International Journal of Microbiology and Biotechnology
2017; 2(2): 102-105
http://www.sciencepublishinggroup.com/j/ijmb
doi: 10.11648/j.ijmb.20170202.17

Assessment of Bacteriological Quality in Selected Commercially Important Shrimps of Visakhapatnam, East Coast of India

Ramesh Babu K.[1, *], Govinda Rao V.[1], Krishna N. M.[1], Geetha S.[2], Kakara R. R.[3]

[1]Department of Marine Living Resources, Andhra University, Visakhapatnam, Andhra Pradesh, India

[2]Department of Microbiology, Andhra University, Visakhapatnam, Andhra Pradesh, India

[3]Central Institute of Fisheries Technology, Visakhapatnam Research Centre, Visakhapatnam, Andhra Pradesh, India

Email address:

krameshmlr@gmail.com (Ramesh B. K.), govind.v.mlr@gmail.com (Govinda R. V.), krishna.muddu217@gmail.com (Krishna N. M.), murthigeetha@gmail.com (Geetha S.), rushicift@gmail.com (Kakara R. R.)

[*]Corresponding author

To cite this article:

Ramesh Babu K., Govinda Rao V., Krishna N. M., Geetha S., Kakara R. R. Assessment of Bacteriological Quality in Selected Commercially Important Shrimps of Visakhapatnam, East Coast of India. *International Journal of Microbiology and Biotechnology.* Vol. 2, No. 2, 2017, pp. 102-105. doi: 10.11648/j.ijmb.20170202.17

Received: November 17, 2016; **Accepted**: February 8, 2017; **Published**: March 1, 2017

Abstract: The present study was carried out on microbial investigation to screening of pathogenic microorganism of selected commercially important shrimp samples *Parapenaeopsis stylifera* (Milne-Edwards, 1837); *Penaeus merguiensis* (de Man, 1888) *Penaeus japonicas* (Spence Bate, 1888) *Ganjampenaeopsis uncta* (Alcock, 1905) and *Penaeus indicus* (Milne Edwards, 1837) collected from fishing harbour of Visakhapatnam, east coast of India. The study was performed during the period of April 2015 to March 2016. Selectively, five commercially important shrimp were used to evaluate the quality of samples in terms of microbial content, using Agar plate method, Total Bacterial Count (TBC), Total coliform counts (TCC) was performed. The TBC ranged from $1.82X10^2$cfu/g to $3.23X10^2$cfu/g and TCC was found in between $2.14X10^2$ and $5.22X10^2$ whereas the total coliform count was not exceeded the acceptable limit recommended by FAO. The highly pathogenic bacteria *Salmonella sp., Vibrio sp.,* was found in the collected shrimp samples.

Keywords: TBC, TCC, Shrimps, Microbial Examination, East Coast of India

1. Introduction

Shrimp is one of the world's most popular shell fish and is mainly consumed in the Asian Countries. Shrimps are highly priced seafood delicacy, are cash crop grown mainly for the affluent export and urban markets. Seafood are an significant fraction of a healthy diet where they have high quality protein and other indispensable nutrients can be low in saturated fatty acids and may contain omega-3 fatty acids [1]. Screening of pathogenic microorganisms from commercially important marine fishes [2]. As the demand for fish is continuously increasing, making the required protein available to the existing population is a challenge [3]. The microbial load and the presence of the bacterial pathogens in seafood are a good indication of the food quality and the potential health risk they pose to consumers [4]. Pathogenic microbes usually are anaerobic forms harboured within the intestinal micro flora [5] which has a close connection, with micro-flora present in the environment. These are considered to be the major organisms contributing to the rapid deterioration of shrimp quality. Often, shrimp products are rejected for the export markets due to small size, bacterial load or chemical residue levels and are shunted to local markets [6]. Shrimp is a perishable product, and postmortem changes occur rapidly compared with those of fish. Rapid microbial spoilage during postmortem storage is a serious problem in shrimp processing [7]. Free amino acids and other soluble non-nitrogenous substances in shrimp serve as digestible nutrients for microbial growth [8]. In spite of the high demand, good flavor, and price of the blue shrimp muscle, studies and information about the postmortem changes and their impact on quality changes are scarce.

