Preprocessing Hazards at the Veraval Fish Landing Centre in Gujarat

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In tropical conditions there is a considerable loss in quality during handling and trading. The ambient shelf lives of most species of tropical fish are fairly short, most species spoiling within a few hours after landing unless adequately iced. Implementation of quality control measures and HACCP compliance is more focused with respect to the seafood processing plants. However, the hazards prevailing outside the fish processing plants have a significant effect on the subsequent quality of the raw material to be processed.

Key words: Pre-processing hazards, Veraval fish landing centre, Gujarat

Fish is a highly perishable commodity. In tropical conditions there is a considerable loss in quality during handling and trading. The ambient shelf lives of most species of tropical fish are fairly short, most species spoiling within a few hours after landing unless adequately iced. The most important topic in the food processing industry today is quality assurance.

Implementation of quality control measures and HACCP compliance is given more emphasis with respect to the seafood processing plants. However, the hazards prevailing outside the fish processing plants have a significant effect on the subsequent quality of the raw material to be processed. In this study an attempt is made to assess such preprocessing hazards at the Veraval fish landing centre in Gujarat, so as to develop a holistic approach to the seafood quality assurance programmes.

Materials and Methods

The study was carried out for a period of two years. Regular samples were collected from various points in the landing centre. The samples for microbiological analysis were collected with sterility precautions and bought to the laboratory in insulated containers. The APHA (1995) methods were followed for the analysis. Hygiene swabs were collected from ten different

sources at the landing centre. The points identified as probable hazard sources are open drain at landing centre, landing centre, outlet water pipe, fish surface swab, vehicle surface swab, worker's hand swab, boat deck swab, ice at landing centre, stagnant water at landing centre, landing centre tap water and landing centre floor. The hygiene score was done on the basis of total plate count (TPC) and total coliform count (Talaro & Talaro, 1996). The sample collection was for a period of 4 months and a total of 9 sets of samples were collected. Primary data was collected from the Veraval-Patan municipality and Seafood Exporters Association of Veraval. Activities in the fish landing centre were monitored for two fishing seasons and data was collected by interviews with the different grades of workers present there and also by observation of practices at the landing centre premises. Raw material collection, handling, and mode of storage were extensively monitored at different locations. The methodology followed was of a participatory nature.

Results and Discussion

Results of analysis of the hygiene swabs collected over a period of 4 months are shown in the Tables 1and 2. It has been seen that the total bacterial count (TPC) in all the samples are very high. The risk score or the hygiene score was hence done on the basis of the total coliform count. The entire collection period was divided into 9 lots and the highest three scores in an individual lot were selected. On the basis of observed results it was seen that the stagnant water, vehicle surface, boat deck and ice at landing centre are sources of major hazards.

It can be seen that the landing centre premises, infrastructure, drainage facilities and practices followed have a role to play in the seafood processing operations carried out at Veraval. Similar studies were done in Nigeria. The artisanal fishery sector of Nigeria contributes to 90% of the total fish production. Potential hazards related to public health and fish spoilage were studied by Akande (1998). It has been seen that untreated wastewater was responsible for a widespread epidemic of salmonellosis in Marrakech city. On the basis of this work, it is clear that there are several hazards existing outside the processing plant and that these have a significant bearing on the raw material quality. The environment in the vicinity of these processing plants is significantly polluted and could be regarded as potential hazard zones. These hazards should be taken into consideration when any quality control program is implemented. The efforts should be directed to

Table 1. TPC and total coliforms of the hygiene swabs collected from various points in the landing centre during April-May 2001

