Fish as a Healthy Source of Human Nutrition: An Exploratory Study

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Abstract

This study posits that fishery industry has an important role in the global economy and is performing two functions – economic development and food production. The production of fish primarily occurs through two main methods: capture fishing, where commercial exploitation of the wild stocks occurs; and culture fishery, which is known as aquaculture and is the process of fish breeding in a controlled environment. One of the broadest classifications for fish are finfish and shellfish; the latter provide many vital nutrients and play an important role in global food security. Fish is the main source of food with high nutritional value that has an abundance of high-quality protein, amino acids, vitamins, and minerals yet is a low-fat food. On top of that, it has proved to be a great choice for those that want to remain in the healthy weight category as well as those that are in the process of shedding their excess weight. The protein contained in fish is highly absorbable and comes with good amounts of both essential and non-essential amino acids that are critically needed for the body's well-being. This study is having an exploratory to present the data combined with observations and facts based on content analysis.

Keywords: Fish, Seafood, Nutrition, Benefits, Human Health

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Introduction

Fisheries are an economic and food production activity. There are two main sources of fish production. Fish is either harvested from the wild called capture fisheries or it is raised in captivity in controlled units called culture fisheries or more generally aquaculture (United States Department of Agriculture, 2013; Eslick et al., 2009). Controlled fish culture can be at small scale for local use or at large scale for commercial sale and profit (FAO, 2018). Fish are further categorized as fin fish or shellfish. They breathe with gills and swim with fins, and both are poikilothermic or cold blooded (Canadian Food Inspection Agency, 2021). Finfishes are vertebrates and have gills, fins with rays, and scales covering the body (Clark RF, 1999). Shellfish invertebrates have gills, with various types of locomotory organs. Unlike finfishes they have exoskeleton which cover their body (FAO, 2018; Swanson et al., 2012).

Among all the livestock fish is the most efficient in converting feed into high quality food. Hence its feed conversion ratio and efficiency are always at the top of the other livestock (DA, 1998). At the global level fish and fish-related products are the source of income and livelihoods for several communities. Seafood is not only a healthy protein important for food security, but it is also a key export commodity for many developing nations providing employment for millions of people. Different factors like environmental, development, policy, and governance facilitate its contribution to food security (Harris et al., 2002).

Literature Review

Mishra (2020) suggested conducting an awareness campaign to

promote the health advantages of consuming fish. Fish serve as a valuable source of nourishment from aquatic ecosystems. These substances include a high concentration of both macronutrients and micronutrients, which are necessary for optimal growth and human well-being. Fish proteins contain immunoglobulins that serve as a defense mechanism against viral and bacterial illnesses, as well as preventing protein calorie deficiency. Fish lipids contain n-3 PUFA such as EPA and DHA, which not only regulate blood pressure but also aid in the prevention of cardiovascular illnesses. Iron aids in the production of hemoglobin and helps to avoid the development of anemia. Selenium has a crucial role in the proper functioning of the thyroid gland. The presence of calcium and vitamin D in fish naturally helps to avoid rickets and low bone mineral density. Vitamin A is essential for maintaining optimal vision and a healthy immune system.

According to Tilamia & Sampels (2018), eating fish twice a week is excellent for human nutrition. Their high concentrations of n-3 long-chain polyunsaturated fatty acids are the primary reason for this suggestion. There is evidence that these fatty acids participate in a wide variety of metabolic activities, and they are essential for human nutrition. They are essential for the efficient functioning of the circulatory system, the brain, and neurological tissue; they also have anti-inflammatory characteristics and decrease platelet aggregation. Proteins, peptides, and amino acids sourced from fish have also just lately been shown to provide health advantages. In addition to being a great source of calcium, selenium, vitamin D, and phosphorus, fish is also an extremely healthy dietary option.

Fish is an essential animal-based staple for millions of people in

Bangladesh, where the research was done by Bogard et al. (2015). Malnutrition remains a big development impediment in this country. However, present data on fish nutritional content mostly focus on a small number of components and do not cover the rich variety of possibilities. The researchers in this study set out to fill a gap in our knowledge by analyzing the nutritional value of fish that are popular in Bangladesh. To do this, 55 distinct types of fish, prawns, and prawns were analyzed for their proximate, vitamin, mineral, and fatty acid content. These fish and prawns were obtained from coastal, aquaculture, and inland fisheries. The dietary composition, which has major ramifications for public health, differed between species. The amounts of iron, zinc, calcium, vitamin A, and vitamin B12 were found to vary between 0 and 2503 µg/100 g, 0.6 to 4.7 mg/100 g, 8.6 to 1900 mg/100 g, and 0.50 to 14 µg/100 g, respectively. Species caught in fisheries often have high concentrations of docosahexaenoic acid and other important fatty acids (86–310 mg/100 g).

