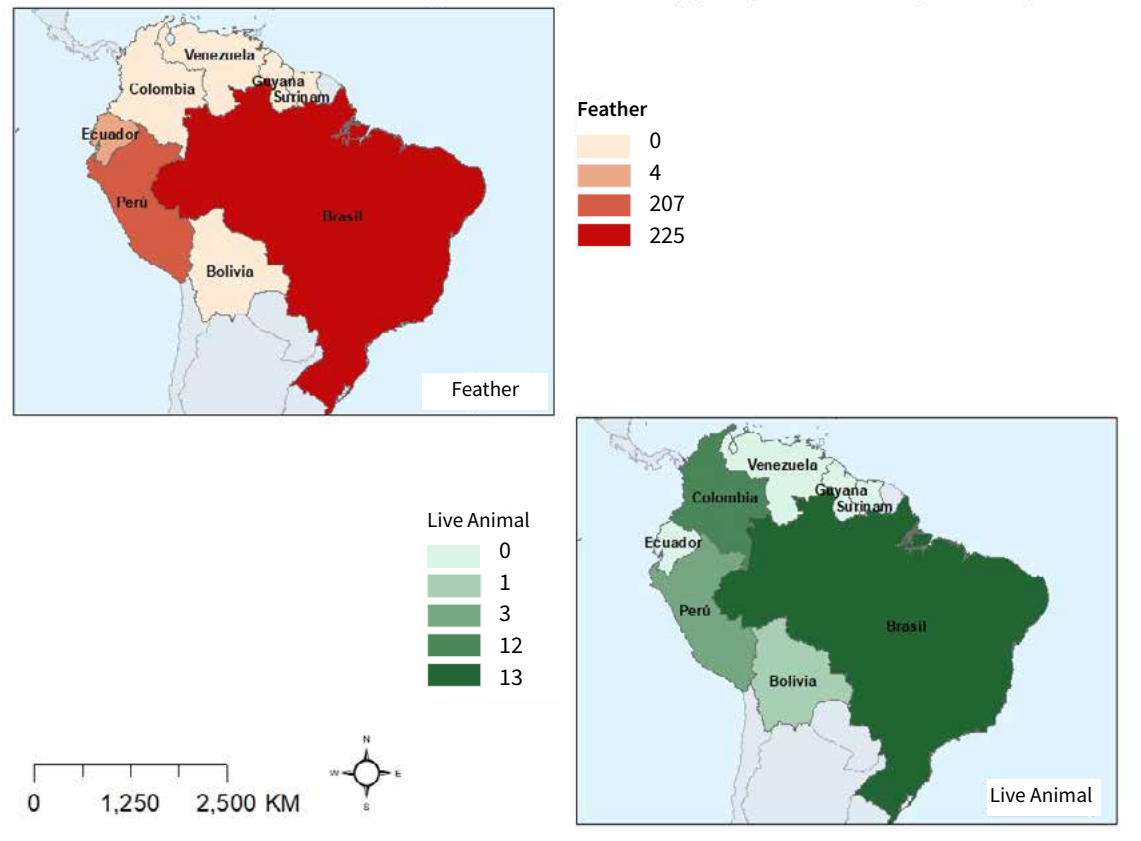



Prepared by: Gohar Petrossian
Source: IGIS Map

Photo: ©iStock

*Ocelot (Leopardus pardalis)*

**Map 9.**
**Illegal Trafficking by Specimens - Scarlet Macaw (*Ara macao*) | 2009 - 2020**




Prepared by: Gohar Petrossian
Source: IGIS Map

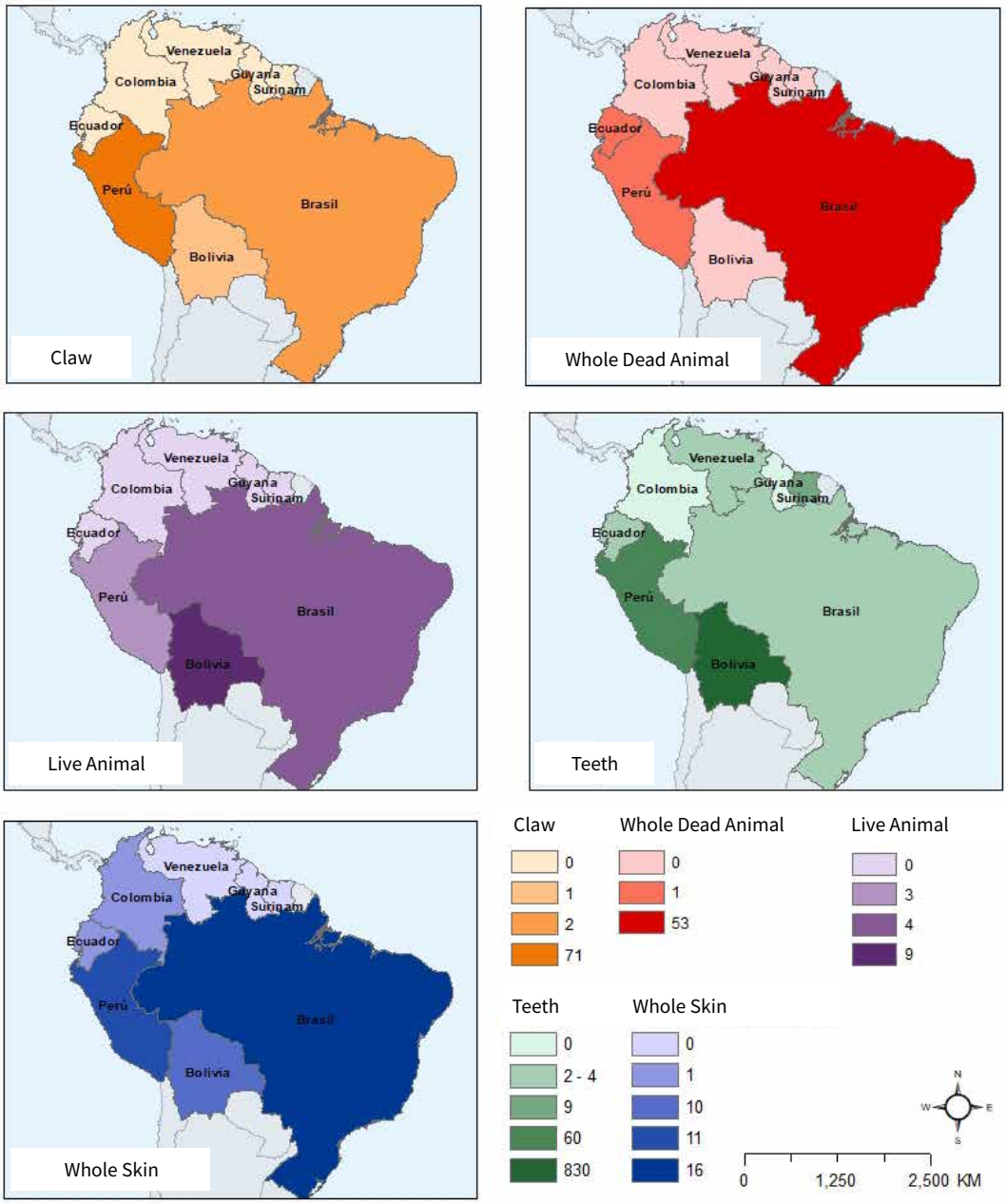
In the case of the scarlet macaw, two main types of specimens were identified, feathers and live birds. Macaws have brightly colored feathers, which are used as decoration for different objects as it was identified in one incident. Brazil and Peru are the countries that report the highest amount of feather trafficking of this bird. Ecuador is in third place with four trafficked feathers (Map 9).

A second specimen is the trafficking of live macaws, as they are highly demanded as exotic pets [54]. Brazil reports the highest quantity with 13 live macaws trafficked, followed by Colombia with 12 live birds. Finally, Peru and Bolivia report smaller numbers of live macaws trafficked.

However, it can be observed that the quantities of feathers vary considerably with the quantities of live macaws, leading to a possible conclusion that the scarlet macaws are trafficked more for their feathers than as live individuals. In this context, it is important to note that confiscations of feathers of this species were mostly carried out in control centers in the United States reporting 44 seizures with quantities ranging from one to 108 feathers. Further investigation is required to identify if these incidents were attempts

of international trafficking, or rather cases of lack of knowledge, considering that it is completely forbidden to enter the United States with this specimen, even if they are implemented in decorative objects [63], and given that the average quantity is 10 feathers per incident in the previously mentioned

**Map 10.**
**Illegal Trafficking by Specimens - Jaguar (*Panthera onca*) | 2009 - 2020**




Prepared by: Gohar Petrossian
Source: IGIS Map

country. Nonetheless, the demand for feathers indirectly reflects the poaching of the scarlet macaw.

In the case of the jaguar, this species recorded the highest number and variety of confiscated specimens (Map 10). The use of the different jaguar parts and live jaguars at the national level has been recorded since pre-Columbian times in the Americas [64]. However, today this demand often leads to poaching, use and illegal trade of this feline for cultural, medicinal, subsistence and commercial purposes, and even in some instances, as self-defense [65]. The results of the main jaguar specimens trafficked within the countries of the Amazon Region are presented below.

When looking at the different types of products, jaguar teeth are considerably in first place as the most requested specimen in all countries in the Amazon Region, with the exception of Colombia and Guyana. In addition, it is important to mention that Bolivia and Peru are positioned as the main countries for jaguar teeth trafficking with 830 and 60 confiscated units, respectively. Furthermore, in comparison with the other specimens, jaguar teeth were trafficked in a greater number of countries (Map 10).

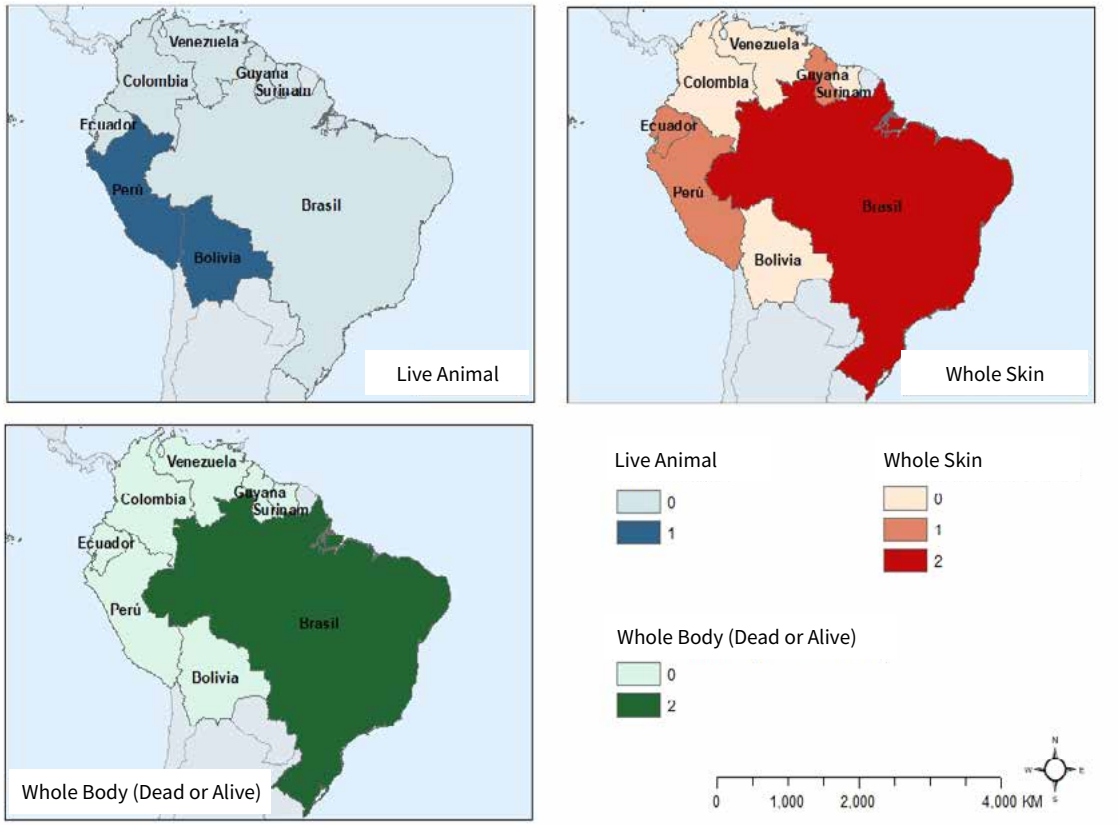
Jaguar claws were another main type of product in demand, with greater activity in the southern countries, Bolivia, Brazil and Peru, with the latter registering a differentiated number of 71 claws trafficked compared to the other Amazonian countries (Map 10).

Whole dead jaguars were detected as specimens in Brazil, recording the poaching of 53 individuals. In Peru and Ecuador, one was recorded in each country. In the confiscations registered in Brazil, there were two incidents where 19 and 28 dead jaguars were found, as well as firearm weapons (Map 10). The offenders conducted jaguar safaris with foreign clients. Additionally, in one of these incidents, a culprit was arrested for the second time for having committed the same illegal hunting act previously.

Whole body jaguar skins are another specimen in high demand, mainly in Brazil with 16 trafficked skins, Peru with 11, Bolivia with 10 and finally Ecuador and Colombia with one trafficked skin each (Map 10).

Finally, live jaguars, particularly cubs, are classified as another main type of specimen. Bolivia reports the highest number with nine live jaguars, followed by Brazil with four and Peru with three jaguars (Map 10). Usually, when found in their burrows or after hunting the mother, jaguar cubs are kept or illegally traded as pets, or sold for private wildlife collections [65].

**Map 11.**
**Illegal Trafficking by Specimens - Margay Cat (*Leopardus wiedii*) | 2009 - 2020**




Prepared by: Gohar Petrossian
Source: IGIS Map

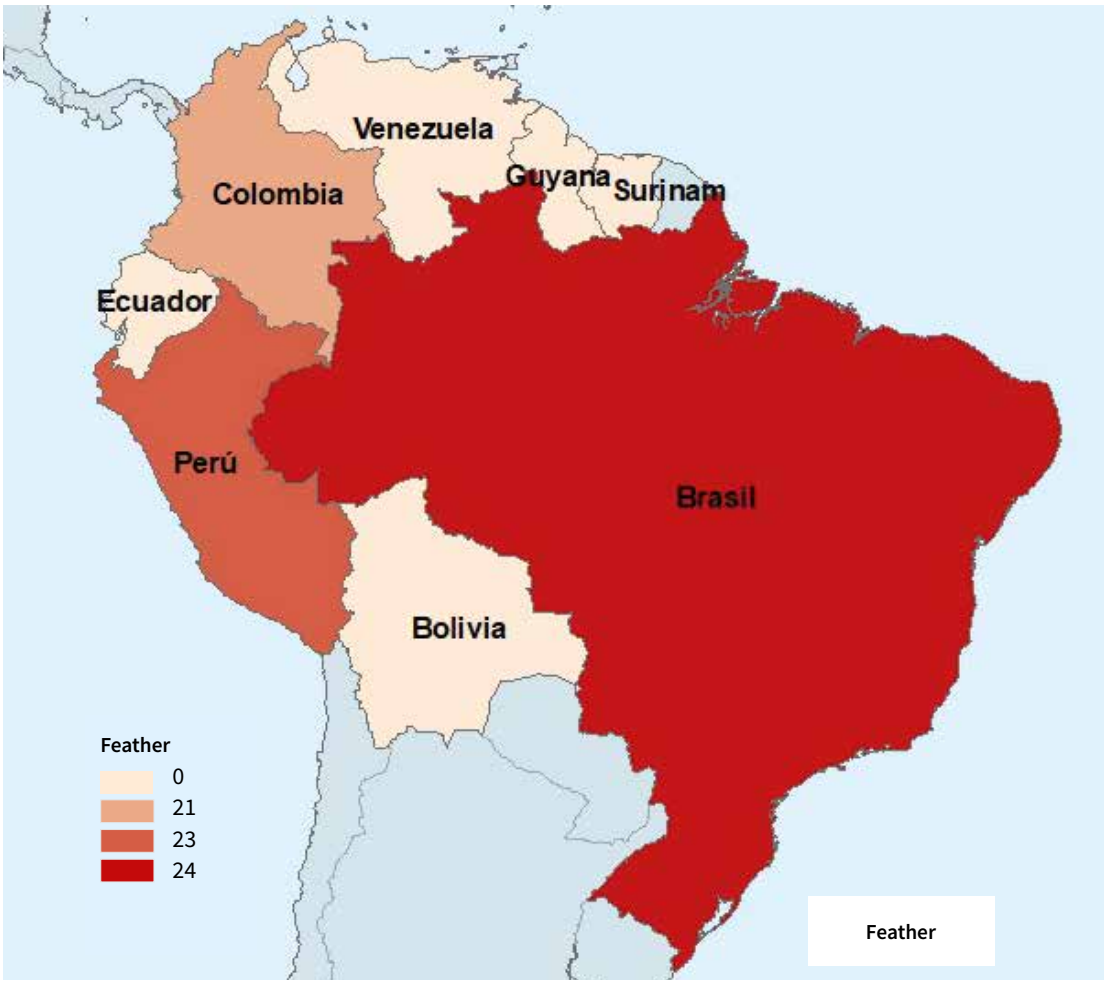
The main types of specimens identified for the margay cat were whole body skin, live animal and the identification of individuals without specifying whether they were alive or dead (whole body (dead or alive)) (Map 11). There is a higher demand for margay cat skins than other types of products, reflected in quantity in units and number of countries involved, Brazil with two units, and Peru, Ecuador and Guyana with one (Map 11). For the specimens, live animal and whole body (dead or alive), few cases are reported however, considering that this feline is small in size, weighing between 2.3 - 4.9 kg, the margay cat is in demand as a pet [43], which could reflect that both types of products involving live margay cats have been captured with the objective of being sold as pets.

