

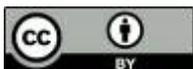


Expanded fish health survey

Interim report April/May 2012

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Background

In August 2011, the Queensland Government received reports of barramundi fish and subsequently other species being caught with obvious signs of ill health, including bulging/red eyes, blindness, severe skin lesions and skin discolouration.

On 16 September 2011, Fisheries Queensland closed Gladstone Harbour and the surrounding area to fishing, for a period of 21 days, under section 96 of the *Fisheries Act 1994* in response to concerns about human health and the transfer of disease between fish and entry into the food chain.

From the initial testing of nine ill barramundi, two conditions were identified that were affecting barramundi in the Gladstone area:

- Red-spot disease (epizootic ulcerative syndrome (EUS)), which is caused by a fungus endemic to fin fish species of mainland Australia. This condition was only confirmed in one fish from Port Alma.
- An external parasite *Neobenedenia sp.*, which was affecting the eye and skin particularly in the barramundi in Gladstone Harbour.

Other fin fish species presented a range of generally mild skin conditions from localised skin inflammation, skin erosion and redness. No bacterial, parasitic or fungal pathogens were found which could explain the skin conditions.

Reports were also received from the Gladstone Area Water Board that an estimated 30,000 large barramundi entered the Boyne River in early 2011 when the Awoonga Dam spilled over for the first time since 2002. Commercial catches of barramundi in 2011 demonstrate that the numbers of barramundi in the Boyne River and Gladstone Harbour exceeded by 20 times the average annual catch from 2005 to 2010.

In response to the fish health issues, the Queensland Government set up an investigation program that included fish sampling and testing, water quality sampling and testing, and investigation into human health concerns.

Fisheries Queensland commenced monitoring fish health in Gladstone Harbour after the closure of the Harbour was declared, and has continued to monitor fish health in Gladstone and adjacent areas in conjunction with commercial fishers. Fisheries Queensland continues to provide samples of a wide range of fish, crustacean and mollusc species to Biosecurity Queensland for more detailed studies.

In October 2011, a Scientific Advisory Panel was established to provide independent scientific advice to the Queensland Government on the fish health investigation in Gladstone Harbour. The Panel reviewed the Queensland Government's monitoring regimes, results and analysis primarily focusing on fish health in Gladstone Harbour and surrounds, but also considered water quality monitoring and human health issues where relevant and appropriate.

The Panel acknowledged that this was a complex issue and supported the Government's ongoing investigation of the issue and noted that good progress had been made. The Panel made specific comments and recommendations in relation to the issues of fish health, water quality and human health with a view to identifying a possible cause(s) of the fish health issues being observed in Gladstone Harbour.

Overview

Based on the Scientific Panel's recommendations, the Government is undertaking an expanded integrated program to understand the causes of fish health issues in Gladstone Harbour through further monitoring and research.

The current sampling builds on the fish health investigations conducted by Fisheries Queensland since September 2011 in the Gladstone region and surrounding waters. Previous sampling events have provided important information for a range of health issues being expressed by fish and crustacean species, in particular the relationship between parasite burden (*Neobenedenia* sp.) and skin discolouration seen in barramundi. Previous sampling will be used to guide the structure of this extended sampling program (see [Fish health survey report 1 March 2012](#) on sampling from September 2011 to March 2012, on www.qld.gov.au/gladstoneharbour).

A more intensive sampling program is required to better understand the variation in temporal (seasonal) and spatial prevalence of symptoms expressed in fish and crustacean species. Previous sampling provided important information on the health status of a number of fish and crustacean species during late spring and early summer. The extended sampling period will be completed by 30 September 2012 and, when considering previous investigations, will provide Fisheries Queensland with sampling information for a 12 month period from both within and outside the Gladstone region.

The intensive nature of the sampling program will facilitate more robust statistical analysis of results. It will also provide a reference point for any future monitoring that looks at longer term temporal variation (e.g. annual) in health status of fish and crustacean species in the Gladstone region.

The objectives of the expanded Gladstone fish health sampling program are:

- To continue monitoring the fish health in Gladstone Harbour and the surrounding waterways so that Fisheries Queensland has 12 months of data to account for seasonal influences.
- To determine the health status of fish and crustacean species in the Gladstone Harbour and surrounding waterways. For the purposes of this study, health status is defined as the observed prevalence and severity of significant infectious diseases and pathological lesions.
- To determine whether the health status of fish and crustacean species in Gladstone Harbour and surrounding waterways is significantly different to other areas along the Central Queensland coast.
- To provide information to the conceptual model being developed by the Queensland Government. This will help to narrow the range of possible causes for the observed health issues and provide focus for ongoing investigations.

