Environment Protection Authority

EPA Submission Regarding Reconsideration of EPBC 2012/6406

Purpose

This submission is made to the Federal *Department of Climate Change, Energy, the Environment* and Water (DCCEEW) in response to correspondence dated 30 November 2023 which invites comment on the NCA-PM decision made in 2012 regarding marine farming in Macquarie Harbour.

The purpose of this submission is to provide:

- An overview of the EPA's actions since becoming responsible for the environmental regulation of finfish farming in Tasmania in 2016;
- A summary of monitoring and reporting undertaken under Environmental Licence conditions;
- An analysis of compliance with environmental performance standards specified in Environmental Licences;
- An outline of EPA's plan for future environmental regulation.

Macquarie Harbour ecological condition – an overview

Macquarie Harbour status reports were prepared in 2015, 2016 and 2017 in response to concerns about potential impacts of farming on *Tasmanian Wilderness World Heritage Area* (TWWHA) values and provide a good summary of ecological conditions and impacts. The 2017 report can be found at Macquarie Harbour Tasmanian Wilderness World Heritage Area Environmental Status Report – May 2017 (EPA website).

EPA understands that DCCEEW has received a submission from NRE TAS which provides an overview of identified impacts and management responses in Macquarie Harbour from 2017 to present. The information compiled by NRE Tas utilises information provided by EPA within Statement of Reasons in support of biomass and TPDNO determinations.

More recently EPA prepared a summary of current scientific knowledge in the context of Environmental Licence renewals (November 2023). The report is available at Circumstances for Consideration Under (S24(T)(5) (EPA website).

Regulatory functions undertaken by EPA since 2017

EPA assumed responsibility for the environmental regulation of Tasmanian finfish farms in July 2016. The EPA Director initially acted under delegation from the Secretary of DPIPWE. In December 2017, legal arrangements were formalised through the *Finfish Farming Environmental Regulation Act* which inserted relevant sections into the *Environmental Management and Pollution Control Act* (EMPCA). Subsequently, the EPA Director issued Environmental Licences in 2018 which substantially mirrored the Marine Farming Licence conditions at the time.

In addition, the EPA Director has been able to make determinations regarding biomass caps and *Total Permissible Dissolved Nitrogen Outputs* (TPDNO). These are not lease-specific but applicable to multiple leases operated by a company and are made under management controls of the Macquarie Harbour Marine Farming Development Plan rather than Environmental Licences.

Determinations regarding biomass or TPDNO

Expansion of finfish farming in Macquarie Harbour occurred from 2005. The biomass cap (i.e. the maximum permissible biomass within a determined area at a point in time) specified in the original EPBC NCA-PM

decision issued on 3 October 2012 was 15,340 tonnes (52.5% of the identified maximum sustainable biomass of 29,500 tonnes). This limit was subject to review in 2013, at which time the cap was removed and effectively replaced by the modelled maximum sustainable biomass of 29,500 tonnes. In April 2016 this was lowered to 21,500 tonnes.

In November 2016, due to concerns about environmental conditions within the harbour, in particular the presence of Beggiatoa mats and declining benthic infauna abundance within the TWWHA, the EPA Director required Tassal to destock the Franklin lease (MFL 266), located approximately 1 km outside of the TWWHA boundary, by March 2017.

To reduce pressure on the harbour and allow for environmental recovery, the biomass cap was progressively lowered. In January 2017 the EPA Director issued a determination reducing the biomass cap for Macquarie Harbour from 21,500 tonnes to 14,000 tonnes. This determination was valid for the period 14 February to 30 April 2017 and was replaced by a new determination in May 2017 that reduced the biomass cap to 12,036 tonnes for the period 1 June 2017 to 31 May 2018. Without the cap, biomass levels were projected to reach 18,000 tonnes at peak production in December 2017.

In May 2017, Tassal was provided with a supplementary apportionment of approximately 4,000 tonnes, contingent on the implementation of an approved Waste Capture System (WCS) for its remaining two leases, MF 214 and MF 219, designed to offset the portion of the biomass on theses lease which exceeded the biomass cap (see details in Attachment 3). The rationale underpinning this determination was set out in the Director's Statement of Reasons.

Subsequent determinations in June 2018 and June 2020 reduced the biomass cap to 9,500 tonnes, due to ongoing concerns about the ecological health of the harbour. This biomass cap determination was valid for the period 1 June 2018 to 31 May 2022.

On 1 September 2022 the EPA Director replaced the biomass cap with a *Total Permissible Dissolved Nitrogen Output* (TPDNO) determination. TPDNO is reflective of actual nitrogen content in feed and is considered a more relevant constraint on production because it is more closely related to overall environmental impact. It is specified for any 12-month rolling period. The TPDNO was set at 500.1 tonnes for the entire harbour and apportioned to the three companies according to lease area. The TPDNO amount represents a 10% reduction in feed input compared to 2021 levels.

Further details regarding all biomass and TPDNO determinations from January 2017 onwards, including associated Statement of Reasons, can be accessed on the EPA website at Macquarie Harbour – Management Determinations.

The current TPDNO decision remains in force until August 2027, unless the EPA Director issues a modified determination, e.g. by reducing the TPDNO in response to deteriorating environmental impacts. This would reduce the amount of nitrogen in feed that is discharged into Macquarie Harbour, thereby reducing overall salmon production, waste release and the associated dissolved oxygen consumption.

Compliance with the current TPDNO was first assessed upon completion of the first rolling 12-month period in September 2023, and on an ongoing monthly basis since then. To date, no non-compliances have been identified.

A timeline of key events regarding the marine farming activities in Macquarie Harbour is shown in Figure 1. Attachment 1 illustrates feed input and standing biomass levels and the relevant caps (or limits), for the period from 2006 to present.