Free amino acids (FAAs) make up a substantial amount, up to half, of the total amino acid pool in marine pelagic fish eggs from various latitudes, according to Rønnestad et al. (1999). The FAA pool seems to have its origins in the breakdown of a yolk protein and is produced during the latter stages of oocyte maturation. As the organism begins to eat for the first time, its pool of free amino acids (FAA) rapidly declines during yolk resorption. The main function of FAA is to fuel metabolism; however, they are also used in protein synthesis throughout the body. After the first feeding begins, amino acids play an essential role as substrates for catabolism and may account for 60% or more of the energy loss. Since the main characteristic of development is the increase in muscle mass via protein synthesis and accretion, it follows that the very fast-

growing fish larvae have a high need for amino acids in their diet.

In their 2020 study, Byrd et al., comprehend the nutritious contribution of fish and other aquatic species to human diets, the authors depend on nutritional composition data for a limited number of species. However, a wide variety of species with varied, poorly structured, or unknown nutrient compositions are consumed by aquatic food consumers, who are particularly nutritionally vulnerable. Aquatic organisms that are abundant in vitamins, minerals, iron, zinc, calcium, vitamin A, and docosahexaenoic acid (DHA) are the primary subjects of the research. The results demonstrate that these species may often provide all the nutrients that small children and pregnant women need in only one meal. They provide a great service to the fields of fisheries and nutrition by collecting all the information currently available on the dietary makeup of fish and other aquatic animals. We may learn more about these vital species and include them in fisheries management and policies and programs pertaining to food with the aid of this resource.

Methodology

This study used a qualitative research method with an exploratory design. It used desktop research, observation, content analysis of literature and deductive approach. The research pulled together the broad review of already existing literature on fisheries and aquaculture and the effectiveness of fish as a human nutrient through journals, research articles, reports, and other pertinent publications. Data collection included data regarding world fish caught quantities, farming of fish methods and nutritional characteristics of fish. Analysis was done to investigate the connection between eating fish and its effects on human health, with the focus on protein intake, fat content,

cholesterol levels, and essential nutrients provision. The collected was categorized systematically into the structured segments containing fisheries, aquaculture and the nutritional maximize of fish. The writing process included writing definite and simple text, citing correct sources, and using them as proofs of the main ideas. The content was checked and edited to make it clear, coherent, and exact, the abstract was then formulated to present the main results of the research.

Nutritional value of Fish

Fish is a source of quality protein and balanced profile of essential amino acids. It also has the best profile of vitamins and minerals with comparatively little fat but having rich sources of essential fatty acids. In the following paragraphs comparative presence and importance of its presence in the human diet will be explained (Key et al., 2020; Ross, 2005). Fish is low calorie food which contradicts other energy sources like meat and poultry. These meats produce a lot more energy on burning than fish meat. Approximately 3-ounce cooked cod, flounder, or sole produces less than 100 calories of energy (Meyer-Rochow & Meyer-Rochow, 2009). Mackerel, salmon, and herring are placed in high fat fishes. When a 3-ounce piece from these fishes is cooked it produces approximately 200 calories (Beddington & Rettig, 1983). Therefore, consumption of seafood means consumption of low calories at the same time fulfilling the daily protein needs (Vince, 2012). Therefore, eating fish one can maintain an ideal weight and if required can also lose extra weight. Seafood is a source of high-quality protein and is comparatively better digestible than other meats. Contradictory to fish meat beef, mutton, and poultry have more connective tissues which hinder their

digestibility (Shahzad, 2022). Because fish muscles are very fragile hence, they convert into flakes during cooking (animals.com, 2023). Hence, it can beat without any further cutting and slicing which is of great help for elderly and children who face difficulty in chewing and cutting. Three sounce serving can provide 1/3 of the daily recommend requirement of adult human (Alberts, et al., 2002). It is a good balance of essential and non- essential amino acids required to maintain human health. The bioavailability of fish protein is higher than that from plants. Approximately 5–15 percent higher protein is available from fish to the body for metabolism and incorporation. Due to this reason, several studies have reported that it also carries several health benefits (Allen et al., 2006).

Fish protein, peptides, and hydrolysates have proven themselves in the control and prevention of various diseases. Important of them are development of cancer, inflammation, insulin resistance, osteoporosis, metabolic syndrome, and obesity related comorbidity (Aguero & Costello, 1989). When metabolic syndrome induced rats were offered these products, they showed decreased adipose tissue oxidative stress, lower insulin resistance followed by leptin, and Tumor Necrosis Factor alpha (TNF-a) subsequently reducing the intensity of hyperglycemia (Canadian Food Inspection Agency, 2021; Byrd et al., 2020).

