

**Standard Operating Procedures for *Fish Larvae***

**Version 2.0**

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## Introduction

The Standard Operating Procedure (SOP) for Fish Larvae describes the purpose of the Fish Larvae assessment, how the monitoring will be conducted, who is responsible for specific tasks and how the collected data will be analysed and reported. The document is intended to be taken in the field during any Fish Larvae surveys for the LTIM and should be updated throughout the life of the Long Term Intervention Monitoring Program to reflect any agreed changes to method or procedure.

## Objectives and hypotheses

This monitoring protocol for Fish Larvae addresses the following Basin scale evaluation questions:

### Long-term (five year) questions:

- What did Commonwealth environmental water contribute to native fish populations?
- What did Commonwealth environmental water contribute to species diversity?

### Short-term (one year) questions:

- What did Commonwealth environmental water contribute to fish community resilience?
- What did Commonwealth environmental water contribute to native fish survival?
- What did Commonwealth environmental water contribute to native fish reproduction?

The Area Specific evaluation questions to consider are:

### Long-term (five year) questions:

- What did Commonwealth environmental water contribute to the recruitment of Golden Perch in the adult population in the lower Goulburn River?

### Short-term (one year) questions:

- What did Commonwealth environmental water contribute to Golden Perch spawning and in particular what magnitude, timing and duration of flow is required to trigger spawning?
- What did Commonwealth environmental water contribute to the survival of Golden Perch larvae in the lower Goulburn River?

We expect that spring-summer freshes will trigger spawning, particularly for Golden Perch. This may result in a broader range of age classes in the population (currently the Golden Perch population comprises only large, old fish) and an increase in abundance. Increased baseflows in late summer/early autumn might also promote subsequent larval survival and recruitment into the adult Golden Perch population. A range of other species might also be expected to benefit from spring-summer freshes and increased baseflows.

## Indicators

Fish Larvae is a Category II monitoring indicator for the LTIM Program in the lower Goulburn River. It requires annual surveys of larval fish and eggs at 3 sites in each nominated zone. The standard method stipulates 6 larval surveys to be carried out each summer, but we feel this is insufficient to adequately capture spawning events. Instead, we will undertake 10 surveys per season, with possible additional survey/s funded through other sources (e.g. VEWH). The surveys will use drift nets to catch fish eggs and larvae from each site. Fish collected will be identified and counted to assess relative abundance and links to flow events.

This indicator will also be measured in the Edward-Wakool, Lachlan, Murrumbidgee and Gwydir Selected Areas. The monitoring method has been specified by the M&E Advisor. The Fish River surveys will complement this indicator because they will measure successful recruitment (young-of-year fish) following any fish spawning. The Fish Movement component will also complement this indicator. In particular, it will provide critical information on whether fish need to migrate to specific areas to spawn and under what environmental conditions (e.g. freshes).



## Locations for monitoring

Monitoring will be conducted at 3 sites in Zone 2 (Shepparton to Murray junction), and at 1 site in Zone 1 (Goulburn Weir to Shepparton), noting that the Zone 1 monitoring will not be compliant with the standard method (i.e. not being done at 3 sites).

Zone 2 was identified as a priority for monitoring because it is where we most expect to detect a response (e.g. spawning) to flow events, as previous monitoring has shown that spawning activity by Golden Perch is concentrated in this zone (Koster unpublished data). The monitoring sites are shown in Table 1. The sites are subject to change depending on access.

**Table 1: Proposed fish larval monitoring sites for Zones 1 and 2. Existing ARI larval monitoring sites are shown.**

Zone	Site	Lat	Long	Existing ARI site
1	Pyke Road	-36.427	145.357	✓
2	Loch Garry	-36.242	145.287	
2	McCoys Bridge	-36.177	145.123	
2	Yambuna	-36.131	145.003	✓

## Timing and frequency of sampling

Larval sampling will generally occur weekly during the spawning season, with the specific timing to be tailored to best measure the response of flow events in each year (e.g. before, during and after spring freshes). At present flow events to trigger spawning are scheduled to occur between October and December. This period coincides with planned environmental flow release and the peak spawning period for Golden Perch. Sampling will be conducted every year at each site over the five year program.

