BIOAMAZON NEWSLETTER

BIOAMAZON PROJECT
Conservation of species threatened by unsustainable trade

ACTO
Amazon Cooperation Treaty Organization

ISSUE N.7, JANUARY-FEBRUARY 2021

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Cyrtochilum macranthum

Ecuador generates a proposal to strengthen the orchid value chain in the Amazon region (Napo, Morona Santiago and Zamora Chinchipe)

This is the Bioamazon Project Newsletter, of the Amazon Cooperation Treaty Organization (ACTO). It is published every two months to disseminate the actions and results of the Project and its partners.

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Dear Readers,

The last twelve months have been difficult for everyone, mainly due to the pandemic and its effects. But in challenging times we must seek the courage and strength to keep working.

In this 2021, with more experience, we kept hope, because we are here for a greater good, which is the Amazon Region, its nature and its inhabitants, who inspire us to continue working with the Member Countries to better take advantage of opportunities, having sustainable development as north ... The Amazon deserves it!

In this first edition of the year of the Bioamazon Newsletter, we are pleased to share the achievements of the project in its execution in 2020, such as the progress of the Amazon Regional Observatory. In the Amazon Countries section, we provide technical papers and notes on studies carried out by partner institutions, with the support of ACTO, on the region's advances in protecting paiche, cedar and other wild species. We also recall our commitment to celebrate World Wildlife Day 2021, which is commemorated on March 3, under the theme "Forests and Livelihoods: Sustaining People and Planet".

We wish you all a great 2021, with health and hope.

Warm regards,

María Alexandra Moreira López

General Secretary
Amazon Cooperation Treaty Organization (ACTO)

ACTO works with Amazonian countries to develop Regional Plan for Cedar

On March 3, World Wildlife Day, a webinar with the theme "Management of neotropical tree species included in CITES" was held and broadcasted live on the ACTO YouTube channel

The Amazon Cooperation Treaty Organization (ACTO) is carrying out work to support Amazonian countries in conducting studies on the population of different species of the genus Cedrela spp. (Cedar) and to prepare them for the implementation of Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Since August 2020, with the inclusion of this genus in Appendix II of the Convention, all species will have to comply with more export requirements. There are 17 species of the genus Cedrela in the world, 11 of which occur in the Amazon Region.

The next step in supporting the Amazonian countries is the development of a Regional Plan for Cedar, which will allow to develop a joint vision of the situation of this arboreal genus in the Amazonian region and, thus, to coordinate the efforts so that the exploitation and exportation of this forest resource do not compromise the survival of species in the wild.

Cedar is a tree that can reach 40 meters in height in the middle of the forest, and is highly sought after for the processing and sale of timber whose characteristics of high resistance and brightness make this forest resource quite explored and exported.

2021 World Wildlife Day

"Forests and livelihoods: Sustaining People and Planet" is the theme of this year's World Wildlife Day, celebrated on March 3rd.

As part of the recognition of the importance of forests for people's lives, ACTO, through the Bioamazon Project, the Peruvian Ministry of the Environment, the CITES Scientific Authority - Peru, and the CITES Secretariat's Neotropical Trees Working Group from CITES hosted the international webinar "Management of Neotropical tree species included in CITES".

The webinar was broadcasted to the public on the ACTO YouTube channel on Wednesday, March 3rd, and the work teams of the Amazonian countries discussed a Regional Plan for Cedro.

A first Regional Workshop on Non-detriment findings (DENP) was promoted by ACTO, in November 2020, with over ninety participants, when the methodological basis for the formulation of DENP for timber species in CITES Annex II was presented. The Non-detriment findings are essential requirements for international trade.

In addition to the workshop, a consultancy specialized in DENP hired by the Bioamazon Project, held bilateral meetings with each ACTO´s Member Countries in order to clarify doubts and detail the situation and needs of the Amazonian countries to adapt to the new requirements for international trade of species of the genus Cedrela.

Strengthening the capacities of the CITES´s Administrative and Scientific Authorities and the Forest Authorities of ACTO Member Countries - Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela - is a step towards reaching a regional vision on the exploitation of cedar in the Amazon.

"It is essential to build, through cooperation with the Amazonian countries, the regional vision for the conservation of this forest resource so that its exploitation is carried out in a sustainable manner throughout the biome. In this way, the different cedar species can, at the same time, serve the region's economy and prevail as wild species in the Amazon", said Mauro Ruffino, coordinator of the Bioamazon Project.

Development of the Amazon Regional Observatory has begun

Providing information about the Amazon is one of the primary objectives of the Amazon Cooperation Treaty Organization

The process of selecting and contracting companies to develop the Amazon Regional Observatory (ARO) was completed in December 2020 and activities are already underway.

Two companies were selected. The first - **INGENIOSIG Cía. Ltda. from Ecuador** - is responsible for the development and implementation of the ARO and publication through the ACTO website, with its different modules operable with their functionalities, including the collection, interoperability and loading of pre-existing information and available from official sources of the ACTO Member Countries and also from other sources. The company **IQUITOS PLAY SRL, from Peru**, is responsible for developing and putting into operation the thematic module CITES with all its functionalities, and publishing on the Observatory.

Both works are part of the activities of Component 1 - National and regional information and knowledge management systems - of the Bioamazon Project. This component aims to improve and balance the level of information and knowledge management by supporting and strengthening the information systems on Biodiversity and CITES of ACTO Member Countries, as well as information management by the ACTO Permanent Secretariat.

Context

ACTO Member Countries have been generating qualitative and quantitative information in different areas (forests, water resources, species of flora and fauna threatened with extinction, among others); however, this information has not yet been articulated and made available regionally. Thus, the implementation of the Amazon Regional Observatory has been prioritized by PS/ACTO as a space for articulation in different areas of information in the Amazonian countries.

The forecast is that the final products of the consultancies will be completed by the end of July 2021.

ACTO strengthens government institutions in Amazonian countries with equipment and technical studies

Financial cooperation is carried out within the scope of the Bioamazon Project, which is funded by the German Development Bank (KFW). Amazon Cooperation Treaty Organization (ACTO) aims to reduce asymmetries between countries and strengthen environmental conservation in Amazonian countries.

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Throughout 2020, the ACTO allocated USD 1,850,802.07 for purchase of equipment for government institutions in the eight Amazonian countries. This is a way of contributing to the improvement of the institutions' infrastructure and equipment in order to strengthen the information systems and knowledge management of countries for nature conservation, especially in the Amazon region.

Countries benefited from acquisitions to support research such as laboratory equipment - microscopes, freezers, deep freezers, refrigerators, electric generators, solar panels and sliding files to protect scientific samples. For operation in the field, drones, cameras, camera traps, GPS and, in some cases, small boats were purchased. The acquisition of Information Technology equipment such as servers, routers, computers, laptops, printers, scanners, as well as air conditioning and humidifiers was also financed.

Bolivia received equipment to strengthen its workshops for monitoring species protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The Bolivia´s National Museum of Natural History will also benefit from portable and office computers and equipment such as scanners, printers, photocopiers, cameras, projectors, TVs, drones, among others.

In Brazil, an example of a benefited institution is the Forest Products Laboratory, of the Brazilian Forest Service, which now has an electron microscope and a high-tech stereomicroscope. The new equipment is assisting the Forest Products Laboratory team in conducting research and developing a traceability system for Brazilian wood species.

In **Colombia**, the Sinchi Institute benefited, in particular the Laboratory of Geographic Information Systems and Remote Sensors. One of the most important equipment acquired was a robust server that will support the processing and generation of data for Environmental and Biodiversity Monitoring in the Colombian Amazon region. Equipment was also purchased to improve the storage and dissemination of fauna information through the SIB-Colombia Biodiversity Information System and the Sinchi Institute website.

In the case of **Suriname**, the monitoring of forests in the Amazon region, where there are challenges with the lack of adequate infrastructure to reach these areas, has been carried out with the support of a drone. Computer equipment has also been delivered to support nature conservation activities in the country.

In **Peru**, the Ministry of the Environment (MINAM) benefited from the purchase of a drone, laptop and GPS equipment for field actions. As for the Ministry of Production

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(PRODUCE) and the National Forestry and Wildlife Service (SERFOR), equipment was purchased to strengthen their traceability systems.

Technical support

In addition to the equipment, the Bioamazon Project is supporting countries in hiring technical consultancies to:

i) development and improvement of national and regional information systems on biodiversity and CITES species through the implementation of the Amazon Regional Observatory (ARO);

ii) development, improvement of electronic systems for issuing CITES licenses; and

iii) carrying out studies on Amazonian flora and fauna, in particular on species threatened by trade and which are protected under the Convention on International Trade in Endangered Species of Fauna and Flora (CITES), for the development of management and protection systems, traceability of these species in the eight Amazonian countries, which are signatories to the Convention.

