PIRARUCU / ARAPAIMA (Arapaima *spp*.)

also known as paiche in Peru

The arapaima belongs to the class Actinopterygii, order Osteoglossiformes and family Osteoglossidae, in which two genera occur: Osteoglossum (aruanã) and Arapaima (arapaima). There are five species known pirarucu species: Arapaima gigas, Arapaima agassizii, Arapaima mape, Arapaima arapaima and Arapaima leptosoma (AMARAL, 2019). The most common is the Arapaima gigas, which is one of the largest freshwater fish on the planet. The species lives in lakes and tributary rivers, with clear waters, with temperatures ranging from 24° to 37°C. The arapaima is not found in places with strong currents or in waters with sediment (WWF, 2024).
The pirarucu is the largest fish with scales in South America, living in the Amazon basin and can reach 200 kg and 3+ meters in length. In a productive environment, this species can reach 10 kg in one year with a 57% yield of spineless fillet (VARELA et al, 2020).
Dried salted pirarucu was a major staple of intraregional trade in the Amazon (CHICRALA et al, 2017).

BY-PRODUCTS

In the past, the dominant form of sale was **dried salted pirarucu**, but nowadays, pirarucu is sold in several different ways of preservation, with the main forms of pirarucu sold today in markets and supermarkets being **fresh, frozen or salted pirarucu. Smoked pirarucu** can also be found in some restaurants and supermarkets, and there has been an increase in interest in smoking pirarucu (EMBRAPA, 2017).
Recent research carried out by Embrapa has developed **canned pirarucu fillet**, which can add value to fish, emerging as an active potential in the bioeconomy and being another option in the canned fish market (EMBRAPA, 2023).
Another product originating from **pirarucu is fish leather**, and there is a growing interest in fish skin transformed into leather and used in shoes and wallets/bags (BITENCOURT et al., 2015; CARVALHO, 2023).

CURRENT MARKET SIZE & PROJECTED FUTURE MARKET SIZE

Brazilian pirarucu production in 2019 reached 1,892,650 kg (≅ 1.892 tons), with production value reaching BRL 25.2 million (≅ USD 6.06 million), with an average value per kilo of BRL 13.33 (≅ USD 3.18). The states that produced the most were Rondônia with 979,457 kg ≅ 979.4 tons (BRL 11.07

million ≅ USD 2.6 million), Pará with 272,321 kg ≅ 272.3 tons (BRL 5.2 million ≅ USD 1.2 million) and Amazonas with 168,400 kg ≅ 168 .4 tons (BRL 1.6 million ≅ USD 392,2 thousand) (IBGE, 2020).
In 2020, Brazilian production was 1,885,805 kg (≅ 1,885 tons), with the value of production reaching BRL 26 million (≅ USD 4.7 million), with an average value per kilo of BRL 13.83 (≅ USD 2 ,54). The states that produced the most were Rondônia with 980,284 kg ≅ 980.2 tons (BRL 11.1 million ≅ USD 2.04 million), Pará with 295,157 kg ≅ 295.1 tons (BRL 6.02 million ≅ USD 1.1 million) and Amazonas with 143,950 kg ≅ 143 .9 tons (BRL 1.4 million ≅ USD 269,3 thousand) (IBGE, 2021).
In 2021, Brazil reached the milestone of 2,136,865 kg of pirarucu produced (≅ 2,136 tons), with the value of production reaching BRL 32.8 million (≅ USD 5.5 million), with an average value per kilo of BRL 15.36 (≅ USD 2.60). The states that produced the most were Rondônia with 1,220,831 kg ≅ 1,220 tons (BRL 16.5 million ≅ USD 2.8 million), Pará with 221,336 kg ≅ 221.3 tons (BRL 4.8 million ≅ USD 821.7 thousand) and Amazonas with 194,350 ≅ 194, 3 tons (BRL 2.09 million ≅ USD 354.8 thousand) (IBGE, 2022).
In 2022, the last year of data provided, Brazilian pirarucu production continued at more than 2 million kilograms, standing at 2,028,247 kg (≅ 2,028 tons), with the production value reaching BRL 34.1 million (≅ USD 6.4 million), with an average value per kilo of BRL 16.84 (≅ USD 3.17). Again, the state that produced the most, representing 57.4% of national production, was the state of Rondônia with 1,164,297 kg ≅ 1,164 tons (BRL 19.08 million ≅ USD 3.6 million), followed by the states of Amazonas with 319,665 kg ≅ 319 .6 tons (BRL 3.3 million ≅ USD 633.1 thousand) and Pará with 153,810 kg ≅ 153.8 tons (BRL 3.6 million ≅ USD 691.2 thousand) (IBGE, 2023). Over the last few years, we can see an increase in the quantity of pirarucu produced and an increase in the price per kilogram. This shows the expected upward trend for future productions.

