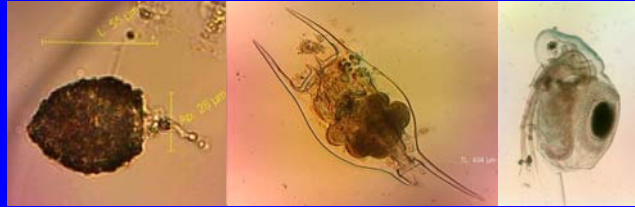


## **Coorong & Murray Mouth zooplankton Nov 2010-Apr 2011**



August 24, 2011

Drs Russ Shiel & Kane Aldridge, School of Earth  
& Environmental Sciences, University of  
Adelaide.



- **objective of study was to document changes in the zooplankton community in the Coorong following barrage releases**
- **survival of freshwater species and responses of estuarine species were of particular interest**

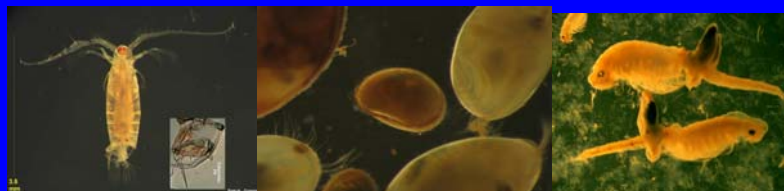
## Freshwater zooplankton

- Consists primarily of protists, rotifers, microcrustaceans (copepods, cladocerans, ostracods) and occasionally, smaller macroinvertebrates (dipteran larvae, water mites)



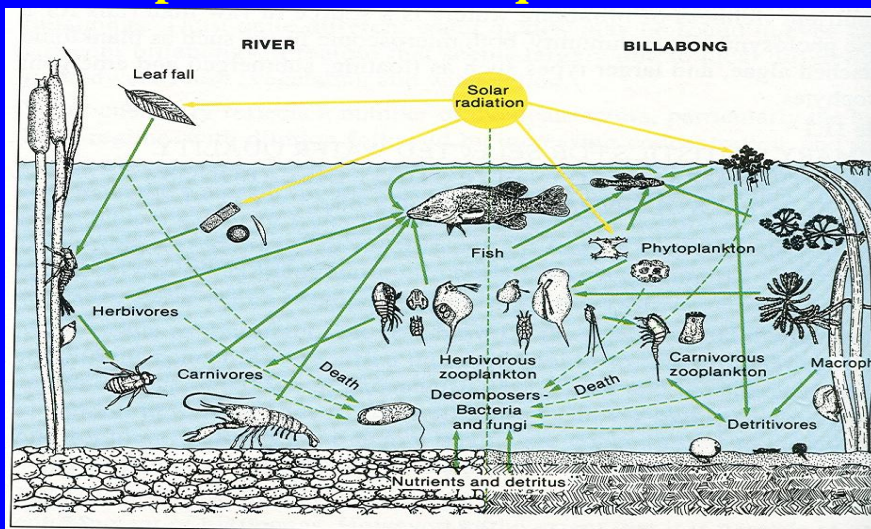
## Estuarine zooplankton

- Consists of halotolerant or halophile copepods, ostracods, occasional rotifers, brine shrimps, crab larvae, barnacle larvae, polychaete larvae





