CHAPTER-II

Review of Literature

2.1 Review of Literature:

Fish species had received tremendous attention to the researchers due to the excellence in its nutritional aspects. In the age of globalization the entire world speaks in harmony specially in the field of research works. Experimental horizon broadens the natural resources with a vision to construct a healthy world in a healthy environment.

Fish have high nutritive value enriched with essential nutrients, unique protein content of high quality and easy digestibility. Fish contains essential and non essential amino acids in desirable quantities. Important omega-3-fatty acids, vitamins A, B, D and a variety of minerals such as calcium, phosphorus, potassium, iron, copper and iodine needed for supplementing both infant and adult diets (Owaga et al., 2010). Fish meat and oil contains high amount of polyunsaturated fatty acids that are important in decreasing the serum cholesterol leading to prevent coronary heart diseases and lowering the risk of Alzheimer's diseases and also the risk of developing dementia. Regular consumption of fish promotes the defence mechanism, against invasion of human pathogens due to the presence of antimicrobial peptide in the fish food. (Ravichandran et al, 2010)

2.2 Literature survey in International background:

Fish consumption is of growing importance because it provides the high content of health significant omega-3-PUFAs, particularly eicosapentaenoci acid (20:5n-3, EPF) and dicosahexaenoic acid (22:6n-3,DHA) (Elvevoll et al., 2000).

Varljen et al., 2003 studied on lipid classes and fatty acid composition of *Diplodus vulgaris* and *Conger canger* originating from the Adriatic Sea. Their study reported that both

fish species contain appreciable levels of n-3-polyunsaturated fatty acids (PUFA) and would be suitable for highly unsaturated low fat diets.

Nazeer et al. 2008 reported that a major content of lipid was accumulated in liver (6.22%) when compared with remaining organs like muscle (2.7%) and skin (1.0%). However, the muscle contained more cholesterol than liver and skin. The vitamin contents and fatty acids composition of Rainbow Trout (*Ondorynchus mykiss*) from the region of Central Bulgaria was investigated by Starcheve et al., 2010. Their study revealed that the lipid fraction contains sustainable amounts of fatty acids and fair contents of fat soluble vitamins (A, E, D_3) in the fresh edible tissues of Rainbow trout.

Sutharshiny et al., 2011 studied on total lipid and cholesterol contents in the flesh of the five important commercial fishes from water bodies around Jaffna Peninsula, Sri Lanka. Similarly, Daniel et al., 2015 studied on proximate composition of three commercial fishes commonly consumed in Akwa IBOM state, Nigeria and pointed out that the studied fishes were rich in crude protein, lipid, moisture and ash needed for nutritional requirements of human being.

Ashraf and co-workers (Ashraf et al, 2011) worked on nutritional values of wild and cultivated silver Carp (*Hypophthalmichthys molitrix*) and grass carp (*Ctenapharyngodon idella*). Their study revealed that Grass Carp contained higher protein and lipid contents and lower moisture contents than Silver Carp.

Ahmed et al., 2012 worked on the nutrient composition of indigenous and exotic fishes of rainfed water logged paddy fields in Lakshmipur, Bangladesh. A comparative characterization of lipids and nutrient content of *Pangasius pangasius sutchi* available in Bangladesh was studied by Islam et al, 2012. Minar et al., 2012 studied on proximate composition of hilsa in laboratory condition and found higher fat contents in hilsa fish than many other freshwater fish species.

Chalamaiah along with his colleagues (Chalamaiah et al,. 2012 carried on literature survey on fish protein hydrolysates, proximate composition, amino acid composition, antioxidant activities and applications. The paper highlighted on the excellent fish protein with good amino acid balanced bioactive peptides.

Investigations on total lipid, phospholipid and cholesterol contents of six commercially important fishes of Tulicorin, South east coast of India were done by Immaculate and his coworkers (Immaculate et al., 2013). They ensured that the estimated lipid, phospholipid and cholesterol contents of he studied fishes carry nutritional values.

The identification of fatty acid profile, lipid characterization and nutritional status of *Clarius batrachus* was carried out by Islam and his team (Islam et al., 2013) .*The* result of their study concluded the fatty acid profile of *C batrachus* such that lauric acid (2.6%),palmitic acid (37.41%),oleic acid(49.1%) and stearic acid (3.6%),arachidic acid (3.04%),behanic acid(4.21%) respectively.

The study of proximate compostion and fatty acid profile in some commercially important fish species from lake Kainji, Nigeria was performed by Effiong et al. , 2013. Tasbozen and others (Tasbozen et al., 2013) worked on nutritional composition of spiny eel (*Mastacembelus mastacembelus*) caught from the Ataturk Dam Lake in Turkey .Their investigation concluded that spiny eel is a beneficial source of food supplement for the human health.

