Algal blooms

Indicators and thresholds

Phytoplankton are important in the Gippsland Lakes, and through their photosynthesis, provide the primary driver of food webs in the main lakes (Grigg et al. 2004, Cook et al. 2008, Holland et al. 2009). Generally the phytoplankton community is dominated by dinoflagellates and diatoms, typical of estuaries and coastal waters in temperate Australia (Day et al. 2011). The Gippsland Lakes experience periodic algal blooms and since 1986, a number of blooms of the common estuarine cyanobacterium (blue-green algae) *Nodularia spumigena* have been recorded across Lake King and Lake Victoria (Webster et al. 2001, Beardall 2008, Day et al. 2011). In 2007, for the first time, a bloom of the normally marine cyanobacterium *Synechococcus* spp. extended across large areas of the main lakes for over five months (Beardall 2008, Day et al. 2011).

In terms of the frequency of **algal blooms**, the Resource Condition Targets (RCT) for the Ramsar site have been used to derive thresholds.

RCT = A reduction in the number of years in which blue-green algal blooms occur in the lakes to less than five over the 20 years (East Gippsland CMA 2015).

Condition thresholds for algal blooms are as follows:

- Good = meets RCT (< 5 algal blooms in 20 years)
- Fair = between 5 and 8 algal blooms in 20 years
- Poor > 8 algal blooms in 20 years

Locations

Phytoplankton is important to the main lakes and is a driver of food webs and productivity in the coastal lagoons. In the fringing wetlands, there is less information on phytoplankton and its importance in food webs is less certain. The assessment of algal blooms is across the main lakes.

Results

Summary

Indicator	Status and trends				Summary
	Unknown	Poor	Fair	Good	
Algal blooms	**Data quality:** Good **Data custodian:** DELWP				The indicator for algal blooms was assessed as “fair” due to the number of blooms in the past two decades (eight since 2001). Four of these were of the blue-green algae *Nodularia*, three were the blue-green algae *Synechococcus* and the bloom in the summer of 2015/16, was of the diatom *Pseudo-nitzschia*. The long-term record for algal blooms is incomplete and it is difficult to know if there is a trend in the frequency or extent of algal blooms in the system.

Status

There have been eight algal blooms in the main lakes in the past two decades (data from DELWP unpublished):

- 2001/02 – *Nodularia*
- 2007/08 – *Synechococcus*
- 2010/11 – *Nodularia*
- 2011/12 – *Nodularia*
- 2015/16 – *Pseudo-nitzschia*
- 2017/18 – *Synechococcus*
- 2018/19 – *Nodularia*
- 2019/20 – *Nodularia* and *Syenchococcus*

The eight blooms indicate a condition of “fair”. There were successive blue-green algal blooms in the lakes in 2010/11 and 2011/12; and in the three years from 2017/18 to 2019/20. The extent of the algal blooms is also a consideration for the condition of the lakes, with localised blooms less of an impact than those that cover a large proportion of the lakes. For example, the Nodularia bloom in 2010/11 covered greater than 10 % of the main lakes while the bloom in 2011/12 was smaller as was the 2017/18 bloom. Similarly, the *Nodularia* bloom in March 2019 was localised to around Marley Point, but the March 2020 *Syenchococcus* bloom was widespread and likely covered more than 10% of the system. There have therefore been several blooms that covered a substantive portion of the Lakes in the past two decades.

Trend

There is little contemporary information upon which to assess a trend in algal blooms. A study of the long-term history of algal blooms in the Gippsland Lakes from sediment cores indicates that there are two distinct periods of blue-green algal blooms in the lakes (Holland et al. 2013). The first was prior to the opening of the entrance to the Southern Ocean, when catchment inputs were concentrated in the closed lagoon system resulting in increased algal blooms. The construction of the channel at Lakes Entrance saw an immediate reduction in algal blooms and a period of low algal growth, as the system filled and flushed with marine water. More recently high algal growth and frequency of algal blooms coincide with high nutrient concentrations linked to catchment inputs (Holland et al. 2013). Whether there is a sustained trend in algal bloom frequency, extent or intensity in the lakes is not known.

References

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