



# Expanded fish health survey

Interim report June/July 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](http://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.

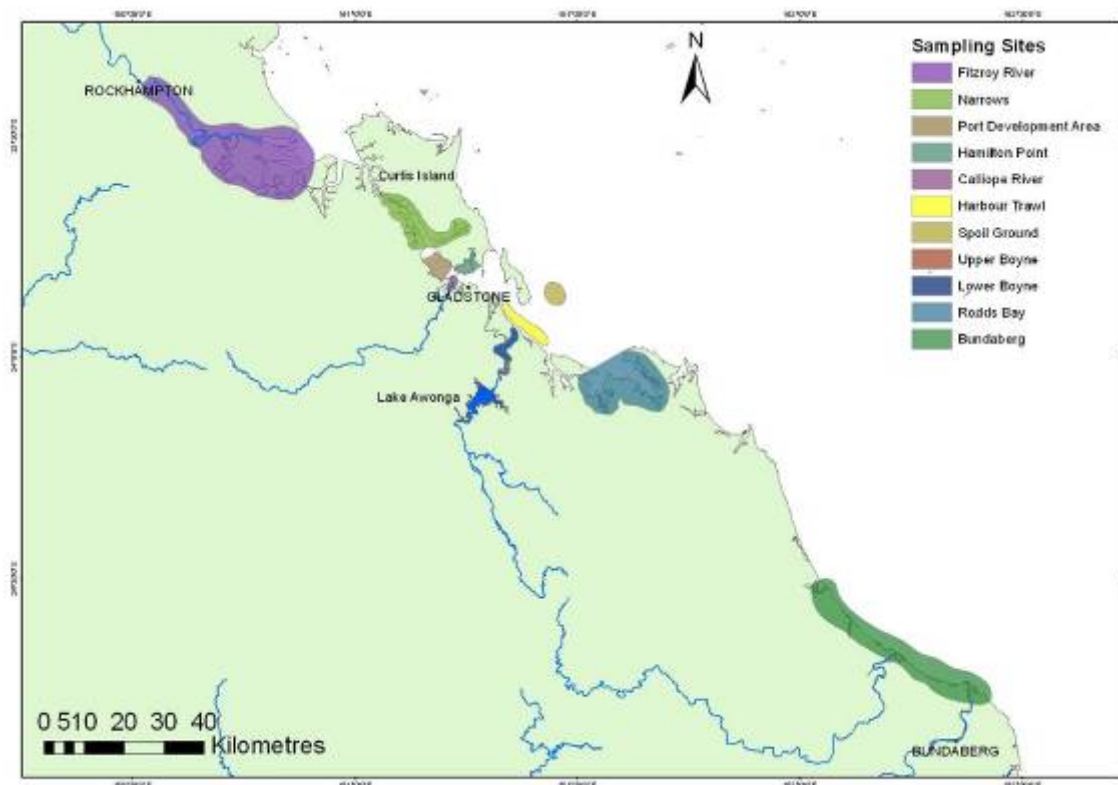
The objectives of the expanded Gladstone fish health sampling program are:

- 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 fin fish, 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. During sampling events these fish have shown some signs of redness and ectoparasites.

## Sampling regime

### Timing

The sampling regime commenced in April 2012, was repeated in June/July 2012, with the final sampling event planned for September 2012 to provide three separate sampling periods. At each location, candidate species have been identified for sampling.

### Gear type

Multiple gear types are being used during the sampling program depending on site and candidate species. The gear types are consistent with commercial fishing apparatus and 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 are being observed upon capture and assessed visually for signs of ill health. Records are being made of skin discolouration, eye conditions, lesions and presence of ecto-parasites.

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

Crabs are assessed for shell abnormalities. Shell lesions are 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 report on Phase 1 findings is available on the web at [www.qld.gov.au/gladstoneharbour](http://www.qld.gov.au/gladstoneharbour)

## Phase 2: Expanded sampling April – September 2012

### Summary of April/May 2012 sampling (Trip 1)

The most significant finding during the April 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).

Further details of the April/May sampling is reported on the web at [www.qld.gov.au/gladstoneharbour](http://www.qld.gov.au/gladstoneharbour)

### June/July 2012 sampling (Trip 2)

The June/July sampling event was intended to provide information about the health of candidate species during the winter period. Sampling commenced on 17 June and was completed on 14 July. With the exception of bull sharks, samples of candidate species were collected from all proposed monitoring sites. No bull sharks were collected during the June/July sampling event, with anecdotal evidence provided by commercial fishers that bull sharks move out of the study area during winter.

