

# The Impact of Shandong Province's Fishery Development on the Income and Expenditure of Fishermen's Households

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**Abstract:** As one of the important traditional industries in Shandong Province, fisheries occupy a significant position in regional economic development and the livelihoods of fishing households. Based on the current status of fishery development in Shandong Province, this study examines the impact of fishery development on the income sources and expenditure structures of fishing households. It explores existing challenges such as resource management issues, rising production costs, and market mechanism imperfections. The paper proposes countermeasures including strengthening fishery resource protection and management, improving market mechanisms and risk prevention systems, optimizing policy implementation, and promoting the integrated development of the fishery industry. These suggestions aim to support the healthy development of Shandong's fisheries and enhance the well-being of fishing families. Investigating the influence of fishery development on fishing households' economic conditions not only reveals the relationship between fishery growth and household economies but also provides scientific foundations for formulating policies to promote sustainable fisheries and improve fishermen's livelihoods.

**Keywords:** Fishery Development; Income and Expenditure of Fishing Households; Impact; Countermeasures

## 1. Introduction

Since ancient times, fisheries have been an integral part of China's agricultural economy [1]. Shandong Province, as a significant coastal region in eastern China, boasts abundant fishery resources and is one of the nation's key bases for fishery production. With its vast maritime area and diverse fishery

resources, Shandong's fishery output value ranks among the highest in the country. According to the "China Fishery Yearbook," in 2023, the total output value of Shandong's fishery economy reached 476.1 billion yuan, with the fishery output value alone amounting to 180.8 billion yuan. Shandong's extensive coastline and numerous inland water bodies provide exceptional conditions for the development of fisheries. In recent years, continuous transformations and advancements in the fishery industry have profoundly impacted the income and expenditure of fishing households. On one hand, the development of fisheries has brought increased income to fishing families; on the other hand, challenges such as resource and environmental pressures and market fluctuations have affected the stability and sustainability of their income and expenditure. Therefore, conducting in-depth research on the impact of Shandong's fishery development on the income and expenditure of fishing households is of significant practical importance for formulating scientifically sound fishery policies, promoting income growth for fishermen, and ensuring the sustainable development of the fishery industry.

## 2. Current Status of Fishery Development in Shandong Province

### 2.1 Scale of the Fishery Economy

#### 2.1.1 Total output of the fishery economy

In 2023, the total output of Shandong's fishery economy reached 476.2 billion yuan, marking a 7.90% increase compared to 2022. From 2019 to 2023, the average annual growth rate was 22.63%, demonstrating a steady upward trend. An analysis of the composition of the fishery economy's total output (e.g., Table 1. Total Output and Composition of Shandong Province's Fishery Economy <2019-2023>) reveals that from 2019 to 2023, fishery

production accounted for a stable 40% of the total fishery economy output, while fishery-related industry and construction and fishery-related circulation and services each maintained a stable share of around 30%. For example, in 2022, the proportions of fishery production, fishery-related industry and construction, and fishery-related circulation and services in Shandong were 39.2:32.2:28.7, respectively. Overall, Shandong's fishery

industry structure is relatively balanced, with minor differences in the proportions of the three sectors and rapid development. The continuous growth in marine fishery-related output value highlights the increasing importance of the fishery industry to the agricultural economy. Therefore, further development of the marine fishery economy is necessary, with more opportunities to promote its expansion.

**Table 1. Total Output and Composition of Shandong Province's Fishery Economy (2019-2023)**

Industrial Composition	2019 year		2020 year		2021 year		2022 year		2023 year	
	produce/ trillion	account for/%	produce/ trillion	account for/%	produce/ trillion	account for/%	produce/ trillion	account for/%	produce/ trillion	account for/%
fishing industry	1474	35.75	1566	37.75	1732	42.77	1730	39.20	1808	37.96
Involved in fishing industry and construction industry	1409	34.17	1407	33.91	1338	33.03	1419	32.15	1497	30.44
Fishery circulation and service industry	1240	30.08	1175	28.34	980	24.20	1264	28.65	1457	31.60
amount to	4123	100.00	4147	100.00	4050	100.00	4413	100.00	4762	100.00

