CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Seventy-fourth meeting of the Standing Committee
Lyon (France), 7 - 11 March 2022

Species specific matters

JAGUARS (*PANTHERA ONCA*): REPORT OF THE SECRETARIAT

1. This document has been prepared by the Secretariat.

2. At its 18th meeting (CoP18, Geneva, 2019), the Conference of the Parties adopted Decisions 18.251 to 18.253 on *Jaguars* (Panthera onca) as follows:

18.251 Directed to the Secretariat

The Secretariat shall:

*a) subject to the availability of external funding, commission a study on illegal trade in jaguars (*Panthera onca*) to:*

i) map illegal trade in the jaguar throughout its range, including poaching, trade pathways and networks, and main markets that are driving this trade, and how it is connected to other wildlife trafficking activities in the region;

ii) analyse the uses of jaguar specimens, both within range states and in international markets, as well as the extent to which illegally-sourced jaguar products are entering international trade;

iii) analyse the modus operandi *associated with illegal trade in jaguar specimens and possible drivers of this activity; and*

iv) characterize the overall impact of illegal trade on jaguar populations throughout the species' range;

b) present the findings of the study referred to in Decision 18.251, paragraph a) to the Standing Committee together with any recommendations it may consider relevant; and

*c) issue a Notification seeking input from Parties, in particular exporting, re-exporting and importing countries affected by illegal trade in jaguar (*Panthera onca*) specimens, and relevant stakeholders to provide information to the Secretariat for the purposes of completing the study outlined in Decision 18.251, paragraph a).*

18.252 Directed to Parties, especially those that are range States of the jaguar (Panthera onca), and relevant stakeholders

*Parties, especially those that are range States of the jaguar (*Panthera onca*) and relevant stakeholders, are encouraged to take action to:*

a) support the preparation of the study referred to under paragraph a) of Decision 18.251;

b) respond to the Notification as described in paragraph c) of Decision 18.251;

*c) recognize the jaguar (*Panthera onca*) as the flagship species of its range countries so that the protection and conservation of the species and its habitat becomes a joint priority;*

*d) urgently adopt comprehensive legislation and enforcement controls aimed at eliminating the poaching of jaguars (*Panthera onca*) and illegal trade in their parts and derivatives, including online sales of specimens;*

*e) promote the design and implementation of conservation corridors between range countries of the jaguar (*Panthera onca*), strengthening cooperation mechanisms on a local, national and regional level in order to promote good conservation practices, channel investments to the conservation of the species, reduce the threats to the connectivity of its habitats, and strengthen the capacities of the main players involved;*

f) raise awareness about the importance of the jaguar, its role in the ecosystem and the threats it faces, including illegal trade;

*g) participate in conferences and workshops, among other events, in order to share experiences and knowledge about the priority issues identified to combat illegal trade in jaguars (*Panthera onca*); and*

h) consider making a voluntary contribution to conduct the study or implement its recommendations.

18.253 Directed to the Standing Committee

The Standing Committee shall consider the findings of the study referred to in Decision 18.251, paragraph a) as well as the report and recommendations of the Secretariat and make recommendations as appropriate until the 19th meeting of the Conference of the Parties.

Implementation of Decision 18.251: Study on Illegal Trade in Jaguars

3. The study on illegal trade in jaguars focused on the supply-side factors of this phenomenon. It was commissioned by the Secretariat in accordance with Decision 18.251, paragraph a) and is available in English and Spanish. The study, including an executive summary, is presented in Annex 2 to the present document. The Secretariat would like to thank the Government of Switzerland for the generous funding provided for conducting this activity.

4. In accordance with paragraph c) of Decision 18.251, the Secretariat issued Notification to the Parties No. 055/2020 of 2 September 2020, seeking relevant information from Parties for completing the study, in particular exporting, re-exporting and importing countries affected by illegal trade in jaguar specimens. The Secretariat received replies from national authorities from 15 jaguar range States [Argentina, Bolivia (Plurinational State of), Brazil, Colombia, Costa Rica, Ecuador, France (French Guiana), Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru and Suriname) and five non-range States (China, the Czech Republic, Serbia, the United States of America and Uruguay). Twenty-five non-governmental organizations (NGOs) working on jaguar conservation also replied to the Notification. The information provided by the Parties included official jaguar poaching and jaguar specimen seizure numbers and characteristics; reports of covert and overt investigations carried out by enforcement agencies or independent investigators; academic and non-academic research findings; national laws regarding jaguars or the illegal wildlife trade; national jaguar conservation action plans; and media reports covering jaguar poaching or illegal trade events.

5. In response to Notification to the Parties No. 055/2020, the Secretariat also received a few reports corresponding to undercover investigations conducted by journalists or NGOs. This information has been included in a separate confidential report with restricted circulation and intended for use by authorities responsible for wildlife law enforcement. The report has been made available to INTERPOL in November 2021. INTERPOL confirmed to the Secretariat that it would be drawn upon to inform INTERPOL's ongoing activities related to jaguar.

6. Notification No. 055/2020 was followed in November 2020, and March and November 2021 by three informal consultations via videoconference with range States and relevant stakeholders to exchange information; present the preliminary findings and solicit feedback; and share the final draft of the study, respectively. The Secretariat would like to thank the respondents to the Notification and all those who provided feedback on the first draft of the study and participated in these videoconferences.

7. Data for the study was also obtained from a wide range of sources, including the CITES annual trade report and annual illegal trade reports and the World WISE Database managed by the United Nations Office on Drugs and Crime (UNODC). Additionally, a non-systematic literature search was conducted, adding 247 academic, media and grey literature reports. Additional literature and seizure information was collected by consulting 32 national and international experts, and by accessing wildlife trade databases such as TRAFFIC's Wildlife Trade Portal and records shared by the Environmental Investigation Agency (EIA).

8. A key finding of the study refers to the biases and limitations in the data collected for the study and the absence of a mechanism to collect in a systematic manner the fragmented evidence available on the illegal trade in jaguars in all the range States. Taking into account the existing gaps in information, the restricted reports received as explained in paragraph 5) above and the biases identified, careful consideration of the results of the study is needed to reach conclusions.

9. The three main sources of information consulted in this study (i.e. the UNODC's World WISE Database, Parties' responses to Notification No. 055/2020, and the general literature, including inputs obtained from a stakeholder consultation) presented important differences in the reporting of the scale and trends of seizures, of poaching and illegal trade in jaguars, and of the dominant drivers of this illegal trade. These differences make it challenging to ascertain the level of illegal trade in jaguars, and which are the main international and domestic markets for jaguar specimens. The biases and limitations in the data stress the need for improved systems for the collection, standardization, systematization, analysis, and sharing of information on jaguar poaching and illegal trade.

10. Illegal trade in jaguars may be going undetected and unreported because of the lack of a proper monitoring system. Although the major threats for the jaguars are the loss of habitat and human-animal conflict, the study indicates that conditions for an acceleration of the illegal international trade in jaguar specimens are present. Given the presence in several jaguar ecosystems of criminal networks operating in illegal mining, illegal logging and illicit drugs, existing domestic trade could rapidly and easily be absorbed by those networks to supply the demand for jaguar products in international markets. Understanding the links between loss of habitat, human-animal conflict and the dynamic generated by globalisation is critical for the assessment of the illegal trade in jaguars.

11. In the following paragraphs, the Secretariat will highlight the key findings of the study. In Annex 1 to the present document, the Secretariat will recommend follow-up actions in draft decisions for the consideration of the Standing Committee. The key findings of the study are organized around the four mandated themes stated in paragraph a) of Decision 18.251: mapping illegal trade in jaguar specimens; uses of jaguar specimens; *modus operandi* and possible drivers; and impact on jaguar populations. The follow-up actions in Annex 1 are based on paragraphs c) through g) of Decision 18.252 and address the following issues:

    1. Legislation and enforcement [paragraph d) of Decision 18.252];

    2. A proposal to establish a monitoring system for the illegal killing of jaguars, associated trade in their parts and derivatives and other key aspects related to jaguar conservation [paragraph e)];

    3. Demand reduction and behaviour change strategies [paragraph f)];

    4. Cooperation, alignment and integration of CITES activities with other ongoing jaguar conservation efforts [paragraphs e) and g)];

    5. Outreach and communications [paragraph c)].

Key findings

12. The Secretariat would like to highlight the key findings of the study for the four mandated themes, as follows:

Mapping illegal trade in jaguar specimens

a) The study identifies four geographical routes of illegal trade in jaguar specimens: i) from range States to the United States of America, ii) from range States to the European Union, iii) from the United States to the European Union and vice versa, and iv) from range States to China (via Europe). The purposes and characteristics of demand for illegal jaguar body parts in these destination countries are currently largely unknown and could be a key area for further investigation.

b) Officially documented seizures of jaguar specimens have remained relatively stable over the past two decades at relatively low levels.

c) Brazil, Bolivia (Plurinational State of), Colombia, Mexico, Peru, Suriname and Venezuela encountered evidence of recent illegal international trade.

d) The United States of America reported the largest number of seizures and was the most frequent country of destination ahead of Germany and China.

e) The Plurinational State of Bolivia was the only country in the jaguar range with confirmed evidence implicating China as the country of destination of illegal jaguar body parts. The study found limited evidence from seizure data regarding illegal trade in jaguars destined to China.

Uses of jaguar specimens

f) The study explains the domestic and international uses of the jaguar. It highlights that more information is available about the domestic illegal trade in jaguar specimens, which seems to far exceed international illegal trade in the species at the moment. Illegal domestic demand for jaguar body parts occurs throughout the jaguar range. Almost all jaguar body parts, particularly jaguar teeth, skins, skulls and fat, have cultural, decorative, medicinal and other functional uses at the domestic level. The uses of jaguar body parts outside of range States are less understood due to the limiting factors explained in paragraphs 8 and 9 above.

Modus operandi *and possible drivers*

g) Illegal trade in jaguars is largely opportunistic and undertaken by marginalized individuals through networks of family, friends and acquaintances. However, there is evidence suggesting that the illegal trade is becoming more organized in some range States. Traffickers are also taking advantage of online platforms and social media to advertise products and to consolidate larger illegal trade networks and consumer bases. Additional research on both the opportunistic and organized aspects of the illegal trade, and their relative impacts, is necessary. The study concludes that strengthened law enforcement capabilities at the national and regional levels would help in combating poaching and illegal trade in jaguars.

h) Multiple drivers are associated with human-induced jaguar mortality, including domestic demand for jaguar body parts; traditional uses and local livelihoods; human-jaguar conflict; financial incentives from the high prices of jaguar specimen; tourism-related demand associated with trade in jaguar souvenirs; illegal pet trade and private wildlife collections; and illegal trophy hunting. There is limited empirical evidence on the relative importance of these drivers on jaguar populations when compared to each other, and to other threats facing jaguars, such as habitat loss. However, opportunistic poaching associated with domestic markets, traditional uses and local livelihoods, and human-jaguar conflict appear to be responsible for the greatest numbers of poached and illegally traded jaguars.

Impact on jaguar populations

i) Population viability models suggest that current illegal offtake levels may be affecting jaguar populations throughout the range. Small and fragmented populations are particularly at risk from poaching or illegal trade as are larger populations in countries with apparently larger and targeted illegal trade or with lower institutional and legal capacity to combat poaching and the illegal trade in jaguars.

j) A better understanding of the impacts of the domestic and international illegal trade on jaguar populations is needed, and would require a collaborative effort between governments, civil society, academia and communities to build a robust monitoring system for jaguar populations and their threats, including poaching and illegal trade, over time. A better understanding of the synergistic effects between poaching, illegal trade, and habitat loss is particularly crucial to unravel the actual status of jaguar populations across their range and their vulnerability to human-related offtake.

13. Overall, the study shows that illegal trade has once again become a concern for jaguar conservation. Beyond the official seizure data, the analysis of the general literature and information contained in the confidential report referred to in paragraph 5 above suggest that the conditions could lead to an increase in the illegal trade in jaguars.

14. In the light of the information gaps mentioned in paragraph 8 above, the Secretariat reminds Parties that data collected on any illegal domestic and international trade in jaguars is to be included in their annual illegal trade reports in accordance with Resolution Conf. 11.17 (Rev. CoP18) on *National reports* and Decision 18.76 on *Annual illegal trade reports*.

15. The Secretariat believes that early preventive action is needed now that the situation appears to deteriorate but early detection and interventions are still doable. There is a need for a concerted continental response from range States to coordinate and work together to ensure appropriate law enforcement, and to establish a long-term system for monitoring illegal killing of jaguars, associated illegal trade in their parts and derivatives and other key aspects related to jaguar conservation. Such a system could enhance information *inter alia* on the types and causes of jaguar deaths; incidences of human-jaguar conflict; demographic data (sex and age) of jaguars killed; location of deaths/incidences of conflict; jaguar population estimates; and demand for jaguar specimens. The Secretariat proposes developing a proposal to establish such a long-term monitoring system, to be discussed and refined at a meeting of the jaguar range States and other relevant stakeholders. If agreed, such a monitoring system could be anchored in a future species-specific resolution on jaguars.

16. In this regard, the Secretariat has conducted a brief review of Resolutions and Decisions on big cats to examine whether jaguar-related recommendations could be inserted in one of the existing Resolutions. The only two Resolutions currently referring to cats are Resolution Conf. 12.5 (Rev. CoP18) on *Conservation of and trade in tigers and other Appendix-I Asian big cat species* and Resolution Conf. 10.14 (Rev. CoP16) on *Quotas for leopard hunting trophies and skins for personal use*. Both of these Resolutions are very specific and in their actual structures do not appear to offer a coherent place to insert jaguar-related recommendations. In addition to the Decisions on jaguars referred to in paragraph 2 above, the Conference of the Parties adopted Decisions 18.244 to 18.250 on *African lions* (Panthera leo) *and the CITES Big Cats Task Force*; Decisions 18.165 to 18.170 on *Quotas for leopard* (Panthera pardus) *hunting trophies*; Decisions 18.254 to 18.255 on *Leopards* (Panthera pardus) *in Africa*; and Decisions18.56 to 18.61 on the *Joint CITES-CMS African Carnivores Initiative*. The Secretariat believes that the main challenge regarding a jaguar-specific resolution would be to align jaguar-related recommendations with other CoP Decisions on big cats, as appropriate. At the same time, it will be important to consider ways to integrate and promote cooperation with other ongoing efforts on jaguar conservation.

Cooperation with relevant partners

17. Cooperation is essential to achieve jaguar conservation goals and combat illegal killing of jaguars and illegal trade in their parts and derivatives. In this regard, the Secretariat has identified two major areas of cooperation. The first area involves the members of the International Consortium on Combating Wildlife Crime (ICCWC) to bring coordinated support to the national wildlife law enforcement agencies and to the subregional and regional networks that, on a daily basis, combat jaguar poaching. Cooperation with ICCWC is expected to assist range States in strengthening law enforcement measures and activities and international collaboration to address trafficking in jaguar specimens.

18. The Secretariat will liaise with ICCWC members to facilitate information exchange and engagement between counterparts in different countries affected by jaguar trafficking. This includes building upon existing initiatives involving ICCWC partners and inviting INTERPOL and the World Customs Organization (WCO) to include jaguars as key species of focus in any regional or global law enforcement operations they may initiate, based on available information and intelligence collected during the development of the study.

19. The second area involves the Secretariat of the Convention on Migratory Species and the Coordination Committee for the 2030 Jaguar Conservation Roadmap. The CITES Secretariat supports jaguar-related efforts under the Convention on Migratory Species (CMS) as part of its collaboration with the CMS

Secretariat under the CMS CITES Joint Work Programme. CMS, at its 13th meeting of the Conference of the Parties (CMS COP13, Gandhinagar, 2020), listed the jaguar on Appendices I and II. As a result of the jaguar listing under CMS Appendix I, all jaguar range States that are Parties to CMS [Argentina, Bolivia (Plurinational State of), Brazil, Costa Rica, Ecuador, France (French Guiana), Honduras, Panama, Paraguay, and Peru) are required to prohibit jaguar 'taking' (i.e. capture, killing, trade, persecution) in their territories and to endeavour to take measures to conserve jaguar habitats, enable their movement, and prevent any risk factors. The listing under CMS Appendix II encourages CMS Parties to conclude international agreements to conserve jaguars and their habitats across boundaries. Since February 2020, the proponents of the inclusion of the jaguar in the CMS Appendices [Argentina, Bolivia (Plurinational State of), Costa Rica, Paraguay, Peru and Uruguay) established a working group named "CMS Jaguar Sub-Group", tasked with advancing actions towards the implementation of the jaguar listing obligations under CMS. Furthermore, the CMS Secretariat has prepared a report which, based on interviews with CMS Focal Points from the Convention's jaguar range States, describes national and regional conservation priorities for the jaguar. These priorities can be classified as actions to control habitat threats and enforce the law; increase habitat protections; establish and manage protected productive landscapes; and increase research and monitoring. The report echoes the results of the CITES study on illegal trade in jaguars, highlighting *inter alia* the need for better monitoring of jaguar populations, poaching and illegal trade; and for more stringent law enforcement to combat these threats. The report also highlights the need to leverage synergies between CMS and CITES and with other existing initiatives focussed on jaguar conservation. The report is made available to the present meeting as an information document.

20. The CITES Secretariat is also cooperating with the Coordination Committee for the 2030 Jaguar Conservation Roadmap for the Americas, an initiative led by the United Nations Development Programme (UNDP), Panthera, the Wildlife Conservation Society (WCS) and the World Wide Fund for Nature (WWF), to secure and connect priority jaguar landscapes and stimulate sustainable development and human-jaguar coexistence across the jaguar range by the year 2030. The Coordination Committee of the initiative is, at the time of writing the present document, in the process of preparing a medium sized project (MSP) proposal to the Global Environment Facility (GEF) for funding under GEF7. The objective of the proposal is to facilitate the implementation of the Jaguar 2030 Roadmap through enhanced intergovernmental cooperation; mainstreaming the Roadmap in development policies and action; and establishing new financing mechanisms. The proposal focuses *inter alia* on establishing an official structure, preferably utilizing an existing intergovernmental platform, namely CMS and/or CITES, for jaguar conservation. The Secretariat will update the Committee orally on the status of the proposal.

Conclusions

21. In accordance with paragraph 3 (c) of Article XI of the Convention, the Parties shall review at the Conference of the Parties the progress made towards the restoration and conservation of the species included in Appendices, I, II and III. In the light of this mandate and the findings of the study on the illegal trade in jaguars, the Secretariat believes that a concerted response from CITES Parties is needed to address the multiple threats to jaguars, which go far beyond illegal trade at domestic and international levels and include key matters such as habitat loss, habitat fragmentation and human-animal conflict. Such a response should be integrated and aligned with the ongoing efforts to enhance jaguar conservation described in paragraphs 17 to 20 above.

22. As mentioned in paragraph 11 above, paragraphs c) though g) of Decision 18.252 identify the main actions that Parties could undertake to achieve their jaguar conservation goals. The Secretariat recommends that those actions be restated in a new set of CoP Decisions to be adopted at CoP19. As these actions have a permanent nature, Parties may consider the need to include them in a future species-specific resolution on jaguars or any other relevant resolution.

23. The Secretariat therefore recommends that the current Decisions on jaguars be revised and extended with a view to:

    a) encourage collaboration between governments, multilateral environmental agreements, intergovernmental organizations, non-governmental organizations and other stakeholders in the conservation of jaguars and to combat poaching and illegal trade in the species;

    b) convene a meeting of jaguar range States, in cooperation with partner organizations and stakeholders, to agree on collaborative activities and review options for an intergovernmental platform aimed at supporting jaguar conservation and combating poaching and illegal trade in jaguars through a continental action plan;

c) establish a long-term system for monitoring illegal killing of jaguars, associated illegal trade in their parts and derivatives, and other key aspects related to jaguar conservation, to be agreed by the range States and implemented as part of the international platform referred to in paragraph b) above; and

d) ensure that progress with the implementation of the draft decisions directed to Parties and stakeholders can be monitored.

Draft text for such decisions can be found in Annex 1 to the present document.

Recommendations

24. The Standing Committee is invited to:

a) note the main findings and conclusions of the jaguar study;

b) consider the draft decisions on illegal trade in jaguars contained in Annex 1, and provide comments to the Secretariat for onward submission to the 19th meeting of the Conference of the Parties;

c) request the Secretariat to further engage in consultations with jaguar range States, destination countries, the host of the next Conference of the Parties, the Chair of the Animals Committee, the Secretariat of the Convention on Migratory Species and the Coordination Committee for the 2030 Jaguar Conservation Roadmap for the Americas led by the United Nations Development Programme, and other relevant stakeholders with the aim of maintaining the momentum. Consultations should focus in particular on the development of a proposal to establish a long-term system for monitoring illegal killing of jaguars, associated illegal trade in their parts and derivatives, and other key aspects related to jaguar conservation, and on the purposes and characteristics of demand for illegal jaguar body parts in destination countries which constitute a key area for further investigation.

DRAFT DECISIONS OF THE CONFERENCE OF THE PARTIES

19.AA Directed to Parties, especially those that are range States of the jaguar, and relevant stakeholders

Parties, especially those that are range States of the jaguar, and relevant stakeholders are encouraged to:

a) urgently adopt comprehensive legislation and enforcement controls aimed at eliminating the poaching of jaguars and illegal trade in their parts and derivatives, including online sales of specimens;

b) include the jaguar as a priority species to be targeted as part of enforcement operations, measures and controls deployed to respond to and address wildlife crime;

c) ensure that any illegal domestic and international trade in jaguar specimens detected are included in annual illegal trade reports in accordance with Resolution Conf. 11.17 (Rev. CoP18) on *National reports*;

d) promote the design and implementation of conservation corridors between range countries of the jaguar, strengthening cooperation mechanisms on a local, national and regional level in order to promote good conservation practices; channel investments to the conservation of the species; reduce the threats to the connectivity of its habitats; and strengthen the capacities of the main players involved, including by mobilizing Global Environment Facility (GEF) funding for this purpose;

e) support the development of the proposal for establishing a long-term system for monitoring illegal killing of jaguars, associated illegal trade in their part and derivatives and other key aspects related to jaguar conservation;

f) raise awareness about the importance of the jaguar and its protection status, its role in the ecosystem and the threats it faces, including illegal trade;

g) participate in the meeting of jaguar range States referred to in paragraph c) of Decision 19.BB, and other events as appropriate, in order to share experiences and knowledge about the priority issues identified to combat illegal trade in jaguars;

h) recognize the jaguar as the flagship species of its range countries so that the protection and conservation of the species and its habitat becomes a joint priority; and

i) provide information to the Secretariat on the measures and activities they undertook to implement the actions directed to them under this Decision.

Directed to the Secretariat

19.BB The Secretariat shall, subject to the availability of external funding, cooperate with the Secretariat of the Convention on Migratory Species and the Coordination Committee for the 2030 Jaguar Conservation Roadmap for the Americas led by the United Nations Development Programme with a view to:

a) integrate and align conservation efforts, demand reduction strategies, behaviour change and livelihood alternatives to prevent illegal killing of jaguars and associated illegal trade in jaguar part and derivatives;

b) develop a proposal for establishing a long-term system for monitoring illegal killing of jaguars, associated illegal trade in their part and derivatives and other key aspects related to jaguar conservation;

c) convene a meeting of jaguar range States to:

i) identify opportunities for cross-border collaboration and regional cooperation, joint actions, and resource mobilisation aimed at reducing habitat loss, habitat fragmentation and human-animal conflict, and preventing the illegal killing of and illegal trade in jaguars;

ii) review options for an intergovernmental platform aimed to support jaguar conservation and combating the poaching and illegal trade in jaguars through a continental action plan;

iii) review the Secretariat's proposal for establishing a long-term system for monitoring poaching and other key aspects related to jaguar conservation, referred to under paragraph b) of the present Decision; and

iv) promote the reporting of any illegal domestic and international trade in jaguar specimens in CITES annual illegal trade reports in accordance with Resolution Conf. 11.17 (Rev. CoP18) on *National reports*; and

19.CC The Secretariat shall,

a) support Parties in their implementation of Decision 19.AA; and

b) report on the implementation of the Decisions 19.AA and 19.BB to the Standing Committee and the Conference of the Parties with recommendations as appropriate.

19.DD Directed to the Standing Committee

The Standing Committee shall review the implementation of Decision 19.BB as well as the report and recommendations of the Secretariat under Decision 19.CC and make recommendations to range States, transit and destination countries, as appropriate.

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA (CITES)

THE ILLEGAL TRADE IN JAGUARS (PANTHERA ONCA)

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DISCLAIMER

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National Authorities:

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Wildlife Conservation Department, National Forestry and Grassland Administration of P.R. China
Ministerio de Ambiente y Desarrollo Sostenible de Colombia
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Czech Environmental Inspectorate
Ministerio del Ambiente y Agua de Ecuador
Office Français de la Biodiversité – French Guiana
Consejo Nacional de Áreas Protegidas de Guatemala
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Secretaria de Medio Ambiente y Recursos Naturales de México
Ministerio del Ambiente y los Recursos Naturales de Nicaragua
Ministerio de Ambiente de Panamá
Ministerio de Agricultura y Riego de Perú, Servicio Nacional Forestal y de Fauna Silvestre
Ministerio del Ambiente y Desarrollo Sostenible de Paraguay
Serbia Ministry of Environmental Protection
Suriname Forest Service
Ministerio de Ambiente de Uruguay
United States Department of the Interior Fish and Wildlife Service

Intergovernmental Bodies:

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Secretariat
United Nations Office on Drugs and Crime
Convention on Migratory Species

International and National Organizations and Academia:

Conservation International (CI) Suriname
Earth League International (ELI)
Environmental Investigation Agency (EIA)
Freeland – Brazil
Fundación Moisés Bertoni
Fundación Yaguará Panama
Guyra Paraguay
Human Initiative to Save Animals (HISA)
IUCN Cat Specialist Group
IUCN Netherlands

Itaipú Binacional
Panthera
Primero Conservation
Rede Nacional de Combate ao Trafico de Animais Silvestres
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EXECUTIVE SUMMARY

In recent years, the illegal trade in jaguars has become a growing concern for the conservation of the species, following academic, media and NGO reports suggesting the emergence of international trafficking to China, and the existence of thriving domestic markets for jaguar body parts across the range. Jaguar hunting, and the use and trade in their body parts have a long history in Latin America, tied to the traditional practices and belief systems of past and current indigenous and mixed-ethnicity societies. Through most of the 19th and 20th centuries, jaguars were hunted at commercial scales for their skins, to supply the fashion industry in Europe and North America. The listing of jaguars under Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1975, which prohibits international commercial trade, along with the establishment of national hunting laws, successfully put an end to commercial-scale international trade in jaguars. Since then, illegal trade became a minor concern amidst a larger set of threats facing the species, including habitat loss, fragmentation and increased conflict with humans over real or perceived livestock depredation. After nearly five decades since their listing under CITES, recent findings suggesting that the demand for jaguar body parts is expanding to other continents, particularly Asia, have raised concerns about the potential impacts of illegal trade on the survival of the species. These concerns have translated into conservation actions at the national and international level, including CITES Decisions 18.251 to18.253 on Jaguars (*Panthera onca*), adopted at the 18th meeting of the Conference of the Parties to CITES held in Geneva, Switzerland in August 2019. In accordance with Decision 18.251, the CITES Secretariat commissioned this study to:

i) map illegal trade in the jaguar throughout its range, including poaching, trade pathways and networks, and main markets that are driving this trade, and how it is connected to other wildlife trafficking activities in the region;

ii) analyse the uses of jaguar specimens, both within range states and in international markets, as well as the extent to which illegally-sourced jaguar products are entering international trade;

iii) analyse the modus operandi associated with illegal trade in jaguar specimens and possible drivers of this activity; and

iv) characterize the overall impact of illegal trade on jaguar populations throughout the species' range.

Jaguars have a wide distribution, from the South-western United States to northern Argentina, covering 8.42 million km² across 19 countries (de la Torre et al., 2017). Despite being a highly charismatic species, their population status is poorly understood and their abundance estimates vary greatly. Jaguars are classified as Near Threatened under the IUCN Red List. However, most jaguar subpopulations with the exception of the Amazon subpopulation (including parts of the Pantanal, Yungas and Chaco biomes), have been assessed as Endangered or Critically Endangered due to their small size, isolation and deficient protection (de la Torre et al., 2017). The threats to jaguars are increasing, with deforestation growing inside and outside protected areas, driven by the expansion of agriculture, cattle ranching, and human infrastructure. These threats have synergistic impacts on jaguars by increasing access of poachers into remote areas, reducing prey abundances, and increasing the risk of human-jaguar conflict. Targeted poaching of jaguars for the illegal commercial trade adds to the pressures that jaguars are already facing, and may affect the survival of sub-populations that are at critical risk of extinction. Understanding the scale, characteristics and impacts of this growing threat to jaguars is essential to design and implement Decision 18.252, in particular paragraphs c) to g) as well as other effective jaguar conservation actions.

In accordance with Decision 18.252 Parties, especially those that are range States of the jaguar (*Panthera onca*) and relevant stakeholders, are encouraged to take action to:

a) support the preparation of the study referred to under paragraph a) of Decision 18.251;

b) respond to the Notification as described in paragraph c) of Decision 18.251;

c) recognize the jaguar (*Panthera onca*) as the flagship species of its range countries so that the protection and conservation of the species and its habitat becomes a joint priority;

d) urgently adopt comprehensive legislation and enforcement controls aimed at eliminating the poaching of jaguars (*Panthera onca*) and illegal trade in their parts and derivatives, including online sales of specimens;

e) promote the design and implementation of conservation corridors between range countries of the jaguar (*Panthera onca*), strengthening cooperation mechanisms on a local, national and regional level in order to promote good conservation practices, channel investments to the conservation of the species, reduce the threats to the connectivity of its habitats, and strengthen the capacities of the main players involved;

f) raise awareness about the importance of the jaguar, its role in the ecosystem and the threats it faces, including illegal trade;

g) participate in conferences and workshops, among other events, in order to share experiences and knowledge about the priority issues identified to combat illegal trade in jaguars (*Panthera onca*); and

h) consider making a voluntary contribution to conduct the study or implement its recommendations.

Data collection, sources of information and methods

In an effort to provide a comprehensive understanding of the illegal trade in jaguars, a wide range of sources were consulted for this study. Official seizures were obtained from the CITES annual reports on illegal trade that are managed by United Nations Office on Drugs and Crime's (UNODC) and included in the UNODC's World WISE Database. Also included in this Database are seizures from other global wildlife trade databases, including the United States Fish and Wildlife Service's Law Enforcement Management Information System (LEMIS), the European Union's Trade in Wildlife Information Exchange Database (EU-TWIX) and reports submitted independently by national governments. A different set of official seizure data was obtained from governments' responses to CITES Notification 055/2020, which requested inputs for this study. Twenty governments, including 15 range States (Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, France (French Guiana), Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname) and five non-range countries (China, Czech Republic, Serbia, United States[1] and Uruguay), responded to this request and in addition to official seizures, provided official reports on the characteristics of the illegal trade in jaguars in their territories (uses, drivers, modus operandi, impacts). Additionally, a non-systematic literature search was conducted, adding 247 academic, media and grey literature reports. To these other literary and seizure inputs were added, collected by consulting 32 national and international experts and key

[1] While the south-western tip of the United States is part of the jaguar range, the country has not been assessed as a jaguar range State in this report, due to the small and transient nature of its jaguar population. However, data on the illegal trade in jaguars in the United States is provided in Chapter 4.

informants, and by gaining access to other wildlife trade databases like TRAFFIC's Wildlife Trade Portal, and to records shared by the Environmental Investigation Agency (EIA).

Information challenges and limitations

A key conclusion of this study refers to the multiple challenges and limitations of the evidence that is currently available on the illegal trade in jaguars. The three main sources of information consulted in this study (i.e. the UNODC's World WISE Database, government responses to CITES Notification 055/2020, and the general literature, including inputs obtained from a stakeholder consultation), presented important differences (and inconsistencies) in the scale and trends of seizures and reports of poaching an illegal trade in jaguars, and in the markets of illegally traded jaguar specimens. These differences make it particularly challenging to ascertain, based on the limitations of the fragmented information currently available, whether the illegal trade in jaguars is in fact increasing or not, and which are the main international and domestic markets for jaguar body parts. Moreover, all sources revealed serious biases in reporting on the illegal trade in jaguars and poaching of the species across countries, and a concerning lack of information and examples of effective law enforcement. These limitations stress the need for improved information systems on jaguar poaching and illegal trade, and of stronger law enforcement capabilities. These evidence deficiencies also mean that stakeholders involved in addressing the illegal trade in jaguars should consider a wide range of sources together to obtain a more comprehensive understanding of this threat, and be particularly cautious about the implications of data fragmentation, biases and limitations.

Poaching and the illegal trade in jaguar specimens

Information on the quantities, characteristics and trends in seizures and reports of poaching and illegal trade in jaguar specimens was analysed and presented separately for each of the three main types of information sources consulted in this study: 1) the UNODC's World WISE Database; 2) government responses to CITES Notification 055/2020 requesting inputs for this study, and 3) the general literature, including inputs obtained from a stakeholder consultation and other wildlife trade databases. This separation was meant to account for the sources' differences in origins, methods and formality (official vs. unofficial accounts).

The UNODC's World WISE Database contained 120 official jaguar seizure records for the years 2000 to 2018, involving 179 specimens (or 101 whole organism equivalents). Seizures remained relatively stable in the past two decades, averaging 6.3 incidents per year, with the highest number of incidents occurring in 2017. The country with the largest number of seizures was the United States (49.2%) followed by Mexico (18.3%), Germany (5.8%), France (5%), Guatemala (4.2%) and French Guiana (2.5%). All remaining countries had less than two seizures in that period. The most commonly seized jaguar body parts were skins (23%), teeth (21%) and live animals (12%). Peru was the most frequent source of shipments of jaguar body parts (19 out of 78 records containing country of source - 24.4%), followed by Bolivia (14.1%) and Mexico (11.5%). The United States was the most frequent shipment destination (58 out of 76 records containing destination country – 76.3%), followed by Germany (5.3%) and China (4%).

Based on jaguar poaching and seizure data submitted by 15 range, and five non-range State authorities in response to CITES Notification 055/2020, which requested inputs for this study, the number of illegally traded jaguar body parts varied greatly by country, from one specimen reported by Serbia, to 603 specimens reported by Bolivia. Most countries presented their seizures either as isolated incidents or in an aggregated format, not permitting the evaluation of temporal trends. Out of those with yearly reports (Bolivia, Peru, Suriname and the United States), the number of seizure events and specimens seized varied by country and time-frame, presenting both increasing and decreasing trends. The most

frequently seized specimens were jaguar teeth (totalling 689 teeth across reporting countries), followed by live animals (103), skins (65), and undefined jaguar products (63). The number of reported jaguars poached in jaguar range countries (not necessarily due to illegal trade) ranged from one in Mexico to 369 in Panama, with varying time frames. A few countries, including Argentina, Brazil, Mexico, Paraguay, Peru, Suriname, Czech Republic and Serbia presented evidence either suggesting or confirming the existence of international illegal trade in jaguar body parts (seizures made at airports or border areas). Overall, there was limited evidence of international illegal trade in jaguars provided by countries, and the number of seizures for those with confirmed evidence were low.

Based on poaching records and seizures reported in the academic, media and grey literature, or shared by relevant stakeholders, countries with higher reported annual jaguar mortalities caused by poaching were Bolivia (with an average of 61 reported jaguars poached per year), Brazil (54), Venezuela (31), Suriname (17) and Panama (12). With regards to seizures of jaguar specimens, Bolivia also had the highest annual averages of seized or illegally traded specimens (30, whole organism equivalents), followed by China (12), Belize (9), Suriname (6), Peru (6) and Venezuela (6). Teeth were the most commonly traded items according to the literature. Jaguar poaching and illegal trading events (including supply, trade, or demand/possession) occurred in most Latin American countries and often overlapped geographically, but illegal trade incidents were not limited to the jaguar range and also took place in urban areas, ports of exit or smuggling routes. Since the literature sources analysed in this study were collected in a purposive way and they varied in type, methods, quality and detection effort, it is not appropriate to draw conclusions about trends in reporting on jaguar poaching or illegal trade in jaguars, nor in the number of reported incidents or specimens seized from this dataset. However, systematic searches of jaguar seizures in the literature (such as Morcatty et al., 2020), have detected increasing trends in jaguar seizures and in the number of illegally traded specimens over the past decade, and the sources analysed herein point to a similar conclusion.

Uses of jaguar specimens

Jaguars are part of the identity, artistic traditions, myths, and rituals of multiple past and modern indigenous societies in Latin America, and they also have a cultural significance for mixed ethnicity communities that coexist with the species throughout its range. Cultural and social motivations behind the use of jaguar body parts, along with other commercial and non-commercial drivers of use at the domestic level, have not received substantial research attention, but they are widespread and can occur at potentially unsustainable scales. Based on all sources consulted in this study (including government information and literature reports), almost all jaguar body parts are used at the domestic level. Jaguar teeth are the most sought-after jaguar part, being used as jewellery, symbolizing bravery and status, or as spiritual amulets. Skins are used to make traditional costumes or decorative wall-hangings, as well as a wide range of garments and accessories such as purses, hats, belts and wallets. Skins, along with skulls and taxidermies serve as trophies, or as proof of effective predator control. Jaguar cubs are kept as pets or sold as attractions for private wildlife collections. Small items like claws, tails, paws, and organs have a range of decorative and medicinal uses. Jaguar fat was reported as a key item by several studies, being used to allegedly treat a wide range of illnesses, from rheumatism to asthma, and also serving as a natural protection against crop raiding animals. Jaguar meat was also consumed for nutritional and cultural reasons.

There is less robust evidence about the uses of jaguar body parts outside of jaguar range States. This remains one of the most significant gaps in current knowledge about the illegal trade in jaguars. The uses of jaguar body parts in the United States, Germany and other European countries, which had jaguar seizures reported in the UNODC's World WISE Database, have received limited attention and remain largely unknown. While media coverage of international illegal trade in jaguars has assumed that jaguar body parts are being used in Traditional Chinese Medicine as substitutes of tiger body parts,

this hypothesis currently holds little weight due to the overall limited seizure evidence of 'jaguar paste' (boiled bones and flesh) or other jaguar-based medicinal products in China or elsewhere. On the other hand, existing seizures of China-bound jaguar teeth suggest that these items may be used in China as status-granting collectibles, as part of the Chinese subculture of 'Wenwan'. However, there is limited research or confirmed information on the uses of jaguar body parts in China. Jaguar body parts are also used to make jewellery, handcrafts and souvenirs for domestic and foreign tourists. Jaguar body parts' prices vary widely, suggesting large information asymmetries in the market.

Drivers behind the illegal trade in jaguars

The consulted sources provided key insights into the multiple drivers of the illegal trade in jaguars. Domestic markets and traditional uses of jaguar body parts make jaguars a target of demand, while forest dependent livelihoods like hunting for wild meat, logging, non-timber forest product collection and mining, increase the odds of accessing jaguars. Negative attitudes towards jaguars caused by fear, and by the emotional and financial losses imposed by livestock-depredating jaguars, lead to retaliatory killing and to a compensating usage of the resulting body parts. These incidents are ever more frequent due to encroachment of jaguar habitat by cattle ranching and the advancement of the agricultural frontier. Financial incentives from the high prices of jaguar body parts make jaguar poaching an attractive complement to rural livelihoods, and also attract people with higher incomes. Demand from foreign markets has emerged as yet another driver of poaching and the illegal trade in jaguars. Jaguar body parts have been smuggled to the United States and Europe, but the characteristics of demand in these countries is not well understood. Seizures of jaguar body parts in countries like Bolivia and Suriname, which were either destined to China or illegally traded by jaguar traffickers of Chinese descent (unconfirmed nationality and migratory status) have highlighted the role of Chinese wildlife markets in the demand for jaguar body parts. Tourism, involving both domestic and foreign tourists, offers another opportunity to sell jaguar crafts and souvenirs to a wealthier consumer base. For countries like Peru, Mexico, Guatemala and Belize, tourism is a well-evidenced driver, with multiple jaguar body part seizures made at crafts shops, restaurants, hotels and facilities located at tourist destinations. The desire to possess live jaguars as household pets or as part of private wildlife collections, as tourist attractions or for personal enjoyment, was identified as another driver of the illegal trade in jaguars. Trophy hunting, though banned throughout the jaguar range, was a less common but persisting driver of jaguar poaching and of the illegal possession and trade in jaguar specimens.

There is limited empirical evidence on the relative importance of these divers on jaguar populations when compared to each other, and to other threats facing jaguars, such as habitat loss. However, both opportunistic poaching associated with domestic markets, traditional uses and local livelihoods, and human-jaguar conflict appear to be responsible for the greatest numbers of poached and illegally traded jaguars. Addressing these drivers can become a challenge in the presence of several contextual and institutional factors that facilitate the illegal trade in jaguars in range countries, including a lack of financial and human resources for adequate enforcement, corruption, legal deficiencies, and lack of awareness about jaguars and their legal status. Tackling poaching and the illegal trade in jaguars will require multifaceted strategies that focus on the multiple drivers and enabling factors behind these threats, from increased enforcement to detect and stop transboundary illegal trade, to awareness building, behaviour-change, human-wildlife conflict mitigation approaches and habitat conservation.

Modus operandi

Jaguar poaching occurs opportunistically, when poachers encounter jaguars by chance, or intentionally, when poachers explicitly search for jaguars following attacks on livestock, for illegal sport hunting activities or for trafficking purposes. Targeted poaching also occurs by order of traffickers or

consumers. Jaguar poaching orders are delivered in different ways, including through the use of wide-audience communication channels like radio broadcasts or paper flyers posted in public spaces, social media, or by directly approaching potential suppliers and establishing illegal trading networks. The methods used to kill jaguars resemble those used during the commercial hunting of spotted cats for the fur trade until the 1970's, including specialized active and passive capture tactics and luring methods. Poached jaguars, or their body parts, are transported by roads or rivers from the forest to villages, tanneries, saddleries, shops and other facilities for processing. They are then sold at customer-facing outlets (e.g. craft markets in tourist areas, jewellery shops), online platforms/social media, or through networks of trusted friends or family. Seizures involving illegal international trafficking of jaguar body parts have confirmed the use of postal services and commercial air travel to smuggle jaguar body parts. While the involvement of organized criminal groups in the illegal trade in jaguars has been suggested, and few countries like Bolivia and Brazil present more structured trade networks, verified examples suggest that the illegal trade in jaguars remains a largely opportunistic and informal activity. More research and enforcement efforts by range State authorities are needed to confirm the involvement of organized criminal groups and the degree to which the illegal trade in jaguars may be linked to other crimes.

Impacts of the illegal trade in jaguars

Despite its great adaptability and strength, the jaguar is a slow reproducing species that occurs at naturally low densities, and which is sensitive to humans. The impacts of poaching and the illegal trade in jaguars will depend on each country's specific jaguar conservation status (and vulnerability to other threats such as habitat loss), levels and characteristics of poaching and illegal trade, and ability to respond to these threats given their current legal systems and institutional capacities. Based on an exploratory qualitative analysis of these factors, it was possible to determine that jaguar populations that are small, fragmented, and highly endangered by other threats such as habitat loss (such as those outside of the Amazon biome, in much of Central America and the southern extreme of the jaguar range - Argentina and Paraguay), are unlikely to withstand even small, opportunistic levels of poaching or illegal trade over the long term. Similarly, jaguar populations in countries with apparently larger and more organized, illegal international trade in jaguar body parts (e.g. Bolivia, Brazil, Mexico, Peru, Suriname and Venezuela, within the limitations of the evidence), may also be particularly vulnerable. Finally, countries that lack jaguar-specific regulations, national jaguar conservation action plans, governmental and non-governmental actions against jaguar poaching and illegal trade, or incentives for coexistence with jaguars (e.g. several countries in Central America and northern South America, within the limitations of the evidence), may also experience population declines from these threats. Improved enforcement, data collection and systematization, as well as collaborative, well-designed, long-term jaguar population and threat monitoring systems, are urgently needed to better understand, estimate and actually measure the impacts of illegal offtake across range countries.

International cooperation, regional events and global initiatives

Owing to their multiple threats and to growing concerns about the impacts of illegal international commercial trade in jaguar body parts, jaguars have received considerable attention in recent years. Multiple initiatives have been set in motion at the regional and international level to address the illegal trade in jaguars and conserve the species in the long-term. In addition to the CITES mandate on jaguars, other biodiversity related agreements (such as the Convention on Migratory Species) have recently adopted decisions on jaguars and international cooperation. Range-wide government commitments were also made in the past years (e.g. the Lima Declaration and the Alliance Against the Illegal Trade in Jaguars), as well as agreements between governments and other relevant stakeholders (Jaguar 2030 Conservation Roadmap for the Americas). At the national level, range State authorities together with

civil society partners and local communities are also working to address jaguar poaching and the illegal trade in jaguars on the ground. There is a vast potential to find and build synergies to implement Decision 18.252 and other jaguar conservation activities between the relevant multilateral environmental agreements, diplomatic efforts and conservation initiatives, aimed at consolidating a unified strategy for jaguar conservation. Party-driven efforts to harmonize and build participatory and inclusive events, coalitions and platforms between actors at the international, regional, national and community-based level could contribute towards leveraging funding opportunities, political will and collective actions to combat the illegal trade in jaguars.

Summary of key findings

- The characteristics of the illegal trade in jaguars depend strongly on the sources of information consulted. Current data limitations make it particularly challenging to ascertain whether the illegal trade in jaguars is in fact increasing or not, and which are the main international and domestic markets for jaguar body parts. Moreover, there are serious biases in reporting on poaching and the illegal trade in jaguars, and an overall lack of enforcement action and information (e.g. on prosecutions). Consequently, improved systems for the collection, standardization, systematization, analysis, reporting, and sharing of information on jaguar poaching and illegal trade, and efforts to strengthen law enforcement capabilities are urgently needed (Chapter 4).

- Jaguar seizures found in the UNODC's World WISE Database from 2000 to 2018, which includes data from multiple official sources, are low in number and have remained relatively stable over the past two decades. Based on this source, the United States was the country with the largest number of jaguar seizures, and it was also the most frequent country of destination. The seizures in the World WISE Database suggests a possible role of the United States, and to a lesser degree countries of the European Union, in the illegal trade in jaguars, a matter that has not received previous attention when compared to the considerably larger focus placed on China (Chapter 4).

- Seizures contained in the UNODC's World WISE Database suggest that there are at least four geographical routes of repeated instances (more than twice since 2000) of international illegal trade in jaguar body parts, which include: 1) from range countries to the United States (53 records), 2) from range countries to the European Union (8 records), 3) from the United States to the European Union and vice versa (5 records), and 4) from range countries to China, by way of Europe (3 records). These routes do not necessarily represent the actual scale or characteristics of the international illegal trade in jaguar body parts (Chapter 4).

- While most range States acted as source or destination countries of illegal international shipments of jaguar specimens at one point in time (in the studied timeframe) according to the UNODC's World WISE Database, only Bolivia, Brazil, Colombia, Mexico, Peru, Suriname and Venezuela had confirmed government evidence of recent international trade (seizures made at airports or ports since 2010, or those categorized as source or destination countries for more than two jaguar body parts seized since 2010 according to the UNODC's World WISE Database). Except for Bolivia, Mexico and Peru, the evidence of international trade was limited and suggested low scales. Overall, the governments of jaguar range countries held very limited information about poaching and illegal trade in jaguars within their territories (Chapter 4).

- Despite being often referred to as an important international market for jaguar body parts by the media, there is limited seizure evidence on the illegal trade in jaguars in China. Based on the UNODC's World WISE Database, China was identified as the destination country in just three out of 76 (4%) seizures involving illegal international trade in jaguar body parts, involving less than 10 specimens. Another three seizures were found in the literature from 2010 to 2020 involving a total of 137 teeth,

13 claws and 1.49 kg of bones (unofficial). The remaining evidence of demand for jaguars in China found by this study is based on seizures or investigations conducted outside of China, which implicated China either as a destination country of illegally traded jaguar body parts[2], or as the alleged nationality of jaguar traffickers (Chapters 4 and 6).

- Examples provided by governments and found in the literature highlighted the importance of domestic illegal trade in jaguars. With the exception of Bolivia, nearly all the information presented by governments involved domestic demand for jaguar specimens, and so did 70% of literature reports. Illegal domestic demand for jaguar body parts occurs throughout the jaguar range. Almost all jaguar body parts, particularly jaguar teeth, skins, skulls and fat, have cultural, decorative, medicinal and other functional uses at the domestic level. The uses of jaguar body parts outside of range States are less understood. Teeth are most likely used as status-granting collectibles and souvenirs, while products like jaguar paste have alleged medicinal properties, though their use in China remains unconfirmed (Chapters 4, 5 and 6).

- The illegal trade in jaguar body parts has been associated with multiple drivers, including domestic demand for jaguar body parts and local livelihoods, human-jaguar conflict, financial incentives, foreign demand for jaguar body parts, tourism-related demand, the illegal pet trade and private wildlife collections, and illegal trophy hunting. There are multiple institutional factors that enable the domestic illegal trade in jaguars, including but not limited to a lack of financial and human resources to enforce the law, inadequacies in the law, challenges in coordination between national and sub-national government agencies and non-governmental actors, corruption, and a lack of state presence in vulnerable areas (Chapter 6).

- The illegal trade in jaguars is largely opportunistic, and accordingly, its modus operandi often involves relatively simple techniques to obtain and sell jaguar body parts, with much of the illegal trade occurring through networks of family, friends and acquaintances, and overtly in villages and rural towns. However, traffickers are also taking advantage of online platforms to advertise products and to consolidate larger illegal trade networks and consumer bases. Additionally, the existence of more organized groups with links to other crimes, and of illegal trophy hunting operations, has been identified in some countries such as Argentina, Bolivia and Brazil and deserve further attention and enforcement responses (Chapter 7).

- Population viability models suggest that current offtake levels associated with opportunistic poaching and retaliatory killing may already be affecting jaguar populations throughout the range. Populations that are small and fragmented are particularly at risk from even small, opportunistic levels of poaching or illegal trade over the long term. So are jaguar populations in countries with apparently larger and targeted illegal trade, and those in countries with a lower institutional and legal capacity to address poaching and the illegal trade in jaguars. More efforts are needed to monitor the impacts of these threats (Chapter 8).