Finally, the harpy eagle records feathers as the primary specimen trafficked. However, two talons, a skull and a leg of this bird of prey were also confiscated. Unlike the scarlet macaw, which has brightly colored feathers, the harpy

eagle has gray and white feathers. Nonetheless, the harpy eagle is one of the largest eagles in the world and is classified as the most imposing bird on the planet [30]. These characteristics make the harpy eagle an attractive species to illegally trade, as well as for bushmeat and even as a reason to see them up close out of curiosity, are the main motivators for hunting these birds [31].

Finally, it can be seen that Brazil is the country with the highest demand with 24 feathers, Colombia in second place with 21 units and finally Peru with 12 feathers (Map 12). However, further research is required on the illegal trade of the harpy eagle and its specimens.

**Map 12.**
**Illegal Trafficking by Specimen – Harpy Eagle (*Harpia harpyja*) | 2009 - 2020**



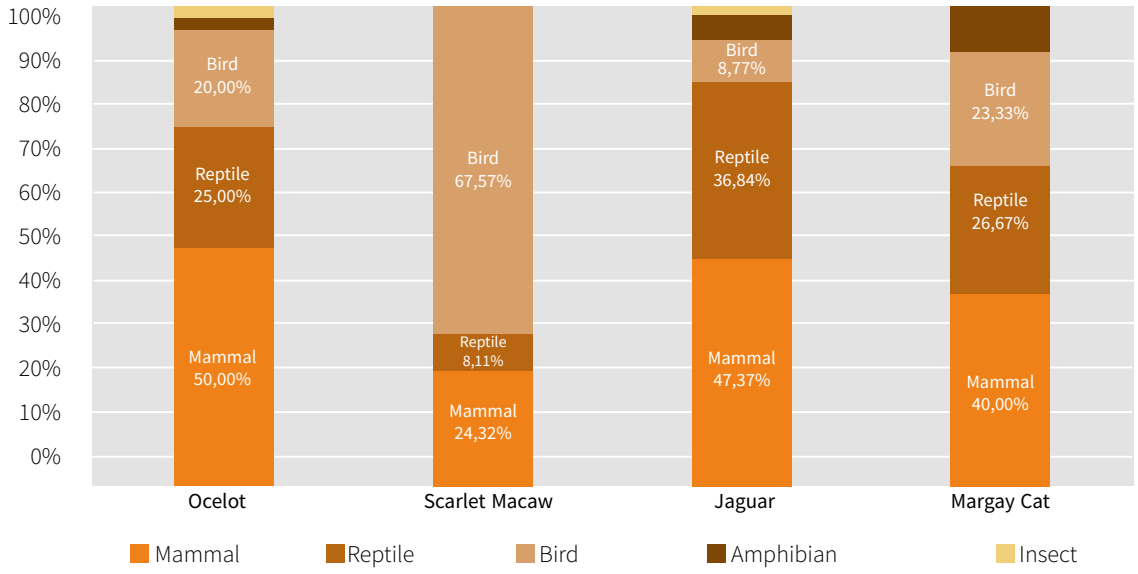

Prepared by: Gohar Petrossian
Source: IGIS Map

## Other Illegally Trafficked Species

In a variety of seizures, other illegally trafficked species along with the ones selected for this report were recorded, with the exception of the harpy eagle, which does not record this data. The format in which other species involved in the incidents were presented, had a variety of taxonomic levels, therefore this information was systematized to five categories according to the taxonomic level class: mammal, bird, reptile, amphibian and insect (Figure 6). Although there is a possibility that the capture/poaching of other species took place on a different occasion than those of the selected five, an analysis is carried out considering that all the species (selected and secondary) registered in an incident, were captured in a single hunting trip.

**Figure 6.**

**Percentage of Other Species Involved by Incident | 2009 - 2020**



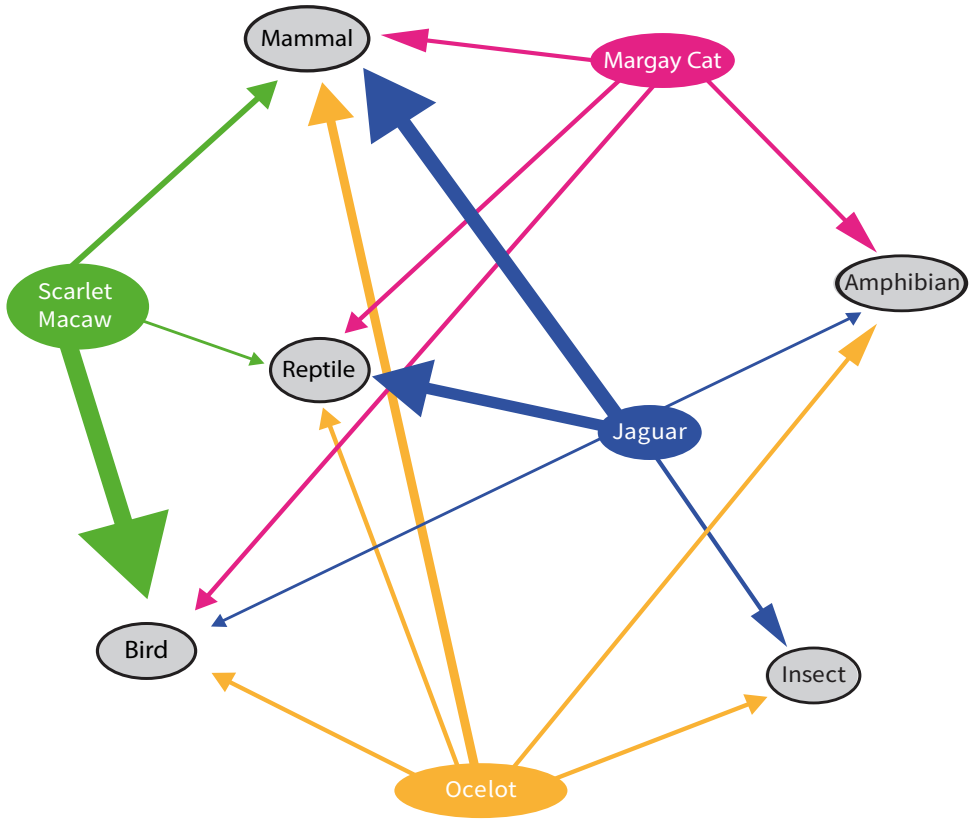

Prepared by: Natalia Méndez Ruiz-Tagle

In the case of felines, a similarity can be observed between them, where these poached felines are reported along with a high percentage of other mammals also captured, followed by hunted reptiles in smaller proportions and, to a lesser extent, birds (Figure 7). However, the ocelot and jaguar are the only ones to additionally register a connection with other species trafficked with them, specifically amphibians and insects. One of the main reasons

for this similarity may be related to the ease with which other mammals and reptiles can be sighted when tracking a feline as opposed to birds. The ocelot and the margay cat are felids that climb trees in different circumstances [43] [21], the margay cat is even considered a felid adapted to arboreal habitats [43], which may explain the fact that both have higher percentages in birds hunted along with them compared to the jaguar, and in that context, the margay cat has a higher percentage than the ocelot. Another possibility could be related to the use of traps, bait or hunting dogs [65] to capture these felines, increasing the probability of accidental captures of secondary species such as other mammals and reptiles.

The scarlet macaw records in its seizures with other species also captured, with predominance, the trafficking of other birds (Figure 7). In lesser proportions, mammals and reptiles are recorded. Again, a possible relationship of greater ease of sighting other birds when hunters are looking for scarlet macaws, and/or accidental hunting of other bird species, could be taking place.

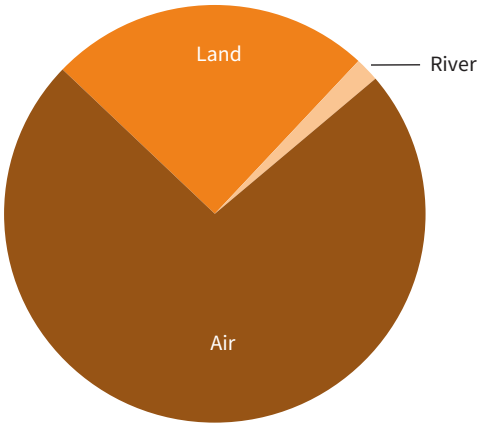
**Figure 7.**
**Network Graph of the Five Species and Other Species Involved | 2009 - 2020**




Prepared by: Bryce Barthuly

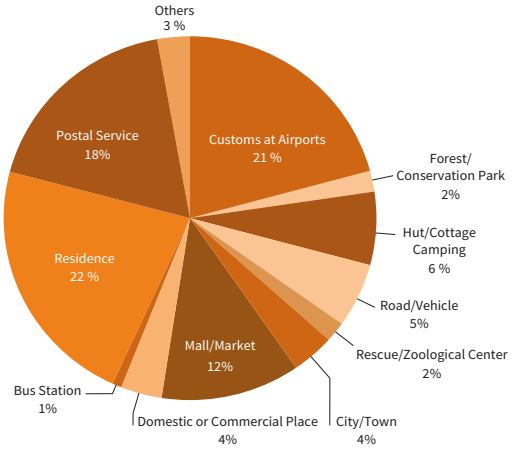
## *Modus Operandi*

**Figure 8.**
**Transport Methods for the Illegal Trafficking of the Five Species | 2009 - 2020**




Prepared by: Monique Sosnowski

**Figure 9.**
**Locations where the Species was Detected/Found | 2009 - 2020**




Prepared by: Monique Sosnowski

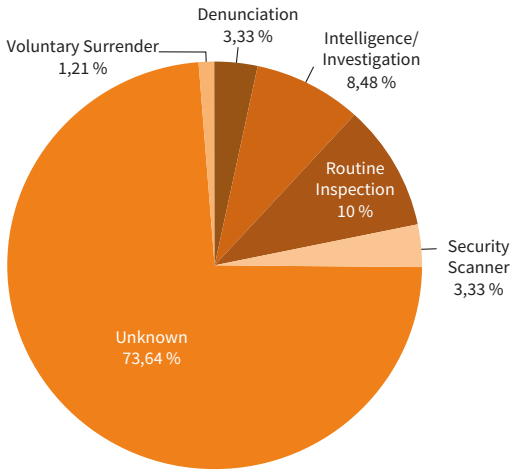
The methods of transport detected in the seizures of the five species were aerial, terrestrial and fluvial (Figure 8). It was identified that the most frequently used method of transport in the trafficking of the five species was aerial, and it was even observed that one of the places where the species analyzed were detected most often was at airport customs and postal services (Figure 9), the vast majority of which transport their parcels using airplanes.

A second method of transport used for species trafficking is by land. Unlike air transport (used in all but one case of international traffic), the method of transport by land is internal and used more at the national level, since in no case an international border crossing by land was detected. In addition, these were carried out using commercial transport such as buses and also private vehicles, the latter in the majority of cases.

A third method of transport by river was detected. Although there is not much information on this incident, it is known that it occurred in the community of Chiru Isla, Parroquia Cap. Augusto Rivadeneira, Aguarico, Orellana, Ecuador. This place does not have roads in its vicinity but does have a variety of rivers that not only connect the community with the nearest road, but also connects Chiru Isla with two conservation areas, the Cuyabeno Fauna Production Reserve and the Yasuni National Park. In that sense, this may be

**Figure 10.**

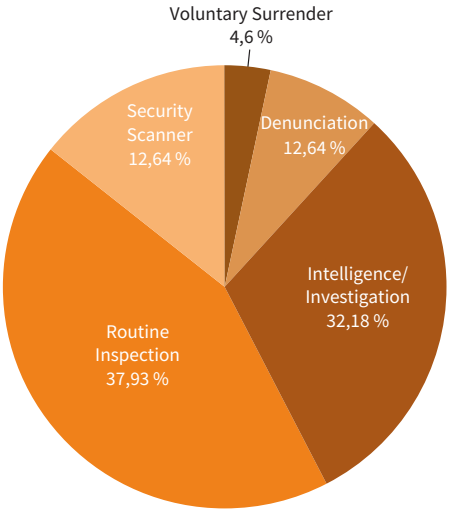
**Detection Methods by Incidents | 2009 – 2021**




Prepared by: Monique Sosnowski

**Figure 11.**

**Detection Methods by Incidents without Unknown | 2009 – 2021**




Prepared by: Monique Sosnowski

a one-off case, but it could also reflect a common *modus operandi*, occurring in rural areas with close proximity to national parks or nature reserves, where local hunters extract the species from its habitat, to then be transported to places such as residences, cabins, cottages or campsites [65]. Then, once the opportunity arises, the species or specimen is moved to closer urbanized areas for possible sale in local markets.

There is a considerable percentage where the detection method used to discover cases of illegal trafficking of the five species is unknown (Figure 10), because most of the incidents did not register this information. However, of those that do have this information, it can be observed that five different detection methods predominate. The Routine Inspection and Intelligence/ Investigation methods are the most commonly used by regulatory agencies. Then, in smaller proportions, methods such as Security Scanner, Denunciation and Voluntary Surrender are applied (Figure 11).

Routine inspection is the most frequently used detection method, the same that can be carried out in different contexts, whether on a busy highway, at border points, or even at airports. One possible reason could be linked to the fact that most of the traffic seizures were intended to be transported by air (Figure 8), where routine inspections are often carried out.

In second place the Intelligence/ Investigation method is identified. In several of these seizures where an

investigation was previously carried out, it was observed that these illegal acts were registered and published on social media, which allowed obtaining information to locate the offenders and proceed with the respective confiscations.

The Security Scanner detection method was mostly registered and used in postal and parcel delivery services, mainly in Bolivia. Finally, the methods Denunciation and Voluntary Surrender were also used, where it is important to note that for the latter, the species were delivered to zoos or abandoned at the doors of veterinary centers.

In addition, the *modus operandi* of the trafficking of the five species was analyzed using the Crime Scripting methodology. It is a methodology used in the area of criminology and which has already been used in wildlife trafficking [66]. The crime is divided into nine stages to identify and record in detail all aspects of a criminal act, which also serves as a tool to prevent crimes (see Annex Methodology).

**Table 4.**
**Crime Scripting of the Five Species | 2009 - 2020**

| | Scarlet Macaw | Ocelot | Margay Cat | Jaguar | Harpy Eagle |
|---|---|---|---|---|---|
| *1. Preparation* | | | | - Dogs bred for hunting<br>- Sell illegal hunting safaris | |
| *2. Entry* | | | | - Information/photos shared regularly in social platforms (i.e., Facebook | |
| *3. Precondition* | - Deforestation | - One case involved possession of firearms | - One case involved possession of firearms | - Chinese demand<br>- Ten cases involved possession of firearms | - Deforestation |
| *4. Instrumental precondition* | | | | | |
| *5. Instrumental initiation* | | | | | |
| *6. Instrumental actualization* | | - Hunted due to human-wildlife conflict (chickens) | | - Hunted due to human-wildlife conflict (livestock) (dogs, chickens) | |
| *7. Doing* | -Killed with a slingshot | - Fell into a trap | | - Killed with firearms<br>- Killed using dogs | |
| *8. Post condition* | - Wings cut<br>- Transported in suitcases, backpacks, buckets; anesthetized to not make noise | - Transported in a box/luggage using public transport (bus) | - Boarding a plane with skins | - Fangs being trafficked via airport<br>- Skins found in a box at a bus station | |

| | | | | | |
|---|---|---|---|---|---|
| ***9. Exit*** | - Used for tourist selfies<br>- Kept as pets<br>- Feathers used for art<br>- Taken to residence | - In a bazaar<br>- Illegal pet shop<br>- Taken to residence<br>- To be sold to a zoo<br>- Sold for its skin<br>- Abandoned at veterinary clinic | - Taken to market<br>- Held in personal captivity | - Selling for meat<br>- Teeth sold in a chicken market<br>- Internet sale<br>- Parts sold for medicine and shamanism<br>- Handicraft shopping center<br>- Kept as pet<br>- Parts sold in market<br>- Head kept in freezer<br>- Parts displayed in home as decor | |
| *Notes* | *- Incidents involved up to 4 individuals*<br>*- Most kept live* | *- Combo of primarily skins and live animals*<br>*- One case involved firearms possession* | *- Policemen involved in two cases of trafficking/ poaching*<br>*- One case involved firearms possession* | *- Ten cases involved firearms possession*<br>*- Gold also confiscated*<br>*- Cannabis plants also confiscated*<br>*- Information/photos often shared via social media (i.e., Facebook)* | |

Prepared by: Monique Sosnowski

It can be observed that poaching of both birds arises from a precondition, which is deforestation (Table 4). In the case of the macaw, a slingshot was identified as a weapon for hunting, followed by its transportation in different storage objects, where in some cases, the feathers of its wings are mutilated to prevent its escape. If these birds are still alive, they are kept as pets in residences or exploited in the tourism industry. If the macaw is dead, then its feathers are used as decoration. Finally, it was identified that in the confiscations there was possession of up to four macaws, which were retained alive after capture.

Within the *modus operandi* of jaguar trafficking, the presence of hunting dogs was identified on different occasions, as well as the presentation and exposure of data prior to a future hunt or jaguar trafficking on social media (Table 4).

