Details of fish markets, respondents engaged in marketing, marketing and capture fishing as well as marketing and culture fishing activities from Choryasi taluka and Surat city are discussed here. Additionally results of statistical and microbiological analyses are also presented.

3.1 Fish Markets' Details

In Choryasi taluka of Surat district and Surat city, fishes were sold through wholesale and retail markets. Vendors also played role in fish marketing. New trend in selling of live Indian major carps was also observed from the study area.

3.1.1 Wholesale Fish Market

The only wholesale fish market located at Nanpura area of Surat city (Plate-I, Figs. 1-3) was studied. The market was constructed in 1950 by Surat municipal corporation (SMC). Total 68 traders were enrolled and allotted fixed place by SMC for fish trading from 6:00 a.m. to 10:00 a.m. The market was dominated by women wholesalers.

Trucks loaded with fishes were brought to fish market early in the morning without cooling facility. Fishes sold in the wholesale market were brought from villages of Choryasi taluka (Bhimpore, Dumas, Hazira, Magdalla, Kavas and Ichchhapore), outside Surat city (Porbandar,
Veraval, Jamnagar, Junagadh, Jakhao and Golai) and other states of Maharashtra, Andhra Pradesh and Kerala by road and railways. Approximately 40 ton fishes were marketed daily by wholesalers of Nanpura fish market. Dead fishes were packed in thermocol boxes with ice while live fishes were brought to the market in drums. Fishes were sorted according to the species and size and sold in the market.

Fish distribution was at local and district level. Traders of Nanpura wholesale fish market sold their fishes to retailers of various local fish markets (Nanpura, Golwad, Navsaribajar, Saiyadpura, Dilligate, Rander, Bhimpore, Dumas, Suvali and Hazira), fish markets of Valsad and Navsari, retail outlets, vendors, also to hotels and restaurants of Surat district.

Variety of freshwater fishes such as Catla sp. (catla), Labeo sp. (rohu), Cirrhinus sp. (mrigal), Pangasius sp. (pangas), Oxygaster sp. (chaliya), Mystus sp. (singala) and Macrobrachium sp. (sondhiya) were found to be sold in the market. Among marine water fishes viz., Dasyatis sp. (patara), Atropus sp. (bangda), Stromateus sp. (paplet), Harpodon sp. (bumla), Parastromateus sp. (halwa), Polynemus sp. (rawas, cheriyu, dara), Muraenesox sp. (vam), Protonibea sp. (ghol), Scylla sp. (karachla) and Penaeus sp. (zinga) were commonly sold in Nanpura wholesale fish market.
From these fishes, freshwater fishes *Catla* sp., *Labeo* sp., *Cirrhinus* sp. and marine water *Stromateus* sp., *Parastromateus* sp. and *Muraenesox* sp. were brought from other states. Only *Clarius* sp. (magur) was found to be sold in live condition and fetched better price. Commonly available fishes in the wholesale market are shown in Plates II, III (Figs.1 & 3), IV and V (Figs.2 & 3).

The wholesale market was centrally located in Surat city. There was no proper building for marketing, the selling of fish was on the road without facility of electricity, water, drainage, storage room and proper flooring. Small platform was constructed in the market but wholesalers did not use for fish selling. There was no lavatory and washing facilities. Hygienic conditions were very poor. Fishes were piled up on the floor (Plate-VI, Fig.1). Most of the fish merchants did not use ice or any chilling facilities while very few of them used meagre amount of crushed ice during selling the fishes (Plate-VI, Fig.2). As a result, fishes tend to deteriorate the quality and traders sold at lower price. Some traders were found to pack the unsold fishes in thermocol boxes with ice for the next day sale (Plate-VI, Fig.3).

Fish auction was not observed in Choryasi taluka and Surat city. Price was fixed by wholesalers of Nanpura fish market. Fishes brought from Andhra Pradesh and other states fetched higher price compared to the local one due to quality and demand. Wholesalers earned commission
from traders who sent their fishes from different parts of India to Nanpura wholesale fish market. They also got profit by selling fishes to retailers.

State fisheries Department issued the license to all registered traders who paid Rs.1000/annum to the license issuing authority. The Surat municipal corporation authority was found to check the fish quality periodically and collect the revenue from the traders at the rate of Rs.5/10 kg weight of fishes. SMC provided a container for collection of spoilt fishes and waste of fish selling. Moreover, the market premise was washed everyday by the SMC mobile unit.