Study area

The principal study area is Gladstone Harbour and surrounding waterways, including waters within the port limits for the Port of Gladstone and Port Alma, both of which are controlled by the Gladstone Ports Corporation. Sampling takes place at a range of sites within the principal study area, and the locations of these sites are shown in Figure 1. The sites are The Narrows, Hamilton Point, Calliope River, Gladstone Harbour (trawl), spoil ground, Upper Boyne River, Lower Boyne River and Rodds Bay.

The main reference sites (i.e. for comparison with the study area) for the scheduled monitoring program include the nearby Fitzroy River to the north and Bundaberg with its adjacent coastal waters to the south. Opportunistic data collection will also take place in a variety of sites throughout the state, depending on routine activity in the Fisheries Observer Program and other sampling programs.

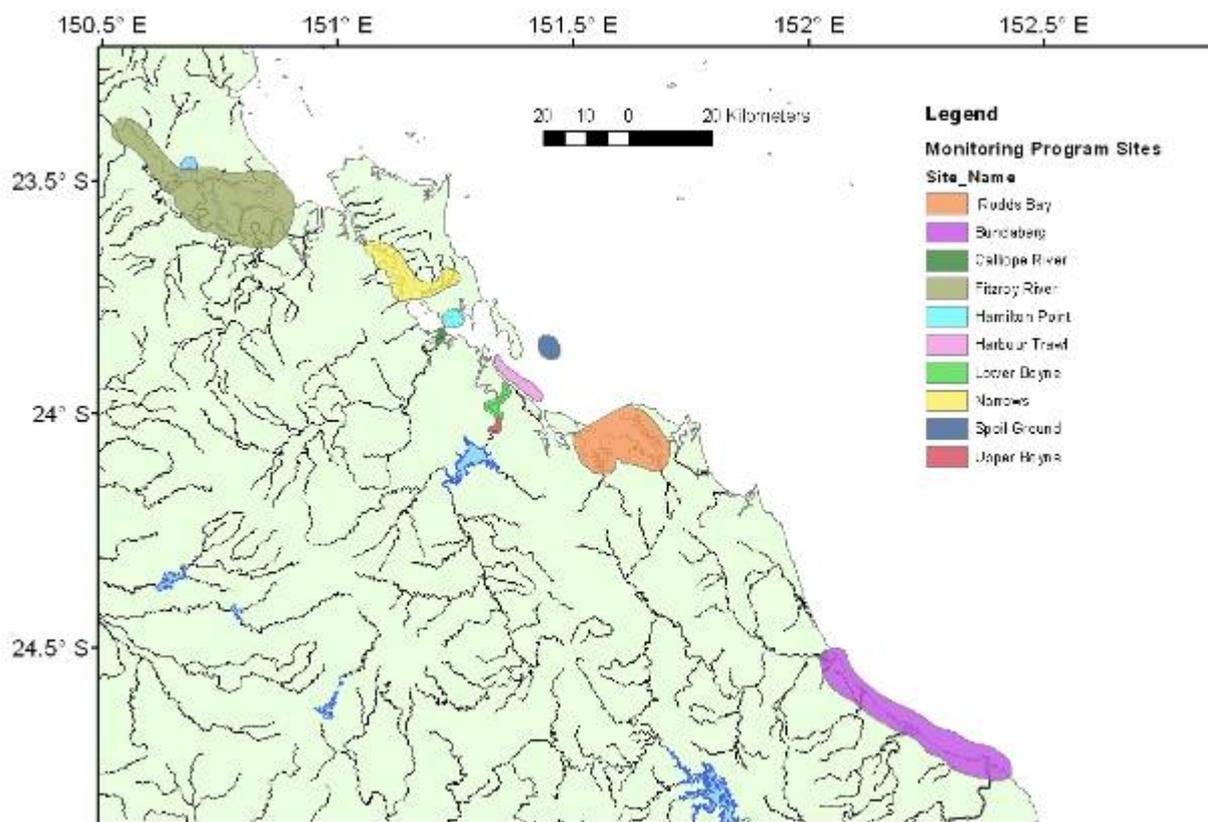


Figure 1. Sampling and reference sites within the principal study area.

Candidate species

The monitoring program will focus on seven species of finfish, one species of shark, one species of prawn, and one species of crab listed below. These species represent a range of different life cycles (e.g. catadromous and estuarine) and trophic levels (e.g. predatory, omnivorous detritivores and scavengers). They are species that have been encountered during regular sampling in the principal study area and reference areas to date (i.e. since September 2011), are caught using a range of different methods/fishing gear, and have displayed a variety of abnormalities.