Data source: China fishery statistical yearbook

### 2.1.1 Fishery production performance

In the overall composition of Shandong Province's fishery economy, fishery output plays a dominant role (e.g., Table 2. Fishery Output and Composition in Shandong Province <2019-2023>). In 2023, the fishery output of Shandong Province reached 180.8 billion yuan, marking a 4.50% increase compared to 2022. From 2019 to 2023, the average annual growth rate was 22.63%, indicating a generally stable growth pattern. Breaking it down by sector, within the capture fishery output, freshwater

capture accounts for the smallest proportion but has shown an upward trend, rising from 1.08% in 2019 to 1.30%. In contrast, marine capture holds a larger share but exhibits a fluctuating upward trend. In the aquaculture sector, freshwater aquaculture constitutes a relatively small proportion and follows a fluctuating growth pattern, whereas marine aquaculture represents the largest share of Shandong's fishery output and demonstrates a steady upward trend.

**Table 2. Fishery Output and Composition in Shandong Province (2019-2023)**

Industrial Composition	2019 year		2020 year		2021 year		2022 year		2023 year	
	produce/ trillion	account for/%	produce/ trillion	account for/%	produce/ trillion	account for/%	produce/ trillion	account for/%	produce/ trillion	account for/%
Marine fishing	2998	20.34	355	22.69	338	19.50	346	20.00	350	19.38
mariculture	888	60.27	931	59.52	1073	61.93	1140	65.89	1181	65.33
Freshwater fishing	16	1.08	17	1.10	20	1.17	20	1.18	24	1.30
freshwater aquaculture	193	13.11	183	11.69	222	12.80	223	12.92	253	13.99
Aquatic seedlings	77	5.20	78	5.00	80	4.60	87	5.05	89	4.93
amount to	1474	100.00	1566	100.00	1732	100.00	1730	100.00	1808	100.00

Data source: China fishery statistical yearbook

## 2.2 Current Status of Fishermen Household Income and Expenditure in Shandong Province

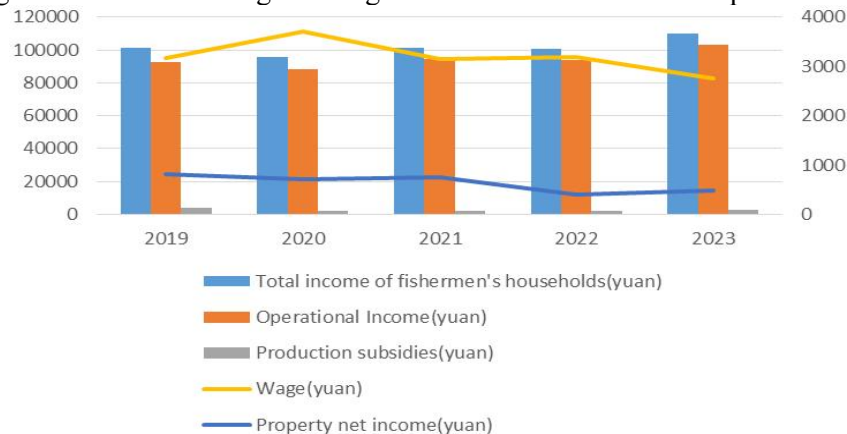
### 2.2.1 Income status of fishermen households in Shandong province

The living conditions of fishermen reflect the rise and fall of the fishing industry, and household income-expenditure surveys serve as a primary means to assess their production and living standards [2]. Overall (e.g., Figure 1. Income Status of Fisher Households in

Shandong Province) 1, from 2019 to 2023, the total household income of fishermen in Shandong Province exhibited a fluctuating upward trend. By 2023, the average household income reached 109,758 yuan, marking a 9.30% year-on-year increase compared to 2022. From Figure 1, it can be observed that the total household income of fishermen in Shandong Province has generally been increasing. Breaking it down by component, the operational income showed a fluctuating trend from 2019 to 2023, reaching 102,985 yuan by

