# Fish Habitat Researcher Survey
## Fish habitat review Finding 2

Queensland Government

# Contents

# Introduction

A 2010 departmental Fish Habitat Review of management and planning activities (Enram Enterprises 2010) found research is required to quantify the relationship between Queensland fish habitats and fisheries productivity, including quantifying the impact of fish habitat loss on fisheries productivity.  In 2011, internal departmental Fish Habitat Review Action Group 2 reviewed information needs about the impact of fish habitat loss on fisheries productivity using a 'Fish Habitat Researcher survey' (the Survey) in relation to Queensland's fish habitats to address gaps and research priorities for all habitat types.  The final 2011 Survey results are summarised in this report.

Since 2005, Fisheries Queensland of the Department of Agriculture, Fisheries and Forestry (DAFF) (and former Department of Employment, Economic Development and Innovation (DEEDI)) has used the Urban Fish Habitat Management Research Program (the Program) to prioritise research supporting marine fish habitat management decisions.  The Program is also used to:
1. foster post-graduate research project opportunities;
2. link to fish habitat offset research projects where fish habitat removal cannot be avoided; and
3. select DAFF Marine Fish Habitat Scholarships projects.

Four (4) research streams of the 2010 Program[i] formed the basis of Survey:
1. Fish habitat utilisation;
2. Impacts on fish habitats;
3. Intertidal and subtidal structures as fish habitats; and
4. Rehabilitation of fish habitats.

The Survey enabled identification of key issues and additional research needs prior to the recent departmental update of research/ management streams reported in the 2012 Program (DAFF 2012a; 2012b).

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[i] updated in 2012 as the 'Fish Habitat Research and Management Program'

# Background

For the 2011 Survey, all fish habitats were addressed, with expansion of Program priorities to include freshwater issues. Participants were asked to anonymously rate research subcategories within each of the four research streams. New priorities for research were also submitted by participants. The Survey provided an opportunity to seek the views of researchers, research providers and natural resource management groups, with the provision that completed Survey information would be collated and included as 2012 Program priorities.

The online Survey (using SurveyMonkey) was distributed to 112 Qld based researchers, government staff/ managers, NRM groups/ managers inviting participation during May 2011 and June 2011. A total of 59 individuals responded to the Survey, representing a response rate of approximately 53%. Organisations[ii] invited to participate in the Survey and participation rates are indicated as percentages shown in Figure 1.
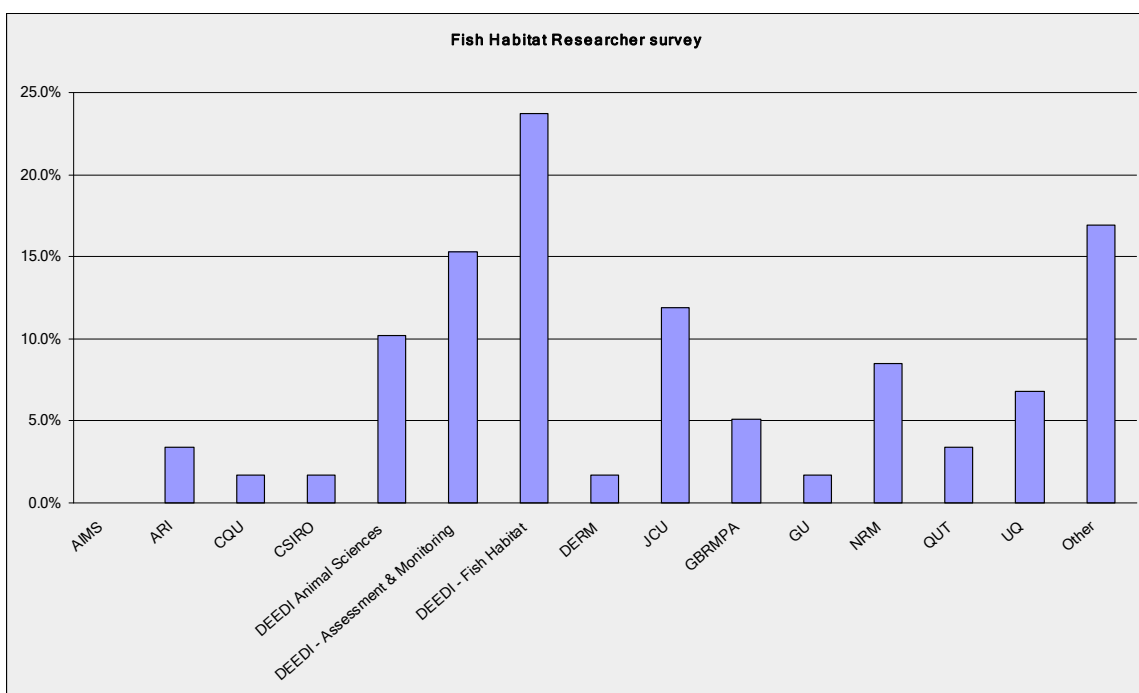


