

Annual status report 2007

Queensland Eel Fishery



The Department of Primary Industries and Fisheries (DPI&F) seeks to maximise the economic potential of Queensland's primary industries on a sustainable basis.

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Introduction

The Queensland Eel Fishery (QEF) targets the longfin eel, *Anguilla reinhardtii*, and the shortfin eel, *Anguilla australis*, in rivers and freshwater impoundments. The QEF is unique in that the resource is harvested at two stages in the life cycle—the adult stage (length >30 cm) and the glass eel/elver stage (length <30 cm) for both species. Commercial adult-eel trappers collect adult eels from impounded waters¹; whereas commercial juvenile-eel 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.

This report covers the period January–December 2006.

Fishery profile 2006—Adult eel fishery

Total harvest from all sectors: approximately 17 t

Commercial harvest 2006: approximately 16 t

Recreational harvest 2005: negligible—30 individual freshwater eels reported as captured (24 released) in the 2005 Recreational Fishing Information System (RFISH) survey

Indigenous harvest 2000: negligible—869 eels reported as caught by Indigenous fishers in Queensland, in the National Recreational and Indigenous Fishing Survey (NRIFS)

Charter harvest 2006: none reported

Commercial Gross Value of Production (GVP): approximately \$160 000

Number of licences: 37 as of January 2007

Commercial fishers accessing the fishery: 17 during 2006

Fishery season: January–December

Fishery profile 2006—Juvenile eel fishery

Commercial harvest (weight) 2006: approximately 304 kg

Commercial harvest (number of individuals) 2006: approximately 2 286 228

Recreational harvest 2006: nil

Indigenous harvest 2000: nil

Charter harvest 2006: nil

Commercial Gross Value of Production (GVP) 2006: approximately \$335 000²

Number of licences: Twelve

Commercial fishers accessing the fishery: Six

Fishery season: January–December

¹ Impounded waters are defined in the Fisheries (Freshwater) Management Plan 1999.

² Production originated from the on-growing of juvenile eels captured in more than one fishing year.

Description of the fishery

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 codend 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 set-up are stipulated in the Fisheries (Freshwater) Management Plan 1999:

- The maximum size of an eel trap is 2.0 × 0.6 × 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 and 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 the authority number and full name of the authority holder.
- The tail of the codend must also be attached to a float or buoy of adequate size so that at least part of the codend floats at the surface to allow trapped animals access to surface air.

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 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 codend 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 codend 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

The longfin eel is distributed along the east Queensland coastline and is found throughout the eastern states of Australia. The abundance of longfin eel is greatest in Queensland and New South Wales. The shortfin eel is at its northern distribution limit in southern Queensland. The species is more abundant in southern Australian states such as New South Wales, Victoria and South Australia.

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 1). 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 publicly 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.

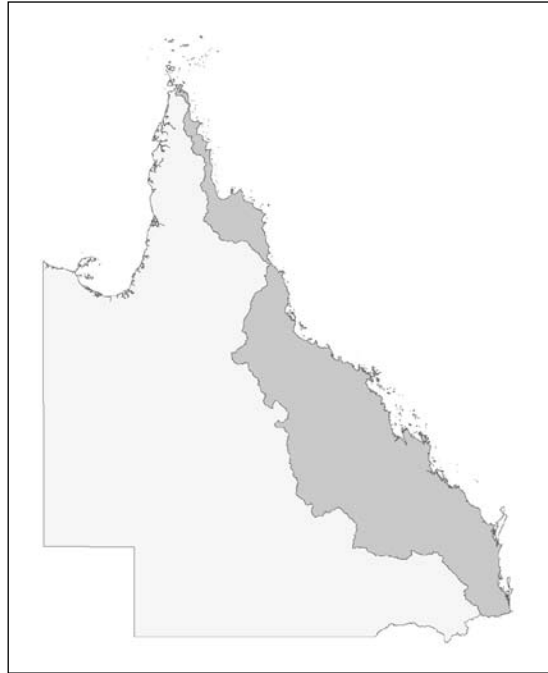


Figure 1: Area open to adult eel trapping.³

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 2). Within these basins, juveniles may only be collected at, or downstream of, the most downstream dam or weir⁴ 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.

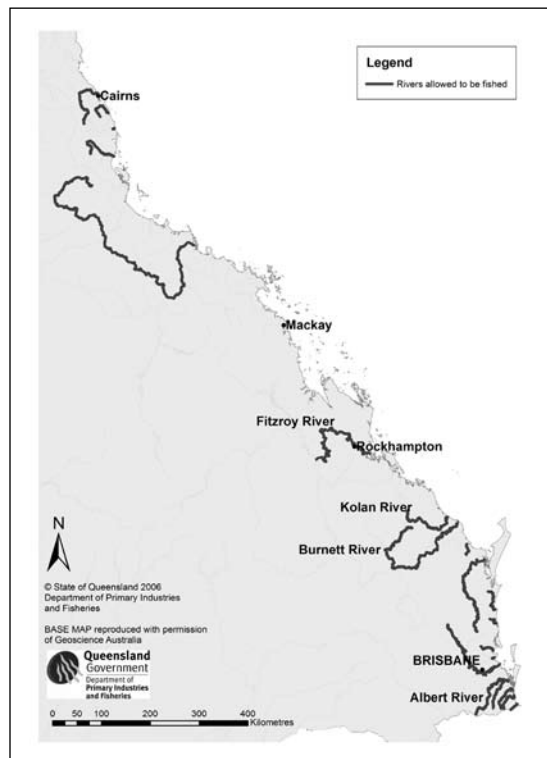


Figure 2: Map of permitted juvenile eel fishing rivers.