- Many international, regional and national initiatives to monitor jaguar populations, improve and connect their habitats, and tackle mortalities from human-jaguar conflict and the illegal trade in jaguars are currently underway, promising to advance jaguar conservation in the next decade. These efforts should be better integrated with each other, carried through and increased, supported by all levels of society, particularly range State governments (Chapter 9). National level initiatives directly influencing jaguar conservation on the ground must also be supported and scaled-up.

[2] References to China as a destination country of jaguar body parts were based on the destination addresses in confiscated packages containing jaguar body parts, or as the destination country of travellers smuggling jaguar body parts.

1. INTRODUCTION

The jaguar (*Panthera onca*), Latin America's largest felid, is protected from commercial international trade, being included in CITES Appendix I since 1975. Widely known for its golden rosetted fur and powerful bite, it is a cultural symbol of many past and present Amerindian civilizations and one of the region's most iconic species. Humans have persecuted the jaguar and commercialized its body parts throughout their history with the species. Jaguar poaching, along with habitat loss and fragmentation, have reduced jaguar populations in the past, and continue to make the future of jaguars uncertain. In an effort to protect the long-term viability of jaguars and maintain their important ecological role across Latin American ecosystems, several jaguar conservation efforts have been underway over the past decades, led by intergovernmental agencies, jaguar range States, the civil society, and local communities. On top of the multiple challenges to protect the large landscapes that are required by jaguars, and to reach a sustainable coexistence between humans and this predator, illegal trade in jaguar body parts to supply domestic and international markets is becoming a growing concern for the conservation of the species. If unaddressed, the illegal trade in jaguars could severely impact jaguar populations and move the species closer to extinction, as it already has with other big cats, especially the tiger (*Panthera tigris*). However, there is hope for the prevention of this grim scenario. Multiple actors have joined forces to recognize and raise awareness about the seriousness of the illegal trade in jaguars, and to strengthen the protection of jaguars and the habitats where they live. This document, commissioned by the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), in accordance with Decision 18.251 adopted at the 18th meeting of the Conference of the Parties to the Convention (CoP18, Geneva, 2019), is a manifestation of such efforts, and a contribution towards coordinated action against the illegal trade in jaguars.

1.1 Historical perspective on the trade in jaguars

The use and trade of jaguar body parts has a long history in the Americas. Evidence of large-distance maritime and terrestrial trade in, and large-scale use of, jaguars and their body parts by ancient indigenous rulers and merchants dates back to the Early Ceramic Age (500 BCE – CE 1,000), with the finding of culturally modified jaguar body parts and accumulated jaguar remains found at centres of state power and trade routes in Classic Mesoamerica (Cooke and Sanchez-Herrera, 1997; Laffoon et al., 2014; Sugiyama et al., 2018). More recently in the early to mid-20th century, jaguars became a target of the large-scale commercial trade in spotted felid skins for the fashion industry in North America and Europe. This period, which became colloquially known as the "jaguar craze" or the "tigrilladas" in Spanish, had a severe impact on jaguar populations. An estimated 180,000 jaguars were killed during that period in the Brazilian Amazon alone (Antunes et al., 2016), a number that surpasses even the least conservative estimates of the global jaguar population in present times (170,000, Jędrzejewski et al., 2018). All throughout the jaguar range, trade in jaguar skins became an important source of income for rural households and a livelihood alternative to the oppressive labour systems associated with the rubber and Brazil nut (*Bertholletia excelsa*) collection industries (Beltrán, 2013; Matos and Caldarelli, 2017; Smith, 1976).

International trade subsided gradually after jaguars became listed under Appendix I of CITES in 1975, receiving maximum protection against commercial international trade. Around that same decade, most jaguar range countries also imposed legal prohibitions against jaguar killing, consumption and trade at the domestic level (see Appendix for national laws). However, the persecution of jaguars continued due to non-commercial reasons. Retaliation in response to livestock or other domestic animal depredation by jaguars, fear of attacks on humans, and subsistence or traditional hunting, remained and continue to be pervasive drivers of jaguar poaching and illegal trade at the domestic level (Castano-Uribe et al., 2016). Jaguar poaching adds to the intensifying threats that jaguars already face from habitat loss and fragmentation, which have extirpated them from over 50% of their historic

range, and diminished their area of occupancy by 20-25% over the past 20 years (Quigley et al., 2017). Combined, these threats have merited the classification of the jaguar as a Near Threatened species by the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species, a status held since 1996. Despite this global classification, which is largely based on the abundant and well connected Amazonian jaguar subpopulation, most range states have assigned a more conservative national conservation status to jaguars, considering them either Vulnerable, Endangered or Critically Endangered (see Appendix for country-specific conservation status).

1.2 Resumed attention to the illegal trade in jaguars

Four decades after the halt of large-scale trade in jaguars imposed through the listing of the species under CITES Appendix I, international illegal commercial trade in jaguars has once again emerged as a concern for jaguar conservation (Morcatty et al., 2020; Verheij, 2019a), threatening to revert the progress made to recover jaguar populations from past overexploitation (Reuter et al., 2018). While current evidence on the illegal trade in jaguars characterizes it as a complex issue, driven by a wide range of factors including domestic demand and human-jaguar conflict, to date, a focus has been placed on a number of examples of jaguar body part smuggling to China, and demand from traffickers and consumers from the Chinese diaspora within range countries. These examples were first brought forward by an investigation led by the World Wide Fund for Nature (WWF) in Suriname in 2010, which identified the trafficking of jaguar teeth and meat by individuals of the Chinese diaspora in the country (Kerman and Felix, 2010). Further investigative work carried out by other non-governmental organizations revealed that networks of jaguar traffickers of Chinese descent (of unconfirmed nationality or migratory status), in partnership with local poachers in Suriname, were involved in the illegal production of 'jaguar paste', a substance made with jaguar meat and bones for alleged medicinal purposes (Lemieux and Bruschi, 2019). The production of jaguar paste and the existence of jaguar traffickers of Chinese, Korean, Brazilian, Guyanese, Cuban and Indian descent (of unconfirmed nationality or migratory status), was recognized by Surinamese authorities citing those investigations (Suriname Forest Service, *in litt.*, 2021). Other examples emerged from Bolivia, where at least 22 out of 55 (40%) jaguar trafficking incidents from 2013 to 2020 described by the Wildlife Conservation Society (WCS-Bolivia), with the acknowledgement from Bolivian authorities, had China as the country of destination of jaguar body parts (WCS-Bolivia, *in litt.*, 2021). Three jaguar traffickers of Chinese descent (of unconfirmed nationality or migratory status), who were found to be in illegal possession of jaguar body parts in Bolivia received penal sentences in that country (MMAyA, *in litt.*, 2021). A scientific study on jaguar seizures available online later found that almost one-fifth of seizures of jaguar body parts in the region from 2012 to 2018 had links to China[3] (Morcatty et al., 2020).

While these examples of jaguar body part smuggling to China and demand from traffickers and consumers of Chinese descent have captured significant attention from authorities, the media, and conservation organizations, there are still several gaps in the understanding of the role of this new market. A paucity of confirmed jaguar seizures in China raise questions about the existence of a formal market for jaguar body parts in the country and the scale of the demand. Similarly, while it has been assumed that jaguar body parts may be substituting those of the scarcer wild tiger (*Panthera tigris*) in Traditional Chinese Medicine (TCM) or in the market for luxury wildlife collectibles (Nunez and Aliaga-Rossel, 2017; Villalva and Moracho, 2019), to date, there are no studies on consumer motivations or on the uses of jaguar body parts in China. Moreover, there have been numerous claims about an association between the increase in jaguar seizures and the growth of Chinese-led infrastructure development in Latin America (Morcatty et al., 2020; Verheij, 2019a), and the involvement of criminal

[3] "These links could refer to Chinese nationals or descendants living in or visiting southern America being implicated in the seizure; confiscated packages with China reported as the end destination; explicit mentioning of China as the destination of the confiscated goods; or seizures made in China with explicit links to southern American countries" (Morcatty et al., 2020).

organizations linked to broader Chinese mafias (Crosta et al., *in litt.*, 2020), but these claims have not been verified by criminal proceedings or official government reports. Aside from Bolivia and Suriname, where authorities recognize the existence of, and have prosecuted, jaguar traffickers of Chinese-descent (of unconfirmed nationality or migratory status), the involvement of these actors in the illegal jaguar trade in other jaguar range countries remains anecdotal. More research and enforcement actions are needed to understand the scale and characteristics of this demand for jaguars and their body parts.

Beyond the role of Chinese wildlife markets, the resumed attention to the illegal trade in jaguars has started to shed light on important, but often overlooked, interacting drivers of illegal trade in jaguars. New evidence is pointing to the importance of domestic markets and local traditional uses of jaguar body parts, as well as to the links between the illegal trade in jaguars, wild meat hunting and human-jaguar conflict (Arias et al., 2021a, 2020; SERFOR and WCS, 2019). Similarly, other jaguar body parts' traffickers and consumers have been identified, such as urban elites and tourists of diverse nationalities (Arias et al., 2021b; Braczkowski et al., 2019). With regards to international markets, wildlife seizure databases like the World WISE Database from the United Nations Office on Drugs and Crime (UNODC) (described in Chapter 4.1), provide insights on the importance of other countries like the United States and members of the European Union as transit or destination countries of illegally traded jaguar body parts. Though rarely mentioned in the news headlines, these drivers, which are discussed in detail in this report (Chapter 6), hold much of the weight of current evidence on jaguar poaching and on the illegal trade in jaguars in Latin America. Consequently, addressing the illegal trade in jaguars will require multifaceted strategies that focus on the multiple drivers of this threat, from increased enforcement to detect and stop criminal groups and transboundary illegal trade, to awareness building, behaviour-change and human-wildlife conflict mitigation approaches.

1.3 CITES Decisions on the illegal trade in jaguars

As a result of increasing concern over examples of international trade in jaguars, several efforts have been launched to gain a better understanding of this phenomenon, increase awareness, improve the institutional capacity of wildlife authorities, and to foster collaboration with relevant stakeholders to address it. Among the concrete measures adopted at the international level to tackle the problem are CITES Decisions 18.251-18.253 on Jaguars (*Panthera onca*), adopted at the 18th meeting of the Conference of the Parties to CITES held in Geneva, Switzerland in August 2019 (CITES, 2019a). These Decisions encourage CITES Parties and relevant stakeholders to implement four main actions: recognize and raise awareness about the jaguar as a flagship species so that its protection becomes a priority; adopt legislation and enforcement controls to eliminate jaguar poaching and illegal trade; promote jaguar habitat conservation; and share experiences and knowledge to combat illegal trade.

Additionally, Decision 18.251 directs the CITES Secretariat to commission a study on the illegal trade in jaguars, with inputs from Parties and relevant stakeholders. The aims of this study are to assist CITES Parties in understanding the uses of jaguar specimens, the illegal trade patterns involving jaguar specimens (e.g., pathways, networks, main markets, drivers, modalities, links with other criminal activities), as well as the impacts of illegal trade throughout the species' range. This gained knowledge will ultimately assist CITES Parties, and particularly range States, to adopt evidence-based measures aimed at eliminating jaguar poaching and illegal trade. The study will also inform the implementation of Decisions 18.245 and 18.246 on African lions (*Panthera leo*) and the CITES Big Cats Task Force.

Before and during the study's elaboration, range State authorities, CITES representatives and relevant international organizations and third sector stakeholders came together online and offline to discuss the progress of the report and to share information on the illegal trade in jaguars, further strengthening the consolidation of this regional group on the illegal trade in jaguars. The study and its

findings, reviewed by all stakeholders, will be discussed at the CITES Standing Committee meeting, tentatively scheduled for the first half of 2022. The Standing Committee will consider the findings of the study, as well as the associated report and recommendations of the CITES Secretariat, and make recommendations as appropriate to the 19th meeting of the Conference of the Parties. The study was made possible thanks to the financial support provided by the Government of Switzerland.

2. BACKGROUND ON JAGUARS

2.1 Biology, habitat, distribution and population size

The jaguar is the largest native felid in the Americas, and third largest in the world, following the tiger and lion. Female and male jaguars weigh an average of 65 to 105 kg, and have an average body length of 1.30 and 1.56 meters, respectively, with floodplain populations being significantly larger than forest populations (Hoogesteijn and Mondolfi, 1996; Macdonald and Loveridge, 2010). The home range sizes of jaguars also vary by sex, location, and seasonality, from 5-321 km^2 for females and 20-1359 km^2 for males, being larger in the dry season (CMS, 2020; Quigley et al., 2017). The home ranges of males and females sometimes overlap, depending on seasonal resource dispersion and breeding opportunities, which occur throughout the year (Macdonald and Loveridge, 2010). Like other large body size obligate carnivores, jaguars have slow reproductive rates to account for the long post-weaning period that is required for juveniles to learn how to hunt large body sized prey (Bekoff et al., 1984). Jaguar gestation lasts 91-101 days (in captivity), normally resulting in two cubs (up to four), which remain with females for up to two years (Quigley et al., 2017; Sunquist and Sunquist, 2002).

The jaguar is a highly adaptable species, existing in a variety of different environments and habitat types. Among these are tropical moist lowland forests, tropical moist montane forests, tropical dry forests, deserts, herbaceous lowland grasslands, herbaceous montane grasslands, temperate forests and mangroves (Sanderson et al., 2002). They are generally associated with lower elevations (below 3000 meters above sea level) and with the presence of water bodies (Sunquist and Sunquist, 2002). Within these ecosystems, jaguars play an ecological role as top predators, controlling the populations of 111 wild species that conform their diet, from 1 kg rabbits to 130 kg tapirs (Hayward et al., 2016).

Jaguars are distributed from south-western United States to northern Argentina (Fig. 1), having an estimated range of 8.42 million km^2 across 19 countries (de la Torre et al., 2017). They are locally extinct in El Salvador and Uruguay, and now occupy only 51% of their historic range (Quigley et al., 2017). Morphological and genetic analyses have demonstrated extensive gene flow between populations in Central and South America, and there is currently no support for the existence of discrete jaguar subspecies (Eizirik et al., 2001; Ruiz-García et al., 2012). However, four incompletely separated phylogeographic groups (Mexico and Guatemala, southern Central America, northern South America, and South America south of the Amazon River) and 34 geographically independent subpopulations have been identified (de la Torre et al., 2017; Eizirik et al., 2001). Loss in genetic diversity and the start of genetic differentiation has been recently detected in Mesoamerican populations, particularly in north-eastern Mexico and Honduras, due to increasingly fragmented habitats (Wultsch et al., 2016a). The “Amazon subpopulation”, including parts of the Pantanal, Yungas and Chaco biomes, is the largest geographically interconnected population, covering 79% of the species global range (de la Torre et al., 2017). While most subpopulations occur within national boundaries, there are at least 10 jaguar subpopulations that cross international borders (Mexican Pacific; Selva Maya; Maya Mountains; Honduran Mosquitia; Indio Maíz-Tortuguero; Talamanca; biogeographic Choco; Sierra Nevada de Santa Marta; Amazonia; Iguazu), requiring regional conservation efforts (CMS, 2020). Due to the species’ large range and dispersal needs, and to the importance of maintaining its genetic connectivity throughout its range and particularly across transboundary areas, jaguars have recently been included in Appendices I and II of the Convention on Migratory Species (CMS, 2020).

There are two main studies estimating the size of jaguar populations across their range, but their predictions vary widely. De la Torre et al., (2017) estimated the global population of jaguars to be around 64,000 individuals (lower estimate 62,156; upper estimate 66,030), of which the vast majority (89%) correspond to the Amazon subpopulation (including parts of the Pantanal, Yungas and Chaco

biomes). On the other hand, Jędrzejewski et al., (2018) estimated this number to be at 173,000 individuals (lower estimate 138,000; upper estimate 208,000). These differences illustrate the challenges of robustly assessing the population of such an elusive predator, and have important implications for decision-making to conserve the species.

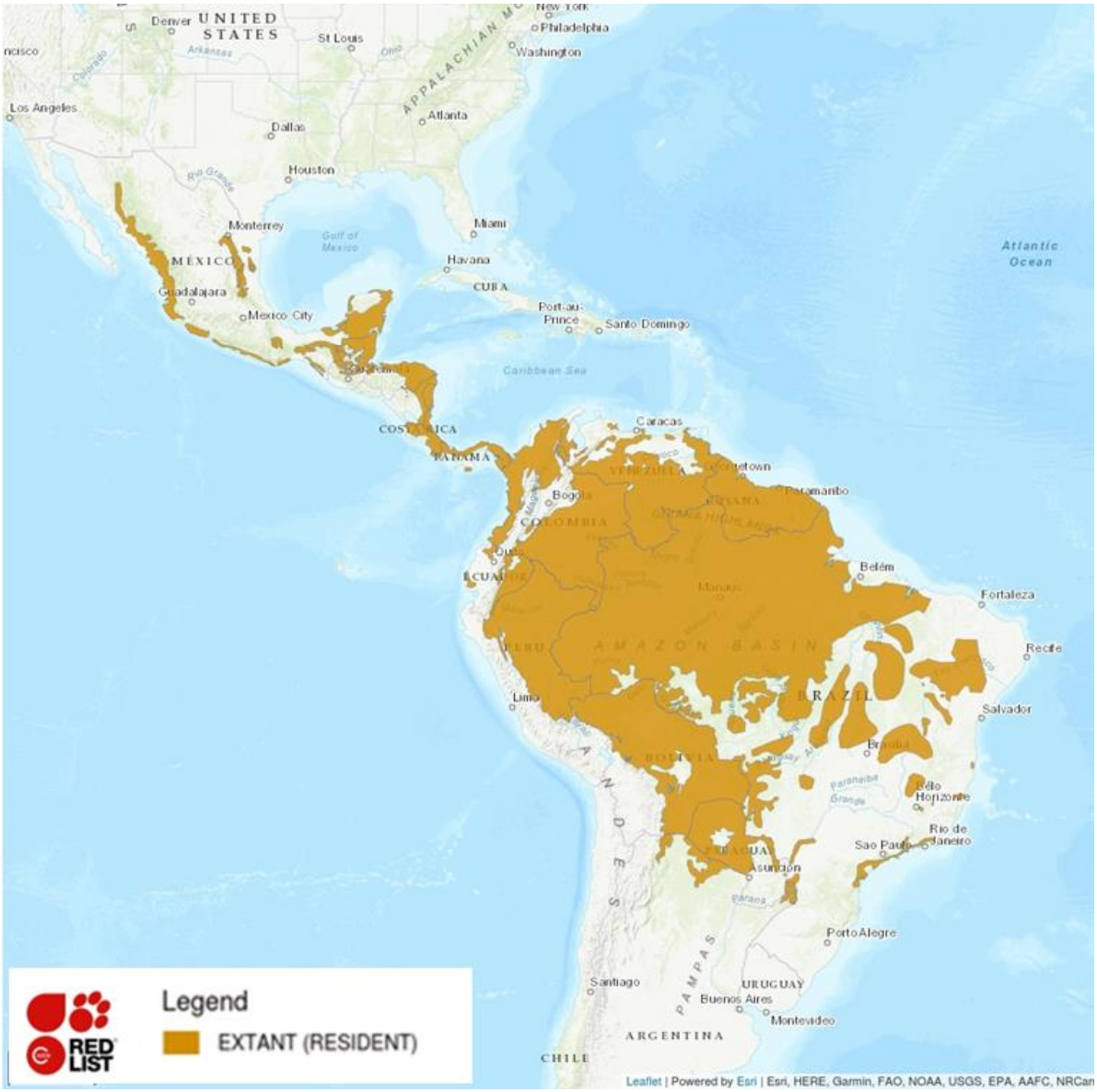

Figure 1. IUCN Red List jaguar range map (Quigley et al., 2017). Compiled by Panthera (2017).

2.2 Conservation status and threats

Jaguars are listed in CITES Appendix I and classified as Near Threatened under the IUCN Red List, due to "a suspected 20-25% decline over the past three generations (21 years) in area of occupancy, extent of occurrence, and habitat quality, along with actual or potential levels of exploitation" (Quigley et al., 2017). This global classification, which is the second lowest risk category in the IUCN Red List after Least Concern, is largely based on the jaguar's wide range and its large Amazon subpopulation (including parts of the Pantanal, Yungas and Chaco biomes, de la Torre et al., 2017). However, the species' conservation status varies geographically and most range countries have assigned their own conservation classification to their national populations. Aside from the Amazon subpopulation, all other subpopulations have been assessed as Endangered or Critically Endangered due to their small

size, isolation and deficient protection (de la Torre et al., 2017). Populations that have been assessed to have a low chance of survival include those in the Atlantic Tropical Forest and Cerrado biomes of Brazil; the Chaco in northern Argentina; the Gran Sabana of northern Brazil, Venezuela and Guyana; the coastal dry forest in Venezuela; Central America and Mexico (Quigley et al., 2017; Sanderson et al., 2002). This greater level of risk affecting most subpopulations is also reflected in most of the jaguar range countries' national threatened species listings, and in the decision to list jaguars in both Appendix I and Appendix II of the Convention on Migratory Species (CMS, 2020; de la Torre et al., 2017). Due to this, it is possible that the global conservation status of jaguars under the IUCN may be changed to Vulnerable in the near future (Quigley et al., 2017).

One of the main threats to jaguars is habitat loss caused by deforestation. The key drivers of deforestation across the jaguar range include agricultural expansion, mainly for the production of commodities like soybean or palm oil, cattle ranching and the growth of human settlements and infrastructure (Quigley et al., 2017). Only 38% of the jaguar range lies within protected areas (de la Torre et al., 2017). This percentage drops to 34% and 11% for core jaguar habitat (jaguar conservation units, JCUs) and the corridors between them, respectively (Olsoy et al., 2016). JCUs and their corridors lost an area of 37,780 km^2 (0.93%), and 45,979 km^2 (4.43%) of forest, respectively, from 2000-2012, and showed increasing annual deforestation and fragmentation rates (Olsoy et al., 2016). Deforestation has taken place in both protected and unprotected sections of JCUs and corridors, and was found to be particularly concerning in those located in Central America and the southern edge of the jaguar range in Brazil (Olsoy et al., 2016). Even though jaguars may sometimes occupy or cross agricultural landscapes as they search for prey, mates or territory, their presence is strongly linked to the existence of conserved forests and wetland patches (Boron et al., 2020; Jędrzejewski et al., 2017a), which are crucial to sustaining jaguar populations into the future, particularly as the demand for land will increase following growing human population trends.

Linked to deforestation and climate change, the frequency and severity of forest fires has also been increasing across the jaguar range, posing a direct threat to the species. For example, large-scale forest fires in Brazil and Bolivia in 2019 left an estimated 500 jaguars displaced or deceased in a matter of a few months (Panthera, 2019), while Argentina declared "environmental emergency" after forest fires decimated remaining jaguar habitat in the Yungas biome in 2020 (SAIJ, 2020). Also linked with deforestation and habitat loss is the threat of illegal hunting or poaching. Deforestation and road building facilitate access for humans into remote jaguar habitats, where they can not only kill jaguars, but also severely degrade their ecosystems by removing jaguar prey, turning core jaguar areas into sinks (Espinosa-Andrade, 2012; Romero-Muñoz et al., 2019). Competition between jaguars and humans over prey can be intense, and overhunting can force jaguars to stray into human settlements or productive areas in search for prey, increasing the chances of livestock and domestic animal depredation, and with it the frequency of retaliatory jaguar killing (Foster et al., 2016; Romero-Muñoz et al., 2019).

Poaching by humans is a growing threat for jaguars. One of the leading drivers of jaguar poaching is related to the negative consequences of human-jaguar coexistence, namely, conflict over livestock depredation, which is widespread throughout the jaguar range (Castano-Uribe et al., 2016). Jaguars can predate on a wide range of livestock and domestic animals, from chicken to adult cattle and dogs (Inskip and Zimmermann, 2009; Steinberg, 2016). Livestock depredation by jaguars can cause substantial economic losses (Tortato et al., 2017), and lead to negative attitudes towards jaguars and intolerance to their presence by local communities (Knox et al., 2019; Marchini and Macdonald, 2012). Even though jaguar attacks on humans are rare, they occasionally do happen (Iserson and Francis, 2015; Neto et al., 2011) and fear of these attacks is sometimes enough to justify the persecution and elimination of jaguars (Jędrzejewski et al., 2017b). Jaguar poaching for illegal use and trade, which is

the topic of this study, is another driver of jaguar persecution and a threat of growing importance to jaguars (Morcatty et al., 2020; Quigley et al., 2017).

2.3 Socio-ecological and political importance

As a top predator in the Americas, the jaguar plays an important ecological role in regulating prey populations. Its removal from ecosystems can lead to trophic cascade effects, such as the increase in herbivores and the risk of disease transmission by ungulates; and the increase in meso-predators, and the decline in abundance of birds, small mammals and reptiles (Jorge et al., 2013). Jaguars are commonly referred to as an umbrella species because their habitats and corridors substantially overlap with those of other co-occurring mammals, such that their conservation can indirectly benefit a wide array of threatened species (Thornton et al., 2016). Thus, conserving jaguars and their habitats can be seen as an important strategy to maintain well-functioning, biodiverse and healthy ecosystems, and it can support global health objectives under the "One Health" approach, which recognizes the strong interconnection between people, animals, plants, and their shared environment (Mackenzie and Jeggo, 2019). This is particularly important in the aftermath of the Covid-19 pandemic, which highlighted the close relationship between the unsustainable and unregulated wildlife trade, the loss of biodiversity and ecosystem balance, and the emergence of zoonotic diseases that risk human lives.

Beyond their important role in maintaining balanced and healthy ecosystems, jaguars have a strong social and cultural value, being embedded in the identity and cultural symbolism of several past and present indigenous and non-indigenous societies in Latin America (Rabinowitz, 2014; Saunders, 1998).This socio-cultural value, along with its charisma as a threatened big cat, makes the jaguar a key flagship species in the region, or in other words, a high-profile species that is able to draw society's support and attention towards conservation and a wider range of environmental and social causes (Rabinowitz, 2014; Verissimo et al., 2011). In recent years, the jaguar has become a symbol for the preservation of cultural heritage and traditional livelihoods, the conservation of biodiversity, and the fight against climate change, and its conservation is aligned with the achievement of the Aichi Biodiversity Targets, the Sustainable Development Goals, and the Paris Agreement on Climate Change (Panthera et al., 2019; WWF, 2019). Moreover, at the First High-Level Conference on Illegal Wildlife Trade in the Americas, held in Lima, Peru in October 2019, the jaguar became officially recognized as Latin America's emblem for the fight against the illegal wildlife trade.

3. DATA COLLECTION, SOURCES OF INFORMATION AND METHODS

3.1 Data Collection

A wide range of sources were consulted for this study, in an effort to provide an initial comprehensive understanding on the illegal trade in jaguars. These included global trade databases, governments' seizure records, academic and non-academic publications, investigative media reports, news articles, intelligence investigations, as well as inputs provided by multiple stakeholders for the specific purposes of this study. The study's findings, while not being a complete picture of the illegal trade in jaguars, represent the most recent and comprehensive snapshot of the current situation surrounding the illegal trade in jaguar body parts as represented by the evidence available, and should serve to highlight key areas where additional research and conservation efforts should focus.

Illegal Wildlife Trade Databases:

The United Nations Office on Drugs and Crime (UNODC) provided jaguar seizure records from the World WISE Database, from January 2000 to March 2018, which include records of illegal trade data submitted by CITES Parties in their annual illegal trade reports, the United States Fish and Wildlife Service's Law Enforcement Management Information System (LEMIS), the European Union's Trade in Wildlife Information Exchange Database (EU-TWIX) and national governments. The study also includes records shared by the Environmental Investigation Agency (EIA), and those found in TRAFFIC's Wildlife Trade Portal (records from the latter two databases were analysed as general literature, as they include media seizures and other non-official seizure information).

Responses to CITES Notification 055/2020:

An official Notification requesting inputs to this study was sent out by the CITES Secretariat to all exporting, re-exporting and importing countries affected by illegal trade in jaguar specimens, and relevant stakeholders in September 2020. The Notification requested relevant information including:

- jaguar poaching and illegal trade incidents and statistics,
- illegal trade pathways and networks,
- main markets that are driving this illegal trade,
- connections to other wildlife trafficking activities in the region,
- uses of jaguar specimens, both within range States and in international markets,
- modus operandi associated with illegal trade in jaguar specimens,
- possible drivers of the illegal trade in jaguars, and,
- impacts of illegal trade on jaguar populations throughout the species' range.

CITES Notification 055/2020 was followed by video-conferences held in November 2020 and March 2021 with range States and relevant stakeholders, and by email exchanges between the CITES Secretariat and relevant Parties to arrange the exchange of information.

National authorities from 15 jaguar range countries (Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, French Guiana, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname) and five non-range countries (China, Czech Republic, Serbia, United States[4] and Uruguay) sent official responses to CITES Notification 055/2020. Relevant stakeholders, including key non-

[4] While the south-western tip of the United States is part of the jaguar range, the country has not been assessed as a jaguar range State in this report, due to the small and transient nature of its jaguar population. However, data on the illegal trade in jaguars in the United States is provided in Chapter 4.

governmental organizations (NGOs) working on the illegal trade in jaguars also sent responses to the Notification. The information sent included official jaguar poaching and jaguar specimen seizure numbers and characteristics (covering varying periods), reports of covert and overt investigations carried out by enforcement agencies or independent investigators, academic and non-academic research findings, government laws regarding jaguars or the illegal wildlife trade, national jaguar conservation action plans, and media reports covering jaguar poaching or illegal trade events.

Stakeholder Consultation:

In order to widen the scope of the consultation, jaguar range States and relevant stakeholders were requested to send the contact information of individuals or organizations working to address the illegal trade in jaguars or on jaguar conservation more broadly within their countries. Based on these suggestions, an additional 81 national experts and key informants were contacted by email from December 2020 to January 2021 to provide additional information. Contacted stakeholders included government officials, jaguar scientists, NGO representatives, and journalists, of which 32 were able to contribute with additional inputs for the study.

Literature review:

All literature and other secondary sources (e.g. NGO reports, media and academic articles, etc.) shared by Parties and relevant stakeholders following the information requests described above were reviewed in detail for this study. The references cited in those documents were also reviewed, and information specifically pertaining to poaching and illegal trade in jaguars was extracted whenever it was available. Additional key word searches on the internet were also conducted when key knowledge gaps were identified. Geographic locations of poaching or illegal trade incidents were georeferenced when available. While no systematic literature searches were performed for this particular study, the study includes the results of four recent systematic literature and online trade analyses on the topic of illegal trade in jaguars. These include a recent range wide, multi-language study which systematically collected data on jaguar seizures from publicly available online sources (Morcatty et al., 2020), a multi-country analysis of the illegal online trade in jaguars based on systematic searches of online platforms (Polisar et al., *in litt*., 2020), a discourse analysis of international coverage of Bolivian illegal trade in jaguars by the media (Li, 2021), and a systematic review of range-wide academic literature on jaguar poaching and illegal trade (Arias and Lambert, 2019).

First hand data

This study is also based on the insights and data collected by the consultant as part of her PhD on the illegal trade in jaguars at the University of Oxford. This includes data obtained from 41 key informant interviews with jaguar scientists, wildlife rescue centre directors, NGO staff involved in jaguar conservation, protected area managers, as well as government and law enforcement representatives, from 20 different institutions in Belize, Guatemala and Honduras (Arias et al., 2020) and from 1107 household surveys in over 30 rural communities involved in the illegal trade in jaguars in north-western Bolivia (Arias et al., 2021a, 2021b).

3.2 Data Analysis

The information from all these sources was systematized in a database under the broad themes of: source identification and methods used for data collection; number of jaguars poached and body parts illegally traded by location; illegal supply and trade chain locations, routes and characteristics; actor characteristics; modus operandi; enforcement actions; illegal trade drivers; and conservation actions.

Descriptive statistics and illegal trade flows were analysed and visualized using Excel and TRAFFIC's TradeMapper program (TRAFFIC, 2018).

Given the differences in the officiality of the sources consulted, the data was analysed separately, and results were also presented separately for: 1) seizures found in the UNODC World WISE database (section 4.1), 2) poaching and seizure records provided by governments in response to CITES Notification 055/2020 (section 4.2), and, 3) poaching and trade events found in the literature (section 4.3, including academic and grey literature, media articles, inputs from the stakeholder consultation, and any other source not encompassed in the previous two categories).

Incidents of jaguar poaching (defined here as the illegal killing of a jaguar, not necessarily related to illegal trade) were analysed separately from incidents of illegal trade in jaguar specimens. 'Specimens' were defined as any live or dead animal, or any readily recognizable part or derivative thereof (CITES, 2020). Only specimens that were described as a recognizable, quantifiable unit were analysed quantitatively, while others labelled ambiguously as "body parts", "crafts", "jewellery", among others, were either described as such or excluded (for the case of literature sources). For recognizable body parts and derivatives, whole organism equivalents (WOE) were estimated following Harfoot et al., (2018). For example, bodies, skins, and skulls were equal to one organism, teeth were equal to 0.25 organism, and claws were equal to 0.05. Resulting WOE numbers were rounded up and different products were assumed to have been sourced from different animals.

Information from the third category, referring to the general literature, required a more careful examination to account for the vast differences in methodologies used to collect the data, the different timeframes considered by each source, and the duplication of poaching and trade events across sources. For each literature source on the illegal trade in jaguars, the dates, quantities, and locations of illegal trade in jaguars or poaching records were analysed, and compared to those found in other literature or official (governmental) sources to identify duplicate events. This was not always possible, as non-official seizure and poaching records found in the literature were often presented in an aggregated format, without providing the raw data. For countries that have received considerable media and conservation attention, such as Bolivia and Suriname, multiple reports describe roughly the same events (e.g. seizure of mailed jaguar teeth packages in Bolivia), making it particularly challenging to identify independent events. Duplicated events were classified as such, and only recognizably independent events were analysed quantitatively to avoid overestimation.

For literature sources, the number of independent jaguars poached and specimens traded were each added across sources, for each country and each year between 2000 and 2020. When sources provided aggregated information (e.g. 10 jaguars poached in 4 years), the number of jaguars or jaguar specimens were divided by the number of years reported by each source, and these resulting values were added across sources on a yearly basis. Finally, the average of annual jaguars poached or specimens traded was obtained for each country, for the years with available information only (Table 2). Obtaining these annual averages helps to standardize across different sources, different timeframes, and different ways of presenting the information. However, it should be noted that the use of annual averages means that countries with few years of reports may have larger annual averages than those with more years of reports, without necessarily having more seizures or incidents of poaching overall. The stated years with information must therefore be considered for each country (Table 2). The analysis focused on data from the year 2000 and onwards only, but when sources included poaching or trade records from before 2000, the number of jaguars poached or specimens traded were divided by the source's complete timeframe to obtain annual estimates.

3.3 Findings review

A preliminary draft of the study was reviewed by jaguar range countries, relevant stakeholders, and by the CITES Secretariat from April to May 2021. Comments were provided by the governments of Argentina, Colombia, Mexico, Panama, Paraguay and Venezuela, by the Convention on Migratory Species, and by the non-governmental organizations Panthera, the Wildlife Conservation Society and Yaguará Panama Foundation. Amendments were incorporated in the final version of the report.

4. OVERVIEW OF THE ILLEGAL TRADE IN JAGUARS

As a species listed under CITES Appendix I since 1975, international trade in jaguar specimens (defined as any live or dead animal, or any readily recognizable part or derivative thereof), is prohibited except when the purpose of the trade is not commercial (e.g. scientific research) and is authorized by import, export and re-export permits issued by the Scientific and Management Authorities of the corresponding importing, exporting and re-exporting countries (CITES, 2020). At the national level, most jaguar range States offer legal protections against jaguar poaching and the illegal possession, use, transport and trade of jaguar specimens (see Appendix for country-specific laws). Some countries like Belize, specifically allow lethal predator control when there is a risk to human lives or human property (e.g. livestock) subject to authorization; while others like Bolivia, allow hunting and traditional, non-commercial uses of wildlife (including endangered species like jaguars) by indigenous communities in their territories, whose practices precede colonial times (MMAyA, 2020a). However, unless specified otherwise, all examples of jaguar poaching and illegal trade in jaguars included in this report should be understood as illegal.

4.1 Seizures reported on the UNODC's World WISE Database

The UNODC's World WISE Database includes data from multiple official sources such as CITES, the United States Fish and Wildlife Service's Law Enforcement Management Information System (LEMIS), the European Union's Trade in Wildlife Information Exchange Database (EU-TWIX) and reports submitted independently by national governments. The World WISE Database contained 120 records of jaguar seizures from January 2000 to March 2018 (data for 2018 is incomplete), involving the illegal trade of a minimum of 179 jaguar specimens (body parts or live animals). Jaguar seizure events recorded on the World WISE Database remained relatively stable in the past two decades, averaging 6.3 incidents per year, ranging from 1 to 11, with the highest number of incidents occurring in 2017 (Fig. 2). Only 18% of the seizures on the database occurred since 2015. The country with the largest number of seizures was the United States (49.2%) followed by Mexico (18.3%), Germany (5.8%), France (5%), Guatemala (4.2%) and French Guiana (2.5%). All remaining countries had less than two seizures in that period. Collectively, these seizures involved a minimum of 101 jaguars (whole organism equivalents, including only recognizable parts), if seizure records are considered independent.

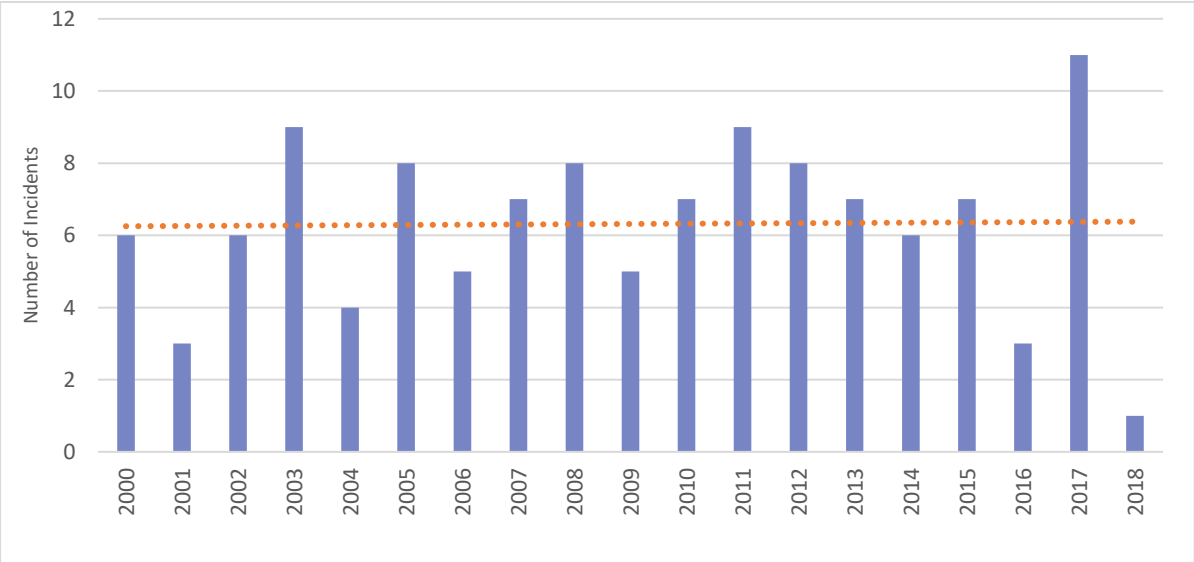

Figure 2. Number of seizures of jaguar body parts across time (2018 is incomplete). Source: UNODC (2021) World WISE Database.

The average number of specimens (defined as any live or dead animal, or any readily recognizable part or derivative thereof) illegally traded and seized across years is 9.42, ranging from 1 to 21, with the highest number of specimens illegally traded occurring in the year 2006, and also presenting a relatively stable trend (Fig. 3). The most commonly seized jaguar body parts were skins (23%), teeth (21%) and live animals (12%).

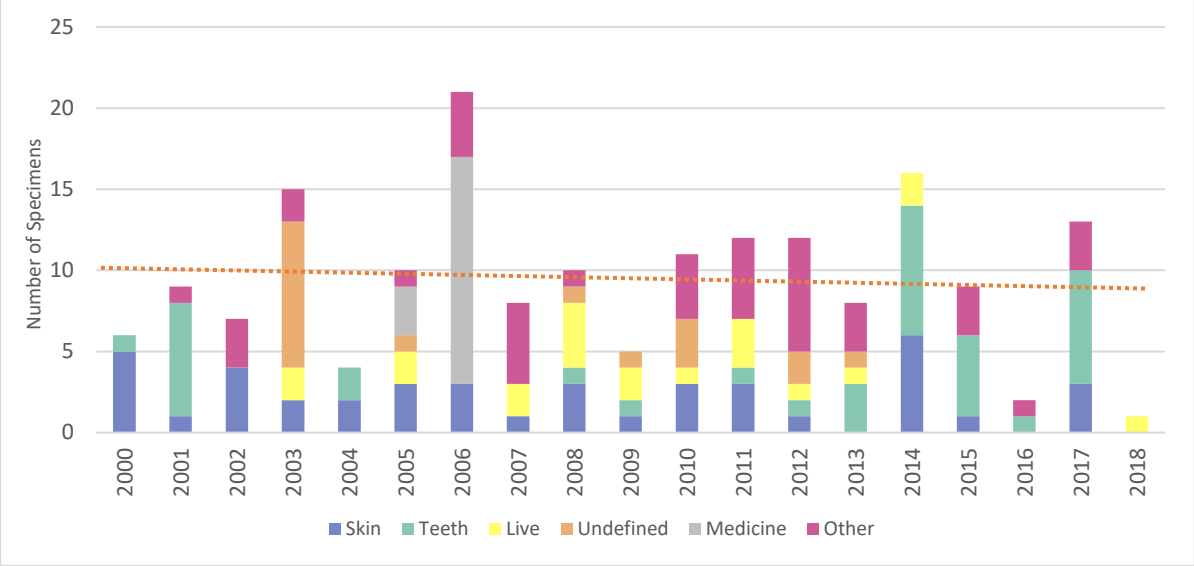

Figure 3. Number of seized jaguar specimens across time (2018 is incomplete), by body part. The category 'other' includes skin pieces, skulls, leather products, garments, bodies, jewellery, scientific specimens, hair products, and feet. The database provided no specific details of which body parts are included under the category 'medicine'. Source: UNODC (2021) World WISE Database.

Seventy eight out of 120 (65%) of the records in the World WISE Database were international in nature, meaning that there was an exchange between two or more countries labelled as shipment source or destination, or seizure countries (Fig. 4). Peru was the most frequent source of jaguar body parts shipments (19 out of 78 records containing data on shipment source country - 24.4%), followed by Bolivia (14.1%), Mexico (11.5%), Brazil, Nicaragua and Guatemala (5.1% each), and Colombia and Venezuela (3.8% each). Other shipment source countries like Costa Rica, Ecuador, Guyana, French Guiana, Paraguay and Panama, among others[5], were involved in less than two seizures. The United States was the most frequent destination of shipments of jaguar body parts (58 out of 76 records containing data on destination country - 76.3%), followed by Germany (5.3%) and China (4%). Other destination countries included Austria, Brazil, Denmark, Honduras, Spain, New Zealand, Portugal and Switzerland, with less than two seizure records each. Seizures that had the United States as a destination country were shipped from across the jaguar range (with the exception of Argentina, Belize, Honduras, Suriname and French Guiana); and also from outside the jaguar range, including countries like Canada, China, Germany, Greece, Italy and Liberia. Collectively, seizures involving the United States as a destination country included 89 specimens, and a minimum of 59 jaguars (whole organism equivalents). Seizures that had Germany as a destination country were shipped from Bolivia, Guyana and the United States, and included four jaguar specimens and an equivalent number of minimum jaguar individuals. Seizures that had China as a destination country were shipped from Venezuela, Bolivia and Brazil through Germany (in 2010, 2014, and 2017, respectively). Collectively, seizures involving China as a destination country included 10 specimens and represented a minimum

[5] Other non-range source countries included: Angola, China, El Salvador, France, Germany, Greece, Italy, and Liberia.

of four jaguar individuals. For each of these countries of destination, the purpose of the trade is not specified.

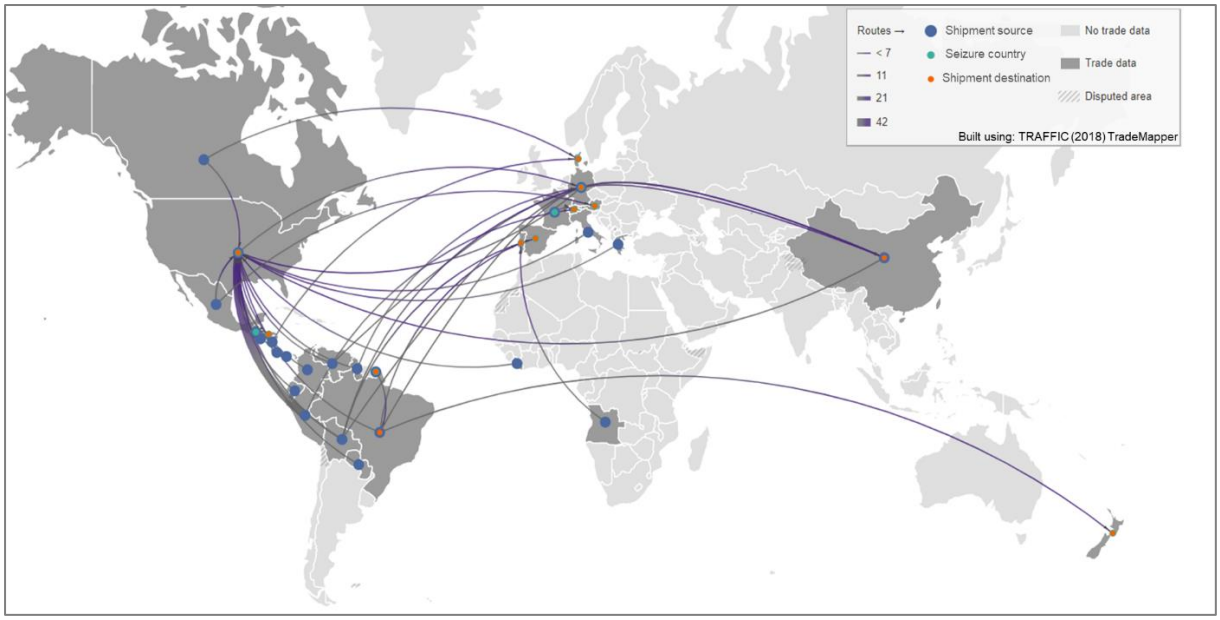

Figure 4. International illegal trade records (seizures) from 2000-2018 (2018 is incomplete). Arrows represent number of body parts illegally traded. Source: UNODC (2021) World WISE Database.

Overall, jaguar seizures reported in the World WISE Database can be characterised as relatively low in scale and stable across time. These seizures suggest the existence of at least four routes of repeated instances of international illegal trade in jaguars: 1) from range countries to the United States (53 records), 2) from range countries to the European Union (8 records), 3) from the United States to the European Union and vice versa (5 records), and 4) from range countries to China, by way of Europe (3 records). There were also a few other isolated records of illegal trade involving African countries (Angola and Liberia), Oceania (New Zealand), North America (Canada), as well as trade between European countries and between range countries, all involving single specimens. These illegal trade routes are a representation of seizure data only, and do not represent the actual scale or characteristics of the international illegal trade in jaguar body parts.

4.2 Seizures reported by governments responding to CITES Notification 055/2020

Fifteen (out of 18) jaguar range State authorities, and five non-range State authorities, submitted information on the illegal trade in jaguars in their countries as a response to CITES Notification 055/2020. The seizure information presented in countries' responses to Notification 055/2020 are not necessarily the same as those contained in the UNODC World WISE Database, and mostly pertain to cases of domestic illegal trade in jaguars. CITES Notification 055/2020 requested inputs to this study, including information on jaguar seizures and the characteristics behind the illegal trade in jaguars, such as jaguar body part uses, drivers, modus operandi and impacts. French Guiana, Honduras, Guatemala, and Nicaragua stated that while domestic and opportunistic illegal trade exists in their countries, official seizures or mortalities have not been recorded or systematized. Similarly, Panama, Uruguay and China responded to the information request, but did not identify any particular incidents of illegal trade in jaguars in their countries. The study missed official responses from Belize, Guyana and Venezuela, but the government of Venezuela reviewed a preliminary draft of the present study.

The reporting period varied from country to country, averaging nine years, and most countries presented the information on an aggregated time scale (Table 1). The number of illegally traded jaguar body parts (specimens) also varied with country, from one specimen (reported by Serbia), to 603 specimens (reported by Bolivia). The most abundant specimens were jaguar teeth (689 aggregating across reporting countries), followed by live animals (103), skins (77), and jaguar products (52, jaguar crafts and accessories). The number of officially reported jaguars poached in each country (not necessarily due to illegal trade) ranged from 1 (in Mexico) to 369 (in Panama). Reporting periods and country-specific values can be found in Table 1.

Table 1. Official jaguar seizures and poaching data shared by range and non-range government authorities responding to CITES Notification 055/2020.