Agnes and his team (Agnes et al., 2013) studied on nutritional levels in edible marine fish Paratrnateus niger and its depletion during storage. The study reports revealed the cause of decrease in nutrition quality of the fishes due to microbial activity. Akhirebulu and his team (Akhirerbulu et al., 2013) worked on variation of amino acid and fatty acid profiles of parts of cultured *Helerobranchus bidorsalies* (Geoffroy Saint – Hilaire, 1809). The study revealed that the cultured cat fish should be consumed in whole for the sake of full nutritional benefits.

Abbas et al., 2013 worked on *Notopterus notopterus* and *Rita rita*, the two indigenous small fishes found in India, Bangladesh, Pakistan and other regions of Asia. Ali et al., 2013 went through a research on the biochemical variation among some pond fishes and observed the antioxidant enzyme activities of the fishes to establish environmental impact of toxic effect on anthrogenic pollution on pond.

Alfa in together with his colleagues (Alfa et al., 2014) studied on proximate composition and mineral components of some species of fish sold in Bida Fish market. The study reported a high contents of potassium (K) in the selectd fishes.

Firlianty along with other researchers (Firlianty et al., 2014) investigated on protein profile and amino acid profile of vacuum drying and freeze dying of Famiyhamidae collected

from Central Kalimantan, Indonesia. The study report concluded that the powder products possessed 14 complete important amino acid.

Zhang and colleagues (Zhang et al., 2014) investigated on the lipod contents fatty acid profiles and nutritional quality of nine wild caught freshwater fish species of the Yangze Basin, China. They reported that fatty acid profiles were different among the fish species and they experimentally established the potentiality of the fish species as dietary sources of essential fatty acids from the nutritional stand point.

The research report of Farid et al., 2014 on the fish species Shoal (*Channa striatus*) and Taki (*Channa punctatus),* revealed that studied fresh fish species contained high moisture and low protein contents.

Oromadike (Oromadike., 2015) investigated on the proximate compostion of wild African catfish *chrysichthys nigrodigitatus* (Lacepede 1802). He reported high protein contents and semi high oil contents of the studied species.

Bogard and the group (Bogard et al., 2015) worked on the nutritional composition of important fish species in Bangladesh and potential contribution to recommended nutrient intakes.

The nutrient composition of important fish species in Bangladesh and potential contribution to recommended nutrient intakes were investigated by Bogard and his colleagues (Bogard et al.,2015) The research work concluded significant contributions of small indigenous fishes containing rich nutrient profiles, to the pregnant as well as lactating mothers. Fish foods are beneficial in the development of neuron in infants and in fat glycemic control (Mozaffarian et al., 2015). Moreover, fish has a good contribution towards essential amino acids, specifically lysine which is low in cereals, providing nutritional balance in the quality of mixed diet (FAO, 2005).

Magondu and colleagues(Magondu et al., 2016) carried on growth performance of milkfish (*Chanos Chanos Forsskal*) fed on formulated and non formulated diets made from locally available ingredients in South Coast region, Kenya. The analysed result revealved that

the fishes which were fed on formulated diet showed higher mean weight gain than them which were fed on non formulated diets.

Teame et al., 2016 studied on proximate and mineral composition of some commercially important fish species of Tekeze reservoir and lake Hashenge, Ethiopia. Kaisar and team (Kaisar et al., 2017) experimented on quality aspect and heavy metal contents of fresh and dry salted Hilsa (*Tenualosa ilisha*) of Bangladesh. Their work documented that the fish

species Hilsa can be regarded as a fatty fish. The concentrations of heavy metals in the studied fish species were found to be of acceptable range for human consumption.

2.3 Literature survey in National background:

In view of searching about the improvement of health status of the community and upliftment of the commercial potentiality it is important to estimate the nutritional profile of the food fishes available in the entire region of the country. A comparative study about the body composition of different small indigenous species, shoal fish and ilish were performed by Begam and her group (Begum et al.,2010) . They observed that the small fishes contained good nutritional value and not less than the larger fish helping to decresase the nutrient deficiency of the people.

To ensure the maximum utilization of the food fishes the world of biochemistry is investigating for their proximate contents (Ghelichpour and Shabanpour, 2011).

Fishes are highlighted as an important source of Vitamin A, D and E. There are large number of literatures reporting the significance of fish in brain development, and learning in children in protecting vision and eye health, decreasing incidence of breast cancer, rheumatoid arthritis, multiple sclerosis, asthma, psoriasis, inflammatory bowel disease and regulation of prostaglanding synthesis (Dhaneesh et al., 2012).

Jakhar and his team (Jakhar et al., 2012) Andhra Prades, India investigated on four common Indian fishes Catla *(Catla catla*), Rohu (*Labeo rohita),* Magur (*Clarius batrachus)* and Pangas (*Pangasian oclonhypophthalmus*). The result of their studies revealved the importance of fish nutrition in the human diet for preventing many life risk disease like heart problems, cholesterol and many nerve oriented problems. The study concluded that the lipid content of the fishes were inversely related to the moisture contents of the species.

The proximate compostion and macro and micro mineral elements of some smoke-dried hill stream fishes from Manipur, India were studied by Hei and his group (Hei et al., 2012). They documented that the fishes were good sources of minerals, protein and other nutrients needed for the balanced diet of human being.

