The Value of Tuna: Economic and Nutritional Perspectives on Global Occurrences, Sources, Utilisation and Future Opportunities in Somalia

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Abstract
This review synthesises current global and regional knowledge on tuna resources, their economic value, nutritional significance, and utilisation patterns, with a special focus on Somalia's emerging opportunities. Tuna is a globally significant marine resource that provides high-quality protein, omega-3 fatty acids, and essential micronutrients while supporting multi-billion-dollar fisheries. Somalia, with its 3,333 km coastline and productive upwelling zones in the Indian Ocean, possesses substantial yet underutilised tuna resources. Drawing on data from FAO, WHO, IOTC, ISSF, and peer-reviewed sources, this review examines tuna distribution, management, trade, and nutritional benefits. Findings indicate that Somali tuna fisheries are predominantly artisanal (~85% of catch) and constrained by limited infrastructure, weak monitoring, and illegal, unreported, and unregulated (IUU) fishing. With strategic investment in port facilities, cold storage, processing capacity, fisheries governance, and human resource development, annual tuna catch could rise from ~30,000 to 150,000–200,000 metric tons, creating 50,000–80,000 jobs and increasing GDP contributions from USD 30–50 million to USD 300–500 million. Sustainable management and regional cooperation are vital for economic growth, food security, and improved nutritional outcomes.

Keywords: Tuna Fisheries, Somalia, Economic Growth, Sustainability, Nutrition, Opportunities

1. Introduction

Tuna is important economically, ecologically, and nutritionally on a global scale. Economically, tuna fisheries are among the most lucrative worldwide, generating billions of dollars each year (FAO, 2022) [6]. The global tuna market, encompassing canned and fresh/frozen varieties, sustains the livelihoods of millions, particularly in developing coastal nations (FAO, 2022) [7].

Tuna serve as apex or near-apex predators in marine ecosystems, regulating lower trophic levels and maintaining the equilibrium of pelagic environments (Collette *et al*., 2011) [3]. Their migratory patterns also link diverse maritime ecosystems (Collette *et al*., 2011) [3].

Tuna is a substantial source of protein, omega-3 fatty acids, and vital micronutrients (iron, selenium, and vitamin D), rendering it a significant element of global food security and nutrition policies (FAO, 2020) [5].

Countries bordering the Pacific, Indian, and Atlantic Oceans depend significantly on these oceans. Bordering countries are highly reliant on tuna resources for export earnings and jobs. Catching tuna supports large-scale processing industries, large-scale fleets, and small-scale fishermen who manufacture canned, frozen, and fresh goods (Barclay *et al*., 2016) [1]. Ecologically, tuna plays a crucial role in maintaining the balance of marine communities. Tuna species are apex and mesopredators that regulate the prey populations of other prey species, such as small pelagic fish and squid (Juan-Jordá *et al*., 2018) [16].

Yellowfin Tuna (*Thunnus albacores*) is canned and marketed fresh. It is widely distributed in tropical and subtropical waters, forming the backbone of large commercial fisheries. Bigeye Tuna (*Thunnus obesus*) is highly in demand due to its high fat content and is particularly suited for the sashimi market, especially in Japan. Bigeye stock is overexploited in some areas, though, which raises concerns regarding conservation (ICCAT, 2021) [13].

Numerous tuna species of significant commercial value exist worldwide; *skipjack* (*Katsuwonus pelamis*) constitutes around 60% of the global tuna harvest and is predominantly used in canned goods (ISSF, 2023). It is exceedingly plentiful and rapidly proliferating. *Yellowfin* (*Thunnus albacares*) is esteemed in both the canned and fresh sashimi markets and is widely found in tropical and subtropical waters. Bigeye (*Thunnus obesus*) holds significance in sashimi markets and is recognised for its deep-water habitat and elevated market value. *Albacore* (*Thunnus alalunga*), commonly referred to as "white tuna" in canned goods, is a migratory fish of moderate commercial worth. Bluefin tuna (*Thunnus Thynnus*) and related species) It is the most valuable tuna species, particularly in Japan's sashimi market, although it is biologically susceptible owing to overfishing (ISSF, 2023; FAO, 2022) [6].

