LA TROBE UNIVERSITY

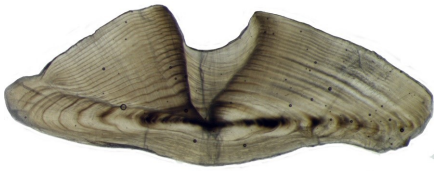
Centre for Freshwater Ecosystems

Fact Sheet

MMCP Collaboration

How does river flow and temperature affect growth of Murray cod and golden perch?

This project, is one of five research themes that make up MMCP. This research theme investigated how variation in annual flows and temperature combine to affect growth rates of Murray cod and golden perch.



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Background

Fish are:

- Indicators of the ecological outcomes arising from environmental flows under the Murray –Darling Basin (MDB) Plan.

  ⇒ A Basin Plan objective is to improve the number of individuals in a population that survive from one year to the next—we wish to improve 'survival'.

- Survival is difficult to measure, so indicators of survival that are easier to measure would be useful.

  ⇒ Growth may be an indicator of survival.

Otoliths to measure growth

We assessed:

- Long-term patterns in growth rates of fishes using 'otoliths', which are fish ear bones.
- Otoliths are comprised of concentric rings—like growth rings in a tree—that tell us how quickly a fish was growing during a certain year.

We measured:

- Growth histories of golden perch and Murray cod using otoliths.
- Otoliths were collected from the Gwydir, Lachlan, Murrumbidgee, Edward-Wakool, Goulburn and Lower Murray River Systems.

Management implications

This study highlights:

- The importance of high flows—including floods—to the productivity of Murray cod populations.

  ⇒ However, given the annual flows that lead to optimal growth vary with age, interannual variation in annual flow is important for productivity of Murray cod populations as a whole.

- In light of current forecasts for drought frequency and magnitude, as well as air temperatures for the Basin, the present research indicates climate change poses a significant threat to the recruitment and overall productivity of Murray cod populations.

Project team

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Key findings

We found no evidence for any effect of annual flow or temperature on golden perch growth. This is likely due to the difficult of relating annual flow and temperature measurements taken from a few, fixed locations in the MDB, to the growth of a mobile fish species whose movement patterns are not completely understood.
Growth of Murray cod—a more sedentary species—showed significant and strong relationships with annual flow and temperature:

- Growth of adult (greater than 5-years old) and late juvenile (3-5 year-olds) cod increased with annual flow.
- Growth of early juvenile (1 and 2-year-olds) peaked at intermediate mean flows; a pattern that may be driven by increasing surface area of slackwaters at intermediate flows.
- The optimal temperature for cod growth became warmer as fish aged.

Findings and recommendations

Species	Findings		Recommendations
	Annual discharge	Temperature	
Golden	• Inconclusive	• Inconclusive	• NA
Murray cod	• Showed age-specific responses. • Growth of early juveniles (1+ and 2+) peaks at median annual discharge in all rivers, and declines at flows lower or higher than the median.Growth of late juveniles (3+ to 5+) and adults (>5+) increases linearly with annual discharge.	• Showed age-specific responses. • The annual temperature (mean daily maximum air temperature) at which maximum growth occurred increased with age, such that growth was maximal at 23 °C, 24 °C and 26–27 °C in early juveniles, late juveniles and adults, respectively.	• No single level of annual discharge optimal throughout lifetime, so interannual variability in flows must be maintained over the long term. • Delivering flows that increase surface of slackwater habitat will enhance growth during early juvenile stage. • Delivering flow pulses that increase annual discharge may increase growth of late juvenile and adults. • Current climate forecasts for the MDB, coupled with this work, indicate that the forecast rate of warming poses a significant threat to early juveniles, hence recruitment.

Further information

MMCP Collaboration (MMCP) is a project supported by the Joint State Governments and the Murray-Darling Basin Authority to generate and adopt freshwater ecological knowledge through collaboration, to maintain research capability and contribute supporting science to underpin the Basin-Wide Watering Strategy.

MMCP Collaboration Final report: doi.org/10.26181/5d19927544b20
Fish growth report: doi.org/10.26181/5d1ead54d10d9

Other publications: doi.org/10.1111/fwb.13061

Other fish growth factsheets: doi.org/10.26181/5c63a34ad3a6b

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