The National Fisheries Development Board (NFDB), Hyderabad had allotted a grant of Rs. 1.39 crore to Surat Municipal Corporation in the year 2011 for the construction of a modern fish market at Nanpura area of Surat city. There was a need to broaden the roads near the market to renovate the Nanpura fish market which would have affected the houses of local people. Residents of the area and wholesalers protested, SMC planned to shift the market from Nanpura to other place of Surat. Till date no modern fish market is constructed in the city.

### 3.1.2 Retail Fish Markets

Total eleven retail fish markets were found to be located at Choryasi taluka and Surat city. From these Bhimpore, Dumas, Suvali (Plate-VII, Figs. 1-3), Hazira and Rander (Plate-VIII, Figs.1 & 2) were
situated at Choryasi taluka while Katargam (Plate-VIII, Fig.3), Nanpura, Golwad, Navsaribajar (Plate-IX, Figs.1-3), Saiyadpura and Dilligate (Plate-X, Figs.1 & 2) were located at Surat city. From these, Navsaribajar and Saiyadpura fish markets were constructed in 1950 by SMC. Only Rander market had small platform, remaining other retail markets did not have any constructed area. Fishes were sold in retail markets from 8:00 a.m. to 11:00 a.m. in the morning and 5:00 p.m. to 8:00 p.m. in the evening.

Total 1832 active fisherfolks of Choryasi taluka engaged in marketing as well as in marketing and capture fishing were registered in Fisheries Department. On the other hand, there was no record of registered retailers of Surat city in SMC or Fisheries Department. Men and women both were involved in marketing but retail fish markets were dominated by women fish sellers.

Fishes were brought to retail markets from fisherfolks of Choryasi taluka who were engaged in marketing and capture fishing as well as from Nanpura wholesale fish market of Surat city. Fishes were transported by vehicles without any cooling facility. Approximately daily 25 ton fishes were marketed by retailers. Dead fishes were packed in thermocol box, bamboo baskets and aluminum vessels while live fishes were carried to the market in drums. Fish distribution was carried out at local and state level. Retailers of Choryasi taluka and Surat city sold their
fishes to consumers and vendors except the retailers of Katargam fish market. They sold their fishes to traders of Kolkata. Prominent role of middlemen was observed in Rander village. Moreover, retailers of Variav, Bhimpore and Dumas also sold their fishes to middlemen who supplied the fishes to Rander market and fetched more profit.

Variety of freshwater fishes like *Catla sp.* (catla), *Labeo sp.* (rohu), *Cirrhinus sp.* (mrigal), *Pangasius sp.* (pangas), *Oxygaster sp.* (chaliya), *Mystus sp.* (singala), *Wallago sp.* (padhin), *Heteropeustes sp.* (singhi) and *Macrobrachium sp.* (sondhiya) were found to be sold in the market. Estuarine fishes viz., *Mugil sp.* (boyee) and *Hilsa sp.* (palwa) were sold. Among marine water fishes viz., *Dasyatis sp.* (patara), *Stromateus sp.* (paplet), *Harpodon sp.* (bumla), *Parastromateus sp.* (halwa), *Muraenesox sp.* (vam), *Protonibea sp.* (ghol), *Polynemus sp.* (rawas, cheriyu, dara), *Scoliodon sp.* (magru), *Tenualosa sp.* (modar), *Sardinella sp.* (kati), *Scylla sp.* (karachla) and *Penaeus sp.* (zinga) were sold in retail markets of Choryasi taluka. Freshwater fish *Clarius sp.* (magur) and brackish water fish *Boleophthalmus sp.* (levta) were sold in live condition (Plate-II, Fig.3 and Plate-III, Fig.2) while *Harpodon sp.* (bumla) was sold in dried form (Plate-V, Fig.1). Common fishes of retail markets are shown in Plates II-IV (Figs.2 & 3) and V.

Infrastructure of retail fish markets was very poor. Proper building and flooring, facility of electricity, water drainage and storage room were
not seen in any of the market. Platform was constructed only in Navsaribajar, Saiyadpura and Rander fish markets. There was no lavatory and washing facilities. Hygienic conditions were very poor (Plate-VII, Figs.2-3 and Plate-X, Fig.3). Retailers sold their fishes on the roadside without maintaining the quality of fish. There was no Government organised shop or outlet found from the study area.

