Review of fish habitat associations, restoration protocols & trends in distribution & abundance

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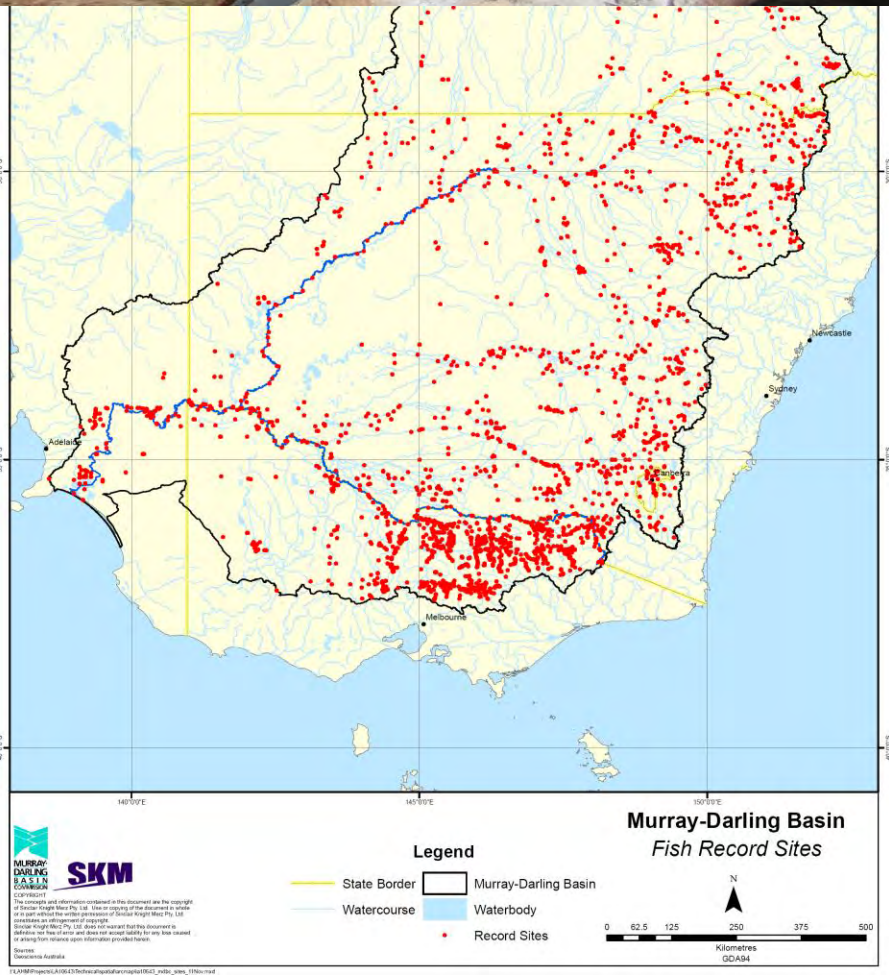

Recent and current projects

- Review of fish habitat associations
- Compilation of a database of fish habitat associations
- Development of guidelines and protocols for fish habitat management
- Compilation of a database of fish survey records
- Analysis of trends in fish distribution and abundance

Fish habitat associations

- Project objectives were to:
  - Document key ecological, biological and habitat information on native fish.
  - Identify knowledge gaps on the fish habitat requirements.
  - Compile a database of habitat information

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- Literature reviews and a workshop with fish biologists were used to gather ecological, biological & habitat information
- A detailed report was prepared that presented:
  - Life history characteristics & habitat preferences
  - Migration & spawning triggers, timing & behaviour
  - Egg characteristics & water quality tolerances
  - Larval, juvenile & adult habitat associations & water quality tolerances
  - Knowledge gaps and future research recommendations
  - Annotated citations and bibliography that identified quality of and confidence in literature used to compile the review

Fish habitat associations

- Information was collected on 35 native species
- Over 350 references, unpublished data and personal communications cited
- Key knowledge gaps included:
  - Water quality tolerances, particularly for egg and larval development
  - pre-and post-spawning behaviour
  - Larval habitat preferences and larval movement
- Further research recommendations included:
  - Water quality tolerances of key native fish species
  - Habitat associations of small native fish species
  - Importance of floodplain and temporary wetland habitats
  - Habitat use interactions between native and exotic fish
  - Review of diet, behaviour and spawning requirements of native and exotic fish

