2.0 REVIEW OF LITERATURE

Information about the coastal fishing community of Bangladesh was first made by FAO through a household survey. This report stated that the number of fishermen villages in Bangladesh was around 706 (FAO, 1972). However, an NGO (CODEC) conducted a census to enumerate the fishermen communities in the coastal and estuarine region of Bangladesh. This survey identified 1350 fishermen villages. Majorities of the fishermen villages were found in Chittagong. Coastal fishermen villages now occupy a number of districts and the population of the community has also increased (CODEC, 1991).

The fishing activities in the coastal areas can be divided into four main types. These are river-based fishery, canal-based fishery, estuary and sea based fishery and pond based fishery. The coastal fishermen communities in general are very poor. In, most cases, more than 50% of the fishermen have not sufficient valuable assets including land **(**Jensen, 1985).

Fishing is considered as a low-class profession and fishermen are traditionally poor. They lived from hand to mouth (Hannan, 1984). These fishermen are socially, economically and educationally disadvantaged communities and lack their own financial resources (Rahman, 1994 b).

Fishermen and their families in the South and South East Asia often are considered to be among the poorest of the poor (Bailey, 1994).

In Bangladesh, most of the fishermen are illiterate and few have primary level of education (Rahman, 1994a). Coastal fishermen of Bangladesh have a low level of education (Bailey and Doulman, 1994).

Ahmed (1996) found that the full time fishermen in Tangail district area were 84%; 24% had subsidiary occupation, 81% were found fishing throughout the year and 92% were member of some associations, clubs and co-operatives.

A survey on the professional fishermen was done in the Project area in Tangail district under the Compartmentalization Pilot Project (CPP, 1996). It was reported that 52% were owner of jhaki jal (cast net), 54% earned 50 taka daily, 70% took loan from moneylender and 69% fish individually.
Mannu (1999) obtained data on the sea going fishermen at Kuakata and reported that 72% were full time fishermen, 89% earned an average 25000 taka per year, 2% were owners of a trawler, and 4% carried out fishing during winter and rainy season.

Mahabubullah (1986) studied the polder fishing community of Bangladesh. He reported that 64% had no boat and 61 % had no gear. While, 98% reported, fishing as their main source of income and 71% earned 400 taka per month or above. A similar study was conducted by DOF (1993) on fishermen community of the chanda beel and revealed that there were 22% professional and 74% non-professional fishermen. 85% carried out fisheries activities individually, 5% were members of cooperatives, 34% aware of NGO programs. Average household income was 15000 taka per year.

DOF (1990) further conducted a survey on the socioeconomic conditions of the fishermen in eleven upzillas of the district of Patuakhali and Barguna under fisheries extension development project and reported that rate of literacy among fishing communities was far less than other areas. Their economic condition was so bad that they often could not afford educational expenses for their children. This study reported that about 70-80% fishermen were laborers (work in other gear and boats). About 70% of fishermen had an average daily income of taka 20-25, and the rest 30% taka 25-40.

Ahmed (1999) studied the socioeconomic conditions of the coastal fishermen and reported that 73.33% earned taka 50 per day.

Al-Muhit (2000) carried out a study on the fishermen communities of the Dhaleswari River. This study reported that the vast majority (90% and 91.66%) fishermen engaged in full time fishing. This study also revealed that maximum fishermen caught fish individually, and more than 97% fishermen were members of different associations.
Chantarasri (1994) reported about the Sunderbans Reserve Forest (SRF) fishermen community. Fishing was carried out in-groups. Most fishermen own their fishing gears with which they caught less than 40-kg fish per month. Typically monthly earning was between 2000 and 3000 taka.

Azam and Hasan (2001) conducted a detailed study on "Present status of post harvest fishery activities in the south western region of Bangladesh". This study reported the present fisheries activities in greater Khulna region i.e. fisheries activities in the Sunderbans Reserve Forest, fish marketing channel, fish landing center and wholesaler involved in fish trading.

