PART 1

PEARL OYSTER HEALTH AND INDUSTRY

1.1 Why the interest in pearl oyster health?

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The multibillion dollar value pearl oyster industry, which is growing throughout southeast Asia, Australia, India, the Middle East and South America, is based entirely upon shellfish health. The pearl itself is a product of the immune defenses of the mollusc, which rally to wall off any indigestible irritation to the soft-tissues (Sparks, 1985; Awaji and Suzuki, 1995). All molluscs possess this ability, however, certain species, such as the Pteridae of the South Pacific, produce pearls of gem quality. Since significant energy is required to lay down this defensive pocket of calcium carbonate and protein, the most productive pearl oysters are those that are in good health with access to the energy reserves required (Numaguchi, 1996).

In the wild, pearl production is a random event, with environmental conditions and physiological stresses on individual oysters playing a key role in the quality of the end product. Human intervention, in the form of pearl culture, reduces the uncertainty and waste in searching for "wild pearls" and has evolved into a multibillion dollar industry, with various shapes, sizes and colours of pearls being produced with consistent quality (Fassler, 1998).

The pearl oyster industry shares commonalities with edible mollusc aquaculture world wide, on top of which the end product, pearl production, is unique to the sector.

Increasing pearl culture means an increased demand for pearl producing oysters, with certain species and stocks being exploited more heavily than others. It also means that cultured oysters receive greater handling than non-cultured oysters. This has led to greater awareness and monitoring of oyster health and survival – a positive step for selecting the fittest stocks or individuals for pearl surgery. However, the same handling and monitoring presents a physiological stress that the oyster would not normally face in the wild (Dybdahl, Harders and Nicholson, 1990).

The energy requirements for pearl production have to be carefully balanced against the need to handle and grow the oysters in conditions they did not evolve to fit (Dybdahl, Harders and Nicholson, 1990). This balancing act is simplified if no additional factors, such as overcrowding (Intés, 1994), overfishing (Sims, 1992 a,b) or disease (Dybdahl, Harders and Nicholson, 1990) enter the equation. Interestingly, pearl oysters have not yet faced the types of contagious disease agents which have plagued mollusc culture elsewhere in the world. Most disease problems center upon opportunistic pathogens taking advantage of oysters weakened by the stress of handling, including

PLATE 1.1.1
Species of pearl oyster which produce pearls of gem quality

COURTESY OF S.E. MCGLADDERY

COURTESY OF M.G. BONDAD-REANTASO

Gold-lip or silver-lip pearl oyster (*Pinctada maxima*) producing the "white" South Sea cultured pearls

COURTESY OF S.E. MCGLADDERY

COURTESY OF M.G. BONDAD-REANTASO

Black-lip pearl oyster (*Pinctada margaritifera*) producing the "black" South Sea cultured pearls

COURTESY OF F.C.J. BERTHE

COURTESY OF F.C.J. BERTHE

Nucleus implantation in Akoia oysters (*Pinctada fucata*)

pearl surgery and sub-optimal growing conditions (Dybdahl, Harders and Nicholson, 1990; Sims, 1990; Rio-Portilla, Re-Araujo and Voltolina, 1992; Buestel *et al.*, 1995). The lack of contagious disease problems, although an unquestionable blessing, has also left the industry with relatively minimal pathology support or a good reference of information documenting normal versus abnormal parasites, pest and diseases for the various species cultured (Sims, 1990; Joll, 1992). Since increased development of the industry will, inevitably lead to pressure to select oysters from more and more remote sources (Wada, 1993, 1996; Benzie, 1994; Fassler, 1994, 1998; Sims and Sarver, 1994; Numaguchi, 1995) and sub-optimal growing areas (Gervis and Sims, 1992), this increases the risk of accidental disease introduction or induction. Both remote sources and mixed stocks enhance the chance of introducing a pathogen to a naïve or vulnerable (stressed) population (Sindermann, 1986; ICES, 1995) and the best defense against such an unwanted event is a solid knowledge of the health profiles of the animals on a culture site, as well as those from source sites.

Once an epizootic occurs in an aquatic habitat, the chances of eradication and control are limited. In fact, there are no examples, to date, of any molluscan disease agent being actively eradicated from an open-water system. This is important to remember when conducting risk-benefit analyses for new species, stocks, growing techniques or habitats. It is also an important fact to remember when mortalities are observed and quick health management action is required.

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