Additionally, a similarity in the *modus operandi* was recorded for the three feline species, which consisted of firearms possession, however, the data points to a greater amount of firearm possession in jaguar trafficking incidents (Table 4). In jaguar trafficking, a distinctive interest by citizens of Chinese origin was discovered, which coincides with other reports and investigations that were carried out highlighting this case [67] [2]. In some incidents, ocelots and jaguars were recorded to be involved in human-wildlife conflicts, specifically, due to predation of livestock.

The methodologies employed to capture ocelots and jaguars are different for both. For the ocelot traps are used, while for the jaguar, hunting dogs and firearms were identified as instruments (Table 4).

Now, once the jaguar is retained, two post-crime stages are analyzed next, which consist of the decisions that will be made for the disposal, in this case, of jaguars and/or specimens (Table 4). Jaguar teeth are trafficked using air

transport, while other parts such as skins are trafficked by land. The reason may be related to size and difficulty in evading customs controls, since a whole jaguar skin takes up a lot of space in a suitcase compared to a tooth. Another stage in the disposal of jaguars and/or their parts consists of selling them on the internet or in markets, usually where farm animals (e.g. poultry) or handicraft markets are sold. Additionally, in the event that they are not sold in markets, they can also be kept as pets, or their parts can be used as decoration in homes.

Once an ocelot is hunted, it was analyzed and identified that its transportation is by land, usually using public transportation such as buses (Table 4). The reason for this may be because ocelots are trafficked as whole skins or as live animals, making the trafficking of live ocelots or whole skins by air less accessible due to the higher probabilities of detection. Finally, as a last stage of disposal, ocelots are kept in captivity in residences, or sold in bazaars, illegal pet markets, or even in zoos. In some cases, ocelots were abandoned in veterinary centers, which suggests a possible repentance on the part of the offender, or a complication or difficulty in keeping them in captivity, as some seizures reported abandoned ocelots in poor conditions.

In the case of the margay cat, the *modus operandi* is different (Table 4). Once captured, this feline is kept alive or killed and its skin is extracted. In Brazil, there have been cases where whole skins of margay cats were transported by air. The reasons may be related to its small size, which facilitates its storage to hide it in luggage suitcases. Finally, as a last stage in this mode of trafficking, the margay cat is taken to markets for sale or held in captivity. It is important to mention that poaching and trafficking of margay cats was linked to current and former police officers, specifically from the Brazilian police.

## Drivers of the Illegal Wildlife Trade

The drivers of illegal wildlife trade are usually related to regulatory and socioeconomic issues. In this report, the application of the legal framework to these illegal acts and the socioeconomic factor are analyzed in general terms.

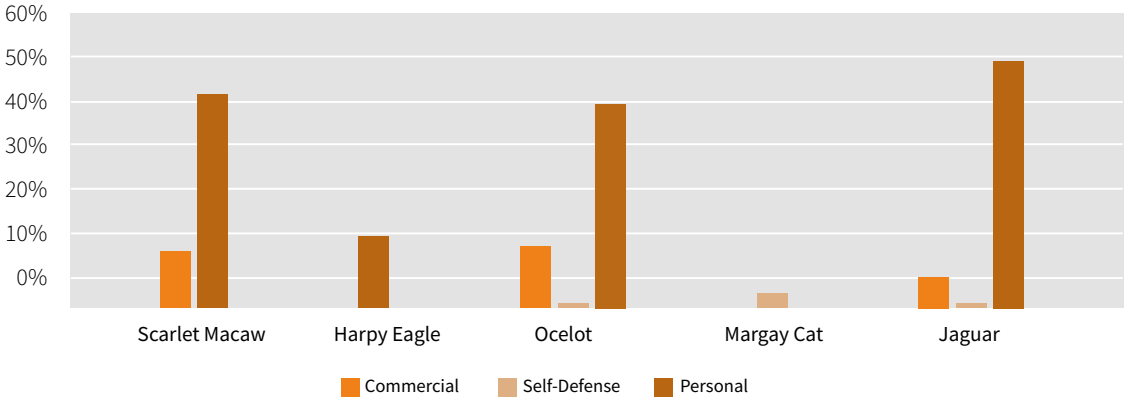
The five species studied are under CITES Appendix I, which implies that any import/export for commercial purposes is prohibited at the international level. Whilst the jaguar is a feline that is protected in all ACTO MCs under national regulations, where its hunting and capture is prohibited [57], according to the data in this report, it is the most trafficked species. On the other hand, of the eight Amazonian countries, legal exports of wild birds are limited to three: Guyana, Suriname and Peru, however, only an annual quota of trade in non-threatened species is allowed in these countries [68]. Currently, the most significant direct pressure on many wild birds comes from the capture of wild birds for illegal trade. Apart from Guyana, Suriname and Peru, which accept wild bird markets at the national level, the other Amazonian countries maintain efforts to control these markets, which arise mostly from the necessities of a low-income population [68]. Although different Amazonian countries elaborate mechanisms at the governmental level to identify and discuss common problems related to illegal transboundary wildlife trade, seeking solutions and incorporating technical, operative and access to information support from international organizations (such as for example the International Criminal Police Organization – INTERPOL) [68], meticulous and coherent laws, as well as rigorous enforcement are still required.

**Table 5.**
**Fines and Sanctions of the Five Species | 2009 – 2020**

| | N. | Minimum | Maximum | Average | Standard Deviation |
|---|---|---|---|---|---|
| Number of People Sanctioned | 35 | 1 | 8 | 1.49 | 1.29 |
| Number of People Fined | 12 | 1 | 3 | 1.24 | 0.62 |
| Total Fines (USD) | 14 | 909.00 | 180,274.00 | 17,737.49 | 47,285.39 |
| Estimated Value (USD) | 40 | 1 | 900.00 | 177.70 | 259.37 |
| Quantity | 331 | 1 | 185 | 6.10 | 17.46 |

Prepared by: Monique Sosnowski

**Figure 12.**
**Reason for Committing Illegal Act of Trafficking | 2009 - 2020**




Prepared by: Monique Sosnowski

In the database of trafficking incidents, up to eight people were sanctioned and up to three people were fined in a single incident. The fines, presented in United States dollars (USD), ranged from USD 909.00 to USD 180,274.00 per incident (Table 5). In addition, the average number of specimens per incident was six, and the estimated value of these specimens averaged up to USD 900.00. Likewise, it was recorded that the reasons why the offender committed an illegal traffic act were mainly for personal reasons, followed by commercial purposes and finally, to a lesser extent, as an act of self-defense. In this sense, despite the fact that most of this information (reason for committing an illegal act) comes from the CITES and USFWS-LEMIS databases, more research is required on the possible causes for which a large number of the offenders declared personal rather than commercial purposes in the incidents.

The estimated values of fines per species were analyzed in the SPSS statistical program. It is necessary to emphasize that these values per species are fines per incident, which in some cases may consider fines for other species involved, as well as fines for one or more persons sanctioned in the seizure.

There are many incidents which do not report fines issued. This may mean: (1) a lack of enforcement and application of fines by the responsible authority at the time of detection of the illegal act; or (2), the lack of coordination when different entities are involved in the different collection of data from a confiscation, for example, those that report and confiscate and others that penalize. The average fine for the scarlet macaw trafficking is USD 7,968.74, and USD 909.00 for the harpy eagle. Regarding felines, the values vary between USD 1,325.00, USD 2,245.00 and USD 61,939.67 for the margay cat, ocelot and jaguar, respectively (Table 6).

**Table 6.**

**Estimated Fines in USD per Incident for the Five Species | 2009 - 2020**

| | N. | Missing | Average (USD) | Median (USD) | Minimum (USD) | Maximum (USD) |
|---|---|---|---|---|---|---|
| Scarlet Macaw | 7 | 74 | 7,968.74 | 2,728.00 | 909.00 | 22,000.00 |
| Harpy Eagle | 1 | 16 | 909.00 | 909.00 | 909.00 | 909.00 |
| Ocelot | 2 | 87 | 2,245.00 | 2,245.00 | 2,182.00 | 2,308.00 |
| Margay Cat | 1 | 11 | 1,325.60 | 1,325.60 | 1,325.60 | 1,325.60 |
| Jaguar | 3 | 151 | 61,939.67 | 4,636.00 | 909.00 | 180,274.00 |

Elaboración: Monique Sosnowski

Whilst analyzing the minimum and maximum values of fines, without considering the values for the harpy eagle and the margay cat, since these have just one record per species, and in the case of the ocelot two incidents with fines are identified, one with a minimum value of USD 2,182.00 and another with a maximum value of USD 2,308.00, there is a great variation between values for the jaguar and the scarlet macaw (Table 6). In the case of the jaguar, a minimum value of USD 909.00 and a maximum value of USD 180,274.00 were recorded. The incident that registers this approximate value of USD 180,000 was a case where a mother jaguar and her cub were hunted, both jaguars were chased by hunting dogs to the point of exhaustion and collapsing, later the mother and cub were killed and one of them decapitated. On the other hand, the incident with the minimum value (USD 909.00), was a confiscation of a jaguar head and a wild bird (*Amazona aestiva*). Both incidents occurred within a couple of years apart in Brazil.

In the case of the scarlet macaw, the maximum value of USD 22,000.00 is for an incident where a person had a macaw and two species of birds in captivity. Nonetheless, there is an incident where a fine of USD 6060.00 was imposed for having in captivity two scarlet macaws and 21 additional live wildlife species including reptiles, birds and even primates. In the case of this parrot, the seven confiscations with fines occurred in Brazil (Table 6).

All the incidents (14) which had data on fines (Table 5), occurred in Brazil. It is important to highlight that this data does not necessarily mean that Brazil is the country where the most trafficking occurs, but perhaps, it may be a possible reflection of information system deficiencies or lack of penalization from the other countries. In addition, the reasons why these 14 incidents show a large difference in values may be due to different factors such as for example, the quantity of animals, the mistreatment given to the animal, the record history of the offender or the criteria considered by the authority imposing the penalty [69].

Although fines exist and are issued, they are almost never paid, and even numerous wildlife traffickers have been arrested several times for the same crime and are still at liberty [70].

Among these drivers that lead to the illegal wildlife trade is the socioeconomic factor, and as previously mentioned, the people motivated to carry out this type of crime are those from a sector with a low economic income. For this reason, an analysis was made of the monetary values by type of product for each of the five species (Table 8) (Table 7). Additionally, most of these estimated values in United States dollar (USD) come from data provided by USFWS-LEMIS.

Although data on values by type of product were analyzed for each of the five species trafficked, no data is recorded for the margay cat (Table 8).

In the case of the birds, values were obtained specifically for feathers, where a value of USD 5.94 per feather of the scarlet macaw was recorded. For the feather of the harpy eagle, a value of USD 250.00 was obtained, but this is reflected in a single incident. Additional data is required for this analysis as only eight values were used for the scarlet macaw and one for the harpy eagle (Table 8).

In the case of the ocelot, which is more in demand for its skin and as a live animal, it can be observed that the value of a live ocelot is USD 413.50, while a whole ocelot skin has an average value of USD 335.90 (Table 8).

A jaguar skin is worth USD 370.00, a skull USD 100.00 and USD 43.00 for a tooth. Considering only the four fangs of a jaguar plus the skin and skull, an average minimum total profit of USD 642.00 can be obtained without considering other parts also in demand such as claws, fat and even bones [71] [12] [65]. Considering that the minimum wages in Amazonian

**Table 7.**
**Product Type Codes* and Definitions**

| Code | Definition |
|---|---|
| BOD | Whole Dead Animal |
| CLA | Claw |
| FEA | Feather |
| FOO | Paw |
| JWL | Jewelry |
| LIV | Live Animal |
| LPS | Small Leather Product |
| SHO | Shoe |
| SKI | Whole Body Skin |
| SKO | Leather Items |
| SKP | Pieces of Skin |
| SKU | Skull |
| TEE | Tooth |
| WAT | Wallet |

* CITES and USFWS-LEMIS Coding

Prepared by: Natalia Méndez Ruiz-Tagle

countries vary between USD 1.00 and USD 394.00 for the year 2021 [72], that the people involved in the trafficking of species, in most cases, do not make a minimum wage worth of income [10] and additionally, the values of illegally traded specimens, it can be possibly inferred that a fundamental reason for illegal trafficking is the low economic income of traffickers.

**Table 8.**

**Estimated Values in USD by Type of Species Product | 2009 - 2020**

| | N. | Missing | Average (USD) | Median (USD) | Minimum (USD) | Maximum (USD) |
|---|---|---|---|---|---|---|
| **Scarlet Macaw** | | | | | | |
| FEA | 9 | 41 | 5.94 | 2.50 | 1.00 | 30.00 |
| JWL | 1 | 1 | 1.25 | 1.25 | 1.25 | 1.25 |
| **Harpy Eagle** | | | | | | |
| FEA | 1 | 11 | 250.00 | 250.00 | 250.00 | 250.00 |
| **Ocelot** | | | | | | |
| FOO | 1 | 1 | 50.00 | 50.00 | 50.00 | 50.00 |
| LIV | 2 | 6 | 413.50 | 413.50 | 43 | 784 |
| LPS | 1 | 3 | 100 | 100 | 100 | 100 |
| SKI | 5 | 23 | 335.90 | 158.00 | 21.50 | 700 |
| SKO | 1 | 0 | 100.00 | 100.00 | 100.00 | 100.00 |
| SKP | 2 | 6 | 3.82 | 3.82 | 0.50 | 7.15 |
| WAT | 1 | 0 | 51.50 | 51.50 | 51.50 | 51.50 |
| **Jaguar** | | | | | | |
| BOD | 1 | 11 | 14.11 | 14.11 | 14.11 | 14.11 |
| CLA | 1 | 6 | 50.00 | 50.00 | 50.00 | 50.00 |
| LIV | 1 | 18 | 800.00 | 800.00 | 800.00 | 800.00 |
| SHO | 1 | 0 | 250.00 | 250.00 | 250.00 | 250.00 |
| SKI | 5 | 23 | 370.00 | 300.00 | 50.00 | 900.00 |
| SKU | 1 | 6 | 100.00 | 100.00 | 100.00 | 100.00 |
| TEE | 5 | 51 | 43.00 | 50.00 | 5.00 | 100.00 |

Prepared by: Monique Sosnowski

# Potential Environmental and Social Impacts due to Illegal Wildlife Trade

The most commonly cited environmental impact directly attributed to illegal wildlife trafficking is the decline in populations of those species in demand for illegal trade. Indirect impacts can include the spread of diseases and invasive species. All these impacts generate a chain of ecological effects, which not only lead to the loss of species, but also, in the absence of species-habitat relationships, result in the deterioration of ecosystems. Thus, degraded ecosystems lose their functions and services, leading to a direct impact on the well-being of communities that depend on and make use of them [73]. This report analyzes, generally and hypothetically, the possible environmental impacts that could arise by the pressure of illegal trafficking on the five species analyzed in this report, supported by scientific research on the subject.

## Potential Environmental Impacts due to the Illegal Trafficking of Species

### Population Decline

As previously mentioned, a direct cause of illegal trafficking of species is reflected in the decline of populations. Although there may be other factors responsible for the decline in populations of the five species, there is evidence that illegal trade is one of the major contributors [33] [43] [21] [25] [47].

In some cases there are fundamental preferences that make trafficker hunters look for individuals with specific characteristics. For example, in the case of felines and fur trafficking, the profit is usually higher if large adults are hunted [74], however, ocelot and margay cat cubs are also reported to be hunted, possibly for the purpose of pet trafficking. In the case of the harpy eagle, it is the adults who are usually hunted [31], and for the scarlet macaw, studies point to a preference for capturing adults as well until recent years, where a high preference and demand for harvesting and trafficking macaw eggs has been reported [68].

The life stages at which these species are removed from their natural habitats can drastically affect the species' populations and even their demographic structures, which has repercussions on survival rates [73]. As previously observed, the macaw, for example, has a low reproductive rate, reproducing once every 1-3 years and having between 1 - 3 offspring [47], therefore the removal of eggs considerably reduces the ability of macaw populations to recover, increasing the probability of extinction [75]. On the other hand, it has been seen that the trafficking of scarlet macaws between countries in the Amazon Region to supply the different breeders, affects

the classification of macaw subspecies, not only causing limitations to register their respective places of origin, but with the possibility of altering their genetic diversity [47].

## Impact on other Species

Trafficking of target animal species may have an impact on non-target species, because they could be directly or indirectly connected with the target species. An indirect connection would be, for example, considering the accidental capture of other species in traps meant for target species [76] [77]. While a direct connection would be, for instance, the poaching of other species to attract the species in demand and species found in proximity [73].

There are different methods carried out by traffickers for the poaching of big cats, one of them consists of attracting the feline in demand by using secondary species that are part of the target animal´s diet as bait. For instance, to hunt ocelots, they first hunt primates or even birds to attract this feline; for jaguars, on the other hand, peccaries are poached and dragged within the area where this predator was sighted, leaving traces of the prey through trails of blood [74].

## Loss of Ecosystem Functions

All species play a functional role within an ecosystem of which they are a part [78]. The impacts caused by species loss are not entirely clear, but can be considerable [73]. The time scales within which the effects become evident can vary substantially [79]. There is the so-called 'empty forest syndrome' which are forests systems that have become deprived of animal species [80] and where the effect of an absence of species roles in an ecosystem may be evident decades later [81]. Although it is difficult to show a direct connection between species trafficking and the loss of ecosystem functions, there is evidence of the negative impact that this illegal activity has on species populations, leading to a possible analysis of impacts on ecosystems due to a loss of functions/roles performed in habitats by trafficked species [73].