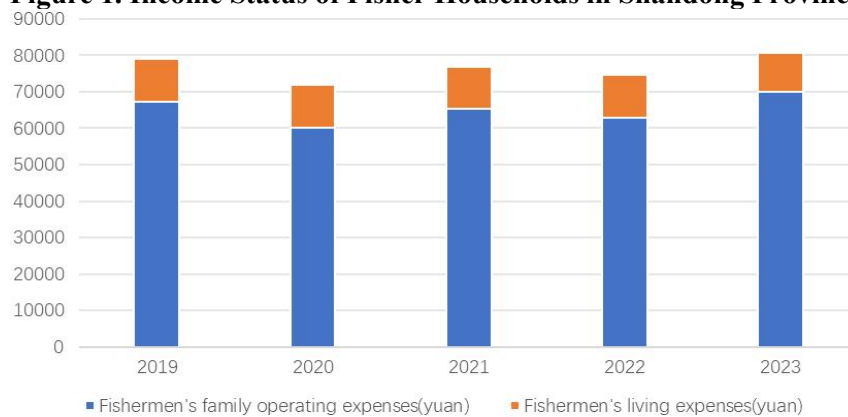
2023 and accounting for 93.83% of the total income. Wage income and property income peaked in 2020 and 2019, respectively, and have since been declining. Additionally, the figure illustrates that over time, with the development of the marine fishery industry, the living standards of fishermen have continuously improved. Meanwhile, government subsidies for fishermen primarily include fuel subsidies for motorized fishing vessels, living allowances during fishing

moratorium periods, subsidies for fishing vessel insurance, and subsidies for vessel reduction and livelihood transition [3]. The amount of fishery financial subsidies varies with policy changes, peaking in 2019 at 3,864 yuan. These subsidies have, to some extent, contributed to increasing fishermen's income levels. Overall, the household income of fishermen is trending positively, which is closely tied to the policies and support from both the national and provincial governments.



Data source: China fishery statistical yearbook

**Figure 1. Income Status of Fisher Households in Shandong Province**



Data source: China fishery statistical yearbook

**Figure 2. Household Expenditure of Fishers in Shandong Province**

### 2.2.2 Household expenditure of fishermen

Fishermen's household expenditure is closely tied to their income. Overall (e.g., Figure 2. Household Expenditure of Fishers in Shandong Province), from 2019 to 2023, their expenditure exhibited a fluctuating trend, reaching 70,116.15 yuan by 2023, with an annual growth rate of 4.40%. Although the increase was modest, it still reflected a positive upward trend. In contrast, living consumption expenditure showed a fluctuating decline, dropping to 10,430.14 yuan by 2023, with an annual decrease of 11.60%. The figure indicates that fishermen allocated a significant

portion of their income to business operations, naturally resulting in reduced spending on daily living expenses.

### 3. Impact of Fishery Development on Fishermen's Household Income and Expenditure

Shandong Province, as a major fishery hub in China, boasts abundant fishery resources and a robust industrial foundation. In recent years, with advancements in fishing technology, optimization of industrial structure, and strengthened policy support, Shandong's fishery sector has achieved remarkable

progress. However, the impact of fishery development on fishermen's household finances is multifaceted. While it has contributed to income growth, it has also led to increased expenditures. The modernization of fisheries has raised production costs, including fuel, equipment, and labor, while government subsidies and market opportunities have helped boost revenue. This dual effect has resulted in higher overall household income but also shifted spending patterns, with a greater proportion allocated to business operations rather than daily living expenses. In summary, fishery development in Shandong has brought both economic benefits and financial challenges to fishing households.

### 3.1 Impact on Fishermen's Household Income

The impact of fishery development on fishermen's household income is manifested in both direct and indirect aspects, with certain regional variations.

3.1.1 The advancement of fishing technology and industrial upgrading has increased the income level of fishermen's households.

First, the application of new aquaculture technologies (such as deep-sea cage farming and ecological farming) and advanced fishing equipment (such as modern fishing vessels and sonar detection technology) has improved fishery production efficiency, increased the yield and quality of aquatic products, and directly boosted the income of fishermen's households from fishery production [4]. For example, the farming of high-value aquatic products such as sea cucumbers and shrimp has brought greater economic benefits to fishermen's families.