Tuna is a principal contributor to the economies of small island developing states (SIDS), on which many individuals depend on fishing license charges, processing, and export earnings. With only tuna fisheries in the Western and Central Pacific Ocean contributing an estimated USD 5 billion annually, they contribute to economic development and employment (Pilling *et al*., 2019) [19]. Tuna accounts for more than 20% of the overall value of marine capture fishery exports, with worldwide trade estimated at $40 billion per year (FAO, 2022) [7]. Major exporting countries include Thailand, Ecuador, Spain, and Indonesia. In contrast, Japan, the European Union, and the United States are the leading consumers; tuna fisheries play a crucial role in providing employment, generating foreign exchange income, and supporting coastal communities, especially in developing countries (ISSF, 2023). As an economical and nutrient-dense source of protein, tuna contributes to global food security, particularly in Small Island Developing States (SIDS) and coastal areas (FAO, 2020) [5]. The coastline of Somalia is one of the longest in Africa (3333 km along the Indian Ocean and the Gulf of Aden) (World Bank, 2022) [22]. EEZ gives Somalia exclusive rights over 825,000 kilometres of the sea, which has rich tuna fishing grounds. The western Indian Ocean is considered one of the most productive areas in the world for catching tuna, specifically skipjack and yellowfin tuna (IOTC, 2022) [14]. Considering its location, Somalia has the opportunity to emerge as a major player in the international tuna industry, contingent upon the development of sustainable fisheries management and infrastructure. For this benefit, however, the Somali tuna fishery is underdeveloped. These factors encompass inadequate infrastructure, the lack of monitoring and enforcement capacity, as well as foreign fleets' IUU fishing, which has hindered the nation from reaping the most significant benefits from its ocean resources (Houssein *et al*., 2020) [12].

Sustainably managing tuna and ensuring fair access are crucial to maintaining healthy ecosystems and securing long-term economic and nutritional benefits, particularly for developing coastal nations like Somalia.

The Objectives

The aim and scope of the review are

- The Economic contribution and Nutritional importance of tuna globally
- Potential opportunities for Somalia.

Methodological strategy

A literature search was conducted for the Value of Tuna, focusing on Economic and nutritional-related articles in Google Scholar and Research Gate and academia.

2. The Economic contribution and Nutritional importance of tuna globally

2.1. Global Tuna Occurrence and Distribution

Tunas are highly migratory and occur in tropical, subtropical, and temperate seas worldwide. Tunas are among the most economically valuable marine fish, with industrial and small-scale fisheries (FAO,2022) [7]. The distribution, abundance, and management of tunas are crucial to ensure a stable global seafood supply, ecological balance, and sustainable economic growth (FAO,2022) [6].

Table 1: Major Tuna Species and Habitats in Global Commercial Fishing.

Species	Habitat Distribution	Oceanic Region	Notes on Commercial Importance	Source
Skipjack	Epipelagic, surface to 200 m	Pacific, Atlantic, and Indian Oceans	Most abundant; major canned tuna species	FAO, 2022 [6]
Yellowfin	Surface to 250 m	Tropical & subtropical oceans	Popular for fresh & canned markets	FAO, 2022 [7]
Bigeye	Mesopelagic, 100–500 m	Indo-Pacific, Atlantic	Sashimi market; overfished in some regions	ICCAT, 2021[13]
Albacore	Epipelagic, temperate & tropical waters	Pacific, Atlantic, and Indian Oceans	Premium canned white meat tuna	FAO, 2022 [6]
Bluefin	Epipelagic, temperate waters, coastal & offshore	Atlantic & Pacific	High-value sashimi; critically overfished	Collette *et al*., 2011[3]

Global Tuna Catch Trends (2000-2021) World production of tuna has been increasing consistently due to the growth of industrial fishing and global demand (FAO, 2022) [6].

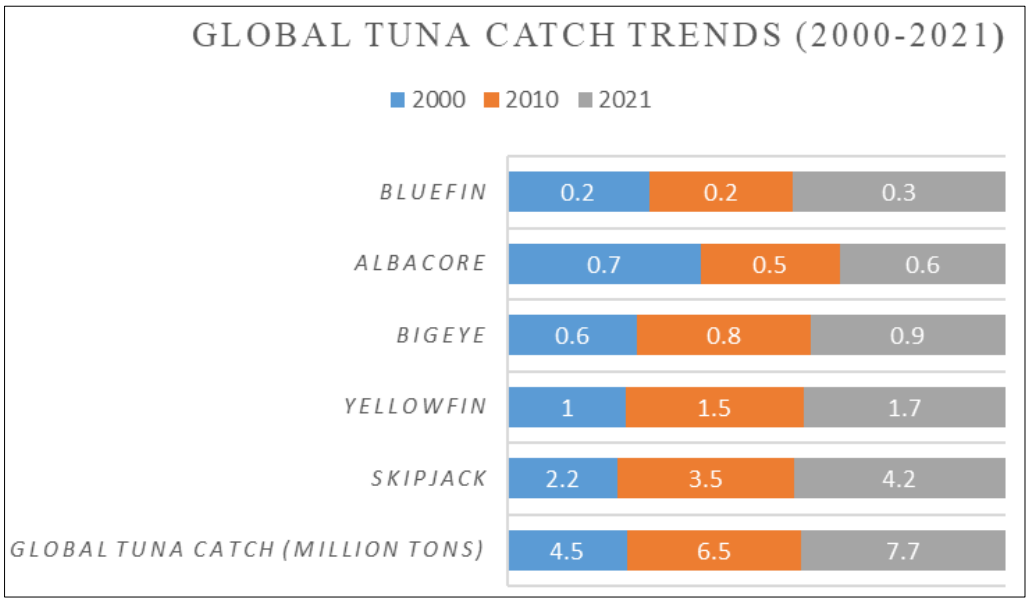

Fig 1: World production of tuna has increased steadily due to industrial fishing and global demand. Skipjack comprises ~55% of the total catch (FAO, 2022) [7].