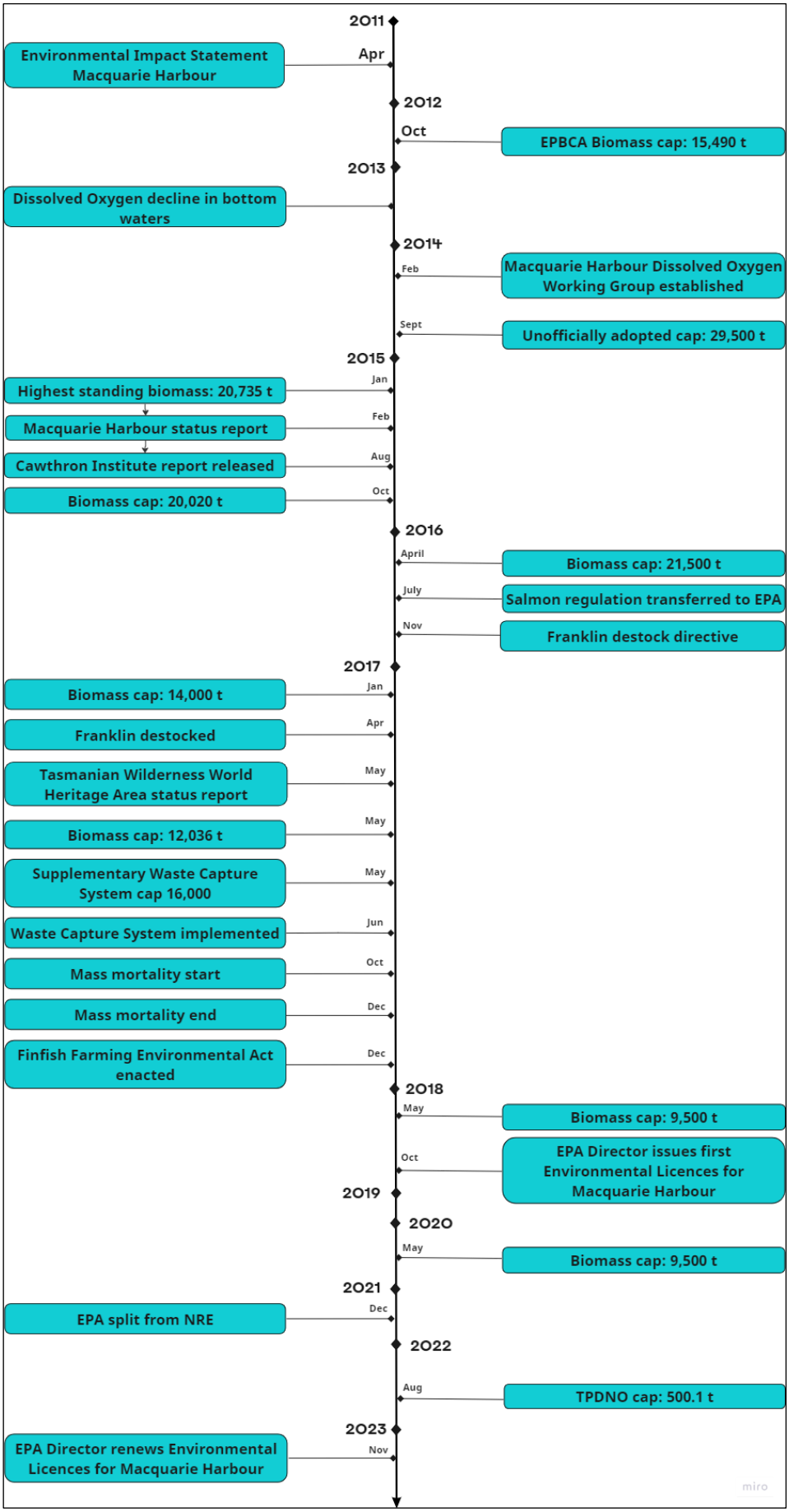

Figure 1: Timeline of relevant events including biomass / TPDNO determinations

Environmental licences

Environmental Licences currently contain a range of monitoring requirements in relation to benthic condition and broadscale environmental monitoring requirements including water quality. EPA regularly conducts compliance assessments against licence conditions.

Compliance with benthic condition performance criteria

Benthic conditions are monitored outside the lease boundary ('compliance sites'), at control sites within the broader Macquarie Harbour region, and within the farms under pens.

Performance criteria are specified in relation to compliance sites and pen bay sites.

Table 1 shows the outcome of assessments undertaken in relation to compliance sites.

Table 1: Summary of EPA assessments – benthic condition at compliance sites

Survey Date	No. Sites Surveyed	Total NC	No. Leases with a NC Site	Percentage NC	MH Determinations
Sept 2016	91	19	4	20.9	April 2016 – 21,500 t Biomass cap
Jan 2017	105	38	6	36.2	14 Feb 2017 – 14,000 t Biomass cap
May 2017	104	4	1	3.8	1 June 2017 – 12,000 t Biomass cap
Sept 2017	100	4	1	4.0	
Jan 2018	104	10	4	9.6	
May 2018	105	8	4	7.6	1 June 2018 – 9,500 t Biomass cap
Sept 2018	109	10	3	9.2	
Jan 2019	109	6	5	5.5	
May 2019	113	4	3	3.5	
Sept 2019	106	7	5	6.6	
Jan 2020	105	13	3	12.4	
May 2020	110	3	1	2.7	1 June 2020 – 9,500 t Biomass cap
Sept 2020	103	3	2	2.9	
Jan 2021	95	2	2	2.1	
May 2021	103	1	1	1.0	
Sept 2021	103	3	2	2.9	
Jan 2022	102	3	1	2.9	
May 2022	102	0	0	0.0	
Sept 2022	102	3	2	2.9	1 Sept 2022 – 500.1 t TPDNO
Jan 2023	111	3	2	2.7	
May 2023	107	0	0	0.0	
Sept 2023	105	1	1	1.0	

NC means non-compliance, whereby observation of 'significant visual, physio-chemical or biological impacts attributable to marine farming operations at, or extending beyond, 35 metres from the boundary of the lease areas' is classified as a non-compliance.

Percent NC refers to the number of identified non-compliances as a percentage of all compliance sites (at 35 m from lease boundary or beyond) surveyed in that monitoring event. The number of compliance sites to be surveyed has varied throughout the monitoring period, as shown in the table in the column 'No. Sites Surveyed'.

It is evident that benthic conditions at near farm scales have significantly improved since 2016/17. Since May 2020, non-compliance levels have ranged between 0 and 2.9 per cent, in contrast to the worst conditions which were recorded in January 2017 (36 per cent). It is worth noting that the May and September 2023 observations represent the best consecutive compliance assessment scores recorded by the EPA to date.

At the end of December 2023 compliance levels are considered to be stable, with only minor seasonal fluctuations being noticeable. These fluctuations are likely to be reflective of production patterns, with

production generally increasing from September until the harvest period commencing in December followed by typically lower production in autumn and winter.

Comparison with feed input data indicates that there may be a lag of several years before a reduced scale of finfish farming translates into improved benthic conditions, with the May 2018 biomass reduction not being consistently reflected until May 2020. Similar observations were made by Ross et al. (March 2022, p. 46) in relation to nutrient concentrations in the harbour. Concentrations increased noticeably between 2012 and 2017 but appear to have declined from 2018. The increase in Total Kjeldahl Nitrogen and to a lesser extent Total Nitrogen suggest that there was an increase in the organic nitrogen pool within the system that is beginning to decline.

Table 2 shows EPA's assessment of benthic condition observed within farms. Observations are based on video footage collected under pen bays at regular intervals.

Table 2: Summary of EPA assessments – benthic condition within farm (under pens)

Year	Number of non-compliances	Number of leases recording non-compliances	Types of non-compliance
2017	3	1	Spontaneous gas bubbling
2018	8	5	Spontaneous gas bubbling & Failure to comply with any written notice or request
2019	0	0	n/a
2020	1	1	Spontaneous gas bubbling
2021	2	1	Spontaneous gas bubbling & Excessive feed dumping
2022	13	5	Spontaneous gas bubbling & Excessive feed dumping
2023	6	3	Spontaneous gas bubbling

Pen bay compliance levels are likely to be primarily influenced by farming practices at individual leases. It is therefore not surprising that there is no consistent trend over the 2017 to 2020 period, nor is there a clear correlation with harbour-wide biomass or TPDNO.

However, in examining the 2017/18 results more closely it is evident that pen bay performance remained stable for the first part of 2017, then declined from October 2017 at the same time low oxygen levels were observed in bottom waters.

Beggiatoa observations at control sites

Control sites are located throughout Macquarie Harbour at some distance from farms (see Figure 2). These sites are monitored at 4-monthly intervals to determine the presence or absence of *Beggiatoa* mats in a joint effort by the companies. While there are no specific performance requirements, the results provide useful insights into long-term trends. The presence of *Beggiatoa* at control sites is indicative of a low DO environment and organic inputs. However, these observations do not indicate the source of the organic matter and it is acknowledged that in addition to aquaculture inputs there are other significant sources of organic matter that may contribute to oxygen drawdown in Macquarie Harbour (e.g. riverine inputs from the Gordon River).

