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Microbiological Examination of Three Types of Common Edible Marine Fishes from Visakhapatnam Fishing Harbour, East Coast of India

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Abstract: The present study was carried out for microbiological analysis to assess the quality of raw fish sold in the Fishing harbour of Visakhapatnam, East Coast of India. The study was performed during the period of April 2012 to March 2013. Three commonly edible fishes were selected for the microbial analysis to evaluate the quality of fish samples in terms of microbial content, the samples were inoculated and counted using Agar plate method. The microbial count was done by Total Bacterial Count (TBC), Total coliform counts (TCC) Total faecal coli form counts (TFCC). In the fishes of *Upeneus vittatus* (Forsskal 1775) *y*ellow banded goat fish, *Nemipterus japonicus* (Bloch, 1791) Japanese thread fin bream, *Priacanthus hamrur* (Forsskal, 1775) crescent tail big eye fish. 10 gms of fresh muscle is swabbed from the dorsal fin region was chosen as the target sample for the estimation of the microbial load. The TBC ranged from 2.39 x 10^4 cfu/g to 4.96 x 10^4 cfu/g while the total coliform count was noticed to greater than 160 MPN/g in *Nemipterus japonicus*, whereas the lowest count of 75 MPN/g in *Upeneus vittatus*. The pathogenic bacteria *Salmonella* spp., *Vibrio* spp. were mostly present in the collected samples. The findings of this study infer that the fish obtained from these sources contain potentially pathogenic microorganisms. Therefore the edible fishes should be properly cleaned and cooked before consumption to avoid health risks.

Key words: Microbiology · TPC · TCC · TFCC

INTRODUCTION

Fish is a very important source of high quality, balanced and easily digestible animal protein source. Fish has become an increasingly important source of protein and other element necessary for the maintenance and healthy body [1]. About 80% of animal protein in our diet comes from fish [2]. Consumption of improperly cooked fish may sometimes cause infection or intoxication, which is due to continuous exposure of the fish to the microbes present in the water and sediment and there would be influence of the microorganism on the external and internal surface of the fish. The Microbial population present in the natural environment is the source for fish to be polluted [3]. During transportation of contaminated fish to landing centres and wholesale markets, the microorganisms are transferred to the persons involved in the handling process [4]. The quality of fish is based on the physical, chemical and microbiological forms of deterioration are implicated [5].

The Fishing harbour of Visakhapatnam has special yard with modern facilities like ice manufacturing plants, display trays, trained personnel, electric balances and attractive packaging system available in harbour for selling and transportation of fish to different areas. Improper hygienic conditions and disposal of waste material favours the adaptability of microbial population to alter. Microbial contamination from environment may be transferred to the food products directly through surface contact by personnel, pests, air movements and cleaning regimes [6]. The aim of the study is to identify the microbial flora and pathogenic bacteria present in the 3 types of edible fishes like *Upeneus vittatus, Nemipterus japonicus, Priacanthus hamrur.*

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MATERIALS AND METHODS

In Visakhapatnam, middle East Coast of India the fishes like *Upeneus vittatus, Nemipterus japonicus, Pricanthus hamrur* are fished throughout the year and used of consumption as fresh and dried forms. These fishes are characterized as short lived, fast growing fishes with relatively high rates of natural mortality.

Collection of Fish Samples: Fresh fish samples were collected from fishing harbour during the early hours of the day between 7:00 and 8:00 AM and transferred to lab and processed within 1 hour. The fish sample is collected from the fish hold into a sterile aseptic container together with ice. For analysis of microbial population, 3 species of commonly edible fish were selected. *Upeneus vittatus* (Forsskal 1775) Yellow banded goat fish, *Nemipterus japonicus* (Bloch, 1791) Japanese threadfin bream and *Priacanthus hamrur* (Forsskal, 1775) Crescent tail Big eye are the fishes that were selected for present study [7, 8, 9]. Identification of fish was done according to Fish Base 2010(10). In the present study, five microbiological parameters for examination of sample fishes were considered which includes Total plate count (TBC), Total coliform counts (TCC) and qualitative analysis of *Staphylococcus* spp., *Vibrio* spp. *and Salmonella* spp.

Preparation of Sample: About 10 gms of muscle with skin is swabbed from the dorsal region with a sterile knife. The sample was crushed in a sterile mortar with 10 ml sterile water. From the crushed sample, 1ml of aliquot volume was measured and homogenized in a clean and dry sterile beaker containing 9 ml of distilled water giving a 1:10 dilution. This method is followed for all the 3 fish samples. Each sample was serially diluted and aliquots of each diluted sample were plated for microbiological count according to the APHA (11).

Microbial Count: An automatic colony counter is used for counting the number of colonies from cultured Petri plates and the count was expressed as Colony Forming Unit (cfu/g). The total count and faecal coliform bacteria were enumerated by using Most Probable Number (MPN) procedure.