## Zooplankton in the aquatic food web



➤ Few studies of M/D Basin/Lower Lakes zooplankton

➤ Shiel *et al.* (1982) reported on Lower Murray zooplankton

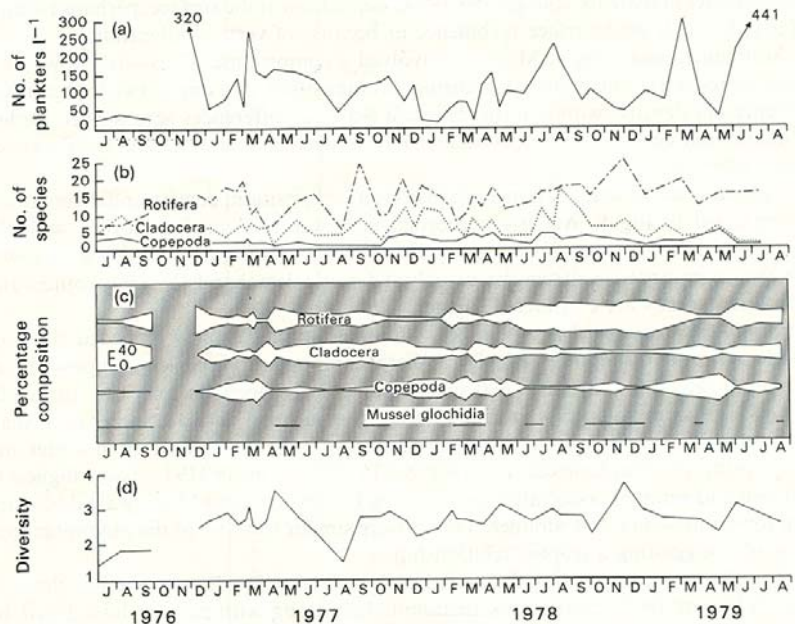
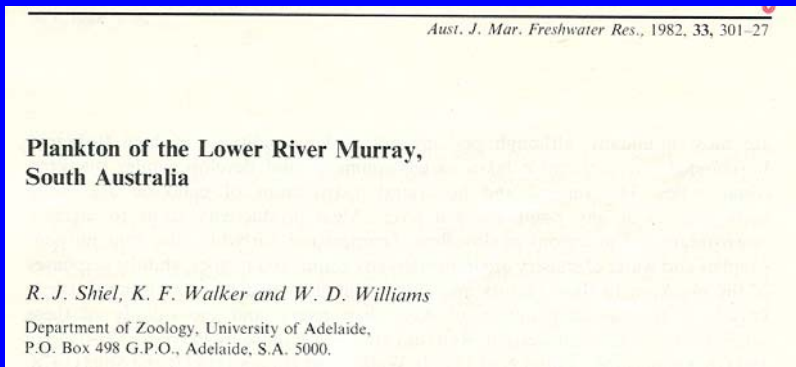
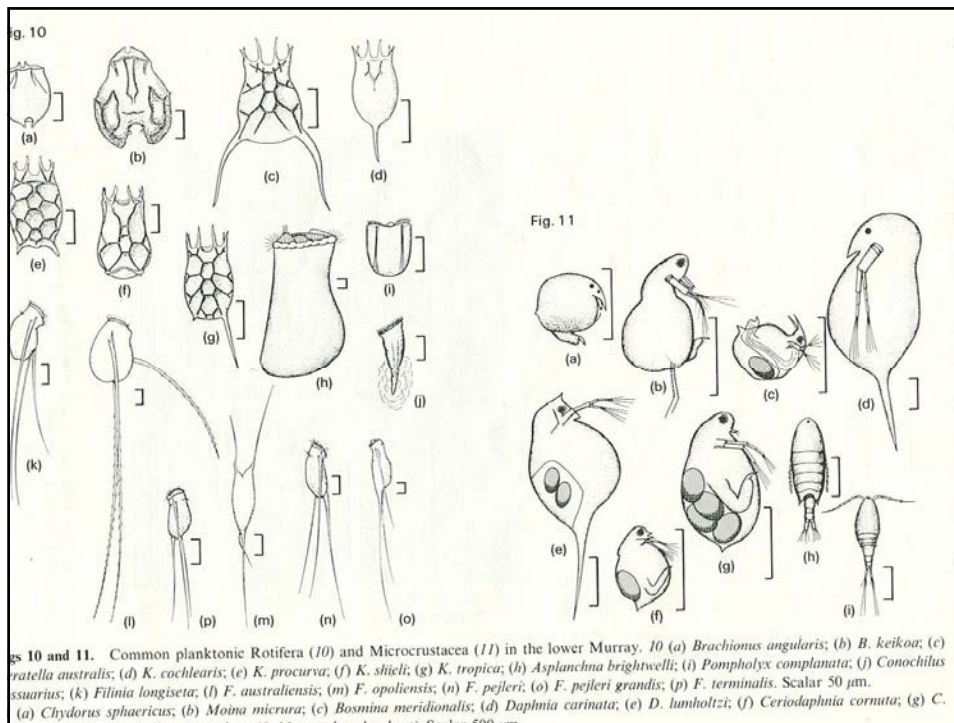


Fig. 8. Temporal variations in zooplankton in the lower Murray, 1976-79. (a) Density. (b) Number of species of Rotifera, Cladocera and Copepoda. (c) Percentage composition. (d) Diversity ( $H'$ ).



➤ The two rivers provided different assemblages below the confluence: the Murray a cool temperate microcrustacean plankton derived from locks, weirs and reservoirs; the Darling, relatively unimpounded, a warm-water (tropical) rotifer-dominated plankton.



