Fisheries
Long Term
Monitoring Program
Sampling Protocol

Sea Mullet:
(2007 onwards)

Section 1

Queensland the Smart State
Fisheries
Long Term
Monitoring Program
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Department of Primary Industries and Fisheries
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Section 2 - Operational Protocols

Section 2 of this sampling protocol can be obtained by contacting the Fisheries Data Coordinator:

Telephone +61 7 3405 6822, Fax +61 7 3224 2805 or

Email FishDataCoordinator@dpi.qld.gov.au

Acronyms

CFISH Commercial Fisheries Information System, DPI&F

DPI&F Department of Primary Industries and Fisheries, Queensland

LTMP Long Term Monitoring Program, DPI&F
Rationale

The sea mullet (*Mugil cephalus*) is a major commercial fish species in Australia and many other parts of the world. In Australia, the main commercial fisheries for sea mullet are in New South Wales, Queensland and Western Australia harvesting 2552, 1607 and 200 tonnes per annum respectively during 2005-2006 (ABARE 2007). The mullet catch for Queensland waters is composed predominantly of sea mullet with the majority of the catch coming from ocean beaches in the southern half of the state (NSW border to Sandy Cape) (Williams 2002). Further north, the mullet fishery is mainly estuarine based, hence the total catch is relatively small compared to southern Queensland and also includes diamond scale (*Liza vaigiensis*), flat-tail mullet (*Liza argentea*), and other smaller *Mugil* species (Williams 2002). The estuarine fishery uses gill and tunnel nets to target fish for the local fresh fillet market throughout the year. The ocean beach fishery uses seine or haul nets to target pre-spawning female fish to supply an international export market for mullet roe.

The ocean beach component of the fishery is limited to 62 license-holders (K-endorsement) in Queensland and to a season extending from 1 April to 31 August (Fisheries Regulation 1995). The K endorsement allows fishing activities on licence-specific ocean beaches (eight zones) during these months using seine nets with a maximum mesh size of 70 mm. Commercial ocean beach fishers target mullet on their seasonal, winter, pre-spawning migration north along the coast from estuaries in New South Wales and southern Queensland, to Sandy Cape on Fraser Island. Monofilament seine (or haul) nets are used to capture migrating fish, which are usually spotted either schooling in estuaries or swimming in near shore ocean beach gutters. The fish are tracked until they reach a suitable area where the net is deployed by boat around the school and hauled onto the beach.

The estuarine net fishery (various N endorsements) encompasses a wider area and has significantly more licence holders involved. In the estuarine fishery sea mullet are taken as both target and incidental catch. Catches from the estuarine fishery are generally smaller in size (CFISH database, December 2006) and contain higher numbers of smaller individuals (Bell *et al.* 2005). The majority of the estuarine catch (61%) is taken during the months of the ocean beach season (CFISH database, December 2006) however operations under an N licence are not permitted on ocean beaches during the ocean beach season.

No significant amounts of sea mullet are caught on ocean beaches between September and December. However, depending on market and environmental conditions, schools of non-reproductive fish – known as hardgut mullet – migrating from estuarine waters to ocean beaches can be targeted. Comparatively small in total catch size, the hardgut run was historically economically significant with the scarcity of other fish species bringing relatively higher prices but in recent times this run of fish has been inconsistent or non-existent and is generally not targeted (D.Roy, DPI&F, pers. comm. August 2007).

Despite the research undertaken on the biology of sea mullet in many parts of the world, few studies have undertaken formal stock assessments. A preliminary stock assessment was undertaken by Dichmont *et al.* (1999) indicating that the mullet stock were possibly being subjected to unsustainable levels of fishing mortality. In response to this finding DPI&F instigated monitoring the characteristics of sea mullet catch in 1999. The monitoring was designed to complement the compulsory commercial logbook program already in place to collect data on catch and effort. A recent comprehensive stock assessment of the Queensland and NSW mullet fishery was conducted by Bell *et al.* (2005). Recommendations arising from this report included retaining current management strategies and proposed changes to the data collected by the LTMP.
Within the mullet fishery the use of mobile phones for better communication, internet access for current and predicted weather patterns, high speed dinghy’s for shooting nets around schools, mechanical hauling techniques (i.e. use of tractors rather than hand hauling) and high quality netting material have contributed to a greater fishing efficiency.

The sea mullet fishery is managed by the Fisheries Regulation 1995 which imposes:

- a minimum size limit of 300 mm
- restrictions on gear
- restriction on the number of commercial licences
- permanent closure areas
- seasonal closures (1st September to 31st March).

Department of Primary Industries and Fisheries (DPI&F) Long Term Monitoring Program (LTMP) collects fishery-dependent samples to monitor the characteristics of the commercial sea mullet catch. Sampling is stratified by area and collected from across the main commercial harvest area throughout the year.

**Objectives**

The objective of the LTMP mullet monitoring project is to collect representative data on the following aspects of the Queensland commercial sea mullet catch:

- Length structure
- Age structure
- Sex structure.

Data on these parameters is required for regular stock assessment to guide the management of the mullet resource, on which the various commercial and recreational fisheries depend.

