

Status atual da aquicultura no mundo: primeiros impactos da COVID-19

Current status of aquaculture in the world: COVID-19 first impacts

Estado actual de la acuicultura en el mundo: primeros impactos de COVID-19

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Resumo

O objetivo deste trabalho é entender o cenário atual, com base na análise geral da aquicultura e de alguns fatos pertinentes a essa atividade, destacando os primeiros sinais da aquicultura em resposta a pandemia, além de prospectar tendências de como a cadeia irá se comportar após a pandemia do COVID-19. O estudo é de caráter exploratório que utilizou o método de pesquisa bibliográfica, onde o levantamento ocorreu de janeiro a junho de 2020, através da consulta de plataformas oficiais, porém, este cenário deve mudar, devido as interrupções das atividades cotidianas de toda a população, especialmente o isolamento social, restrições nas fronteiras e redução da frota aérea em diversos países na tentativa de frear o avanço da doença. Este cenário criou desafios para a comercialização de pescados, que poderão refletir em impactos na cadeia em longo prazo.

Palavras-chave: Piscicultura; SARS-CoV-2; Pescado.

Abstract

The objective of this work is to understand the current scenario, based on the general analysis of aquaculture and some facts related to this activity, highlighting the first signs of aquaculture in response to a pandemic, in addition to prospecting trends in how the association will be affected after a COVID-19 pandemic. The study is exploratory in nature

using the bibliographic research method, where the survey takes place from January to June 2020, through the consultation of official platforms, however, this scenario had to be changed, due to interruptions in the daily activities of the entire population, especially social isolation, border restrictions and reduction of air travel in several countries in an attempt to increase the spread of the disease. This scenario created challenges for the commercialization of fish, which may be reflected in long-term impacts on the chain.

Keywords: Fish farming; SARS-CoV-2; Fish.

Resumen

El objetivo de este trabajo es comprender el escenario actual, basado en el análisis general de la acuicultura y algunos hechos relacionados con esta actividad, destacando los primeros signos de la acuicultura en respuesta a una pandemia, además de las tendencias prospectivas sobre cómo será la asociación afectado después de una pandemia de COVID-19. El estudio es de naturaleza exploratoria utilizando el método de investigación bibliográfica, donde la encuesta se lleva a cabo de enero a junio de 2020, a través de la consulta de plataformas oficiales, sin embargo, este escenario debe cambiarse debido a interrupciones en las actividades diarias de toda la población. , especialmente el aislamiento social, las restricciones fronterizas y la reducción de la flota aérea en varios países en un intento por aumentar la propagación de la enfermedad. Este escenario creó desafíos para la comercialización de pescado, lo que puede reflejarse en los impactos a largo plazo en la cadena.

Palabras clave: Piscicultura; SARS-CoV-2; Pescado.

1. Introduction

Aquaculture, among animal protein production chains, has stood out as an activity with rapid growth, contributing significantly to the generation of jobs and income, consequently reducing the rates of poverty and hunger in different parts of the world. These socioeconomic impacts provide a new sustainable look at the production of aquatic organisms, the then known Blue Revolution (Siqueira, 2018).

Aquaculture is the activity that works with the controlled cultivation of aquatic organisms (FAO, 2016), including fish, crustaceans, molluscs and even higher aquatic plants and algae. Among all the chains involved, the one that stands out most is fish farming, where it is responsible for the production of more than half of the fish used for human consumption (FAO, 2020a), and to meet this demand, it has been continuously expanding, with the

development of new techniques, producing more in less time and in a sustainable way (Calixto et al., 2020).

World and Brazilian fish farming was on an increasing curve, year after year, with positive data (FAO, 2020a), however, with the emergence of SARS-COV-2, and the establishment of COVID-19, many international markets were closed, many segments have been affected, and aquaculture, being a complex chain, should feel its own in 2020.

For this reason, the objective of this work is to understand the current scenario, based on the general analysis of aquaculture and some facts pertinent to this activity, demonstrating the first signs of aquaculture in response to the pandemic, in addition to prospecting trends on how the chain will behave after the COVID-19 pandemic.

2. Methodology

The present work is of an exploratory nature for using the bibliographic research method, quali-quantitative, for a data survey that took place from January to June 2020, through the consultation of official platforms and the conjectures of possible causes found from a chronological approach to the trajectory of fish farming (Pereira et al., 2018).