The Marine Stewardship Council's certification pushes for practices that are sustainable and Also, rules for Fish Aggregating Devices try to lower the number of unwanted species, like sharks, turtles, and young tuna, that are caught. Some tuna types, such as bigeye and Bluefin, have seen improvements because of these management plans, but putting them into action is still hard in fisheries on the open sea (Collette *et al*., 2011) [3].

The main fisheries management and sustainability steps for tuna fisheries are These steps include: MSC Certification: This encourages lasting catch and supply chains for all types of marketable tuna (MSC, 2021). FAD Rules: These seek to lower the number of young fish caught and lessen the impact on the environment for Bigeye and Yellowfin tuna (IOTC, 2021) [14]. Catch Limits and Quotas: These are set up to stop too much fishing of Bluefin and Bigeye tuna (ICCAT, 2021) [13]. Observer Programs: These are made to watch if rules are being followed and to help gather data from all marketable tuna fisheries (IOTC, 2021) [14].

Table 2: Key Global Tuna Sustainability Measures and Their Applications

Measure	Purpose	Target Species	Source
MSC Certification	Promote sustainable catch & supply chain	All commercial tuna	MSC, 2021
FAD Regulations	Reduce juvenile bycatch & ecosystem impact	*Bigeye, Yellowfin*	IOTC, 2021[14]
Catch Limits & Quotas	Prevent overfishing	*Bluefin, Bigeye*	ICCAT, 2021[13]
Observer Programs	Monitor compliance & data collection	All commercial tuna	IOTC, 2021[14]

2.2. Sources and Utilisation of Tuna

Tuna is the most internationally significant marine product, supporting the processing industry, capture fisheries, international seafood trade, and international nutrition (Hampton & Williams, 2021) [10]. Tuna earns much revenue for coastal nations' economies and to international demand for cost-effective and healthy protein (Hampton & Williams, 2021) [10]. This part assesses tuna sources by capture fisheries, value and processing networks, and nutritional composition and intake of tuna products (Radtke & Wessells, 2023) [20]. The tuna is obtained mainly through two fishing systems, i.e., industrial fishing fleets and artisanal fisheries (Radtke & Wessells, 2023) [20]. Industrial tuna fishing involves large purse seine and longline fleets operating in distant ocean waters, which are largely controlled by multinational companies (Radtke & Wessells, 2023) [20]. The fleets dominate the majority of global tuna landings (Radtke & Wessells, 2023) [20]. On the other hand, artisan fisheries are small-scale and, in many cases, family- or community-owned, and normally nearshore, utilising traditional equipment such as handlines, small nets, or pole-and-line (Gutierrez *et al*., 2022) [9]. Many small-scale fishers depend on tuna as their main income source, selling their catch fresh at local markets or processing it in small facilities (Gutierrez *et al*., 2022) [9].

Comparison of Industrial and Artisanal Tuna Fishing Methods. Industrial fishing fleets catch the most tuna worldwide, 85%, but artisanal fisheries are very important to local economies and food security and catch 15&, especially in island countries and coastal towns (Gutierrez *et al*., 2022) [9].

Table 3: Comparison of Industrial and Artisanal Tuna Fishing Methods

Fishing System	Vessel Size & Gear	Typical Species Targeted	Geographic Scope	Share of Global Catch
Industrial	Purse seine, longline, >50 m	Skipjack, yellowfin, bigeye	High seas, EEZ of coastal states	~85%
Artisanal	Hand lines, small boats	*Skipjack, yellowfin*	Nearshore and coastal waters	~15%

Though world landings are dominated by industrial fleets, small fisheries ensure island nations and coastal communities' food security and local livelihoods (Delgado *et al*., 2021) [4]. The livelihood of most artisanal fishers is founded on tuna because it is fresh sold in proximate markets or processed in small-scale plants (Delgado *et al*., 2021) [4].

Once caught, tuna undergoes various processing streams depending on market demand, species, and destination. Tuna may be consumed fresh, frozen, or in a can (Hampton & Williams, 2021).

Fresh tuna finds its major markets in upscale markets like Japan, the United States, and Europe. Bluefin and bigeye are especially sought after for sashimi and sushi markets (Hampton & Williams, 2021) [10].

Frozen tuna finds applications in food service and retail markets (Tacon & Metian, 2021) [21]. Sea-based quick freezing prevents loss of quality and increases shelf life (Tacon & Metian, 2021) [21].

