



**CONSUMER BEHAVIOUR TOWARDS SEAFOOD AND SEAFOOD SAFETY - A REVIEW PAPER**

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**ABSTRACT**

Seafood, rich in omega 3 fatty acids, a lean source of proteins and other essential nutrients has been recommended to be consumed more frequently by nutritionists and health experts. The safety associated with consumption of seafood is an important concern for consumers, making seafood a high involvement food product, in everyday life. Marketing seafood efficiently is a challenge due to its specific quality and safety attributes. Literature on consumer behaviour studies which focus on seafood safety is sparse though there are many consumer behaviour studies on seafood available. This paper highlights, the determinants of consumer behaviour towards seafood safety. Consumer's attitudes, preferences, and perceptions towards seafood safety and also consumer's knowledge and information on seafood safety determine purchase of seafood. Sustainability and traceability of seafood products also influence consumer behaviours towards it. This paper examines consumer behaviour towards seafood safety and highlights consumer attitudes and perceptions associated with seafood consumption. A common attitude of consumers is to pay a great deal of attention to quality and safety aspects of seafood which influence their purchasing behaviour. In general, consumers are better aware of the content and effect of harmful substances than of nutrients in fish. An attempt is made to enlist the strategies to reduce seafood perceptions of seafood consumers.

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**INTRODUCTION**

Fish is a healthy food, mainly attributed to presence of high amount of omega-3 fatty acids. Fish consumption has gained popularity in recent years as research has revealed many positive health benefits from eating fish. Researchers have touted the benefits of eating fish and growing world population demanding more protein has led to an increased fish consumption, substantially. Doctors and nutritionists advice consumers to consume fish and fishery products in their diets. Since consumption of seafood is a part of maintaining a healthy diet, consumer research on seafood is valuable for the health authorities and marketers.

Consumers consider fish as healthy and many studies have emphasized the importance of fish as part of the healthy diet. Omega-3-fatty acids belongs to the long chain polyunsaturated fatty acid group whose main sources are fish oils and seafood. The last two decades have witnessed the amazing benefits of omega -3-fatty acids. Mozaffarian (2006) found out that consumption of fish species higher in n-3 PUFAs, reduces the risk of coronary heart diseases (CHD) deaths by 36 % and reduces total mortality by 17%.

Fish intake also favourably affects other clinical outcomes in adults and is also beneficial for early neuro-development during gestation and infancy. Seafood proteins are known to be highly digestible in the gastrointestinal tract. High ileal digestion results in lower loss of essential amino acids into the colon and less protein fermentation in the colon which in turn lowers the formation of toxic compounds (Borresen, 2008). In a detailed literature review on the health benefits of regular consumption of seafood as part of diet prepared by CESSH (2009) have provided in dot point form the evidence of health benefits of seafood consumption. The benefits of seafood consumption on different health issues like Asthma and Allergies, overall cardiovascular disease, cancer, cystic fibrosis, diabetes, inflammatory conditions, maternal health and even mental health have been detailed in it.

Consumers believe that consuming fish and fishery products have positive effect on the health of the being (Ergonul, 2013). Peter *et al.* (2013) in their review on the health benefits of omega-3-fatty acids have pointed out the preventive roles and benefits of omega-3-fatty acids in dyslipidaemia, overall cardiac health, and arteriosclerosis and also the non-cardiac benefits. The article also provides AHA (American Health Association) dosage guidelines for daily intake of omega-3-fatty acids and at same time it also reminds as about the adverse experiences associated with omega-3-fatty acids.

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Total fish and fishery products will continue to be highly traded, with about 38% of world fish production exported in 2020. World *per capita* fish food consumption is projected to reach 17.9 kg *per capita* in 2020, from 17.1 kg *per capita* of the average 2008-2010, OECD/FAO (2011). Future expansion of fish trade will be affected by several issues: one among them being, consumer's perceived risks and benefits for human health from fish consumption, OECD/FAO (2011). Safety is an important quality attribute of seafood, due to which its effective marketing becomes very challenging. Consumer's seafood safety perceptions influence their seafood consumption while their risk perceptions are a potential barrier for seafood consumption. Seafood producers must understand consumer's safety concern of seafood to market their products efficiently. Consumers are increasingly requiring high standards of quality assurance and demanding guarantees that the fish they purchase are produced sustainably and quality certified. To gain an understanding of the diversity of consumer needs is a great challenge that the food sector faces, to develop successful marketing strategies in it (Onwezen *et al.*, 2012). Wang *et al.* (2013) have given a message to major exporters and importers of the US seafood industry that they should work to boost their safety and quality, and that the ones who gain at the margin will have a substantial advantage in the US market. By 2030, the FAO predicts that an additional 40 million tonnes of seafood will be required to satisfy the growing demand. Per capita consumption is rising, as is affluent nations' demand for imported seafood products.