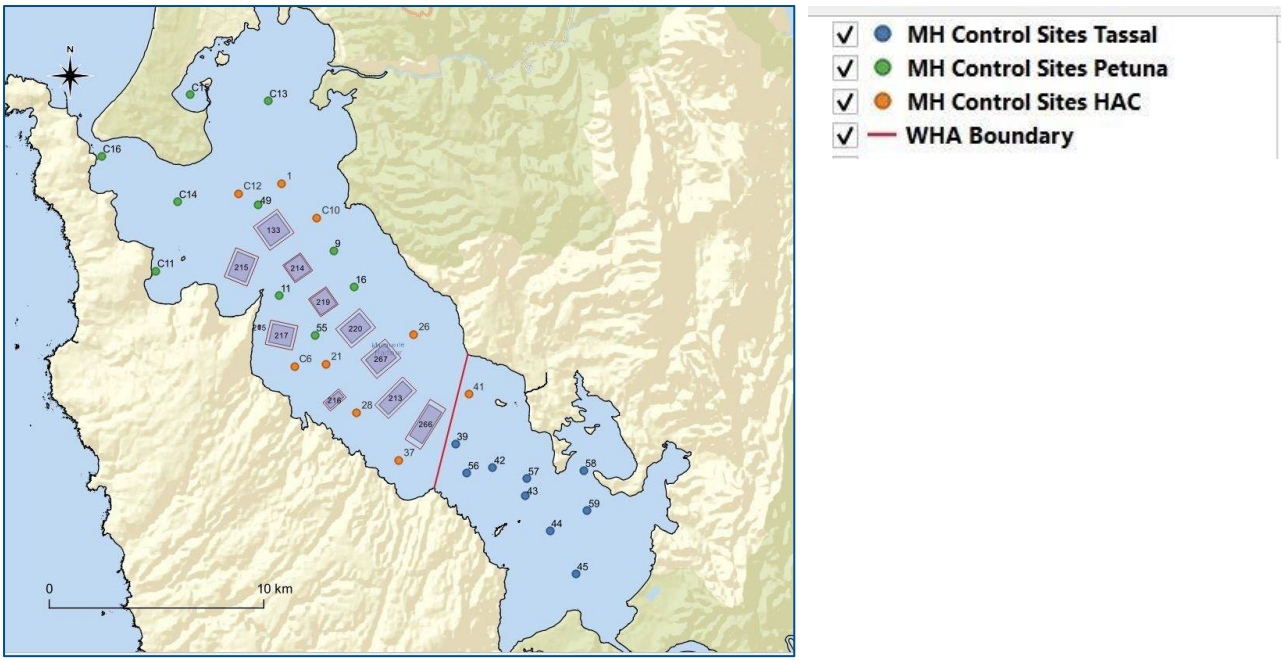

Figure 2: Control site locations within Macquarie Harbour

The results of the control site surveys (Table 3) highlight that observations of the presence of *Beggiatoa* at control sites have predominantly occurred at 4 control sites (43, 44, 58 and 59) located within the TWWHA more than 5km from the nearest finfish farming lease. Since monitoring started in 2015, there have only been 3 occasions where *Beggiatoa* has been observed outside of the TWWHA at control locations adjacent to finfish farming locations.

Table 3: Beggiatoa observations at control sites in Macquarie Harbour

Values in brackets in the middle column identify the number of *Beggiatoa* observations at sites located within the TWWHA.

Survey Month Year	No. Sites Surveyed	Sites w Beggiatoa	Percentage Beggiatoa sites	MH Determinations
Sept 2016	19	5 (5)	26	April 2016 – 21,500 t Biomass cap
Jan 2017	28	5 (5)	18	14 Feb 2017 – 14,000 t Biomass cap
May 2017	28	1 (1)	4	1 June 2017 – 12,000 t Biomass cap
Sept 2017	28	1 (1)	4	
Jan 2018	28	0	0	
May 2018	28	3 (3)	11	1 June 2018 – 9,500 t Biomass cap
Sept 2018	28	4 (4)	14	
Jan 2019	28	4 (4)	14	
May 2019	28	4 (4)	14	
Sept 2019	28	4 (4)	14	
Jan 2020	28	4 (4)	14	
May 2020	28	4 (4)	14	1 June 2020 – 9,500 t Biomass cap
Sept 2020	28	3 (2)	11	
Jan 2021	28	1 (1)	4	
May 2021	28	1 (1)	4	
Sept 2021	28	6 (6)	21	
Jan 2022	28	5 (4)	18	
May 2022	28	3 (3)	11	
Sept 2022	28	5 (5)	14	1 Sept 2022 – 500.1 t TPDNO
Jan 2023	28	5 (5)	18	
May 2023	28	6 (5)	21	
Sept 2023	28	2 (2)	7	

Assessment of adherence to water quality limits specified in Environmental Licences

Water quality limits in current Environmental Licences mirror those specified in the 2012 NCA-PM decision and apply to all monitoring sites which form part of the *Macquarie Harbour Broadscale Environmental Monitoring Program* (MHBEMP) which commenced in 2012. Limits are in place for the parameters ammonia (at 2 m and 20 m depth), nitrate (at 2 m depth) and oxygen (at 2 m depth).

Compliance is tested by comparing the 12-month median value calculated for each parameter / depth against the corresponding limit. EPA has to date not identified any non-compliance with the specified limits but notes that the effects of finfish farming are more likely to be detected at deeper water levels, particularly in a stratified water body such as Macquarie Harbour.

EPA have identified the lack of Dissolved Oxygen (DO) and nitrate limits for mid- and bottom waters as a shortcoming. This concern is echoed by IMAS within the MHBEMP review (Ross et al., 2022, pp. 100-101):

"The current parameters and depths limits do not appear to be adequate as environmental standards to monitor and protect the environmental health of Macquarie Harbour. An oxygen limit for bottom and mid waters is strongly recommended to ensure the adequate protection of the flora and fauna of Macquarie Harbour. - Additionally, given that ammonia appears short lived within the system, consideration should be given to the inclusion of nitrate as an indicator and limit for bottom waters."

EPA intends to address the issue through variations in Macquarie Harbour Environmental Licences. This process is linked with implementation of the *Environmental Standards for Tasmanian Marine Finfish Farming*. Currently it is intended that water quality Investigative Trigger Values will be incorporated into Environmental Licences during 2024.

DO management requirements

In November 2023, as part of the Environmental Licence renewal process, the EPA introduced new requirements to ensure that each licence holder is working towards improving water quality in Macquarie Harbour.

The recently imposed Dissolved Oxygen Management conditions (see Attachment 2) require each licence holder to determine the DO consumption that is caused by their fish farming activities and to identify measures to reduce or off-set DO consumption. These calculations will help to clarify to what extent individual farms contribute to the low DO levels in the broader harbour. Note that off-setting can be achieved by means of oxygen supplementation (i.e. technological means) or biomass reduction. Companies are required to submit oxygen consumption reports by 31 January 2024.

The industry is also required to develop an additional monitoring program to measure and report on the success of the identified mitigation measures towards meeting the recently published Macquarie Harbour *interim Default Guideline Values for Aquatic Ecosystems*.

These requirements are complemented by, although independent of, the Macquarie Harbour Oxygenation Project which is conducted in partnership between the industry and FRDC and led by IMAS.

Other relevant actions progressed by the EPA

Environmental Standards implementation

The *Environmental Standards for Tasmanian Marine Finfish Farming*, which took effect on 18 October 2023, provide the basis for a contemporary approach to environmental regulation of finfish farming and introduce a range of new measures to be applied through Environmental Licences, Determinations by the EPA Director and Offence Provisions.

All marine farms in Macquarie Harbour will be required to comply with these new requirements which are gradually being implemented by the EPA. This includes the roll-out of new environmental standards conditions to be imposed in Environmental Licences in 2024.

Oversight of Macquarie Harbour Broadscale Environmental Monitoring Program (MHBEMP)

A comprehensive description of the existing MHBEMP is provided in NRE Tas's submission to DCCEEW.

MHBEMP requirements are stipulated in Environmental Licences. Results collected at 17 sites and associated reports are routinely reviewed by the EPA.

An independent international review of the *Macquarie Harbour Broadscale Environmental Monitoring Program* was conducted by international consultants SAMS enterprise in 2022. The aim of this review was to assess whether the current monitoring strategy is fit for purpose and aligned with contemporary science. The SAMS report contains several recommendations to strengthen and modernise the existing program. The EPA Director intends to incorporate the recommendations into a revised BEMP for Macquarie Harbour.

Previously IMAS had undertaken a comprehensive review of MHBEMP monitoring undertaken from 2011 to 2020 and analysed the monitoring data against performance criteria specified in Environmental Licences. The review also considered other relevant information (e.g. nutrient inputs from the broader catchment) to interpret the results and identified changes in the dynamics of key water quality indicators in Macquarie Harbour. One of the main findings is that there is evidence that total nitrogen in the harbour has increased, indicating that nutrients are being retained within the system. A knowledge gap analysis and recommendations for improvements to program design are also included in the March 2022 report which can be accessed at Assessment of the Macquarie Harbour Broadscale Environmental Monitoring Program (BENP) data from 2011-2020 – March 2022 (EPA website).

The EPA intends to revise the existing MHBEMP requirements in 2024, as part of the implementation phase of the *Environmental Standards for Tasmanian Marine Finfish Farming*.

Independent monitoring conducted by the EPA

The EPA has been monitoring water quality within Macquarie Harbour since 1993. The monitoring has been undertaken on a near-quarterly basis and has included physico-chemical parameters, nutrients and metals. Following logger deployment at several locations in Macquarie Harbour including on the TWWHA boundary in 2013, data were continuously logged until December 2022. After a short pause, loggers were re-established in September 2023.

Data outputs have been used to characterise water quality within the harbour as well as catchment inflows, primarily from the Gordon and King Rivers, and the exchange of marine and harbour water through Kelly Channel. The data has also aided the EPA in making management determinations (e.g. biomass / TPDNO) and as input for research projects (MHBEMP, FRDC project 2016/067, Macquarie Harbour Dissolved Oxygen Working Group reports).