	Country	Timeframe	# Jaguars Poached[1]	# Traded Jaguar Body Parts	Main Locations	Alleged or Confirmed International Trade as stated by governments
Range States						
1	Argentina[2]	2006-2018	22	9 skins; 2 skulls; 3 taxidermies; 30 products	Jujuy, Salta, Chaco, Formosa, Santiago del Estero, Misiones, Neuquén and Buenos Aires Provinces	Border with Bolivia is a suspected jaguar trafficking route. One confirmed case of smuggling of a jaguar carcass to Hungary in 2006.
2	Bolivia[3]	2013-2020	-	4 skins; 25 live; 561 teeth; 1 skull; 8 bones; 1 claws; 1 fat; 2 products	Beni, Cochabamba, La Paz, Pando, Santa Cruz, Tarija Provinces	22 out of 55 (40%) confirmed seizure records had China as country of destination; four seizures totalling 100 teeth were made at airports.
3	Brazil	2006-2017	-	18 skins; 1 live; 13 teeth; 3 skulls; 1 products	North and Mid-west states	One teeth seizure at airport.
4	Colombia	2009-2015	3	2 skins; 8 live; 12 products	Amazonas, Caquetá and Putumayo Departments	-
5	Costa Rica	2020	12	15 live[3]	-	Border with Nicaragua is suspected jaguar trafficking route.
6	Ecuador	2014-2019	5	1 skins; 1 body	Orellana Province	-
7	French Guiana	-	-	-	-	-
8	Guatemala	-	-	-	-	-
9	Honduras	2021	-	21 live[4]	-	-
10	Mexico	2019-2020	1	11 live; 4 products	Mexico City, Selva Lacandona	Seizures at airport
11	Nicaragua	-	-	-	-	-
12	Panama	1989-2021	369	-	-	-
13	Paraguay	2007-2016	3	2 skins	Chaco	One skin seizure at border with Bolivia (2007).
14	Peru	2000-2020	4	26 skins; 16 live; 42 teeth; 14 skulls; 6 taxidermies; 2 products	Lima/Callao, Ucayali and Loreto Departments	-
15	Suriname[5]	2009-2020	22	2 skins; 5 live; 60 teeth; 3 skulls; 2 body	Saramacca, Wanica, and Commewijne Districts	Three seizures totalling 14 teeth made at airports.
Non-Range						
16	China	2019-2020	-	-	-	-
17	Czech Republic	2006-2020		2 teeth		One teeth seizure made at airport (from Mexico).
18	Serbia	2017		1 live		Live jaguar smuggled to Bosnia.
19	United States	2015-2019	-	1 skin; 11 teeth; 2 skulls; 3 claws; 12 skin products	-	-
20	Uruguay	-	-	-	-	-

[1] Reported jaguar individuals poached by humans (not necessarily due to illegal trade, not equivalent to the minimum number of individuals illegally traded as suggested by body part seizures).
[2] Argentina also reported 73 legal causes of action for jaguar poaching or illegal trade in jaguar body parts, based on legal complaints initiated by Red Yaguarete Foundation.

[3] Official seizure records systematized by the Wildlife Conservation Society Bolivia, and shared with CITES by the Bolivian Ministry of Environment and Water.
[4] Time frame of live animal seizures not stated.
[5] Seizure records systematized by Conservation International and Panthera, and shared with CITES by the Suriname Forest Service.

Out of the countries that provided official information on the illegal trade in jaguars, Argentina, Bolivia, Brazil, Mexico, Paraguay, Peru, Suriname, Czech Republic and Serbia presented evidence either confirming or suggesting the existence of illegal international trade in jaguar body parts originating from their countries (Table 1). Bolivia, Brazil, Mexico and Suriname had seized jaguar body parts (mainly teeth) at airports on a few occasions, but the destination of the parts was not stated in the reports provided by the governments with the exception of Bolivia, which had China as country of destination. Argentina, Costa Rica and Paraguay suspected the existence of jaguar trafficking routes involving their neighbouring countries, but specific examples of trafficking incidents were not provided. In their report, Peruvian authorities mentioned demand by jaguar traffickers of Asian descent, but there were no mentions of seizures or apprehensions of such traffickers confirming their nationality. Overall, there was limited evidence of international illegal trade in jaguars provided by countries in their official reports, and except for Bolivia, the number of seizures for those with confirmed evidence were relatively low.

Bolivia, Peru, Suriname and the United States presented their seizure information on a year-by-year basis, enabling an analysis of seizure trends. Seizure trends are not the same as trends in poaching or the illegal trade in jaguars. Trends should be interpreted carefully, as the enforcement effort behind the seizures is unknown, and the number of years with reported incidents is small. The number of seizures in Bolivia remained stable from 2013 to 2020, experiencing peaks in 2016 and 2019, with 11 and 12 seizure events, respectively. Meanwhile, the number of seized body parts has been declining since 2014, from a peak of 237 specimens in 2014 (~62 whole organism equivalents, WOE) to a single live jaguar seized in 2020 (MMAyA, *in litt.,* 2021). Peru experienced a peak in both the number of seizures and seized items in 2008, with 10 seizure events resulting in 14 seized specimens (14 WOE). After experiencing declining jaguar body part seizure trends from 2008 to 2014, the country sustained an increase starting in 2015, with two seizure events resulting in the confiscation of 38 jaguar teeth and one skin (11 WOE). Both the number of seizures and the number of seized items presented a smaller increase from 2016 to 2019, declining again in 2020 (MINAGRI and SERFOR, *in litt.*, 2020). In Suriname, the number of specimens (jaguar teeth) officially seized by the government rose from three teeth in 2017 to six in 2019, and recorded illegal trade events compiled by Conservation International and shared by the Suriname Forest Service also presented an increase, from one illegal trade event involving 17 teeth (five WOE) in 2017 to seven illegal trade events representing 9 jaguars (WOE) in 2020 (Suriname Forest Service, *in litt*., 2021). The number of specimens seized in the United States increased from 2015 to 2019, from two specimens (two WOE) to 14 (unknown WOE), respectively, but the number of seizure events was not specified. Other countries presented their seizures either as isolated incidents or in an aggregated format, not permitting the evaluation of temporal trends.

4.3 Poaching and illegal trade incidents found in the literature or reported by other stakeholders

Additional incidents of illegal trade in jaguars and jaguar poaching were obtained from the literature shared by governments and relevant stakeholders and through a purposive internet search, including 66 academic articles on the illegal trade in jaguars, jaguar ecology and conservation; 32 national species action plans and other governmental reports; 25 NGO reports; 123 media reports; and 32 personal communications with jaguar experts either by videoconference or email from November 2020 to February 2021. Unlike the information presented in sections 4.1 and 4.2, which is based on confirmed seizures made by governments and shared through the UNODC World WISE Database or through CITES Notification 055/2020, incidents of poaching and illegal trade in jaguars found in the

general literature have not been confirmed by governmental authorities and do not necessarily represent actual seizures (legal enforcement).

As described in Chapter 3, several of these data inputs included broader literature reviews, or multi-country reports that did not always detail the specific source of each illegal trade or poaching record, and which often repeated the information found in other sources. This was particularly the case for countries that have received considerable media attention concerning the illegal trade in jaguars, like Bolivia or Suriname (Table 2). For example, out of 46 reports that were shared by stakeholders or found in the literature describing jaguar seizures in Bolivia, 34 (74%) reported the same seizure events. Several other countries also had a high prevalence of duplicated information, including China (75%), Belize (55%), Peru (43%), Suriname (41%), Brazil (26%), Panama (16%), and Mexico (4%). Notably, the majority (9 out of 12) of reports describing jaguar seizures in China focused on a single seizure of 119 teeth and 13 claws in 2015 at the Beijing Airport (Beijing People's Court, 2015).

Despite the limitations in how jaguar poaching events and seizures are presented in the literature (aggregated through time and space, with few specific details, and with a high prevalence of duplicates), an effort was made to identify and eliminate duplicate events, and to calculate yearly annual averages of reported jaguars poached and specimens illegally traded (defined as any live or dead animal, or any readily recognizable part or derivative thereof that has been traded) per country, for the timeframes with available evidence (from 2000 onward, Table 2). Based on this assessment of the literature (non-official), countries with a higher reported annual average of jaguar poaching (not necessarily due to illegal trade) are Bolivia, Brazil, Venezuela, Suriname and Panama (Table 2). Other countries may have similar or higher rates of poached jaguars, but lacked specific research into jaguar mortality, hence the lower values. With regards to illegally traded jaguar specimens, Bolivia had the highest annual average of illegally traded specimens (WOE), followed by China, Belize, Suriname, and Peru. Summing across countries and timeframes in the literature (excluding sources with data prior to 2000), 2089 jaguar specimens (individual body parts) were described as specific, quantifiable body parts, of which the majority were jaguar teeth (71.4%), followed by skins (7.8%), live animals (7.5%), claws (5.5%), and skulls (4.7%). Other body parts like paws, fat, heads, complete carcasses and bones were also described in the literature, but in lower quantities. On the other hand, jaguar paste, organs and genitals were mentioned in the literature, but specific quantities were not provided.

While most (70%) of literature reports referred to instances of poaching and illegal trade in jaguars domestically within range countries, 27.4% mentioned the existence of a market for jaguar body parts in China. However, aside from three unique reports of seizures or illegal online trade in jaguar body parts in China (Beijing People's Court, 2015; Polisar et al., *in litt.,* 2020; Xiamen News, 2014), all other mentions of the country's involvement found in the general literature were based on incidents occurring domestically in range countries (mostly Bolivia and Suriname) or were anecdotal in nature. Meanwhile, only 2.6% of literature reports mentioned other countries outside of Latin America aside from China, such as Italy, the United States or Viet Nam.

Table 2. Reported annual and total jaguars poached and illegally traded since 2000, based on a the literature (non-official and not comprehensive).

		Reported Poached Jaguars[1]			Reported Traded Specimens (WOE)[2]		
Country	**# Sources (duplicates)**	**Years with Information**	**Annual Average[3]**	**Total**	**Years with Information**	**Annual Average[3]**	**Total**
Argentina	9 (0)	2000-2014	7.4	111	2004-2010	0.4	3
Belize	18 (10)	2000-2019	4.3	86	2004-2006; 2007-2019	8.5	51
Bolivia	46 (34)	2000-2019	61.0	1220	2009-2020	29.8	357
Brazil	30 (8)	2000-2020	53.8	1130	2003-2011; 2015-2020	3.5	53

Chile	1 (0)	-	-	-	2012-2018		-
China	12 (9)	-	-	-	2014-2015; 2019-2020	12.0	36
Colombia	4 (0)	2007-2018	1.7	19	2007-2010	0.7	2
Costa Rica	6 (0)	2012-2018	0.4	3	2000; 2019-2020	0.7	2
Ecuador	4 (0)	2006-2018	1.5	19	2003-2008; 2013-2014; 2016; 2019-2020	1.4	15
French Guiana	2 (0)	-	-	-	-	-	-
Guatemala	9 (0)	2008-2018	0.6	7	2008-2018; 2020	0.6	7
Guyana	1 (0)	-	-	-	-		-
Honduras	12 (1)	2001-2009; 2012-2020	3.6	64	2009-2020	1.7	20
Mexico	51 (2)	2000-2020	6.3	133	2000-2020	4.0	84
Nicaragua	7 (1)	2003-2005;2009-2018;2020	0.7	10	2000; 2009-2011; 2018;2020	1.3	8
Panama	6 (1)	2000-2021	11.5	253	2013	2.0	2
Paraguay	5 (0)	2000-2018	2.0	38	2007;2016	1.0	2
Peru	14 (6)	2001-2019	3.4	64	2001-2020	6.0	120
Salvador		-	-	-	2011	1.0	1
Suriname	17 (7)	2007-2010; 2012-2018; 2020	17.3	208	2007-2010; 2014-2019	6.2	62
United States	2 (0)	-	-	-	2012	1.0	1
Uruguay	3 (0)	-	-	-	2019-2020	0.5	1
Venezuela	6 (0)	2000-2018	31.0	590	2000-2015; 2019-2020	5.8	103
Viet Nam	2 (0)	-	-	-	2019-2020	0.5	1

[1] Defined as any illegal killing of a jaguar, not necessarily related to illegal trade. Values are not extrapolated to country-level, and are based on the specific case studies and locations described in the literature.
[2] Defined as any traded live or dead animal, or any readily recognizable part or derivative thereof. Only specimens that were described as a recognizable, quantifiable units were included. Numbers represent whole organism equivalents (WOE). See methods for details.
[3] Annual averages were obtained by: 1) adding the number of poached jaguars and traded specimens across literature sources (non-official), for each year and each country, and 2) calculating the average for each country's respective timeframe (years with incidents only). Annual averages should be considered with reference to the number of years with information. See methods for details.

Since the literature (non-official) sources analysed in this study were collected in a purposive (non-systematic) way and they vary widely in type, quality and detection or research effort, it is not appropriate to draw conclusions about trends in reporting on jaguar poaching or illegal trade in jaguars, nor in the number of reported incidents or specimens involved from this dataset. For reference only, the number of sources reporting on both jaguar poaching and illegal trade in jaguar specimens across countries increased from 15 and 4 in 2000, respectively, to a peak of 41 and 25 in 2018, respectively, and declined in 2019 and 2020. While the number of annually poached jaguars reported by literature sources remained relatively stable over the past decades, the number of annually traded specimens (WOE) reported by these sources increased from nine jaguars in 2000 to a peak of 156 in 2018, also declining in 2019 and 2020. Again, these numbers do not reflect the actual scale or trends of poaching or illegal trade in jaguars, and they are not based on a comprehensive nor systematic literature review. However, systematic efforts such as the one conducted by Morcatty et al., (2020), which is also based on literature reports available on the internet, also suggest increasing trends in seizures and in the number of illegally traded specimens from 2012 to 2018.

4.4 Mapping of jaguar poaching and illegal trade incidents:

It was possible to extract the approximate location for 1078 incidents of jaguar poaching and illegal trade across all sources (Fig. 5). Jaguar poaching and illegal trading (including the illegal supply, sale, or demand/possession) events were spread across the jaguar range. While poaching events are necessarily restricted to areas inhabited by jaguars, illegal trade events also took place in towns and urban areas further away from jaguar habitat, where there is existing demand, or where there are ports of exit or illegal trade routes.

The records shown in Figure 5 provide an indication of research and enforcement efforts across countries, rather than a representation of the actual scale or distribution of the illegal trade. Venezuela is one of the countries with the most comprehensive assessments of jaguar poaching and illegal trade/possession in the country (Jędrzejewski et al., 2017b), hence its large representation on the map (Fig. 5). Meanwhile, this study found few research/enforcement efforts reporting jaguar poaching and illegal trading in Brazil, relative to the country's large size and large jaguar populations. Further efforts to study jaguar poaching and illegal trade using appropriate sampling designs would provide more insights into the presence and absence of these threats, and would allow modelling the factors that make some locations more likely to pose a risk to jaguars. Additionally, linking jaguar poaching and illegal trading events to specific jaguar subpopulations or jaguar conservation units would further highlight priority areas for jaguar conservation.

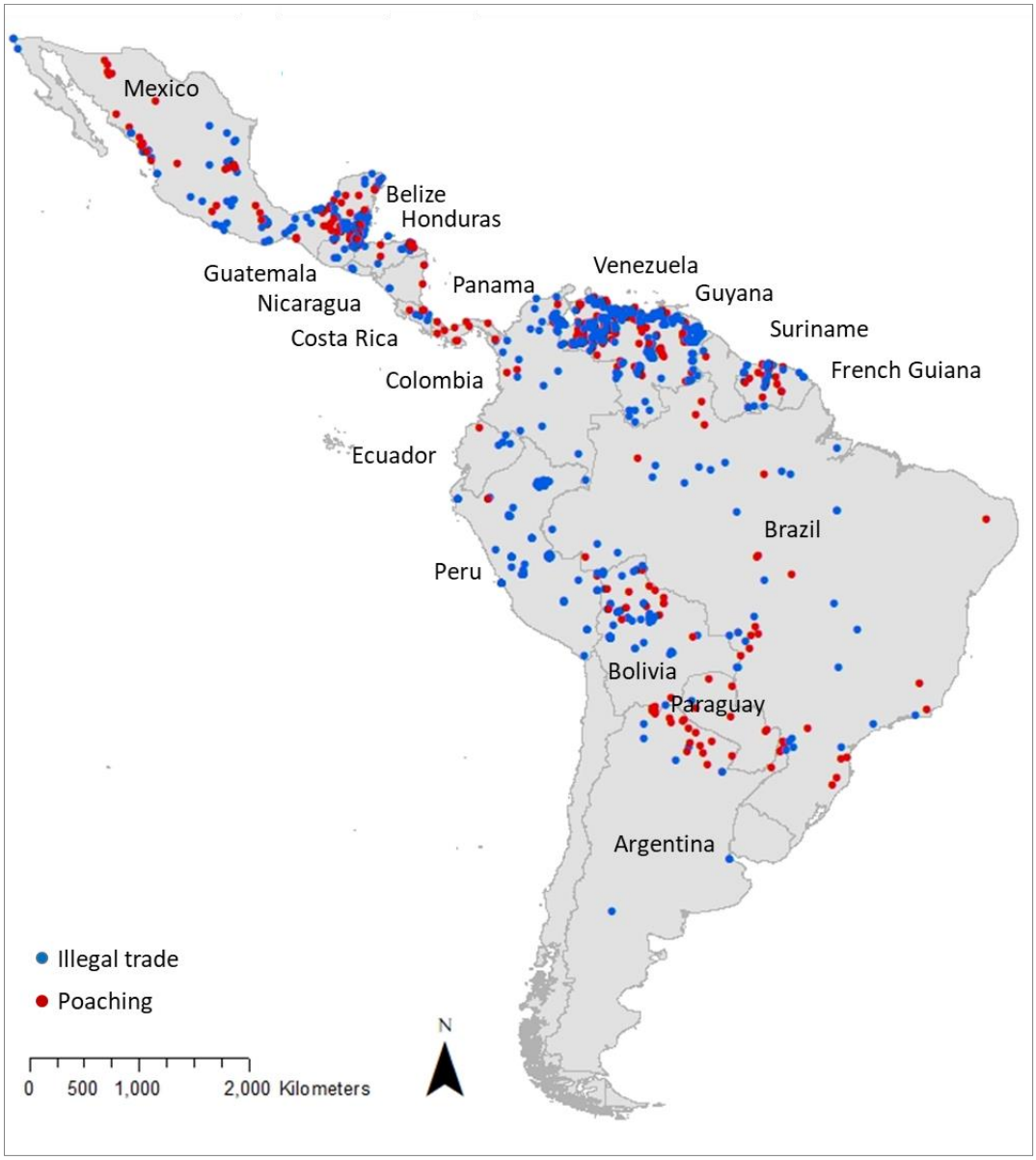

Figure 5. Map of jaguar poaching and illegal trade events based on all sources (official and non-official) and timeframes containing geographical information. Depending on how the information was presented, some points may represent single events, while others may represent aggregated events. Note: These records provide an indication of the distribution of research and enforcement across countries based on the sources consulted in this study, and do not represent the actual scale or distribution of poaching and the illegal trade in jaguars.

4.5 Information challenges and limitations:

Many of the examples of jaguar poaching and illegal trade in jaguars contained in this report were obtained from seizures carried out by enforcement authorities and later reported by different sources (e.g. the UNODC's World WISE Database, governments' responses to CITES Notification 055/2020, secondary literature). Wildlife seizures represent a snapshot of the overall illegal wildlife trade, and they are subject to the numerous biases including, among others, unknown proportions of seized items; unidentified detection rates; varying enforcement effort, effectiveness, and reporting across countries; taxonomic and product biases (Symes et al., 2018; Underwood et al., 2013). Countries that have high numbers of jaguar seizures are not necessarily the most affected by the illegal trade in jaguars. Instead, countries with seizures tend to be the ones dedicating the most effort into fighting

wildlife trafficking, and they are often transit countries rather than source or destination countries (UNODC, 2016). Seizures are also usually lacking in more specific details about the illegal wildlife trade, such as the characteristics of consumers, traffickers, and their networks. Enforcement efforts are also less likely to detect more organized and sophisticated modus operandi of traffickers, which are purposively designed to avoid detection, than opportunistic or simple trafficking methods, and thus may fail to adequately characterize the methods and routes used to smuggle jaguars. Therefore, seizures of jaguars and their body parts are an imperfect indicator of the scale or characteristics of the illegal trade in jaguars, and the results above should be interpreted with caution.

As done here, information from official seizures can be complemented with academic studies or other NGO-led or journalistic investigations on the illegal trade in jaguars (referred to here as the general literature). These investigations can greatly expand the geographic and temporal coverage, and the amount of detail obtained from illegal trade incidents. However, these sources are also subject to numerous biases, emerging from the widely different methods that are used to collect the information, from statistically designed surveys of suppliers, traffickers and consumers, to market observations, undercover interviews or anecdotal accounts. These methodological differences make it particularly challenging to combine, compare and contrast incidents of illegal trade across different sources. For example, the sampling design of a study (e.g. random vs. purposive) and its geographical scope can greatly affect whether poaching and illegal trade incidents are representative of the situation in the entire country, or whether they should be understood and interpreted on a limited scale. Generalizations unwarranted by the evidence should be avoided.

The challenge to combine and analyse literature sources is further accentuated by the differences in how these sources present their information, often aggregated in time or space, and without sufficient accompanying detail about the characteristics of each reported incident or the methods used to collect the data. These details are necessary to isolate incidents, quantify them, and detect trends in poaching and illegal trade over time. Moreover, as shown in section 4.3, some of these sources, and particularly journalistic investigations, have a tendency to report on the same poaching and illegal trade incidents that have already been reported elsewhere, particularly when the incidents are more likely to receive attention from the public or the authorities (e.g. large seizures or seizures involving international trafficking). Accounting for information duplication within seizure or illegal trade reports found in the literature is necessary, because failing to do so may lead to a false perception that illegal trade is increasing, when instead, it may simply be the coverage of those seizures what is actually increasing. Crucially, many of the examples of poaching or illegal trade found in the general literature may have not necessarily been verified through enforcement efforts by the authorities, or may have not been collected in an approved or ethical manner, adding to the limitations of these sources. Therefore, using literature sources as evidence of illegal trade in jaguars also requires careful scrutiny.

Given the widely different sources of information used in this study, and their biases and limitations, below are a few considerations that must be taken into account when interpreting the results above:

Inconsistencies in the trends of jaguar seizures and reports of illegal trade and poaching:

As mentioned in section 4.1, which analyses jaguar seizure data found in the UNODC's World WISE Database, the number of seizure events involving international smuggling of jaguar specimens, along with the number of seized specimens therein, appear to have remained relatively stable over the past two decades. Government responses to CITES Notification 055/2020 (section 4.2), which are not the same as those reported in the UNODC's World WISE Database, mostly did not allow a determination of seizure trends, as seizures were presented as isolated incidents or in an aggregated manner. However, the countries that did present yearly seizure information (Bolivia, Peru, Suriname and the United States) showed both declining and increasing trends in the number of seizures and specimens

seized, depending on the country and the timeframe considered. On the other hand, literature sources (section 4.3) presented an increase in the number of reports of cases of jaguar poaching and illegal trade in jaguar specimens, and in the number of reported annually traded specimens, coinciding with systematic reviews on jaguar seizure trends (Morcatty et al., 2020); while the number of reported annually poached jaguars remained relatively stable across time. However, trends in the literature included in this report are unreliable due to the purposive way in which those sources were collected, and their mostly unknown and non-systematic research effort.

The inconsistencies in reporting trends behind jaguar poaching and illegal trade incidents, which depend on the source of the information, highlight the biases and limitations that are inherent to each different dataset. They also underscore the importance of accounting for those biases and considering multiple datasets together when it comes to making decisions on the illegal trade in jaguars. Importantly, the trends and quantities reported by these different sources represent an unknown percentage of the overall trends and magnitude of the illegal trade in jaguars.

Inconsistencies in the markets for jaguar specimens:

The main groups of sources of information included in this study (UNODC's World WISE Database, government's responses to CITES Notification 055/2020, and the general literature), also differed in their representation of the markets for jaguar body parts. For example, jaguar seizure records found in the UNODC's World WISE Database highlighted the potentially important role of the United States as the country with most seizures of jaguar specimens, and the most frequent country of destination of jaguar shipments, 14 and 19 times ahead than Germany and China, respectively. This study was not able to determine whether the important role of the United States as a seizure location and destination country of smuggled jaguar specimens is caused by the country's greater enforcement capacity or due to it being a greater market for jaguar body parts, as it is not clear how the United States' enforcement effort and capacity compares to that of Germany or China. Meanwhile, governmental responses to CITES Notification 055/2020 pointed to a predominant domestic market for jaguar specimens, and were mostly lacking in more than isolated instances of international trade, with the exception of Bolivia and Suriname. Literature sources also revealed the importance of the domestic market for jaguar specimens, and when referring to markets outside of the jaguar range, focused almost exclusively on China as a destination country, despite the small number of seizures in China. Other jaguar body part destination countries, such as the United States or Europe, which dominated seizures in the UNODC's World WISE Database, were largely missing from the other sources of information. Given the small amount of detail accompanying seizure records in the UNODC's World WISE Database, the characteristics of the market for jaguar body parts in these other regions is not understood and remain a key knowledge gap. The differences in how the markets for illegal jaguar specimens are portrayed by different sources further stresses the importance of considering multiple sources of information to more accurately represent the illegal trade in jaguars.

Biases in reporting across countries:

When considering all sources in this study, the differences in reporting, enforcement and research efforts across countries became evident. In particular, Brazil stood out due to its small number of seizures and reported incidents of jaguar poaching and illegal trade, despite having about 50% of the world's wild jaguars (Jędrzejewski et al., 2018). This does not necessarily mean that Brazil has less incidents of jaguar poaching or illegal trade than other countries. Instead, other reports on illegal wildlife trade in the country (e.g. Charity and Ferreira, 2020) have suggested that the low number of seizures may be due to decentralization in Brazil's enforcement and environmental management responsibilities across different federal, state, and municipal authorities, and the lack of a centralized data collection system. In their response to CITES Notification 055/2020, the Brazilian Institute of

Environment and Renewable Natural Resources (IBAMA) also stated that their reported seizures may not represent all seizures in the country as there are multiple institutions in charge of wildlife-related enforcement efforts. The absence of systems to collect and centralize information on jaguar poaching and illegal trade in jaguars was also evident in countries like French Guiana, Guatemala, Honduras, Nicaragua and Panama, which did not provide any specific seizures despite acknowledging the existence of this threat in their countries (based on responses to CITES Notification 055/2020).

Absence of information on law enforcement:

Aside from seizures, most countries' responses to CITES Notification 055/2020, with the exception of Argentina, Bolivia, Czech Republic and Serbia, did not specify whether any actions were taken to apply the law following identified instances of jaguar poaching and illegal trade in jaguars. Details like the number of complaints and legal actions, trials, or the application of prison sentences or fines were largely missing from countries' reports. Literature sources, and particularly the media, provided some additional details on poacher and trafficker arrests or the application of fines for countries like Bolivia, Brazil, China, Guatemala, Mexico, Peru and Suriname. However, the profiles of traffickers and the characteristics of the sentences were not always specified, and it was not clear whether the sentences were completed.

In response to CITES Notification 055/2020, this study also received a few reports corresponding to undercover investigations conducted by journalists or NGOs in Bolivia and Suriname. Some of these reports were based on undercover interviews with alleged jaguar traffickers in these countries, and suggested the existence of organized criminal groups involved in international trafficking of jaguar teeth and jaguar bone paste, with links to broader international criminal networks in neighbouring countries and China. However, based on all sources consulted in this study, enforcement efforts by government authorities have not corroborated the existence of such transnational organized criminal groups. It is not clear whether there are currently any official intelligence investigations underway to verify such accounts. The information contained in those reports has been included in a separate confidential document for law enforcement purposes.

Need for improved information systems on jaguar poaching and illegal trade:

The information limitations described above highlight the importance of: 1) conducting more research, intelligence and enforcement efforts to understand poaching and the illegal trade in jaguars at the national and regional levels; and 2) building more robust data collection, systematization, standardization, analysis and reporting systems across time. Following Resolution Conf. 11.17 (Rev. CoP18) on National reports, and Decision 18.76 on Annual illegal trade reports, Parties are urged to submit their annual illegal trade reports to improve the knowledge base on the illegal trade in jaguars, as a way of reducing reliance on non-official sources that may not accurately characterise or contextualize international illegal trade. Systems to consolidate information on poaching and illegal trade of a domestic nature are also necessary.

5. JAGUAR BODY PART USES

The use and trade of materials derived from wildlife is a longstanding and widespread practice across human societies, and mammals are amongst the species most often utilized and most affected by human exploitation (Alves et al., 2013). Medicinal and nutritional uses threaten over 300 mammal species across the world, but mainly in developing countries that harbour the largest biodiversity (Ripple et al., 2016). Carnivores are particularly impacted, not only because of their naturally low abundances and vulnerability to environmental changes, but because they are killed for multiple consumptive and non-consumptive reasons, from medicinal traditions and protein consumption, to the protection of self and property or even as trophies (Muth and Bowe, 1998; Ripple et al., 2014; von Essen et al., 2014). The jaguar is no exception, and the monetary and non-monetary incentive to kill jaguars often outweighs the admiration, fear and respect for the species that many rural and indigenous societies traditionally have (Saunders, 1998). The use of jaguar body parts for cultural or subsistence purposes by indigenous or mixed ethnicity rural communities is not necessarily illegal. For example, Bolivia allows non-commercial uses of wildlife by indigenous communities, defined as those whose traditional practices precede colonial times - within their own territories (MMAyA, 2020a). Similarly, the rules against the trade in jaguars do not apply to communities that traditionally derive their means of subsistence from the forest in French Guiana (OFB, *in litt.*, 2021), see Appendix for country-specific laws). However, aside from a few exceptions and unless otherwise stated, the uses of jaguar body parts in this section should be regarded as illegal despite often having a subsistence or cultural motivation. It should be noted that while some local cultural practices and traditions may end up incentivizing the use and illegal trade in jaguars, others actively oppose it. For example, while Cabecar people in Costa Rica have been known to consume jaguar meat, the same practice has been described as a cultural taboo amongst the Nukak people of Colombia and by some riverine communities in the Brazilian Amazon (da Silva, 2007; Kelly, 2019). What follows is a summary of the different uses that are assigned to jaguars and their body parts, domestically and internationally.

5.1 Domestic uses of jaguars and their body parts

Jaguars have a long history of utilization by pre-Columbian civilizations in the Americas, documented in a rich body of archaeological and anthropologic literature (Saunders, 1998; Sugiyama et al., 2018; Valdes Valverde, 2005). Their physical power, crepuscular habits and affinity for caves inspired their association with the underworld, war, destruction, and fertility, a rich symbolism that permeated the cosmic worldviews, identities, artistic traditions, myths, and rituals of past and present indigenous and non-indigenous Latin American societies (Saunders, 1998). These symbolic values of the jaguar often translate into jaguar poaching, and the illegal use and illegal trade in their body parts for cultural, medicinal, subsistence, or commercial purposes. Moreover, they often become intertwined with other functional and utilitarian motivations for poaching, including self-defence. Though illegal, most jaguar body parts have a use at the domestic level (Table 3), and the local illegal trade (and its sustainability), require further investigation.

Teeth: The information sources included in this study suggest that jaguar teeth are currently the most sought-after jaguar derivative. Jaguar teeth are domestically used for decorative purposes, mainly as jewellery pieces. Teeth are sold in their raw condition or as pendants, sometimes carved or engraved with silver, gold, or precious stones and other materials like black coral. They are purchased for personal use, gifted or inherited. As described by the literature consulted, these decorative purposes often blend with the desire to show status or wealth, with consumers displaying jaguar teeth as trophies or symbols of strength or hunting prowess. Due to this symbolic value, rural and urban elites, including community leaders, government officials and military personnel have been seen wearing jaguar teeth (Belize, Arias et al., 2020). They are also used in a spiritual context, as amulets for protection against evil or for good luck (MINAGRI and SERFOR, *in litt.*, 2020; SEMARNAT, *in litt*., 2020),

such as the case of the Guna people in Panama (Moreno 2021, *pers. comm*.). Closely related to those cultural beliefs, few studies based on interviews with rural communities in Colombia and Bolivia have reported that jaguar teeth are also used for medicinal purposes, for treating illnesses caused by "spells of misfortune" (by burning and grinding the teeth), and dental illnesses (Arias et al., 2021b; Gonzalez-Maya et al., 2010). All countries, except Argentina, Guyana, Honduras, and Paraguay had evidence of domestic illegal trade in jaguar teeth.

Skins: The use of jaguar skins to make coats and jackets for the European and North American fashion industry was the main cause for the commercial killing of hundreds of thousands of jaguars in the early to mid-20th century, which led to a precipitous decline in jaguar populations prior to their listing under CITES Appendix I (Antunes et al., 2016; Smith, 1976). Currently, jaguar skins are no longer used to make high-end clothing as before, but they continue to be used to make traditional costumes (Fig. 6), which are used to mark special occasions or to perform cultural rituals. For example, the Carnival of Tenosique in Tabasco, Mexico, features a jaguar warrior dance during its public parade ahead of Easter, and dancers have been photographed wearing costumes made with jaguar skins (Garcia, 2014; Fig. 6A). Similarly, Tacana children in north-eastern Bolivia wear jaguar skin costumes as they enact theatrical and poetic performances in celebration of mother's day (Fig. 6B). Aside from these examples, the consulted sources reported the use of traditional jaguar costumes in Kwamalasemutu, Suriname (Kerman and Felix, 2010), Alta Verapaz in Guatemala (CONAP, *in litt.*, 2021), Nezahualcóyotl and Tijuana in Mexico (PROFEPA, 2018a) and in Panama amongst the Naso people (Moreno 2021, *pers. comm*.). It is unclear whether these uses are legal in each of these countries, as this depends on the location and characteristics of users.

A. "Danza del Pochó", Carnaval de Tenosique, Tabasco-Mexico. Source: (Garcia, 2014), Photos: SECTUR-Tabasco

B. Tacana children celebrating mother's day, La Paz, Bolivia. Source and Photos: Nuno Negrões/ACEAA-Conservación Amazónica

Figure 6: Jaguar skins used as traditional costumes.

Jaguar skins are also used to make jaguar leather garments and accessories such as purses, hats, belts and wallets (Fig. 7). In Argentina, there have been several legal complaints and legal causes of action taken against leather workshops, tanneries, and sellers on e-commerce platforms for attempting to sell traditional horseback riding products and garments like saddlecloths and girths made with jaguar skins (MAyDS, *in litt.*, 2020). Skins are also considered decorative items or trophies and placed at poachers' or consumers' homes to display hunting prowess or masculinity, as suggested by Kelly, (2018) for the case of Costa Rica. Arias et al., (2021b) found that jaguar skins are not only associated with masculinity in rural Bolivia, but that they are also desired for their softness and beauty, and used by women just as much as men to decorate their homes, shops or restaurants, and to make furniture (Fig. 7). Although less common, jaguar skins have also been described to possess medicinal attributes,

such as alleviating headaches when burnt (Arias et al., 2021b) or as amulets (Alves et al., 2013; Braczkowski et al., 2019; Moreno 2021, *pers. comm*.).

A. Jaguar wallets for sale at a crafts market in Trinidad, Bolivia. Photos: Melissa Arias and Miguel Fernandez

B. Jaguar bed frame in Chiquitania, Bolivia. Photo Paola Nogales Ascarrunz

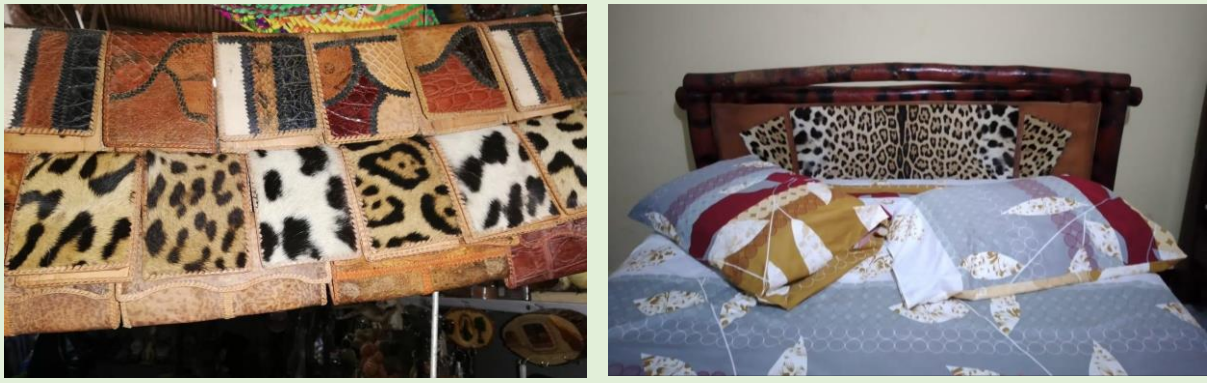

Figure 7: Jaguar accessories and furniture

Live animals: Live jaguars, and particularly cubs, appeared as the third most frequently illegally traded jaguar specimens in this study after teeth and skins. When found in their dens, or after the poaching of the mother, jaguar cubs are often kept or illegally traded as pets or sold as attractions for private wildlife collections. In Guatemala there were at least six recent reports of live jaguars taken from the wild and illegally sold to private collectors or to people interested in using them as a tourist attraction (Arias et al., 2020). Similarly, Honduras had two recent high-profile cases of illegal trade in live jaguars of unknown origin for private zoos and tourist attractions owned by people associated with drug trafficking and money laundering (Silva Avalos, 2020). The authorities of Bolivia and Peru reported the seizure of 25 (2013-2020) and 16 (2000-2020) illegally traded live jaguars, respectively (MINAGRI and SERFOR, *in litt.*, 2020; MMAyA, *in litt.,* 2021*)*. The Federal Attorney's Office for Environmental Protection (PROFEPA) of Mexico has made at least 10 seizures of live jaguars over the past decade, which were illegally kept at private residences, illegal zoos and other wildlife facilities. The animals were seized due to lack of documentation on their origin, lack of official permits, or because they were being kept in deplorable conditions, being defanged, declawed and sterilized to become tame (PROFEPA, 2018b, 2018c, 2018d). In a single year in 2019, the Mexican government reported 11 seizures of live jaguars (SEMARNAT, *in litt.,* 2020).

Skulls and taxidermies: Jaguar skulls and head taxidermies are used as trophies. In 2016, the seizure of five jaguar head taxidermies, kept inside a freezer at a gun factory in Curionopolis, Brazil, along with other body parts suggesting the poaching of at least 16 jaguars, revealed the existence of organized clandestine illegal trophy hunting in the country (Fig. 8A, IBAMA, 2016). Seizures of full body taxidermy trophies were also reported in Argentina (MAyDS, *in litt.*, 2020), Guatemala (Fig. 8B, Arias et al., 2020) and Perú (MINAGRI and SERFOR, *in litt*., 2020), where jaguar hunting is also illegal. Moreover, jaguar skulls are used as evidence of jaguar killing in the context of human-jaguar conflict, and ranchers are sometimes financially compensated by ranch-owners for each poached animal, adding an incentive to retain the parts (Arias et al., 2021b). Though jaguar killing to defend human lives or property is legal in some circumstances in countries like Belize, the extraction and use of jaguar body parts is illegal. Skulls and heads are also used for decorative and cultural purposes, sometimes painted and used as masks for traditional dances, or as house decoration objects such as lamps.

A. Jaguar head taxidermies seized in Curionopolis, Brazil in 2016. Source: IBAMA

B. Jaguar taxidermy seized at drug raid in Izabal, Guatemala. Source: CONAP Izabal. Photo: Melissa Arias.

Figure 8. Seizures of jaguar taxidermies used as trophies.

Small items: The illegal use and trade of smaller jaguar body parts, such as claws and tails were also reported in countries like Belize, Bolivia, French Guiana, Mexico, Peru and Suriname. Claws are used as pendants or earrings, while the tip of the tail can be made into keychains. Similarly, paws are sold as crafts at souvenir markets in Peru (SERFOR and WCS, 2019), and have also been illegally traded in exchange for livestock in Costa Rica (Reuter et al., 2018). Mutilated jaguar carcasses, with their paws removed, have been found at least twice in forests and roadsides in Sinaloa and Chiapas in Mexico (Cassaigne, *in litt.*, 2014; Melgoza, 2020). Jaguar genitalia and other organs such as heart, brain, gastrointestinal tract and eyes have also been mentioned in the literature for domestic medicinal and cultural purposes in Mexico (Garcia-Alaniz et al., 2010; Melgoza, 2020), Belize (Harmsen and Urbina, 2017) and Bolivia (Arias et al., 2021b).

Fat: Arias et al., (2021b) found that jaguar fat was amongst the most widespread and commonly mentioned jaguar body parts in north-western Bolivia. The use of jaguar fat has also been reported across the jaguar range in countries like Belize, Brazil, Colombia, Guatemala, Mexico, Peru, Suriname, and Venezuela. The extraction of fat is not restricted to jaguars, but fats and oils of pumas, manned wolf, snakes and many other species have also be found at folk medicine markets in towns like Iquitos, Peru, or Trinidad, Bolivia. Although there have not been empirical studies testing its effectiveness or actual composition, jaguar fat is used to allegedly treat a wide range of bone, joint and respiratory illnesses in countries like Bolivia, Mexico and Panama (Fig. 9, Arias et al., 2021b; Garcia-Alaniz et al., 2010, Moreno 2021, *pers. comm*.). The same sources have described the use of jaguar fat as a repellent for crop raiding herbivores.

A. Jaguar fat ointment in north-western Bolivia. Photos: Melissa Arias

B. Jaguar fat syrup in Bolivia. Photos: Paola Nogales Ascarrunz

Figure 9. Jaguar fat used for medicinal purposes.

Meat: Even though for some communities, like the 'ribeirinhos' in the Medio Rio Negro of the Brazilian Amazon, the consumption of jaguar meat is seen as a cultural taboo that can cause illness (da Silva, 2007), jaguar meat is occasionally consumed in other areas. In other regions of the Brazilian Amazon, like the Mamirauá and Amanã reserves and Para state, jaguar consumption is not a rare event and poachers who kill jaguars donate their meat to low income communities (Srbek-Araujo, 2015; Valsecchi do Amaral, 2012). Domestic meat consumption was also reported in Belize (Arias et al., 2020), Bolivia (Arias et al., 2021b), Colombia (Gonzalez-Maya et al., 2010), Costa Rica (Kelly, 2019) French Guiana (Gaillard 2021, *pers. comm.*), Panama (Moreno et al., 2016a) and Venezuela (Jędrzejewski et al., 2017b). Aside from its nutritional benefits, eating jaguar meat was associated with spiritual benefits, including accessing the spirits of the mountain in Costa Rica (Kelly, 2019) or gaining strength and luck for hunting.

5.2 Illegal uses of jaguar body parts outside the jaguar range

There is less robust evidence about the uses of jaguar body parts outside of jaguar range States. Aside from one investigation on the illegal online trade in jaguar body parts which included China and Viet Nam (Polisar et al., *in litt.*, 2020), the remaining information available on foreign demand for jaguar body parts is based on investigations focused on supplier or intermediary actors in the illegal trade chain within Latin America, rather than on consumers outside range countries. This is perhaps the most significant gap in current knowledge about the illegal trade in jaguars. An improved understanding on jaguar consumption outside of Latin America, from the perspective of actual consumers is needed. However, the limited evidence on illegal trade in jaguars outside of range States suggests that jaguar body parts are used as collectibles or medicines in the context of Chinese wildlife markets, or for tourism-related purposes (such as souvenirs or attractions) by foreigners of multiple nationalities.

China-related uses of jaguar body parts: Since 2010, jaguar traffickers and consumers of Chinese descent (of unconfirmed nationality or migratory status) have been implicated in cases of attempted smuggling of jaguar teeth to China in countries like Bolivia and Suriname, as recognized by the authorities (Suriname Forest Service, *in litt*., 2021; MMAyA, *in litt.*, 2021). These events gave rise to speculations about the uses of jaguar teeth in Chinese wildlife markets, but to date, there are no studies on the motivations behind the use of jaguar body parts in China. A recent study of the media

portrayal of the illegal trade in jaguars in Bolivia found that 119 out of 298 news articles on the matter placed Traditional Chinese Medicine (TCM) as the leading use of jaguar body parts by jaguar consumers in China (Li, 2021). TCM is a widely popular medical practice that has evolved in China for more than 5,000 years, based on the use of a wide range of plant and animal ingredients, including some endangered species (Gratwicke et al., 2008; Mainka et al., 1995; Still, 2003). The rationale for the link between the illegal trade in jaguars and TCM was the suspicion that jaguar body parts may be replacing those of the endangered tiger, which were used in TCM before China joined CITES, and before being banned in the country in 1993 (Villalva and Moracho, 2019). Tiger body parts, particularly their bones, were used in TCM to treat severe bone and joint diseases, including arthritis and rheumatism (Moyle, 2009). Following the ban on tiger products, the formal TCM sector has opted for alternatives such as African lion bones, which are legally traded in certain circumstances (Moyle, 2009; Williams et al., 2015). Illegally, other big cats have also been found in TCM treatments, including snow leopards (Coghlan et al., 2015), which led to the belief that the same might hold true for jaguars (Nunez and Aliaga-Rossel, 2017; Villalva and Moracho, 2019). However, the emphasis on teeth instead of bones in jaguar seizures to date, makes this hypothesis unlikely, since tiger teeth have rarely been used for medicinal purposes in China (Moyle, 2009). Moreover, while news and academic articles reporting on the illegal trade in jaguars in Belize, Bolivia, Panama, Suriname and Venezuela, have mentioned demand for full jaguar carcasses and body parts such as jaguar bones, genitalia, bile or blood for TCM (e.g. Arias, et al., 2020; Li, 2021, Moreno 2021, *pers. comm*.; Jedrzejewski, 2011), there is currently no hard evidence to corroborate these uses.

Instead of TCM, the interest in jaguar teeth appears to be related to the Chinese subculture of 'Wenwan' (文玩), meaning 'toys of culture or sophistication' (Li, 2021). Wenwan includes a wide range of collectible items like carvings, ornaments, jewellery, and trinkets that show an owner's "taste, discernment and status", and they sometimes include high value and rare endangered species products such as elephant tusks, rhino horn and charms made with tiger teeth, bones or claws (Stannard, 2019; Y.K. Lam, 2018). Unlike TCM, which follows an official compendium of accepted ingredients (the Chinese Pharmacopeia), the Wenwan market has been described as fluid and flexible, adapting to new trends in demand and being receptive to new species and products (Y.K. Lam, 2018). A recent investigation of the illegal trade in jaguar body parts of online platforms, which took place between May 2019 and March 2020, covering the years 2010 to 2020, found 18 jaguar teeth for online sale in China, which were linked to the online market for other big cat body parts (Polisar et al., *in litt.*, 2020), providing evidence that jaguars are entering the Chinese market of big cat body parts. However, the study did not find evidence for the sale of any other jaguar parts, such as skins or bones in China, supporting the hypothesis that the demand for jaguar teeth could be more associated with the Wenwan (collectibles) market in China than with TCM.

However, recent investigations carried out by non-governmental organizations and acknowledged by Suriname's authorities in their response to CITES' Notification 055/2020 (which requested inputs to this study) have suggested that jaguars are being trafficked to produce "jaguar paste", a black viscous substance that is made by cooking and simmering the jaguar's body for a week, which is allegedly used for medicinal purposes by jaguar consumers in China and in Suriname (Lemieux and Bruschi, 2019). Jaguar paste resembles tiger paste, which is produced in a similar way and also used for medicinal benefits in China, Viet Nam and Thailand, despite being illegal (Coals et al., 2020; Davis et al., 2020; EIA, 2019). Analyses of the composition of the paste are also needed, as even medicines that have been marketed as containing tiger body parts in Asia have been found to be made up of livestock bones and to contain rather small (or even non-existent) quantities of wild felids (Wetton et al., 2002). Individuals from the Chinese diaspora in Suriname have also been implicated in the consumption of jaguar meat (Kerman and Felix, 2010; Verheij, 2019).

Tourism-related uses of jaguar body parts: Most seizures of jaguar body parts in countries like Guatemala, Belize (Arias et al., 2020) and Peru (SERFOR and WCS, 2019), have taken place at souvenir shops and crafts markets in touristic areas visited by foreign and national tourists. These seizures suggest that foreign (and national) tourists of diverse nationalities may be implicated in the illegal purchase and smuggling of jaguar body parts. However, aside from a seizure of two jaguar teeth pendants that had been purchased by Czech tourists at a market in Mexico in 2018, who were fined by Czech authorities (Czech Environmental Inspectorate, *in litt.*, 2020), no additional evidence of the prosecution of tourists for the illegal trade in jaguars was presented for this study. In addition to the fact that several jaguar seizures have been made in touristic locations, recent studies have found that tourists and other visitors of European descent are leading buyers of jaguar body parts in rural communities in north-western Bolivia (Arias et al., 2021b) and that bracelets or pendants made with jaguar skin and teeth are being sold to foreign tourists in Peru, as part of the 'ayahuasca' experience, claiming that they act as amulets that can enhance the effects of this herbal traditional psychoactive brew (Braczkowski et al., 2019).

Table 3: Illegal domestic and foreign uses of jaguar specimens and countries with reports of use, based on all types of sources consulted in this study. Note: not all of these uses have been verified through seizures or enforcement, but they are all reported in published literature (cited in the text above).

Body Part	Countries with reports	Use Category[2]	Use detail (alleged and confirmed)
Teeth	**Range:** Belize, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, French Guiana, Guatemala, Mexico, Nicaragua, Panama, Peru, Suriname, Venezuela **Non-range:** China, Czech Republic, France, Germany, New Zealand, United States, Uruguay, Viet Nam	Crafts/Housing	Jewellery (domestic and foreign); collectibles (domestic and foreign); souvenirs (domestic and foreign).
		Medicinal	Treatment for facial paralysis caused by a spell of misfortune (domestic); dental treatment (domestic).
		Spiritual	Necklaces worn at traditional festivals (domestic); amulets to protect against bad luck or evil (domestic); items of status and prestige (domestic and foreign).
Skin	**Range:** Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Venezuela **Non-range:** Austria, China, Denmark, France, Germany, Portugal, Spain, Sweden, Turkey, United States	Crafts/Housing	Home decoration: tapestries, rugs, chairs, hammocks (domestic); personal accessories and clothing garments: belts, wallets, purses, hats, shoes, saddles, briefcases (domestic and foreign).
		Spiritual	Costumes and drums for traditional dances (domestic).
		Medicinal	Treatment for headaches (domestic).
Skull and taxidermies	**Range:** Argentina, Belize, Bolivia, Brazil, Costa Rica, Mexico, Panama, Peru, Suriname, Venezuela. **Non-range[1]:** Netherlands, Switzerland, United Kingdom, United States	Crafts/Housing	Trophies (domestic); painted and turned into lamps (domestic).
		Spiritual	Amulet for good luck in business (domestic); witchcraft (domestic); traditional dance masks (domestic).
		Functional	Repellent for crop raiding animals (domestic); prevents encounters with jaguars (domestic).
Live	**Range:** Belize, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Peru, Suriname, Venezuela **Non-range:** Bosnia, France, El Salvador, Slovakia	Captivity	Pets (domestic); attractions for private wildlife collections (domestic and foreign).
Small items (tail, claws, paws, genitalia and organs)	**Range:** Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, French, Guiana, Guatemala, Mexico, Nicaragua, Panama, Peru Suriname, Venezuela **Non-range:** China, United States, Viet Nam	Crafts/Housing	Jewellery (domestic and foreign); crafts and collectibles (domestic and foreign); exchanged for goods and cattle (domestic).
		Spiritual	Amulet for good luck and strength (domestic); Brain and heart are used for rituals (domestic).
		Medicinal	Eyes are used as a treatment for poor eyesight (domestic).
Fat	**Range:** Belize, Bolivia, Colombia, Ecuador French Guiana, Guatemala, Mexico, Panamá, Peru, Suriname, Venezuela	Medicinal	Rubbing ointment (domestic): rheumatism, arthritis, welling, muscle pain, cramping, burnt or inflamed skin, varicose veins, complicated child births; Drinking syrup (domestic): common cold, pneumonia, embolism, asthma, bronchitis, uric acid, kidney disease.
		Functional	Repellent for crop-raiding animals (domestic); to manage untamed cattle (domestic).
Meat	**Range:** Belize, Bolivia, Brazil	Nutritional	Food for humans and domestic animals like dogs (domestic).