Shrimps deteriorate due to improper handling, and further

processing can never bring back its freshness. Low quality frozen foods are related with improper processing and poor hygienic conditions. Contamination in shrimp may be due to poor hygienic condition including inappropriate processing, preservation and storage condition [8] [9]. Consequently, shrimps may be contaminated with different types of bacteria such as *Vibrio sp*., *Salmonella sp*., *coliform*, *shigella sp*., *pseudomonas* and *Staphylococcus sp.,* those spoil fishes and are responsible for causing cholera and other food borne disease outbreaks [10], [11], [12]. The common species of bacteria occurring in fresh meat are *Pseudomonads, Staphylococci, Salmonella, Shigella, Vibrio* etc., and are largely a reflection of the microbial quality of the environment from where they have been isolated [13]. The Food and Agricultural Organization of the United Nations and the World Health Organization [14] state that illness due to contaminated food is perhaps the most widespread health problem in the contemporary world and an important cause of reduced economic productivity [15]. The present investigation attempted to quantify the pathogenic bacteria in the commercially important shrimp samples of Visakhapatnam fishing harbor, east coast of India.

2. Material & Methods

Sampling Area

The commercially important marine shrimp samples were collected in fish landing centre off Visakhapatnam and transported to the laboratory for further microbiological analysis during the period from March 2015 to January 2016. The four common shrimps are *Parapenaeopsis stylifera* (Milne-Edwards, 1837), *Penaeus merguiensis* (de Man, 1888), *Penaeus japonicas* (Spence Bate, 1888), *Ganjampenaeopsis uncta* (Alcock, 1905) and *Penaeus indicus* (Milne Edwards, 1837) were selected for the screening of microbial population. The selective shrimps were identified using standard taxonomic identification sheets [16].

10 gm of collected sample (Muscle) was homogenized through blending with 90 ml peptone water individually in sterile automatic blender and were serially diluted up to 10^{-6}). The sample (0.1 ml) was spread onto nutrient agar (NA) Eosin methylene blue agar (EMB) for analysis of total Bacterial count (TPC) Total Coliform Count (TCC), and Pseudomonas Agar, Salmonella / Shigella Agar (SSA), Thiosulfate Citrate Bile Salt Sucrose Sugar Agar (TCBS), and Manital Salt Agar (MSA) for, qualitative analysis of *Pseudomonas sp., Salmonella sp., Shigella sp., Vibrio sp., and Staphylococcus sp.,* counts respectively. After spreading, the plates were incubated at 37°C for 24 hours.

3. Results

The result of microbial quality assessment was conducted on five selected shrimps in Visakhapatnam fishing harbor, east coast of India. Table 1 showed the total bacterial counts and total coliform counts of different shrimp samples. Table 2 depicted the following status of the bacterial pathogens from different shrimp samples.

Table 1. *TBC and TCC isolated from collected shrimp samples.*

Samples Names	TBC	TCC
Parapenaeopsis stylifera	$2.56X10^2$	$4.82X10^2$
Penaeus merguiensis	$3.04X10^2$	$5.22X10^2$
Penaeus japonicas	$2.22X10^2$	$4.23X10^2$
Ganjampenaeopsis uncta	$3.23X10^2$	$5.22X10^2$
Fenneropenaeus indicus	$1.82X10^2$	$2.14X10^2$

The highly total count (CFU/ml) was reported in sampling of shrimp (5.9×10^3) compared to the other sampling count (Table 1). The highest count of TPC was found in *Ganjampenaeopsis uncta* $3.23X10^2$ CFU/g and the lowest count$1.82X10^2$ were found in *Penaeus indicus*. Indicator organisms as the Total Coliform Count (TCC) were found in almost all the samples of five shrimp, collected from Visakhapatnam fishing harbour. The highest count of TCC ($5.22X10^2$) found in *Penaeus merguiensis* and *Ganjampenaeopsis uncta* and the lowest count was found in *Penaeus indicus* samples.

