THE UNIVERSITY OF MELBOURNE

Commonwealth Environmental Water Office
Monitoring, Evaluation and Research Program

Pelagic Metabolism - SOP-v1.0

Standard Operating Procedures
Pelagic Metabolism rates v 1.0

8 March 2021

1. Introduction

The Standard Operating Procedure (SOP) for pelagic metabolism rates describes the purpose of the Goulburn pelagic metabolism assessment being conducted under the contingency monitoring program, procedures for conducting monitoring, specific task responsibility along with further procedures for data reporting and analysis. The document is intended to be taken in the field during any pelagic metabolism 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 and differentiate between Benthic and Pelagic metabolism in the Goulburn river, the largest Victorian tributary of the Murray-Darling Basin. The project will use dissolved oxygen readings to determine pelagic metabolism to assess metabolic processes of the water column itself. These data will be used to understand the constraints limiting the growth of organisms in the river, in comparison to the whole stream metabolic data, currently measured by continuous loggers throughout the river. The project will also consider potential explanatory factors such as nutrient levels, pH, temperature, and light availability to gain a better understanding of the drivers and limitations of metabolic processes within the river system. The research is important as it will help in understanding food availability for invertebrate and fish populations in the Goulburn.

3. Indicators

Dissolved oxygen, temperature, surface light (PAR), and bottle depth (see sampling protocol below) are required to be measured every 10-14 days over the Australian Summer-autumn period (December to March). YSI probes (Pro DSS DIGITAL) and temperature and light loggers (HOBO Pendant Temp/Light MX2202 Logger) will be employed to measure the parameters. Also, water samples will be collected with the same intervals to determine DOC, TP, TN, NH3, FRP, and NOx levels.

4. Locations for Monitoring

There will be 3 locations used for monitoring in this project. All sampling locations are in close proximity to the continuous loggers already in place. These locations are Darcy's Track, Loch Garry, and McCoy's bridge and are well known locations for the MER Program.

5. Timing and frequency of sampling

Sampling trips will be made every 2 – 3 weeks starting from the end of December 2020 into April 2021. There are 7 sampling trips planned lasting 2 days each.

6. Responsibilities and identifying key staff

Field program

Probe calibration and maintenance, data and water sample collection, and light penetration measurements will be conducted every 10-14 days by Master of Engineering students of the University of Melbourne.

Luke Russell, Nikita Christopher, and Parya Baghbanorandi will be responsible for the fieldwork and statistical analysis.

While Angus Webb is the project supervisor, Xue Hou and Michael Grace are the co-supervisor and external sponsor, respectively.

7. Monitoring Methods

Field methods

Equipment

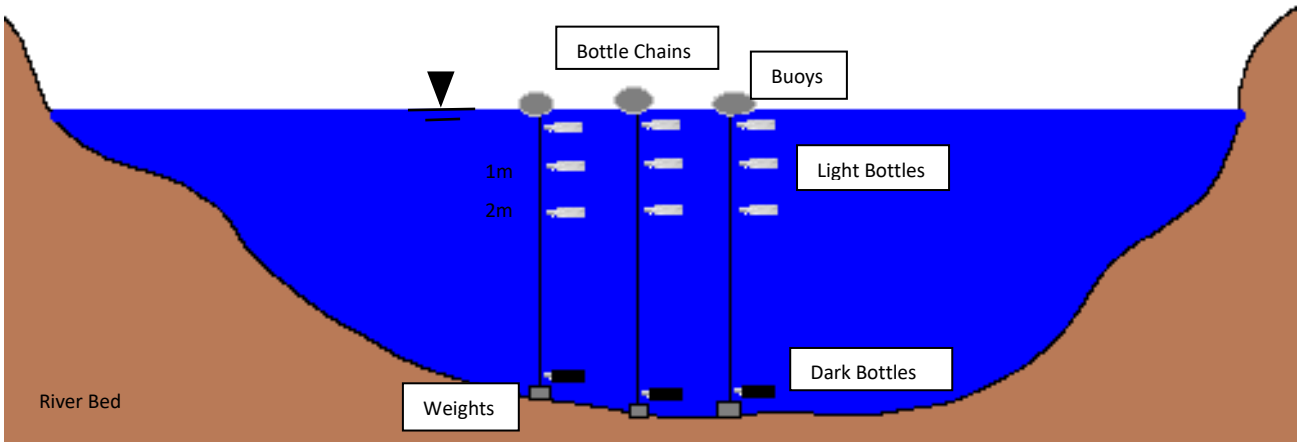
- 1 x boat
- 1 x Measuring tape
- 3 x Waders, sizes L

- 1 x Rope 50m
- 1 x First aid kit
- 1 x Snake bite kit
- 3 x Rubber gloves
- 50 x Syringes
- 50 x 0.22 micron filters
- 12 x 4.7 cm diameter filter paper
- 45 x Clear plastic bottles (65ml)
- 1 x esky
- Ice to fill the esky
- Sample bags/bottles
- 4 x Buoys
- 4 x 2kg weights
- 1 x shade cloth
- 1 x YSI probe
- 1 x thin diameter DO probe
- Cable ties
- Gaffer tape

Sampling protocol

Using a plastic bottomed kayak, light (clear) and dark (opaque) bottles are filled using surface water from the middle of the river. Three identical bottle chains are formed with light bottles suspended at the surface and depths of 1m and 2m, and including one dark bottle on the chain at the bottom. Three light and temperature loggers are attached to one bottle chain at the same depths as the light bottles. The loggers are connected via bluetooth to a smartphone application called HOBOconnect. These bottle chains along with the loggers are then lowered into the water with the exact time noted, ensuring bottle chains are sufficiently distant so that they block light from one another.

Figure 1: Bottle chain sampling schematic



From the same section of the river, use a YSI multiprobe to determine temperature, turbidity, conductivity, pH and dissolved oxygen levels. Rinsing a bucket with the same water, take a sample of water to be used for chlorophyll analysis.

Bottle chains must remain in the water column for a minimum of 1 hour.

While waiting, using a syringe and 0.7-micron filter paper, filter 800ml (minimum of 600ml can be used but the exact amount must be recorded) of the water sample just taken. Wrap in aluminium foil and store the filter paper in an esky for lab analysis of chlorophyll A levels.

After waiting and retrieving the bottle chains from the river, the exact time of removal must be recorded for each bottle chain. The dissolved oxygen level in each bottle is then recorded and 80ml from five bottles is filtered through a 0.2-micron filter then stored in the esky with ice, to be taken back to the lab for nutrient level analysis.

The same process is repeated at every location.

Laboratory methods

Laboratory analysis (DOC, NH_3, NOx, PO4, ChlA) are being done the NATA accredited Water Studies Centre lab at Monash University with results emailed directly to the students. This is the same lab being used for other water quality analyses in the MER Program.

8. Quality assurance/ quality control

The collected data will be entered into a shared spreadsheet on Google Drive. Parya Baghbanorandi will enter the data obtained from the YSI multiprobe and the DO probe, while Nikita Christopher will enter the data collected by the light and temperature loggers. Luke Russell will communicate with the Water Studies Lab at Monash and publish the Chlorophyll A and nutrient results on the spreadsheet.

9. Data Analysis and Reporting

Data analysis methods have not been finalised but will be developed to determine the relative amounts of benthic and pelagic metabolism in the Goulburn system on the days of sampling.

The student supervisors will prepare a section for inclusion in the metabolism chapter of the MER Annual Report in 2021. The students are required to submit a final report for assessment of the Master of Engineering project. This report will be included as an appendix to the Scientific Report of the project.

10. References

angus.webb@unimelb.edu.au