Food and Agriculture Organization of the United Nations

Proactive approach proved key to survival for the **Australasian Pacific oyster industry**

Since 2008 Pacific Oyster Mortality Syndrome (POMS) has emerged as a significant threat to the Pacific oyster industry globally. The disease was first detected in Australia and New Zealand in 2010.

The Australian industry is located in three states: New South Wales (NSW), Tasmania and South Australia, which produce up to 10 500 tonnes per year of Pacific oysters, *Magallana gigas* (previously classified as *Crassostrea gigas*). Hundreds of growers operate across the three states, using hatchery-reared spat as the basis for their production.

The first Australian outbreak of POMS, a disease caused by an Ostreid herpesvirus, occurred in NSW, which was contributing about 5 percent to the national production of this species. In 2016, POMS spread to Tasmania, which was contributing about 35 percent to national production and was home to all the large-scale hatcheries. The POMS virus was found in South Australia, the other major producing state, in 2018 but has yet to infect farms.

POMS is a major challenge to Pacific oyster growers globally and threatened to decimate the Australian industry and its many small scale growers

In 2004, well before the arrival of POMS, the Australian Pacific oyster industry had established its own independent breeding company, Australia Seafood Industries Pty Ltd. (ASI), to improve oyster survival and marketable traits such as shell shape and meat quality. Through ASI, the industry was able to pool its resources and secure government grants for a genetic improvement programme that would have been unaffordable for any individual grower. Although ASI was based in Tasmania and worked with the Tasmanian hatcheries it conducted performance trials of families in all producing states.

When POMS was first identified in Australia in 2010, ASI refocused its programme to breed for POMS resistance. Biosecurity regulations designed to stop the spread of POMS restricted the initial resistance breeding efforts. Nevertheless, ASI was able to make significant progress over the next four years with funding assistance from the Australian Government and collaboration with research and government agencies.

After three years of initial research into breeding resistance, ASI predicted that it could achieve 70 percent survival for one-year-old oysters in a POMS outbreak by 2018. However, additional funding was needed to accelerate the breeding programme to reach this target. In 2014, ASI and industry leaders were able to achieve the support necessary by getting grower support for a levy on all industry spat sales. The levy recognised that improved genetics would benefit the industry as a whole.

When POMS first occurred in Tasmania in 2016, it devastated the local industry, with survival rates on some farms falling as low as 5 percent. However, oysters in ASI trials in Tasmania's infected areas demonstrated 60–80 percent survival. Paradoxically, at the time the programme was most needed, ASI's business model was temporarily disrupted with the hiatus in spat sales following the Tasmanian outbreak; this resulted in a significant loss of levy income. A one-off government subsidy helped to keep ASI afloat during this time. Prior to the demonstration of POMS resistance in ASI oysters in 2016, commercial use of ASI genetics was not widespread; underpinning no more than 25 percent of national production. Following the POMS outbreak in Tasmania there was an immediate increase in the use of ASI broodstock to 100 percent in this state; however, usage remained lower in NSW and South Australia. The availability of POMS-resistant oysters is credited with saving the industry from collapse.

By 2017, spat from broodstock with a POMS survival rate of 80 percent for one-year-old oysters was available to growers. By 2020, the survival rate of the ASI strain at one-year-old had risen to 100 percent and the breeding programme was working to improve spat survival, with a target of 70 percent by 2022.

Strong heritability for POMS resistance and high selection intensity for the trait enabled a rapid and predictable response to selection

The availability of the POMS-resistant strain allowed the Tasmanian Pacific oyster sector to return to previous production levels within three years. However, the outbreak in Tasmania and related biosecurity restrictions created a secondary issue that has had a more severe and longer-lasting impact on growers in South Australia. South Australia produced about 60 percent of the national oyster production but had limited hatchery capacity; Tasmania produced 90 percent of spat for the industry nationally. Following the POMS outbreak in 2016, biosecurity measures meant Tasmania could no longer sell spat to South Australia or to uninfected areas of NSW. South Australia has subsequently increased its hatchery capacity, but the state has lagged behind its pre-POMS production levels for five years, despite suffering no direct infection.

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NSW production also declined more severely as a result of restrictions on spat supply rather than disease. Despite this, the state remains reliant on Tasmanian hatcheries due to the relatively small size of its Pacific oyster sector. New biosecurity protocols have allowed spat supplies to resume but production continues to lag behind previous levels.

New Zealand was also affected by POMS and, at the time, had a similar market-focused breeding programme in operation through the Cawthron Institute, an independently endowed research organisation. Wild spat collection dominates production systems in New Zealand, but the Cawthron programme worked closely with those growers interested in transitioning to hatchery spat. In 2010, it refocused its breeding programme to prioritise POMS resistance. Over the next six years the Cawthron Institute was able to increase spat survival in a POMS outbreak to 80 percent. This success also led to increased use of hatchery spat, which rose from 25 percent of commercial production in 2010 to 40 percent by 2021.

The pre-existing industry breeding programme enabled the industry to rapidly pivot to breeding for disease resistance

In summary, good foresight and strong industry leadership underpinned the establishment of breeding programmes for Pacific oysters in both Australia and New Zealand. Both programmes were in place before the POMS threat emerged and had well-established collaborations with industry, government and research organizations. These factors proved critical in developing POMS-resistant oysters which were quickly deployed into commercial oyster farms. Industry ownership or partnerships also helped to attract government funding in the initial development of POMS-resistant strains and allowed the growers as a whole to share the benefits of genetic improvements. Although the breeding programmes still attract public funding, their business models have evolved in a way that they are no longer dependent on this funding source.