# Scoping the knowledge requirements for Murray crayfish

**Dean Gilligan, Rob Rolls and Phil Duncan (NSW DPI)**

**John Merrick and Jim Kohen (Macquarie University) and Mark Lintermans (Environment ACT)**

# Murray crayfish (*Euastacus armatus*)

- Popular recreational fishery in Southern Basin.
- Despite social importance, virtually no published research.
- Data exists as:
  - Unpublished departmental manuscripts or data.
  - Student theses.
  - Short articles published outside of peer-reviewed scientific journals.
- General perception that Murray crayfish have declined in distribution, size and abundance.
- Lack of data availability limits the ability to develop management strategies.

# Objectives

- Review and synthesize existing knowledge on the ecology and management of Murray Crayfish.
- Present unpublished NSW data.
- Undertake a review of traditional ecological knowledge.
- Identify existing knowledge gaps and prioritise areas for future investigations.

# Literature search

- Literature was sourced by:
  - Reviewing the reference lists of known outputs
  - Electronic literature databases
  - Departmental reports and data-sets
  - Student theses

# 12 primary studies identified

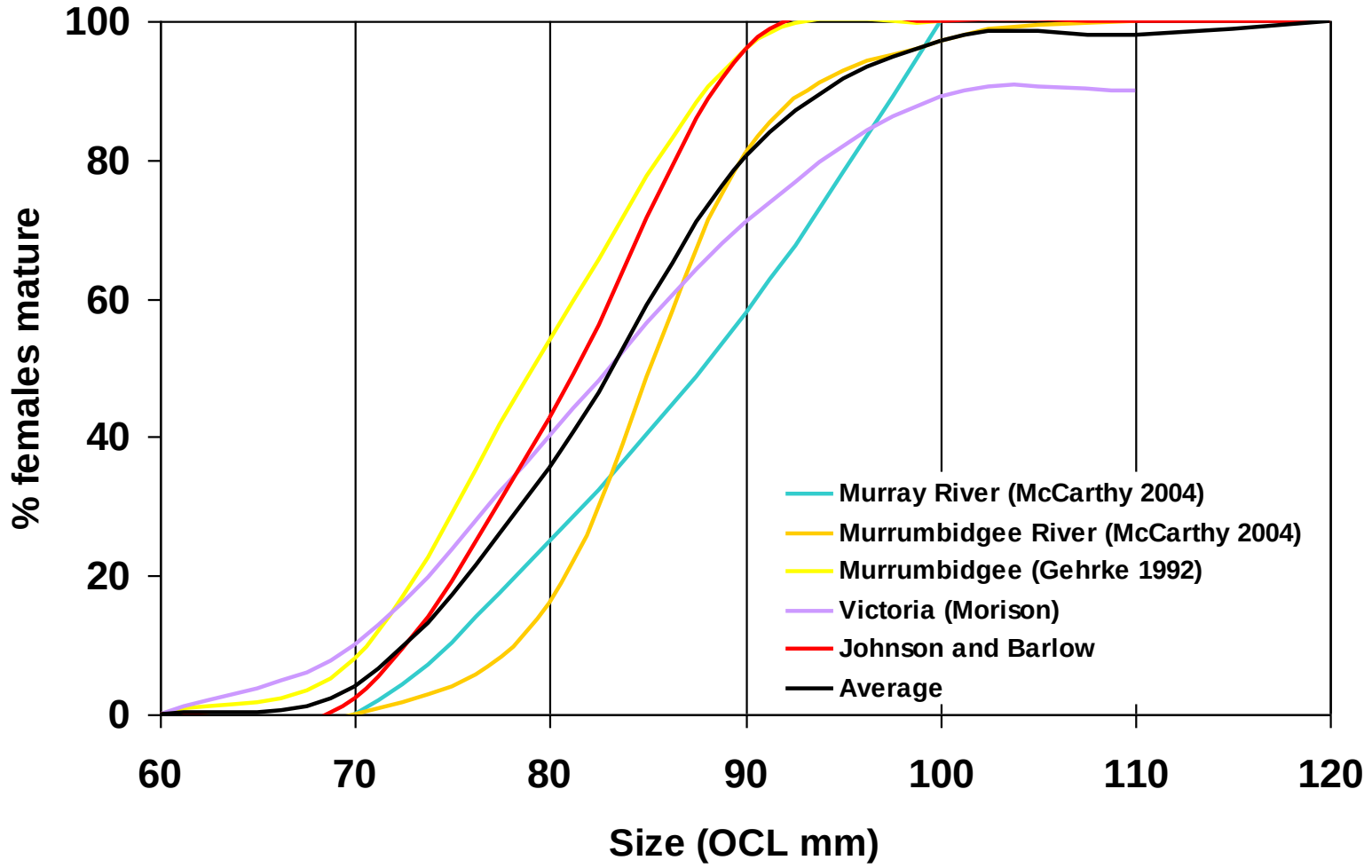
1. Johnson and Barlow (unpublished) in 1974 and 1980.
2. O'Connor (unpublished) from 1981 – 1985.
3. Hume and Morison ( unpublished) from 1984 – 1987
4. Hume and Morison ( unpublished) from 1984 – 1987
5. Lintermans and Rutzou (1991) between 1988 – 1989.
6. Sloan and McGonigle (unpublished) from 1988 – 2005.
7. Gehrke (unpublished) in 1992.
8. Geddes et al. (1993).
9. Asmus (1999) from 1997 – 1998 and 2003 - 2004.
10. McCarthy (2005) in 2004.
11. Ryan (2005) in 2005.
12. Edney and Lawler (current) in 2005 - 2006.