The dynamics and evolution of the international ornamental market for freshwater rays; a diagnosis of the local management of Yellow-spotted River Turtle (*Podocnemis unifilis*) in the department of Loreto, Peru; diagnosis of Amazonian orchids in Ecuador and compliance with CITES rules for Cedro (Cedrela spp.), a species recently included in Appendix II of this convention, are some examples of studies that have been developed in Amazonian countries with the support of ACTO through of the Bioamazon Project.

In 2020, ACTO generated 134 new jobs in short-term consultancies in Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela. The total amount of disbursements for the works being performed through 62 consultancy contracts reaches USD 1,688,195.22, with payments expected until the first half of 2021.

The distribution of consultancy contracts by country was 06 in Bolivia, involving 22 people; 10 signed in Brazil, involving the work of 19 people; 01 contract in Colombia benefiting 1 person, and 05 in Ecuador benefiting 12 people. In Guyana there were 07 contracts, benefiting 15 people; in Peru, there are 17 contracts involving 29 people; and 03 contracts in Suriname, generating 7 jobs. Finally, in Venezuela, 2 contracts were signed, involving 2 people. The Executing Unit had 11 contracts signed, which generated 27 job positions.

According to the coordinator of the Bioamazon Project, Mauro Ruffino, the Covid-19 pandemic strongly affected all Amazonian countries and people. However, the Bioamazon Project and partner institutions in the countries adapted to the emergency situation and continued to carry out the work, even with limitations and remotely. “It was an atypical and difficult year, but we were not inactive and we managed to promote the necessary advances, equipping the institutions and developing the consultancies. The efficiency in management and the achievement of the goals allowed the extension of the Project’s execution period until the end of 2022”, said Ruffino.

Bolivia

Delivery of Equipment for the to the National Museum of Natural History of Bolivia

Author: Ministry of Environment and Water (MMAyA)

The Amazon Cooperation Treaty Organization (ACTO), within the framework of the Regional Project for the Management, Monitoring and Control of Wild Fauna and Flora Species Threatened by Trade (Bioamazon Project) has been supporting the strengthening of national information systems and knowledge management of the Plurinational State of Bolivia.

The National Museum of Natural History, under the supervision of the Ministry of the Environment and Water, is a public scientific institution that conducts permanent research on biodiversity in the country and in the management of this information. Additionally, the Museum is a CITES Scientific Authority and is an important tool for the Ministry of the Environment and Water in providing information and having the support of technical scientists to assist in decision-making.

As part of Component 1 of the Project, National and regional information and knowledge management systems, ACTO has financed the purchase of equipment for the National Museum of Natural History (MNHN), an investment that amounts to a total of US $ 60,910.00 (423,934.00 bolivianos).

On December 23, 2020, 47 multiple pieces of equipment were delivered to the Museum by the Vice Minister of Environment, Biodiversity, Climate Change and Forest Management and Development, M. Sc. Ing. Magín Herrera López and the General Director of Biodiversity and Protected Areas Enzo Aliaga Rossel PhD. This equipment will be of great help for the Museum in: i) the generation and constant complementation of biodiversity information through field work; ii) contribute to the renewal of equipment and improve the registration / documentation of information and support the work of researchers, iii) disseminate the information generated through its media and Environmental Education and iv) strengthen the Museum's information system and its databases.

The authority also visited the facilities of the MNHN and the collections of paleontology, flora (National Herbarium of Bolivia) and fauna (Bolivian Fauna Collection), collections of great national and international renown.

Finally, the Executive Director General a.i. of the Museum, Hugo Aranibar Rojas, thanked the Ministry of the Environment and Water and the ACTO for the equipment received and for the willingness to work together on future projects.

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Photo 1. Deputy Minister of Environment, Biodiversity, Climate Change and Forest Management and Development, M.Sc. Ing. Magín Herrera López, hands over the drone to the director of the National Museum of Natural History-MNHN, Lic. Hugo Aranibar Rojas.

Photo 2. The Director General of Biodiversity and Protected Areas, PhD. Enzo Aliaga Rossel, formally delivers the 47 equipments to the MNHN as part of the Bioamazon Project co-financed by OTCA and the KfW of the German Government.

Photo 3. The Vice Minister, visiting the National Herbarium of Bolivia, the result of an agreement with the MNHN and the Universidad Mayor de San Andrés.

Photo 4. Vice Minister of Environment, Biodiversity, Climate Change and Forest Management and Development, M.Sc. Ing. Magín Herrera López visits facilities of the MNHN Paleontology Unit.

Photo 5. The Vice Minister Ing. Magín Herrera López visiting the Bolivian Fauna Collection, the result of an agreement with the MNHN and the Universidad Mayor de San Andrés.

Brazil

Traceability of arapaima: a necessity to protect the species

System is being developed in Brazil with support from ACTO

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The Amazon Cooperation Treaty Organization (ACTO) is supporting Brazil in the development of a traceability system for Arapaima gigas meat and skin. The cooperation, with financing from KfW, is done through the Bioamazon Project, the Brazilian Institute of Environment and Renewable Resources (Ibama) and contracted consultancy. The objective of having a traceability system for the meat and skin of arapaima is precisely to certify that these by-products of arapaima have a sustainable origin, respecting a quota annually authorized by Ibama for the management of the species. It will be a management tool of Ibama that will increase the guarantee of origin favoring the commercialization by the arapaima managers in natural environments.

Traceability is a fundamental condition for guaranteeing the origin of products, monitoring the production chain, access to new markets and raising awareness among consumers about the importance of sustainable management of arapaima. The largest freshwater scaly fish in the world is very appreciated and consumed by

Amazonian populations, which have in this species an important source of protein. It is a fish also exported to other states of Brazil and countries, and present in refined dishes of gastronomy.

Arapaima is a commercial species, used in commercial and sport fishing, in aquarium keeping and fish farming. Castello & Stewart (2010) report that the main threat to the species is overfishing and habitat degradation.

The International Union for Conservation of Nature (IUCN) classifies Arapaima gigas with insufficient data (Data Deficient). The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) lists arapaima in Appendix II and confirms that there are no known data for both wild and captive populations. For the genus Arapaima there are records of occurrence for Brazil - Amazon basin and its tributaries and also for the Araguaia and Tocantins river basin. In addition, the taxon occurs in neighboring countries such as Peru, Colombia, Ecuador, Bolivia (where the species was introduced), and Guyana, in the Essequibo River basin (Castello & Stewart 2010; Goulding et al., 2003).

In international trade, Brazil is the main exporter and Japan is the main importer. The Convention informs in its CITES Identification Manual entries for Arapaima gigas that 442 live specimens and 25 units were reported by CITES Parties from 1979 to 1982. In the last 10 years, mainly arapaima skins have been exported by Brazil to international trade - around 22,752 units of tanned skin from authorized management in the State of Amazonas - and 33,931.5 kg of arapaima meat from aquaculture. The main importing country was the United States, followed by Mexico. (SISCITES/IBAMA 2021).

Participative Process

The development of the traceability system concept for arapaima is being carried out with consultations with Ibama, focusing on the state of Amazonas (Brazil). The EITA Cooperative, a consultancy firm hired to elaborate the traceability system proposal, first conducted a stage of interviews with advisors from Arapaima Management Units and cultivation / fish farming, representatives of slaughterhouses and tanneries and public managers from the state government of Amazonas. In all there were 13 interviews that allowed the mapping of the production chain of arapaima and the flows of inspection data. The interviews were held in July 2020.

Information gathering activities were also carried out and the collective construction of the Arapaima Traceability System proposal with nine IBAMA staff members from the General Coordination for Monitoring the Use of Biodiversity and Foreign Trade and the Local Core of IBAMA in Amazonas. In IBAMA's case, the survey of information with environmental analysts and coordinators provided a better understanding of the context of arapaima management and workflows for monitoring the production chain.