To attain deeper understanding into seafood safety concerns of consumers, a knowledge of consumer's behaviour towards seafood safety is essential. Consumer behaviour has become an integral part of strategic marketing planning and calls on marketers to fulfil the needs of their target markets in ways that improve society as a whole (Schiffman and Kanuk, 2002). Consumer behaviour is the study of how individuals, groups and organisations select, buy, use and dispose of goods, services, ideas, or experiences to satisfy their needs and wants (Kotler and Keller, 2006). Consumers buying behaviour is affected by many uncontrollable factors that have to be considered while trying to understand the complex behaviour of the consumers. Consumer research takes place at every phase of consumption process, before the purchase, during the purchase and after the purchase. Consumer's positive behaviour towards a product leads to customer retention and repeat purchases. Studying consumers provide clues for improving or introducing products or services, setting prices, devising channels, crafting messages, and developing other marketing activities (Kotler and Keller, 2006)

The review papers on consumer behaviour were classified under the following headings sections, general consumer behaviour studies, and consumer behaviour studies towards food and consumer behaviour studies towards seafood. Consumer behaviour studies are done on variety of products and services. From the review of consumer studies towards food it found out that consumers are most concerned about quality and freshness of food (Lee *et al.*, 2013). Behaviour were classified under the following sections, seafood attitudes, seafood perceptions, food safety knowledge, use and trust of information, sustainability and seafood labels. The authors have done a country wise classification of consumer studies towards seafood. It is found out from that majority of the researches have taken place in Europe. This can be accounted to the

importance of seafood in the European diet, and the concerns they have about the safety and quality of the seafood they consume.

Consumer behaviour of different products like, omega three fatty acids (McManus *et al.*, 2011), fruits and vegetables (Pollard *et al.*, 2001), and other services like eco labelling (Schumacher, 2010), and even odours in restaurant (Gueguena & Petr, 2006), have been studied by researchers. Consumer behaviour towards different food products like fresh meat (Verbeke & Viaene, 1999), healthy drinks (Lee *et al.*, 2013), bush meat (Schenck *et al.*, 2006), organic products (Schleenbecker & Hamm, 2013), sustainable foods (Vanhonacker *et al.*, 2013) and pre-packed food products (Boxstael *et al.*, 2014) have been researched on.

Verbeke & Viaene (1999) assessed consumer beliefs, attitudes and behaviour towards fresh beef, pork, and poultry meat in Europe. The results of the study forecast that the future of fresh meat consumption will be determined by the ability of beef and pork sector to produce, deliver and guarantee products that are intrinsically safe, and moreover perceived as such by consumers. With increasing emphasis on understanding consumer preferences in export markets, particularly in Asia, there is a need to determine those factors that influence food choice in other cultures (Prescott *et al.*, 2002). Different consumer groups can be identified with clearly distinguishable valuation and behavioural patterns towards food choice (Barreiro-hurle *et al.*, 2008).

From the moment a food is produced, its properties will evolve (Boxstael *et al.*, 2014) Theoretically, consumers demand food product attributes like food quality, taste, etc and food product is considered to be a bundle of these individual attributes which give rise to utility. Shanghai consumer's consumption, perceptions, and uses with regard to food products were researched and detailed information about their consumption habits, markets outlet choices and consumption trends were collected by Zhang (2002). Kubberod *et al.* (2002) studied the concept of disgust in relation to meat and meat-eating. Dierks (2006) investigated the role of trust as a determinant of consumer behaviour in Germany. In Europe, Danish consumers have been found to be relatively negative towards the concept of functional foods (Krutulyte *et al.*, 2008). Cox *et al.* (2008) studied the influence of product attributes on Australian consumer's preference for conventional and novel genetically modified sources of foods rich in long chain omega - 3- fatty acids. In conventional supermarkets and discount stores, of Western Europe and USA organic products (certified as organic according to EU Regulation 834/2007 need to compete with conventional products and their quality attributes (Schleenbecker & Hamm, 2013).