### Barramundi

#### June/July sampling

- Barramundi were collected from all proposed sites with a total of 93 observed (see Graph 1).
- No *Neobenedenia* or eye conditions were observed on barramundi at any of the sampling locations.
- Most notable in the barramundi samples collected, was the presence of two fish from the upper Boyne River showing recovering lesions. The lesions were well infiltrated with connective tissue, indicating recovery from injuries that have occurred at least one month ago, as described by the attending veterinary officer. The recovering injuries observed in these fish were consistent with the fresh injuries observed on fish during the April/May sampling event in the Boyne River, which were attributed to fish passing over the Awoonga Dam spillway in March 2012 (see Figures 2 and 3).
- Barramundi were also caught in the Calliope and Burnett Rivers with injuries in more advanced stages of recovery. New skin had completely covered the old injuries and new

4 and 5). Given the advanced stage of the healing, it is believed these injuries did not happen this year.

- Most barramundi sampled in Gladstone were considered to be in good condition. The majority of skin discolouration or lesion conditions observed during June/July were from barramundi caught in the Fitzroy River (outside of Gladstone) and were represented by red pin point marks, individual scales detached or those attributed to physical injuries (see Graph 1).



**Figure 2: A barramundi caught in the Boyne River during the April/May sampling event with injuries to the jaw and body attributed to passing over the Awoonga Dam spillway during an overtopping event in March 2012.**



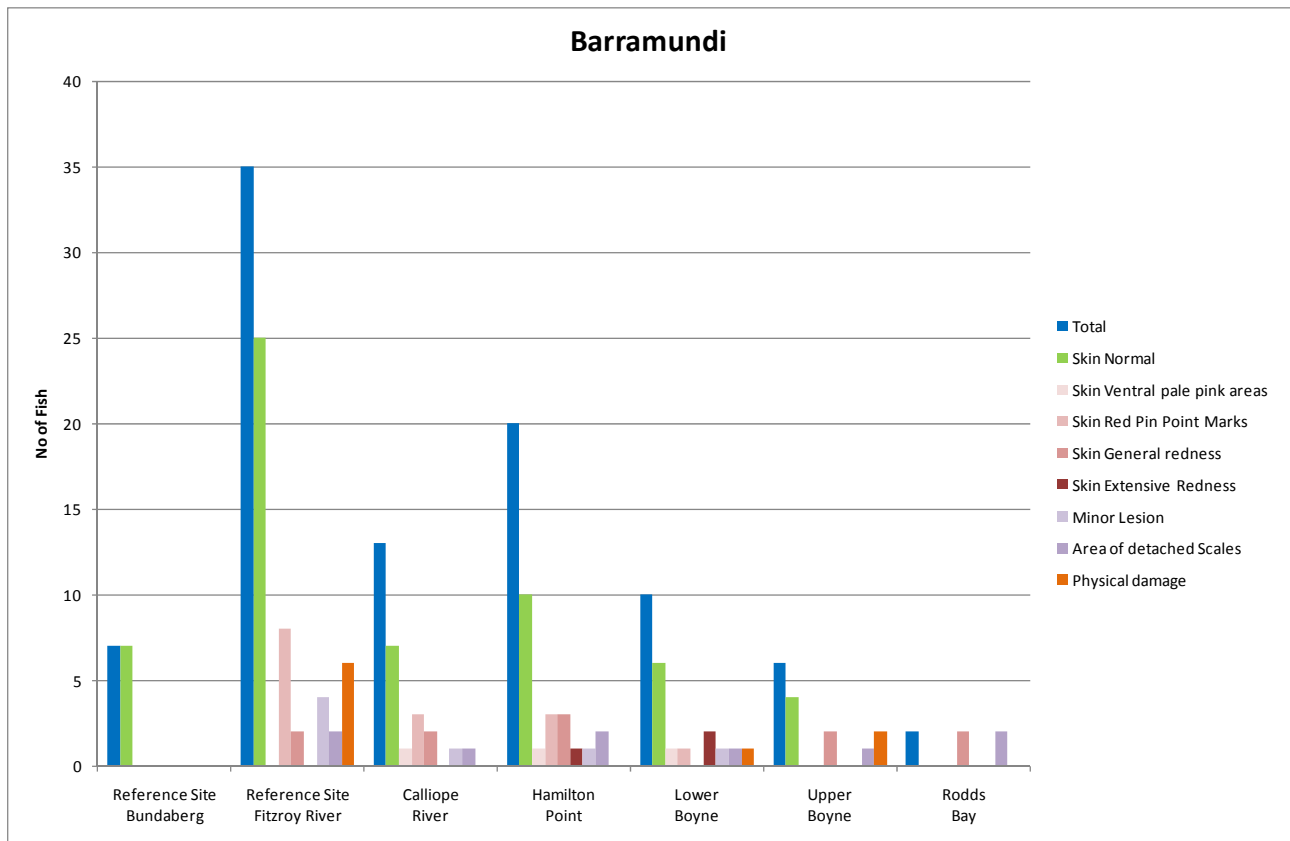
**Figure 3: A barramundi caught in the Boyne River during the June/July sampling event with recovering injuries to the jaw and body.**



