



## Post-operative care of implanted pearl oysters *Pinctada fucata* in low salinity seawater improves the quality of pearls



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### ABSTRACT

Current techniques for culturing the Akoya pearl oyster *Pinctada fucata* result in low yields of blemish-free, round pearls (high-quality pearls). We compared the effects of five factors on the proportion of high-quality pearls produced during culture using a generalized linear model (GLM). Two factors were physiological, shell-closing strength (SCS) and the whole wet weight of host pearl oysters, and three factors were procedural, post-operative care method, technician, and nucleus diameter. Our results suggest that post-operative care methods have the most significant effect on increasing the proportion of high-quality pearls. The proportion of high-quality pearls was five-fold higher in the group held in low salinity seawater than in the conventional treatment group. We propose a new post-operative care method in which oysters are immersed in low salinity seawater to increase the production of high-quality pearls.

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### 1. Introduction

Current methods for culturing pearls result in low yields of high-quality pearls (Norton et al., 2000; Kripa et al., 2007). The minimum requirement for a high-quality pearl is that it be round and have no blemishes (Matlins, 1996; Wada, 1999; Akamatsu, 2003; Kripa et al., 2007). The commercial value of pearls is decreased by the presence of deformities and blemishes (Matlins, 1996; Norton et al., 2000; Akamatsu, 2003; Kripa et al., 2007; Ogimura et al., 2012). Deformed pearls have projections or humps. Although blemishes do not affect the shape, they are visible as bluish black or dark brown spots. Minimizing or preventing such deformities and blemishes is one of the most important technical issues currently facing the industry.

Pearl culture consists of four steps (Wada, 1999; chapter 8 by Taylor and Strack, Southgate and Lucas, 2008): 1) pre-operative conditioning, 2) nucleus implantation (hereafter, implantation), 3) post-operative care, and 4) culturing and harvest. A number of studies have evaluated methods for implantation and post-operative care and have resulted in improvements in pearl quality (Norton et al., 2000; Ruiz-Rubio et al., 2006; Atsumi et al., 2011). During implantation, nuclei and mantle grafts are embedded into the gonad of host oysters (Cochennec-Laureau et al., 2010). Proper post-operative care minimizes extrusion

of the nuclei soon after implantation and reduces the occurrence of abnormal pearls (Uemoto, 1962; Wada, 1999; Akamatsu, 2003). During post-operative care, the host oysters are placed into small mesh nets that are suspended in the sea in areas that do not experience strong currents or rapid changes in salinity and temperature and held for 1 to 2 weeks after implantation.

The quality of pearls is influenced by at least five factors: post-operative care method (Uemoto, 1962; Hayashi, 2008; Atsumi et al., 2011), the competency of the technician performing the implantation (Nava et al., 2000; Atsumi et al., 2011), the shell-closing strength (hereafter, SCS) of the host oyster (Aoki et al., 2010a), the whole wet weight of the host oyster, and the nucleus diameter (Hasuo, 1961; Funakoshi et al., 1991).

We recently developed a new post-operative care method that increased the proportion of blemish-free, round pearls (hereafter, high-quality pearls). Immersion in low salinity (25 psu) seawater just after implantation (hereafter, the low salinity treatment) resulted in a significantly higher proportion of high-quality pearls than from oysters that were immersed in the sea (hereafter, the conventional treatment) during the post-operative care period (Hayashi, 2008; Atsumi et al., 2011). SCS is the maximum load value needed to open the shell of the pearl oyster to 10 mm with a shell opener. This index is useful as an indicator of an individual oyster's health and physiological condition (Okamoto et al., 2006a; Okamoto et al., 2006b; Aoki et al., 2010b). The unit of SCS is kilogram-force (kgf), where 1 kgf is approximately equal to 9.8 N (SI unit). Aoki et al. (2010a) noted that the proportion of high-

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