RESULTS AND DISCUSSION

Tables 1 and 2 show the individual results of microbiological analysis conducted on selected 3 samples of fishes.Table:1shows the total bacterial count of the three fish samples. Comparative analysis of TBC and TCC showed great variation from species to species as shown in Fig.1. The highest count of TBC was found in *Nemipterus japonicus* 2.60×10^4 CFU/g and the lowest count 2.39×10^4 were found in *Upeneus vittatus*. The bacterial flora on freshly caught fish depends on the environment in which it is caught rather than on the fish species [12, 13].

The total coliform count as indicator organisms were found in almost all the samples of 3 fishes. The highest count of TCC (160MPN/g) found in *Nemipterus japonicus* and lowest count was found in *Upeneus vittatus* in samples. Almost all values exceed the IAMS [14] limits (100/g) for total coliform and 11/g for faecal coliform that infers on the supply of low quality fish in most of the fish markets. The presence of coliform group *E. coli* is in higher range, which indicates the contamination of the samples before or during handling processing and marketing [15].

Table 1: Total Plate Count of Bacteria and Total Coliform Counts in the 3 fish samples

Name of fish	Total Bacterial Count (CFU/g)	Total Coliform Counts (MPN/g)
Upeneus vittatus (Yellow banded Goat Fish)	2.39×10^4	75
Nemipterus japonicus (Japanese threadfin bream)	2.60×10^4	160
Priacanthus hamrur (Crescent tail big eye)	2.58×10^4	93

Table 2: Variants of isolates in the culture.

Organisms	*Upeneus vittatus*	*Nemipterus japonicus*	*Pricanthushamrur*
Vibrio	62	102	80
Salmonella	32	75	50
Shigella	10	22	20
Staphylococcus	40	52	56
Total	144	251	206

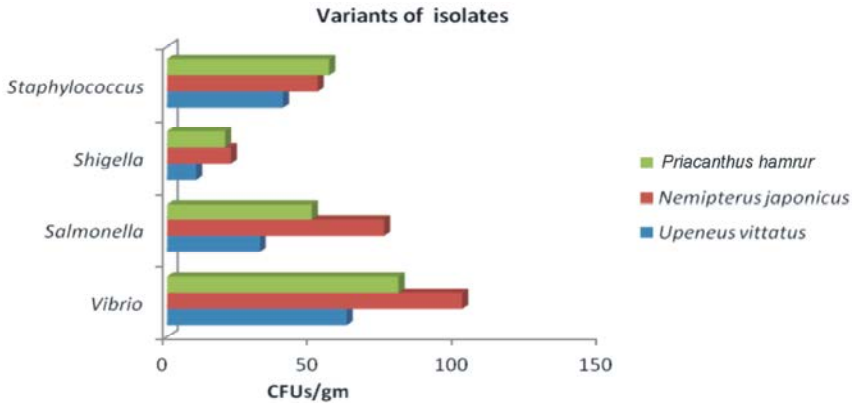

Fig. 1: Occurance of microbial isolates.

Presence of *Vibrio* spp. in the fish can cause infection to the consumer. In the present investigation, *Vibrio* spp. was studied qualitatively and was found in all the three fish samples. According to recommendation of International Association of Microbiology Societies, fresh and frozen fish should be free of *Vibrio* (0/g) [16]. The present study revealed that microbial quality was not good due to presence of Vibrio spp. in all the samples.

Salmonella spp. is highly pathogenic and this is the major reason for isolation from fish samples. In the present study, *Salmonella* spp. was examined qualitatively and was found in all the three fish samples. The results indicate the consequence of contamination +of the process, improper handling, hygienic and sanitary conditions of Visakhapatnam harbour. Drinking faecal contaminated water can also lead to an outbreak of the same. Fish harvested from such water can carry S*almonella* spp. [17, 18]. It has been shown that *Escherichia coli* and *Salmonella* spp. can survive for very long periods in tropical waters and once introduced may become adaptable to the new conditions favouring the growth of microorganism in the environment [19].

The presence of *S. aureus* indicates the contamination of the fish and its natural environment by the human beings and warm blooded animals. Clucas and Ward 1996 recorded the presence of *S. aureus* in natural micro flora of fish and shell fish. This suggests that fish was contaminated with this pathogen during the post harvest handling procedures [20,21].

The bacterial number and type found on frozen fish is dependent on many factors, of which source of the fish contributes the major factor [22]. It is therefore recommended that proper processing of frozen fish has to be carried out before consumption.

CONCLUSION

The microbial examination of the obtained results revealed that the presence of bacterial population was found to be higher than the approved safety standard by (BSI, FDAC) to overcome this situation, it is necessary to follow the code of practice concerning handling of the catch, icing, post-harvesting procedures and storage including depuration and hygienic measures. Therefore this study is intended to provide basic information about these micro-organisms when present in frozen fish and can lead to microbial infection and likely to cause food-borne diseases.

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