Barramundi (*Lates calcarifer*)

Barramundi is a highly predatory species and a principle target in the region for recreational line and commercial net fishers. It is catadromous, in that fish live in fresh and marine waters but must migrate to marine waters to spawn. Barramundi fingerlings are stocked into freshwater impoundments throughout the Port Curtis and Fitzroy River catchments, including Awoonga Dam.

Sea mullet (*Mugil cephalus*)

Sea mullet is an omnivorous detritivore with a catadromous lifecycle. The species is caught mainly by commercial net fishers, although smaller numbers are also caught by recreational fishers (mainly for bait) using cast nets. Sea mullet have been stocked into Awoonga Dam.

Banana prawn (*Fenneropenaeus merguensis*)

Banana prawns are omnivorous detritivores and a principle target for the commercial trawl fishery in the region, as well as for recreational fishers using cast nets. Banana prawns use the numerous intertidal mangrove-lined creeks as nursery habitats, then move into more coastal waters as they grow.

Mud crab (*Scylla serrata*)

Mud crab is the principle target species for recreational and commercial crabbers in the region. The species is an active omnivorous scavenger that occurs in estuarine and coastal habitats with mud substratum.

Bull shark (*Carcharhinus leucas*)

Bull shark is a predatory estuarine and coastal species caught frequently in the region by commercial net fishers and recreational line fishers. The species is known to migrate into freshwater, particularly as juveniles.

Trawl species: Grinner (*Saurida* sp.), Australian Threadfin (*Polydactylus multiradiatus*) and Castelnau's Herring (*Herklotsichthys castelnaui*)

These three taxa are small in size and common in the local demersal fish assemblages, which makes them common in bycatch of trawlers operating inside the study area. They are caught occasionally by recreational anglers.

Pelagic species; Queenfish (*Scomberoides* sp.)

Queenfish is a pelagic species occurring throughout the region and commonly caught in barramundi nets. In previous sampling these fish have shown some signs of redness and recently many fish have been found with a high prevalence of ectoparasites.

Sampling regime

Timing

The sampling regime commenced in April 2012 and will be repeated in July and September 2012, providing three separate sampling periods. At each location, candidate species have been identified for sampling.

Gear type

Multiple gear types will be used during the sampling program depending on site and candidate species. The gear types will be consistent with commercial fishing apparatus and will include:

- gill net / haul net – barramundi, sea mullet, bull sharks and queenfish
- prawn trawl gear – banana prawn, grinner, Australian Threadfin, Castelnau's herring
- crab pots – mud crabs
- electrofisher – fish species in freshwater.

Field observations

Fish were observed upon capture and assessed visually for signs of ill health. Records were made of skin discolouration, eye conditions, lesions and presence of ecto-parasites.

Prawns were observed upon capture and assessed visually for signs of shell erosion and parasites.

Crabs were assessed for shell abnormalities. Shell lesions were graded according to the methods described in Dr Leonie Andersen's Masters Thesis.

Significant findings

Phase 1: September 2011 – March 2012

Sampling within the greater Gladstone region between September 2011 and March 2012 identified a number of health issues observed in fish and crustacean species. In particular:

- Barramundi showing signs of skin discolouration, skin lesions, eye abnormalities and parasitism by the monogenean fluke *Neobenedenia* sp on the body surface. Barramundi caught within the tidal reaches of the Boyne River were observed to have the highest prevalence of these conditions.
- Blood flukes and protozoans in gills from barramundi were later observed by Biosecurity Queensland using histopathology techniques.
- Mud crabs showing signs of shell abnormalities with many attributed to "rust spot shell disease".
- Bull sharks showing signs of skin redness and parasitism by a monogenean fluke from the family Microbothriidae.
- A range of mild skin conditions were observed on a number of fish species, however it was generally described as slight discolouration and was observed at low prevalence.

With the exception of barramundi, the findings from the Phase 1 sampling indicated that gross signs of health issues were present across a number of fish and crustacean species, but were generally observed at low prevalence. Sampling also showed that there was variation in prevalence of symptoms throughout the broader study area.

A summary of Phase 1 is reported on the web at www.qld.gov.au/gladstoneharbour

Phase 2: Expanded sampling April – September 2012

Trip 1

The commencement of sampling was previously intended to start in March but was delayed until 10 April 2012 due to unfavourable weather conditions. In particular, persistent freshwater flows in rivers around the Gladstone region after heavy rain and strong winds affecting offshore sampling sites made netting and offshore trawl activities impractical and unsafe.

All fish and prawns that were caught using nets and trawl were collected in April. The monitoring of mud crabs continued until 16 May 2012.