Second, the upgrading of the fishery industry (such as the shift from traditional fishing to aquaculture and processing) has extended the industrial chain, creating additional income sources for fishermen's households in sectors like aquaculture and processing. For instance, the development of aquatic product processing has provided more employment opportunities and income channels for fishermen's families.

3.1.2 Industrial development and employment opportunities have enhanced the economic benefits of fishermen's households.

The development of the fishery industry in Shandong Province has not only directly increased the income of fishermen's

households but also indirectly enhanced their economic benefits by driving the growth of related industries [5]. For example, the prosperity of sectors such as aquatic product processing, logistics, and sales has provided fishermen's families with more non-fishing employment opportunities, boosting their wage-based income. Additionally, the emergence of new business models like recreational fisheries and marine ranching has created fresh income streams for these households. For instance, tourism projects leveraging fishery resources—such as fishing-themed homestays ("yujiale") and offshore angling—have generated supplementary earnings for fishermen's families.

### 3.2 Impact on Fishermen Household Expenditure

The development of the fisheries sector has not only transformed the income structure of fishing households but also significantly influenced their expenditure patterns.

3.2.1 Changes in productive expenditure

With technological advancements and industrial upgrading in the fisheries sector, the productive expenditures of fishermen households have increased significantly.

First, Higher Costs of Equipment Acquisition and Maintenance. The purchase and upkeep of modern fishing vessels, aquaculture facilities, and other equipment entail substantial costs, raising productive expenditures. Second, Rising Operational Costs. Expenses such as fuel and fishing gear maintenance during fishing and aquaculture operations have increased, further intensifying financial pressure on fishermen families. Third, Additional Expenditures for Sustainable Development. To meet sustainability requirements—such as reducing pollution and resource waste—fishermen households now face additional environmental protection costs.

3.2.2 Changes in household consumption expenditure

The income growth resulting from fisheries development has led to structural changes in the expenditure patterns of fishermen households. First, Increased Spending on Education. With rising living standards, fishermen families are placing greater emphasis on children's education, leading to a growing proportion of household budgets allocated to schooling. Second, Higher

Healthcare Expenditure. The expansion of medical insurance coverage and improvements in healthcare services have increased fishermen households' spending on medical care. Third, Diversification of Consumption. Households are spending more on food, housing, and entertainment, reflecting an overall improvement in living standards and a more varied consumption structure.

### 3.2.3 Optimization of expenditure structure and improvement in quality of life

The growth of fisheries has not only increased fishermen households' expenditures but also optimized their spending structure, leading to improved living standards. With diversified income sources, their expenditure patterns have become more balanced—transitioning from merely meeting basic needs to pursuing higher-quality lifestyles.

Key changes include: First, Upgraded Consumption Patterns. Increased spending on education, healthcare, and recreation reflects enhanced quality of life. Second, Reduced Financial Pressure. Government subsidies and expanded social insurance coverage have alleviated burdens in education and medical expenses. Third, Sustainable Livelihood Development. More disposable income enables investments in skills training and asset accumulation, fostering long-term prosperity.

## 3.3 Comprehensive Impact on Fisher Households' Economic Conditions

The comprehensive impact of fishery development on the economic conditions of fisherfolk families is reflected in the balance between income growth and expenditure increase as well as changes in economic stability.

### 3.3.1 The balanced relationship between income growth and expenditure increase

In regions with well-developed fisheries, the income of fisherfolk families has grown rapidly, covering the increase in expenditures and leading to a significant improvement in their economic conditions. For instance, by developing high-value aquatic products and recreational fisheries, the income of fisherfolk families has increased significantly, enabling them to cope with the rising production and living expenses. However, in areas where resources are declining or production costs are high, the increase in expenditures of fisherfolk families outpaces their income growth,

resulting in considerable economic pressure. For example, overfishing has led to a reduction in resources, causing the income of fisherfolk families to decline, while production expenses continue to rise, posing challenges to maintaining a balance between income and expenditure.

### 3.3.2 The impact of fishery development on economic stability

The advancement of fishing technology and industrial upgrading have enhanced the stability of fishermen's household income, mitigating risks caused by resource depletion or market fluctuations [6]. For instance, diversified operations (e.g., aquaculture, processing, and recreational fisheries) provide additional income sources for fishermen's families, strengthening their economic resilience. Additionally, government subsidies, insurance, and other policy supports contribute to improving their financial stability. For example, the widespread adoption of fisheries insurance helps reduce economic losses caused by natural disasters or market volatility.