SOLD/CONSUMED VOLUMES

The total volume of pirarucu sold by Brazil and consumed in 2020 was 1,885,805 kg (≅ 1,885 tons). In 2021 this number rose to 2,136,865 kg of pirarucu produced (≅ 2,136 tons) and in 2022 it remained at that level, with 2,028,247 kg (≅ 2,028 tons).

PRICE TRENDS

In 2024, the average price of fresh and frozen pirarucu at popular fairs (community markets) is be around BRL 15.00* (≅ USD 2.84). In supermarkets and large retailers in Brazil, the price per kilo can reach around BRL 109 (≅ USD 20.64). In the United States and Europe, the minimum value found in markets in 2021 was around $20–25 per kg ($44.00–55.00 per pound).
Dry salted pirarucu in the State of Amazonas ranged from around BRL 20.00* to 24.00* in popular fairs/community markets (≅ USD 3.78 to 4.54). In the state of Pará, the cheapest price for a kilo of salted pirarucu can be found for around R$ 44.90 (≅ USD 8.50).
A boot made from pirarucu choir costs around USD 600.00 (≅ BRL 3,168) in 2024.
*this value refers to the state of Amazonas (which has the lowest average price per kilo).

HISTORY

Since the beginning of the 18th century, pirarucu was sold in blankets, dried and salted. In the ports of Belém, in the state of Pará, average productions of 1,300 tons/year were recorded. In the 19th and early 20th centuries, more than 3,000 tons/year of pirarucu were exported from the Brazilian Amazon. Centuries of commercial exploitation led to the serious depletion of pirarucu stocks at the beginning of the 20th century, where the estimate was reduced to 300 tons/year. This fact meant that in 1975, the arapaima was placed on the list of Annex II of the Convention on International Trade in

Endangered Species of Wild Fauna and Flora (CITES), to regulate and control its exploitation (WWF, 2011).
Since the 1990s, strategies for the preservation and conservation of pirarucu in the Amazon have led to the recovery of local stocks. They include technical management standards and new assessment methods, as well as the effective participation of fishermen in the development of management measures (WWF, 2011).
After the 2000s, the capture of arapaima in the Brazilian Amazon basin increased, from 495 tons in 2001 to 1,236 tons in 2006 (Ibama, 2006). Production in the state of Amazonas in 2006 was 961 tons (78%) and the remainder (22%) was distributed, in order of importance, among the following states: Pará, Goiás, Tocantins, Amapá, Acre, Rondônia and Roraima (WWF, 2011).

MANAGEMENT SYSTEMS & ENVIRONMENT
The management system for pirarucu has the potential to transform the management of floodplain fisheries and land use. Successful pirarucu management systems improve conditions for other fish species and aquatic biodiversity in general (CAMPOS-SILVA; PERES, 2016). Research has shown that the productivity of floodplain fisheries is directly related to the extent of floodplain forest cover. Ten percent more forest, results in a 10% improvement in fishing productivity (CASTELLO et al., 2017). This creates an incentive for fisher farmers to reduce the number of cattle and allow the recovery of floodplain forests, thereby not only increasing the productivity of local fisheries. but also generating additional income through forest management.

PRODUCER PROFILE & SOCIAL IMPACTS
The pirarucu management system involves almost exclusively traditional and indigenous communities, composed of families that engage in a variety of productive activities including fishing and farming, forest collection and especially in the eastern Amazon small scale cattle raising.