Development

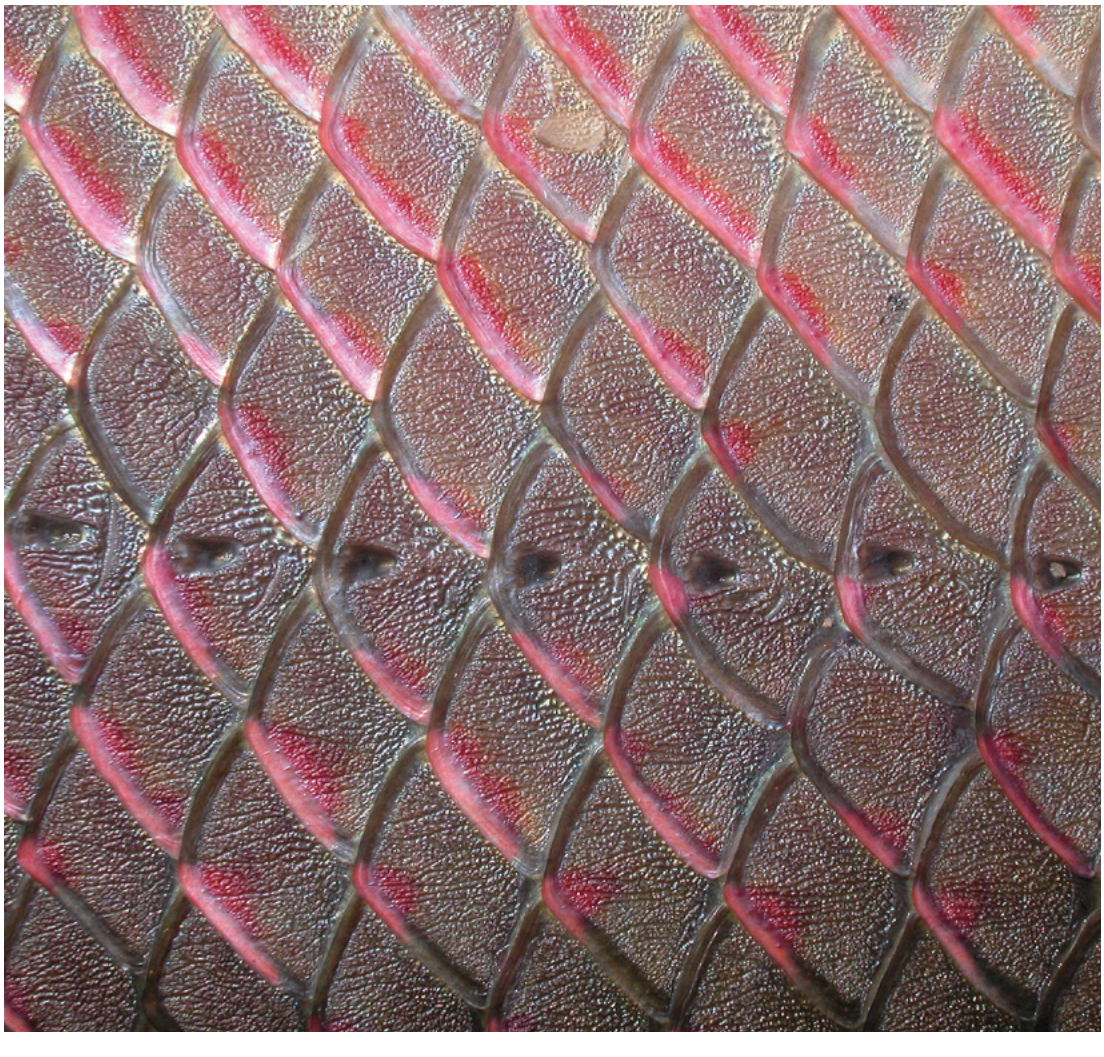
The current moment is dedicated to Ibama's analysis of the concept, requirements and data model of the arapaima traceability system proposal elaborated by the

consultancy based on the interactions with Ibama and other productive chain actors. The process of elaboration of the proposal indicated the need of adjustments in regulations required for the management of the species for the beginning of the use of the system by the productive chain, once it will be obligatory the register of information in the system for social groups that manage arapaima, brokers, slaughterhouses and tanneries.

At a later stage, in future hiring of consultants, will be the development stage of the system proposal. It will be in this stage of development that tests will take place next to the segments involved in the productive chain.

The strategic objectives of this work are to increase the efficiency and control of IBAMA's administrative flows, to qualify the monitoring and inspection of the stages and to allow the traceability of the production chain, from the exporter to the community or cultivation.

In the opinion of the Bioamazon project coordinator, Mauro Ruffino, this partnership between ACTO and Ibama is an opportunity to expand the monitoring of the use of arapaima with a view to strengthening the sustainability and viability of the species in nature. "This typically Amazonian species with restricted distribution still needs to be better studied and protected. We cannot measure efforts to guarantee, at the same time, its existence as a wild species in nature and also an adequate and monitored use", he commented.



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Colombia

Monitoring of wildlife destined for consumption in Estrella Fluvial de Inírida EFI, Colombia

The EFI, which was designated a RAMSAR site in 2014

Author: Sinchi Institute

In the Colombian Amazon, as in the Pan-Amazon region, local communities, especially indigenous communities, have a close relationship with wildlife, not only because it is an important source of protein for their diet, but also because of its role in their different cultures, myths and rituals. Given the importance of wildlife and the concern of local communities to know the status of this resource, the Sinchi Institute, together with 24 indigenous and peasant communities of Estrella Fluvial Inírida, has been monitoring the species of fauna that are part of their diet.

Estrella Fluvial de Inírida (EFI) is a wetland complex formed by the confluence of the lower basins of the Inírida, Guaviare and Atabapo rivers, and the influence of the Ventuari River from the State of Amazonas in Venezuela. The EFI, which was designated a RAMSAR site in 2014, is located in the east of the Colombian Amazon, northeast of the department of Guainía and southeast of the department of Vichada, and covers an area of 253,000 ha (Figure 1).

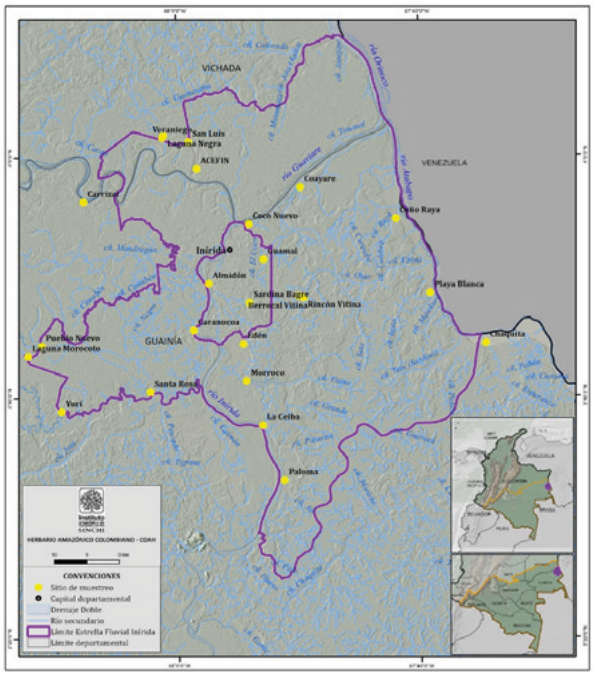

Figure 1. Location of Estrella Fluvial de Inírida (EFI) and the 24 communities participating in the monitoring of consumer fauna.

With the support of the GEF Forest Conservation and Sustainability Program in the Heart of the Amazon and partner entities, the Ministry of Environment and Sustainable Development of Colombia and the Corporation for the Sustainable Development of the Northern and Eastern Amazon (CDA), local researchers from the 24 communities present in the EFI, belonging to the Curripaco, Puinave, Piapoco, Sikuani, Cubeo, Tucano and peasant ethnic groups, and their representative bodies, the Corporación Mesa Ramsar Estrella Fluvial Inírida and the Asociación de Campesinos de la Estrella Fluvial Inírida (ACEFIN), have recorded data on fauna exploitation in the territory for 11 continuous months. This follow-up is technically supported by the Sinchi Institute, for which it has also received equipment support from the Regional Project for the Management, Monitoring and Control of Wild Fauna and Flora Species Threatened by Trade (Bioamazon Project) executed by the Permanent Secretariat of the Amazon Cooperation Treaty Organization (PS/ACTO) and financed by the German Development Bank (KfW).

To date, the consumption of 58 species of fauna has been documented: 26 mammal, 17 bird, 11 reptile, 3 insect and 1 amphibian species. Of the species used for consumption in Estrella Fluvial de Inírida (EFI), 25 are included in the CITES appendices: 3 in appendix I and 22 in appendix II. During this period, half of the prey captured corresponded to CITES species, mostly from Appendix II, which represent 65% of the biomass harvested and include six of the species most used by the communities (*Peltocephalus dumerilianus, Podocnemis erythrocephala, Caiman crocodylus, Tayassu pecari, Paleosuchus sp.* and *Tapirus terrestris*) (Figure 2).

