ADOPTION OF HYGIENIC FISH HANDLING PRACTICES BY FISHERMEN

Thesis submitted in part fulfilment of the requirements for the Degree of
Master of Fisheries Science in Fisheries Extension
to the Tamilnadu Veterinary and Animal Sciences University, Chennai

YUMLEMBAM JACKIE SINGH, B.F.Sc.
ID. No. MFT 07009 (FEX)

DEPARTMENT OF FISHERIES EXTENSION
FISHERIES COLLEGE AND RESEARCH INSTITUTE
TAMILNADU VETERINARY AND ANIMAL SCIENCES UNIVERSITY
THOOTHUKUDI- 628 008

2009

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CERTIFICATE

This is to certify that the thesis entitled, **"ADOPTION OF HYGIENIC FISH HANDLING PRACTICES BY FISHERMEN"** submitted in partial fulfilment of the requirements for the degree of Master of Fisheries Science in Fisheries Extension to the Tamilnadu Veterinary and Animal Sciences University, Chennai is a record of bonafide research work carried out by **YUMLEMBAM JACKIE SINGH** under my guidance and that no part of this thesis has been submitted for the award of any other degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journal or magazine.

Place : Thoothukudi
Date :

(Dr. R. SANTHAKUMAR)
Chairman

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Date :

EXTERNAL EXAMINER

APPROVED

Chairman : Dr. R. SANTHAKUMAR

Members : 1. Dr. N.V. SUJATHKUMAR

2. Dr. K. RATHNAKUMAR

Place : Thoothukudi
Date :

ACKNOWLEDGEMENTS

I express my heartiest gratitude and indebtedness to the chairman of the Advisory Committee **Dr. R. Santhakumar**, Associate Professor, Department of Fisheries Extension for his concrete suggestion, valuable guidance, immense help in preparation of manuscript and guidance at every stage of my research work.

I am very much grateful to the Advisory Committee Members, **Dr. N. V. Sujathkumar,** Associate Professor, Department of Fisheries Extension and **Dr. K. Rathnakumar,** Associate Professor, Department of Fish Processing Technology, for their generous support and encouragement throughout the research work

I am grateful to **Dr. Nagoor Meeran**, Associate Professor and Head of the Department of Fisheries Extension for his everlasting encouragement.

I am also grateful to **Dr. V.K. Venkataramani**, Dean, Fisheries College and Research Institute, Thoothukudi for his valuable suggestions and encouragement.

I wish to extend my sincere thanks to **Mrs. G. Arul Oli**, Assistant professor, Department of Fisheries Extension for her valuable advice and suggestions.

I thank **Mr. Jayaraj**, Fishery Assistant for his help during the research work.

I sincerely thank **Th. R. Kumaresan**, Assistant Librarian and **Tmt. R. Ezhil Rani**, Library Assistant for their help in literature collection.

A special thanks to my friends, **Sivaraman, Aken, Senthil, Vijayaragavan, Mohanraj, Muralidharan, Jothilakshmanan, Sangeetha, Viji** and **Gangeswari** who shared the warm companionship and support during my endeavours.

I express my hearty thanks to my **Parents** and my **Family members** for their wholehearted support and encouragements of my research work.

Above all, I dedicate my success to the almighty for his infinite showers of blessings.

(YUMLEMBAM JACKIE SINGH)

Dedicated to my beloved parents

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

1.	**Title**	**:**	**Adoption of hygienic fish handling practices by fishermen**
2.	**Name**	**:**	**Yumlembam Jackie Singh**
3.	**Degree**	**:**	**M.F.Sc. (Fisheries Extension)**
4.	**Chairman**	**:**	**Dr. R. Santhakumar**
5.	**Department**	**:**	**Department of Fisheries Extension**
6.	**College**	**:**	**Fisheries College and Research Institute**
7.	**Year and University**	**:**	**2009, Tamilnadu Veterinary and Animal Sciences University, Chennai**

Hygienic fish handling practices onboard holds a lot of importance since people are mostly concerned about the HACCP in fish processing plants and industries and they are not concerned on hygienic fish handling practices onboard. Proper handling of fish onboard is very essential to keep the fish fresh and safe for human consumption for a longer period of time. Moreover, certain amount of the fish catch is spoiled due to improper handling practices and as such the total fish catch is not fully utilized in terms of both food and resource value. Adopting proper handling practices will serve as an efficient measure to check these problems and eventually will help in enhancing the quality and quantity of fish exported.

The present study was carried out to find out adoption of hygienic fish handling practices by fishermen in Thoothukudi district. The villages viz. Tharuvaikulam, Thoothukudi South and Thoothukudi North were selected based on majority of the

fishermen involved in fishing activities. One hundred and twenty fishermen were selected randomly from the selected villages and the data were collected through interview schedule and analysed with statistical tools.

Most of the respondents were middle age group (47.50%), educated up to middle level (40.83%) and married (96.67%). Majority of the farmers (88.33%) had nuclear family and family size upto 5 members. A total of 61.67 per cent of the fishermen had fishing as primary occupation. Most of the fishermen (58.33%) had medium annual income.

Majority of the respondents (84.16 %) listened to radio programmes. Most of the respondents (49.17 %) had medium level of economic motivation and 57.50 per cent of the respondents occasionally participated with fishermen co-operative societies.

Majority of the respondents (51.67%) had medium level of mass media exposure and 64.17 per cent of the respondents had above 16 years experience in fishing. Most of the fishermen occasionally had contact with Fisheries Co-operative Society (57.50%), Universities/Colleges (43.33%), Department of Fisheries (25.83%) and NGOs (15.83%).

Most of the respondents (65.83%) had medium level of scientific orientation and 68.33 per cent of the respondents had undergone training on hygienic fish handling practice. Majority of the respondents (72.50%) had high level of innovativeness and 55.83 per cent of the respondents had medium level of knowledge.

Most of the respondents (54.42%) did not adopt the hygienic fish handling practices while 45.58 per cent of them adopted the practices.

CHAPTER – 1

INTRODUCTION

Fishing is one of the oldest traditional occupations of a large section of the population living in the coastal areas. The development of fishing and allied industries has a special significance because this sector is best suited for a large mass of backward and economically weaker sections of the rural community.

The marine and inland fish production of the country has increased from 0.75 million tonnes during 1950-51 to 6.4 million tonnes in 2003-04. This increase in fish production has been possible due to the improvements in harvesting technologies, post-harvest fishery infrastructure, product diversification, and consistent demand in the internal and export market and development in the processing sector (Narayanakumar and Sathiadhas, 2006). The production can still be increased with the further improvement in harvesting and post harvesting activities. Our country has exported marine product to the tune of 5.12 lakh tones with a value of Rs. 7,245 crores during the year 2005-2006. The major marine products exported from India are in the form of frozen shrimp, frozen fish, frozen cuttlefish, frozen squid, dried items, live items and chilled items. Our major markets for the marine products are European Union, USA, Japan, China, South East and Middle East Asia. Of which, European Union occupies a prominent place with a value of 27.37% share to the total. In India, Thoothukudi exported marine product with a value of 9.56% share to the total (Sukumar, 2006).

The quality of seafood is of major concern to seafood processors and public health authorities. It has been estimated that there are more than 80 million cases per annum of food borne illness and the cost of these illness is in the order of many billions of dollars per year(Venkataramani, 2006).The freshness of the fish is very important and has become a major issue in the fishing industry. The quality of the product reaching the end user will greatly depend on how the fish was handled onboard the vessel, how it was preserved, packaged, transported, etc. Much emphasis has been given on hygienic handling of the fish right from catch in order to ensure good quality and long storage life. Primary responsibility for ensuring the quality of landed fish rests with those who handle it onboard. Many factors affect the quality of fish onboard such as cleanliness of the deck and fish holds, quality and quantity of water used, temperature at which fish is maintained, the general handling practices adopted, cleanliness of the equipments and utensils used in handling, packaging and storage and the personal hygiene of the fish handlers. The quality of ice is of utmost importance to preserve fishery products from being spoiled. The ice should be made of fresh water or portable water to produce good quality ice. The water should be chlorinated to avoid bacterial contamination and shall be tested for bacterial factors such as Total Plate Count, *E. coli*, *Staphylococcus*, *Salmonella and V. cholerae/ parahaemolyticus* at least on monthly basis (Shankar Rao 2008). Good handling practices at sea should ensure that the fish retains its natural freshness to the maximum possible extent.

Tamilnadu has 1079 km long coastline with 0.19 million ha of EEZ (Exclusive Economic Zone) and 41,412 sq. km of continental shelf. About 6, 90,000 marine fishermen from 591 fishing villages along the coastline are fishing with 53,844 traditional

and 12,325 mechanized crafts (Sakthivel, 2008). Presently, the fishermen of Tamil Nadu coasts are carrying out hygienic fish handling practices on their own experiences and most of the technical aspects of carrying out right hygienic fish handling practices are not being known in order to get quality fish by consumers. The fishermen are aware of some of these aspects and it needs further stress for proper adoption. It is essential that all the mechanised fishermen undertake induction training so that they understand the food safety risks associated with handling fish. They need to be trained in basic hygiene and handling to ensure the production of safe seafood.

The fish-eating people of the coastal areas prefer marine fish, but those residing in the interior mainland generally prefer freshwater fish. In this background, the present study entitled, 'Adoption of Hygienic fish handling practices by fishermen' was taken up with the following specific objectives:

1. To study the socio-personal characteristics of fishermen.
2. To study the extent of adoption of improved hygienic fish handling practices among fishermen.
3. To identify the problems in adoption of hygienic fish handling practices and suggestions to overcome the problems.

Scope of the study

The findings of this study would reflect the socio personal characteristics of fishermen and extent of adoption of hygienic fish handling practices. The result of the study would also help us to know the adoption level of fishermen on hygienic fish handling practices. This investigation would highlight the problems encountered in fish handling practices and the suggestions to overcome the problems for effective adoption of appropriate hygienic fish handling practices by fishermen.

Limitations of the study

Despite the limitations of shortage of time and resources, the study was conducted in three villages of Thoothukudi district. Many a times, the fishermen hesitated to share certain information yet sincere efforts were made to bring out several points on the extent of adoption of hygienic fish handling practices. Although the status of fishermen and their level of adoption is not uniform at all the places, the results would be applicable only to a similar situation.

