



Gladstone Harbour Integrated Aquatic Investigation Program 2012 Report

Gladstone Harbour Fish Health
Interdepartmental Committee

Prepared by: Department of Environment and Heritage Protection

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Executive summary

In August 2011, commercial fishers raised concerns over the health of fish in Gladstone waterways. Human health concerns were also raised by local fishers or people associated with the industry.

In response, the Queensland Government set up an investigation program, working closely with key interest groups, to understand the extent and nature of the issue and identify any specific causes. The extensive program included sampling and testing of fish, water quality and sediment in and around Gladstone Harbour, and investigations into human health concerns.

Gladstone Harbour and surrounding areas were also temporarily closed to fishing in response to the concerns about human health and the possible transfer of disease between fish and humans and entry into the food chain.

In early 2012, in response to the recommendations from the independent Gladstone Fish Health Scientific Advisory Panel, the Queensland Government launched the *Integrated Aquatic Investigation Program for Gladstone Harbour*—an expanded investigation program which builds on the work undertaken by the Queensland Government. The water quality and fish health sampling programs undertaken as part of this investigation were completed in September 2012.

The key findings in the report are consistent with the extensive information made public throughout 2012 and includes summaries of fish health, water quality and human health investigations. The report also includes information about the government's response and next steps to be taken for the health of Gladstone waterways. The majority of the data referred to in this report has been previously published (see **Attachment 1 – Relevant Queensland Government publications**).

Key findings:

- No link was identified between the conditions found in fish and the human health issues, or between water quality and reported human health conditions. The human health cases described did not form a single outbreak of disease.
- Results do not suggest that the water quality of Gladstone Harbour and related waterways present a threat to fish health, with the possible exception of sites around South Trees Inlet.
- There is no evidence that dredging in Gladstone Harbour increases dissolved metal concentrations or leads to acidic conditions.
- It is unlikely that metals are at a level that would cause any ongoing suppression of the immune system or increased susceptibility to disease in fish and other aquatic organisms throughout Gladstone Harbour.
- No single cause has been identified for all fish health issues. The conditions that have been identified are naturally occurring organisms that have been seen elsewhere in Queensland
- Results of sampling in 2012 indicated that fish health was much improved:
 - Most barramundi sampled were in good condition, and did not display the ulcerative lesions, eye conditions and infections from *Neobenedenia* that were documented in 2011; and there was evidence that previously observed physical injuries were healing.
 - Sharks across all sites, including reference sites, displayed redness and the presence of the parasitic flatworm *Dermophthirius maccallumi*.
 - Crustaceans displayed a low incidence of shell erosion.
 - No significant signs of ill health were observed in any other focus species.
- Seafood available through retail outlets is from regulated and wide-ranging sources and continues to be safe to purchase and eat.

Next steps:

Samples of a wide range of fish, crustacean and mollusc species are currently undergoing more detailed studies. When these results have been received, reports incorporating all information from the 12-month period September 2011 to September 2012 will be completed and published in 2013.

Further investigations of the water quality in South Trees Inlet are being conducted. Results of the tests are expected to be available in 2013.

1 Background/Context

In August 2011, the Queensland Government received reports of barramundi and other species being caught with obvious signs of illness. Symptoms included cloudy eyes, skin discolouration and lesions.

On 13 September 2011, commercial fishers also reported concerns with their own health which they suggested were related to water quality and/or contact with fish that appeared ill.

On 16 September 2011, Fisheries Queensland closed Gladstone Harbour and surrounding areas to fishing for a three-week period in response to concerns about human health and the possible transfer of disease between fish and humans and entry into the food chain.

The Gladstone Ports Corporation is currently undertaking one of Australia's largest dredging programs within Gladstone Harbour and suggestions have been made that the dredging has caused or contributed to declines in the health of fish and other marine animal health.

2 Government response Phase 1 (Sept 2011–Feb 2012)

In response to the reported fish and human health issues, the Queensland Government, working closely across agencies and also with industry, local government and community groups, commenced an investigation to understand the extent and nature of the issue and identify any specific cause(s).

The response was led by the then Department of Environment and Resource Management (DERM) and involved:

- sampling and testing of fish, water quality and sediment in and around Gladstone Harbour
- investigation into human health concerns
- regular engagement with interested parties through reference groups and committees, publication of test results, as well as communication through web portals, bulletins and media releases.

Governance arrangements

Whole-of-Government Response

The response was overseen by an Interdepartmental Committee, led by the then Department of Environment and Resource Management (DERM) and including the then Department of Employment, Economic Development and Innovation (Fisheries Queensland, Biosecurity Queensland), Department of the Premier and Cabinet, Queensland Health, Justice and Attorney General (Workplace Health and Safety Queensland) and Safe Food Production Queensland.

Extended Oversight Committee

The Gladstone Harbour Fish Health Extended Oversight Committee was established by the Queensland Government to provide regular communication with peak stakeholder groups on Gladstone fish health issues.

The Extended Oversight Committee operated between October 2011 and February 2012. Prior to the formation of this group, there were a number of other groups that held regular meetings, including the Gladstone Control Group and the Brisbane Oversight Committee/Task Group. These groups were amalgamated to form the Extended Oversight Committee.

The committee included representatives from:

- Queensland Government
- Gladstone Regional Council
- Gladstone Ports Corporation
- Queensland Seafood Industry Association
- Queensland Seafood Marketers Association
- Sunfish Queensland
- Fitzroy Basin Association
- Capricorn Conservation Council

- Liz Cunningham MP, State Member of Gladstone
- Ken O'Dowd MP, Federal Member for Flynn.

Fish health investigations

On 28 August 2011, nine barramundi were provided to Biosecurity Queensland for testing. Test results received in September showed the majority of fish were infested with an external parasitic fluke (*Neobenedenia* sp.) affecting the eye and skin.

In September 2011, it was noted that tens of thousands of large adult barramundi were washed over the Awoonga Dam spillway into the Boyne River between December 2010 and March 2011 as a result of the significant rainfall during this period.

In September 2011, Fisheries Queensland, in cooperation with commercial fishers, commenced a survey of fish health across a number of sites in the Gladstone area (**Attachment 2**). By mid October 2011, it was found that while the relative number of barramundi with ulcerative lesions had decreased, the numbers affected by *Neobenedenia* were still significant, with the majority of affected fish being found in the Boyne River.

Fish sampling of a wide range of species continued on a monthly basis until March 2012. Results found barramundi health continued to improve, with a decreased incidence of lesions and eye conditions. Other conditions were observed, including hyperaemia (redness) and parasitic infection by the external flatworm *Dermophthirius maccallumi* in sharks, shell erosion on mud crabs and gill parasites in prawns. All the identified fish health issues had been observed previously from either within the Gladstone area, or in other parts of Queensland. No one bacterial, parasitic, viral or fungal pathogen was found that could be considered to have caused all the observed fish health issues.

Human health investigations

Queensland Health received reports from 37 people who were concerned that a range of health issues they were experiencing were a result of contact with diseased fish or seawater. Most of these people were interviewed by Queensland Health to establish whether there was any clear pattern of illness among interviewees and to identify possible links between diseased fish and risks to human health. A range of symptoms were reported, including flu-like illnesses, infected injuries, boils, eye discharge and redness/rashes on the hands and feet.

The cases described did not form a single outbreak of disease and no link was identified between the conditions found in fish and the human health issues.

Water quality/sediment investigations

In September 2011, DERM conducted a review of all existing water quality data for the Gladstone area, in order to determine if there were any changes in water quality which could cause or contribute to fish ill-health. The data from the estuaries in the region were collated from Queensland Government monitoring and data in the harbour was collated from monitoring conducted by Gladstone Ports Corporation. The results, published on 4 October 2011, indicated that water quality in Gladstone Harbour and the Boyne and Calliope estuaries was consistent with historical trends—apart from the impacts of flooding in January 2011, which saw salinity levels drop for an extended period of time.