**Figure 4: A barramundi caught in the Burnett River, Bundaberg, during the June/July sampling event with an old injury in an advanced stage of healing. Note the new skin completely covering the old injury with new scales forming over the affected area.**



**Figure 5: A barramundi caught in the Calliope River during the June/July sampling event with an old injury in an advanced stage of healing. Note the new skin completely covering the old injury.**



**Graph 1.** Conditions observed in barramundi – June/July 2012.

## Sea mullet

### June/July sampling

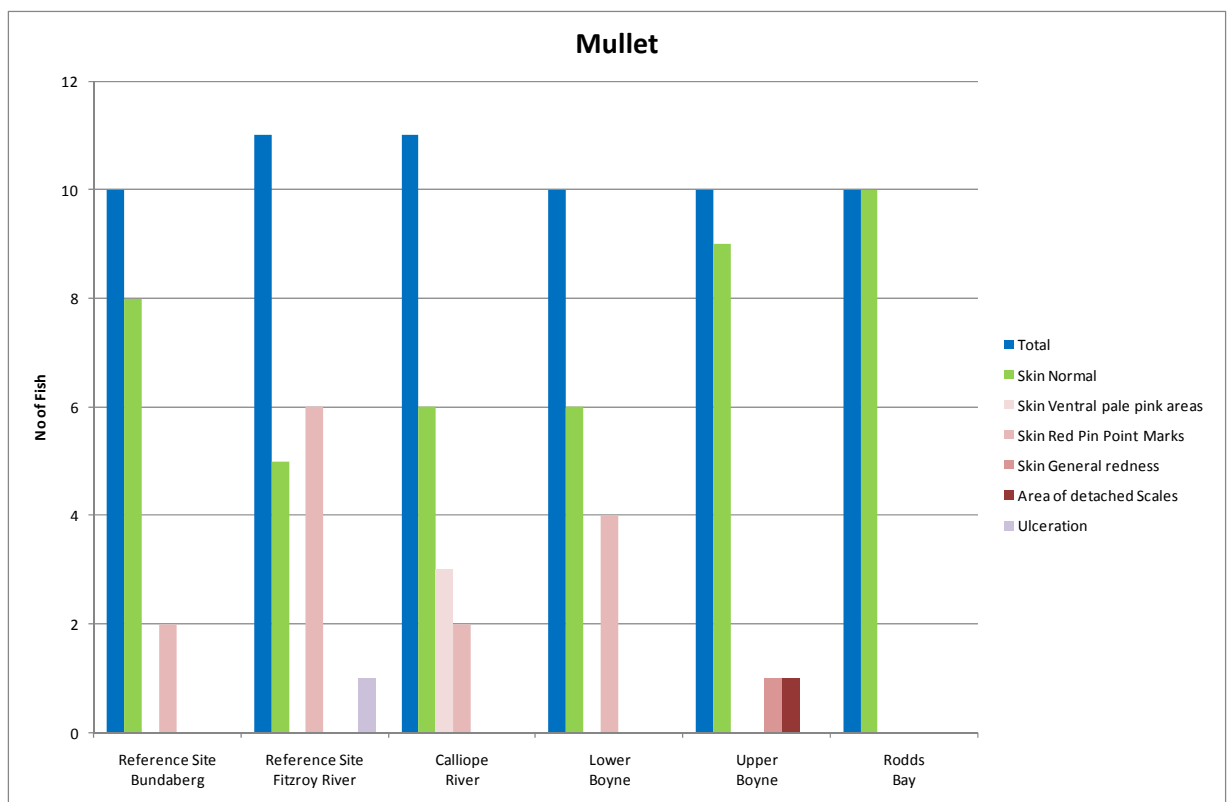
- Mullet were collected from all proposed sites with a total of 62 observed (see Graph 2).
- Some of the mullet samples included other species besides sea mullet.
- Mullet were observed with red pin point marks on the body surface from all sites except Rodds Bay and the upper reaches of the Boyne River. This condition was most prevalent in the Fitzroy River (6 of 11 mullet sampled).
- The ventral pale pink areas observed in 6 out of 10 mullet caught in the Calliope River were thought to be associated with the capture process
- A single mullet from the upper reaches of the Boyne River presented with both general redness and lesions comprising of small areas of detached scales (see Figure 6).
- A single mullet caught in the Fitzroy River was observed to have ulcerative lesions on both sides of its gill covering (operculum) (see Figure 7).