CHAPTER – 2

REVIEW OF LITERATURE

This study attempts to find the adoption of hygienic fish handling practices by fishermen. The objectives of the present study are to find out various socio-personal characteristics of fishermen, to study the extent of adoption of hygienic fish handling practices among fishermen, to identify the problems in adoption of hygienic fish handling practices and suggestions to overcome the problems.The review of related studies is presented in the following subheadings:

2.1. Socio-personal characteristics of fishermen.

2.2. Extent of adoption of improved hygienic fish handling practices among fishermen.

2.3. Problems in adoption of hygienic fish handling practices and suggestions to overcome the problems.

2.1. Socio-personal characteristics of fishermen.

2.1.1. Age

Nagoor Meeran and Prince Jayaseelan (1999) observed that majority (52%) of the shrimp farmers were young aged followed by medium (42%) and old (6%) aged. Sujathkumar (2000b) reported that majority (53.31%) of the fisherwomen were middle aged followed by medium (28.13%) and old (18.56%) aged.

Ponnusamy *et al.* (2004) reported that the majority of the fisherfolk belonged to young (51.40%) and middle (31.40%) age groups. Esakkias (2007) reported that majority (59.17%) of the fisherwomen were middle aged followed by young (29.17%) and old (11.66%) aged.

Sarma and Bose (2008) reported that the majority of mechanized fishing operators belonged to middle age group (57%) followed by young (33%) and old (10%) age groups.

2.1.2. Educational status

Mohini Gadhia *et al*. (1999) revealed that 76.50 per cent of the fisherfolk were illiterate followed by 20.97 per cent and 2.53 per cent educated upto primary and secondary levels, respectively.

Sujathkumar (2000b) found that majority of the fisherwomen were illiterate and functionally literate (61%). The percentage of the respondents who had primary level of education was only 15.93 percent. Respondents of 13.63, 7.88 and 1.56 percent had middle, secondary school and collegiate levels of education respectively

Balasubramaniam and Bankey (2002) reported that 40 per cent of the fishermen did not have any formal education and 45.22 per cent of them had only primary education. Arul Oli (2004) reported that 44 per cent of the marine fishermen had educated upto primary level followed by middle (36%), functionally illiterate (10%), illiterate (5%), secondary (4%) and collegiate (1%) levels.

Kumaran *et al.* (2004) reported that the educational status of fisherfolk varied from primary (33%), middle (25%), SSLC (25%) and collegiate levels (17%). Swathi Lekshmi *et al.* (2005) reported that 41 per cent of the shrimp farmers had secondary level of education, 30 per cent had primary level of education and 29 per cent had collegiate education.

2. 1. 3. Marital status

Mary Thomas *et al.* (1996) reported that 86 per cent of the fisherwomen respondents were leading married life followed by unmarried (10%) and widows (4%).

Ponnusamy *et al.* (2004) reported that 71.40 per cent of the respondents were leading to married life followed by unmarried (28.60%).

Veeraputhiran (2000) reported that 60. per cent of the fisherwomen respondents were leading married life followed by unmarried (32%) and widowed (8%). Kumaran (2002) found that 98.90 per cent of women respondents were married and only 1.10 per cent of women were widow in the study.

2.1.4. Family status

2.1.4.1. Family type

Mamatha and Hiremath (2002) stated that more than 65 per cent of farm women families belonged to nuclear family system. Arpita Sharma (2003) concluded that most of the women had nuclear families in the study.

Ramamoorthy and Durairaja (2002) reported that majority of the small scale fishermen families (63.7%) belonged to nuclear and only 36.3% had joint family system. Narayanan (2004) reported that 65.84 per cent of the self help group women belonged to joint family. Ponnusamy (2004) reported that 74 per cent shrimp entrepreneurs belonged to nuclear family and the remaining 26 per cent belonged to joint family system.

2.1.4.2. Family size

Narayana Kumar *et al.* (2003) reported that 54 per cent of the fisherwomen were found with a family size of 2-4. Mamatha and Hiremath (2002) revealed that 75 per cent

of the farm women families had less than five members and only 25 per cent of the families had more than five members.

Ponnusamy *et al.* (2004) reported that 54.30 per cent of fisherfolk families had more than five members and only 45.70 per cent of fisherfolk families had upto 5 members. Karumalai Kannan (2005) reported that 81.76 per cent of the women self help group members had upto 5 members in their family.

2.1.5. Occupational status

Sathiadhas *et al.* (1994) pointed that 72 per cent of the fishermen were actively engaged in fishing. Sadangi *et al.* (1999) reported that 60 per cent of fisherwomen were primarily involved in fishing and fish trading and 40 per cent of fisherwomen were involved in aquaculture.

Kumaran and Ponnusamy (2001) reported that 34 per cent of the farmers were involved exclusively in aquaculture and 66 per cent of farmers were involved in aquaculture and allied activities. Ashaletha *et al.* (2002) concluded that 60 per cent of the fisherwomen involved in prawn peeling and 40 per cent in the processing of other fishery products. Arul Oli (2004) pointed that 92 per cent of the fisherfolk were having fishing as primary activity.

Ponnusamy *et al.* (2004) concluded that 37 per cent of the farmers were exclusively involved in aquaculture and 31 per cent of farmers were involved in aquaculture and allied activities.

2. 1. 6. Annual income

Sambennet and Arumugam (1993) reported that the income of majority of the small scale fisherfolk ranged from Rs. 400 to Rs. 700 per month. Sharma (1998) reported that the average monthly income of fisherwomen was Rs. 781/-

Sujathkumar (2000a) reported that the annual income of fisherwomen family ranged between Rs.14,000/-and Rs. 21,000/-. Mathuravalli (2001) reported that the annual income of fisherfolk families ranged between Rs. 9,000/- and Rs. 27,000/-.

Arivukkarasu and Sujathkumar (2005) expressed that the average annual income of the fisherfolk from fishing related activities constituted Rs.26,550. Karumalaikannan and Santhakumar (2005) reported that 64.17 per cent of the women SHG members had low level of annual income followed by medium (30%) and high (5.83%) level of annual income.

Nitai Roy (2007) stated that 43.33 per cent of fish farmers had annual income of Rs.30,000-40,000 followed by Rs. 20,000-30,000 (23.33%), Rs. 40,000-50,000 (16.68%), Rs.10,000-20,000 (6.67%), Rs. 50,000-60,000 (3.33%), Rs.60,000-70,000 (3.33%) and Rs. 70,000-80,000 (3.33%).

2.1.7. Information source exposure

SujathKumar (2000b) found that radio programmes on fisheries were listened by 63.75 per cent of the fisherwomen followed by television programmes watched by 26.25 per cent of fisherwomen.

Kumaran *et al.* (2003) reported that 53 per cent of information sources for the shrimp farmers from Brackish water Fish Farmers Development Agency and 40 per cent of information sources for the shrimp farmers from Marine Products Export Development Authority.

Arivukkarasu and Sujathkumar (2005) reported that 88 per cent of fisheries information from television followed by radio programmes (73.34%) and newspapers (69%).

2.1.8. Economic motivation:

Sujathkumar (2000b) observed that 59 per cent of the fisherwomen had medium level of economic motivation followed by high (27.19%) and low (13.75%) levels. Veeraputhiran (2000) found that only 43.33 per cent of the fisherwomen had medium level of economic motivation while 28.89 and 27.78 per cent of them had low and high levels of motivation respectively.

Pandey *et al.* (2001) reported that the higher profit was one of the major economic motivation of the respondents. Arul oli (2004) found that 70 per cent of the fisherfolk had medium level of economic motivation followed by high (20%) and low (10%) levels.

Arivukkarasu and Sujathkumar (2005) revealed that 48.33 per cent of the fisherfolk had medium level of economic motivation, 35.84 per cent of fisherfolk had high level of economic motivation and only 15.83 per cent of fisherfolk had low level.

2.1.9. Social participation status

Bankey *et al*. (1997) reported that only 16.66 per cent fishermen had low level of social contact with social organizations. Nagoor Meeran and Prince Jayaseelan (1999) found that 78 percent of shrimp farmers had low level of social participation.

Sujathkumar (2000b) revealed that many of the women had medium (34.69%) and high (34.06%) level of social participation followed by low level (31.25%). Arul Oli

(2004) revealed that large group (93%) of fisherfolk had medium level of social participation status. Ponnusamy *et al.* (2004) reported that 40 per cent of shrimp entrepreneurs had low level of social participation.

Swathi Lekshmi *et al.* (2005) stated that 47 per cent of shrimp farmers had low level of social participation followed by high (27%) and medium (26%) levels of social participation.

2.1.10. Mass media exposure

Kappen and Pushkaran (1994) revealed that mass media exposure significantly influenced the adoption of hygienic practices in peeling sheds. According to Sheela (1995), 13 per cent of the respondents used radio and 30 per cent read newspapers for knowing day to day information. Nagoor Meeran and Prince Jayaseelan (1999) found that 72 per cent of the shrimp farmers had medium level of exposure to mass media.

Veeraputhiran (2000) found that more than 60 per cent fisherwomen had medium level of mass media exposure followed by high (28.33%) and low (11.67%) levels.

Kumaran and Ponnusamy (2001) reported that 60 per cent of the farmers had medium level of mass media exposure.

Ponnusamy *et al.* (2004) pointed that 62.90 per cent of the shrimp farmers had high level of mass media exposure. Arivukkarasu and Sujathkumar (2005) indicated that majority of fisherfolk (84%) exposed to mass media like television followed by radio (81.66%) and newspaper (63.34%).

Senthilkumar and Veerabhadran (2008) stated that 75.83 per cent of the fish farmers had medium level of mass media exposure followed by low (16.67%) and high (7.50%) levels.

2.1.11. Experience in fishing

Veeraputhiran (1998) reported that majority of the respondents had high level of experience in fishing. Sujathkumar (2000a) found that 49 per cent of the fisherwomen had experience for more than 15 years, 38 per cent of them had 10-15 years and 13 per cent of them had experience upto 10 years in fishing.

Sujathkumar (2000b) found that majority of the respondents (57.50%) had 10-15 years of experience in small scale fisheries while almost equal number of respondents had either low or high experience in small- scale fisheries.

Veeraputhiran (2000) found that more than half of the respondents (54.44) had low level of experience. One-fourth of the respondents had medium level of experience while one-fifth of the fisherwomen had high level of experience in fishing.

Arul Oli (2004) concluded that 49 per cent of fisherfolk had more than 16 years of experience in fishing.

2.1.12. Contact with extension agency

Veeraputhiran (2000) reported that 66.67 per cent of the respondents were found to have low level of contact with extension agencies followed by medium (23.89%) and high (9.44%) level of contact.

Ponnusamy *et al.* (2004) reported that 57 per cent of the fisherfolk had high level of contact with extension agencies. Arivukkarasu and Sujathkumar (2005) concluded that contact of fisherfolk with extension organizations was very low.

Karumalai Kannan and Santhakumar (2005) opined that 44.17 per cent of the women SHG members contact the development personnel once in a week followed by 30 per cent forth-nightly,18.33 per cent monthly and only 7.50 per cent had contact occasionally with the development personnel.