Siddique (2000) in his book "Life Struggle of Marine Fishermen" highlighted the life struggle of the coastal fishermen communities of Bangladesh. He discussed in detail the process of fish extraction from the coastal region of Bangladesh,

the fishermen involved in this trade and their professional details including the economic condition, fishing boats and gear used in the fishing season.

From the stands points of quality, product deterioration, and food safety, particular attention should be focused on the microbiology of dried fishery products. The physical factors used in processing, dehydration, heat and chemical preservatives, limit microbial proliferation but do not control it (Graikoski, 1973).

Given a suitable environment, microorganisms will multiply. All fish contain microorganisms on the skin, gills and in the gut. Air, fresh and salt water, nets, fish boxes, ice, insects, smoking and drying equipment, and people handling the fish are all sources of micro-organisms. Contamination of fish muscle by a wide range of microorganisms is unavoidable. However, the rate of growth and the predominance of different types of microorganisms can be influenced and hence controlled by good hygiene and processing technology (James, 1998).

The microbiology of dried fish is not well documented, primarily because of lack of detailed microbiological studies. This lack has been due, no doubt, to the complexity of the microbial relationships and the wide diversity of the products involved. Microbiological studies have been prompted, in most cases, by problems associated with product deterioration. Dried fish products do not lack in importance regarding fish utilisation since they are consumed by a substantial number of people. They are the predominant food bringing vital protein to people in rural areas of least developed countries (Graikoski, 1973).

Once a microorganism finds its way onto the surface of dead fish, it will multiply. The rates at which this will occur depend on a multitude of factors and relate to the nature of the particular microorganism (Doe, *et. al*, 1998).

Proper processing requires knowledge of the microbiology of the raw products. This is of particular importance in the processing of dried-salted fish products, since micro-organisms surviving the conditions will reflect the micro flora of original products as well as that obtained in handling and storage. (Graikoski, 1973).

Microbiology of fresh and spoiled fish have been reviewed extensively (Tarr, 1954; Wood, 1967; Shewan, 1961; Shewan and Hobbs, 1967). Microbial proliferation begins with death of fish, at which time each natural defense mechanisms are destroyed. The rate of growth will depend on the number of types present on the fish and the temperature at which the fish are held. (Graikoski, 1973).

The microbial aspects of the drying of pre-cooked fish flesh has been studied in some detail (Shewan, 1954**).**

Ichine *et. al.,* (1977) studied twenty five samples of commercial dried fishes and stated their average total bacterial count as 1.2 x 10^6cfu/g. Mansur (1989) determined the total bacterial count of traditionally dried fishes. They found total bacterial count of 1.5 x $10^{6,}$ 1.0 x 10^5, 1.8 x 10^5, 1.6 x 10^5 and 1.6 x 10^5cfu/g in *Labeo rohita, Barbus sarana, Channa striatus. Corica soborna* and *Gudueis chapra* respectively. Haq and Kamal (1989) observed the total bacterial count of 1.8 x 10/g in dried *Mugil cuscosia* collected from a local market.

Sachithananthan (1976) reported the presence of *Escherichia coli* on locally dried fish in Sri Lanka.

Bacteriological examinations for evidences of insanitary handling include determinations for total count and coliform organisms often referred to as " indicator organisms" in food microbiology. The use of such indicators recognises that it is impossible to examine foods for every possible pathogen and that sanitation is linked inseparably with the wholesomeness and microbiological safety of foods (Olson and Shelton, 1973).

Drying and salting are traditional methods, which have been used for centuries for preserving fish (Cole and Greenwood-Barton, 1965; Waterman, 1976). The microbial stability of dried fish products during processing and storage is depended upon their moisture content (Scott, 1957; Waterman, 1976; Chirife and Iglesias, 1978; Troller and Christian, 1978).