## ➤ Geddes (1984) reported on the zooplankton of L. Alexandrina

*Aust. J. Mar. Freshw. Res.*, 1984, 35, 417-26

### Seasonal Studies on the Zooplankton Community of Lake Alexandrina, River Murray, South Australia, and the Role of Turbidity in Determining Zooplankton Community Structure

M. C. Geddes

Department of Zoology, University of Adelaide, P.O. Box 498, Adelaide, S.A. 5001.

**Table 3. Zooplankton species recorded from Lake Alexandrina**

Species in brackets were recorded only during the period of strong flushing from November 1975 to April 1976

#### Copepoda

*Boeckella triarticulata* (Thompson)  
*Calamoecia ampulla* (Searle)  
*Cyclops australis* Sars<sup>A</sup>

#### Cladocera

|  |  |
|--|--|
| <i>Daphnia carinata</i> s.l. King        | [ <i>Chydorus sphaericus</i> (Müller)] |
| <i>D. lumholtzi</i> Sars                 | [ <i>Alona rectangula</i> Sars]        |
| <i>Ceriodaphnia quadrangula</i> (Müller) | [ <i>Monospilus</i> , sp. nov.]        |
| <i>Diaphanosoma unguiculatum</i> Gurney  | [ <i>Macrothrix</i> sp.]               |
| <i>Bosmina meridionalis</i> Sars         |  |
| <i>Moina micrura</i> Kurz                |  |

#### Rotifera

|                                       |   |
|---------------------------------------|---|
| <i>Brachionus calyciflorus</i> Pallas | [ <i>Brachionus angularis bidens</i> Plate] |
| <i>Keratella australis</i> (Berzins)  | [ <i>B. caudatus</i> Barrois & Daday]       |
| <i>Filinia australiensis</i> Koste    | [ <i>B. diversicornis</i> (Daday)]          |
| <i>F. pejleri</i> Hutchinson          | [ <i>B. falcatus</i> Zacharius]             |
| <i>Conochilus dossuarius</i> (Hudson) | [ <i>Keratella cochlearis</i> (Gosse)]      |
| <i>Asplanchna brightwelli</i> Gosse   | [ <i>K. quadrata</i> (Müller)]              |
|                                       | [ <i>K. tropica</i> (Apstein)]              |
|                                       | [ <i>Filinia longiseta</i> (Ehrenberg)]     |
|                                       | [ <i>Trichocerca</i> sp.]                   |

<sup>A</sup>This species may represent a new genus (D. Morton, personal communication).

with peak momentary species composition of 11 (three copepods, five cladocerans, three rotifers). The major species, drawn to a common scale, are shown in Fig. 2, for almost all species, individuals were larger in winter than in summer (Table 4).

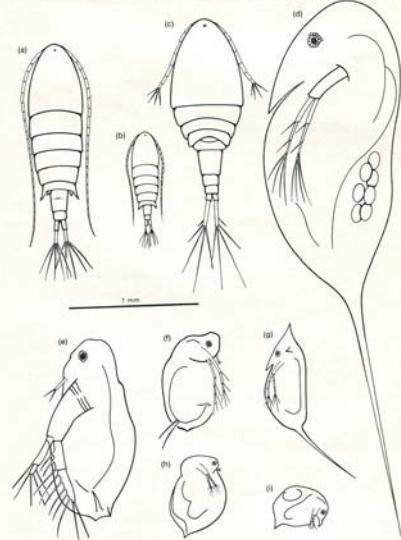
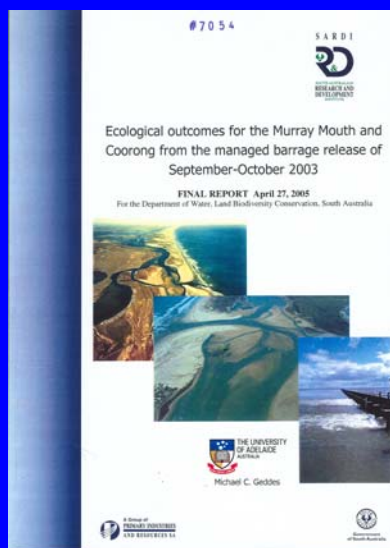
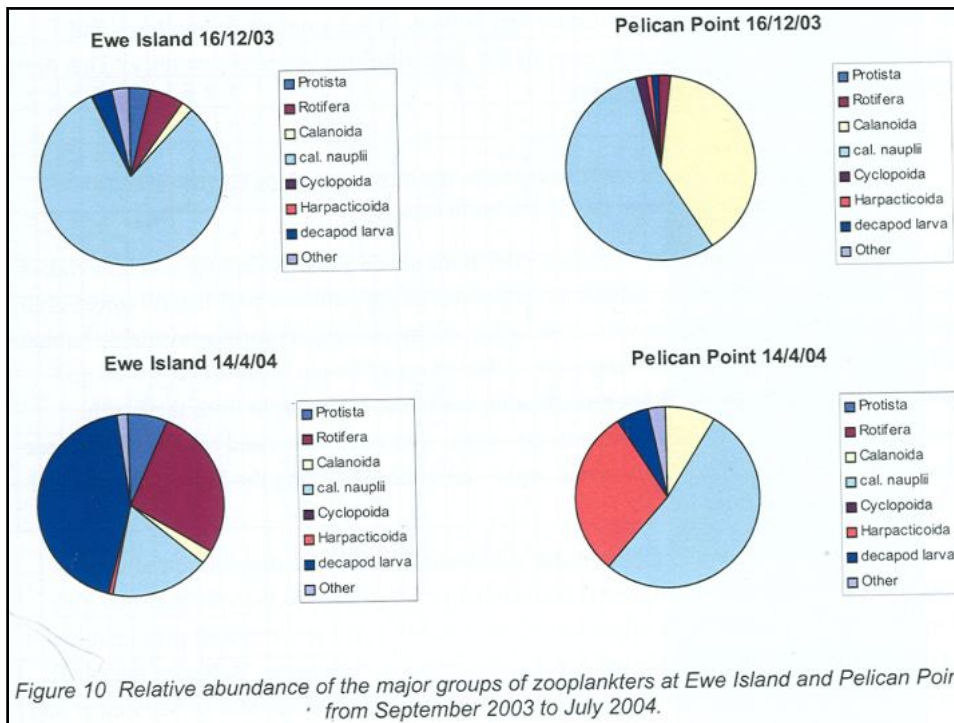