Swathi Lekshmi *et al.* (2005) concluded that 70 per cent of the shrimp farmers had medium level of contact with extension agencies.

Ali Hassan and Veerabhadran (2006) observed that majority (60%) of the SHG women had medium level of extension agency contact followed by low (24.16%) and high (15.84%) levels. Esakkias (2007) reported that most (77.50%) of the fisherwomen had medium level of extension agency contact.

2.1.13. Scientific orientation

Sujathkumar (2000b) reported that about 53.13 percent of the respondents had medium level of scientific orientation followed by high (30.39%) and low (15.94%) level of scientific orientation.

Arul Oli (2004) opined that fisherfolk were oriented towards the use of new information and scientific methods in the activities of sustainable marine fisheries development.

Kumaran and Ponnusamy (2001) found that 60 per cent of the shrimp farmers had high level of scientific orientation. Arul Oli (2004) reported that 80 per cent of the fisherfolk had medium level of scientific orientation.

2.1.14. Training undergone

Nagoor Meeran and Prince Jayaseelan (1999) stated that 54 per cent of the shrimp farmers did not undergo any training programme on shrimp farming.

Kumaran and Ponnusamy (2001) concluded that 90 per cent of the shrimp farmers had training on health management practices of shrimp farming. Ponnusamy (2004) reported that 76 per cent of the shrimp farmers had not undergone any training programme on shrimp farming.

Patterson and Samuel (2005) stated that out of 20 fisherwomen selected, only 10-15(50-75%) participated actively in the training programme on crab fattening.

2.1.15. Innovativeness

Veeraputhiran (2000) indicated that 47.22 per cent of the fisherwomen had medium level of innovativeness followed by low (29.45%) and high (23.33%) levels. Arpita Sharma and Radha Das (2001) reported that 42.10 per cent of the fisherwomen had high attitudes towards fisheries and aquaculture innovations.

Balasubramanium *et al.* (2003) observed that innovation proneness could be positively changed through the operation of extension schemes and by strengthening the support system activities such as adequate distribution of inputs, availability of credit through co-operatives and the developmental efforts of non governmental organizations.

2.1.16. Knowledge level

Gupta and Srinath (1992) found that there was significant increased in the knowledge level of fisherfolk after attending the training programmes. The impact of

demonstration on scientific prawn culture brought desirable changes in their level of knowledge and understanding.

Sheela (1995) concluded that 75 per cent of the fisherwomen were found to have medium level of knowledge, while 37 per cent of them had high and low knowledge in seaweed utilisation respectively.

Bankey *et al*. (1997) reported that the knowledge of the fishermen towards motorization of crafts was only 76.17 per cent. Pradipkumar and Randhir Singh (2000) reported that the majority of the fisherfolk had medium (69%) level of knowledge followed by low (17%) and high (14%) levels on fisheries activities.

2.2 Adoption of hygienic fish handling practices by fishermen

Braj Mohan *et al*. (1996) analysed technological gaps among fishing crafts and found that the extent of adoption of individual practices were higher among the fishermen operating plywood crafts and lower among the fishermen operating motorized plank built crafts.

Balasubramaniam *et al*. (2000) analysed adoption of improved practices and annual fish catches among mechanized boat owners and reported that they had medium level of adoption of practices.

Braj Mohan *et al*. (2003) analysed adoption of recommended practices by fish processing plants and stated that extent of adoption was high among the respondents for three categories namely, use of quick freezers (60%) assessment of water quality (50%) and type of corrugated box for frozen shrimp (55%).

Arivukkarasu and Sujathkumar (2005) studied the extension service requirement for transfer of technologies and pointed that 54.40 per cent of respondents were non adopters of the selected fisheries technologies. De and Saha (2005) analysed adoption of semi intensive carp culture practices and reported that 68 per cent of farmers had adopted eradication of weeds.

Charles Jeeva *et al.* (2009) analysed the adoption of Good Management Practices by aquafarmers and concluded that the extent of adoption of each practice varied significantly among the aquafarmers with the overall mean adoption score of 70.09% (n=73)

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2.3 Problems in adoption of hygienic fish handling practices and suggestions to overcome the problems.

Vasanthakumar *et al.* (1990) reported that only 46.67 per cent of respondents reported lack of scientific know-how as a problem. Nair and Kandoran (1992) concluded that inadequate training facilities and finance as the major problems.

Braj Mohan *et al.* (1993) indicated that for higher adoption of improved technological practices, the extension education programmes would have to be complemented with other supporting services, marketing facilities and technological assistance programmes. Narayanan *et al.* (1999) reported that inadequate staff, untrained extension personnel, etc., have resulted in poor extension services.

Sujathkumar (2000b) found that only 12.81 per cent of the fisherwomen perceived lack of publications as one of the constraints in the extension system. Utpal Bhaumik *et al.* (2001) reported that non-adoption of modern technologies by fisherfolk

were attributed to the inadequate support systems such as extension, credit, input supplies,etc. Arul Oli (2004) reported that subsidies on gears, crafts, engines, fuel and on repairing works (92%),lack of communication facilities (78%), problems of debts (66%) and problems on capital investment (55%) were faced by the fishermen as major constraints.

CHAPTER - 3

RESEARCH METHODOLOGY

This chapter deals with the selection of district, villages and respondents, sampling procedures, selection procedures, selection of variables and their measurements, data collection methods and use of statistical tools which have been discussed under the following sub headings:

3.1. Selection of the study area

3.2. Description of the study area

3.3. Selection of the respondents

3.4. Identification of variables

3.5. Operationalisation and measurement of the independent variables

3.6. Operationalisation and measurement of the dependent variable

3.7. Development of interview schedule

3.8. Method of data collection

3.9. Statistical tools used

3.1 Selection of the study area

Among the thirteen coastal districts of Tamilnadu, Thoothukudi district was selected for this investigation due to the following reasons. Many of the fishermen are involved in fishing activities in both traditional and mechanized vessels.

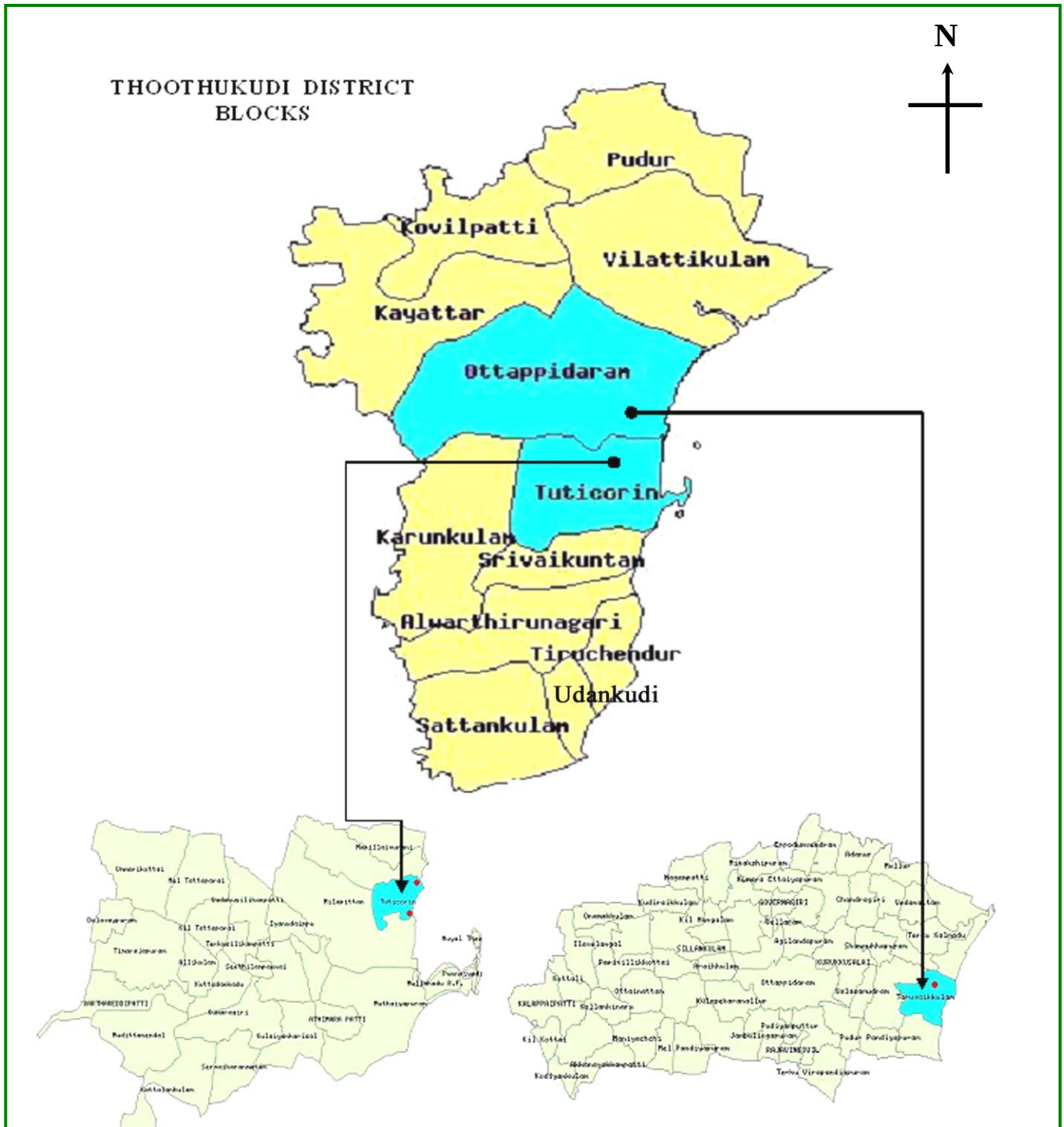

Fig.1. Map showing the study areas

3.2. Description of the study area

Thoothukudi district has 163 kilometres coastal length which constitutes 15.15 per cent of the total coastal length of the state. The district has a total of 21 coastal fishing villages. It has a total of 352 mechanised vessels and 2197 non-mechanised crafts. (Department of Fisheries, 2000). The mechanised fishermen are available only in four fishing villages of Thoothukudi district such as Tharuvaikulam, Thoothukudi South, Thoothukudi North and Vembar. The survey was conducted in Tharuvaikulam, Thoothukudi South and Thoothukudi North (Fig.1) and a pilot survey was conducted in Vembar.