SMC authority provided space only to the retailers of Surat city for fish marketing. The SMC authority was found to check the fish quality periodically and collect the revenue from the retailers at the rate of Rs.5/10kg weight of fishes. SMC also provided containers near markets of Surat city whereas Gram Panchayat provided containers to markets of Choryasi taluka for collection of spoilt fishes and waste of fish.

Government did not play any role in fixation of price. It was fixed by the retailers and varied from species, size, season and quality of fish. Due to intermediary’s role, producers and consumers suffered for better revenue.

3.1.3 Marketing Through Vendors

Fish marketing through vendors was not common in study area. Door to door fish selling by women vendors were seen in Damka, Vasva and Junagam villages of Choryasi taluka. Approximately ten vendors were involved in fish vending from 9:00 a.m. to 12:00 noon. Each vendor
dealt with approximately less than 10 kg of fishes. Vendors sold variety of fishes such as *Catla sp.* (catla), *Labeo sp.* (rohu), *Cirrhinus sp.* (mrigal), *Macrobrachium sp.* (sondhiya) and marine fishes such as *Stromateus sp.* (paplet), *Harpodon sp.* (bumla) etc. They carried the fishes in bamboo baskets or aluminum containers without any preservation facility.

### 3.1.4 Special Observations

A new trend in marketing of live Indian major carps in Katargam fish market of Choryasi taluka was observed from the study area during 5:00 p.m. to 8:00 p.m. (Plate-XI, Fig.1). Live fishes were brought from culture farm of Magdalla, Kavas and Ichchhapore villages to Katargam retail fish market. Though Olpad is not included in study area but it is worth to mention that here also live fish marketing was observed (Plate-XI, Figs.2-3 & Plate-XII, Fig.1). Fishes were brought from farms to Olpad taluka.

Approximately 80 kg live fishes were marketed daily by retailers. Live fishes *Catla sp.*, *Labeo sp.* and *Cirrhinus sp.* were carried in oxygenated tank (Plate-XII, Fig.2). Retailers used aerator (Plate-XI, Fig.1) and oxygenated tank for selling fishes (Plate-XII, Fig.3). Retailers of Katargam and Olpad fish market sold live fishes to local consumers. Dead fishes were sold at the rate of Rs. 100/Kg whereas live fishes cost
was Rs. 200/Kg thus retailers fetched double price through selling of live fish. Elite class consumers preferred to pay higher price for live and quality fishes.

3.2 Respondents' Details

All the members engaged in marketing are described as respondents. From the present data, respondents from Choryasi taluka (Rander, Varivav, Magdalla, Umra, Kavas, Gabheni, Budia, Bhimpore, Dumas, Damka, Vasva, Suvali, Junagam, Hazira, Vanz, Karadva, Ichchhapore and Abhva and Surat City (Nanpura, Narsaribajar, Golwad, Saiyadpura and Dilligate) were classified in two categories viz., respondents of category I and respondents of category II. Under these categories, related information on socio-economic and professional status were analysed.

3.2.1 Respondents of Category I

This category included the respondents engaged in marketing as well as marketing and capture fishing having large number of samples. From Choryasi taluka, there was no respondent involved in wholesale marketing whereas 1832 respondents in retail marketing were registered in Government Fisheries Department and 183 (10%) respondents were interviewed. 68 respondents from Surat city were registered in Fisheries
Department and SMC for wholesale marketing. 41 respondents (60%) were interviewed. No registration was made at any organization for retail marketing from Surat city. However approximately 60 nonregistered retailers were observed during the study and 36 (60%) were interviewed. Thus total 260 respondents were interviewed and analysed under the respondents of Category I.

Villagewise maximum respondents (21.9%) were observed from Bhimpore village followed by Dumas (15.4%) for retail marketing from Choryasi taluka (Plate-XIII, Fig.1). Fishes were captured from inland and marine water. Small scale fishing and marketing were noted from Rander, Variav, Magdalla, Umra, Kavas, Gabheni, Budia, Bhimpore, Dumas, Damka, Vasva, Suvali, Junagam and Hazira villages of Choryasi taluka. Wholesale and retail markets of Nanpura from Surat city represented maximum respondents (Plate-XIII, Fig.1). Sexwise, there was not much difference among the respondents. Males (51.2%) and females (48.8%) participated in the occupation of fish marketing. Males mainly contributed in capture fishing while females of same families were involved in marketing (Plate-XIII, Fig.2). Fishing activities of capture and marketing were dominated by Machhi community (83.1%) followed by Halpati (13.5%) and Koli Patel (3.5%) as shown in Plate-XIV, Fig. 1, the age group of 41-62 year covered the maximum respondents of 51.2% (Plate-XIV, Fig.2) followed by 22-40 years (38.8%). Only 10% of
respondents were found beyond 62 years age groups. The middle age group of respondents community dominated the occupation.