Table 2. *Microorganisms isolated from collected shrimp samples.*

Bacterial Isolates	Frequency (%)	*P. stylifera*	*P. merguiensis*	*P. japonicus*	*G. uncta*	*P. indicus*
Pseudomonas sp	12 (28)	+	+	+	+	+
Salmonella sp	04 (9)	-	+	+	-	-
Shigella sp	06 (14)	-	+	+	+	+
Vibrio sp	08 (19)	+	+	+	+	-
Staphylococcus sp	13 (30)	+	+	+	+	+

Table 2 depicted the following status of the bacterial pathogens from the surface of different shrimp and prawn samples i.e. *Pseudomonas sp* [12 (28%)] and *Staphylococcus sp* [13 (30%)] were most frequently isolated being present in all samples, followed by *Vibrio sp*. [8 (19%)] and *Shigella sp* [06 (14%)] were found in almost all of the samples, whereas *Salmonella sp*. [4 (9%)] present only in *P. merguiensis* and *P. japonicas* respectively.

4. Discussion

The environment acts as main source of this organism in aquaculture products rather than poor standards of hygiene and sanitation. But external contamination may also be the source of the occurrence of these bacteria in fish and prawns [17]. The presence of indicator and other organisms examined in this

study is of special concern and perhaps the greatest danger associated with shrimps used for food preparation, eating purposes and for other human consumption is contamination by human excrement [18], [19]. The need for microbial assessment of shrimps and other seafood products processed and repackaged for human consumption to reduce possible contamination [20], [21]. The microbial studies on shrimps suggests that there is need to improve on hygienic and sanitary practices in public frozen seafood processing outlets in order to obtain relatively safe products for consumption. The presence of *Staphylococcus sp* and *Salmonella sp.* was also reported in sausages sold in Abeokuta and Benin-city, Nigeria in a similar study by [22]. According to [22] most of the sausage being sold as ready-to-food pose health risk to consumers, making it imperative to institute not only sanitary measures during its production and sales bit for retailers selling raw of pre-processed foods to have a steady source of power supply.

As the processing plants follow proper EU guidelines for handling, processing and storage of fish, polluted aquaculture environment might be responsible for the presence of *Salmonella sp.* Similarly [23] for Gulf shrimp and [24] for Bombay prawns both reported Achromobacter, Bacillus and Pseudomonas as the main groups present on fresh shrimp. The isolation and identification of bacteria from the surface of frozen seafood products were *Enterobacter aerogenes, Salmonella sp., Flavobacterium sp.* and *S. auerus* [25]. According to ICMSF guidelines, other bacteriological parameters were within the acceptable limits and total coliform limit is 1.0X10 CFU/g can be present in the food, but all of the shrimp and prawn samples were exceeding the limit. The presence of *S. aureus*, *Salmonella sp*. and *Shigella sp*., pathogenic organisms of public health concern and significance in these shrimp samples and these might have contaminated from source as a result of handling by processors. Improper handling and improper hygiene might lead to the contamination of sea foods and this might eventually affects the health of the consumers [26], [27], [28]. However, the processors/handlers/sellers should observe strict hygienic measures so that they will not serve as source of chance inoculation of microorganisms and contamination of these shrimp samples.

5. Conclusion

The present study concluded the local market shrimps from harbor boast enormous collection of pathogenic microorganisms. In view of these findings, this study recommended to pursue a proper guideline for the maintenance of microbiological quality of shrimps. Proper hygiene and sanitation should be maintained throughout the time period from capture and delivery to the consumers of the shrimps where thereby assist in the diminution of food borne disease.