3.2.1. Thoothukudi

This is the 28^{th} district in Tamilnadu and it covers an area of 4621 km^2 accounting for 3.53 per cent of the total geographical area of the state. It is bounded on the north by the district of Tirunelveli, Virudhunagar and Ramanathapuram, on the east and south east by Gulf of Mannar and on the west and south west by the district of Tirunelveli. The total fisherfolk population of the district was 69,558. Out of this, the total male population was 35,828 and the female population was 33,730. (Department of Fisheries, 2000)

3.3. Selection of the respondents

The fishermen of the selected mechanized fishermen fishing villages constituted the sampling unit. The sample size for each fishing villages was selected proportionately to the total fishermen of three fishing villages so as to get a total sample size of 120 for

this study. From each of the selected fishing villages, the list of mechanized fishermen was obtained from the records of Fisheries Department, Thoothukudi. From the lists, fishermen were randomly selected from each fishing village making a total sample size of 120. Village wise distribution of the respondents is shown in the Table 1 below.

Table.1 List of fishing villages and number of respondents selected for the study

Sl.No	Name of the fishing villages	Number of fishermen available	Number of respondents selected
1	Tharuvailkulam	11	6
2	Thoothukudi North	124	59
3	Thoothukudi South	116	55
	Total	**251**	**120**

3.4. Identification of variables

Based on the literature available and discussions held with the extension officials of the Department of Fisheries and the staff of Fisheries College and Research Institute, Thoothukudi, a list of independent variables and hygienic fish handling practices were prepared. For selecting suitable variables and appropriate hygienic fish handling practices for the study, the prepared list of variables and hygienic fish handling practices were sent to an expert panel, comprising 75 judges including scientists, researchers and academicians working in various fisheries organizations / institutions in the country and requested to select suitable variables and appropriate fish handling practices for the study in a 5 point continuum viz., most relevant, more relevant, relevant, less relevant and least relevant with the score of 5,4,3,2 and 1 respectively (Appendix-I) : (Annexure I&II).

Of the 75 judges, 52 judges sent their responses. The total score for each item was obtained on the five point continuum. The mean and standard deviations were worked

out for all the items. The variables and hygienic fish handling practices with score values of more than the mean plus standard deviation were selected for the study and included in the interview schedule. Keeping in view the objectives of the study, adoption of hygienic fish handling practices by fishermen was considered as the dependent variable for the study. Each independent variable was measured individually to know its influences on the dependent variable. The details of the variables and hygienic fish handling practices selected for the study and their measurements are given in Table 2.

Table 2. Independent / Dependent variables and their empirical measurements

Sl.No.	Variables	Measurements
A. Independent		
X1.	Age	Scoring procedure followed by Uma Maheswari (2003)
X2.	Educational Status	Scoring procedure followed by Sujathkumar (2000b)
X3.	Marital Status	Scoring procedure followed by Veeraputhiran (2000) with slight modification in score
X4.	Family status	Scoring procedure followed by Arpita Sharma (2003) modified by Karumalai Kannan (2005)
X5.	Occupational status	Scoring procedure followed by Uma Maheswari (2003)
X6.	Annual income	Scoring procedure followed by Sarma (2008) with slight modification in category and score
X7.	Information source exposure	Scoring procedure followed by Karthikeyen (1997) with slight modification
X8.	Economic Motivation	Scoring procedure followed by Veeraputhiran (2004)
X9.	Social participation status	Scoring procedure followed by Sujathkumar (2000b)
X10.	Mass media exposure	Scoring procedure followed by Veeraputhiran (2000) with slight modification

X11.	Experience in fishing	Scoring procedure followed by Arul Oli (2004)
X12.	Contact with extension agency	Scoring procedure followed by Sujathkumar (2000a)
X13.	Scientific orientation	Scoring procedure followed by Ali Hassan with slight modification in statements(2006)
X14.	Training undergone	Scoring procedure followed by Ponnusamy (2004)
X15.	Innovativeness	Scoring procedure followed by Veeraputhiran with slight modification in statements(2000)
X16.	Knowledge Level	Scoring procedure followed by Arul Oli (2004)
B. Dependent variable		
Y1.	Adoption of hygienic fish handling practices	Scoring Procedure followed by Kumaran *et al*. (2003)

Table 3. Hygienic fish handling practices selected

S.No	Hygienic fish handling practices
1	On board cleaning
2	Cleaning of fish hold and accessories
3	Washing of fish
4	Sorting of fish
5	Evisceration and removal of gills and bleeding of big fishes
6	Packaging of fish
7	Method of icing
8	Personnel Hygiene
9	Auction hall cleaning

10	Handling of fish in auction hall

3.5. Operationalisation and measurement of Independent variables

The dependent variable depends on some other variable which has preceded it in time. The phenomenon or antecedent variable is called independent variable. The measurement of independent variables are given below

3. 5.1 Age

Age has been operationalised as the number of completed years of the respondents at the time of enquiry and the chronological age was taken as a measure. The completed years of the respondent was taken as such for the analysis. Scoring procedure followed by Uma Maheswari (2003) was used in this study. The respondents were classified into three categories according to their age given below and presented in Table 4.

Table 4. Scoring procedure for Age

Sl.No.	Category	Score
1.	Young (upto 35 years)	3
2.	Middle (36 – 45 years)	2
3.	Old (above 45 years)	1

3. 5.2 Educational status

It refers to the educational status of fishermen involved in mechanized fishing activities. The sub items were illiterate, functionally literate, primary education, middle school education, secondary education, and collegiate education. Illiterate is an

individual who did not know to read and write. Functionally literate is one who could read and write only. Primary education refers to formal schooling up to fifth standard. Middle education refers to the education in school from sixth to eight standard. Secondary education meant the education from ninth standard to plus two level. Collegiate education refers to degree / diploma after schooling. The scoring procedure used by Sujathkumar (2000b) was followed in this study which is presented in Table 5.

Table 5. Scoring procedure for Educational status

Sl. No.	Category	Score
1.	Illiterate	1
2.	Functionally literate	2
3.	Primary education	3
4.	Middle school education	4
5.	Secondary education	5
6.	Collegiate education	6

3.5.3. Marital status

Marital status of fishermen was classified as married and unmarried. The scoring procedure developed by Veeraputhiran (2000) was followed with slight modification in score to suit the present study. The scores were given below which is presented in Table6.

Table 6. Scoring procedure for Marital status

Category	Scores
Married	2

Unmarried	1

3.5.4. Family status

Family type refers to nuclear or joint family. Family size meant the number of individuals living together in a house. The scoring procedure followed by Arpita Sharma (2003) and Karumalai Kannan (2005) was used in this study and presented in Table 7.

Table 7. Scoring procedure for Family status

Sl.No.	Category	Classification	Score
1.	Family type	Nuclear	1
		Joint	2
2.	Family size	Upto 5	1
		Above 5	2

3.5.5. Occupational status

It refers to the occupational status of the respondents. The scoring procedure followed by Uma Maheswari (2003) was used and presented in Table 8.

Table 8. Scoring procedure for Occupational status

Sl.No.	Category	Score
1.	Fishing as primary activity	2
2.	Fishing as secondary activity	1

3.5.6. Annual income

Annual income was operationalised as the total income in rupees obtained by a respondent from different sources like fisheries activities, agricultural activities, wages, services, business and other sources in one year. The scoring procedure used by Sarma (2008) was followed with slight modification in category and score to suit the present study which is presented in Table 9.

Table 9. Scoring procedure for Annual income

Sl.No.	Category	Score
1.	Low (Rs.50,000 & below)	1
2.	Medium (Rs.50,001 to Rs.1,00,000)	2
3.	High (Rs.1,00,001 & above)	3

3.5.7. Information source exposure

It was operationalised as the extent to which an individual was exposed to messages related to fisheries and allied areas through various information sources. The scoring was done on the frequency of the exposure to different sources as followed by Karthikeyen (1997) with slight modification in frequency of exposure, sources and score to suit the study

Table 10. Scoring procedure for Information source exposure

Sl.No	Sources	Frequency of Exposure	Score
1	Seminar	Regular Occasional Never	3 2 1
2	Training programme		
3	Scientific books/literature		
4	Newspaper		
5	Fisheries related magazine and other publications		
6	Radio programme		
7	Television programme		
8	Others, if any		

Sum of total scores of these items was taken as a measure of the information source exposure of the respondent.

3.5.8. Economic motivation

It was operationalised as the profit maximization and relative value placed on economic ends by the fisherfolk. It was measured using the scale followed by Veeraputhiran (2000). This scale consisted of five statements of which the last statement alone was negative and rest were positive which is presented in the Table. 11

Table11. Scoring procedure for Economic motivation

Sl.No	Statements	Response	Score
1	Fisherfolk works towards higher productivity and profitability	Agree Undecided Disagree	3 2 1
2	The most successful fisherman is the one who makes more profit.		
3	Fishermen should try any new hygienic fish handling practices		
4	It is difficult for fishermen to adopt good quality management practices unless they are provided with economic assistance		
5	Fishermen must earn for their livelihood and should not be only for economic forms		

The pooling of response score was measured on the three point continuum for both positive and negative statements constituted the total score obtained by a respondent for economic motivation. The score an individual would obtain on these scale was from 5 to 15.

3.5.9 Social participation status:

This refers to the degree of participation/ involvement by the respondents in small social organizations either as member or office bearer and the frequency of participation. Scoring procedure followed by Sujathkumar (2000b) was used and presented in Table 12.

Table 12. Scoring procedure for Social participation status

Sl.No.	Frequency of participation	Score
1.	Daily	5
2.	Weekly	4

3.	Monthly	3
4.	Occasionally	2
5.	Never	1

3.5.10. Mass media exposure

Mass media exposure is operationalised as the degree to which different mass media sources exposed by the respondents to get information in hygienic fish handling practices. The sources of exposure were radio, television, newspaper and others. The scoring procedure used by Veeraputhiran (2000) was followed with slight modifications in frequency of participation and score to suit the present study which is presented in Table 13.

Table 13. Scoring procedure for Mass media exposure

Sl.No.	Frequency of participation	Score
1.	Daily	5
2.	Weekly	4
3.	Monthly	3
4.	Occasionally	2
5.	Never	1

3.5.11. Experience in fishing

The total number of years of experience of the respondent in fishing was considered as experience in fishing. The scoring procedure followed by Arul Oli (2004) was followed in this study which is presented below in the Table 14.

Table 14. Scoring procedure for Experience in fishing

Sl.No	Experience in fishing (in years)	Score
1	Upto 5	1
2	6 to 10	2

3	11 to 15	3
4	16 and above	4

3.5.12. Contact with extension agency

It was operationalised as the contact of the respondents with different extension systems through personal contacts and participation in various extension activities for acquiring information on hygienic fish handling practices and other fisheries activities. The scoring procedure used by Nagoor Meeran (1996) was followed with slight modification in the frequency of contact and the score to suit the present study which is presented below in Table 15.

