



Water Science
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**Port Curtis and Tributaries:
Comparison of current and historical water quality**

Qld DERM, October 2011

***Review by Professor Barry Hart for Fitzroy Basin Authority
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- This report was prepared in response to assertions that a decline in water quality (perhaps due to recent dredging of the harbour and the 2010/2011 summer floods) was the cause of an increase in fish disease in the Port Curtis Harbour around August-September 2011.
- The method adopted to address the question (was a decline in water quality the reason for the fish disease incident?), was to analyse existing water quality data for the harbour and the Boyne and Calliope Estuaries for any anomalous trends over the period April 2010 to August 2011. It appears that the data for the harbour available between April 2010 and August 2011 (frequency of sampling not known) was provided by the Gladstone Ports Corporation, while that for the two estuaries was provided by DERM (monthly sampling between January 1994 and August 2011).
- The available data was reported in the form of concentration vs time plots, although the data plotted on the various graphs not clearly identified (e.g. temperature data (p3-4) for Port Curtis Harbour was presumably collected by Gladstone Ports Corporation, but this is not clear). Additionally, the actual water quality data was not provided in the report, nor were the sampling methods, preservation techniques, analytical methods or QC/QA protocols. For this reason the data lacks credibility and the report conclusions must be treated with caution.
- Additionally, a major limitation with this report is the fact that there is a lack of information on how and why the water quality indicators (temp, DO, pH, turbidity, salinity) reported and analysed are related to fish disease. A conceptual model of the cause-effect relationships should have been prepared to justify why showing that if the selected water quality indicators changed little over the study period, dredging and floods could be eliminated as potential reasons for the fish disease incident.
- The data in the report appear to show that the selected water quality indicators were not significantly different from what has been noted since 1994 (at least in Boyne and Calliope estuaries (but not Port Curtis). However, this does not prove that water quality degradation was not a reason for the observed fish disease

outbreak (some other water quality indicator may have been the problem). Without a better conceptual model linking the water quality indicators to fish disease this possibility cannot be discounted.

- The report also plots total heavy metals concentrations (aluminium, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver and vanadium) sampled at 12 sites in the harbour on 4 occasions (Oct 10, Jan 11, Apr 11 and Aug 11). These are graphed in Attachment 8. Again no data are provided, and also no information on the sampling methods, preservation techniques, analytical methods or QC/QA protocols. Without this information the data lack credibility.
- To exclude heavy metals as a reason for the fish disease outbreak, the report authors compare the total metal concentrations with the trigger values in the ANZECC guidelines. Unfortunately, these trigger values are not listed in the report nor on the various graphs, so the reader cannot confirm statement such as the 'Gladstone metals data assessed is mostly within guidelines' (p29).
- Additionally, as the report authors note, the dissolved (or filterable) forms of the heavy metals are most likely to cause toxicity problems for fish, and not the total amounts since much of the total will be bound to particulate matter in non-toxic forms.
- While it is well known that many heavy metals are toxic (acute or chronic) to fish, the report authors have provided no rationale for a causal link between heavy metal concentrations and fish disease. Without such a rationale, there is no guarantee that fish disease would not be triggered even if the concentrations were below the guideline toxicity trigger values.
- The report appears to have been rather hastily prepared. The methodology is poorly described, no actual data is made available, there is confusion over what data is reported, and the relationship between the water quality data for the Boyne and Calliope estuaries (sites not shown on Fig 1) and the harbour is not clear.
- Additionally, the report does not list the authors. Anomalous reports have no credibility even if produced under the label of a Government department.

In summary, the report '*Port Curtis and Tributaries: Comparison of current and historical water quality*' lacks credibility. The report does not justify why the particular water quality indicators were chosen - a clear cause-effect link between the water quality indicators reported and fish disease is not provided. Therefore, even if the authors could provide clear evidence that these water quality indicators had not declined over the study period, this would not prove that some other water quality indicator caused the fish disease incident in Port Curtis Harbour.

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