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# Effects of Overfishing on Kuwait Bay

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**----------ABSTRACT----------**
*Kuwait's economy has drastically changed from one that depends on marine operations to one dominated by oil since the early 1950s. Kuwait is currently dependent on oil incomes, and the conventional marine enterprises have reduced tremendously Excessive fishing levels contribute to declining catches in Kuwait bays. Overfishing is attributed to the declining yields, particularly with the protection of juvenile nurse areas and the implementation of high length limits. The present study assesses various fish stocks and discusses the effect of overfishing on Kuwait bays. The results indicate that overfishing causes a decline in fish stocks and affects fish recruitment patterns. The study's findings provide instrumental insights and a practical starting point for a comprehensive investigation that attempts to combine data on the changing fishing patterns in Kuwait bays. The study is essential for fishery management in identifying whether a decrease in fishing activities would be significant.*

***Keywords:*** *conventional marine enterprises, overfishing, juvenile nurse areas, fishery management*

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## I. INTRODUCTION

The law of diminishing returns applies in the fishing industry, like other highly exploitative ventures such as mining and farming. To put it another way, extreme exploitation contributes to production decrease by diminishing the resource, which is considered overfishing in the described industry. Overfishing has been noticeable in Kuwait bays as a result of increased competition, and the rise of innovative fishing methods that allow increased catches. These factors reduce fish stocks and increase offtake. The challenge has been the topic of heated global discussions over sea laws and fishing rights. Overfishing was also identified as the primary obstacle faced by fishing companies in Kuwait during their inception. The government of Kuwait should adopt new fisheries management strategies and laws to prevent a decline in the fish density in fishing areas and increase fish population in the bays.

**Effects of Overfishing**

Overfishing can be considered an instrumental subject to include in discussions associated with fisheries. International fishery catches have averaged almost 80 million tons in the last ten years as a result of increased catching efforts. The stabilizing catches are widely attributed to overfishing fish specifies that depend on their structure and stock size for growth and reproduction (Nithyanandan et al. 452). Most fish stocks do not recover with a decrease or degrade of fishing pressure contrary to popular beliefs because overfishing changes the stock's age structure leaving young stocks to reproduce. The whole ecosystem will be affected by trophic cascade impacts as fisheries exploit the ecosystem's top predators. Both offshore and coastal overfishing has induced remarkable tropical changes, which is challenging to restore even with a decrease in high fishing (Nithyanandan et al. 454). The current loss of biodiversity and extinction rates have been construed the most notable planetary boundaries. Alqattan et al. also cite overfishing as the critical driver for fisheries and marine environments, which is different from other terrestrial systems that consider habitat change as the dominant driver (13). In this regard, the entire ecosystem is affected indirectly by the pursuit of specific stocks.