Table 15. Scoring procedure for Contact with extension agency

Sl.No.	Frequency of contact	Score
1.	Daily	5
2.	Weekly	4
3.	Monthly	3
4.	Occasionally	2
5.	Never	1

3.5.13. Scientific orientation

It is the degree to which the respondent is inclined to use scientific method in farming and allied activities. The scoring procedure used by Ali Hassan (2006) was followed with slight modification in the statements to suit the present study which is presented in Table 16.

Table 16. Scoring procedure for Scientific orientation

Statement	Response				
	Strongly agreed	Agreed	Undecided	Disagreed	Strongly Disagreed

Positive Statement	7	5	4	3	1
Negative Statement	1	3	4	5	7

3.5.14. Training undergone

It refers to the training undergone by the respondents on hygienic fish handling practices and other allied fishing activities at the time of enquiry. The scoring procedure used by Ponnusamy (2004) was followed with slight modification in score to suit the present study. The scores were given and presented below in Table 17.

Table 17. Scoring procedure for Training undergone

Sl.No	Training category	Score
1	Undergone	2
2	Not undergone	1

3.5.15. Innovativeness

Innovativeness was operationalised as the degree to which a fisherman is relatively earlier in adopting new ideas than the other members of the social system. The scoring procedure used by Veeraputhiran (2000) was followed with a slight modification in scoring procedure.

Table18. Scoring procedure for Innovativeness

Sl.No	Statements	Response	Score
1	Good fisherfolk experiment with new ideas in fish quality management	Agree	3
2	Though it takes time for fishermen to learn new practices on hygienic fish handling practices, it is worth taking the efforts.		
3	As soon as you get information on new ideas on hygienic fish handling practices, you will take immediate step to put into	Undecided	2

	practice.	Disagree	1
4	If the government is to help you to provide assistance for fish quality management, would you take?		
5	Do you think fishermen experimenting with their own ideas but maintaining their own team/enterprise without loss could be called innovative?		

3.5.16. Knowledge level

One of the important variables of this study is to assess the knowledge level of fishermen on hygienic fish handling practices. The knowledge level of respondents has been defined as their ability to have the thing in mind, to be able to memorise or to be acquainted with theoretical or practical knowledge of understanding the hygienic handling practices of fish. To measure the knowledge level of fishermen in respect of hygienic fish handling practices, the teacher made test was used. In the present study, knowledge denotes the ability of fishermen to understand the different aspects in hygienic fish handling practices.

3.5.17. Item collection

The contents of the knowledge composed of questions are called items. A large number of items with respect to hygienic fish handling practices were collected after having reviewed the available literature and after consulting experts and extension personnel. Collection of items was done on the basis of two criteria viz. it should promote thinking rather than memorization, it should differentiate well informed fishermen from uninformed fishermen. The items were converted into multiple choice questions.

3.5.18. Item analysis

The collected 40 items were administered to 25 fishermen of the non-sampling areas. One score was given for every correct answers and zero was given for incorrect answers. The total score for each respondent was calculated. Then the respondents were

arranged in descending order of their score from highest to lowest. At this stage, it was decided to consider only those items that were correctly answered by the fishermen and finally 20 items were selected for inclusion in the knowledge test.

3.5.19. Method of Scoring

Two score was given to each respondent for the correct answer and one for the incorrect answer. The total knowledge score for each respondent was calculated by summing up the number of items correctly answered by an individual respondent. The respondents were classified as low, medium and high in their knowledge level based on mean and standard deviation. The scoring procedure used by Arul Oli (2004) was used with slight modification in score to suit the present study and presented in Table 19.

Table 19. Scoring procedure for Knowledge level

Sl.No.	Category	Score
1.	Correct	2
2.	Incorrect	1

3.6. Operationalisation and measurement of dependent variable

Dependent variable is defined as the phenomenon or characteristic hypothesized to be the outcome effort, consequent or output of some input variables.

3.6.1. Extent of adoption of hygienic fish handling practices among fishermen.

Adoption is a complex decision making process which involves a sequence of thoughts and actions. The term in this study is used to measure the respondents' adoption level of hygienic fish handling practices. Ten hygienic fish handling practices were listed

out and a unit score was given for the adoption of each of the practices. The sum of scores on individual practices was taken as a adoption score of the individual respondent.

The adoption level of each respondent was calculated using the formula developed by Kumaran *et al.* (2003).

$$\text{Adoption} = \frac{\text{No. of respondents who had adopted the practice}}{\text{Total number of respondents}} \times 100$$

3.7. Development of interview schedule

After the perusal of available literature and in consultation with the fisheries experts, a draft interview schedule was prepared according to the objectives of the study. After incorporating suggestions of various fisheries experts, a well structured interview schedule was designed. Thus, the interview schedule was constructed including all the selected independent and dependent variables. The structured interview schedule was pre-tested in a non-sampling area. Based on the results of the pre-testing, modifications were made in the schedule and the final interview schedule was prepared for collecting information from farmers.

3.8. Method of data collection

The data were collected from the selected respondents after building up a good rapport with them. The data were collected through personal interview. The study was conducted based on ex-post facto design.

3.9. Statistical tools used

3.9.1. Percentage analysis

Percentage analysis was done to make simple comparisons wherever necessary.

3.9.2. Use of mean and standard deviation

The mean and standard deviation were used to classify the respondents into low, medium and high categories and also to classify the respondents according to these socio-personal characteristics. The classification details are as follows:

Low = Mean – Standard deviation

Medium = Mean ± Standard deviation

High = Mean + Standard deviation

3.9.3. Correlation coefficient

This was used to find out the correlation between any two sets of variables viz. independent and dependent variables. The computer software package, Statistical Package for Social Science was used for the analysis of data.

CHAPTER-4

RESULTS AND DISCUSSION

This chapter deals with the findings that have emerged out of this study. The collected data were classified, tabulated and then treated with appropriate statistical tools to get the results. The results were tabulated and interpreted to trace out the relationships between the selected variables. The results of the study are presented in the following sections.

4.1 Socio-personal characteristics of fishermen.

4.2 Extent of adoption of improved hygienic fish handling practices among fishermen.

4.3 Problems in adoption of hygienic fish handling practices and suggestions to overcome the problems.

4.1. Socio-personal characteristics of the fishermen

The socio-personal characteristics of fishermen would give a clear picture of the factors that influence the adoption of hygienic fish handling practices among fishermen. Based on the opinions given by judges, a total of 16 variables have been chosen. The results have been presented and discussed in this section

4.1.1. Age

The findings of the study presented in Table 20 indicated that 47.50 per cent of the fishermen were middle aged followed by old (35.83%) and young (16.67%) aged.

Table 20. Age distribution of the fishermen

(n=120)

Sl.No.	Category	Number	Percentage
1.	Young (upto 35 years)	20	16.67
2.	Middle (36 – 45 years)	57	47.50
3.	Old (Above 45 years)	43	35.83
	Total	**120**	**100**

4.1.2. Educational status

The data presented in the Table 21 revealed that 25.00 per cent of the respondents were functionally illiterate and 40.83 per cent had middle level of education. The percentage of respondents who had primary school level of education and secondary level of education were 17.50 per cent and 2.5 per cent respectively, while 14.17 per cent of respondents were illiterate. However, none of the respondents were found to have collegiate level of education.

Table 21. Educational status of the fishermen

(n=120)

Sl.No.	Category	Number	Percentage
1.	Illiterate	17	14.17
2.	Functionally literate	30	25.00
3.	Primary	21	17.50
4.	Middle	49	40.83
5.	Secondary	3	2.50
6.	Collegiate	0	0

	Total	**120**	**100**

4.1.3. Marital status

It could be observed from Table 22 that majority of the fishermen (96.67%) were found to be married whereas only 3.33 percent were unmarried. This finding is accordance with the findings of Mary Thomas *et al.* (1996) and Ponnusamy *et al.* (2004).

Table 22. Marital status of the fishermen

(n=120)

Sl.No.	Category	Number	Percentage
1.	Married	116	96.67
2.	Unmarried	4	3.33
	Total	**120**	**100**

4.1.4. Family status

It could be seen from Table 23 that majority of the fishermen (88.33%) belonged to nuclear family and 11.67 per cent belonged to joint family. This distribution might have significantly influenced the size of the family too. Hence, it was found that 82.50 per cent of the fishermen family had family size upto 5 members and only a 17.5 per cent of the fishermen had a family size above 5. This finding is accordance with the findings of Ponnusamy (2004) and Karumalai Kannan (2005).

Table 23. Family status of the fishermen

(n=120)

Sl. No.	Nature of the family	Category	Number	Percentage
1.	Family type	Nuclear	106	88.33
		Joint	14	11.66
		Total	**120**	**100**
2.	Family size	Upto 5	99	82.50
		Above 5	21	17.50

		Total	**120**	**100**

4.1.5. Occupational status

It could be seen from Table 26 that 61.67 per cent of the fishermen had fishing as a primary occupation followed by 38.33 per cent of fishermen having fishing as secondary occupation.

Table 24. Occupational status of the fishermen

(n=120)

Sl.No.	Category	Number	Percentage
1.	Fishing as primary occupation	74	61.67
2.	Fishing as secondary occupation	46	38.33
	Total	**120**	**100**

4.1.6. Annual income

It could be observed from Table 25 that majority of the fishermen (58.33%) had medium level of annual income followed by high (15.00%) and low (26.67%) levels of annual income.

Table 25. Annual income of the fishermen

(n=120)

Sl.No.	Annual Income	Numbers	Percentage
1.	Low (Rs. 50,000 & below)	32	26.67
2.	Medium (Rs. 50,001 – Rs. 1,00,000)	70	58.33
3.	High (Rs.1,00,001 & above)	18	15.00
	Total	**120**	**100**

4.1.7. Information source exposure

With respect to information source exposure, it could be seen from Table 26 that 84.16 per cent of the fishermen listened to radio programmes followed by television programmes (71.66%) and newspapers (61.66%) regularly. Most of the respondents (63.33%) had undergone training programmes on hygienic fish handling practices occasionally. It could be concluded that radio, television and newspapers were mostly utilized by the respondents. Seminar, books/literature, magazine were not utilized by the respondents for getting information on fish handling practices which might be due to lack of opportunities in accessing to such information sources. This finding is in accordance with the findings of Sujathkumar (2000b).

Table 26. Information source exposure of the fishermen

(n=120)

Sl.No.	Sources	Regular (%)	Occasional (%)	Never (%)
1.	Seminar	--	--	100
2.	Training programme	--	63.33	36.67
3.	Scientific books / literature	--	--	100
4.	Newspapers	61.66	38.34	--
5.	Fisheries related magazines and other publications	--	--	100
6.	Radio programme	84.16	15.83	--
7.	Television programme	71.66	28.34	--

4.1.8. Economic motivation

Data presented in Table 27 revealed that 49.17 per cent of the respondents had medium level of economic motivation followed by high (33.33%) and low (17.50%) levels. This implies that majority of the fishermen had medium level of economic motivation.