Additionally, in September 2011, DERM commenced monthly investigations of water quality in Gladstone waterways, including testing for dissolved metal concentrations and metals in sediments, and looking for any pattern in water quality which could be explained by dredging or other causes (**Attachment 3**). This monitoring was also used to validate the monitoring data collected by the Gladstone Ports Corporation.

Results showed no significant environmental concern with water quality in Gladstone Harbour and surrounding waterways. There was no clear pattern to suggest that dredging was having any major impact on water quality.

Harbour reopened to fishing

On 7 October 2011, the Queensland Government lifted all fishing bans, noting:

- the illness in fish did not appear to be of human health significance

- the results of human health and water quality investigations revealed no significant issues that warranted continuation of the fishing ban.

3 Gladstone Fish Health Scientific Advisory Panel

On 27 September 2011, the Gladstone Fish Health Scientific Advisory Panel was established to provide independent scientific advice to the government. The panel reviewed the Queensland Government's monitoring regimes, results and analysis primarily focusing on fish health in Gladstone Harbour and surrounds, but also considering water quality monitoring and human health issues where appropriate.

On 6 January 2012, the panel released its final report which concluded that after an extensive review of available data and literature, it was not able to provide a conclusive view on the cause of the fish conditions observed in Gladstone Harbour.

In reviewing the Queensland Government's response, the panel acknowledged and supported the government's ongoing investigation of the issue and noted that good progress had been made to date.

The panel recommended further monitoring and research to aid in identifying the cause of the fish health issues, while noting that:

- identifying the cause(s) of the disease(s) and prevalence of parasites on fish in Gladstone Harbour is a complex and difficult task
- determining conclusively whether any environmental changes have anything to do with the reported fish health problems is a formidable and perhaps impossible undertaking
- the Queensland Government had already acted upon some of its recommendations, including undertaking analysis of dissolved metals but noted that there was no evidence of heavy metal impacts on fish.

Queensland Government response to the panel's report

In a statement issued on 6 January 2012, the Queensland Government accepted the recommendations of the panel for further research into a range of areas and agreed to implement these through an *Integrated Aquatic Investigation Program for Gladstone Harbour*, building on the work already undertaken by the Queensland Government agencies.

On 14 February 2012, the Queensland Government's response to the panel's final report, implementation status of all recommendations and summary information about the Integrated Aquatic Investigation Program for Gladstone Harbour was published on the former DERM website. Most of the recommendations were either complete, underway or under consideration at the time of the report's release.

In September 2012, Workplace Health and Safety Queensland advised that the recommendations to establish a baseline for illness in commercial fishers in Gladstone and collect occupational health and safety statistics on the Queensland commercial fishing industry was not feasible, due partly to limited data sources and the prohibitive costs associated with these actions.

A full list of recommendations and activities undertaken by the Queensland Government is provided at **Attachment 4**.

4 Government response Phase 2 (Feb 2012–Sept 2012)

Integrated Aquatic Investigation Program for Gladstone Harbour

In February 2012, the Queensland Government launched the *Integrated Aquatic Investigation Program for Gladstone Harbour*, an expanded integrated investigation to identify the causes of fish health issues in Gladstone Harbour. The program builds on the work already undertaken by the Queensland Government and implements the recommendations of the independent Gladstone Fish Health Scientific Advisory Panel.

The program involves an expanded fish health and water quality investigation program guided by conceptual models and further scientific research.

The program is overseen by an Interdepartmental Committee, comprising senior executives and scientists from:

- Department of Environment and Heritage Protection (*lead agency*)
- Department of Agriculture, Fisheries and Forestry (Fisheries Queensland, Biosecurity Queensland)
- Department of Science, Innovation Technology, Innovation and the Arts
- Department of the Premier and Cabinet
- Queensland Health
- Justice and Attorney General (Workplace Health and Safety Queensland)
- Safe Food Queensland.

Professor Ian Poiner, the Chair of the Scientific Advisory Panel and other panel members were consulted on key elements of program development.

Conceptual model

The Scientific Advisory Panel recommended that a conceptual model of possible cause-effect relationship(s) should be completed to help guide the fish health and water quality investigations and focus research on potential causal factors.

The first stage of the conceptual model was developed by a multi-agency collaborative team and completed in February 2012.

In May 2012, a workshop was held to review and further develop the conceptual model, including incorporating the results of the comprehensive literature review on the potential effects of chemicals. This workshop was attended by the Chair of the Scientific Advisory Panel, Professor Ian Poiner.

The model has been used to inform the development of the expanded fish health and water quality investigations.

Fish health investigations

In March 2012, based on the Scientific Advisory Panel's recommendations, the fish health sampling program was expanded. This expanded sampling was guided by the conceptual model and focused on, but was not restricted to, six species of fin-fish, one species of shark, one species of prawn and one species of crab (**Attachment 2**). These species are caught using a range of methods and represent a range of different life cycles and levels in the food chain. Because of difficulties in catching the required numbers of queenfish, other fish species were included in the pelagic sampling, especially from the site adjacent to the spoil ground.

Sampling occurred in April–May and June–July 2012 with trips running for an average of two-three weeks across 10 locations, including reference sites in the Fitzroy River and Bundaberg. The sampling trip in September 2012 focused on looking for the presence of *Neobenedenia* on barramundi in the Boyne River.

Results indicated that fish health was much improved. The ulcerative lesions, eye problems and infection by *Neobenedenia* documented in barramundi during 2011 were not observed during Phase 2 sampling. Sharks caught across all sites, including the reference sites, displayed redness and the presence of *Dermophthirius maccallumi*. There was a low incidence of shell erosion in crustaceans. No significant signs of ill health were observed in any other focus species.

In late March 2012, Awoonga Dam again overtopped the spillway. In April-May 2012, barramundi in the Boyne River displayed significant physical damage, including loss of scales and broken jaws, consistent with injuries observed when fish have passed over a spillway. In June-July 2012, these injuries were healing, and most barramundi were considered to be in good condition.

Water quality investigations

Responding to the recommendations of the Scientific Advisory Panel, the Queensland Government monthly sampling program was expanded in February 2012 to examine potential contributions of contaminants from industrial discharges.

The monthly water quality monitoring consists of measuring dissolved and total concentrations of 21 metals and metalloids as well as levels of turbidity, dissolved oxygen, salinity, temperature, pH and chlorophyll-a at up to 52 sites across Gladstone Harbour and related waterways.

The dissolved metals which were found to exceed the water quality guideline values in one or more occasions were aluminium, arsenic, copper, molybdenum and zinc, however only low reliability trigger values are available for aluminium, arsenic and molybdenum.

Most exceedances of copper occurred in the Marina and Auckland Creek, which is not unexpected as copper is often a component of anti-fouling coatings for boats and marine structures. Zinc exceeded the trigger value once at a site in The Narrows in March 2012.

A localised increase in turbidity levels was observed at the dredging sites, but these elevated levels were not observed across the harbour or consistently over long periods of time. There was no significant relationship between turbidity and dissolved metals.

pH did not fall below 7.5 at any site and no anoxic or hypoxic events were found in the harbour or associated waterways, indicating it is unlikely acid sulphate soils are having an impact in the water quality.

The water quality results from the sampling round conducted February–September 2012 do not suggest that water quality parameters assessed in the waters of Gladstone Harbour and related waterways present a threat to fish health, with the possible exception of sites around South Trees Inlet which had repeated exceedances of aluminium and molybdenum concentrations (see section 7.1).