Within an ecosystem different interactions take place between species, and between species and the natural environment through their functions. One of these functions of a species is to be a food source (prey) for other species and/or the consumer (predator) of other species. These interactions maintain a population balance of the species, which is why anthropogenic interference, such as the traffic of predatory and prey species, can lead to an effect of disruption of the entire food chain, causing a 'trophic cascade'. In this context, it has to be considered that the jaguar, ocelot, margay cat and harpy eagle are all predatory species. The jaguar is considered an apex predator, which is a key component of ecosystems, as they fulfill and help maintain biodiversity and ecological processes balanced through multiple food chain pathways [82] [83]. The jaguar's diet is known for its variety, composed of approximately 85 different prey species [84], and with a preference for medium (1-15 kg) and large (> 15

kg) prey species [85], even hunting prey such as the Central American tapir (Tapirus bairdii), which can weigh up to 300 kg [86]. The harpy eagle is the aerial apex predator, as it is classified as a large bird of prey, making it an ecologically unique species due to its effects on prey populations [87] [88], and even for other species, where the presence of raptors is perceived as a potential risk of being preyed upon, which affects the distribution and behavior of prey species [89] [90] [91]. The ocelot and the margay cat, also considered predators, have smaller species in their diets, still performing an important role in maintaining the balance in populations of smaller size species [43] [21].

In tropical rainforests, most tree seeds are dispersed by animals, so the loss of these species results in colossal impacts on tree species, their diversity and composition [73]. Continuing with the idea of a chain of negative impacts, the decrease in tree density can result in an impact to an essential ecosystem service, which corresponds to carbon dioxide sequestration [92], and be a possible contributor to climate change [93]. The scarlet macaw falls into the category of being a 'gardener' species, which in scientific terms, has the role and title of seed disperser. These birds are capable of dispersing fruits at high rates (75-100% of fruits) between distant trees up to 1,200 m, where they consume the pulp and discard whole seeds, which contributes significantly to forest regeneration and connectivity between distant fragmented forest islands [94]. Additionally, macaws are not only synzoochory (transporting seeds in their beaks), but they are also endozoochory by consuming fruits with smaller seeds, transporting them and then eliminating them through their feces, which makes them even more important, since synzoochorous birds disperse large seeds, something that even large birds such as the great curassow, Andean guan (Cracidae), toucan (Ramphastidae) or even mammals such as the tapir (Tapiridae), because they are terrestrial, are unable to do [94].

### Spread of Diseases

Capturing and transporting animals increases their susceptibility to contract diseases due to the high levels of stress and precarious transportation methods they are given. Consequently, those that manage to survive and are returned to their natural environment can carry diseases that will later be transmitted to other individuals, causing population imbalances and even possible extinctions [73]. In a case of illegal trafficking in Brazil, an ocelot was found in the residence of a person who kept it in unhealthy conditions as a pet. It is believed that due to direct contact with domestic cats in the residence, the ocelot contracted notoedric mange (Notoedres cati), a highly transmissible disease, which was the first case recorded in an ocelot in the Brazilian Amazon Region [95]. Although trafficking increases the mortality risk of these commercialized species, these diseases can have a severe impact on wild populations if the species is returned to the wild without proper evaluation [73].

## Potential Social and Economic Impacts due to Species Trafficking

The possible environmental impacts that may arise from the illegal trafficking of wild animals, specifically of the species studied in this report, were listed above. However, there are also social impacts due to illegal trafficking.

One category related to the social impacts is the use of ecosystem services. The loss of species such as the scarlet macaw, which contributes to the diversity and abundance of tree species by being a seed disperser, degrades an essential ecosystem service for humans: carbon sequestration. It is estimated that due to species trafficking, the Amazon could stop capturing 313 billion kilograms of carbon, causing an economic impact of approximately 5.9 trillion and 13.7 trillion United States dollars (USD) [93].

Ecotourism in the Amazon is another social factor that can be affected by species trafficking. Although ecotourism in the Amazon Region is practiced in a small proportion due to the lack of information regarding the places where it can be implemented, this activity generates economic income for several communities in the Amazon Region. In the Tambopata province of Peru alone, ecotourism generated USD 11.6 million in 2005 [96], and in 2009 Brazil had 3 million ecotourists visiting the Amazon Region [97]. The public that chooses ecotourism has a marked preference for the privilege of sighting Amazonian species rather than for the comfort of the accommodation [96]. In this sense, the reduction of species populations due to trafficking obstructs the sighting of charismatic species in their natural habitat, as it is the particular case of the jaguar and the scarlet macaw, categorized as flagship species, directly impacting on a possible reduction in ecotourism and therefore in the economic income and job positions.

While the potential impacts of spread of diseases between animal species were previously discussed, there is also the risk of zoonotic diseases, which are transmitted from animal to human. Wildlife trafficking can have a significantly negative impact on human health, national security and economic development. The current pandemic caused by the SARS-CoV-2 virus is a possible example. It has had a negative impact on human health with the possibly zoonotic disease COVID-19 related to a pathogen found in wild bats (Chiroptera), which is believed to have been transmitted to humans through an intermediary, the pangolin (Pholidota), the most trafficked species worldwide for consumption of its meat and use of its scales sold in wet markets in China and Vietnam [71]. This pandemic has caused the death of four million people up to August 2021 [98], and may result in losses of up to USD 8.5 trillion in production over the next two years, not only wiping out the gains of the last four years, but also caused 34.3 million people to fall below the extreme poverty line by 2020 [99]. Although it is believed that the COVID-19 pandemic possibly originated in a wet market in China, these markets are known to agglomerate different species in limited

spaces, facilitating the transmission of viruses and bacteria. Such markets also exist in the Amazon Region, where a variety of species, including some of the five species in this report, are clustered together, making these spaces 'ground zero' zones for the next zoonotic disease.

Amazonian species are part of the cultural identity of traditional and modern societies in the region. Through beliefs and even mythology, these species become emblematic symbols of great importance to the population [57]. For the Arhuaco indigenous community located in Colombia, the jaguar is responsible for sustaining the sun and preventing it from touching the earth, maintaining a balance and preventing a change in climate. For other communities, the jaguar is a god that protects the earth at night, capable of transforming and mediating between different spiritual worlds [100]. In the Mojo community located in Bolivia, it is believed that each jaguar is an incarnated spirit with whom shamans have the ability to communicate [101]. However, the jaguar is also considered a threat, as some communities living in proximity of these felines, fearing for its safety, and these cultural values are transmitted to younger generations believing that the jaguar should only be kept in zoos and not in its natural habitat [102] [103], demonstrating a possible loss of values related, for example, to this feline.

# Conclusions and Recommendations

***Ara macao***
Photo: ©iStock

***Leopardus wiedii***
Photo: ©iStock

# Conclusions and Recommendations

During the data collection process in the eight Member Countries (MCs) on trafficking of Amazonian animal species, there were difficulties and limitations in obtaining the aforementioned information. Although some MCs provided data, the amounts were substantially low, which made it difficult to project scenarios close to the reality of species trafficking occurring in the Amazon Region. In addition, the information provided was incomplete due to lack of data in different sections, specifically in terms of confiscation and poaching incidents. In terms of population data, these could not be used for analysis because they were scarce and incomplete. Methodologies to store data efficiently and rapidly should be implemented at the national level, maintaining a regional approach through the standardization of formats for storing information and ensuring cooperation and distribution of information between MCs, the same that has to be easily accessible for efficient monitoring using the trafficking incidents.

A lack of control with regards to the detection of wildlife trafficking in rural areas is observed. Likewise, in most cases of the incidents, no sanctions are reported for the persons responsible for committing such acts and on some occasions, the offenders were arrested more than once for trafficking wild species. In addition, police agents were identified as being involved in wildlife trafficking crimes, reflecting corruption in this activity. These organized crime groups operate at an international level, using sophisticated transportation methods to avoid detection, and even involving police agents in such acts. In some cases, the magnitude of products being trafficked is observed, involving a variety of stakeholders.

If countries increase the control and penalties for illegal trafficking acts and all those related to this activity in a rigorous manner, these will have for example, access to the different tools to combat species trafficking provided by United Nations Convention against Transnational Organized Crime (UNTOC). Moreover, by working on coherent regulations at the Amazonian regional level between MCs, gaps are closed and the displacement of species trafficking in countries with lower penalties is prevented. Additionally, this can improve transboundary investigations and judicial cooperation [71]. At the seventeenth CITES Conference a resolution was adopted calling on Parties to take measures to prevent and combat corruption linked to illegal wildlife trade [104]. In 2019, the United Nations (UN) adopted the

first resolution to prevent and address corruption in crimes that have an impact on the environment [105]. These tools help create and strengthen regulations to combat corruption, showing the importance of the subject by raising awareness and the colossal effects that corruption has on this activity.

People involved in species trafficking are usually of low economic resources [12] [10]. Their reasons are mainly commercial and personal, where they may see an incentive to participate because of the high profits generated and the weakened penalization of this activity. Furthermore, noting that the COVID-19 pandemic left more than 34 million people in extreme poverty [99], the possible factor of an increased wildlife trafficking activity emerges due to a shortage of legal job opportunities. Considering the role of local communities is of utmost importance, as they can be victims of such activity, as well as actors contributing in this crime [71]. The active participation of local communities should be strengthened through regulations that conserve and protect wild species and at the same time, benefits society. It is important to provide incentives and conditions for sustainable wildlife management. In addition, it is important to empower local communities through initiatives based on natural resource management and create alternative solutions, to strengthen the economic income of the communities involved and thereby, reduce the incitement to engage in illegal wildlife trafficking. Likewise, rescuing the culture, beliefs and mythology related to trafficked species in the communities, will enhance the protection of these animals.

The protection of the illegally trafficked species in this report will benefit and generate protection of other species. Effectively, in a variety of confiscations, the involvement of other species also trafficked alongside the five main ones was detected, such as mammals, reptiles, birds, amphibians, and even insects. The species in this report are classified as 'umbrella' species, i.e., species that have large geographic ranges, and the protection of these animals benefits other species that overlap their geographic distribution. The incorporation of strategies and planing to protect these umbrella species at the regional level substantially benefits the protection of other animals, so it is of utmost importance to consider this point during the elaboration of different programs and projects.

A variety of wildlife species were detected in different wildlife markets in the Amazon Region. These markets are high-risk areas for humans, as they facilitate the transmission of viruses and bacteria between animals and to people due to the lack of biosecurity [106]. Viruses such as Ebola, HIV, anthrax and salmonella are some examples of zoonotic transmissions due to close interactions between animals and humans [107]. Suriname, Guyana and Peru are countries where these markets operate actively at the national level, and even where they are legal to extract species from their natural habitat [68]. In different markets located in

the Amazon Region of Peru, viruses such as Flavivirus (causing yellow fever and dengue), Filovirus (causing hemorrhagic fever), Conoravirus (causing respiratory diseases and severe diarrhea), Henipavirus (causing severe encephalitis) and bacteria such as Salmonella, the main cause of diarrheal diseases in Peru, were detected [108]. The trade of wild birds as pets is legal in the three countries previously mentioned, as long as they do not exceed the established annual quota. However, the practice of exceeding these limits through corruption is common, giving way and possible beginning to species trafficking, since trafficking and sale of Amazonian animals behind closed doors, in capital city markets, located outside the Amazon Region, has been detected [68]. The regulation and controlling of these markets is of utmost importance. The strengthening of police agents, regulations and support to the communities that economically depend on these activities, through alternatives and solutions, are necessary actions to combat illegal wildlife trade.

# References


| | |
|---|---|
| [1] | OTCA, «Organización del Tratado de Cooperación Amazónica,» 2015. [En línea]. Available: http://www.otca-oficial.info/amazon/our_amazon. [Last access: June 21, 2021]. |
| [2] | P. Verheij, «An Assessment of Wildlife Poaching and Trafficking in Boliva and Surinam,» IUCN, Amsterdam, 2019. |
| [3] | PNUMA, «Three ways the United Nations Environment Programme Works to Address Illegal Trade in Wildlife Ecosystems and Biodiversity,» 2020. [En línea]. Available: https://wedocs.unep.org/handle/20.500.11822/17554. [Last access: June 21, 2021]. |
| [4] | S. Guynup, «Brazilian Amazon Drained of Millions of Wild Animals by Criminal Networks: Informe,» Mongabay Amazon Conservation, 2020. [En línea]. Available: https://news.mongabay.com/2020/07/brazilian-amazon-drained-of-millions-of-wild-animals-by-criminal-networks-informe/. [Last access: June 21, 2021]. |
| [5] | T. Lam, M. Shum, H. Zhu, Y. Tong, X. Ni, Y. Liao, W. Wei, W. Cheung, W. Li, L. Li, G. Leung, E. Holmes, Y. Hu y G. Y, «Identifying SARS-CoV-2 related coronaviruses in Malayan pangolins.,» *Nature*, vol. 583, nº 7815, pp. 282-285, 2020. |
| [6] | R. Lu, X. Zhao y J. Li, «Genomic characterization and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding,» *The Lancet*, vol. 395, nº 10224, pp. 565-574, 2020. |
| [7] | M. Olinger, La Difución del Crimen Organizado en Brasil a Partir de los Años 2000, Washington D.C: Woodrow Wilson International Center for Scholars, 2013. |
| [8] | J. Haken, «Transnational Crime in the Developing World, Global Financial Integrity,» 2011. [En línea]. Available: http://transcrime.gfintegrity.org/. [Last access: June 21, 2021]. |
| [9] | SERNAP, «Aprehenden a Presunto Traficante de Colmillos de Jaguar,» Los Tiempos, 2016. [En línea]. Available: http://www.lostiempos.com/tendencias/medio-ambiente/20160603/aprehenden-presunto-traficante-colmillos-jaguar. [Last access: June 21, 2021]. |
| [10] | C. Bergman, «Smithsonian Magazine,» Diciembre 2009. [En línea]. Available: https://www.smithsonianmag.com/travel/wildlife-trafficking-149079896/. [Last access: June 21, 2021]. |
| [11] | PerúWCS, «Evidencias del Tráfico de Partes de Jaguar en la amazonía Peruana,» WCS, 2019. [En línea]. Available: https://peru.wcs.org/es-es/WCSPerú/Publicaciones. [Last access: June 21, 2021]. |
| [12] | R. Navia, «Mongabay,» Mongabay Series: Latin American Wildlife Trade, 26 Enero 2018. [En línea]. Available: https://news.mongabay.com/2018/01/fang-trafficking-to-china-is-putting-bolivias-jaguars-in-jeopardy/. [Last access: June 21, 2021]. |
| [13] | M. A. Nuñez y R. E. Aliaga, «Jaguar Fangs Trafficking by Chinese in Bolivia,» *IUCN*, vol. 65, pp. 1027-2992, 2017. |
| [14] | ROUTES, «In Plane Sight: Wildlife Trafficking in the Air Transport Sector,» Routes Partnership, 2018. |
| [15] | S. Charity y J.M. Ferreira, Wildlife Trafficking in Brazil, Cambridge: TRAFFIC, 2020. |

| | |
|---|---|
| [16] | A. Hansen, L. A, D. Joly, S. Mekaru y J. Brownstein, «Digital Surveillance: A Novel Approach to Monitoring the Illegal Wildlife Trade,» *PLoS ONE*, vol. 7, nº 12, 2012. |
| [17] | L. Emmons y F. Feer, «Neotropical rain forest mammals a field guide,» *Environmental Conservation*, vol. 25, nº 2, pp. 175-185, 1998. |
| [18] | J. L. &. G. G. L. Murray, «Leopardus pardalis. Mammalian Species,» vol. 548, pp. 1-10, 1997. |
| [19] | K. &. J. P. Nowell, «Wild cats: Status survey and conservation action plan,» *Gland, Switzerland: IUCN*, 1996. |
| [20] | T. G. de Oliveira, M. A. Tortato, L. Silveira, C. B. Kasper, F. D. Mazim, M. Lucherini y M. E. Sunquist, «Ocelot ecology and its ef- fect on the small-felid guild in the lowland neotropics,» *Biology and Conservation of Wild Felids*, pp. 559-580, 2010. |
| [21] | ISEC, «International Society for Endangered Cats Canada,» 2018. [En línea]. Available: https://wildcatconservation.org/wild-cats/south-america/ocelot/. [Last access: June 17, 2021]. |
| [22] | L. F. Aguirre, T. Tarifa, R. B. Wallace, N. Bernal H., L. Siles, E. Aliaga-Rossel y J. Salazar-Bravo, «Lista actualizada y comentada de los mamíferos de Bolivia,» *Scielo*, vol. 54, pp. 2075-5023, 2019. |
| [23] | R. Hoogesteijn y E. Mondolfi, «Body mass and skull measurements in four jaguar populations and observations on their prey base,» *Florida Museum Nat. Hist.*, nº 39, pp. 195-219, 1996. |
| [24] | H. Quigley, R. Foster, L. Petracca, E. Payan, R. Salom y B. Harmsen, «Panthera onca,» *IUCN Global Species Programme Red List Unit*, vol. https://doi.org/e.T15953A50658693, 2017. |
| [25] | ISEC, «International Society for Engangered Cats ISEC Canada,» 2014. [En línea]. Available: https://wildcatconservation.org/wild-cats/south-america/jaguar/. [Last access: June 21, 2021]. |
| [26] | M. Sunquist y F. Sunquist, Wild Cats of the World, Chicago: The University of Chicago Press, 2002. |
| [27] | M. Hayward, J. Kamler, R. Montgomery, A. Newlove, S. Rostro-García, L. Sales y B. Van Valkenburgh, «Prey preferences of the jaguar Panthera onca reflect the post- pleistocene demise of large prey,» *Front. Ecol. Evol.,* nº 3, p. 148, 2016. |
| [28] | M. Bekoff, T. Daniels y J. Gitleman, «Life History Patterns and the Comparative Social Ecology of Carnivores on JSTOR,» *Annu. Rev. Ecol. Syst.*, nº 15, pp. 191-232, 1984. |
| [29] | CMS, «Proposal for the inclusion the jaguar (Panthera onca) on CMS Appendices I a II,» de *Doc.27.1.2 2*, Gandhinagar, 2020. |
| [30] | R. Nuwer, «National Geographic,» National Geographic Magazine, 10 Abril 2020. [En línea]. Available: https://www.nationalgeographic.com/animals/article/saving-worlds-largest-eagle. [Last access: June 21, 2021]. |
| [31] | M. Salazar, <Dying of curiosity: Why people shoot harpy eagles> Mongabay News, 16 de Marzo 2021. [En línea]. Available: https://news.mongabay.com/2021/03/dying-of-curiosity-why-people-shoot-harpy-eagles/. [Last access: July 17, 2021]. |
| [32] | J. Ferguson-Lees y D. Christie, «Raptors of theworld,» *Princeton University Press*, 2001. |