Figure 1 Fish habitat researcher survey participation rate for individual research organisations.

Survey respondents indicated their interests or research expertise in one of more areas. Research Stream 2 'impacts on fish habitats' received the highest response (Figure 2).

Survey respondents also provided individual feedback about the appropriateness of the four (4) 2010 Program research streams in addressing fish habitat management needs, and nominated other relevant research areas for fish habitat management. Sixty-three percent (63%) of Survey respondents considered the current broad streams (as follows) to be appropriate to current or potential research needs:
1. Fish habitat utilisation;
2. Impacts on fish habitats;
3. Intertidal and subtidal structures as fish habitats; and
4. Rehabilitation of fish habitats.

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[ii] 'Other' participants included: Catchment Management Groups/ Community NRM Groups; Murray Darling Basin Authority; Griffith Centre for Coastal Management; Local Government; OceanWatch Australia

**Fish Habitat Researcher survey**

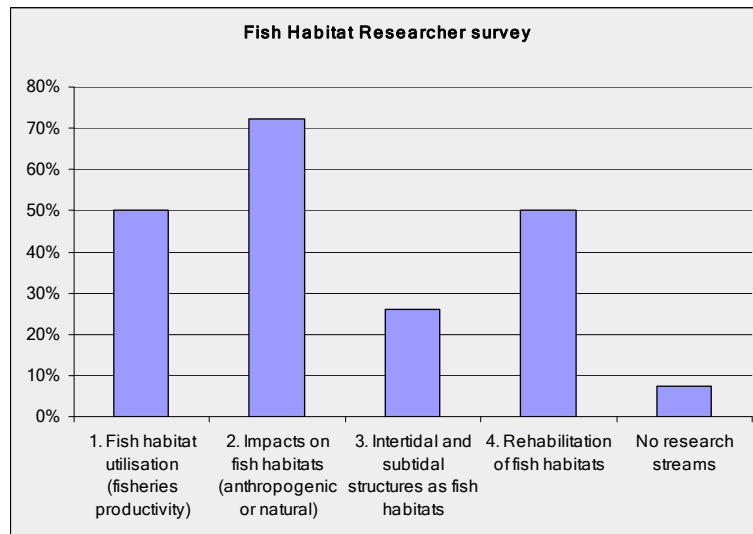Figure 2 Survey respondents indicated which research streams related to their interests or expertise.

The remainder of thirty-seven percent (37%) of respondents nominated other potential research areas and new research streams (having cross-linkages to one or more streams). During the review of the 2010 Program priorities (see Appendix 1), all research areas and additional research streams nominated were considered for inclusion in the 2012 Program (see DAFF 2012a; 2012b). The identified research linkages for each of the nominated research areas are shown below (in red).