Table 27. Distribution of the respondents according to their economic motivation

(n=120)

Sl.No.	Category	Number	Percentage	Mean	Standard deviation
1.	Low (upto 11.54)	21	17.5	14.17	2.63
2.	Medium (11.54 to 16.81)	59	49.17		
3.	High (above 16.81)	40	33.33		
	Total	**120**	**100**		

4.1.9. Social participation status

It could be seen from Table 28 that 57.50 per cent of the fishermen had occasionally participated with fishermen cooperative societies. Only 40.83 per cent of the respondents had occasionally participated with Panchayat Union and 17.50 per cent participated in SHGs activities and a few (13.33%) participated in Men’s clubs.

Table 28. Social participation status of the fishermen

Sl. No.	Name of the Institution	Frequency of participation (%)				
		Daily (%)	Weekly (%)	Monthly (%)	Occasionally (%)	Never (%)
1.	Fishermen Cooperative Society	--	--	22.50	57.50	20.00
2.	Adult education groups	--	--	--	--	100
3.	Panchayat unions	--	--	--	40.83	59.17
4.	Men's Club	--	--	--	13.33	86.67
5.	SHG	--	--	--	17.50	82.50
6.	Agriculture Credit Society	--	--	--	--	100

4.1.10. Mass media exposure

It could be seen from Table 29 that 51.66 per cent of the fishermen had medium level of mass media exposure followed by high (28.33%) and low (20.00%) levels.

Table 29. Mass media exposure of the fishermen

(n=120)

Sl.No.	Category	Numbers	Percentage	Mean	Standard deviation
1.	Low (upto 11.54)	24	20.00	14.17	2.632
2.	Medium (11.54 to 16.81)	62	51.66		
3.	High (above 16.81)	34	28.33		
	Total	**120**	**100**		

4.1.11. Experience in fishing

It is evident from the Table 30 that 64.16 per cent of the respondents had more than 16 years of experience in fishing and 35.83 per cent of the respondents had 11-15 years of experience in fishing. The finding is in line with the findings of Sujathkumar (2000a) and Arul Oli (2004).

Table 30. Scoring procedure for Experience in fishing

(n=120)

Sl.No	Categories (in yrs)	Number	Percentage (%)
1	Upto 5	0	0
2	6 to 10	0	0
3	11- 15	43	35.83
4	16 and above	77	64.16
	Total	**120**	**100**

4.1.12. Contact with extension agency

It could be observed from Table 31 that 57.50 per cent of the respondents had contacted the fishermen cooperative societies occasionally and 29.16 per cent of the respondents contacted Department of Fisheries monthly. 43.33 per cent of the respondents occasionally contacted Universities/ Colleges and only 15.83 of the respondents occasionally contacted NGOs.

Table 31. Contact with extension agency by the fishermen

Sl. No.	Name of the Institution	Frequency of contact (%)				
		Daily (%)	Weekly (%)	Monthly (%)	Occasionally (%)	Never (%)
1.	Department of Fisheries (Tamilnadu)	--	--	29.16	25.83	45.00
2.	Universities/ Colleges (Central / State)	--	--	--	43.33	56.67
3.	Marine Products Export Development Authority (MPEDA)	--	--	--	--	100
4.	Fishermen cooperative society	--	--	--	57.50	42.50
5.	Fisherwomen cooperative society	--	--	--	--	100
6.	District Rural Development Agency	--	--	--	--	100
7.	Non governmental organization (NGO)	--	--	--	15.83	84.17

4. 1. 13. Scientific orientation

To assess the level of scientific orientation of the fishermen towards scientific practices, data were collected and analysed. The information on scientific orientation are given in Table 32.

Table-32. Scientific orientation of the fishermen

(n=120)

Sl.No	Level of Contact	Number	Percentage	Mean	Standard

					deviation
1	Low (below 15.56)	25	20.83		
2	Medium (15.56-23.45)	79	65.83	19.51	3.94
3	High (above 23.45)	16	13.33		
	Total	**120**	**100**		

It could be seen from the Table 16 and Fig.2 that majority (65.83%) of the respondents had medium level of scientific orientation followed by low (20.83 per cent) and high (13.33%) level of scientific orientation respectively. It could be concluded that the respondents were oriented towards the use of scientific methods in post-harvest activities in fisheries.

4.1.14 Training undergone

It could be seen from Table 33 that majority of the fishermen (68.33%) had undergone training on hygienic fish handling practices.

Table 33. Training undergone by the fishermen

(n=120)

Sl.No	Type of training	Undergone		Not undergone	
		Number	**Percentage**	**Number**	**Percentage**
1	Hygienic fish handling practices	82	68.33	38	31.67

4.1. 15. Innovativeness

To find out the tendency of the fishermen to try and use new ideas relatively earlier than other members in the social system, data have been collected and analysed. The results of the analysis are presented in Table 34 and Fig.3. The result is supported by the findings of Veeraputhiran (2000)

Table 34. Innovativeness of the fishermen

(n=120)

Sl.No	Innovativeness	Number	Percentage (%)	Mean	Standard deviation
1	Low (upto 9.27)	12	10.00		
2	Medium(9.27 to 14.21)	21	17.50	11.74	2.47
3	High (above 14.21)	87	72.50		
	Total	**120**	**100**		

From the above Table, it could be inferred that most of the fishermen possessed high level (72.50%) of innovativeness followed by medium (17.50%) and low level (10%). This result is supported by the findings of Veeraputhiran (2000)

4.1.16. Knowledge level

It could be seen from Table 35 and Fig.4 that majority of the fishermen (55.83%) had medium level of knowledge followed by high (23.33 per cent) and low (20.83%) levels. This finding is supported by the findings of Sheela (1995) and Sathishkumar and Santhakumar (2008).

Table 35. Knowledge level of the fishermen

(n=120)

S.No.	Category	Numbers	Percentage	Mean	Standard deviation
1.	Low (below 28.29)	25	20.83		

