

Purpose

- Study the behaviour of dissolved oxygen affected by respiration
- Amount of carbon produced in the river can be found by carbon to oxygen ratio
- Get the idea of carbon uptake and utilisation

Why is it necessary?

- Understand the carbon and nutrient cycling in rivers
- Carbon produced in the river will combine with the water to form carbonic acid
- High amount of carbon dioxide will result in dead fish
- Affect the ecosystem and the water quality

Methodology

- Equation of changes of dissolved oxygen in river: $\frac{dDO}{dt} = P + ER + k_a(DO_{sat} - DO)$
- Experiments are done at night time, no photosynthesis
- Aerate the river to saturation point manually, to avoid aeration between atmosphere and river
- The measured dissolved oxygen is only related to respiration



Experiments Location

- The River Ebbles
- Part of the River Avon in the Hampshire section
- Characterised by open chalk downland with steep scarp slopes
- The River Avon is located in the south of England
- 60km long and covers a total catchment area of approximately 1750km²

ACKNOWLEDGEMENTS

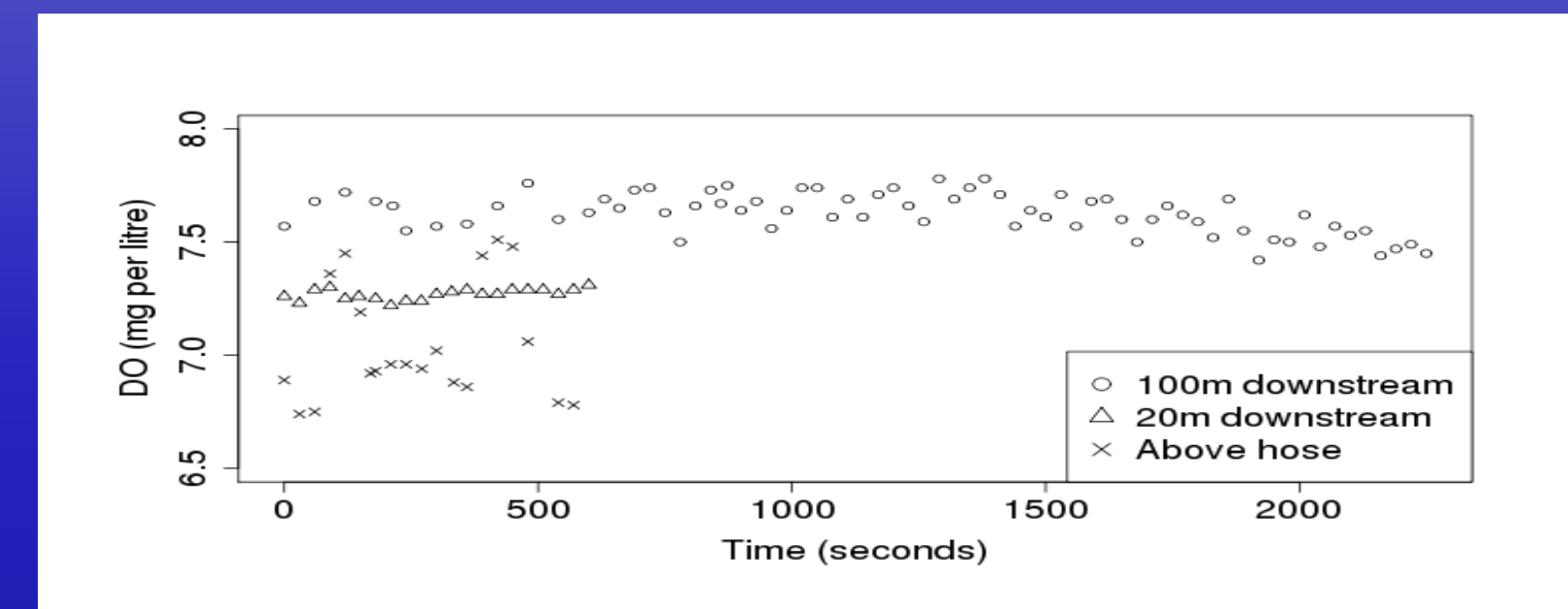
Many thanks to my supervisor, Dr. Adrian Butler, whose contribution in stimulating suggestions and reviewing. I would also like to thank you Dr. Simon Parker and Mr. Jimmy O'Keeffe who guided me in the project especially during the experiments.

