学 位 論 文 の 要 旨

論文題目　Molecular genetic variation and fisheries of *Mesopodopsis orientalis* (Crustacea: Mysida) in Indonesian waters, with remarks on fisheries of *Acetes* (Crustacea: Decapoda)
（インドネシアに産する浮遊性小型食用甲殻類の漁業及びアミ類 *Mesopodopsis orientalis* の種内分子変異）

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Edible crustaceans belonging to mysids (Crustacea: Mysida) were studied on their molecular analysis and fisheries in Indonesia during 2008 to 2012. The fisheries of *Acetes* (Crustacea: Decapoda) were also involved in this study as remarks because these organisms were found together with mysids.

Samples were obtained by field samplings and buying fresh and dried materials and shrimp paste at local markets across Indonesia for fisheries purposes. In addition to fisheries matter, interview surveys were conducted and fishery data obtained from public offices and processing industries. A variety of sampling gears were employed to collect these crustaceans based on the purpose of this study, such as: plankton-net, push-net, lift-net, scoop-net and boat-seine, and also depended on the type of sampling sites.

The molecular analysis was conducted on *Mesopodopsis orientalis*, as a main fishing target. A total of 458 base pairs (bp) of partial fragment sequences of *COI* region were determined for 136 specimens collected from 10 sites. All sequences were unambiguously aligned, revealing 37 haplotypes. Haplotype diversity (h) and nucleotide diversity (π) were 0.8036 ± 0.0273 and 0.0089 ± 0.0049, respectively. Phylogenetic analyses of the mitochondrial *COI* showed that *M.*

orientalis involves several stem lineages, which are genetically divergent at a high level and were subsequently divided into two clades in phylogenetic trees. Haplotypes of *M. orientalis* population from Indonesia differed from those of Malaysia and Thailand, and formed different clades in the phylogenetic trees. A maximum parsimony tree showed that Indonesian clades are closer to Thailand`s than to Malaysian`s, which may refer to what has happened during the Pleistocene glacial period. The haplotype network also indicated the presence of two genetic clades, Clades 1 and 2 separated from each other by two nucleotide substitutions. Concerning genetic diversity within each local population, the number of haplotypes was polymorphic. Concerning genetic differentiation among populations, average sequences differences (d_A) of 22 of a total 45 pairs were significant after sequential Bonferroni corrections. Haplotype compositions differed among populations, although these populations were divided into two genetic groups. The AMOVA testing significance of Groups 1 and 2 demonstrated that genetic differentiations were significant. Consequently a series of DNA analysis for haplotype sequences of *COI* gene showed the presence of a geographical barrier that separates the two distinct genetic groups across between Java-Madura and Bali-Kalimantan Island systems in Indonesian waters.

There was no exact information regarding the peak seasons of mysids, but they were available in brackish and salt ponds throughout a year. *Acetes* was caught throughout all seasons, but the peak fishing season varied depending on the locations of the fishing grounds and the alternation of monsoons. Fishing time for mysids and *Acetes* was either day or night, but the best time for fishing was during darkness, either at dusk or dawn. The catches and values of a mixture of mysids and *Acetes* ("rebon") fluctuated year-by-year and there was much greater annual catch at the sea than in brackish ponds. The catch of "rebon" in Madura was highest of all locations surveyed, which was about 4 tons/day with the value of Indonesian Rupiah (IDR) 15,300,000 (about 1,700 US$) / ton in the peak fishing season from February to March. The economically

important species of mysids were *Mesopodopsis orientalis* and *M. tenuipes*. In *Acetes* the following species were fishing targets: *A. indicus*, *A. serrulatus*, *A.erythraeus*, *A. sibogae sibogae, A. japonicus,* and *A. vulgaris.* They were all used for making fermented shrimp pastes called "terasi". There were three types of shrimp pastes in terms of its composition; 1) a mixture of mysids and *Acetes*, 2) *Acetes* only, and 3) mysids only. The price at market for "rebon" and "terasi" varied depending on the quality of the product and the locality. Dried and fresh "rebon" were sold for IDR 5,000 to 15,000/kg (US$ 0.6 - 1.7/ kg), whereas "terasi" for IDR 3,000 - 40,000/kg (US$ 0.3 - 4.4/ kg).

The sustainability of mysid and *Acetes* fisheries depends on exact fisheries statistics and consideration of the genetics of target species.