STURGEONS IN THE CASPIAN SEA AND THEIR CONSERVATION MEASURES

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Abstract: The Caspian Sea, which hosts a wide variety of sturgeon species, has experienced a significant decline in sturgeon populations due to pollution, overfishing, and habitat destruction. These factors have led to a drastic reduction in their numbers. There are three sturgeon species that are crucial for maintaining ecological balance: Beluga (Huso huso), Russian sturgeon (Acipenser gueldenstaedtii), and Starry sturgeon (Acipenser stellatus). In particular, pollution continues to drive these species toward extinction, resulting in a significant decline in their populations. Research findings indicate that several factors hinder the survival of sturgeons. These factors negatively impact the ability of sturgeon species to sustain their populations. Unsustainable fishing practices, the construction of dams, and industrial development have led to the abandonment of spawning grounds, while pollution further disrupts the ecosystem. Conservation strategies, such as fisheries management and habitat restoration projects, are currently key topics of discussion. Sturgeons are the primary research focus of this study. The research suggests that further investigation and collaboration with international organizations are necessary to ensure the sustainable and protective management of sturgeon species in the Caspian Sea.
Keywords: Caspian Sea, sturgeons, conservation measures, pollution, fish species

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Introduction

There is evidence that sturgeons living in the Caspian Sea have historically played a significant role in both the region's economy and its biological system. To ensure the preservation of the region’s biodiversity, it is crucial to investigate the existence of these ancient fish, which have been present in the area for over two hundred million years. Over the past few decades, the number of these fish has significantly decreased due to various anthropogenic impacts, including pollution, overfishing, and habitat degradation [4]. This decline has occurred as a result of a combination of factors—the result of several different conditions coming together simultaneously. These threats have affected sturgeons, including species such as Beluga (*Huso huso*), Russian sturgeon (*Acipenser gueldenstaedtii*), and Stellate sturgeon (*Acipenser stellatus*), with a significant portion of these species now facing the threat of extinction within the next few decades [1].

Figure 1. Sturgeon Fish Species

Source [6]

One of the most important factors contributing to the decline of sturgeons is the high demand for sturgeon caviar production. This demand has led to a decrease in their numbers. Another key factor causing the decline of sturgeons is overfishing. It is possible that the construction of dams, as well as the pollution of freshwater rivers and the spawning grounds where sturgeons deposit their caviar, has disrupted the typical migration patterns of these fish, which in turn adversely affects their viability. There are many other factors contributing to this problem. Pollution of the Caspian Sea as a result of industrial and agricultural activities has further complicated the resolution of these issues. This is because pollution affects not only the health of sturgeons but also their habitat [2].

In response to these concerns, a range of conservation measures have been developed. Some of these initiatives include the restriction of fishing, habitat restoration, and the establishment of programs for the artificial breeding of fish. Considering that these methods have limited impact, participating in even more coordinated international cooperation to ensure the survival of these species is of vital importance. Unfortunately, despite all these efforts, the effectiveness of these measures remains quite limited.

Caspian Sea and Sturgeon Species

The sturgeon species in the Caspian Sea have been significantly influenced by various natural and anthropogenic factors. Throughout human history, the Caspian Sea has served as a habitat for numerous different sturgeon species. The implementation of industrial fishing and the growing demand for caviar that began in the 19th century led to the depletion of these species due to unsustainable fishing practices. This occurred in the 19th century and was the primary cause of the decline of sturgeon populations.

Fishing practices—including large-scale fishing and illegal poaching—have had a significant impact on sturgeons, especially in light of the sharp increase in caviar demand. The normal reproductive cycles of sturgeons have been disrupted, leading to the degradation of their spawning grounds as a result of the damming of rivers flowing into the Caspian Sea. Sturgeons are among the species encountered in the Caspian Sea. It has been determined by the International Union for Conservation of Nature (IUCN) that the Beluga sturgeon is in a critically endangered state. This is one of the many sturgeon species in the Caspian Sea facing the threat of extinction [1].

Furthermore, the construction of dams, pollution, and changes in weather conditions are also among the factors that pose specific threats to sturgeons. All of these factors have contributed to an increase in these risks. Dams hinder sturgeons from reaching their spawning grounds in freshwater rivers, resulting in an inability to achieve their normal migration. It is crucial for their reproductive success that they reach these spawning areas; however, dams obstruct this process. Additionally, the water quality in the Caspian Sea has deteriorated due to pollution from industrial, agricultural, and municipal sources, creating an even more dangerous situation regarding the ability of sturgeons to persist.

Various Strategies for the Conservation of Sturgeon Species in the Caspian Sea

Sturgeon species are currently in

decline, and various conservation measures are being implemented to counteract this trend. Fishing restrictions, artificial breeding programs, habitat restoration, and international cooperation are examples of these efforts.

Table 1. Self-Sufficiency Level in Azerbaijan, Percentage

	2020	2021	2022	2023
All Types of Meat and Meat Products	84,5	86,4	86,0	85,3
Fish and Fish Products	81,7	78,2	76,7	75,4

Source: [5]

According to the conclusion, the levels of self-sufficiency in meat, fish, and products derived from these sources in Azerbaijan between 2020 and 2023 have been substantiated withvariousexamples.

