PHOTOSYNTHESIS & PAM FLUOROMETRY WORKSHOP
JANUARY 20 – 21, 2014

10th International Temperate Reef Symposium Satellite Event
University of Western Australia

BASIC STRUCTURE

DAY 1:

- Session 1: Tutorial sessions on theory behind active chlorophyll fluorescence measurements and applications of the technique (morning to early afternoon). Other measurements and techniques will be discussed to maintain the perspective of chlorophyll fluorescence as representing just one part of a complex metabolic process.
- Session 2 - Familiarisation: Get the equipment out in the lab setting and get used to the different pieces of equipment, taking measurements and interpretation of data.

DAY 2:

- Session 3 - Field: Attendees get to go into the field and take measurements under the guidance of an experienced user. A return to the lab in the afternoon will allow a first cut at data processing and interpretation and short presentations of the results. With a project plan in place, the data collected could be used to create a publication.

WORKSHOP LEADERS

Dr John Runcie (UTS; Aquation Pty Ltd)

Dr Jeff Cosgrove (Murdoch University)

WORKSHOP PARTICIPANTS

This workshop is open to 10th International Temperate Reefs Symposium delegates and local researchers with an interest in investigating systems responses via interrogation of chlorophyll-*a* fluorescence dynamics using PAM fluorometry.

This workshop aims to make attendees more confident in their understanding of chl-*a* fluorescence dynamics, how to obtain useful chl-*a* fluorescence data and useful information on how to interpret your data. We also aim to provide participants with experience using a variety of PAM-fluorometers.

Aimed at beginner to intermediate users of PAM fluorometers.

DAY 1

8:30 – 9AM

REGISTRATION, COFFEE/TEA

9 – 9:20AM

INTRODUCTIONS / ICEBREAKER

9:15AM – 2:30PM

THE ORIGIN OF CHLOROPHYLL FLUORESCENCE

THE PHOTOSYNTHETIC APPARATUS AND LIGHT CAPTURE

ENERGY PATHWAYS AND PRIMARY CHARGE SEPARATION

CHL FLUORESCENCE AND DECONSTRUCTING THE KAUTSKY CURVE.

PSII vs PSI

Kautsky Curve

- Slow phase parameters
  - Fo, Fm, Fv/Fm, F', Fs…qP, NPQ etc.
  - Measuring electron transport rate
- Fast phase parameters
- Common protocols and analysis (RLC, Induction, Quenching components)

CHLOROPHYLL FLUORESCENCE IN THE BIGGER PICTURE

HOW DOES CHL FLUORESCENCE RELATE TO O_2 EVOLUTION AND CARBON FIXATION?

Yields (Φ_{PSII}, Φ_{O2}, Φ_C)

Alternative electron pathways

APPLICATIONS OF CHLOROPHYLL FLUORESCENCE MEASUREMENTS

Climate change (temperature, pH), shading impacts, nutrient limitation, disease and toxicology, strain selection etc.

ACTIVE CHLOROPHYLL FLUOROMETERS

MEASURING CHLOROPHYLL FLUORESCENCE – PULSE AMPLITUDE MODULATED FLUOROMETERS

- Requirements (Actinic light, Measuring light, filters etc.)
- Development
- Differences (e.g. between diving PAM and Aquation submersible PAM)

CRITICAL REVIEW EXERCISE

(We provide a range of journal articles that have employed chl fluorescence analysis as one of their primary techniques – participants critique the article (mainly method and interpretation) using their new knowledge → discussion)…or their own sampling and analysis plan.

3PM – 5PM

FLUOROMETER FAMILIARIZATION

Participants get to try taking measurements with the various fluorometers in the lab – including setting up and settings considerations

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DAY 2

MORNING – EXPERIMENTAL DATA COLLECTION

Participants will take submersible fluorometers into the field to take measurements of photosynthetic parameters of the seagrass *Halophila ovalis* from early morning to noon across a depth profile. Aquation's unique respirometer system will be deployed also.

This will demonstrate the major role recent light history plays in influencing photochemical yield measurements and that a good understanding of irradiance is required in order to utilise yield measurements as a diagnostic tool.

The availability of different fluorometers will also allow some investigation into the impact fluorometers design and application on experimental design and data.

AFTERNOON – DATA PROCESSING AND INTERPRETATION

Data collected in the morning session will be downloaded and groups will work to process and interpret this information, with the aim of integrating the results and bringing it all together by the end of the day to present a picture of the outcomes.