A report was commissioned from the University of Queensland on the immunosuppression of aquatic animals resulting from chemical contamination of water. This report was used to compare levels of contamination obtained in the water quality investigation with likely impacts on fish. The magnitude and frequency of exceedance of immunosuppression levels is critical for an effect. Two metals—aluminium and zinc—had minimal exceedances. The results indicated that immunosuppression was unlikely to be resulting from metal contamination.

Samples of sea water and sediment from the Gladstone area were also tested for the micro algae *Pfiesteria*, which has been associated with harmful algal blooms and has previously been suggested to cause both fish and human illness. A report by an Australian expert in this field, Dr Christopher Bolch, found that the algae were either absent in the samples, or present at levels below the detection limits, and are therefore unlikely to have been the cause of fish and human illness in Gladstone waterways.

Sediment investigations

In February 2012, a second round of sediment samples was collected at 31 sites throughout Gladstone Harbour. These samples were analysed for hundreds of potential contaminants, including metals and metalloids, pesticides, dioxins and furans, polychlorinated biphenyls (PCBs), benzene, toluene, ethylbenzene and xylene, polycyclic aromatic hydrocarbons (PAHs) and the presence of petroleum hydrocarbons. The results of these tests were combined with previous sampling, providing a collation of 462 samples collected throughout the harbour and ranging in depth from the surface down to 22.4 metres.

The results of these combined sediment tests show that Gladstone Harbour generally contains low amounts of contamination. No organic contaminants exceeded guidelines, and only limited irregular exceedances occurred for silver, arsenic and antimony. This means that the risk is very low of dredging releasing contaminants into the waters at concentrations likely to cause environmental harm.

There were no exceedances in the water of silver and antimony, and arsenic exceeded guidelines only in South Trees Inlet well away from dredging activities, and therefore not associated with sediment disturbance. This is further evidence to support the claim that there is no link between dredging and elevated metals in water.

Human health investigations

Queensland Health has continued to investigate any reported human health issues reported by commercial and recreational fishers in the Gladstone area.

Lyngbya

In May 2012, a commercial fisherman reported experiencing health problems such as skin, eye and respiratory irritation after cleaning 'slime' from fishing nets. Testing by the Queensland Government confirmed that the slime was found to contain the blue-green algae, *Lyngbya*.

Lyngbya occurs naturally, growing attached to seagrass, corals and other shallow substrates. When *Lyngbya* is present in large amounts it rises to the surface and forms large conspicuous floating mats or 'blooms'. *Lyngbya* blooms occur around the world, and in Australia have occurred in Moreton Bay and Shoalwater Bay. *Lyngbya* has previously been recorded in the Gladstone region; however there have been no reports of blooms in this region since the investigation commenced in September 2011.

Food safety

All seafood that is supplied for human consumption must meet national standards for suitability and food safety. Unsuitable product cannot be supplied. Failure to meet requirements is in breach of the legislation and severe penalties apply.

Safe Food Production Queensland monitors to ensure all seafood supplied for human consumption meets national standards for suitability and food standards. Seafood available through retail outlets is from regulated and wide-ranging sources and continues to be safe to purchase and eat

5 Key findings to date

5.1 Human health

No link was identified between the conditions found in fish and reported human health issues, or between water quality and public health.

The cases described did not form a single outbreak of disease.

Seafood available through retail outlets is from regulated and wide-ranging sources and continues to be safe to purchase and eat.

5.2 Water quality/sediment

The water quality results do not suggest that water quality parameters assessed in Gladstone Harbour and related waterways present a threat to fish health, with the possible exception of sites around South Trees Inlet which had repeated exceedances of aluminium and molybdenum concentrations.

It is unlikely that metals are at a level that would cause any ongoing suppression of the immune system or increased susceptibility to disease in fish and other aquatic organisms throughout Gladstone Harbour.

There is no evidence that dredging in Gladstone Harbour has increased dissolved metal concentrations or led to acidic conditions.

The micro-algae *Pfiesteria* is unlikely to have been the cause of fish and/or human illness.

Some issues have been identified with the water quality in South Trees Inlet. The Queensland Government is working with Gladstone industry to determine the impact of the elevated metals in the area.

5.3 Fish health

No single cause has been identified for all fish health issues. The conditions that have been identified are naturally occurring organisms that have been seen elsewhere in Queensland.

Results of sampling in 2012 indicated that fish health was much improved:

- Most barramundi were in good condition, and did not display the ulcerative lesions, eye conditions and infections from *Neobenedenia* that were documented in 2011. There was also evidence that physical damage observed in previous sampling runs (such as loss of scales and broken jaws) were healing.
- Sharks across all sites, including reference sites, displayed redness and the presence of the

parasitic flatworm *Dermophthirius maccallumi*.

- Crustaceans displayed a low incidence of shell erosion.

No significant signs of ill health were observed in any other focus species.

6 Next steps

The fish and water quality sampling programs conducted as part of this program were completed in September 2012. When combined with previous investigations, this provides the Queensland Government with sampling information for a 12-month period from both within and outside the Gladstone region.

Samples of a wide range of fish, crustacean and mollusc species have been provided to Biosecurity Queensland for more detailed studies. When all results have been received, reports incorporating all information from the 12-month period September 2011 to September 2012 will be completed and published.

7 Other related activities

7.1 Regulation, compliance and enforcement activities

Management and regulation of dredging program and other industries

The Gladstone Ports Corporation is currently undertaking one of Australia's largest dredging programs within Gladstone Harbour and suggestions have been made that the dredging has caused or contributed to declines in the health of fish and other marine animal health.

Gladstone comprises the single largest concentration of major industry and port facilities in Queensland. Established industries include Queensland Alumina Limited, Boyne Smelters Limited, NRG Gladstone Power Station, Orica Chemical Plant, Rio Tinto Alcan Yarwun, Cement Australia and Gladstone Ports Corporation.

All dredging requires a development approval from the Department of Environment and Heritage Protection. The approval issued to the Gladstone Ports Corporation for dredging sets limits for turbidity during dredging operations, requirements to maintain water quality in Gladstone Harbour to protect fish habitat and allow for the recovery of seagrass.

All major industries are regulated with environmental conditions set by the department. Conditions for the dredging program and the LNG developments in Gladstone Harbour, as well as other areas of the state, provide stringent environmental controls.

The Gladstone Ports Corporation is required to manage dredging, and dredge disposal, in accordance with the approval conditions set out by the State and Commonwealth governments.

The Department of Environment and Heritage Protection takes appropriate action against any industry found to be in breach of their development approval conditions.

Cyanide sampling at Orica Yarwun site

In February 2012, Orica notified the Queensland Government that wastewater discharged from its plant in Gladstone exceeded the quality limits allowed in its development approval.

In response, the Queensland Government immediately instigated an investigation that included sampling and testing of water, sediments and fish.

Results indicated:

- no obvious abnormalities in the sampled fish consistent with toxic levels of cyanide and no evidence of toxicoses or poisoning
- no cyanide detected in any water samples taken in March and April 2012
- free cyanide levels did not exceed the Australian and New Zealand Water Quality Guideline trigger. One sample from Wiggins Island in May 2012 was equal to the Australian and New Zealand Water Quality Guideline trigger

- total cyanide detected at 0.005–0.019mg/L in two sediment samples immediately adjacent to the discharge point, however, no other forms of cyanide were detected in any sediment samples.

Orica was penalised a total of \$432,000; of which \$250,000 has been diverted to public benefit projects in the Gladstone area, including \$60,000 provided for the Gladstone Healthy Harbour Partnership.