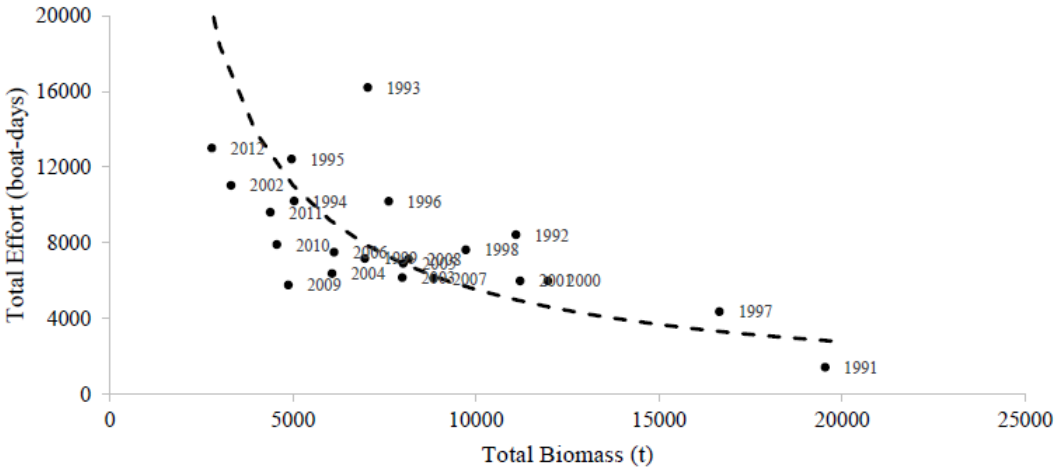


**Fig 1:** Effort dynamics in Kuwait shrimp fishery (Abdulrahman).

Overfishing is the primary cause of diminishing catches in Kuwait bays. Intensive fishing may not only lead to a reduction in the density of fish in a fishing area but may also contribute to a vast decrease in the fish population. Overworking of fishing grounds has affected ecological habitats, which has made it challenging to offer a suitable environment for marine life, especially during the larvae and egg stages (Alqattan et al. 14). The fish population is forced to seek other settings that are not effective or suitable, which limits their growth and survival. This process is illustrated by the case of shrimp fishing in Kuwait bays. Immigration and population growth keep the population balanced by balancing the mortality rates in the ecosystem under natural conditions. However, three organizations, including the Gulf Fishing Co. the International Fisheries Co., and the National Fisheries Co consistently fought to obtain shrimps. This competition contributed to a noticeable reduction in the shrimp population and huge income deficits (Emanuelsson 11). Kuwait companies should identify wide fish varieties and fishing regions to reduce overfishing.

Kuwait shrimps provide a practical example of the effects of overfishing in Kuwait bays. The Kuwait shrimp fishery witnessed unprecedented growth as a result of massive yield in the 1980s. The shrimp fishery is currently construed Kuwait's most instrumental fishery accounting for more than 36% of the country's annual value (Abdulrahman 17). Kuwait considers the green tiger prawn as the most instrumental penaeid, accounting for more than 60% of the total yearly catches. The government employs a combination of control measures such as closed areas and licenses to prevent overfishing. Massive biomass decline has also been caused by poor environmental conditions and unlicensed fishing around fishing areas. (Abdulrahman 19. The paper investigates the monthly effort and catches data from Kuwait's shrimp fishery. The study leverages a seasonal statistical catch at age model to identify key figures associated with mortality rates, fish recruitment patterns, and risk-exposed biomass. It also uses the ratio of mortality rates to the mortality rate of the fish that achieves optimum yield and the vulnerable stock biomass ratio relative to the biomass that will lead to optimum results to determine the effects of overfishing on the shrimp fishery (Abdulrahman 20). The optimum management performance and historical management performance concerning income will be compared through retrospective seasonal analysis.

**Life Cycle of a Seafood Product Perspective**

Several stages are involved when a product originates from capture fisheries. Harvesting is the first one, and it is considered the most energy-intensive one and leads to wide-ranging environmental effects (Emanuelsson 21). The effects on the ecosystem are also felt in this stage, especially regarding high mortality driven by the fisheries to seafloor disturbance as well as non-target and target specifies. Food processing is the second stage that happens on factory ships or large fishing vessels and mainly involves various processes such as packaging, freezing, filtering, gutting, and storing. Besides, semi-finished goods processing, including readymade dishes and fish fingers, is conducted in land-based industries (Emanuelsson 22). The overall effect from the phase must be categorized into categories because the processes contribute to various products such as non-edible parts such as bones, scales, and fins as well as minced fish and fillet. Therefore, a mass balance allocation approach was selected to harmonize the results and studies.

Transportation is the third phase that may be used to frame the effects of overfishing in Kuwait bays. The stage involves either fresh or deep-frozen products without or with the application of cooling conditions (Emanuelsson 22). Trains and freight as transportation channels perform better in impact categories associated

with energy consumption compared to air transport. The retail phase is the next one, and it is considered environmentally friendly. The stage presents little environmental impacts because it only encompasses storage, freezing, or cooling. However, fish wastage as a result of extended shelf stay and bad logistics is a vital retail impact with unintended effects on the landed fish required for sustainable consumption (Emanuelsson 23). The consumer stage is the final one and involves transportation from the seller to the household. Household waste can also increase the environmental challenge despite its limited effect regarding electricity use. Therefore, the consumer could be responsible for rising seafloor disturbance and overfishing.