Seafood is low in fat and fats are of two types: saturated and unsaturated fats. Saturated fats are usually solid at room temperature, butter or lard for example. Unsaturated fats on the other hand are usually liquid at room temperature and include vegetable and fish oils. Current dietary recommendations suggest that consumption of seafood help us to increase the amount of unsaturated fats and decrease the amount of saturated fats in our

daily rations (Beddington & Rettig, 1983; Sann, 1998). Fats present in seafood are mainly unsaturated. These fats comprise long chain poly unsaturated fatty acids. They are unique in their characteristics in the provision of additional health benefits and are called omega-3 fatty acids.

Consuming seafood one can easily meet and fulfill current dietary recommendations. The fats present contain higher amounts of unsaturated fatty acids, mainly long-chain poly-unsaturated fatty acids (LC-PUFAs). These PUFAs are quite unique and play a key role in the health and well-being of adult humans, improving child development both physical and mental. Due to the presence of LC-PUFAs intake of fish is recommended twice a day (Young, 2001). LC-PUFAs are an essential part of human diet specifically for growing children, pregnant women, and nutrient deficient population. These fatty acids are an integral part of several metabolic functions in the human body which are essential for its growth, health, and development of immune functions. They are essential parts of cell membranes and give flexibility to membranes for easy transport of nutrients in and out. They decrease platelet aggregation and facilitate the optimum functioning of heart and brain. In addition to the above they have an anti-inflammatory role in the body. It is interesting to note that many small fishes which most of the people do not like are the richest sources of LC-PUFA (Young, 2001; Béné, 2009). These fish are low in cost and easily available. Important of them are sardines and anchovies from oceans (Béné, 2009).

Regular intake of seafood helps us to meet the recommendations of the health experts regarding reduction in calories and fat intake. They recommend cutting down our total fat intake to less than 30 percent of the calories. This is

only possible when we reduce our fat intake and fish can help us conveniently to meet these targets successfully. Lean fish contains far less fat than fatty fish as well as other meats (Harris et al., 2002). Normally fish contain less than 5% total fat which is significantly lower than present in other meats. Even those meats which are considered lean cannot compete with fish in fat contents (Mohsin et al., 2015). The fattiest fish contains far less fat than the leanest meat. For example, processed meats, ground beef, and darker parts of poultry can hardly compete with the fat composition of fish. Herring, king salmon and mackerel are the considered the fattiest fishes (Thorpe et al., 2000). The fat contents of these fishes are still lower than other meats. The presence of fats gives a specific color tinge to fish flesh (Vince, 2012). For example, cod and flounder are the leanest fishes with lowest fat contents and are light in color while the fattiest fishes usually have dark colored flesh. There are several factors which affect the fat contents in fish. Time and place of harvest are important among others (United States Department of Agriculture, 2013). Nutritional quality and quantity of fats present in fish are important during evaluation.

Cholesterol

Cholesterol is another category of fat present in all the animals, including sea food. It is not considered good for health, specifically for heart health due to its artery clogging qualities. Health experts recommend presence of cholesterol in human diet is less than 300 milligrams per day (Alberts, et al., 2002). In 3-ounce cooked fish and shellfish cholesterol is well under 100 milligrams. Leaner fish can even go well below this level. Three ounces of cooked lean fish has less than 60 milligrams (animals.com, 2023). Shrimp is

an exception. Its cholesterol contents are higher than other fishes (Maroon & Bost, 2006). Contradictory to normally consumed fishes, 3-ounces cooked serving of shrimp contain 170 milligrams of cholesterol. Squid, however, surpasses all the sea food (Vince, 2012). The cholesterol level in squid is much higher than shrimp as well as fatty fishes. In 3-ounce cooked squid cholesterol is 400 mgs. In addition to the whole body of aquatic animals their parts which are less likely to eat are also big sources of cholesterol (Khan, 2006; Byrd et al., 2020). Mustard of crabs, tomalley of lobsters, fish livers, fish eggs, also called roe or caviar may be quoted a few examples (Beddington & Rettig, 1983; Müller & Krawinkel, 2005).

Among other nutrients, fish is also low in sodium. High sodium contents stimulate high blood pressure resulting in heart failure (Alder, Campbell, Karpouzi, Kaschner, & Pauly, 2008). Recommended dosage is less than 2300 mg for normal healthy individual. Lower dosages are however recommended for higher risk groups (Canadian Food Inspection Agency, 2021). Intake of seafood further reduces it up to 1500 mg per day because of its inherently low sodium contents (Müller & Krawinkel, 2005). Fish are unique in the sense that even a processing cannot elevate its sodium level. It has been observed that 3 ounces of cooked fish contain less than 100 mg of sodium (Clark RF, 1999). Shellfish on the other hand and has more sodium. In 3 ounces cooked serving the sodium content can go up 500 mg (Sann, 1998; Longhurst, 2010). Some frozen and then processed seafood may contain significantly higher sodium concentrations which may be attributed to the nature of their storage, preservation and then processing (Mishra, 2020). Some seafood and their products are well brought to enhance their shelf life; others

are smoked or processed to surimi or imitation shellfish products they may contain even much higher salt concentrations (Sann, 1998).