The study reported that the proximate composition of fish depends on season and also on age, sex, reproducing cycle, breeding season and region of catch.Roy and her colleagues (Roy et al, 2012) studied the bioenergetics and microbial status of leaf fish *Nandus nandus* (Ham, 1822). The study concluded the presence of fair contents of protein in the fish *Nandus nandus.* The fish was documented to be in acceptable range as far as the total microbial flora in the fish is concerned. The fish species were found to feed more in summer than in winter.

The estimation of proximate, amino acids, fatty acids and mineral composition of mullet (*Mugil cephalus*) of Parangipettai, South east coast of India was carried out by Kumaran and co-researchers (Kumaran et al., 2012) . The study documented that the flesh of *Mugil cephalus* contained important w-3 and w-6 fatty acids and hence could be recommended for daily human consumption.

Marichamy and group (Marichamy et al., 2012) experimented on proximate and mineral composition of 12 edible fishes of Parangipettai coastal waters. They ensured the nutrient significance of the fishes for the sake of human health.

Sankar with his group (Sankar et al., 2013) studied the chemical composition and nutritional value of Anchory (*Stalephorus commersonil*) caught form Kerala coast, India. Their analysis demonstrated high nutrient contents of the studied species and also rich in PUFA & MUFA, low sodium, high potassium and calcium. Pawar and team (Pawar et al., 2013) studied on fish muscle protein, highest sources of energy .

The estimation of moisture content in fish species gives the amount of water contained by the fish body. One of the major proximate constituents is the quality of moisture content of the fish. According to Rahman and his group (Rahman et al., 2014) the moisture content was the most abundant composition of the *C. punctatus* and *A. mola* of ponds. The studies of Bijayalakshmi and group (Bijayalakshmi et al,2014) revealed the simalar report of moisture content on the same species.

Ramharsha with the team (Romharsha et al., in 2014) Manipur, India worked on the proximate compostion of some hill stream fishes viz, Neolissochilus stracheyi, Labeo pangusia

and semi plotus manipurenls. They reported high protein contents of the species and justified the same by the omnivons feeding habit of the studied fishes species.

According to the research report of Bijayalakshmi and group (Bijayalakshmi et al., 2014) the small indigenous fish species namely *Channa striata, Trichogaster fasciatus* and *Puntuys sophore* contained higher lipid content than the other fish species.

Kumar with his colleagues (Kumar et al., 2014) worked on the evaluation of nutrients in Trash fish, Parangipettai (South east coast of India).Tthe result of the study concluded that fatty acids such as saturated, mono saturated and poly saturated fatty acids were highly present in *Leiognathus dussumiri.*

Ray and his team (Ray et al., 2014) investigated on antioxidant potential and nutrient contenst of selected small indigenous species of fish. The study suggested the presence of appreciable amount of nutrients and antioxidants in the fishes.

Palami and group (Palami et al., 2014) worked on proximate and major mineral compostion of 23 medium sized marine fin fishes landed in the Thoothkidi Coast of India. Their research work reported that most of fishes were rich sources of phosphorus.

Mahanty with the team (Mahanty et al., 2014) studied on proximate composition, amino acid, fatty acid and micronutrient profiles of small indigenous fish *Puntius sophore*:. Their work recorded that the studied fish species was rich in proteins and minerals. The essential amino acids, Histidine was most prominent in that species. Moreover the fish *Puncius sophore* was rich in unsaturated fatty acid, specially oleic acid.Mahanty with colleagues (Mahanty et al., 2014) studied on amino acid composition of 27 fishes and their importance in clinical nutrition. The experimental result showed that the cold water species were rich in lysine and aspartic acid. Marine fishes were rich in leucine while the small indigenous fishes, in histidine.

Vijayakumar and his colleagues (Vijaykumar et al., 2014) studied on the proximate composition of Clupeidae and Engraulidae. The study discussed on the variation of the nutritional contents from species to species.

Debnath and his team (Debnath et al.,2014) worked on protein and mineral compostion of some local fishes of Tripura, India. The selected fish species *Amblypharyngodon mola, Esomus. danricus, Puntius sophore, Channa fasciata, Labeo. bata, Catla catla, Labeo. rohita*

and *Cirrhinus. mrigala* were analyzed and the reports concluded that all the fish species were nutritionally competitive even in their dried state. The study revealed that the small indigenous fishes were highly nutritive and these species can assure the nutritional security of the poor classes owing to their low cost and tremendous availability.

Gogoi and groups (Gogoi et al., 2015) studied on Morphometric and meristic study of *Amblypharyngodon mola* from different habitats of Assam. The report revealed no change in meristic counts with increase in body length of the studied fish species.

Anusuya and Hemlata (Anusuya & Hemalatha, 2016) in Tamil Nadu investigated on nutritive composition of *Channa striatus* fish after 2, 4-D pesticide treatment and concluded that there was a detorious effect of 2, 4-D usage in aquaculture vicinity.