**(Research Stream 1 – Fish habitat utilisation)**
- Habitat carrying capacity
- Impact of fishing in a Fish Habitat Area
- Freshwater/ fluvial/ lacustrine/ palustrine fish habitats
- Fishways - species are impacted by barriers which prevent them from accessing important upstream habitats which they utilise as nursery and feeding areas. There is no point having good habitat upstream for important commercial and recreational fish species if they cannot access this habitat.
- Utilisation of fish habitat primary productivity in higher trophic levels
- Better research to understand the ecosystem-level relationships between species in inshore areas. We have rec fishers taking a range of fish species and crabs/prawns, we have commercial fishers taking a range of species and crabs/prawns but we have little if any information on the ecosystem-level relationships between many of these species.
- Ecosystem services provided by these habitats to estuarine and great barrier reef ecosystems
- The biology of the fish habitats e.g. further research on seagrass dynamics (such as seed bank characteristics in disturbed areas) might aid this strategic research focus of the group.

**(Research Stream 2 – Impacts on fish habitats)**
- Status (including condition & extent) of fish habitats
- Developing appropriate thresholds and tools to protect and assess fish habitats during developments
- Pest and climate change impacts as well as the best practice for climate change adaptation (Climate change impacts
- Water quality influence on fish productivity diversity
- Land use impacts on fish productivity and diversity
- Improving the resilience of fish habitats. Understanding what makes fish habitats resilient to impacts is potentially more beneficial than impacts (i.e. climate change and ever expanding

utilisation of waterways). Maximising resilience is the most adaptive and productive action to take in the face of unstoppable pressures.

- 'Impacts (Stream 2)' to be seen in a wider context of both abiotic and biotic influences, involving connectivity between natural ecosystem habitats, and downstream flows (directional influences) from catchment lands.

(Research Stream 3 – Intertidal and subtidal structures as fish habitats and Research Stream 4 - Rehabilitation of fish habitats)

- Habitat enhancement: Although related to restoration, habitat enhancement may be used to increase carrying capacity of certain fish stocks. (e.g. impoundments, enhancement of habitat (eg rocky reef construction, snagging etc) and may be used to reduce predation of fingerlings by cormorants, or to provide territories and breeding habitats for cod or biofilm feeding substrates for mullet. Also artificial reef construction
- Enhancement of alternative habitat types to compensate the loss of habitat by development

New (draft) Research Stream (5) – "Habitat data for response management" (included in response to the suggested priorities for mapping, habitat condition analysis, co-management and delivery)

- mapping - No comprehensive habitat map for subtidal areas for Queensland. Without this key map we are missing the most fundamental information tool for any fisheries activities and any research will not have a spatial link.
- habitat condition analysis - Research criteria for assessment and monitoring of habitat condition and health. This research stream would also address habitat resilience and functional capacity, noting that such attributes will greatly shape and determine the longer term viability of fish habitats faced with global climate change coupled with direct human pressures.
- habitat condition analysis - Research capacity for rapid response to significant events affecting fish habitats. The earliest quantification of impact type, severity and magnitude will greatly increase capacity for the successful intervention for mitigation and rehabilitation. A dedicated research stream is needed to draw a focus on this critical need and to have established budget allocations prepared.
- co-management and delivery - Develop practical ways of involving and integrating regional and local communities, Councils, NRM organisations, Oceanwatch etc into co-management partnerships of FHAs
- co-management and delivery - Effectiveness of management arrangements in FHAs

# Collated Results

The SurveyMonkey results were collated using the priority rating choices available to participants as: 'High' (scored as '3'); 'Medium' (scored as '2'); 'Low (scored as '1'); or 'Not Applicable' (scored as '0'). Colour coding (Figure 3) was used to show where the highest or least number of respondent votes lie using the available choices in each research priority categories of the four research streams (Tables 1-10).

| |
|---|
| **Highest number of respondents selected the priority** |
| **Medium number of respondents selected the priority** |
| **Lowest number of respondents selected the priority (minimum of 3 respondents)** |
| **Maximum of 2 respondents selected the priority** |
| **No respondents** |

Figure 3 Colour coding used in Tables 1-10 to show high, medium, low, <2, or no respondents.

