Sydney Rock Oyster Breeding Program Update

SEPTEMBER 2022

The Sydney Rock Oyster breeding program started in the 1990s to increase industry productivity, provide management options to industry in times of oyster diseases, and establish a platform to respond to future needs and threats such as climate change.

The current industry goal is to produce commercial oysters with greater than 70% survival through one QX disease outbreak and 30% faster growth without changing meat condition when compared to a wild oyster.

The latest selected lines on DPI research leases from September 2022 show 80% survival through one QX outbreak, 20% faster growth, and no change to meat condition compared to wild Sydney Rock Oysters.

How the breeding program works

Oysters used to establish the Sydney Rock Oyster breeding program were collected from across NSW. There are now more than 200 pedigree families in the breeding population.

Representatives from each family undergo performance trials to assess growth, QX disease survival and meat condition. The top performing families across all traits are used to create the next generation. Annual family breeding runs are done at DPI Port Stephens Fisheries Institute during spring and summer. The goal for each breeding run is to produce 30-50 new families for each year class. The year class denotes the year that families were produced. The year runs from July 1 through to June 30. Examples of Sydney Rock Oyster families are shown in Figure 1.

DPI works with geneticists at CSIRO to formulate breeding strategies based on industry advice. All data for the breeding program is housed in a customised data management system designed by CSIRO.

Families for industry use

Currently, DPI provides broodstock families to hatcheries after the families they wish to use have been selected from the CSIRO data management system. All families were available for commercial use by aquaculture permit holders until the outbreak of QX disease in Port Stephens in 2021. The QX disease biosecurity closure restricts some hatcheries accessing Port Stephens broodstock. Hatcheries that cannot receive stock from Port Stephens can access representatives of some families held in NSW estuaries not impacted by QX disease. A commercial hatchery run requires a minimum of two families. Pedigree data allows inbreeding levels to be calculated and managed.

Figure 1: Family broodstock in Wallis Lake. These families are from year class 2016. They were grown on the same lease, using the same cultivation techniques, presented side by side to illustrate the influence genetics has on their growth and general appearance. Image: Select Oyster Company

There are several private sector hatcheries that can produce, and supply Sydney Rock Oyster spat spawned from selected families. See this link for details: https://www.nswoysters.com.au/spat-availability.html

There is a $3/1000 spat service fee charged at the point of exit from a commercial hatchery for producing selected lines of spat in a hatchery. This system is currently under review by the Sustainable Sydney Rock Oyster Breeding Program Reference Group.

For access to details of families for commercial hatchery production either through an online CSIRO site or from DPI contact Michael Dove (phone: 04916 3807 or email: Michael.dove@dpi.nsw.gov.au)

Figure 3: Sydney rock oyster breeding line commercial broodstock inspection. Image: Select Oyster Company

Latest performance results for QX resistant Sydney Rock Oysters

Estimated breeding values (EBVs) are calculated for each family in the breeding program and represent a family's genetic potential for the traits under selection. EBVs take into account the pedigree and performance data of a family in relation to QX survival, growth and meat condition. The EBV is expressed as a percentage and represents the difference between the family's genetics and the genetic base it is compared to. In the Sydney Rock Oyster Breeding Program EBVs are compared to a non-selected, or wild, Sydney Rock Oyster. Ten percent is added to the EBV for QX survival to account for 10% of wild oysters surviving a typical Georges River QX disease outbreak.

The Sydney Rock Oyster breeding program has made significant genetic progress for QX survival. The top ten families have an average EBV of 80% survival through one QX disease event and grow 20% faster without a change in meat condition compared to wild Sydney Rock Oysters. However, QX survival is reduced with two seasons of disease exposure. Growth is considered an important trait for QX survival as it can enable oysters to be harvested before a second exposure providing the timing of spat deployment is at the end of the QX infection period.

Figure 2 shows differences in QX disease survival depending on the selection history over two seasons of QX disease exposure (8/2/2017 to 9/7/2018) at Lime Kiln Bar in the Georges River.

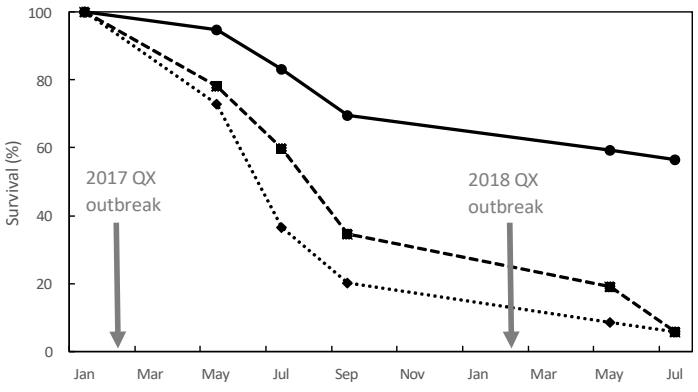


Figure 2. QX disease survival (%) over two QX disease exposures in the Georges River. The solid line shows families with parents from QX Disease Resistance lines, the dashed line shows families with parents from Fast Growth lines and the dotted line shows families with parents from wild or non-selected oysters.