³ Within this area, trapping is only allowed in artificially created impoundments in those catchments listed on an eel Authority, for which a trapper has gained access from the landholder or water-controlling agency.

⁴ A tidal barrage is not considered a weir for the purpose of these conditions.

Main management methods used

The Department of Primary Industries and Fisheries (DPI&F) 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 Fisheries (Freshwater) Management Plan 1999, which is subordinate legislation to the Queensland *Fisheries Act 1994*. Fishing activity in this component of the fishery is also controlled by the Fisheries Regulation 1995.

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 39 authorised fishers and is closed to new applicants
 - the juvenile eel fishery is restricted to 12 authorities
- restrictions on the type and design of apparatus and number of each gear type that can be used (Figure 3)
- restrictions on the use of juvenile eels (may be sold to authorised aquaculture facilities within Australia only).

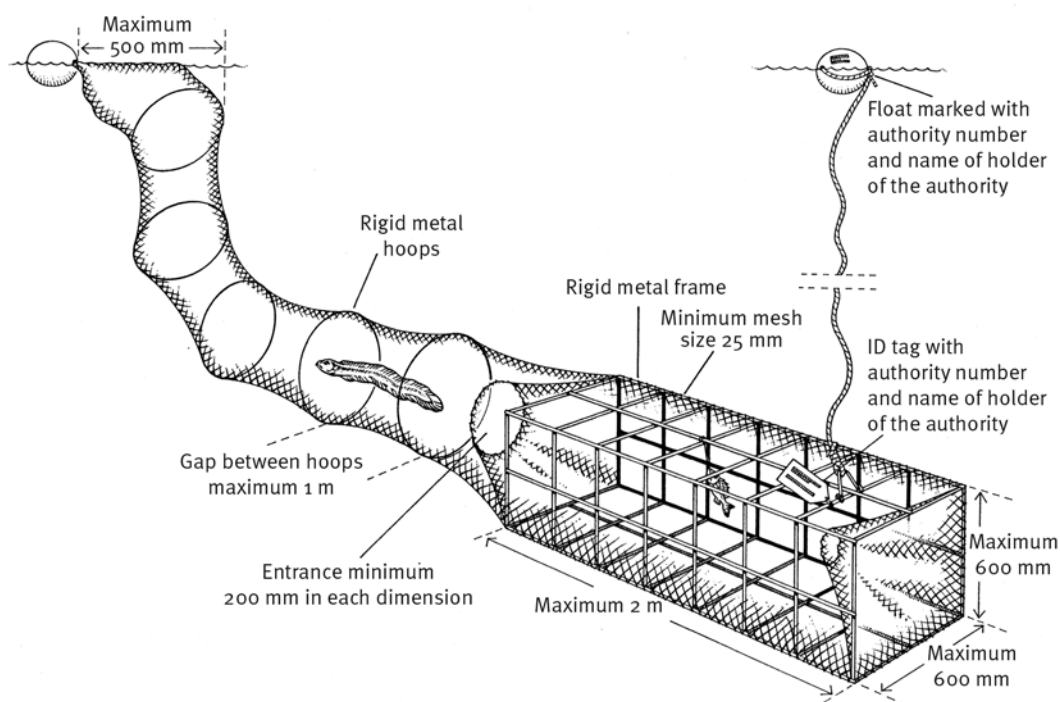


Figure 3: Eel trap used by adult eel trappers.

Approximate allocation between sectors

The Queensland eel fishery is predominately a commercial fishery. The recreational harvest of eel reported in the 2005 RFISH diary survey indicates six individual eels were retained and 24 released. Previous Indigenous⁵ surveys recorded negligible levels of adult eel harvest.

Fishery accreditation under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*

The Queensland eel fishery was granted a five-year exemption from the export requirements of part 13A of the Australian Government EPBC Act on 6 November 2004. The exemption expires 22 September 2009. The exemption acknowledges that the fishery is being managed in an ecologically sustainable manner and allows the export of eel harvested from Queensland waters.

Catch statistics

Commercial—Adult eel

Commercial catch data are maintained by DPI&F in the Commercial Fisheries Information System (CFISH) via compulsory monthly catch returns in the fishery logbooks.

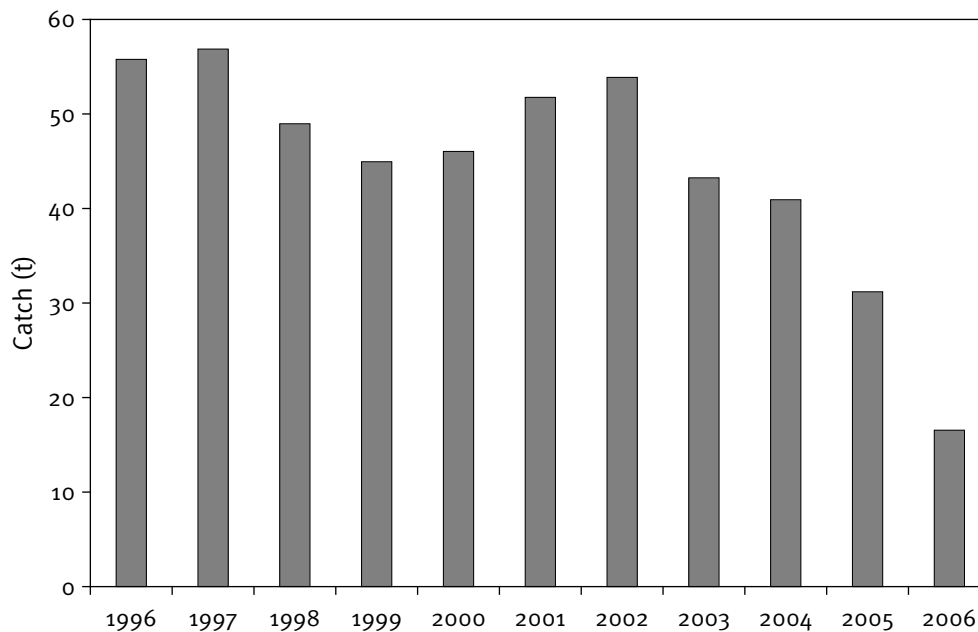


Figure 4: Queensland adult eel reported annual catch 1996–2006 (Source: DPI&F CFISH database. Data correct as at 18.01.2007).

Annual reported catch of adult eel declined from approximately 31 t in 2005 to 17 t in 2006 (Figure 4). There has also been a continuing decline in annual reported catch from the highest historical reported level seen in 2002.

⁵ GW Henry & JM Lyle, *The National Recreational and Indigenous Fishing Survey*, Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, ACT, Australia, 2003.

The decline in catch since 2002 has mirrored the number of days fished (Figure 5). Limits were placed on entering the fishery in 1999. Since then, the number of active operators has steadily declined as fishers retired from the industry and rescinded their licenses, which has led to a reduction in effort (days fished) in the fishery. Reduction in effort has also resulted from limitations on access to fishable waters brought on by drought conditions.

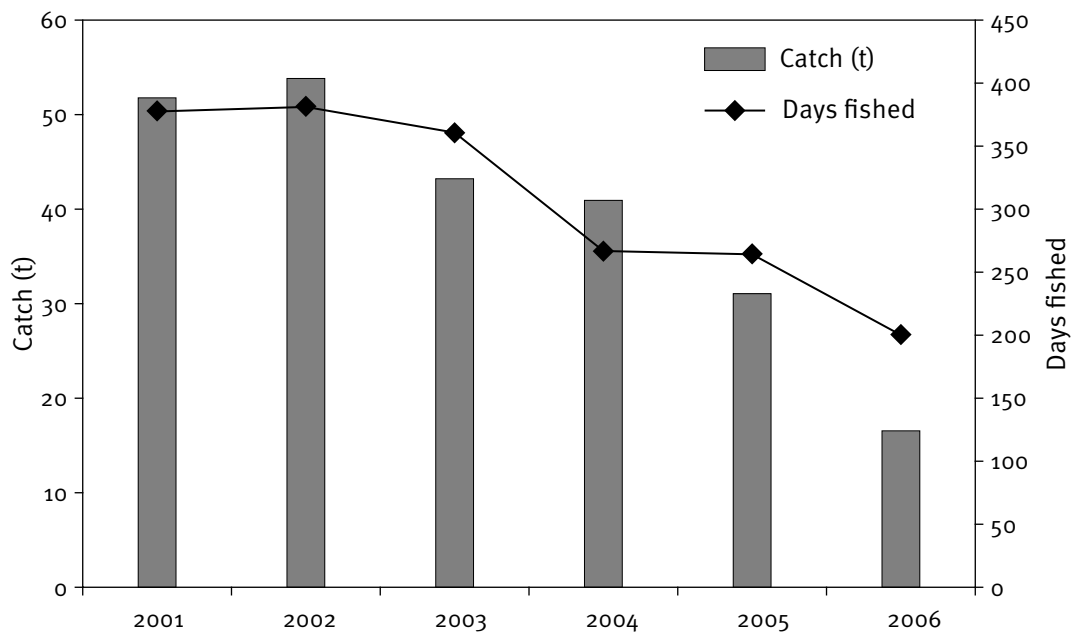


Figure 5: Queensland adult eel reported annual catch and days fished 2001–06 (Source: DPI&F CFISH database. Data correct as at 8.01.2008).

Recreational—adult eel

Negligible numbers of freshwater eels are retained by the recreational sector. The RFISH 2005 diary survey indicates that approximately six individual freshwater eels were retained and 24 released. These data are substantially less than those estimated in the NRIFS in 2001 (7766 ± 2728). The NRIFS estimated recreational catch of eels is an estimate of all eel species harvested in Queensland, including *Conger* spp. (saltwater) in addition to the *Anguilla* species targeted by the commercial fishery.

Indigenous—adult eel

Indigenous community fishing activity was analysed for Queensland as part of the NRIFS⁶ conducted in 2000. In Queensland, 869 eels were reported as being taken by Indigenous fishers. These eels would have included other marine and estuarine species (e.g. *Conger* spp.) in addition to the *Anguilla* species targeted by the commercial fishery.

Commercial—juvenile eel

Annual reported catch of juvenile eels increased from approximately 214 kg in 2005 to approximately 304 kg in 2006 (Table 1, Figure 6). The catch of juvenile eels has fluctuated greatly since 1996, with total reported annual catches between 0.9 kg and 304 kg (Figure 6).

6 *ibid.*

Table 1: Fishery details for the commercial harvest of juvenile eels 1996–2006 (Source: DPI&F CFISH database. Data correct as at 8.01.2008).

Year	Days fished	Catch (numbers)	Catch (kg)
1996	10	6965	0.90
1997	196	1 024 890	131.30
1998	202	506 712	76.20
1999	145	211 731	32.10
2000	49	95 776	13.30
2001	22	60 980	8.70
2002	9	252 980	38.80
2003	172	985 295	205.00
2004	172	679 225	141.30
2005	228	1 323 968	214.20
2006	389	2 286 228	304.30

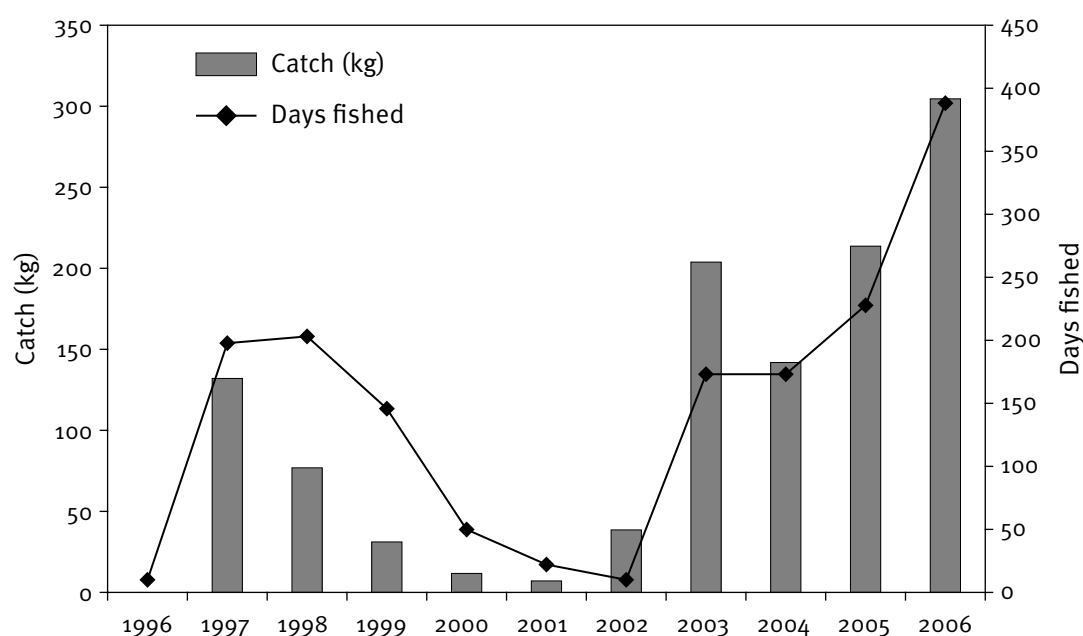


Figure 6: Total reported commercial catch (kg) and effort (days fished) in the Juvenile Eel Fishery 1996–2006 (Source: DPI&F CFISH database. Data correct as at 8.01.2008).

Fluctuations in annual catches of juvenile eels are expected due to the temporal nature of the fishery. Seasonal, weather and tidal cycles impose natural restrictions and significant variation in both catch and fishing effort.

The number of approval holders remained at 12 operators—of these six were active in the 2006 fishing season. The increase in effort expended in the fishery reported from 2002–06 may be due to several factors, including the market opening up to interstate sale, an increase in demand from aquaculture farms for on-growing and an increase in market demand from Asia, where the majority of the produce is exported live.

Spatial issues/trends

The collection of juvenile eels is concentrated at specific river locations that favour collection (such as waterway barriers). In 2006 juvenile eels were harvested from five of the 21 rivers where collection is permitted, namely the Albert, Burnett, Fitzroy, Kolan and Mary Rivers.

During 2006, most of the fishing effort in the juvenile eel fishery was expended in the Burnett and Kolan rivers.

Juvenile eels were also reported as being caught in the Gregory River, which is not one of the rivers permitted for juvenile eel collection. The Gregory River joins the Burrum River downstream of the most downstream weir on the Burrum. The license holder responsible for fishing the Gregory was consulted and it is apparent that they believed they were fishing in waters allowable under the *Juvenile Eel Policy*. The license holder has been informed of their mistake to prevent future recurrences.

Socio-economic characteristics and trends

The majority of eels, including wild-caught adult eels and juvenile eels grown on farms to export size, are exported live to Asia. In 2006, prices ranged from \$10/kg to \$10.50/kg for adults and \$13/kg to \$16/kg for grow-out juveniles. Prices have remained fairly stable in recent years.

Fishery performance

The adult eel fishery operates within impounded waters and as such the potential impact of the fishery on natural waterways is minimised. Seventeen licence holders fished in the 2006 season, which is a result of the limits which were placed on entry into the fishery in 1999. Since 1999, the number of active operators has declined, which has resulted in reduced effort and subsequently reduced reported annual catch.

The juvenile eel fishery operates at a very small scale, with six active operators in the 2006 season. In 2006 the number of days fished—along with the total reported catch—increased from 2005 (Figure 6). This may be a result of favourable weather, tidal and market cycles and an increase in the number of fishers actively participating in the fishery (five fishers in 2005, six in 2006). Catch in the juvenile eel fishery generally fluctuates due to the temporal nature of the fishery.

Anecdotal evidence and past research suggests that bycatch in both the adult and juvenile eel fisheries is low. The gear used 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 glassfish⁷. A Species of Conservation Interest (SOI) logbook was implemented in both the juvenile and adult eel fisheries in November 2006 and the resulting data are discussed in the Interactions with protected species section of this annual status report.

In 2006, an ecological risk assessment (ERA) was undertaken for the fishery and, subsequently, a performance measurement system (PMS) was developed to ensure the fishery continues to be managed in an ecologically sustainable manner. The outcomes of the ERA and PMS are included in later sections within this annual status report.

Progress in implementing Department of the Environment, Water, Heritage and the Arts (DEWHA) recommendations

During its assessment of the fishery in 2004, DEWHA made a range of recommendations to DPI&F in order to address any perceived risks or uncertainties. Further details of the progress DPI&F has made in implementing each of these recommendations are provided in Table 2 overleaf.

⁷ GJ Gooley & BA Ingram, *Assessment of Eastern Australian Glass Eel Stocks and Associated Eel Aquaculture*, Final Report FRDC Project No. 97/312 (and No. 99/220), 2002.

Table 2: Implementation of recommendations.

Recommendation	Progress	Improvements to management regime
DPI&F to inform DEWHA of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on bycatch, protected species or the ecosystem.	<i>Ongoing</i> No changes were made to management arrangements during the reporting period.	N/A
By the end of 2006, DPI&F to revise fishery specific objectives for the adult and juvenile eel fisheries to ensure that they specifically recognise the need to manage impacts on bycatch, protected species and the ecosystem. DPI&F to also develop performance indicators and performance measures for target, bycatch, protected species and impacts on the ecosystem.	<i>Complete</i> The Queensland Eel Fishery Performance Measurement System (PMS) has been adopted in the fishery following submission to DEWHA in February 2007. Reporting against the performance measures can be found in the Management Performance section in this report.	The PMS is a key component of any enhanced management arrangements for the eel fishery, as it provides a set of transparent and verifiable measures against which DPI&F can assess and report on the performance of the fishery. The PMS also provides a measurably sustainable basis for the ongoing operation of the fishery.
DPI&F to monitor the status of the adult and juvenile fisheries in relation to the performance measures once developed. Within 3 months of becoming aware of a performance measure not being met, DPI&F to finalise a clear timetable for the implementation of appropriate management responses.	<i>Ongoing</i> Reporting against the performance measures follows in the Management performance section in this annual status report. Four performance measures were triggered during the 2006 calendar year. Descriptions of each of the trigger events can be found in the Management performance section of this document.	This is the first year in which the newly developed Queensland Eel Fishery Performance Measurement System objectives have been reported against. As part of DPI&F's commitment to sustainable fisheries management, performance of the fishery against the identified objectives will be analysed and reported publicly on an annual basis. A timetable for the implementation of appropriate management responses arising from the performance measure triggers will be developed within three months.
DPI&F to conduct a risk assessment of compliance and enforcement activities in the adult and juvenile eel fisheries. Outcomes of the risk assessment will be used to develop a compliance and enforcement strategy for the fisheries, including a timetable for the implementation of key components of the strategy.	<i>Ongoing</i> Queensland Boating and Fishing Patrol (QBFP) are coordinating compliance risk assessments and strategy development across all Queensland fisheries. The Queensland eel fishery was completed in March 2007. Detailed strategies to address the risks identified by this assessment will be developed through the QBFP strategic and operational planning processes that are reviewed annually.	A compliance risk assessment is used by QBFP in undertaking operational planning activities associated with management of the fishery. Through identification and prioritisation of compliance risks associated with the fishery, planning and operational processes at the district level may be improved and risks mitigated.
From 2005, DPI&F to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure once developed.	<i>Ongoing</i> This annual status report is the third to be completed for the Queensland Eel Fishery.	DPI&F has an ongoing commitment to publicly reporting on the fishery every year.

Recommendation	Progress	Improvements to management regime
DPI&F to undertake fishery independent monitoring of representative impounded rivers on an annual basis to enable trends in adult eel abundance indicative of any declining recruitment to be identified.	<i>Ongoing</i> Fishery independent monitoring continues annually through the Long Term Monitoring Program (LTMP).	The Monitoring programs and results section of this document reports trends in adult eel abundance between 2000 and 2006 as reported by the LTMP.
DPI&F to develop and implement sustainability indices for eel stocks within 3 years to ensure some assessment of the proportion of adult eels that can be sustainably harvested is conducted on an annual basis. The annual assessment of the adult eel resource will incorporate assessment of the impacts of environmental variability, where possible.	<i>Ongoing</i> The DPI&F and the Fisheries Research and Development Corporation (FRDC) project 1998/128, <i>Biological data and model development for management of longfin eel fisheries</i> , showed that fishery independent CPUE data obtained from LTMP surveys was suitable to use as an index of abundance of adult eels and as a sustainability indicator.	LTMP surveys are currently conducted annually.
In the event that the current genetic study on Longfin Eels reveals that eel stocks harvested in the fishery are not panmictic, DPI&F will investigate alternative management arrangements with a view to implementing management measures that ensure that catchment fidelity is adequately taken into account. A program for the collection of fishery dependent and independent data to inform management will also be investigated.	<i>Ongoing</i> Postgraduate research is underway at Southern Cross University in NSW into the genetic population structure of longfin eels. A recently published journal paper has found genetic trends which suggest panmixia within juvenile eel populations along Australia's east coast. Discussion of the article can be found in the Recent research and implications section of this document. Fishery dependent data continues to be collected through compulsory monthly log books. Fishery independent monitoring continues annually through the LTMP. Analysis of trends in adult eel abundance from 1999–2006 is included in the Research and monitoring section of this report.	N/A
DPI&F to conduct a cost-benefit analysis on methods to facilitate juvenile eel recruitment upstream past waterway barriers. If an appropriate mechanism is identified, DPI&F to implement the mechanism and/or encourage relevant authorities to put in place measures to facilitate ongoing juvenile eel recruitment past waterway barriers.	<i>Started</i> A literature search and preliminary discussions have begun.	N/A

Recommendation	Progress	Improvements to management regime
Within three years, DPI&F to undertake a risk analysis of the bycatch species, including protected species, taken in the fishery to identify those species vulnerable to fishing. Management measures to mitigate threats to any species found to be at high risk from fishing operations should be developed and implemented in a timely manner.	<i>Complete</i> An ecological risk assessment (ERA) of the Queensland Eel Fishery was undertaken in September 2006. The ERA was submitted to DEWHA in July 2007.	Completion of an ERA is one of many aspects of DPI&F's commitment to progress sustainable fisheries management. The ERA showed that risk posed to bycatch and protected species by the fishery is negligible to minor.
DPI&F to implement the Species of Conservation Interest logbook in the adult and juvenile eel fisheries within 12 months to enable ongoing recording and monitoring of protected species interactions.	<i>Complete</i> A Species of Conservation Interest (SOCl) logbook for both the adult and juvenile components of the Queensland Eel Fishery was implemented in November 2006. Results for the 2006 calendar year are reported in the relevant section of this report.	DPI&F and the Queensland fishing industry are committed to minimising the impacts of fishing on protected species. SOCl logbooks will enable DPI&F to monitor and mitigate interactions with Queensland's protected species, which will further support DPI&F's commitment to sustainable fisheries management.

Management performance

DPI&F applied the Queensland Eel Fishery Performance Measurement System (PMS) to the adult and juvenile eel fisheries following submission to DEWHA in February 2007. The PMS was developed in consultation with representatives from the commercial fishing sector, other fishery stakeholders, fishery managers, researchers, and assessment and monitoring staff to ensure that objectives were meaningful, defensible, precautionary and measurable against available data. The performance measurement system was approved by a delegate of the chief executive and is a formal instrument for measuring the performance of this fishery.

The designated performance measures and the fishery's adherence to them is outlined below in Table 3.

Table 3: Performance measures in the juvenile and adult eel fisheries.

Element of eel fishery	Performance measure	Measured	Performance
Juvenile eels	The proportion of nominated rivers fished exceeds the highest historical proportion of rivers fished (2002-05), for both elvers and glass eels.	<i>Measured</i>	<i>Triggered</i> Prior to 2006 the highest historical proportion of nominated rivers fished was 24%, equivalent to five of the 21 nominated rivers, (in 2004). In 2006, six rivers were fished (including one non-permitted river) exceeding the highest historical proportion by 5%.

Element of eel fishery	Performance measure	Measured	Performance
Juvenile eels	Annual catch exceeds the highest historical annual catch (2002–05), for both elvers and glass eels.	<i>Measured</i>	<i>Triggered</i> In 2006, there was an increase of 90 kg (estimated at 962 260 eels) in the reported annual catch in the juvenile eel fishery compared with the highest historical annual catch (Table 1).
Juvenile eels	Annual effort per river shows a continual increasing or decreasing trend for three consecutive years, for both elvers and glass eels.	<i>Measured</i>	<i>Triggered</i> The annual effort expended in the Albert river has shown a continual decreasing trend from 2004-2006 in the juvenile eel fishery.
Juvenile eels	The risk ranking assigned to bycatch species issues in the ERA process increased from the previous assessment of the juvenile eel fishery.	<i>Not measured</i>	The ERA was finalised in July 2007. It is proposed that the ERA be reviewed every three years.
Juvenile eels	Interactions with threatened, endangered or protected species (TEP species) show an increasing trend over three years in the juvenile eel fishery.	<i>Not measured</i>	SOCI logbooks were adopted in the juvenile eel fishery in November 2006. There is not yet any historical information with which to compare reported interactions, although there were no reported interactions with TEP species in the juvenile eel fishery during December 2006.
Juvenile eels	The risk ranking assigned to TEP species issues in the ERA process increased from the previous assessment of the juvenile eel fishery.	<i>Not measured</i>	The ERA was finalised in July 2007. It is proposed that the ERA be reviewed every three years.
Juvenile eels	For each river monitored in the LTMP Freshwater Surveys (east coast only) in which the juvenile eel fishery operates there is a consistent decreasing trend in the number of fish species recorded annually in the LTMP over a three year period.	<i>Measured</i>	<i>Not triggered.</i> The rivers monitored by LTMP that are also accessed by the juvenile eel fishery are: the Albert, Logan, Johnstone, Mary and Noosa rivers. Over the past three years there has <i>not</i> been a consistent decreasing trend in the number of fish species recorded annually across the five rivers. ⁸
Adult eels	Total annual catch of adult eels exceeds the highest reported historical annual catch (from 1996 to 2005).	<i>Measured</i>	<i>Not triggered</i> Figure 4 in this document demonstrates that annual catch of adult eels in 2006 remained below the highest reported historical annual catch.
Adult eels	Annual effort in the adult eel fishery shows a continual decreasing trend for three consecutive years.	<i>Measured</i>	<i>Triggered</i> Annual effort (days fished) has decreased continually for the past three years, with 267, 263 and 200 days fished in 2004, 2005 and 2006 respectively.

⁸ WL Hagedoorn & DG Smallwood, *Fisheries Long Term Monitoring Program—Summary of freshwater survey results: 2000–2005*, Department of Primary Industries and Fisheries, Brisbane, Australia, 2007.

Element of eel fishery	Performance Measure	Measured	Performance
Adult eels	The risk ranking assigned to bycatch species issues in the ERA process increased from the previous assessment of the adult eel fishery.	<i>Not measured</i>	The ERA was finalised in July 2007. It is proposed that the ERA be reviewed every three years.
Adult eels	Interactions with TEP species show an increasing trend over three years in the adult eel fishery.	<i>Not measured</i>	SOCI log books were introduced in November 2006. Therefore there is not yet any historical information with which to compare reported interactions.
Adult eels	A risk ranking for TEP species in the ERA increases from the previous assessment of the adult eel fishery.	<i>Not measured</i>	The ERA was finalised in July 2007. It is proposed that the ERA be reviewed every three years.

DPI&F became aware of four trigger events in January 2008. Within three months of becoming aware that a review event has been triggered, DPI&F is required to finalise a clear timetable for implementation of appropriate management responses. This process is currently underway and will be reported on in the 2008 annual status report.

Resource concerns

There is some concern about the effect of waterway barriers on eel migration. Glass eels have been known to enter fishways but they are yet to be recorded successfully negotiating the fish passage devices currently in operation in Queensland. Larger eels are more likely to be able to negotiate fishways. As part of DPI&F's management of this issue, a cost–benefit analysis of the possible solutions to this issue will be undertaken.

Ecosystem

Non-retained species/bycatch

There are no by-product species taken in the Queensland Eel Fishery 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.

Restrictions on the apparatus permitted for juvenile collection and the locations from which they can be harvested reduce the potential impact on bycatch. Previous research on juvenile eels found that bycatch over a three year period consisted of 40 species, comprised of five crustacean and 35 fish species in the Albert River⁹. In general, the majority of bycatch, in terms of quantity and diversity comprised small abundant and common species, such as glassfish (*Ambassis* spp.). These data along with anecdotal evidence from fishers indicate that the juvenile eel fishery has a low level of bycatch.

⁹ GJ Gooley & BA Ingram *Assessment of Eastern Australian Glass Eel Stocks and Associated Eel Aquaculture*, Final Report FRDC Project No. 97/312 (and No. 99/220), 2002.

Interactions with protected species

A Species of Conservation Interest (SOCl) logbook was adopted within both the adult and juvenile eel fisheries in November 2006 to facilitate reporting of any interactions with protected species.

Adult eel fishery

There were a large number of interactions with freshwater turtles reported when the SOCl logbook was introduced at the end of 2006. In the 28 days of fishing effort expended between the introduction of the SOCl logbooks in November 2006 and the end of the fishing season in 2006, there were 988 interactions with freshwater turtles. Of these, 96% of the freshwater turtles were released alive. During this time there was one interaction with a platypus that was also released alive (Table 4).

The vast majority (88%) of the interactions with fresh water turtles occurred in the Herbert catchment in North Queensland. Efforts will be made in 2008 to investigate alternative designs of adult eel traps, with the aim of reducing interactions with SOCl.

Freshwater turtle interactions as listed in Table 4 refer to species regarded as common (longneck and shortneck) under the *Nature Conservation Act 1992*. Turtle species listed as endangered, vulnerable or rare under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) do not occur in the limited area of the adult eel fishery (dams) as they are either cloacal breathers (which do not live in dams), or do not occur within the geographic range of the fishery.¹⁰

Table 4: Interactions with species of conservation interest reported during November–December 2006.

Common name	Numbers released alive	Numbers released dead	Total number of interactions
Freshwater turtle	948	40	988
Platypus	1	0	1

Juvenile eel fishery

Within the juvenile eel fishery, there was no fishing between the introduction of the SOCl logbooks and the end of the calendar year. Hence there were no interactions with species protected under the EPBC Act.

Fishery impacts on the ecosystem

The impact of the eel fishery on the ecosystem is considered to be low. The apparatus used is considered to have only a 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 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 a negligible impact on the ecosystems of natural waterways.

¹⁰ F Hill, *Ecological Risk Assessment of the Queensland Eel Fishery*, Queensland Department of Primary Industries and Fisheries, Brisbane, Australia, 2007.

Other ecosystem impacts

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, the hydrology of the river and species-specific features, such as swimming capacities and timing of migration.¹¹ 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.

Research and monitoring

Recent research and implications

No recent research has been undertaken by DPI&F in the Queensland Eel Fishery since DPI&F–FRDC project 1998/128 completed in 2004.

A recently published study suggests possible panmixia in juvenile eel populations.¹² The study found that there were no significant variances in genes from juvenile eel samples along the east coast of Australia. However, advice from an expert geneticist within DPI&F¹³ suggests that the level of resolution inherent in the study methods could have resulted in a lack of detection of subtle genetic differences between populations.

These findings have implications for co-management of eel populations along the east coast of Australia. It also further supports the extrapolation of LTMP stock monitoring/assessments across Queensland's river basins.

Monitoring programs and results

Long Term Monitoring Program

The freshwater LTMP objective is to monitor population changes of key recreational and commercial species as well as changes in species diversity, water quality and habitat conditions in freshwater river systems.

Figure 7 maps the river systems that are surveyed. River systems were chosen for a variety of reasons:

- They are subject to considerable recreational angling pressure.
- They support commercial fisheries in adjacent coastal/estuarine areas.
- They are likely to experience changes in the near future (e.g. Fishway installation).
- They have a history of monitoring established sites.

