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Assessment of microbiological and bio-chemical quality of fish in a supply chain in Negombo, Sri Lanka

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Abstract

This study aimed to investigate quality of fish landed in Negombo area and distributed in suburban areas in Western province of Sri Lanka. Hundred samples of large fish (*Katsuwonus pelamis* and *Euthynnus affinis*) and 60 samples of small fish (*Amblygaster sirm*, *Pterocaesio chrysozona*, *Stolephorus commersoni*, and *Sardinella albella*) were sampled from different stages of a supply chain at five and six sampling visits, respectively. All fish samples (N=160) were analysed for aerobic plate counts (APC) at 37°C, Coliforms, faecal coliforms, *Escherichia coli*, *Salmonella* spp., *Listeria monocytogenes*, total volatile base nitrogen (TVB-N) while 130 were analysed for histamine. Water from fishery harbor basin, fishery harbour, ice manufacturing plants and ice used in multiday boats were also analysed for microbiological parameters. Large and small fish contained APC in the range of 2.0×10^2 - 2.0×10^6 and 8.0×10^3 - 2.0×10^8 cfu/g, respectively. Faecal coliform counts ranged between not detected (ND) and 90 MPN/g in large fish and between ND and >1100 MPN/g in small fish. 5% of large fish were contaminated with *E.coli* and ranged from ND to 15 MPN/g. *E.coli* was present in 70% of small fish samples and ranged from ND to >1100 MPN/g. Of the 160 fish samples, tested *Salmonella* spp were detected in nine occasions. Of the 160 fish samples, *L. monocytogenes* was found in eight *Katsuwonus pelamis* and one *Sardinella albella* fish. TVB-N of large fish were found at range of 1-67 mgN/100 g and 79% samples contained unacceptable levels. Small fish contained about 25.10-104.30 mgN/100 g

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while 78% samples exceeded acceptable levels. Histamine level of large and small fish, 26% and 83% of samples exceeded the maximum acceptable levels, respectively. Harbour basin water was heavily contaminated with *Salmonella* spp. (50%), *Faecal streptococci* (100%), Faecal coliforms and *E.coli* (100%). Ice samples (20%) from one ice plant were found contaminated with *Salmonella* spp.

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Keywords: Chemical quality; Fish quality; Microbiological quality

1. Introduction

Fish is more perishable than other proteinacious animal food and its freshness is the most important criteria for judging the quality¹. Proper post-harvest handling of catch is the most crucial step in the production of a high quality finished fishery product to meet the consumer demand². Contamination of fish with pathogenic bacteria reflects use of un-cleaned utensils, contaminated water and ice, inadequate amount of ice and unhygienic handling practices³.

The deteriorative changes occurring in fish results in the gradual accumulation of volatile and carbonyl compounds in the flesh due to the effect of varieties of biochemical and microbial mechanisms. Total volatile basic amines (TVB) are one of the most widely used measurements of seafood quality⁴. Quantification of these compounds can provide a measure of the progress of deterioration⁵.

Negombo is one of the main food fish supply location in the Western province of Sri Lanka. Annual fish supply from Negombo is about 41,000 mt. Generally, large fish is supplied from multi-day boats whereas small fish caught in day-boats. Fish from both multi-day and one-day boats are landed at Fishery Harbour (Lellama) landing centre while other fishing crafts are landed at shore (Wella) in Negombo. Recent observations made by government officials and complain by consumers on low quality fish indicates poor handling practices along fish supply chains. However, scientific information on fish quality along supply chains in the area is not abundant. This study aimed to conduct scientific study on microbiological and biochemical quality of fish landed in Negombo.

2. Methodology

2.1 Sample fish species and fish supply chains

Present study was conducted with fish samples obtained in two fish supply chains begun at fish landings in Negombo from April to June 2014. One chain consisted of the distribution of large fish along four consecutive stages: 1) From multiday boats anchored at Negombo fishery harbour 2) Auction place at pier of fishery harbour 3) Immediately after transporting of fish in a vehicle to the sales destination 4) At fish retailing stall. The other chain included small fish which were caught in day boats and destined over two successive stages: 1) Day-boat at near shore (Wella) in Negombo and 2) During retailing of fish at a fish market near show in Negombo.

2.1. Simulation of present handling practices and field sampling of large fish

Large fish were sampled in five field visits including *Katsuwonus pelamis* and *Euthynnus affinis* in four and one visits, respectively. Initially, twenty fish were purchased directly from a multiday boat and fish were randomly separated in to four groups as to contain five fish in each group. All fish samples were moved along the fish supply chain by following commonly adhered handling practices. All samples units in chill storage were transported to Quality Control Laboratory of Institute Post Harvest Technology at NARA in two hours.

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