Dissolved metal testing in South Trees Inlet

In May and June 2012, additional sites in South Trees Inlet and Boyne River were added to the sampling program and expansion of the investigation into the effects of the exceedances of metal concentrations in South Trees Inlet sites adjacent to industrial areas.

The sampling found repeated exceedances of aluminium and molybdenum concentrations in South Trees Inlet, indicating a need for further investigation of water quality in this area and the influence of the industry operations on the adjacent waterways.

The Department of Environment and Heritage Protection has requested a further program over 12 months to test the waters to determine if they are safe for aquatic species. The program will include monitoring of dissolved metals at three month intervals commencing this summer. Results of the tests are expected to be available next year.

7.2 Marine strandings

Since April 2011, Gladstone Harbour, like other locations along the north Queensland coast, experienced a high rate of turtle and dugong strandings, however the levels in Gladstone Harbour were not the highest along the Queensland coast.

High rainfall, low salinity, turbidity from the flooded Burnett, Boyne, Calliope and Fitzroy rivers and cloud cover from the La Nina event in 2009-2010 resulted in a decline of seagrass across Gladstone Harbour.

The numbers of turtle strandings due to boat strike in 2011 and 2012 was significantly higher than in previous years. EHP is working with Maritime Safety Queensland and industry to reduce this impact.

A regular update on marine strandings is available from www.ehp.qld.gov.au/gladstone, which compares the stranding numbers of turtles and dugongs in Queensland with previous years.

7.3 Gladstone Healthy Harbour Partnership

On 4 May 2012, the Premier announced that a partnership agreement would be established to ensure the ongoing monitoring and improvement of Gladstone Harbour and surrounding catchments.

The Gladstone Healthy Harbour Partnership includes representatives from government, industry, research, community and other interests. The partnership will work to align activities, harness the co-investment potential, implement an adaptive management framework and deliver a shared vision for a healthy Gladstone Harbour.

The partnership will focus on best practice collaborative monitoring and management of the harbour. Decisions made by the partnership will be informed by an independent science panel and a subcommittee of the Gladstone Region Environmental Advisory Network (GREAN).

The partnership will be responsible for the development of a Gladstone Healthy Harbour Report Card and any actions needed to address its findings. By implementing collaborative actions, the partnership will maintain and continuously improve harbour health.

Attachment 1: Relevant Queensland Government publications

Water quality reports

Released 2011

Port Curtis and Tributaries: Comparison of Current and Historical Water Quality

(<http://www.ehp.qld.gov.au/water/monitoring/documents/port-curtis-water-quality.pdf>) — released on 5 October 2011

Water Quality of Port Curtis and Tributaries: Supplementary Report based on data collected in the week of 26 September (<http://www.ehp.qld.gov.au/water/monitoring/documents/port-curtis.pdf>) — released on 4 November 2011

Released 2012

Second Update on the Water Quality of Port Curtis and Tributaries - Including Data Collected in the Week of 24 October 2011 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-2nd-update-report.pdf>) — released on 4 January 2012

Third Update on the Water Quality of Port Curtis and Tributaries Including Data Collected in the Weeks of 21 November and 12 December 2011 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-3rd-update-report.pdf>) — released on 27 January 2012

Fourth Update on the Water Quality of Port Curtis and Tributaries Including Data Collected in the Week of 9 January 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-4th-update-report.pdf>) — released on 2 March 2012

Fifth Update on the Water Quality of Port Curtis and Tributaries Including Data Collected in the Week of 6 February 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-5th-update-report.pdf>) — released on 2 May 2012

Sixth Update on the Water Quality of Port Curtis and Tributaries Including Data Collected in the Week of 5 March 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-6th-update-report.pdf>) — released on 2 May 2012

Seventh Update on the Water Quality of Port Curtis and Tributaries Including Data Collected in the Week of 2 April 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-7th-update-report.pdf>) — released on 22 June 2012

Eighth Update on the Water Quality of Port Curtis and Tributaries Including Data Collected in the Week of 8 May 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-8th-update-report.pdf>) — released on 31 July 2012

Ninth Update on the Water Quality of Port Curtis and Tributaries Including Data Collected in the Week of 5 June 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-9th-update-report.pdf>) — released on 17 August 2012

Tenth Update on the Water Quality of Port Curtis and Tributaries Including Data Collected in the Week of 3 July 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-10th-update-report.pdf>) — released on 10 September 2012

Eleventh Update on the Water Quality of Port Curtis and Tributaries Including Data Collected in the Week of 1 August 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/port-curtis-11th-update-report.pdf>) — released on 3 October 2012

Water quality data

Released 2011

October 2011 data (<http://www.ehp.qld.gov.au/water/monitoring/port-curtis-sampling.html>) — released on 22 November 2011

Released 2012

[November 2011 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-november-2011.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-november-2011.html) — released on 4 January 2012

[December 2011 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-december-2011.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-december-2011.html) — released on 27 January 2012

[January 2012 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-january-2012.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-january-2012.html) — released on 17 February 2012

[February 2012 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-february-2012.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-february-2012.html) — released on 2 May 2012

[March 2012 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-march-2012.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-march-2012.html) — released on 2 May 2012

[April 2012 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-april-2012.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-april-2012.html) — released on 16 May 2012

[May 2012 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-may-2012.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-may-2012.html) — released on 22 June 2012

[June 2012 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-june-2012.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-june-2012.html) — released on 31 July 2012

[July 2012 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-july-2012.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-july-2012.html) — released on 14 August 2012

[August 2012 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-aug-2012.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-aug-2012.html) — released on 10 September 2012

[September 2012 data](http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-sept-2012.html) (http://www.ehp.qld.gov.au/gladstone/port-curtis-sampling-sept-2012.html) — released 17 October 2012

Sediment quality reports

Released 2011

Water Quality of Port Curtis and Tributaries: Supplementary Report based on data collected in the week of 26 September (http://www.ehp.qld.gov.au/water/monitoring/documents/port-curtis.pdf) — released on 4 November 2011

Released 2012

Update on the Quality of Sediment from Port Curtis and Tributaries (http://www.ehp.qld.gov.au/gladstone/pdf/sediment-report-may-2012.pdf) — released on 4 May 2012

Fish health reports

Released 2011

Fish Health Sampling Reports, Gladstone Harbour, as at 3 November 2011 — released on 4 November 2011

Fish Health Sampling Reports, Gladstone Harbour, as at 8 December 2011 (http://www.daff.qld.gov.au/documents/Fisheries_CommercialFisheries/BQ-gladstone-fish-health-report-8Dec11-web.pdf) — released on 13 December 2011

Released 2012

Fish Health Survey Report (to mid Dec 2011) — released 20 January 2012

Commercial catch of key species, Gladstone 2006–2011 — released on 25 January 2012

Fish Health Sampling Report, Gladstone Harbour as at 27 February 2012 (http://www.daff.qld.gov.au/documents/Biosecurity_GeneralAnimalHealthPestsAndDiseases/BQ-Gladstone-Harbour-fish-health-sampling-report.pdf) — released on 2 March 2012

Fish Health Survey, Gladstone Harbour, as at 1 March 2012

(http://www.daff.qld.gov.au/documents/Fisheries_CommercialFisheries/Gladstone-fish-health-survey-report.pdf) — released on 2 March 2012

Pathology results for fish collected from Gladstone Harbour on 2 March following cyanide discharge

(http://www.daff.qld.gov.au/documents/Fisheries_PestsAndDisease/pathology-results-gladstone-harbour-2-march.pdf) — released on 12 March 2012

Commercial catch of key species, Gladstone 2006–2011 (as of 20 April 2012) — released on 12 July 2012

Expanded fish health survey, Interim report April/May 2012

(http://www.daff.qld.gov.au/documents/Fisheries_CommercialFisheries/FQ-interim-sampling-report-April-May-2012.pdf) — released on 18 May 2012