The level of education of respondents could also be an important factor in learning and adopting the new technology in fish marketing and capture fishing. Maximum respondents (33.8%) were found to have primary education, minimum respondents (0.4%) had education upto college and beyond while 23.3% were illiterate (Plate-XV, Fig.1). The type of house is an indicator for the status of respondents. It was observed that 49.2% respondents had pakka house while 12.7% had kachha house (Plate-XV, Fig.2). Body mass index (BMI) is an indicator to show the health status of respondents. According to Body mass index analysis, more than 80% respondents had normal weight. 18.5% respondents were found to be underweight (Plate-XVI, Fig.1). Among gadgets, most common was television sets used by more than 50% of respondents followed by the necessary gadget like refrigerator (33.1%). Plate-XVI, Fig.2 shows that though the mobile phone is very widely used but only 5.4% of respondents used the mobile phones. In terms of mobility, it was found that 62.3% of respondents' families owned two wheelers. Nearly 26.5% of respondents' families did not have any vehicle (Plate-XVII, Fig.1).

Economic status of respondents engaged in marketing as well as marketing and capture fishing is depicted through Plate-XVII-XVIII.
Plate -XVII, Fig.2 shows the overall picture of income of respondents indicating 53.1% of respondents had income between Rs. 2,000-20,000 followed by 31.2% respondents in income group of Rs. 20,001-40,000. These respondents belonged to villages of Choryasi taluka (rural area) and Surat city the urban area which have different measures of income to check the poverty line. Applying the criteria, analysis was made separately for both groups. 36.6% of respondents from the village of Choryasi taluka of Surat district were found below poverty line (BPL) and 63.4% of respondents were above poverty line (APL). On the other hand, 100% respondents of Surat city were APL (Plate-XVIII, Fig.1).

Plate-XVIII, Fig.2 shows that 16.3% of respondents gained handsome profit from fish sale whereas 33.7% of respondents got marginal profit and continued the business as traditional occupation. Respondents of this category were analysed for their role only in marketing as well as marketing and capture fishing activity. 29.6% of respondents were engaged only in business of fish marketing whereas larger number of respondents (70.4%) were engaged in marketing and capture fishing (Plate-XIX, Fig.1). Total 86% of respondents accepted fishing and marketing as a full time occupation (Plate-XIX, Fig.2). Findings indicated that majority of respondents (91.8%) had fish occupational experience for more than ten years (Plate-XX, Fig.1). Marketing, capture and marketing of fish was the traditional business of
82.1% respondents and remaining 17.9% opted the profession for earning money (Plate-XX, Fig.2).

Fishes sold in the market included freshwater, estuarine and marine contributing 42.5% shell fish consisted mainly prawn and crab had higher contribution than the fin fish (Plate-XXI, Fig.1). Quantity of fish sold by the respondents in the markets varied. Plate-XXI, Fig.2 shows that 76.4% respondents dealt with the weight of less than 5 kg for selling whereas more than 20 kg fishes were handled by 23% of respondents. During field study it was observed that 38.3% respondents used ice boxes for preservation of fishes while 61.7% respondents did not use any freezing facilities (Plate-XXII, Fig.1). Plate-XXII, Fig.2 depicts that 41.8% of respondents sold their catch directly to local people and consumers. 27.2% respondents sold their catch to fish markets and 16.6% respondents dealt with retailers. Middlemen shared the catch of 10.1%. Minimum respondents (0.4%) sold their fishes to private agency. The survey results revealed that the majority of respondents (78.2%) did not respond to problems in occupation of marketing, capture fishing and marketing. 15.8% respondents expressed that there was less catch and insufficient availability of fish for sale. Only 5.4% respondents expressed problem of preservation and transportation (Plate-XXIII, Fig.1).
3.2.2 Respondents of Category II

This category included eight respondents from Choryasi taluka (Magdalla, Vanz, Karadva, Budia, Kavas, Ichchhapore and Abhva) having occupation of marketing and culture fishing activity. Every village had one farmer except Kavas with two farmers. All eight farmers registered in State Fisheries Department were selected for case study.