## II. THEORY

The Maximum Sustainable Yield (MSY) approach has been embraced as a key management objective for the European Union (EU). This concept is used to ensure the restoration of fish stocks to levels that may contribute to maximum yields. Moreover, the shift towards the model has been adopted by the Council of Ministers, the European Commission, the ICES and the International Council for Exploration of the Sea that set the maximum fishing quotas (Emanuelsson 27). Data obtained from various stock assessments are accessible yearly and based on approaches using multinational survey ships and commercial landing records (Emanuelsson 28). The spawning stock biomass and the total biomass are the two metadata provided by the evaluation.

## III. METHODS

Kuwait fishery agencies today evaluate overfishing levels in comprehensive methods primarily based on a broad range of information sources. Traditional models keep track of death and birth rate within a specific population that is categorized according to effort indices, maturity information, landings, and survey data. Other complex models include a wide variety of data types such as modelling in a probabilistic manner and metadata from different fishing areas. The most sophisticated approaches have received immense criticism for involved subjective and transparency modelling decisions. Data obtained by the Kuwait Institute for Scientific Research (KISR between 1965 and 2012 was used in the paper. The effort and catch data for the last 21 years was recorded by month. A seasonal statistical catch at age (SCA approach) was leveraged reconstruct shrimp stock-recruitment, and sustainable biomass is given the compensation ration (the relative increase in juvenile survival rates) and unexploited biomass. The status of the Kuwait shrimp fishery as a result of overfishing was determined by the mortality rate that will contribute to optimum yield and the fish biomass that would maintain the sustainable product.

Kuwait fisheries management policy is primarily based on protecting shrimp exploitation during the spawning period. Fishing is not regulated, which makes the shrimp fishery an open-access area. The current policy was evaluated through the implementation of the concept of the omniscient manager, which recommends employing the seasonal reproductive timing to evaluate the most effective fishing pattern (Almutairi 38). The fundamental objective of the retrospective analysis was to distinguish between the current policy regarding recruitment anomalies, conditional on the best parameters, and the net revenues. Kuwait banned the targeted fishing for various marine life, including sharks and rays except for the Graceful Shark and the Grey Sharp nose Shark in 2008 (Almutairi 39). The ban includes the sale and display of the stated specifies at landing sites or markets in the nation. Thus, authorities must be notified about all specifies captured accidentally and the animals released alive.

## IV. RESULTS AND DISCUSSION

The SCA accounting approach was utilized to establish the seasonal statistics of effort and catch in Kuwait shrimp fishery. The model also accounted for high mortality and rapid growth rates of the shrimp stock. The SCA afforded the opportunity to address the impacts of fundamental assumptions regarding the interplay between recruitment dynamics and effort, catch, and stock size (Abdulrahman 21). Besides, the SCA model has a considerable setback. For instance, the approach makes unsubstantiated assumptions that contribute to immense biases. Furthermore, a comprehensive difference between reactions in abundance indices and fish catch biomass time series is essential for a practical seasonal SCA. A high effort is witnessed at the initial fishing season, reducing in later periods because a rising portion of fishers cannot obtain adequate CPUE to maintain fishing activities. What is more, a substantial recovery was experienced in the 1980s according to the study's management reference points (Abdulrahman 23). The research established that the Kuwait shrimp stock is experiencing high overfishing. In this regard, non-fishing activities and overfishing account for the current Kuwait shrimp stock precarious scenario.