Expanded fish health survey, Interim report June/July 2012

(http://www.daff.qld.gov.au/documents/Fisheries_CommercialFisheries/FQ-gladstone-interim-sampling-report.pdf) — released on 21 August 2012

Fish kill testing summary: Catfish Boyne River, Gladstone, as at 28 September 2012

(http://www.daff.qld.gov.au/documents/Biosecurity_GeneralAnimalHealthPestsAndDiseases/catfish-report.pdf) — released on 28 September 2012

Advisory panel reports

Released 2012

Gladstone Fish Health Scientific Advisory Panel Final Report

(<http://www.ehp.qld.gov.au/gladstone/pdf/gladstone-sap-report.pdf>) — released on 5 January 2012

Queensland Government response to Gladstone Fish Health Scientific Advisory Panel Final Report

(<http://www.ehp.qld.gov.au/gladstone/pdf/gov-response-to-sap.pdf>) — released on 14 February 2012

External reports (released by Queensland Government)

Released 2012

Chemically induced immunosuppression and disease susceptibility in marine wildlife: A literature review

(<http://www.ehp.qld.gov.au/gladstone/pdf/immunosuppression-report.pdf>) — Report by National Research Centre for Environmental Toxicology (Entox), University of Queensland — released by the Queensland Government on 30 May 2012

Queensland Government summary of the ENTOK report's findings

(<http://www.ehp.qld.gov.au/gladstone/immunosuppression.html>) — released May 2012

The absence of Pfiesteria species and Cryptoperidiniopsis brodyii from Gladstone Harbour based upon polymerase chain reaction assays

(<http://www.ehp.qld.gov.au/gladstone/pdf/pfiesteria-report-june-12.pdf>) — Report by Dr Christopher Bolch — released by the Queensland Government on 29 June 2012

Media releases

15 Sep 2011 - [Temporary fishing closure in Gladstone](http://www.daff.qld.gov.au/30_20910.htm) (http://www.daff.qld.gov.au/30_20910.htm)

16 Sep 2011 - [Temporary fish closure placed in Gladstone](http://www.daff.qld.gov.au/30_20922.htm) (http://www.daff.qld.gov.au/30_20922.htm)

23 Sep 2011 - [Preliminary test results on Gladstone fish samples](http://www.daff.qld.gov.au/30_20952.htm) (http://www.daff.qld.gov.au/30_20952.htm)

10 Oct 2011 - [Gladstone fish sampling results](http://www.daff.qld.gov.au/30_21034.htm) (http://www.daff.qld.gov.au/30_21034.htm)

4 Nov 2011 - [Gladstone fish investigation test results](http://www.daff.qld.gov.au/30_21115.htm) (http://www.daff.qld.gov.au/30_21115.htm)

4 Nov 2011 - [Second Gladstone harbour water quality test results released](http://www.ehp.qld.gov.au/mediareleases/2011/11/gladstone-harbour.html) (<http://www.ehp.qld.gov.au/mediareleases/2011/11/gladstone-harbour.html>)

- 22 Nov 2011 - [Next round of Gladstone Harbour water quality tests published](http://www.ehp.qld.gov.au/mediareleases/2011/11/further-round-gladstone-harbour.html)
(<http://www.ehp.qld.gov.au/mediareleases/2011/11/further-round-gladstone-harbour.html>)
- 26 Nov 2011 - [Sampling finds Gladstone prawns in good health](http://www.daff.qld.gov.au/30_21267.htm)
(http://www.daff.qld.gov.au/30_21267.htm)
- 14 Dec 2011 - [Fish test results for Gladstone released](http://www.daff.qld.gov.au/30_21265.htm) (http://www.daff.qld.gov.au/30_21265.htm)
- 4 Jan 2012 - [Gladstone Harbour water quality tests](http://www.ehp.qld.gov.au/mediareleases/2012/01/latest-gladstone-harbour-tests.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012/01/latest-gladstone-harbour-tests.html>)
- 6 Jan 2012 - [No risk to human health from Gladstone fish: independent scientific panel](http://statements.qld.gov.au/Statement/Id/78367)
(<http://statements.qld.gov.au/Statement/Id/78367>)
- 10 Jan 2012 - [Dredging companies ordered to suspend suction dredging in Gladstone Harbour](http://www.ehp.qld.gov.au/mediareleases/2012/01/gladstone-harbour-turbidity.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012/01/gladstone-harbour-turbidity.html>)
- 18 Jan 2012 - [Cutter suction dredging to recommence in Gladstone Harbour](http://www.ehp.qld.gov.au/mediareleases/2012/01/cutter-suction-gladstone.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012/01/cutter-suction-gladstone.html>)
- 23 Jan 2012 - [Positive signs for Gladstone fish health](http://www.daff.qld.gov.au/30_21362.htm) (http://www.daff.qld.gov.au/30_21362.htm)
- 27 Jan 2012 - [Latest water quality results for Port Curtis](http://www.ehp.qld.gov.au/mediareleases/2012/01/port-curtis-water-results.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012/01/port-curtis-water-results.html>)
- 2 Mar 2012 - [Latest water quality and fish test results for Gladstone](http://www.ehp.qld.gov.au/mediareleases/2012/03/gladstone-fish-health.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012/03/gladstone-fish-health.html>)
- 6 Mar 2012 - [EHP investigations reveal no detectable levels of cyanide from Orica Gladstone facility](http://www.ehp.qld.gov.au/mediareleases/2012/03/orica-investigation2.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012/03/orica-investigation2.html>)
- 26 Apr 2012 - [Gladstone fish health monitoring expanded](http://www.daff.qld.gov.au/30_21664.htm) (http://www.daff.qld.gov.au/30_21664.htm)
- 2 May 2012 - [Latest water quality testing in Port Curtis](http://www.ehp.qld.gov.au/mediareleases/2012-05-latest-water-quality-testing-port-curtis.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012-05-latest-water-quality-testing-port-curtis.html>)
- 4 May 2012 - [Gladstone harbour dredging not releasing contaminants](http://www.ehp.qld.gov.au/mediareleases/2012-05-gladstone-harbour-dredging.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012-05-gladstone-harbour-dredging.html>)
- 18 May 2012 - [Latest report on Gladstone fish health monitoring released](http://www.daff.qld.gov.au/30_21706.htm)
(http://www.daff.qld.gov.au/30_21706.htm)
- 20 Jul 2012 - [Top scientist sought to lead Gladstone Harbour panel](http://statements.qld.gov.au/Statement/Id/79929)
(<http://statements.qld.gov.au/Statement/Id/79929>)
- 20 August 2012 - [Winter survey finds Gladstone fish healing](http://www.daff.qld.gov.au/30_22037.htm)
(http://www.daff.qld.gov.au/30_22037.htm)

Other related issues

- 3 May 2012 - [Gladstone Harbour turbidity management levels amended](http://www.ehp.qld.gov.au/mediareleases/2012-05-gladstone-harbour-turbidity.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012-05-gladstone-harbour-turbidity.html>)
- 6 Mar 2012 - [EHP investigations reveal no detectable levels of cyanide from Orica Gladstone facility](http://www.ehp.qld.gov.au/mediareleases/2012/03/orica-investigation2.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012/03/orica-investigation2.html>)
- 1 Mar 2012 - [EHP investigates Orica Gladstone](http://www.derm.qld.gov.au/media-room/2012/03/orica-investigation.html) (<http://www.derm.qld.gov.au/media-room/2012/03/orica-investigation.html>)
- 18 Jan 2012 - [Cutter suction dredging to recommence in Gladstone Harbour](http://www.ehp.qld.gov.au/mediareleases/2012/01/cutter-suction-gladstone.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012/01/cutter-suction-gladstone.html>)
- 10 Jan 2012 - [Dredging companies ordered to suspend suction dredging in Gladstone Harbour](http://www.ehp.qld.gov.au/mediareleases/2012/01/gladstone-harbour-turbidity.html)
(<http://www.ehp.qld.gov.au/mediareleases/2012/01/gladstone-harbour-turbidity.html>)