The most prevalent type of processed tuna across the globe is canned tuna, offering a cheap and cost-effective source of protein (Radtke & Wessells, 2023) [20]. The most common canning species is skipjack (Radtke & Wessells, 2023) [20].

Fresh processing targets Bluefin, bigeye, and yellowfin tuna for the high-end sushi/sashimi market and is primarily centred in Japan, the EU, and the USA. Frozen processing is applied to yellowfin and skipjack tuna to serve the retail and food service markets, with major hubs located in East Asia, the EU, and the USA. ((Hampton & Williams, 2021; Bell *et al*., 2020) [10, 2].

Table 4: Tuna Processing Types and Target Markets

Processing Type	Main Species Used	Target Market	Processing Hubs	Processing Type
Fresh	*Bluefin, bigeye, yellowfin*	High-end (sushi/sashimi)	Japan, EU, USA	Fresh
Frozen	*Yellowfin, skipjack*	Retail & food service	East Asia, EU, USA	Frozen

The trade in tuna is highly mobile in terms of the product: tuna is first caught in the Western Pacific, then processed in Thailand, and shipped to the United States or the European Union (Radtke & Wessells, 2023) [20]. This cross-national mobility has led to globalised seafood with added value in the process (Radtke & Wessells, 2023) [20].

Exported tuna from other countries in 2022 stood at over USD 40 billion, with yellowfin and skipjack dominating trading volumes (Radtke & Wessells, 2023) [20]. The largest single market for tuna is in the European Union, which imports over 1.2 million tons each year (Hampton & Williams, 2021) [10]. The United States is also an important importer, mainly of canned tuna (Hampton & Williams, 2021) [10]. Japan continues to have the biggest market for high-value fresh and frozen tuna, mainly bluefin and bigeye species (Hampton & Williams, 2021) [10].

Tuna's global seafood business role is not only financial but strategic as well: numerous contracts rely on tuna exports as their foreign exchange earner, source of employment, and source of funding for coastal infrastructure (Delgado *et al.*, 2021) [4]. The tuna sector is also a major source of global food security due to its volume, price, and distribution around the world (WHO, 2022) [24].

Presents the global tuna trade by major ocean regions, highlighting key exporting and importing countries along with dominant product forms. The Western Pacific leads in exports from the Philippines and Indonesia to major markets like Japan, the EU, and the USA, primarily in fresh, frozen, and canned forms. The Indian Ocean, including Seychelles and the Maldives, mainly supplies frozen and canned tuna to the EU and Middle Eastern markets, while the Atlantic Ocean trade is dominated by Spain and Ghana exporting fresh and canned tuna to the EU (FAO, 2022) [6].

Table 5: Global Tuna Trade by Ocean Region (2022)

Region of Catch	Major Exporters	Major Importers	Dominant Product Form
Western Pacific Ocean	Philippines, Indonesia	Japan, EU, USA	Fresh, frozen, canned
Indian Ocean	Seychelles, Maldives	EU, Middle East	Frozen, canned
Atlantic Ocean	Spain, Ghana	EU	Fresh, canned

2.3. Consumption and Nutritional Benefits

Tuna is also greatly prized as a nutrient-rich food consisting of top-quality protein, omega-3 fatty acids, vitamins (including B12, D, and niacin), and mineral nutrients such as selenium and iodine (World Health Organisation (WHO, 2022) [24]. A 100-gram tuna can serving generally contains 25–30 grams of protein and around 200–300 mg of omega-3 fatty acids (Tacon & Metian, 2021) [21].

3. Potential opportunities for Somalia

3.1. Tuna in Somalia: current status and potential

Tuna fisheries offer tremendous potential to make meaningful contributions to the economic growth, food security, and social well-being of Somalia (FAO, 2022) [6]. With the nation's extensive coastline along the Indian Ocean and Exclusive Economic Zone (EEZ), there is an unprecedented chance to establish a sustainable and economically beneficial tuna industry (FAO, 2022) [6]. The following subsection clarifies Somalia's geographical advantages, existing tuna fisheries, economic and social considerations, and the nutritional significance of tuna to the general public (MFMR, 2023). Somalia boasts one of Africa's longest coastlines, along over 3,300 km of coastline along the Indian Ocean. Its Exclusive Economic Zone (EEZ) covers about 835,000 km² and therefore provides huge access to tuna-rich waters (Ministry of Fisheries and Marine Resources (MFMR, 2023) [17]. Among the most notable geographical advantages is the Somali upwelling system, the most productive of the Indian Ocean upwelling areas. Cold nutrient-rich water is brought up to the ocean surface in this area, providing high productivity to plankton (FAO, 2022) [7]. It is conducive to huge aggregations of tuna species, especially skipjack, yellowfin, bigeye, and albacore (FAO, 2022) [7].