	Colombia, Costa Rica, French Guiana, Guatemala, Mexico, Nicaragua, Suriname, Panama, Venezuela	Spiritual	Consumed for vitality and strength, particularly amongst hunters (domestic).
Bones or paste	**Range:** Belize, Bolivia, Guatemala, Suriname, Panama, Venezuela **Non-range:** China	Medicinal	Medicine for strength, range of therapeutic benefits, including arthritis relief, increased vitality, sexual potency and toxin removal (foreign).
		Spiritual	Kept at home for luck (domestic).
[1] No description of the uses given to these items in these countries [2] Categories based on Thomas-Walters et al., (2020)			

5.3 Prices of jaguar body parts

The literature review revealed that the prices of illegal jaguar body parts are wide ranging, as has been already suggested in the past (Arias and Lambert, 2019; Kelly, 2018). This depends on multiple factors, starting with whether the body parts are sold in their raw condition, or whether they have been crafted or processed. Teeth pendants that have been encrusted with precious metals or stones are generally on the higher price end. Another factor that plays a role in the price is the location where the price is recorded, and whether it is closer to source, transit or destination locations (Felbab Brown, 2017). Teeth claws, paws or skin products found in craft shops at tourist destinations or urban areas, which have been manufactured into jewellery, souvenirs or accessories, tend to be more expensive than those purchased directly from rural villages closer to the source. This has to do with the market and buyers, but also with the fact that a portion of the profit is likely accrued by intermediary actors in the illegal trade chain. The price is also dependent on the market knowledge possessed by the seller and their place of residence. For example, the price of jaguar body parts varied with the culture and ethnicity of the sellers in Costa Rica, with indigenous 'Cabecar' people offering the parts at lower prices than mixed ethnicity 'Ticos' (Kelly, 2018). Similarly, in certain locations in Mesoamerica and Bolivia, jaguar body parts are often exchanged or gifted without any financial exchanges, depending on peoples' awareness of the illegal market (Arias et al., 2021a, 2020).

6. DRIVERS AND ENABLING FACTORS BEHIND THE ILLEGAL TRADE IN JAGUARS

Drivers are "forces, conditions or factors that lead people to behave in a particular way" (TRAFFIC, 2008). There are multiple drivers and enabling factors behind the illegal wildlife trade, ranging from wildlife harvesting dependent livelihoods and traditional practices at the local level, to national laws and international consumer markets (Harrison et al., 2015c; TRAFFIC, 2008). There are a few studies that have specifically investigated the drivers of the illegal trade in jaguars in Latin America. They have done so both qualitatively through interviews with experts working on the issue on the ground (Arias et al., 2020; Da Silva, 2017; Reuter et al., 2018), and quantitatively, through statistical analyses describing seizure patterns and traffickers' behaviours (Arias et al., 2021a; Morcatty et al., 2020). In broad terms, some of the identified drivers of the illegal trade in jaguars include, domestic demand for jaguar body parts, local livelihoods, human-jaguar conflict, poverty and financial incentives, foreign demand for jaguar body parts, tourism, private collections, and illegal trophy hunting. These drivers can be more cumbersome to address in the presence of enabling factors that facilitate the illegal trade in jaguars in range countries, including a lack of financial and human resources for adequate enforcement, corruption, legal loopholes and deficiencies, and lack of awareness about jaguars and their legal status (Arias et al., 2020; Morcatty et al., 2020; Reuter et al., 2018).

The order of these drivers is based on a consideration of their importance based on the evidence included in this report. However, this should be interpreted within the limitations of the evidence collected for this study (Chapter 4.5) as there is limited empirical evidence on the relative importance of these factors on jaguar populations when compared to each other, and to other threats facing jaguars, such as habitat loss. Moreover, the weight of these drivers and enabling factors is likely to vary across countries and sites, limiting the effectiveness of one-size-fits-all approaches to address the illegal trade in jaguars. Beyond further investigating the effects of these drivers and their interactions on jaguar mortality at the site-level, efforts to address the illegal trade in jaguars would benefit from adopting multi-faceted approaches that address a combination of these factors, and that build the capacity of wildlife authorities to uphold the law. However, based on the evidence consulted in this study, domestic demand, local livelihoods and human-jaguar conflict appear to be responsible for the greatest numbers of poached and illegally traded jaguars. Those numbers, which necessarily underestimate the true scale of jaguar poaching and of the illegal trade in jaguars (probably by several orders of magnitude), and which do not consider other direct and indirect human-induced jaguar mortalities, such as those caused by the loss of prey and habitat, vehicle collisions, forest fires, and the spread of disease, seem to be already affecting the long-term survival of jaguar populations based on estimated from population viability assessments (Chapter 8). Thus, these drivers must be properly investigated and addressed due to their ubiquitous nature and potentially high impact on jaguar populations, and because they affect both the demand and supply for jaguar body parts, with or without the presence of foreign markets.

6.1 Drivers of the illegal trade in jaguars

Domestic demand for jaguar body parts and local livelihoods:

As described in Chapter 5, jaguars have an important and longstanding cultural value for many indigenous and non-indigenous communities throughout their range, and their body parts are often used for a range of decorative, spiritual, functional and subsistence purposes within domestic wildlife markets. Despite being widespread and mostly illegal, domestic and traditional uses of jaguar body parts have not received substantial research attention, nor have they been the focus of jaguar conservation projects. This may be partly because they often occur in a blurred line of legality and illegality, as some countries do explicitly allow traditional use of protected species by indigenous

communities (see Appendix for national laws), but also because of a general perception that they occur at low scales and do not represent a threat to jaguar populations. However, recent studies are starting to suggest that illegal domestic markets for jaguar body parts can reach considerable scales and deserve more attention. Recent international investigations of jaguar seizures (Morcatty et al., 2020) and of the illegal online trade in jaguars (Polisar et al., *in litt.*, 2020), found that while 34% of jaguar body part seizure reports, and 26% of online posts of illegal trade in jaguars, respectively, were linked to China[6], the remaining detected seizure reports or online posts concerned domestic markets.

Though it is not clear whether demand from domestic markets leads to the targeted persecution of jaguars, it can act as an incentive for poaching jaguars when an opportunity arises, such as during chance encounters between jaguars and wild meat hunters. Opportunistic jaguar poaching, associated with local uses and wild meat hunting, has been recognized as a leading driver of the illegal trade in jaguars in several countries in the jaguar range (Arias et al., 2020; Reuter et al., 2018). In rural areas of north-western Bolivia, where wild meat hunting is a predominant livelihood, Arias et al., (2021a) found a strong and significant statistical association between wild meat hunting, jaguar poaching, and the illegal trade in jaguar body parts, and wild meat hunters were the main jaguar traffickers in the area. Over 40% (out of 1107) of the interviewed participants had personally used jaguar body parts, and 48% had the desire to kill jaguars if given the opportunity to do so. Similarly, in Venezuela, over half of 301 jaguar poaching events recorded from 2001 to 2014 were driven by subsistence purposes, including personal consumption and income from the sale of body parts, making this the leading cause of jaguar poaching in the country (Jędrzejewski et al., 2017b). In Argentina, out of the 42 jaguar poaching events that were recorded from 1995-2009 in northern Misiones, the majority were carried out by hunters who found a jaguar by chance while hunting for wild meat (Paviolo, 2010). Wild meat hunting not only increases access to jaguars by people who are trained and equipped to hunt animals of varying sizes, but it can also threaten jaguars indirectly by reducing prey numbers in areas with high offtake levels, and forcing them to stray outside of protected areas and into human settlements in search for food, where their risk of being poached or of entering into conflict with humans becomes higher (Espinosa et al., 2018; Romero-Muñoz et al., 2019). It should be noted that recent estimates suggest that over 45 million people across Central and South America hunt and rely to some extent on wild meat, and that hunting by non-indigenous, 'campesino' communities, and its sustainability, is poorly understood (Nielsen et al., 2018; Petriello and Stronza, 2020). Hence, the direct and indirect impacts of wild meat hunting on jaguars, and its relationship with the illegal trade in jaguars should not be underestimated.

Aside from wild meat hunting, other forest dependent livelihoods also increase human contact with jaguars and possibly drive jaguar poaching and illegal trade. In Bolivia, for example, Knox et al., (2019) reported that communities whose livelihoods rely predominantly on the collection of Brazil nut or Acai fruit have high rates of jaguar poaching. Similarly, logging and artisanal gold mining livelihoods have also been associated with jaguar poaching in Suriname and French Guiana (OFB, *in litt*., 2021; Verheij, 2019).

Human-jaguar conflict:

Conflict between humans and jaguars due to livestock and other domestic animal (e.g. dogs) depredation by jaguars is considered to be among the top two threats to jaguar populations across the species range, together with habitat loss (Castano-Uribe et al., 2016; Quigley et al., 2017). Human-

[6] For Morcatty et al (2020), "these links could refer to Chinese nationals or descendants living in or visiting southern America being implicated in the seizure; confiscated packages with China reported as the end destination; explicit mentioning of China as the destination of the confiscated goods; or seizures made in China with explicit links to southern American countries". For Polisar et al (2020), the link refers to posts of jaguar body parts for sale in online platforms in the Chinese language.

jaguar conflict can cause substantial economic losses to ranchers and local communities, especially those under the poverty line (Tortato et al., 2017), and it also has a psychological and emotional impact (Amit and Jacobson, 2017a). Fear of jaguar depredation and of attacks on people leads to negative attitudes and intolerance towards jaguars and their presence (Knox et al., 2019; Marchini and Macdonald, 2012; Moreno et al., 2020). This ultimately results in retaliatory killing of jaguars, even in cases where jaguars are not to blame for any losses, as a precautionary measure, or because they are wrongly accused. Jaguars are often blamed for attacks done by other predators or feral dogs, or even by farm staff who intentionally hurt calves to attract jaguars in order to shoot them and receive a reward from farm owners (Fernandes-Ferreira, 2014; Moreno et al., 2016b, 2015). Retaliatory jaguar killing is illegal in most range States, but in some countries like Belize, there are specific regulations permitting jaguar killing for self-defence or to defend livestock, without much regulation. However, even in cases where lethal control is allowed, the extraction, use and trade of jaguar body parts remains illegal in Belize (see Appendix for country-specific laws).

Conflict-related jaguar mortality has reached alarming levels, and it is perceived to be increasing as jaguar habitat diminishes and jaguars are pushed into closer proximity to humans and livestock (Marchini and Crawshaw, 2015; Moreno et al., 2020). In some areas, the numbers of reported retaliatory killings of jaguars are astounding. In a single year (2003-2004), 110-150 jaguars and pumas were poached due to conflict in one municipality in the Brazilian Amazon's arc of deforestation (ICMBio, 2013; Michalski et al., 2006). In Panama, 95% of the 230 confirmed jaguars poached (out of a possible 900) from 1998 to 2014 were poached due to conflict (Moreno et al., 2016a, 2015), a number that has increased to 370 confirmed jaguars poached until 2021 (Moreno 2021, *pers. comm.*). Conflict and fear accounted for 42% of 307 documented jaguar mortalities in Venezuela from 2001 to 2014 (Jędrzejewski et al., 2017b). Research carried out in 85 cattle ranches spread over the Pantanal, Chaco, Chiquitania and Beni ecoregions, covering 656,000 hectares in Bolivia, reported 347 jaguars poached in a four year period (Arispe et al. 2009 in MMAyA, 2020b). Another study of cattle ranches in Beni, reported the poaching of 93 jaguars in a year in 30 cattle ranches, equivalent to 10.6 jaguars poached per 100 km^2 in an area of 87,979 ha. (Inchauste Ibanez, 2015). In Belize, poaching due to livestock depredation by jaguars, led to an estimated annual offtake of 200 jaguar individuals nation-wide, representing about 45% of the population residing outside of the two main protected area blocks in the country (Foster, 2008).

Due to its high incidence, human-jaguar conflict has been suggested as an important potential source of jaguar body parts for the illegal wildlife market. People who experience conflict with jaguars have a direct access to jaguar body parts, and their accumulated stocks from past and present conflict killings may now be supplying the market for illegal jaguar body parts (Da Silva, 2017; Romo, 2020). Moreover, ranchers suffering from conflict related economic losses could have an added incentive to sell jaguar body parts in compensation for their losses (Jędrzejewski et al. 2017b; Reuter et al. 2018). Even though the body parts of jaguars poached due to conflict are not always extracted or illegally traded (sometimes ranchers simply want to get rid of the problem and discard the carcass), this is a common outcome. In Venezuela, for example, only one in 195 people who described the uses of jaguar body parts following poaching events claimed to have discarded the complete carcass, while all others removed valuable body parts (Jędrzejewski et al., 2017b). Based on those findings, the study concluded that poaching due to conflict or subsistence are almost indistinguishable in terms of the products utilized from poached animals (Jędrzejewski et al., 2017b). A similar situation has been described for Panama, where ranchers have been known to hire poachers to kill jaguars that have depredated on livestock, allowing them to retain the resulting jaguar body parts as pay (Moreno 2021, *pers. comm*.). A survey on wild meat hunting and wildlife uses in Belize, which reached 1,525 people in 2017, identified 16 people who admitted to poaching jaguars due to conflict, after which the majority (72%) extracted their body parts (Harmsen and Urbina, 2017).

In north-western Bolivia, the hypothesis that the illegal trade in jaguars and human-jaguar conflict may be connected was tested by Arias et al., (2021a). The findings showed that ranching livelihoods and livestock depredation by jaguars strongly and significantly explained jaguar poaching and the possession of body parts by survey participants. Moreover, about a third of the people who admitted to both poaching and selling jaguar body parts had also personally experienced depredation by jaguars, making conflict a likely source of illegally traded body parts. However, both ranching livelihoods and human-jaguar conflict were not strong predictors of commercial behaviours when compared to other drivers like wild meat hunting or financial incentives (Arias et al., 2021a). Therefore, in that specific case, human-jaguar conflict was found to be an important driver of the illegal trade in jaguars, but not the only one, nor the most significant. Elsewhere, the links between human-jaguar conflict and the illegal trade in jaguars have not been statistically assessed.

Financial incentives from the illegal trade in jaguars:

Poverty is often cited as a leading driver of the illegal wildlife trade. However, studies on the links between poverty and poaching have found limited empirical support for this association, worsened by an oversimplification of contextual and historical factors (e.g. colonial legacies, perceived injustices), and a tendency to disregard the multidimensional meanings of poverty (Duffy et al., 2016; Duffy and St John, 2013; Harrison et al., 2015a).

The relationship between the illegal trade in jaguars and poverty has not been explored in detail, but it has been inferred and reported extensively by the media (Li, 2021), due to the fact that jaguar poaching often occurs in marginalized areas with little access to public services, and at the hands of low income communities who rely on hunting as a livelihood. Morcatty et al., (2020) began to unravel the relationship between poverty and the illegal trade in jaguars by analysing jaguar seizures from 2012 to 2018, and finding that countries with lower gross national income (GNI) per capita have higher numbers of jaguar seizures. Even though national level economic indices may not reflect the circumstances of people involved in the illegal trade in jaguars, these findings may be indicative of a trend and deserve further investigation. Another study specifically looking at the links between engagement with the illegal trade in jaguars and communities' socioeconomic characteristics in north-western Bolivia found no significant association between income and jaguar poaching and selling behaviours (Arias et al., 2021a). However, people with lower incomes were significantly less likely to have purchased jaguar body parts. Importantly, people who were aware of the prices of jaguar body parts and of the presence of jaguar traffickers in and around their communities were up to four times more likely to have poached, owned, sold, and bought jaguar body parts. Also in Bolivia, an analysis of three penal cases against jaguar traffickers conducted by the UNODC and the Ministry of Environment and Water revealed that jaguar traffickers had moderate and stable incomes from legal businesses, such that their actions were not driven by poverty (UNODC and MMAyA, *in litt.*, 2021).

In alignment with the broader literature on poverty and illegal wildlife trade, these findings suggest that it is not necessarily poverty per se what drives the illegal trade in jaguars, but rather a desire to increase wealth combined with market knowledge and the low risks associated with wildlife crimes (Harrison et al., 2015b; McNamara et al., 2016). In particular, the high prices that are being offered for jaguar body parts, and which are dictated by trends in domestic and foreign demand, provide an incentive for people to engage in jaguar poaching and trafficking. Researchers have noted that in some instances, the prices that are currently being offered for jaguar teeth in the illegal market may exceed the minimum national monthly wages in source countries (Moreno 2021, *pers. comm*.; Nunez and Aliaga-Rossel, 2017). High prices and profitability could also incentivize criminals involved in different lines of crime, such as drug traffickers or wildlife traffickers focused on other species, to diversify their illegal activities or to switch into the business of the illegal trade in jaguars due to its high margins and

low risks, as it has been already seen for the case of timber in countries like Colombia, Mexico and Panama (van Uhm et al., 2021).

Moreover, it is not only poor rural communities that poach and illegally trade jaguars, but also wealthier cattle ranchers, urban elites, merchants, people employed in natural resources extraction and infrastructure development and illegal trophy hunters. Indirectly, these wealthier groups are also affecting jaguars by driving habitat conversion through the establishment of large-scale cattle ranching, agriculture and natural resource extraction, which bring people into closer proximity to jaguars and increase the likelihood of poaching and the intensity of human-jaguar conflict.

Foreign demand for jaguar body parts:

Based on official seizures reported in the UNODC's World WISE Database, jaguar body parts are smuggled to several destinations outside the jaguar range, such as the United States, Germany and China (section 4.1). The United States in particular had the largest number of seizures of jaguar body parts, and it was also the most frequent country of destination. However, demand for jaguar body parts in the United States has not received much research or media attention in the past years relative to other foreign markets such as China, and therefore, its characteristics are largely unknown. Out of the seizures of jaguar body parts that were made in the United States (59) based on the UNODC's World WISE Database, most (64%) were jaguar skins and leather subproducts, followed by teeth. Based on the United States' response to CITES Notification 055/2020, which included seizures from 2015 to 2019 (representing 30 jaguar specimens), skin products were also amongst the most common objects seized followed by teeth, and the purposes were classified as either personal or commercial. Aside from these broad categories, the motivations behind the illegal trade of these items in the United States is not understood, nor are its actors. Seizures made in Germany also included a mix of teeth and skin items (equalling 14 specimens), but the purposes and actors behind the trade are unknown.

Based on the UNODC's World WISE Database, China was identified as the destination country in three out of 76 records (4%) of illegal international trade in jaguar body parts (records containing destination country, Chapter 4). Seizures that had China as a destination country were shipped from Venezuela, Bolivia and Brazil through Germany from the years 2010 to 2017, and collectively involved 10 jaguar specimens and a minimum of four jaguar individuals. Although China did not present any jaguar seizures in their response to CITES Notification 055/2020, which requested inputs for this study, and the number of jaguar seizures involving China were low compared to other countries like the United States according to UNODC's World WISE Database, the literature consulted in this study characterized China as the main market for illegal jaguar body parts outside the jaguar range.

There were 12 literature sources describing illegal trade in jaguars in China, of which nine contained duplicated information describing a single jaguar seizure which was made by customs authorities at the Beijing International Airport in 2015. In this seizure, a passenger traveling from Santa Cruz de la Sierra, Bolivia, to Beijing, China (with transit in Sao Paulo and Paris), was found to be carrying 119 jaguar teeth, 13 jaguars claws, and 2 anteater claws in his carry-on and checked luggage, for which he received a sentence of four years and six months imprisonment and a fine of USD $7,836 (RMB $50,000, currency conversion rate of date of sentence, Beijing People's Court, 2015). The remaining non-duplicate literature reports of illegal trade in jaguars in China included a seizure of alleged jaguar bones by Gaoqi Airport Customs from a passenger arriving from Amsterdam in 2014 (Xiamen News, 2014) and the advertisement of 18 jaguar teeth for sale in online platforms in China from 2010 to 2020 (based on searches conducted from 2019-2020, Polisar et al, *in litt.*, 2020). The seizure of nine puma teeth by Xiamen's post office customs in 2019, which originated from Peru, was also found in the literature (Sina Fujian News, 2019). Although this latter seizure does not specifically involve jaguars, it

is relevant because puma teeth have been mislabelled as jaguar teeth in past seizures of jaguar body parts in Bolivia, which were also destined for China (Romo, 2020).

Aside from these seizures, the remaining evidence of demand for jaguars in China found by this study is based on seizures or investigations conducted outside of China, and which implicated China either as a destination country of illegally traded jaguar body parts, or as the alleged nationality of jaguar traffickers. It should be noted that the nationality of alleged "Chinese jaguar traffickers" in Latin America and their migratory status was not verified by any of the official or non-official sources in this study. Since China does not allow dual citizenship, it is possible that some of the "Chinese jaguar traffickers" in Latin America are range country nationals or residents of Chinese descent, rather than Chinese nationals. This distinction is important to determine whether the illegal trade in jaguars is driven by domestic or international demand, independently of the ethnicity of traffickers. Regardless of nationality, jaguar traffickers should be taken as individuals who knowingly or unknowingly break the law, rather than a representation of their broader ethnic and social groups.

Chinese migration into Latin America is not a new phenomenon. Hundreds of thousands of Chinese immigrants arrived in Latin America in the 19th century to provide labour for the region's expanding agricultural and construction sectors. They were followed by a smaller in size, but extended influx of Chinese immigrants, composed of independent labourers and small businessmen who settled in national and provincial capitals throughout most of the 20th century (Hu-deHart and López, 2008; Look Lai and Tan, 2010). A more recent wave of Chinese migration has taken place over the past decades, associated with China's "going out" strategy, which encourages firms to invest abroad, predominantly in the infrastructure and natural resource extraction industries (Gonzalez-Vicente, 2012; McDonald et al., 2009). These immigrant communities have become the established Chinese-Latino communities of today, which have a strong presence in the services and commerce sectors (Mazza et al., 2016).

Within Latin America, confirmed evidence of demand for jaguar body parts from wildlife markets in China, or of the involvement of jaguar traffickers of Chinese-descent (of unknown nationality, immigration status or relationship to China or Chinese corporations), is limited to Bolivia and Suriname. In Bolivia, between 2013 and 2020, 22 out of 55 (40%) cases of illegal trade in jaguars recognized by the authorities (involving a total of 436 jaguar teeth), involved mail shipments of jaguar teeth or seizures made at airports that had China as a destination country (WCS-Bolivia, *in litt.*, 2021). Moreover, 22 out of 26 (85%) complaints of jaguar trafficking presented to the Environmental Police (POFOMA) from 2013 to 2016 involved 10 jaguar traffickers of Chinese descent, and two out of 54 (3.7%) criminal prosecutions that were initiated by the authorities for jaguar trafficking between 2007 and 2019 resulted in a three to four year prison sentence for three jaguar traffickers of Chinese descent (MMAyA, *in litt.,* 2021). The offenders were originally from China, but were residing in Bolivia and owned businesses in the food sector, but no proof of migratory and labour status accompanied the cases (UNODC and MMAyA, *in litt.*, 2021). In Suriname, investigations conducted by non-governmental organizations also uncovered the involvement of individuals with Chinese background in the illegal trade in jaguars and the production of jaguar paste in the country (Kerman and Felix, 2010; Lemieux and Bruschi, 2019). In their response to CITES Notification 055/2020, the Suriname Forest Service acknowledged allegations that jaguar body part buyers and traders include individual merchants of Chinese descent living in Suriname, and people of diverse origins who are working in the interior of the country in the forest and mining sectors, including people of Chinese, Brazilian, Korean, Guyanese, Cuban and Indian background (Suriname Forest Service, *in litt*., 2021). Additionally, Surinamese authorities reported three seizures totalling 14 jaguar teeth made at international airports in the country (Suriname Forest Service, *in litt*., 2021), which based on news reports, involved jaguar traffickers of Chinese descent who were released after paying a fine (Star Nieuws, 2018; Suriname Herald, 2019).

Demand from Chinese wildlife markets, in China and within Latin American countries (by residents from the Chinese diaspora) for jaguars and their body parts, remains largely anecdotal in other countries aside from Bolivia and Suriname. Morcatty et al., (2020) described that around 30% (out of 93) jaguar seizures available online in countries like Brazil, Bolivia, Peru, Colombia and Suriname implicated China, but the characteristics of those seizures and of the traffickers are not available, nor is it clear whether the seizures were verified by authorities. The same scientific study also found a statistical association between jaguar seizures and countries with higher levels of Chinese private investment. Despite the fact that some local businesses owned by Chinese descendants may be implicated in the illegal trade of jaguar body parts, to date and based on all sources consulted in this study, there are no officially verified cases of involvement of Chinese companies in the illegal trade in jaguars. The illegal sale of jaguar teeth, carcasses, bones and skulls to traffickers of Chinese descent for the alleged production of jewellery and medicines has been anecdotally described in Bolivia, Panama, Peru and Venezuela (Arias et al., 2021b; Jedrzejewski et al., 2011; Reuter et al., 2018), but there are no official seizure or enforcement reports confirming this.

Tourism-related demand:

Tourism is an important but less mentioned driver of the illegal trade in jaguars. The evidence on the role of tourism comes from the fact that a large portion of jaguar seizures have been made at crafts shops and markets in towns that are frequently visited by domestic and foreign tourists. In these locations, jaguar crafts are openly displayed and sold as novelty items or souvenirs. During a survey of physical markets in Peru from 2018 to 2019, 102 jaguar body parts were found at 27 craft markets and hotels in tourist destinations like Iquitos, Pucallpa, Puerto Maldonado and Puno (MINAGRI and SERFOR, *in litt.,* 2020; SERFOR and WCS, 2019). The ayahuasca tourism, which attracts foreign tourists, was revealed as another driver of the illegal trade in jaguars in Peru (Braczkowski et al., 2019). In Mexico, jaguar body parts have been found at tourist locations such as bus terminals, taxi stands, tourist buses as well as open air markets at popular holiday destinations (Reuter et al., 2018). The Czech Republic reported a seizure of two jaguar teeth pendants that had been purchased by Czech tourists at a market in Mexico in 2018 (Czech Environmental Inspectorate, *in litt.,* 2020). A jaguar skin was seized at a hotel in Jujuy, Argentina in 2018 (MAyDS, *in litt*., 2020). Moreover, based on interviews with enforcement agents in Belize and Guatemala, Arias et al., (2020) reported that several jaguar body part seizures have been made at popular tourist destinations like Antigua, Flores, Placencia and the Cayes off the coast of Belize, and that hotels and tourism guides may act as intermediary actors in the illegal trade chain. In 2020, Guatemalan authorities arrested a crafts trader illegally selling jaguar and other wildlife teeth and Mayan archaeological artefacts at a tourist shop in the same town (Ministerio Público, 2020). In addition to selling jaguar body parts to tourists, live jaguars are also used as tourist attractions. Illegal keeping of jaguars of wild or unknown origin at hotels, restaurants, and wildlife facilities open to tourists have been reported in Guatemala (Arias et al., 2020), Nicaragua (La Prensa, 2009), Honduras (Silva Avalos, 2020), and Mexico (PROFEPA, 2018d, 2017).

Tourism-related illegal trade in jaguars has received little coverage by the media when compared to other drivers like demand from Chinese wildlife markets. However, it is a well evidenced driver and in some countries like Peru, it may very well be the leading driver of the illegal trade in jaguars. Even in countries like Bolivia, which are known for their Chinese-related seizures, studies have found that the presence of foreign tourists (described as being of European descent) was more strongly and significantly associated with illegal jaguar trading behaviours amongst local communities, than that of other trafficker and consumer groups such as Bolivian and Chinese-origin traffickers (Arias et al., 2021b). Tourism as a driver of the illegal trade in jaguars matters because it has been reported throughout the range, and because it implies that jaguar body parts are being smuggled outside of range countries without being noticed. Moreover, jaguar body parts that are illegally commercialized in a tourism context have usually been offered alongside other illegal wildlife products, such as river

dolphin, sea lion, crocodile, shark, and small carnivore teeth, positioning the illegal trade in jaguars within the broader illegal and legal wildlife trade.

Illegal pet trade and private wildlife collections:

The desire to possess live jaguars as household pets or as part of private wildlife collections, whether for tourism or for personal enjoyment, is another driver of the illegal trade in jaguars. In Mexico, live jaguars have been seized by the environmental authority, PROFEPA, at zoos, veterinary centres, private residences, buildings and airports (SEMARNAT, *in litt*., 2020), often times along with other illegally kept exotic big cats like lions or tigers. Live jaguar confiscations have taken place in locations like Cancun (2011), Tamaulipas (2015), San Luis de Potosi (2017), Mexico state (2017), Campeche (2017), Michoacán (2017), Culiacan (2017, 2020), Morelos (2018), Tijuana (2018) and Nayarit (2018). Peru reported the seizure of 16 live jaguars form 2000 to 2020 (MINAGRI and SERFOR, *in litt.,* 2020), while a survey of the illegal trade in jaguars in north-western Bolivia revealed that at least 4% of 1,107 randomly selected survey participants had kept a live jaguar in the past five years (Arias et al., 2021b). Illegal keeping of jaguars was also reported in countries like El Salvador (2011), Brazil (Para, 2015, 2018; Acre, 2016), Nicaragua (Managua, 2009), Honduras (Roatan, 2015), and Ecuador (Coca and Lago Agrio, 2014), to name a few. Outside of range States, private wildlife collections have also been implicated in the illegal trade in jaguars. Upon conducting an enforcement operation of an ex-circus in Serbia in 2016, one of the jaguars in the circus disappeared and was later found in a private zoo in Bosnia and Herzegovina, having moved across the border without the issuing of any permits. Despite the awareness of the authorities in both countries, the lack of in-country wildlife rescue facilities with the capacity to receive big-cats has caused the specimen to remain in a private captive facility illegally (Serbia Ministry of Environment Protection, *in litt.*, 2020).

The literature provided a few examples where people involved with drug or arms trafficking were found to be in illegal possession of jaguars or their body parts. Some examples include seizures of live jaguars or body parts that were found during drug raids at private residences in Wampusirpi, Honduras in 2016 (Reuter et al., 2018), and Izabal, Guatemala in 2016 (Arias et al., 2020), Culiacan, Mexico in 2020 (Elizalde, 2020). Drug lords and money launderers have also been implicated in the illegal possession of wildlife collections, including jaguar specimens in Honduras (Silva Avalos, 2020). Other studies have drawn links between the illegal trade in jaguar body parts and drug trafficking in Guatemala, Costa Rica and Brazil (Arias et al., 2020; Berton, 2018; Kelly, 2018).

The existence of illegal or informal jaguar collections, particularly those with unregulated breeding programs, poses a challenge to jaguar conservation. By removing individuals from the wild, these activities affect populations directly, and pose a danger to both people and the welfare of animals when no adequate management protocols are in place. Moreover, breeding big cats without appropriate permits can compromise enforcement activities to counteract the illegal trade in jaguar derivatives within countries, by introducing loopholes in the sourcing of jaguar products in the absence of adequate traceability and DNA testing technologies.

Illegal Trophy hunting:

Unlike other big cats that are targeted by legal and illegal trophy hunting operations (e.g. lion), sport hunting for trophies has been considered a relatively low threat for jaguars since prohibitions on jaguar killing and trading became established in the 1970's and 1980's throughout their range. However, illegal trophy hunting does continue to exist in some countries, and it could have substantial impacts on jaguar populations if uncontrolled. Most recent cases of illegal trophy hunting have taken place in Brazil, where the practise is illegal. In 2019, the Federal Justice in Brazil opened a criminal case against a group of nine illegal trophy hunters in the state of Acre. The poachers, who included doctors,

government officials and agriculturalists, had been involved in jaguar poaching for over three decades (Rodrigues, 2019). Another group of illegal trophy hunters was apprehended in 2016 in Curionopolis, state of Para, after poaching 16 jaguars and taking their heads as trophies (Cristaldo, 2016). In 2010, a police operation fined six tourists (of Argentinian, Paraguayan and Brazilian nationalities, including military officials) and local guides who were going on a paid illegal trophy hunting safari in Sinop, state of Mato Grosso. The poachers, who had paid $1,500 USD per jaguar, arrived in private aircrafts and transported their trophies to Curitiba where they were taxidermized. A year later, the safaris had resumed and a new enforcement operation was set in motion to sentence the owner of the poaching grounds (Critica, 2010; Pellegrini, 2011). It is not clear whether these organized jaguar sport hunting operations still exist in Brazil. However, there is growing pressure from pro-hunting groups to withdraw prohibitions against hunting in Brazil, with several amendments to the existing hunting legislation being currently under consideration (Bragagnolo et al., 2019). Illegal trophy hunting has also been regarded as a serious threat to jaguars in Argentina (MAyDS, *in litt.*, 2020). In 2007, the CITES Management Authority of Argentina was notified by the CITES Management Authority of Hungary of a jaguar that had been poached in Santiago del Estero in 2006 and smuggled to Hungary by a trophy hunter of Hungarian nationality. Another case of trophy hunting took place in an island in the Parana River in Corrientes Province in 2006, and ended in the seizure of the resulting taxidermy from a residence in the city of Esquina (MAyDS, *in litt.*, 2020). Other examples of trophy hunting took place in the years 2011 and 2013 in Jujuy and Salta Provinces, respectively, and were identified through photograph posts on hunting or social media websites (MAyDS, *in litt.*, 2020). Other instances of trophy hunting have been reported in Guatemala (Ministerio Publico, 2020), Mexico (Cassaigne, *in litt.,* 2012), Suriname (Suriname Forest Service, *in litt.*, 2021) and Venezuela (Jedrzejewski et al., 2011). However, examples from the latter countries do not appear to be the organized illegal sport hunting operations as the ones observed in Brazil.

6.2 Enabling factors behind the illegal trade in jaguars

As with all illegal wildlife trade, the illegal trade in jaguars is facilitated by a range of social, political and economic enabling factors that inhibit an effective response from government agencies and other sectors of society. Even though most Latin American countries have adopted increasingly strong environmental laws and policies, from constitutional environmental protections to dedicated environmental courts and police units, these improvements constantly struggle to compete with more established state, societal and criminal networks with divergent or contradictory interests (Ungar, 2017). At a regional level, environmental prosecution is severely impaired by: limited financial and human resources to enforce the law; challenges in coordination between national and sub-national government agencies and non-governmental actors; the existence of organized criminal networks that hinder the investigation of environmental crimes and the safety of environmental defenders; a lack of legal clarity caused by the complexity of the law and its interpretation; corruption; lack of state presence in vulnerable areas; poor civic engagement in conservation; and the engulfment of legal prosecution by micro and macroeconomic policies that favour natural resource extraction and environmental degradation as unavoidable costs for economic development (Ungar, 2017; Vizeu Pinheiro et al., 2020).

The enabling factors behind the illegal trade in jaguars were also explicitly mentioned in some governments' responses to CITES Notification 055/2020, which requested inputs to this study. For example, Argentina has jaguar specific laws that provide the maximum protection to jaguars from poaching and illegal trade at the national and subnational level, but the authorities described a pervasive "sense of impunity" surrounding jaguar-related offenses caused by a lack of enforcement capacity (including lack of training of wildlife authorities to collect and manage evidence) and the challenges of coordinating between institutions with wildlife-related mandates (MAyDS, *in litt*., 2020, 2016). Argentinian authorities also mentioned that the locations where poaching and the illegal trade

in jaguars take place are often remote and difficult to access (near country borders), representing an important logistical and capacity-related challenge for detection (MAyDS, *in litt.,* 2020). In Bolivia, an analysis of the few legal processes that have been taken against jaguar traffickers in recent years revealed serious issues with law enforcement processes, including a lack of investigation of traffickers' networks and their supply chains, excessively long judicial processes even in the presence of sufficient evidence, failure to implement precautionary measures to avoid the escape of suspects, and a lack of awareness, interest and coordination between legal institutions in charge of enforcing the law for environmental crimes (UNODC and MMAyA, *in litt.*, 2021). The authorities of French Guiana raised concerns about the laws surrounding jaguar killing, describing them as "giving free rein to the hunting of these animals", while also describing severe limitations in enforcement capacity with all environmental inspectors and park guards occupied almost exclusively with illegal gold panning (OFB, *in litt.*, 2021). The issue of limited resources and enforcement capacity to adequately address jaguar poaching and the illegal trade in jaguars, even inside protected areas, was also described by Honduran (ICF, *in litt.*, 2021) and Surinamese authorities (Suriname Forest Service, *in litt*., 2021).

Additionally, a few studies have specifically investigated the legal and governance challenges behind addressing the illegal trade in jaguars. For the case of Belize and Guatemala, Arias et al., (2020) found that wildlife authorities, enforcement agents, and conservation organizations in charge of addressing jaguar poaching and the illegal trade in jaguars are critically underfunded and understaffed, and that the lack of basic resources like vehicles and fuel constantly limit their range of action. Other problems that were identified in those countries included the lack of political will; excessive bureaucracy; mistrust between authorities and local communities; corruption of enforcement officers; outdated legal systems; lack of seriousness given to wildlife crimes; lack of capacity to collect evidence; weak mandates of wildlife authorities and park rangers to enforce the law; limited coordination between institutions like the police, the military, and environmental, justice and defence ministries; and fear of retaliation from criminals. For all Mesoamerican countries, Reuter et al., (2018), identified the absence of information gathering management systems on jaguar poaching and illegal trade incidents, the inadequacy of wildlife laws and enforcement capacity, and the limited information exchange and collaboration between source and destination countries, as key challenges to addressing the illegal trade in jaguars. Moreover, Morcatty et al., (2020) found a strong relationship between range countries' corruption perception index and gross national income (GNI) per capita and the number of jaguars seized, suggesting that corruption and scarcity of financial resources promote the establishment of supply chains for jaguar trafficking in the region.

7. MODUS OPERANDI

Modus operandi refers to the patterns and methods that are used to conduct a given activity. The modus operandi of wildlife traffickers is reflected in their choice of means of transport, routes, concealment methods and the logistics involved in the illegal trade (UNODC, 2020). These are decided by traffickers in an effort to minimize costs from transport, detection, and enforcement, and to maximize the benefits from selling wildlife. Based on the sources consulted in this study, the poaching of jaguars, and the subsequent illegal trade in jaguar body parts, is largely opportunistic, and it is undertaken by vulnerable communities who are often unaware of the importance of the species or of the legal consequences of poaching them. The processes and methods used to illegally obtain and trade jaguar body parts are summarized below. However, it should be noted that the modus operandi can vary greatly with the socio-political and economic context of each country, as well as its location and geography. Similarly, more organized and sophisticated modus operandi are generally harder to detect, and thus their limited space in this report may reflect the limitations of current evidence rather than their actual absence from the illegal trade in jaguars. Unofficial (non-governmental) information on organized criminal groups operating behind the illegal trade in jaguars in Bolivia and Suriname was shared by relevant stakeholders in response to CITES Notification 055/2020. This information has been included in a separate confidential report for law enforcement purposes.

7.1 Jaguar poaching contexts

The illegal trade in jaguars begins with the poaching of a jaguar. This can occur in three main contexts, including opportunistic poaching during chance encounters with jaguars, targeted poaching due to retaliation, sport, or other commercial and non-commercial motivations, and poaching by order. The contribution of each of these jaguar poaching circumstances to the supply of jaguar body parts is unknown for most of the jaguar range and it probably varies from country to country depending on the type of market that is in place (e.g. domestic or international, supply vs. demand-driven, the prices and incentives), the purposes behind the illegal trade, and the existing socioeconomic conditions of suppliers. For example, areas with predominant cattle ranching livelihoods are probably more likely to source jaguar body parts from retaliatory killings than areas with more dominant hunting livelihoods. While some studies from Venezuela, Bolivia, Brazil, Guatemala (Arias et al., 2020, 2021b; Jędrzejewski et al., 2017b; Valsecchi do Amaral, 2012) suggest that jaguar poaching and related illegal trade in body parts is largely opportunistic, others (in Belize and Panama) point to a greater influence of targeted retaliatory killings (Foster, 2008; Moreno et al., 2015). It should be noted that the relative importance of the different jaguar poaching contexts also depends on the goals and methodologies used by the studies monitoring them. Studies based on cattle rancher interviews are more likely to identify retaliatory killings than poaching resulting from chance encounters, and may also dismiss the weight of poaching by order. Therefore, monitoring jaguar poaching in diverse supplier groups using adequate sampling strategies and suitable questioning techniques is still necessary to determine the most significant processes leading to the supply of jaguar body parts.

Opportunistic poaching - chance encounters:

Jaguar poaching often occurs when poachers encounter a jaguar by chance. This usually happens during wild meat hunting or fishing trips, sometimes with the help of hunting dogs or flashlights, which make it easier to detect wildlife. Chance encounters also occur when people are walking to their agricultural plots or farms, following forest trails to rivers to collect water or to wash clothes, or while collecting timber or non-timber forest products (Arias et al., 2021a, 2001b; Jędrzejewski et al., 2017b; Valsecchi do Amaral, 2012). Increasingly, opportunistic jaguar poaching events have been associated with mining operations in remote areas in countries like Suriname, which increase the access of people into forested areas and the odds of encountering jaguars (Saffon, 2020; Verheij, 2019b). The

circumstances of the encounter affect the odds of poaching jaguars, as people are not always armed or prepared to kill a jaguar. However, jaguar poaching is a common outcome of chance encounters (Jedrzejewski et al., 2011), except when poachers are inexperienced or lack the appropriate firearms (e.g. small calibre guns), when there are cultural taboos against jaguar poaching, when communities organize against poaching, when there is a lack of necessity for poaching, when people have pro-conservation values, when there is adequate enforcement, or when communities can gain benefits from jaguar conservation (e.g. tourism, compensation, Caruso et al., 2019; Engel et al., 2017a, 2017b, 2016).

Targeted poaching:

Jaguar poaching is also targeted, and it can occur due to retaliation for livestock or domestic animal depredation, due to fear, or as part of illegal sport hunting excursions. Targeted hunts can also include commercial or non-monetary purposes (e.g. traditional uses) that may lead poachers to specifically pursue jaguars. Targeted jaguar poaching in the context of human-jaguar conflict involves local communities with small-scale livestock farming livelihoods (including cattle, pigs, goats, chickens, etc.), up to large-scale and higher-income ranchers with hundreds or even thousands of animals. Although the relative impact of retaliatory jaguar killing conducted by these different groups of ranchers are not well understood, the scale of the losses (in terms of number of animals and income) influence rancher's attitudes and tolerance towards jaguars, as does their wealth and financial capacity to cope with the losses and to implement depredation prevention measures (Amit and Jacobson, 2017a, 2017b; Zimmermann et al., 2005). Regardless of the motivation, targeted jaguar poaching is highly effective at eliminating jaguars. Jędrzejewski et al., (2017b) found that the methods and tools used for retaliatory jaguar killing (or targeted poaching) are significantly different to those used for subsistence hunting (or opportunistic poaching). Unlike opportunistic poaching, targeted poaching uses animal baits, traps, poison, and trained dogs. Moreover, ranch owners often compensate farm staff for killing jaguars, hire specialized jaguar poachers to resolve conflict-related issues, or call upon community members to go on organized jaguar hunts that can last several weeks and lead to the killing of more than one cat (Jędrzejewski et al., 2017b; MAyDS, 2016; Moreno 2021, *pers. comm*.).

Poaching by order:

A third context in which jaguar poaching occurs is when poachers follow an explicit request or order from an interested stakeholder (e.g. ranchers, consumers or traffickers). The requests or orders to poach jaguars and illegally supply body parts are delivered in different ways, and are targeted at different supplier audiences. One approach has been the use of wide-audience communication channels like radio broadcasts or paper flyers posted in public spaces. Radio broadcasts requesting jaguar body parts were reported in Bolivia, in towns like Rurrenabaque, San Borja, San Ignacio, Trinidad, Baures, Santa Ana de Yacuma, and Bella Vista. A phone number or address would be provided in the message to arrange the collection or drop-off of the items. In Bolivia, legal proceedings were started against some radio-station owners (Jemio, 2016). Another strategy to deliver jaguar poaching orders to a large audience is through social media. Investigations from Suriname and Bolivia revealed that online hunting and buy/sell groups offered an opportunity for traffickers to incentivize jaguar poaching (Lemieux and Bruschi, 2019; Verheij, 2019). Given the law enforcement actions that followed some of these unselective, large-audience, supplier recruitment efforts, the strategy to openly request jaguar body parts has become less frequent in the past few years and it is believed that it may be due to a change in traffickers' modus operandi (Romo, 2020).

A more inconspicuous approach that has been used by jaguar traffickers to request jaguar body parts in Bolivia, Belize, Peru and Suriname, is to directly approach poachers, ranchers, or other suppliers (like miners or loggers) in their communities (Kerman and Felix, 2010; Verheij, 2019) or indirectly

through networks of contacts (Arias et al., 2020). When jaguar traffickers approach villages, they identify people who can supply jaguar body parts and place an order, promising to return in a few months' time to collect the items and deliver the payment (Da Silva, 2017). The provision of an initial payment in the form of poaching equipment (e.g. firearms, ammunition, flashlights, etc.) has also been reported. Subsequently, the poaching to order strategy triggers a multi-layered supply chain within villages, as recruited suppliers recruit others to support in the delivery of the order. In a random sample of 1,107 participants in rural areas of north-western Bolivia, 17% had been requested to kill a jaguar in the past five years (Arias et al., 2021a, 2021b). Participants in the same study reported the presence of jaguar traffickers of multiple ethnicities approaching their villages to request jaguar body parts, including Bolivians (described by 42.6% of participants), traffickers of Chinese descent (17.6%), traffickers of European descent (14.5%), and traffickers from other South American countries (5.9%). Following the requests, 9% of respondents disclosed that they acted as "killing traders", who buy and sell jaguar body parts from others, while also poaching jaguars. There were also those who just traded the body parts, without poaching ("traders", 5.6%), those who received an order but had not undertaken an action ("attempted recruits", 4.5%), and those who acted as "messengers" receiving and passing orders (1.5%).

In addition to villages, jaguar traffickers have also been known to approach craft markets in touristic and non-touristic areas to place orders for jaguar body parts (Braczkowski et al., 2019). Craft shop owners have thus become an intermediary player in the illegal trade in jaguars, requesting body parts from poachers and reselling them to traffickers or directly to consumers (e.g. tourists).

7.2 Jaguar poaching methods

The large-scale trade in jaguars for the fur industry of the 20th century revealed that despite their elusiveness and low densities, professional jaguar poachers can be quite effective at attracting and poaching jaguars using a range of specialized methods. Based on the accounts from Payan and Trujillo, (2006) and Smith, (1976), jaguar hunters of the time used a wide array of specialized methods to attract, trap and kill jaguars, including live and dead animal baits, imitation of jaguar and prey calls, and trained hunting dogs. These methods led to staggering figures of killed animals, including an estimated 180,000 jaguars in the Brazilian Amazon alone from 1904 to 1969 (Antunes et al., 2016). Even though commercial jaguar killing gradually reduced after the listing of jaguars under CITES Appendix I in 1975, these and other methods continue to be used to kill jaguars in opportunistic and targeted contexts. Current jaguar poaching methods can be divided into active and passive capture strategies and luring methods (Fernandes-Ferreira, 2014). Examples from Bolivia, Brazil, Panama and Venezuela (Arias et al., 2021b; Jędrzejewski et al., 2017b; Moreno 2021, *pers. comm.*; Valsecchi do Amaral, 2012), suggest that active capture followed by luring methods are the two most common mechanisms to obtain jaguar body parts in present times, with passive strategies being less frequent.

Active capture methods:

Active capture methods involve intentional or unintentional encounters between poachers and jaguars that involve an active chase or an attack from either side. They tend to occur opportunistically during wild meat hunting or fishing trips, and they commonly involve the use of fire arms and/or hunting dogs. The use of hunting dogs has been described as a common strategy to poach jaguars in Panama (Moreno 2021, *pers. comm.*). They also take place in the context of illegal retaliatory killing and illegal sport hunting, when poachers are specifically looking for jaguar tracks and signs. Industrial or artisanal hunting firearms are the most common tool for actively poaching jaguars, and they are used regardless of the poaching context (subsistence, commercial, retaliatory; Jędrzejewski et al., 2017b; Valsecchi do Amaral, 2012). Other less common tools to kill jaguars include sticks, knives and machetes, as reported in Panama, Bolivia and Brazil (in very close encounters/attacks, self-defence,

Arias et al., 2021b; Moreno et al., 2015, 2016a, 2016b; Valsecchi do Amaral, 2012) and even more rarely, spears and arrows (almost exclusively used by indigenous peoples, Fernandes-Ferreira, 2014). Clubbing or drowning jaguars that are crossing rivers has also been described in Panama, Venezuela and Brazil (Jędrzejewski et al., 2017b; Moreno 2021, *pers. comm.*; Valsecchi do Amaral, 2012). Poachers also take jaguar cubs from their dens or after their mother is poached (Arias et al., 2020).

Luring methods:

Luring methods are those that attract or force jaguars to approach a desired area where they can become an easier target for awaiting poachers. While in the past the most common luring method was baiting through the use wild prey carcasses and blood trails, currently baiting occurs mostly in the context of human-jaguar conflict, and common baits are either live or recently depredated livestock. Poachers wait in the vicinity of the bait or on a shooting platform for the jaguar to approach, shooting it from a short distance. In Venezuela, this method accounted for 19.8% of 232 jaguar hunts (Jędrzejewski et al., 2017b), and it was also a common poaching strategy in Bolivia and Panama (Arias et al., 2021b; Moreno 2021, *pers. comm.*). As described above, another luring method that continues to be used, although it is rarer, is sound luring with natural instruments or calls.