Newsletters – the Gladstone Source

[Issue 1 - June 2012](http://www.vision6.com.au/em/message/email/view.php?id=919168&u=50147) (<http://www.vision6.com.au/em/message/email/view.php?id=919168&u=50147>)

[Issue 2 - July 2012](http://www.vision6.com.au/em/message/email/view.php?id=930162&u=50147) (<http://www.vision6.com.au/em/message/email/view.php?id=930162&u=50147>)

Issue 3 - September 2012

(<http://www.vision6.com.au/em/message/email/view.php?id=943279&u=50147>)

Brochures

Gladstone Harbour Water Quality Update (<http://www.ehp.qld.gov.au/gladstone/pdf/gladstone-water-quality.pdf>) – released 30 May 2012

Gladstone Fish Health Update (<http://www.ehp.qld.gov.au/gladstone/pdf/gladstone-fish-health.pdf>) – released 30 May 2012

Gladstone fish health survey, Mud crab update

(http://www.daff.qld.gov.au/documents/Fisheries_ResearchAndDevelopment/MudcrabUpdate.pdf)— released on 7 September 2012

Gladstone Harbour Fish Health Extended Oversight Committee

Terms of reference — endorsed on 30 January 2012

Meeting Outcomes from 30 January 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/extended-oversight-committee-2012-01-30.pdf>)

Meeting Outcomes from 16 January 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/extended-oversight-committee-2012-01-16.pdf>)

Meeting Outcomes from 9 January 2012 (<http://www.ehp.qld.gov.au/gladstone/pdf/extended-oversight-committee-2012-01-09.pdf>)

Meeting Outcomes from 19 December 2011 (<http://www.ehp.qld.gov.au/gladstone/pdf/extended-oversight-committee-2011-12-19.pdf>)

Meeting Outcomes from 12 December 2011 (<http://www.ehp.qld.gov.au/gladstone/pdf/extended-oversight-committee-2011-12-12.pdf>)

Meeting Outcomes from 5 December 2011 (<http://www.ehp.qld.gov.au/gladstone/pdf/extended-oversight-committee-2011-12-05.pdf>)

Meeting Outcomes from 28 November 2011 (<http://www.ehp.qld.gov.au/gladstone/pdf/extended-oversight-committee-2011-11-28.pdf>)

Meeting Outcomes from 21 November 2011 (<http://www.ehp.qld.gov.au/gladstone/pdf/extended-oversight-committee-2011-11-21.pdf>)

Meeting Outcomes from 14 November 2011 (<http://www.ehp.qld.gov.au/gladstone/pdf/extended-oversight-committee-2011-11-14.pdf>)

Other related publications

Scallops

Scallop sampling: Bundaberg and Gladstone waters, February 2012

(http://www.daff.qld.gov.au/documents/AnimalIndustries_OtherAnimals/scallop-report.pAdf) — released on 18 May 2012

Marine wildlife strandings

Released 2011

Marine strandings until 6 September 2011 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-060911.pdf>)

Marine strandings until 20 September 2011 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-200911.pdf>)

Marine strandings until 4 October 2011 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-041011.pdf>)

Marine strandings until 18 October 2011 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-181011.pdf>)

Marine strandings until 8 November 2011 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-081111.pdf>)

Marine strandings until 22 November 2011 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-221111.pdf>)

Marine strandings until 6 December 2011 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-061211.pdf>)

Marine strandings until 20 December 2011 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-201211.pdf>)

Released 2012

Marine strandings until 17 January 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-report-170111.pdf>)

Marine strandings until 31 January 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-3101012.pdf>)

Marine strandings until 14 February 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-report-140212.pdf>)

Marine strandings until 28 February 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-280212.pdf>)

Marine strandings until 13 March 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-130312.pdf>)

Marine strandings until 27 March 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-270312.pdf>)

Marine strandings until 10 April 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-100412.pdf>)

Marine strandings until 24 April 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-240412.pdf>)

Marine strandings until 7 May 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-070512.pdf>)

Marine strandings until 22 May 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-220512.pdf>)

Marine strandings until 5 June 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-050612.pdf>)

Marine strandings until 30 June 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-300612.pdf>)

Marine strandings until 31 July 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-310712.pdf>)

Marine strandings until 31 August 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-310812.pdf>)

Marine strandings until 30 September 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-300912.pdf>)

Marine strandings until 31 October 2012 (<http://www.ehp.qld.gov.au/wildlife/caring-for-wildlife/pdfs/marine-strandings-update-311012.pdf>)

Seagrass (released by Gladstone Ports Corporation)

2011

Development of a light based seagrass management approach for the Gladstone Western Basin Dredging program

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Development%20of%20a%20Light%20Based%20Seagrass%20Management%20Approach%20for%20the%20Gladstone%20Western%20Basin%20Dredging%20p.pdf>)

Gladstone Permanent Transects Seagrass Monitoring Sites — February and March 2011 Update

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Seagrass%20report%20DEEDI%20March%202011.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — April 2011 Update

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Seagrass%20report%20April%202011.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — July 2011 Update

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Seagrass%20report%20DEEDI%20July%202011.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — Additional September 2011 assessment Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/DEEDI%20Seagrass%20report%20September%202011.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — October 2011 Interim Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Seagrass%20report%20DEEDI%20October%202011.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — November 2011 Interim Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Seagrass%20report%20november%202011%20interim.pdf>)

2012

Gladstone Permanent Transect Seagrass Monitoring — January 2012 Interim Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Port%20Curtis%20Seagrass%20Report%20January%20interim%20report%202012.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — February 2012 Interim Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/February%202012%20Seagrass%20Interim%20Report.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — March 2012 Interim Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/March%202012%20Seagrass%20report.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — April 2012 Interim Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/April%202012%20Seagrass%20report.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — May 2012 Interim Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Gladstone%20Permanent%20Transect%20May%202012%20Interim%20Update.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — June 2012 Update Report (h

<http://www.westernbasinportdevelopment.com.au/media/pdf/June%202012%20Transect%20Seagrass%20Monitoring.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — July 2012 Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Gladstone%20Permanent%20transect%20seagrass%20report%20July%202012.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — August 2012 Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Gladstone%20Permanent%20Transect%20Seagrass%20report%20August%202012.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — September 2012 Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Permanent%20Transect%20Seagrass%20Monitoring%20September%202012.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — October 2012 Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Gladstone%20Permanent%20Transect%20Seagrass%20Monitoring%20October%202012%20Update%20Report.pdf>)

Gladstone Permanent Transect Seagrass Monitoring — November 2012 Update Report

(<http://www.westernbasinportdevelopment.com.au/media/pdf/Gladstone%20Permanent%20Transect%20Seagrass%20Monitoring%20Nov%202012.pdf>)