In the past, European food safety policy has largely focussed on informing and educating consumers about food safety. Objective food safety is based on the assessment of the risk of consuming a certain food by scientists and food experts. Behrens *et al.* (2009) investigated consumer attitude towards food irradiation in Brazil through qualitative research perspective. Consumers however have different ideas about food safety compared to experts. Even for the wealthier consumer segments, the main driver for shopping in supermarkets must certainly be convenience (Behrens *et al.*, 2010). In Brazil the consumption of traditional foods such as rice, beans, potatoes, sugar and bread has reduced in the last

thirty years while consumption of ready to eat and minimally processed foods has increased, substituting whole and in natural foods in daily meals (Brehens *et al.*, 2010). Food Safety is clearly an important issue, although other factors as, for example, convenience related to both food purchases and retail outlet also influences food choices (Brehens *et al.*, 2010).

Lee *et al.* (2013) identified the links among product attributes and personal values associated with healthy drinks consumption decisions within 34 Chinese markets. Fawi and Abdalla (2013) in their research studied the preferences of consumption of milk and factors affecting consumer's purchase decision of dairy products in Khartoum, State capital of Sudan. Quality was the main factor found to be affecting the purchase decision, followed by price of the products.

The aim of this review paper is to carry out a literature survey on consumer behaviour towards seafood safety and identify the determinants of consumer behaviour towards seafood safety. This paper also tries to understand the consumer's perceptions on seafood safety. Finally the paper discusses some strategies to reduce the risk of seafood consumers. It also recommends the need to conduct more studies on consumer behaviour studies towards seafood safety. It also highlights the need to create awareness among seafood consumers and seafood producers. All these steps will prevent many seafood borne outbreaks among seafood consumers and also help in improving handling practices of seafood consumers and producers.

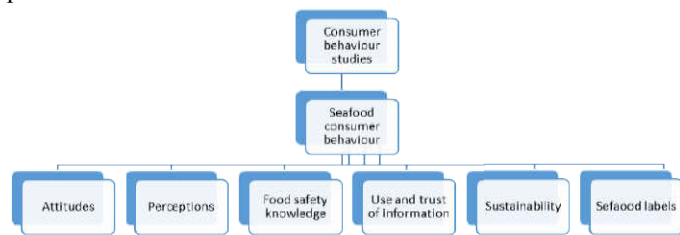


Figure 1 Consumer behaviour studies towards seafood

### Seafood consumer behaviour studies

Pieniak *et al.*, (2007, 2008, 2009, 2010), Verbeke *et al.*, (1999, 2007a, 2007b, 2007c, 2007d), Brunso (2008), Scholderer and Trondsen (2008), and Olsen (2001, 2003a, 2003b, 2008) are the major players in seafood consumption research and they have conducted studies all over Europe. Houston *et al.* (1998) in their study, related fish market and product development, in Oman to consumer habits, perceptions, income and other demographic and socioeconomic factors. Complementary relationship between seafood and variation in lifestyle factors have been addressed by hypothesizing that the consumption of seafood is strongly influenced by variation in lifestyle factors (Myrland *et al.*, 2000). Al-Mazrooei *et al.* (2001) in their study investigated Oman consumers' attitudes and preferences for fish purchase from market outlets using an information-processing model.

A theoretical model of involvement in consumption of food products was tested in a representative survey of Norwegian households for the particular case of consuming seafood as a common family meal by Olsen (2001). Olsen (2003) pointed out that in Poland age seemed to be a major factor in seafood preferences. Young consumers tend to eat less fish than elder consumers (Olsen, 2003) since fish consumption are related to religious compulsions and elderly population hold stronger to