2.	Medium (28.29 – 36.16)	67	55.83	32.22	3.93
3.	High (above 36.16)	28	23.33		
	Total	**120**	**100.00**		

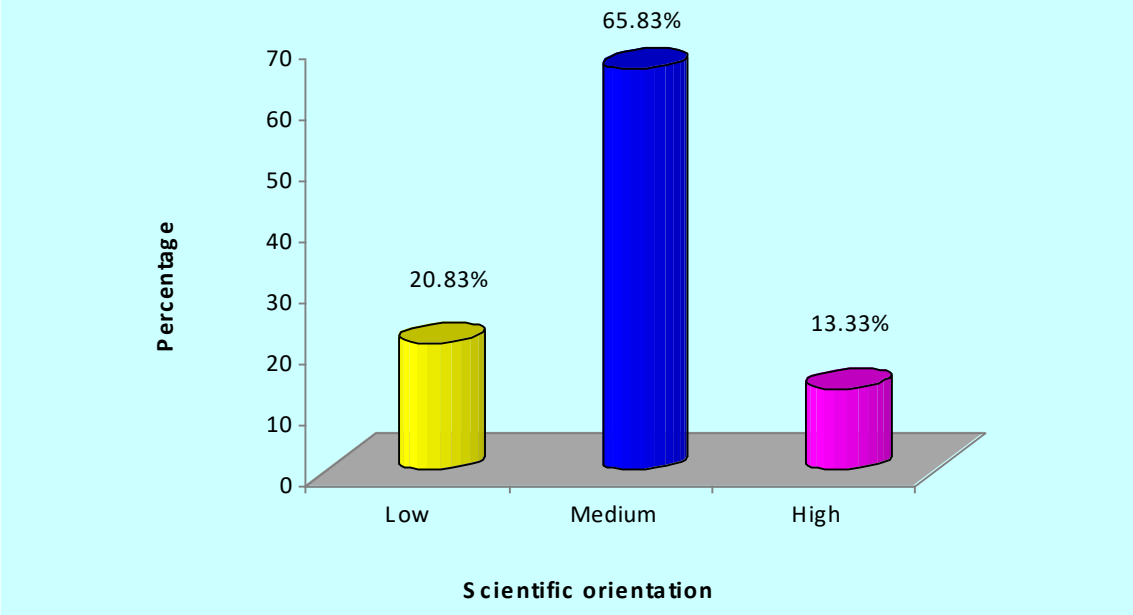

Fig.2. Scientific orientation of the respondents

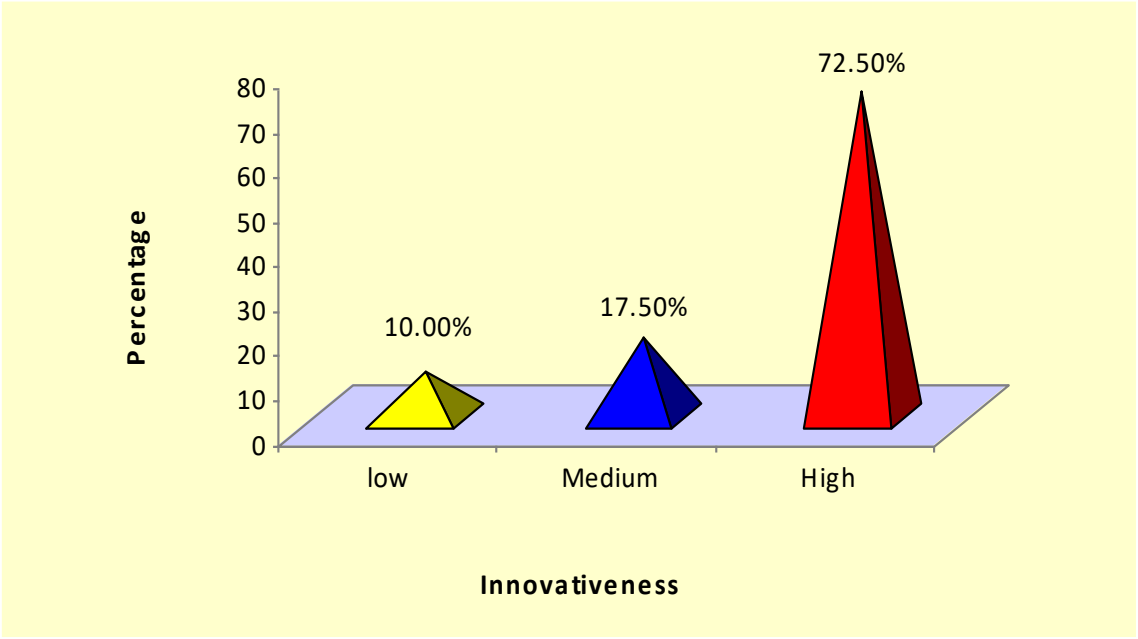

Fig.3. Innovativeness of the respondents

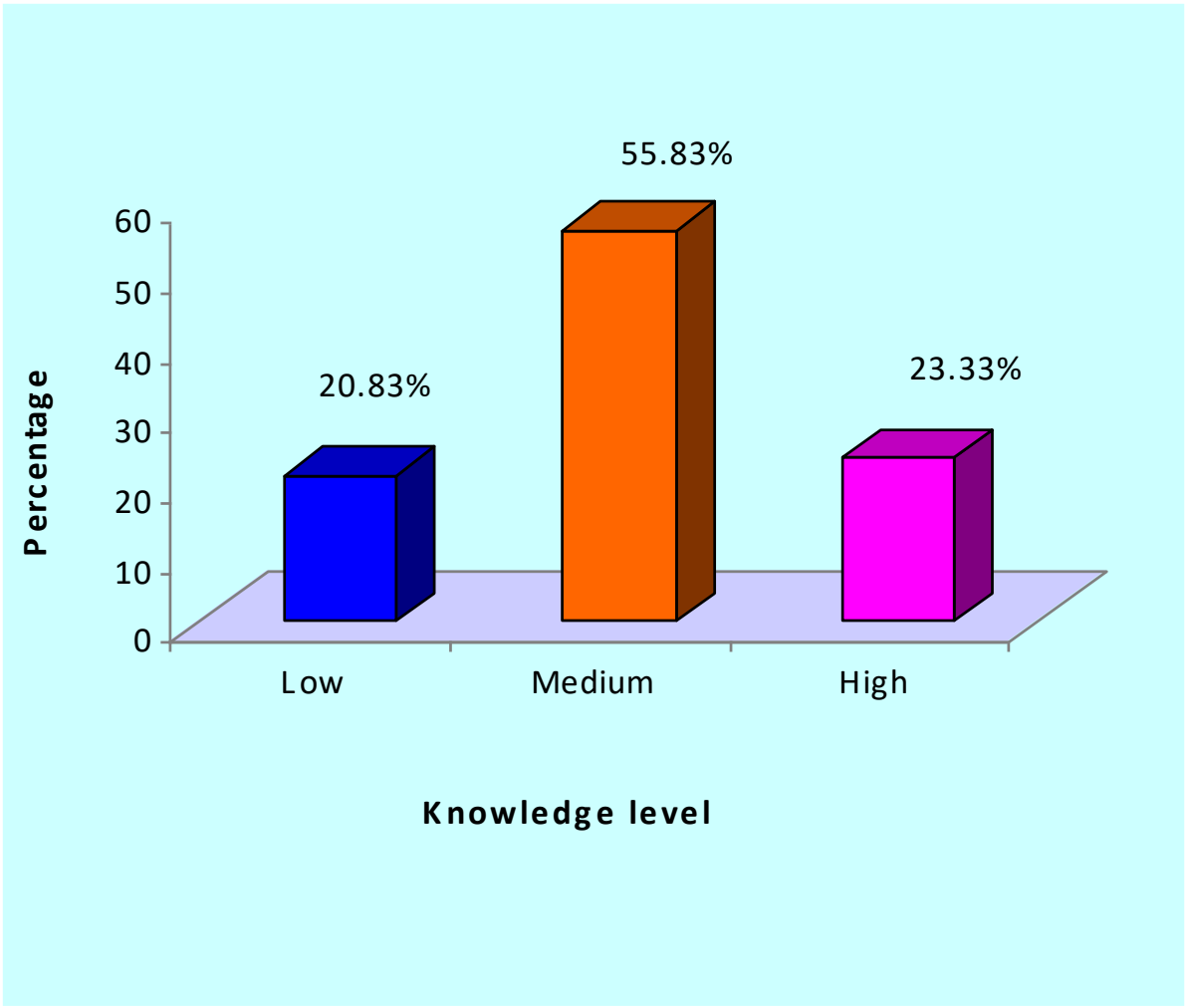

Fig.4. Knowledge level of the respondents

4.2. Extent of adoption of hygienic fish handling practices by fishermen

4.2.1 Adoption of hygienic fish handling practices by the respondents

It could be seen from Table 36 that 94.17 per cent of the fishermen practiced regular cleaning of deck of the fishing vessel (Fig.5) followed by 90.83 per cent of the fishermen who practiced cleaning of fish hold and accessories (Fig.6). None of the fishermen practiced washing of fish in the sea and evisceration or removal of gills and intestines.

Only 15.80 per cent of the fishermen practiced proper sorting of fish species-wise and size-wise (Fig.7 and Fig.8). Most of the fishermen (96.67 %) practiced icing of the fish (Fig.9) followed by 77.50 per cent of the fishermen who practiced packaging of the fish (Fig.10). Most of the fishermen (60.83%) maintained personnel hygiene and only 6.67 per cent of the fishermen practiced the auction hall cleaning (Fig.11) and 13.33 per cent of the fishermen practiced hygienic handling of fish in auction hall (Fig.12).

Fig.5. Fishermen cleaning on board

Fig.6. Cleaning of fish hold

Fig.7.Fishermen unloading the catch

Fig.8. Sorting the fish size-wise and species-wise

Fig.9. Icing of fish

Fig.10. Packaging of Fish

Fig.11. Auction hall

Fig.12. Fish handling in auction hall

A total of 45.58 per cent of the fishermen were adopters of hygienic fish handling practices and 54.42 per cent of the fishermen did not adopt hygienic fish handling practices

Table 36. Adoption of hygienic fish handling practices by the fishermen

Sl. No.	Adoption of practices	Adoption		Non adoption	
		Numbers	Percentage	Numbers	Percentage
1.	Cleaning of deck	113	94.17	7	5.83
2.	Cleaning of fish hold and accessories	109	90.83	11	9.17
3.	Washing of fish	0	0	120	100
4.	Sorting of fish	19	15.83	101	84.17
5.	Evisceration and removal of gills and bleeding of big fishes	0	0	120	100
6.	Packaging of fish	93	77.50	27	22.50
7.	Icing of fish	116	96.67	4	3.33
8.	Personnel Hygiene	73	60.83	47	39.17
9.	Auction hall cleaning	8	6.67	112	93.33
10.	Hygienic handling of fish in auction hall	16	13.33	104	86.67
	Average adoption of all practices put together		**45.58**		**54.42**

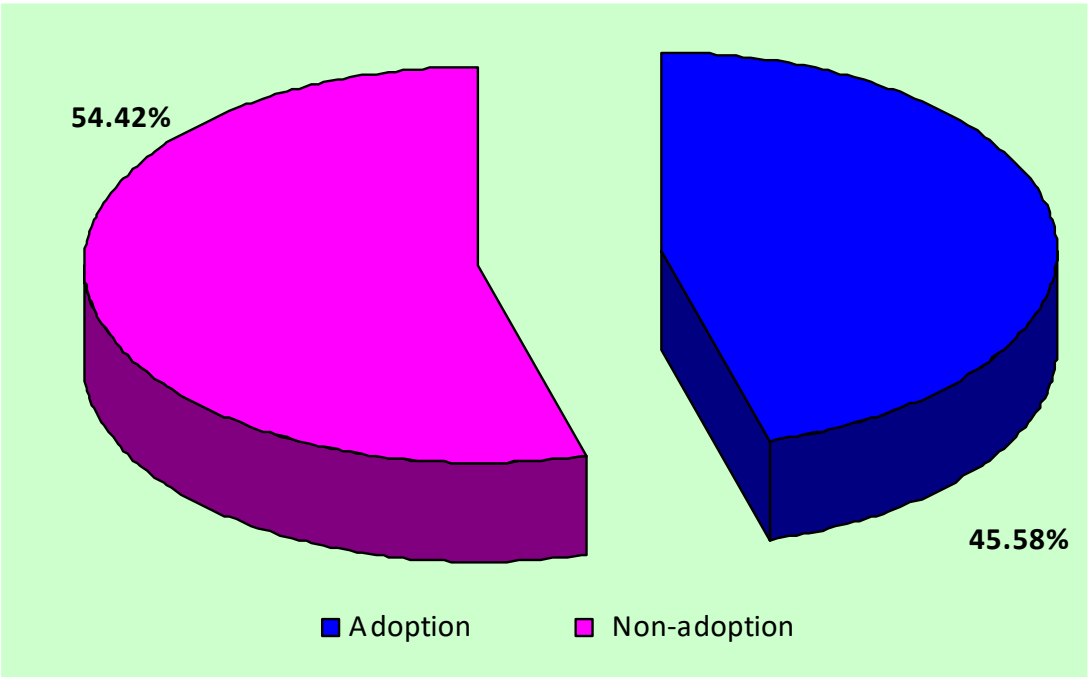

Fig.13. Adoption of hygienic fish handling practices by fishermen

4.2.2 Relationship between the socio-personal characteristics of the fishermen and their adoption

It could be observed from Table 37 that educational status, annual income, information source exposure, mass media exposure, experience in fishing, scientific orientation, innovativeness and knowledge level had shown significant and positive relationship with the adoption of hygienic fish handling practices by fishermen.

Contact with the extension agency had non-significant and negative relationship with the adoption of hygienic fish handling practices by fishermen. The other variables have shown non-significant relationship with the adoption of hygienic fish handling practices.

Table 37. Correlation between the socio-personal characteristics of fishermen and their adoption.

Sl.No	Variables	r-value
1	Age	0.042457 NS
2	Educational status	0.3128**
3	Marital status	0.0891 NS
4	Family status	0.0986 NS
5	Occupational status	0.0374 NS
6	Annual income	0.4136**
7	Information source exposure	0.3415**
8	Economic motivation	0.0102 NS
9	Social participation status	0.1417 NS
10	Mass media exposure	0.2936*
11	Experience in fishing	0.2748**

12	Contact with extension agency	-0.0352 NS
13	Scientific orientation	0.3142**
14	Training undergone	0.1573 NS
15	Innovativeness	0.4714**
16	Knowledge level	0.5138**

* - Significant at 5%, level ** - Significant at 1% level, NS – Non-significant

It could be concluded that the adoption of hygienic fish handling practices by fishermen was very much influenced by educational status, annual income, information source exposure, mass media exposure, experience in fishing, scientific orientation, innovativeness and knowledge level. In the case of trawler owners/ partners, all the selected variables did not show any significant relationship indicating that the trawler owner/partner did not vary in their socio-economic characteristics and the adoption behaviour of on-board fish handling practices. Change in their socio-economic characteristics is needed to bring about change in their adoption behaviour.

4.3. Problems and suggestions of fishermen

Under this section, important problems as perceived by the fishermen that hindered the hygienic fish handling practices are presented.

