

SCIENCE
Stage 3 Living World

Growth and survival of living things

How do physical conditions affect growth and survival of living things?



This resource supports the Georges Riverkeeper Stage 3 Education Module 7: Aquatic Food Webs and Life Cycles

Outcome: examines how the environment affects the growth, survival and adaptation of living things ST3-4LW-S

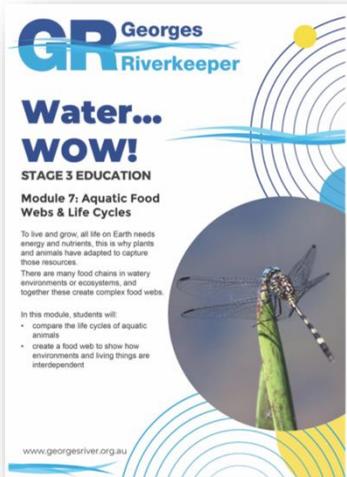
Focus Question: How do physical conditions affect the survival of living things?

Learning Intentions: I can identify some of the causes that lead to poor water quality in rivers and how they affect oysters and dragonflies.

Success Criteria: I can list some of the ways Aboriginal people (or First Nations people) and early settlers used oysters in the past. I can recall the impacts on the survival of oysters in the Georges River. I understand the role of macroinvertebrates in the Georges River.

Overview:

There are signs that recent management strategies along the Georges River are having positive effects in the water quality. Less pollutants are being discharged into the river by industries and the rehabilitation of riverine vegetation has improved biodiversity. After the decimation of oysters in the river over the last 250 years, it is unlikely that the oyster industry will return in the foreseeable future. However, recently mud oysters have returned to the Georges River and jellyfish and soldier crabs have recently been sighted ([source](#) 2018). Physical conditions, such as water quality, are critical to the survival of living things in the Georges River. Oysters are a valuable environmental indicator and sometimes referred to as the ‘canary of the estuary’ or ‘keystone species’, indicating the overall health of the river ecosystem ([source](#)). Macroinvertebrate sampling can also provide a rapid assessment of the health of the aquatic ecosystem.



Aboriginal and Torres Strait Islander Histories and Cultures



Traditional Aboriginal uses of oysters

Shell middens dating back at least 6,450 years prove that oysters have been a valuable food resource for Aboriginal people ([source](#)). There were heaped piles of oyster shells in what are known as middens on the sandy shores of the rivers. Enormous numbers of shells, from oysters which Aboriginal people had gathered from the rocky shores or the trunks or aerial roots of mangroves, suggest that eating was a social time, with many people participating together, in places to which they returned frequently. These oysters were large and plentiful. When Lieutenant Cook landed in Botany Bay in 1770, he commented they were ‘the largest he had ever seen’ and would have been mud oysters (*Ostrea angasi*) and not rock oysters. Check out the [Oysters NSW Snapshot](#) to see the different oyster types.

Aboriginal people shared food with the settlers years later. One report suggested Biddy Giles “gathered native honey and oysters” to share. The pressure of these two settler desires - to taste home on their lips by eating oysters and to build homes over their heads with lime made from oyster shells – led to the decimation of the local stock of Sydney oysters ([source](#)).



Aboriginal people have used oyster and turban shells to make fishhook. They were either C- or J-shaped and curved to a point but not barbed, and attached to a line made from two strands of flax or bark fibre twisted together. A small stone was attached to the line to act as a sinker. No bait was put on the hook but chewed shellfish were spat out on the surface of the water to attract fish. The pearl lustre of the shell would have acted as a lure. Photo: Aboriginal shell fish hooks ([Source](#)).



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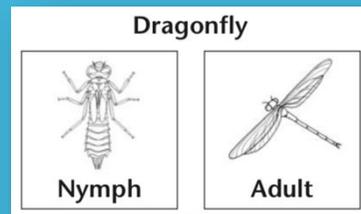
What has affected the living things in the Georges River?