Barramundi

April sampling

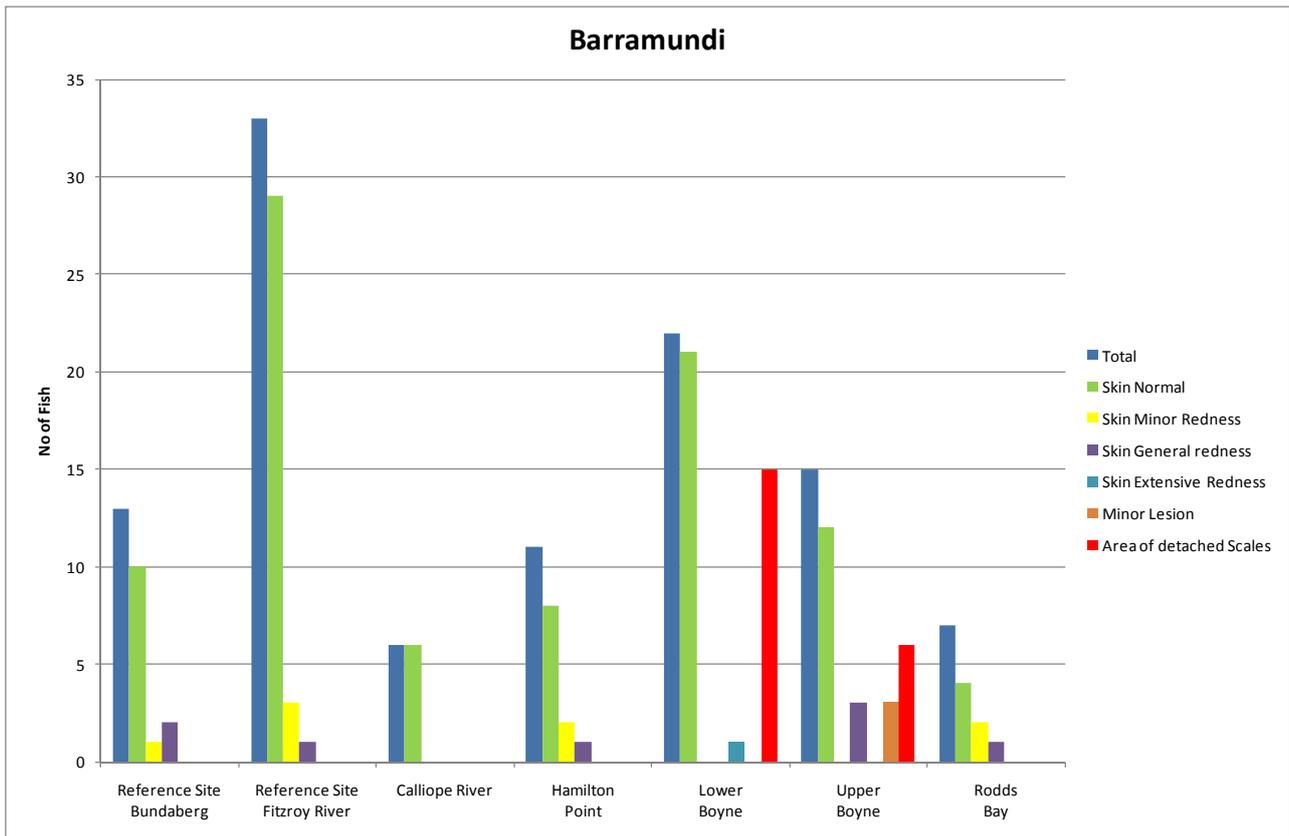
- Barramundi were collected from all proposed sites with a total of 107 observed (see Graph 1).
- No *Neobenedenia* or eye conditions have been observed at any of the sampling locations.
- High prevalence (50-75%) physical damage (see Graph 1 Areas of detached scales) has been observed in the Boyne River:
 - physical damage appeared as graze type injuries and included loss of large areas of scales often on one side of the body, operculum damage and some mandible fractures
 - physical damage (photo 1) has been attributed at this stage to fish passing over the Awoonga spillway earlier this year (Awoonga overtopped in late January to early February and late March 2012).
 - the observed damage is consistent with injuries seen in fish after being washed over spillways of other impoundments.
- Other than the physical damage observed in barramundi from the Boyne River, no significant signs of ill health were noted during sampling, with fish generally considered to be in good condition.



Photo 1. Boyne River barramundi showing physical damage consistent with being washed over the Awoonga spillway.



Photo 2. Barramundi in good condition, caught at Rodds Bay.



Graph 1. Conditions observed in barramundi – April 2012.