Acknowledgements

The authors very thankful to Head of the department of Marine Living Resources, Microbiology and Environmental Sciences department, College of Science and Technology, Andhra University for providing facilities during the entire study period.

References

[1] Kakara RR, Geetha S, Muddula Krishna N, Govinda Rao V, Ramesh Babu K (2016). Microbial assessment of commercially important crabs from Visakhapatnam fishing harbour, east coast of India. *Europina Journal of Experimental Biology,* 6 (4): 57-61.

[2] Geetha S, Govinda Rao V, Muddula Krishna N, Ram Sai Reddy N, Ramesh Babu K (2014). Screening of pathogenic microorganisms from commercially important marine fishes of Visakhapatnam fishing harbour, east coast of India. *International Research Journal of Environment Sciences*, 3 (11): 47-51.

[3] Ra KR, Viji P, Sreeramulu K, Sreedhar U (2016). Proximate Composition and Heavy Metal Accumulation in Deep-Sea Crustaceans from Selected Stations in the Indian Exclusive Economic Zone (EEZ). *Fish. Technology,* 53: 155-161.

[4] Rosmini MR, Signorini ML, Schneider R, Bonazza JC (2004). Evaluation of two alternative technique for counting mesophilic aerobic bacteria in raw milk. *Food Control*, 15 (1): 39-44.

[5] Tannock GW (1995). Normal Microflora- An introduction to microbes inhabitating the human body. Chapman & Hall, London, 115p.

[6] Primavera JH (1994). Shrimp Farming in the Asia-Pacific: Environmental and Trade Issued and Regional Cooperation. In: Trade and Environment in Asia-Pacific: Prospects for Regional Cooperation. Workshop held in East-West Center, Honolulu, 23-25th September 1994. Tigbauan, Iloilo, Philippines: Aquaculture Department Southeast Asian Fisheries Development Center.

[7] Gokoglu N, Yerlikaya P (2008). Inhibition effects of grape seed extracts on melanosis formation in shrimp (*Parapenaeus longirostris*). International Journal of Food Science and Technology, 43: 1004–1008.

[8] Zeng QZ, Thorarinsdottir KA, Olafsdottir G (2005). Quality changes of shrimp (*Pandalus borealis*) stored under different cooling conditions. *Journal of Food Science*, 70 (7): 449–446.

[9] Frazier WC, Westhoff DC (1995). Food Microbiology. 4th ed. New Delhi: Tata McGraw-Hill publishing Company Limited. pp. 384-96.

[10] Dalsgaard T, Canfield DE, Petersen J, Thamdrup B, Acun Agonzalez Z (2003). N2 production by the anammox reaction in the anoxic water column of GolfoDulce, Costa Rica. *Nature*, 422: 606–608.

[11] Mobin SMA, Chowdhur MB, Islam MS, Uddin MN (2001). Status of bacterial flora in the intestine of two freshwater fish. *Bangladesh Journal of Life Science,* 13 (1&2): 149-155.

[12] World Health Organization (WHO) 2012. Alzheimers disease: the brain killer. Downloaded from http://www.searo.who.int/en/section1174/section1199/section1567/section1823-8066.htm on 26/7/2012.

[13] Yanar Y, Celik M (2006). Seasonal amino acid profiles and mineral content of green tiger shrimp (*Penaussemisulcatus*, De Haan, 1844) and speckled shrimp (*Metapenausmonoceros*, Fabricus 1789) from the Eastern Mediterranean sea. *Food Chemistry,* 94: 33-36.

[14] FAO/WHO Codex Alimentarius Commission., 2000. Recommended Codes of Practice: Shrimps/Prawns (CAC/RCP 17-1978); Quick Frozen Shrimps/Prawns (Rev. 1-1995).

[15] Edema MO, Omemu AM, Bankole MO (2005). Microbiological safety and quality of ready-to-eat foods in Nigeria. University of Agriculture, Abeokuta, pp: 26.