Fig. 2. Major zooplankton species in Lake Alexandrina, showing relative sizes and shapes. (a) *Boreckella triarticulata*. (b) *Calanocysta ampulla*. (c) *Cyclops australis*. (d) *Daphnia carinata*. (e) *Diaphanosoma unguiculatum*. (f) *Moina micrura*. (g) *Daphnia lumholzi*. (h) *Ceriodaphnia quadrangula*. (i) *Bosmina meridionalis*.

➤ Less is known of the Murray Mouth/Coorong zooplankton community.

Geddes (2005) reported on responses to barrage releases during the drought





Geddes & Francis (2008) reported on trophic ecology at Pelican Point

# 72 65

Marine Environment and Ecology

SARDI  
SOUTH AUSTRALIAN  
RESEARCH & DEVELOPMENT

Trophic Ecology Pilot Study in the River Murray Estuary at Pelican Point

SARDI Publication No. F2007/001193-1  
SARDI Research Report Series No: 274

Michael C. Geddes and Julie Francis

SARDI Aquatic Sciences,  
2 Hamra Avenue West Beach SA 5024

February 2008



Table 5: Zooplankton abundance and biomass estimates for five replicate samples (mean of 3 subsamples) and overall means.

| Coorong Zooplankton:<br>Taxon [size]                         | Dry Weight<br>$\mu\text{g}$ | Rep #1            |                    | Rep #2            |                    | Rep #3            |                    | Rep #4            |                    | Rep #5            |                    | Overall Mean      |                    |
|--|-----------------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|
|  |                             | Mean              | Mean Biomass       | Mean              | Mean Biomass       | Mean              | Mean Biomass       | Mean              | Mean Biomass       | Mean              | Mean Biomass       | Mean              | Biomass            |
|  |                             | $\text{n m}^{-3}$ | $\text{mg m}^{-3}$ | $\text{n m}^{-3}$ | $\text{mg m}^{-3}$ | $\text{n m}^{-3}$ | $\text{mg m}^{-3}$ | $\text{n m}^{-3}$ | $\text{mg m}^{-3}$ | $\text{n m}^{-3}$ | $\text{mg m}^{-3}$ | $\text{n m}^{-3}$ | $\text{mg m}^{-3}$ |
| Copepoda: Calanoida: nauplii [169-280 $\mu\text{m}$ ]        | 0.1                         | 358.2             | 35.8               | 71.4              | 7.1                | 148.1             | 14.8               | 152.4             | 15.2               | 78.2              | 7.8                | 161.7             | 16.2               |
| Copepoda: Calanoida: copepodites [392-498 $\mu\text{m}$ ]    | 0.5                         | 238.8             | 119.4              | 309.5             | 154.8              | 125.3             | 62.7               | 285.7             | 142.9              | 156.5             | 78.2               | 223.2             | 111.6              |
| Copepoda: Cyclopoida: copepodite [408 $\mu\text{m}$ ]        | 0.5                         | 0.0               | 0.0                | 0.0               | 0.0                | 22.8              | 11.4               | 19.0              | 9.5                | 39.1              | 19.6               | 16.2              | 8.1                |
| Copepoda: Cyclopoida: adult [560 $\mu\text{m}$ ]             | 1.2                         | 0.0               | 0.0                | 11.9              | 14.3               | 11.4              | 13.7               | 0.0               | 0.0                | 0.0               | 0.0                | 4.7               | 5.6                |