Attachment 2: Samples taken during fish health investigations

* indicates multiple species included in category

Fish Species (taxonomic group eg. Family or Genus or Species)	Phase 1 Sept 2011 – Feb 2012	Phase 2 March 2012 – Sept 2012	Total
Anchovies * (<i>Engraulidae</i>)	355		355
Australian threadfin * (<i>Polydactylus spp.</i>)	361	545	906
Barramundi (<i>Lates calcarifer</i>)	281	216	497
Batfish * (<i>Ephippidae, Drepaneidae</i>)	3	1	4
Beach salmon (<i>Leptobrama muelleri</i>)	2		2
Black jew (<i>Protonibea diacanthus</i>)	1		1
Black pomfret (<i>Parastromateus niger</i>)	3		3
Blue threadfin (<i>Eleutheronema tetradactylum</i>)	51	1	52
Bony bream (<i>Nematalosa erebi</i>)	42		42
Bream * (<i>Acanthopagrus spp.</i>)	46		46
Butter Bream (<i>Monodactylus argenteus</i>)	2		2
Catfish (<i>Ariidae</i>)	129		129
Cod/Groupers * (<i>Epinephelus spp.</i>)	17	1	18
Flathead * (<i>Platycephalus spp.</i>)	9	1	10
Mackerels and Bonitos* (<i>Scombridae</i>)		7	7
Grinner * (<i>Bathysauridae, Synodontidae</i>)	80	179	259
Herring * (<i>Clupeidae, Pristigasteridae, Elopidae</i>)	72	346	418
Javelin fish * (<i>Pomadasys spp.</i>)	35		35
King threadfin (<i>Polydactylus macrochir</i>)	21		21
Milk fish (<i>Chanos chanos</i>)	1		1
Mullet * (<i>Mugilidae</i>)	149	125	274
Ponyfish * (<i>Leiognathidae</i>)	366		366
Queenfish * (<i>Scomberoides spp.</i>)	89	71	160
River jew * (<i>Johnius spp.</i>)	419		419

Fish Species (taxonomic group eg. Family or Genus or Species)	Phase 1 Sept 2011 – Feb 2012	Phase 2 March 2012 – Sept 2012	Total
Scad * (<i>Carangidae</i>)	18		18
Scats * (<i>Scatophagidae</i>)	10		10
Sharks and rays * (<i>multiple Families</i>)	227	26	253
Silverbiddies (<i>Gerreidae</i>)	24		24
Snappers (<i>Lutjanidae</i>) *	2		2
Snubnose dart (<i>Trachinotus blochii</i>)	42		42
Sole * (<i>Soleidae, Cynoglossidae</i>)	1		1
Sweetlips and Emperors* (<i>Haemulidae, Lethrinidae</i>)	3	2	5
Trevally * (<i>Carangidae</i>)	49	5	54
Tripletail (<i>Lobotidae</i>)	3		3
Whiting * (<i>Sillago spp</i>)	303		303
Total	3211	1526	4737
Crustaceans and Molluscs	Phase 1 Sept 2011 – Feb 2012	Phase 2 March 2012 – Sept 2012	Total
Moreton Bay bug * (<i>Thenus spp.</i>)	1		1
Scallops (<i>Pectinidae</i>)	23		23
Prawns (not banana) * (<i>Penaeidae</i>)	294		294
Banana prawns (<i>Fenneropenaeus merguensis</i>)	266 (+ an additional 85kg not quantified)	574	840
Crabs - Not mud crabs * (<i>Portunidae</i>)	5		5
Mud crabs (<i>Sylla serrata</i>)	1435	1599	3034
Total	2024 + (+ = 85kg banana prawns)	2173	4197+

Attachment 3: Properties measured during water quality and sediment sampling

Water quality

Metals (total and dissolved)

- aluminium
- antimony
- arsenic
- boron
- cadmium
- chromium
- cobalt
- copper
- gallium
- iron
- lead
- manganese
- mercury
- molybdenum
- nickel
- selenium
- silver
- thallium
- tin
- vanadium
- zinc

Physical-chemical properties

- turbidity (NTU)
- temperature (°C)
- salinity (PSU)
- dissolved oxygen (% saturation)
- pH

Nutrients

- Total Phosphorus
- Inorganic phosphorus (filterable reactive phosphorus)
- Total Nitrogen
- Ammonia Nitrogen

- Nitrogen Oxides

Phytoplankton biomass

- chlorophyll-a concentrations

Sediments

- metals and metalloids (as above)
- pesticides
- petroleum hydrocarbons, including polycyclic aromatic hydrocarbons (PAHs) and BTEX (the aromatic hydrocarbons benzene, toluene, ethylbenzene and xylene)
- polychlorinated biphenyls (PCBs)
- dioxins and dioxin-like chemicals

Attachment 4: Government response to Gladstone Fish Health Scientific Advisory Panel

Recommendation	Activities undertaken	Status
Fish Health		
FH1. On-going focus on fish health The fish health issue should be the on-going focus of Queensland Government studies	<u>Activities completed</u> Studies into fish health issues in Gladstone Harbour and surrounding areas have been undertaken since September 2011. Samples taken have been provided to Biosecurity Queensland for gross pathology, histology, bacteriology, metals, and toxicity testing. All fish sampling, results and reports are made publicly available at www.qld.gov.au/gladstoneharbour In March 2012, the fish health investigation program was significantly expanded as part of the Integrated Aquatic Investigation Program for Gladstone Harbour. The sampling program design has been guided by the conceptual modelling (ref: FH2)	✓ Implemented Fish health studies undertaken Sept 2011–Sept 2012
FH2. Conceptual model A conceptual model should be completed of possible cause-effect relationship(s) to help guide studies and eliminate potential causal factors	<u>Activities completed</u> The first stage of the conceptual model was completed in February 2012. In May 2012, a workshop was held to review and further develop the conceptual model, including incorporating the results of the comprehensive literature review on the potential effects of chemicals (ref WQ3). This workshop was attended by the Chair of the Scientific Advisory Panel, Professor Ian Poiner. The model has been used to inform fish health and water quality investigations.	✓ Implemented Conceptual model developed and used to inform investigations
FH3. Case definition for “reddening” A case definition for the observed skin discolouration in fish should be developed	<u>Activities completed</u> A case definition for “reddening” (including the ability to accurately describe the location and extent of skin discolouration) has been developed, substantially revised and used in all sampling since November 2011.	✓ Implemented A case definition for “reddening” developed and used

Recommendation		Activities undertaken	Status
FH4.	<p>On-going monitoring</p> <p>Ongoing monitoring of the prevalence of the parasite, lesions and skin discolouration and the associated pathology investigations, guided by the conceptual model</p>	<p><u>Activities completed</u></p> <p>Monitoring of fish health in Gladstone Harbour and surrounding areas has been undertaken since September 2011. Samples taken have been provided to Biosecurity Queensland for gross pathology, histology, bacteriology, metals, and toxicity testing.</p> <p>In March 2012, the fish health investigation program was significantly expanded as part of the Integrated Aquatic Investigation Program for Gladstone Harbour. The program design is guided by the conceptual modelling (ref: FH2) and includes expanded sampling and investigation of fish in Gladstone, Fitzroy and Bundaberg areas with trawl, net and crab pot sampling, as well as greater use of research vessels.</p> <p>All fish sampling, results and reports are published at: www.qld.gov.au/gladstoneharbour</p> <p><u>Further activities</u></p> <p>Finalisation of pathology, histology, bacteriology, metals, and toxicity testing by Biosecurity Queensland.</p>	<p>✓</p> <p>Implemented</p> <p>Fish health studies undertaken Sept 2011–Sept 2012</p>
FH5.	<p>Experimental work with diseased fish and <i>Neobenedenia</i></p> <p>Consideration of experimental work to better understand the parasite's taxonomy, biology and pathogenesis; studies on wild fish with lesions held in captivity</p>	<p><u>Activities completed</u></p> <p>In-field measurements were taken in October 2011 comparing the numbers of parasites on individual fish with the degree of skin discolouration.</p> <p>James Cook University has been undertaking research on <i>Neobenedenia</i> biology and pathogenesis.</p> <p><u>Further activities</u></p> <p>Increase understanding of fish parasite biology and pathogenesis through research project.</p> <p>Maintain contact with James Cook University on <i>Neobenedenia</i> research to inform future investigations.</p>	<p>✓</p> <p>Implemented</p> <p>Discussions have been held with JCU researchers</p>

