Since early times, man has adopted fishing as livelihood (Biswa, 1989) and fish for food value (Spore, 1986). Fish is a cheap and good source of protein, vitamins, minerals and contributes food security to underprivileged population in developing countries. Fish needs to be transported from the point of production to the place of consumption as quickly as possible due to its highly perishable nature. It requires careful handling, special facilities for cold storage, refrigerated transport and rapid delivery to consumers with reduced physical and nutritional loss mainly through markets. An organized fish marketing system provides remunerative price to the producer though the interest of the consumer is also protected.

Fishes are generally collected and distributed at small or large scale through landing centers. Traders, wholesalers and retailers bring fishes from landing centers to fish markets. Srinath et al. (2006) reported that there are about 1068 landing centers in India. Major landing centers of Gujarat are located at Mangrol, Veraval, Porbander, Jakhao, Kandla and Okha. Findings of current study revealed that landing facilities were not observed in Choryasi taluka and Surat city.

It is known that Tukiji fish market of Tokyo is the biggest wholesale fish market of the world. This fish market has cold storage rooms, non slippery floor, continuous temperature control, adequate light and auction facilities (www.wageningnur.nl). Floor of markets in
Bobigny (France) and Bielefeld (Germany) were covered with tiles. Automatic doors were used in the markets. Restrooms were located away from the seafood Departments with the hand washing facilities and lavatory. Workers had to wear plastic boots, coats, caps and gloves in the fish market. Chemical solutions were available for the disinfection of boots, coats, caps and gloves. Routine health checkups of workers were carried out by the administration in all markets (Mol and Saglam, 2004). On the other hand, Olalusi et al. (2010) found the erratic supply of electricity, inadequate cold storage facilities and stalls in the markets of Nigeria. The fish sellers of Okawango delta, Botswana were constrained by several factors including lack of preservation facilities and transport (Jagger and Pender, 2001; Adeokun et al., 2006). Findings of present study showed that even basic facilities like electricity, water, drainage and proper flooring were not found in the fish markets of Choryasi taluka and Surat city. Hygienic conditions were found to be very poor. Mol and Saglam (2004) reported that all the vehicles carrying fishes to the wholesale market of Rangis (France) and Madrid (Spain) were not equipped with any cooling system. Similar results were found in present study showing poor infrastructure and less developed wholesale and retail markets.

Olalusi et al. (2010) reported that the Liverpool fish market in Lagos state of Nigeria was mostly dominated by women and only few
men were found to be involved in the market. Omezzine (1994) described that Masirah fresh fish market was handled by fishermen and processors. The work of Madugu and Edward (2011) showed that both men (50%) and women (50%) were involved in fish marketing. In coastal area of Bangladesh, largely women were seen in marketing of fishes for self employment (Sabur and Rahman, 1979; Ahmed et al., 1993). Lawel and Idega (2004) found that 90% of women participated in fish marketing in Benue state. Jim-Saiki and Ogunbadejo (2004) revealed that in Lagos state of Nigeria, fishing was undertaken by males while marketing was carried out by female. Similar observations were made in the current study. Fishing was carried out by male whereas wholesale and retail fish markets of Choryasi taluka and Surat city were dominated by women indicated active participation in fishing sector.

Olubunmi and Bankole (2012) found in Oyo state of Nigeria that maximum respondents preferred frozen fish, followed by smoked fish, dried fish while minimum respondents preferred live fish. These results were supported by Alam et al. (2010) and finding showed that majority of the people preferred frozen fish. These results were not supported by finding of current study because fresh and dried fish marketing were very common in the study area. A new trend of live fish marketing of Indian major carps was noticed from two areas during the study of fish marketing status of Surat city and its vicinity. The same has been
supported by Amao et al. (2006). According to Quagrainie (2006) live seafood marketing was observed in North central region of United States. Ewart, (1996); Puduri et al. (2010) and Myers et al. (2010) reported that live seafood was mainly preferred by consumers of northeastern US. Dochtermann (1996) emphasized the need to maintain quality throughout the growth cycle of fish is essential for live marketing. This remarkable change in fish marketing provides high quality of fish and lucrative income.

A well organized marketing network is essential for distribution of fish at reasonable price. According to Roy (2008) maximum respondents sold their catch directly to local people while some of them sold their catch to middlemen. Middlemen bought fishes from fishers at cheaper rates and sold them to the markets for better price. Fishermen’s share was found highest when fish was directly sold to consumers and was the lowest when intermediaries were involved (Gupta, 1984). Similar results were observed particularly from the retail market of Rander village of Choryasi taluka. Results of current work indicated that economic status of respondents was affected by middlemen.