Experimental Setup



- Choose a suitable location to set up aeration device
- Hose with holes are placed in the river to allow air to be pumped in
- Connections to the compressor for fine adjustment of pressure

Pulse tests at daytime

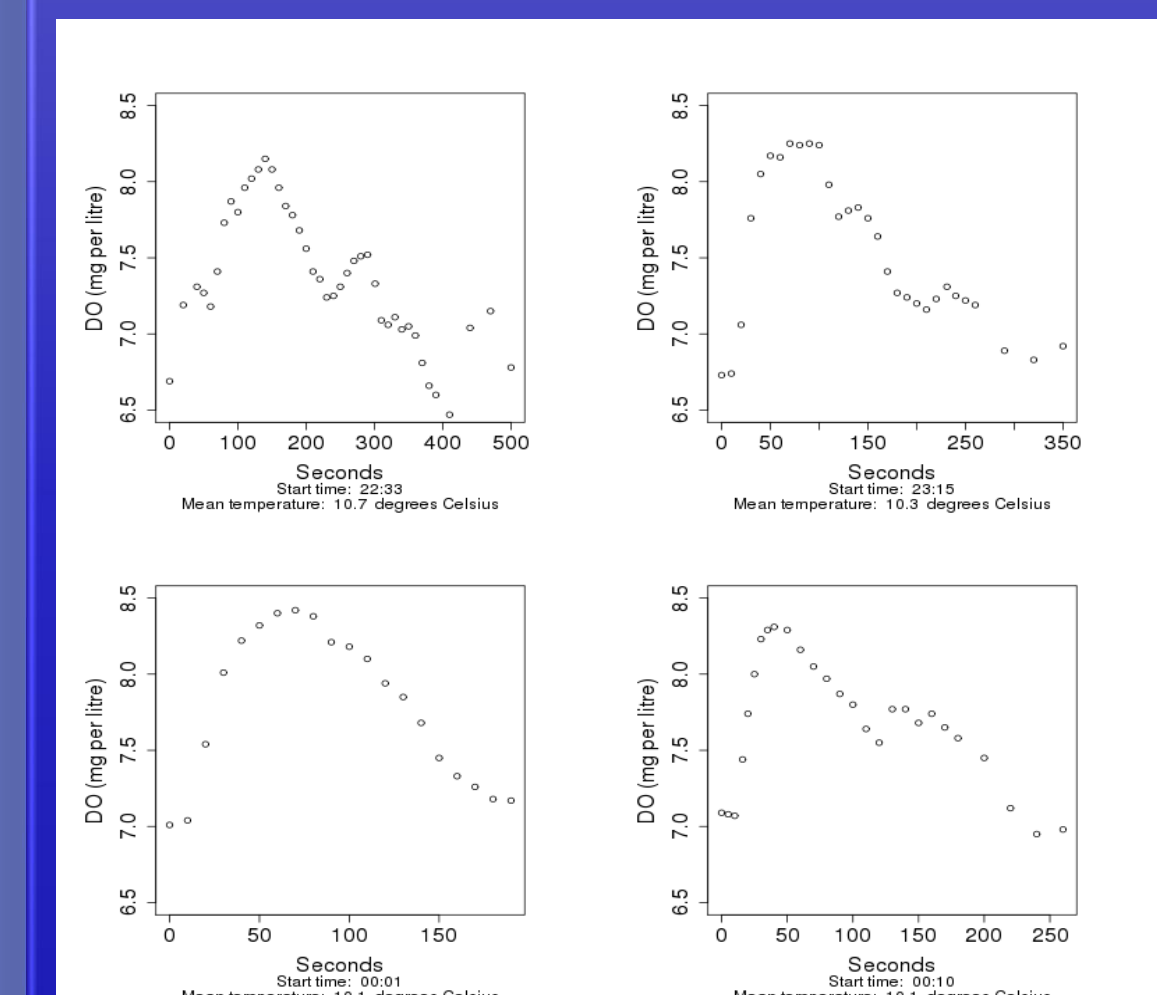


- No changes in DO level after pumping air into water

Discussion and Conclusion

- Accuracy of device – DO meter
 - Calibration should be carried out in the laboratory with conditions of 25°C, 0 g/l salinity and 760 mmHg
- Results of the experimental site
 - The natural DO level never goes above saturation point even in daytime
 - It was found that there are not many plants in the river and there is high BOD because of the waste from cows in the farm upstream
 - Not enough time for the oxygen to dissolve in water before escaping to atmosphere
- The apparatus used could not provide sufficient amount of oxygen to increase the DO level above saturation point and could be improved by:
 - Stronger compressor
 - Hose with micro-holes to provide tiny air bubbles
 - Use pure oxygen instead of air

Pulse tests at night-time



- An increase of 1.4mg/l DO was detected