Passive capture methods:

Passive capture methods include different kinds of traps that are set along jaguar paths, and which do not necessarily require the presence of the poacher to kill or capture the animals. Metal or wooden cage traps with bait have been used in Venezuela and Brazil to capture jaguars (Fernandes-Ferreira, 2014; Jędrzejewski et al., 2017b). There are also reports on the use of non-selective gun traps, which automatically activate and shoot in a desired direction when an animal passes by and sets off a string set along the path (Arias et al., 2021b; Jędrzejewski et al., 2017b). The injection of poison on livestock baits and snares was less common, but also mentioned in the literature (Arias et al., 2021b; Mora et al., 2016; Moreno et al., 2015). Similarly, there are few examples from Belize and Mexico where animals that were killed by cars later had their body parts (paws, teeth) removed opportunistically by roadside walkers (Arias et al., 2020, Cassaigne, *in litt.*, 2014).

7.3 Supply chain description and illegal trading methods

From poaching site to village, farm or ranch:

After poaching, the extraction of jaguar body parts occurs either at the site where the animal was poached or in nearby villages or farms. This depends on the poacher's awareness of the law and on the risks of being seen by enforcement agents or others who can inform the authorities, and on the equipment and time that poachers have at hand. When it is unsafe or unviable to move the animals, poachers might choose to take the most valuable parts only, such as the head, paws and skin, while discarding or abandoning the remaining parts. In the past few years, decapitated and mutilated jaguar carcasses have been found in Belize (3), Brazil (1) and Mexico (2), their remains thrown at roadsides, rivers, or dumpsters (Branford, 2020; Melgoza, 2020). Carcasses have also been burned to destroy the evidence, with examples from Mexico and Guatemala (Prensa Libre, 2011; Verdebandera, 2014). Otherwise, jaguars are taken to villages, farms, or other processing areas carried on poacher's backs, tied and hung by a log, or by canoe, bicycle, motorcycle, or car.

In villages or farms close to poaching areas, desired jaguar body parts are extracted and depending on the part, cleaned, polished or processed into secondary products. Body parts like meat and fat are often kept locally, being consumed by the poacher and the poacher's family or distributed amongst neighbours and community members without a cost as "gifts" or in exchange for other goods. Skins

are also kept as decorative items, or used to build furniture or other household products. Arias et al., (2020) identified these actors as jaguar body part "possessors", who keep jaguar body parts for personal or family use within villages. Possessors sometimes retain jaguar body parts even in the presence of formal buyers who could pay higher prices for them, an indication that depending on the context and motivation behind the use of jaguar body parts (e.g. cultural, prestige) demand for jaguar body parts does not necessarily involve external markets or financial exchanges.

From villages to processing centres or urban markets:

Body parts that are unwanted by possessors, those requiring a more sophisticated processing (e.g. taxidermies or crafts), or those which have a higher value in distant markets are then transferred to larger towns and urban centres for further processing, storing, smuggling or to reach a wider consumer market. There is not a lot of information about how this transfer process is carried out, but investigations into the production of jaguar paste in Suriname have suggested that jaguar carcasses are transferred from distant villages and mining camps to the capital Paramaribo in private cars early in the morning or late at night, making several stops and switching cars along the way to avoid detection, and using a scout car for added safety (ICMBio, *in litt.,* 2020; Lemieux and Bruschi, 2019). The use of ground transportation has also been reported in Peru, to move jaguar body parts from Amazon towns to main cities along the "Interoceanica" road (MINAGRI and SERFOR, *in litt.,* 2020). Jaguar body parts have also been documented to arrive in towns like Iquitos, Peru, from distant communities in the Amazon by river, along with other forest and river products including wild meat (Berton, 2018).

Processing jaguar body parts:

A range of accessories and crafts made out of jaguar skin, teeth, claws, tails and paws, are processed at handicraft workshops or jewellery shops. Similarly, leather products and taxidermies are produced in tanneries and saddleries. In a rather unusual case in Bolivia, jaguar crafts were produced by prisoners in detention centres surrounding the town of Trinidad, and then sold to crafts markets in the town or at the prison's exterior (Arias et al., 2021b). Most information on the processing of jaguar body parts pertains to the production of jaguar paste in Suriname. A detailed product-based crime script outlined the multiple steps involved in the process, including the concealed arrival of jaguar carcasses to processing premises owned by traffickers of Chinese descent in Paramaribo, where the bones, meat and skin are boiled and simmered down in large pans for seven days, producing 20-30 500 gram pots of jaguar paste (Lemieux and Bruschi, 2019). A different study based on interviews with villagers in Suriname found that not owning a freezer or refrigerator in rural areas can be a limitation for the illegal trade in jaguars, as carcasses must be fresh at the time of being sold (Reulen, *in litt.*, 2020).

Selling strategies:

Customer-facing outlets:

Once they have reached their final raw or processed state, jaguar body parts are illegally traded and sold to intermediaries or end-consumers in multiple ways. One strategy that occurs throughout the range is to display jaguar body parts openly in markets, formal and informal handicraft and souvenir shops or stands, jewellery stores and other customer facing outlets. Preferred locations are those where tourists or other visitors gather, such as open air markets, parks, town fairs, bus terminals, taxi stands, piers, touristic streets, holiday areas and even inside hotels (Reuter et al., 2018). Outside of Bolivia (where most jaguar seizures have been made at post-offices), most jaguar body part seizures have taken place in these locations. In areas where previous enforcement efforts have taken place,

jaguar body parts may not be openly displayed at these sites, but they can still be found behind the counter or in nearby warehouses, and they are made available upon request or upon being offered by the sellers (Braczkowski et al., 2019).

In the case of Suriname and Bolivia, a few shops and restaurants owned by traffickers of Chinese descent have been identified as illegal points of sale and processing of jaguar body parts (UNODC and MMAyA, *in litt.*, 2020; Suriname Forest Service, i*n litt*., 2021). These shops sell numerous legal goods and products, and they are located in main cities like Santa Cruz de la Sierra (Bolivia) or Paramaribo (Suriname), but also in smaller towns and remote rural areas, including the surroundings of mining camps in the interior of Suriname (Verheij, 2019). These shops are believed to provide safety to the illegal trade, as they function as legal businesses (Arias et al., 2020; Bale, 2018a).

Online platforms:

In addition to being used to place jaguar poaching orders, online platforms appear to be a preferred jaguar body part selling strategy because they prevent direct contact between buyers and sellers (Nijman et al., 2019). A study led by the Wildlife Conservation Society (WCS) on the use of online platforms for illegally trading jaguar body parts, which covered 34 online platforms in seven languages between 2010 to 2020, found 248 posts, of which 77 were classified as appearing to contain legitimate jaguar body parts. These latter posts reached a total of 140 body parts, most of which were jaguar teeth (109), for illegal sale within Latin American countries and China (Polisar et al., *in litt.*, 2020). The latter study did not investigate illegal online trade in jaguars using closed channels (e.g. private social media groups, encrypted messaging apps), which could also potentially be used by jaguar traffickers and require further investigation. Based on other studies, common platforms include Facebook and WeChat, which are used by traffickers of both Latin American and Chinese descent (Verheij, 2019). In Argentina, the attempted sale of horseback riding implements made with jaguar skins on platforms like Mercado Libre has also been detected by authorities and jaguar conservation groups (MAyDS, *in litt.*, 2020). Hunting groups and buy/sell groups on social media, with varying levels of privacy are used to post pictures of hunted jaguars or body parts, with a short description of the objects and the price, along with contact details. Social media platforms have also been used by poachers on numerous occasions in countries like Mexico and Suriname to boast jaguar trophies, or by individuals keeping jaguars in captivity. The governments of Bolivia, Brazil, French Guiana, Guatemala, Mexico, Paraguay and Suriname reported to have investigated instances of illegal trade in jaguars through online platforms, though aside from Bolivia, which sentenced an online jaguar trafficker with three years' imprisonment in 2017, and Suriname, which stated to have arrested online jaguar traffickers (number not stated), it is unclear whether other countries have achieved criminal sentences for the illegal online trade in jaguars.

Approaching potential buyers:

Studies carried out in Belize and Peru have found that jaguar traffickers also directly approach potential buyers in streets or shops to offer jaguar body parts (Arias et al., 2020; Braczkowski et al., 2019). The same has been observed in Panama (Moreno 2021, *pers. comm.*). This less common strategy is more opportunistic in nature, and it is most likely used by suppliers who have not received a prior jaguar order from a buyer, by those lacking a more secure network through which to sell jaguar body parts or by those less aware of the illegality of the trade. This strategy has also been observed in tourist areas in Peru and Belize in contexts where it is relatively easy for locals to identify tourists or other visitors (Arias et al., 2020; Braczkowski et al., 2019).

Trusted illegal trade networks:

The illegal trade in jaguars also occurs within trusted circles of suppliers, intermediaries and consumers. In rural towns and villages, those in possession of jaguar body parts sometimes illegally trade the items through family members, neighbours or friends (Arias et al., 2020a). This type of illegal trade can involve financial transactions, or non-monetary exchanges. Similarly, jaguar body parts can be passed on as gifts or inheritance among networks of friends or relatives (Arias et al., 2020a). Those connections are also used to transfer the items to larger markets and urban areas, where other friends or relatives might live. An academic study in Suriname based on interviews with authorities, academics, hunters and jaguar traffickers in the country also suggested that jaguar paste is sold through friend-to-friend networks (Lemieux and Bruschi, 2019).

International smuggling of jaguar specimens:

Shipping by post:

The illegal trade in jaguars in Bolivia is unique in its traffickers' early strategy to smuggle jaguar body parts to China by post. Traffickers in other countries could potentially be using the same approach, but this specific modus operandi has not been reported by other range States. In Bolivia, 18 different postal shipments containing 336 jaguar teeth were seized by the Bolivian Postal Service, ECOBOL, and the country's environmental police, POFOMA, between 2014 and 2016 (WCS-Bolivia, *in litt.*, 2021). The packages, which contained an average of 19 teeth, ranging from three to 76, were destined to addresses in mainland China and contained Chinese sender names (MMAyA, *in litt.,* 2021). The teeth were camouflaged inside other goods such as stuffed toys, chocolate boxes and washing up sponges (Nunez and Aliaga-Rossel, 2017).

Personal travel by air:

Jaguar traffickers have also tried to smuggle body parts by personally traveling with them on commercial flights, stored inside their luggage, as evidenced by multiple seizures that have been made by customs authorities at airports in Bolivia, Brazil, China, Czech Republic, Mexico, and Suriname (Table 4). Most airport seizures have been limited to jaguar teeth, but there were two confiscations of jaguar bones and claws in China in 2014 and 2015, respectively, and two instances of domestic illegal trade in live jaguar cubs through airline packaging sections in Mexico in 2014 and 2018. Other products like jaguar paste, which are allegedly produced for jaguar consumers in China (Lemieux and Bruschi, 2019), have not been confiscated by airport customs authorities in any country, based on all sources consulted by this study. The predominance of tourism as a driver of the illegal trade in jaguars, and of national and international tourists as demand actors in multiple range countries (Chapter 6), suggests that several countries may be unknowingly receiving jaguar body parts carried by tourists returning to their countries after visiting jaguar range States. The seizure of two jaguar teeth in 2018 by Czech authorities in Prague International Airport, which were being carried by travellers upon their return from visiting craft markets in Mexico is an example of the potential role of tourism and tourists in the international smuggling of jaguar body parts (Table 4, Czech Environmental Inspectorate, *in litt.,* 2020). The small size and high concealability of jaguar teeth pose a challenge for detection by airport customs. Jaguar teeth have been smuggled by passengers inside wine boxes and baby food (Beijing People's Court, 2015; Suriname Herald, 2019).

Table 4. Jaguar seizures made at airports from 2000-2019. Other airport seizures were made in Austria, France, Germany and the United States, involving 5 skins, 18 teeth, and 44 claws (UNODC, 2021).

Country of seizure	Year	Airport	Origin	Destination	Body Part	Number	Source
Bolivia	2014	El Alto Int. Airport	Bolivia	China	Teeth	73	WCS-Bolivia (2021)
Bolivia	2014	El Alto Int. Airport	Bolivia	China	Teeth	12	WCS-Bolivia (2021)
Bolivia	2016	El Alto Int. Airport	Bolivia	China	Teeth	12	WCS-Bolivia (2021)
Bolivia	2017	El Alto Int. Airport	Bolivia	China	Teeth	3	WCS-Bolivia (2021)
Brazil	2006-2017	-	-	-	Teeth	13	IBAMA (2020)
China	2015	Beijing Int. Airport	Bolivia	China	Teeth/Claws	119/13	Beijing People's Court (2015)
China	2014	Xiamen Gaoqi Airport	Netherlands	China	Bones	1.49 kg	Xiamen News (2014)
Czech Republic	2018	Prague Int. Airport	Mexico	Czech Republic	Teeth	2	Czech Environmental Inspectorate (2020)
Mexico	2018	Tijuana Int. Airport	Mexico CDMX	Tijuana, MX	Live cub	1	PROFEPA (2018d)
Mexico	2014	Culiacán Airport	Mexico CDMX	Culiacán, MX	Live cub	1	PROFEPA (2014)
Suriname	2019	Johan Adolf Pengel Int. Airport	Suriname	-	Teeth	6	Suriname Forest Service (2021)
Suriname	2018	Johan Adolf Pengel Int. Airport	Suriname	-	Teeth	5	Suriname Forest Service (2021)
Suriname	2017	Zorg & Hoop Int. Airport	Suriname	-	Teeth	3	Suriname Forest Service (2021)

8. IMPACTS OF THE ILLEGAL TRADE IN JAGUARS

Assessing the impacts of the illegal wildlife trade on affected species requires understanding the levels of offtake (number of animals poached) in a given area, and the effects of that offtake on the species of concern (Milner-Gulland and Akçakaya, 2001). Offtake effects depend on the species' population numbers and on biological characteristics dictating their growth capacity in a resource-limited environment. Species' demographic characteristics and life history strategies play a role in determining how vulnerable or resilient they may be to poaching pressures. On the other hand, understanding offtake levels requires investigating the methods used by poachers and their motivations for poaching, from the time and effort that they devote to searching for the animals and their success rates, to the socio-cultural and economic factors that influence them to poach. Local traditions, subsistence needs, economic incentives, and the costs associated with wildlife harvesting must all be factored in when assessing the likely impacts of killing animals for the legal or illegal wildlife trade. At the same time, these factors are influenced by wildlife governance systems, including wildlife laws, regulations or management regimes, and the capacity of institutions or stakeholders to enforce compliance. Mathematical models of varying complexity have been developed to predict the impacts and sustainability of different poaching scenarios. However, the validity and usefulness of these models depends on the possibility of accurately measuring or estimating each of these biological, socio-economic and governance factors, and of accounting for their temporal and geographic dynamics and uncertainty. This can become a challenging task, particularly when the information on species biology, offtake intensity or governance factors is lacking.

While it was beyond the scope of this study to undertake such a quantitative assessment, the study provides an initial qualitative exploration of the potential impacts of poaching and the illegal trade in jaguars, considering countries' current knowledge on: 1) jaguar population status and threats, 2) jaguar poaching and illegal trade, and 3) jaguar conservation governance structures. This exploratory analysis is loosely based on the methodology and variables used by the International Union for the Conservation of Nature (IUCN, 2008) for assisting CITES Scientific Authorities to develop species management regimes, described in the Appendix. While this IUCN guideline (IUCN, 2008) is not originally designed for species fully protected from international trade (CITES Appendix I), it includes a set of variables that are useful to provide an indication of trade-related overexploitation, and which are applicable to all legally or illegally traded species. Additionally, the variables have been adapted to the specific case of the illegal trade in jaguars for the purpose of this study, and are only meant to support an exploratory analysis of the threat imposed by poaching and the illegal trade in jaguars, not substituting the need for continued monitoring and more robust quantitative impact assessments.

The analysis is based on the information shared by governments and other consulted stakeholders, and that found in National Jaguar Action Plans or external literature, when available. However, it is not based on an exhaustive review of all available sources or on a participatory stakeholder consultation for each country, and so it should not be considered a complete assessment of the impacts of the illegal trade in jaguars. Instead, its purpose is to provide an exploratory analysis of the situation and challenges facing jaguar range countries with regards to jaguar poaching and illegal trade, and serve to highlight issues of particular concern or key gaps in the current knowledge.

This section starts by providing information on the characterization of the potential effects of illegal offtake on the species, based on existing jaguar population viability assessments and historical hunting information. It then explores some of the biological factors that make jaguars vulnerable to offtake from poaching or illegal trade. Finally, it explores the potential impacts of poaching and illegal trade in jaguars, for countries with different jaguar population vulnerability, levels of poaching and illegal trade, and jaguar conservation governance structures. The analysis is based on the country profiles in the Appendix.

8.1 Characterization of the potential effects of illegal offtake on jaguars

Few studies have expressly studied recent cases of jaguar poaching and illegal trade across the jaguar range. Those which have, have not always used sampling designs that can be extrapolated over larger geographies, or questioning methods capable of overcoming the challenges of detection of sensitive or illegal behaviours (e.g. through the application of specialized sensitive questioning techniques to reduce social desirability bias). The present study found no research efforts that have explicitly measured the impacts of the illegal trade (or other motivations behind poaching) directly on jaguar abundances and population trends using adequate controls and timeframes. Consequently, the prevalence, distribution and intensity behind this activity remain largely unknown. Importantly, the available poaching statistics and seizures of jaguar body parts, described in Chapter 4, provide a limited understanding of poaching and the illegal trade in jaguars, being subject to numerous biases that are characteristic of seizure data, including unknown proportions of poached and seized specimens; unidentified detection rates; varying enforcement effort, effectiveness, and reporting across countries; product biases; among others (Symes et al., 2018; Underwood et al., 2013; UNODC, 2020). Without an understanding of the enforcement and research efforts that yielded the reported poaching and illegal trade quantities, and how representative they are of the situation at the national level, it is very challenging to assess the scale of these threats.

Population viability assessments (PVAs) can provide an indication of the potential impacts of poaching and illegal trade on jaguar populations, by simulating the effects that different initial population sizes, growth and mortality rates, and habitat conditions can have on jaguars' extinction risk. Out of the few jaguar PVAs found in the literature, all concur that small jaguar populations (under 200 individuals) are highly susceptible to extinction. This is concerning, particularly when considering that 200 individuals represents about the average size of jaguar populations across their range, excluding the populations in the Amazon and adjacent biomes (Pantanal and parts of Chaco and Yungas, de la Torre et al., 2017).

A PVA exercise conducted during the Jaguar National Action Plan workshop in 2012 in Brazil found that given a theoretical maximum jaguar population annual growth rate of about 5% (not accounting for stochastic fluctuations, inbreeding, immigration/emigration), small jaguar populations (under 200 individuals), are extremely vulnerable to harvesting (Desbiez et al., 2012). In a case study with data from an Amazon reserve in Brazil, it was determined that jaguar populations with around 180 individuals or less are highly susceptible to extinction in 100 years' time when considering an annual removal of as little as 12 individuals, particularly if they are reproductive females (De Carvalho and Desbiez, 2013). Another case study from Emas National Park, Brazil, which did not explicitly consider poaching, revealed that the Park's jaguar population of about 10-60 individuals has an extinction risk of 70 to 90% in the absence of net immigration, requiring large interconnected habitats beyond their current size to supress their extinction risk (Finnegan et al., 2021). Similarly, other studies found that outside of the Amazon biome, more than 50% of jaguar populations in protected areas in Brazil will be viable for up to 10 years only in the absence of large-scale immediate conservation efforts (Sollman et al., 2008). Elsewhere in the jaguar range, the situation is also worrisome. In north-western Mexico, an assumed initial population of 350 jaguars could face an abruptly greater extinction risk with the annual removal of just 6-7 reproductive females (Miller, 2014). In Belize, Foster (2008) found that annual jaguar offtake levels above 8% of the population (equivalent to about 45 individuals jaguars, based on Jędrzejewski et al., 2018), would cause a population collapse outside protected areas in 100 years. The same study concluded that the country's estimated jaguar poaching levels outside protected areas (in 2008) may reduce that timeframe to just 20 years in the absence of natal dispersers (2-4 year olds) immigrating from protected areas. Moreover, emigration levels from protected to unprotected areas above ~12% per year, would reduce the probability of persistence of populations inside and outside protected areas by ~50% in 100 years' time (Foster, 2008).

These assessments suggest that in many areas where jaguar populations are below average, the magnitude of poaching and illegal trade found in the literature (Chapter 4, Table 2), which are based on reported seizures or trade events only, may already be affecting the short term viability of some jaguar populations. The situation may be even more worrisome when considering the effects of habitat loss and fragmentation. A study introducing habitat variables into PVAs for jaguar populations across the range, discovered that habitat fragmentation dramatically reduces jaguar persistence probability, even in landscapes with a large proportion of suitable habitat and a high jaguar density, possibly due to an increase in mortality from greater contact with humans and impediments to dispersal (Zanin et al., 2015). Due to the synergistic effects of habitat loss and fragmentation, only two of the 28 evaluated populations in that study were deemed to have a high probability of persistence, leading authors to predict that jaguar conservation is already in a 'dangerous situation' (Zanin et al., 2015). Under this context, current levels of poaching and illegal trade in jaguars (which are mostly domestic-driven), combined with habitat fragmentation and loss, can be expected to further accentuate the decline in jaguar populations in much of the jaguar range. Correspondingly, any increase in demand for jaguar body parts (domestic or international) can severely affect jaguar viability and cause local extinctions within the current generation.

The jaguar is already extinct in two of its historical range countries: Uruguay and El Salvador. In Uruguay, jaguars were abundant and widespread until the start of the 19th century, when they were systematically persecuted following increasing cases of human-jaguar conflict caused by the expansion of large-scale cattle ranching in the country and resulting habitat loss (Pereira-Garbero and Sappa, 2016). By the end of the 19th century, jaguars were considered rare and the last record of a hunted jaguar took place in 1901 (Pereira-Garbero and Sappa, 2016). The factors that led to the extinction of jaguars in El Salvador are less clear (as is the date of extinction), but are probably related to the small size of the country and the existence of only small and isolated forest patches, high human population densities, civil war, deforestation, and excessive hunting of jaguars and their prey (Campbell, 2015). While these extinctions occurred in a different temporal context than today, they reveal the impact that indiscriminate hunting can have on jaguars, particularly when aggravated by habitat loss and fragmentation. Moreover, these extinctions occurred in areas of the jaguar range which currently contain Endangered or Critically Endangered jaguar populations (Central America and the southern extreme of the range). To prevent the extinction of those populations, special habitat conservation efforts and initiatives to address poaching and illegal trade in jaguars are needed.

8.2 Biological characteristics influencing vulnerability to offtake

Even though the jaguar is a highly charismatic species that has received substantial research and conservation attention, there is considerable uncertainty about its population biology and about the impacts of different threats on its populations. As described earlier, the few range-wide jaguar population estimates that are currently available (de la Torre et al., 2017; Jędrzejewski et al., 2018b) differ greatly from one another (from an estimated 64,000 jaguars in the former, to about 173,000 jaguars in the latter), and are based on extrapolations from a limited number of robust population surveys. These surveys are often conducted in protected areas or well conserved habitats, which are not always representative of disturbed landscapes that make up a significant portion of the jaguar range. There are also limited studies on jaguar genetics, physiology and reproductive biology in wild populations, and these data are often taken from captive populations, which differ from wild ones.

According to the International Union for the Conservation of Nature (IUCN, 2008), some of the biological characteristics of species that dictate their responses to anthropogenic offtakes include life history traits such are their reproductive rates and life spans, their ecological adaptability, dispersal efficiency and sensitivity to humans. Each of these factors may vary from location to location,

particularly when considering the vast geographical range of jaguars, and the different biomes and ecosystems in which they inhabit. However, the descriptions below assume similar biological characteristics across all jaguar subpopulations, which influence their vulnerability to illegal offtake.

Life history:

Like other large body size obligate carnivores, jaguars have low reproductive rates to account for the long postweaning period that is required for juveniles to learn how to hunt large body sized prey (Bekoff et al., 1984). On average, jaguars have a gestation period of 98 days, produce small litters of mainly two cubs, and have an interval of at least one year between litters (Andrews et al., 2019; SDZG, 2020). Juveniles reach independence after one year and a half, and maintain social bonds for two years or more, roughly coinciding with when they reach sexual maturity (2.5 years for females and up to 4 years in males, SDZG, 2020). Although jaguars can live for 20-27 years under managed care, their longevity in the wild is considerably lower, with few reported individuals living past 11 years (Harmsen et al., 2017; SDZG, 2020). Based on Robinson and Redford's, (1991) classification, this life span in the wild would place jaguars as a either a short or medium-lived species, whose age of last reproduction is at least five but less than 10 years. This is consistent with parameters used in population viability assessments (Zanin et al., 2015). Due to these characteristics, jaguars can be classified as a low reproductive rate and short or medium lived species.

Ecological adaptability:

The jaguar is a highly ecologically adaptable species, existing in a variety of different environments and habitat types (Sanderson et al., 2002). However, unlike the sympatric puma, the jaguar's habitat is limited by elevation, existing only at elevations below 3000 meters above sea level, and most commonly below 2000 meters (Sunquist and Sunquist, 2002) Congruous to this wide habitat diversity, jaguars predate on over 100 species of varying sizes (Hayward et al., 2016). Their diet is also highly adaptive to the specific environment in which they live, switching prey depending on its local availability (Oliveira, 2002). For example, jaguars in disturbed areas have been found to consume prey of lower body mass than those inside protected areas, and to supplement their diet with domestic animals (Foster et al., 2010). Similarly, jaguars living in flooded environments, like the varzea forests of the Amazon, switch their diet from terrestrial mammals to arboreal mammals and reptiles like caiman (*Caiman crocodilus and Melanosuchus niger*), consuming even their eggs (Da Silveira et al., 2010). Despite their high dietary adaptability, in some environments like the Selva Paranense of Argentina, jaguar declines have been associated to those of specific prey species, like peccary (*Tayassu pecarí*) (Paviolo, 2010). This suggests that their ecological adaptability may also be context-specific. Based on these characteristics, jaguars can be classified as a generalist species in terms of habitat and prey.

Dispersal efficiency:

Jaguars have large range sizes, ranging from 5-321 km^2 for females and 20-1359 km^2 for males (CMS, 2020; Quigley et al., 2017). They have been recently added into Appendices I and II of the Convention on Migratory Species (CMS), precisely due to their large range sizes and demand for vast interconnected habitats and corridors, extending beyond country boundaries. Individual jaguars have mean daily movements of 1.8 (females) and 3.3 (males) kilometres, and can reach a mean dispersal of 74 (females)/248 (males) kilometres per trimester (Bernal-Escobar et al., 2015). When becoming independent, juveniles can disperse substantially to establish new territories away from adults, particularly males. However, dispersal is limited during their early life stages, spending two months in their dens before they can follow their mothers, and sharing their maternal territory until independence (Bekoff et al., 1984; SDZG, 2020). While the jaguar's dispersal ability can protect it from

localized deforestation, jaguars are less able to escape large scale threats like forest fires, or even humans, particularly at earlier life stages (Panthera, 2019). Therefore, jaguars can be classified as a species with overall good dispersal efficiency.

Tolerance to humans:

Even though jaguars may sometimes occupy or cross agricultural landscapes and other environments disturbed by humans as they search for prey, mates or territory, their presence is strongly linked to the existence of conserved forests and wetland patches (Boron et al., 2020). Jaguar abundances are greatly affected by the presence of human settlements and infrastructure like roads, due to avoidance and direct poaching by humans, or indirectly as a result of lower prey availability due to wild meat hunting (Espinosa et al., 2018; Romero-Muñoz et al., 2020). Jaguars are more sensitive to human presence than pumas due to a greater trophic specialization, a higher appeal for poachers, their larger territorial requirements and lower reproductive potential (Paviolo, 2010). Their populations have been identified as highly susceptible to poaching pressures, even in habitats that are otherwise suitable for jaguar presence (Romero-Muñoz et al., 2019). As a result, jaguars can be classified as a sensitive species with regards to their tolerance to humans.

8.3 Exploratory analysis of the potential impacts of poaching and the illegal trade in jaguars

In addition to considering the biological characteristics described above when exploring the potential effects of poaching and illegal trade on a species, the IUCN guidelines (IUCN, 2008), which were adapted for the case of jaguars for the purpose of this study, and which are detailed in the Appendix, suggest assessing the species' national conservation status, the offtake levels (in this case from poaching or the illegal trade) and characteristics, as well as protections and conservation governance factors. The Appendix provides a detailed overview of each of these factors for each country, which could be used to monitor future country-specific progress in jaguar conservation and in addressing the threats of poaching and illegal trade in jaguars.

National Conservation Status:

Some of the indicators of a species' national conservation status include its: 1) given national risk classification, 2) national distribution, 3) abundance, 4) population trend, 5) the status of threats and 6) the quality of information on the population status (Appendix). Countries with jaguar populations classified as Endangered or Critically Endangered, and those with isolated jaguar populations, with low and decreasing abundances, and a high levels of threats, are likely to experience worse impacts from poaching and the illegal trade in jaguars.

With the exception of Ecuador, all countries with Endangered or Critically Endangered jaguar populations (at the national level) are located either in Central America or the southern extreme of the jaguar range (Argentina and Paraguay, Appendix). Not coincidentally and with a few exceptions, these are also the countries where jaguar populations are most fragmented, have small population numbers and low densities, presenting mostly declining trends. For the case of many countries in Central America, this is most likely a reflection of the overall small country sizes, their narrowness, and the resulting high density of threats to remaining forested areas (Campbell, 2015). For countries in the southern edge of the range, the reduced jaguar distribution and population size are a result of long-term habitat loss and direct exploitation (MAyDS, 2016; SEAM et al., 2016). Elsewhere in the range, other countries also contain isolated jaguar sub-populations that are at a high risk of extinction. Some noteworthy examples include jaguar populations in the Pacific coast of Ecuador, in the Atlantic forest of Brazil, and in the Perija, La Costa and Turimiquire mountain ranges of Venezuela. The threats to all these populations are persistent, and pertain to continued habitat loss due to encroachment by cash

crops, cattle ranching and human infrastructure (e.g. roads, mining, settlements); prey loss due to overhunting, and poaching due to retaliation, fear, and cultural and commercial reasons. Given their small population sizes (subpopulations below 200 individuals, and sometimes considerably below, see Appendix), high fragmentation, and the intensity of their threats, even small levels of jaguar poaching and illegal trade of about a dozen individuals or less per year could severely impact jaguar viability in these countries. For some countries (e.g. Argentina and Panama), reported poaching and illegal trade offtakes (section 4.3), which represent an incomplete and biased representation of the actual magnitude of these threats, are already at concerning levels. Other countries with endangered jaguar populations may be experiencing similar or even greater pressures from poaching and the illegal trade in jaguars, but may have more limited research and enforcement capacity.

A particular concern was that nine out of 18 countries (50%, Appendix) did not have any information regarding national population trends (based on the literature consulted in this study), and the trends of remaining countries were in most cases not based on long-term robust population monitoring systems. In particular, countries like Bolivia, Colombia, Ecuador, French Guiana, Guatemala, Guyana, Honduras, Nicaragua, Peru, Suriname, and Venezuela were lacking in updated jaguar population studies covering all of their jaguar populations. The lack of long-term, robust jaguar population monitoring systems severely imperils the detection and assessment of the impacts of poaching and illegal trade on jaguar populations.

National characteristics behind the illegal offtake (poaching and illegal trade)

Some of the variables to consider when analysing the characteristics and potential impacts of poaching and the illegal trade in jaguars include: 1) the presence and status of both threats in range countries, 2) their reported geographical distribution in the country, 3) the transboundary scope of the illegal trade (domestic or international), 4) its level of sophistication (modus operandi), 5) its links to other crimes, 6) and the quality of information on these threats (Appendix). Countries with greater magnitudes or more widespread poaching and illegal trade in jaguars, as suggested by the evidence, those with verified links to other crimes or with organized and sophisticated illegal trade networks, and those with cases of illegal international trade require attention due to the potentially large impacts of these threats on jaguar populations. However, as this analysis is based on seizures and other reports of limited scope and high levels of uncertainty (Chapter 4.5), which may not accurately represent both poaching or the illegal trade in jaguars, it is possible that other countries with less evidence could be more affected by these threats, and should therefore continue to be monitored. For all countries, current reliance on opportunistic seizures and on sporadic academic research and media reporting efforts as the main sources of evidence on poaching and the illegal trade in jaguars represents a significant limitation to accurately assessing the potential impacts of these threats.

Based on the evidence consulted in this study, all countries possessed some evidence of poaching and illegal trade in jaguars, with the exception of Guyana, which did not have any recent information on these threats. Jaguar poaching (not necessarily related to illegal trade and mainly related to subsistence hunting or human-jaguar conflict), was reported as a high-level threat in most jaguar range countries. However, countries like Colombia, Ecuador, French Guiana, Guyana and Nicaragua had comparatively less information on jaguar poaching. On the other hand, the illegal trade in jaguar specimens was described by the consulted sources (Chapter 4) as a high threat to jaguars in Bolivia, Mexico, Peru, Suriname, and Venezuela, while remaining countries had more limited reports of illegal trade. The countries with recent (since 2010) and more than occasional (more than twice) cases of attempted or actual cases of international smuggling of jaguar body parts included Bolivia, Brazil, Colombia, Mexico, Peru, Suriname and Venezuela. Other countries like Belize, Guatemala, French Guiana and Honduras had reports of jaguar body parts smuggling across the borders with neighbouring countries, not all of which verified (Chapter 4 and Appendix). More complex modus operandi and more

organized illegal trade networks were described for Bolivia, Brazil, Honduras, Mexico, Peru, Suriname and Venezuela (Chapter 7 and Appendix). These often involved the use of packaging or postal services, organized poaching (or illegal trophy hunting) operations, poaching by order and other strategies involving more than occasional or opportunistic trafficker interactions and the existence of intermediaries. Meanwhile, countries with links to other crimes (albeit few) were Bolivia, Brazil, Guatemala, Honduras, Mexico and Suriname (Chapter 6 and Appendix). These links were usually related to possession of jaguar specimens by people involved in other crimes (other wildlife, drug or arms trafficking, money laundering, or illegal mining).

As mentioned in Chapter 4.5, it is worth noting that some countries like Brazil, which contains about 50% of the global wild jaguar population, have a noticeably high degree of underreporting of cases of illegal trade based on official and non-official sources. Other countries with particularly lacking information on the illegal trade in jaguars include French Guiana, Honduras, Guatemala, Nicaragua, and Panama, as recognized by their corresponding authorities, who stated that while illegal trade is known to exist in their countries, official jaguar seizures or mortalities have not been recorded. Meanwhile, the absence of official responses to CITES Notification 055/2020 from the governments of Belize, Guyana and Venezuela mean that it is currently not possible to assess the availability of official information on jaguar poaching or illegal trade in these countries. Caution should be exercised when interpreting these results, as the overall limited evidence on poaching and the illegal trade in jaguars may lead to a misleading understanding of their threat levels, characteristics and impacts. This reveals the importance of a stronger illegal wildlife trade monitoring and reporting system, and of a more detailed assessment of the potential impacts of poaching and the illegal trade in jaguars.

National jaguar protections and conservation governance

Countries' jaguar protections and conservation governance include: 1) the types of laws that are in place to protect jaguar populations, 2) the existence of a national jaguar conservation action plan, 3) initiatives to protect jaguars from illegal offtake (poaching, retaliatory killing), 4) initiatives against the illegal trade in jaguar body parts, and 5) the existence of incentives for coexistence. Countries that do not have a national jaguar conservation action plan in place or in progress, or any jaguar-specific conservation laws, those with few or limited actions to reduce jaguar poaching and illegal trade, and those with deficient enforcement capacity, as described by the authorities or the literature, are highlighted in this section.

Based on the sources consulted in this study, the majority of jaguar range countries (14 out of 18, 78%), did not have any jaguar specific laws or regulations, but rather included jaguars within broader wildlife laws. In these cases, jaguars were usually listed under a national red list of threatened species or hunting agenda, and protections were established at the national level based on their assigned risk category. In some cases like French Guiana or Bolivia, these legal protections did not cover all jaguar populations in the country, as those found within indigenous territories or within the reach of communities who traditionally derive their means of subsistence from the forest, are still vulnerable to hunting (but not to commercial use or trade, Appendix). Similarly, in other countries like Belize and Venezuela, jaguar hunting is allowed through the emission of a special license or government authorization in cases of risk of an attack on livestock, or for scientific and management purposes, respectively (Appendix). Argentina, Colombia, Nicaragua and Paraguay had specific laws or regulations targeting jaguars. Half of range countries had a national jaguar conservation plan (Appendix), containing information about the status of the species in the country and detailing a set of planned conservation actions. Guatemala, Peru and Suriname, which are among the countries lacking a national jaguar conservation action plan, indicated that they have begun the process to consolidate a national plan. For countries with a national plan, the progress towards compliance with the plan was not clear, and with the exception of Brazil, which provided an execution plan and timeline (for the

purpose of this study), it was not always clear how responsibilities were assigned, or whether any funding had been secured for implementation.

All range countries had at least one governmental or civil society initiative to address jaguar poaching, mainly in the context of human-jaguar conflict. In most cases, these initiatives included incentives for coexistence, such as the provision of livestock depredation mitigation measures, rapid-response teams, livestock insurances, certification schemes, alternative livelihood support or ecotourism. Communication and education campaigns were another common strategy used by governments and NGOs (Appendix). However, the effectiveness of these actions and their level of implementation was rarely stated. On the other hand, less countries had initiatives in place specifically tailored to addressing the illegal trade in jaguars. Aside from general wildlife enforcement activities, this study did not find information on specific projects or measures taken at the national level to address the illegal trade in jaguars in Colombia, Costa Rica, French Guiana, Honduras, Nicaragua or Venezuela. It is possible that such initiatives do exist in these countries and were not captured by this study. However, the current analysis should serve to highlight what appear to be legal and governance-related gaps in jaguar protections and conservation actions across the range. More efforts are needed to map out and track the progress of existing and future efforts, particularly in countries with vulnerable jaguar populations and with concerning levels of poaching and illegal trade in jaguars.

9. INTERNATIONAL COOPERATION, REGIONAL EVENTS AND GLOBAL INITIATIVES

Owing to its multiple threats, and to the growing concern over the illegal international commercial trade in jaguar body parts, jaguars have received considerable attention from the international conservation community in recent years. Multiple initiatives have been set in motion at the regional and international level to achieve the long-term viability of the species throughout its range, from binding international instruments (such as CITES or CMS Decisions), to range-wide government commitments (e.g. the Lima Declaration and the Alliance Against the Illegal Trade in Jaguars), and agreements between governments and other relevant stakeholders (Jaguar 2030 Conservation Roadmap for the Americas). At the national level, governments together with the civil society and local communities are also working to address jaguar poaching and the illegal trade in jaguars on the ground (see Appendix for national projects and initiatives). Though the specific goals and actors differ slightly, all of these efforts hold the elimination of jaguar poaching and illegal trade in jaguar body parts at their core, recognizing it as a key impediment to sustainable jaguar conservation. There is a vast potential to build synergies between these initiatives, consolidating a unified voice for jaguar conservation. Harmonizing efforts and building highly participatory and transparent coalitions between actors at the international, regional, national and community-based level, could contribute towards leveraging funding opportunities, political will and collective actions to end the illegal trade in jaguars.

9.1 CITES Decisions on Jaguars

CITES Decisions 18.251-18.253 on Jaguars (*Panthera onca*) were adopted at the 18th meeting of the Conference of the Parties to CITES held in Geneva, Switzerland in August 2019 (CITES, 2019a). Based on working document CoP18 Doc. 77.1 submitted by Costa Rica and Mexico, these Decisions encourage Parties and relevant stakeholders to cooperate on matters related to jaguar conservation and the elimination of poaching and the illegal trade in jaguars, including the preparation of this study. Jaguars are also included within the CITES Big Cat Task Force (Decision 18.245), also adopted at the 18th meeting of the Conference of the Parties to CITES, which is currently being established, and which will consist of representatives from Parties most affected by the illegal trade in big cats from Africa, Asia and Latin America, and relevant stakeholders. This Task Force will discuss enforcement and implementation issues related to the illegal trade in specimens of big cats, promote information exchange, and develop strategies to improve international cooperation on the enforcement of CITES concerning the illegal trade in specimens of big cats. Following Resolution Conf. 11.17 (Rev. CoP18) on National reports, and Decision 18.76 on Annual illegal trade reports, CITES urges Parties to submit annual illegal trade reports by 31st of October each year, as a way to centralize and manage data on the illegal trade in jaguars and other wildlife, to improve monitoring and decision making to conserve the species.

9.2 Inclusion of Jaguars in the Convention on Migratory Species (CMS)

In February 2020, a proposal to include jaguars in Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS), supported by Costa Rica, Argentina, Bolivia, Paraguay, Peru and Uruguay, was approved at the 13th Meeting of the Conference of the Parties to the CMS (CMS COP13) held in Gandhinagar, India. The rationale for the inclusion of the jaguar was the continued loss and increasing fragmentation of their range, which most severely affects isolated endangered and critically endangered subpopulations, and to maintain the integrity and connectivity between transboundary populations (CMS, 2020). The goal of the inclusion was to “help countries draw attention to endangered subpopulations with transboundary corridors, prioritize corridor management to avoid extinction of more isolated populations, and to coordinate regionally to avoid

further isolation of endangered jaguar subpopulations" (CMS, 2020). Following the listing, and in accordance with the text of the Convention (1979), range countries that are Parties to the CMS (Argentina, Brazil, Costa Rica, Ecuador, French Guiana, Honduras, Panama, Paraguay and Peru) must endeavour to conserve the habitats that are of importance to the species, prevent or remove obstacles to the migration of the species, reduce factors that are endangering the species, prohibit the taking of animals of the species, and to conclude global or regional Agreements for the conservation of the species (CMS, 1979). Argentina, Bolivia, Costa Rica, Peru, Paraguay, and Uruguay have established a CMS group to identify the necessary measures to comply with the CMS, including exploring options of how best to follow up on the Appendix II listing, for example by endeavouring the formulation of international agreements for the species' conservation and management. National and regional work plans are in the process of being developed. The CMS group has identified illegal trade as a key issue to incorporate within the work plans, and the need to find synergies with CITES and the Jaguar 2030 Roadmap.

9.3 First High-Level Conference on Illegal Wildlife Trade in the Americas

On October 11th and 12th, 2018, the London Conference on the Illegal Wildlife Trade took place, and delegations from jaguar range States (Bolivia, Colombia, Costa Rica, Mexico, Nicaragua, Panama and Peru), signed the resulting London Illegal Wildlife Trade Declaration (Gov UK, 2018). Through it, they recognized the detrimental economic, environmental, security and social impacts of the illegal trade in wildlife, and committed to tackling it as a serious and organized crime, to work in partnership, and to reduce demand for wildlife. At the Conference, delegations from the Americas met and committed to coordinated action to address the illegal wildlife trade in the region, and announced the organization of the first regional conference on illegal wildlife trade in Peru the following year, highlighting the jaguar as a focal species.

Building on the momentum and commitment from the London Conference on the Illegal Wildlife Trade, Peru welcomed governments and Regional Economic Integration Organizations to the First High-Level Conference on Illegal Wildlife Trade in the Americas, held in Lima, Peru in October 2019. Participating actors adopted the Lima Declaration on Illegal Wildlife Trade (2019) committing to, among other things, declaring the jaguar, "an emblematic species of the Americas, because of its importance in maintaining the integrity and functionality of the ecosystems, and because it represents a spiritual and cultural icon of many peoples throughout their area of distribution and a symbol of the fight against illegal wildlife trade". All range States adopted the Lima Declaration, with the exception of Belize, Guyana, French Guiana and Venezuela. The Second High-Level Conference on Illegal Wildlife Trade, initially set to take place in Colombia in 2021 (pre-Covid19), is expected to occur the near future.

9.4 Regional alliances for jaguar conservation and against the illegal trade in jaguars

In July 2019, at an international workshop in Santa Cruz de la Sierra, Bolivia, national authorities from Argentina, Bolivia, Costa Rica, Ecuador, Paraguay and Peru signed a manifesto establishing an Alliance Against the Illegal Trade in Jaguars (CITES, 2019b). Range States participating in this Alliance, recognized that the illegal trade in jaguars is a problem that is affecting the region and that must be treated as a serious, transnational and organized crime. Consequently, they committed to collaborate to combat poaching and illegal trade in jaguars and other wildlife at the regional and international level. Additionally, the States declared the jaguar as a regional emblem for the fight against the illegal wildlife trade, and recognized the urgency of sharing information on this threat between institutions and governments, and of enhancing the legal and enforcement capacity of jaguar range States to address this threat. Included in this last point are actions to train of enforcement officers, update laws and regulations and develop awareness building strategies against the illegal trade in jaguars.

The 'Latin American Alliance for Jaguar Conservation" was established during the International Symposium on Jaguar Ecology and Conservation, held in Mexico in June 2018. Expanding on the efforts and achievements of the existing Mexican National Alliance for Jaguar Conservation, the Latin American Alliance aims to unite scientists and representatives from multiple countries in the jaguar range to build government and private alliances, standardize data collection on jaguar populations and their threats, and scale-up jaguar conservation efforts across the continent.

9.5 The Jaguar 2030 Conservation Roadmap for the Americas

In March 2018, fourteen jaguar range States and collaborating national and international organizations held the Jaguar 2030 High-Level Forum at the UN Headquarters in New York. The Forum resulted in the "Jaguar 2030 New York Statement" and the establishment of an annual International Jaguar Day (29 November), jumpstarting region-wide cooperation for jaguar conservation and raising awareness about the jaguar as an icon for sustainable development (Panthera et al., 2019). The outcomes of the Forum further materialized at the 14th meeting of the Conference of the Parties of Convention on Biological Diversity (CBD) held in Egypt in November 2018, with the presentation of "The Jaguar 2030 Conservation Roadmap for the Americas".

Led by the United Nations Development Programme (UNDP), the Wildlife Conservation Society (WCS), Panthera, and the World Wide Fund for Nature (WWF), the Jaguar 2030 Roadmap constitutes an ambitious commitment to secure 30 priority conservation landscapes for jaguars by 2030 (Panthera et al., 2019). The Roadmap includes four main pathways of action, which include range-wide coordination to protect and connect these landscapes (Pathway #1), development and implementation of national strategies for jaguar conservation (Pathway #2), scaling-up sustainable development models in jaguar conservation units (Pathway #3) and enhancing financial sustainability of actions to conserve jaguars and their habitat (Panthera et al., 2019). The foundation of the Roadmap is the harmonization of national, regional and international efforts to protect jaguars across their range, enabling landscape scale connectivity and conservation.

Addressing human-induced mortality across priority jaguar conservation landscapes and their corridors is an essential component of the Roadmap. The illegal trade in jaguars is explicitly mentioned in Pathway 2, as a key issue that should be integrated into national policies and jaguar conservation plans. Strategy 2.3 states that governments should strengthen regional coordination on illegal trade in jaguars, and support institutions in charge of law enforcement, including police, prosecutors, customs offices and environmental authorities. Illegal trade is also mentioned in Pathway 3 (Strategy 3.5), which aims to strengthen and empower local communities and institutions to supress the illegal trade in jaguar body parts. As part of this strategy, the characteristics of the illegal trade should be evaluated in areas where it emerges, and the sources of demand should be actively prosecuted to deter further poaching (Panthera et al., 2019).

To date, 15 out of the 18 jaguar range countries have endorsed the Roadmap, including Costa Rica, Bolivia, Paraguay, Honduras, México, Argentina, Suriname, Colombia, Uruguay, Peru, Ecuador, Panamá, Brazil, Guatemala and Belize. Communication campaigns are underway to encourage more countries to join the initiative, and endorsing countries to take decisive actions to conserve jaguars.

10. MAIN FINDINGS AND CONCLUSION

Nearly five decades after the listing of jaguars under CITES Appendix I in 1975, which prohibits international commercial trade in specimens of the species, the illegal trade in jaguars at the domestic and international levels has once again become a concern for jaguar conservation. Addressing the illegal trade in jaguars at the domestic and international level, in addition to the multiple other threats facing the species, will present a complex challenge for jaguar range States, other source and destination countries, and relevant stakeholders over the coming decades. However, the jaguar and the illegal trade in jaguar specimens have already captured the attention and interest of these multiple actors and of society at large, and there is still time to prevent the threat of illegal trade from escalating and further threatening jaguars with extinction, as it has with other big cats.

This study, commissioned by the CITES Secretariat following CITES Decision 18.251, adopted at the 18th meeting of the Conference of the Parties to CITES held in Geneva, Switzerland in August 2019, has evaluated the characteristics of the illegal trade in jaguars throughout the species' range and outside of it, based on a wide range of sources, including official government and enforcement reports, international illegal trade databases, academic and grey literature, and expert consultation. The main findings of the study are described below.

- The characteristics of the illegal trade in jaguars depend strongly on the sources of information consulted. Given the different qualities, biases and limitations of the evidence, stakeholders involved in jaguar conservation should consider a wide range of sources to obtain a more comprehensive understanding of the illegal trade in jaguars, and be cautious about the interpretation of results. The three main sources of information consulted in this study (e.g. the UNODC's World WISE Database, government responses to CITES Notification 055/2020 requesting inputs for this study, and the general literature, including inputs obtained from a stakeholder consultation), presented important differences (and inconsistencies) in the scale and trends of seizures and reports of poaching an illegal trade in jaguars and in the markets of illegally traded jaguar specimens. These differences make it particularly challenging to ascertain, based on current information, whether the illegal trade in jaguars is in fact increasing or not, and which are the main international and domestic markets for jaguar body parts. Moreover, all sources revealed serious biases in reporting on the illegal trade in jaguars and poaching of the species across countries, and a concerning lack of information on enforcement of the law for the case of jaguars.

- Evidence limitations stress the urgent need for improved systems for the collection, standardization, systematization, analysis, reporting, and sharing of information on jaguar poaching and illegal trade. These systems should be aligned with CITES Resolution Conf. 11.17 (Rev. CoP18) on *National reports*, and Decision 18.76 on *Annual illegal trade reports* for cases of international illegal trade in jaguars. Along with improved data systems, law enforcement capabilities must be significantly strengthened nationally and regionally beyond reactionary efforts.