Recommendation	Activities undertaken	Status	
Water Quality			
WQ1.	<p>Dissolved metals</p> <p>Water quality monitoring is expanded to include analysis for dissolved metals.</p>	<p><u>Activities completed</u></p> <p>Monthly monitoring for dissolved metals by the Government has been undertaken since September 2011. All results are available at: www.ehp.qld.gov.au/gladstone</p> <p>Monitoring of sediment metal concentrations was completed by the Government in September 2011. Results were published on 4 November 2011 on the EHP website www.ehp.qld.gov.au/gladstone</p> <p>Gladstone Ports Corporation (GPC) data of sediment sampling undertaken in 2008-09 (pre-dredging) has been obtained by the Government.</p> <p>Additional monitoring of sediment metal concentrations was completed by the Government during February 2012 as part of the Integrated Aquatic Investigation Program for Gladstone Harbour.</p> <p>In May 2012, results of sediment samples taken in February 2012 and analysis of GPC data of sediment sampling undertaken in 2008-2009 (pre-dredging) was published on the EHP website: www.ehp.qld.gov.au/gladstone</p>	<p>✓</p> <p>Implemented</p>
WQ2.	<p>Continued water quality monitoring</p> <p>Water quality monitoring program to continue.</p>	<p><u>Activities completed</u></p> <p>Monthly water quality monitoring has been undertaken since September 2011.</p> <p>In February 2012, the water quality investigation was expanded to include additional sediment sampling for dissolved metals (ref WQ1), persistent organic pollutants (ref WQ4).</p> <p>The sampling program design has been guided by the conceptual modelling (ref: FH2) and will be re-assessed and amended as necessary, as further information comes to hand (ref WQ5).</p> <p>All water quality monitoring data and reports are made publically available at: www.ehp.qld.gov.au/gladstone</p>	<p>✓</p> <p>Implemented</p> <p>Water quality investigations undertaken Sept 2011– Sept 2012</p>

Recommendation		Activities undertaken	Status
WQ3.	<p>Literature review of chemicals</p> <p>A comprehensive literature review on the potential of chemicals to cause the observed signs in fish is conducted and an appropriate test program targeting the chemicals is designed.</p>	<p><u>Activities completed</u></p> <p>An independent company was contracted to undertake a review of potential chemicals which can cause the observed signs in fish. This report has been received, reviewed and published on the EHP website: www.ehp.qld.gov.au/gladstone</p> <p>The report was used by the government in the development of the expanded fish and water quality sampling/investigation programs</p>	<p>✓</p> <p>Implemented</p>
WQ4.	<p>Organic pollutants in sediments and fish lipid tissue</p> <p>Quantification of legacy persistent organic pollutants in sediments.</p>	<p><u>Activities completed</u></p> <p>Quantification of organic pollutants fish lipid tissue has been undertaken as part of Biosecurity Queensland's toxicology testing.</p> <p>In February 2012, the water quality investigation was expanded to include additional sediment sampling for persistent organic pollutants and dissolved metals (ref WQ1).</p> <p>In May 2012, results of sediment samples taken in February 2012 was published on the EHP website: www.ehp.qld.gov.au/gladstone</p> <p><u>Further activities</u></p> <p>Finalisation of organic pollutants fish lipid tissue testing by Biosecurity Queensland.</p>	<p>✓</p> <p>Implemented</p> <p>Quantification of legacy persistent organic pollutants in sediments completed.</p> <p>Investigation of organic pollutants fish lipid tissue is continuing.</p>

Recommendation		Activities undertaken	Status
WQ5.	<p>Adaptive management of monitoring program</p> <p>DERM to re-assess and amend the monitoring program as necessary, as more information becomes available.</p>	<p><u>Activities completed</u></p> <p>In September 2011, a monitoring program was designed based on available information, including incorporating monitoring of dissolved metals and sediment metal concentrations. This monitoring program has been continually re-assessed and amended in response to feedback.</p> <p>In February 2012, the water quality investigation was expanded to include additional sediment sampling for dissolved metals (ref WQ1), persistent organic pollutants (ref WQ4). The sampling program design has been guided by the conceptual modelling (ref: FH2).</p> <p>All relevant Government investigation and monitoring programs have been reviewed and evaluated. Other relevant investigation and monitoring programs have been identified and review and evaluation of these programs have commenced (ref: WQ6).</p> <p>The water quality investigation program was re-assessed and amended following the results of the comprehensive literature review on the potential effects of chemicals (ref WQ3), the workshop on the conceptual model (ref FH2) and the results of sediment samples taken in February 2012 and analysis of GPC data of sediment sampling taken in 2008-2009 (ref WQ1).</p>	<p>✓</p> <p>Implemented</p> <p>Water quality investigation continued to be re-assessed and amended</p>
WQ6.	<p>Engagement with PCIMP and other industries</p> <p>The Queensland Government should engage with the Port Curtis Integrated Monitoring Program (PCIMP) and industries around Gladstone to ensure monitoring programs have the ability to detect potential impacts of the multiple stressors on Gladstone Harbour.</p>	<p><u>Activities completed</u></p> <p>In February 2012, DERM officers met with PCIMP, Gladstone Ports Corporation, Central Queensland University, Gladstone Industry Leadership Group and CSIRO officers regarding collaboration and integration of water quality monitoring programs.</p> <p>On 4 May, the Premier announced that an arrangement, not dissimilar to Moreton Bay's Healthy Waterways Partnership, would be developed for Gladstone.</p> <p>This arrangement (the Gladstone Healthy Harbour Partnership) will build on the engagement conducted as part of the Gladstone Fish Health response (but will be conducted as a separate program).</p>	<p>✓</p> <p>Implemented</p> <p>On-going engagement with PCIMP and industries regarding monitoring programs</p>

Recommendation		Activities undertaken	Status
Human Health			
HH1.	<p>Baseline for illness in commercial fishers</p> <p>Conduct a study to establish a baseline for commercial fishers in Gladstone and possibly other areas of Queensland.</p>	<p><u>Activities completed</u></p> <p>Options to progress a study to establish a baseline for illness in commercial fishers in Gladstone and possibly other areas of Queensland have been discussed.</p> <p>In September 2012, based on advice from Workplace Health and Safety Queensland, the Gladstone Harbour Interdepartmental Committee agreed that implementation of this recommendation is not feasible.</p>	Action closed
HH2.	<p>OH&S statistics for commercial fishers</p> <p>Appropriate OH&S statistics be routinely collected for the Queensland commercial fishing industry.</p>	<p><u>Activities completed</u></p> <p>Mechanisms to capture work-related injury and disease data for commercial fishing industry have been investigated.</p> <p>In September 2012, based on advice from Workplace Health and Safety Queensland, the Gladstone Harbour Interdepartmental Committee agreed that implementation of this recommendation is not feasible due to limited data sources.</p>	Action closed
HH3.	<p>OH&S guidelines for fishing</p> <p>Appropriate best practice OH&S guidelines for fishing and fish handling be developed in collaboration with the commercial fishing industry</p>	<p><u>Activities completed</u></p> <p>OH&S information has been developed and published on DAFF Gladstone webpage: http://www.dpi.qld.gov.au/28_20898.htm</p> <p>A fact sheet on "Managing skin infections in the fishing industry" has been produced.</p> <p>Workplace Health and Safety Queensland has written to commercial fishers to gauge their interest in working collaboratively to develop further understanding of OH&S issues for commercial fishing industry</p>	<p>✓</p> <p>Implemented</p>