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Characterization studies of gill-specific crustin isoform (MjCRS) and WAP four-disulfide core domain-like gene (MjWFDC-like) in kuruma shrimp *Marsupenaeus japonicus*

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Summary

専攻 Major	APPLIED MARINE BIOSCIENCE	氏名 Name/Student No.	GAURAVKUMAR M. TANDEL 1661006
論文題目 Title	Characterization studies of gill-specific crustin isoform (MjCRS) and WAP four-disulfide core domain-like gene (MjWFDC-like) in kuruma shrimp <i>Marsupenaeus japonicus</i> クルマエビ <i>Marsupenaeus japonicus</i> エラ特異的クラスチンおよび WAP four-disulfide core domain 様遺伝子の研究		

Fisheries and aquaculture have played a significant role in human diet, both in present and past time. In present time, aquaculture has become one of the important million-dollar industrial practice. Asia play a major role in world shrimp aquaculture industry where Southeast Asian countries account 60 % in total production. Much of the livelihoods are generated through this million-dollar industry in this region. However, this industry has been under constant threat of various bacterial and viral disease outbreak. Hence, studying shrimp innate immunity has become an important aspect in searching for an effective method to control and prevent the contraction and spread of infectious diseases in culture pond. Currently, many shrimp immunity studies have been conducted based on EST sequence analysis finding many putative immune genes. The previous microarray analysis of the immune-related organ of kuruma shrimp *Marsupenaeus japonicus* generated many EST sequences from its gill tissues. These EST sequences showed putative crustin antimicrobial peptide containing WAP domain and WFDC domain containing sequences from different crustacean species in NCBI GeneBank database. Majority of previously conducted crustin studies were mainly focused on its identification and characterized from crustaceans hemocyte. On the other hand, while writing this, NCBI GeneBank database showed some 8428 nucleotides hits of “WAP domain” in animal species suggesting numerous existences of WFDC domain containing sequences of medically, as well as other commercially, important animal species. However, they are not well studied, and little functional information is available. Thus, this dissertation aims to identify and characterize crustin and WFDC-like genes from the gill tissues of kuruma shrimp, *M. japonicus*.

Chapter 1 provides the background information focusing on the economic importance of world shrimp aquaculture industry and Asian shrimp aquaculture contribution in the total world shrimp aquaculture production. A detail of major shrimp viral diseases have been provided and a brief explanation of the different solution approaches such as prevention, detection and treatment for the diseases is given. Further, our current understanding of shrimp immunity has been explained and why studying shrimp innate immunity is important as a part of preventative measure has been discussed. Antimicrobial peptides (AMPs), the important humoral immunity component of shrimp has been presented with its biological significance and its current understating of molecular mechanism. A detail description of crustin AMPs, their different types, biological significance are provided. The application of EST and microanalysis assay technologies have been discussed in the last part of the chapter and some of the studies conducted by these technologies in shrimp immunity have been presented.

Chapter 2 provides the detail description of new gill-specific crustin isoform MjCRS8 and MjCRS9 discovery from kuruma shrimp *M. japonicus*, its molecular cloning and characterization.

Chapter 3 emphasis on the finding of another new gill-specific crustin isoform MjCRS7 and a new gene named MjWFDC-like and their comparative sequential analysis.

Chapter 4 presented sequential analysis of type 2 crustin isoform, MjCRS6, showing its presence solely in gills tissue by tissue distribution analysis.

Lastly, chapter 5 provides the general conclusion of newly identified crustin isoform MjCRS6-9 and a new gene MjWFDC-like presented in chapter 2,3 and 4 from kuruma shrimp *M. japonicus*. Together, the results of this study provide the basis to hypothesis the different origin of crustin based on the its presence solely in gills.