Pirarucu Value Chain: Growth in the volume of sustainably managed pirarucu has stimulated the transformation of the traditional pirarucu fishery and is pressuring the supply chain to reinvent itself as a modern cold value chain that delivers wild, sustainably managed pirarucu from community lakes deep in the Amazon to regional and national consumer markets with minimal loss of quality. Towards this end, local pirarucu management organizations are joining forces to organize regional supply chains, while several private sector initiatives are investing in key components of a modern supply chain infrastructure. A third aspect of the supply chain involves digitizing the existing chain of custody system to ensure that pirarucu from unmanaged lakes are unable to enter the pirarucu supply chain.
Market: As the total catch of managed pirarucu grows, efforts are ramping up to develop markets to absorb the growing volume of sustainably managed pirarucu in Brazil and in promising international markets in the US, Europe and Asia.

CARBON CREDIT/SEQUESTRATION POTENTIAL
The productivity of Amazon floodplain fisheries is directly related to floodplain forest cover, the greater the forest cover around a lake, the higher the productivity of lake fisheries. Forest carbon credits can provide an additional incentive to motivate floodplain fisher-farmers to make the transition from fish and cattle to managing floodplain fisheries and forests.

CERTIFICATION PROGRAMS

The pirarucu management system has had difficulty satisfying certifiers, in large part, because pirarucu management is a decentralized community level system that violates a central element of the MSC's and other certifiers "whole stock principle". This position ignores two decades of scientific research showing the steady growth in pirarucu populations in managed lakes even as the total catch and the number of fishers also increases. Another indicator that lakes can be effective management units is the striking contrast in pirarucu populations between adjacent lakes, one managed with pirarucu densities of 35+ individuals per km and the other unmanaged lakes with densities below 5 individuals per km2.

CITES

The pirarucu is also cited in Appendix II of CITES. Appendix II includes species for which there is insufficient data on the status of the species. However, the CITES Livelihood Fact Sheet (2019) on the pirarucu, notes that "Community-based harvest and trade can be a more effective contribution to species conservation and the fight against illegal trade than relying on bans and law enforcement measures, even for a species seriously depleted by illegal harvest and trade. . . Key success factors here include local leadership and experimentation, support from the relevant government agencies, existing community socio-political organization, and integration of traditional knowledge (CITES; LIVELIHOODS CASE STUDY, 2019).

THE ORIGINS CERTIFICATION

Pirarucu management associations in the state of Amazonas have adopted the Origins Certification system (FEMAPAM, 2020). This is not a certification of the management system but rather, as the name implies, an affirmation of the cultural and ecological legitimacy of the pirarucu management system, an example of the potential of collaborations between scientists and experienced pirarucu fishers.

RELEVANT INDUSTRIES

Aggregators/Suppliers

Retailer	Site
Association of Rural Producers of Carauri (ASPROC)	R. Castelo Branco, 380 - Centro, Carauari - AM, 69500-000, Brazil https://asproc.org.br/#
Mamirauá Sustainable Development Institute	https://www.mamiraua.org mamiraua@mamiraua.org.br +55 (97) 3343-9700, headquartered in Tefé (AM) or (91) 3086-9184, office in Belém (PA)

Processors / Exporters / Importers

Retailer	Site
Friolins	Manaus, AM Friolins Pescados Ltda. is located at: R. Duque de Caxias, 266 - São Francisco, Manacapuru - AM, 69400-380, Brazil., +55 92 3361-1425
Frigopesca	2472 Avenida Correnteza, Manacapuru, AM 69400-000

REGULATORY INFORMATION

INCI Name : Arapaima *spp*.
Harmonized System Code :
EINECS No :
CAS Number :
NCM: 302.89 e 303.89

PS.: For all conversions from Brazilian real (BRL) to US dollar (USD), an average of the values for each year was made (example: sum of the monthly averages for the year 2021, divided by 12. The result was taken with the value dollar average in 2021).

Table with monthly averages:

Year 2009: USD 1 ≅ BRL 2,11 (annual average).
Year 2018: USD 1 ≅ BRL 4,02 (annual average).
Year 2019: USD 1 ≅ BRL 4,16 (annual average).
Year 2020: USD 1 ≅ BRL 5,44 (annual average).
Year 2021: USD 1 ≅ BRL 5,90 (annual average).
Year 2022: USD 1 ≅ BRL 5,30 (annual average).
Year 2023: USD 1 ≅ BRL 5,18 (annual average).
Year 2024 (until April): USD 1 ≅ BRL 5,28 (annual average).