| Copepoda: Harpacticoida: copepodite [240-304 $\mu\text{m}$ ] | 0.3                         | 19.9              | 6.0                | 47.6              | 14.3               | 45.6              | 13.7               | 95.2              | 28.6               | 39.1              | 11.7               | 49.5              | 14.8               |
| Copepoda: Harpacticoida: adult [496-576 $\mu\text{m}$ ]      | 1.2                         | 79.6              | 95.5               | 71.4              | 85.7               | 91.2              | 109.4              | 57.1              | 68.6               | 117.3             | 140.8              | 83.3              | 100.0              |
| Ostracoda: cf. Candonocypris [785 $\mu\text{m}$ ]            | 5.0                         | 19.9              | 99.5               | 0.0               | 0.0                | 0.0               | 0.0                | 0.0               | 0.0                | 0.0               | 0.0                | 4.0               | 19.9               |
| Ostracoda: juvenile [280-464 $\mu\text{m}$ ]                 | 1.0                         | 0.0               | 0.0                | 11.9              | 11.4               | 11.4              | 19.0               | 19.0              | 0.0                | 0.0               | 0.0                | 8.5               | 8.5                |
| Decapoda: larvae [360-408 $\mu\text{m}$ ]                    | 2.0                         | 517.3             | 1034.7             | 750.0             | 1500.0             | 353.2             | 706.5              | 704.8             | 1409.5             | 391.2             | 782.3              | 543.3             | 1,086.6            |
| Decapoda: later instar [800-1220 $\mu\text{m}$ ]             | 10.0                        | 0.0               | 0.0                | 59.5              | 595.2              | 11.4              | 113.9              | 0.0               | 0.0                | 0.0               | 0.0                | 14.2              | 141.8              |
| <b>Total plankters</b>                                       |                             | 1,234             | 1,391              | 1,333             | 2,383              | 820               | 1,057              | 1,333             | 1,693              | 821               | 1,040              | 1,108             | 1,513              |

## Coorong sampling sites

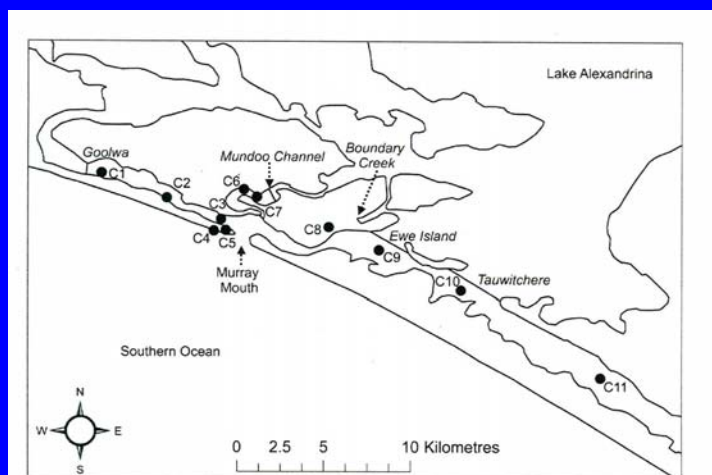


Figure 2. Map of sampling locations in the North Lagoon of the Coorong and Murray Mouth region. C1 – Goolwa Barrage Downstream; C2 – Half Way; C3 – Sugar's Beach; C4 – Southern Ocean; C5 – Murray Mouth; C6 – Hunter's Creek; C7 – Mundoo Channel; C8 – Boundary Creek; C9 – Ewe Island; C10 – Tauwitche; C11 – Mark Point. Labelled in italics are barrages.

All sites sampled were in open water. Sites C4 (Southern Ocean beach) and C5 (Murray Mouth) were sampled from wader depth from the shore. All other sites were sampled from a boat. Sampling dates were 01 November 2010, 27 November 2010, 05 January 2011, 31 January 2011, 28 February 2011 and 26 April 2011.