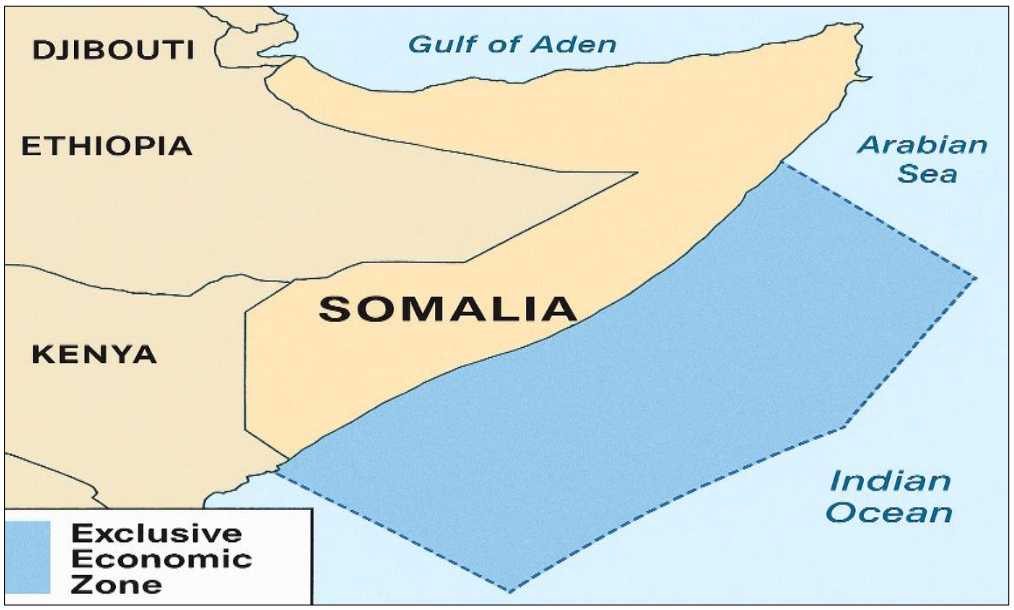

Fig 2: Map of Somalia showing the Exclusive Economic Zone (EEZ) and key tuna fishing grounds in the Western Indian Ocean. The Somali upwelling system supports high tuna productivity, especially for skipjack, yellowfin, and bigeye species (FAO, 2022; MFMR, 202) [6]

Artisanal fishing is the dominant mode of tuna fishing in Somalia (Houssein *et al*., 2022) [11]. Thousands of small-scale fishermen work along the coast, employing hand lines, small vessels, and gill nets to take yellowfin and skipjack tuna (Houssein *et al*., 2022) [11]. The fisheries are community-operated and frequently seasonal, based on monsoon patterns and fish migration (Houssein *et al*., 2022) [11].

The Tuna fishing industry is predominantly driven by the Artisanal Fishery, which uses hand lines and small boats to catch Skipjack and Yellowfin (comprising ~85% of the total catch), thereby generating the highest employment in coastal communities. The smaller Semi-industrial (using longline/purse seine for Yellowfin/Bigeye at ~10% share) and Foreign Fleets (using purse seine/longline for various species at ~5% share) complete the structure, with the latter contributing primarily through licensing revenue rather than direct local employment. (MFMR, 2023).

Table 6: Tuna Fishing Industry in Somalia (MFMR, 2023)

Type of Fishery	Gear Used	Species Targeted	Share of Total Catch	Employment Impact
Artisanal	Hand lines, small boats	*Skipjack, yellowfin*	~85%	High (coastal communities)
Semi-industrial	Longline, purse seine	*Yellowfin, bigeye*	~10%	Moderate
Foreign fleets	Purse seine, longline	*Skipjack, yellowfin, bigeye*	~5%	Low (licensing revenue)

Due to limited domestic capacity, Somalia signed fishing agreements with foreign fishing fleets from Asia and Europe (FAO, 2022) [6]. These agreements earn revenue in the form of license fees. Still, the absence of monitoring, control, and surveillance (MCS) has led to difficulty in enforcing compliance and raising reasonable revenues (FAO, 2022) [7].

IUU fishing, which is illegal, unreported, and unregulated, is a critical issue with staggering economic implications (Houssein *et al*., 2022) [11]. Studies put the estimate of costs lost by Somalia at tens of millions of USD every year in unlicensed tuna fishing (Houssein *et al*., 2022) [11].

Somalia's fishing infrastructure is low (World Bank, 2023) [23]. Only a few of its ports are functioning, with poor cold storage facilities and inadequate processing facilities (World Bank, 2023) [23]. The majority of the landed tuna is marketed fresh in the domestic markets or exported abroad in small lots through informal chains (World Bank, 2023) [23]. Development of landing sites, ice factories, and transport systems would be vital to increasing the sector (World Bank, 2023) [23].