Price fixation was generally determined by the fish sellers including in present study on fish marketing in Choryasi taluka and Surat city. The work of Graddy (2006) strengthen the concept.
The socio-economic and professional background of respondents involved solely in marketing, capture fishing and marketing as well as culture fishing and marketing determined their habitat, attitudes and awareness on entrepreneurial activities. Capture fishing was the main occupation of Machhi caste in the Bhimpore and Umergaon Villages of Gujarat (Sehara et al., 1986). In the present study, marketing as well as capture fishing and marketing were also dominated by Machhi caste while culture fishing and marketing were carried out by Koli Patel. The results revealed that still the traditional castes were engaged in marketing as well as capture fishing and marketing and preferred the traditional occupation than any other occupation whereas people have also entered in non-traditional fishing activities like fish culture and marketing to earn more money as an income generating and lucrative business.

Experience may helps in earning. Findings of current study expressed that the middle age group of respondents with the experience of more than ten years dominated the occupation of marketing as well as capture fishing and marketing whereas maximum young respondents were involved in culture fishing and marketing. Similar results were observed by (Ponnumammy, 2004). Edwards (2000) and Dey et al. (2002) agreed that experience is crucial and contributing to the success of occupation. Once again it proved that younger group of people entered and accepted the culture activity to generate more money.
Most of the fishermen of Okavango delta of Botswana were illiterate (Harris et al., 2002 and Rahman et al., 2002). It was also observed during current field study the respondents of category I (marketing and capture fishing) had primary education due to poverty and low income. The lack of education resulted in lack of skills in developing marketing strategies (Fafield, 1992). Maximum respondents of category II (marketing and culture fishing) were educated upto graduate level. The level of education of respondents could be an important factor for the respondents to adopt latest technology in culture practices. The observation was supported by Dash (1989).

Findings of present study described that majority of respondents of category I were above poverty line (APL) while few respondents were below poverty line (BPL) as uncertainty of fish catch which resulted in not getting enough money on regular basis to fulfill their requirements. However, all respondents of category I from Surat city were above poverty line (APL). Most of wholesalers and retailers of Surat city brought their fishes from local market and outside the Surat city and sold. They earned money regularly and were under APL. All respondents of category II were APL. Their economic status was better due to profitable business.

Ghosh (1984) and Muthu (1980) suggested 1 to 3 ha pond size is best from the economic point of view. Farmers from the study area
were found to possess 0.8-6 ha pond size. Culture on a limited operation area may help in minimizing the risk and fetching good harvest. Ponnusamy (2004) recorded the majority of farmers had sole ownership. Similar results were found in current study. The farmers preferred the sole ownership to have freedom in adopting technologies.

Shailender et al. (2012) described that farmer followed all steps of culture practice to get more production. In current study seven respondents engaged in fresh water aquaculture. Out of these, three had adopted the composite fish farming technique. Only one respondent was involved in brackish water culture and followed all steps of pond management practice with latest technology to get more production.

Muhammad et al. (2012) reported the 1089 kg ha\(^{-1}\) crop\(^{-1}\) production of Indian major carps and tilapia at 10,000 fingerlings/ha stocking densities under polyculture. Ramanathan et al. (2005) found that the stocking density between 10-20 post larvae/m\(^2\) was ideal for successful shrimp farms. Sundarrajan et al. (1980) reported 514.7 kg ha\(^{-1}\) crop\(^{-1}\) of *Penaeus monodon* at 20,000 nos./ha stocking densities under monoculture in the Santhom farm, Madras. Sandier et al. (2007) reported 3,656 kg ha\(^{-1}\), 5,050 kg ha\(^{-1}\), and 4,625 kg ha\(^{-1}\), at 10, 20 and 30 seed/m\(^2\) stocking density was good for production and cultivation of shrimps. Results of present work revealed that stocking density of seed varied from 5,000-20,000 fingerlings/ha and 25,000-1,00,000 post larvae of
shrimps/ha. Income of respondents who were involved in marketing and culture fishing was better due to more production of cultivation species.

Statistical analysis showed that there was significant influence of income level on body mass index (BMI). It was also found that education age and type of occupation had significant influence on income level whereas there was no significant influence of experience, gender and full or part time involvement of respondents in occupation on income level.

Income of respondents affected BMI, when income level was poor, they did not fulfill the basic requirements of balanced diet and respondents were underweight. Same findings were observed by Chee et al. (2004).

There was significant influence of education on income level observed during present study. Forde (1994) stated that the low level of education was constraints to adopt new technology and their development. Okwu et al. (2011) described that secondary education could positively influence access to improve modern fisheries practice for better profit. The current observations also showed that the higher level of education (secondary to college) in respondents having fish and shrimp farming could be correlated with adoption of technology and higher income.