Habitat database

- Provides a summary version of the habitat associations report
- Provides references to information sources
- Easy to use Excel format
- Updateable as new information becomes available

Species

Macquarie Perch

Taxonomy

Family	Percichthyidae
Scientific name	*Macquaria australasica*
Other names	Mountain Perch, Bream, Black Bream, White-eye, Silvereye

Conservation status

World Conservation Union	Data deficient
National	Endangered
Australian Society of Fish Biology	Endangered
Queensland	
New South Wales	Vulnerable
Australian Capital Territory	Endangered
South Australia	
Victoria	Endangered (L)

Distribution

Upland	**
Midslope	*
Lowland	

* Partial association

** Strong association

Spawning

Pre-spawning migration	Upstream migration in lake populations but not necessary in riverine populations (8, 47, 54, 149)
Timing of migration	Spring - summer (8, 47)
Migration trigger	Increasing water temperature and day length (8, 149)
Spawning season	Late spring - early summer (47, 54, 102)
Spawning trigger	Increasing water temperatures & day length (102, 300)
Spawning site	Adhesive eggs dispersed amongst gravel, pebbles and boulders in shallow riffles & runs (8, 47, 54, 149)
Post-spawning migration	Downstream return in lake populations
Parental care	None observed (149)
Other	-

Larvae and Juveniles

Movement	Initially palegic larvae swept downstream (51, 149)
Habitat	Larvae initially present in mid-water but rapidly progress to bottom cover (198, 337)
Temperature range	9°C (54)
Salinity tolerance (mg/L)	<4000 mg/L (266)
DO tolerance (mg/L)	Data deficient
Other	-

Adults

Habitat	A riverine species typically found in deep holes, mostly bottom feeding but can survive well in lakes with accces to suitable spawning sites in inflowing streams (44, 46)
Temperature range	Data deficient
Salinity tolerance (mg/L)	Data deficient
DO tolerance (mg/L)	Data deficient
Other	-

General summary

Macquarie Perch historically were found in the upland, mid-slope and lowland regions of the south-east reaches of the Basin, and the coastal catchments of the Shoalhaven and Hawkesbury/Nepean Rivers. They have also been introduced into some other coastal waters in NSW and Victoria. It is probable that the eastern (coastal) and western (Basin) populations are different species. They can survive well in impoundments provided suitable tributary streams are available for breeding and reservoirs are an important habitat for some remnant populations (e.g. Dartmouth Dam). They prefer clear, cool water and deep holes interspersed with riffles in slow flowing river sections. They spawn in faster flowing riffles and gravel beds.

Summary of key threats

The distribution and abundance of Macquarie Perch is declining, mostly as a result of habitat loss, sedimentation of spawning sites, over-fishing and competition from introduced species. It is listed Nationally as Endangered under the EPBC Act 1999, listed as Vulnerable in NSW under the NSW Fisheries Management Act 1994 and as Endangered in the ACT under the ACT Nature Conservation Act 1980. In Victoria, they are considered Endangered and listed under the Victorian FFG Act 1988.

References

8: Appleford, P., Anderson, T. A. and Gooley, G. J. (1998). Reproductive cycle and gonadal development of Macquarie Perch, Macquaria australasica Cuvier (Percichthyidae), in Lake Dartmouth and tributaries of the Murray-Darling Basin, Victoria, Australia. Marine and Freshwater Research 49: 163-169.

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47: Cadwallader, P. L. (1986). The Macquarie Perch of Lake Dartmouth. Australian Fisheries 4: 14-16.

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54: Cadwallader, P. L. and Rogan, P. L. (1977). The Macquarie Perch, Macquaria australasica (Pisces: Percichthyidae), of Lake Eildon, Victoria. Australian Journal of Ecology 2: 409-418.

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198: McDowall, R. M. (1984). 1983/84 Dartmouth report. Unpublished report, Fisheries and Wildlife Division, Department of Conservation, Forests and Lands, Victoria.

266: Ryan, T. and Davies, P. (1996). Environmental effects of salinity and nutrients from salt disposal: approaches to the development of management criteria. Flora and Fauna Technical Report No. 137. Department of Natural Resources and Environment, Melbourne.