[16] Fischer W, Bianchi B (eds) (1984). Shrimps and Prawns. 5: 1-5. In FAO species identification sheets for fishery purposes. Western Indian Ocean.

[17] Huss HH (1994). Assurance of Seafood Quality. FAO Fisheries Technical Paper 334. Food and Agriculture Organization, Rome, 1994, 94, 97, 169.

[18] Edema MO, Omemu AM, Fapetu OM (2001). Microbiology and Physicochemical Analysis of different sources of drinking water in Abeokuta. Nigeria. *Nigerian Journal of Microbiology,* 15 (1): 57-61.

[19] Okonko IO, Adejoye OD, Ogunnusi TA, Fajobi, EA, Shittu OB (2008a). Microbiological and physicochemical analysis of different water samples used for domestic purposes in Abeokuta and Ojota, Lagos State, Nigeria. *African Journal of Biotechnology*, 7 (3): 617-621.

[20] Afolabi OR, Adams RF, Popoola TOS (2004). Comparative studies and Microbial risk assessment of fruit juices and fruit drinks available in the market. In: the Book of Abstract no. 59 of the 1st International Conference on Science and National Development, organized by COLNAS, UNAAB, from 25-28th October. p. 56.

[21] Fagade OE, Ogunjobi AA, Oyelade AA (2005). Microflora of noncarbonated orange drink. In: the Book of Abstract of the 29th Annual Conference & General Meeting (Abeokuta 2005) on Microbes As Agents of Sustainable Development, organized by Nigerian Society for Microbiology (NSM), UNAAB, from 6-10th November. p. 16.

[22] Oluwafemi F, Simisaye MT (2005). Extent of microbial contamination of sausages sold in two Nigerian cities. In: the Book of Abstract of the 29th Annual Conference & General Meeting (Abeokuta 2005) on Microbes As Agents of Sustainable Development, organized by Nigerian Society for Microbiology (NSM), University of Agriculture, Abeokuta, from 6-10th November. p. 28.

[23] Williams OBLL, Campbell J and Rees HB (1952). The bacteriology of Gulf Coast shrimp. I. Experimental procedures and quantitative results. *Texas Journal of Sciences*, 4: 49-52.

[24] Shaikhmahmud F, Magar NG (1956). Bacteriological study of Bombay Prawns (*parapeneopsis stylifera* Edw.). *Journal of Science Indian Research*, (India) Sect. C 15: 174-176.

[25] Okonko IO, Ogunjobi AA, Adejoye OD, Ogunnusi TA, Olasogba MC. (2008b). Comparative studies and Microbial risk assessment of different water samples used for processing frozen sea-foods in Ijoraolopa, Lagos State, Nigeria. *African Journal of Biotechnology,* 7 (16): 2902-2907.

[26] Amusa NA, Ashye OA, Aiyegbayo AA, Oladapo MO, Oni MO, Afolabi OO (2005). Microbiological and nutritional quality of hawked sorrel drinks (Soborodo) (the Nigerain locally brewed soft drinks) widely consumed and notable drinks in Nigeria. *International Journal of Food Agriculture Environment,* 3: 47-50.

[27] Omemu AM, Bankole MO (2005). Ready-to-eat (RTE) vegetable salad: effect of washing and storage temperature on the microbial quality and shel-life. In: the Book of Abstract of the 29th Annual Conference & General Meeting (Abeokuta 2005) on Microbes As Agents of Sustainable Development, organized by Nigerian Society for Microbiology (NSM), UNAAB, from 6-10th November. p. 28.

[28] Okonko IO, Ogunjobi AA, Fajobi EA, Onoja BA, Babalola ET, Adedeji AO (2008c). Comparative studies and microbial risk assessment of different Ready-to-Eat (RTE) frozen sea-foods processed in Ijoraolopa, Lagos State, Nigeria. *African Journal of Biotechnology*, 7 (16): 2898-2901.