4.3.1. Problems perceived by the fishermen in adopting the hygienic fish handling practices

The results presented in Table 38 and Fig. 26 revealed that most of the respondents (84.16%) experienced erratic fluctuations in price of the fish as one of the major problems in the hygienic handling of fish. Only 75.83 per cent of the respondents

reported lack of cold storage facilities as one of the problems followed by insufficient loans/ subsidies (74.16%).

Table 38. Problems perceived by the fishermen

(n=120)

Sl.No.	Problems	Frequency	Percentage
1.	Erratic price fluctuations	101	84.16
2.	Lack of cold storage facilities	91	75.83
3.	Insufficient loans/ subsidies	89	74.16

4.3.2. Suggestions of the fishermen for tackling the problems

It could be seen from the results furnished in Table 39 (Fig. 26) that majority of the fishermen (77.50%) suggested the regulation of price by Government intervention while 70.00 per cent of the fishermen suggested to establish cold storage in auction hall and 62.50 per cent respondents suggested to provide sufficient loans/ subsidies without collateral security from banks.

Table 39. Measures suggested by the fishermen

(n=120)

Sl.No.	Measures	Frequency	Percentage
1.	Price regulation by Government invention	93	77.50
2.	Establishment of cold storage in auction hall	84	70.00
3.	Provide sufficient loans/ subsidies without collateral security from banks	75	62.50

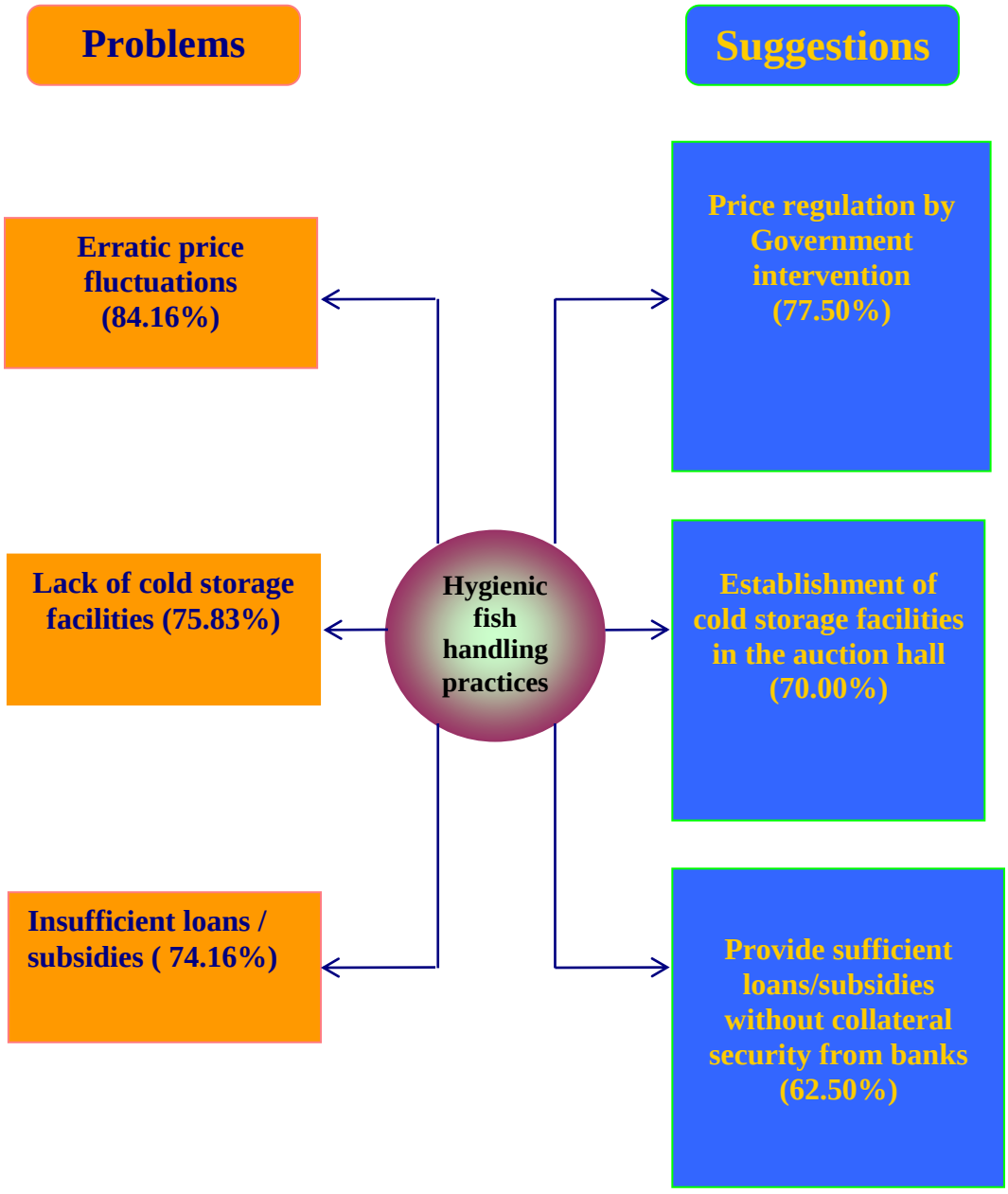

Fig.14 Problems and Suggestions of the fishermen

CHAPTER – 5

SUMMARY AND CONCLUSION

Hygienic handling of fish onboard holds a lot of importance since people are mostly concerned about the HACCP in fish processing plants and industries and they are not concerned on how fish are handled onboard. Proper handling of fish onboard is very essential to keep the fish fresh and safe for human consumption for a longer period of time. Moreover, certain amount of the fish catch is spoiled due to improper handling practices and as such the total fish catch is not fully utilised in terms of both food and resource value. Adopting proper handling practices will serve as an efficient measure to overcome these problems and eventually will help in enhancing the quality and quantity of fish exported. Keeping this in view, this study entitled, "Adoption of hygienic fish handling practices by fishermen" has been undertaken with the following objectives.

1. To study the socio-personal characteristics of fishermen
2. To study the extent of adoption of improved hygienic fish handling practices among fishermen.
3. To study the problems in adoption of hygienic fish handling practices and suggestions to overcome the problems.

The present study was undertaken at Thoothukudi district of Tamilnadu. Three fishing villages were selected from the district viz. Tharuvaikulam, Thoothukudi South and Thoothukudi North. One hundred and twenty farmers were selected proportionately from the three fishing villages.

The independent variables selected for the study were Age (X_1), Educational status (X_2), Marital status (X_3), Family status (X_4), Occupational status (X_5), Annual income (X_6), Information source exposure (X_7), Economic motivation (X_8), Social participation status (X_9), Mass media exposure (X_{10}), Experience in fishing (X_{11}), Contact with extension agency (X_{12}), Scientific orientation (X_{13}), Training undergone (X_{14}), Innovativeness (X_{15}), Knowledge level (X_{16}) and Adoption of hygienic fish handling practices (Y_1) as dependent variable.

The data were collected by personal enquiry through a well structured and pre-tested interview schedule. The collected data were analysed using necessary statistical tools such as correlation, standard deviation, mean, percentage, etc. The salient findings of the study are given below.

5.1. Socio- Personal characteristics of the fishermen

1. Majority of the respondents (47.50 %) were found to be in the category of middle aged followed by old aged (35.83 %) and young (16.67 %).
2. The percentage of respondents who had middle school level of education and functionally illiterate were 40.83 per cent and 25.00 per cent respectively.
3. Most of the respondents (96.67 %) were married and 88.33 per cent of respondents belonged to nuclear family type and followed by 82.50 per cent of respondents who has the family size of more than five members.
4. Majority of the respondents (61.67 %) were engaged in fishing activities as their primary occupation followed by 38.33 per cent of the respondents who practiced fishing as their secondary occupations.

5. Majority of the respondents (58.33%) had medium level of annual income (Rs. 50,001 – Rs. 1,00,000) followed by 26.67 per cent of respondents with low annual income and 15.00 per cent of respondents with high annual income.
6. As far as information source exposure was concerned, majority of the respondents (84.16 %) depend on radio programmes followed by television programmes (71.66 %) and newspapers (61.66 %)
7. Most of the respondents (49.17 %) had medium level of economic motivation towards higher productivity and profitability.
8. Majority of the respondents (57.50 %) occasionally contacted the fishermen co-operative society for accessing information on fishing and allied activities.
9. Most of the respondents (51.66 %) had medium level of mass media exposure.
10. Most of the respondents (64.17 %) had above 16 years of experience in fishing followed by 35.83 % of respondents having 10-15 years of experience in fishing.
11. Only 57.50 per cent of the respondents occasionally contacted the fishermen co-operative society followed by universities/ colleges (43.33 %), Department of Fisheries (25.83%) and NGOs (15.83 %)
12. Most of the respondents (65.83 %) had medium level of scientific orientation followed by low (20.83 %) and high (13.33 %) level.
13. Majority of the respondents (68.33 %) were trained on hygienic fish handling practices.
14. Majority of the respondents (72.50 %) possessed high level of innovativeness on experiments with new ideas in fish quality management.

15. Most of the respondents (55.83 %) had medium level of knowledge followed by high (23.33 %) and low (20.83 %).

5.2. Extent of adoption of hygienic fish handling practices by fishermen

Only 45.58 per cent of the fishermen were adopters of hygienic fish handling practices and a majority of the respondents (54.42%) were non adopters.

5.3. Problems and suggestions of the fishermen

Erratic price fluctuations (84.16%), Lack of cold storage (75.83%) and insufficient loans/subsidies (74.16%) were the major problems faced by the fishermen in practising the hygienic fish handling practices.

Price regulation by Government intervention (77.50%), establishment of cold storage in auction hall (70.00%) and providing sufficient loans/ subsidies without collateral security from banks (62.50%) were the suggestions of the fishermen for the perceived problems.

5.4. Implications of the study

1. As the educational level among the fishermen is low, there is a need for creating awareness by organizing and conducting training programmes through government and voluntary organizations.
2. In order to improve the social participation level of fishermen, general meetings, campaigns, etc. should be organized and conducted to facilitate their exposure/ participation through the Fishermen Cooperative Societies and panchayat unions.
3. The contact of the fishermen with the extension agencies was low. Therefore, opportunities must be provided by organizing and conducting different extension programmes through various extension agencies.

4. The knowledge level of fishermen was found to be medium. Hence, the Government and Non- Government organizations should conduct short term and need based training programmes, demonstrations and other extension services regularly for disseminating improved or new innovations for effective diffusion and adoption and for the welfare of the fishermen in their village itself.
5. The scientific orientation was found to be medium. Hence, the Department of Fisheries, Fisheries College and Non- Government organizations should undertake extension services regularly for disseminating improved and new technologies for speedy diffusion and adoption.

CHAPTER – 6

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