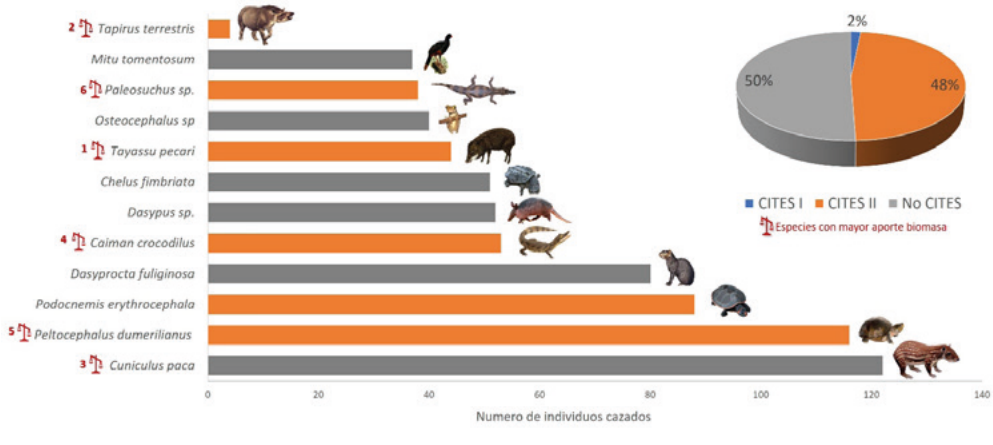

Figure 2. Volumes of use of fauna for consumption and percentage of CITES species used by the communities that are part of Estrella Fluvial de Inírida (EFI).

ERegarding the destination of the hunt, the communities of EFI use the hunt mainly for consumption (79%) and only 14% of the catch is marketed locally, either in its entirety or a portion of the prey. Of the total number of commercialization events, 60% correspond to CITES species such as turtles (*Peltocephalus dumerilianus* ey *Podocnemis erythrocephala*) and cachirres (*Caiman crocodylus* and *Paleosuchus sp.*) (Figure 3).

It is important to note that trade is developed **at a local level**, there are no records of transboundary trade, and in many cases it occurs within the same communities where the animals are captured. In this sense, this study does not address international

trade issues that are the strict object of the CITES Convention, however, it provides elements for the sustainable use and conservation of species, both species included in the Appendices and those that are not part of them.

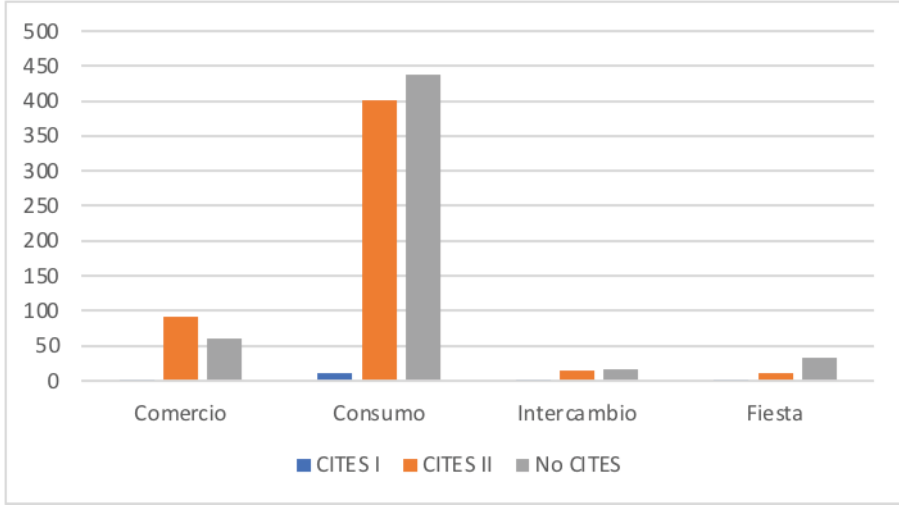

Figure 3. Consumption and local trade of CITES species in Estrella Fluvial de Inírida (EFI).

The most important species in the subsistence of the communities is the paca (*Cuniculus paca*), a NON-CITES species, which is the most important both in terms of consumption and trade within the communities. This monitoring revealed that the use of fauna, both CITES and non-CITES species, shows differences within Estrella Fluvial de Inírida (EFI) and it is possible that these differences are related to the availability of fauna at the level of each sector or basin; some examples are shown in Figure 4.

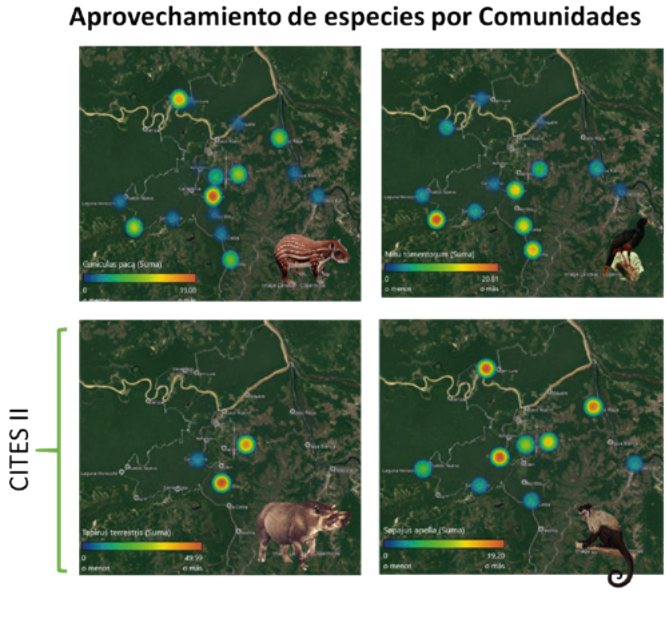

Figure 4. Levels of utilization by community for some species of fauna in Estrella Fluvial de Inírida (EFI). Above NON-CITES species, left: Paca (*Cuniculus paca*) and right: Paujil (*Mitu tomentosum*). Below species included in CITES Appendix II, left: Tapir (*Tapirus terrestris*) and right: Maicero monkey (*Sapajus apella*).

To better understand the sustainability of use, this year we began estimating the availability (abundance) of harvested species, implementing photo-trapping methodologies and line transect counts focused on terrestrial species. For species with aquatic habits, protocols are being designed and tested to enable community records to be made to establish the abundance of important species such as turtles and alligators. The purpose of all this is to have information that will allow us to review, adjust and propose management measures that guarantee the sustainability of the wild populations and also the food security and sovereignty of the communities.

Collection and recording of data for monitoring wildlife for consumption in Estrella Fluvial de Inírida EFI, Colombia.

Ecuador

Ecuador generates a proposal to strengthen the orchid value chain in the Amazon region (Napo, Morona Santiago and Zamora Chinchipe)

Authors: María Alejandra Gallardo; Germán Esteban Trujillo; Renato Ismael Jaramillo and José Luis Rodríguez.

MAG & PARTNERS Consultores y Asesores GPCA S.A>

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Cyrtochilum macranthum

ABSTRACT*: The proposal to strengthen the orchid value chain in Ecuador is based on a situational diagnosis based on a territorial development approach, identifying how all the actors interact to integrate the value chain, and the existing restrictions and strengths in the three provinces that are the subject of this study. Meanwhile, the gathering of information on productive initiatives already generated in the territory was complemented with a market study of orchid products, sub-products and services and their derivatives. At the same time, strategies were determined to improve the living conditions of local orchid producers through a business*

plan with their respective value proposition, commercialization, profitability and sustainable management of orchid production in these Amazonian areas. Considering that the implementation of a business plan also implies improving the capacities and empowerment of local producers, a strengthening plan is designed based on the situational diagnosis with a territorial approach that contributes to the implementation of endogenous strategies, taking advantage of the use of orchids to improve the economy of the families linked to this activity.

KEYWORDS*: Orchids; conservation; sustainable management; in vitro propagation, productive chain, associativity, biotrade; Ecuador; Amazon; value chain; Napo; Morona Santiago; Zamora Chinchipe; orchid route; Bioamazon Project; Ministry of Environment and Water; biodiversity.*

Orchids, because of their beauty[1] and elegance, are the oldest and most valued plants in the world, with an estimated 25 to 35 thousand species and occur in all continents. These plants belonging to the Orchidaceae family whose origin dates back 65 million years, have a wide presence in the Ecuadorian territory at the level of all provinces and regions of the country, a factor that has allowed the country to be classified as mega diverse (Ministry of Tourism, 2013).

En el Ecuador habita el 14% de orquídeas del mundo y están presentes 4 de las 5 subfamilias existentes a nivel mundial, 20 tribus, 30 sub-tribus, 273 géneros, 4.032 especies clasificadas y publicadas, 1.714 especies endémicas y al menos 400 especies en proceso de estudio y consiguiente descripción (Ministerio de Turismo del Ecuador 2018).

Ecuador is home to 14% of the world's orchids and 4 of the 5 existing subfamilies worldwide, 20 tribes, 30 sub-tribes, 273 genera, 4,032 classified and published species, 1,714 endemic species and at least 400 species in the process of study and consequent description are present (Ministry of Tourism of Ecuador 2018).

1 considered one of the most attractive flowers due to its particular shape and vibrant colors.

This sector shows the capacity to generate integration, not only in economic, commercial and productive aspects, but also in environmental, social, tourism and cultural aspects. The great variety of orchids present in Ecuador is due to its geographic location with a wide variation of climatic zones, microclimates and habitats that have been used for production and commercialization in the national and international markets.