Rating averages (weighted with the percentage of respondents voting) were reported for each research priority (the highest attainable being '3' for 100% of Survey respondents choosing a priority as 'High' and lowest attainable as '0' where 100 % of respondents chose a priority as 'Not Applicable'). Other priorities[iii] identified by respondents are reported for each Research Stream. Abbreviations used in tabulated priorities (Tables 1-10) are: H= High; M= Medium; L = Low; and N/A = Not Applicable.

## RESEARCH STREAM 1 - FISH HABITAT UTILISATION

Table 1 Fish habitat utilisation priorities

| (Question 5.) Fish habitat utilisation priorities – **Research Stream 1** (*indicates subcategory priorities are listed and ratings are shown in Tables 2-3) | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Importance of fish habitat connectivity | | | | | 2.8 |
| **Relative productivity of fish habitats*** | | | | | 2.54 |
| **Ecosystem services*** | | | | | 2.45 |
| Role of habitat mosaics | | | | | 2.31 |

**New "Fish Habitat Utilisation" priorities[iv] suggested:**

**H** - Effectiveness of waterway rehabilitation on fish numbers (*Importance of fish habitat connectivity*)

**H** - Population assemblages/dynamics changes associated with climate change *(Relative productivity of fish habitats)*

**H** - Community ownership of FHAs (*Streams 2 and 4 linked, or identify a new research stream e.g.* "Habitat data for response management")

**H** - Resilience of mosaics of habitats ("Role of habitat mosaics" or *Stream 2 linked*)

Table 2 Relative productivity of fish habitats subcategory priorities

| (Question 6.) *Relative productivity of fish habitats *subcategory* priorities – **Research Stream 1** | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Mangrove communities | | | | | 2.53 |
| Freshwater habitats (wetlands) | | | | | 2.5 |
| Freshwater habitats (in-stream) | | | | | 2.46 |
| Seagrass communities | | | | | 2.43 |

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[iii] Other suggested priorities were collated and included in the review of the 2010 Program.

[iv] Priorities match bracketed existing priorities or research streams.

| | | | | | |
|---|---|---|---|---|---|
| Rocky reefs | | | | | 2.36 |
| Saltmarsh communities | | | | | 2.3 |
| Algal communities | | | | | 2.13 |
| Bare tidal/intertidal flats/substrate | | | | | 2.02 |
| Saltpan communities | | | | | 1.94 |

Table 3 Ecosystem Services subcategory priorities

| (Question 7.) *Ecosystem Services *subcategory* priorities – **Research Stream 1** | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Quantify fisheries specific ecosystem services of fish habitat | | | | | 2.53 |
| Habitat-fisheries production modelling | | | | | 2.09 |

**New "Ecosystem Services" subcategory priorities[v] suggested:**
**H** - Modelling productivity of habitat under various connectivity scenarios (i.e. drought/flood) (*Relative productivity of fish habitats*)
**H** - Quantify the fate of fish habitat primary productivity (*Relative productivity of fish habitats*)
**H** - Value of ecosystem services to marine park ecosystems (*Ecosystem Services)*
**H** - Quantify non-fisheries roles of various habitat types (*Ecosystem Services – all Provisioning, Regulation, Cultural and Support services*)
**H** - Stability of shorelines as intertidal fish habitat and their buffering of subtidal fish (*Ecosystem Services – Regulation - erosion protection*)
**H** - Continuity of wetland vegetation for sequestration of carbon (blue carbon) below ground as seen for mangroves & saltmarsh (*Ecosystem Services - Regulation – climate regulation*)

## RESEARCH STREAM 2 - IMPACTS ON FISH HABITATS

Table 4 Impacts on fish habitats priorities

| (Question 8.) Impacts on fish habitats priorities – **Research Stream 2** (*indicates subcategory priorities are listed and ratings are shown in Tables 5-7) | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Catchment development and runoff | | | | | 2.58 |
| Size and management of buffers | | | | | 2.55 |
| Quantification of fish habitat losses at various spatial scales | | | | | 2.4 |