In September 2023, the EPA commenced a project of monitoring equipment renewal. Equipment at some of the long-term sites was replaced and upgraded and new sites are to be incorporated into the program. By the end of February 2024, EPA equipment is to be operational at 14 sites in total.

All data collected under this program is compared to long-term datasets generated by the EPA.

In February 2023 the EPA published a report regarding DO in Macquarie Harbour.

Water Quality Considerations

Relevance of dissolved oxygen (DO) for Maugean skate health and reproduction

Research conducted to date indicates that reduced DO in Macquarie Harbour is a significant threat to the Maugean skate. As outlined in the *Conservation Action Plan* (NRE Tas, 2024), Maugean skate prefer low to moderate oxygen concentrations (40 to 80% saturation, although they may be able to tolerate lower levels for periods of time. The species has a preferred range of salinity (18 – 27 ppt) and temperature conditions (12 – 15 °C) and is known to frequent shallower channels between 5 and 15 m in depth. Egg capsules have been detected at depths around 20 m. Dissolved oxygen conditions at water depths between 10 and 25 m are therefore particularly important.

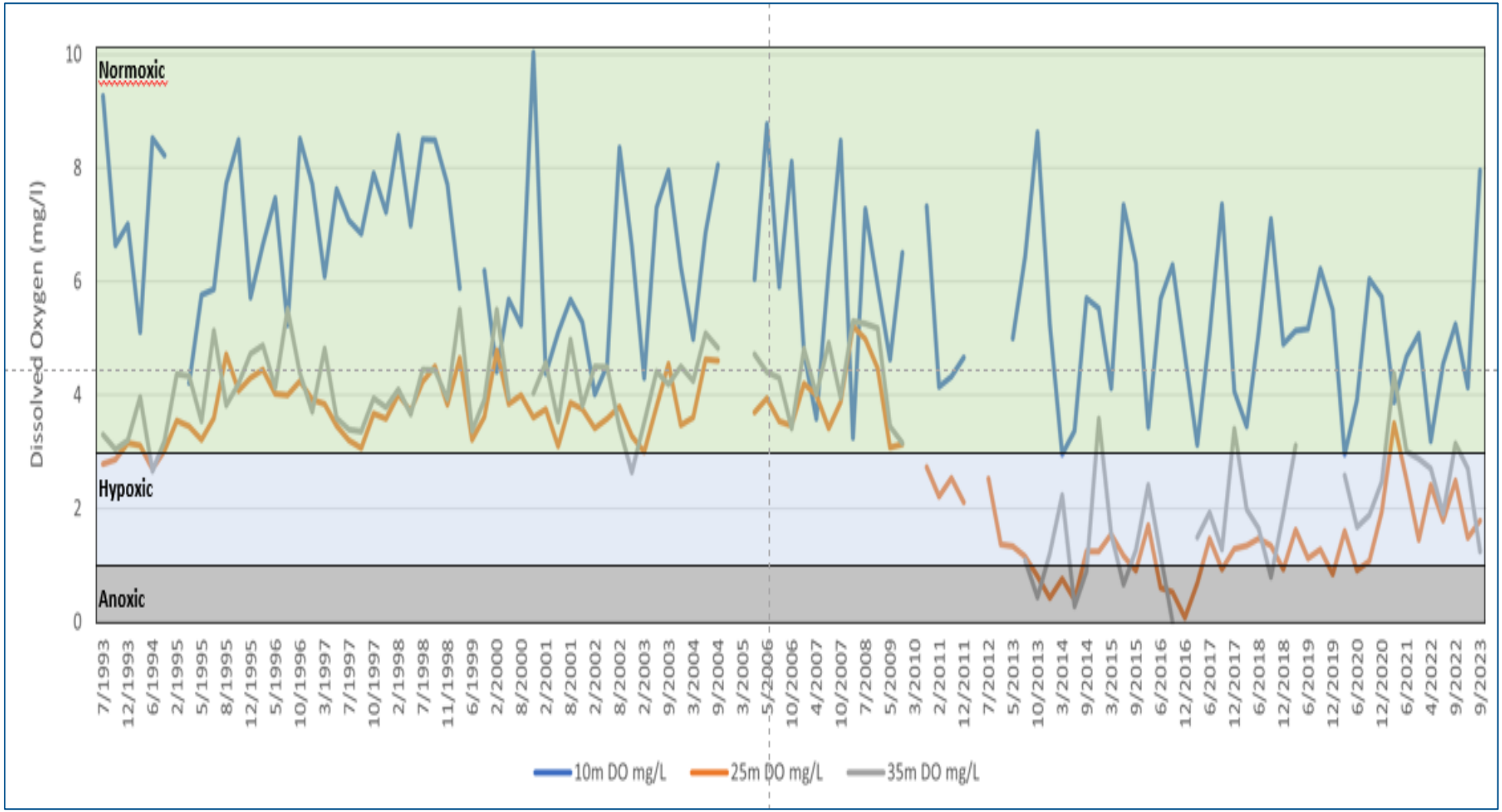

Figure 4: Dissolved Oxygen long-term trends at monitoring site MH27 @ 10m, 25 m and 35 m depth

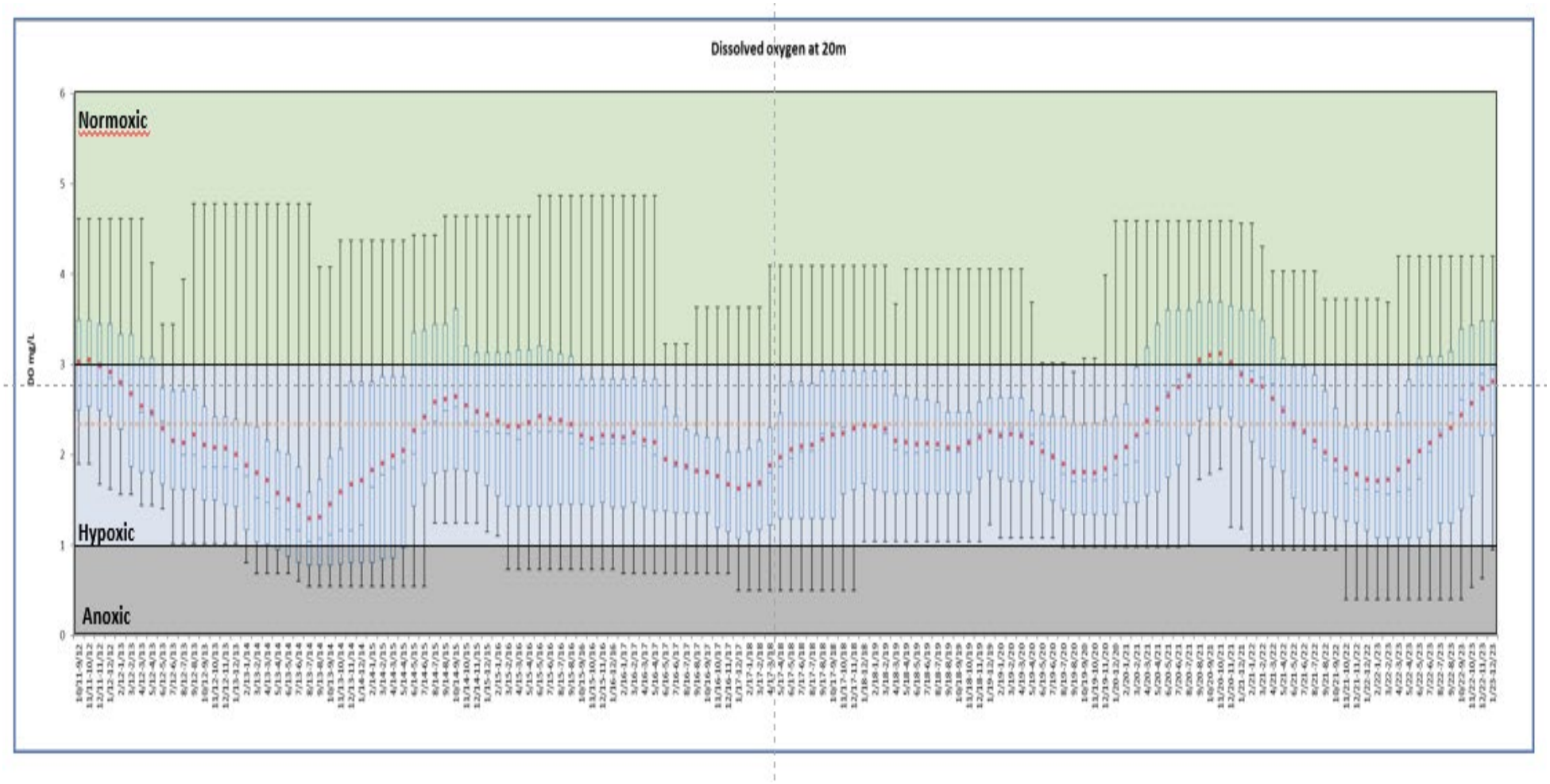

Figure 5: Dissolved Oxygen measurements at 20 m depth at MHBEMP sites

Notes:

- Each bar on the chart represents a 12-month rolling period. The red dot represents the mean value, end points of each bar represent 80th and 20th percentile values respectively.
- The first period shown is October 2011 to September 2012, last period is January 2023 to December 2023.
- For each sampling event, results for all MHBEMP sites are averaged.