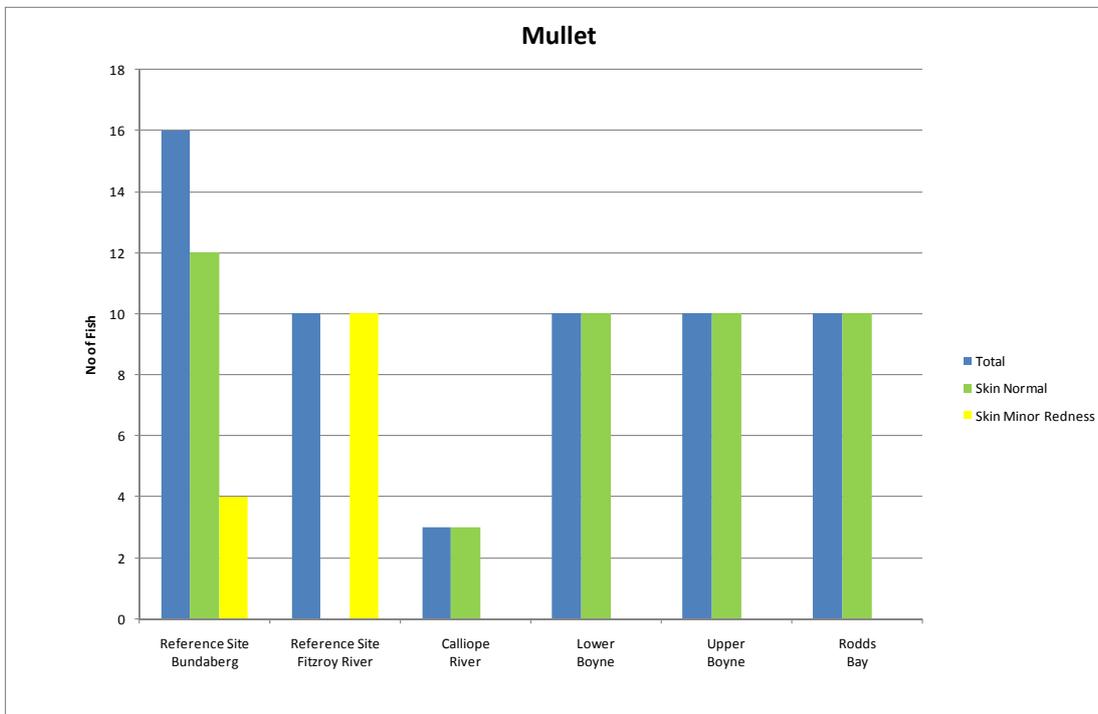
Sea mullet

April sampling

- Mullet were collected from all proposed sites with a total of 59 observed (see Graph 2).
- Some of the mullet samples included other species beside sea mullet.
- No significant signs of ill health were observed in any mullet caught during the April sampling events.
- Minor redness was observed in samples collected from both reference sites, but was not observed in samples collected in Gladstone.



Photo 3. Mullet caught in the Boyne River



Graph 2. Conditions observed in mullet – April 2012.

Banana prawn

April sampling

- Observations were made from a sub sample of the catch. Catch size was 150 kg or greater at each site.
- A single prawn was collected at the Gladstone Harbour and one at the reference site Fitzroy River with shell erosion.
- A single prawn at Bundaberg and at the Fitzroy River was collected with a gill parasite.
- Other than these observations, no significant signs of ill health were observed in banana prawns caught during the trawl sampling.