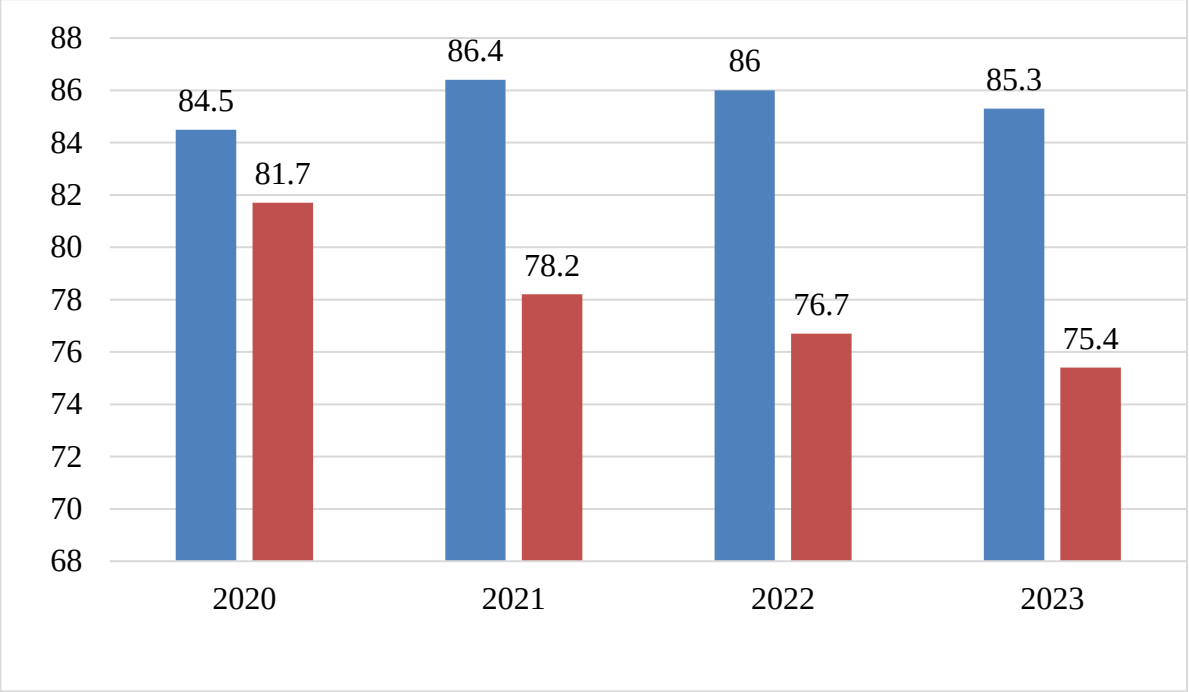

Figure 1. Graphical Representation of Self-Sufficiency Level in Azerbaijan, Percentage
Source: [5] based on

Based on Graph 1, it can be observed that the self-sufficiency level for meat and meat products increased from 84.5% in 2020 to 86.4% in 2021, followed by a slight decline to 86.0% in 2022 and 85.3% in 2023. In contrast, the self-sufficiency percentage for fish and fish products has shown a continuous decline, decreasing from 81.7% in 2020 to 75.4% in 2023.

Overall, while Azerbaijan has managed to maintain a high level of self-sufficiency in meat production, the declining trend in fish and

fish products raises concerns. To reverse this trend and enhance food security in the sector, issues such as overfishing, investments in aquaculture, and improved fisheries management must be addressed.

To combat overfishing and reduce illegal fishing activities, countries surrounding the Caspian Sea have imposed fishing restrictions. The objective of these restrictions is to curb excessive fishing practices. Strict fishing quotas, seasonal fishing bans, and regulations controlling the sale of caviar are part of efforts to prevent the overexploitation of the caviar sector. However, enforcement remains a challenge, particularly in regions where illegal poaching practices are still widespread [2].

Several countries have initiated efforts to restore critical habitats necessary for sturgeon spawning. These ecosystems are essential for the survival of sturgeon species. A key goal of these initiatives is to replenish the Caspian Sea with natural nutrients that support sturgeon spawning grounds. One of the most crucial aspects of these conservation efforts has been the implementation of programs aimed at restoring wetland areas and modifying or removing dams to facilitate migratory fish passage. To facilitate these habitat restoration operations, the United Nations Environment Programme (UNEP) has established a regional framework under the Tehran Convention [2].

The implementation of artificial breeding and rearing programs is another conservation strategy for sturgeon species. These projects aim to provide a controlled environment for sturgeon reproduction and, after successful juvenile development, release them back into the wild. Although this approach has shown some success, it is not a long-term standalone solution. It must be complemented by environmental improvements and strengthened fishing regulations [3].

Ultimately, global coordination is essential for the success of conservation initiatives. Given that the Caspian Sea spans international borders and sturgeon species migrate across different regions, cross-border cooperation is crucial. The Tehran Convention, a regional environmental agreement, has proposed a structured approach to the conservation of Caspian Sea ecosystems, including the protection of sturgeon species, which are an integral part of these ecosystems. Additionally, the Caspian Environment Programme (CEP) aims to minimize pollution levels in the Caspian Sea and ensure the sustainable management of its natural resources.

Conclusion:

Despite the significant decline in sturgeon populations in the Caspian Sea, addressing this issue requires a comprehensive conservation strategy that integrates multiple approaches. While efforts have been made to mitigate these challenges, much remains to be done. Sturgeon species face serious threats due to pollution, habitat degradation, and overfishing, all of which jeopardize their survival.

To ensure the future of these ecologically and culturally valuable species, international cooperation, stricter fisheries regulations, habitat restoration, and breeding programs will be essential. In recent years, artificial breeding initiatives have become increasingly important in conservation efforts. If collaboration and investment in conservation programs continue, there is reason for optimism that sturgeon populations can be safeguarded, and their aquatic environment in the Caspian Sea can be improved.

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