THE UNIVERSITY OF MELBOURNE

Commonwealth Environmental Water Office
Monitoring, Evaluation and Research Program

Fish - Work Order - MER Plan SOP Fish Tracking v1.0

Standard Operating Procedures
Fish Movement v 1.0

14 October 2020

1. Introduction

The Standard Operating Procedure (SOP) for Fish Movement describes the purpose of the Fish Movement 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 Movement activities for the MER program and should be updated throughout the life of the MER Program to reflect any agreed changes to method or procedure.

2. Objective and Hypotheses

The aim of this project is to investigate the movement behaviours and habitat use of juvenile Murray cod and/or trout cod in the Goulburn River using telemetry. Populations of both species have declined substantially, due to factors such as altered flow regimes and habitat degradation and are now listed as threatened nationally. Consequently, conservation management for these species has a strong focus on rehabilitating habitat and providing adequate flows for movement and sustaining habitats. However, insufficient information on movement and habitat use of these species limits the development of targeted conservation-management strategies. This project will use telemetry techniques to determine movement and fine-scale ecohydraulic characteristics (e.g. depth, velocity) of habitats used by juvenile Murray cod and trout cod. This information can be used for instance to assess how flow delivery can be used to optimise or conversely, prove detrimental to critical habitat availability.

3. Indicators

Locations of tagged fish will be determined by triangulation with a handheld, three-element Yagi antenna and an ATS receiver. This technique has a high location accuracy (typically within 2 m). Locations will be recorded using a hand-held GPS unit. Locations will be plotted in GIS software and the distance between locations (shortest distance by water between fixes) in metres calculated to determine the distances moved.

Total linear ranges for each fish will be estimated by determining the distance between the two most distant fixes. To examine the influence of occasional long-distance movement on home-range estimates, 80 and 50% linear ranges will also be calculated for each fish by calculating the minimum distance containing at least 80 and 50% of locations respectively.

To determine the ecohydraulic characteristics of habitats used by fish, at each fish location, mesohabitat type, depth, flow velocity (surface and bottom), and structural habitat (e.g. presence of snags, vegetation) will be measured. Mesohabitats will be recorded using the following categories: riffle (fast-flowing with broken water surface), pool (slow flowing with smooth water surface) and glide or run (in-between pool and riffle with wavy water surface or swift flow. Depth will be measured using a weighted tape measure. Flow velocity will be measured using an FP211 Flow Probe. Structural habitat at each fish location (within a ~3 m radius) will be classified according to the presence of wood (>10 cm diameter), macrophytes, or both.

4. Locations for Monitoring

Up to twenty fish comprising Murray cod and/or trout cod will be collected and tagged in the Goulburn River in the region around Murchison-Toolamba (Zone 1). This region has been selected on the basis that it currently supports abundant Murray cod and trout cod populations.

5. Timing and frequency of sampling

Murray cod and/or trout cod will be collected using boat electrofishing and tagged with radio transmitters around spring 2021. Fish will be located by manual tracking from a boat using a handheld antenna and a receiver over 8 trips every 1–2 weeks covering about 10-12 weeks between late spring and summer. This period has been chosen on the basis that it is thought to represent a key period for fish movement activity. This period also provides an important opportunity to examine movement and habitat use before and during (and potentially after) elevated river flows during summer associated with inter valley water transfers (IVT's).

6. Responsibilities and 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 work and any relevant training, and preparing safety plans. Other experienced staff from ARI may also participate in the surveys at times where needed. ARI Biometricians will conduct data analysis. Wayne Koster and David Dawson will be responsible for collating, checking and uploading collected data.

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

- Discuss the overall program to the new staff member and introduce to team members.
- Outline and document the roles and responsibilities of the new staff member
- Explain and provide access to relevant program documents
- Explain and discuss the standard operating procedure
- Explain and discuss the project risk assessment and the required safety measures
- Demonstrate sampling methods to staff in the field and supervise staff undertaking these methods until satisfactory competency is demonstrated.
- Explain and demonstrate data collation, analysis, uploading procedures and assist staff in performing these tasks as required

No formal accreditation is required to undertake radio-tracking. However, any new inexperienced staff involved in field work with other staff who have at least 2-3 years' experience. Staff operating vehicles must hold a valid Victorian drivers' licence. Staff operating boats must hold a boating licence and AMSA Low Complexity Duties certificate. 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.

7. Monitoring Methods

Field methods

Equipment

Electrofishing boat (fish collection), measuring board and scales

Small boat (fish tracking)

GPS

Datasheets and/or field computer

Handheld, three-element Yagi antenna and an ATS receiver

Weighted tape measure

FP211 Flow Probe

Sampling protocol

<u>Fish collection and tagging</u>

Fish will be captured using boat electrofishing methods. Operators will follow all protocols and procedures as outlined in the ARI Electrofishing Standard Operating Procedures (SOP17-001). Fish for tagging will be measured for length and weight. All other fish collected (i.e. bycatch) will be immediately released at the site of capture.

Transmitters will be implanted into the peritoneal cavity via a 5-8 mm incision on the ventral surface, between the pelvic and anal fins. The incision will be closed with 1-2 dissolvable external synthetic absorbable monofilament sutures. Once the fish maintain their balance and freely swim, they will be released near their point of capture.

Fish tracking

Fish will be located by manual tracking during daylight hours from a boat using a handheld antenna and a receiver over 8 visits every 1–2 weeks covering about 10-12 weeks between late spring and summer.

Laboratory methods

NA

8. 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.
- 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 (application in progress). Permits will be carried while sampling. Prior notification to Fisheries for any sampling will be made as per permit conditions.
- Data will be entered into an excel spreadsheet. 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.

9. Data Analysis and Reporting

Data for each fish location will be reported as:

- Date and time
- Location (latitude and longitude)
- Mesohabitat type
- Depth
- Flow velocity (surface and bottom)
- Structural habitat (e.g. presence of snags, vegetation).

It is proposed that movement patterns of tagged fish will be analysed using generalised linear models. A range of extrinsic (i.e. environmental) and intrinsic (i.e. fish specific) covariates will be developed to predict probability of movement. Chi-Square analyses will be used to examine preferences for particular habitats. A brief report will be produced that details movement and habitat use, including linear ranges, ecohydraulic characteristics of habitats used by fish, and links between movement and factors such as river discharge.

10. References

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