## Responsibilities – identifying key staff

### Field program

Wayne Koster and David Dawson from the Arthur Rylah Institute will be responsible for overseeing the planned monitoring, conducting the field surveys and any relevant training, and preparing safety plans. Other experienced staff from ARI may also participate in the surveys at times where needed. Angus Webb from Melbourne University will conduct data analysis. Wayne Koster and David Dawson will be responsible for collating, checking and uploading collected data.

### Laboratory requirements (if any)

- Samples collected will be preserved in 90% ethanol and transported via car to ARI and sorted in the ARI fish laboratory under a dissecting microscope, and identified using a guide (Serafini and Humphries 2004). All samples will be stored in ethanol in the ARI fish laboratory for the duration of the project.

### Procedure for transferring knowledge to new team members

The discipline lead (Wayne Koster) will be responsible for ensuring new team members have a sound understanding of the program and are able to competently undertake required tasks. The discipline lead will undertake the following steps to facilitate this process

1. Discuss the overall program to the new staff member and introduce to team members.
2. Outline and document the roles and responsibilities of the new staff member
3. Explain and provide access to relevant program documents
4. Explain and discuss the standard operating procedure
5. Explain and discuss the project risk assessment and the required safety measures



6. Demonstrate sampling methods to staff in the field and supervise staff undertaking these methods until satisfactory competency is demonstrated.
7. Explain and demonstrate data collation, analysis, uploading procedures and assist staff in performing these tasks as required

No formal accreditation is required to undertake netting surveys. However, any new inexperienced staff involved in surveys will only work with other staff who have at least 2-3 years' experience. Staff must hold a valid Victorian drivers licences and boating licence. A Coxswains certificate will also be required from mid-2015. Staff must also have completed accredited 4WD training and First Aid (Level 2) training. David Dawson will be the senior field technical officer within the field team. David will liaise regularly with Wayne Koster and will train any new staff required throughout the duration of the project. Wayne Koster will convene (face to face) regular debriefs with the field team after field trips to identify any issues of concern. Scheduled debriefings will occur after each field trip for the duration of the project. Any significant matters will be dealt with immediately rather than waiting for a scheduled debrief.

## Monitoring methods

### Field methods

#### Equipment

Small boat  
 Fine mesh larval nets, floats and ropes  
 GPS  
 Datasheets and/or field computer  
 Sample containers  
 Turbidity meter  
 Velocity meter

#### Sample placement within sites

- Larval density is measured using stationary drift nets.
- Three Drift nets per site (total of nine per zone, per sampling event) should be positioned in water with a moderate velocity, preferably where the discharge is concentrated through a narrow section of the river (a funnel effect). Ideally, drift nets should not be closer than 100 m to each other.

### Sampling protocol

#### Drift nets

- Drift nets should be constructed of 500 µm mesh, have an opening diameter of 50 cm, tapering over 1.5 m to an opening of 9 cm, to which a reducing bottle should be fitted.
- Volume through the net should be estimated so that larval abundances in drift nets can be expressed as a density: number of individuals per m<sup>3</sup>. The water volume passed through the net is determined as follows: number of revolutions (T2-T1) x 0.3 (impeller pitch) x net opening area (m<sup>2</sup>) x 1000 = water volume

#### Laboratory methods

- Samples collected will be preserved in 90% ethanol and transported via car to ARI and sorted in the ARI fish laboratory under a dissecting microscope, and identified using a guide (Serafini and Humphries 2004). All samples will be stored in ethanol in the ARI fish laboratory for the duration of the project.



## Data analysis and reporting

### Relative abundance

- Drift net abundances for each species will be expressed as densities; number of individuals for each species per cubic metre of water filtered for the site.