The tuna industry can, in the future, contribute a substantial percentage of Somalia's Gross Domestic Product (GDP) and create employment opportunities (World Bank, 2023) [23]. Fisheries already contribute a small percentage of GDP now, but the contribution can be significantly increased if properly developed (World Bank, 2023) [23].

Table 7: Estimated Economic Contribution of Somali Tuna Fisheries (World Bank, 2023) [23]

Indicator	Current Estimate (2023)	Potential with Expansion (2030)
Tuna catch volume	~30,000 metric tons	150,000–200,000 metric tons
GDP contribution (USD)	$30–50 million	$300–500 million
Employment (direct & indirect)	~10,000 jobs	50,000–80,000 jobs

Tuna is a cheap and convenient source of protein for Somali families, especially among coastal dwellers due to low access to other sources of animal protein (WHO, 2022) [24]. Tuna has 25–30 grams of protein per 100 g and nutrient-dense micronutrients like omega-3 fatty acids, vitamin B12, selenium, and iodine.

Tuna's nutritional benefits for Somali families are clear. It greatly helps meet daily food needs by supplying protein and omega-3s, both good for muscles and hearts. Also, tuna gives key micronutrients like iodine, selenium, and vitamin B12. These help the thyroid, protect cells, and make red blood cells. Tuna is a helpful and nutritious food choice for Somali families (WHO, 2022) [24].

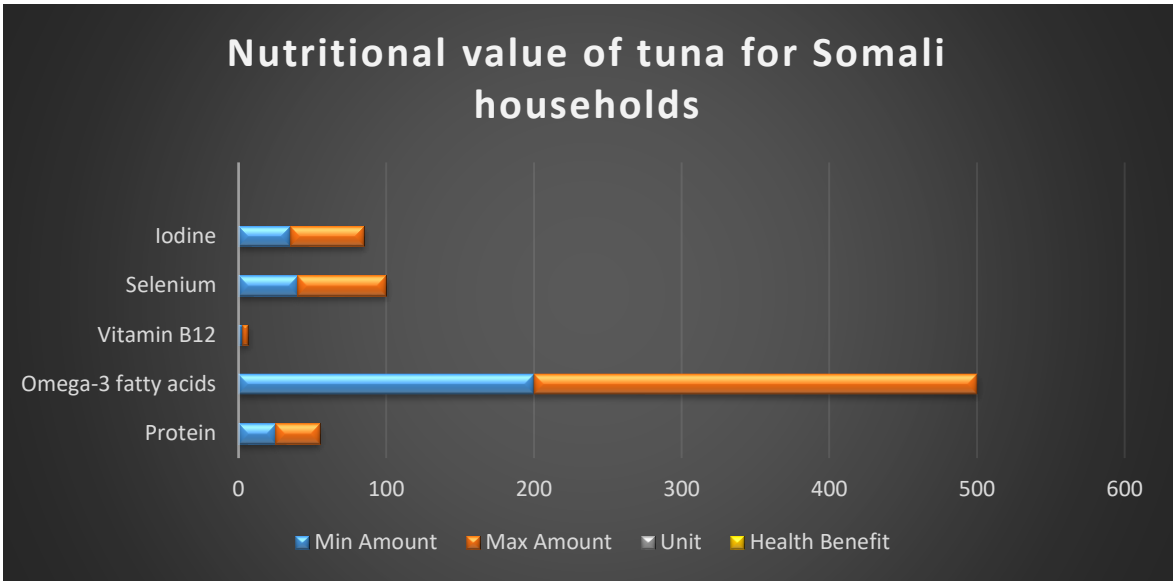

Fig 3: Nutritional profile of tuna as a major protein source in Somalia. Tuna contributes essential micronutrients such as omega-3 fatty acids, vitamin B12, selenium, and iodine, supporting food security and public health (WHO, 2022) [24].

Table 8: Health Benefits of Local Fish Species (FSNAU, 2012)

Fish Species	Health Benefits	Region
Yellowfin tuna	Treats malnutrition, fever, and diabetes	Burao
Mackerel	Anaemia, malaria, constipation	Burao, Berbera, Bardera
Shark	Improves libido, treats joint pain	Hafun, Eyl, Kismayo

3.2. Challenges and Barriers

IUU fishing continues to be Somalia's most urgent issue (Houssein *et al*., 2022) [11]. Illegal activity by foreign fleets continues without effective oversight, and it translates to heavy economic losses and stock depletion (Houssein *et al*., 2022) [11].

Illegal, Unreported, and Unregulated (IUU) fishing significantly impacts Somalia through three key activities, each requiring a tailored strategic response. Unlicensed foreign vessels lead to lost revenue and stock depletion, necessitating a response of satellite monitoring and patrol vessels. Underreporting of catch creates data gaps and weakens stock management, which is addressed through electronic reporting and observer programs. Finally, Transhipment at sea results in a loss of control over landings and traceability, requiring a strategic focus on regulating and monitoring transhipment activities. (Houssein *et al*., 2022) [11].