| | |
|---|---|
| [33] | J. Vargas, D. Whitacre, R. Mosquera, J. Albuquerque, R. Piana, J. Thiollay, C. Márquez, J. Sanchez, M. Lezama-Lopez, S. Midence, S. Matola y e. al, «Estado y distribucion del aguila arpia (Harpia harpyja)en Centro y Sur America.,» *Ornitologia Neotropical*, vol. 17, pp. 39-55, 2006. |
| [34] | F. Aguiar-Silva, «Dieta do gavião-real Harpia harpyja (Aves: Accipitridae) em áreas de terra firme de Parintins, Amazonas, Brasil,» *Instituto Nacional de Pesquisas da Amazônia*, 2007. |
| [35] | S. Port-Carvalho, F. Ferrari y Marcio, «Predation of an Infant Collared Peccary by a Harpy Eagle inEastern Amazonia,» *THE WILSON BULLETIN*, vol. 115, nº 103-104, 2003. |
| [36] | N. Rettig, «Breeding behavior of the harpy eagle, Harpia harpyja,» *Auk*, vol. 95, pp. 629-643, 1987. |
| [37] | E. Alvarez Cordero, «Biology and conservation of the Harpy Eagle in Venezuela and Panama,» *University of Florida*, 1996. |
| [38] | R. Muñiz-Lopez, «Ecologia, biologia y habitat del Aguila Harpia (Harpia harpyja). In: Tufiño P, editor. Cunsi Pindo. Conservacion del Aguila Harpia en Ecuador,» *SIMBIOE*, pp. 190-251, 2007. |
| [39] | A. Ruschi, Aves do Brasil, São Paulo: Rios Ltda, 1979. |
| [40] | R. Arispe, D. Rumiz y C. Venegas, «Segundo censo de jaguares (Panthera onca) y otros mamíferos con trampas cámara en la Estancia San Miguelito,» Wildlife Conservation Society, Santa Cruz, 2005. |
| [41] | T. De Oliveira, «Leopardus wiedii,» *Mammalian species*, vol. 579, pp. 1-6, 1998. |
| [42] | A. Romero-Muñoz, E. Aliaga-Rossel y R. Arispe, «Leopardus wiedii,» de *Libro rojo de los vertebrados de Bolivia*, La Paz, Ministerio de Medio Ambiente y Agua de Bolivia, 2009, pp. 740-751. |
| [43] | ISEC, «Internatinal Society for Endangered Cats Canada,» 2018. [En línea]. Available: https://wildcatconservation.org/wild-cats/south-america/margay/.[Last access: June 21, 2021]. |
| [44] | R. Ridgway, The birds of Nort and Middle America, New York: U.S Natural Musem, 1916, pp. 1-543. |
| [45] | J. Forshaw, Parrots of the world, Willoughby Australia: Lansdowne Editions, 1989. |
| [46] | R. Ridgely, «The dcurrent distribution and status of mainland neotropical parrtos,» de *Conservation of New World Parrto*s, Washington DC, Smithsonian Institution Press, 1981, pp. 233-384. |
| [47] | E. Iñigo-Elías, «Ecology and breeding biology of the Scarlet Macaw (Ara macao) in the Usumacinta drainage of Mexico and Guatemala,» *Ph.D.Diss*, 1996. |
| [48] | N. J. Collar, «Globally threatened parrots: criteria, characteristics and cures,» *Int. Zoo Yearbook*, vol. 37, pp. 21-35, 2000. |
| [49] | R. Ridgely, «The distribution, status, and conservation of Neotropical mainland parrtos,» *Yale University*, vol. 1, nº Unpublished, 1982. |
| [50] | C. Munn, «Macaws: winged rainbows,» *National Geographic*, vol. 185, pp. 118-140, 1994. |
| [51] | P. Roth, «Repartição do habitat entre psitacídeos simpátricos no sul da Amazônia,» *Acta Amazonica*, vol. 14, pp. 175-221, 1984. |
| [52] | H. Sick, Birds in Brazil, a Natural History, New Jersey: Princeton University Press, 1993. |

| | |
|---|---|
| [53] | EIA, «Environmental Investigation Agency,» 2 Noviembre 2020. [En línea]. Available: https://eia-international.org/news/while-youve-been-in-lockdown-so-have-wildlife-criminals-and-many-of-them-have-been-working-from-home/. [Last access: June, 2021]. |
| [54] | S. Charity y J.M. Ferreira, Wildlife Trafficking in Brazil, Cambridge: TRAFFIC, 2020. |
| [55] | M. Giraldo-Amaya, F. Aguiar-Silva, K. Aparicio-U y S. Zuluaga, «Human Persecution of the Harpy Eagle: A Widspread Threat?,» *Journal of Raptor Research*, vol. 55, nº 1, p. 6, 2021. |
| [56] | P. Sinovas y B. Price, «Ecuador´s Wildlife Trade,» UNEP-WCMC, Quito, 2015. |
| [57] | WWF, «World Wildlife Fund Jaguar Strategy 2020-2030,» 2020. |
| [58] | J. R. Barbosa Vale, F. França Pereira y T. K. Costa Drago, «Análise do desmatamento no município de São Félix do Xingu-PA, entre os anos de 2000 e 2014,» *In: Anais Do Simpósio Brasileiro de Sensoriamento Remoto*, vol. 978, 2017. |
| [59] | S. Gluszek, D. Ariano-Sánchez, P. Cremona, A. Goyenechea, D. Luque Vergara, L. Mcloughlin y A. Knight, «Emerging trends of the illegal wildlife trade in Mesoamerica,» *Oryx*, vol. 55, nº 5, pp. 708-716, 2021. |
| [60] | G. Dias Fernandes, «Testando limites interespecíficos entre Leopardus pardalis e L. wiedii na Amazônia,» *Instituto Nacional de Pesquisas da Amazônia*, 2013. |
| [61] | UNEP-WCMC, «World Heritage Datasheet,» Naciones Unidas, 2011. [En línea]. Available: http://world-heritage-datasheets.unep-wcmc.org/datasheet/output/site/sangay-national-park/. [Last access: August 5, 2021]. |
| [62] | UNODC, «Methodological Annex to the 2nd edition of the World Wildlife Crime Informe: Trafficking in protected species,» United Nations, New York, 2020. |
| [63] | USFWS, «U.S Fish & Wildlie Service,» 2021. [En línea]. Available: https://www.fws.gov/international/scarlet-macaws.html. [Last access: June 17, 2021]. |
| [64] | N. Saunders, «Icons of power : feline symbolism in the Americas,» *Routledge*, 1998. |
| [65] | M. Arias, «El comecio ilegal del jaguar (Panthera onca),» CITES, 2021. |
| [66] | M. C. Sosnowski, J. Weis S y G. A. Petrossian, «Using Crime Script Analysis to Understand the Illegal Harvesting of Live Corals: Case Studies From Indonesia and Fiji,» *Journal of Contemporary Criminal Justice*, vol. 36, nº 3, 2020. |
| [67] | T. Q. Morcatty, J. C. Bausch Macedo, A.-I. Nekaris, Q. Ni, C. C. Durigan, M. S. Svensson y V. Nijman, «Illegal trade in wild cats and its link to Chinese-leddevelopment in Central and South America,» *Conservation Biology*, vol. 34, nº 6, pp. 1525-1535, 2020. |
| [68] | B. Ortiz-von Halle, «Bird´s -Eye View: Lessons from 50 years of bird trade regulation & conservation in Amazon countries,» TRAFFIC, Cambridge, 2018. |
| [69] | Decreto6514, «Camara dos Deputados,» 22 Julio 2008. [En línea]. Available: https://www2.camara.leg.br/legin/fed/decret/2008/decreto-6514-22-julho-2008-578464-norma-pe.html. [Last access: June 21, 2021]. |
| [70] | BrasiliaTV, «Agência Brasil,» 14 Febrero 2021. [En línea]. Available: https://agenciabrasil.ebc.com.br/geral/noticia/2021-02/trafico-de-animais-e-tema-do-caminhos-da-reportagem. [Last access: June 21, 2021]. |
| [71] | UNODC, «World Wildlife Crime Informe 2020: Trafficking in Protected Species,» United Nations, New york, 2020. |

| | |
|---|---|
| [72] | OIT, «Informe Mundial sobre Salarios 2020-2021: Los salarios y el salario mínimo en tiempos de la COVID-19,» Oficina Internacional del Trabajo, Ginebra, 2021. |
| [73] | UNEP, «United Nations Environment Programme,» 2016. [En línea]. Available: https://wedocs.unep.org/bitstream/handle/20.500.11822/17554/FINAL_%20UNEA2_Inf%20doc%2028.pdf?sequence=2&isAllowed=y. [Last access: June 21, 2021]. |
| [74] | N. J. Smith, «Spotted Cats and the Amazon Skin Trade,» *The International Journal of Conservation*, vol. 13, nº 4, pp. 362-371, 2009. |
| [75] | T. Wright, C. Toft, E. EnkerlinHoeflich, J. GonzalezElizondo, M. Albornoz, A. Rodríguez-Ferraro, F. RojasSuárez y e. al, «Nest poaching in Neotropical parrots,» *Conservation Biology*, vol. 15, nº 3, pp. 710-720, 2001. |
| [76] | J. Baillie y E. Butcher, «Priceless or Worthless? The World´s Most Threateened Species,» *Zoological Society of London*, 2012. |
| [77] | R. Timmins, W. Robichaud, B. Long, S. Hedges, R. Steinmetz, A. Abramov, D. Tuoc y D. Mallon, «Pseudoryx nghetinhensis. The IUCN Red List of Threatened Species,» vol. 2014, nº 3, 2008. |
| [78] | M. Kaiser y S. Jennings, «Ecosystem perspectives on conserving targeted and non-targeted species. In: Reynolds, J.D., Mace, G.M., Redford, K.H. and Robinson, J.G. (Eds.). Conservation of exploited species,» *Cambridge University Press*, pp. 343-369, 2001. |
| [79] | K. Gaston y R. Fuller, «Commonness, population depletion and conservation biology,» *Trends in Ecology and Evolution*, vol. 23, nº 1, pp. 14-19, 2008. |
| [80] | K. Redford, «The empty forest,» *BioScience*, vol. 42, nº 6, pp. 412-422, 1992. |
| [81] | A. Robertson, A. Trass, J. Ladley y D. Kelly, «Assessing the benefits of frugivory for seed germination: the importance of the deinhibition effec,» *Functional Ecology*, vol. 20, nº 1, pp. 58-66, 2006. |
| [82] | J. Estes y e. al, «Trophic downgrading of planet Earth,» *Science*, vol. 333, pp. 301-306, 2011. |
| [83] | W. J. Ripple y e. al, «Status and ecological effects of the world's largest carnivores,» *Science*, vol. 343, pp. 124-1484, 2014. |
| [84] | M. Weckel, W. Giuliano y S. Silver, «Jaguar (Panthera onca) feeding ecology: distribution of predator and prey through time and space,» *J. Zoo*, vol. 270, pp. 25-30, 2006. |
| [85] | T. Oliveira, «Comparative feeding ecology of jaguar and puma in the Neotropics / Ecología comparativa de la alimentación del jaguar y del puma en el neotrópico,» de *El jaguar en el nuevo milenio*, México D.F, Fondo de Cultura Económica/Universidad Nacional Autónoma de México/Wildlife Conservation Society, 2002, pp. 265-288. |
| [86] | J. Pérez-Flores, H. Arias-Domínguez y N. Arias-Domínguez, «First documented predation of a Baird's tapir by a jaguar in the Calakmul region, Mexico,» *Neotropical Biology and Conservation*, vol. 15, nº 4, pp. 453-461, 2020. |
| [87] | E. L. Preisser, D. Bolnick y M. Benard, «Scared to death?,» *Ecology*, vol. 86, pp. 501-509, 2005. |
| [88] | C. Sekercioglu, «Increasing awareness of avianecological function,» *Trends in Ecology and Evolution*, vol. 21, pp. 464-471, 2006. |
| [89] | E. Harris, E. de Crom, J. Fouche y A. Wilson, «Comparative study on the short-term effects of audioand visual raptor presence on a pigeon population, witha view towards pest control,» *International Journal of Pest Management*, vol. 66, pp. 31-39, 2020. |

| | |
|---|---|
| [90] | R. Gilda-Costa, A. Palleroni, M. Hauser, J. Touchton y J. Kelley, «Rapid acquisition of an alarmresponse by a Neotropical primate to a newly intro-duced avian predator,» *Proceedings of the Royal SocietyB: Biological Sciences*, vol. 270, pp. 605-610, 2003. |
| [91] | N. Sodhi, A. Didiuk y L. Oliphant, «Differences in bird abundance in relation to proximityof Merlin nests,» *Canadian Journal of Zoology,* vol. 68, pp. 852-854, 1990. |
| [92] | J. Brodie y H. Gibbs, «Bushmeat hunting as climate threat,» *Science*, vol. 326, nº 5951, pp. 364-365, 2009. |
| [93] | C. Peres, T. Emilio, J. Schietti, S. Desmoulie`re y T. Levi, «Dispersal limitation induces long-term biomass collapse in overhunted Amazonian forests,» *Proceedings of the National Academy of Sciences of the United States of America*, vol. 113, pp. 892-897, 2016. |
| [94] | A. Baños-Villalba, G. Blanco, J. Díaz-Luque, F. Denés, F. Hiraldo y J. Tella, «Seed dispersal by macaws shapes the landscape of an Amazonian ecosystem. ,,» *Scientific informes*, vol. 7, nº 1, p. 7373, 2017. |
| [95] | A. Scofield, R. Cunha dos Santos, N. Carvalho, A. Linhares Martins y G. Goés-Cavalcante, «First record of notoedric mange in ocelot (Leopardus pardalis Linnaeus, 1758) in the amazon region, Brazil,» *Revista Brasileira de Parasitologia Veterinaria*, vol. 20, nº 4, 2011. |
| [96] | C. Kirkby, R. Giudice, B. Day, K. Turner, B. Soares-Filho, H. Oliveira-Rodrigues y D. Yu, «Closing the ecotourism-conservation loop in the Peruvian Amazon,» *Environmental Conservation*, vol. 38, nº 1, pp. 6-17, 2011. |
| [97] | A. Janér, «Assessing the Market for Ecotourism in the Brazilian Amazon with Focus on Tefé and Santarém,» Scientific Magazine UAKARI, vol. 8, nº 2, pp. 7-25, 2012. |
| [98] | WHO, «WHO Coronavirus (COVID-19) Dashboard,» United Nations, 8 Julio 2021. [En línea]. Available: https://covid19.who.int/. [Last access: July 8, 2021]. |
| [99] | DESA, «United Nations Department of Economic and Social Affairs,» United Nations, 2020. [En línea]. Available: https://www.un.org/en/desa/COVID-19-slash-global-economic-output-85-trillion-over-next-two-years. [Last access: July 8, 2021]. |
| [100] | PIDAMAZONIA, «Plataforma de Información y Diálogo paa la Amazonía Colombiana,» PIDAMAZONIA, 21 Diciembre 2020. [En línea]. Available: https://www.pidamazonia.com/content/jaguar-el-felino-emblematico-de-la-amazonia. [Last access: July 8, 2021]. |
| [101] | A. Métraux, «The Social Organization and Religion of the Mojo and Manasi in Primitive Man,» vol. 16, pp. 1-30, 1943. |
| [102] | J. Kleiven, T. Bjerke y B. Kaltenborn, «Factors influencing the social acceptability of large carnivore behaviours,» *Biodiversity & Conservation*, vol. 13, nº 9, pp. 1647-1658, 2004. |
| [103] | D. Figueiredo de Almeida, L. dos Santos y C. E. Costa de Campos, «The value of the jaguar (Panthera onca) according to secondary students,» *Scielo Brasil*, vol. 21, nº 1, 2015. |
| [104] | CITES, «Resolution Conf. 117.6,» CITES, 20. [En línea]. Available: https://cites.org/sites/default/files/document/E-Res-17-06_0.pdf [Last access: July 8, 2021]. |
| [105] | UNCAC, «United Nations,» United Nations Convention Against Corruption, [En línea]. Available: https://www.unodc.org/documents/treaties/UNCAC/. [Last access: July 8, 2021]. |
| [106] | UNODC, «United Nations Office on Drugs and Crime,» United Nations, 22 Abril 2020. [En línea]. Available: https://www.unodc.org/documents/Advocacy-Section/Wildlife_trafficking_COVID_19_GPWLFC_public.pdf. [Last access: July 10, 2021]. |

| | |
|---|---|
| [107] | D. Fine Maron, «National Geographic,» National Geographic, 15 Abril 2020. [En línea]. Available: https://www.nationalgeographic.com/animals/article/coronavirus-linked-to-chinese-wet-markets. [Last access: July 10, 2021]. |
| [108] | A. P. Mendoza, N. Cavero y C. Rynaby, «Comercio de Animales Silvestres en la Región de Loreto. 2007 - 2012,» *Wildlife Conservation Society*, vol. Agosto, 2014. |
| [109] | V. Romo, «Proyecto Operación Jaguar,» Mongabay, 2020. |
| [110] | CITES, «Convention on International Trade in Engangered Species of Wild Fauna and Flora,» 30 Julio 2001. [En línea]. Available: https://cites.org/sites/default/files/eng/com/ac/17/E17-08-1.pdf. [Last access: June 21, 2021]. |
| [111] | M. Pasquali, «Minimum monthly wage in selected Latin American countries 2021,» Statista, 14 Enero 2021. [En línea]. Available: https://www.statista.com/statistics/953880/latin-america-minimum-monthly-wages/. [Last access: June 21, 2021]. |
| [112] | C. B. D. N. E. R. D. Munn, «Proceedings of the First Mesoamerican Workshop on the Conservation and Managemente of Macaws,» Center for the Study of Tropical Birds Inc, 1991, pp. 42-47. |
| [113] | InternationalBirdLife, «Species factsheet: Harpia harpyja,» 2021. [En línea]. Available: http://datazone.birdlife.org/species/factsheet/harpy-eagle-harpia-harpyja/text. [Last access: June 21, 2021]. |
| [114] | D. Mosquera B, «Los felinos de Yasuní,» de *Los Secretos del Yasuní Avances en la Investigación del Bosque Tropical Estación de Biodiversidad Tiputini Universidad San Francisco de Quito*, Quito, Prodeim, 2017, pp. 116-360. |