All the respondents of this category were male and marketed their own cultured animals. Occupation was dominated by Koli Patel community. Six of the respondents belonged to age group of 35-41 years. One trader was very young of 27 year from Ichchhapore and other one had higher age of 55 years from Karadva. Respondents from Magdalla and Kavas were found to have education upto collage level while one respondent from Abhva was postgraduated in the subject of Aquatic Biology. Respondents of Vanz, Budia, Ichchhapore and Karadva had education upto higher secondary. All the respondents had pakka houses with all modern gadgets. 60% respondents owned two wheeler vehicles. The remaining 40% respondents from Magdalla and Abhva had the four wheelers.

Out of total eight farmers, seven were engaged in fresh water culture fishing activity and one was associated in brackish water shrimp farming. Each member of category II adopted the fishing activity and
marketing as a source of income and none had this occupation as traditional.

Seven respondents had freshwater culture. Five ponds were from Vanz, Budia, Ichchhapore Karadva, and Magdalla having size of 1-6 ha (Plate-XXIV, Figs.1 & 2) Two ponds were from Kavas with the size of 1 ha. Villages of Magdalla and Budia had private ponds. Respondents of other villages had ponds on lease for ten years from State Fisheries Department. All ponds were perennial. Respondents of Magdalla, Vanz, Karadva and Budia stocked their ponds with major carps. While respondents of Kavas and Ichchhapore adopted composite fish culture technique and stocked their ponds with major carps (Catla sp., Labeo sp., Cirrhinus sp.), grass carp (Ctenopharyngodon sp.) and fresh water prawn (Macrobrachium sp.) for obtaining better production and economic gain. Fresh water was drawn to the ponds through canal. Stocking density of seed varied from 5,000-20,000 fingerlings/ha and 25,000-30,000 post larvae of Macrobrachium sp./ha. The highest stocking density was in Magdalla pond with 20,000 fingerlings/ha. In composite fish culture, the highest stocking density was in Kavas with 5,000 fingerlings/ha and 30,000 post larvae/ha. Only respondents of Kavas and Ichchhapore fed their fishes with supplementary feed (rice bran). Respondents did not have farming training from any organization except the respondent of Karadva village. Respondents of Karadva and Budia villages harvested
their crops thrice a year through retailers of Katargam and private parties. Ponds of Kavas and Ichchhapore were stocked with Indian major carps, grass carp and prawns were harvested twice a year and sold to outlet of Hazira market from Ichchhapore while respondents of Magdalla and Vanz villages harvested their crops once a year (Plate-XXIV, Fig.3). Respondent of Magdalla harvested maximum quantity (3,000 kg/year), from freshwater culture fishery followed by Kavas and Ichchhapore (2,000 kg/year), Karadva (1,500 kg/year), Vanz and Budia (1,000 kg/year).

New trend in marketing of live Indian major carps were observed in Choryasi taluka. Respondents of Magdalla and Vanz sold their fishes in live condition to retailers of Katargam fish market (Plate-XXV, Figs.1 & 2). The fishes were sold partly in live condition to consumers and bulk was sent to Kolkata city. Respondents of Kavas sold their live fin fishes to retailers of Katargam fish market and dead shell fishes to Nanpura wholesale or local markets of Choryasi taluka. The earning from the culture was Rs.50,000/year in Budia village. Respondents of Magdalla, Vanz, Karadva, Kavas and Ichchhapore earned more money in the range of Rs.1,00,000-2,00,000/year.

Only one respondent from Abhva village was engaged in brackish water shrimp farming activity. He had twenty ponds having size of 0.8 ha (Plate-XXV, Fig.3). Land was on lease from the State Fisheries
Department for ten years. Water from creek of Arabian Sea was drawn into the ponds for stocking of *Penaeus monodon* (Tiger shrimp) at 1,00,000/ha density. The respondent was well aware of changing trends in shrimp farming and followed all the steps of pond management practice including pond preparation, water quality management, seed stocking, feeding, aeration, disease control, biosecurity (Plate-XXVI, Fig.1) etc. till harvesting. Culture period of shrimp was 180 days and ponds were used for two crops/year. There was one technical assistant and other staff for maintaining the culture farm. Technical assistant monitored farm conditions at all levels including purchase of quality hatchery seeds, fertilizer application, feed and feeding, soil, water quality and disease management. The crop production of shrimp was reported of about 80,000 kg/year.