- Jaguar seizures found in the UNODC's World WISE Database are low in number and have remained relatively stable over the past two decades (unlike the trends suggested by the literature). The United States was the country with the largest number of jaguar seizures in this database, and it was also the most frequent country of destination, 14 and 19 times ahead of the next countries of destination (Germany and China, respectively). These results highlight the potentially important role of the United States and to a lesser degree Germany (as well as other European countries) in the illegal trade in jaguars, a matter that has not received previous attention when compared to the considerably larger focus placed on China. The purposes and characteristics of demand for illegal jaguar body parts in these countries is currently largely unknown and should be a key future area of investigation.

- Based on the seizures contained in the UNODC's World WISE Database, there appear to be at least four geographical routes of repeated instances (more than twice since 2000) of international illegal trade in jaguar body parts, which include: 1) from range countries to the United States (53 records), 2) from range countries to the European Union (8 records), 3) from the United States to the European Union and vice versa (5 records), and 4) from range countries to China, by way of Europe (3 records). These illegal trade routes are a representation of the seizure data in this database only, and do not necessarily represent the actual scale or characteristics of the international illegal trade in jaguar body parts, nor the only existing routes.

- While most range States acted as source or destination countries of illegal international shipments of jaguar specimens, only Bolivia, Brazil, Colombia, Mexico, Peru, Suriname and Venezuela had confirmed (government reports or seizures in the UNODC's World WISE Database) evidence of recent international trade (since 2010) involving more than two jaguar specimens. Except for Bolivia, Mexico and Peru, the evidence of international trade was limited and suggested low scales. Overall, the governments of jaguar range countries held very limited information about poaching and illegal trade in jaguars within their territories.

- Despite being often referred to as an important or the main international market for jaguar body parts, there is limited seizure evidence on the illegal trade in jaguars in China. Based on official seizures reported on the UNODC's World WISE Database, China was identified as the destination country in just three out of 76 records (4%) of seizures involving illegal international trade in jaguar body parts, representing less than 10 specimens. Another three seizures were found in the literature from 2010 to 2020 (non-official), totalling 137 teeth, 13 claws and 1.49 kg of bones. Aside from these seizures and instances of illegal online trade, the remaining evidence of demand for jaguars in China found by this study is based on seizures or investigations conducted outside of China, which implicated China either as a destination country of illegally traded jaguar body parts, or as the alleged nationality of jaguar traffickers. Bolivia was the only country in the jaguar range with confirmed evidence implicating China as the country of destination of illegal jaguar body parts, as specified in 22 out of 55 (40%) cases of illegal trade in jaguars (involving a total of 436 jaguar teeth), from 2013 to 2020, recorded by WCS-Bolivia with the recognition of Bolivian authorities. Airport seizures in Suriname (involving 14 teeth) involved traders of Chinese-descent, but the destination was not specified.

- Current examples provided by governments (through responses to CITES Notification 055/2020) and found in the general literature highlight the importance of domestic illegal trade in jaguars. With the exception of Bolivia, nearly all the information presented by governments involved domestic demand for jaguar specimens, and so did 70% of literature reports. Almost all jaguar body parts, particularly jaguar teeth, skins, skulls and fat, have cultural, decorative, medicinal and other functional uses at the domestic level, making jaguars a desirable species to poach. The uses of jaguar body parts outside of range States are less understood. Teeth are most likely used as status-granting collectibles and souvenirs, while products like jaguar paste have alleged medicinal properties (though their use in Asia remains unconfirmed).

- The illegal trade in jaguar body parts has been associated with multiple drivers, including domestic demand for jaguar body parts and local livelihoods, human-jaguar conflict, financial incentives, foreign demand for jaguar body parts, tourism-related demand, the illegal pet trade and private collections, and illegal trophy hunting. These drivers vary geographically and have varying levels of support in the literature. However, both opportunistic poaching associated with domestic markets, local livelihoods, and human-jaguar conflict appear to be responsible for the greatest numbers of poached and illegally traded jaguars. There are multiple institutional factors that enable the illegal trade in jaguars, including but not limited to a lack of financial and human resources to enforce the law, inadequacies in the law,

challenges in coordination between national and sub-national government agencies and non-governmental actors, corruption, and a lack of state presence in vulnerable areas.

- The poaching of jaguars, and the subsequent illegal trade in jaguar body parts, is largely opportunistic and it is undertaken by marginalized individuals who are often unaware of the legal consequences of their actions. The modus operandi reflects the opportunistic nature of the illegal trade, with relatively simple techniques being employed to obtain and sell jaguar body parts, and with much of the illegal trade occurring overtly in villages and rural towns. However, there are fewer but important pieces of evidence suggesting that the illegal trade in jaguar body parts is becoming more organized in some countries. Traffickers are also taking advantage of online platforms and social media to advertise products and to consolidate larger illegal trade networks and consumer bases. Additional research on both the opportunistic and organized aspects of the illegal trade, and their relative impacts, are necessary.

- Despite their great adaptability and strength, jaguars are a slow reproducing species, sensitive to humans, and unlikely to withstand growing offtake levels associated with poaching and illegal trade over the long term. Estimating the impacts of the illegal trade on jaguar populations is urgently needed, and it would require a collaborative effort between governments, civil society, academia and communities to build a robust monitoring system for jaguar populations and their threats, including poaching and illegal trade, over time. In particular, a better understanding of the synergistic effects between poaching, illegal trade, and habitat loss is crucial to unravel the actual status of jaguar populations across their range and their vulnerability to human-related offtake.

- The potential and actual population impacts of poaching and the illegal trade in jaguars will likely vary with each country's national jaguar population status (and their vulnerability to other threats), levels and characteristics of poaching and the illegal trade, and ability to respond to these threats given their current legal systems, institutional capacities and conservation governance. Based on an exploratory qualitative analysis of these factors, it was possible to determine that jaguar populations that are small, fragmented, and highly endangered by other threats such as severe habitat loss (such as those in much of Central America and the southern extreme of the jaguar range - Argentina and Paraguay) are unlikely to withstand even small, opportunistic levels of poaching or illegal trade over the long term. Similarly, jaguar populations in countries with apparently larger and more organized, international, targeted or sophisticated modus operandi (e.g. Bolivia, Brazil, Mexico, Peru, Suriname and Venezuela), within the limitations of the evidence, may also be particularly vulnerable. Finally, countries that lack jaguar specific regulations, national jaguar conservation action plans, governmental and non-governmental actions against jaguar poaching and illegal trade or incentives for coexistence with jaguar (e.g. several countries in Central America and northern South America), may also experience population declines from these threats. More efforts are needed to map out and track the progress of existing and future jaguar conservation efforts, particularly in countries with vulnerable jaguar populations and with concerning levels of poaching and illegal trade in jaguars.

- Many initiatives to monitor jaguar populations, improve and connect their habitats, and tackle mortalities from human-jaguar conflict and the illegal trade in jaguars are currently underway, promising to advance jaguar conservation in the next decade. Some examples include CITES Decisions 18.251 to 18.253 on Jaguars (*Panthera onca*), the inclusion of jaguars in the Appendices of the Convention on Migratory Species, the First High Level Conference on Illegal Wildlife Trade in the Americas (and subsequent future conferences), multiple regional alliances for jaguar conservation and against the illegal trade in jaguars, and the Jaguar 2030 Conservation Roadmap, among many other national and sub-national initiatives. These efforts should be carried through and increased, supported by all levels of society. Indigenous peoples and local community perspectives have been largely missing from this report, a reflection of their exclusion from the discussion surrounding the illegal trade in

jaguars. This trend should be reverted, as indigenous peoples and local communities have the highest stakes in the matter, being the most affected by, and the ones who could benefit the most from, coexisting with jaguars, through the establishment of jaguar conservation incentives (e.g. ecotourism, jaguar-friendly certifications).

Jaguars have endured intensive periods of historical overexploitation, demonstrating their strength and resilience. However, jaguars have never been more threatened by the ever-increasing frequency and intensity of anthropogenic threats, which are rapidly shrinking their habitats, decimating their prey and threatening the species even in the most remote corners of its range. Decisive actions are needed to increase jaguar protection, and to translate existing international and national jaguar conservation commitments into effective actions with measurable impacts on the ground. Jaguar conservation, and the elimination of the illegal trade in jaguars, will not be achieved through enforcement alone, due to the strong socio-cultural values attached to it, and the complex context behind human-jaguar coexistence. Governments, relevant stakeholders, and local communities must work together to unpack that complexity, and focus on building socially just, participatory and evidence-based strategies to safeguard jaguars from anthropogenic threats and guarantee their survival into the future.

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APPENDIX – Jaguar Range Country Profiles and Variables of Vulnerability to Poaching and Illegal Trade

Methodological Notes

This exploratory analysis adapted the methodology and some of the biological, offtake-related (poaching and illegal trade) and governance factors used by the International Union for the Conservation of Nature (IUCN, 2008) for assisting CITES Scientific Authorities to develop species management regimes. These broad factors and their subcategories were adapted to the specific context of jaguars, and evaluated against the information shared by governments and other consulted stakeholders, and that which was found in National Jaguar Action Plans or external literature, when available. The exploratory analysis is not based on an exhaustive review of all available sources or on a participatory stakeholder consultation for each country. Instead, its purpose is to provide an exploratory indication of the situation and challenges facing jaguar range countries with regards to jaguar poaching and illegal trade, and serve to highlight issues of particular concern or key gaps in the current knowledge.

For each range State, some of the factors (Table AP1) that can be used to analyse the potential impact of the illegal trade in jaguars include the jaguar's biological characteristics, the status of jaguar populations at the national level, the characteristics behind jaguar poaching and the illegal trade in jaguars, and the regulatory, institutional and conservation governance systems in place to protect the species. The analysis (Chapter 8) was carried out at the national level, but differences between jaguar subpopulations at the sub-national level were considered, as were conservation initiatives carried out at the subnational, regional or international level. Based on IUCN (2008), each variable is structured in Likert-scale form, ranging from least to most concern. Unlike the original guidelines, a fifth category was added for cases in which no information was found. The original guidelines enable a quantitative assessment of Likert scale scores, allowing comparisons across species or countries to be made. However, following the advice of governments and relevant stakeholders, no scores were assigned in this analysis, to reflect its exploratory nature and to account for the fact that the information contained herein is incomplete and subject to bias. Country comparisons are not appropriate in this context, due to information limitations and the subjectivity of the categories. However, these variables and the information provided can highlight key information gaps, and be used by countries and relevant stakeholders as a baseline to track progress into the future.

The information contained in the country profiles below was reviewed by the governments of Argentina, Colombia, Mexico, Panama, Paraguay and Venezuela, and by the non-governmental organizations Panthera, the Wildlife Conservation Society and Yaguará Panama Foundation. Their comments and revisions were incorporated in the country profile text and their corresponding variable status.

Table AP1: Factors and variables used to analyse potential impacts from jaguar poaching and illegal trade adapted from IUCN (2008).

Factors	Least Concern	Low Concern	Medium Concern	High Concern	**No information**[1]
1. Biological characteristics (same scoring for all countries)					
1a) Life history	High reproductive rate, long-lived	High reproductive rate, short-lived	Low reproductive rate, long-lived	Low reproductive rate, short-lived	No information
1b) Ecological adaptability	Extreme generalist	Generalist	Specialist	Extreme specialist	No information
1c) Dispersal efficiency	Very good	Good	Medium	Poor	No information
1d) Tolerance to humans	No interaction	Pest or commensal	Tolerant	Sensitive	No information
2. National status (country-specific scoring)					

2a) National classification	Near Threatened	Vulnerable	Endangered	Critically Endangered	No information
2b) National distribution[2]	Widespread, contiguous	Widespread, fragmented	Restricted, fragmented	Localized	No information
2c) National abundance[3]	Abundant	Common	Uncommon	Rare	No information
2d) National population trend[4]	Increasing	Stable	Reduced, but stable	Reduced and still decreasing	No information
2e) Quality of population information	Recent scientific (or other reliable) studies	Outdated or limited scientific (or other reliable) studies	Good local knowledge	Anecdotal information	No information
2f) Major threats[4]	None	Limited	Substantial	Severe	No information
3. Poaching and Illegal trade status (country-specific scoring)					
3a) Presence and status of poaching[5]	Not present or outdated	Present, marginal threat	Present, medium threat	Present, large threat	No information
3b) Presence and status of illegal trade[5]	Not present or outdated	Present, marginal threat	Present, medium threat	Present, large threat	No information
3c) Geographical pattern of poaching/illegal trade[6]	Not present or outdated	Localized	Spread-out	Ubiquitous	No information
3d) Transboundary nature of the illegal trade[7]	Not present or outdated	Domestic	Neighbouring countries	International	No information
3e) Level of sophistication of the illegal trade[8]	Not present or outdated	Informal or opportunistic	Somewhat organized	Highly organized	No information
3f) Links to other crimes	None	Unconfirmed links	Few confirmed links	Several confirmed links	No information
3g) Quality of poaching or illegal trade information[9]	Governments with official enforcement data	Government remarks without enforcement data	Scientific (or other reliable) studies	Media and Anecdotal accounts	No information
4. Protection from poaching or illegal trade (country-specific scoring)					
4a) Laws and regulations addressing poaching or illegal trade	Species-specific, targeting all populations	Species-specific, targeting some populations	Not specific to the species	None	No information
4b) Species conservation action plan	Existing	In progress	Planned	None	No information
4c) Initiatives against poaching	Existing	In progress	Planned	None	No information
4d) Initiatives against illegal trade (domestic or international)	Existing	In progress	Planned	None	No information
4e) Incentives for coexistence	Existing	In progress	Planned	None	No information

Table Notes:

[1] No information found by this study specifically. Differs from the category "None", which implies a confirmation of absence.

[2] Widespread (widely distributed within range areas in the country); Contiguous (found in continuous habitats with connectivity between them); Fragmented (found in isolated and disconnected habitat patches); Restricted (found in one or few restricted habitats, biomes, or administrative area in the country); Localized (found in a single location).

[3] Abundant (densities above 3 individuals per 100 km^2); Common (2.1 to 3 individuals per 100 km2); Uncommon (1.1 to 2 individuals per 100 km^2); Rare (below 1 individual per 100 km^2). Country averages used are those found in Jędrzejewski et al (2018), unless there are more updated national studies.

[4] When multiple subpopulations exist within a country, trends and threats of the most vulnerable ones were used.

[5] Unless the level of threat posed by poaching (and the illegal trade) was qualitatively characterized as low, medium or high by authorities or the literature, in which case the corresponding score was given, illegal offtake levels reported by authorities or found in the literature (Tables 1 and 2, Chapter 4) were used to assess the threat level in a subjective manner, taking into consideration jaguar population sizes, offtakes reported for other countries with similar characteristics, the quality of information available and other threats to the species.

[6] Localized (occurring in a single area in the country); Spread out (occurring in a few or several areas in the country); Ubiquitous (occurring in many or most places where jaguars and humans coexist)

[7]Countries with international illegal trade were those with confirmed government evidence on recent international trade (seizures made at airports or ports since 2010, Table 1 in Chapter 4), or those categorized as source or destinations countries for more than two jaguar specimens seized since 2010 according to the UNODC's World WISE Database.

[8] Informal or opportunistic (e.g. illegal trade mostly a by-product of other poaching causes, occurring once or few times depending on opportunity); Somewhat organized (networks with little structure, not employing violence, involving swift and fluid relationships between actors); Organized (hierarchical structures, disciplined, rational, may use violence and corruption, have longevity). Definitions based on (Wyatt et al., 2020).

[9] Based on responses to CITES Notification 055/2020.

Country profiles with regards to jaguar population status, poaching and illegal trade in jaguars, and jaguar protections and conservation governance

Argentina

Factors and Variables	Status
National Population Status	
National classification:	Critically Endangered
National distribution:	Restricted, fragmented
National abundance:	Rare
National population trend:	Reduced and still decreasing
Quality of population information:	Recent scientific (or other reliable) studies
Status of major threats:	Severe
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present, large threat
Presence and recognition of illegal trade:	Present, medium threat
Geographical pattern:	Spread-out
Transboundary:	Domestic
Sophistication:	Informal or opportunistic
Links to other crimes:	No information
Information quality	Official government/enforcement
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Species-specific, targeting all populations
Conservation action plan:	Existing
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing
Incentives:	Existing

National Population Status

Historically, jaguars occupied nearly all of central and northern Argentina. Human expansion and development over the past centuries removed jaguars from approximately 95% of their historical distribution, leaving three small and isolated jaguar populations in the northern extreme of the country, in the Yungas, Chaco and the Selva Paranaense ecoregions, bordering with Bolivia, Paraguay and Brazil (Di Bitetti et al., 2016; MAyDS, *in litt.*, 2020). Current jaguar populations in the country are distributed in 9 national and 41 provincial protected areas, which on their own do not provide sufficient protection to secure viable populations over the long term (MAyDS, 2016).

There are an estimated 200 to 300 adult jaguars left in Argentina, with around 53 to 81 in Misiones Atlantic Forest (Selva Paranaense, density 0.1-1.48 individuals per 100km^2), between 100-200 in Yungas (density 0.3-1.1 individuals per 100km^2), and less than 20 in Chaco, representing less than 1% of historical populations (Di Bitetti et al., 2016; Paviolo, 2010; Paviolo et al., 2019; Perovic et al., 2015). Jaguar populations in the Yungas have the highest odds of survival in the country due to the ruggedness of the terrain which limits human activities, but they are still considered to be declining. Meanwhile, those in the Chaco are considered ecologically extinct and declining, with only 42 independent signs (tracks and other signs) registered from 2016 to 2020 (MAyDS, 2016; Quiroga et al., 2014, *in prep*.). Similarly, populations in the Atlantic forest are isolated and only three subpopulations may have more than 50 individuals (Paviolo et al., 2016). While the number of jaguars in Misiones (Atlantic Forest) has been increasing over the past years, the overall small population is not enough to eliminate the risk of extinction (MAyDS, *in litt.,* 2020). The remaining populations have among the lowest jaguar densities found in the entire range, and the national density estimate is 0.41 individuals per 100 km^2 (Jędrzejewski et al., 2018). Even though jaguar numbers in this biome have been increasing relative to the start of the century, their likelihood of survival over the long term has been found to be less than 50%, showing high susceptibility to fragmentation (already detectable through their loss of genetic variability), human-related mortalities, and prey decline (Haag et al., 2010; MAyDS,

2016; Paviolo, 2010). The remaining jaguar populations in Argentina are well monitored across the different biomes (MAyDS, *in litt*., 2020, 2016).

Jaguar populations in the country are highly threatened by poaching, human-jaguar conflict, roads and infrastructure development, habitat conversion into agriculture and cattle ranching, all of which are increasing (MAyDS, 2016). Increasingly, jaguars are threatened by forest fires in the country. In 2020, Argentina declared "environmental emergency" after forest fires decimated remaining jaguar habitat in the Yungas biome (SAIJ, 2020). Poaching has been identified as the main threat to jaguars in Argentina, and in areas like the Chaco, which have a strong hunting culture, poaching has extirpated jaguars even where suitable habitat is still available (Altrichter et al., 2006). Due to the critical population status, and the high intensity of threats, the jaguar, locally known as yaguareté, has been classified as Critically Endangered in the country.

Poaching and Illegal Trade Status

Poaching of jaguars has been recognized by Argentinian authorities as the main threat affecting the species (Altrichter et al., 2006; MAyDS, 2016; Paviolo, 2010; Quiroga et al., 2014). Jaguar poaching is carried out by local people, particularly cattle ranchers, and it is mostly a retaliatory or preventative response to actual or potential livestock depredation by jaguars, or caused by the fear and negative perceptions towards the species (Caruso et al., 2019; MAyDS, *in litt*., 2020). The existence of professional jaguar poachers who are hired by ranch owners to eliminate livestock-depredating jaguars has been reported in the country (MAyDS, 2016). However, the overall incidence of real or perceived human-jaguar conflict in areas like Chaco or Misiones is low, due to low jaguar numbers (Paviolo, 2010; Quiroga et al., 2014). Opportunistic jaguar poaching during wild meat hunting trips has also been identified as a key problem for jaguar populations in the country, and it synergistically affects the species by reducing prey numbers (Paviolo, 2010).

The illegal trade in jaguars is also present in Argentina, as recognized by Argentinian authorities. However, the illegal trade within the country appears to be mainly a result of jaguar poaching for other reasons (retaliation, fear) rather than a targeted activity. Previous cases of illegal trade in jaguars have also been associated with the longstanding lifestyle of cattle ranchers of "gaucho" culture, and to a lack of awareness about the critical conservation status of the species (Altrichter et al., 2006; MAyDS, *in litt.,* 2020; Quiroga et al., 2014). As part of this lifestyle in the northeast of the country, jaguar skins have been traditionally (though illegally) used for the production of luxury horseback riding products and garments like saddlecloths and girths. As part of their response to CITES Notification 055/2020, Argentinian authorities provided several examples of legal complaints and causes of action taken against leather workshops and tanneries, and sellers on e-commerce platforms like Mercado Libre for attempting to sell such items (MAyDS, *in litt.*, 2020). There was also an example of an attempted export of a saddlecloth with jaguar skin inserts by a commercial firm in 2013. According to the authorities, 73 similar legal complaints have been brought forth by the Red Yaguarete Foundation for jaguar poaching and the illegal sale of raw or processed jaguar skins.

In Argentina, there are also a few examples of illegal trophy hunting of jaguars. In 2007, the CITES Management Authority of Argentina was notified by the CITES Management Authority of Hungary of a jaguar that had been poached in Santiago del Estero in 2006 and smuggled to Hungary by a trophy hunter of that nationality. This is the only example of international smuggling of jaguar body parts from Argentina, but aside from this example, other cases of jaguar trafficking are domestic. Another case of trophy hunting, which was described by Argentinian authorities as an example of "canned hunting", took place in an island in the Parana River in Corrientes Province in 2006, and ended in the seizure of the resulting taxidermy from a residence in the city of Esquina. Other examples of trophy hunting took place in the years 2011 and 2013 in Jujuy and Salta Provinces, respectively, and were

identified through photograph posts on hunting or social media websites like Cazalia.com or Facebook (MAyDS, *in litt.*, 2020). Although the illegal trade in jaguar body parts does not appear to have been explicitly studied in the country, a past study in the Chaco identified occasional sales of jaguar skins, but was unable to find evidence that people made a regular living from selling jaguar hides (Altrichter et al., 2006).

The potential escalation of illegal trade-driven poaching for international markets, following trends observed in Bolivia, has concerned authorities, but it has not yet been detected in the country. Similarly, there was no information on potential links to other criminal activities or other types of illegal wildlife trade. Jaguar poaching and illegal trade is distributed towards the northern edges of the country, where jaguar populations remain, but there have been reports of possession of jaguar body parts (skins and taxidermies, trophies) further south, away from the jaguar range, in provinces like Buenos Aires and Neuquen. This suggests that jaguar body parts may be transported across vast distances by land or air.

Protections against Poaching and Illegal Trade

The jaguar's Critically Endangered Status in Argentina has granted it with the maximum level of legal protection against poaching and illegal trade within the country, according to Resolution Nº 1030/2004, Resolution N°513/07 and Decrees Nº 666/97 of National Law Nº 22.421. Sanctions for offenders are described in Articles 24-27, with up to two years imprisonment and five years of special disqualifications for those involved at any stage of the illegal trade chain. Jaguars are also recognized as a Natural Monument at the national (National Laws LNº 25.463, Nº 22.351) and provincial levels, in the provinces of Misiones (Provincial Law. Nº 2.589), Chaco (Provincial Law. Nº 4.306), Formosa (Provincial Law. N° 1673), Salta (Provincial Decree Nº1.660) and Corrientes (Provincial Law. Nº 6.491). This recognition requires provinces to take actions to conserve the species. Jaguars are also recognized as a "Species of Special Value" in Santiago del Estero Province (MAyDS, *in litt.,* 2020). In the Provinces of Misiones and Salta, the provision of financial compensation to mitigate human-jaguar conflict is stipulated in the law, as an incentive for human-jaguar coexistence. Similarly, the province of Chaco has a specific "Procedural protocol to verify infractions and crimes against Natural Monument species" (Provincial Decree, 2127).

Argentina has a National Conservation Plan for jaguars, entitled "Plan Nacional de Conservación del Monumento Natural Yaguareté", created in 2016 and approved by Resolution 149/17 of the Ministry of Environment and Sustainable Development (MAyDS) in 2017. Additionally, each of the regions with remaining jaguar populations has its own specific Conservation Plan for the species. The National Action Plan includes actions to: reduce the impacts from habitat loss, human-jaguar conflict, poaching of jaguars and their prey, infrastructure and development projects; support local communities in the implementation of sustainable resource management practices; increase jaguar habitat and improve protected areas; strengthen the legal and judicial system for addressing cases of poaching and illegal trade; promote research and awareness; and to identify sustainable funding sources, among others. The National Plan was complemented with a three year Operational Plan (2019-2021), with responsibilities assigned to a group of governmental and non-governmental institutions. This Operational Plan is currently under implementation, but it is dependent on stakeholders' budgets (WWF, 2019).

Government and non-governmental institutions have implemented several jaguar conservation actions over the past decades, some specifically focused on reducing jaguar poaching and illegal trade mortalities. For example, workshops have been organized with judges and security forces in Misiones province to build awareness about the seriousness of jaguar poaching crimes (Di Bitetti et al., 2016). In the same province, the National Parks Administration (APM), Fundación Vida Silvestre Argentina

(FVSA), and the Ministry of Ecology launched a radio, television and primary-school awareness building campaign focused on jaguar conservation (Di Bitetti et al., 2016). In Misiones and the Chaco biomes, Yaguareté Project (CeIBA) has been leading jaguar conservation communication and education campaigns in schools in rural areas and cities since 2015, reaching thousands of children and teenagers (Cruz et al., 2017; Quiroga et al., 2018). Other jaguar-focused communication campaigns have followed, under the leadership of Red Yaguareté and Greenpeace in regions like the Yungas.

Human-jaguar conflict research and mitigation projects have been established in Salta by Red Yaguareté, and in Jujuy by Fundación para la Conservación de Especies y el Medio Ambiente, the Palpala Municipality and the Jujuy Fauna Authority, including the establishment of a cattle loss compensation scheme (Di Bitetti et al., 2016). Plans to create new protected areas for jaguars in the Yungas have been led by Fundación ProYungas, while the implementation of a transboundary "Green Corridor" uniting jaguar populations in Misiones with those across the border in Brazil has been set in motion by a binational multi-stakeholder commission (Schiaffino, 2011). An ambitious jaguar rewilding project in Iberá Natural Reserve in Corrientes province, led by Conservation Land Trust Argentina, has returned jaguars to an area where they had been previously extirpated (CLT, 2020).

Despite the existence of species-specific laws and jaguar action plans at the national and provincial levels, and of multiple actions and initiatives undertaken by the government and relevant stakeholders to conserve jaguars and address poaching and illegal trade related mortalities, the National Jaguar Action Plan of Argentina highlights several weaknesses in the implementation of these actions. For example, specific protocols detailing how authorities should carry out enforcement operations and make decisions on the prosecution of poaching complaints are lacking from the Jaguar Action Plans (MAyDS, 2016). There is also limited coordination between national and sub-national institutions working on jaguar conservation (MAyDS, 2016). Human and financial resources associated with jaguar enforcement actions on the ground are deficient, and most complaints of jaguar poaching or illegal trade are left unanswered (MAyDS, 2016). In the past years, at least 60 complaints of jaguar poaching and illegal trading have been received by the Environmental Crime Investigations Unit (UFIMA), 44 of which were filed a criminal case, and 16 of which were dismissed, but no sentences or ongoing processes were identified at the time of this study (MAyDS, *in litt.,* 2020). Resource management authorities, enforcement agents, and judges continue to lack training in the prosecution of environmental crimes, and the absence of specialized environmental courts have led to a "sense of impunity" for crimes associated with jaguars and other wildlife in the country (MAyDS, 2016). Low levels of awareness about jaguars amongst the general population (and authorities) continue to compromise jaguar conservation (MAyDS, 2016).

Belize

Factors and Variables	Status
National Population Status	
National classification:	No official classification
National distribution:	Widespread, contiguous in country
National abundance:	Common
National population trend:	Stable
Quality of population information:	Recent scientific (or other reliable) studies
Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present, large threat
Presence and recognition of illegal trade:	Present, medium threat
Geographical pattern:	Ubiquitous
Transboundary:	Neighbouring countries
Sophistication:	Informal or opportunistic
Links to other crimes:	Unconfirmed
Information quality	Scientific (or other reliable) studies
Protections Against Poaching and Illegal Trade Status	

Laws and regulations:	Not specific to the species
Conservation action plan:	None
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing
Incentives:	Existing

National Population Status

Belize does not have a national conservation status classification system for jaguars following IUCN categories. Jaguar population estimates for the country are amongst the highest in the entire jaguar range relative to the size of the country, with an estimated 446 to 754 individuals, and densities ranging from 1.2 (Fireburn) to 8 individuals (Cockscomb basin) per 100 km^2 (CMS, 2020; Figueroa, 2013; Jędrzejewski et al., 2018). The national average density estimate is 2.69 individuals per 100 km^2 (Jędrzejewski et al., 2018).

Jaguar populations are distributed throughout the national territory, in at least 55 out of the 70 protected areas in the country (covering 35% of the mainland territory), and in unprotected forests (Figueroa, 2013). There are two large contiguous forest blocks that comprise jaguar habitats, including the Maya Mountains Massif towards the south of the country, and the Selva Maya towards the north, shared with Mexico and Guatemala. These two large conservation blocks are separated by the Western Highway in the centre of the country, but are interconnected through the Maya Forest Corridor, also named Central Belize Corridor, which has maintained high levels of gene flow between populations (Figueroa, 2013; Menchaca et al., 2019). Other isolated protected areas and unprotected forests in the rest of the country also play an important role in jaguar conservation (Figueroa, 2013).

Populations in southern Belize and the Selva Maya have been categorized as stable, and with 99 to 100% chances of long term survival, respectively (Sanderson et al., 2002). More recent assessments have detected a mean annual population increase of approximately 4% in well protected areas like the Cockscomb Basin Wildlife Sanctuary (Harmsen et al., 2017) and relatively stable populations in areas with varying levels of logging (Kelly and Rowe, 2014). However, high jaguar emigration rates in other protected areas, such as Chiquibul Forest Reserve and National Park and Mountain Pine Ridge Forest Reserve, of about 18% in one generation, may indicate decreasing population trends in areas with growing threats (Wultsch et al., 2016b).

Indeed, the latter reserves have experienced increased levels of illegal incursions from bordering Guatemalan settlements, led by the extraction of natural resources like timber, xate leaves (*Chamaedorea sp*), macaws, and wild meat, and by drug-trafficking and illegal farming activities, which may be displacing jaguars (Arias et al., 2020; Wultsch et al., 2016). In addition to illegal incursions, jaguars in Belize are facing numerous threats from habitat conversion caused by industrial agriculture, hydropower development, logging, mining and road development, which have given Belize one of the highest deforestation rates in Central America (Briggs et al., 2013; Wultsch et al., 2016b). Human-jaguar conflict and competition with humans for food have also increased (Foster, 2008; Foster et al., 2020).

Poaching and Illegal Trade Status

Jaguar poaching has been identified as one of the main threats to the species in Belize, along with habitat loss. Poaching, which occurs predominantly in retaliation to livestock depredation by jaguars, led to an estimated annual offtake of 200 individuals nation-wide, representing about 45% of the population residing outside of the two main protected area blocks in the country (Foster, 2008). Based on population simulation models, these offtake levels could lead to a population collapse outside protected areas in 20 years' time (Foster, 2008). Populations inside protected areas presented a high

probability of persistence over the long term, providing a buffer for poaching (hence it was classified as a medium threat in this study), but could become affected if dispersing jaguars are poached in non-protected areas (Foster, 2008).

Illegal domestic trade in jaguar body parts is also present in Belize and it is widespread in the country, although it has been characterised as a mainly opportunistic activity, driven largely by wild meat hunting (chance encounters) and human-jaguar conflict (Arias et al., 2020). However, a portion of the illegal trade is also commercially-driven, with this being the admitted motivation of 30% (out of 16) jaguar poachers participating in a survey of wildlife use in Belize (Harmsen and Urbina, 2017). According to the same study, even when jaguar poaching is opportunistic or retaliatory, jaguar body parts were personally consumed or sold by poachers in about 70% of the cases, with the abandonment of the carcasses being a less likely outcome. The district of Cayo appears to be a main market for illegal domestic trade in jaguar body parts, due to its central location and easy access to neighbouring Guatemala. Meanwhile, Toledo appears to be a source of jaguar body parts, with most known jaguar poachers being people of Mayan ethnicity residing in this area (Harmsen and Urbina, 2017). Mayan communities in the country have longstanding cultural traditions surrounding jaguars, and their use and consumption (unconfirmed whether legal or illegal) of jaguar body parts for cultural and spiritual purposes has been documented (Arias et al., 2020). An academic study based on interviews with wildlife authorities, enforcement agents and jaguar experts in the country highlighted that jaguar body parts have been known to exit the country to Guatemala through the southern border, and that authorities are concerned about the potential role of Guatemalan incursionists, involved in other illegal activities like drug trafficking along the western border, in the illegal trade in jaguars and other wildlife (Arias et al., 2020).

Recent investigations have highlighted tourism as a driver of the illegal trade in jaguars in Belize, with several jaguar body part seizures occurring at tourist destinations like the Caye islands off the coast of the country, and beach areas like Placencia (Arias et al., 2020; Harmsen and Urbina, 2017). These seizures not only revealed the existence of a domestic maritime route for jaguar body parts from the mainland ports to markets in the islands, but suggest that there may be illegal international smuggling of body parts purchased by tourists (Arias et al., 2020). Additionally, local communities in Toledo District in southern Belize have reportedly been approached by people of Asian descent interested in jaguar body parts, but it is unclear whether this demand may have any connection with wildlife markets in Asia (Arias et al., 2020). To date, no actual jaguar seizures have involved any members of the Chinese diaspora in the country.

Protections against Poaching and Illegal Trade

Jaguars are protected against poaching by the Hunting Schedule of the Wildlife Protection Act (Law Revision Commissioner Belize, 2000). However, jaguars that come into conflict with humans or human property (livestock) can be legally killed with the authorization of authorities, meaning that jaguar protections do not extend to populations outside protected areas, where human-jaguar conflict is common. Even in this latter circumstance, trade in jaguar body parts is not allowed domestically or internationally and any resulting body parts remain the property of the State and should be reported within a month of the incident. The Wildlife Act also establishes sanctions for those breaking the law, with a fine of $250 or $500 USD for the first and second offence, respectively, or imprisonment of up to six months.

Belize has no National Jaguar Action Plan. However, the Forest Department of Belize, which is the entity responsible for wildlife in the country, does have mechanisms to address instances of human-jaguar conflict and illegal trade, and has been involved in numerous jaguar conservation initiatives along with NGO partners. The Forest Department has a standardized protocol to carry out site

inspections in locations where human-jaguar conflict has been reported (Arias and Milner-Gulland, *in litt., 2019)*. Regarding human-jaguar conflict, the Forest Department has assisted farmers and ranchers with the removal of jaguars that consistently attack cattle, with the support of the Belize Zoo; and participated in a Panthera-funded "Problem Jaguar Program", which assisted ranchers with the implementation of mitigation measures. Another actor addressing human-jaguar conflict is the Yaaxche Conservation Trust through a jaguar friendly model-farm pilot project.

To combat the illegal trade, joint enforcement operations have been carried out between the Forest Department, the Belize Defence Force and the police in tourist areas, having achieved seizures of jaguar teeth and other body parts in street stands and markets, where they are sold as jewellery and souvenirs (Arias and Milner-Gulland, in litt., 2019). The same institutions, along with the NGO Friends for Conservation and Development and other NGOs, have established agreements for the co-management of Chiquibul National Park and other protected areas in the country, and continuously conduct joint enforcement operations to control illegal incursions along the border with Guatemala, aiming to protect jaguars and other vulnerable wildlife. Other stakeholders involved in addressing the illegal trade in jaguars include the Wildlife Conservation Society and the Environmental Research Institute, researching the illegal trade, and the Belize Zoo, through communication campaigns focused on the illegal trade in jaguars. While there is no compensation system in place for farmers and ranchers who struggle to coexist with jaguars, nature tourism is very strong in Belize, and the Cockscomb Basin Wildlife Sanctuary and Jaguar Preserve is a main tourist destination centred on jaguars, providing direct benefits to communities around the protected area through the co-management of the Belize Audubon Society. Following two incidents in which mutilated jaguars were found floating in rivers and canals near Belize City in 2018, the government established a $5000 USD reward for citizens possessing information on the culprits of such acts (BBN Staff, 2018).

There are multiple limitations to the government's capacity to respond to illegal trade in jaguars, stemming from its low levels of human and financial resources. In 2018, only four people supported the Forest Department's Wildlife Program in the capital city, and an even more limited number support field district offices (Arias and Milner-Gulland, *in litt*., 2019). The lack of vehicles and fuel to attend reports of jaguar poaching was cited as a key issue, along with the lack of mandate of wildlife authorities to conduct seizures and arrests without the support of the police or the Belize Defence Force (Arias and Milner-Gulland, *in litt.,* 2019). Coordinating joint operations between these institutions is a challenge. Studies on the illegal wildlife trade in the country found involvement of enforcement personnel in poaching and illegal wildlife trade, highlighting the low levels of law and conservation awareness amongst the population (Harmsen and Urbina, 2017). The Forest Department, along with the Belize Wildlife and Referral Clinic have provided training to police members and the Belize Defence Force on the illegal wildlife trade, to increase support for joint operations (Arias and Milner-Gulland, *in litt.,* 2019). Another important issue is that wildlife laws in the country are outdated and current fines for wildlife crimes are not a deterrent. The Wildlife Protection Act is being revised, to strengthen the protection of species threatened by poaching and trade, and to elevate the penalties for offenders (WCS, 2020a). The government is also investing resources into the implementation of CITES in the country and the establishment of a CITES Act (WCS, 2020). However, these updates of the legislation have taken many years and are still in progress.

Bolivia

Factors and Variables	Status
National Population Status	
National classification:	Vulnerable
National distribution:	Widespread, fragmented
National abundance:	Uncommon
National population trend:	Reduced and still decreasing
Quality of population information:	Outdated or limited scientific (or other reliable) studies

Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present, large threat
Presence and recognition of illegal trade:	Present, large threat
Geographical pattern:	Ubiquitous
Transboundary:	International
Sophistication:	Somewhat organized
Links to other crimes:	Few confirmed links
Information quality	Government or enforcement reports
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	Existing
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing
Incentives:	Existing

National Population Status

The jaguar is classified as a Vulnerable species in Bolivia (MMAyA, 2020b). It is widely distributed across Bolivia's lowland territory, in the Departments of Cochabamba, Chuquisaca, La Paz, Santa Cruz, Pando, Beni and Tarija, within 16 national protected areas and five internationally recognized jaguar conservation units, including Madidi, Noel Kempff Mercado, Baritu Calilegua, Gran Chaco and Pantanal (MMAyA, 2020b). The low human densities across much of the jaguar habitat in Bolivia have allowed the species to retain most of its historical distribution (MMAyA, 2020b), though jaguar habitat has become fragmented due to the expansion of agriculture, cattle ranching and human infrastructure.

Bolivia's National Jaguar Action Plan informs of the existence of more than 20 scientific studies documenting jaguar ecology and human jaguar-interactions. Jaguar densities in the Gran Chaco biome range from 1-5 individuals per km^2, while those in the Chiquitano forests of Santa Cruz range from 4-6 individuals per 100 km^2 (MMAyA, 2020b). Studies in the Amazon point to densities of 0.49 to 7.45 individuals per 100 km^2 (MMAyA, 2020b), and the national average density is 1.73 individuals per 100 km^2 (Jędrzejewski et al., 2018). All jaguar conservation units in Bolivia have been found to have a high likelihood of jaguar survival in the long term (above 70%, in 2002) (Sanderson et al., 2002). However, there is limited information about jaguar populations outside of Madidi and Kaa Iya National Parks.

Jaguar populations appear to be decreasing at the national level, due to the pervasiveness of threats (Maffei et al., 2016), but populations in a few specific areas like Madidi have reported local increases. The main threats for jaguars in Bolivia are deforestation due to agricultural expansion and cattle ranching, with areas like the Chaco having lost about 30% of jaguar habitat from 1985 to 2013 (Romero-Muñoz et al., 2019); and conflict with humans due to livestock depredation (MMAyA, 2020b). Poaching driven by the illegal wildlife trade has become a major threat to the species over the past decade (MMAyA, 2020b), as have forest fires, which damaged 16.5% of the jaguar's habitat in the Chiquitano forest in 2019 (Romo, 2020). Deforestation and jaguar poaching have a synergistic effect on the decline of jaguar populations, even inside protected areas (Romero-Muñoz et al., 2019).

Poaching and Illegal Trade Status

Poaching due to human-jaguar conflict is recognized as a longstanding, leading threat to jaguars in Bolivia, being responsible for elevated magnitudes of economic losses and jaguar mortalities, occurring in all areas where there is extensive cattle ranching (Negroes et al., 2016). About half of cattle ranchers who participated in human-jaguar conflict surveys in Santa Rosa del Yacuma (53% out of 75) and Santa Cruz (49% out of 100) reported jaguar attacks on their cattle, and in ranches like San Miguelito, jaguars were responsible for nearly 50% of cattle mortalities, representing the loss of up to $5,000 USD per year (Negroes et al., 2016; Rumiz et al., 2011). Lethal control of jaguars was seen as

the most effective way to prevent losses in the Tacana territory, where 64% (out of 80 people interviewed) reported poaching jaguars (Negroes et al., 2016). Research carried out in 85 cattle ranches spread over the Pantanal, Chaco, Chiquitania and Beni pampas ecoregions, covering 656,000 hectares in Bolivia, reported 347 jaguars poached in a 4 year period due to conflict (Arispe et al. 2009 in MMAyA, 2020b). Similarly, another study of 30 cattle ranches in Beni, reported the poaching of 93 jaguars in a single year in 30 cattle ranches, equivalent to 10.6 jaguars poached per 100 km^2 in an area of 87,979 ha. (Inchauste Ibanez, 2015).

While legal and illegal trade and use of jaguar body parts always existed in Bolivia as part of the cultural practices of indigenous and mixed ethnicity rural villages, since 2014, a reactivation of illegal trade in jaguar body parts was detected, with links to demand from Chinese wildlife markets. Bolivia is to date, the country with the largest amount of evidence of illegal trade in jaguar body parts to China, with 40% out of 55 confirmed seizure records having China as the country of destination, and the involvement and sentencing of traffickers of Chinese descent (MMAyA, *in litt.,* 2021; WCS-Bolivia, *in litt.*, 2021). Similarly, Bolivia was the source of 14% (out of 78 international) seizures reported in the UNODC's World WISE Database. Authorities from neighbouring Peru, and investigators, have suggested that jaguar body parts are illegally traded between Bolivia and neighbouring countries Peru and Brazil, depending on enforcement pressures at each of the country's ports of exit, but seizures have not been made at the tri-national border (MINAGRI and SERFOR, *in litt.*, 2020; Verheij, 2019a). Domestically, the illegal trade in jaguar body parts has been reported in urban areas like Trinidad and Rurrenabaque, and illegal possession of jaguar body parts in rural villages is high throughout the lowlands, reaching 46% of a random sample of 1107 people across 36 villages in Pando, Beni and La Paz Departments (Arias et al., 2021a; 2021b). The same study found that jaguar body part suppliers were predominantly local Bolivian poachers (75%), who then sell body parts to traffickers of multiple nationalities, including Bolivians (43%), people of Asian-descent (20%), people of European-descent (15%), people from neighbouring countries (6%) and other (6%). Enforcement operations have revealed that the modus operandi of traffickers includes radio broadcasts, social media, and in-person requests, and attempted smuggling by post and air travel, suggesting that the illegal trade is somewhat organized. Two arrested jaguar traffickers were also in possession of other illegal products, including ivory estatuilles and illegal weapons (UNODC and MMAyA, *in litt*., 2020), showing a link to other illegal activities.

Protections against Poaching and Illegal Trade

Bolivia declared a ban on the capture and commercialization of wild animals and their by-products in 1986, which includes jaguars (Sup. Dec. 21312 of 27 June 1986). The Bolivian Environmental Law (Law 1333 of 27 April 1992) sets out the general framework for the protection of the environment, including sanctions for wildlife offences under the Penal Code, amounting to a one to six year prison sentence. The Law of Mother Earth (Law 300, Art. 44, 2012) further dictates that environmental crimes are not subject to alternative measures. In 2017, Supreme Decree 3048 came into force and was followed by 2020's Administrative Resolution 014/2020, both of which tighten the rules for wildlife trade in the country. Additionally, Bolivia has specific legislation for: approving rules against the illegal wildlife trade, including coordinating enforcement activities with the police; importing and exporting wildlife, including permit procedures; and rules for using certain species; among others (MMAyA, 2020a).

However, in the context of the illegal trade in jaguars, the application of laws pertaining to wildlife has limitations. Only five out of 54 (9.3%) criminal cases that were initiated by the authorities for jaguar trafficking between 2007 and 2019 resulted in a three to four year prison sentence for jaguar traffickers (MMAyA, *in litt.,* 2021). An analysis of some of these successful sentences revealed serious issues with law enforcement processes, including a lack of investigation of traffickers' networks and their supply chains, excessively long judicial processes even in the presence of sufficient evidence,

failure to implement precautionary measures to avoid the escape of suspects, and a lack of awareness, interest and coordination between legal institutions in charge of enforcing the law for environmental crimes (UNODC and MMAyA, *in litt.*, 2021). Due to this, the government is currently in the process of creating an Animal Protection Law, to specifically address and penalize cases of wildlife trafficking (Romo, 2020). Communication campaigns informing about existing and future laws are needed, as studies have found a strong lack of awareness among the public about jaguar killing prohibitions (Arias et al., 2021a). Budget and staff restrictions, corruption, and a severe lack of coordination between authorities at the multiple levels of government and with NGOs, have also been found to greatly affect the country's ability to respond to this threat (Da Silva, 2017).

Bolivia has a recently created National Jaguar Action Plan, launched in 2020, which includes actions like establishing protocols for monitoring and addressing the illegal wildlife trade, strengthening the CITES-Bolivia Authority, monitoring the effects of infrastructure projects on jaguar habitats, increasing awareness about jaguars and wildlife laws, and strengthening the capacity of wildlife authorities, the Environmental Police and the judicial system (MMAyA, 2020b). The government has also led the official establishment of a National Alliance for the protection and conservation of the jaguar, including a wide range of civil society actors (CITES, 2019b). These actors have engaged strongly with the topic of illegal trade in jaguars in the country, launching communication campaigns and intelligence operations, initiating projects to mitigate human-jaguar conflict, establishing community-based informant networks, training police forces, and conducting research on the illegal trade in jaguars using social surveys and genetic tools. Importantly, the seizures of jaguar body parts mobilized the public in cities like La Paz, adding pressure to the sentencing of jaguar traffickers of Chinese-descent. The Chinese embassy has also responded to these seizures, issuing a warning to its citizens in Bolivia to refrain from participating in the illegal trade in jaguars (Verheij, 2019). There is also a project entitled "Ruta del Jaguar" aimed at initiating jaguar-based ecotourism in the country, in partnership with cattle ranchers, to reduce human-jaguar conflict pressures (Berton, 2017).

Brazil

Factors and Variables	Status
National Population Status	
National classification:	Vulnerable
National distribution:	Widespread, fragmented in country
National abundance:	Uncommon
National population trend:	No information
Quality of population information:	Recent scientific (or other reliable) studies
Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present, large threat
Presence and recognition of illegal trade:	Present, medium threat
Geographical pattern:	Spread-out
Transboundary:	International
Sophistication:	Organized
Links to other crimes:	Few confirmed links
Information quality	Government or enforcement reports
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	Existing
Initiatives against poaching::	Existing
Initiatives against illegal trade:	Existing
Incentives:	Existing

National Population Status

In Brazil, jaguars are considered Vulnerable at the national level, but each of the biomes in which jaguars exist within the country has their own risk classification for jaguars, being Near-Threatened in

the Amazon, Endangered in the Cerrado and Pantanal, and Critically Endangered in the Atlantic Forest and Caatinga (ICMBio, 2013). Jaguars are distributed throughout the country, and 29% of the national territory of Brazil falls within internationally recognized jaguar conservation units, both inside and outside protected areas (ICMBio, 2013). Despite their widespread distribution, sub-populations in biomes like the Atlantic forest are highly fragmented, and population densities have been considered low everywhere except in the Amazon biome, with national average density estimate of 1.89 individuals per 100 km^2 (Jędrzejewski et al., 2018). The Amazon jaguar population is estimated to be composed of over 10,000 individuals (ICMBio, 2013). The Caatinga has the lowest recorded densities (0.3 individuals per 100 km^2), compared to other biomes like the Cerrado (2 individuals per 100 km^2) and the Pantanal (6 individuals per 100 km^2 (ICMBio, 2013). The Atlantic forest population is estimated to contain less than 170 individuals, with many isolated subpopulations containing less than 50 jaguars (ICMBio, 2013), but more recent population estimates yielded densities of 3.22 individuals per 100 km^2 which are amongst the highest reported for the biome (Srbek-Araujo and Chiarello, 2017). Populations in this biome have a low probability of survival (Sanderson et al., 2002). Brazil's National Jaguar Action Plan states that the population trends for jaguars are uncertain, but populations appear to be declining, especially in the Atlantic Forest, where extinction is predicted to occur in 80 years (ICMBio, 2013). The country has a large number of studies on jaguar populations and ecology, but due to its large extension, it relies on broad scale extrapolations that may not be representative of the entire jaguar range, particularly in unprotected areas (ICMBio, 2013).

The threats to jaguars are substantial in Brazil, particularly from habitat loss and fragmentation, poaching, and prey loss (ICMBio, 2013). In the Cerrado, more than 2 million km^2 of the original vegetation have been transformed for cattle ranching and agriculture, leaving an area of merely 33,000 km^2 inside protected areas, which are not of sufficient size to keep viable jaguar populations in the long term (ICMBio, 2013). In the Pantanal, forest fires are an emerging threat, and deforestation is estimated to eliminate the habitat of at least 20 jaguars per year (ICMBio, 2013). Poaching has been regarded as a serious threat to jaguars based on population models, which revealed that even low levels of poaching decrease jaguars' resilience to other threats such as habitat loss (ICMBio, 2013).

