13th October 2019

# Pacific Oyster Mortality Syndrome (POMS): Fact Sheet 4 - update

## Water temperature, season and disease expression

Pacific Oyster Mortality Syndrome (POMS) is a serious disease of Pacific oysters that is caused by infection with *Ostreid herpesvirus 1* (OsHV-1). Research supported by FRDC, oyster farmers, Hornsby Shire Council and the University of Sydney has focussed on how water temperature influences the disease. This is fact sheet was initially produced to support a POMS emergency response in Tasmania in 2016 and was updated with new information in 2019.

### POMS disease expression in NSW

The first outbreaks in NSW occurred when water temperatures were approximately 23-24°C. OsHV-1 established in these estuaries and outbreaks of POMS have recurred each summer. Based on monitoring over 5 years, outbreaks in NSW have not commenced until water temperatures reached or exceeded 20°C in spring and they continued intermittently until it fell below 17 °C in autumn[1]. Examples are shown in Figure FS4.1. These temperatures are much higher than the POMS threshold in France, which is about 16°C. The reason for the difference between Australia and Europe is unknown, but it suggests temperature is not the only factor.

### POMS disease expression in Tasmania

Preliminary analysis of water temperatures recorded on an affected oyster farm at lower Pitt Water revealed average daily water temperatures of 20-21°C when the outbreak began in 2016. Average daily water temperature at the farm exceeded 20°C since early December 2015. Water temperatures in Tasmania that summer were up to 2°C warmer than during the previous summer. Water temperatures in oyster farm leases across Tasmania were on average up to 4°C cooler than in oyster farm leases in South Australia and New South Wales for corresponding periods (Figure FS4.1).

### Experimental findings on water temperature

The importance of water temperature was confirmed in controlled laboratory experiments[2,3,4] by injection of OsHV-1 into oysters acclimated to different temperatures. Mortality was nil at 14°C, 23% at 18°C, 77% at 22°C and 84% at 26°C. At 18°C there was no mortality in individuals injected with a low dose of virus whereas at the higher temperatures, oysters challenged with the low dose died. Viral replication was slower at the lower temperature. Increases in water temperature after non-lethal infection at 18°C did not lead to death. Oysters conditioned by exposure to the virus at 18°C survived when later challenged at 22°C. These results have important implications for predicting and managing disease outbreaks caused by OsHV-1, and with further research and development may be exploited commercially.

### Summary

Mass mortality due to POMS is recurrent, seasonal and temperature dependent. There may be differences between regions in the permissive temperature ranges. Based on preliminary assessments of field outbreak data and experimental data in Australia, average daily water temperatures above 20°C are extremely risky for POMS. Other factors may be important to explain the seasonality of POMS, and these factors may vary between regions. Further research is required to increase confidence in use of water temperature data for risk assessments.

[1] Whittington RJ, Liu O, Hick PM, Dhand N and Rubio A (2019). Long-term temporal and spatial patterns of *Ostreid herpesvirus 1* (OsHV-1) infection and mortality in sentinel Pacific oyster spat (*Crassostrea gigas*) inform farm management. Aquaculture 513: 734395 https://doi.org/10.1016/j.aquaculture.2019.734395

[2] de Kantzow M, Hick P, Becker JA and Whittington RJ (2016). Effect of water temperature on mortality of Pacific oysters *Crassostrea gigas* associated with microvariant ostreid herpesvirus 1 (OsHV-1 µVar). Aquaculture Environment Interactions 8: 419-428.

de Kantzow MC, Whittington RJ and Hick P (2019). Prior exposure to *Ostreid herpesvirus 1* (OsHV-1) at 18 °C is associated with improved survival of juvenile Pacific oysters (*Crassostrea gigas*) following challenge at 22 °C. Aquaculture 507:443-450.

de Kantzow MC, Whittington RJ and Hick PM (2019). Different in vivo growth of ostreid herpesvirus 1 at 18 °C and 22 °C alters mortality of Pacific oysters (*Crassostrea gigas*). Archives of Virology https://doi.org/10.1007/s00705-019-04427-2.

**Figure FS4.1. Average daily water temperatures on multiple oyster farm leases in New South Wales, Tasmania and South Australia during 2014-2016. The times of onset are shown for the first POMS mortality events seen in 2014 and 2015 in NSW, and for the Tasmanian outbreak in 2016. The dashed line is at 20°C, above which there has been high risk of mass mortality.**