# Annex

## Methodology for the Report of Illegal Wildlife Trade of Five Prioritezed Species of Appendix I of CITES Emblematic for the Amazon Region

### Introduction

**This document describes the methods used to analyze the different sections of the Report of Illegal Trafficking of Five Species of Appendix I of CITES Emblematic to the Amazon Region. The information used came exclusively from the database built for this consultancy, which has information related to confiscations and poaching incidents/ seizures of the five selected species. It includes the methods used to obtain the illegal trafficking hotspots; flows and routes of illegal trafficking; the main demands and specimens; other species illegally trafficked along with the five ones; the *modus operandi*; the driving factors of illegal trafficking of these animal species; and finally, potential environmental and social impacts of illegal trafficking.**

### Selection of the Five Species

In the Terms of Reference of this consultancy, it is instructed to choose five species that meet the following conditions, they should be: (i) subject to illegal trafficking, (ii) from the Amazon region, and (iii) included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Although how to appropriately assess and prioritize threatened species continues to be the subject of debate in the conservation field (e.g. [1] [2]), the assessment criteria of the Red List of Threatened

Species created by the International Union for Conservation of Nature (IUCN) is recognized and accepted worldwide. Moreover, many countries around the world are adapting this method for domestic use [3], since among its different limitations stand out the difficulty of applying it in situations with little data available [4]. It is important to note that the IUCN uses independent components to measure species extinction risk based on population and distribution range indicators [3].

In this sense, in order to carry out the evaluation of Amazonian animal species that are under the greatest pressure due to illegal trafficking (as indicated in the Terms of Reference of the consultancy) it was necessary to focus and base the analysis, mainly, on confiscations and poaching incidents of the evaluated species [5]. However, due to the scarce information available on this variable, this consultancy proposed to consider it and complement it in the analysis with the IUCN variables under a specific methodology described later in this annex.

In this context, the methodology used for the selection of the five Amazonian species subjected to illegal trafficking is presented below, along with a detailed analysis of the variables involved in the methodology and, consecutively, the results obtained from the application of the proposed methodology are presented, having used two alternative selection schemes.

## Methodology for the Selection of Species

### Methodology to Establish the Universe Group of Analysis

To carry out the selection of the five CITES Appendix I species, the first step was to establish the universe group of analysis by identifying all animal species of the same Appendix that are within the Amazon region. The CITES SpeciesPlus tool was used to identify the species that are within the eight Amazon Coopertation Treaty Organization (ACTO) Member Countries (MC), and consecutively, using the IUCN geographical map to confirm if the species are part of the Amazon region.

For the characterization of the information of the universe group of analysis, the components used by the IUCN were taken into consideration, that is, geographic range and the population of each species. However, due to the lack of information, the variables used to represent these components were adapted both to the existing information, and to the objectives of this consultancy. Regarding the species geographic range variable, the ACTO MCs were taken into consideration, while for the population variable, due to the lack of information, the IUCN species population status was used. Considering

that the objective of this consultancy focuses on species that are victims of the illegal wildlife trade, this was added as an important additional variable for the selection of species.

## Species Selection Methodology

Once the universe group of all these Amazonian species included in Appendix I was established, a Selection Index (SI) was proposed to be used to distinguish and rank (prioritize) the group of species in relative terms.

For the construction of the Index, three variables ($V_i$) were used, each one of which is weighted by a relative weight ($K_i$) whose values depended on the relative importance between variables (the higher the value, the greater the importance), and which also reflected the importance of the specific objectives that were to be achieved in this consultancy.

The general equation of the index is as follows:

$$IS = V_1*K_1 + V_2*K_2 + V_3*K_3$$

Where:

**$V_i$:** are the variables used for prioritization. Considering that these variables have different measurement units in the equation, all of them were taken to base 1.

**$K_i$:** are the weighting factors or relative weight values given to the variable in the equation. The sum of all K factors should be 1.

**IS:** is the Selection Index that characterized and differentiated each of the species of the universe group and, in this way, the selection of the five species depended on the value that launched the Index for every one of them. For this purpose, the species were ordered from highest to lowest, according to the value of their SI, and the first in the list were chosen.

## Analysis and Justification of the Variables and Respective Relative Weights

Considering that the methodology was a proposal for this consultancy, this subsection was created to explain each variable chosen, along with its methodological considerations, the sources from which the information was extracted, as well as a justification of the weight attributed to each one in relation to the others.

The three variables chosen were: (i) the geographic range of each species in the ACTO MCs; (ii) the total number of specimens confiscated in the illegal trade incidents; and (iii) the status of its population.

### *Variable 1. Geographic Range of the Species in the Member Countries*

This variable corresponds to the territorial distribution of each species within the ACTO MCs. To locate the countries where each species is present, the IUCN website and CITES SpeciesPlus tools were used. In cases where CITES has categorized a species in a country as "Extinct?" and/or "Uncertain", situation that is not conclusive regarding the presence or not of the species in the respective country, due to the lack of information in that country, it was categorized as absent[2].

In this case, the sum of the number of countries in which the species is present was considered.

Although geographic range is an IUCN primary variable, it is also a strong predictor of the species extinction risk [6]. Those species with larger ranges will be buffered against local losses of both individuals and habitat, and will be less likely to experience catastrophic losses throughout their distribution [7] [8].

Additionally, as one of the objectives of this consultancy is to raise public awareness about the illegal trafficking of Amazonian animals, a species with a greater territorial distribution, i.e., that encompasses more Amazonian countries, it will mean a broader public and, therefore, increased awareness of the species.

### *Variable 2. Total Specimens in Seizure Incidents due to Illegal Traffic*

The CITES Trade Database tool for the years 2009 to 2018 was used for this variable; years 2019 and 2020 are not included due to lack of information. The data selection format for each species in the aforementioned tool is detailed below:

Year Range: 2009-2018;
Exporting Countries: all Member Countries;
Importing Countries: all countries;
Source: Confiscations/Seizures;
Purpose: All Purposes; and
Trade Terms: All Terms.

For each species, the sum of specimens in annual incidents of illegal trade (seizures) was taken into account. The importance of this variable lies in the fact that it reflects, even partially, the pressure that the species suffers due to illegal trafficking. This, besides being our main objective, is also an extrinsic threat that contributes directly to the population decline (Variable 3) of a species [9].

2 An SI sensitivity analysis was conducted to detect its variation in a presence or absence scenario of the species.

### *Variable 3. Population Status of each Species*

In the case of this variable, the IUCN database was used to extract information regarding the population status of each species. In its format, species populations are categorized as: Increasing, Stable, or Decreasing.

In the case of this variable, the value of (1) was assigned to increasing populations, (2) for stable, and finally (3) for decreasing, since those threatened populations were prioritized.

The status of the populations of each species is important as it reflects the high probability of species extinction when the population is small [10]. A small population usually suffers from less genetic variety, which impacts in breeding systems [11], and small populations are susceptible to demographic stochasticity (random fluctuations in population size) [12]. Additionally, it is an IUCN core variable.

## Analysis and Justification of the Relative Weights of the Variables

The relative weights of the variables that intervene in the Selection Index equation reflect the importance of each one with respect to the others. In this context, it was proposed to use the following weighting factors for the variables:

- $\mathbf{K_1}$ with 30% for the Geographic Range Variable;
- $\mathbf{K_2}$ with 40% for the Variable of Specimens in Seizures for Illegal Traffic; and
- $\mathbf{K_3}$ with 30% for the Population Status Variable.

The difference between the assigned values is intended to reflect the greater relative importance to be given to illegal trade of Amazonian species, considering that it is the central focus of the consultancy.

## Results

The Selection Index application following two alternative procedures for the five species is explained hereafter. The first procedure is focused on the application of the SI to the universe group of analysis and, the second one, by applying the SI on four different subgroups, each of them built according to class category (mammals, birds, reptilia, elasmobranchii) and obtained from the universe group. Finally, both procedures and their respective results were presented to ACTO, which approved to work with the five species obtained in the single Universe Procedure.

### Species Selected by the Single Universe Procedure

Considering the 31 Amazon species in CITES Appendix I as a single universe group, the first five species with the highest index are listed below in order (from highest to lowest).[3]

**Table 1.**
**Species Selected by the Single Universe Procedure**

| Class | Order | Family | Scientific Name | Common Name | Selection Index |
|---|---|---|---|---|---|
| Bird | Psittaciformes | Psittacidae | *Ara macao* | Scarlet Macaw | 1.00 |
| Mammal | Carnivora | Felidae | *Leopardus pardalis* | Ocelot | 0.638 |
| Mammal | Carnivora | Felidae | *Panthera onca* | Jaguar | 0.629 |
| Bird | Falconiformes | Accipitridae | *Harpia harpyja* | Harpy Eagle | 0.622 |
| Mammal | Carnivora | Felidae | *Leopardus wiedii* | Margay Cat | 0.603 |

3 For further information and detail, refer to Table 2 Species Selection Index 'All' Tab.

## Table 2.
## Species Selection Index - 'All' Tab

| N° | Clase | Orden | Familia | Especie | | Variable 1 | | | | | | | | | Variable 2 | | | | | | | | | | | | Variable 3 | | | Indice de Selección |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Distribución Territorial en los Países Miembros | | | | | | | Total de Países | Variable llevada a 1 | Cantidad de Especímenes en Confiscaciones | | | | | | | | | | Variable llevada a 1 | Estatus de la Población | | | |
| | | | | | | | | | | | | | | | Año | | | | | | | | | | | | Estatus | N° | Variable llevada a 1 | |
| | | | | Nombre Científico | Nombre Común | Br | Bo | Co | Ec | Gy | Pe | Su | Ve | | | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Total | | | | | |
| 1 | Mamífero | Artiodactyla | Cervidae | *Blastocerus dichotomus* | Ciervo de los Pantanos | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0,375 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,413 |
| 2 | Mamífero | Carnivora | Canidae | *Speothos venaticus* | Zorrito Vinagre | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,002 | Disminución | 3 | 1,000 | 0,601 |
| 3 | Mamífero | Carnivora | Felidae | *Leopardus pardalis* | Ocelote | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 2 | 21 | 3 | 3 | 0 | 3 | 2 | 2 | 1 | 3 | 40 | 0,096 | Disminución | 3 | 1,000 | 0,638 |
| 4 | Mamífero | Carnivora | Felidae | *Leopardus tigrinus* | Gato Tigrillo | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0,005 | Disminución | 3 | 1,000 | 0,602 |
| 5 | Mamífero | Carnivora | Felidae | *Leopardus wiedii* | Margay/Gato Pintado | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0,007 | Disminución | 3 | 1,000 | 0,603 |
| 6 | Mamífero | Carnivora | Felidae | *Panthera onca* | Jaguar | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 2 | 1 | 7 | 4 | 3 | 1 | 1 | 0 | 6 | 5 | 30 | 0,072 | Disminución | 3 | 1,000 | 0,629 |
| 7 | Mamífero | Carnivora | Lutrinae | *Pteronura brasiliensis* | Nutria Gigante | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,600 |
| 8 | Mamífero | Cingulata | Dasypodidae | *Priodontes maximus* | Armadillo Gigante | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,002 | Disminución | 3 | 1,000 | 0,601 |
| 9 | Mamífero | Pilosa | Atelidae | *Oreonax flavicauda* | Mono Choro de Cola Amarilla | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,338 |
| 10 | Mamífero | Pilosa | Cebidae | *Callimico goeldii* | Tamarino de Goeldi | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 5 | 0,625 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,488 |
| 11 | Mamífero | Pilosa | Cebidae | *Saguinus bicolor* | Tamaino Calvo | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,338 |
| 12 | Mamífero | Pilosa | Cebidae | *Saguinus martinsi* | Tamrino de Martinsi | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,338 |
| 13 | Mamífero | Pilosa | Pitheciidae | *Cacajao calvus* | Huapo Rojo | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0,250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,375 |
| 14 | Mamífero | Pilosa | Pitheciidae | *cacajao melanocephalus* | Mono Chucuto | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0,250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Estable | 2 | 0,667 | 0,275 |
| 15 | Mamífero | Pilosa | Pitheciidae | *Chiropotes albinasus* | Saki Nariblanco | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,338 |
| 16 | Mamífero | Rodentia | Cuniculidae | *Cuniculus paca* | Paca | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 7 | 0,875 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 8 | 0,019 | Estable | 2 | 0,667 | 0,470 |
| 17 | Mamífero | Rodentia | Dasyproctidae | *Dasyprocta punctata* | Agouti | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Estable | 2 | 0,667 | 0,500 |
| 18 | Mamífero | Sirenia | Trichechidae | *Trichechus inunguis* | Manati Amazónico | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 6 | 0,750 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,525 |
| 20 | Aves | Ciconiiformes | Ciconiidae | *Jabiru mycteria* | Jabirú Americano | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,600 |
| 21 | Aves | Falconiformes | Accipitridae | *Harpia harpyja* | Águila Harpía | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 3 | 0 | 0 | 1 | 0 | 4 | 9 | 0 | 3 | 3 | 23 | 0,055 | Disminución | 3 | 1,000 | 0,622 |
| 22 | Aves | Psittaciformes | Psittacidae | *Ara macao* | Guacamayo Bandera | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 12 | 27 | 0 | 1 | 14 | 64 | 235 | 0 | 23 | 40 | 416 | 1,000 | Disminución | 3 | 1,000 | 1,000 |
| 23 | Aves | Psittaciformes | Psittacidae | *Ara militaris* | Guacamayo Verde/Militar | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 4 | 0,500 | 0 | 0 | 0 | 0 | 0 | 22 | 3 | 0 | 5 | 0 | 30 | 0,072 | Disminución | 3 | 1,000 | 0,479 |
| 24 | Aves | Psittaciformes | Psittacidae | *Guarouba guarouba* | Cacatua Dorada | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,338 |
| 25 | Aves | Psittaciformes | Psittacidae | *Primolius couloni* | Guacamayo Cabeciazul | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0,250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,375 |
| 26 | Aves | Psittaciformes | Psittacidae | *Primolius maracana* | Guacamayo Maracaná | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,338 |
| 27 | Reptilia | Crocodylia | Alligatoridae | *Caiman crocodilus apaporien* | Caimán del Río Apaporis | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Estable | 2 | 0,667 | 0,238 |
| 28 | Reptilia | Crocodylia | Alligatoridae | *Melanosuchus niger* | Caimán Negro | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 3 | 0,375 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,002 | Estable | 2 | 0,667 | 0,313 |
| 29 | Reptilia | Crocodylia | Crocodylidae | *Crocodylus intermedius* | Cocodrilo del Orinoco | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0,250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0,002 | Disminución | 3 | 1,000 | 0,376 |
| 30 | Elasmobran | Pristiformes | Pristidae | *Pristis pristis* | Pez Sierra Común | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 3 | 0,375 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,413 |
| 31 | Elasmobran | Pristiformes | Pristidae | *Pristis pectinata* | Espadachín | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,338 |
| | | | | | | | | | | | | | | 0,3 | | | | | | | | | | | 0,4 | | | 0,3 | |

Especies Seleccionadas | Países que no entran en el apendice I | Países donde presencia es Incierta | Factores de ponderación | Kg Gr | 1 especimen de 1Kg de los 77

## Species Selected by the Class Sub-group Procedure

Considering as subgroups the existing class categories in the 31 Amazonian species of CITES Appendix I, four subgroups are obtained: mammal, bird, reptilia, and elasmobranchii. In the selection process, the same Selection Index was applied in each subgroup and the two species of the mammal class were selected (for having the highest quantity of species in the universe group) and one species (the first one) of the other classes.[4] A table with the five species selected under this procedure is presented below.