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[v] Priorities match bracketed existing priorities/ subcategory priorities

| | H | M | L | N/A | Rating Average |
|---|---|---|---|---|---|
| Barriers to fish migration (man made) | | | | | 2.37 |
| Quantification of fish habitat gains at various spatial scales | | | | | 2.27 |
| Seagrass impacts* | | | | | 2.18 |
| Mangrove impacts* | | | | | 2.16 |
| Climate induced community changes | | | | | 2.14 |
| Saltmarsh impacts* | | | | | 2.09 |
| Barriers to fish migration (weed chokes) | | | | | 1.93 |
| Acid sulfate soil runoff | | | | | 1.86 |
| Algae (related fisheries impacts, benefits and management) | | | | | 1.81 |
| Sewage discharge | | | | | 1.81 |

## New "Impacts on fish habitats" priorities[vi] suggested:

- Impacts of land use on fish productivity in fish habitats (*Catchment development and runoff & Quantification of fish habitat losses at various spatial scales*)
- Effects of fishing

**H** - Chronic and episodic pollutant induced community impacts

**H** - Condition and health of fish habitat communities (*identify a new research stream e.g.* suggestion "Habitat data for response management")

Table 5 Mangrove impacts subcategory priorities

| (Question 9.) *Mangrove impacts by *subcategory* priorities – **Research Stream 2** | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Dieback | | | | | 2.17 |
| Trimming | | | | | 1.72 |

## New "Mangrove impacts" subcategory priorities suggested:

Outright clearing for development

**H** - Inundation frequency

**H** - Overall condition and health

**H** - Seedling density and diversity

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[vi] Priorities match bracketed existing priorities/ subcategory priorities

**H** - Erosion
**H** - Burial
**H** - Defoliation
**H** - Stem damage
**M** - Pollutants like large oil spills
**M** - Impacts of herbicides
**M** - Sedimentation

Table 6 Saltmarsh impacts subcategory priorities

| (Question 10.) *Saltmarsh impacts *subcategory* priorities – **Research Stream 2** | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Grazing | | | | | 1.98 |
| Mowing | | | | | 1.78 |
| Burning | | | | | 1.76 |

**New "Saltmarsh impacts" subcategory priorities suggested:**

**H** - Inundation frequency
**H** - Overall condition and health
**H** - Erosion
**H** - Burial
**H** - Pollutants like large oil spills
**H** - Removal

Table 7 Seagrass impacts subcategory priorities

| (Question 11.) *Seagrass impacts *subcategory* priorities – **Research Stream 2** | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Smothering | | | | | 2.4 |
| Scouring | | | | | 2.28 |

**New "Seagrass impacts" subcategory priorities suggested:**

Effect of fishing/ Trawl effects
**H** - Light deprivation
**H** - Dredging
**H** - Elevated nutrients
**H** - Shading due to turbidity (dredging/runoff)
**M** - Removal
Scouring/ sedimentation effects in combination – anthropogenic dredging of a channel (removal) and anthropogenic sedimentation
**H** - Impacts related to invasions by introduced species
**H** - Pollutants like large oil spills

**H** - Effects of nutrient pollution
**M** - Effects of herbicides

## RESEARCH STREAM 3 - INTERTIDAL & SUBTIDAL STRUCTURES AS FISH HABITATS

Table 8 Intertidal and subtidal structures as fish habitats priorities

| (Question 12.) Intertidal and subtidal structures as fish habitats priorities – **Research Stream 3** | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Flow - dams, weirs | | | | | 2.45 |
| Fish access - culverts, crossings, floodgates, saltwater barrage levees | | | | | 2.44 |
| Stabilisation - banks, levees, groynes, revetments | | | | | 2.07 |
| Drainage and Discharge - stormwater & sewage networks/outlets | | | | | 2.02 |
| Grazing - ponded pastures | | | | | 1.76 |
| Human access - jetties, piers, pontoons | | | | | 1.68 |
| Reduced impacts - moorings | | | | | 1.68 |
| Pest control - runnels for mosquito management | | | | | 1.41 |