religious compulsion (Pieniak *et al.*, 2011). Batzios *et al.* (2003) analysed the Greek consumer's purchasing behaviour and attitudes towards the shellfish market. Batzios *et al.* (2004) did yet another detailed investigation of the Greek consumer's image of the cultured mussel market to provide information on consumer behaviour. Arvanitoyannis *et al.* (2004) surveyed Greek consumers to evaluate their attitude towards wild and farmed fish in order to understand and satisfy market needs. Jaffry *et al.* (2004) explored the nature and extent of the response of UK consumers to the introduction of labelled seafood products and explores the potential of product differentiation to promote sustainable fisheries. Results of the study conclude that, the scale of the effect has been shown to be greater for sustainability and quality forms of product differentiation than the effect generated by any of the other potential labels. Analysis of consumer's attitudes concerning basic quality and marketing aspects on marine captured and farmed fish market could be a useful tool towards a more rational tool for organization of the distribution roots (Batzios *et al.*, 2005).

Russian consumers' food choice motives were studied in a survey, with the purpose of identifying consumer segments based on these motives. These segments were then profiled using consumption, attitudinal and demographic variables (Honkanen & Frewer, 2009). In Middle East, generally, consumer preference is for captured fresh whole fish. However, in the last few years, whole fresh farmed fish as well as frozen fish and value-added seafood products have become widely available and accepted in most states (Feidi, 2009). A study done in Russia identified individual differences in Russian consumers according to their perceptions of health risks and benefits associated with fish consumption (Van Dijk *et al.*, 2011). Scientific data on the attitudes and knowledge of Turkish people regarding seafood consumption is very limited. Erdogan *et al.* (2011) evaluated consumption habits and preferences of Turkish people for seafood, based on the example of Istanbul, which is the most crowded and cosmopolitan city of Turkey.

In Brazil determinants of fish consumption in the population that attends open air street markets was identified (Vasconcellos *et al.*, 2013). In US eating invasive species is a management strategy on the marketing side, one of the biggest hurdles at this moment is that American consumers have a negative view of Asian carp as food. Varble and Secchi (2013) analysed attitudes of US fish consumers towards invasive Asian Carp to harvest it for human consumption. Much of this stems from the misconception that bighead and silver carp taste like their cousins, the common and grass carps. (Varble & Secchi, 2013). A high consumer demand for Asian carp would result in more people fishing and processing them, which would not only remove carp from waterways, but would also create more jobs (Varbel & Secchi, 2013). With the purpose of achieving a deeper knowledge of one of the most important seafood markets in Europe, a survey into the seafood consumption preferences and patterns in the Portuguese population was carried out in Portugal (Cardoso *et al.*, 2013).

Polish people perceive labels on fish as a good source of information (Olsen, 2013). Pieniak *et al.* (2008) classified fish consumers of France, Poland and Spain into four groups based on their attitude towards healthy eating. These groups are, low interest in healthy eating, positive health enthusiasts, health strikers and health involved. These segments differ

significantly with respect to fish consumption, attitudes and knowledge about the health benefits of fish, interest in potential informational cues when purchasing fish, and individual socio-demographic characteristics. The segment low interest in healthy eating is characterised by younger age, more males, higher BMI, low fish consumption and low interest in information, and herewith emerges as a relevant though difficult to reach segment from a food and health policy perspective. Positive health enthusiasts and health strivers have a strong involvement with food, and a strong interest in healthy eating. Both segments have a very favourable disposition towards fish consumption, which would fit with their focus to either stay healthy (positive health enthusiasts) or improve their current health status (health strivers). Health uninformed consumers do not care strongly about health in general; though they attach high importance to eating healthily (Pieniak, 2008).

For dishes in remote areas cured fish is also popular in most states (Feidi, 2009). Larger demersal species such as grouper, snapper, mullet, empero and various breams are traditionally popular marine species and larger pelagic species such as tuna and Spanish mackerel are also popular. There is interest within US consumers for Asian carp meat. The eradication of invasive Asian carp in US would open up ecological niches for other species and this should be investigated. Alternative fisheries and products will have to be developed in the long term. (Varble & Secchi, 2013). It is critical to create bio economic models based on realistic carp population growth models to establish how commercial fishing will help in reducing population pressure, and whether the carp can be completely eradicated, perhaps with complimentary policies (Varbel & Secchi, 2013).