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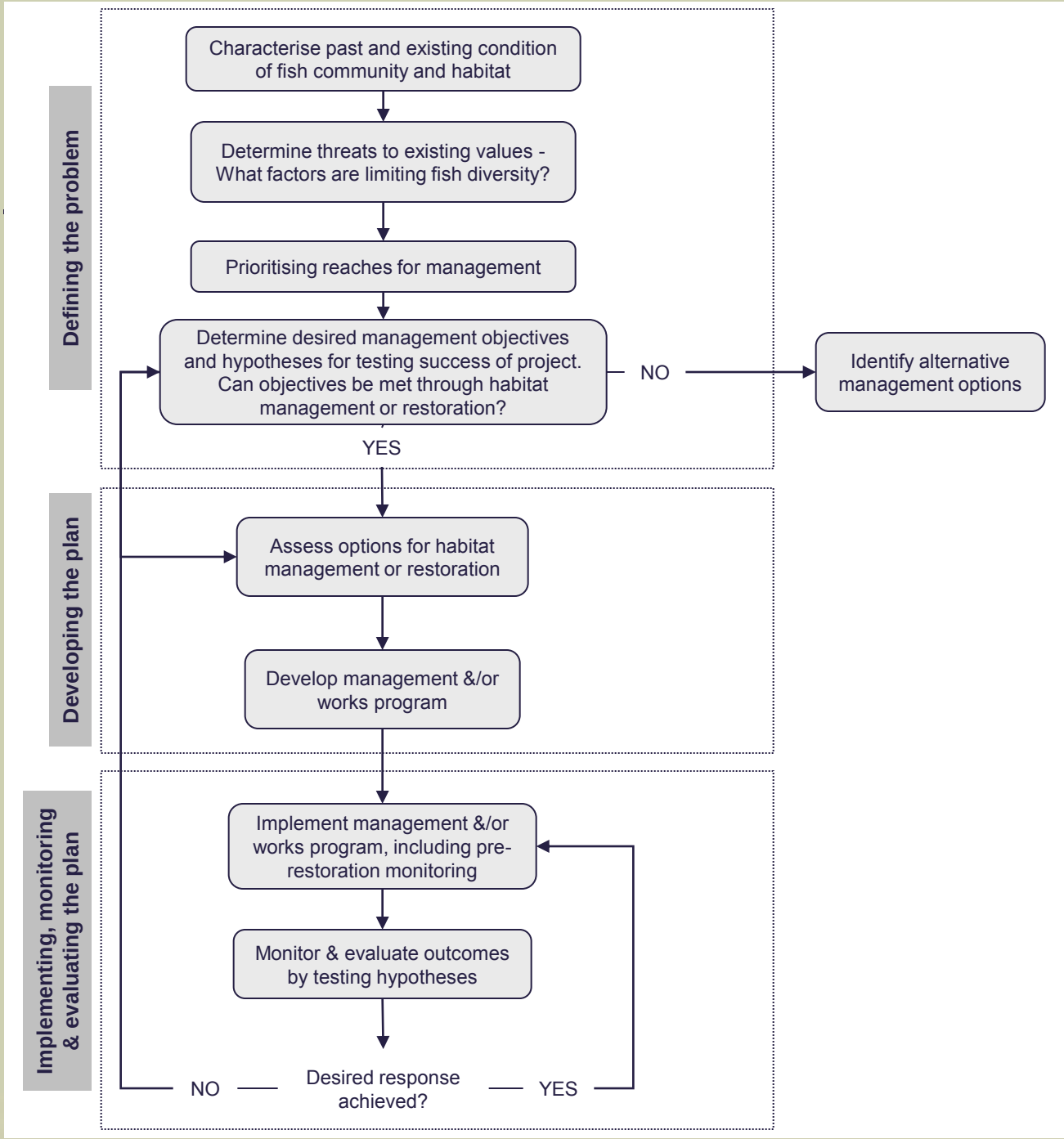
337: B. Ebner, Environment ACT and M Lintermans, MDBC, unpublished data.