**Sites**

Sampling occurs from Sandy Cape on Fraser Island in the north, to the Queensland–New South Wales border in the south, which is the area of the Queensland ocean beach fishery. The sampling area includes both ocean beach and estuarine areas. To facilitate sampling, the area of the fishery is spatially stratified by region. For the ocean beach sampling, “K” areas are the sampling strata used to spatially stratify sampling effort whilst for the estuarine component of the monitoring corresponding CFISH 30 min grids are used. Temporal stratification of sampling effort also occurs.

Based on the level of commercial catch, target numbers of lengths (8000) and otoliths (2000) were allocated between the ocean beach and estuarine sectors. To meet the ocean beach target numbers, 21 individual catches are sampled from the ocean beach fishery. As the estuarine sector produced a larger number of smaller catches, 40 individual catches are sampled from this sector to ensure the samples are more representative of this commercial catch. Sample target numbers are allocated to each stratum based on the proportion of the commercial catch that was reported from each stratum before the ocean beach season (1 January – 31 March), during the ocean beach season (1 April – 31 August) and after the ocean beach season (1 September – 31 December). The estuarine catch is also divided between gillnet catch and tunnel net catch within each stratum/season combination. For this analysis an ocean beach catch refers to any fish reported as being landed during the ocean beach season by a K endorsed licence. The remaining landings are regarded as estuarine even though they may be taken from an ocean beach.
Figure 1. Fishery endorsement areas for K-licenced operators and commercial fishing grids (light grey) used to stratify sampling effort.
Fishery-dependent sampling of commercial catches of mullet occurs throughout the calendar year (Table 1). Consultation with commercial fishers and processors is undertaken to ascertain the start and finish of the season and to coordinate the collection of samples from them.

Table 1. Target numbers of sea mullet samples to be collected during the calendar year

<table>
<thead>
<tr>
<th>Gear Type</th>
<th>CFISH 30 min grid/ K Area</th>
<th>Before ocean beach season</th>
<th>During ocean beach season</th>
<th>After ocean beach season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean Beach Net</td>
<td>K1</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>K2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>K3</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>K4</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>K5</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>K6</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>K7</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>K8</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Gillnet (Estuary)</td>
<td>U32</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>V33</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>V34</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td></td>
<td>W32</td>
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<td>W33</td>
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<td>W34</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>W35</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>W37 &amp; W38 (Moreton Bay)</td>
<td>3</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Tunnel Net (Estuary)</td>
<td>W37 &amp; W38 (Moreton Bay)</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
Monitoring procedure

On-site Procedures

Samples are collected directly from commercial ocean beach mullet fishers or through processors. Representative age sampling procedures are described in the Commercial Catch Sampling protocol (DPI&F In Prep. c).

Criteria for the collection of samples are the catch must:
- not be graded or sorted in any way, and
- be large enough to allow the target number of lengths per catch to be measured (see below).

Catches not meeting the above criteria are not sampled.

Sea mullet are selected at random from the catch until:
- 200 fork lengths have been measured from an ocean beach catch, or
- 100 fork lengths have been measured from an estuarine catch.

Where possible every fourth mullet measured (i.e. 50 fish per ocean beach catch) is systematically retained for the collection of age, length and sex information. Where this isn't possible purchasing approximately 25% of the measured fish is required. For an ocean beach catch 25% will be approximately 50 fish and for an estuarine catch it will be about 25 fish. The poor age-length relationship for this species (Dichmont et al. 1999) makes this systematic approach to subsampling necessary, rather than a stratified, length based system.

Laboratory Procedures

Once in the laboratory each mullet in the subsample is processed in the following manner:

- Each fish is allocated a unique identifying number containing year, resource and fish number (DPI&F 2007).
- For each fish record as described in LTMP Data Protocol (DPI&F In Prep. a):
  - Length (caudal fork length to the nearest 5 mm)
  - Sex (male, female or unknown).
- Sagittal otoliths are removed, cleaned, dried and stored (DPI&F 2007).
- An estimation of fish age is made by reading sectioned otoliths. Otolith preparation and reading protocols are as described in the LTMP Ageing Protocols (DPI&F In Prep. b).
Permits and approvals

This project does not require any permits as all samples are taken by commercial fishers as part of normal fishing practice and sold, through licensed fish processors, to DPI&F for the project.

Notifications

No notifications are required as all samples are caught by commercial fishers as part of normal fishing practise and purchased by DPI&F for the project.

Stakeholders and the general public are kept informed through a variety of media resources including press releases, pamphlets, reports and web site information, as described in the Assessment and Monitoring Communication Strategy.

Data access

Access to LTMP data is subject to a formal application process. The Fisheries Data Coordinator is to be contacted for all applications:

Telephone +61 7 3405 6822, Fax +61 7 3224 2805 or
Email FishDataCoordinator@dpi.qld.gov.au

All use of DPI&F data is subject to a data agreement between the Department and the party requesting the data. The data agreement covers how data must be acknowledged in publications and other restrictions that may be placed on data use. If the publication is based substantially on LTMP data and on LTMP survey design then co-authorship may be requested or advised. All documents that utilise LTMP data must be sent to the Fisheries Data Coordinator as drafts for perusal before they are published. Copies of final documents utilising LTMP data must be provided to the Fisheries Data Coordinator free of charge for lodgement in the DPI&F library.
References