#### ***Determinants of consumer behaviour towards seafood safety***

Though there are many papers on seafood consumer behaviour, the literature on consumer behaviour towards seafood safety is sparsely populated. Determinants of consumer behaviour towards seafood safety were studied by the following authors (Yeung and Morris, 2001; Johnston *et al.*, 2000 ; Holland and Wessels, 1998; Tzouros and Arvanitoyannis, 2000; Arvanitoyannis *et al.*, 2004; Batzios *et al* 2004; Wilcock *et al.*, 2004; Verbeke *et al*, 2007; Verbeke *et al*, 2007; Verbeke *et al* 2007; Verbeke *et al* 2007; Verbeke *et al* 2009; Wang, 2010; Dijk *et al.*, 2011; Claret *et al.*, 2012; Stefani *et al* 2012; Vasconcellos *et al* 2013; Loose *et al.*, 2013; Cardoso *et al.*, 2013; Pieniak *et al* 2013; Wang *et al*, 2013;)

The findings of these studies on consumer perception, consumer attitudes, consumer preferences and consumer knowledge associated with seafood safety are presented in this paper. Safety and sustainability of seafood and certification and traceability of seafood products are an emerging area of study.

#### ***Attitudes***

Consumers' attitudes towards food safety and their practices related to food are themes of interest to food producers and retailers, public authorities and health educators (Wilcock *et al.*, 2004). The relationships between attitudes and behaviour has been the subject of extensive research described in consumer behaviour. Attitude puts people into a frame of liking or disliking an object. Attitudes have several functions:

they can guide perception and influence behaviour. No such thing as an attitude towards fresh meat exists but that the different meat and meat types as well as their specific situation and problems have to be considered separately (Verbeke & Viane, 1999). Consumers' attitudes have been shown to influence and predict behaviour (Wilcock *et al.*, 2004). Measures to reduce consumer uncertainty are all, a matter of effective and transparent information communication to the consumer (Van Wezemael, 2010). Varble & Secchi, (2013) surveyed the US consumer's attitudes towards Asian carp. Wang *et al.* (2013) studied three issues related to US consumers' attitude about food safety for imported food. There is a gap in the literature regarding how consumer's perception about such specific labels affects their preference on country of origin (COO), and how consumer's behaviour and perception might be inconsistent, especially in seafood.

#### ***Perceptions***

Consumers perceive seafood as a safe food but not all consumers consider it to be fit for consumption. Negative attitude and risk perception towards seafood acts as a hindrance for its effective consumption. Consumers should be made aware of the health benefits of seafood consumption. Major safety risks of seafood as perceived by the consumer are possible contaminants, Pollutants, Methyl mercury level, PCB, Hormones or antibiotics, hygienic handling of fish Consumer risk perception and the impact on purchasing behaviour are seen to be very relevant to food safety issues (Yeung and Morris, 2001). Most research up-to-date has focussed on risk – increasing factors and increasing factors and external events but understanding consumer perceptions of food risk is the actual key to assessing levels of risk (Brehens *et al.*, 2010). Quality perceptions are shaped by consumer perceptions towards search, credence and experience attributes (Van Wezemael., 2010).

Consumers preferred not only the sea fish at 6 €/kg but were also willing to pay up to 12 €/kg, which seems to reinforce the existence of a price-perceived quality relationship. Consumers seem to be willing to pay a higher price as a guarantee of the freshness and safety of the fish they consume, considering the high perishability of fish (Claret *et al.*, 2012). Portuguese consumers like whole fish products much more than fish steaks or fish fillets, (49.0% vs 35.5% and 34.1% ) which may reflect the preference for fresh quality as whole fish protects the flesh, which is exposed for microorganism degradation after filleting without proper packaging or other protection, (Cardoso *et al.*, 2013). De Moura *et al.*, 2012 explored women's perception about benefits and risks of fish consumption, while exploring differences on their views about wild and farmed fish, considering light fish consumers.

#### ***Food safety knowledge***

In a typical food consumer decision making process, safety is usually a non-negotiable product attribute. Although the public is increasingly concerned about food-related risks, the rise in food poisoning cases suggests that people still make decisions of food consumption, food storage and food preparation that are less ideal from a health and safety perspective (McCarthy *et al.*, 2007).