Production data were compiled from publications by the *Food and Agriculture Organization* - FAO, in the *Fishery and Aquaculture Statistics* (FAO, 2019) and in *The State of World Fisheries and Aquaculture* (FAO, 2020a), complemented with data from the Brazilian Institute of Geography and Statistics - IBGE, present in the report on Municipal Livestock Production (IBGE, 2020) and information from the Yearbook of the Brazilian Association of Fish Farming (PeixeBR, 2019; 2020).

Then, a mapping of the scientific content that portrayed the impacts of COVID-19 on aquaculture was carried out in the *Web of Science*, *PubMed*, *Scopus* and *Google academic databases*, using the descriptors: “COVID-19” and “fish farm” with the objective of building a contextualization of the problem, generating perspectives on the theme.

3. Results and Discussion

According to FAO (2020a), the growth of worldwide aquaculture is notorious over the years, and can be seen by looking at the data from 2011 to 2018 present in table 1.

Table 1. Production (capture and aquaculture) and use of world fish in the years of 2011 to 2018 (million tons).

Category	2011	2012	2013	2014	2015	2016	2017	2018
Production*								
Capture								
Inland Waters	10.7	11.2	11.2	11.3	11.4	11.4	11,9	12,0
Marine	81.5	78.4	79.4	79.9	81.2	78.3	81,2	84,4
Total capture	92.2	89.5	90.6	91.2	92.7	89,6	93,1	96,4
Aquaculture								
Inland Waters	38.6	42.0	44.8	46.9	48.6	48,0	49,6	51,3
Marine	23.2	24.4	25.4	26.8	27.5	28.5	30,0	30,8
Total aquaculture	61.8	66.4	70.2	73.7	76.1	79.5	79,5	82,1
Total (Capture+Aquaculture)	154.0	156.0	160.7	164.9	168.7	166.1	172,5	178,5
Utilization								
Consumo Humano	130.0	136.4	140.1	144.8	148.4	148.2	152,9	156,4
Non-food use	24.0	19.6	20.6	20.0	20.3	17.9	19,7	22,1

* Excluding aquatic mammals, crocodiles, alligators, algae and other aquatic plants

Source: Adapted from FAO (2020a)

World aquaculture grew 32.85%, from 61.8 million tons in 2011 to reach 82.1 million tons in 2018. Of this amount, aquaculture in inland waters represents a sudden majority, with 62.48% of this chain when compared to marine aquaculture (37.52%). Excluding aquatic mammals, crocodiles, alligators, algae and other aquatic plants, aquaculture in 2018 represented 45.99% of the total fish production in the world.

Of the 178.5 million tons produced (capture and aquaculture), 156.4 million tons (87.62%) were destined for human consumption, and the remainder for non-food use (production of oil and fish meal). This rapid expansion can be attributed to the introduction of new production techniques, with increasingly affordable costs and ensuring significant gains in productivity and quality (Silva et al., 2020).

Regarding the contribution by continent, Asia has dominated the scenario since the 90s, representing 88.7% in 2018 of world production, where China is prominent, being responsible for more than 60% of the world's fish production from aquaculture (FAO, 2020a). The superiority of the Asian continent is seen in Table 2, when the sum of aquaculture production from other continents reaches 9,283 million tons, corresponding only to 11.3% of

world production.

Table 2. Aquaculture production by continent and worldwide in the years of 1995 to 2018 (million tons and percentage of the world total).

Region	1995	2000	2005	2010	2015	2018
Asia	21.678	28.423	39.188	52.452	67.881	72.812
	88,9%	87,7%	85,5%	89%	89,3%	88,7%
America	920	1.423	2.177	2.514	3.274	3.799
	3,8%	4,4%	4,9%	4,3%	4,3%	4,6%
Europe	1.581	2.051	2.135	2.523	2.941	3.083
	6,5%	6,3%	4,8%	4,3%	3,9%	3,8%
Africa	110	400	646	1.286	1.772	2.196
	0,5%	1,2%	1,5%	2,2%	2,3%	2,7%
Oceania	94	122	152	187	186	205
	0,4%	0,4%	0,3%	0,3%	0,2%	0,3%
World	24.383	32.418	44.298	58.962	76.054	82.095

* Excluding aquatic mammals, crocodiles, alligators, algae and other aquatic plants

Source: Adapted from FAO (2020a)

This positioning by China is not considered a novelty in the aquaculture scenario. Despite the intensification of its production in the twentieth century, aquaculture in this country is an ancient tradition, being considered the birthplace of aquaculture. Around 2,500 BC, there are already signs of the production of carpa comum (*Cyprinus carpio*), this activity has developed over the centuries, leading to the diversification of cultivable species, growth of the fishing industry, intensification of production, among others (Schulter & Vieira-Filho, 2017).