1. Closs and Driver (unpublished) from 1994 – 1995.
2. Koehn ???? – Mitta Mitta (Dartmouth Study).

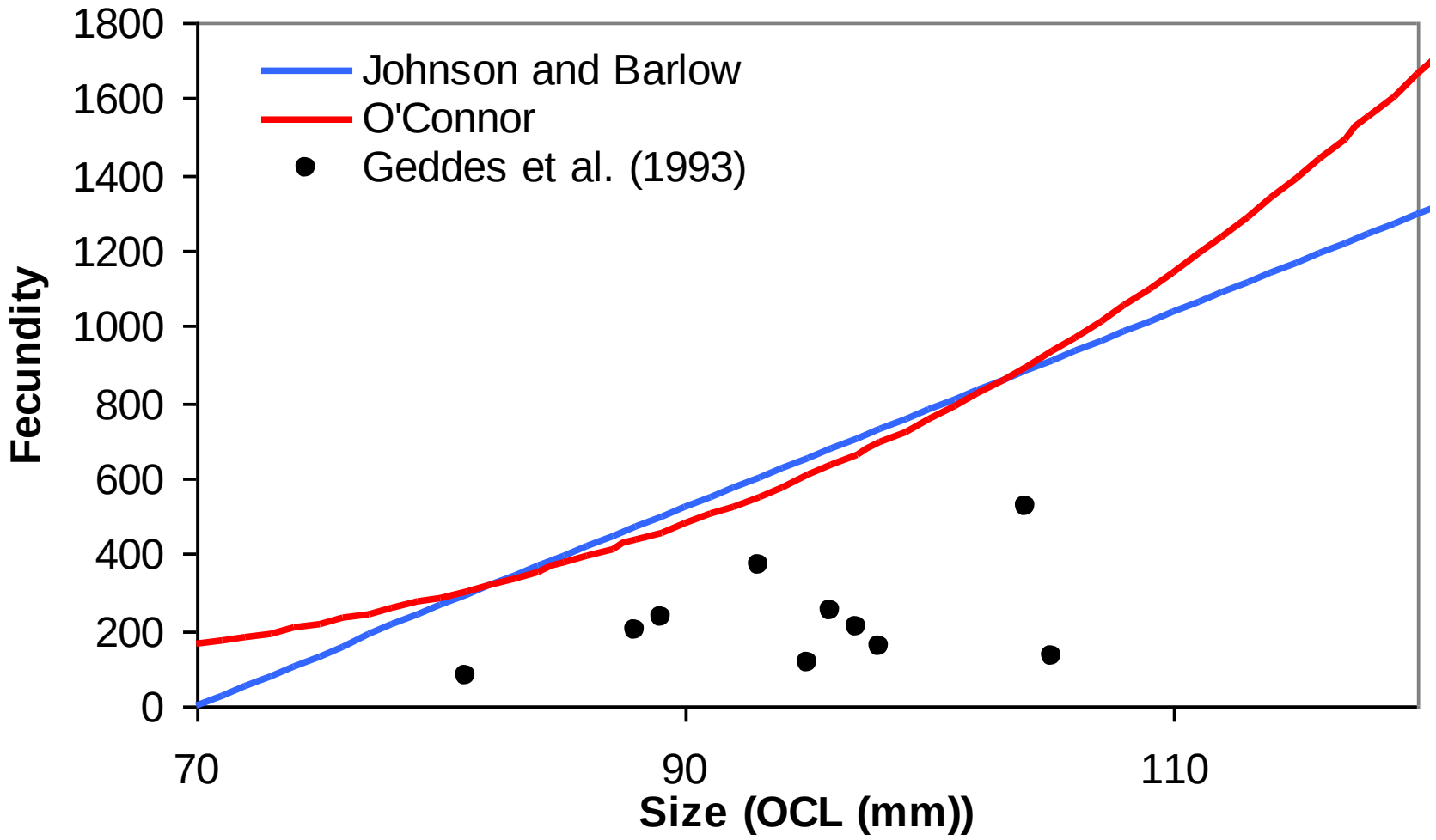
# These provide data on:

- Systematics
- Population genetics
- Habitat requirements
- Water quality tolerances
- Movement
- Home range size
- Diel and seasonal behaviour
- Spawning
- Fecundity
- Development
- Moulting
- Growth
- Size at maturity
- Mortality
- CPUE

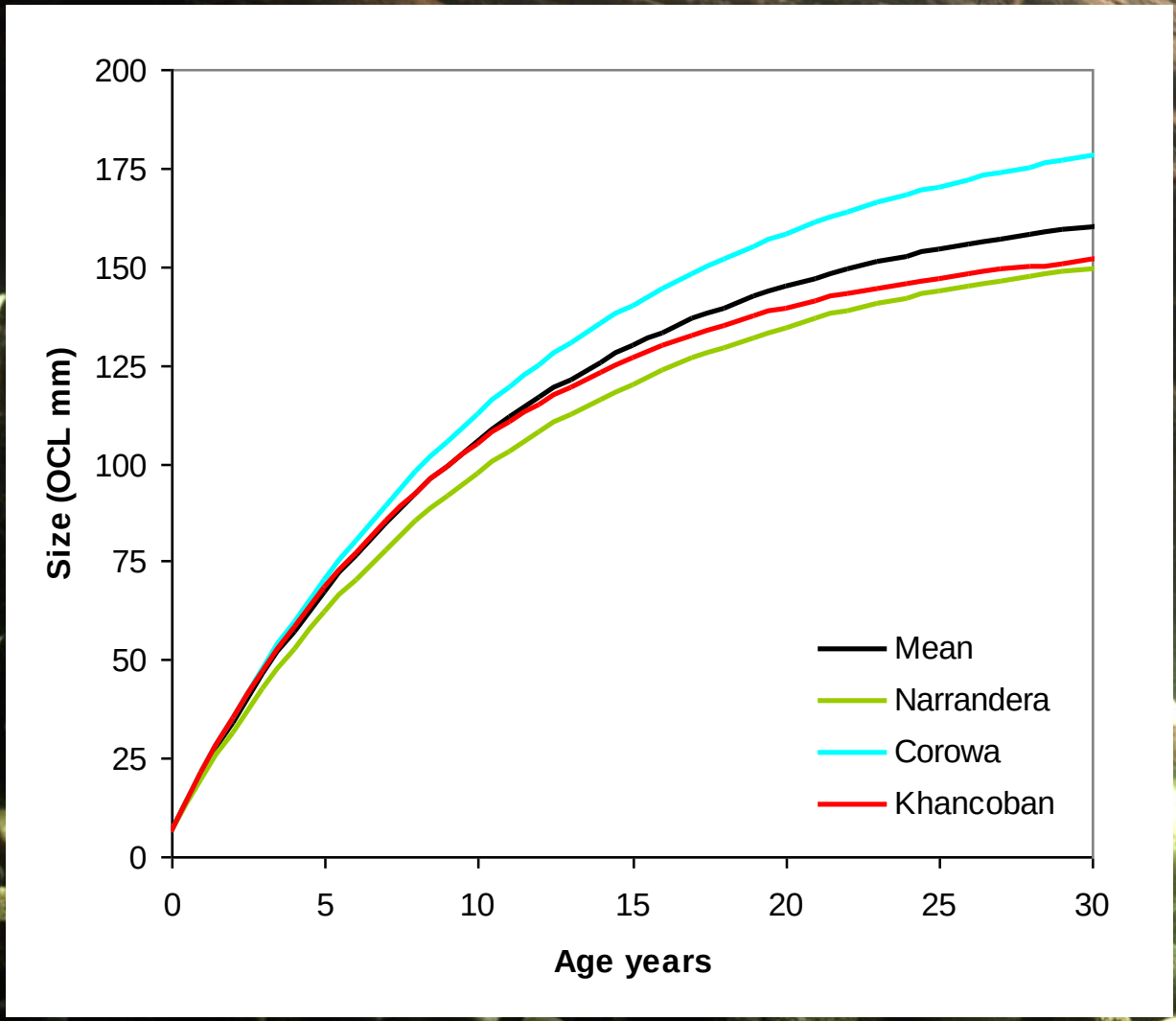
# Size at Maturity - Females



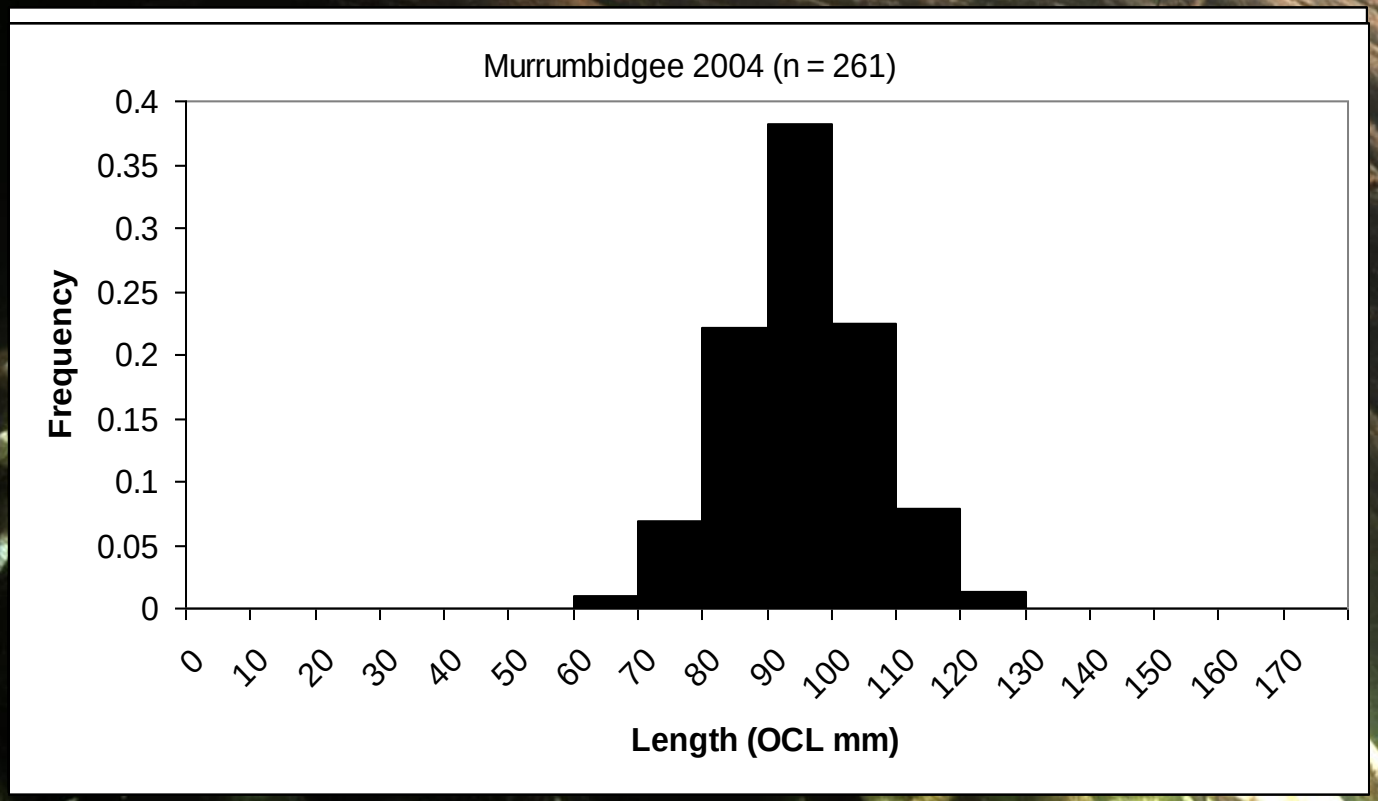
# Fecundity


Johnson and Barlow
O'Connor
Geddes et al. (1993)
Fecundity
1800
1600
1400
1200
1000
800
600
400
200
0
70
90
110
Size (OCL (mm))