This assessment was carried out by the consulting firm MAG & PARTNERS, contracted by the Regional Project for Management, Monitoring and Control of Fauna and Flora Species Threatened by Trade (Bioamazon Project) implemented by the Permanent Secretariat of the Amazon Cooperation Treaty Organization (PS/ACTO) with financial support from the German Development Bank (KfW) and at the request of the Ministry of Environment and Water (MAAE) of Ecuador.

THE ORCHID MARKET IN ECUADOR

The information reported by the Central Bank of Ecuador corresponding to the participation in the foreign trade of orchids, through the tariff subheadings 0603130000 "Orchids" and 060290100 "Orchids including rooted cuttings"

(Figure 1), determines that in the last 5 years Ecuador has specialized in exporting orchids in vitro in the process of growth, not in products ready for sale to the end user.

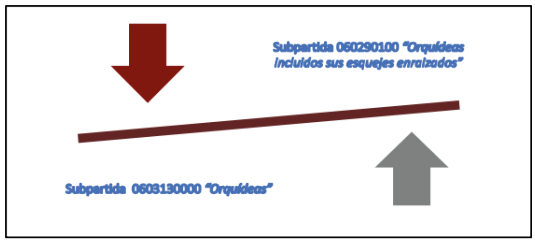

Figure 1. Tariff subheadings. Source: Central Bank of Ecuador. Prepared by: MAG & PARTNERS.

Exports of Orchids, including their rooted cuttings are large and steady in terms of export revenue, and from 2016 to 2019 their main destinations were the United States, Germany and Singapore. And according to the CITES Database (https://trade.cites.org/), these first two countries also lead the international orchid market in terms of imports.

In Latin America, for the cumulative period from 2016 to 2019, Costa Rica cumulatively leads the region's exports, followed by Brazil and Ecuador in terms of units exported (Figure 2).

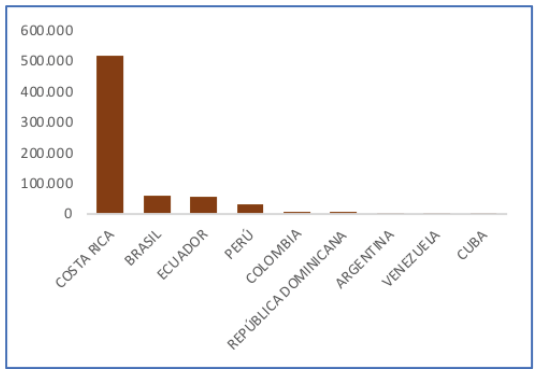

Figure 2. Main orchid exporting countries in Latin America (units). Source: CITES Database. Prepared by: MAG & PARTNERS.

As part of the analysis carried out, it was identified that the main player in Ecuadorian orchid exports is the company *Géneros Ecuatorianos Ecuagenera Cía. Ltda.*, which with 30 years of experience has achieved important competitive and comparative advantages, positioning itself as one of the main players in the international market. On the other hand, based on the information gathered in the territory, the orchid value chain was established, which is made up of the following links (Figure 3): Inputs where you can find suppliers of propagation material, agrochemicals, fertilizers, growing media, biostimulants, seeds and other necessary materials, Production whose link is led by *Géneros Ecuatorianos Ecuagenera Cía. Ltda.*; Distribution where it became evident that small producers market their products, both plants and cut flowers, to tourists or collectors who visit them in their homes and nurseries without having traceability logistics to the final consumer.

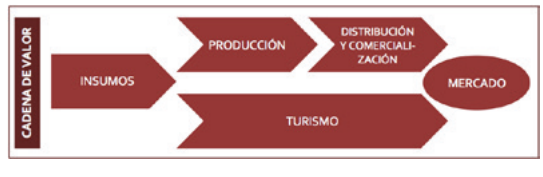

Figure 3. Orchid value chain. Prepared by: MAG & PARTNERS..

In the orchid market, tourism stands out as a particular element, considered as a transversal link, since those who demand this service like to see it from the production phase to the commercialization of the products.

ORCHID GROWERS' PROBLEMS

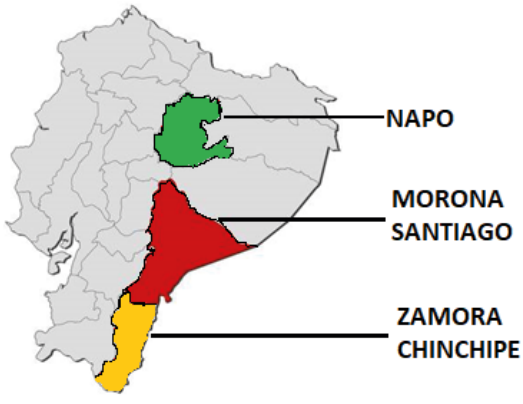

Figure 4. Geographical location of the three provinces in this study.

The needs and behaviors of orchid producers in the three Amazonian provinces of Ecuador (Figure 4) where the study is focused show a significant barrier to entry for new actors and competitors, and there is also a low level of rivalry in the sector, due to the fact that it is led by the company *Géneros Ecuatorianos Ecuagenera Cía. Ltda*, which has a wide learning curve over all the links of the chain, generating a total forward and backward integration, with an important participation in international trade. In addition, there are small local orchid growers, most of whom are involved in an activity adopted for entertainment, in which their passion, time and resources are used for the maintenance and conservation of orchids outside their natural habitat, where the commercialization of these species is not the main activity for obtaining family income. On the other hand, the local communities themselves promote community development through tourism initiatives based on orchids and focused on conservation, observing great market opportunities at the local level and generating linkages with other activities in each of the provinces.

On the other hand, the bargaining power of both buyers and suppliers is low; for the orchid value chain, there is no specific supplier of specialized inputs for the reproduction of these species that has significant bargaining power. For the legal commercialization of orchids, patents granted by the National Environmental Authority are required. Orchid growers in the three provinces are aware of the current regulations that typify crimes against wild fauna and flora; however, in spite of this, they have decided to remain illegal. This is due to the lack of resources to hire experts to develop certain requirements for obtaining patents, since they see orchid production and commercialization as a complementary source of family income. But, on the other hand, the illegal trafficking of orchids and their sale at low cost and without control is permanent in the markets of these provinces.

There is no evidence of a threat of substitute products, because these species are unique with special characteristics that are aligned to a factor of tastes and preferences on the part of consumers. Rather, the main factors limiting the entry of new competitors into the sector are the lack of: patents, product differentiation, start-up capital, specialized technology, innovation, development and knowledge of the entire orchid in vitro propagation process.

Figure 5. Five Competitive Forces of Orchids. Prepared by: MAG & PARTNERS.

HOW DO WE SOLVE THE PROBLEM?

Business Plan

Based on operating conditions, availability of inputs and territorial characteristics, a mixed-method business proposal is established to take advantage of all available resources, offering products, by-products and services to intermediate and end users, distributing sources of income and reducing costs and investments.

Table 1 – Portfolio of products, by-products and services related to the orchid production chain in Ecuador by 2020.

CODE	PRODUCTS, BY-PRODUCTS AND SERVICES
P001	Seed and Cuttings Production
P002	Substrates
P003	Orchid Plants
SP001	Orchid Flower
SP002	Vanilla
S001	In Vitro Orchid Reproduction
S002	Orchid Acclimatization
S003	Orchid Management Course - "Commercial Purposes".
S004	Visits to growers' nurseries, exhibition sites.

Prepared by: MAG & PARTNERS.

The business model was structured with a maximum operating capacity that a local player can assume based on its economic financing conditions. It should also be noted that the financial viability analysis model assumes possible negative external shocks by establishing variable sales of up to 50% of the estimated sales for the entire period considered for the project. Thus, together with the dynamic operational capacity, the benchmark labor required to produce the products and services was established. This definition was given under the following approach:

Mano de Obra Requerida=Si (Valor<=X;"1 persona trabaja";Si (Valor < =Y;"2 personas trabajan o se asocian";Si (Valor<=Z;"3 personas trabajan o se asocian";0))

As a result of the different financial scenarios, generation of indicators and territorial structural analysis, a comprehensive evaluation of the project was carried out, as well as an analysis for each pre-established product and service.

Table 2 – Financial Feasibility of orchid production in Ecuador in 2020.

JOINT PROJECT	$ 257,719.33
INVESTMENT	$ 57,167.90
CURRENT VALUE OF SERVICES	**$ 314,887.23**
Seed and Cuttings Production	$ 108,095.19
Substrates	$ 8,565.55
Orchid Plants	$ 203,522.15
Orchid Flower	$ 3,103.16
Vanilla	$ 8,976.18
In Vitro Orchid Reproduction	($ 54,166.49)
Orchid Acclimatization	$ 2,876.36
Orchid Management Course - "Commercial Purposes".	$ 21,474.24
Visits to growers' nurseries, exhibition sites.	$ 12,440.89

Source: On-site information gathering. Prepared by: MAG & PARTNERS.

