

## Using a population model to conserve a harvested threatened species



### Background

Murray Spiny Crayfish (*Euastacus armatus*) is the second largest freshwater crayfish in the world and holds high cultural, economic and social values. Once widespread and abundant throughout the Murray River system of south-eastern Australia, the species has suffered dramatic declines in range and number since the 1950s. Murray Spiny Crayfish is threatened by river regulation, habitat loss and harvest over-exploitation. While commercial harvest for the species was banned in the late 1980s a recreational fishery remains.

The species is found in a wide range of habitats, from small upland streams to large lowland rivers, showing a preference for clean, fast-flowing water with abundant and complex structural (woody) habitat. Murray Spiny Crayfish plays a key role in the structure and functioning of river systems through the transfer of nutrients within foodwebs and movement of debris within rivers. The cray is long-lived (> 25 years), extremely slow-growing, late-maturing (8-9 years) and has limited mobility. These unique biological and ecological characteristics make the species particularly vulnerable to harvest over-exploitation.

For almost 20 years, the Murray-Darling Basin Authority (MDBA) and research scientists from the Arthur Rylah Institute (ARI, DELWP) have monitored the health of the Murray River through The Living Murray (TLM) program. This research helps improve our understanding of species' ecology and how harvest affects population dynamics and species persistence. This includes the use of mathematical models to predict how species respond to specific threats and management scenarios.

### Current Harvest Regulations

The current harvest regulations for Murray Spiny Crayfish in Victoria, include:

- a restricted harvest season (July 1 – August 31)
- a restricted harvest zone (Murray River and tributaries below Hume Weir downstream to Tocumwal)
- bag limit (2/person/day, max. of 4 in possession)
- harvestable slot limit length (HSSL – 100 to 120 mm, Occipital Carapace Length: OCL), and
- a ban on possessing egg bearing females.

### Project aims

The current project was undertaken with the aim of collecting field data on Murray Spiny Crayfish to improve species management and conservation. Data will be incorporated within an established crayfish population model to assess potential risk from harvest pressure and harvest strategies.

### Methods

Murray Spiny Crayfish were monitored in winter 2017, when they are most active. Munnyana nets were baited with ox liver and set at specific locations along the Murray River at Barmah-Millewa National Park.

Field data was used to analyse changes in abundance and changes in sex-ratios in response to different harvest pressures and harvest strategies. Four harvest levels (0.1, 0.2, 0.3 and 0.4, representing 10, 20, 30 and 40% of crayfish captured and kept) were chosen to represent fishing pressures expected to occur in the wild. Harvest strategies included male only, female only and combined sex catch. Changes in population

parameters were used to highlight the utility of current harvest regulations in the management and conservation of Murray Spiny Crayfish.

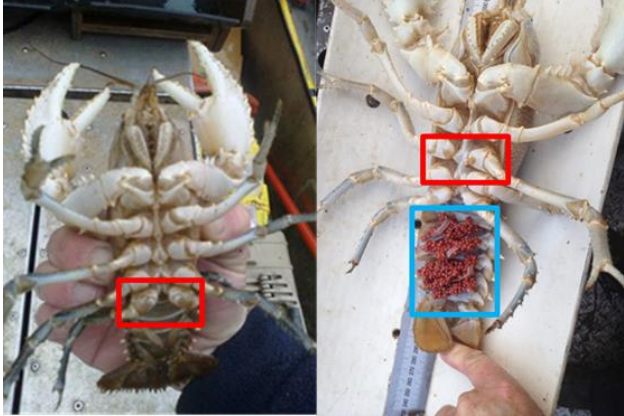


Figure 1: Male (left) and female (right) adult Murray Spiny Crayfish. The sexes are distinguished by the location of reproductive openings (gonopores) which in males is on the fourth pair of walking legs and on the second pair of walking legs in females (red rectangles). Fertilized eggs are entrained by setae on the abdomen of females (blue rectangle). Photo: Scott Raymond, ARI).

## Key findings

Our research found that:

- 1) increasing fishing pressure resulted in increased risk of the population declining to a small number of individuals
- 2) crayfish abundance declined most rapidly under the combined male and female harvest strategy (current harvest regulations) compared with a male only strategy, and
- 3) sex-ratios became more biased with increasing fishing pressure as more females were captured and kept.

Our findings provide valuable insights into the likely impacts of the current regulations and options to reduce impacts from harvest. We suggest that:

- 1) the current HSLL be increased to account for higher risk posed by current harvest regulations and

- 2) a harvest strategy which allows only males to be caught and kept represents the least risk to the species persistence.

Mathematical models continue to provide valuable insights into how best to manage and conserve threatened species such as Murray Spiny Crayfish.

## Future studies

Further research should focus on:

- identifying relationships between environmental variables (e.g. flows) and abundance and distribution
- changes in population structure over time, and
- movement patterns, recruitment and survivorship.

## Project partners

This project involves strong collaboration across a range of partners including:

- Department of Environment, Land, Water and Planning (DELWP) and Arthur Rylah Institute
- Murray-Darling Basin Authority (MDBA)
- Goulburn-Broken Catchment Management Authority
- Wangaratta Sustainability Network
- Victorian Fisheries Authority, and
- interested community members who continue to advocate for healthy crayfish communities across the southern Murray-Darling Basin.

Partnering with relevant stakeholders has been essential to foster ownership in sampling and assisting in the recovery of Murray Spiny Crayfish in north-eastern Victoria.

## Funder

This project was funded by the MDBA through 'The Living Murray' (TLM) initiative.

## Contact:

[Scott.raymond@delwp.vic.gov.au](mailto:Scott.raymond@delwp.vic.gov.au)



### Disclaimer

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

## Accessibility

If you would like to receive this publication in an alternative format, please telephone the DELWP Customer Service Centre on 136186, email [customer.service@delwp.vic.gov.au](mailto:customer.service@delwp.vic.gov.au), or via the National Relay Service on 133 677 [www.relayservice.com.au](http://www.relayservice.com.au). This document is also available on the internet at [www.delwp.vic.gov.au](http://www.delwp.vic.gov.au).