## 4. Issues and Challenges

While the development of the fisheries industry in Shandong Province has improved fishermen's household income and quality of life, it also faces a series of problems and challenges. These issues not only affect the financial balance of fishermen's families but also pose a threat to the sustainable development of the fisheries sector.

### 4.1 Decline of Fishery Resources

The decline in fishery resources is one of the major issues affecting fishermen's household income. Factors such as overfishing, environmental pollution, and climate change have led to the depletion of fishery resources, directly reducing fishing income for fishermen's families. For example, the dwindling stocks of traditional commercial fish species (such as hairtail and yellow croaker) have forced fishermen to shift to catching lower-value aquatic products, resulting in decreased earnings. Additionally, resource depletion has increased production costs (e.g., the need to fish in more distant waters), further squeezing profit margins.

### 4.2 Rising Production Costs

Rising production costs in the fishing industry

pose challenges to the financial balance of fishermen's households. First, the purchase and maintenance costs of modern fishing vessels, aquaculture facilities, and other equipment are high, increasing production-related expenditures for fishermen's families. Second, rising fuel prices and fishing gear maintenance costs further amplify their financial burden. Additionally, sustainable fisheries development requires reduced pollution and resource waste, leading to higher environmental compliance costs for fishermen. The overall increase in production costs has narrowed profit margins, putting pressure on household income and expenditure stability.

#### **4.3 Market Volatility Risk**

First, changes in market supply and demand, as well as volatility in the international trade environment, contribute to price instability, undermining income predictability for fishing families [7]. For instance, pandemic-related export disruptions led to price declines, reducing household earnings. Second, information asymmetry and limited market access place fishermen at a competitive disadvantage, exacerbating income volatility risks.

#### **4.4 Inadequate Implementation of Policies**

Despite a series of government policies aimed at supporting fisheries development and increasing fishermen's household income, challenges remain in their implementation. For example, delays in subsidy disbursements have dampened fishermen's production incentives. Inadequate technical training and extension services have limited households' ability to adopt new technologies. Additionally, the limited coverage of fishery insurance has failed to effectively mitigate production risks. These implementation gaps weaken policy effectiveness and hinder improvements in fishermen's household finances.

### **5. Countermeasures and Suggestions**

#### **5.1 Strengthen the Protection and Management of Fishery Resources**

The decline in fishery resources is a core issue affecting fishermen's household income, and sustainable utilization must be achieved through scientific management and conservation measures. First, implement a

strict fishing quota system. Establish a scientific fishery resource assessment framework to set reasonable catch limits and curb overfishing [8]. By allocating quotas, fishery resources can be utilized within sustainable boundaries while ensuring basic income for fishing households. Second, promote ecological aquaculture and marine ranching. Encourage fishermen to transition to sustainable models such as eco-friendly aquaculture and marine ranching. Measures like artificial reef construction and stock enhancement can help restore fishery resources and improve farming efficiency. For example, expanding the ecological farming of high-value species like sea cucumbers and abalone can boost household income. Third, enhance fishery resource monitoring and enforcement. Utilize satellite remote sensing, drones, and other technologies to strengthen real-time monitoring of fishery resources. Simultaneously, intensify crackdowns on illegal fishing to ensure effective implementation of conservation policies.

#### **5.2 Reduce the Production Cost of Fisheries**

Rising production costs are squeezing profit margins for fishing households, necessitating technological innovation and policy support to reduce expenses. First, promote energy-efficient and eco-friendly technologies. Encourage fishermen to adopt fuel-saving vessels and sustainable aquaculture equipment to cut energy consumption. For example, expanding the use of solar, wind, and other clean energy sources in fisheries can lower operational costs. Second, provide low-cost financing support. Offer low-interest loans through policy-backed financial institutions to help fishing households upgrade boats and aquaculture facilities. Additionally, incentivize private investment in fishery infrastructure to ease financial burdens. Third, enhance technical training and extension services. Organize workshops to equip fishermen with modern fishing and aquaculture techniques. By improving technical skills, production efficiency can increase while reducing costs.