Habitat management guidelines

- Project objectives were to:
  - Discuss processes threatening fish habitat
  - Review the principles of habitat management
  - Develop guidelines for habitat management considering key habitat associations, threatening processes & principles of management and restoration

Habitat management flow chart



Habitat management guidelines

- The guidelines describe the processes to follow when undertaking habitat management or restoration projects.
- They provide general technical advice and links to more detailed technical advice where such technical guidelines already exist.
- They are targeted at Local Councils and Waterway Managers. They do not provide the precise level of detail required to undertake a specific restoration project.
- Detailed design and works requirements for specific projects will still need to be undertaken on a site-specific basis using appropriately skilled scientists and engineers.

Technical details are provided for:

- Managing riparian vegetation
- Managing macrophytes
- Managing large woody debris
- Managing barriers to fish passage
- Managing flow regimes
- Managing water quality
- Managing pools and substrate diversity
- Managing bank and bed erosion
- Managing alien species

Analysis of trends in distribution & abundance

- Project objectives are to:
  - Compile a database of fish survey data
  - Analyse data for trends in abundance and distribution
  - Report on trends at the sub-basin and state scale

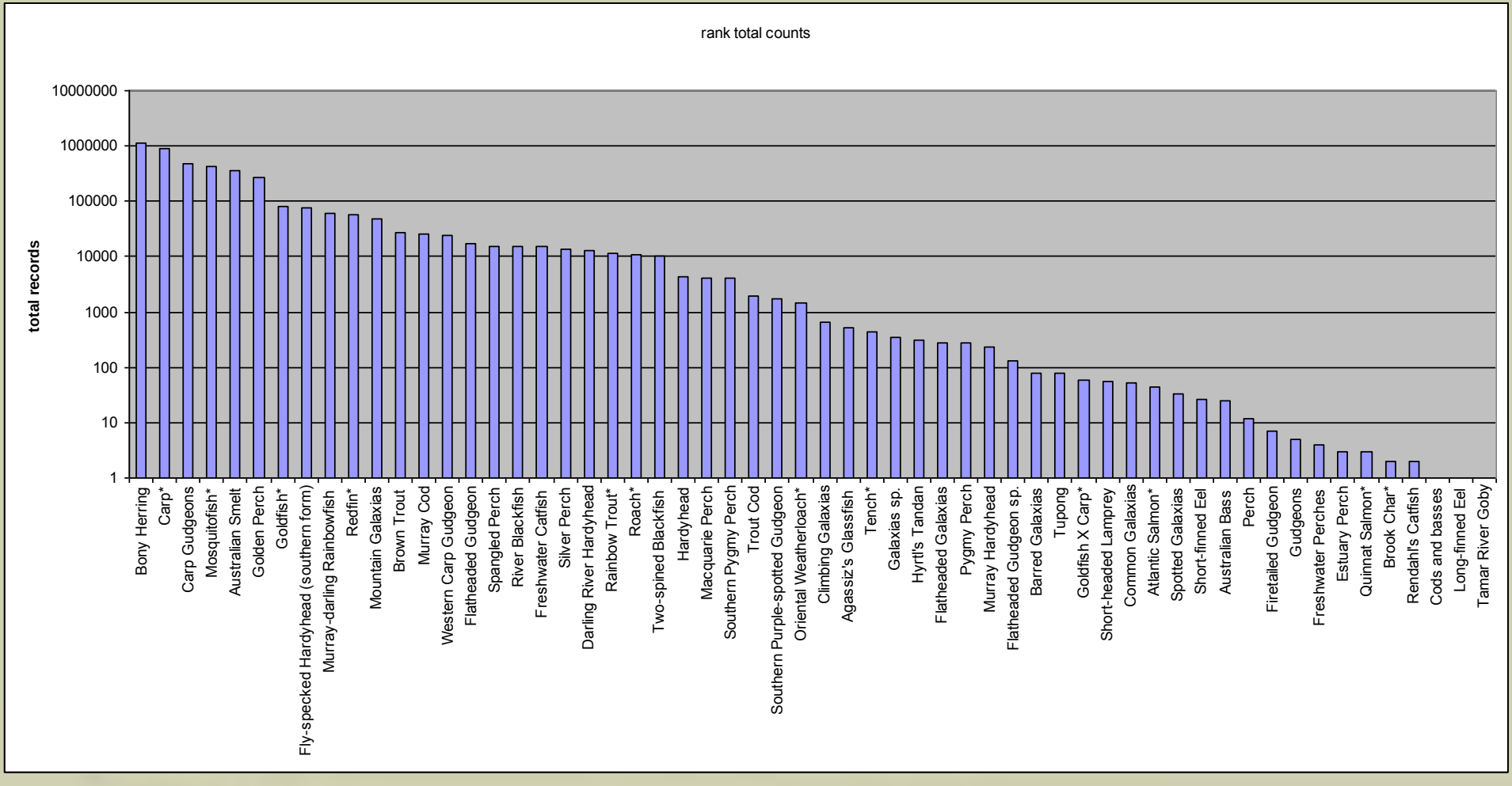
Data sources

- Data has been sought from:
  - Primary Industries Research Victoria (PIRViC);
  - Department of Sustainability and Environment (DSE) Aquatic Fauna database;
  - South Australian Research and Development Institute (SARDI);
  - NSW Fisheries;
  - Environment ACT;
  - Queensland Department of Natural Resources & EPA;
  - Queensland Museum
  - SA Museum;
  - Australian Museum;
  - Museum Victoria; and
  - Hardcopy survey data, technical reports, journal articles and grey literature