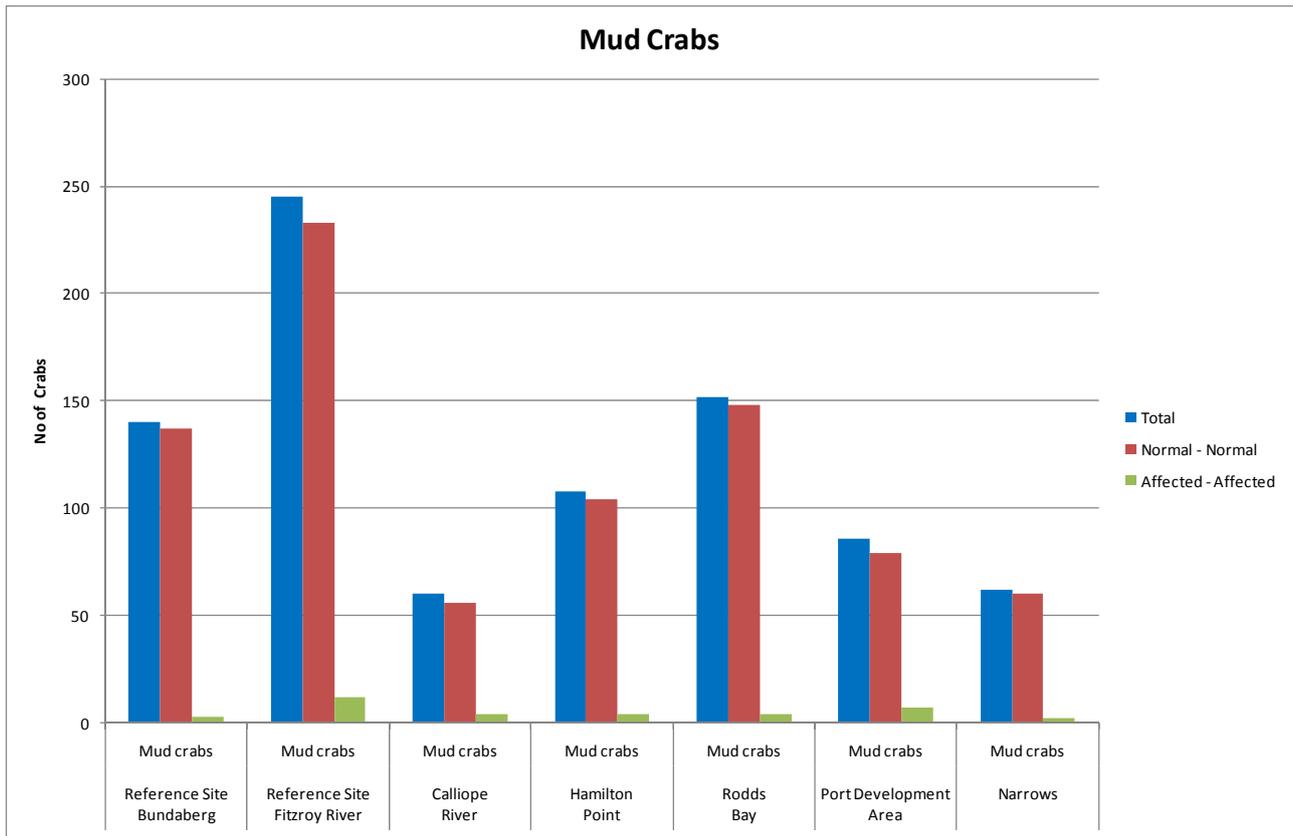
Mud crab

April/May sampling

- A total of 853 crabs were observed during sampling from seven sites within the study area. (see Graph 3) (385 in the reference sites and 468 within Gladstone).
- The prevalence of shell abnormalities (Grades 1 to 5 observed):
 - ranged from 2.1% in the Rodds Bay area to 8.1% near Fisherman's landing within the port development site
 - averaged 4% in the reference sites and 4.4.% in Gladstone.
- Mud crabs with shell abnormalities consistent with “rust spot shell disease” were observed at low prevalence from all sites sampled during the April/May sampling period.
- Grade 5 lesions (most severe shell damage) were found throughout the study area including both reference sites (Fitzroy River and Bundaberg).



Photo 4. Mud crab caught in the Fitzroy River showing signs of “rust spot shell disease” on the carapace.



Graph 3. Shell condition observed in mud crabs caught April/May 2012. Hamilton Point included samples collected from Nutmeg Gully and Endfield Creek. The Port Development Area included samples collected from the barge landing on Curtis Landing and on the western foreshores between Fisherman’s Landing and the Calliope River.