Under the assumption of offering all products and services (without excluding each other), the project reaches a Current Net Amount of $ 257,719.33, being the In Vitro Orchid Reproduction service the only one that is not profitable for a local producer, since it requires an important investment and a large scale production to reach financial profitability.

In view of this situation, a scenario analysis was performed, excluding the "In Vitro Orchid Reproduction" service, ensuring profitability based on the assumptions of linear sales projection and random sales projection.

The service of In Vitro Orchid Reproduction needs to be addressed in a timely manner.

Other productive initiatives may be promoted individually or collectively, taking into account market demand, exclusion due to profitability and production volume management.

The project should pursue a value proposition that aims to take advantage of market space with the following strategies:

- Certifications of product quality and origin;
- Packaging and arrangement of the plant;
- Advice on the handling and care of the plant;
- Associativity and environmental conservation;
- R&D+i (research + development + innovation).

Strengthening Plan

The main challenge to implement the suggested business model is focused on improving the capacities and empowerment of local producers. In this sense, a strengthening plan is presented with endogenous strategies that will guarantee the use of orchid production and the generation of higher income for these families.

To this end, it will be necessary to identify the actors of the territory that wish to join this project and establish commercial relations, through an association between the actors of the geographical area, in order to generate advantages and capacities; guaranteeing sustainability of the productive initiatives of orchids and their derivatives, through cooperativism, strategic positioning in the market and legality.

Once the Association is formed, it should focus on the design of an "ORCHID ROUTE" (Figure 6), as the main marketing strategy, in order to promote the portfolio of orchid products and services and their derivatives.

Figure 6. Orchid Route. Source: On-site information gathering. Prepared by: MAG & PARTNERS.

The design of this Route should be carried out with the competent Ministries and stakeholders in the territory, since it will be necessary to strengthen: the conditions of tourism initiatives and knowledge, valuation, conservation and sustainable management of heritage and the concept of tourism, which through practical learning of the role of nature, culture and history, will increase the knowledge of each tourist.

To this end, after analyzing the strengths, opportunities, weaknesses and threats, and identifying constraints as key elements for the generation of strengthening strategies, a national action plan is presented within the framework of the orchid sector. It is designed around strategies to strengthen the value chain by promoting the development of small producers and initiatives focused on the conservation, management and sustainable

use of species with a view to increasing income, improving conditions for local communities, reducing endangered

species, and improving the capacities of small producers. The implementation of this program is intended to promote research and development of the orchid sector, as well as to increase the economic sustainability of producers and their families through diversification of income sources and greater linkage of activities that can be exploited through orchids, facilitate access to differentiated markets with greater added value, and promote investment in sustainable production practices in the sector.

This instrument is built as a strategic input and support for the National Environmental Authority in terms of the implementation and definition of public policy for the development of the orchid sector. The strategic objectives seek to guide actions and efforts for the development of the sector and small producers with a focus on the conservation and sustainable use of species. Thus, the strengthening plan is composed of 3 strategic objectives that address the sector from an intersetorial and participatory vision, incorporating each of the actors and productive initiatives, with the actions required and necessary to promote the development of the sector.

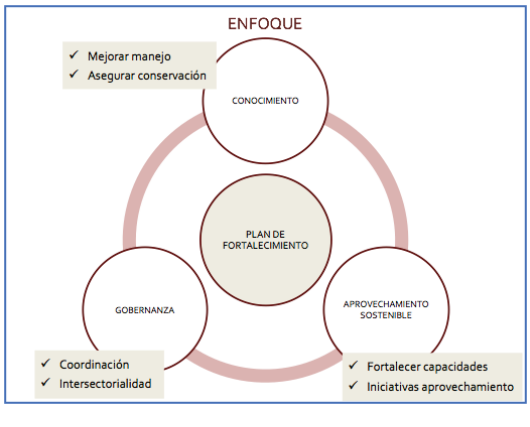

Figure 7. Strategic axes for a strengthening plan to promote the development and conservation of the orchid sector in Ecuador. Prepared by: MAG & PARTNERS.

Vision of the strengthening plan

To be the country recognized worldwide for the conservation of orchid diversity and their habitats, generating economic benefits through the management and sustainable use of the species, improving the conditions and quality of life of the communities and small producers in the sector.

Mission of the strengthening plan

Promote the development of the orchid sector and conservation through coordinated actions that strengthen the technical capacities, management, and sustainable use of the species by the sector's stakeholders and small producers.

Strategic objectives of the strengthening plan

Figure 7 shows the strategic axes that form the basis and support of the strengthening plan:

Strategic Objective 1: To expand the knowledge about orchids in Ecuador, in order to improve their management and ensure their conservation.

Strategic Objective 2: Promote the sustainable management and use of orchids in Ecuador, strengthening the capacities of the actors linked to the value chain.

Strategic Objective 3: Strengthen the governance and inter-sectoral coordination of the orchid value chain.

Figure 8. Strategic objectives and lines of action for a plan to strengthen the orchid value chain in Ecuador. Prepared by: MAG & PARTNERS.

CONCLUSIONS AND RECOMMENDATIONS

According to the study, the first step is the improvement of the capacities and empowerment of local producers according to the strengthening plan designed, achieving a better use of orchid production and the generation of higher income for the families, through the implementation of the suggested business model. This should be followed by the establishment of commercial relations, through an association between the actors in the geographical area, generating advantages and capabilities. Once the Association is formed, the design of an "ORCHID ROUTE" is proposed as the main marketing strategy to promote the portfolio of orchid products and services and their derivatives.

The implementation of the business model, together with the proposed strengthening plan, will be able to integrate not only economic, commercial and productive aspects, but also environmental, social, tourism and cultural aspects, contributing to the local development of these three provinces.

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Peru

Situation diagnosis of the arapaima fish-farming (*Arapaima gigas*) in the Peruvian Amazon

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ABSTRACT: *The arapaima (Arapaima gigas) is one of the main commercially important fish of the Peruvian Amazon and is included in CITES Appendix II[1]; since in past decades it suffered from overfishing that endangered natural populations, until it almost disappeared from the Amazonian markets. Now, with the aquaculture activity, the arapaima can be sold in the national and international market, as this activity has been an important tool for the conservation of this species. The diagnosis carried out is a compilation of office information and technical visits to the farming centers in the departments of Loreto, Ucayali, Madre de Dios, San Martin, Huanuco and Junin, where an analysis was made of the rights granted under the new General Aquaculture Law, as well as their form of farming, the form of feeding in the farming ponds and the evolution of the CITES Certificates.*

1 Appendix II lists species that are not necessarily threatened with extinction but could become so unless trade is strictly controlled. This Appendix also includes so-called "look-alike species", i.e., species whose specimens in trade are similar to those of the species listed for conservation reasons. - https://cites.org/esp/app/index.php

In addition, a working outline of the production chain of this resource in Peru has been prepared, in addition to providing recommendations for improving the arapaima farming.

***KEYWORDS**: Arapaima; CITE (Centro de Innovación Tecnológica), CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), Appendix II, Fingerlings, Production Chain, By-products, Hatchling Raising, DIREPRO.*

THE ARAPAIMA IN PERU

Currently in Peru, the departments of Ucayali and Loreto have the largest number of aquaculture rights granted for arapaima farming; the Department of Ucayali has a total of 694 rights[2] (313.44 hectares), Loreto has 251 rights (518.69 hectares), followed by San Martín with 166 rights (244.49 hectares), Madre de Dios, with 23 rights (97.82 hectares), Piura (14 rights with 2.35 hectares), Huánuco (11 rights with 9.22 hectares), Junín (10 rights with 12.36 hectares) of water surface; these are the main departments at the national level, as shown in the following chart:

Aquaculture Rights that have been farming arapaima at National Level by Departments

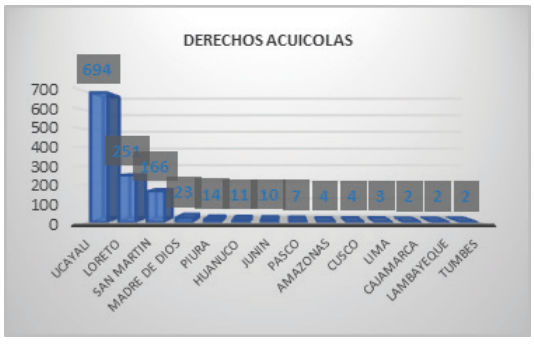


Chart 1: Aquaculture rights for the farming of arapaima and other species.

Source: Aquaculture Records. Prepared by the Company.

2 Information compiled as of October 31, 2020.

In terms of production level, (AREL, AMYPE y AMYGE[3]), the largest number of aquaculture rights have been granted to individuals under the AREL scheme with 666 aquaculture rights in 143.98 hectares of water surface, followed by AMYPE with 525 aquaculture rights in 1084 hectares of water surface and AMYGE with two rights and 18.16 hectares of water surface, which in the case of arapaima is not yet fully developed.