Consumers can make rational decisions only when they are aware of the risks associated to their personal behaviours (Brehens *et al.*, 2010). Safety concerns remain an important

issue that strongly affects meat consumption behaviour (Van Wezemael., 2010). During the last decade, the importance to deal with subjective food safety has been recognized (Verbeke *et al.*, 2007). It is apparent and well known that cross-contamination is the physical movement or transfer of the harmful microorganisms from one person, place or an object to another. Thus, preventing cross contaminations especially at home kitchens is a key factor for food safety, consumer protection and preventing food borne illnesses (Ergonul, 2013).

Verbeke *et al.*, in 2007 presented some cases of seemingly irrational and inconsistent consumer behaviours with respect to food safety and risk information.

Wang *et al.*, 2013 looked into various issue relating seafood purchase and consumers attitude toward the COOL (country of origin label) and safety certification label in US. Their study revealed that older people tend to care more about COOL while consumers with higher consumption care more about the labels explicit on food safety. They also addressed consumers' perception on the level of safety associated with fish and shellfish products produced in six major U.S. seafood importing countries. US seafood consumers trust Canada much more than Indonesia, Ecuador, Thailand, China and Viet Nam, and quality certification labels will help to improve the trust on Indonesia and Ecuador but not much on the other countries (Wang *et al.*, 2013). Rafeeqe & Sekharan (2017) also identified increase in the food safety certifications in seafood industry in India.

Arvanitoyannis *et al.*, (2004 ) in their survey of Greek respondents indicated almost two-thirds of respondents claim that they know how to distinguish the freshness of a fish, a percentage that indicates strong involvement in, and knowledge of the fish purchasing and consumption process. Half of sample (n=1093) rely on a fish eyes to evaluate its freshness, with an additional one third of the respondents relying on the appearance of its gills.

#### **Use and trust of information**

Exploring consumer's interest for safety and safety information will reveal marketing possibilities to provide consumers with appropriate information to enhance consumer trust in food safety. In a quotidian and presumably safe setting, trust has a merely marginal impact on the behaviour of German consumers (Dierks, 2006). Television and newspapers currently reach the most people in terms of disseminating food-safety information. Recent years, TV and radio shows on nutrition, healthy diet, consumer protection and food safety became so popular in Turkey (Ergonul, 2013). Consumers expressed that they found scientists and professors extremely reliable, and they thought that scientists were giving important and useful advices to consumers about food safety and consumer health (Ergonul, 2013).

The research undertaken by Batzios *et al.*, in Greece in 2004 suggests that most consumers of mussels trusted the information provided by veterinary authorities on the safety of mussels. 90.9% respondents trusted the confirmation provided by the veterinary authorities regarding the enforcement of EU legislation on mussel hygiene (EEC Commission Decisions 91/492/EEC and 91/493/EEC 1991), but only 65.1% felt ready to buy mussels after a recent interdiction, regardless of consumer's income and education level, age or place of

residence ( $p > 0.10$ ). The same research points out that media announcements and articles in newspapers also have great influence on consumer behaviour. Of all respondents, 46.0% reported having been strongly influenced by the media regarding the safety of shellfish. The statistical evaluation following the breaking down of these data in parallel with the characteristics of participant's demographic and socio-economic status indicated no dependence between the degree of media influence and the above characteristics ( $p > 0.10$ ).

According to their sample of seafood consumers (Holland & Wessels, 1998), the strongest preferences are related to seafood inspection and Products indicating an inspection by either the USDA or the FDA are preferred to products with no inspection. Of the two agencies USDA is preferred over FDA maybe because consumers associate with meat and poultry inspection and feel comfortable with the USDA acting as a seafood inspector as well. Diverging findings exist regarding the potential of quality claims or certifications to increase seafood consumption. Regarding the potential of quality claims or certifications contradictory findings have come out from researches. No effect of quality claims could be observed in an in-home test involving preparation and consumption of real cod samples (Kole, Altintzoglou, Schelvis-Smit, & Luten, 2009). Total Quality Management (TQM) and HACCP can form the foundations upon which seafood industries will be certified regarding the quality and safety assurance of their products (Tzouros and Arvanitoyannis, 2000). From a food control point of view commercial designation, production method, and catch area are important information cues (Pieniaket *et al.*, 2011).

