

# **Tasmanian Freshwater Eel Fishery**

---

**Application to the Department of the  
Environment, Water, Heritage and Arts for the  
re-assessment of the Tasmanian Freshwater Eel  
Fishery.**

---

**August 2009**

**Submitted by the Inland Fisheries Service  
Tasmania**

# Application to the Department of the Environment, Water, Heritage and Arts for the re-assessment of the Tasmanian Freshwater Eel Fishery.

July 2009

## 1. Description of the fishery

### a. Background

The Tasmanian Freshwater Eel Fishery is a small fishery based on two species of anguillid eels; short-finned eel (*Anguilla australis*) and the long-finned eel (*Anguilla reinhardtii*). The fishery commenced in 1965 and subsequent expansion has been relatively slow. At present the fishery remains small with growth and development in the wild harvest component constrained by environmental influences in recent years. The fishery is focused on “brown” feeding eels harvested in inland waters with migrating spawning “silver” eels generally comprising a minor part of the overall harvest. There has been periodic interest in eel culture using Tasmanian glass eels/elvers from Tasmanian, interstate and overseas entities. This interest has led to aquaculture trials but this has not progressed into the development of significant commercial production.

The fishery is managed by geographically defined commercial fishing licences. The fishery is subject to closed catchments, significant protection of juvenile eels (glass eels and elvers)/migrating silver eels and gear restrictions.

The Tasmanian Freshwater Eel fishery was initially assessed by the then Department of Environment and Heritage against the guidelines for the ecological sustainable management of fisheries in 2003 and the fishery was subsequently declared as an approved Wildlife Trade Operation (WTO), under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)*. This declaration allowed the export of product from the fishery under permit for the next five years. The approval expires in November 2009.

This report updates the Department of Environment, Water, Heritage and the Arts (DEWHA) on changes to the Tasmanian Freshwater Eel Fishery, to enable re-assessment of the fishery against the Guidelines for the Ecologically Sustainable Management of Fisheries required for another export permit.

This report should be read in conjunction with the initial agency submission - (<http://www.environment.gov.au/coasts/fisheries/tas/freshwater-eel/pubs/freshwater-eel-submission.pdf>) and the subsequent DEWHA assessment (<http://www.environment.gov.au/coasts/fisheries/tas/freshwater-eel/pubs/freshwater-eel-assessment.pdf>).

## b. Fishery Overview

The commercial freshwater eel fishery in Tasmania commenced in the mid-1960's based on two species of freshwater eels; short-finned eel (*Anguilla australis*) and the long-finned eel (*Anguilla reinhardtii*). The short-finned eel is distributed around South East Australia, some South Pacific islands and New Zealand. In Australia, this eel is more abundant in Victoria and Tasmania and abundance recedes northwards in New South Wales and Queensland. The distribution of long finned eels is similar except that the pattern of abundance is reversed. This eel is more common in Queensland and New South Wales and decreases further south in Victoria and Tasmania. This eel is also found in the northern parts of the Northern Island of New Zealand and is only a minor component of the New Zealand eel fishery (Jellyman 2007).

In Tasmania, the commercial eel fishing activity and harvests are focussed on the short-finned eels. Long finned eels have historically only comprised on average less than 1.5% in harvest biomass. Although in 1988/89 this proportion reached 9% of total harvest. The fishery is a limited licence managed fishery based on waters allocated within large scale catchments. Prior to 1995/96 licences were issued generally on an individual water basis. Twelve eel fishing licences presently exist and this number has remained constant since the change to a catchment defined licensing system in 1995. The twelfth licence was created in 1997/98.

A management plan does not exist for the fishery. Management has evolved slowly since commencement of the fishery and the Service has shaped management adaptively in response to arising issues. This approach has been measured and satisfactory for the fishery given the small size of the fishery and it's slow rate of development and growth.