Microbiological analysis is a tool to check the quality of fish and pathogens harmful to humans. Type and total number of bacteria indicate
the quality of fishes. The total viable count / total plate count in fish samples have been observed by number of scientists. The permissible limit of total plate count for fresh fish had been found out by Surendran et al. (2008) was $5 \times 10^5$/g at $37^\circ$C.

Marine fish samples (*Atropus sp.* and *Stromateus sp.*) from wholesale and retail fish markets from study area had high TVC with *Escherichia coli* and *Klebsiella pneumoniae* exceeded the permissible limit. Hygienic conditions of wholesale and retail fish markets were very poor in Choryasi taluka and Surat city. On the other hand, samples of freshwater fishes *Catla catla* and *Labeo rohita* analysed from same wholesale and retail markets of study area were found completely free from bacterial growth indicating less susceptible to microbial counts and pathogens. Jha et al. (2010) found $78 \times 10^3$ CFU/g total plate count (TPC) from skin surface of freshwater fish *Labeo rohita* collected from markets in Silliguri city of West Bengal. *Escherichia coli* was observed with low TPC in this fish which did not exceed the permissible limit due to preservation with ice. Temperature plays an important role in growth of bacteria. Dutta et al. (2010) reported that number of *Escherichia coli* had increased remarkably at the temperature between $31^\circ$C to $34^\circ$C in all fish samples collected from ponds of Nadia district of West Bengal due to increase in temperature effected the population of *Escherichia coli*. This temperature is extremely suitable for *Escherichia coli* growth and
proliferation. The results confirmed that the role of abiotic environment factors have profound influence on the quantity and distribution of microorganisms (Alexander, 1971). Low TVC with *Escherichia coli* and *Klebsiella pneumoniae* in *Penaeus monodon* below permissible limit were recorded from Abhva shrimp farm. It was due to excess care taken throughout the growth of *Penaeus monodon* and precautions in preservation with ample amount of ice before sent for marketing. The bacterial load was significant with *Escherichia coli* in *Penaeus monodon* detected from Nanpura wholesale fish market exceeding the permissible limit. It was due to unhygienic condition and inadequate use of ice. The results of two sites claimed for proper preservation facilities for bacterial load. The contamination of fish with pathogenic *Escherichia coli* occurs during handling of fish (Ayulo et al., 1994; Asai et al., 1999) and the fishes are contaminated with pathogenic bacteria indicates poor hygiene and sanitary condition.

The permissible limit of Total plate count for dried fish had been standardized by (Surendran et al., 2008) was $1 \times 10^5$/g at $37^\circ C$. They recorded TPC ($3.5 \times 10^3$ CFU/g) with *Escherichia coli* in marine fish *Sardinella fimbriata* which crossed the permissible limit (Kumar, 2008). In present study, the highest TVC ($99.8 \times 10^5$ CFU/g) was observed in dried *Polynemus sp.* and lowest TVC ($1.2 \times 10^5$ CFU/g) was found in dried *Harpodon nehereus*. *Escherichia coli* was found in both dried fish
samples while *Klebsiella pneumoniae* was observed only in *Harpodon nehereus*. Both fish samples crossed permissible limit due to unhygienic conditions of market. Drying done in unhygienic way also added faecal bacteria in fishes (Anand et al., 2002). Dried seafood absorb the moisture from atmosphere and leads to the spoilage of products (Lilabati et al., 1999).

Fishes having TPC below permissible limit with pathogenic bacteria were not harmful to consumer while TPC with pathogenic bacteria above permissible limit, the fishes were hazardous for human consumption. *Escherichia coli* and *Klebsiella pneumoniae* are pathogenic organisms of Enterobacteriaceae (Podschun and Ullman, 1998; Amin et al., 2009). These organisms are capable of producing hazardous amounts of toxin histamine in a very short period of time when the fishes are kept at elevated temperature and cause fish poisoning (Lopez-Sabater et al., 1996; Kim et al., 2001; Cemek et al., 2006). Some human pathogens such as *Escherichia coli*, *Klebsiella pneumoniae*, *Salmonella sp.* and *Vibrio sp.* have been found to survive and multiply in the fish and thus it becomes potential vector of human disease over long periods (Allen and Hepher, 1969). *Escherichia coli* and *Klebsiella pneumoniae* in fish and fish products cause a health hazard to human (Caldreich and Clark, 1966; Fapohunda et al., 1994; Ampofo and
Clerk, 2010). These two microorganisms cause food poisoning, diarrhoea, meningitis and septicaemia (Ananthanarayan and Paniker, 2009).

It is important to note that the quality deterioration of fishes could be due to long transportation without cooling system, unhygienic handling, processing and preservation of the fish after harvesting. Fish spoilage is influenced by high temperature and considerable distance of landing ports to points of utilization (Agbon et al., 2002). Spoilage in fish results into reduction in market price of fish leading to an economic loss to fish seller.