Table 9: IUU Fishing Impacts and Strategic Responses (Houssein *et al*., 2022) [11]

Type of IUU Activity	Impact on Somalia	Strategic Response
Unlicensed foreign vessels	Lost revenue, stock depletion	Satellite monitoring, patrol vessels
Underreporting of catch	Data gaps, weak stock management	Electronic reporting, observer programs
Transhipment at sea	Loss of control over landings and traceability	Regulate and monitor transhipment

Without timely and reliable information, fisheries management will collapse (MFMR, 2023). The absence of Somali scientific facilities and poor monitoring of the biomass of tuna frustrate evidence-based decision-making (MFMR, 2023).

Somalia's tuna sector is also affected by market access constraints due to poor infrastructure, the absence of quality assurance systems, and a lack of capital for investments (World Bank, 2023) [23].

Climate change presents a long-term risk to tuna fisheries (Bell *et al*., 2020) [2]. Prolonged high ocean temperatures and changed current flows will be expected to re-route tuna migrations in the Western Indian Ocean (Bell *et al*., 2020) [2].

3.3 Future opportunities and strategic directions

The Somali tuna industry stands at a crossroads at which proper planning, institution building, and investment can unleash enormous economic, social, and environmental value. Given its geographical location, productivity of the ocean, and increasing regional demand for seafood, Somalia can spearhead the modernisation of its tuna fisheries from an artisanal-based industry to a competitive and sustainable one (World Bank, 2023; FAO, 2022). [23, 6]

One of the most important areas of future strengthening is in

the management of fisheries to facilitate the sustainable catching of the tuna resource. Somalia currently has little MCS capacity, with illegal and unregulated fishing carried out in its EEZ. Enhancing MCS systems through investment in coastal radar, patrol boats, and satellite monitoring would be extensive in IUU fishing prevention (Houssein *et al*., 2022) [11].

Somalia struggles with weak monitoring, limited income from licenses, old laws, and poor cooperation in the region. To fix these problems, Somalia should grow its coast guard and use satellite tracking to improve surveillance. It can also bring in more money by updating its licensing system to be more digital and open. Somalia also needs to update its laws to match regional standards and work more closely with the IOTC and nearby countries (FAO, 2022) [7].

Table 10: Governance and Strategic Actions for Somali Tuna Industry (FAO, 2022) [6]

Governance Area	Current Status	Strategic Action Needed
MCS capacity	Weak surveillance, few patrol assets	Expand the Coast Guard, satellite/VMS tracking
Llicensing system	Limited revenue capture	Digitalise, increase transparency and compliance
Legal framework	Fragmented and outdated	Harmonise with regional fisheries management measures
Regional cooperation	Limited coordination	Engage with IOTC and neighbouring states

It is also critical to strengthen revenue and licensing measures. Somalia can best realise its economic gains by renegotiating foreign fishing agreements, levying fair fees, and ensuring enforcement. Subsequent increased revenues can be invested in fisheries management as well as in community development (FAO, 2022) [7].

The absence of modern fishing infrastructure is a significant limitation but also an opportunity for development. Investment in a cold chain system, processing plant, and port would allow Somalia to develop the value addition of its tuna production and be able to compete better in regional and international markets (World Bank, 2023) [23].

The necessary infrastructure for Somalia's tuna business. It points out that the biggest needs are for places to bring in fish and harbours, along with refrigeration and prep areas. Getting the fish to market is somewhat of a problem. To make the business stronger and more valuable, these needs must be addressed through focused spending and updates (World Bank, 2023) [23].