## RESEARCH STREAM 4 - REHABILITATION OF FISH HABITATS

Table 9 Rehabilitation of fish habitats priorities

| (Question 13.) Rehabilitation of fish habitats priorities – **Research Stream 4 (*** indicates subcategory priorities are listed and ratings are shown in Table 10) | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Restoration of fish passage/ connectivity - mechanisms | | | | | 2.71 |
| Restoration of fish passage / connectivity - benefits | | | | | 2.71 |
| Habitat mosaic (i.e. connectivity between multiple habitat types) | | | | | 2.67 |
| **Marine plant communities*** | | | | | 2.26 |

| | H | M | L | N/A | Rating Average |
|---|---|---|---|---|---|
| Shallow intertidal flats | | | | | 2.05 |
| Rocky reefs | | | | | 2.02 |
| Saltpan | | | | | 1.86 |
| Yabby banks | | | | | 1.79 |

Table 10 Marine plant communities subcategory priorities

| (Question 14.) Marine plant communities *subcategory* priorities – **Research Stream 4** | | | | | |
|---|---|---|---|---|---|
| | H | M | L | N/A | Rating Average |
| Mangrove | | | | | 2.38 |
| Seagrass | | | | | 2.37 |
| Saltmarsh | | | | | 2.2 |
| Algal | | | | | 1.88 |

# RESEARCH GAPS IDENTIFIED BY RESPONDENTS FOR EACH RESEARCH STREAM

(Question 15.) Are there other fish habitat research gaps including those that should be addressed as a priority to help quantify Queensland's fish habitats and fisheries productivity relationships?

Responses identified gaps and priorities (Tables 11 (a-c) below). Abbreviations used for the priorities: H = High M = Medium, L = Low, N/A = Not Applicable or U = Unassigned. Responses are nominated for inclusion within Program research and management streams. Potential topics (in italics) are suggested and derived from identified research gaps as shown in Tables 11 (a-c).

**RESEARCH STREAM 1 - FISH HABITAT UTILISATION**

Table 11 a) Summary of research gaps identified during the Survey, including priorities, to help quantify Queensland's fish habitats and fisheries productivity relationships

| **1. Relative productivity of fish habitats priority** |
|---|
| **Freshwater habitats** |
| **U** - *Productivity enhancement in impounded (man-made) waters.* |

**U** - *Determine productivity of fish habitats adjacent different land uses.*

Productivity (carrying capacity/assemblage diversity) of fish habitats adjacent to different land use (urban/agricultural/forestry/national park)

**L** - *Pest species impacts on habitat utilisation*

## Mangrove communities

**M** - *Fisheries recruitment comparison analyses using mangrove type and patch size.*

Relative value to recruitment of different patches (e.g. is one patch of mangrove more valuable in terms of recruitment than another patch of mangrove).

## Relating to all fish habitat types

**H** - *Fisheries productivity and fish habitat quality linkages*

What quality of habitat is required to support the fishery resource?

**H** - *What environmental conditions are required to maintain healthy fish habitats?*

What environmental conditions are required to maintain healthy habitats (e.g. sediment, nutrient, contaminant concentration trigger values)?

**H** - *Definition of the limits of acceptable change in fish habitats for productive fisheries*

What is the limit of acceptable change in these habitats before they are no longer viable?

**H** - *Mapping fish habitat connectivity between the catchment and the coast.*

What areas of habitat exist that provide the necessary connectivity between the catchment and the coast?