## Table 3.
## Species Selected by Class Sub-group Procedure

| Clase | Orden | Familia | Nombre Científico | Nombre Común | Índice de Selección |
|---|---|---|---|---|---|
| Mammal | Carnivora | Felidae | *Leopardus pardalis* | Ocelot | 1.0 |
| Mammal | Carnivora | Felidae | *Panthera onca* | Jaguar | 0.9 |
| Bird | Psittaciformes | Psittacidae | *Ara macao* | Scarlet Macaw | 1.0 |
| Reptilia | Crocodylia | Crocodylidae | *Crocodylus intermedius* | Orinoco Crocodile* | 0.9 |
| Elasmobranchii | Pristiformes | Pristidae | *Pristis pristis* | Common Sawfish | 0.6 |

* The Orinoco Crocodile obtained the same SI as the Black Cayman; however, the Crocodile is considered to have a decreasing population status compared to the Cayman, whose population is stable.

4 For further information and detail, refer to Table 4. Species Selection Index 'Mammals' Tab, Table 5. Species Selection Index 'Birds' Tab, Table 6. Species Selection Index 'Reptilia' Tab, and Table 7. Species Selection Index 'Elasmobranchii' Tab.

## Table 4.

## Species Selection Index - 'Mammals' Tab

| N° | Clase | Orden | Familia | Especie | | Variable 1 | | | | | | | | | | Variable 2 | | | | | | | | | | | | Variable 3 | | | Indice de Selección |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Distribución Territorial en los Países Miembros | | | | | | | | Total de Países | Variable llevada a 1 | Cantidad de Especímenes en Confiscaciones | | | | | | | | | | | Variable llevada a 1 | Estatus de la Población | | | |
| | | | | | | | | | | | | | | | | Año | | | | | | | | | | | | Estatus | N° | Variable llevada a 1 | |
| | | | | Nombre Científico | Nombre Común | Br | Bo | Co | Ec | Gy | Pe | Su | Ve | | | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Total | | | | | |
| 1 | Mamífero | Artiodactyla | Cervidae | *Blastocerus dichotomus* | Ciervo de los Pantanos | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0,375 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,4125 |
| 2 | Mamífero | Carnivora | Canidae | *Speothos venaticus* | Zorrito Vinagre | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,025 | Disminución | 3 | 1,000 | 0,6100 |
| 3 | Mamífero | Carnivora | Felidae | *Leopardus pardalis* | Ocelote | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 2 | 21 | 3 | 3 | 0 | 3 | 2 | 2 | 1 | 3 | 40 | 1,000 | Disminución | 3 | 1,000 | 1,0000 |
| 4 | Mamífero | Carnivora | Felidae | *Leopardus tigrinus* | Gato Tigrillo | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0,050 | Disminución | 3 | 1,000 | 0,6200 |
| 5 | Mamífero | Carnivora | Felidae | *Leopardus wiedii* | Margay/Gato Pintado | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0,075 | Disminución | 3 | 1,000 | 0,6300 |
| 6 | Mamífero | Carnivora | Felidae | *Panthera onca* | Jaguar | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 2 | 1 | 7 | 4 | 3 | 1 | 1 | 0 | 6 | 5 | 30 | 0,750 | Disminución | 3 | 1,000 | 0,9000 |
| 7 | Mamífero | Carnivora | Lutrinae | *Pteronura brasiliensis* | Nutria Gigante | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,6000 |
| 8 | Mamífero | Cingulata | Dasypodidae | *Priodontes maximus* | Armadillo Gigante | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,025 | Disminución | 3 | 1,000 | 0,6100 |
| 9 | Mamífero | Pilosa | Atelidae | *Oreonax flavicauda* | Mono Choro de Cola Amarilla | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,3375 |
| 10 | Mamífero | Pilosa | Cebidae | *Callimico goeldii* | Tamarino de Goeldi | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 5 | 0,625 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,4875 |
| 11 | Mamífero | Pilosa | Cebidae | *Saguinus bicolor* | Tamaino Calvo | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,3375 |
| 12 | Mamífero | Pilosa | Cebidae | *Saguinus martinsi* | Tamrino de Martinsi | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,3375 |
| 13 | Mamífero | Pilosa | Pitheciidae | *Cacajao calvus* | Huapo Rojo | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0,250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,3750 |
| 14 | Mamífero | Pilosa | Pitheciidae | *cacajao melanocephalus* | Mono Chucuto | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0,250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Estable | 2 | 0,667 | 0,2750 |
| 15 | Mamífero | Pilosa | Pitheciidae | *Chiropotes albinasus* | Saki Naribianco | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,3375 |
| 16 | Mamífero | Rodentia | Cuniculidae | *Cuniculus paca* | Paca | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 7 | 0,875 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 8 | 0,200 | Estable | 2 | 0,667 | 0,5425 |
| 17 | Mamífero | Rodentia | Dasyproctidae | *Dasyprocta punctata* | Agouti | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Estable | 2 | 0,667 | 0,5000 |
| 18 | Mamífero | Sirenia | Trichechidae | *Trichechus inunguis* | Manati Amazónico | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 6 | 0,750 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,5250 |
| | | | | | | | | | | | | | | | 0,3 | | | | | | | | | | | 0,4 | | | 0,3 | |

Especies Seleccionadas | Países donde presencia es Incierta | Factores de ponderación | Kg Gr

## Table 5.

## Species Selection Index - 'Birds' Tab

| N° | Clase | Orden | Familia | Especie | | Variable 1 | | | | | | | | | | Variable 2 | | | | | | | | | | | | Variable 3 | | | Indice de Selección |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Distribución Territorial en los Países Miembros | | | | | | | | | | Cantidad de Especímenes en Confiscaciones | | | | | | | | | | | | Estatus de la Población | | | |
| | | | | | | | | | | | | | | Total de Países | Variable llevada a 1 | Año | | | | | | | | | | | Variable llevada a 1 | Estatus | N° | Variable llevada a 1 | |
| | | | | Nombre Científico | Nombre Común | Br | Bo | Co | Ec | Gy | Pe | Su | Ve | | | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Total | | | | | |
| 1 | Aves | Ciconiiformes | Ciconiidae | *Jabiru mycteria* | Jabirú Americano | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,600 |
| 2 | Aves | Falconiformes | Accipitridae | *Harpia harpyja* | Águila Harpía | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 3 | 0 | 0 | 1 | 0 | 4 | 9 | 0 | 3 | 3 | 23 | 0,055 | Disminución | 3 | 1,000 | 0,622 |
| 3 | Aves | Psittaciformes | Psittacidae | *Ara macao* | Guacamayo Bandera | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 1,000 | 12 | 27 | 0 | 1 | 14 | 64 | 235 | 0 | 23 | 40 | 416 | 1,000 | Disminución | 3 | 1,000 | 1,000 |
| 4 | Aves | Psittaciformes | Psittacidae | *Ara militaris* | Guacamayo Verde/Militar | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 4 | 0,500 | 0 | 0 | 0 | 0 | 0 | 22 | 3 | 0 | 5 | 0 | 30 | 0,072 | Disminución | 3 | 1,000 | 0,479 |
| 5 | Aves | Psittaciformes | Psittacidae | *Guarouba guarouba* | Cacatua Dorada | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,338 |
| 6 | Aves | Psittaciformes | Psittacidae | *Primolius couloni* | Guacamayo Cabeciazul | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0,250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,375 |
| 7 | Aves | Psittaciformes | Psittacidae | *Primolius maracana* | Guacamayo Maracaná | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,338 |
| | | | | | | | | | | | | | | | 0,3 | | | | | | | | | | | 0,4 | | | 0,3 | |

Especies Seleccionadas | Países donde presencia es Incierta | Factores de ponderación | Kg Gr | 1 especimen de 1Kg de los 77

## Table 6.

## Species Selection Index - 'Reptilia' Tab

| N° | Clase | Orden | Familia | Especie | | Variable 1 | | | | | | | | | | Variable 2 | | | | | | | | | | | | Variable 3 | | | Indice de Selección |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Distribución Territorial en los Países Miembros | | | | | | | | Total de Países | Variable llevada a 1 | Cantidad de Especímenes en Confiscaciones | | | | | | | | | | | Variable llevada a 1 | Estatus de la Población | N° | Variable llevada a 1 | |
| | | | | | | | | | | | | | | | | Año | | | | | | | | | | | | | | | |
| | | | | Nombre Científico | Nombre Común | Br | Bo | Co | Ec | Gy | Pe | Su | Ve | | | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Total | | | | | |
| 1 | Reptilia | Crocodylia | Alligatoridae | *Caiman crocodilus apaporiensis* | Caimán del Río Apaporis | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0,333 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Estable | 2 | 0,667 | 0,300 |
| 2 | Reptilia | Crocodylia | Alligatoridae | *Melanosuchus niger* | Caimán Negro | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 3 | 1,000 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1,000 | Estable | 2 | 0,667 | 0,900 |
| 3 | Reptilia | Crocodylia | Crocodylidae | *Crocodylus intermedius* | Cocodrilo del Orinoco | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0,667 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1,000 | Disminución | 3 | 1,000 | 0,900 |
| | | | | | | | | | | | | | | | 0,3 | | | | | | | | | | | 0,4 | | | 0,3 | |

Especies Seleccionadas | Países que no entran en el apendice I | Factores de ponderación | Kg Gr

## Table 7.

## Selection Index - 'Elasmobranchii' Tab

| N° | Clase | Orden | Familia | Especie | | Variable 1 | | | | | | | | | | Variable 2 | | | | | | | | | | | | Variable 3 | | | Indice de Selección |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Distribución Territorial en los Países Miembros | | | | | | | | Total de Países | Variable llevada a 1 | Cantidad de Especímenes en Confiscaciones | | | | | | | | | | | Variable llevada a 1 | Estatus de la Población | N° | Variable llevada a 1 | |
| | | | | | | | | | | | | | | | | Año | | | | | | | | | | | | | | | |
| | | | | Nombre Científico | Nombre Común | Br | Bo | Co | Ec | Gy | Pe | Su | Ve | | | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Total | | | | | |
| 1 | Elasmobranchii | Pristiformes | Pristidae | *Pristis pristis* | Pez Sierra Común | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 3 | 1,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,600 |
| 2 | Elasmobranchii | Pristiformes | Pristidae | *Pristis pectinata* | Espadachín | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0,333 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,000 | Disminución | 3 | 1,000 | 0,400 |
| | | | | | | | | | | | | | | | 0,3 | | | | | | | | | | | 0,4 | | | 0,3 | |

Selección de Especie | Países donde presencia es Incierta | Factores de ponderación

## The Database

The database was created for this report which contains information (335 data/ records)[5] collected at the national and international levels. At a national level, the respective focal points of the eight ACTO MCs were contacted to obtain national information. The information collected from databases of international entities comprised a total of five organizations: ENVIRONET Platform, USFWS-LEMIS Database, CITES Trade Database; 'On The Trail' Traffic Bulletins and TRAFFIC's Wildlife Trade Portal.

Before conducting the respective statistical analyses, the database was systematized and United Nations (UN) rules were used to construct proxy variables for the missing countries of origin and destination, and to determine the role of the country of occurrence, in the trafficking flow chain [13]. More emphasis was given to countries of origin and destination, as transit countries usually have incomplete information, which applies to this case. Two UN scenarios were used to identify and build proxy variables[6]:

Scenario 1: Information on country of destination is available, while the origin country is missing. In this case, if the species is native in the occurrence country, then the occurrence country is assumed to be the country of origin. Otherwise, no assumptions can be made on the country of origin and it is left blank.

Scenario 2: There is information available about the country of origin, while the country of destination is missing. In this case, the country of occurrence is considered to be the destination, as long as it is different from the country of origin.

Under these two criteria, 113 more data were added under scenario 1 and one more under scenario 2.

There are incidents in the database in which the countries of origin are accompanied by the symbology 'XX'. These data were not considered for routes and hotspots since the entities that provided these data (CITES and USFWS-LEMIS) specify that 'XX' means there is no country of origin in the incident therefore, it remains that way until the country clarifies so. Additionally, Bolivia sent five incidents which do not specify whether it is a confiscation or poaching incident and in this sense, they were not considered for the systematization and analysis of this report, since it could be other types of incidents such as roadkill or cases not related to illegal trafficking of species.

5 There are 10 incidents of data that were not considered in the analysis due to lack of information regarding whether these are occurrences of confiscations, poaching, or another related case.

6 A proxy variable is defined as a measure that, when isolated, is not in itself directly relevant, but it allows other more useful measures to be obtained. In order for a variable to be a good proxy, it must have a close correlation with the variable of interest.

## Illegal Wildlife Trade Hotspots

To conduct the respective analyzes and obtain the hotspots of illegal trafficking of the five species, the Kernel Density analysis tool of the ArcGIS software was used to produce the maps. The data used were all those incidents that had information regarding the place of origin (X,Y coordinates) and the scientific name of the species. A total of 165 occurrences were used to produce illegal trafficking hotspot maps. Additionally, maps of illegal trafficking incidents by country of origin were produced to complement those hotspots maps, since the occurrences provided by CITES and USFWS-LEMIS report data on the place of origin, but only at the country level. For this reason and noting that these two extraction sources hold almost 50% of the data contained in the database, a map of trafficking hotspots is presented for each species with the specific places of origin, along with a pie chart with the total number of illegal trafficking incidents in percentages by country of origin. In the latter, a total of 310 incidents were used. Finally, it is important to mention that it was not possible to create a map of illegal trafficking hotspots for the harpy eagle due to lack of data.

The hotspots map for the scarlet macaw showed two CITES incidents with country-of-origin Palau and Peru as country of export, which were not considered.

## Illegal Wildlife Trade Routes

A systematization of data was conducted to obtain the trafficking flows of the five species. It was concluded that data from transitory countries would not be used, since the database only had one incident of this type. The X,Y coordinates for the country of origin and X,Y coordinates for the country of destination were used to build the maps. Noting that in some occurrences there was specific information about the location (such as for example the coordinates of an airport) and in others only the country, it was decided to systematize all this information at the country level for Map 6. A total of 175 incidents were used in this section.

## Main Demands and Specimens

To obtain the main demands and specimens, the incidents that provided information about country of origin, specimen code, and quantity of specimens were used, using a total of 299 data in the analysis. There were two incidents provided by CITES, which had Peru as exporting country and Palau as the country of origin, for this reason they were not considered. Likewise, 17 data did not specify quantities of specimens. In this way, the use of 318 data was reduced to 299 complete records. This reduced the use of 318 data to 299 complete records.

To obtain these results, the ArcGIS software was used to prepare the maps according to the number of units of each type of animal product or specimen in

each country of origin. It is important to mention that all incidents that possessed the information previously described were considered whether the incident took place inside or outside of the Amazon Region.

## Other Illegally Trafficked Species

In this section, only the incidents reporting secondary trafficked species apart from the target ones were selected and used. In this section, only incidents involving other trafficked species besides the five main species that were selected were used. In this case, a meticulous systematization had to be performed, as the presentation of the other trafficked species was categorized under different taxonomic levels. Therefore, it was decided to classify all these species under the taxonomic group class. The count of other trafficked species was considered at the incident level, where each of the secondary trafficked species were connected to the target ones. The quantities of other species trafficked were not considered, as these were linked to different product types and in this context, product type was not being analyzed. Three incidents had two target species, so it was decided to assign to each main species the same number of secondary species, according to the incident. In this way, each secondary species was connected to a main one, using a total of 201 connections in 46 incidents (where three are repeated).

This data was processed with the Gephi software to obtain the network graph.

## Modus Operandi

To analyze the *modus operandi* section on the five selected species, the following areas were considered, and the respective percentages were obtained for: transportation methods; place where the species were detected; and the detection methods used. All these percentages were counted at the incident level, according to the availability of information for each topic previously mentioned.

In a second subsection, the *modus operandi* was analyzed using the *Crime Scripting* tool. This analytical technique is used to understand the different *modus operandi* in crimes related to illicit drugs [14], child sex trafficking [15], terrorism [16] and wildlife-related crimes [17]. Through a process of dividing the crime into nine steps, it is possible to sort and understand the crime and thus collect as much detail as possible. It also serves as a prevention tool. The nine steps are:

1. ***Preparation***. The acquisition of the necessary tools, selecting of co-offenders, as well as agreeing on the selected locations to engage in offending.
2. ***Entry***. The entry into the selected location(s) where the crime is to be committed.
3. ***Precondition***. Crime is not committed at once. Some pre-conditional steps may be taken to enable the commission of crime, such as, for example, waiting at the location for place managers to leave or for the area to clear.
4. ***Instrumental precondition***. Identifying the suitable targets.
5. ***Instrumental initiation***. Closing-in

and approaching the target.

6. ***Instrumental actualization.*** Engaging with the target, such as either breaking into a home or a car or isolating the target for assault.
7. ***Doing***. Carrying out the intended crime, such as, for example, stealing from the burglarized home, stealing the car, or assaulting the victim.
8. ***Post condition***. This entails leaving the crime setting or escaping from the crime scene.
9. ***Exit***. The decisions that need to be made post crime commission, such as disposing of the stolen goods.

This method was developed for each of the five species using only the incident description column of the database, which corresponds to a total of 128 incidents.

## Drivers of Illegal Wildlife Trade

A descriptive statistical analysis was performed considering all incidents in possession of information on people sanctioned, people fined, the total value in United States dollars (USD) of the fines, and the estimated value (USD) of the types of products of each of the species. The statistical software IBM SPSS was used where the amount of data used for each section previously mentioned is reflected in the table below, under the N column, showing the amounts of data used for the analysis.