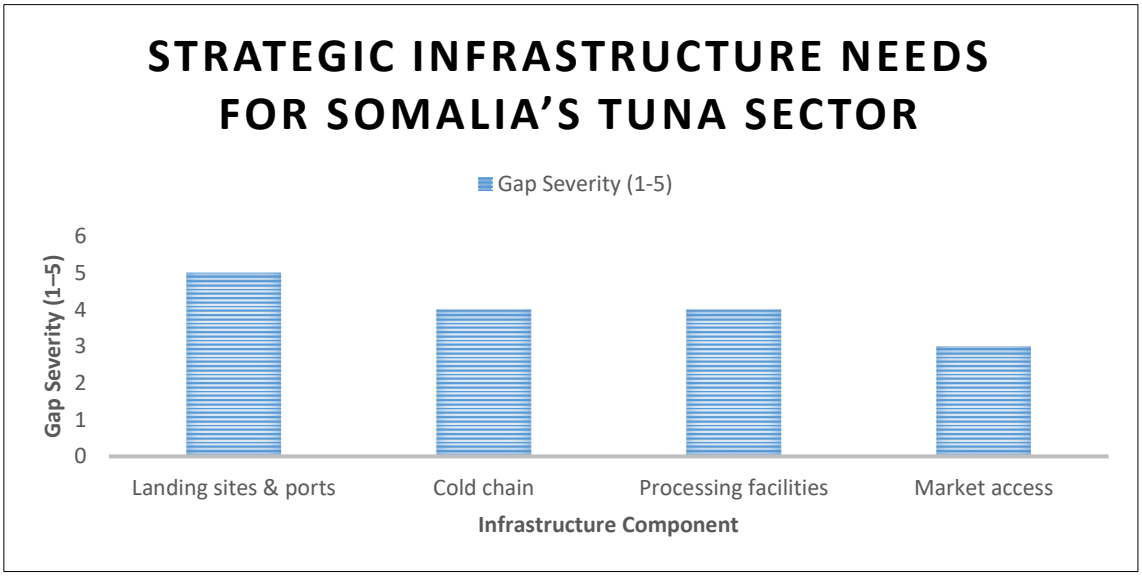

Fig 4: Schematic of the infrastructure requirements for Somalia's tuna industry. Addressing gaps in landing facilities, cold-chain logistics, and processing capacity is essential for maximising economic returns (World Bank, 2023) [23].

Sustainable management of tuna fishery resources is needed to enhance long-term economic sustainability and environmental well-being. Application of eco-certification schemes (e.g., Marine Stewardship Council—MSC) and traceability programs can add value to the market and enhance consumer trust (FAO, 2022) [7].

There must be sustainable tuna growth supported by science and capacity building. Somalia lacks sufficient fisheries data, research establishments, and people. Strengthening national fisheries science programs at universities and technical institutions would enhance the country's capacity to conduct stock assessments, resource mapping, and ecosystem monitoring (MFMR, 2023).

Conclusion

Tuna is a valuable sea resource for global commerce, jobs, and diet. Somalia's long coast, productive zones, and location in the Western Indian Ocean offer a chance to build a lasting tuna business. To achieve this, investments in infrastructure, better management, and strong tracking to stop illegal fishing are needed. Growing small-scale and big fisheries, improving supply chains, and boosting local eating habits can lead to financial gains, jobs, and better food security for the country. Lasting tuna care in Somalia needs teamwork between government groups, local communities, regional groups, and global partners to protect the environment, grow the economy, and improve food security.

Conflict of Interest
This research received no external funding. There is no competing interest that might influence the research work.

Data Availability Statement
All data used in this study are derived from publicly available sources, including FAO, WHO, IOTC, ISSF, and World Bank databases. No new data were generated for this review.

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Authors' Contributions
Sakariye Ahmed Hashi: Conceptualisation of the study, literature review, manuscript drafting, and data synthesis.
Mohamed Sharif Hussein: Supervision, guidance on regional fisheries data, critical revision of the manuscript, and final approval.
Both authors contributed to the interpretation of results, formulation of recommendations, and approved the final version for submission.

Recommendations
The Tuna industry in Somalia requires a logical policy framework, investments and regional associations to support the sustainable development of the industry. In accordance with the intensive analysis of the global tuna dynamics and the situation in Somalia in particular, the following major recommendations can be suggested:

✓ **To prepare national tuna management plans**
An elaborate national tuna management plan that is in tandem with best practices, as recognised internationally, as well as regional fisheries management frameworks, should be put in place in Somalia. This strategy must include licensed systems, surveillance and monitoring, data gathering, and enforcement instruments that would help reduce illegal, unreported, and unregulated (IUU) fishing. In addition, the plan should incorporate the ecosystem-based management concepts so that the tuna stocks become sustainable over the long term.

✓ **Investment in artisanal fisheries and value addition**
Artisanal fisheries can be better invested in by providing training programmes, upgrading fishing equipment and providing more access to modern landing sites to drive domestic production and improve the livelihoods of fishers. At the same time, investment in value-addition, such as building processing plants, cold chain infrastructure, and packaging solutions, will help Somalia to gain a larger share of market values, generate jobs, and reinforce its competitive advantage in both its domestic and international tuna markets.

✓ **Promote Cooperation in the Region.**
Tuna is a much migratory fish species, which needs joint regional management. A more effective partnership with the states and regional fisheries institutions, including the Indian Ocean Tuna Commission (IOTC), will increase the presence of common data, the ability to detect and monitor, and promote equal access to resources.

✓ **Increase Nutritional Consciousness and National Consumption.**
Some of the ways that can help improve the situation with malnutrition and food insecurity in Somalia include the promotion of tuna as an inexpensive and high in nutrients food item. A domestic demand can be boosted by public awareness campaigns, nutrition programmes and school-feeding programmes and supplement export strategies and see to it that local populations are the beneficiaries of this national resource.

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