Poaching and Illegal Trade Status

Based on the literature, Brazil has high levels of jaguar poaching. In a single municipality in the arc of deforestation in the Amazon, Michalski et al., (2006) reported the poaching of 110-150 jaguars and pumas in a single year. The states of Para and Amapa are also considered key areas of conflict, as are the Cerrado and Pantanal biomes (ICMBio, 2013). A study of jaguar poaching across 49 reserves containing jaguar populations in Brazil, revealed that jaguars are poached in at least 43% of protected areas, with an annual mean per reserve of 1.8 individuals (ranging from 1 to 6), caused predominantly by retaliatory killing (47%), perceived risk to human life (29%) and illegal sport hunting (14%) (de Carvalho and Morato, 2013). In areas with lower levels of cattle ranching, like the central Amazon, opportunistic jaguar poaching linked to wild meat hunting has been identified as a key threat, with the annual take of jaguars ranging from 23 to 44 individuals in rural communities near the Mamiraua reserve (Valsecchi do Amaral, 2012). Brazil is also one of the few countries with known cases of organized illegal trophy hunting of jaguars, and illegal trophy hunting is also practiced informally (Cavalcanti et al., 2010; Critica, 2010; ICMBio, 2013).

While illegal trade in jaguar body parts exists in Brazil, there is not a lot of evidence about its characteristics from the side of the government, which reported seizures amounting to only 3 jaguar specimens per year (IBAMA, *in litt.*, 2020). However, this is an underestimation, as IBAMA, the entity in charge of wildlife at the federal level within the country, does not systematize seizure information collected at the sub-federal level. The literature review provided more insights on the illegal trade in jaguars in the country. For example, Brazil had the highest number of reports of illegal trade in jaguars

found in a recent large-scale survey of online jaguar seizure events in Latin America (60 in 489 reports, out of which four mentioned China as a destination country, Morcatty et al., 2020). Similarly, Brazil was the source of 5.1% (out of 78 international) seizures reported by the UNODC's World WISE Database. Moreover, enforcement operations carried out by the police at the domestic level revealed an interesting pattern, with several recent jaguar body part seizures occurring in Parana, Para and Amazonas states, being linked to broader illegal wildlife, drug, and weapons trade activities, involving criminal groups of more than 10 people (Charity and Ferreira, 2020; Da Cruz, 2010; Globo1, 2018; IBAMA, 2016; Moraes, 2018). Information about these enforcement operations is only available through media reports, and it is not clear whether there are any intelligence investigations by the police on these groups. The government is aware that Brazilian citizens working in gold mining across the border in Suriname have also been implicated in the illegal trade in jaguars in that country (ICMBio, *in litt.*, 2020).

Protections against Poaching and Illegal Trade

Brazil's Wildlife Protection Law of 1967 (Law No. 5,197/67), criminalizes the hunting of wild animals throughout the country and the trade of wildlife products, including jaguars. A few amendments to the legislation exist for species like wild boar, and for sport hunting when deemed acceptable and sustainable by environmental agencies and scientific studies (El Bizri et al., 2015). The possession of firearms is also prohibited for the general public, except for subsistence hunters (de-criminalized by law) and members of shooting clubs (El Bizri et al., 2015). The Law of Environmental Crimes (Law No. 9605/98) also prohibits unlicensed wildlife hunting and imposes imprisonments of six months to one-year for offenders, and an additional four years for those illegally possessing a firearm. However, it does not officially mention wildlife trade. Similarly, the Penal Code (Art. 288) imposes up to three years of prison for those who are part of a larger criminal operation.

The Federal Constitution of 1988 and Complementary Law No. 140, established rules to ensure cooperation and division of responsibilities between federal, state, and municipal authorities on wildlife issues (Charity and Ferreira, 2020). This caused challenges in the coordination between agencies, and a loss in the information on wildlife trade at the federal level. Even though wildlife crimes are subject to both criminal and administrative penalties, the processes generally take a long time, and rarely end up in imprisonment, instead being channelled as Penal Transactions, equivalent to a settlement. Administrative fines can reach $1250 USD for each illegally traded endangered species (Charity and Ferreira, 2020). The decriminalization of subsistence hunting has been considered a loophole in the law, as subsistence hunters in the country act as primary suppliers of animal parts for the trade (Charity and Ferreira, 2020).

Brazil has a National Jaguar Action Plan created in 2013, and a National Action Plan for the Conservation of Big Cats with activities planned until 2023 (targeting jaguars and pumas). The Plans include actions related to maintaining adequate habitats, increasing connectivity, reducing poaching, promoting coexistence measures, minimizing business impacts and strengthening animal rescuing capacities. Also included within the Plan is the consolidation of a database with information on illegal poaching of big cats in the country, and a quantification of the scale of this issue. The Plan has a timeline, budget and responsibilities assigned for achieving these action points, and a working group made up of government, civil society and academia representatives is in charge of its execution.

Brazil has several active academic and third sector stakeholders working on jaguars and other felids in the country, but most of the work is related to jaguar monitoring and human-jaguar coexistence. The NGOs RENCTAS and Freeland Brasil are researching the illegal trade. Under the National Action Plan, other organizations in charge of investigating and addressing poaching and illegal trade in jaguars in Brazil include the University of Sao Paulo, Insituto Mamiraua, Instituto Pro Carnivoros, Naturantins,

Pantera, Insituto Oncafari, to name a few. Brazil has the most successful jaguar tourism operations in Latin America, which have produced large-scale monetary incentives for local communities, and increased tolerance towards the species (Tortato and Izzo, 2017).

Colombia

Factors and Variables	Status
National Population Status	
National classification:	Vulnerable
National distribution:	Widespread, fragmented in country
National abundance:	Uncommon
National population trend:	Reduced and decreasing
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present but marginal threat
Presence and recognition of illegal trade:	Present but marginal threat
Geographical pattern:	Spread-out
Transboundary:	International
Sophistication:	Informal or opportunistic
Links to other crimes:	No information
Information quality	Government or enforcement reports
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Species specific, targeting all populations
Conservation action plan:	Existing
Initiatives against poaching:	Existing
Initiatives against illegal trade:	No information
Incentives:	Existing

National Population Status

In Colombia, jaguars are classified as a Vulnerable species, but subpopulations within the country, like the one in Valle del Cauca have different risk classifications, such as Critically Endangered due to the severe decline in population numbers (Payán et al., 2015). Jaguar populations are distributed within four population blocks, in the Amazon, Orinoquia, Choco and Serrania San Lucas, within 25 out of the 50 National Parks in the country, and in seven jaguar conservation units (Payan et al., 2013; Sanderson et al., 2002). There are few estimates of jaguar densities in Colombia: Amazon protected and unprotected areas, llanos, and Magdalena Medio. Population densities include the following estimates of individual jaguars per 100 km^2: 4.2 (Amacayacu National Park), 2.8 (unprotected Amazon), and 1.9 (Colombian Llanos) (Boron et al., 2016; Mena et al., 2020; Payan Garrido, 2009). The estimated national average density is 1.9 individuals per 100 km^2 (Jędrzejewski et al., 2018). Populations in Valle del Cauca are considered locally extinct, while populations in the Choco biome have been described as well conserved (Payán et al., 2015). The number of studies on jaguar biology and interactions with humans are scarce (Payán et al., 2015), and population trends for some regions like the Valle del Cauca are decreasing.

The main threats to jaguars in Colombia are related to habitat loss and logging for the establishment of large scale cattle ranching and agriculture (sugar cane, rice, and other monocultures), followed by retaliatory killing and mining (Payan et al., 2013). Beyond affecting jaguar habitats, people employed in the logging and mining industries hunt wildlife, reducing jaguar prey, and may also poach jaguars. Non-retaliatory poaching has also been identified as a threat, particularly in rural towns and villages (Balaguera-Reina and Gonzalez-Maya, 2007). There are not many studies on jaguar poaching in Colombia to determine its effects on jaguars relative to other threats.

Poaching and Illegal Trade Status

The Ministry of Environment and Sustainable Development of Colombia collected information on the illegal trade in jaguars and illegal offtake from departmental environmental authorities (Regional Autonomous Corporations) for the purposes of this study (Minambiente, *in litt.*, 2020). Livestock depredation events and retaliatory killing were reported in the Departments of Antioquia, Santander, Caquetá and Putumayo, being more intense in the last Department. A study in Antioquia further confirmed jaguar mortalities associated with conflict, with 11 jaguars poached in Magdalena Medio-Nordeste from 2009 to 2011 (Arias Alzate et al., 2013). Beyond these reports, the scale of retaliatory killing throughout the country, and its relative impacts on jaguars, appear uncertain for Colombia.

Seizures of jaguar body parts have not been registered by the authorities in the past three years. From 2009 to 2015, the majority of seizures took place in the southern Amazon of Colombia, in the Departments of Amazonas, Caquetá and Putumayo. Out of the 25 specimens seized, most corresponded to manufactured products (48%), live animals (32%), dead animals (12%) and skins (8%). Seizure data from the UNODC (World WISE Database), contained few seizure incidents and specimens (both less than 5) that had Colombia as the source country in the past 10 years. The government of Colombia did not report any other internationally-bound seizures, but some of the seizures were made near the border with Peru and Brazil, suggesting a potential exchange between neighbouring countries. Similarly, regional authorities did not report any incidents of illegal hunting for commercial purposes, and illegal trade was instead related to negative interactions with jaguars over livestock depredation (Minambiente, i*n litt.*, 2020). The illegal trade in jaguars in the country appears to be largely domestic and opportunistic. The literature contained examples of subsistence poaching, including the illegal consumption of jaguar meat and its illegal sale in local wild meat markets, and the illegal use of other jaguar body parts for medicinal and ornamental purposes (Balaguera-Reina and Gonzalez-Maya, 2007; Gonzalez-Maya et al., 2010). In a study including nearly 400 interviewees across 85 localities in five Departments of Colombia, the use of jaguar body parts was reported 10 times (2.5%, Gonzalez-Maya et al., 2010). Based on this, illegal trade in jaguar body parts in the country appears to be a low magnitude threat.

Protections against Poaching and Illegal Trade

Jaguars are protected by Colombian legislation since 1972 through Resolution 848 INDERENA, which forbids hunting of animals in the order Carnivora. Law 99 de (1993) and Decree 3570 (2011) assign responsibilities to the Ministry of Environment and Sustainable Development, explicitly stipulating the adoption of legislation and controls to eliminate jaguar poaching and illegal trade in jaguar body parts, including online sales (Minambiente, *in litt.,* 2020). Law 1333 (2009) and Resolution 2064 (2010) establish sanctions for environmental crimes, and guidelines for the management of apprehended flora and fauna specimens. Decree 1076 (2015) harmonizes and encompasses all decrees regulating wildlife use in the country. However, there have been concerns about the degree to which these laws are implemented and whether they can effectively protect jaguars in the country (Payán et al., 2015).

Colombia does not a have a National Jaguar Action Plan, but it has an outdated program for the Conservation of Felids (2005). This program included key actions related to poaching and trading of felids, including reducing illegal trafficking, building enforcement capacity and awareness, strengthening the implementation of the law, training staff on matters related to illegal trade, establishing an information network, building rescue centres and assessing human-jaguar conflict. However, this plan has not been implemented (WWF, 2019), and it is uncertain whether there are existing plans for the creation of an updated National Jaguar Action Plan. Colombia has a National Strategy for the Prevention and Control of Illegal Wildlife Trade (2002) and a management strategy for the conservation of threatened fauna as part of the National Policy on the Integral Management of

Biodiversity and Ecosystem Services (PNGIBSE). However, the level of implementation of these is also uncertain, and there was no information on actions to address the illegal trade in jaguars specifically.

The Autonomous Regional Corporation of Valle del Cauca has its own Jaguar Management Plan, which includes key actions to assess jaguar presence outside and inside protected areas, evaluate connectivity, and build awareness about livestock management (Payán et al., 2015). The Magdalena region has also built a Management Plan for Felids in the Sierra Nevada de Santa Marta area, where jaguars are critically endangered, and recently achieved the inclusion of the jaguar within the Zoning Plan of the Santa Marta Municipality, as a joint initiative with ProCAT. The project has also began a Jaguar Friendly Certification scheme for coffee producers in the area to increase tolerance to jaguars and to guarantee habitat protection. Similarly, the Macarena Corporation has a Protocol for managing human-jaguar conflict in Meta Department (Botero et al., 2018). In partnership with Panthera, the country has recognized the Jaguar Corridor Initiative and signed agreements to carry it forward (Payán et al., 2015). Panthera is also leading human-jaguar conflict mitigation through its GRECO Program (Felid Conflict Response Group) and jaguar ecotourism projects in Colombia.

Costa Rica

Factors and Variables	Status
National Population Status	
National classification:	Critically Endangered
National distribution:	Widespread, fragmented in country
National abundance:	Uncommon
National population trend:	No information
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Limited/reversible
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and large threat
Presence and recognition of illegal trade:	Present but marginal threat
Geographical pattern:	Spread-out
Transboundary:	Domestic
Sophistication:	Informal or opportunistic
Links to other crimes:	Unconfirmed links
Information quality	Government or enforcement reports
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	None
Initiatives against poaching::	Existing
Initiatives against illegal trade:	No information
Incentives:	In progress

National Population Status

The jaguar is classified as Critically Endangered within Costa Rica (Wildlife Conservation Law No. 7317). Costa Rica has monitored jaguar populations through scientific studies since the 80s, and has nearly 140 wildlife monitoring studies based on camera traps, but there are no national level jaguar population estimates (MINAE, *in litt.*, 2020). Population estimates for specific locations include 127 (101-152) individuals in the Tortuguero region, 47 (25-69) in Talamanca, and 30 in Parque Nacional Corcovado (SINAC, 2018). The estimated national average density is 1.48 individuals per 100 km^2 (Jędrzejewski et al., 2018). In 2018, researchers and staff at the Ministry of Environment and Energy of Costa Rica elaborated the first report on the conservation status of jaguars in Costa Rica, based on a country-wide information sharing partnership between multiple stakeholders (SINAC, 2018). This produced a country level jaguar distribution and habitat suitability model, indicating that key areas for jaguar conservation in the country include northern Guanacaste, North Caribbean, Osa Península and Talamanca. Populations are spread throughout the country, but fragmented inside protected areas, with a potential for establishing biodiversity corridors.

The threats to jaguars in Costa Rica include habitat loss, poaching pressures, and prey depletion. Costa Rica experienced drastic deforestation rates caused by agriculture, cattle ranching, forest plantations and human settlements over the past two decades. However, government and non-government conservation strategies have allowed for a net recovery of forest cover, minimizing the impacts of this threat (SINAC, 2018). On the other hand, wild meat hunting and jaguar poaching due to human-jaguar conflict have been identified as key threats (SINAC, 2018).

Poaching and Illegal Trade Status

Human-jaguar conflict is believed to be the main cause of jaguar mortality in Costa Rica (Gonzales-Maya et al., 2016; MINAE, *in litt.*, 2020; SINAC, 2018). There have been around 600 cases of livestock depredation by predators reported in the country since 2013, of which 95 were jaguar attacks, based on information from UACFel, a specialized Wild Cat Conflict Response Unit (MINAE, *in litt.,* 2020). Retaliatory killing is a common response taken by ranchers, and together with other types of poaching (subsistence, sport), an estimated 12 jaguars are poached on an annual basis within the country (MINAE, *in litt.,* 2020). However, jaguar poaching has not received substantial research attention (Gonzales-Maya et al., 2016).

Illegal trade has also been recognized as a threat to jaguars by Costa Rican authorities. Illegal possession and trade in live jaguars exists in the country, with 15 jaguars being held in zoos and sanctuaries as of 2020 as a result of poaching and illegal trade (MINAE, *in litt.,* 2020). Illegal trade in jaguar body parts is also present, although no records of this were presented by the Ministry of Environment and Energy (MINAE) for this study. There are no reports of international illegal trade in Costa Rica, except for unconfirmed mentions of Italian nationals purchasing jaguar skins for export to Europe (Kelly, 2018).

The illegal trade in jaguars in the country appears to be predominantly domestic. Skins and other jaguar body products are illegally used by rural villagers and indigenous communities in the Barbilla Destierro Biological Sub Corridor (SBBD), as trophies or decorative items symbolizing masculinity, or exchanged locally for other goods like furniture (Kelly, 2018). Jaguar body parts are also illegally sold to people from urban areas of Costa Rica, like San Jose and Limon, who own properties in the country side (Kelly, 2018). Interviews in this area suggested that there may be a link between the illegal trade in jaguars and drug trafficking in the country (Kelly, 2018), but this has not been confirmed.

Protections against Poaching and Illegal Trade

Jaguars are legally protected in Costa Rica by Decrees No. 32633 (MINAE 2005), No. 26435 (MINAE 1997) and No. 25167 (1996), non-specific to jaguars (Gonzales-Maya et al., 2016). They are also protected under the country's Wildlife Conservation Law (No. 7317) and Environment Law (No. 7554), granting the species full protection in the national territory. Costa Rica has laws for the implementation of CITES, and has banned sport hunting since 2012. Awareness about these laws has been described as high throughout the country (MINAE, *in litt.,* 2020). In 2014, the National System of Conservation Areas (SINAC) organized a workshop for the creation of a conservation strategy for felids in the country, which included an action plan to be carried out from 2015 to 2020. The action plan was at least partially implemented, and one of its results was the compiling of information on jaguar populations in the country (SINAC, 2018). However, this effort is not considered an official national Jaguar Conservation Plan, which is still lacking for the country.

Jaguar conservation at the national level has been partly supported by the MAPCOBIO project, in cooperation with the government of Japan up until 2018. Through this project, Costa Rica

implemented a participatory environmental monitoring project (not limited to jaguars), bringing together protected area managers and local communities to monitor wildlife through camera traps and to increase local awareness on biodiversity. MAPCOBIO also launched an information sharing effort between government institutions and the civil society working on jaguars in the country, which became a formal National Agreement. There is also a system for filing environmental complaints, and at least 10 monthly cases of illegal hunting (not-jaguar specific) are reported through this system (MINAE, *in litt.,* 2020). The government of Costa Rica has been a key actor in denouncing and elevating the issue of the illegal trade in jaguars internationally, but it is not clear whether there are any specific initiatives in place to investigate or address the issue domestically.

The civil society in Costa Rica is very active in jaguar conservation, and there are over 31 institutions involved in different jaguar working groups, on topics like research, policy, habitat, environmental education and human-felid conflict (SINAC, 2018). Key civil society and academic organizations working on jaguar conservation in the country include Panthera, Programa Jaguar - ICOMVIS/UNA, Coastal Jaguar Conservation, Programa Gente y Fauna, ProCAT, Biology School-UCR, UACFel. UACFel is a partnership between Panthera and the Ministry of Environment and Energy of Costa Rica, which provides assistance to farmers who experience conflict with felids, aiming to reduce retaliatory killings. Gente y Fauna is implementing a project to provide incentives for rural communities in Upala, based on certification systems and payments for biodiversity.

Ecuador

Factors and Variables	Status
National Population Status	
National classification:	Endangered
National distribution:	Restricted and fragmented
National abundance:	Uncommon
National population trend:	No information
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Severe/irreversible
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present but marginal threat
Presence and recognition of illegal trade:	Present but marginal threat
Geographical pattern:	Localized
Transboundary:	Domestic
Sophistication:	Informal or opportunistic
Links to other crimes:	No information
Information quality	Government or enforcement reports
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	Existing
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing
Incentives:	No information

National Population Status

Ecuador has two jaguar subpopulations, distributed in the country's western Amazon region and the eastern Pacific Coast, completely separated from each other by the Andes mountain range. Jaguar populations in the Amazon are considered Endangered, while those in the Pacific Coast have been classified as Critically Endangered, being further subdivided into three smaller and isolated populations (MAE and WCS, 2014; UNDP and GEF, 2020). The estimated national average density is 2.1 individuals per 100 km^2 (Jędrzejewski et al., 2018). Densities in the Amazon vary from 0.65 to 3.91 individuals per 100 km^2, based on studies from six locations (Espinosa et al., 2016; MAE, *in litt.*, 2021). A recent large scale study on the tri-national border between Ecuador, Peru and Colombia, identified jaguar densities of 2.2 individuals per 100 km^2, implying an abundance of 322 jaguars in this Amazon

corridor (95% CI = 217–477, Mena et al., 2020). Only the populations in the northern Amazon are viable over the long term, while those in the coast have a high likelihood of extinction in the next 20 years, with only a few transient individuals found despite substantial monitoring efforts (Espinosa et al., 2016; MAE and WCS, 2014). There are no long-term jaguar monitoring projects currently in place to determine population trends, but it is probable that populations are declining due to a 30% contraction of their range in the Amazon, and the loss of over 90% of the original vegetation in the coast (MAE and WCS, 2014). Only 70% (26% protected) and 20% (17% protected) of jaguar habitat remains for populations in the Amazon and the coast, respectively (MAE and WCS, 2014).

In Ecuador, jaguars are threatened by loss of habitat and connectivity, poaching as a retaliatory response to human-jaguar conflict, and the loss of prey due to subsistence and commercial wild meat hunting (MAE and WCS, 2014). Ecuador has one of the highest deforestation rates in Latin America (Mosandl et al., 2008), making this a priority threat for jaguars. There is also evidence of a marked drop in jaguar abundances in areas with the presence of wild meat hunting (Espinosa et al., 2018).

Poaching and Illegal Trade Status

Poaching has been recognized as a threat to jaguars in Ecuador, but there is scarce information about it, whether retaliatory or commercial (MAE and WCS, 2014; UNDP and GEF, 2020). Unpublished data collected by the Wildlife Conservation Society (WCS) suggests that at least 18 jaguars have been poached from 2006 to 2016 due to conflict, involving mainly domestic animals like dogs (Espinosa et al., 2016).

The Ministry of Environment of Ecuador provided information on five official cases of domestic illegal trade in jaguars from 2014 to 2019, of which only two contained details, indicating the illegal trade of two skins in Orellana province in 2019 (MAE, *in litt.,* 2021). Other seizures have been reported in the literature, including the illegal trade of three live animals and one medicinal product between 2013 to 2016 (WCS, 2020b) and 10 cases of illegal trade in jaguars (apparently live animals) from 2003 to 2008 (Espinosa et al., 2016). Eight teeth were illegally traded online in Ecuador and Peru combined from 2010 to 2020, based on searches conducted from May 2019 to March 2020 (Polisar et al., *in litt.*, 2020). Based on anecdotal accounts, jaguar body parts are sold in distant markets in towns like Gualaquiza and Sacha in Amazon provinces like Morona Santiago and Orellana, and are illegally traded across the border with Colombia and Peru (UNDP and GEF, 2020). The illegal use of jaguar body parts in Ecuador also has a cultural aspect, for the elaboration of clothing garments used by hunters and ranchers in traditional festivities (Espinosa et al., 2016). The illegal trade in jaguars appears to be largely opportunistic and domestic in the country.

Protections against Poaching and Illegal Trade

In Ecuador, jaguar poaching and illegal trade has been regulated since before the ratification of CITES due to the pressures from the past skin trade (Reg. No. 818, 1970) (Espinosa et al., 2016). Jaguars are also protected under the Rights of Nature in the National Constitution, and by the Unified Environmental Legislation (Arts. 61 and 72) which protects threatened species (MAE and WCS, 2014).

Ecuador has a 10-year National Jaguar Action Plan, created in the year 2014 and approved in 2016. The plan includes four main action lines, including research, habitat connectivity, in-situ management, and environmental awareness and education (MAE and WCS, 2014). The Plan includes specific actions to reduce human-induced jaguar mortalities, such as assessing the risk of human-jaguar conflicts, quantifying poaching and controlling the illegal trade in jaguars. The Ministry of the Environment is responsible for leading the implementation of the Plan, along with private and public executing institutions. The government is currently carrying out an evaluation of the progress achieved to date

from the implementation of the Action Plan. The government has also led a multi-year communication campaign to raise awareness about the illegal wildlife trade. However, there is still a lack of awareness about the illegal wildlife trade and about best management practices to reduce conflict in the country (UNDP and GEF, 2020). The government's jaguar conservation efforts have been affected by a budget deficit, which has reduced funds for wildlife conservation and protected areas (UNDP & GEF, 2020).

WCS is a key actor in jaguar conservation in the country, having several projects that are directly aligned with the National Action Plan, such as the implementation of community based wildlife management initiatives, human-jaguar conflict mitigation activities, and of an environmental education curriculum entitled "Jaguars Forever". The Ministry of Environment, WCS, UNDP and GEF led a past project to monitor jaguars and their prey at the landscape level, and are currently starting a new project to catalyse jaguar conservation in the country (UNDP and GEF, 2020). This project aims to collect information about the status of jaguar populations and their threats. Specifically on illegal trade, the project aims to improve the legal framework around wildlife crimes, develop capacities within authorities to prosecute illegal wildlife trade and poaching, incentivize cooperation between countries involved in the illegal trade chain of jaguar products, and build awareness about the jaguar as the emblem of the fight against illegal wildlife trade (UNDP and GEF, 2020). There was no information about the creation of incentives for jaguar conservation in the country.

French Guiana

Factors and Variables	Status
National Population Status	
National classification:	Near Threatened
National distribution:	Widespread, contiguous in country
National abundance:	Uncommon
National population trend:	Stable
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and medium threat
Presence and recognition of illegal trade:	Present and medium threat
Geographical pattern:	No information
Transboundary:	Neighbouring countries
Sophistication:	Informal or opportunistic
Links to other crimes:	Unconfirmed links
Information quality	Government remarks without enforcement data
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Species specific, targeting some populations
Conservation action plan:	None
Initiatives against poaching:	Existing
Initiatives against illegal trade:	No information
Incentives:	Existing

National Population Status

The jaguar is classified as Near Threatened in French Guiana, having the same status as the global population (Gaillard and Zipper, 2020). It is distributed widely throughout the territory of the Department, in forested areas as well as coastal and urbanized areas (OFB, *in litt.*, 2021). Populations are considered to be in a good condition based on two relatively recent population studies, which resulted in densities ranging from 2.9 to 5.1 individuals per 100 km² (De Thoisy et al., 2016) and around 3.2 individuals per 100 km² (Petit et al., 2018). The estimated national average density is 1.95 individuals per 100 km^2 (Jędrzejewski et al., 2018). The jaguar population in French Guiana has a high probability of survival, and is stable in relation to other countries (OFB, *in litt.,* 2021; Sanderson et al., 2002).

The major threats to jaguars in the Department of French Guiana are habitat destruction and fragmentation and loss of natural prey, particularly in coastal areas nearest to human settlements (OFB, *in litt.,* 2021). Poaching is also a concern, due to the existence of significant levels human-jaguar conflict (Gaillard and Zipper, 2020; OFB, *in litt.,* 2021), but also due to a large presence of people in forested areas, including those involved in illegal gold panning. "Tens of thousands" of gold miners are spread through jaguar habitat and in addition to causing deforestation and hunting wild meat at large scales, they can also kill jaguars. The loss of prey on the hands of miners has been described as the most serious threat facing jaguars in French Guiana (De Thoisy et al., 2016).

Poaching and Illegal Trade Status

The project Felid-Livestock Coexistence (COFEEL), led by the Human Initiative to Save Animals (HISA) in partnership with the French Office for Biodiversity (OFB) has been addressing human-felid conflict in French Guiana since 2018. Through their work with farmers and ranchers, they found that human-jaguar conflict occurs in most areas in the coast of French Guiana, and that it can represent substantial losses to farmers. In a sample of 158 livestock breeders, 52% had suffered attacks on livestock by jaguars, 30% of them being recent (since 2018) (Gaillard and Zipper, 2020). Jaguars were responsible for most attacks (70% out of 101) which occurred in 2019, representing about 10 times more attacks than the puma. The project did not record retaliatory killing, and there was no additional information found on jaguar mortalities associated with conflict to enable assessment of its scale or importance.

In a recent inspection of jewellery stores and craft markets in French Guiana in 2020, the French Office for Biodiversity (OFB) identified a "regular and flourishing" illegal sale of jaguar body parts, including teeth, claws and skins, in raw form or prepared as jewellery. Similarly, investigations of social media platforms revealed that sales also take place online. French Guiana had three seizure events reported in the UNODC's World WISE Database involving single units of jaguar teeth, one of them having Brazil as a destination country, suggesting illegal trade with neighbouring countries. The OFB was aware of cases of illegal trade in jaguars in Suriname involving smuggling to Asia, but had not identified a similar situation in French Guiana. A key concern expressed by the OFB was that illegal mining is growing in French Guiana, and illegal miners may poach jaguars.

Protections against Poaching and Illegal Trade

The OFB described the legal situation surrounding jaguar killing in French Guiana as complex, "giving free rein to the hunting of these animals". Ministerial Decree of 1986 sets out the measures to protect mammals in French Guiana, and felids are separated into different protection levels. While smaller felids, like that jaguarondi receive full protection (Art. 1), jaguars and pumas are protected against trade but not against killing (Art. 2) (OFB, *in litt.*, 2021). Jaguars and puma are also subject to a quota system under prefectural decree No. 583 (2011) but the quota has been presently set at zero (OFB, *in litt.*, 2021). These rules do not apply to communities who traditionally derive their means of subsistence from the forest, under regulations R.170-56 of the State domain code article L.331-15-3 of the environment code (OFB, *in litt.*, 2021).

Enforcement of wildlife regulations was also described as severely limited by the OFB, due to a lack of human resources, with only 11 OFB inspectors throughout the territory and around 15 Amazonian Guyana Park guards, occupied entirely on addressing illegal gold panning (OFB, *in litt.*, 2021). Similarly, studies have described the existence of rampant poaching by illegal gold miners, and a several decade long absence of hunting management in French Guiana (De Thoisy et al., 2016). There are no existing Jaguar Action Plans for French Guiana.

Since 2012, the National Office for Hunting and Wild Fauna (ONCFS) has carried out two projects to understand the biology and ecology of pumas and jaguars, and to offer support to farmers and ranchers involved in human-felid conflict, including the capture of individuals that repeatedly attack livestock. The agency has also built a guide to mitigate attacks. Building on these efforts, the Human Initiative to Save Animals (HISA) has been working closely with the OFB since 2018 on a human-felid coexistence project in French Guiana, entitled COFEEL. This project has supported farmers and ranchers by offering alternatives to lethal control of carnivores through the implementation of efficient depredation mitigation measures. Funding for this project is due to end in the summer of 2021, posing a challenge to the sustainability of the project. It is expected that ranchers will revert back to lethal control of jaguars if denied access to an appropriate public response (OFB, *in litt.*, 2021).

Guatemala

Factors and Variables	Status
National Population Status	
National classification:	No official classification
National distribution:	Restricted and fragmented
National abundance:	Common
National population trend:	No information
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and large threat
Presence and recognition of illegal trade:	Present and marginal threat
Geographical pattern:	Spread-out
Transboundary:	Neighbouring countries
Sophistication:	Informal or opportunistic
Links to other crimes:	Few confirmed
Information quality	Government remarks without enforcement data
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	Planned
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing
Incentives:	Existing

National Population Status

Guatemala has two jaguar populations, located in the Selva Maya (part of the Maya Biosphere Reserve bordering Mexico and Belize) and the Maya Mountains (bordering Belize). Both populations are considered Endangered in Guatemala, although unofficially (CONAP, *in litt.*, 2020). They are distributed across an area of 41,290 km^2, of which only 58% lies inside protected areas. There has been considerable research on jaguar abundances in the Selva Maya, although not all studies have used appropriate methodologies (CONAP, *in litt.*, 2020). Jaguar densities are only available for the Selva Maya subpopulation, and the few studies with reliable methods resulted in densities ranging from 0.87 ± 0.52 individuals per 100 km^2 in Mirador-Rio Azul National Park and 1.52 ± 0.34 individuals per 100 km^2 in Melchor Forest Concessions (CONAP, *in litt.*, 2020). The estimated national average density is 2.3 individuals per 100 km^2 (Jędrzejewski et al., 2018). Population estimates reach 628 jaguars (CI 95% 396-929, CONAP, *in litt.*, 2020), but this study found no information on population trends. A key threat to jaguars in Guatemala is habitat loss, which began in the 1960's with the expansion of sugar cane and cotton, followed by land reforms in the 1970's. Today, deforestation and forest fires caused by the expansion of cattle ranching are rampant, and have caused human-jaguar conflict and associated retaliatory killing to become large threats to jaguars (CONAP, *in litt.*, 2020).

Poaching and Illegal Trade Status

Human-jaguar conflict has been identified as a key threat to jaguars in Guatemala (CONAP, *in litt.*, 2020). The rates of attacks on livestock appear to be high, with cattle ranchers in the Maya Biosphere Reserve reporting 104 attacks from 2003 to 2007, of which 79% were caused by jaguars (Soto-Shoender and Giuliano, 2011). There are examples of poachers who have been hired to kill jaguars in retaliation for livestock losses, and of the use of poison to kill jaguars that return to feed on depredated carcasses (CONAP, 2021; Prensa Libre, 2011). However, there are not many studies on this threat, and its scale and impact on jaguar populations is uncertain.

The illegal trade in Guatemala has been characterised as opportunistic and domestic, and highly linked to human-jaguar conflict, wild meat hunting and tourism (Arias et al., 2020). Consejo Nacional de Areas Protegidas (CONAP), the national authority for wildlife and protected areas, affirmed that there is no targeted or organized jaguar poaching in the country, and that domestic illegal trade in jaguars occurs sporadically when cattle ranchers who kill jaguars choose to illegally keep their body parts as trophies or for eventual sale (CONAP, *in litt*., 2021). Illegal possession and illegal trade of cubs for small-scale tourist attractions, and of jaguar body parts have also been reported in Petén, Izabal and Guatemala Departments, and there are seizures involving illegal possession of jaguar body parts by drug traffickers (Arias et al., 2020). An academic study based on interviews with wildlife authorities, enforcement agents and jaguar experts in the country highlighted that jaguar body parts have been known to enter the country from Belize, facilitated by illegal activities occurring in the border (Arias et al., 2020). Similarly, few seizures have occurred at touristic destinations like Flores in Petén, where jaguar body parts are sold as souvenirs (Ministerio Público, 2020). This suggests that jaguar body parts may occasionally be transported abroad by tourists, but there have not been any seizures at customs, and seizure records were not provided by the government for this study.

Protections against Poaching and Illegal Trade

Jaguars are included in CONAP's List of Threatened Species, updated in 2020, which dictates that the capture of jaguars can only occur under licenced scientific purposes throughout the country (CONAP, i*n litt*., 2020). Further, the Law of Protected Areas (1989) regulates the collection of wildlife parts and derivatives, and imposes sanctions of five to 10 years and a fine of up to $2,600 USD for offenders. There is also a Law on Hunting (2004), which protects endangered species from this activity (CONAP, i*n litt*., 2020). Since 2015, the Department of Petén established the first environmental court in the country, with judges specifically trained to handle wildlife crimes. The existence of a specialized court has helped to elevate the seriousness with which cases of illegal wildlife trade are treated in Guatemala, but the court is limited in staff and capacity to effectively process cases (Arias et al., 2020). Guatemala also has a specialized environmental police (DIPRONA), but there have been criticisms about their effectiveness and corruptibility, as well as other serious challenges to effective law enforcement in the country stemming from a severe lack of resources (Arias et al., 2020).

Guatemala lacks a National Jaguar Action Plan, but has started the planning process for its creation (CONAP, i*n litt*., 2020). The government has taken actions to reduce mortalities associated with human-jaguar conflict through a partnership between CONAP, the Ministry of Agriculture and Livestock (MAGA) and WCS, to provide support to ranchers experiencing attacks by jaguars. These institutions conducted workshops with over 200 ranchers to provide guidance on conflict mitigation measures and assistance on cattle health and management, and have piloted different conflict mitigation strategies on the ground (Garcia-Anleu et al., 2016). WCS is also leading projects to establish a permanent jaguar monitoring project in the Maya Biosphere Reserve, to monitor the illegal trade in jaguar body parts online, and to kick-start jaguar focused ecotourism operations involving rural communities (CONAP, *in litt.*, 2020). Panthera works for the conservation of jaguars in the Maya

Mountains, and has an acoustic monitoring project which aims to detect and monitor gunshots and threats from poaching. WWF is also working in the Maya Biosphere reserve, with activities including the reduction of illegal poaching of jaguars and their prey.

Guyana

Factors and Variables	Status
National Population Status	
National classification:	Endangered
National distribution:	Widespread and contiguous
National abundance:	Common
National population trend:	No information
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Limited /reversible
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	No information
Presence and recognition of illegal trade:	No information
Geographical pattern:	No information
Transboundary:	Not present or outdated
Sophistication:	No information
Links to other crimes:	No information
Information quality	Official enforcement data
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	None
Initiatives against poaching:	In progress
Initiatives against illegal trade:	In progress
Incentives:	No information

National Population Status

There are limited studies describing the conservation status or population ecology of jaguars in Guyana. A study carried out in the Rupununi region found site-level jaguar densities ranging from 1.96 to 5.58 individuals per 100 km^2 (Hallet, 2017). Densities in logged and unlogged forests in Iwokrama Forest in central Guyana reached 1.72 individuals per 100 km^2 (95% CI; 1.55 – 2.32) and 16.20 individuals per 100 km^2 (95% CI; 6.92 – 26.7), respectively (Roopsind et al., 2017). The estimated national average density is 2.1 individuals per 100 km^2 (Jędrzejewski et al., 2018). Jaguars are widely distributed throughout the country, and considered Endangered (CMS, 2020; Kerman and Felix, 2010). This study found no published long-term monitoring studies or governmental information on population trends. Panthera is monitoring jaguar populations in the country.

Over 75% of Guyana is covered in tropical forests, and the country has one of the lowest human densities in the jaguar range, providing suitable conditions for the survival of jaguars in the long term (Hallet, 2017; Sanderson et al., 2002). Jaguar densities in areas like the Rupununi Region did not appear to be significantly affected by land tenure (indigenous lands vs. cattle ranching areas) or hunting pressure, suggesting overall low threat levels (Hallet, 2017). However, logging had a significant effect on jaguar densities in Iwokrama Forest (Roopsind et al., 2017). Areas with ecotourism presented higher jaguar abundances (Hallet, 2017). Like with Suriname and French Guiana, gold mining is a growing threat in Guyana, causing habitat degradation, prey loss, and increased pressures from poaching. While human-induced mortalities exist, there are no studies quantifying the scale of human-jaguar conflict or poaching for commercial purposes or otherwise.

Poaching and Illegal Trade Status

This study found no information on human-induced mortalities in Guyana, except that the country was reported as the source of shipment of two seizures found in the UNODC's World WISE Database, each

involving a single specimen, but only one since 2010. More information is needed to verify whether illegal trade in jaguars exists in the country beyond these seizures.

Protections against Poaching and Illegal Trade

Guyana's Wildlife Conservation and Management Act (No. 22 of 2016) establishes the Commission for Wildlife Conservation and Management, and regulates all matters pertaining to wildlife use and trade. It is closely based on CITES Appendices, and accordingly, grants jaguars full protection from hunting and trade under Schedule 1 (equivalent to Appendix I). Lack of compliance with the law makes offenders liable to fines ranging between $3,600 and $9,600 USD, and imprisonment for no more than three years. The country does not possess a National Action Plan for jaguar conservation.

The Wildlife Management and Conservation Commission is working towards developing a plan to address human-jaguar conflict, and has established a conflict response team (WWF, 2019). WWF Guianas has included jaguar conservation in its 2024 Strategic Plan, to conduct jaguar population surveys, assess habitat health and threats, evaluate the magnitude of illegal trade, launch communication and awareness building campaigns on the illegal trade in jaguars and human-jaguar conflict (WWF, 2019). Other civil society actors like Panthera-Karanambu Trust, and IFAW, through Operation Jaguar, have started to work in the country to study jaguar populations and investigate the illegal trade in jaguars in collaboration with the Ministry of Natural Resources and the Environment. There are several ecotourism operations in the country, including those run by Karanambu Trust, whose operations have been associated with higher jaguar abundances (Hallet, 2017), but it is not clear whether incentives exist for the conservation of jaguars explicitly. No information on law awareness or on the effectiveness of current jaguar conservation regulations and initiatives was found.

Honduras

Factors and Variables	Status
National Population Status	
National classification:	Endangered
National distribution:	Widespread and fragmented in country
National abundance:	Common
National population trend:	No information
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and large threat
Presence and recognition of illegal trade:	Present and medium threat
Geographical pattern:	Spread-out
Transboundary:	Neighbouring countries
Sophistication:	Somewhat organized
Links to other crimes:	Few confirmed links
Information quality	Government remarks without enforcement data
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	Existing
Initiatives against poaching:	Existing
Initiatives against illegal trade:	No information
Incentives:	Existing

National Population Status

Honduras classifies the jaguar as an Endangered species in the national territory (ICF, 2011). Jaguars are widely distributed in the Miskito region of Honduras, including three of its protected areas: Rio Platano Biosphere, Tawahka Biosphere, and Patuca National Park. Jaguars are also found along the Caribbean coast, and along the border with Guatemala, inside Cusuco and Cerro Azul Copán National

Parks, the Río Tulián basin and Agua Merendón Productive Zone (Mora et al., 2016). Jaguar presence has also been reported in Jeannete Kawas National Park, and Nombre de Dios mountain range, and they may exist in the centre and south of the country, but these areas have not been extensively surveyed (ICF, 2011; Mora et al., 2016). Jaguar densities have been measured in Tawahka and Texiguat Reserves, Rus Rus, Pico Bonito and Jeannete Kawas National Parks, resulting in densities of 1.4, 1.2, 4.2, 0.25-2.27, and 1.55 individuals per 100 km^2, respectively (ICF, 2011; Mora et al., 2016). The estimated national average density is 2.5 individuals per 100 km^2 (Jędrzejewski et al., 2018). This study found no information on jaguar population trends.

A key factor affecting jaguars in Honduras is forest loss and habitat fragmentation, caused by agricultural and cattle ranching growth led by mixed-ethnicity Hondurans ("ladinos"), who have invaded indigenous lands and key jaguar habitat inside protected areas (Mora et al., 2016). Wild meat hunting levels by these same groups and by indigenous communities has also been described as unsustainable, greatly reducing prey availability (ICF, *in litt.*, 2021; Mora et al., 2016). There is no information of the relative weight of these threats on jaguar populations.

Poaching and Illegal Trade Status

Targeted jaguar poaching was reported as a large threat in the literature, occurring mainly in the context of human-jaguar conflict (Mora et al., 2016). In Brus Laguna and in communities around the Rio Platano Reseve, ranchers have been known to shoot and poison jaguars, or hire professional jaguar poachers to eliminate them. Out of 45 local ranchers who participated in a workshop in 2008 in these areas, 35% admitted to having shot a jaguar and 16% had used poison to kill jaguars (Mora et al., 2016). In 2008, a farmer in the area reported losing 63 calves and four cows to jaguars, and personally poaching 17 jaguars in five years (Castaneda, 2008 in Mora et al., 2016). Farmers from Sirsirtara and nearby villages also reported significant losses of about $13,000 USD in a single year to jaguar depredation (Mora et al., 2016). However, not all areas within the jaguar distribution in the country are affected by human-jaguar conflict, and the same study reported that ranchers from Atlantida Deparment, or Sico-Paulaya did not have problems with jaguar depredation.

People who poach jaguars in Honduras, due to human-wildlife conflict or opportunistically, sometimes illegally keep their body parts for personal use or sale, or to demonstrate effective predator control to superiors or to those hiring jaguar poachers (Mora et al., 2016). However, the most prominent cases of illegal trade in jaguars in Honduras concerned the illegal trade and possession of live animals. Reports of live jaguars, sourced from the Miskito forest and illegally kept in unlicensed zoos, tourist attractions and private animal collections have reached the media headlines on several occasions (Silva Avalos, 2020). Some of these facilities have been associated with drug trafficking and money laundering activities, being under investigation for several years (Silva Avalos, 2020). The National Institute for Forest, Protected Areas and Wildlife Conservation (ICF) reported the existence of several illegal wildlife sanctuaries holding jaguars in captivity that were unable to verify the source of the animals. Their data suggests that the number of jaguars held in captivity has increased by 50% since 2009, with most of the increase being related to the illegal trade (ICF, *in litt.,* 2021). The ICF also reported that at least some of the animals in captivity are believed to have been smuggled from other countries, though no official seizures were shared. Arias et al., (2020) also reported the probable existence of illegal trade along the border between Guatemala and Honduras based on interviews with experts. Aside from this, the illegal trade in jaguars in Honduras appears to be domestic, but the links with other crimes must continue to be investigated.

Protections against Poaching and Illegal Trade

Jaguars are protected by the Forests, Protected Areas, and Wildlife Law of Honduras (2008). This Law establishes the National Institute for Forests, Protected Areas and Wildlife Conservation (ICF) as the entity responsible for the preservation of wildlife in the country, and prohibits hunting and trade of endangered species, including jaguars (Resolution GG-APVS-003-98). Agreement No. 036-2018 establishes a Protocol for Jaguar Monitoring in Honduras. However, lack of awareness about the law among the public, and severe limitations in the enforcement capacity of ICF in the context of poaching and land grabbing inside protected areas have been cited repeatedly, including by members of ICF, leading to the conclusion that the application of the law is deficient (ICF, *in litt.*, 2021; Mora et al., 2016). Lack of on the ground presence and enforcement capacity by authorities in protected areas of Honduras has been identified as a key problem by scientists and the government (Mora et al., 2016).

Honduras has a National Action Plan for the Jaguar (2011), with key lines of action being the protection of habitat and connectivity, human-wildlife conflict management, research and monitoring, environmental education and community engagement, awareness building and training, legislative and institutional strengthening and ex-situ conservation (ICF, 2011). The plan does not specifically address the issue of illegal trade, and while incentives to reduce human-jaguar conflict (compensation for losses) are mentioned, there was no information on the progress of this action point. Several NGOs including WCS, Panthera, Proyecto Corazon, Fundación Madera Verde, in partnership with the ICF, have conducted environmental education workshops over the past decades, targeting school teachers, local communities, and farmers/ranchers in the Miskito region and Atlántida Department (Mora et al., 2016). Panthera is also monitoring illegal activity along the border with Guatemala with acoustic traps that can detect poaching intensity, and has set up partnerships with the private sector including dairy company Lacthosa, to support ranchers in Honduras.

Mexico

Factors and Variables	Status
National Population Status	
National classification:	Endangered
National distribution:	Widespread and fragmented in country
National abundance:	Uncommon
National population trend:	Increasing
Quality of population information:	Recent scientific (or other reliable) studies
Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and large threat
Presence and recognition of illegal trade:	Present and large threat
Geographical pattern:	Ubiquitous
Transboundary:	International
Sophistication:	Somewhat organized
Links to other crimes:	Few confirmed links
Information quality	Government or enforcement reports
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	Existing
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing
Incentives:	Existing

National Population Status

Jaguars are considered Endangered in Mexico, based on the National List of Endangered Species (NOM-059-SEMARNAT-2010). The species is distributed widely throughout the country, in much of its original historic range, from Sonora and Tamaulipas to the Yucatan Peninsula. Presence has been

confirmed in the states of Sonora, Sinaloa, Nayarit, Jalisco, Estado de México, Guerrero, Tabasco, Querétaro, Tamaulipas, Yucatán, Chiapas, Quintana Roo, Campeche, and Oaxaca, with the largest populations being located in the latter four states (SEMARNAT and CONANP, 2009). It is estimated that the jaguar has lost 60% of its habitat in 40 years, reducing the national population to about 5000 individuals (Chávez and Ceballos, 2006; Gonzalez-Maya et al., 2016). There is research on jaguar populations for most regions and habitat types in Mexico, and the country has a national level jaguar population census (CENJAGUAR), with density estimates for 16 jaguar conservation areas. The estimated national average density is 1.3 individuals per 100 km^2 (Jędrzejewski et al., 2018). Jaguar densities have increased in recent years, and range from 0.05 individuals per 100 km^2 in the mangroves of Chiapas to 7.4 individuals per 100 km^2 in Yum-Balam region in the Yucatan Peninsula (Gonzalez-Maya et al., 2016).

Jaguar threats in Mexico vary in type and intensity throughout the country, but are generally related to land use change, habitat fragmentation, agricultural and ranching activities, road infrastructure, inappropriate tourism development, disease associated with domestic animals, human-jaguar conflict and poaching (Gonzalez-Maya et al., 2016). The latter two are amongst the most important threats to jaguar populations in the country (Chávez and Ceballos, 2006). Several studies on human-jaguar conflict and poaching exist at the site-level, but there is limited data on their impacts on populations. An increasing threat pertains to infrastructure developments within jaguar habitat, such as the Maya Train development project, an intercity railway traversing the Yucatan Peninsula. This development is expected to increase human access into habitat patches that were previously isolated, exposing jaguars to further anthropogenic threats. Such projects require adequate impact assessments that consider jaguar habitat requirements, as well as increased monitoring and control to prevent poaching and criminal activities (SEMARNAT, *in litt.,* 2020).

Poaching and Illegal Trade Status

Human-induced mortalities are a key threat to jaguars in Mexico. According to the CITES Management Authorities in the country, jaguar poaching in Mexico occurs mainly as a result of chance encounters between jaguars and wild meat hunters, especially in the south of the country. Poaching is also an end result of livestock depredation, even though in many instances jaguars are blamed for the attacks of other animals such as feral dogs (SEMARNAT, *in litt.,* 2020). The body parts of poached jaguars are used or sold by wild meat hunters, and by those who opportunistically find jaguar carcasses in the forest or alongside roads after vehicle collisions (SEMARNAT, *in litt.,* 2020). While there are no large-scale assessments on the prevalence or characteristics of this threat, and available studies have relatively small samples sizes, the literature suggests that jaguar poaching is not uncommon in Mexico, and that like with other countries, it is driven by human-jaguar conflict, subsistence poaching, commercial purposes and cultural motivations. Studies on human-jaguar interactions in Chiapas found that 38% (CI 95%, 26–51, n=60) of households had poached at least one felid between 1996 to 2006, the majority being unaware of its illegality (Garcia-Alaniz et al., 2010) and that subsistence poachers locally consume and sell jaguar body parts (Naranjo et al., 2004).