**Figure 6:** A mullet sampled from the upper reaches of the Boyne River displaying general redness and lesions comprised of small areas with detached scales.



**Figure 7: A mullet sampled from the Fitzroy River with ulcerative lesions on the gill covering (operculum) exposing the gills.**



**Graph 2. Conditions observed in mullet – June/July 2012**

## Banana prawn

### *June/July sampling*

- Observations were made from the complete banana prawn catch at both the Gladstone Harbour (approximately 1.5kg) and offshore Fitzroy River sites (approximately 2kg), and from a sub sample of the catch at the Bundaberg site (approximately 200kg).
- Two prawns collected from the Gladstone Harbour and one prawn collected from offshore of the Fitzroy River had minor shell erosion (see Figure 8).
- Two prawns collected from offshore of the Fitzroy River and a single prawn collected from Bundaberg had isopod parasites located on their gills.
- No other signs of ill health were observed in banana prawns caught during the trawl survey.

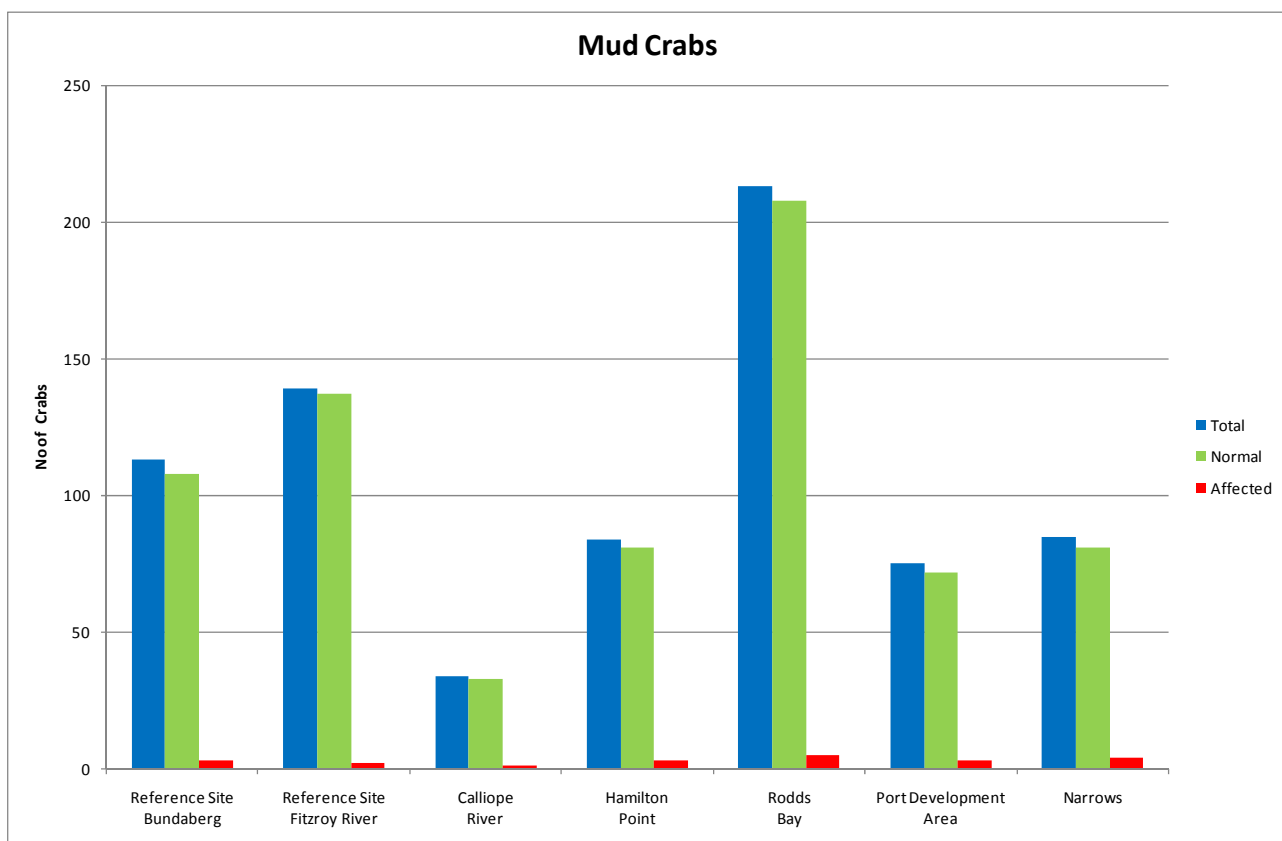


**Figure 8. A banana prawn collected from the offshore Fitzroy River site showing signs of shell erosion (circled).**

## Mud crab

### *June/July sampling*

- A total of 746 crabs were observed during sampling from seven sites within the study area (see Graph 3) (491 in Gladstone and 255 in the reference sites).
- Mud crabs with shell abnormalities including those consistent with “rust spot shell disease” were observed at low prevalence from all sites sampled during the June/July sampling period. The prevalence of all shell abnormalities (Grades 1 to 5 observed, as described in Dr Leonie Andersen’s Masters Thesis):
  - ranged from 1.4% in the Fitzroy River area to 4.7% within the Narrows
  - averaged 1.96% in the reference sites and 3.26% in Gladstone.



**Graph 3.** Conditions observed in mud crabs – June/July 2012.

## Bull shark

### *June/July sampling*

- No bull sharks were collected during the June/July sampling event. Anecdotal evidence from commercial fishers suggests that bull sharks move out of the study area during the winter months.