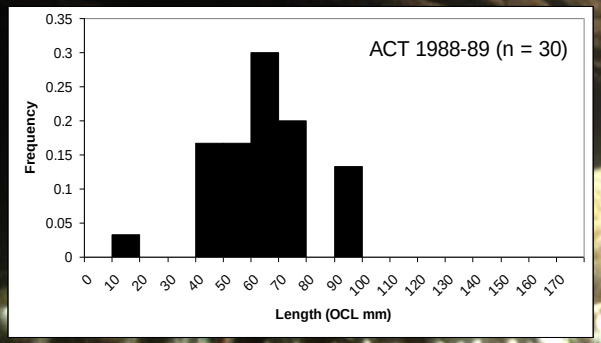
# Length at age

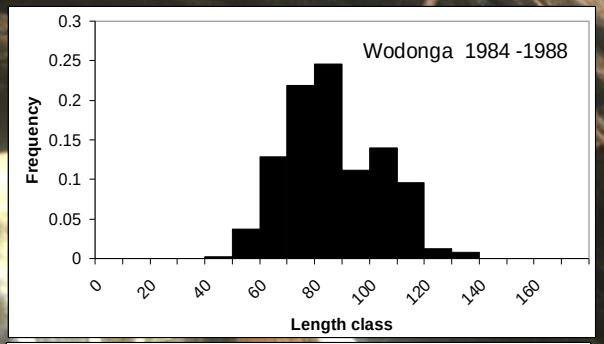


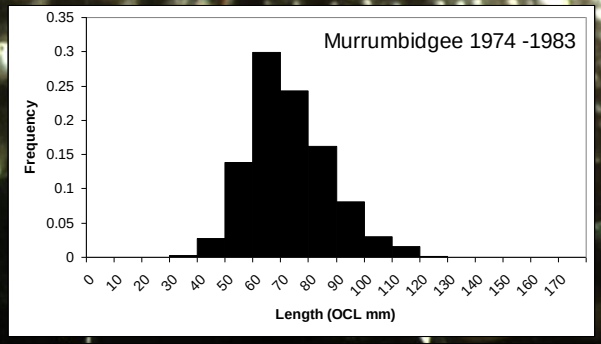
# Length – Frequency: Temporal

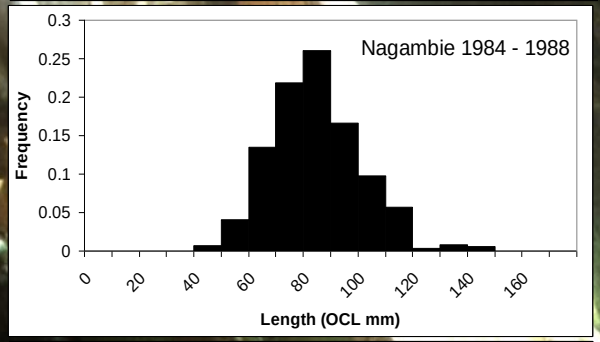


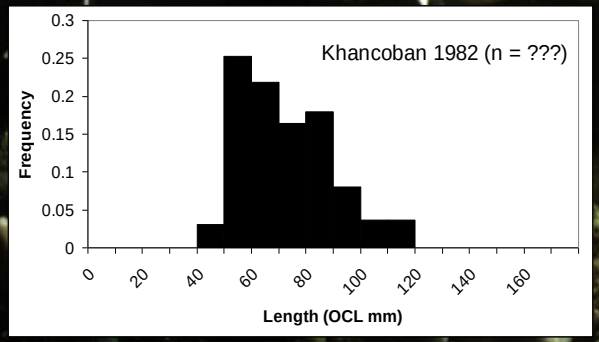
# Length – Frequency: Spatial

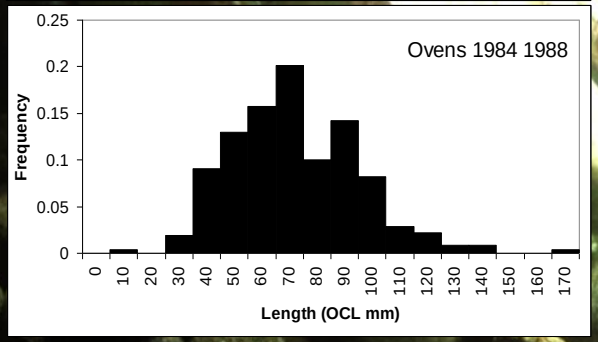


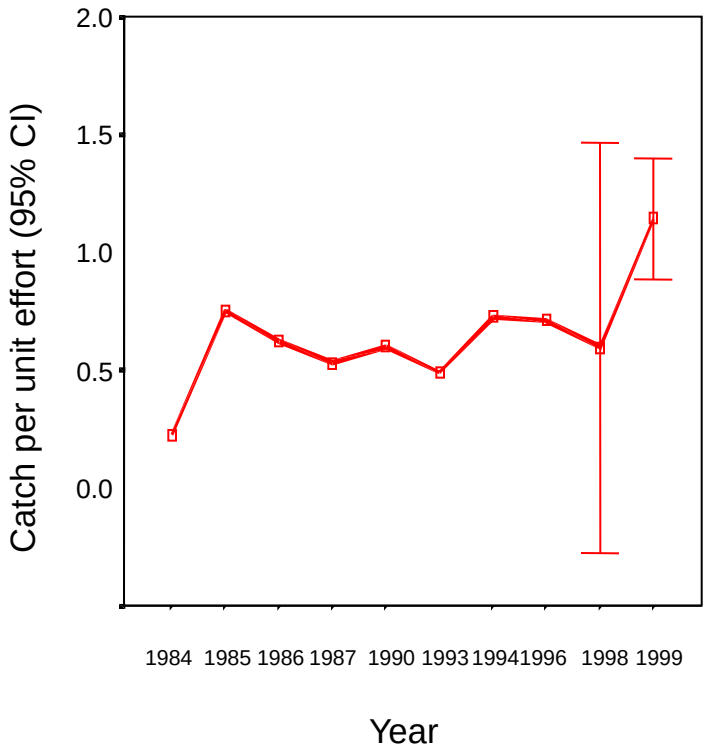



# Status

- In South Australia, the last significant commercial catches were from the 1950's to 1965 (Geddes et al. 1993). Now considered extinct downstream of Mildura.
- In the mid-Murrumbidgee
  - 1981-1985 CPUE = 0.38 per net per lift (O,Connor @ 0.5 - 0.75 hours)
  - 1992 CPUE = 0.77 per net per lift (Gehrke @ 1 hour)
  - 2004 CPUE = 0.73 per net per lift (McCarthy 2005 @ 1 hour)
- In Victoria
  - Lake Nagambie 1984 -1988 CPUE = 0.43 per net per lift (Morison 1988 @ 1 hour)
  - Wodonga Creek 1984 –1988 CPUE = 0.51 per net per lift (Morison 1988 @ 1 hour)
  - Ovens River 1984 - 1988 CPUE = 0.74 per net per lift (Morison 1988 @ 1 hour)
- In the ACT
  - 1988 CPUE = 0.01 per net per lift (Lintermans and Rutzou 1991 @ 0.75 - 1 hours)
  - 2004 CPUE = 0.04 per hour (Ryan 2005)