Water quality (DO) trends over time

Of concern are the bottom and mid-water DO levels in the Harbour. Over the longer term, sub-surface DO concentrations in the harbour have remained low in comparison with historical levels (see figure 4). While some signs of improvement have been observed in recent years, long-term median DO concentrations remain, with a few exceptions, in the hypoxic range. This is illustrated in figure 5, where the hypoxic range is the light blue (middle) section of the chart.

The situation is exacerbated by recorded increases in water temperature of 1.5 – 2 °C which causes reduced oxygen solubility due to warmer waters (Ross et al., 2022, figure 31 / p. 47).

Oceanic recharge events have the effect of improving DO levels significantly. However, water quality monitoring indicates that these effects can be short-lived and do not address the underlying DO demand generated by finfish farms within the harbour in the long term. For example, while a recharge event occurred in February 2016 there was a return to very low oxygen levels in spring 2017. Figure 6 provides an overview of DO recharge and decline over time.

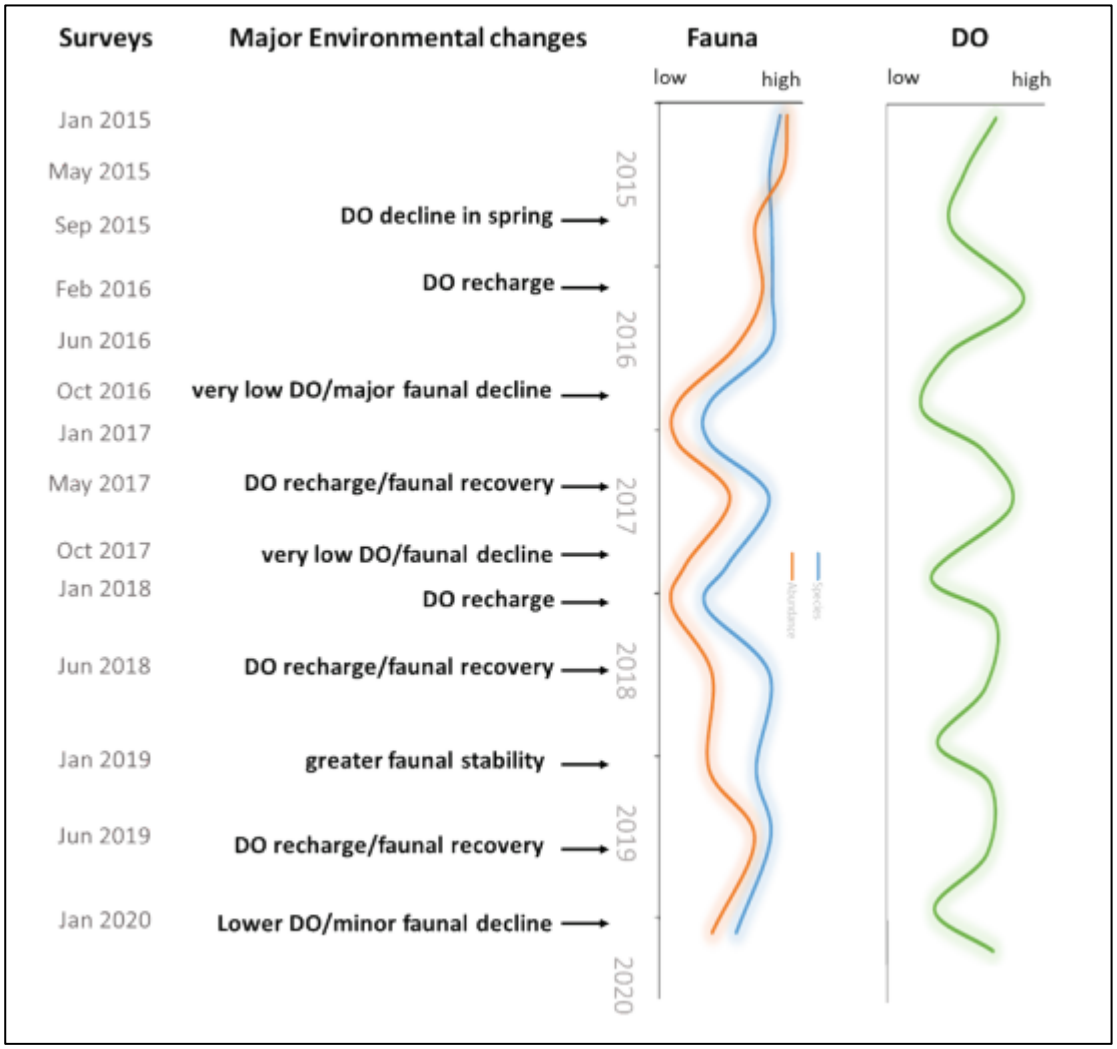

Figure 6: Timeline showing major environmental changes in Macquarie Harbour 2015 – 2020 (from IMAS, March 2021)

Review of long-term EPA monitoring data highlights that DO in mid and deep waters continues to be below pre-2010 levels within most of the harbour, supporting a weight of evidence case for a declined ecosystem health status. Although the levels fluctuate considerably as they are influenced by complex riverine and marine inputs, the DO drawdown due to finfish aquaculture in the middle and bottom water is significant.

Figure 4 shows DO levels at MH27, an EPA monitoring site located approximately 1 km outside the TWWHA, where quarterly monitoring commenced in 1993. While the surface oxygen levels (0 – 5 meters) remain relatively constant due to the effects of wind and wave action and riverine flows, oxygen levels in mid and bottom waters declined from 2009, reaching the lowest levels recorded to date in 2016

with several instances of recurring severe hypoxia and anoxia. Since then, there has been a trend of improving DO, although apart from a few exceptions DO levels remain within the hypoxic range.

The most recent data included in figure 4 are measurements taken in September 2023. By mid-February 2024 EPA will have completed the downloading of more recent data from sensors, including the oceanic recharge event observed in mid-January. Data from additional sensors installed in Macquarie Harbour from September 2023 will also be included. An updated data package will be provided to DCCEEW upon request.

Dissolved Oxygen Budget

IMAS have recently conducted first order estimates of the mass (tonnes) of DO in the harbour based on monthly DO vertical profiles collected at 16 MHBEMP sites. Data were analysed for the time period 2014 to 2023 and are presented in figure 7.

Oxygen budget figures are presented for the whole harbour (all depths) and for two subsets, i.e. the water body below 15 metres and below 30 metres. Data until December 2023 are included.

Figure 7 illustrates considerable variation in the amount of DO present within the harbour over time. Harbour-wide, the oxygen budget has remained within a range of approximately 20,000 to 35,000 tonnes with no clear trend over the past decade being evident. The 15 m depth budget is characterised by significant spikes and troughs over the entire time series. The 30 m depth budget is indicative of an increased volume of DO, arguably from 2018 onwards. This might be indicative of a recovery of DO concentration in bottom waters which is also evident at MH27 (see figure 4).