#### **5.3 Improve Market Mechanisms and Risk Prevention and Control**

Market volatility poses a threat to the income stability of fishing households, necessitating improved market mechanisms and risk

mitigation measures. First, establish an early warning system for aquatic product prices. Leverage big data and AI technologies to create a price monitoring and forecasting system, providing timely market insights to help fishing households optimize production and sales strategies. Second, expand sales channels. Encourage fishing households to adopt e-commerce platforms, livestream sales, and other innovative marketing models to broaden market access. Additionally, support the development of regional aquatic product trading hubs to enhance supply-demand connectivity. Third, promote fishery insurance. Expand insurance coverage to protect fishing households against risks such as natural disasters and market fluctuations. Policy-backed subsidies can lower insurance costs and incentivize participation.

#### **5.4 Optimize Policy Implementation and Execution**

Inadequate policy implementation undermines policy effectiveness, necessitating optimized execution mechanisms and enhanced oversight to ensure policy delivery [9]. First, simplify policy application procedures. Streamline the application processes for subsidies, loans, and other policies by reducing approval steps, ensuring fishing families receive timely policy support. Second, strengthen policy promotion and training. Disseminate fishery policies through multiple channels (e.g., radio, television, online platforms) to ensure fishing households understand policy details. Concurrently, organize policy training sessions to help families master application procedures. Third, establish a policy implementation oversight mechanism. Create a dedicated agency to monitor and evaluate the execution of fishery policies. Implement regular inspections and feedback mechanisms to ensure policies are fully enforced.

#### **5.5 Promote the Integrated Development of the Fishery Industry**

The integrated development of the fishery industry is a critical pathway to increasing the income of fishing households, requiring the extension of industrial chains and the exploration of new business models to boost earnings. Guided by market demand, encourage aquatic product processing enterprises to adopt new equipment,

technologies, and techniques, develop deep processing and cold-chain logistics for aquatic products, diversify product offerings, strengthen brand building, and drive structural optimization and value-added enhancement of local aquatic products [10]. First, develop the aquatic product processing industry. Encourage fishing households to participate in aquatic product processing to extend industrial chains and increase added value. For instance, promote deep processing of products like sea cucumbers and prawns to enhance economic returns. Second, advance the development of recreational fisheries. Leverage fishery resources to foster emerging sectors such as recreational fishing and fishing-themed tourism (e.g., "fishing homestays"). Examples include developing marine fishing experiences and fishery cultural tourism programs to diversify income streams for fishing families. Third, integrate fisheries with technology. Promote the convergence of fisheries and technology to develop smart fisheries. For example, utilize IoT, big data, and other technologies to achieve high-quality development in fishery production.

#### **6. Conclusion**

The impact of fishery development in Shandong Province on the income and expenditure of fishing households is multifaceted, delivering significant income growth while also posing challenges and issues. Through analysis and research, the following conclusions can be drawn:

First, fishery development has substantially boosted the economic income of fishing households through technological advancements, industrial upgrading, and diversified operations. The adoption of new aquaculture technologies (e.g., deep-sea cage farming, ecological aquaculture) and advanced fishing equipment has enhanced production efficiency, increased the output and quality of aquatic products, and directly raised household income from fishery production. Meanwhile, emerging sectors such as aquatic product processing and recreational fisheries have diversified income sources for fishing families, strengthening their economic resilience. However, fishery development also faces challenges. Factors such as declining fishery resources, rising production costs, market volatility, and inadequate policy

implementation have disrupted the income-expenditure balance of fishing households. Overfishing, environmental pollution, and climate change have reduced fishery resources, directly impacting income. Rising production costs have squeezed profit margins, market fluctuations have increased income uncertainty, and ineffective policy enforcement has undermined intended outcomes.

In conclusion, while fishery development in Shandong Province has improved household income, it also confronts issues such as resource depletion, cost pressures, market instability, and policy implementation gaps. Moving forward, measures such as strengthening fishery resource conservation, reducing production costs, improving market mechanisms, and optimizing policy execution should be prioritized to further enhance the financial stability of fishing households and promote sustainable fishery development.

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