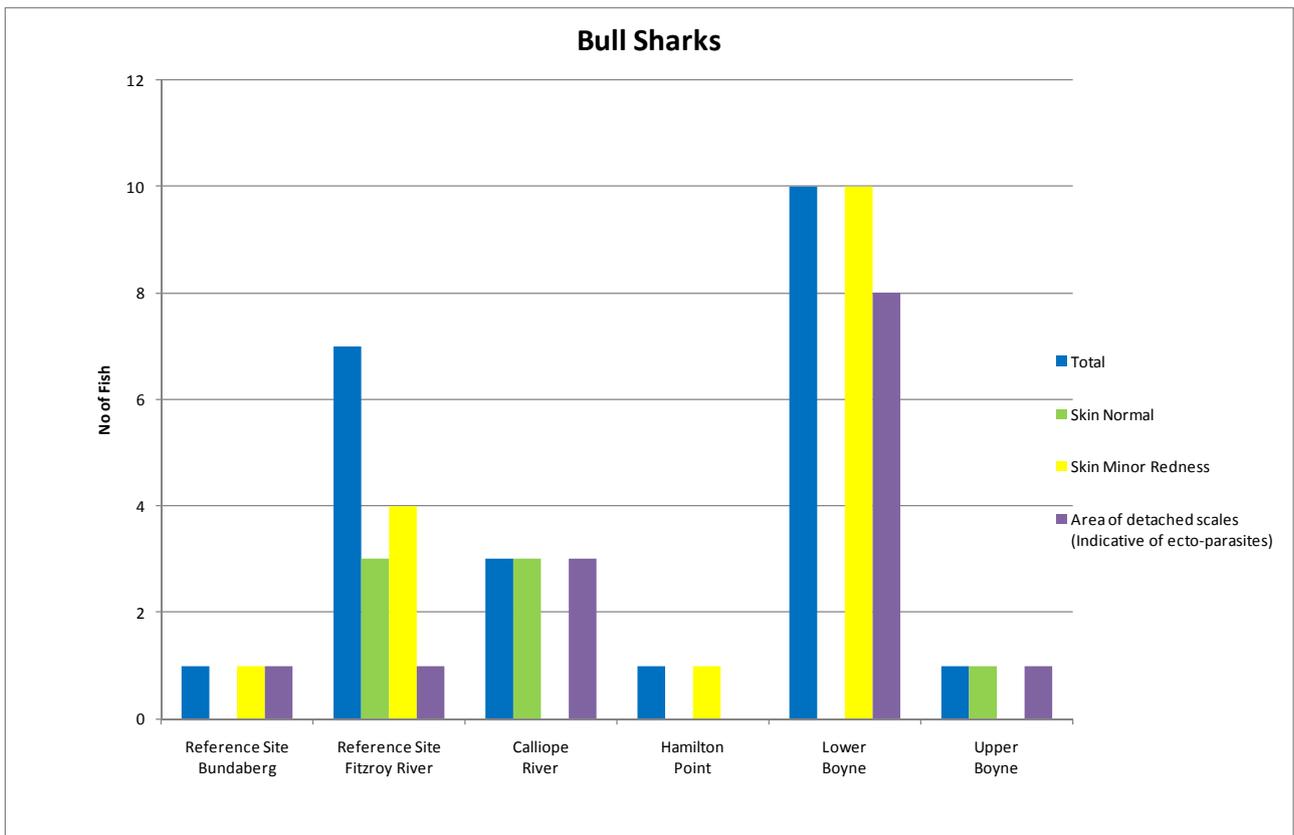
Bull shark

April sampling

- Bull sharks were collected from all proposed sites except for Rodds Bay with a total of 23 observed (see Graph 4).
- Sampling of bull sharks proved difficult during the April period. Anecdotal evidence from fishers suggests that bull sharks leave the estuaries at this time of year.
- Redness was observed on sharks caught, including those caught at the reference sites.
- Evidence of ecto-parasites between the dorsal fins was observed on sharks caught at most sampling locations (see Graph 4).



Photo 5. Bull sharks caught at Bundaberg and the Calliope Rivers showing evidence of ecto-parasites (lighter areas) between the dorsal fins.



Graph 4. Conditions observed in bull shark – April 2012.