➤ DENR staff sampled 15 sites in Lakes Alexandrina & Albert, and the Goolwa Channel [5 visits, Dec '10-Mar '11]







## Results

- 187 zooplankton taxa were recorded across the study area:
  - L. Alexandrina 144
  - L. Albert 50
  - Goolwa Channel 109
  - Murray Mouth/North Lagoon 97

➤ 70% of zooplankton taxa recorded from the Murray Mouth/North Lagoon sites also occurred above the barrages in the Goolwa Channel or Lake Alexandrina

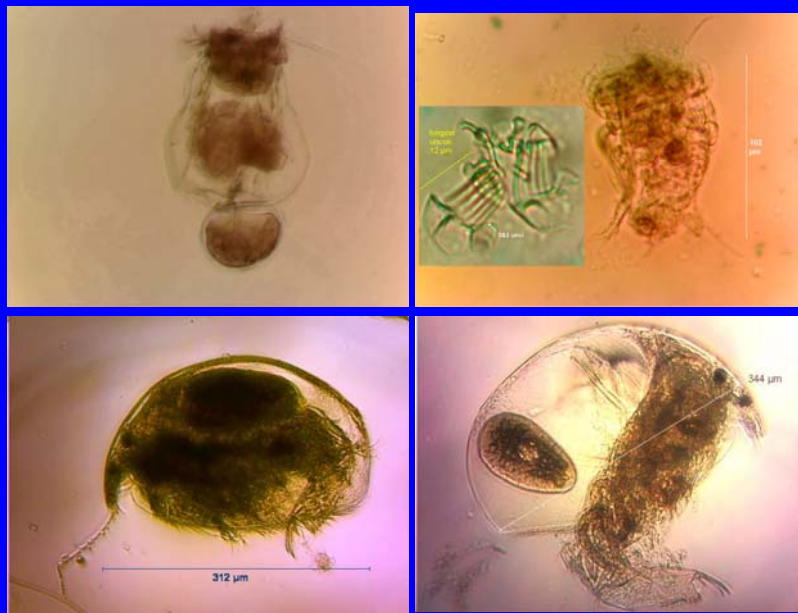
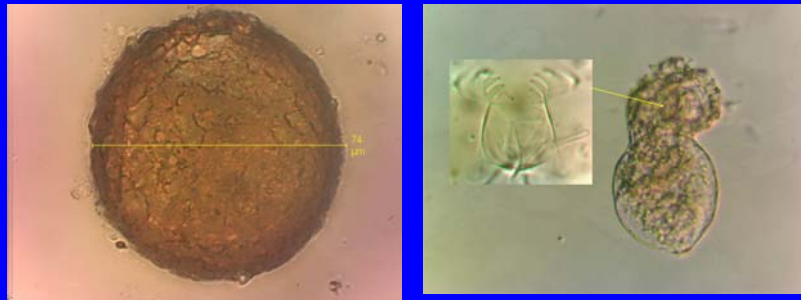
➤ >90% of recorded zooplankters were freshwater in habit