- In the Murray
  - 2004 CPUE = 0.01 per net per hour (Munyana traps) (McCarthy 2005 @ 16 hours)

# Status




From Burston *et al*. 1999

# Conservation Status

- Protected in South Australia under the *Fisheries Act 1982*.
- Vulnerable in the ACT under Section 21 of the *Nature Conservation Act 1980*.
- Threatened in Victoria under the *Flora & Fauna Guarantee Act 1988*.
- Not listed as a threatened species in NSW but part of the 'Lower Murray River Endangered Ecological Community', listed under the *NSW Fisheries Management Act 1994.*
- Nationally 'indeterminate'
- Internationally listed as vulnerable / 'data deficient'
- Only the ACT have developed an action plan (Lintermans 1998; ACT Government 1999).

# Current fishing regulation similarities

- Totally protected in South Australia and the ACT.
- Victoria and New South Wales
  - Size limit – 90 mm OCL
  - Bag limit - 5 with only 1 > 120 mm (but with a possession limit of 10 in NSW).
  - Closed season - 1 September to 30 April
  - Number of nets – 5 hoop nets (but up to 10 hoop nets may be used in some waterways in Victoria - although these are mostly outside the range of Murray crayfish).
  - Lines
    - Collection by hand or using up to 10 baited lines (no hooks) is allowed in Victoria
    - Lines are also legal in NSW but no limits on the number of lines are specified or whether hooks are permissible.
  - Berried females – must be released immediately.
  - Various permanent closed waters in both states.

# Current fishing regulation differences

- Nets
  - Victoria (max diameter = 77 cm, 50 cm drop and no mesh limitations)
  - NSW (max diameter = 1.25 m, 1 m drop and mesh size > 13 mm).
- Eggs
  - illegal to remove eggs from berried females in NSW
  - it is also illegal to removed the young, setae or fibres from female crayfish in Victoria.
- Bait
  - No mammal blood or offal as bait in Victoria.
  - Not specified in NSW
- Landing
  - Must be landed in carcass form in Victoria. Definition of carcass is '*The body of a crayfish is not cut in any way other than to remove one or more legs or claws, or is mutilated in any way other than the absence of one or more legs or claws*'.
  - In NSW, removing claws, head and/or tail in, on, or adjacent to waters is prohibited.