The following chart shows the issuance of aquaculture rights in recent years.

3 DS. 002-2020 that modifies the Regulations of the General Aquaculture Law.

Productive Scales:

10.1. Limited Resource Aquaculture (AREL): It is the activity developed exclusively or in a complementary manner by individuals, who must meet all the requirements established for this category, covers the basic family food needs and is mainly carried out for self-consumption and self-employment oriented enterprises. This category includes aquaculture activities carried out by non-commercial basic education centers. AREL's annual production does not exceed 3.5 gross tons.

10.2. Micro and Small Enterprise Aquaculture (AMYPE): It is the activity carried out for commercial purposes by individuals or companies. AMYPE's annual production is greater than 3.5 gross tons and does not exceed 150 gross tons.

10.3. Aquaculture of Medium and Large Enterprises (AMYGE): It is the activity carried out for commercial purposes by individuals or companies. AMYGE's annual production is greater than 150 gross tons."

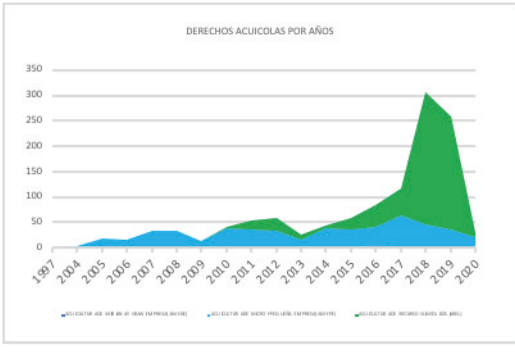


Chart 2: Aquaculture rights granted per year for the cultivation of arapaima and other species by level of production.

Source: Aquaculture Records. Prepared by the Company.

The boom in the number of rights granted in recent years could be the result of the formalization and promotion campaigns carried out by the Peruvian Ministry of Production (PRODUCE) and the Regional Governments (GORE) at the national level, in addition to the relaxation of the requirements for Aquaculture of Limited Resources (AREL), which led many people to obtain their aquaculture rights in recent years but who have not necessarily been carrying out activities.

VERIFICATION AND CHARACTERIZATION OF THE MOST REPRESENTATIVE ARAPAIMA FARMING CENTERS IN THE PERUVIAN AMAZON

Fingerlings Production and Management

In Peru, Ministerial Resolution No. 071-2019-PRODUCE, which approves the guidelines for monitoring arapaima from aquaculture, is in force and governs the actions to be followed in the reproduction, raising and farming of the arapaima in Peru. In summary, the objective of the regulation is that after a reproductive event, the fish farmer notifies the Regional Production Boards (DIREPRO), which carry out an on-site inspection of the fish farm, the release (collection of the arapaima fingerlings) is carried out and a record of the birth is filled out; documentation that is later used to obtain the CITES Certificates.

Feeding varies at this stage. Initially, sometimes they are given balanced feed together with filtered live food found in the very farming ponds.

Until a few years ago, mortality in the raising process ranged between 50 and 60%, but with the use of balanced feed in the first stage and filtering live feed from the ponds, mortality has been reduced to 15 to 20%, according to fish farmers.

Normally, reproductive events occur according to the age of the arapaima. According to fish farmers, a 4-year-old fish can produce one reproductive event per year, while a fish between 6 and 8 years old can produce up to seven reproductive events per year. The average number of specimens obtained in the average breeding season is between 2,000 and 3,000 specimens.

Juvenile Production and Management - Fattening

There is currently no single methodology for cultivation, since producers maintain this hydrobiological resource according to their needs and experience. The major infrastructure found has been earthen ponds. For the juvenile and fattening stage, no differences have been observed in the construction of ponds that are also used for broodstock or the cultivation of other Amazonian species.

Once the fish are raised and brought to sizes greater than 10 cm, they are pla-

ced back into the earthen ponds. According to fish farmers, the use of feed at this stage is a major increase in production costs and considerably reduces their income.

At this stage, the vast majority of fish farmers do not carry out any selection in the ponds and keep the fish until they reach 15 to 18 kilograms (ages between 14 and 18 months), when they are marketed.

Some fish farmers are already starting to market them from 12 kg onwards. Marketing prices are between 12 and 15 soles per kilogram placed on the farm.

The average stocking density for obtaining commercial specimens is five animals per m2; however, the ponds are underutilized because the fish farmers do not have a real knowledge of the demand for arapaima. As for the estimated Feed Conversion Factor, it is around 5:1.

Broodstock Production and Management

There is no differentiated methodology for the management of broodstock in ponds, since producers maintain this hydrobiological resource according to their needs and experience. The largest infrastructure found has been those known as earthen ponds, for the reproduction and fattening stage. The dimensions vary according to the topography of the land, with ponds ranging from 300 m2 to more than 2,000 m2 on average.

Most of the ponds have been built in clay soils due to their impermeability and are mostly filled and fed only with rainwater. Pond heights also vary, ranging from 0.80 to 1.5 meters in height.

In most of the farms visited, an empirical learning process typical of the field has been observed in this activity. In some cases, fish farmers with broodstock indicate that the reproductive event occurs when there is a change in climatic conditions (onset of rains or some anomalous event), which causes the broodstock to become stimulated and reproduce. This behavior should be investigated by the authorities or institutions in order to verify or not what the owners of these farms indicate.

Reproductive events generally occur at the end of October, beginning of November or when the rains begin, and the courtship stage and subsequent care of the nest is carried out by the male. According to the fish farmers who carry out the reproductive event, from the fourth day on, the arapaima hatchlings can already be distinguished as they come out to breathe.

Spawning takes place at dawn and often due to the force of the courtship between the animals there have been deaths, especially of the females.

Once the arapaima farmer has seen that the reproductive event has taken place, he carries out what is known as the raising, which consists of separating the parents from the young and taking them to other ponds or selling them.

CITES CERTIFICATES IN PERU

From 2004 to 2020, 1,612 CITES Certificates have been issued for products from the wild and arapaima from aquaculture. The number of CITES Certificates for species from aquaculture (arapaima) was 1,234 CITES Certificates. Exports have basically been for arapaima fingerlings (79.4%), meat (18.56%), skins (0.89%), leather (0.81%) and others (0.32%), according to the following table:

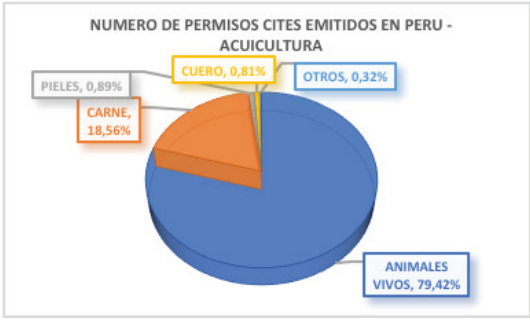


Chart 3: CITES certificates issued by type for export of arapaima from aquaculture (2004 - 2020)

Source: Ministry of Production - VUCE

Exports of Live Arapaima (*arapaima fingerlings*)

The external commercialization of arapaima specimens (fingerlings, juveniles and adults) is mostly for ornamental purposes and is of high growth, from the 1,156 fingerlings requested for export in 2011, it increased to 88,830 in 2015, when the highest export of this species was recorded. During 2020, Export Certificates were granted for 20,021 specimens; lower than the amount requested in 2019 (64% lower), when CITES Certificates were issued for the export of 55,811 arapaima fingerlings. This decrease was mainly due to the closure of international markets due to the COVID 19 pandemic.

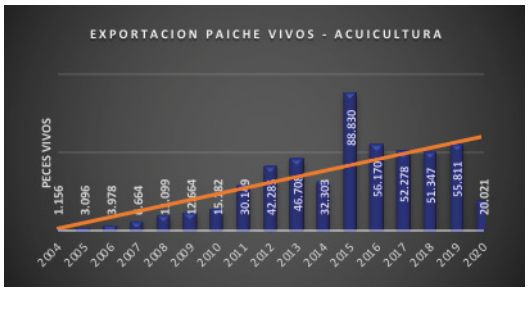


Chart 4: Export of Live arapaima from Aquaculture

Source: Ministry of Production Prepared by the Company.

The 20,021 specimens requested for export in 2020 have had Hong Kong as the main destination country with 13,647 units representing 63.1% of the total exported, followed by the United States with 14.3%, Vietnam with 5.5%, South Korea with 4.2%, Japan with 3.5%, Indonesia with 3.4%, the Netherlands with 2.8%, Thailand with 2.3%, Canada and the Philippines with 0.5% each.

Chart 5: Countries that exported arapaima fingerlings in 2020

Source: Ministry of Production Prepared by the Company.