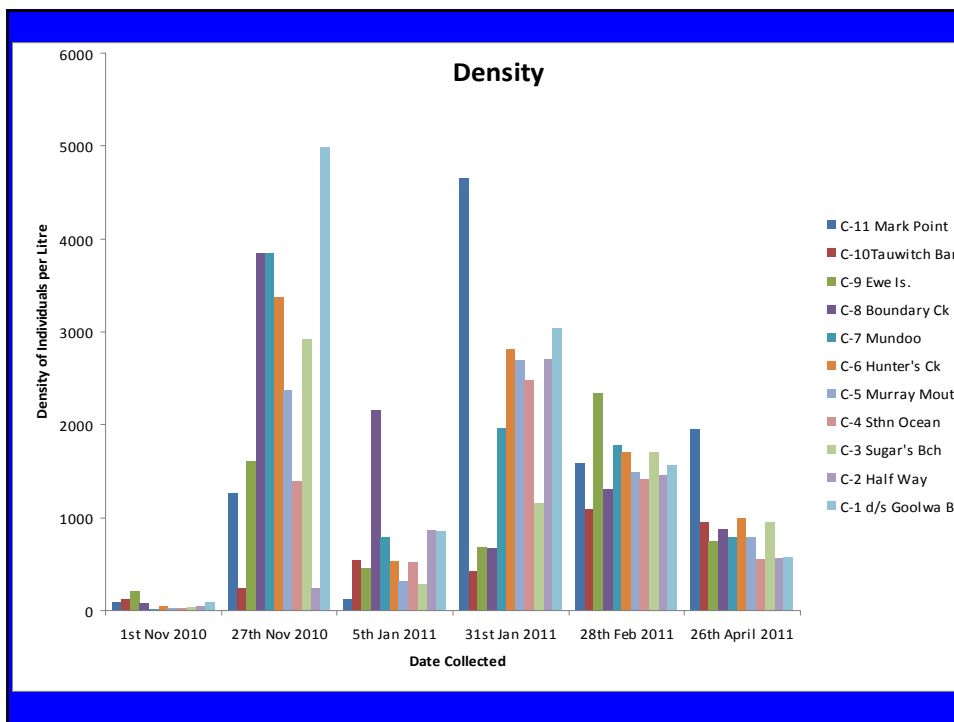
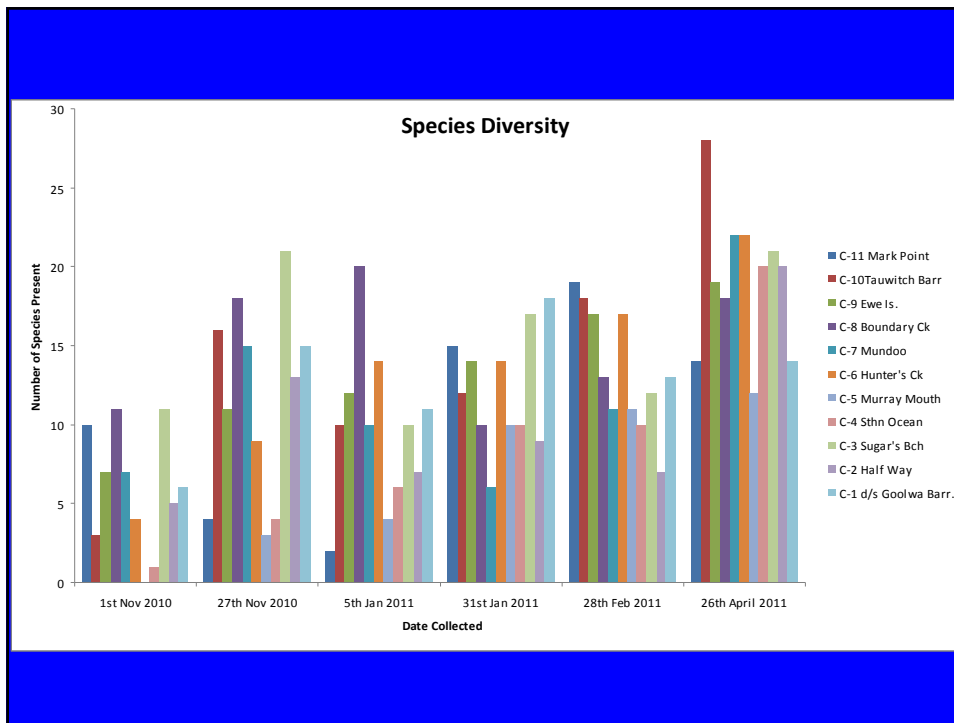
➤ only 18 taxa were recognized halophile or halotolerant estuarine or inland salt lake in habit.



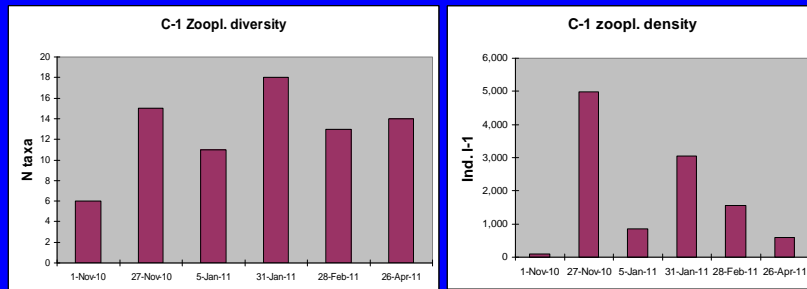
## Undescribed species

- Several testates and rotifers could not be allocated to described species and are regarded as new