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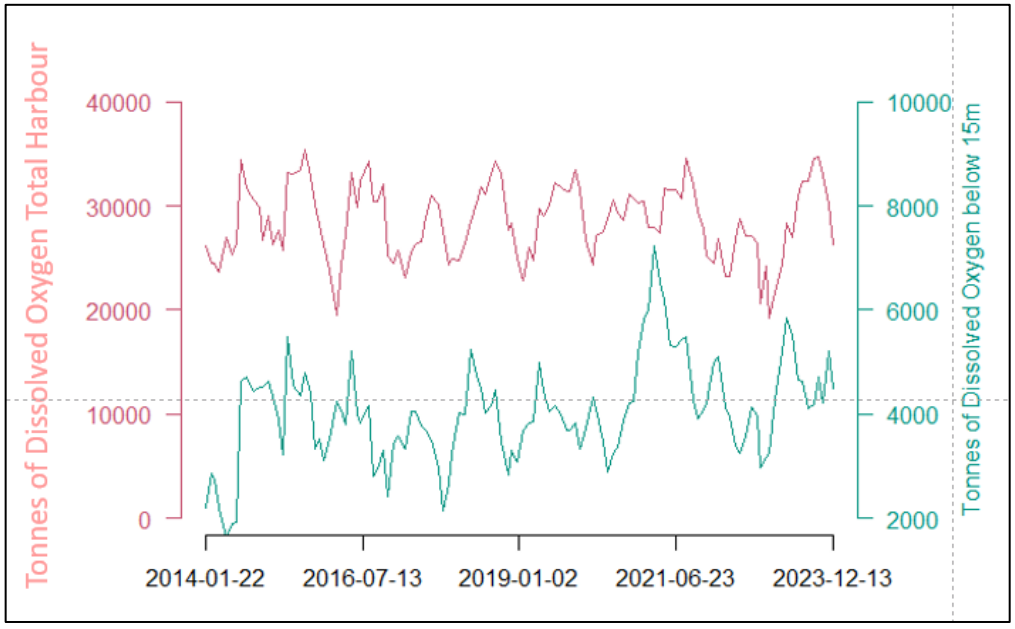


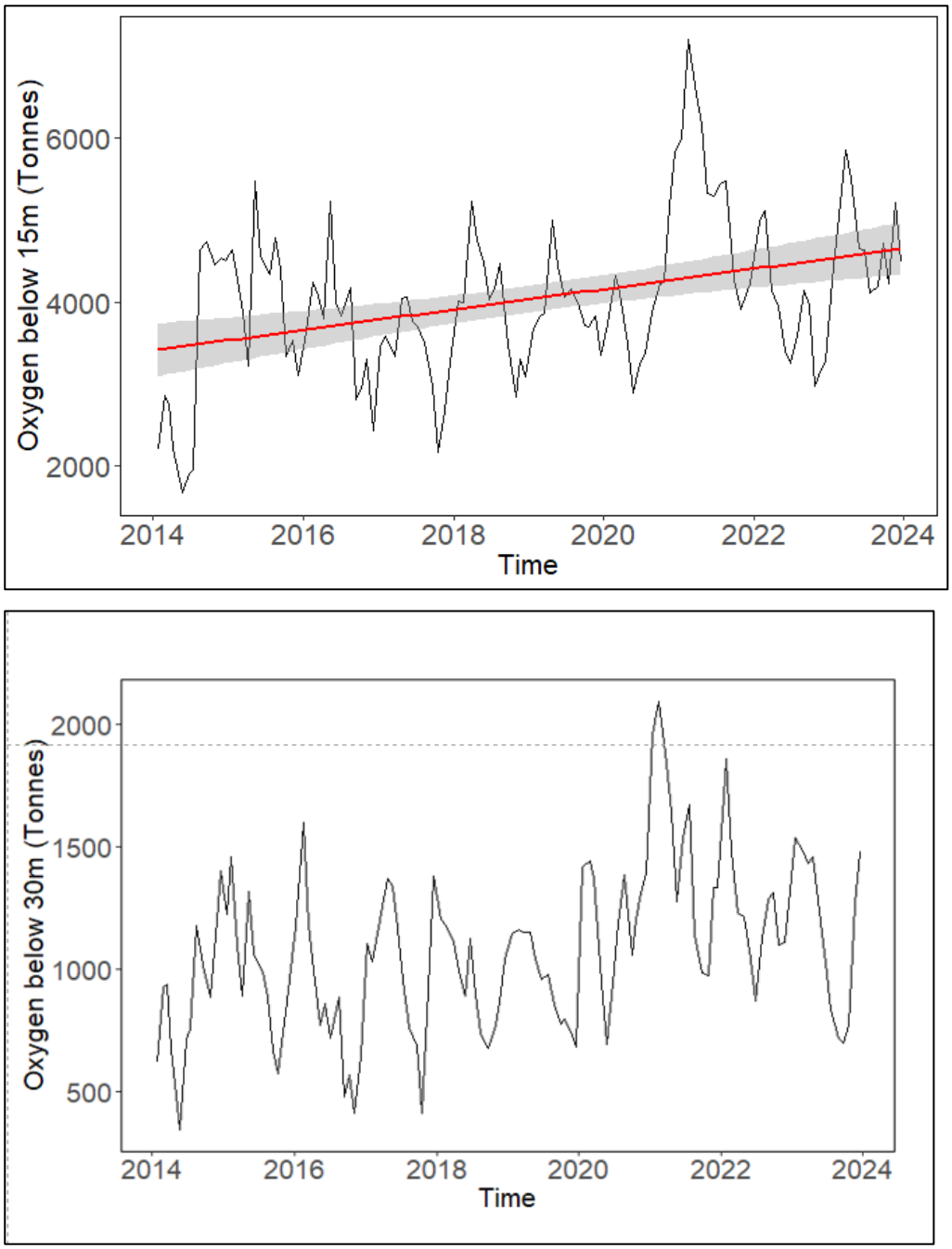


Figure 7: Oxygen budgets prepared by IMAS (January 2024)

Top: Macquarie Harbour, all water depths vs 15 metre depth
Middle: Macquarie Harbour, below 15 metre depth
Bottom: Macquarie Harbour, below 30 metre depth

Interim Default Guideline Values (DGVs) for water quality

The EPA have developed *Interim Default Guideline Values for Aquatic Ecosystems* (DGVs) for Macquarie Harbour. These are based on water quality sampling results from 1993 to 2009, i.e. a period predating the expansion of salmon farming. DGVs for three bioregions 119, 120 and 121 (OSRA segments) have been identified for different water depths. Introducing DGVs for sub-surface waters will overcome the current lack of a performance measure for the mid water layer which is important for the future well-being of the Maugean skate population.

Interim DGVs are referred to in recently imposed Dissolved Oxygen Management conditions of Environmental Licences and provide performance targets to guide remediation work.

DGVs have interim status as they have not been formally endorsed by the EPA Board, nor through the process established under the *Environmental Standards for Tasmanian Marine Finfish Farming*. It is proposed that the setting of *Investigative Trigger Values* for water quality under the Environmental Standards will be progressed in 2024 and that an independent scientific panel will be consulted to ensure contemporary best practice scientific methods are implemented.

EPA future management approach

There are a number of mechanisms which EPA can utilise to ensure environmental impacts within Macquarie Harbour are appropriately managed.

1. Ongoing regulatory focus on assessing compliance with Environmental Licence conditions and lease-specific follow-up actions as necessary.
2. Updating of Environmental Licence conditions to ensure they are aligned with the requirements of the new Environmental Standards. A key aspect is the introduction of additional water quality trigger values for dissolved oxygen concentrations in sub-surface waters to replace the current conditions which specify only a surface water quality limit.
3. Increased emphasis on DO monitoring, analysis and mitigation:
    a) The Environmental Licence conditions issued in November 2023 require the companies to conduct ongoing DO monitoring at the boundary of each lease;
    b) EPA are implementing a program of DO logger installation in various locations in the harbour to generate additional independent monitoring data;
    c) Implementation of new DO management conditions. The conditions require a suite of logically connected plans to be developed either individually by each company or jointly. The first step is to provide a DO consumption (received 31 January 2024). A target date of 30 November 2025 to achieve conformance with the Interim DGVs is specified. Note that Interim DGVs may be replaced by final DGVs in the intervening period.
4. Ensuring compliance with the current TPDNO.
5. If necessary, further reduce the TPDNO. Although the current TPDNO determination does not expire until 31 August 2027, a new TPDNO can be issued by the EPA Director utilising powers under the new *Environmental Standards for Tasmanian Marine Finfish Farming* if there is sufficient evidence to support the need for greater restrictions on farming practices in Macquarie Harbour.
6. Re-specify the MHBEMP to ensure it reflects contemporary scientific standards, including consideration of the recent reviews conducted by SAMS and IMAS;
7. Ongoing participation in the National Recovery Team for the Maugean Skate, Environmental Remediation Working Group, Dissolved Oxygen FRDC project etc.