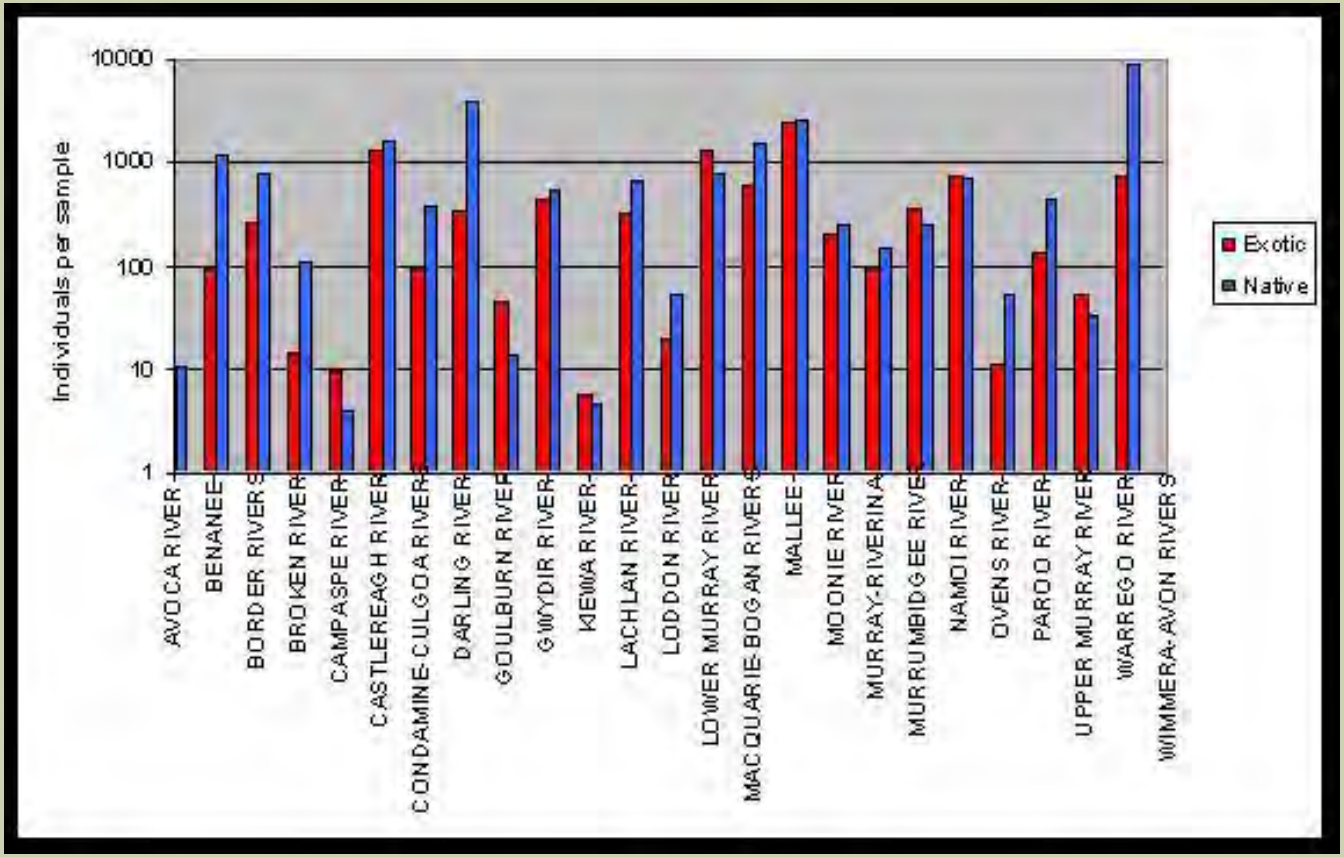
Summary record details

- >4300 sampling sites
- >5,000,000 fish records
  - >2,000,000 alien
  - >3,000,000 native

Rank total counts by species



Individuals per sample



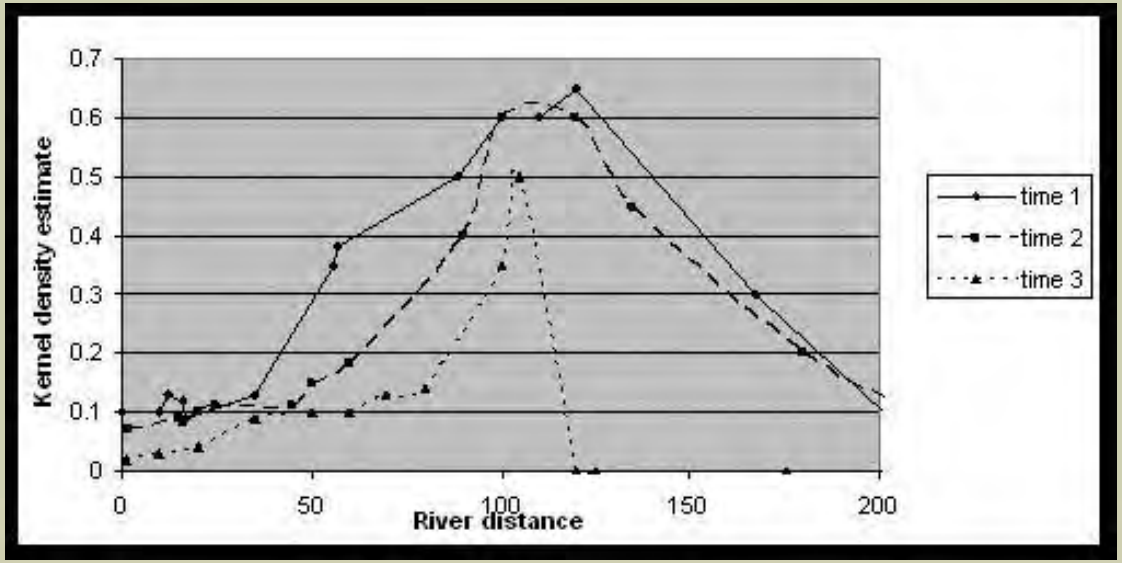
- Northern basins tend to have a greater number of individuals per sampling event compared to southern basins
- Unregulated basins have a greater number of natives compared to exotics

Temporal trend analysis

- Requires standardised effort data
- Requires replicate sampling over time – pooled basin or bioregion results may be used to define categories
- Transformations required to standardise distributions
- Effort data typically only available for last ~10-15 years, so trends may not be significant (ie change has already occurred)
- May be able to analyse trends in some species and basins if sufficient counts & effort data is available
- Analytical techniques being explored include kernel density estimates and poisson regression
- Patterns based on percentage of total catch standardised by collection method are also being explored

Kernel density estimation

- Kernel density estimation can be used to assess trends in abundance along a river reach provided effort data is available.
- In particular it can be used to identify the distribution of populations along a linear scale, and if sufficient temporal data is available it can also detect temporal trends.
- It does not require replicate sites because spatial scale is implicit in the linear nature of the analysis provided sufficient sites are available along the reach.



Progress

- The database inputs have been finalised and we are in the process of extracting suitable data sets for analysis