To minimise losses attributable to QX disease it is recommended to nursery rear spat in estuaries not impacted by QX disease and transfer spat to estuaries affected by QX disease when infections of the disease-causing agent *Marteilia sydneyi* have ceased.

Richmond River oysters are incorporated into the breeding program

Richmond River Sydney Rock Oysters were used as parents to create new families in 2020. These families are available for industry to use for commercial hatchery production.

Sustainable Sydney Rock Oyster Breeding Program Reference Group

The NSW Shellfish Committee established the Reference Group in 2021. It is tasked with informing the DPI of industry needs and goals for the breeding program and a business plan to support the sustainable growth of the breeding program. Contact Emma Wilkie 0428 764 310 for information about the Group and to provide input.

Figure 4: Sydney rock oyster family lines being surveyed. Each section of a tray holds one family line. Image: Select Oyster Company

NSW Farmers Association support

NSW Farmers will oversee the recruitment and administration of an extension officer to extend the outputs of the breeding program and liaise with producers and hatcheries. The Oyster Committee, in consultation with the Reference Group, will guide the operations of the extension officer.

Oyster farmer's experiences

Farmers have shared their experiences, good and bad, with the selected Sydney Rock Oyster stock from estuaries that have experienced QX disease outbreaks.

Macleay River QX update

"Following on from the black summer fires the Macleay River had two blackwater events. Then there was a flood in March 2020, and we started seeing a lot of mortality in our wild Sydney Rock Oyster stock. The oysters were tested and QX disease was detected as the cause of the mortality. This resulted in a loss of about 90% of our wild stock. About 50% of my stock was selected lines (QX resistant) stock, which had 31% mortality, and some of those losses were due to blackwater, not QX disease".

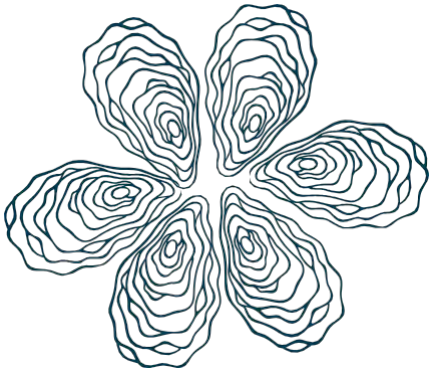
Port Stephens QX update

"Some growers in Port Stephens are disappointed with the selected lines of Sydney Rock Oysters as they've experienced high stock mortality (up to 80%) from the double hit of recent QX outbreaks. It's not a commercially viable product for us at this time, but hope that now the breeding program broodstock lines have also had these hits of QX in Port Stephens, resistance will improve, including resistance to two seasons of QX".

Hawkesbury River QX update

"We use only QX resistant selected lines now. QX is an ongoing issue for us and we find the selected lines have about 50-60% survival, including in stock that's about 2.5 yr old. We're finding the most recent stock we've got is slightly better with higher survival. This stock is about 18 months old now. We work the stock moving from bags downstream to trays upstream to get the most out of it. Growth rates are excellent".

"We are happy with the selected lines of Sydney Rocks. We nurse them in Brisbane Waters and move them to Hawkesbury for fattening, so we're lucky we can manage the stock so it only gets one hit of QX disease, and around 30% mortality. Generally wild caught stock is tougher for example it can stay out of the water for longer periods of time and have better condition. But we notice with each generation of family lines, the growth is excellent and condition is improving".



Additional DPI information regarding Port Stephens

A QX disease outbreak was confirmed in Port Stephens for the first time in September 2021, followed by a reoccurrence in February 2022. Thanks to the diligence of farmers, DPI have been able to support the industry in taking steps to respond to QX. DPI are running surveillance and research work on QX window of infection periods and transmission pathways. It has been an extremely challenging time for farmers, with reports of high levels of oyster loss not only in wild stock but in selected line stock too.

QX disease in Port Stephens has restricted industry access to key broodstock in the breeding program due to the QX disease biosecurity closure. QX has also occurred in Cromarty Bay, Port Stephens where DPI broodstock are held providing the opportunity to use QX survivors for the 2022 year class breeding run. The QX survival performance test in Georges River is being run over two seasons of QX exposure (2021 and 2022 seasons).

Additional QX survival trials using families from the upcoming breeding run can also be done in locations impacted by QX disease in Port Stephens.

NSW DPI are currently monitoring survival of sentinel commercial lines produced in December 2021 and placed in Tilligerry Creek, Karuah and Cromarty Bay in mid-March and September of 2022. NSW DPI are working with farmers to monitor stock performance. Aquatic Biosecurity has secured FRDC funding to research the QX window of infection in Port Stephens. This work has been underway since May 2022. Investigations into alternate hosts for the disease are also underway investigating plankton and polychaete worms.

MORE INFORMATION

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- **Emma Wilkie:** t: 0428 764 310 | emma.wilkie@dpi.nsw.gov.au
- DPI Aquatic Biosecurity
- DPI Aquaculture Permit Holder Website
- DPI QX Disease
- NSW Oysters