In the world ranking of aquaculture developed by FAO (2019), Brazil since 2013 has been in 13th place, being the second largest aquaculture producer in the American continent, reaching 595 thousand tons in 2017 with an increase of 0.85% in relation to the previous year (Table 3).

Table 3. Ranking of the main aquaculture producers in the years of 2013 to 2017 (tons).

Ranking	Country	2013	2014	2015	2016	2017
1°	China	40.336.975	42.297.133	43.748.183	45.815.988	46.823.949
2°	India	4.550.707	4.890.000	5.260.000	5.700.000	6.180.000
3°	Indonesia	3.973.843	4.253.896	4.342.465	4.901.612	6.150.000
4°	Vietnam	3.206.510	3.340.015	3.462.352	3.570.402	3.820.960
5°	Bangladesh	1.859.808	1.956.925	2.060.408	2.203.554	2.333.352
6°	Egypt	1.097.544	1.137.091	1.174.831	1.370.660	1.451.841
7°	Norway	1.247.865	1.332.497	1.380.839	1.326.157	1.308.485
8°	Chile	1.033.206	1.214.523	1.045.790	1.035.254	1.202.948
9°	Myanmar	929.180	962.156	997.306	1.017.614	1.048.692
10°	Thailand	997.517	897.865	920.223	881.181	889.891
11°	Philippines	815.008	788.029	781.798	796.393	822.466
12°	Japan	609.566	647.921	705.452	676.766	615.060
13°	Brazil	477.022	563.500	574.500	590.000	595.000

Source: Adapted from FAO (2019).

Despite having incipient numbers when compared to the major world aquaculture producers (China, India, Indonesia and Vietnam), it is important to mention that Brazil is considered one of the countries with the greatest potential for the development of aquaculture, as it has a favorable climate, water availability (12% of the planet's fresh water, 5.5 million hectares of water in public reservoirs, a coastline of 8,500 km, an Exclusive Economic Zone-EEZ of 4.5 million km²) and natural occurrence of aquatic species of zootechnical and marketing interest (Brabo et al., 2016; Brasil, 2011).

In Brazil, continental fish farming, marine shrimp farming and malacoculture are the main branches of aquaculture, and with a small number of enterprises, freshwater shrimp farming, raniculture, algaculture and cheloniculture are still present (IBGE, 2020).

What follows the world trend, where fish farming (continental and marine) is highlighted, as can be seen in Table 4, with the greatest representativeness, where in 2018 corresponded to 66.14% of world aquaculture production.

Table 4. Aquaculture production by group of fish on the continents and in the world during 2018 (million tons).

Category	Asia	America	Europe	Africa	Oceania	World
Fish	47.400	2.197	2.399	2.184	97	54.279
Mollusks	16.083	640	680	6	102	17.511
Crustaceans	8.414	916	0	6	6	9.387
Other aquatic animals	915	1	0	0	0	919
Total	72.812	3.799	3.083	2.196	205	82.095

Source: Adapted from FAO (2020a).

It is also possible to highlight the production of mollusks, which in the same year reached 17.511 million tons, approximately 21,32% of the world's aquaculture production (FAO, 2020a). These variations may occur due to the environmental characteristics of each continent that must be favorable, forms of incentive for production, availability of technological packages and the population's eating habits.

In addition, it is already in common agreement that fish is considered one of the main sources of biological value proteins, also having unsaturated fatty acids and reduced levels of cholesterol, making it an excellent option for consumption (Gonçalves, 2011), valuing its meat and having excellent market acceptance.

China stands out in almost every segment of aquaculture (fish meal, freshwater fish, marine fish, cephalopods, other mollusks and aquatic plants), leading the expansion of aquaculture in recent decades (Siqueira, 2017). It is followed by countries like India, Indonesia and Vietnam, which dominate the world market. Despite its little expression worldwide, Brazil has already recognized the opportunities of this productive chain, and has been awakening to public policies and investing in fish production in recent years.