Conclusions

- There has been progressive reduction in finfish biomass in the Harbour since 2017, and it is evident that the management decisions by the EPA Director have had positive effects in Macquarie Harbour over time. This is highlighted by IMAS's recent dissolved oxygen budget and the fact that the best two consecutive compliance results from four-monthly benthic video surveys under EPA's watch occurred in 2023.
- EPA further notes that commencement of oxygen injection under the *Macquarie Harbour Oxygenation Project* is imminent and environmental licence conditions now require ongoing mitigation of oxygen demand arising from fish farms.
- In terms of water quality, while there is reason to be cautiously optimistic, the need for a sustained, broad-scale recovery of oxygen levels in the bottom and mid-waters of the harbour is highlighted. The aim is to achieve dissolved oxygen levels which are consistent with the Interim DGVs.
- It is EPA's view that the regulatory regime put in place by the Tasmanian Government and currently being implemented by the EPA provides appropriate tools to deliver further environmental improvements for Macquarie Harbour and the Maugean Skate.

References

- NRE Tas (January 2024): *Conservation Action Plan for the Maugean skate.* Department of Natural Resources and Environment, Tasmania, Hobart.
- Ross J et al. (March 2021): *FRDC 2016/067: Understanding Oxygen dynamics and the importance for benthic recovery in Macquarie Harbour.* Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, Hobart, Tasmania.
- Ross J, Moreno D, Bell J, Mardones J and Beard J (2022): *Assessment of the Macquarie Harbour Broadscale Environmental Monitoring Program (BEMP) data from 2011-20.* Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, Hobart, Tasmania.
- Wild-Allen K et al. (June 2020): *Macquarie Harbour Oyxgen Process model (FRDC 2016-067): CSIRO Final Report.* CSIRO, Australia.

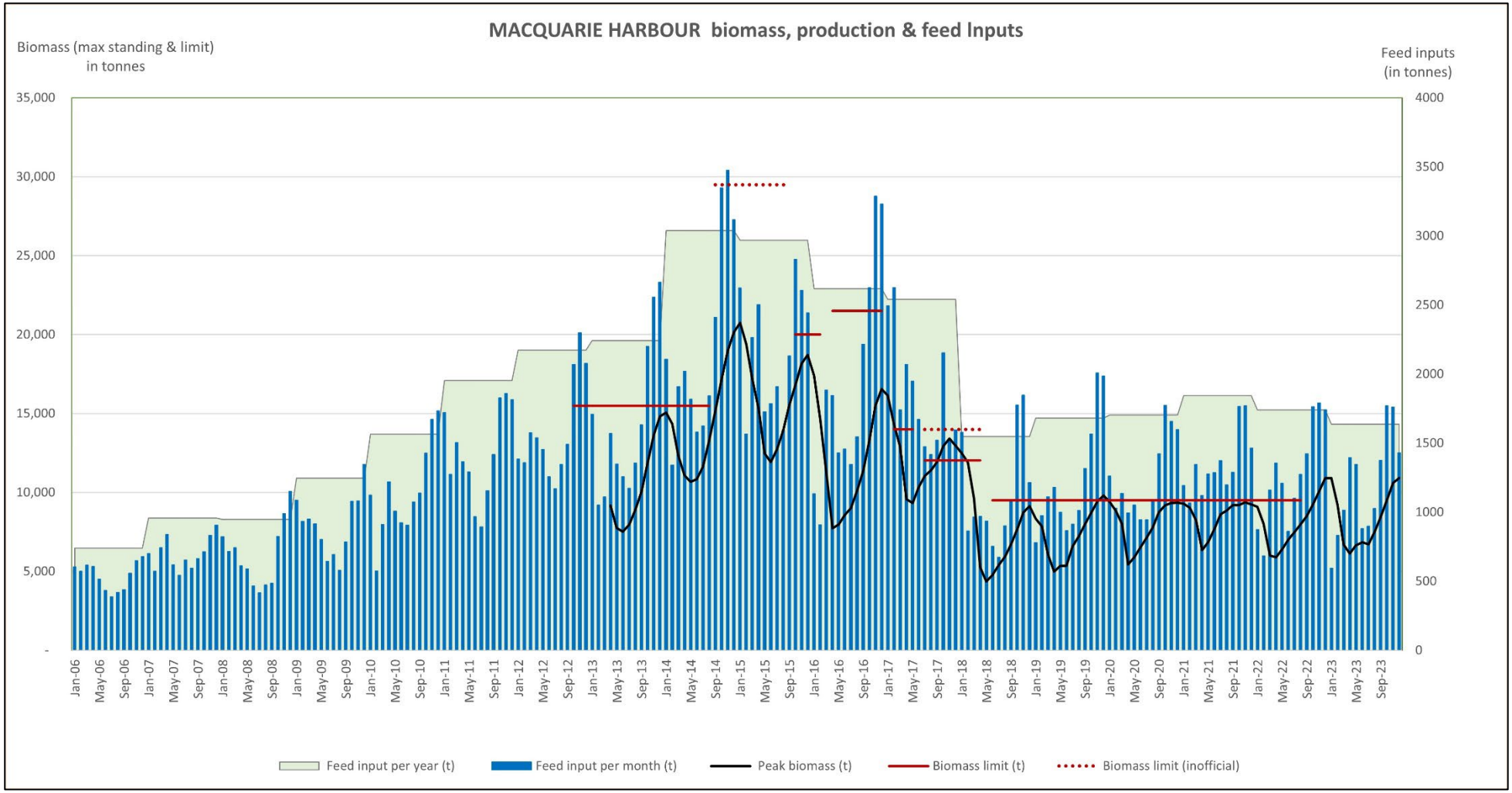
A comprehensive list of available research reports, including hyperlinks, is provided in Attachment 4.

Acronyms

DGV	Default Guideline Value
DO	Dissolved Oxygen
EMPCA	Environmental Management and Pollution Control Act
FRDC	Fisheries Research and Development Corporation
IMAS	Institute for Marine and Antarctic Studies
MHBEMP	Macquarie Harbour Broadscale Environmental Monitoring Program
OSRA	Oil Spill Response Atlas
SAMS	Scottish Association of Marine Sciences
TPDNO	Total Permissible Dissolved Nitrogen Output
TWWHA	Tasmanian Wilderness World Heritage Area
WCS	Waste Capture System

Attachments

Attachment 1: Feed input, standing biomass and relevant biomass caps



Attachments

Attachment 2: DO management conditions (November 2023)

The following conditions were included in Environmental Licences issued on 30 November 2023 for marine finfish farming activities in Macquarie Harbour:

DO1 Dissolved Oxygen Consumption Report

1 By 31 January 2024, or a date otherwise advised by the Director in writing, the licence holder must submit a Dissolved Oxygen Consumption Report for the Director's approval which has been prepared using the methodology provided by the Director.

2 The Dissolved Oxygen Consumption Report must contain the following information:

2.1 The estimated total dissolved oxygen demand resulting from the activity, including a specific estimate of the respiratory oxygen demand of farmed finfish.

2.2 Calculations must be provided for the following periods:

2.2.1 the 12-month period from 1 December 2022 to 30 November 2023 and separately for each season within this period, based on actual feed input and dissolved nitrogen outputs; and

2.2.2 the 12-month period from 1 December 2023 to 30 November 2024 and separately for each season within this period, based on predicted feed and dissolved nitrogen outputs.

3 The Dissolved Oxygen Consumption Report must include a description of the scientific methods and assumptions underlying the calculations, and the degree of confidence in their accuracy.

4 By 1 January 2025, or a date otherwise advised by the Director in writing, the licence holder must submit a report containing revised dissolved oxygen consumption calculations for the 12-month period from 1 December 2023 to 30 November 2024, based on actual feed and dissolved nitrogen outputs.

DO2 Dissolved Oxygen Mitigation Plan

1 By 24 April 2024, or a date otherwise advised by the Director in writing, the licence holder must submit a Dissolved Oxygen Mitigation Plan for the activity.

2 The Dissolved Oxygen Mitigation Plan must be submitted for the Director's approval and must outline measures to offset or reduce the estimated dissolved oxygen demand resulting from the activity.