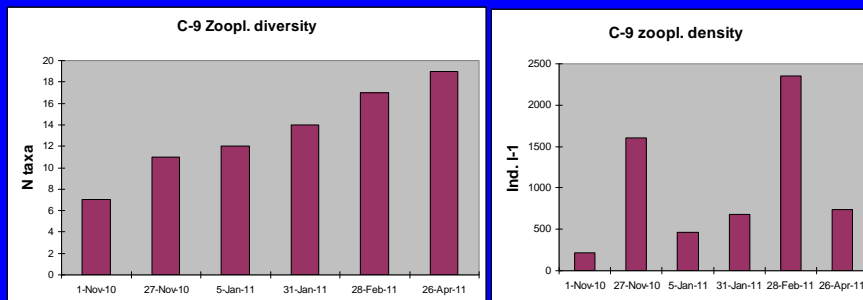


## Zooplankton density and diversity at C1, downstream of the Goolwa Barrage.



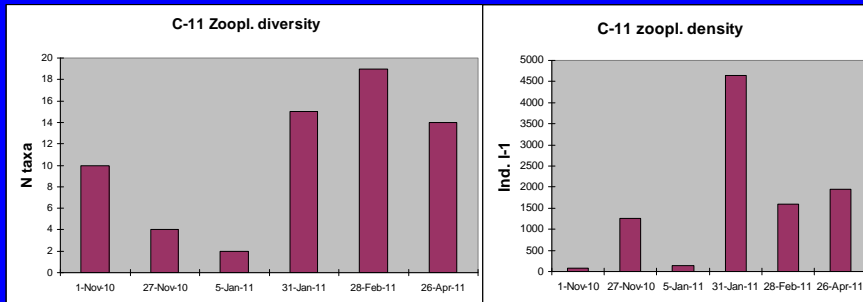
Testate ciliate *Stenosemella lacustris* responsible for pulse Nov. 27.

## Zooplankton density and diversity at C9, Ewe Island

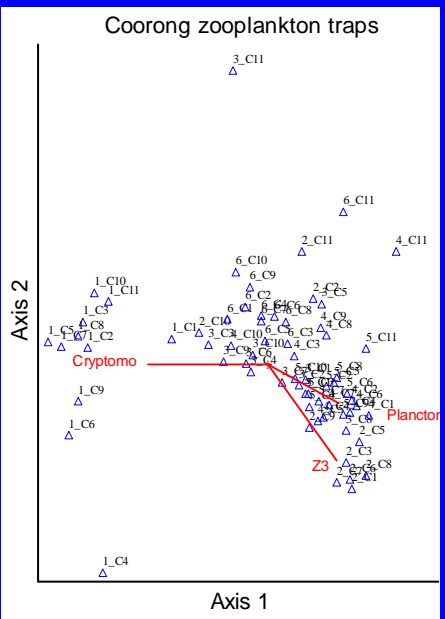
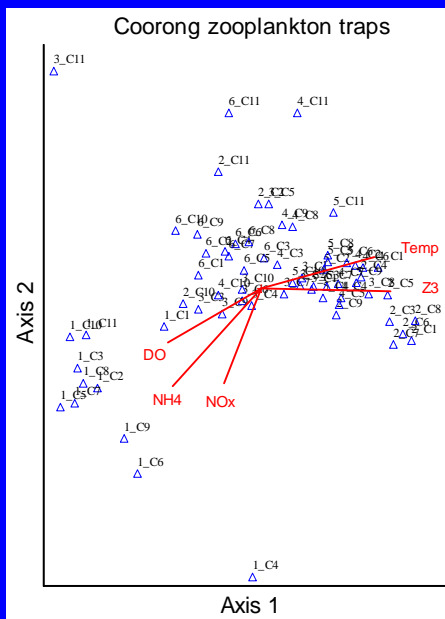


Population pulses again attributed to *Stenosemella lacustris*

## Zooplankton density and diversity at C11, Mark Point



Diversity decline likely a result of higher salinities ( $24 \text{ mS cm}^{-1}$ ). Halotolerant *Synchaeta* pulse Nov. 27, *Proalides* Jan 31.



## Conclusions

- Separation of trip 1 from following trips represents heterogeneous 'residual' or drought microcrustacean assemblage from Goolwa Channel/L. Alexandrina
- Subsequent samples suggest increasing heterogeneity of inocula from barrage releases, effectively a more riverine, rotifer/protist dominated assemblage

### In terms of the objectives:

- Barrage releases carried a freshwater assemblage into the salinized Murray Mouth and North Lagoon, replacing the estuarine plankton which had established over the drought
- The latter are not lost from the system. A propagule egg bank remains in the sediments, and will recolonize when appropriate cues return
- Significant increases in secondary productivity are a likely consequence of the diverse plankton inocula



## Acknowledgements

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**The study was managed by Dr Alec Rolston, Senior Project Officer, Ecological Investigations, Coorong, Lower Lakes and Murray Mouth Program, DENR, who is thanked for critical assessment and improvements to the final report.**

**Thanks to Mike Geddes (Univ. Adelaide) and Coby Mathews (EPA S.A) for clarifying the dietary habits of Goolwa cockles!  
Thanks to Deb Furst (Univ. Adelaide) for access to zooplankton samples from Chowilla collected at the height of the 2010-2011 floods during her PhD**