Oysters - After 200 years of settlement, the Georges River estuary had NSW's second most productive oyster industry, but around the world there was growing recognition that pollution from industry and urbanisation were threatening the waterways. In the 1990s, the Georges River oyster industry was decimated, all commercial fisheries were closed and restrictions on recreational fishing were imposed. The Georges River oyster industry suffered major losses in the mid-1990s from QX disease, a protozoan parasite, *Marteilia sydneyi*, which is harmful to oysters but not to humans. The oysters were killed by the QX disease, but only after being weakened by years of sewage, toxins, dredging and acid sulphate sediments contaminating the river ([source](#)).

Water bugs or aquatic macroinvertebrates are small creatures that have no backbone and can be seen with the naked eye. They live all or part of their life in water, providing a food source for larger animals such as fish, frogs and birds. Macroinvertebrates include snails, beetles, dragonflies, and yabbies. Different water bugs have different tolerances to pollution and can therefore provide an indication of the health of waterways. A healthy waterway will have an abundance and wide diversity of water bugs ([source](#)).

ACTIVITY 1: Make a lifecycle of a dragonfly out of natural materials.

Flying insects such as dragonflies, mosquitoes and midges spend most of their life underwater. Adults lay their eggs in water and the juveniles live, eat and grow underwater, emerging as flying adults. Aquatic macroinvertebrates develop in a variety of ways, with 3 or 4 stage life cycles ([source](#)). Watch this amazing [video on a dragonfly nymph](#) emerging from the water and turning into a dragonfly. Take a walk outside to grab some natural materials to make a dragonfly lifecycle with. Take a photo of the finished product.



ACTIVITY 2: How can we investigate the role of oysters?

The Georges River Environmental Education Centre (GREEC) in collaboration with Elisa Bone, have been working with Bonnet Bay and Como Public Schools to engage the students in the study of the health of their local waterways. Elisa Bone, who has worked as a science adviser for the Billion Oyster Project with New York students, talked about the ways that the local rivers have changed since European settlement. She also spoke about the roles that oysters play in Aboriginal lifestyles, their ecological role, and about their decline and potential restoration. Students were shown the filtration capacity of oysters filtering the river water in tanks. Then the students worked with different types of natural materials to build 'oyster houses' to test in the Woronora River. The field trip also included visiting oyster farmers in Woolaware Bay. Students conducted water quality testing, looked at some organisms such as algae, bryozoans, worms and snails under field microscopes, and discussed the ecological goals of the seawall modifications at Carrs and Dover Parks. Photo: Carrs Park



ACTIVITY 3: Macroinvertebrates sampling in a pond



Macroinvertebrates occupy a central position in the food webs of rivers and streams. Sampling reveals information about the abundance, diversity and composition of water bugs. This in turn gives an indication of the health of the waterway. Abundance refers to the number of animals present. Diversity refers to the number of different types of animal present. NSW Waterwatch have created a [Teacher's Guide](#) and [Junior Student Guide](#) to macroinvertebrate sampling. Sampling can be as simple as using a kitchen strainer attached to a broom stick and dipping it into a pond. Use the [Water Bug ID Posters](#) to identify the macroinvertebrates you have found.



These are free water education resources for teachers and students about water in the Georges River catchment in South Sydney, and more generally, in Australia. These education modules have been prepared for Stage 3 in primary schools.

They cover facts for kids about drinking water, water uses, the water cycle, water pollution, water conservation, rainfall, drought, floods, aquatic food webs, and how to measure water conditions using waterbugs, plus much more.

www.georgesriver.org.au/learn-about-the-river/schools

There are many different stakeholders and landowners in the Georges River Catchment who all have a responsibility to manage their land in a way that ensures there is a minimal impact on the river and its ecosystems.

Georges Riverkeeper's Members:



Georges Riverkeeper's Partners:

