

Annual status report 2011

Queensland Eel Fishery



© The State of Queensland, Department of Employment, Economic Development and Innovation, 2011.

Except as permitted by the *Copyright Act 1968*, no part of this work may in any form or by any electronic, mechanical, photocopying, recording, or any other means be reproduced, stored in a retrieval system or be broadcast or transmitted without the prior written permission of the Department of Employment, Economic Development and Innovation. The information contained herein is subject to change without notice. The copyright owner shall not be liable for technical or other errors or omissions contained herein. The reader/user accepts all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly from using this information.

Fishery profile 2010

Species targeted Longfin eel (<i>Anguilla reinhardtii</i>) and southern shortfin eel (<i>A. australis</i>)	Fishery season January to December
Allocation between sectors Predominately commercial	Monitoring undertaken Commercial logbooks (CFISH)
Indigenous harvest Negligible	Accreditation under the EPBC Act Expires 1 May 2014
Charter harvest Nil	Logbook validation No
Adult Eel Fishery	
Commercial harvest 22.6 t	Total number of commercial licences in 2010 19 licences holding an E symbol as of December 2010
Recreational harvest (2005) Negligible	Number of licences accessing the fishery in 2010 16
Commercial Gross Value of Production (GVP) Approximately \$214 700	Fishery symbols E
Juvenile Eel Fishery	
Commercial harvest <20 kg	Total number of commercial licences in 2010 13 licences holding a JE symbol as of December 2010
Recreational harvest (2005) Nil	Number of licences accessing the fishery in 2010 3
Commercial Gross Value of Production (GVP) No Estimate Available	Fishery symbols JE

Key fish resources	Stock status
Longfin eel (<i>Anguilla reinhardtii</i>) and southern shortfin eel (<i>A. australis</i>) East Coast stock	Sustainably Fished

Comment: Recent commercial catch and catch rate of adult eels is less than historically sustained levels—although figures have remained relatively stable over the last four years. Juvenile eel data continues to illustrate fluctuating trends. The harvest of both lifecycle stages are heavily dependant on environmental factors and market driven forces. Performance measures relating to adult and juvenile eel catch and effort in the commercial sector were not triggered in 2010. Length frequency graphs over nine years show healthy distribution of individuals in length classes. Current fishing pressure is considered sustainable under the current management regime—due particularly to strict conditions related to permitted fishing areas.

Introduction

The Queensland Eel Fishery (QEF) targets the longfin eel, *Anguilla reinhardtii*, and the southern shortfin eel, *Anguilla australis*, in rivers and freshwater impoundments. The QEF is unique in that the resource is harvested at two stages in the lifecycle—the adult stage (eels > 30 cm) and the glass eel/elver stage (eels < 30 cm) for both species. Commercial adult eel (E) trappers collect adult eels from impounded waters; whereas commercial juvenile eel (JE) fishers take glass eels and elvers from rivers and supply seed stock for grow-out in aquaculture facilities.

The majority of Queensland's wild-caught adult eel catch is exported live to Asia, principally Hong Kong and Taiwan, with a small percentage of adult eels being sold frozen to European markets. A very small proportion of the harvest is sold fresh to local smokehouses which supply the domestic market.

This report covers fishing activity during the 2010 calendar year.

Fishery description

Fishing methods

In Queensland, commercial capture/harvest of adult eels is only permitted using baited eel traps or round traps which are usually set on the bottom of the impoundment. Adult eel traps consist of a single entry mesh funnel and a floated cod-end to hold the captured eels and ensure that captured eels are not over stressed and that air breathing non-target species may access the water surface to breathe. Traps are generally baited with pilchards or mullet.

Specifications on net design and setup are stipulated in the Queensland Fisheries Regulation 2008:

- the maximum size of an eel trap is 2.0 x 0.6 x 0.6 m when set
- the maximum size of a round trap is a diameter of 1 m and a height of 0.6 m
- the frame of the trap must be made of a rigid material
- a trap (other than its pocket) must have a mesh size of at least 25 mm; any rigid mesh on the trap must be at least 22 mm in each of its dimensions
- a float of at least 150 mm in each of its dimensions must be attached to each trap

- the trap and trap float must be marked with authority number and full name of the authority holder
- the tail of the cod end must also be attached to a float or buoy of adequate size so that at least part of the cod end floats at the surface to allow trapped animals access to surface air.

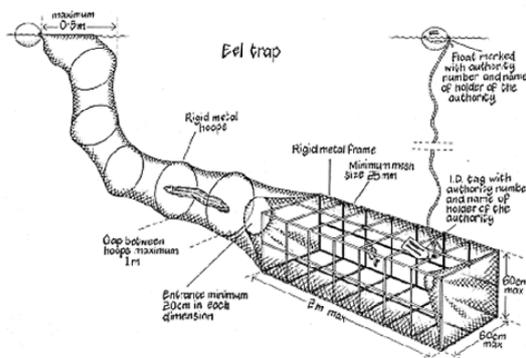


Figure 1: Eel trap used by adult eel trappers.

The juvenile component of the QEF targets juvenile eels using a variety of different gear types, including fyke nets, dip nets and flow traps. Juvenile traps must contain bycatch reduction devices (BRDs) to minimise impacts on non-target species. The maximum total amount of fishing gear allowed to be used under an authority is:

- one small mesh eel fyke net:
 - with a maximum of two wings (length ≤ 15 m)
 - the fyke net must not exceed 4 m in height, width or diameter
 - the ends of the wings and the cod-end of the net must be marked with a reflective float bearing the holder's name and address
 - the net may be fixed by anchor or supported on stakes
 - a float must be attached to the cod-end to ensure that incidentally captured air-breathing animals can access air to breathe.
- three small mesh dip nets
- three flow traps with an effective bycatch excluder that have been approved by the chief executive prior to use.

Fishing area

Adult eel

The adult eel fishery allows fishing in all Queensland East Coast Drainage Division catchments with the

exception of all coastal island catchments (Figure 2). Within this area, trapping of adult eels is only permitted in:

1. artificially created private impoundments in those catchments listed on an eel authority (for example, a farm dam).
2. an impoundment formed by a dam that is specifically listed on an eel authority (for example, a public owned impoundment such as Cressbrook Dam).

The majority of public impoundments are not open to commercial harvesting, and as such, the fishery comprises mainly private impoundments.

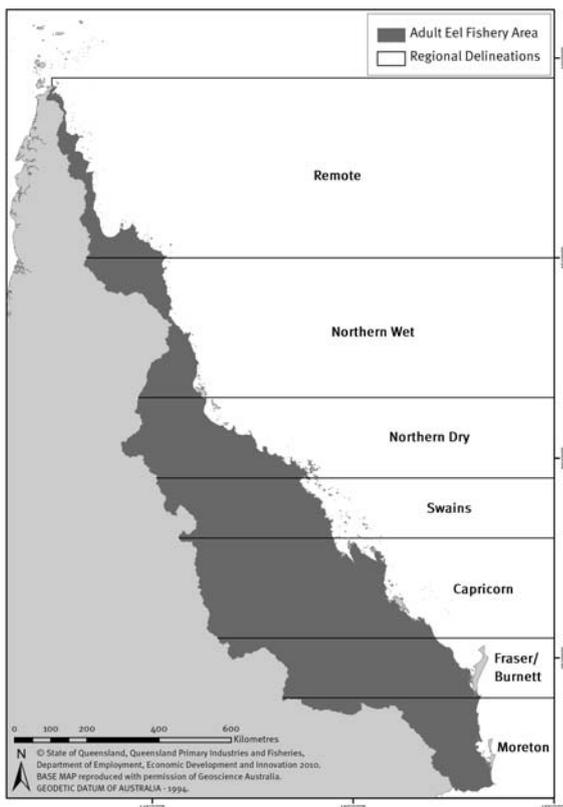


Figure 2: Area open to adult eel trapping including regional delineations.

Juvenile eel

The juvenile eel fishery allows fishing in river basins associated with 21 rivers along the east coast of Queensland, which represent less than 10% of Queensland river systems.

Fishing is permitted in the Albert, Barron, Brisbane, Burdekin, Burnett, Burrum, Caboolture, Coomera, Currumbin, Fitzroy, Johnstone, Kolan, Logan, Maroochy, Mary, Mooloolah, Mulgrave, Nerang, Noosa, Pine and Tully rivers (Figure 3). Within these basins, juveniles may

only be collected at, or downstream of, the most downstream dam or weir¹ and up to 200 m either side of the mouth of the approved rivers. Collecting is also allowed in tributaries that enter the approved rivers downstream of the most downstream dam or weir for a distance of 1 km upstream of the confluence.

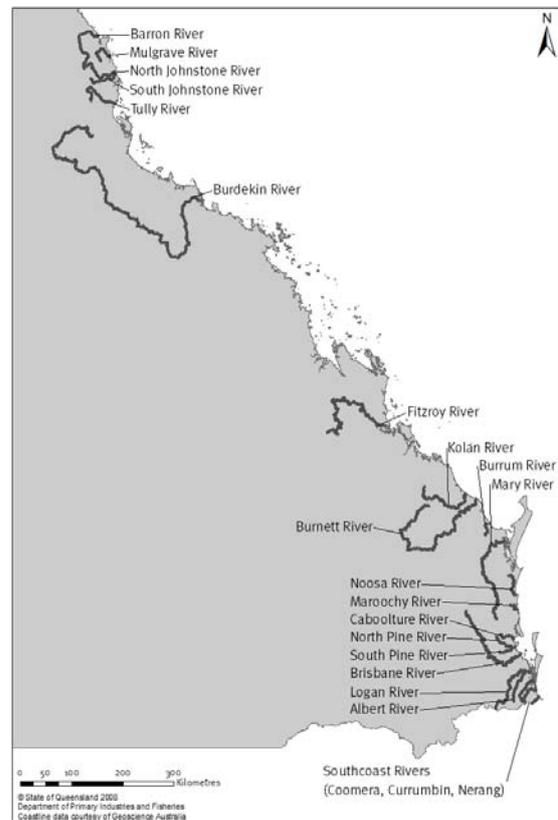


Figure 3: Map of permitted juvenile eel fishing rivers.

Key Species

The QEF targets the longfin eel (*Anguilla reinhardtii*) and the southern shortfin eel (*Anguilla australis*) in rivers and freshwater impoundments.

The longfin eel is distributed along the east Queensland coastline and found throughout eastern states of Australia; abundances are greatest in Queensland and New South Wales. The longfin eel makes up the majority of the adult eel catch in Queensland due to its extensive distribution. The southern shortfin eel is at its northern distribution limit in southern Queensland with higher abundances occurring in southern Australian states.

Southern shortfin and longfin eels are reported to vary in average length at maturity dependant on sex. Longfin eels are reported to grow to an average length at metamorphosis and maturity of 93 cm for females and 56

¹ A tidal barrage is not considered a weir for the purpose of these conditions.

cm for males (Hoyle and Jellyman 2002). Southern shortfin eel females are believed to mature at approximately 55 cm whilst males mature at the legal size of 30 cm (Todd 1980).

All species of anguillid eels are catadromous, spending the majority of their life cycle in freshwater and estuaries. Adult eels migrate to the Coral Sea to spawn (Aoyama et al. 1999; Gooley et al. 1999). During the larval stage individuals are transported via the East Australian Current to near shore waters where they metamorphose into unpigmented ‘glass eels’ (Shiao et al. 2001; Beumer 1992). Glass eels then move upstream to grow and develop through a small, pigmented ‘elver’ stage into the large but still immature ‘adult’ eels. When adults reach sexual maturity they undergo marked changes in their appearance and become silvery. Anatomy and physiology also alter at sexual maturity and eels undertake a once only downstream migration to the spawning grounds, where it is believed they spawn and subsequently die.

Sexual differentiation in eels appears to be influenced by a number of environmental factors (Zeller and Beumer 1995). Females generally occur further upstream (lower salinity and lower population densities), grow larger and mature later than males. Males tend to occur more frequently in downstream brackish and estuarine areas (Beumer 1992). There are no easily distinguishable visual differences between male and females (Moffatt and Voller 2002).

A recently published study and unpublished conclusions from postgraduate research suggest panmixia in juvenile eel populations (Kang-Ning and Wann-Nian 2007; Moore 2008). Both southern shortfin and longfin eel species are believed to belong to a single panmictic genetic stock; this recognises that the recruitment of juveniles within the species distribution is random.

Main management methods used

Fisheries Queensland manages the QEF in accordance with ecologically sustainable development principles. The fishery management methods differ between the adult and juvenile components of the QEF.

The adult wild-caught eel component of the fishery is managed under the Queensland Fisheries Regulation 2008, which is subordinate legislation to the Queensland *Fisheries Act 1994*.

The collection and grow-out of juvenile eels is currently controlled through conditions attached to Commercial Harvest Fishery Licenses under the *Fisheries Act 1994*, Development Approvals for Aquaculture under the *Integrated Planning Act 1997* and the ‘Policy for Management Arrangements for the Commercial Harvesting and use of Juvenile Eels’ (The Juvenile Eel Policy).

A range of input and output controls are in place to manage the harvesting of eels including:

- a minimum size limit (30 cm) for commercial adult eel collectors and recreational fishers
- a recreational in-possession limit for freshwater eels (combined limit of 10 for all species)
- restrictions on which waters are open to collection activities
- a limit on the number of authorities issued to access the fishery:
 - the adult eel fishery has 19 authorities and is closed to new applicants
 - the juvenile eel fishery is restricted to 13 authorities
- restrictions on the type and design of apparatus and number of each gear type that can be used (Figure 1)
- restrictions on the use of juvenile eels (may be sold to authorised aquaculture facilities within Australia only).

Catch statistics

Commercial—adult eel

Between 2009 and 2010 the annual reported commercial catch of adult eels in Queensland increased from 21.8 t to 22.6 t respectively. The 4% increase in total adult eel harvest is comparative to the increase in the number of participants accessing the resource and the increase in the number of fishing days (Table 1, Figure 4).

In 2010, an average fishing day yielded a catch of 30 kg, a decrease of 5% in comparison with 2009 (Figure 4). Catch per unit effort (CPUE; kg/day) is not representative of natural adult eel stocks as adult eels are only harvested from artificial impoundments.

Table 1: Licences, days fished and total catch (tonnes) in the adult eel fishery 2002–10 (Source: Fisheries Queensland CFISH database as at 5 May 2011).

Year	Licences	Days	Catch (t)	CPUE (kg/day)
2001	29	378	51.9	140.6
2002	24	380	53.8	141.5
2003	22	361	43.3	120.0
2004	19	267	41.0	153.5
2005	18	262	31.1	118.8
2006	17	219	18.0	82.0
2007	15	865	24.6	28.4
2008	18	890	24.8	27.9
2009	15	689	21.8	31.7
2010	16	753	22.6	30.0

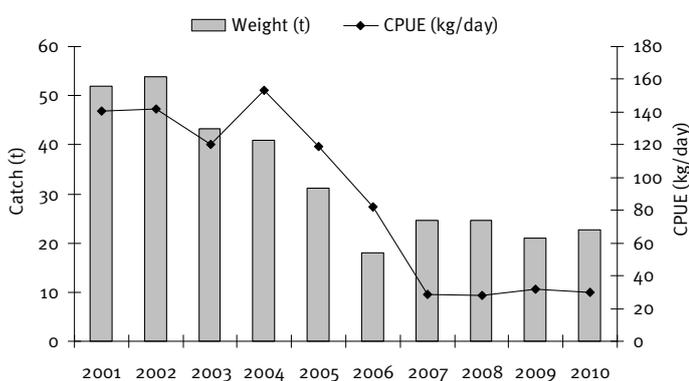


Figure 4: Queensland adult eel reported annual catch and CPUE 2002–10 (Source: Fisheries Queensland CFISH database as at 5 May 2011).

The Moreton region continues to contribute the highest catch of adult eels to the fishery; followed closely by Fraser/Burnett and the Northern Dry regions (Figure 2). Catches in the Moreton and Northern Dry regions were higher in 2010 than 2009 by 22% and 92% respectively. Adult eel catch in the Northern Dry region have been rapidly increasing since 2008.

The adult eel fishery has seen great variation in annual catch totals during the past decade. The continued reduction in fishable waters resulting from drought, and the associated reduction in eel recruitment into fishable impoundments has made it increasingly harder for fishers to harvest large quantities of eel.

Recreational

The statewide recreational catch of eels is considered to be negligible. Refer to the 'Recreational' section of the 2008 Queensland Eel Fishery Annual Status Report for previous figures and catch statistics.

In 2010 Fisheries Queensland commenced a new statewide recreational fishing survey. This survey will provide current and robust data about the recreational

harvest of freshwater eels and other species by Queenslanders. The results of this survey will be available by mid 2012.

Indigenous

No estimates are available on the Indigenous harvest of adult eels.

Commercial—juvenile eel

The annual reported commercial catch of juvenile eels in Queensland decreased from 135.8 kg in 2009 to less than 20 kg in 2010. The decrease in catch is a direct result of a decrease in the number of fishers accessing the resource and decrease in the number of fishing days. This decrease adds to an already existing decline in catch and is recorded as the lowest annual juvenile eel harvest in over a decade. Similarly, catch per unit effort (kg/day) has dropped significantly between 2009 and 2010.

The juvenile eel fishery is temporal in nature with seasonal, weather and tidal cycles imposing natural restrictions and significant variation in both catch and fishing effort is expected. The variation in total catch from year to year is related to the high variability in abundance of juvenile eels entering individual river systems.

Aside from the temporal nature of the fishery, market forces such as increased demand for aquaculture stock can stimulate fishing even in times of poor harvest. Both of these factors are considered responsible for the significant reduction in catch per unit effort experienced in 2010.

Due to confidentiality reasons there will be no further breakdown of catch and effort information for the juvenile eel fishery.

Spatial issues/trends—adult eels

In 2010, 39%, 26% and 23% of the total adult eel catch was harvested from the Moreton, Fraser/Burnett and Northern Dry regions respectively. The spatial patterns associated with the adult eel fishery have remained relatively similar during past decade, with the addition of the Northern Dry region as a high harvest area in 2010.

Spatial issues/trends—juvenile eels

The collection of juvenile eels is concentrated at specific river locations that favour collection (such as waterway barriers). Fisheries Queensland is unable to comment on

any spatial trends identified in the juvenile eel fishery due to confidentiality reasons.

Socio-economic characteristics and trends

The majority of eels, including wild-caught adult eels and juvenile eels grown in farms to export size, are exported live to Asia. In 2010, fishers were typically paid \$9–10/kg for wild-caught adult eels and \$15–17/kg for juveniles that had been grown to a marketable size in captivity².

Biological and ecological information

Monitoring Programs

Fishery independent monitoring

Due to recent resourcing limitations, no monitoring of eastern coastal rivers has been undertaken by Fisheries Queensland post 2007. It is not anticipated that freshwater monitoring by Fisheries Queensland will resume in the near future. However, the Department of Employment, Economic Development and Innovation (DEEDI) is a partner in the South East Queensland Healthy Waterways Partnership which conducts biannual freshwater fish surveys using backpack electrofishers in 18 rivers and creeks in south east Queensland.

Eels were almost ubiquitous in catches between 2003 and 2010 and sometimes abundant (Figure 6).

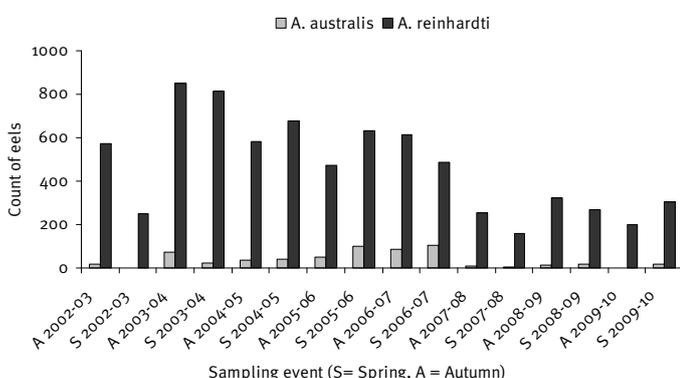


Figure 6: Count of eels (*Anguilla* spp.) recorded during spring and autumn sampling in the Albert Logan rivers catchment as part of the Ecosystem Health Monitoring Program 2002–03 to 2009–10 (Source: Ecosystem Health Monitoring Program, Healthy Waterways Network).

Fisheries Queensland has undertaken some preliminary analysis of these data to assess trends in eel catch rates. The presence of eels during autumn 2009–10 was the lowest reported number in during an autumn period

since the introduction of the survey, whilst the presence of eels during spring 2009–10 were within historical spring levels. There is no indication of any long term declining trend with some seasonal and inter-annual variation in abundance of eels.

Bycatch

There are no by-product species taken in the QEF as eels are the only freshwater fish permitted to be taken for trade or commerce. Adult eel traps have been designed to minimise the likelihood of interactions with non-target species and to reduce the impacts on any individuals captured.

Anecdotal evidence suggests that the adult eel fishery has a low level of bycatch—assumed to be low due to the small scale of the fishery, the restrictions on traps used, the restriction of fishing effort to artificially impounded areas, and the closure of waters in which eel fishing is considered a risk to other aquatic fauna.

Previous research demonstrated that bycatch in the juvenile eel fishery is generally low and consists of small, abundant and common species (Gooley and Ingram 2002).

Interactions with protected species

The Species of Conservation Interest (SOI) logbook was updated to include species specific codes for freshwater turtles. As of February 2011, participants in the adult and juvenile eel fisheries are now reporting species specific interactions in their SOI logbook. Species specific SOI interactions will be presented in the 2012 QEF ASR.

Adult eel fishery

A total of 4 412 interactions were reported in the adult eel fishery during 2010; all but one interaction was with a freshwater turtle. Of the reported freshwater turtle interactions 98% of individuals were released alive (Table 2).

Table 2: Interactions with species of conservation interest reported during 2010.

Common Name	No. released alive	No. released dead	Total no. of interactions
Freshwater turtle	4 309	103	4 412
Water rat	1	0	1

² Prices are based on consultation with commercial fishers.

Options for amending eel trap design, with the aim of reducing interactions with SOCI, will be considered during the review of the freshwater management arrangements scheduled to occur in 2011.

Juvenile eel fishery

In 2010, there were no reported interactions with species protected under the EPBC Act.

Ecosystem Impacts

The impact of the eel fishery on the ecosystem is considered to be low. The apparatus used is considered to have minimal impact on the physical environment and non-target species. Restrictions on the number of traps and the locations in which they can be used in are implemented to minimise potential impacts. The use of apparatus designs that are sensitive to the environment and non-target species is encouraged. The trapping of adult eels occurs mainly in artificially created environments (e.g. farm dams) and therefore the adult eel fishery has negligible impact on the ecosystems of natural waterways.

Man-made barriers such as dams or weirs may affect migration of fish to a variable degree, from short delays to complete obstruction depending on the dimensions and characteristics of the barriers (Northcote 1998). In Queensland, barriers to eel passage upstream such as

dams, weirs and barrages have the potential to reduce recruitment into upstream freshwater environments where female eels develop and grow. Fisheries Queensland has completed a cost-benefit analysis of the potential to facilitate juvenile eel recruitment upstream past waterway barriers (refer to the 'Current Sustainability status and concerns' section).

Sustainability Assessment

Performance against fishery objectives

The Queensland Eel Fishery Performance Measurement System was reviewed in January 2010. The revised version of the PMS was developed by officers of Fisheries Queensland to include a range of improvements, particularly with regards to target species categories. Revision of the PMS included a desktop study and expert consultation and collaboration through a workshop attended by representatives from Fisheries Queensland and Agri-Science ensuring that objectives were meaningful, defensible, precautionary and measureable against available data. The PMS was approved by the Managing Director and is a formal instrument for measuring the performance of this fishery.

The designated performance measures and the fishery's adherence to them are outlined below.

Table 3: Performance measures in the adult eel fishery.

Performance Measure	Performance
<i>Target Species</i>	
A. Total annual Queensland catch of adult eels exceeds the highest historical annual catch (1993~81 t).	A. <i>Not triggered</i> The highest historical annual catch was recorded in 1993 at 81 t. The annual catch of adult eels in 2010 was 22.6 t—72% below the highest historical catch.

Performance Measure	Performance
<i>Target Species</i>	
<p>B. Total annual Australian east coast catch of adult eels exceeds the highest historical Australian annual catch (1993~675 t).</p> <p>C. Annual Queensland CPUE for adult eels shows a continual decreasing trend for five consecutive years.</p>	<p>B. <i>Not triggered</i></p> <p>The total annual Australian east coast catch of adult eels in 2010 was 132 t—which did not exceed the highest historical annual Australian east coast catch of 675 t. In 2010, Queensland harvested 22.6 t, Tasmania harvested 33 t³, Victoria harvested 29.7 t and New South Wales harvested 46.7 t⁴.</p> <p>C. <i>Not triggered</i></p> <p>The CPUE in the adult eel fishery has remained relatively consistent over the last four years—no continual decline has is evident.</p>
<i>Bycatch Species</i>	
The review of the Queensland adult eel fishery ERA indicates any bycatch category requires a Level Two Productivity Susceptibility Analysis.	<p><i>Not measured</i></p> <p>The Queensland Eel Fishery Ecological Risk Assessment is due to be reviewed during 2011.</p>
<i>Protected Species</i>	
<p>A. The percentage of protected species released alive falls below 90%.</p> <p>B. The review of the Queensland adult eel fishery ERA indicates any protected species category requires a Level Two Productivity Susceptibility Analysis.</p>	<p>A. <i>Not triggered</i></p> <p>There were a total of 4412 protected species interactions during 2010, of which 4309 interactions resulted in the release of a live individual. The percentage of protected species released alive for 2010 was 98%.</p> <p>B. <i>Not measured</i></p> <p>The Queensland Eel Fishery Ecological Risk Assessment is due to be reviewed during 2011.</p>
<i>Social</i>	
Greater than 20% of active licences in the fishery are used to commit a Serious Fisheries Offence under the <i>Fisheries Act 1994</i> .	<p><i>Not measured</i></p> <p>During 2010, no commercial inspections were conducted in the adult eel fishery hence the indicator could not be measured.</p>

³ This figure is provisional. The Tasmanian Inland Fisheries Service is still waiting on a number of catch returns for the 2010 calendar year.

⁴ This figure is provisional. New South Wales Fisheries have a number of catch records overdue, incorrect or pending entry for the 2010 calendar year.

Table 4: Performance measures in the juvenile eel fishery.

Performance Measure	Performance
<i>Target species</i>	
<p>A. The proportion of nominated rivers fished exceeds the highest historical proportion of rivers fished (2002–05), for juvenile eels.</p> <p>B. Annual catch exceeds the highest previously recorded annual catch for juvenile eels.</p> <p>C. Annual CPUE per river of juvenile eels shows a continual decreasing trend for five consecutive years.</p>	<p>A. <i>Not triggered</i></p> <p>The highest historical proportion (2002-05) of nominated rivers fished is 24%; equivalent to five of the 21 nominated rivers. In 2010, four rivers were fished which equates to less than the historical proportion.</p> <p>B. <i>Not triggered</i></p> <p>In 2010, the total annual juvenile eel catch did not exceed the previously highest recorded annual catch of 581.9 kg. Due to confidentiality reasons the total annual juvenile eel catch for 2010 cannot be publically released.</p> <p>C. <i>Not triggered</i></p> <p>There has been no continual decrease in CPUE over five consecutive years for any of the rivers fished in the juvenile eel fishery.</p>
<i>Bycatch species</i>	
<p>The review of the Queensland juvenile eel fishery ERA indicates any bycatch category requires a Level Two Productivity Susceptibility Analysis.</p>	<p><i>Not measured</i></p> <p>The Queensland Eel Fishery Ecological Risk Assessment is due to be reviewed during 2011.</p>
<i>Protected Species</i>	
<p>A. Interactions with protected species show an increasing trend over three consecutive years.</p> <p>B. The review of the Queensland juvenile eel fishery ERA indicates any protected species category requires a Level Two Productivity Susceptibility Analysis.</p>	<p>A. <i>Not triggered</i></p> <p>There have been no reported interactions with protected species since the introduction of SOCI logbooks in 2006.</p> <p>B. <i>Not measured</i></p> <p>The Queensland Eel Fishery Ecological Risk Assessment is due to be reviewed during 2011.</p>
<i>Social</i>	
<p>Greater than 40% of active licences in the fishery are used to commit a Serious Fisheries Offence under the <i>Fisheries Act 1994</i>.</p>	<p><i>Not measured</i></p> <p>During 2010, no commercial inspections were conducted in juvenile eel fishery hence the indicator could not be measured.</p> <p>Compliance issues in the juvenile eel fishery were all assessed as low or negligible risk to the fishery. Therefore the Queensland Boating and Fisheries Patrol does not allocate resources to perform targeted enforcement in this fishery.</p>

Current sustainability status and concerns

The QEF is maintained through a multitude of precautionary management arrangements which are aimed towards maximising the probability that the Queensland eel resource will remain ecologically sustainable in the long term. Fisheries Queensland manages the adult eel fishery principally through extensive spatial closures (harvesting only in publicly owned and privately owned artificial impoundments). Trapping is excluded from natural waterways ensuring an appreciable proportion of the population are able to mature and migrate to spawn without being exposed to commercial fishing pressure. The adult eel component of the QEF is a closed fishery to new applicants with a limited number of active fishers; restricting the maximum effort level and therefore protecting resource availability. Similarly, harvesting of glass eels and elvers is only permitted in a small number of rivers/ estuaries (21 rivers which represents less than 10% of river systems in Queensland).

Anecdotal evidence and past research suggests that bycatch in both the adult and juvenile eel fishery is low. The gear utilised in the adult eel fishery is highly selective and observed bycatch in the juvenile eel fishery has been mostly limited to abundant and common species of glassfish (Gooley and Ingram 2002).

Fisheries Queensland has developed and implemented a stock status reporting framework⁵ which uses defined exploitation criteria to determine the status of a stock. In May 2011, a second stock status workshop was held to re-assess the Queensland east coast freshwater eel stock. From the information presented Fisheries Queensland and Agri-Science experts and representatives were able to re-assess the Queensland east coast freshwater eel stock—still considered to be ‘Sustainably Fished’ under the current management regime.

There is some concern about the effect of waterway barriers on eel migration. As part of Fisheries Queensland’s management of this issue, an economic cost-benefit analysis titled ‘Benefit-Cost Analysis for Proposed Juvenile Eel Recruitment Past Waterway Barriers’ (Maroske 2009) was employed to investigate the benefits associated with proposed juvenile eel

recruitment past waterway barriers. A trap-and-transport fish passage system was identified as the most appropriate method to facilitate juvenile eel recruitment upstream (in terms of efficient eel passage and cost effectiveness). The trap-and-transport juvenile eel passage system is a structure specific to the characteristics of migrating juvenile eels. Analysis of the trap-and-transport passage system revealed that the likelihood of the mechanism succeeding in improving juvenile recruitment upstream was dependent upon its design, which in turn was based on available resources. Overall, the analysis suggested that the high costs associated with building and maintaining an effective juvenile eel passage system would have to result in significantly increased eel recruitment for it to be an economically worthwhile initiative. Given the current lack of available resources and the total value of the fishery, the facilitation of trap-and-transport passage systems in the Queensland Eel Fishery is not considered economically feasible. It is therefore difficult to justify the facilitation of such systems in the Queensland Eel Fishery.

Research

Recent research and implications

Fisheries Queensland is not aware of any research specific to the QEF during the reporting year.

Collaborative research

There was no collaborative research in 2010.

Fishery management

Compliance report

During 2010, three inspections were conducted in the adult eel fishery; two of commercial collectors and one of an unattended apparatus. In addition, two unlawful, unattended eel traps were seized during the period for which no owner could be identified. No significant issues were identified by either industry or Fisheries Queensland.

Changes to management arrangements in the reporting year

No changes to management arrangements were made within the adult or juvenile eel fisheries in 2010.

⁵ A copy of the Stock Status Framework can be found at: http://www.dpi.qld.gov.au/28_16916.htm

Communication and education

Queensland East Coast Freshwater Turtle Identification Guide

In February 2011 Fisheries Queensland finalised a package for commercial fishers in the Queensland Eel Fishery containing a new Queensland East Coast Freshwater Turtle Identification Guide⁶, an updated Species of Conservation Interest (SOCI) Logbook and a red-eared slider turtle (invasive species) warning pamphlet. The package was developed in response to a recommendation from the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) to ensure the reporting of species specific interactions with species of conservation interest (SOCI), particularly freshwater turtles.

The Queensland East Coast Freshwater Turtle Identification Guide was developed in collaboration with the Department of Environment and Resource Management (DERM). The guide has been developed for use by commercial fishers operating in the QEF and as such contains only those freshwater turtle species which inhabit the area covered by the QEF. The guide contains a shell anatomy tool which details the various terminologies used to describe components of the plastron and carapace of a freshwater turtle; a dichotomous key by catchment which includes diagrams and explanations (with terms from the shell anatomy key) and a photo identification key showing examples of freshwater turtles at genus and species levels.

The combined use of the Queensland East Coast Freshwater Turtle Guide and updated SOCI logbook will enable QEF fishers to report freshwater turtle interactions by species. Fisheries Queensland endeavours to report species specific interactions in the 2012 QEF ASR.

Freshwater Fishery Review

In April 2011 Fisheries Queensland were given permission to begin a review of freshwater fishery management arrangements, including those relating to the commercial eel fishery. At the time of writing, a Freshwater Working Group was being formed to provide advice to the Department about issues in Queensland's freshwater fishery. The Freshwater Working Group will include representatives from commercial eel fishing,

conservation, recreational fishing, fish stocking and water management bodies amongst others.

Complementary management

As part of the outcomes of the Queensland Eel Fishery Performance Measurement System review conducted in January 2010, Fisheries Queensland engaged in discussions with New South Wales, Victoria and Tasmanian Fisheries representatives. Due to the panmictic nature of the longfin and southern shortfin eel species, Fisheries Queensland has drafted a performance measure which takes into consideration the total harvest of eels in all four Australian east coast states. The functional outcome of finalising this measure will mean that Fisheries Queensland will be required to engage in regular cross-jurisdictional communication with state fisheries representatives, which will aid in the identification and mitigation of issues regarding the sustainability of eel stocks and ensure that future management arrangements consider changes in the east coast eel population.

References

- Aoyama, J., Mochioka, N., Otake, T., Ishikawa, S., Kawakami, Y., Castle, P., Nishida, M. and Tsukamoto, K. 1999, *Distribution and dispersal of anguillid leptocephali in the western Pacific Ocean revealed by molecular analysis*. Marine Ecology-Progress Series, vol. 188, pp. 193-200.
- Beumer, J. P. 1992, *Eels: Biology, control, and culture*. Fisheries Information Leaflet QL92006. QLD Department of Primary Industries. Brisbane, Australia.
- Gooley, G. J. and Ingram, B. A. 2002, *Assessment of Eastern Australian Glass Eel Stocks and Associated Eel Aquaculture - Final Report FRDC Project No 97/312 (and No. 99/220)*.
- Gooley, G. J., McKinnon, L. J., Ingram, B. A., Larkin, B, Colins, R. O. and deSilva, S. S. 1999, *Assessment of juvenile eel resources in south eastern Australia and associated development of intensive eel farming for local production*. Final Report FRDC Project No. 94/067. Marine and Freshwater Resources Institute.
- Hoyle, S. D. and Jellyman, D. J. 2002, *Longfin eels need reserves: modelling the effects of commercial harvest on stocks of New Zealand eels*. Marine and Freshwater Research vol. 53 pp 887-895.
- Kang-Ning, S. and Wann-Nian, T. 2007, *Population Genetic Structure of the Year-Round Spawning Tropical Eel, Anguilla*

⁶ The Queensland East Coast Freshwater Turtle Identification Guide is available at: http://www.dpi.qld.gov.au/28_630.htm

reinhardtii, in *Australia*, Zoological Studies, vol. 46, no. 4, pp. 441-453.

Maroske, J. 2009, *Benefit-Cost Analysis for Proposed Juvenile Eel Recruitment Past Waterway Barriers* (unpublished). Queensland Primary Industries and Fisheries, DEEDI, Brisbane, Australia.

Moffatt, D. B. and Voller, J. K. 2002, *Fish and fish habitat of the Queensland Murray-Darling Basin*. Department of Primary Industries, Brisbane, 98pp.

Moore, A. 2008, *Pers. Comm - Conclusion of panmixia in long finned eels*. Email to Anita Ramage 19 August 2008, Brisbane.

Northcote, T. 1998, *Migratory behaviour of fish and its significance to movement through riverine fish passage facilities*, In *Fish Migration and Fish Bypasses*, eds M. Jungwirth, S. Schmutz and S. Weiss, Fishing News Books, Blackwell Science Publications Oxford, pp. 3-18.

Shiao, J. C., Tzeng, W. N., Collins, A. and Jellyman, D. J. 2001, *Dispersal pattern of glass eel stage of *Anguilla australis* revealed by otolith growth increments*. *Marine Ecology-Progress Series*, vol. 219, pp. 241-250.

Todd, P. R. 1980, *Size and age of migrating New Zealand freshwater eels (*Anguilla* spp.)*. *New Zealand Journal of Marine and Freshwater Research* vol. 14, no. 3, pp 283-293.

Zeller, B. M. and Beumer, J. P. 1995, *Eel harvesting and culture in Queensland: A discussion paper*. Information Series Q195021. Department of Primary Industries.

Information compiled by

Anna Garland

Acknowledgements

Bronwyn Fargher, Dr Malcolm Dunning and Jason McGilvray.

Image

Longfin eel (*Anguilla reinhardtii*)