Vitamins

Vitamins are other important components of our food. Fish is rich in vitamins whereas Vitamin A and Vitamin D are present in excess in fatty fishes like herring and mackerel. Lot of required minerals is also present in fishes. Important of them are phosphorus, selenium, and potassium. Fish does not supply a good quantity of calcium (Mares et al., 2004). However, canning salmon and sardine can provide sufficient calcium due to softening and dissolution of bony parts. Most fish usually have small amounts of minerals with some fluctuations in concentration. Required quantities of magnesium, copper, iodine, iron, zinc, and other trace minerals however can be taken from some species of shellfish like clams, and oysters (Craig, 2009).

Health Benefits

Fish is abundant in numerous essential nutrients that are often deficient in most individuals. This encompasses a rich source of top-notch protein, iodine, plus a diverse array of essential vitamins and minerals. Species with a high fat content are occasionally regarded as the most nutritious (Müller & Krawinkel, 2005). These types of fish, such as salmon, trout, sardines, tuna, and mackerel, provide higher levels of nutrients that are based on fat. This encompasses vitamin D, a lipid-soluble nutrient that is deficient in many individuals. Fatty fish also include omega-3 fatty acids, which are essential for good body and brain function and strongly associated with a decreased risk of numerous ailments. To fulfil your omega-3 needs, it is advisable to consume

fatty fish at least once or twice every week (Picciano, 2003; Maroon & Bost, 2006). For individuals adhering to a vegan lifestyle, it is advisable to choose omega-3 supplements derived from microalgae (Craig, 2009).

Cardiac arrests and cerebrovascular accidents are the predominant factors leading to untimely mortality worldwide. Fish is often regarded as one of the most beneficial diets for cardiovascular health (Lee et al., 2008). Not unexpectedly, numerous extensive observational studies indicate that those who consume fish on a regular basis have a reduced likelihood of experiencing heart attacks, strokes, and death resulting from heart disease. A study conducted in the United States including over 40,000 males found that individuals who had fish at least thrice a week had a 15% reduced likelihood of developing heart disease (Muir, 2004). Scientists believe that fatty varieties of fish are particularly advantageous for cardiovascular well-being owing to their elevated levels of omega-3 fatty acids (Mozaffarian & Rimm, 2006).

Omega-3 fatty acids are crucial for the process of growth and development. DHA, an omega-3 fatty acid, plays a crucial role in the development of the brain and eyes (Wijesundera et al., 2011; MacLean et al., 2006). Therefore, it is frequently advised that pregnant and breastfeeding women consume an adequate amount of omega-3 fatty acids. Nevertheless, several fish species have elevated levels of mercury, which has been associated with impairments in brain development (Torpy et al., 2006). Therefore, it is advisable for pregnant women to consume only low-mercury seafood, such as salmon, sardines, and trout, and limit their intake to a maximum of 12 ounces (340 grammes) each week (Saldeen & Saldeen, 2004). Pregnant women should refrain from consuming raw and uncooked fish due to the potential presence of

harmful germs that might negatively affect the developing fetus (Saldeen & Saldeen, 2004; Mori, 2006).

Conclusion and Recommendations

This research aimed to look at the two important functions of the global fisheries industry, namely as a source of economic growth as well as a source of protein. Also, both capture fishing of wild stocks and fish breeding through aquaculture form a significant part of the supply of fish that is a low-fat rich in quality protein, amino acids, vitamins and minerals needed in the diet for body growth and health. Fish are known to help people manage their weight and the kind of diet they take all over the world. More studies were needed on how to improve sustainable fisheries management to receive an adequate nutritional supply while achieving economic objectives. Based on these observations, the author proposes the following recommendations.

- Support the improvement of science-based fishery management measures for the sustainable exploitation of Wild Capture Fisheries and Aquaculture. This will help in maintaining the fish stock to be available in future.
- Fund research and technological improvement efforts in the fishing and fish farming industries to enhance production rates and output to address world food fish deficit.
- Stimulate consumer awareness campaigns on the specific healthy uses of fish to help increase the market demand for fish. It has the potential

to enhance diets and therefore the general health of the public in the long run.

- Instrumentalize and support fishing and aquaculture industries by offering policy incentives and public infrastructure in developing countries. This will ensure future food-security benefits worldwide are maximized.
- Assess values and impacts at various stages of fishing and aquaculture supply chains to determine where green improvements can be made. There is therefore the need to employ more sustainable methods that will help in the expansion and enhancement of food fish outputs.

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