# Traditional Ecological Knowledge

- Contacted 18 aboriginal groups within the Murray and Murrumbidgee catchments
  - Nine did not respond
  - Three stated that they had no traditional knowledge (Wiradjuri, Ngunawal, Barkinji).
  - Face-to-face discussions with 6 groups (Albury LALC, Cummeragunja LALC – Moama, Deniliquin LALC, Muthi Muthi – Balranald, Narrandera LALC, Yorta Yorta - Barmah).

- Issues discussed included:
  - The role of Murray crayfish in Aboriginal culture
  - The role of Murray crayfish in Aboriginal society
  - Historical patterns

# Traditional Ecological Knowledge

- None of the communities consulted knew of their traditional names for Murray crayfish.
- Murray crayfish did not have a significant totemic role within any of the communities interviewed.
- No *dream-time* stories of Murray crayfish were recalled.
- Murray crayfish were (and continue to be) utilised by Aboriginals as a food resource.
- Perceive Murray crayfish to be key indicators of river health, and as ‘river cleaners’.
- Information obtained supports current scientific opinion
  - Restricted to flowing river reaches and are absent from still waters and billabongs
  - Most active during winter and less active during summer
  - Good bio-indicators of poor water quality.

# Traditional Ecological Knowledge

- Traditional names (Bennett (1834), Theiberger & McGregor (1994) and Blake (2005))
  - *Thangambuluwa* (Ngarigo) and *tanggambalangga* (Jaitmatang) in the highlands of the Murray and Murrumbidgee catchments.
  - *Lip lip wil* (Wemba Wemba), *thip thip* or *thipil* (Madi Madi), *tjipel* (Wadi Wadi), and *thapul* (Meru) in the Murray Riverina and Lower Murray.
  - *Mungola* (Ngunawal), *popa*, *papa* or *ponggongola* (Yorta Yorta), *wuluma*, *ringwong* or *mowak* (Latje Latje) *karta* (Waveroo) and m*eauki* or *kawthawi* (Ngarrindjeri).

- Methods of capture:
  - Captured by hand in shallows or when the river was low
  - Diving
  - Spearing
  - Animal remains wrapped in reeds and placed in shallow water or on sand bars were used as a lure

- Remains of Murray crayfish have been identified from an archaeological site along the Murray River (Smith 1982).

# Traditional Ecological Knowledge

- The Aboriginal communities consulted unanimously suggest that the current recreational harvest is unsustainable and has contributed to a decline of Murray crayfish.
- Aboriginal people have a considerable connection to natural resources and feel unrepresented when making management decisions.

# Potential recovery actions

- A survey of the status of Murray crayfish throughout their range.
  - Many areas remain un-surveyed.
  - Few surveys since regulations implemented.
- The re-establishment of Murray crayfish populations in the lower Murray.
  - Mullaroo Creek.
  - Downstream of Lock 7.
  - Below weirs.
- Assess effectiveness of fishing regulations
  - Few surveys conducted since regulations instated.
  - Not 100% maturity at size limit.
  - Open season in NSW starts before all females have mated.
  - Effects of male biased fishing pressure.

# Key knowledge gaps

- Biology of juveniles (< 40 mm). Sampling methods used by all previous research projects do not effectively sample juvenile crayfish. Need to study:
  - ecology
  - habitat requirements
  - growth rates
  - recruitment
  - dispersal
- Impact of river regulation on burrows and burrow dependant behaviour.
- Assess reason for lack of recovery in protected waters.

# Research needs

- Develop a standard survey protocol for crayfish
  - Assess hoop nets, Munyana traps and gill nets.
- Develop sampling tools for juvenile crayfish (< 40 mm).