**Table 8.**

**Fines and Sanctions for the Five Species | 2009– 2020**

| | N. | Minimum | Maximum | Mean | Standard Deviation |
|---|---|---|---|---|---|
| Number of people sanctioned | 35 | 1 | 8 | 1.49 | 1.29 |
| Number of people fined | 12 | 1 | 3 | 1.25 | 0.62 |
| Total fine (USD) | 14 | 909.00 | 180,274.00 | 17,737.49 | 47,285.39 |
| Estimated value (USD) | 39 | 1.00 | 900.00 | 177.70 | 259.37 |
| Quantity | 331 | 1 | 185 | 6.10 | 17.46 |

As a second step, the fines (USD) per species and the values (USD) per product type of each species were specifically analyzed. To analyze them, the statistical software IBM SPSS was used, and box plots were generated.

For fines, the respective data (USD) and species were used. Specifically, the analysis was carried out at the incident level, since in some occurrences more than one quantity and type of products were observed for a species. In this sense, it was decided to conduct an analysis at the incident level to obtain more precise results than if they were analyzed at the species level. Below is the table obtained for the fines by species:

**Table 9.**

**Estimated Fines in United States dollars per Incident for the Five Species | 2009 - 2020**

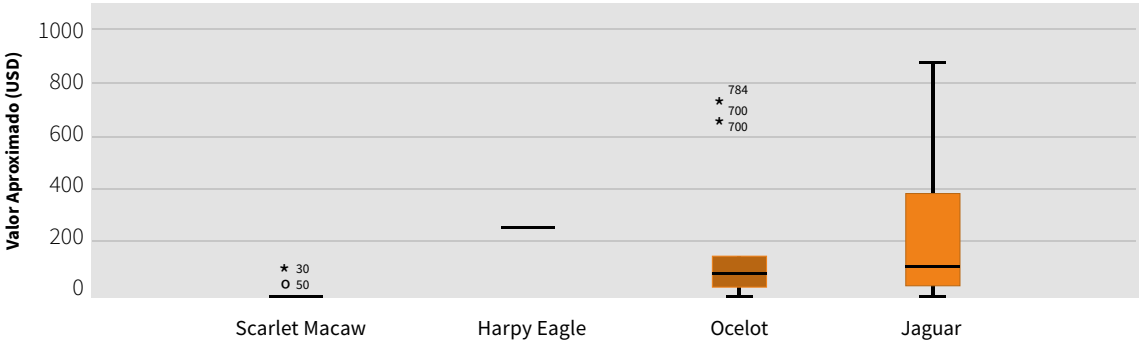
| | N. | Missing | Average (USD) | Median (USD) | Min (USD) | Max (USD) |
|---|---|---|---|---|---|---|
| Scarlet Macaw | 7 | 74 | 7,968.74 | 2,728.00 | 909.00 | 22,000.00 |
| Harpy Eagle | 1 | 14 | 909.00 | 909.00 | 909.00 | 909.00 |
| Ocelot | 2 | 86 | 2,245.00 | 2,245.00 | 2,182.00 | 2,308.00 |
| Margay Cat | 1 | 11 | 1,325.60 | 1,325.60 | 1,325.60 | 1,325.60 |
| Jaguar | 3 | 134 | 61,939.67 | 4,636.00 | 909.00 | 180,274.00 |

An analysis of the estimated value by species was conducted without considering the types of products (Box Plot of Estimated Value by Species). Additionally, the values by type of product for each species were analyzed, with the exception of the margay cat since it does not record data on estimated values by product type in the database.

The values per item (product type) were standardized according to the quantity (only in units and not kg) of product types. These data were analyzed at the species level since each species and type of product (regardless of quantity) had an estimated value. The aforementioned results are shown below:

**Figure 1.**

**Box Plot Diagram of Estimated Value by Species**



## Table 10.
## Estimated Values by Product Type by Species

| | N. | Missing | Mean ($) | Median ($) | Std. Deviation ($) | Range ($) | Min ($) | Max ($) | Q1 ($) | Q3 ($) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Scarlet Macaw** | | | | | | | | | | |
| FEA | 9 | 41 | 5.94 | 2.5 | 9.26 | 29 | 1 | 30 | 2 | 5.67 |
| JWL | 1 | 1 | 1.25 | 1.25 | --- | 0 | 1.25 | 1.25 | 1.25 | 1.25 |
| **Harpy Eagle** | | | | | | | | | | |
| FEA | 1 | 11 | 250 | 250 | --- | 0 | 250 | 250 | 250 | 250 |
| **Ocelot** | | | | | | | | | | |
| FOO | 1 | 1 | 50 | 50 | --- | 0 | 50 | 50 | 50 | 50 |
| LIV | 2 | 6 | 413.50 | 413.50 | 523.97 | 741 | 43 | 784 | 43 | --- |
| LPS | 1 | 3 | 100 | 100 | --- | 0 | 100 | 100 | 100 | 100 |
| SKI | 5 | 23 | 335.90 | 158.00 | 326.70 | 678.50 | 21.50 | 700 | 21.50 | 700 |
| SKO | 1 | 0 | 100 | 100 | --- | 0 | 100 | 100 | 100 | 100 |
| SKP | 2 | 6 | 3.82 | 3.82 | 4.70 | 6.64 | 0.50 | 7.15 | 0.50 | --- |
| WAT | 1 | 0 | 51.50 | 51.50 | --- | 0 | 51.50 | 51.50 | 51.50 | 51.50 |
| **Jaguar** | | | | | | | | | | |
| BOD | 1 | 11 | 14.11 | 14.11 | --- | 0 | 14.11 | 14.11 | 14.11 | 14.11 |
| CLA | 1 | 6 | 50 | 50 | --- | 0 | 50 | 50 | 50 | 50 |
| LIV | 1 | 18 | 800 | 800 | --- | 0 | 800 | 800 | 800 | 800 |
| SHO | 1 | 0 | 250 | 250 | --- | 0 | 250 | 250 | 250 | 250 |
| SKI | 5 | 23 | 370 | 300 | 345.69 | 850 | 50 | 900 | 75 | 700 |
| SKU | 1 | 6 | 100 | 100 | --- | 0 | 100 | 100 | 100 | 100 |
| TEE | 5 | 51 | 43 | 50 | 38.34 | 95 | 5 | 100 | 7.50 | 75 |

## Figure 2.
## Box Plot Diagram of Estimated Values by Product Type - Scarlet Macaw

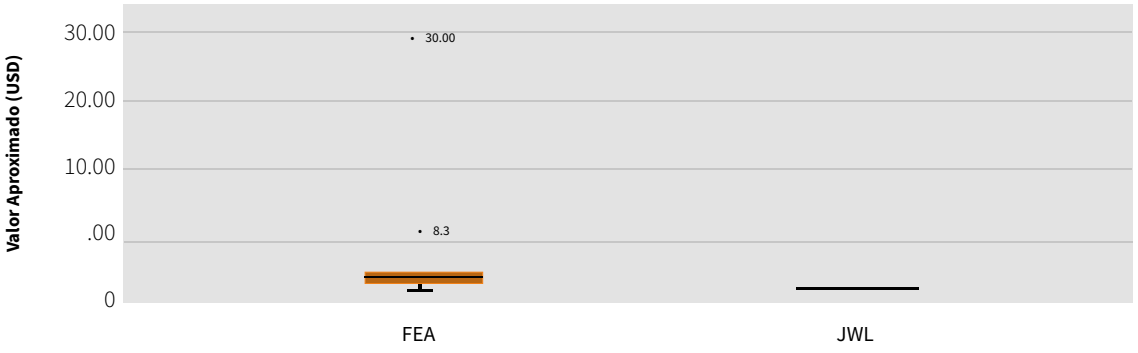


**Figure 3.**

**Box Plot Diagram of Estimated Values by Product Type - Harpy Eagle**

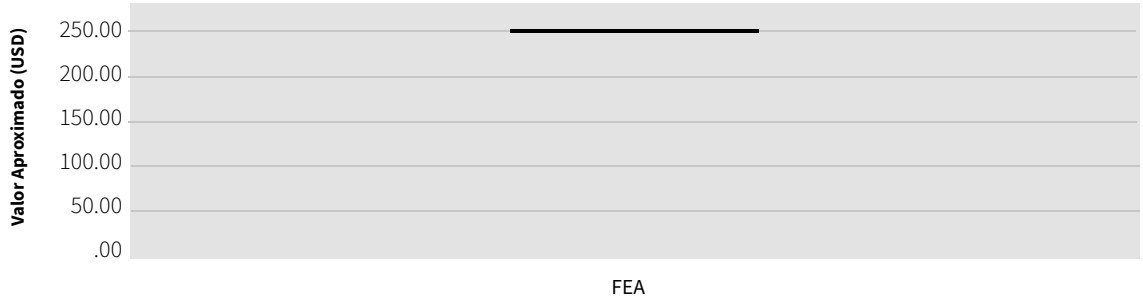



**Figure 4.**

**Box Plot Diagram of Estimated Values by Product Type - Ocelot**

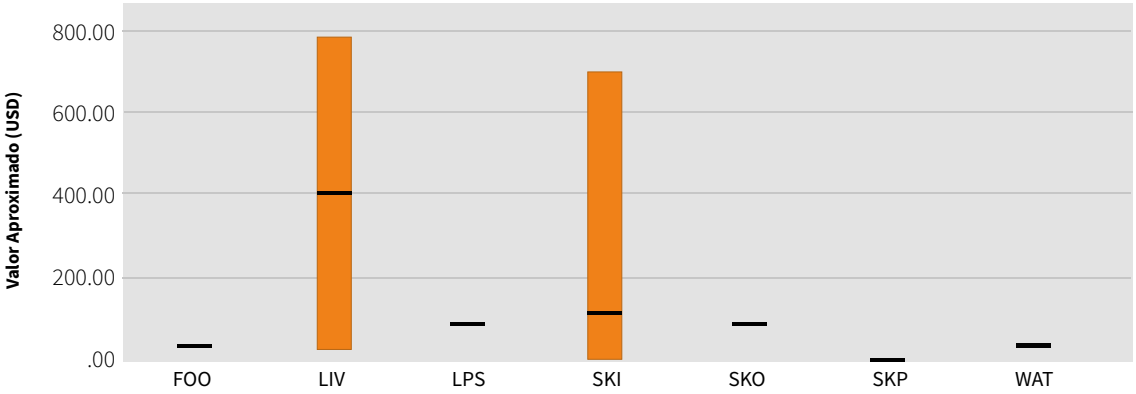
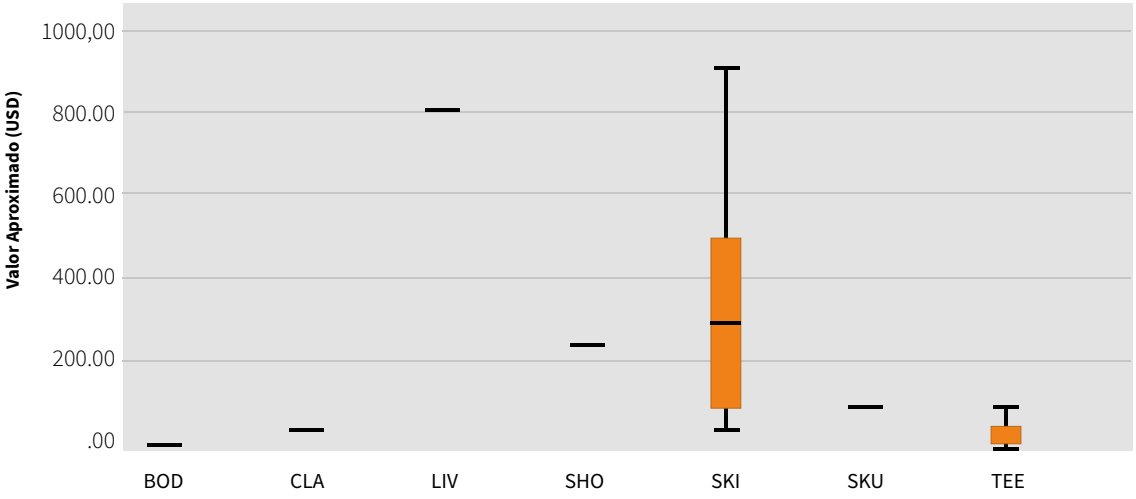



**Figure 5.**

**Box Plot Diagram of Estimated Values per Product Type - Jaguar**



## Potential Environmental and Social Impacts due to Illegal Wildlife Trade

Finally, in the section about possible environmental impacts, specific population data are usually required to conduct a more meticulous analysis of the possible environmental impacts resulting from population decrease of a given species caused by illegal trafficking. Due to the lack of annual population data for the five species, and therefore, of population abundance models, a general hypothetical analysis was conducted, which was complemented and supported by scientific bibliographic references of the possible environmental impacts of illegal trafficking of these species under study. Environmental impacts on both species populations and ecosystem services were analyzed. Additionally, the possible social impacts caused by the possible environmental impacts due to the loss of the populations of the selected species were analyzed.

# Reference


| | |
|---|---|
| [1] | Dulvy, N.K., Ellis, J.R., Goodwin, N.B., Grant, A., Reynolds, J.D. & Jennings, S. (2004). Methods of assessing extinction risk in marine fishes. *Fish Fisher*., 5, 255- 276. |
| [2] | Keith, D., Akçakaya, H.R., Butchart, S.H.M., et al. (2015). Temporal correlations in population trends: conservation implications from time-series analysis of diverse animal taxa. *Biol. Conserv.*, 192, 247- 257. |
| [3] | Le Breton, T.D., Zimmer, H.C., Gallagher, R.V. et al. (2019). Using IUCN criteria to perform rapid assessments of at-risk taxa. *Biodivers Conserv* 28, 863–883. https://doi.org/10.1007/s10531-019-01697-9. |
| [4] | Matsuda, H., Yahara, T. & Kaneko, Y. (2000). Extinction risk assessment of threatened species. *Popul Ecol* 42, 3–4. https://doi.org/10.1007/s101440050002 |
| [5] | Utermohlen, M. & Baine, P. (2017). Flying Under the Radar. C4ADS and USAID Reducing Opportunities for Unlawful Transport of Endangered Species (ROUTES). May 2017. |
| [6] | Gaston KJ, Fuller RA (2009). The sizes of species' geographic ranges. J Appl Ecol 46(1):1–9 |
| [7] | Payne JL, Finnegan S (2007). The effect of geographic range on extinction risk during background and mass extinction. Proc Natl Acad Sci 104(25):10506–10511 |
| [8] | Brook BW, Sodhi NS, Bradshaw CJ (2008). Synergies among extinction drivers under global change. Trends Ecol Evol 23:453–460 |
| [9] | IUCN Standards and Petitions Subcommittee (2017). Guidelines for Using the IUCN Red List Categories and Criteria, Version 13. Available online: http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf |
| [10] | Mace, G. M., Collar, N. J., Gaston, K. J., Hilton-Taylor, C., Akçakaya, H. R., Leader-Williams, N., Milner-Gulland, E. J., & Stuart, S. N. (2008). Quantification of extinction risk: IUCN's system for classifying threatened species. Conservation biology : the journal of the Society for Conservation Biology, 22(6), 1424–1442. https://doi.org/10.1111/j.1523-1739 |
| [11] | Frankham, R. (2005), Stress and adaptation in conservation genetics. Journal of Evolutionary Biology, 18: 750-755. https://doi.org/10.1111/j.1420-9101.2005.00885.x |
| [12] | Lande, R. (1993). Risks of Population Extinction from Demographic and Environmental Stochasticity and Random Catastrophes. The American Naturalist, 142(6), 911–927. http://www.jstor.org/stable/2462690 |
| [13] | UNODC, «Methodological Annex to the 2nd edition of the World Wildlife Crime Informe: Trafficking in protected species,» United Nations, New York, 2020. |
| [14] | Chiu, Y., Leclerc, B., Townsley, M, «Crime script of drug manufacturing in clandestine laboratories: Implications for prevention» British Journal of Criminology, 1, 355-374. https://doi.org/10.1093/bjc/azr005. 2011 |
| [15] | Brayley H., Cockbain, E., Laycock, G, «The value of crime scripting: Deconstructing internal child sex trafficking» A Journal of Policy and Practice, 5, 132-143. https://doig.org/10.1093/police/par024. 2011 |
| [16] | De Bie, J. L., De Poot, C. J., «Studying police files with grounded theory methods to understand Jihadist networks» Studies in Conflict & Terrorism, 39, 580-601. https://doi.org/10.1080/1057610X.2016.1142241. 2016 |
| [17] | Moreto, W. D., Clarke, R. V, «Script analysis of the transnational ilegal market in engangered species» In B. Leclerc & R. Wortley (Eds.), Cognition and crime: Offender decision making and script analyses (pp.209-220). Routledge. 2013 |

Amazon Regional Observatory (ARO)

**Address**
SEPN 510, Bloco A, 3º andar, Asa Norte
70.750-521 Brasilia-DF, Brasil
T: +55 61 3248 4119 / 4142
http://otca.org/en/ / https://oraotca.org/en/

CITES MODULE

ARO

AMAZON REGIONAL OBSERVATORY

ISBN: 978-85-61873-37-0

ARO
AMAZON REGIONAL OBSERVATORY

ACTO
Amazon Cooperation Treaty Organization

BIOAMAZON PROJECT
Conservation of species threatened by unsustainable trade

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by:
KFW

Bolivia Brazil Colombia Ecuador Guyana Peru Suriname Venezuela