	09.04.2001		23.04.2001		26.04.2001		14.05.2001	
	TPC.g^{-1}	Total coliforms.g^{-1}	TPC.g^{-1}	Total coliforms .g^{-1}	TPC.g^{-1}	Total coliforms .g^{-1}	TPC.g^{-1}	Total coliforms .g^{-1}
Landing centre tap water (A)	$4.2x10^3$	9	$3.0x10^4$	ND	$4.0x10^3$	ND	$2.15x10^5$	65
Landing centre floor (B)	$1.3x10^5$	250	$3.2x10^3$	ND	$1.2x10^3$	ND	$4.8x10^3$	6
Open drain at landing centre (C)	7.6x105	ND	$1.5x10^4$	9	$1.5x10^5$	4	$9.0x10^5$	6
Landing centre outlet pipe (D)	$1.4x10^4$	ND	$4.0x10^6$	450	$1.8x10^4$	250	$4.5x10^4$	
Fish surface (from floor of landing centre) (E)	$5.8x10^4$	25	$1.6x10^3$	ND	$1.8x10^4$	250	$1.4x10^3$	9
Vehicle surface (F)	$3.6x10^3$	9	$1.6x10^4$	ND	$3.4x10^4$	450	$1.92x10^5$	15
Worker's hand surface (G)	$1.8x10^4$	45	$9.6x10^3$	15	$1.0x10^5$	250	$2.88x10^5$	4
Boat deck (H)	$1.5x10^2$	ND	$5.6x10^4$	45	$4.0x10^2$	1100	$2.24x10^3$	25
Ice at landing centre (I)	$4.5x10^4$	450	$1.5x10^2$	95	$2.0x10^3$	150	$1.0x10^5$	16
Stagnant water (J)	$1.5x10^7$	250	$8.0x10^3$	1100	$1.6x10^2$	1400+	$2.4x10^3$	ND

ND - not detected

Table 2. TPC and total coliforms from hygiene swabs collected from various points at landing centre during June-July 2001

	06.06.2001		13.06.2001		25.06.2001		31.06.2001		10.07.2001	
	TPC.g^{-1}	Total coliforms .g^{-1}	TPC.g^{-1}	Total coliforms .g^{-1}	TPC.g^{-1}	Total coliforms .g^{-1}	TPC.g^{-1}	Total coliforms .g^{-1}	TPC.g^{-1}	Total coliforms .g^{-1}
Landing centre tap water (A)	$3.5x10^3$	1400+	$3.5\ x10^5$	1400+	$1.2\ x10^2$	7	$2.0\ x10^2$	75	$4.7\ x10^3$	1400+
Landing centre floor (B)	$3.6\ x10^3$	1400+	$3.6\ x10^4$	1400+	$8.0\ x10^1$	ND	$3.2\ x10^3$	20	$2.4\ x10^4$	1400+
Open drain at landing centre (C)	$9.0\ x10^5$	1400+	Crow.	1400+	$1.3\ x10^6$	1400+	$3.0\ x10^5$	250	$2.8\ x10^6$	1100
Landing centre outlet pipe (D)	$2.1\ x10^6$	1400+	$3.0\ x10^5$	1400+	$2.0\ x10^6$	1400+	$5.0\ x10^5$	3	$2.0\ x10^6$	450
Fish surface (from floor of landing centre) (E)	$9.0\ x10^3$	1100	$1.6\ x10^4$	1400+	$4.8\ x10^5$	1400+	$1.5\ x10^3$	1400+	$1.4\ x10^5$	300
Vehicle surface (F)	$4.8\ x10^3$	7	$4.8\ x10^4$	1400+	$2.4\ x10^5$	1400+	$3.2\ x10^2$	30	$2.2\ x10^4$	1400+
Worker's hand surface (G)	$1.0\ x10^5$	1400+	$3.6\ x10^3$	450	$4.4\ x10^4$	1400+	$4.8\ x10^3$	20	$1.6\ x10^5$	35
Boat deck (H)	$1.4\ x10^5$	1400+	$7.2\ x10^3$	7	$4.4\ x10^3$	4	$6.5\ x10^4$	15	$8.0\ x10^5$	250
Ice at landing centre (I)	$2.6\ x10^6$	1400+	$7.0\ x10^4$	115	$3.5\ x10^3$	1400+	$2.4\ x10^4$	1400+	$4.0\ x10^4$	1400+
Stagnant water (J)	-	-	$7.5\ x10^6$	1400+	-	-	$2.4\ x10^2$	95	$3.2\ x10^5$	1400+