Mexico was the country with the highest number of literature reports of illegal trade in jaguars. More importantly, out of the five countries with the most literature reports (Mexico, Bolivia, Brazil, Belize, Suriname), Mexico had the lowest proportion of duplicate to non-duplicate reports (or unique instances of illegal trade in jaguars, as explained in Chapter 4). This suggests that Mexico either has high levels of illegal trade relative to other countries, or that there is a greater effort by multiple stakeholders in the country to detect and report cases of illegal wildlife trade. The latter appears to be true, since several of the reports of illegal trade in jaguars in Mexico were produced either by the Federal Environmental Protection Prosecutor Office (PROFEPA), or by others (e.g. media outlets) reporting enforcement actions taken by PROFEPA. A recent study on wildlife crime in the state of

Oaxaca revealed that from 2004 to 2018, PROFEPA carried out 814 inspections (29-97 per year) of suspected cases of wildlife crime, detecting 609 illegal activities (26-80 per year), including illegal trade, possession and poaching, involving 8,047 vertebrate specimens (Masés-García et al., 2021). Included in these were the seizures of 19 live jaguars, one skin, and two derivatives (Masés-García et al., 2021). Based on these seizures by PROFEPA, the authors revealed that the state of Oaxaca alone was responsible for almost 13% of the estimated worldwide trade in vertebrate species, highlighting not only the important role of Mexico in the illegal wildlife trade, but also that global magnitude of wildlife trafficking may be grossly underestimated (Masés-García et al., 2021).

At the national level, PROFEPA actively monitored social media networks to identify the illegal sale of jaguars and their body parts online. At least two confirmed profiles of jaguar traffickers have been recently identified by PROFEPA, who are involved in the illegal sale of costumes and other products for traditional ceremonies and rituals (SEMARNAT, *in litt.*, 2020). Other common scenarios of jaguar poaching and illegal trade found in the literature involved: illegal retaliatory killing by ranchers and farmers (e.g. Mendez, 2017), illegal trophy hunting found on social media (poachers posting photos posing next to hunted jaguars, Aristegui Noticias, 2013; Express Zacatecas, 2019), illegal possession of jaguars as pets in private residences or as part of illegal wildlife collections (e.g. PROFEPA, 2018d, 2018b, 2018c, 2017), illegal possession of jaguars as pets by drug traffickers (e.g. Elizalde, 2020) and sales of jaguar body parts in tourists stands and craft markets (e.g. Mexico Ambiental, 2017). The role of tourism has been acknowledged by the authorities, who are aware of the sale of jaguar body parts to tourists in the south of Mexico, and of the smuggling of jaguar body parts into Mexico by tourists arriving from countries such as Brazil, Costa Rica and Venezuela (SEMARNAT, *in litt.,* 2020). The cases of jaguar poaching and illegal trade in Mexico that were found in the literature were domestic and appeared somewhat organized, having few confirmed links to consumers associated with drug trafficking, and Mexico played an important role as seizure country and source of shipments of illegal jaguar body parts seized abroad, based on the UNODC's World WISE Database (see Chapter 4).

While other countries had reports of illegal trade and possession of live jaguars, this modality of illegal trade appeared particularly prevalent in Mexico, and it may have to do with the fact that the country allows private possession of endangered and exotic species subject to having a permit and management plan (PROFEPA, 2018b). The government reported the seizure of 11 live jaguars in zoos, private residences, and airports since 2019 (SEMARNAT, *in litt.,* 2020). Additionally, the literature described another 14 recent cases of illegal possession of live jaguars held in the circumstances described above, and live cubs have been seized at airports on multiple occasions (PROFEPA, 2018b, 2014).

There is not a lot of information on jaguar trafficking routes in Mexico, but the border with Guatemala appears to be a key area of concern, due to illegal incursions on both sides of the border (for the extraction on timber), the presence of drug and human trafficking in the area, and migration from central and southern American countries (Melgoza, 2020). The recent finding of a mutilated jaguar carcass, which had its head, paws and testicles removed, at Yaxchilan Natural Monument, located right in the border between the two countries, raised the alarm that targeted jaguar poaching is happening in the area (Melgoza, 2020). Another area of importance appears to be Quintana Roo, between Puerto Morelos and Tulum, where several jaguars that have been killed in road accidents had been previously shot (Infobae, 2019). Oaxaca appears to be a another important illegal trade hotspot and trade route for jaguars and other wildlife species of international commercial interest (Masés-García et al., 2021).

Protections against Poaching and Illegal Trade

Jaguar hunting has been banned in Mexico since 1987 (Villordo-Galván et al., 2010). Jaguars are protected by the General Wildlife Law (2000) and the Regulation of the General Wildlife Law (2006),

the General Law of Ecological Equilibrium and Environmental Protection (1998) which is related to protected area management, and the Federal Penal Code (Art. 420), setting a prison sentence of one to nine years and 300 to 3,000 days of fines to those capturing, possessing, transporting or trading protected species, with added sanctions for commercial purposes. Despite the existence of these penalties, wildlife crimes are rarely prosecuted, and they are still treated as minor offences, limiting the types of evidence that can be presented to court (Masés-García et al., 2021). This limitation has set in motion a petition to the Senate to raise the sanctions to surpass 10 years of prison, the minimum required for a crime to be legally considered a serious crime.

In 2013, PROFEPA, as the authority in charge of enforcing environmental law in Mexico, is executing the National Operation for Jaguar Protection, in all areas of jaguar distribution. This Operation has the goal of protecting jaguars and their habitat, reducing the incidence of environmental crimes, detecting and reducing jaguar poaching, and increasing society's role in jaguar protection (SEMARNAT*, in lit.,* 2020). The Mexican government and civil society have developed several activities for jaguar conservation over the past decades. This includes the creation of a National Action Plan (2009) with activities related to diagnosing the status of jaguar populations, increasing areas under conservation, engaging society and institutions and securing financial resources for jaguar conservation (SEMARNAT and CONANP, 2009). The plan specifically addresses poaching, by aiming to strengthen legal systems, build capacity for enforcement and involve hunters in conservation. However, Mexican authorities believe that more financial and human resources are needed to increase the government's capacity to enforce the law for the case of the illegal trade in jaguars, along with establishing partnerships with customs agencies, postal companies, the National Guard, and the cyber-police (SEMARNAT, *in litt.,* 2020).

Mexico has hosted a series of international workshops for jaguar conservation, which have catalysed jaguar research and conservation action, including the creation of a jaguar recovery plan and a National Jaguar Conservation Strategy (Chávez and Ceballos, 2006; Gonzalez-Maya et al., 2016). Other actions have included the establishment of a working group on jaguar matters within the government and a community-based patrol program. Mexico spearheaded the establishment of the Latin American Alliance for Jaguar Conservation in 2018, based on the example of the Mexican National Jaguar Conservation Alliance, which along with academic institutions like the National Autonomous University of Mexico (UNAM), is supporting the establishment of academic, public and private partnerships to conserve jaguars. The Alliance is endorsing the development of a paper-based biosensor for the detection of jaguar genetic remains, developed by WildTechDNA (wildtechdna.com). This could provide a fast and cheap mechanism to facilitate law enforcement actions concerning the jaguar, by rapidly identifying jaguar body parts and derivatives like bone, teeth, fat or meat. This could be particularly useful for testing the hypothesis that jaguars may be replacing tiger products in the Chinese wildlife market.

Government and civil society actors have established an insurance scheme for cattle ranchers who experience human-jaguar conflict, funded by the National Confederation of Livestock Organizations in Mexico (CNOG, 2020). To reduce human-jaguar conflict, researchers are also testing the use of Conditioned Taste Aversion, a method to reduce the appeal of domestic animals to predators through the use of a chemical aversion agent such as Thiabenzadol (Cassaigne 2021, *pers. comm*.). In partnership with other NGOs, Panthera is developing an ecotourism seal in properties that include jaguar habitat as another potential incentive mechanism for human-jaguar coexistence. The World Wide Fund for Nature (WWF) is running a diagnosis of the illegal trade in jaguars in the Yucatan Peninsula (Sosa-Escalante, 2020), as part of a larger Regional Strategy for Jaguar Conservation. WWF-Mexico has started a plan to become a regional hub on topics related to illegal wildlife trade, and has launched the "Rey Jaguar" campaign to raise awareness and public support for the implementation of the Jaguar 2030 Roadmap by governments, including tackling the illegal trade in jaguars.

Nicaragua

Factors and Variables	Status
National Population Status	
National classification:	Critically Endangered
National distribution:	Restricted and fragmented
National abundance:	Uncommon
National population trend:	No information
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and marginal threat
Presence and recognition of illegal trade:	Present and marginal threat
Geographical pattern:	Spread out
Transboundary:	Domestic
Sophistication:	Informal or opportunistic
Links to other crimes:	None
Information quality	Government remarks without enforcement data
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Species specific targeting all populations
Conservation action plan:	None
Initiatives against poaching:	Existing
Initiatives against illegal trade:	No information
Incentives:	Existing

National Population Status

Jaguars are considered Critically Endangered at the national level in Nicaragua (Jordan et al., 2016; Lista Roja, 2018). Historically, jaguars were distributed throughout Nicaragua, but large-scale forest conversion has left them secluded in forest fragments in the Caribbean coast, in roughly 33% of their historic range (Diaz-Santos et al., 2016). The strongholds for jaguars in the country are the Bosawas Biosphere Reserve towards the north of the country, Cerro Silva, and the Indio Maiz Reserve located in the Southeast Biosphere Reserve, with some level of connectivity between them (Zeller et al., 2011). In the past years, Wawashang Reserve has been severely degraded due to agricultural encroachment, but there might be an additional area of importance north of Wawashan that could still hold an important population of jaguars between Karawala and the Prinzu territories (Petracca et al., 2014). Jaguar densities have been estimated to be between one and 3.6 individuals per 100 km^2, and based on extrapolations in areas that have not been monitored, an estimated 331 jaguars may exist in the country (Diaz-Santos et al., 2016). The estimated national average density is 2.44 individuals per 100 km^2 (Jędrzejewski et al., 2018). Jaguar population trends are not clear in Nicaragua.

Agriculture and forest loss have been identified as the main limitation to habitat use by jaguars in Nicaragua, even inside protected areas (Jordan et al., 2016; Petracca et al., 2014). Protected areas suffer from severe enforcement capacity limitations, and the rampant loss of suitable habitat in protected areas is expected to diminish jaguar viability in the country (Petracca et al., 2014). Hunting of prey species was also identified as a common livelihood and key threat to jaguars in the country, despite being illegal (Petracca et al., 2014). Another potential threat to jaguars in the country is the loss of connectivity due to the expansion of palm oil plantations in the Caribbean coast, land invasions, and longstanding plans to establish a shipping route by constructing a canal to connect the Caribbean Sea and Pacific Ocean on both sides of Nicaragua, which would interrupt the Jaguar Corridor in Mesoamerica (Jordan et al., 2016). Opportunistic poaching and human-jaguar conflict have been described as threats (Diaz-Santos et al., 2016), but they have not been measured in the country.

Poaching and Illegal Trade Status

There is scarce information on human-induced jaguar mortalities in Nicaragua, though these are known to exist based on few reports of retaliatory killing and opportunistic poaching (Diaz-Santos et al., 2016). Retaliatory killing has been documented in seven communities in the north Atlantic of Nicaragua, and towards the southern end of the jaguar national distribution (Diaz-Santos et al., 2016; Paso Pacifico, 2021). Out of 587 interviews conducted with rural villagers in north-eastern Nicaragua, 65% had negative attitudes towards jaguars, and 26% had a desire to kill a jaguar if seen (Petracca et al., 2014). However, mortality levels associated with conflict have not been quantified.

Nicaragua's Ministry of Environment and Natural Resources (MARENA) reported that only small levels of illegal trade in jaguar body parts exist in Nicaragua at the domestic level, with jaguar body parts being sold at rural markets only occasionally (MARENA, *in litt.*, 2021). Incidents of illegal possession and trade in jaguars in Nicaragua have also been reported in the literature, with reports of occasional sales of jaguar teeth and skins in areas like Laguna de Perlas, and occasional possession of jaguar body parts as trophies or decorative items in rural houses, hotels, stores and bars in areas like Bilwi, Bonanza, Haulover, Bluefields, Rosita, Set Net Point and Puerto Cabezas (Anonymous 2021, pers. comm.; Diaz-Santos et al., 2016; Reuter et al., 2018). The prices of jaguar body parts are also reportedly low compared to those found in other countries (Reuter et al., 2018). Jaguar cubs have been seized at urban restaurants in the past (La Prensa, 2009).

Protections against Poaching and Illegal Trade

The jaguar is protected under Ministerial Resolution No. 07-01-2016, with an indefinite ban on hunting. It is also covered under Decree 625 (May 16, 1977) which prohibits commercial use and export of wildlife, explicitly mentioning jaguars, and imposing fines of about $60 USD for each item seized (Reuter et al., 2018). Other laws like Law No. 559 (Nov. 21, 2005) and Law 807 (Oct 19, 2012) forbid the trade in CITES-listed species or species of special value, with heavier fines of $1,000 to $5,000 USD and a prison sentence of six months to a year (Reuter et al., 2018). There was no information found on enforcement capacities behind this law, or awareness of them by the population.

Nicaragua does not have a National Jaguar Conservation Action Plan, but several territorial governments and non-governmental organizations have been working to directly or indirectly benefit jaguar conservation in the country. Local territorial governments have worked on addressing threats to wildlife including the demarcation of territorial land, the protection of autonomous areas from settlers, and control and protection activities. NGOs like the Wildlife Conservation Society (WCS), the Global Wildlife Conservation and Panthera have a long history working on jaguar conservation in the North and South Caribbean Coast Autonomous Regions. WCS has specifically worked on human-jaguar conflict in Bosawas. Meanwhile, the NGO Paso Pacifico has a reforestation project to recover jaguar habitat in the country's Pacific Slope, and have conducted workshops with farmers and ranchers to raise awareness about jaguars, and provided training on improved livestock management practices. They have also established a compensation system for livestock losses associated to depredation by carnivores, and a Junior Ranger Program with an explicit jaguar component.

Panama

Factors and Variables	Status
National Population Status	
National classification:	Endangered
National distribution:	Widespread and fragmented in country
National abundance:	Common
National population trend:	Reduced and decreasing
Quality of population information:	Recent scientific (or other reliable) studies

Status of major threats:	Severe
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and large threat
Presence and recognition of illegal trade:	Present and medium threat
Geographical pattern:	Ubiquitous
Transboundary:	Domestic
Sophistication:	Informal or opportunistic
Links to other crimes:	Unconfirmed links
Information quality	Government remarks without enforcement data
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	Existing
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing
Incentives:	Existing

National Population Status

In Panama, the jaguar is classified as an Endangered species (Res. N° DM-0657-2016). Panama is strategically located between Central and South America, being the only stepping stone connecting populations in both regions (Moreno et al., 2016a, 2016b). The Atlantic Panama Mesoamerican Biological Corridor is a crucial connectivity area for jaguar populations in both regions, even though there are fragmented areas (Meyer et al., 2020, 2015). Jaguars are distributed widely throughout the country, in four main population blocks inside protected areas or other areas where hunting is not permitted (DBVS, 2011). These are the Salamanca region (Bocas del Toro/Chiriqui province), Santa Fé (north of Veraguas province), Donoso, Chagres, Portobelo (Panamá and Colón provinces), the Guna Yala, Wargandi and Madungandi counties and Darien protected area (Darién province). Though no country-wide jaguar census exists, Yaguara Panama Foundation has been leading a long-term monitoring project in Pirre Darien, in operation since 2014. Based on this study, which includes camera trap stations located in over 40 different sites, and other smaller studies, jaguar numbers have been assessed as declining, due to human pressures (Meyer et al., 2020; Moreno, 2006; Moreno et al., 2016a). These studies found no subpopulation density estimates in the country, but the estimated national average density is 1.38-3.42 individuals per 100 km^2, based on eight years of continuous studies of jaguar density inside Darien National Park (de la Torre et al., 2017; Moreno and Meyer, 2017).

Poaching due to conflict with farmers and ranchers, along with an emerging domestic illegal trade in body parts, have been recognized as the main threats to jaguars in Panama (MiAMBIENTE, *in litt*., 2021; Moreno et al., 2020, 2016a, 2016b). At least 21% of the country is occupied by cattle ranching, which is largely subsidized by the state through loans. This means that the incidence of conflict with jaguars is high, and that losing cattle to jaguars causes ranchers to be indebted with financial institutions (MiAMBIENTE, *in litt.*, 2021; Moreno et al., 2016a). Jaguars are strongly pressured by high levels of wild meat hunting in the country, depleting natural prey and forcing jaguars into contact with humans (MiAMBIENTE, *in litt.*, 2021; Moreno et al., 2020). Forests in central Panama, which are crucial for jaguar connectivity in the country and region, are heavily degraded having low species richness and poor representation of large-bodied species that make up the jaguar's diet (Meyer et al., 2015; Moreno et al., 2020). High rates of deforestation, particularly inside indigenous areas and at protected area margins threaten remaining jaguar habitats in the country, leaving less than 43% of forest cover, and only 35% inside protected areas (DBVS, 2011).

Poaching and Illegal Trade Status

Panama is one of the few countries that has large-scale studies on human-induced jaguar mortality conducted by researchers from Yaguara Panama Foundation. From 1989 to 2021, there were 370 known cases of jaguar poaching throughout most provinces in Panama (MiAMBIENTE, *in litt.*, 2021;

Moreno et al., 2020; Moreno, *unpublished data*). It is believed that the number of poached jaguars could be double or triple to those reported during that period. Camera trap studies from eight continuous years of monitoring in Darien rarely captured individual jaguars twice, suggesting a high rotation rate, probably associated with poaching (Moreno et al., 2016b, 2016a; Moreno and Meyer, 2017). Out of the 370 cases identified between 1998 and 2021, 98% happened because of livestock depredation by jaguars (Moreno et al., 2020, 2015; Moreno, *unpublished data*). Jaguar poaching has been reported in private lands and inside protected areas, and appears to be higher in Darien, Colon and Panama and Bocas del Toro provinces. While the overall scale of attacks and livestock losses are unknown, in areas surrounding Chagres and Portobelo National Park, approximately 1,000 cattle were lost in 20 years to large predators (jaguars and puma) (MiAMBIENTE, *in litt.*, 2021; Moreno et al., 2016b, 2016a). From 2017 to 2019, authorities and Yaguara Panama Foundation responded to 133 cases of livestock depredation (MiAMBIENTE, *in litt.*, 2021). In 2020 and 2021, during the Covid-19 pandemic, 35 cases of depredation have been addressed between MiAMBIENTE, Yaguara Panamá, the environmental police, the National Border Service and environmental activism groups in Chepo and Darién (Moreno et al 2020, *unpublished data*).

The illegal possession of jaguar body parts has been identified in areas where there is human-jaguar conflict, like farms in Nuevo Ocu (Colon Province) (DBV, 2011). Illegal domestic trade in jaguar body parts exists in Panama, but the Ministry of Environment (MiAMBIENTE) did not have enforcement reports to provide to this study (MiAMBIENTE, *in litt.*, 2021). Panama is one of the few countries in Central America where there have been reports of the presence of illegal trade in jaguar body parts associated with demand from people of Chinese descent (Moreno et al., 2016a; Reuter et al., 2018). Moreno et al., (2015), reported that 3% of 230 jaguar poaching cases (1998 and 2014) occurred due to demand for jaguar teeth, skins and claws by traffickers of Asian descent. The nationality of these traffickers is not clear, and there is no information on whether the parts were smuggled abroad. Since 1989, the Yaguara Panama Foundation collects data on why felines are killed, and now it has more than 2,500 contacts throughout the country to obtain information about felines, in addition to collecting information through research projects. Based on the intelligence gathered by this informant network, Panama appears to have an opportunistic and informal jaguar trafficking activity. However, there are more established groups of people (farmers, producers, indigenous people) who kill jaguars for commercial purposes and who sell the carcasses to people of Chinese descent (Moreno 2021, *pers. comm.*).

Protections against Poaching and Illegal Trade

In Panama, jaguars are protected by the country's Wildlife Law (Law 24, 7 June, 1995), which regulates all forms of ex situ and in situ conservation and wildlife research. This law establishes penalties of up to $5,000 USD to anyone poaching jaguars in the national territory, while the Penal Code further dictates a prison sentence of two to four years (MiAMBIENTE, *in litt.*, 2021). However, awareness of these laws is still lacking (DBVS, 2011). Multiple organizations are working to increase awareness, with an example of such efforts being the declaration of the first Saturday of March as "Wild Felines National Day" under Executive Decree N° 12 (23rd February 2018) (Moreno et al., 2020). The country has a National Jaguar Conservation Action Plan dating from 2011. Among other key strategies, the Plan specifically addresses human-induced mortalities, including the diagnosis of poaching, the reduction of wildlife crimes through increased law enforcement capacity, the support of volunteer informants, the control of human-jaguar conflict, and the increase in awareness about jaguars and the law (DBVS, 2011).

The Ministry of Environment (MiAMBIENTE) in partnership with Yaguara Panama Foundation, have launched several initiatives to execute the plan and conserve jaguars in the country. The two institutions have a cooperation agreement (ratified in 2017), and have together established two jaguar

working groups. One of them includes a partnership with the environmental police and border control police, and with environmental volunteers, to respond to cases of human-jaguar conflict. The other one is a conservation planning group, which seeks to design and implement human-wildlife conflict mitigation strategies in the short, medium and long term. Under the framework of this partnership, the two institutions launched the project "Sustainable Production Systems and Biodiversity Conservation", to provide human-jaguar conflict support to farmers, improve livestock management and increase jaguar conservation awareness in five areas with higher conflict intensities (Bocas del Toro, Colón, Veraguas, Panamá y Darién). Yaguara Panama Foundation, in alliance with MiAMBIENTE, the UNDP Small Donations Program, and the Global Environment Facility (GEF) Special Fund, have begun a project for the conservation of big cats at the community level, advising seven community-based organizations in seven areas of the country. An achievement was the establishment of the first Community Based Organization with the objective of minimizing human-jaguar conflict in Darién. Another project to minimize human-jaguar conflict in Panama involves the partnership between the Secretariat of Science, Technology and Innovation (SENACYT), Yaguara Panama and MiAMBIENTE, and involves the placement of GPS collars on jaguars near farms that have experienced livestock depredation. The Ministry of Environment and Yaguara Panama Foundation, supported by the GEF are starting a $ 2 million USD project for the conservation of felids and their prey in the country through public private partnerships, with a focus on restoring jaguar landscapes and addressing human-jaguar conflict. In addition to these projects, Yaguara Panama Foundation has delivered workshops on human-jaguar conflict mitigation in 10 protected areas and neighbouring lands since 2012, piloted conflict mitigation strategies (e.g. buffalos) and implemented incentives for conflict reduction including ecotourism, payments for jaguar conservation (rewarding farmers for the presence of jaguars in camera traps). The organization also travels through the national territory, delivering more than 80 talks and 20 workshops per year. During the Covid-19 pandemic, the organizations delivered virtual talks through more than 90 sessions reaching almost 10,000 people. The Mastozoology Society of Panama (SOMASPA) has also developed projects to monitor jaguar populations in Panama. So has the NGO Panthera, by conducting a ground-truthing assessment covering most corridors between protected areas (Petracca et al., 2018), and through the establishment of pilot ranches to explore conflict mitigation strategies in Coclesito, Donoso District, and near Santa Fe National Park.

Paraguay

Factors and Variables	Status
National Population Status	
National classification:	Endangered
National distribution:	Widespread and fragmented in country
National abundance:	Rare
National population trend:	Reduced and decreasing
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Severe
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and large threat
Presence and recognition of illegal trade:	Present but marginal
Geographical pattern:	Ubiquitous
Transboundary:	Domestic
Sophistication:	Informal or opportunistic
Links to other crimes:	No information
Information quality	Governments with official enforcement data
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Species specific, targeting all populations
Conservation action plan:	Existing
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing
Incentives:	Planned

National Population Status

Jaguars are Endangered in Paraguay. They are located in fourof the country's biomes, including the Atlantic forest, Cerrado, Gran Chaco and Pantanal. In the Alto Parana Atlantic Forest, jaguars are distributed in fragmented and isolated forest patches near the border with Argentina and Brazil. The largest populations in this biome are those closest to Brazil within the Mbaracayu and Morombi Reserves, which have densities of 1.29-2.8 and 0.5-3 individuals per 100 km^2, respectively (SEAM et al., 2016). These populations are presumed to be declining due to loss in habitat quality and poaching, but there are no conclusive studies on population trends in the area. There have been anecdotal reports of jaguars in the Department of Concepcion and San Pedro, also towards the east of the country. A study in Parque Nacional Defensores del Chaco Seco resulted in an estimated density of 0.72 individuals per 100 km^2 (Giordano 2015 in SEAM et al., 2016). The national estimated average density is 0.68 individuals per 100 km^2 (Jędrzejewski et al., 2018b), but populations in other biomes are not well understood in terms of size and status (SEAM et al., 2016).

Jaguars are highly threatened with deforestation in Paraguay. In areas like the Atlantic Forest, less than 10% of the original vegetation remains. Deforestation in Gran Chaco is also rampant, and a key issue is the scarcity of protected areas in this biome, with 95% of the territory being unprotected and privately owned, mainly by cattle ranchers (Romero-Muñoz et al., 2019). However, poaching of jaguars and their prey, which is forbidden in all the country, has been considered the main threat in the country (SEAM et al., 2016). Even in areas with suitable habitat and sufficient prey availability in the dry Chaco, jaguars have lower than expected occurrences, suggesting that illegal killing may be a key factor determining jaguar occurrence (Thompson et al., 2020).

Poaching and Illegal Trade Status

Illegal killing has been found to be the main determining factor of jaguar occurrence in areas like the Dry Chaco of Paraguay (Thompson et al., 2020), and it is also a main threat to jaguars elsewhere in Paraguay. Researchers who have captured jaguars for GPS-collaring have found that human persecution of jaguars is severe, with over 50% of captured animals being poached (out of 35, from 2003-2014 (McBride and Thompson, 2018). Jaguar poaching occurs mainly due to human-jaguar conflict, but studies have found that it also takes place in areas where ranching is not common, as a response to fear or other cultural factors and social norms (Thompson et al., 2020). However, human-jaguar conflict and jaguar poaching have not been quantified at the country level.

Poaching for the illegal trade appears less common in Paraguay. The Fauna Department of the Ministry of Environment and Sustainable Development of Paraguay (MADES) reported only two skin seizures in 2007 and 2016, the latter being displayed at a restaurant (MADES, i*n litt*., 2020). They also reported one jaguar poaching event in 2010 by an indigenous community, and were investigating two poaching events that had been posted on social media. The literature did not contribute many more seizures, and there was no evidence to suggest links with illegal international trade or organized crime. However, the authorities at MADES have learned about an illegal "green hunting" operation taking place in the country, involving darting jaguars as part of GPS collaring research projects that are lacking in government permits. This illegal activity was being advertised online by an international hunting company, which failed to provide information to the authorities on the nature of their operations and their providers. MADES also found illegal "green hunting" operations at a private property in Chaco, which is currently under investigation (MADES, *in litt.*, 2020). Scientists in the country (Anonymous 2021, *pers. comm*.) expressed concern about a growing lobbying to legalize trophy hunting in the country.

Protections against Poaching and Illegal Trade

Paraguay is one of the few countries that has a law specific to jaguar conservation (Law 5302 from the National Congress, 2014). This Law recognizes the jaguar as a species threatened with extinction and calls for the establishment of a National Jaguar Management Plan, a declaration of the areas that should become jaguar refuges, a protocol for the translocation of jaguars that may threaten human lives or livestock, and a law awareness building campaign. The Jaguar Conservation Law also stipulated the creation of a Fund for Jaguar Conservation, and calls for the establishment of a reward system for ranchers to receive incentives for their coexistence with jaguars, including a certification scheme that provides benefits, including preferential public contracting, preferential timings for paperwork, and premium prices for their products (BACN, 2014). Under Law No. 716/96 on environmental crimes, those who destroy animals at risk of extinction are subject to a penalty of one to five years of prison, and fines of 500 to 1,500 minimum daily salaries.

Paraguay has a National Jaguar Management Plan, which is still current (2017-2027). Actions related to addressing human-induced mortalities include identifying the socioeconomic, cultural and environmental factors that influence jaguar poaching, working collaboratively to reduce jaguar poaching, strengthening legal protections, generating incentives for jaguar conservation, and reducing human-jaguar conflict (SEAM et al., 2016). However, the implementation of the Plan and of the Jaguar Conservation Law has been limited, mainly due to a lack of funding. To date, the Jaguar Conservation Fund has not been established (MADES 2021, *pers comm*., Jan 19th)

There are several organizations working to reduce human-jaguar conflict in Paraguay. Some of these include WCS, FACEN, Universidad Nacional de Asuncion, and SPECIES. Projects by these organizations involve the implementation of conflict reduction measures and education campaigns for farmers, ranchers and the public. MADES has been supporting WCS in the project "Strengthening the capacity and commitment to combating illegal wildlife trade in Latin America". Under this project there will be an evaluation of the illegal wildlife trade in Paraguay and a revision of the laws and gaps in the enforcement system that prevent effective processing and sentencing of crimes against wildlife. Fundación Moises Bertoni and WWF have a project in the Atlantic Forest, which in addition to conserving jaguar habitats, seeks to understand and reduce the threats of conflict and illegal trade, including the improvement of enforcement capacities through the implementation of SMART.

Peru

Factors and Variables	Status
National Population Status	
National classification:	Near Threatened
National distribution:	Widespread and contiguous in country
National abundance:	Abundant
National population trend:	No information
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Substantial
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and large threat
Presence and recognition of illegal trade:	Present and large threat
Geographical pattern:	Ubiquitous
Transboundary:	International
Sophistication:	Somewhat organized
Links to other crimes:	No information
Information quality	Government or enforcement reports
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	In progress
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing

Incentives:	No information

National Population Status

In Peru, jaguars are distributed throughout the country's oriental lowlands, in ten Departments of the Amazon basin biome. About 23% of their range falls within protected areas, and they have been classified as Near Threatened in the country (Carrillo-Percastegui and Maffei in Tobler et al., 2013). In Peru, jaguars have one of the highest densities reported in the range, reaching a national estimated average density of 3 individuals per 100 km^2 (Jędrzejewski et al., 2018b). In Madre de Dios Department, specifically, Los Amigos Conservation Concession, Bahuaja Sonene National Park and the Espinoza Forestry Concession, jaguars had a mean density of 4.4 ± 0.7 individuals per 100 km^2 (95%CI: 3.1–5.9, Tobler et al., 2013). Other studies have pointed to densities of 11.4 ± 19.8 individuals per 100 km^2 in the Bahuaja-Sonene National Park, Tambopata (Maffei et al., 2011). Jaguar densities were high (4.54 ± 0.83 individuals per 100 km^2) even inside logging concessions (Tobler et al., 2018). Jaguar populations have not been extensively studied elsewhere in their area of distribution in Peru. No information was found on jaguar population trends in Peru.

Jaguars are threatened with increasing deforestation and habitat degradation in Peru. From 2001 to 2015, Peru lost 1.8 million hectares of tropical forests, with the main drivers of deforestation being small, medium and large scale agriculture (including the establishment of monocultures like palm oil), cattle ranching, gold mining (including inside key jaguar reserves), road building and infrastructure development (MAAP, 2017). Hunting of jaguar prey, along with the incidence of extreme weather events like floods or droughts, have also been described as key factors likely to affect jaguar populations in the country (Burrage et al., 2020). A stochastic simulation model showed that the effect of poaching on jaguar populations in Peru may be low relative to these latter two threats, but their synergistic effects must continue to be explored (Burrage et al., 2020).

Poaching and Illegal Trade Status

While the expansion of cattle ranching has led to the assumption that human-jaguar conflict may be intensifying in Peru (Tobler et al., 2013), information on conflict related mortalities was not provided by the government for this study nor found in the literature. On the other hand, jaguar mortalities caused by the illegal trade in jaguar body parts has been identified as a key threat to jaguars in the country (SERFOR and WCS, 2019). The Ministry of Agriculture and Irrigation of Peru (MINAGRI) reported the seizure of 68 jaguar specimens (and 42 teeth and one unidentified product), in 52 enforcement interventions between the years 2000 and 2020 (MINAGRI and SERFOR, *in litt.,* 2020). Teeth were the most commonly seized specimens (42 units), followed by skins (26) and live animals (16). The largest number of interventions and of specimens seized took place in Lima/Callao, Ucayali and Loreto. The city of Iquitos (Loreto) had the highest rates of illegal trade in jaguar body parts. Other important cities are Pucallpa, Puerto Maldonado, and Puno. Jaguar body parts obtained from Puno are transported through the Interoceanic highway to other markets in the country, including the cities of Cuzco, Arequipa, Llave, Desaguadero by way of San Gaban, Macusani and Juliaca. The same route is used to take the body parts to or from Bolivia (MINAGRI and SERFOR, *in litt*., 2020).

According to a collaborative research conducted by the National Forest and Wildlife Service (SERFOR), and WCS, jaguar body parts are illegally and openly sold in crafts markets or upon request, and the demand appears to be largely domestic (SERFOR and WCS, 2019). Peru reported an increase in the use of social media platforms to commercialize wildlife, including jaguar body parts, but a large-scale systematic survey of online illegal trade in jaguar body parts found only 8 teeth being illegally sold online in Peru and Ecuador combined, based on searches between May 2019 and March 2020, covering the years 2010 to 2020 (Polisar et al., *in litt.*, 2020). Peruvians from rural towns or urban centres illegally purchase jaguar body parts as accessories (e.g. wallets, purses) and decorative items,

or as traditional medicines. Another segment of the demand are foreign tourists who buy jaguar body parts at crafts markets either as amulets for ayahuasca rituals (Braczkowski et al., 2019) or as souvenirs, which suggest that jaguar specimens may leaving the country. The majority of non-local buyers have been described as being people of Asian descent (MINAGRI and SERFOR, *in litt.,* 2020), but their nationality was not specified by the authorities. Peru was one of the main source countries of illegal jaguar body parts shipments seized abroad (Chapter 4), suggesting some level of trade organization and sophistication.

Protections against Poaching and Illegal Trade

Peru has several laws and regulations pertaining to wildlife conservation and illegal trade. The National Law on Forests and Wildlife (Law Nº 29763) imposes the conditions for the sustainable use and trade of wildlife in the country, and the National Policy on Forests and Wildlife (Sup. Dec. No. 009-2013-MINAGRI) calls for a special management of species threatened with extinction. Supreme Decree No. 019-2015-MINAGRI sanctions poaching, possessing, or trading wildlife without authorization based on the conservation status of species. Sentences for unauthorized wildlife trade are dictated by the Penal Code (Leg. Decree No. 1237, 2015), including deprivation of liberty for three to five years, with the species' conservation status being an aggravating factor. Additionally, Peru has a National Anti-Wildlife Trafficking Strategy and Action Plan (Sup. Dec. N° 011-2017-MINAGRI) valid until 2027, with the objective of raising awareness about the illegal wildlife trade, developing the necessary multisector conditions for an effective application of the law, and implementing alliances with neighbouring countries and those involved in the illegal trade chain (MINAGRI, 2017). Peru does not have a national jaguar conservation action plan, but has started the process for its creation.

The Peruvian government, along with several organizations from the third sector, have been actively working to address the illegal wildlife trade in the country, with a particular focus on jaguars. Since 2014, MINAGRI and SERFOR have implemented campaigns against wildlife trafficking targeted at the general public. Peru was also the host country of the First High Level Conference on the Illegal Wildlife Trade in the Americas, and played an important role in raising the profile of the jaguar as an emblem of this cause. In addition to supporting the building and implementation of the country's National Strategy to Reduce Wildlife Trafficking, WCS has been working with SERFOR to investigate the characteristics of the illegal trade in jaguars across markets in Peru. Panthera has provided similar support, through the project "Building international capacity and transnational networks to counter big cat trafficking". WWF has been working at the local level, raising awareness about the jaguar within local and indigenous communities through participatory population monitoring, and developing partnerships with the private sector to achieve jaguar friendly FSC certified forest concessions. The NGO Convive Peru is implementing human-jaguar conflict mitigation strategies (such as improving livestock fencing) in the Peruvian Amazon, and compiling data on incidences of conflict and retaliatory killings.

Suriname

Factors and Variables	Status
National Population Status	
National classification:	No official classification
National distribution:	Widespread and contiguous in country
National abundance:	Common
National population trend:	No information
Quality of population information:	None
Status of major threats:	Limited/reversible
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and large threat
Presence and recognition of illegal trade:	Present and large threat
Geographical pattern:	Ubiquitous

Transboundary:	International
Sophistication:	Somewhat organized
Links to other crimes:	Few confirmed links
Information quality	Government or enforcement reports
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	Planned
Initiatives against poaching:	Existing
Initiatives against illegal trade:	Existing
Incentives:	Existing

National Population Status

In Suriname, jaguars are a protected species and grey literature documents have classified them as Endangered (CMS, 2020; Kerman and Felix, 2010), even though there is no official national classification. Due to the country's vast forest cover, jaguars are distributed contiguously throughout the territory. Based on extrapolations, the national estimated average density is 2.2 individuals per 100 km^2 (Jędrzejewski et al., 2018b), but there have not yet been any field studies to measure population densities or trends (Suriname Forest Service, i*n litt*., 2021).

Suriname has a low human population density, with 600,000 inhabitants in about 164,000 km^2, and the territory has large remote areas of tropical forest and uninhabited natural coastal ecosystems which offer suitable habitat conditions for jaguars (Suriname Forest Service, *in litt*., 2021). Fourteen percent of the country is formally protected, and while forest disturbance remains low, there are concerns about increased deforestation due to illegal logging and mining (Verheij, 2019). Protected areas like the Brinckheuvel Nature Reserve and Brownsberg Nature Park, where it is illegal to hunt or collect natural resources, are increasingly threatened by illegal mining (Suriname Forest Service, i*n litt*., 2021). There are no published studies on the threats to jaguars in the country or their impacts on the species, but authorities are aware of the existence of human-jaguar conflict and poaching for illegal trade (Suriname Forest Service, i*n litt*., 2021).

Poaching and Illegal Trade Status

Human-jaguar conflict was described by the Forest Department of Suriname as a longstanding issue, documented to happen in the country for at least the past 40 years. Currently, it takes place in the outskirts of Paramaribo, and the districts of Saramacca (Larecoweg and Wayamboweg area), Wanica (Lelydorp and Reeberg) and Commewijne (Meerzorg – Peperpot) (Suriname Forest Service, *in litt*., 2021). In a small sample size survey of rural communities in Suriname, conflict between humans and jaguars due to livestock depredation was detected in six districts of the country, and jaguar poaching was characterized as a common response to livestock depredation by 71% (out of 14) interviewees, especially in Sipilawini district (Reulen, *in litt.*, 2020).

As with other jaguar range countries, jaguar poaching and illegal trade in Suriname has a cultural and traditional side, and poachers who encounter jaguars by chance, and their communities, use jaguar body parts for medicinal, nutritional, subsistence and decorative purposes (Kerman and Felix, 2010). Jaguars poached due to livestock depredation are locally consumed or sold. Reulen, (2020) found that most opportunistic encounters between poachers and jaguars resulted in the illegal sale of jaguar body parts (as reported by 10 interviewees), and half of the transactions involved buyers of Chinese descent.

As confirmed by the authorities, the demand for illegally traded jaguar body parts includes individuals from the Chinese diaspora in the country, who have been purchasing jaguar body parts for decorative (teeth), nutritional (meat), and medicinal (paste) purposes (Kerman and Felix, 2010; Suriname Forest Service, i*n litt*., 2021). Government reports and published investigations cited by the authorities have shown that jaguars are poached near logging concessions or illegal gold mines, in areas like Apoera,

by nationals and foreigners (Brazilians, Chinese, Koreans, Guyanese, Cubans and Indians) employed in this illegal sector (mining), and then transported by road to shops owned by jaguar consumers of Chinese decent in Paramaribo, who process the bodies for several days to produce jaguar paste. Pots of jaguar paste are later sold between circles of friends or family, or allegedly taken to China by those visiting relatives in the country (Lemieux and Bruschi, 2019). The same investigations mentioned that the illegal trade in jaguars in Suriname is somewhat organized, occurring opportunistically and also by order, and authorities have conducted enforcement investigations and arrested people who have used social media to boast illegal jaguar trophies and to illegally sell jaguar body parts (Suriname Forest Service, *in litt*., 2021). There have been at least five registered attempts to illegally sell jaguar teeth online (Suriname Forest Service, *in litt*., 2021), but there was no verifiable evidence of illegal online trade in jaguar paste (Polisar et al., *in litt.*, 2020). There have been three seizures at airports in Suriname, suggesting international illegal trade, all related to jaguar teeth rather than paste (Suriname Forest Service, *in litt*., 2021).

Protections against Poaching and Illegal Trade

According to the Suriname Forest Department, jaguars have been protected in the country since 2003, when their status was changed from game species with an all year closed season to a fully protected species, through the Game Resolution S.B. 2002 No. 116. In accordance with Suriname's Game Law (1954), poaching, buying, transporting, or possessing prohibited species or their derivatives is punishable by the Law on Economic Offenses. Under the this law, violation of environmental laws can qualify as a felony and is subject to a prison sentence of up to six years (Suriname Forest Service, *in litt.*, 2021). Authorities mentioned arresting jaguar traffickers in their response to CITES Notification 055/2000, but there were no details on the criminal processes and sentences. Literature reports have stated that sentences (particularly prison sentences) have not always been carried through, and there are reports of corruption (Bale, 2018a, 2018b; Verheij, 2019b).

As admitted by the Suriname Forest Department, enforcement of the law is limited due to lack of resources to conduct frequent surveillance, including access to vehicles, fuel, and personnel, and authorities rely on partnerships with local communities, game wardens, the police, eco-tourism operators and NGOs to obtain information on jaguar poaching or illegal trade (Suriname Forest Service, *in litt*., 2021). Concerns about the government's enforcement capacity and the lack of law awareness were also mentioned in the literature. Most people who participated in an interview about the illegal trade in jaguars (76% out of 25) knew that poaching jaguars is illegal, but were not aware of any enforcement actions or penalties associated with it (Reulen, *in litt.,* 2020).

Panthera has started a partnership with the Suriname Forest Department, Conservation International and other institutions in the country, to implement the country's first long-term jaguar monitoring system. This system has the explicit goal of understanding jaguar population trends, in order to detect changes in the population due to poaching and the illegal trade (Suriname Forest Service, *in litt*., 2021). Initial piloting of the system has begun, favouring areas where there are known cases of illegal trade and human-jaguar conflict. Since 2019, Conservation International has been collecting information on cases of illegal trade in jaguars based on a network of informants. The NGO has also organized a communication campaign with two Chinese associations in Suriname, and held meetings with religious and tribal leaders, to raise awareness about jaguar protections. Conservation International has signed conservation agreements with communities against poaching, like those in Alalapdu, and is working with the government to implement SMART as a jaguar poaching monitoring strategy. The government has plans to train enforcement and prosecution personnel with the support from the International Fund for Animal Welfare (IFAW), to create agreements with customs, and to increase awareness building at the community level (Suriname Forest Service, *in litt*., 2021). Actions taken to date have already seen an increase in reports of human-jaguar conflict (as an alternative to poaching). A coalition

of NGOs and government authorities have created a National Jaguar Working Group, and are planning the elaboration of a National Action Plan for jaguars.

Venezuela

Factors and Variables	Status
National Population Status	
National classification:	Vulnerable
National distribution:	Widespread and fragmented in country
National abundance:	Uncommon
National population trend:	Reduced and decreasing
Quality of population information:	Outdated or limited scientific (or other reliable) studies
Status of major threats:	Severe
Poaching and Illegal Trade Status	
Presence and recognition of poaching:	Present and large threat
Presence and recognition of illegal trade:	Present and large threat
Geographical pattern:	Ubiquitous
Transboundary:	International
Sophistication:	Somewhat organized
Links to other crimes:	No information
Information quality	Scientific (or other reliable) studies
Protections Against Poaching and Illegal Trade Status	
Laws and regulations:	Not specific to the species
Conservation action plan:	None
Initiatives against poaching:	Existing
Initiatives against illegal trade:	No information
Incentives:	No information

National Population Status

At the national level, the jaguar is classified as a Vulnerable species by the Red List of Fauna of Venezuela (Rodriguez and Rojas-Suarez, 2008). However, populations north of the Meta-Orinoco Line have been recognized as being at a higher risk of extinction - Endangered (Decree No. 1.485, 11/09/96). Jaguars are distributed throughout most of the national territory of Venezuela, in about 70% of their original range (Jędrzejewski et al., 2017a). The most abundant subpopulation is found in the south of the country, in the Apure, Bolivar and Amazonas states (Jedrzejewski et al., 2011). Other subpopulations can be found in the north east, in the Orinoco Delta up to Paria Peninsula, and in the north west, with isolated and small populations remaining in the Perija and La Costa mountain ranges and the Andean foothills (Jedrzejewski et al., 2011; Rodriguez and Rojas-Suarez, 2008). Populations in the Amazon and Bolivar states are considered stable, while all others are in decline and may soon disappear (Jedrzejewski et al., 2011; Rodriguez and Rojas-Suarez, 2008). Populations in Trujillo state and in the Turimiquire and Costa mountain ranges have almost entirely disappeared (Jedrzejewski et al., 2011). A study conducted in Hato Pinero ranch in the Venezuelan Llanos resulted in a density of 4.44 ± 1.16 adult jaguars per 100 km^2, and a regional assessment pointed to mean densities of 1.97 (1.49-2.43) individuals per 100 km^2 in the country (Jędrzejewski et al., 2017c). Jaguar population studies in other areas, like south of Lake Maracaibo are currently underway, but densities have not yet been published (Mawad, 2020).

Jaguars are threatened with the expansion of human settlements and infrastructure, particularly in the northern parts of their range where populations are already reduced (Jedrzejewski et al., 2011). Jaguars are also commonly poached in retaliation for livestock depredation, and suffer from intensive hunting of their prey (Jedrzejewski et al., 2011). A study looking at jaguar extirpations in Venezuela found that jaguar occurrence is strongly associated with high humidity and environmental productivity, and with low values of human density, ideally below eight people per km^2. Deforestation and poaching pressures make jaguars susceptible to local extirpation, particularly in drier and less productive areas containing less prey (Jędrzejewski et al., 2017a). Additionally, the appearance of skin

lesions in photographed jaguars south of lake Maracaibo and low fertility rates may indicate genetic isolation and inbreeding (Mawad, 2020).

Poaching and Illegal Trade Status

Venezuela is one of the few countries with a country-wide assessment of jaguar poaching and illegal use of jaguar specimens carried out by researchers. From 2009 to 2015, Jędrzejewski et al., (2017b) conducted a large scale survey in rural localities across the country, collecting data on incidences of human-jaguar conflict and jaguar poaching through 485 interviews. They found that there had been at least 22 jaguar attacks on humans, 387 livestock depredation events, and 539 jaguars poached by humans (of which 57% occurred between 2001-2014). Subsistence uses and the illegal trade were the main reasons for poaching jaguars (51.7% out 522 poaching events with a known cause), followed by retaliation due to livestock depredation (38.5%). Subsistence/commercial poaching in general was more frequent and widespread than retaliatory killing (occurring in 85% of the jaguar range in the country), but retaliatory killing appeared to be more detrimental because it is targeted and specialized, and it occurs in areas where jaguars are highly threatened. Jaguar body parts were extracted most of the times (regardless of poaching motivation) for personal use or selling. The authors reported that it was very difficult to distinguish commercial from subsistence poaching, due to their interrelatedness and the similar uses that are given to body parts. The same lead author of that study reported that selling jaguar skins is common in Venezuela, and that there are people from urban areas who are in the business of buying jaguars skins from poachers, as well as buyers of Chinese descent who are interested in the whole carcass and bones for the production of medicine (Jedrzejewski et al., 2011). Although this finding was not publicised when it was first mentioned in 2011, nor has it been further explored, it provides some indication that the production of jaguar paste may be taking place in Venezuela, and for a longer period than expected.

Aside from the comprehensive work carried out by Jędrzejewski et al., (2017b), there were not many more cases of jaguar poaching or trade reported in the literature for Venezuela. Project Sebraba, an organization working south of Lake Maracaibo, has also reported the use of jaguar body parts as part of religious rituals associated with santeria, but the scale or impacts of these uses are not described (Mawad, 2020). Seizure data from the UNODC's (World WISE Database), contained few seizure incidents and specimens (both less than 5) that had Venezuela as the source country in the past 10 years, including China and the United States as destinations. However, illegal trade in jaguar body parts in Venezuela appears to be largely domestic and somewhat organized.

Protections against Poaching and Illegal Trade

Venezuela has a Law for the Protection Wild Fauna (1970), which sets the regulations for hunting in the country, and the protection of rare and endangered species. Through Decree No. 1.485 11/09/96, jaguar hunting was indefinitely banned in the country. However, the aforementioned decree does allow killing of protected species for scientific, control and management purposes only, through the issuing of a hunting license by the National Environmental Authority. Decree No 1.486, 10/10/96, which establishes the official list of species threatened with extinction in Venezuela, includes the jaguar and further stresses that hunting is only allowed for scientific and management purposes. As a protected species, any other unauthorized jaguar hunting is forbidden by law. The Environmental Penal Law (Gaceta Oficial de la República Bolivariana de Venezuela N° 39.913 del 02 de mayo de 2012), makes offenses against natural resources and the environment a crime, and imposes criminal penalties. In its article 77 on Illegal Fishing and Hunting, it contemplates penalties of imprisonment or a fine for: "Whoever practices fishing or hunting of specimens of wild fauna, or trades in forbidden specimens or populations of vulnerable, threatened or endangered species, or non-threatened populations which become threatened due to exploitation, in whichever area of the perpetration".

Venezuela does not have a national jaguar conservation plan, but some specific locations have their own jaguar management plans, such as El Baul (Cojedes state), Hato Pinero, and the Mataclara Private Reserve (Rodriguez and Rojas-Suarez, 2008).

Proyecto Sebraba, in partnership with IUCN Netherlands, have launched Operation Jaguar in Venezuela, to understand the threats to jaguars south of Lake Maracaibo, including those related with poaching and illegal trade. They are also monitoring jaguar populations in the area, working with local communities to build awareness about jaguar conservation, and with local governments to build forest corridors and prevent genetic isolation. However, it is uncertain whether there are any specific projects aiming to reduce jaguar poaching in Venezuela beyond monitoring threats. Similarly, this study found no information on enforcement capacity or national initiatives to conserve the species.