Trawl species: Grinner, Australian threadfin and Castelnau’s herring

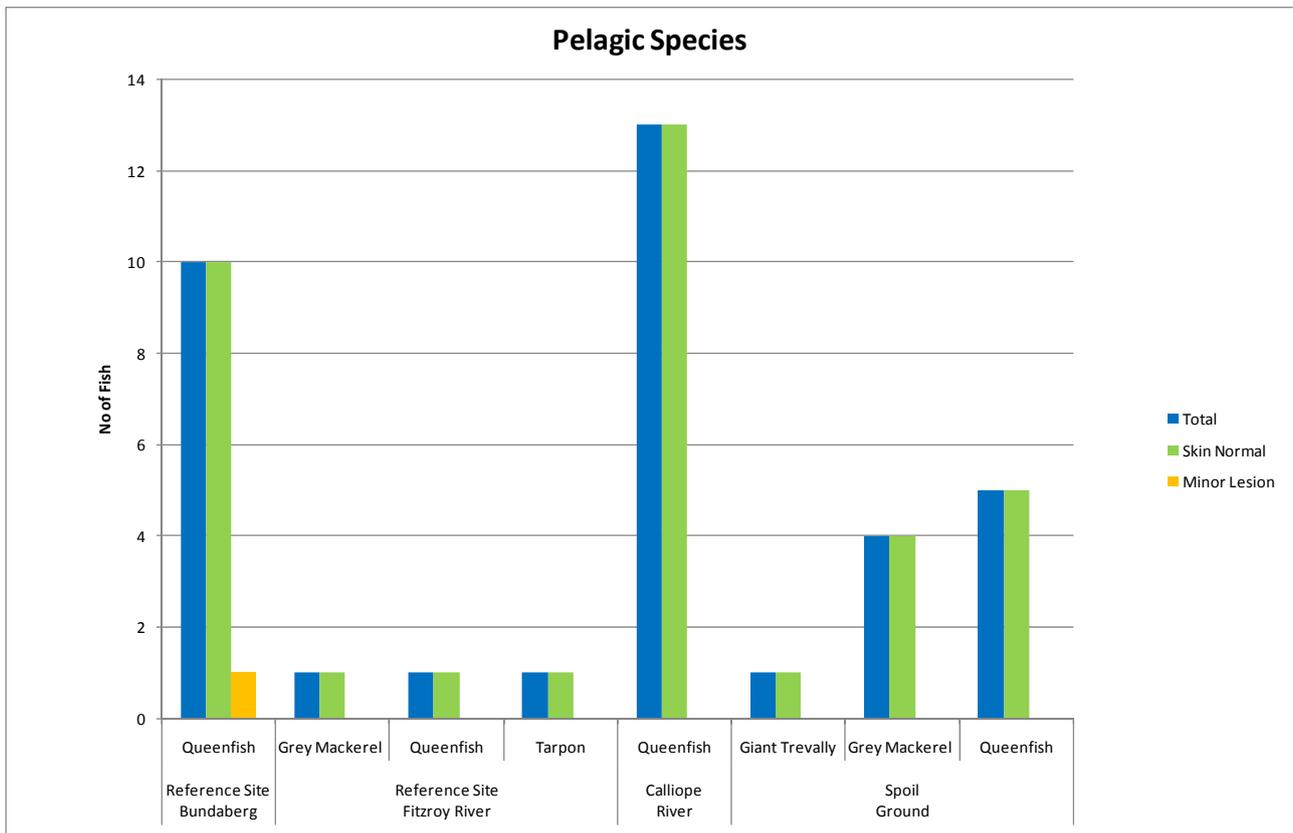
April sampling

- The following candidate fish were observed at the three sites:
 - Bundaberg: no grinner; 105 Castelnau’s herring; 105 Australian threadfin.
 - Gladstone Harbour: 20 grinner; 20 Castelnau’s herring; 100 Australian threadfin.
 - Fitzroy River: 16 grinner; 15 Castelnau’s herring; 100 Australian threadfin.
- No significant signs of ill health were observed in trawl fish species caught during the trawl sampling from offshore Bundaberg, the Gladstone Harbour or from offshore of the Fitzroy River.
- Seven barramundi were also caught incidentally in Gladstone Harbour:
 - commercial fisher identified this as an unusual capture
 - no significant signs of ill health were observed
 - may indicate a larger number than normal being present in Gladstone Harbour.

Pelagic species: Queenfish

April sampling

- It was difficult to collect samples of the target species queenfish. Pelagic fish are mobile. The probability of netting them at a particular site and time is low.
- Consequently, other pelagic species captured during sampling were also observed and selected for pathological examination. Examples of other species included:
 - grey mackerel and tarpon caught at the Fitzroy reference site
 - grey mackerel and giant trevally caught adjacent to the spoil ground.
- All fish were observed to have normal skin appearance.
- A blue threadfin caught at the spoil ground had a laceration and was retained for pathological examination.
- Four of the five queenfish caught at the spoil ground had two to three ecto-parasites (calanoid copepods). Parasites were also present on the queenfish caught offshore of Fitzroy River.
- One queenfish caught at Bundaberg had a small area of scale missing.



Graph 5. Conditions observed in queenfish and other pelagic species – April 2012.

Summary of monitoring

The most significant finding during the April/May 2012 sampling period was the occurrence of barramundi within the Boyne River displaying significant “graze” type injuries/lesions, with associated redness, loss of scales and in some cases fractured jaws. The injuries are consistent with injuries observed elsewhere in the state, which were obtained when fish have passed over a spillway.

In contrast to previous sampling in Phase 1, no *Neobenedenia*, eye problems nor ulcerative lesions were observed in barramundi during the April sampling.

Although the sharks were difficult to obtain during April, the sharks caught displayed redness and the presence of an ecto-parasite between dorsal fins. These conditions were observed not just in Gladstone, but also at the reference sites in the Fitzroy River and Bundaberg. These results are consistent with Phase 1 observations.

All prawns observed during the trawl surveys were in good condition except for two prawns with shell erosion and two with an isopod parasite found on the gills.

The mud crab sampling has shown that crabs from all sampling sites have displayed some abnormalities consistent with “rust spot shell disease”. The prevalence of these abnormalities ranged from 2.1% to 8.1% across the study area. This is similar to the results recorded in Phase 1.

No significant signs of ill health were observed in any of the other candidate species (mullet, pelagic species e.g. queenfish, trawl species e.g. grinner, Australian threadfin and Castelnau’s herring).

The next sampling event will take place in June/July and will run for three weeks to provide information about the health of candidate species during the winter period. Tissue samples collected during the April/May period will be processed by Biosecurity Queensland.