**H** - *Water quality impacts on fish species diversity and productivity*

Water quality impacts on fish diversity and productivity in different habitats

## Ecosystem Services

**H** - *Understanding relative value of seagrass communities*

| |
|---|
| **H** - *Queensland seagrass resources baseline survey update* <br><br> Update Baseline Survey of Queensland Seagrass Resources – A New Seagrass Atlas for Queensland Coastal habitat dynamics and ecosystem services |
| **U** - *True ecosystems services values for fish habitats.* <br><br> True ecosystems services values for Australian, and in particular Queensland's, fish habitats |
| **H** - *What is the value of marine plant communities to the local/global carbon economy?* <br><br> Critical gap in knowledge on the fate of primary productivity of marine plants. How much is incorporated into higher trophic levels including fisheries species. To what extent do these marine plant communities act as a Carbon sink or sequestration? What is the value of marine plant communities to the local/global Carbon economy? |

## RESEARCH STREAM 2 - IMPACTS ON FISH HABITATS

Table 11 b) Summary of research gaps identified during the Survey, including priorities, to help quantify Queensland's fish habitats and fisheries productivity relationships

| |
|---|
| **H** - How current threats and impacts affect the resilience of habitat mosaics (at landscape scales) <br><br> Develop integrated empirical models that assess how current threats and impacts affect the resilience of habitat mosaics (at landscape scales) to future impacts including eutrophication, climate change and pollution. These models need to be based on properly designed field experiments that also incorporate variation among current management classes (e.g. marine park zones). Resilience needs to be measured in the field properly, not simply assumed to exist as is currently being done in almost all conservation modelling based on mathematical algorithms without any empirical support or basis. These studies can be done and there is an urgent need for the realisation that modelling that is not based on empirical data has no functional support for its potential success. It is all based around mathematical equations and these equations do not incorporate biology or ecology. |
| **H** - *Resilience of coastal habitats to cumulative impacts and climate change* |
| **U** - *Habitat rehabilitation to mitigate impacts of climate change on fish stocks* |
| **H** - *Investigate and manage impacts on fisheries productivity for species dependent on freshwater wetlands.* <br><br> Freshwater Wetlands - Barramundi, one of the most important commercial/recreational and traditional fish species in Queensland is dependant on good quality wetlands. Many other freshwater and marine fish species rely on wetlands both directly and indirectly. This also includes access to these wetlands. Freshwater wetlands are some of the most highly impacted areas in Queensland |

| |
|---|
| **U** - *Harvest impacts, non- lethal impacts of reduced water quality, salinity, climate change and sedimentation* |
| **U** - *Report historical and projected anthropogenic impacts on fish habitats*<br><br>Plot/ compare define the trajectory of anthropogenic impacts over time. |
| **H** - *Risk analysis of agricultural pollution on fish habitats*<br><br>A general analysis of the risk of agricultural pollution to fish habitat - freshwater wetlands, mangroves, seagrass |
| **H** - *Habitat risk analysis - quantify the resilience of fish habitats to change (anthropogenic & climatic impacts).*<br><br>In order to quantify productivity, which you want to do into the future, you need to make an assessment of the risk that they will or will not be here in the future. Therefore you need to quantify the productivity today but also quantify the risk or probability that they will be here tomorrow. So a big research gap is quantifying the resilience of these habitats to probably future changes in human and climatic impacts into the future. Then you can estimate the expected future productivity of the habitats. We need to start looking at habitat resilience. |

## RESEARCH STREAM 3 - INTERTIDAL & SUBTIDAL STRUCTURES AS FISH HABITATS

(No research gaps identified by respondents)

## RESEARCH STREAM 4 - REHABILITATION OF FISH HABITATS

Table 11 c) Summary of research gaps identified during the Survey, including priorities, to help quantify Queensland's fish habitats and fisheries productivity relationships

| |
|---|
| **H -** *Access to Baseline information on riparian and wetland areas*<br><br>On-ground rehabilitation works on riparian and wetland areas. The catchment community is engaged in this work and baseline information is not always available and biodiversity indicators are the only "private" research we have accessed. |
| **U** - *Best practice or methods for rehabilitation of fish habitats* |
| **H** - *Effects of habitat enhancement/ rehabilitation on fisheries production* |

# References

Department of Agriculture, Fisheries and Forestry 2012a *Fish Habitat Research and Management Program, Balancing community needs with those of fisheries resources and fish habitats – 2012 & beyond,* 11 pp.

