

## LIST OF TABLES

| Table No.            | TITLE OF THE TABLE  | Page No. |
|----------------------|---|----------|
| <b>Table 1.1.</b>    | State wise details of shrimp production (2007-08)   | 2        |
| Table 1.2.           | RASFF notifications regarding the detection of <i>Vibrio</i> in processed fish and shrimp products imported into EU countries     | 8        |
| Table 1.3.           | RASFF notifications vis-à-vis the detection of <i>Vibrios</i> from processed seafood from India                                   | 9        |
| <b>Table 2.1.</b>    | Worldwide occurrence of <i>Vibrio</i> species in human clinical specimens   | 14       |
| Table 2.2.           | Diseases in marine fish and invertebrates caused by or associated with <i>Vibrio</i> species                                      | 31       |
| Table 2.3.           | PCR methods for <i>V.cholerae</i> , <i>V.parahaemolyticus</i> , <i>V.vulnificus</i> , <i>V.alginolyticus</i> and <i>V.harveyi</i> | 47       |
| Table 2.4.           | Multiplex-PCR methods targeting <i>V.cholerae</i> , <i>V.parahaemolyticus</i> , <i>V.vulnificus</i>                               | 48       |
| Table 2.5.           | Real-Time PCR methods for <i>V. cholerae</i> , <i>V.parahaemolyticus</i> , <i>V. vulnificus</i> and <i>V.alginolyticus</i>        | 51       |
| <b>Table 3.1.5.4</b> | Details of the primers used in the detection of pathogenic <i>Vibrios</i> by PCR  | 73       |
| Table 3.1.5.5.       | Details of the primers used for PCR typing of <i>V.cholerae</i>   | 74       |
| Table 3.1.5.6.       | Details of the primers used in Real Time PCR for <i>V.cholerae</i>  | 74       |
| Table 3.1.5.7.       | Composition of SYBR green jump start Taq ready mix for quantitative PCR (Sigma)   | 75       |
| Table 3.2.2.2.3.     | Details of the remaining clusters (figures) of Noguera and Blanch (2008) scheme for identification of <i>Vibrio</i> species       | 82       |
| Table 3.2.2.2.4.     | List of biochemical tests for <i>Vibrio spp</i> mentioned in the Bergey's manual of Systematic Bacteriology                       | 82       |
| <b>Table 4.1.</b>    | Total Plate Counts in <i>Penaeus monodon</i> hatcheries and aquaculture farms   | 110      |
| Table 4.2.           | <i>E.coli</i> counts in <i>P. monodon</i> hatchery and aquaculture samples  | 112      |
| Table 4.3.           | Mean <i>Vibrio</i> loads in <i>P. monodon</i> hatcheries and Aquaculture farms  | 113      |
| Table 4.4.           | Relative occurrence of sucrose fermenting and non-fermenting <i>Vibrios</i> in <i>P.monodon</i> hatchery and aquaculture samples  | 116      |
| Table 4.5.           | Incidence of pathogenic <i>Vibrios</i> in <i>P.monodon</i> hatcheries   | 119      |
| Table 4.6.           | The incidence of pathogenic <i>Vibrios</i> in hatchery water and post-larvae  | 119      |
| Table 4.7.           | The incidence of total pathogenic <i>Vibrios</i> in pond water,   | 121      |