The commercial fishery is based on the harvest of adult eels. Commercial harvesting by licensees is restricted to eels larger than 300 mm in length. Two other stages of their life cycle have been subject to exploitation by the Service – glass eels and elvers. The harvest of glass eels has only been conducted within a research context to specifically define the extent of the resource. The Service routinely undertakes harvesting of elvers for the provision of environmental stock, re-stock in Tasmania and South-East Australia and export. These harvests are conducted at two locations in two rivers at sites around or above the tidal influence. The harvest sites are situated below a dam (Lake Meadowbank –Derwent River) and at a trailrace (Trevallyn Power Station - Tamar River). Meadowbank Dam creates an obstacle for the passage of elvers whilst the Trevallyn tailrace creates conditions for a mass aggregation of elvers. The elvers at these sites are unable to complete natural migrations further into the catchments and thus are harvested. These are used for a variety of purposes (see above) including replenishment of eel stocks above barriers. These harvests are not expected to have a negative impact on the sustainability of the eel resource. Boxall (2203) provides further advice supporting the use of these elvers.

The harvesting of juvenile eels (glass eels and elvers) or eels less than 300 mm in length by commercial fishers is prohibited. Several short-term permits have been issued under the *Inland Fisheries Act 1995* for exploratory purposes or research on glass eels and elvers for re-stock and culture purposes.

The Service provides elver stock for aquaculture, re-stocking and environmental purposes. A limited allocation of elver re-stock is supplied free of charge to Tasmanian licensed eel fishers to supplement waters. Requests greater than this allocation are generally available on a commercial basis to eel fishers subject to resource availability.

Since 2005/06, the Service and Hydro Tasmania have continued to implement an environmental stocking program to enhance and sustain eel and lamprey populations in catchments impacted by hydro dam infrastructure. This is an active intervention strategy compared to some more passive fish passage strategies (eg fish ladders) used to address fish migration. This assists in the maintenance of biodiversity, ecological function and processes where eel recruitment is prevented or negligible due to the barriers. This stocking occurs in several catchments and the amount of re-stock is based on a catchment area index. Prior to 2005/06 the Service undertook ad hoc transfers of elvers to large catchments impacted by dam infrastructure.

Elvers are harvested below significant hydro dams at Meadowbank Dam on the River Derwent and the Trevallyn tailrace (downstream of the Trevallyn Dam) in the Tamar River. These elvers are released in catchments where eel migration is impaired by dam infrastructure. The following lakes/catchments have received allocations of elvers for environmental purposes – Meadowbank Lake (Derwent catchment), Lake Pieman (Pieman Catchment), Lake Burbury (King River catchment), Lake Rowallan (Mersey/Forth catchment) and the South Esk River (South Esk catchment). The total allocation of elvers is dependant on harvest success. The allocation to each catchment/lake is proportionally determined based on catchment area. The proportional allocation to waters has remained relatively stable ranging between 520 kg- 690 kg during 20005/06-2007/08.

Improvements have also been made to facilitate the natural migration of elvers past the Trevallyn Dam. An elver ladder was built on the face of the dam by Hydro Tasmania and the Service in 1996 but has since been de-commissioned. Other improvements have been made to increase the efficiency of passage of elvers through the dam. The dam wall has several leaks which have always attracted elvers and provided a minor avenue for passage. Improvements have been undertaken to allow greater access to these passage pathways and initial evaluations indicate that significantly more elvers are migrating through the dam.

Hydro Tasmania is continuing to examine options to mitigate the impacts of dam and power generation infrastructure on spawning migrations of silver eels.

Another key component of the sustainable management of the fishery within Tasmania is closed catchments. These closed catchment areas are found between the Huon River and Arthur River catchments in the West including a significant part of central Tasmania. The catchments are closed by policy only and not through any management plan, regulation or other statutory rule. This policy not only contributes to fishery sustainability but also addresses concerns about heavy metal contamination in eels in western Tasmania catchments. Testing of heavy metal loads in the 1980's and 1990's initiated these closures. This policy will remain unchanged as it also supports an important measure for the sustainability of the fishery.

The performance of the commercial eel fishery is influenced by several factors that operate at different levels. There are broad scale factors such as climate that can operate widely across the stock and can influence several aspects of the fishery such as recruitment and water body availability to small specific factors (eg fisher experience, water quality) that have more localised influences.

The level of fishing activity in the Tasmanian fishery has been reduced in recent years. Drought and associated issues have been important determinants in this trend and may have contributed to depressed harvests compared to long term average annual harvest. Drought conditions have reduced the extent of fishing area, fishing localities and created difficulties with access.

The management of the freshwater eel fishery in Tasmania is to a great extent determined by the size of the fishery, its value and critical issues surrounding the fishery. The Service is a small fisheries agency within a freshwater fisheries management context and does not have considerable resources although it has wide range responsibilities and functions. The Service needs to take a pragmatic stance on the intensity and quality of management activity whilst still addressing important issues (eg by-catch and protected species) as part of the Commonwealth's environmental sustainability goals for the fishery.