A report will be produced that will include an assessment of relationships between the timing and abundance of eggs/larvae and flows. The report will focus on the magnitude, timing and duration of flow required to trigger spawning by Golden Perch because we expect spawning of this species be associated with high flow events. Where relevant the report will include modifications or revisions to existing environmental water releases in the lower Goulburn River to enhance fish spawning.

Detailed statistical analysis for the Selected Area evaluation will be conducted by or under the direction of Dr Angus Webb at the University of Melbourne.

### Quality Assurance/Quality Control

- The boat and motor will also be serviced annually by Barry Lawrence Marine. All service certificates will be stored in a filing cabinet in the maintenance department at ARI.
- Larval nets will be checked for holes or cracks prior to every field trip, and also upon completion of sampling at each site. Any net with a hole will be repaired or replaced immediately using a repair kit that is taken on site.
- The monitoring will be conducted under an existing Victorian Flora and Fauna Guarantee Permit (renewed annually) and Fisheries Victoria Research Permit (renewed annually) and ethics permit 13-10 (Arthur Rylah Institute Animal Ethics Committee) (expiry 31/12/2017 but will be renewed prior to expiry). Permits will be carried while sampling. Prior notification to Fisheries for any sampling will be made as per permit conditions.
- All nets will be clearly marked with the permit holders name and permit number. Permit reports will be lodged annually with the relevant body as per permit conditions.
- All data provided for this indicator must conform to the data structure defined in the LTIM Data Standard (Brooks and Wealands 2013) and included in Attachment 1.1. The data standard provides a means of collating consistent data that can be managed within the LTIM Monitoring Data Management System (MDMS).
- Data will be entered into an excel spreadsheet that follows the prescribed template provided in Attachment 1.1. Each cell of data will be cross-checked visually against data sheets for accuracy by David Dawson. Data sheets will be stored in a filing cabinet in David Dawson's office at ARI. All data sheets will be photocopied and stored in a separate filing cabinet in Wayne Koster's office at ARI.
- Data will be stored electronically ARI on a computer network that is backed-up daily. All data is backed up to an external site. Data will be sent by David Dawson via email to Melbourne University to be loaded onto a central database.

## References

Brooks, S. and Wealands, S. (2013) LTIM Data Standard v0.2. Draft Report prepared for the Commonwealth Environmental Water Office by The Murray-Darling Freshwater Research Centre, MDFRC Publication 29.3/2013 November, 29pp.

Serafini, L.G. and Humphries, P. (2004) Preliminary guide to the identification of larvae of fish, with a bibliography, from the Murray-Darling Basin. Cooperative Research Centre for Freshwater Ecology Identification and Ecology Guide No. 48. Cooperative Research Centre for Freshwater Ecology, Murray-Darling Freshwater Research Centre, Albury and Monash University, Clayton, 55 pp.



## Attachment 1 LTIM Data Standard requirements

### Attachment 1.1 Standard Data format for larval fish survey results to be submitted to the CEWO.

Variable	Description	Type	Req	Range
assessmentUnitId	The site, which may be a length of stream of an area of wetland(s) that meets the criteria defined in the standard method	string	Y	
dateStart	Start date (inclusive) that these measures were observed	dateTime	Y	
dateEnd	End date (exclusive) that these measures were observed	dateTime	Y	
speciesName	Latin name for species of fish	string	Y	
lightTrapCatch	NA: variable no longer used with dropping of light traps from program for Y2 onwards			
driftNetCatch	Number of individual per unit effort (number of individuals per cubic metre of water filtered)	number (8 decimals)	N	
trawlNetCatch	Number of individual per unit effort (number of individuals per cubic metre of water filtered)	number (8 decimals)	N	
sampleType	Sampling method	category	Y	DriftNet Trawl
turbidity	NA: variable no longer used with dropping of light traps from program for Y2 onwards	NA	N	NA
qualityTurbidity	Quality code as per Water Quality standard method	integer	N	[1,5]