Department of Agriculture, Fisheries and Forestry 2012b *Project summaries – Fish Habitat Research and Management Program, Balancing community needs with those of fisheries resources and fish habitats – 2012 & beyond*, 50 pp.

Department of Employment, Economic Development and Innovation 2009 *Priority Funding Areas for Seagrass Research Projects*, Fisheries Queensland a service of DEEDI, 9 pp. (see [Seagrass priorities](#))

Enram Enterprises 2010 *An Independent review of fish habitat policy and process in Queensland*. Prepared for the Department of Employment, Economic Development and Innovation, October 2010, 57 pp.


# Acronyms

AIMS – Australian Institute of Marine Science

ARI – Australian Rivers Institute

CQU – Central Queensland University

DAFF – Department of Agriculture, Fisheries and Forestry

DEEDI – (the former) Department of Employment, Economic Development and Innovation

DERM – (the former) Department of Environment and Resource Management

FHA – declared Fish Habitat Area

GBRMPA – Great Barrier Reef Marine Park Authority

GU – Griffith University

H – high (priority)

JCU – James Cook University

L – low (priority)

M – medium (priority)

N/A – not applicable (as a priority)

NRM – Natural Resource Management Groups

Program – (former 'Urban Fish Habitat Management Research Program' renamed as 'Fish Habitat Research and Management Program)

QUT – Queensland University of Technology

Survey – refers to 2011 Fish habitat researcher survey conducted by DEEDI

U – unassigned (priority)

# Appendix 1

2010 Program research priorities identified for revision (highlighted in yellow) using the Survey findings. Additional priorities for freshwater habitats identified at the time of the Survey and potential projects from respondent feedback were considered for the 2012 Program.

| Research stream | Priority<br>H = High<br>M = Medium<br>L = Low |
|---|---|
| 1.Fish habitat utilisation<br>a. Relative productivity of adjacent fish habitats<br>b. Importance of fish habitat connectivity<br>c. role of habitat mosaics<br>d. ecosystem services | 1a. - M<br>1b. - M<br>1c - M<br>1d - M |
| 2. Impacts on fish habitats<br>a. Size and management of buffers<br>b. Acid sulfate soil runoff<br>c. Sewage discharge<br>d. Catchment development and runoff<br>e. Climate induced community changes<br>f. Mangrove<br>    I. Trimming<br>    II. Dieback<br>g. Saltmarsh<br>    I. Burning<br>    II. Mowing<br>    III. Grazing<br>h. Seagrass<br>    I. Smothering<br>    II. Scouring<br>i. Algae<br>    I. Fisheries impacts, benefits and management | 2a. - M<br>2b. - M<br>2c. - M<br>2d. - M<br>2e - H<br>2fI. - H<br>2fII. - H<br>2gI. - M<br>2gII. - M<br>2gIII. - L<br>2hI. - M<br>2hII - H<br>2iI - M |
| 3. Intertidal and subtidal structures as fish habitats<br>a. Human access – jetties, piers, pontoons<br>b. Fish access – culverts, crossings, floodgates<br>c. Stabilisation – banks, levees; groynes<br>d. Discharge – stormwater and sewage outlets<br>e. Flow – dams, weirs<br>f. Grazing – ponded pastures<br>g. Pest control – runnels<br>h. Reduced impacts – moorings | 3a. - H<br>3b. - M<br>3c. - M<br>3d. - M<br>3e. - L<br>3f. - L<br>3g. - L<br>3h - H |
| 4. Rehabilitation of fish habitats<br>a. Habitat mosaic<br>b. Marine plants<br>c. Shallow intertidal flats<br>d. Rocky reefs<br>e. Yabby banks | 4a. - H<br>4b. - H<br>4c. - M<br>4d. - M<br>4e. - L |