Table 3. Hazard analysis schedule of preprocessing hazards in Veraval fish landing centre

Step/Activity	Identify potential hazards	Are there any potential hazards of significance	Is this step a critical control point
Boat	Physical, Chemical, Biological	Yes	
Landing centre water	Physical, Chemical, Biological	Yes	
Landing centre floor	Physical, Chemical, Biological	Yes	
Ice in landing centre	Physical, Chemical, Biological	Yes	It is not possible to assign certain points as more critical over others due to the large extent of overlaps and complexity. Hence it is suggested that all these hazards are contributory to the overall quality of raw material.
Transport vehicles	Physical, Chemical, Biological	Yes	
Landing centre fish hold	Physical, Chemical, Biological	Yes	
Landing centre environment	Physical, Chemical, Biological	Yes	
Workers	Physical, Chemical, Biological	Yes	
Practices followed in landing centre	Physical, Chemical, Biological	Yes	

synchronize these operations effectively so as to gain a systematic insight into these areas hitherto neglected. The process of HACCP implementation in these areas is not possible in isolation. However, the operations and activities in the landing centre could be systematized.

Table 4. List of preprocessing hazards identified in the fish landing centre at Veraval

Preprocessing hazards
Vessel environment and handling
Landing centre water
Landing centre and premises
Ice used in landing centre
Transport vehicles used at the landing centre
Landing centre fish hold
Handling practices followed in the landing centre
Pollution in landing centre creek

The hazard analysis schedules of the preprocessing hazards are shown in Table 3. A preprocessing hazard may bc assumed to be both a CCP and not a CCP as per the decision tree interpretation. While the process of adopting specific measures may control some hazards, it has been seen that as many of the activities are closely interrelated. It is not always possible to monitor the individual control measures adopted. An example would be

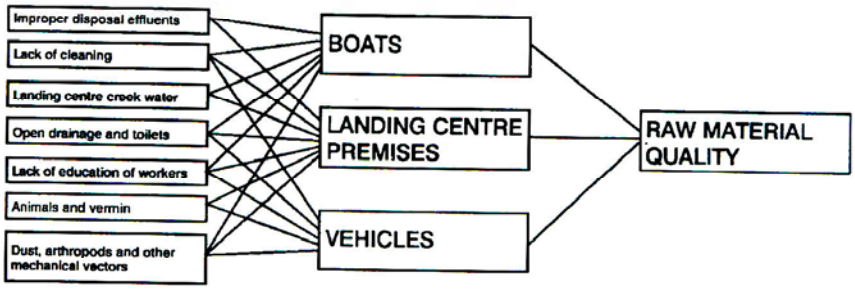

Fig. 1. Hazard map of the fish landing centre at Veraval and their influence on the three areas having maximal contact with raw material

ice used in landing centre. The variables affecting ice are numerous *viz.*, source of water used, handling, mode of breaking, sanitary condition of the workers, condition of the ice-crushing machine, animal contact, stage at which this ice is used (on the landing centre, on vessels going for long trip fishing, on vehicles used to transport fish to the processing plant or in the landing centre fish holds). Hence monitoring the ice quality is not sufficient as there are several other factors that operate simultaneously and they can have an effect on the hazards associated with ice. A list of the pre-processing hazards identified in the fish landing centre at Veraval is given in Table 4. The multi-faceted nature of these hazards leads to variability in control measure response and monitoring. Based on this study, a hazard map of the fish landing centre at Veraval showing the influence of each pre-processing hazards on the raw material quality (Fig. 1) has been developed.

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