## Trawl species: Grinner, Australian threadfin and Castelnau's herring

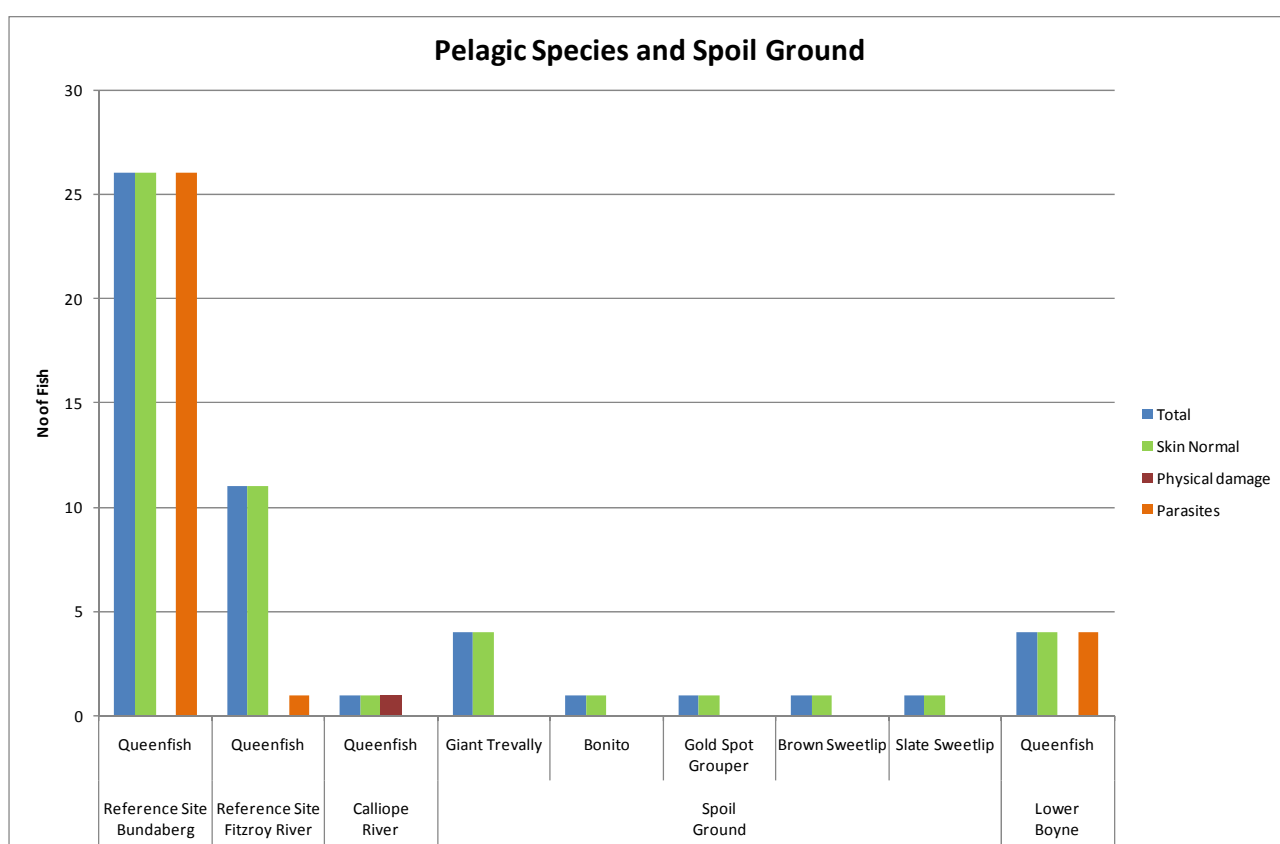
### *June/July sampling*

- The following candidate fish were observed at three sites:
  - Bundaberg: 18 grinner; 10 herring; 25 Australian threadfin
  - Gladstone Harbour: 26 grinner; 100 herring; 100 Australian threadfin
  - Fitzroy River: 100 grinner; 100 herring; 100 Australian threadfin.
- Two Australian threadfin caught at Bundaberg and a single Australian threadfin caught in Gladstone Harbour had isopod parasites present either on the gills or body surface.
- Other than the presence of the above mentioned isopod parasites, no signs of ill health were observed in the fish species collected during the trawl survey at the three sites.

## Pelagic species: Queenfish

### June/July sampling

- Queenfish were observed at both the offshore Fitzroy River and Bundaberg sites, but were not captured at the spoil grounds during the June/July sampling event.
- Queenfish were captured incidentally during netting activities in both the Calliope and Boyne Rivers. Observations of these fish were recorded and included in the results (see Graph 4).
- A number of other species were caught while sampling at the spoil grounds, and observations of these fish have also been included in the results (see Graph 4).
- Queenfish with copepod parasites were observed from all areas except the single fish sampled in the Calliope River. While prevalence of copepods observed on fish was as high as 100% at 2 of 4 sites, most fish only had a few copepods observed.
- Other than the presence of the copepod parasites, all fish appeared to be in good condition