Wood (1967), Horsley (1977) and Santos (1981) have reviewed the work done on the tropical and cold or temperate marine fish bacteria. These researchers have suggested that a comprehensive study is essential and that only after obtaining enough data on the tropical fish bacteria it would be possible to draw useful and meaningful conclusions.

According to Cutting (1962), the chief alteration caused by drying is the loss of moisture which resulted in an increase in protein content and therefore, in food value in terms of a unit of fish. But the changes in food value during curing varied greatly depending on the type of fish and the method of processing employed.

Kamruzzaman (1992) suggested that when water content of fish falls below 25% of the wet weight, bacterial action stop. While when the water content is further reduced to below 15%, mould ceases to grow. When salt *is* added to the fish before drying, less water needs to be removed to achieve the same effect, and the product with a water content of 35-

45%, depending on amount of salt present, is often dry enough to inhibit the growth of molds and bacteria under most climatic condition.

Valsan *et. al.* (1985) reported for non-penaid prawn of Bombay markets that high *moisture* of 24.3% for unsalted sun-dried products promotes growth of microorganism and accelerates the rate of spoilage. Also reported that the bacterial counts also were found considerably and faecal streptococci were detected in samples. He suggested that the sanitary conditions during processing of the market-dried product were satisfactory.

Kuppuswarmy *et al.* (1958) stated that the moisture content of Indian dried fish varied from 2.5 to 17.5 % and the protein from 44 to 71%. According to Qudrat-i-Khuda *et al.* (1962), the protein content of sun-dried shutki of both marine and fresh water fishes varied from 55.50 to 74.18% in *Labotes* surinamensis (Katkoi) and Chanina *marulius* (Gazar) respectively.

A survey was conducted by the Indian Central Institute of Fisheries Technology (Kalaimani and Kamasastri, 1988) at four fish drying yards on the species used, drying practices and the quality of the dried products. The moisture content of the samples varied over a large range, from 12.3% to 54%. Likewise, protein (17.2% to 78%), fat (3.7% to 17.8%) and ash (1.4 to 21.6%) content varied widely over the 23 species analysed.

Tsai, *et. al.,* (1989) reported that sun-dried squid (*Illex argentinus*) had TVB-N and TMA-N content of 78.2 mgN/100gm and 43.01mgN/100gm on dry matter basis. Rubbi, *et. al.,* (1982) studied extensively on the biochemical composition of 8 dried fish (marine) collected from local fish market of Dhaka city and reported that TVB-N and TMA-N content widely varied between 39.17 mgN/100g to 112.9 mgN/100gm and 23.07 mgN/100g to 68.12 mgN/100gm. The pH of these samples ranged from 7.6 to 8.9.

The growth of microorganisms on the dried fish depends on various factors, such as moisture, pH and other factors. Amla and Mazumder, (1989) found that pH of four irradiated fish products ranged between 7.2 to 7.9.

Rehydration is the replacement of water in dehydrated foods, but not all products reconstitute to 100% of their original state because of inherent differences in their chemical composition. According to Wang and Donne (1954), rehydration properties are influenced by six factors which are i) orientation of muscle fibre with reference to main absorption surface of the samples ii) thickness iii) temperature of rehydrating solution iv) osmotic pressure v) pH of rehydrating solution vi) preserving and storage condition of the samples. During drying and also during subsequent storage, certain irreversible changes occur which affect the texture and the reconstitute properties of the products (Connell, 1957).

Connell (1957) reported that fresh fish species dried in the sun reabsorb water to a comparatively small extent and, when reconstituted, are very tough, almost rubber-like, fibrous, compact and dry in mouth. Freshly prepared dry fish will have an attractive cream colour. On long storage they become brownish yellow or brown which indicates varying stages of spoilage (Valsan *et. al.,* 1985).

It is highly desirable that the requirement of a satisfactory dried product should be available to all those who are concerned with the expansion and development of fish processing. In particular for those regions of the world where an improvement in the fishery can have a marked effect on the standard of living of the people.