#### **Sustainability**

Shifting to sustainable food choices is a way to reduce the ecological pressure and impacts resulting from agricultural practices (Vanhonacker *et al.*, 2013). Sustainability issues also acts as one of the factor affecting consumer behaviour. Sustainable seafood productions exist in both capture fisheries and aquaculture. With health concerns of seafood consumption, many sustainable seafood initiatives set up health alert indexes to remind consumers about the health risks of certain species (Wang, 2010).

Sustainability related eco-labels also plays key role in deciding consumer choice. Fisheries management traditionally focuses on supply-side measures, and thus these measures are popular policy instruments in promoting responsible and sustainable fisheries management. But these techniques are not sufficient to address the challenges fisheries face. In 2005, the FAO published a set of voluntary guidelines for the eco-labelling of fish products. Minimum requirements and criteria for assessing whether a fishery should certified and awarded an eco-label, were based on the FAO's Code of Conduct for Responsible Fisheries. Consumer interest in Traceability cannot be taken for granted (Verbeke & Ward, 2006). Sustainability is becoming a headline story and a key concern for all, from the fishing Industry down through to the retailer, and on to the consumer (Seafood Choices Alliance, 2007).

Cawthorn *et al.*, (2011) in his study determined the most commonly available fish species in South Africa by surveying restaurants and retail outlets to assess the conservation statuses of the observed species. Furthermore, the processing states in which fish were mostly sold (fresh, frozen, whole or filleted) and the quality of information available to consumers on fish



at the point of sale were evaluated also evaluated. Consumers who care more about whether seafood is produced using environmentally sustainable practices, whether it is all natural, organic, well packaged, or whether it bears a quality certification label, will deem country of origin information more important when purchasing seafood products (Wang *et al.*, 2013). The Monterey Bay Seafood watch (MBSW) lists species that are safe to eat in terms of population health and fishing practices (green list), okay to eat in moderation (yellow list), and should not be eaten at all (red list). People who follow the recommendations of the MBSW do not consume fish species that are on the red list (Varble & Secchi, 2013). The Monterey Bay Seafood Watch (MBSW) is the oldest and most established seafood guide that helps consumers make ethical seafood choices (Jacquet *et al.*, 2010). Frequency of fish consumption in restaurants and at home, awareness of Asian carp and the problems they cause, awareness of overfishing/depleted fish stocks, health benefits and health concerns associated with consuming fish, purchase habits of new food items, interest in trying if Asian carp was locally caught and processed were the variable measured among US nationals. (Varble & Secchi, 2013). Miller & Mariani, (2013) learned more about the working dynamics of the fish industry in Ireland to identify possibilities for making the industry more sustainable.

#### **Seafood labels**

Traceability and labelling, segmented communication approaches and public involvement in risk management decision making are potential solutions for rebuilding consumer confidence (Verbeke *et al.*, 2006). The provision of nutrition and health information on food labels is increasing as an industry and regulation answer to the growing consumer concern with diet health relationships (Barreiro-hurle *et al.*, 2008). Prior research has shown that the presence of this information on food labels is valued by consumers; however, there is still no clear pattern on which labelling options are more valued and how different consumers value the different options (Barreiro-hurle *et al.*, 2008). Boxstael *et al.*, (2014) recommends a better understanding of the shelf life labels, use by (referring to food safety) and best before dates (referring to food quality) by consumers. They collected information on Belgian consumers, regarding their understanding and attitude towards shelf life labels and dates

Johnston *et al.* (2000) looked into eco labelled preferences of seafood across US and Norway. While food attributes are often not observable, the only source of such information is the food label. Hence, information contained in food labels can affect the demand for the food product. Zero-risk is not achievable and therefore, the labelling of safety in the food industry is a tricky business (Van Wezemael *et al.*, 2010). The specific requirements of markets, retailers and customers motivates the producers to obtain multiple food safety certifications (Rafeeqe & Sekharan, 2018). Region or country of origin is also an important extrinsic safety cue (Van Wezemael *et al.*, 2010). Different countries have different methods of processing seafood, different definitions for what kind of practices are “environmentally sustainable” and different standards for terms “all natural” or “organic”, so when a consumer is interested to know the attributes above, they may want to know from which country the product is produced thus putting a higher rank on country of origin information. This indicates that COO has implications for consumer preferences

over these attributes (Wang *et al.*, 2013). Consumers in the US are using the COO Label information to signal the level of food safety (Wang *et al.*, 2013).