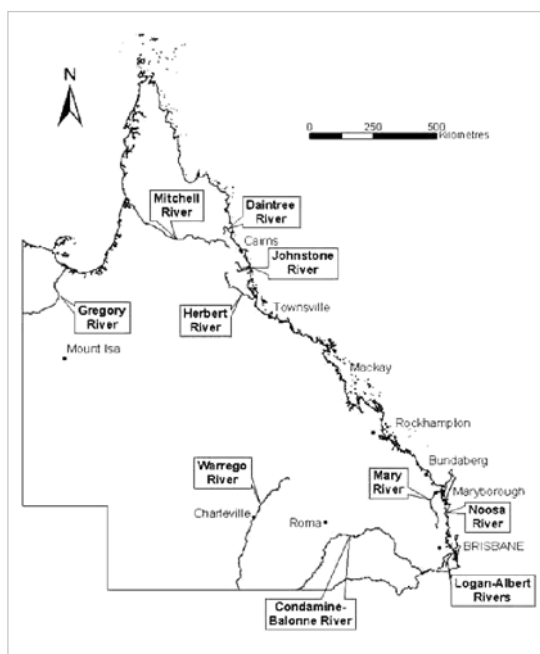


Figure 7: Map of river systems monitored in the Freshwater LTMP.

11 TG Northcote, 'Migratory behaviour of fish and its significance to movement through riverine fish passage facilities', in: M Jungwirth, S Schmutz & S Weiss (eds) *Fish Migration and Fish Bypasses*, Fishing News Books, Blackwell Science Publications, Oxford, 1998, pp. 3–18.

12 S Kang-Ning & T Wann-Nian, 'Population genetic structure of the year-round spawning tropical eel, *Anguilla reinhardtii*, in Australia', *Zoological Studies*, vol 46(4), 2007, pp 441–453.

13 D Broderick (Department of Primary Industries and Fisheries), email, December 2007.

Seven reaches are surveyed annually within each river. Reaches are monitored through boat-mounted electrofishing. Six 50 m shots are randomly chosen within each reach and electrofished for five minutes. Voltage and gain are adjusted to stun fish without damaging them. Stunned fish are netted from the water and placed in an aerated tank. All species caught during the survey are counted and released live back into the water. Length is recorded for important recreational, commercial and noxious species (excluding *Gambusia*) prior to their release.

Table 5 reports LTMP longfin eel catch for surveys undertaken over 2000–06. A joint DPI&F and FRDC report¹⁴ undertook an analysis of the LTMP data between 2000 and 2004. The report found that fishery independent catch per unit effort (CPUE) data obtained from the LTMP are suitable for evaluating trends in eel stocks in rivers and can be used to generate an index of abundance for legal sized (adult) longfin eel stocks.

Table 5: LTMP catch data for longfin eel 2000–06.

River	Average catch (number of fish per 30 min. 'on time' electrofishing)						
	2000	2001	2002	2003	2004	2005	2006
Albert–Logan	2.6	2.8	1.5	1.0	2.8	2.5	2.3
Noosa	1.4	1.4	1.6	1.0	2.0	1.3	0.4
Mary	3.0	4.7	3.5	2.5	2.8	6.6	5.0
Herbert	8.9	7.0	5.5	2.9	13.5	4.0	14.7
Johnstone	4.4	3.5	6.0	3.5	6.3	4.3	5.1
Daintree	13.3	10.7	8.8	2.9	10.1	5.8	8.3

The variability in catch trends over the years reported in Table 5 may be due to multiple factors external to fishing pressure, such as natural fluctuations in eel populations and environmental factors (drought, etc).

Collaborative research

No further collaborative research has been undertaken since the completion of the DPI&F–FRDC project *Biological data and model development for management of longfin eel fisheries* in 2005 (reported on in the 2005 annual status report). The project results supported DPI&F's assertion that the management arrangements in place for the Queensland Eel Fishery are conservative and the best option for ensuring the sustainability of the fishery.

Fishery management

Compliance report

Compliance and enforcement in the Queensland Eel Fishery is the responsibility of the DPI&F Queensland Boating and Fisheries Patrol (QBFP).

During 2006, three units were inspected in the Queensland Eel Fishery. One Fisheries Infringement Notice was issued for failing to mark apparatus in the prescribed way and one commercial eel fisher was successfully prosecuted for unlawful take of eels from an unauthorised area and failing to mark apparatus in the prescribed way.

A compliance risk assessment was conducted for this fishery in March 2007 in order to

¹⁴ SD Hoyle, MJ Hutchison, MJ Sellin, D Peel, D Mayer and WD Sumpton, *Biological data and model development for management of longfinned eels*, Fisheries Research and Development Corporation (Australia) and the Department of Primary Industries & Fisheries, Brisbane, Australia, 2005.

determine compliance priorities and allow the most effective use of QBFP resources. The assessment identified the following activities in the Queensland Eel Fishery as having a high or extreme level of risk. The Queensland Boating and Fisheries Patrol will therefore direct their compliance resources to addressing:

- taking eels from waters other than those permitted in the authority (adult eel fishery)
- use of unauthorised gear in the commercial adult eel fishery (e.g. type, number).

Detailed strategies to address the risks identified by this assessment will be developed through the QBFP strategic and operational planning processes that are reviewed annually.

Changes to management arrangements in the reporting year

No changes to management arrangements were made within the adult or the juvenile eel fisheries in 2007.

Complementary management

Formal discussions with New South Wales and Victorian fisheries agencies in regards to complementary management have not yet occurred. However, officers from different jurisdictions regularly participate in informal contact.

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Image

Longfin eel—*Anguilla reinhardtii*