3 The Dissolved Oxygen Mitigation Plan must:

3.1 be prepared in relation to the 2024/25 production period, or another period specified by the Director in writing, and must address seasonal variation in dissolved oxygen demand;

3.2 contain a detailed description of the measures that will be implemented to offset or reduce the calculated dissolved oxygen demand;

3.3 provide an estimate of the level of offset or reduction to be achieved;

3.4 describe implementation steps including timelines for key milestones;

3.5 describe methods to measure success of the identified mitigation measures;

3.6 provide estimates of resulting dissolved oxygen concentrations at and beyond the lease boundary and comparison against the interim Default Guideline Values published by the EPA for Macquarie Harbour.

Attachments

4 Once approved, the licence holder must act in accordance with the approved Dissolved Oxygen Mitigation Plan. Any variation or substitution of the plan approved by the Director, by notice in writing, replaces the earlier approval with effect from the date specified in the notice.

5 On 1 May 2025, or a date otherwise advised by the Director in writing, the licence holder must submit a report which assesses the success of the Dissolved Oxygen Mitigation Plan. If there is evidence of the interim Default Guideline Values not being met at or beyond the lease boundary, the report must identify further measures to improve conformance with interim Default Guideline Values by 30 November 2025 or a date otherwise advised by the Director in writing.

6 The requirements of this condition may be satisfied via a collaborative industry approach which meets the requirements of this condition simultaneously for multiple finfish farming leases.

DO3 Water Quality Monitoring Plan

1 By 24 April 2024, or a date otherwise advised by the Director in writing, the licence holder must submit a Water Quality Monitoring Plan for the activity.

2 The Water Quality Monitoring Plan must be submitted for the Director's approval and must outline a monitoring program designed to measure success of the dissolved oxygen mitigation measures on water quality at and beyond the lease boundary.

3 The Water Quality Monitoring Plan must:

3.1 take into account existing monitoring requirements;

3.2 be prepared in relation to the 2024/25 production period or another period specified by the Director in writing;

3.3 contain a description of monitoring locations, parameters, water depths and frequency of sampling and / or recording that will be implemented;

3.4 as a minimum, provide for the continuous monitoring of dissolved oxygen at one location at the lease boundary at a number of representative depths in the water column;

3.5 specify methods for the determination of current speed and direction as required to interpret the results of dissolved oxygen monitoring in relation to the activity. Where data gaps are identified, the deployment of an ADCP is to be considered and discussed;

3.6 describe implementation steps including timelines for key milestones (e.g. deployment of equipment); 3.7 identify proposed data collection and reporting methods and timeframes.

4 Once approved, the licence holder must act in accordance with the approved Water Quality Monitoring Plan. Any variation or substitution of the plan approved by the Director, by notice in writing, replaces the earlier approval with effect from the date specified in the notice.

Attachments

Attachment 3: Waste capture trial (Tassal)

Summary

As a condition of being granted a supplementary biomass apportionment from 1 June 2017 to 31 May 2018, Tassal was required to implement a waste capture system (WCS) for its Marine Farming leases 214 (Middle Harbour) and 219 (Gordon). The WCS was to capture waste from 1.5 tonne of fish for every tonne of fish in excess of the biomass apportionment.

Tassal implemented a Waste Capture System (WCS) Trial in Macquarie Harbour in June 2017. The WCS aimed to capture solid emissions from salmon farming operations beneath selected salmon cages at Marine Farming leases 214 (Middle Harbour) and 219 (Gordon). The waste was collected in liners installed beneath individual fish cages and was extracted from a sump, pumped to the surface and stored for transport to shore. Effluent was then transported to the North-West Coast for discharge via wastewater treatment plants at Georgetown and Devonport.

Tassal received an additional 560 tonnes biomass allocation, as per the revised biomass determination dated 6 June 2017.

Results

The results of the trial are documented in the report *Waste Capture System: Summary of Water and Sediment Quality Monitoring, August 2018*. The main findings are:

- During the waste separation period from June 2017 to April 2018, up to 22 liners were deployed on MF219 and up to 10 on MF214.
- A total of 4.2 ML of liquid waste were extracted from waste capture liners at both marine farms which resulted in the generation of 632 tonnes of solid waste. Of this amount, 219 tonnes were generated as a result of production in excess of the biomass cap.
- approximately 1.9 % of feed inputs (dry solids basis) and 5.9 % of the feed inputs in excess of the biomass limit were recovered in the WCS;
- as result of the WCS being in place, it is estimated that between 522 and 1370 tonnes of dissolved oxygen demand present in the form of organic carbon discharged from pens, were removed over the entire trial period;
- as a proportion of DO consumption saved compared to the 'standing stock' of DO available in the sub-halocline water column (i.e. depths below 15 m), it is estimated that <1 % of DO savings occurred.

Outcomes / performance

- The effectiveness of the waste capture system on mitigating DO demand in Macquarie Harbour is at best a localised phenomenon.
- Few measurable improvements were identified in water and sediment quality during the trial, although it is argued that a reduction in feed and waste emitted to the surrounding water column and seafloor would result in reduced organic enrichment in the vicinity of lined cages over time.
- Tassal did not apply for continuation of the trial once completed.

Attachments

Attachment 4: Overview of relevant research reports

FRDC Reports

Report Name	Date	Authors
Environmental Research in Macquarie Harbour- IMAS Progress Report September 2017 (FRDC 2016-067)	September 2017	Ross, Wild-Allen, Macleod
Environmental Research in Macquarie Harbour - IMAS Progress Report February 2018 (FRDC 2016-067)	February 2018	Ross, Macleod
Environmental Research in Macquarie Harbour - IMAS Progress Report on Macquarie Harbour June 2018.pdf (FRDC 2016-067)	June 2018	Ross, Wild-Allen, Andrewartha, Macleod
Environmental Research in Macquarie Harbour - IMAS Progress Report December 2018 (FRDC 2016067)	December 2018	Ross, Wild-Allen, Andrewartha, Stehfest, Macleod
Environmental Research in Macquarie Harbour - IMAS Progress Report July 2019 (FRDC 2016-067)	July 2019	Ross, Wild-Allen, Andrewartha, Beard, Moreno, Macleod
Environmental Research in Macquarie Harbour - IMAS Progress Report February 2020 (FRDC 2016-067)	February 2020	Ross, Wild-Allen, Andrewartha, Beard, Moreno
Macquarie Harbour Oxygen Process model (FRDC 2016-067) CSIRO Final Report	June 2020	Wild-Allen, Andrewartha, Baird, Bodrossy, Brewer, Eriksen, Skerratt, Revill, Sherrin, Wild
Environmental Research in Macquarie Harbour – Understanding oxygen dynamics and the importance for benthic recovery in Macquarie Harbour - IMAS Progress Report October 2020 (FRDC 2016/067)	October 2020	Ross, Beard, Moreno
Understanding oxygen dynamics and the importance for benthic recovery in Macquarie Harbour (FRDC 2016/067)	March 2021	Ross, Beard, Wild-Allen, Andrewartha, Stehfest, Durand, Semmens, Davey, Hortle, Pender, Quigley, Macleod, Moreno

Attachments

Other relevant Macquarie Harbour reports

Report Name	Date	Authors
Characterising benthic pelagic interactions in Macquarie Harbour – organic matter processing in sediments and the importance for nutrient dynamics (FRDC 2012/047)	May 2015	Ross, Hartstein, Macleod
Movement, habitat utilisation and population status of the endangered Maugean Skate and implications for fishing and aquaculture operations in Macquarie Harbour (FRDC 2013/008)	February 2016	Bell, Lyle, Semmens, Awruch, Moreno, Currie, Morash, Ross, Barrett
Understanding the ecology of Dorvilleid Polychaetes in Macquarie Harbour (FRDC 2014/038)	2016	Ross, McCarthy, Davey, Pender, Macleod
Environmental Research in Macquarie Harbour – Interim synopsis of benthic and water column conditions	2017	Ross, Macleod
Managing ecosystem interactions across differing environments: building flexibility and risk assurance into environmental management strategies (FRDC 2015-024)	December 2021	Ross, Macleod, White, Hadley, Moreno, Bush, Barrett
Assessment of the Macquarie Harbour Broadscale Environmental Monitoring Program (BEMP) data from 2011 to 2020	March 2022	Ross, Moreno, Bell, Mardones, Beard
SAMS International review of broadscale environmental monitoring programs: Macquarie Harbour	July 2022	Black, Tett, Reinardy