During the crop harvestation (Plate-XXVI, Fig.2) every care was taken to maintain the quality of shrimp. Ample amount of good quality ice was used for chilled killing and proper preservation (Plate-XXVI, Fig.3 and Plate-XXVII, Figs.1 & 2). The harvested shrimps (Plate-XXVII, Fig.3) were marketed to West Coast frozen food Pvt. Ltd. at Olpad and Shri Dutt aquaculture Pvt. Ltd. at Bilimora where shrimps were processed and exported to Europe, Japan, Russia and South Africa.
3.3 Statistical Analyses

In order to find the influence of one parameter on others, statistical analyses were applied in the assumption. ANOVA test, Post hoc test and Independent sample test were applied in the hypothesis for variables viz., income level, Body mass index (BMI), experience, Part or Full time involved in fishing business, education, age, gender and type of occupation.

3.3.1 ANOVA between Income and Body Mass Index (BMI)

Hypothesis were,

Ho: Models does not exist

H₁: Model exist

Table 3.1 indicates that p-value was less than 0.05, so null hypothesis was rejected at 5% level of significance which means that model exist.

3.3.2 Coefficient between Income and Body Mass Index (BMI)

Ho: There is no significant influence of income level on Body Mass Index (BMI)

H₁: There is significant influence of income level on Body Mass Index (BMI)
Table 3.2 indicates that coefficient of income was significant as P value was 0.001 (<0.05) which means that income of respondent affected the BMI.

### 3.3.3 ANOVA between Experience and Income Level

Hypothesis were,

Ho: There is no significant influence of experience on income level
H<sub>1</sub>: There is significant influence of experience on income level

Table 3.3 shows that P value of ANOVA test for influence of experience on income level was greater than 0.05 (0.311), so null hypothesis was rejected which means there was no significant influence of experience on income level.

### 3.3.4 ANOVA between Part/Full time Fishing Occupation and Income Level

Hypothesis were,

Ho: There is no significant influence of part/full time fishing occupation on income level
H<sub>1</sub>: There is significant influence of part/full time fishing occupation on income level

It can be seen from Table 3.4 that P value was greater than 0.05 (0.154), so we failed to reject null hypothesis which means there was no significant influence of part/full time involved in fishing occupation on income level.
3.3.5 ANOVA between Education and Income Level

Hypothesis were,

Ho: There is no significant influence of education and income level

H₁: There is significant influence of education and income level

Table 3.5 indicates that P value was 0.000 which was less than 0.05 which means that we reject null hypothesis and there was significant influence of education on income level (Plate-XXVIII, Fig.1).

3.3.6 ANOVA between Age and Income Level

Hypothesis were,

Ho: There is no significant influence of age on income level

H₁: There is significant influence of age on income level

Table 3.6 shows that P value was 0.01 which was less than 0.05 so, null hypothesis was rejected which means there was significant influence of age on income level with the increase in age, income level also increases (Plate-XXVIII, Fig.2).

3.3.7 Post Hoc Tests between Age and Income Level

Tukey’s test:

H₀: There is no significant influence of age on income level

H₁: There is significant influence of age on income level

Table 3.7 shows that P value of age group 22-40 and 61-90 was 0.013 which was less than 0.05 so, null hypothesis was rejected. There
was significant difference in the income level of respondents in the age group of 22-40 and 61-90.

**Scheffe Test:**

H₀: There is no significant influence of age on income level

H₁: There is significant influence of age on income level

Table 3.7 shown that P value of age group 22-40 and 61-90 was 0.018 which was less than 0.05 so, null hypothesis was rejected. There was significant difference in the income level of respondents in the age group of 22-40 and 61-90.

3.3.8 Independent Sample Tests between Gender and Income Level

Hypothesis were,

H₀: There is no significant influence of gender on income level

H₁: There is significant influence of gender on income level

It is seen from Table 3.8 that P value was 0.018(>0.05), so null hypothesis was rejected which means that there was no significant influence of gender on income level.