Arapaima Meat Exports

The export of arapaima meat has not been constant, with no sustained growth between 2004 and 2020. There are references that the first export of arapaima meat was in 2004, when only 5 kilograms were exported. Commercial exports began in 2010 with 2,026 kg. The peak of arapaima meat exports occurred in 2013 with just over 111 tons, declining to 101.10 kg in 2019 and only 15 kg in 2020; it should be noted that the decline in arapaima exports has been due to the economic difficulties of the companies involved in this activity; many of them are analyzing reducing or closing their activities for the farming of this species.

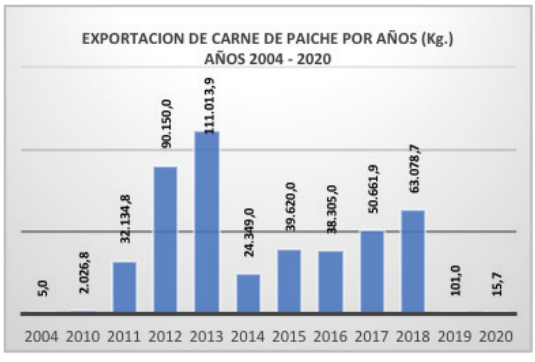


Chart 6: Export of arapaima fingerlings per year

Source: Ministry of Production Prepared by the Company.

DETAILED DESCRIPTION OF THE STRUCTURE OF THE PRODUCTION CHAIN OF ARAPAIMA FROM AQUACULTURE BY TYPE OF PRESENTATION (FINGERLINGS AND JUVENILES FOR ORNAMENTAL PURPOSES, MEAT AND SKIN).

According to documentation found in PRODUCE[4], the production chains are defined as a set of economic agents directly involved in the production, processing and transport of agricultural products to the market (Durufle, Favre and Young, translated by IICA).

The aquaculture production chain in Peru, especially for arapaima, involves several components that are important for the development of the aquaculture activity of this species.

In terms of obtaining seed, the arapaima farming began with the use of natural seed from the various Amazonian lakes. At present, the seed comes from the reproduction carried out in the very ponds.

Regarding the farming component, it is pointed out the way of growing the ponds, the farming, and the type of feeding until the harvest where specimens of 10 to 14 kilograms are obtained from the year of farming.

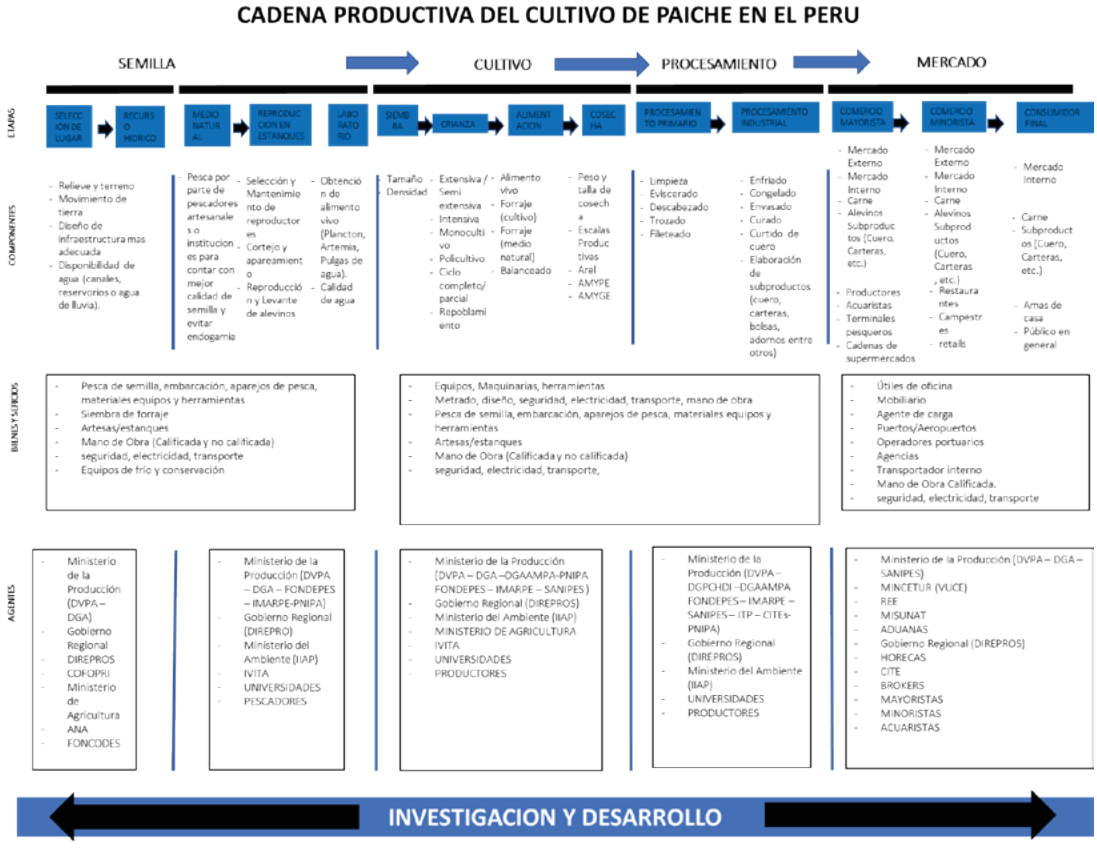
The processing component of the arapaima production chain refers to primary and industrial processing. Primary processing includes cleaning, gutting, beheading, slicing and filleting, while industrial processing includes chilling, freezing, packaging and curing, among others.

In recent years, there are entrepreneurial companies that have been using arapaima by-products for the manufacture and tanning of leather for the production of wallets, handbags, among others, as part of the insertion of the circular economy in aquaculture.

As for the market component, the arapaima is currently exported under the conditions established by CITES and must have a certificate issued by the Ministry of Production, through the General Board of Aquaculture when this species is farmed; the production chain also includes wholesale, retail and the final consumer.

In summary, the arapaima production chain is detailed in the following table:

4 http://www2.produce.gob.pe/RepositorioAPS/3/jer/ACUISUBMENU4/boletines/CADENAS%20PRODUCTIVAS.pdf



RECOMMENDATIONS FOR THE IMPROVEMENT OF ARAPAIMA FARMING IN PERU

After the analysis of arapaima cultivation in Peru, some recommendations have been made, such as:

Market Aspects

1. Generation of Business Rounds/ Productive Meetings for market access with this species.
2. Conceptualize the characterization of the value chains of the arapaima marketed in the main regions of Peru.
3. Preparation of market studies for the arapaima in the main regions of Peru.

Production Aspects

1. Greater impetus to aquaculture extension, that includes as a priority the farming and the improvement of the production chain through the Development of Technical Assistance Modules for arapaima farming to be carried out by aquaculture extensionists.
2. Inclusion of Business Plans/ Projects as a mandatory requirement in the products of aquaculture extensionists who have been supporting arapaima farming, as a form of financial leverage.
3. Promotion of technologies that use higher planting densities in the same farming space.
4. Proposal for determining the sex of arapaima from molecular sexing, by the sexual dimorphism of the arapaima, which does not allow them to be selected in a short time.
5. Proposal to stimulate arapaima farming based on environmental changes to optimize reproduction.

Regulatory and Governmental Aspects

1. Conduct a suitability analysis for the modification of the Tilapia Management Plan in San Martin and Junin and its implications for arapaima farming.
2. Negotiations for the modification and inclusion of tariff items for endangered species in CITES trade, for greater traceability and control by government agencies.
3. Systematization of the procedures of the Regional Production Boards that are requirements for obtaining the Certificate CITES issued by the General Board of Aquaculture, to guarantee the traceability of the arapaima in Peru.
4. Analysis of the convenience of issuing AREL permits for arapaima due to its farming method, which would lead to the Modification of the Regulations of the General Aquaculture Law.
5. Generation of Aquaculture Generated Fisheries (Repopulation activities as a government policy in Amazonian water bodies where arapaima became a means of subsistence for native communities near these water resources, accompanied by PROMAPE (Fisheries Management Programs).

Circular Economy Aspects

1. Coordination with the CITE leather and footwear of the Instituto Tecnológico de la Producción for training and technical assistance to produce by-products (arapaima leather) for aquaculture extensionists and fish farmers.

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About the Bioamazon Project

Bioamazon is a **regional project in the ACTO´s framework** that contributes to the conservation of **Amazon Biodiversity**, especially the species included in the CITES Convention.

To this end, **it seeks to increase the efficiency and effectiveness of the management, monitoring and control of species of wild fauna and flora threatened by trade** in ACTO member countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela.

It is part of a Cooperation Agreement between the Federal Government of Germany and ACTO with implementation through the KfW.

Newsletter Datasheet

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BIOAMAZON PROJECT
Conservation of species threatened by unsustainable trade

ACTO
Amazon Cooperation Treaty Organization

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