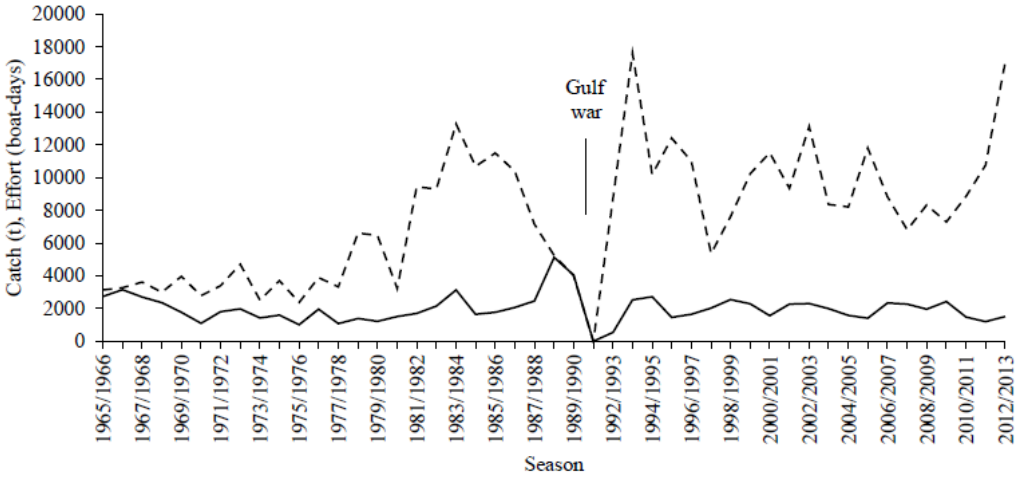


**Fig 2:** Historical catch and effort in the Kuwait shrimp fishery (Abdulrahman).

Overfishing is also contributing to a substantial strain on biotic resources. These resources are responsible for more than 15% of the worldwide animal protein with massive economic and nutritional benefits that are indispensable for most food deficient and low-income economies (Jabado 5). The resource has the potential of replacing various markets associated with different food resources such as meat. From an economic perspective, the international fishery systems are not maximized, which leaves most fishing areas with declined profits as a result of overcapacity and reduced stock sizes (Jabado 9). In this regard, the global profits would increase by more than half of the existing area's total value if the stocks were restored to immense biomasses.

It has long been observed that overfishing contributes to reduced mortality goals and considerable stock sizes based on economics modelling. The model proposes that the annual fishing mortality and the fishing effort that augment economic value are remarkably lower than the total efforts employed to increase the net catch. The retrospective approach utilized in the paper is similar to the standard economic approach, depicting low fishing mortality and effort that would contribute to maximum total catch Environmental issues such as Mesopotamian marshland drainage and decreased Shatt Al Arab river flow discharge have also affected fish stocks in Kuwait in addition to overfishing (Abdulrahman 37). The regression analysis conducted demonstrated a limited interplay between shrimp stock production and the flow rate of the Shatt Al Arab River. However, the effect of the declined Shatt Al Arab flow may be masked by prey-predator association: overfishing and environmental changes have masked reductions in shrimp fisheries (Abdulrahman 38). Thus, the interplay the profitability length and Kuwait bays fishing effort must be thoroughly addressed to overcome the adverse effects of overfishing.

**Future Outlook**

The applications for various stakeholders in the entire product cycle must be demonstrated and refined to reduce overfishing and increase seafood products in the niche market. The paper addresses a manager's perspective by identifying the average stock products. However, a redefined framework can study the changes in different fleet structures, incepting advanced gears or laws while considering potential effects based on changes between domestic and imported products. Size overfishing or size of measurement of the fish catches form part of the future outlook. This element relates to the economic returns of catch quality and fisheries and offers a valid dimension to the lost mass units because overfishing could lower the size structure. Data deficient stocks that need a distinct methodology to model non-target species is another future area to be considered. Any approach that follows ecosystem, resilience, or general vulnerability could be leveraged to establish different marine specifies. Thus, these characterization methods should be the same as swept seafloor, and target stock such as the Kuwait shrimp.

## V. CONCLUSION

Kuwait should shift from conservative policies to practical methods for managing its fisheries to address the negative impacts of overfishing. Numerous concerns regarding the general stock well-being have been employed as a premise to substantiate the declined effort and catch. The study conducted a comprehensive analysis of the Shrimp fishery, which is the most valuable Kuwait fishery. It employed a SCA approach to unravel the impacts of alternative fundamental assertions associated with stock-recruitment, effort, catch, and size dynamics. Overfishing has led to a massive loss of vital biotic resources, reduced mortality goals and considerable stock sizes based on economics modelling. Besides, the mortality rate that will contribute to

optimum yield and the fish biomass that would maintain sustainable yield was used to determine the status of the Kuwait shrimp fishery as a result of overfishing. The findings in this study present valuable insights and future directions to prevent overfishing and its impacts on Kuwait bays. Researchers and policymakers can use the results to inform the implementation of appropriate regulations such as seasonal closures, size limits, and catch limits.

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