According to the Confederation of Agriculture and Livestock of Brazil (CNA, 2011), Brazilian aquaculture is a very promising productive sector, taking into account the availability of resources for the performance of this activity. Brazil had an estimated production of 20 million tons by 2030, being considered by FAO (2013; 2018) as one of the future's largest fish producers in the world. Its production was estimated to grow by 52% by 2024, driven by the increase in domestic demand and by public policies that were supporting the sustainable growth of the activity (OECD, 2015; OECD, 2017), however, this scenario is changing.

With the onset of the coronavirus outbreak (SARS-CoV-2), many areas of the economy were affected by measures to contain the disease (CNA, 2020). COVID-19 has caused interruptions in the daily activities of the entire population, mainly due to social isolation in an attempt to curb the spread of the disease, which has already expanded to 190 countries, including Brazil (WHO, 2020).

As the logistics of the aquaculture chain are complex and are composed of several distinct branches and dependent on each other, and all equally susceptible to the impacts arising from COVID-19 (FAO, 2020b), aquaculture could not be left out. Fish and its derivatives are highly dependent on international trade and ended up suffering very early from the restrictions and closing of global markets. The supply of fresh fish was affected by the closure of the food service sectors; and the processing industry has been suffering from reduced consumer demand (FAO, 2020b; WFO, 2020).

In addition, the rules for stricter border control and air traffic reduction have affected the logistics of inputs in the chain (OECD, 2020). Resulting in difficulty in transporting production, insecurity in the purchase of feed and difficulty in the maintenance of equipment, acquisition of machinery, replacement of parts and support material (Lima et al., 2020).

Additionally, the concerns already raised about the transmission of the virus by aquatic animals used for consumption have also been plaguing the market (Bondad-Reantaso et al., 2020). Jiang et al. (2020) indicated the possibility of the virus appearing in the live animal and seafood market in Wuhan, China, drastically reducing consumer demand, and increasing concerns about health issues (Lima et al., 2020).

Impacts on species produced for the purpose of export have also been reported, such as the panga (*Pangasius bocourti*), because of restrictions already imposed on international markets, such as China and the European Union (Thi, 2020). Despite this, FAO (2020c) stated that family farmers could benefit from reduced competition, with reduced imports, but this was not observed in practice.

In India, several shrimp hatcheries have been forced to destroy their stocks because they have no one to sell to; and in Peru, which is considered the world's largest producer of fishmeal and one of the largest producers of fish oil, had to close several processing facilities due to national blocking measures (OECD, 2020).

In Brazil it was no different, this year the sale of fish during the holy week (nationally known for the increase in demand) was different, and although there are no concrete data available and the strategies taken by several state governments (including selling remotely), consumption reduction of up to 40% is estimated (Cavalli et al., 2020).

In general, with the reduction in sales, fish farmers ended up needing to keep larger quantities of live fish and that necessarily needed to be fed for an undetermined period of time, which is resulting in higher costs and expenses, in addition to a consequent increase in costs. risks, mainly of mortality (FAO, 2020c).

Energetic actions must be taken to mitigate impacts, the Ministry of Agriculture, Livestock and Supply has already formalized a multidisciplinary crisis committee within the government to prevent shortages, Sectoral Fish Chamber, which aims to resolve critical points in this chain (MAPA, 2020).

The pandemic exposed new and rekindled old challenges to society, especially in the Supply Chain, where the multi-stage (horizontal) supply chain or concentrated in a few countries has caused changes in supply. Adherence to social isolation and the Lockdown that occurred in many countries will force the fish trade and industry to take a new stance, with changes in work and alternative means of production, distribution, marketing and communication, necessary to face this crisis.

4. Conclusion and Suggestions

World aquaculture has been heated by the notorious growth in recent years, however, with the establishment of the pandemic, many areas of the economy have been affected. Despite the absence of concrete data, the impacts of COVID-19 on aquaculture can already be perceived, and these have created challenges for the sale of fish, especially fresh fish, even when demand still exists in the national and international markets. Even with the gradual opening in some countries, it is possible that consumers need more time to return to pre-crisis consumption levels outside the home. In addition, the uncertainty of the emergence of new waves of localized epidemic outbreaks can also result in new blocking measures, making the market even more unstable, which may reflect on the chain in the long run.

Finally, after the publication of official post-pandemic data, further studies are needed to measure such impacts throughout the production chain, demonstrating how the health crisis has reduced or not the world's fish production.

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