3.3.9 Independent Sample Tests between Type of Occupation and Income Level

Hypothesis were,

H₀: There is no significant influence of type of occupation and income level
H₁: There is significant influence of type of occupation and income level

Table 3.9 indicates that P value was 0.000 (>0.01), so null hypothesis was rejected which means that there was significant influence of type of occupation on income level. From the mean rank (Table 3.9) it may be interpreted that mean income level of marketing respondents was more than marketing and capture fishing respondents.

3.4 Microbiological analyses

Fifty four fish samples of eighteen species and replicates of each from different freshwater, estuarine and marine fishes from one wholesale, four retail markets, one vendor and one culture farm were analysed to check the quality of fishes.

3.4.1 Total Viable Count (TVC)

The results of total bacterial count in fish samples expressed in colony forming unit per gram (CFU/g) are shown in Table 3.10. Colonies were observed in plate ranged from $10^{-2}$-$10^{-4}$ dilution factor (Plate-XXIX, Figs.1-3).

Results showed highest bacterial count ($137.5\times10^5$ CFU/g and $95.3\times10^5$ CFU/g) in fresh samples of *Mugil parsia* and *Stromateus cinereus* marine fish samples of Dumas retail fish market followed by
fishes from Hazira market. Nanpura wholesale market showed higher bacterial count (69.5×10^5 CFU/g) from marine fresh fish samples whereas fresh samples of Nanpura retail market showed bacterial count (46.3×10^5 CFU/g). Dried samples of marine fish (Polynemus sp.) showed very high bacterial count (99.8×10^5 CFU/g). Fresh fish samples collected from vendors of Gabheni village showed less or no bacterial count (28.5×10^5 CFU/g) compared to other fish markets of Choryasi taluka and Surat city. The minimum bacterial counts (0.95×10^5 CFU/) from shrimp of culture farm of Abhva village was noted. No bacterial growth was observed from Katargam retail market.

Habitatwise, fifteen fresh water fish samples of Catla catla and Labeo rohita from different wholesale and retail markets were found completely free from the bacterial growth while twenty four samples of seven marine species crossed the permissible limit (5×10^5 CFU/g) showing very high bacterial count.

3.4.2 Gram Staining and Biochemical Test

The results of qualitative analysis are shown in Table 3.10. Out of total fifty four fish samples, Escherichia coli was found in twenty one fish samples collected from Nanpura wholesale and retail markets of Nanpura, Dumas and Hazira. Escherichia coli was also observed from fish samples (Stromateus cinereus) collected from vendors of Gabheni
village whereas *Klebsiella pneumoniae* was found in only three samples from Hazira fish market. In Nanpura retail market and shrimp farm of Abhva, *Escherichia coli* and *Klebsiella pneumoniae* both were observed in nine fresh fish samples of *Atropus sp.*, *Polynemus sp.* and *Penaeus monodon*. However, eighteen fresh fish samples were completely free from bacteria. Large circular, slightly raised, translucent white colonies of *Escherichia coli* with entire edge was seen on Nutrient agar (Plate-XXX, Fig.1) while lactose fermenting pink spreading colonies was on MacConkey’s agar (Plate-XXX, Fig.2) and greenish metallic sheen was seen on Eosine methylene blue (EMB) agar (Plate-XXX, Fig.3). *Escherichia coli* exhibited positive reactions to motility and negative to gram stain (Plate-XXXI, Fig.1). *Escherichia coli* was found to be Indole and methyl red positive while Voges Proskauer and Citrate utilization test were negative. Organisms fermented glucose, sucrose, lactose, maltose, xylose and mannitol. Results of various agar plates, gram staining and biochemical tests indicated confirmed presence of *Escherichia coli* in the fish samples.

*Klebsiella pneumoniae* had large, smooth, elevated, opaque, glistening white colonies on Nutrient agar (Plate-XXXI, Fig.2) while lactose fermenting pink mucoid colonies was seen on MacConkey’s agar plate (Plate-XXXII, Fig.1). *Klebsiella pneumoniae* exhibited negative reaction to motility as well as gram stain (Plate-XXXII, Fig.2). This
organism was found to be Voges Proskauer, Citrate utilization and weak urease positive. Organisms fermented glucose, sucrose, lactose, maltose, xylose and mannitol. Results of various agar plates, gram staining and biochemical tests indicated confirmed presence of *Klebsiella pneumoniae* in the fish samples.