



# 論文内容の要旨

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## 題 目

Population dynamics, reproduction, and shell nacre characteristics of an alien freshwater mussel, *Sinanodonta woodiana*, collected from different elevations in West Java, Indonesia

インドネシア Java 島西部の異なる標高に生息する淡水産二枚貝 *Sinanodonta woodiana* の個体群動態, 繁殖, および貝殻真珠層の特徴

Indonesia is well known as a tropical country with a megadiversity. A total of 57 valid species were recorded in Indonesia, reflecting 4.8% of the number of freshwater bivalve species diversity worldwide, and 12 species are alien. Research on alien mussels and treatment are urgently warranted to manage environmental health. Fifty years ago, the alien freshwater mussel *Sinanodonta woodiana* was accidentally introduced into Indonesia with freshwater fish and spread rapidly across the islands. Furthermore, people never harvest this mussel from nature because they consider it not economically worthless. Knowledge of its distribution, growth pattern, life cycle, and nacre shell color and microstructure from lower to high elevations is helpful for fisheries utilization and ecological conservation. The present study explored distribution, reproductive activity, and growth patterns for the predicted invasiveness of this species in the ecosystem. Furthermore, we analyzed the nacre color and microstructure of the inner shell to improve the half-pearl quality produced in their nacre for effective culture.

Our studies revealed that the successful recruitment of *S. woodiana* across elevations with reproductive activity continued throughout the year (3 – 4 times/year), with a high number of larvae per gravid mussel ( $22.3 \times 10^4 - 90.2 \times 10^4$ ). They changed the gender from female to hermaphrodites under environmental pressure in low chlorophyll-a and high suspended solids concentrations. The midland area showed the highest number of larvae per gravid mussel at  $90.2 \times 10^4$  and the fewest number of hermaphrodites mussel at 10% of the total samples. In addition, shell biometric analysis

allowed us to conclude that *S. woodiana* trends protandry. Furthermore, the distribution data showed that the mussel was found in 78.6% of the 56 study locations across elevations. Midland areas showed the highest density of 5.63 ind/m<sup>2</sup>, dominated by medium shell sizes at 100 – 150 mm, and the largest number of cohorts (13 cohorts). The growth von Bertalanffy analysis recorded that they have a long life of 12 – 15 years, with a maximum shell length of 165.3 – 225.9 mm. Accordingly, the continuous growth of *S. woodiana* will significantly increase the density of the species that would occupy the habitat, and eliminate the native species, especially in midland elevations.

Nevertheless, *S. woodiana* has economic potential for producing half-pearl in its nacreous shell, which are gold, yellow, and silver in color. The posterior shell area is a nacre with a strong gold color, which is a high yellowness index, a thicker whole nacre layer, and thinner tablet nacre thickness. Mussels from the midland elevations displayed strong gold-colored nacre with a high yellowness index and high brightness. In addition, shells from a high TSS environment (>10 mg/L) were correlated with abundant freckles in the nacre ( $R = 0.51$ ;  $p < 0.001$ ), a thin whole nacre layer, lowest yellowness index and brightness, and the freckles can decrease quality of pearl. Our nacre shell analysis indicates the best half pearl culture in midlands elevations, posterior shell positions, and low TSS environment (< 10 mg/L).

Our findings highlight the successful recruitment and rapidly increasing population of *S. woodiana* under environmental pressure and across elevations. Hence, we recommend controlling the spread of the population by 1) periodically harvesting with a community-based management strategy to limit the impact of its invasion in Indonesia; 2) producing freshwater half-pearls from the species to add economic benefit and maintain continuous regular harvesting (6 or 12 months) for control in the natural environment; 3) enact legislation to raise public awareness and rule ecologically viable measures to minimize the spread of the species; and 4) integrated research, management, and implementation at the national and regional levels are required to control this species in the Indonesian freshwater ecosystem.

(備考) 日本語 (2000 字以内) または英語 (500 ワード以内) にまとめて記載してください。