Consumers often depend on product information on packaging or labels to determine and evaluate the attributes of the products (Holland & Wessels, 1998). In a survey Batzios *et al.*, (2004) of 409 adults who made the purchasing decision of the household, majority of the respondents (66.3%) reported that they trusted the information on the packaging label regarding mussel origin, while 21.4% did not trust the labelling and 12.3% did not pay any attention. Though this attitude seemed to be independent of consumer age and socioeconomic status ( $p > 0.10$ ), it was dependent on the place of residence, with the consumers living in urban areas showing more confidence ( $p \leq 0.5$ ) in the labelling.

Importance of the attribute, country of origin relates to the quality of the product and this association is very strong in perishable products as consumers perceive a higher risk in terms of health and safety. The preference for autochthonous sea fish can also be attributed to mistrust in exporters safety conditions (Claret *et al.*, 2012). The application of effective information strategies and specific activities such as labels that guarantee the origin, quality and/or safety of farmed fish, among others, might be valuable in order to improve the acceptance of aquaculture products (Claret *et al.*, 2012).

#### **CONCLUSION AND DISCUSSIONS**

While there is a good collection of studies on consumer behaviour towards seafood in general there is only a sparse population of consumer behaviour towards seafood safety in particular. Literature indicates that consumer perception and consumer attitudes are the main determinants of consumer behaviour towards seafood safety. There is very few literature available on the Safety and sustainability of seafood and on its certification and traceability. Consumers generally consume fish to be safe. But the rising issues relate to seafood safety make them concerned, this concern makes it challenging for seafood producers to market it effectively. This review recommends some strategies to reduce the perceived risk of seafood consumers and also puts forth the need for more review on consumer behaviour towards seafood safety. It also recommends the need to create more awareness among seafood consumers and seafood producers.

#### **Strategies to reduce perceived risk of seafood consumers**

Providing scientifically accurate and trustworthy information on physical risks of seafood will help reduce the perceived risks of seafood in consumers. Nutritional toxicological conflict of seafood indicates that consumption of seafood is perceived to have relatively high health benefits compared to safety risks of seafood. By giving consumers a clear understanding of the nutritional toxicological conflict of seafood consumers will be more encouraged to consume fish and seafood products. Consumers are very positive about labels. Ensuring them about the quality of seafood with labels give them more confidence in purchasing seafood. Giving assurances about the quality of seafood with quality certification and traceability systems will convey the freshness and safety of the product. Conveying guarantee of seafood's on labels carry out consumer behaviour studies and consumer awareness on seafood safety

### **The need to review more about consumer behaviour towards seafood safety**

The existing literature on seafood consumer behaviour towards seafood safety is very little. More information on seafood safety is needed by seafood producers, seafood consumers and government agencies. This information is helpful for seafood producers to design better seafood products for the consumers. Government agencies need to facilitate good screening mechanism to ensure seafood safety. Seafood producers can produce seafood products provide information regarding safety of seafood based on consumer's attitudes and consumer perceptions. Seafood consumers can rely on this information to be more responsible consumers. Government agencies can regulate food policies and use the information to educate public on seafood safety and consumption.

### **The need to create awareness among seafood consumers and producers**

Having a knowledge of seafood safety or hazards which can cause illness or injury to consumers is necessary for both seafood consumers and producers as well. The number of seafood borne illness due to consumption of seafood is increasing and consumers need to be aware of safety issues related to seafood. Consumers need to be made aware of the safety issues associated with seafood handling and consumption. Consumers can educate themselves about seafood and be more assured that the seafood they consume is safe. There are many instance of adulterations in value added seafood products. Seafood is one of the most common sources of food allergens. Different countries have different regulations which have to be met while producing, exporting or importing seafood products. The stakeholders in the seafood industries have to be updated on the rules and regulations and policies concerned with seafood safety to avoid poor performances. Producers, governments and other stakeholders should be update about scientific developments taking place about seafood and its safety. There is a need to create awareness on seafood safety for safe handling practices among the consumers and producers. Educating public about the safe handling practices of seafood will help to reduce the risks associated with seafood recalls and outbreaks associated with unsafe seafood consumption. Seafood safety education can be given through media like internet, news-paper, television and radio.

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