|             |  |     |
|-------------|--|-----|
|             | sediment and shrimp  |     |
| Table 4.8.  | Incidence of pathogenic <i>Vibrio spp</i> in aquaculture farms   | 121 |
| Table 4.9.  | The distribution of pathogenic <i>Vibrios spp</i> in pond water, sediment and shrimp   | 122 |
| Table 4.10. | Pathogenic <i>Vibrio</i> cultures isolated from aquaculture farms and hatcheries used for biochemical characterization studies | 127 |
| Table 4.11. | Biochemical reactions of <i>V.cholerae</i> isolated from aquaculture farms   | 128 |
| Table 4.12. | Biochemical reactions of <i>V.vulnificus</i> isolated from shrimp hatcheries   | 131 |
| Table 4.13. | Biochemical reactions of <i>V.alginolyticus</i> isolated from shrimp hatcheries and aquaculture farms                          | 133 |
| Table 4.14. | Biochemical reactions of <i>V.parahaemolyticus</i> isolated from shrimp hatcheries   | 135 |
| Table 4.15. | Biochemical reactions of <i>V.harveyi</i> isolated from shrimp hatcheries  | 137 |
| Table 4.16. | Utilization of pentoses by pathogenic <i>Vibrios</i>   | 140 |
| Table 4.17. | Utilization of hexoses by pathogenic <i>Vibrios</i>  | 141 |
| Table 4.18. | Utilization of disaccharides by pathogenic <i>Vibrios</i>  | 142 |
| Table 4.19. | Utilization of sugar derivatives by pathogenic <i>Vibrios</i>  | 142 |
| Table 4.20. | Utilization of Glycogen by pathogenic <i>Vibrios</i>   | 143 |
| Table 4.21. | Utilization of amino acids by pathogenic <i>Vibrios</i>  | 143 |
| Table 4.22. | Amylolytic activity of pathogenic <i>Vibrios</i>   | 146 |
| Table 4.23. | Gelatin liquefaction by pathogenic <i>Vibrios</i>  | 147 |
| Table 4.24. | Proteolytic activity (gelatin) by <i>Vibrio</i> cultures isolated from shrimp culture system                                   | 148 |
| Table 4.25. | Proteolytic activity of pathogenic <i>Vibrios</i> on fish protein  | 149 |
| Table 4.26. | Proteolytic activity of pathogenic <i>Vibrios</i> on shrimp protein  | 151 |
| Table 4.27. | DNase activity of pathogenic <i>Vibrios</i>  | 153 |
| Table 4.28. | Tributyryn hydrolysis by pathogenic <i>Vibrios</i>   | 154 |
| Table 4.29. | Phospholipase activity of <i>Vibrio</i> cultures isolated from shrimp culture system   | 155 |
| Table 4.30. | Effect of temperature on the growth of pathogenic <i>Vibrio</i> cultures isolated from shrimp culture system                   | 157 |
| Table 4.31. | Effect of pH on the growth of pathogenic <i>Vibrios</i>  | 158 |
| Table 4.32. | Effect of salt on the swarming behaviour of <i>V.alginolyticus</i>   | 172 |
| Table 4.33. | Effect of salt on the utilization of Sucrose by pathogenic <i>Vibrio</i> cultures isolated from shrimp culture system          | 175 |
| Table 4.34. | Effect of salt on the utilization of Mannitol by of pathogenic <i>Vibrio</i> cultures isolated from shrimp culture system      | 177 |
| Table 4.35. | Effect of salt on the utilization of Cellobiose by <i>V.vulnificus</i>   | 179 |

|             |  |     |
|-------------|--|-----|
| Table 4.36. | Effect of salt on the Arginine dihydrolase activity of pathogenic Vibrio cultures isolated from shrimp culture system    | 180 |
| Table 4.37. | Effect of salt Lysine decarboxylase activity of pathogenic Vibrio cultures isolated from shrimp culture system           | 182 |
| Table 4.38. | Effect of salt on the ornithine decarboxylase activity of pathogenic Vibrio cultures isolated from shrimp culture system | 184 |
| Table 4.39. | Effect of temperature on the utilization of Sucrose by pathogenic Vibrio cultures isolated from shrimp culture system    | 186 |
| Table 4.40. | Effect of temperature on the utilization of mannitol by pathogenic Vibrio cultures isolated from shrimp culture system   | 187 |
| Table 4.41. | Effect of temperature on the utilization of Arginine by pathogenic Vibrio cultures isolated from shrimp culture system   | 189 |
| Table 4.42. | Effect of temperature on Lysine decarboxylase activity by pathogenic Vibrio cultures isolated from shrimp culture system | 190 |
| Table 4.43. | Effect of temperature on the utilization of Ornithine by pathogenic Vibrio cultures isolated from shrimp culture system  | 192 |
| Table 4.44. | Quantity Calculations of Real time PCR of <i>V.cholerae</i>  | 231 |
| Table 4.45. | Melting temperature calculation of the Real Time PCR products  | 233 |