**Graph 4.** Conditions observed in queenfish at various sites, and other species caught at the spoil grounds – June/July 2012

## Summary of monitoring

The most significant finding during the June/July 2012 sampling period was the occurrence of barramundi from the Boyne and Calliope Rivers displaying injuries that were healing. In particular, the fish observed in the Boyne River had an injury of a similar type to those observed in the Boyne River during the April/May sampling event, but was now infiltrated with connective tissue and thought to have occurred at least one month prior. The timing of this recovery would coincide with the injuries observed in the April/May sampling event that were thought to have been caused by the fish passing over the Awoonga Dam spillway.

No *Neobenedenia* sp., eye problems or ulcerative lesions were observed on barramundi during the June/July sampling. No sharks were caught during June/July.

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

The mud crab sampling has shown that some crabs from the sampling sites displayed shell abnormalities consistent with “rust spot shell disease”, but the prevalence of these abnormalities was low, ranging from 1.4% to 4.7% across the study area. The prevalence of shell abnormalities recorded at all sites were slightly lower than those recorded during the April/May sampling event except for The Narrows and Bundaberg sites, where the prevalence increased slightly by 0.55% and 1.48% respectively.

The red pin point marks observed on mullet from most sites, including reference sites, was also seen at reference sites during the April/May sampling.

No significant signs of ill health were observed in any of the other candidate species (pelagic species e.g. queenfish, and trawl species e.g. grinner, Australian threadfin and Castelnau's herring). While queenfish were observed with copepod parasites, these parasites are naturally occurring in the environment and the parasite burden (i.e. number of parasites per fish) was not considered abnormal.

Tissue samples collected during the June/July period will be processed if required. The final sampling event in the extended sampling program will take place in September 2012.