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Nacre growth and thickness of Akoya pearls from Japanese and Hybrid *Pinctada fucata* in response to the aquaculture temperature condition in Ago Bay, Japan

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ABSTRACT

This study examines whole nacre thickness and monthly growth of pearls of Akoya pearl oyster, *Pinctada fucata*, which came from Japanese and hybrid strains and relate them to the water temperature of the aquaculture site in Ago Bay. Whole nacre thickness of the pearls was significantly different between Japanese and Hybrid strains (Student's *t*-test, p-value < 0.01), pearls of Japanese strain tend to be thicker than those of Hybrids. This is due to different nacre growth rate between the two strains especially in summer, Japanese strain grew faster than Hybrid in August until November (Student's *t*-test, p-value < 0.01), even though there was no significant difference in December when both strains showed very slow growth of pearl nacre due to the low water temperature. Monthly nacre tablet thickness of pearls of Japanese strain was thicker than that of Hybrid in August, September and November (Student's *t*-test, p-value < 0.01) but no significant difference in November and December. The result of this study shows that pearl nacre growth and thickness are related to the water temperature of the aquaculture site. The fact that both oysters have different range of optimum temperature to grow leads to the possibility of different quality of pearls from both strains since whole nacre thickness, nacre growth and nacre tablet thickness can determine the quality of pearls.

Statement of relevance: The findings of this study will redound to the benefit of commercial aquaculture of pearl oyster in the world generally, and in Japan especially considering that cultured pearl is one of the important aquaculture products in Japan and some other Countries.

1. Introduction

During summer 1994, a mass mortality devastated Japanese pearl oysters, *Pinctada fucata*, in the western part of Japan. This mass mortality has been occurring annually almost every summer since then. In 1996 and 1997, the loss of Japanese pearl oysters in the western region of Japan was over 400 Billion oysters. This created a huge negative impact to the Japanese pearl industry (Miyazaki et al., 1999).

Due to the loss of such a vast number of Japanese pearl oysters, pearl farmers started to import Chinese pearl oysters, *P. fucata* ssp., that came from Hainan Island in the southern part of China (Wada, 1997). This pearl oyster was believed to have a higher survival rate during summer than the Japanese strain. However, the quality of pearls they produce is generally low (Miyazaki et al., 2000).

Shortly after the introduction of Chinese pearl oysters, Japanese and Chinese oyster strains were hybridized in an effort to breed a new strain that could show strong survival in high temperatures yet being able to produce high-quality pearls as well. This new strain survived well in summer, even though their pearl quality is still poor when compared with Japanese strains (Miyazaki et al., 2000).

Both the ability to survive in high temperature periods and to produce high-quality pearls are believed to be related to how the oysters react to temperature changes. Previous studies have proven that mortality of oysters caused by the Akoya disease rose as the water temperature rose, and vice versa (Miyazaki et al., 1999; Wada, 1999; Morizane et al., 2001; Wada, 2007). Conversely, the quality of pearls decreased dramatically as the temperature increased (Miyazaki et al., 1999). The relation of pearl quality to temperature has also been confirmed by FAO (1991), since temperature controls the Metabolic Rate (MR) of the mollusks in general. Higher temperature leads to faster growth in oysters and higher rate of nacre deposition.

According to Wada (1999), the laminar structure and the thickness

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