**c. Target/permitted/prohibited species.**

The target species of the fishery are the short-finned eel (*Anguilla australis*) and the long-finned eel (*Anguilla reinhardtii*).

All other fish (including protected fish) are to be returned to the water. Pest fish classified as a Controlled Fish under the *Inland Fisheries Act 1995* such as European carp, *Cherax spp.* and Eastern gambusia must be kept and reported to the Service.

**d. Management arrangements employed in the fishery.**

The fishery is managed under the *Inland Fisheries Act 1995* and subordinate legislation, specifically the *Inland Fisheries (Commercial Nets and Fees) Regulations 1999*, *Inland Fisheries (Recreational Fishing) Regulations 1999* and *Inland Fisheries (Seaward Limits) Order 2004*.

A management plan does not exist for the fishery. Present management arrangements were framed in policy developed in 1995 and arrangements implemented through statutory instruments, primarily commercial fishing licences issued for the fishery.

Other legislation or statutory instruments (eg management plans for reserves) exist which have the powers to indirectly influence fishing activity. Generally, the conditions of commercial eel fishing licences reflect the requirements of other legislation or statutory instruments.

A number of consultative groups can be used for input or advice on management arrangements. Any significant changes to the management arrangements would be referred to the Inland Fisheries Advisory Council (IFAC) – a body which advises the Minister for Inland Fisheries, the Tasmanian Professional Eel Fishers Association (TPEFA) and referred to DEWHA (as a requirement of the export permit).

**e. Fishing methods employed (gear types).**

*Eel Management*

The Service undertakes the replenishment of eel stocks in inland waters through the harvest and translocation of elvers. Elvers are caught using two methods – a static eel trap at the Meadowbank Dam on the Derwent River and large fine-meshed fyke nets at the Trevallyn tailrace at the Tamar River.

The opening of the nets is rectangular with dimensions of approximately 1 metre wide, 2 metres in height and 10 metres long. The length of the net is tapered, supported with hoops ending with cod-end. The net is made of synthetic mesh with an aperture of 1 mm.

*Commercial Fishery*

The commercial fishery is permitted to use fyke nets and traps to harvest adult eels. However, eel traps are not commonly used (at least over the last 10 years) and fyke netting remains the predominant method. Historically, eel traps are estimated to account for less than 1% of the total historical catch.

The *Inland Fisheries (Commercial Nets and Fees) Regulations 1999* and the *Inland Fisheries (Recreational Fishing) Regulations 1999* defines the basic parameters of a fyke net and eel traps used in the fishery, respectively. Specific measures and modifications to address by-catch issues are defined further in the commercial fishing licence. A fyke net is a net that (a) does not exceed 670 mm in opening height, (b) does not exceed 670 mm in width, (c) has mesh that is not less than 15 mm and not more than 39 mm and (d) any wing or leader of which does not exceed 10 m in length and does not exceed 1 200 mm in drop. An eel trap is a trap that (a) does not exceed 500 mm in height, (b) does not exceed 2 m in length, (c) does not exceed 500 mm in width, (d) does not have wings or leaders and (e) has a mesh of at least 39 mm.

Some fishers are permitted to use gear of slightly different dimensions either under Exemption Permit or as defined by a licence conditions. This is necessary to address unusual fishing situations eg fishing near hydro power generation infrastructure. All fyke nets and eel traps must have by-catch excluder screens or, in certain waters, options are permitted to deploy nets with cod-ends raised at least 300 mm clear of the surface water. These specific measures either exclude platypus or allow platypus to survive until release.

All fishing nets and traps must be clearly marked with identification tags so the fisher can be clearly identified by Service compliance staff or the general public.

**f. Fishing area (including total area the fishery is permitted to operate in as well as locations(s) of majority of fishing effort).**

There are 48 major defined water catchments in Tasmania (DPIWE 2000) and 38 are allocated to the commercial eel fishery. Approximately 35% of the total Tasmanian land area is closed to eel fishing with 65% available for fishing according to geographically defined licences. Within licence areas fishing activity occurs in both public and private waters. Permission is required from private landowners, water authorities or land managers of reserves etc. Most activity is focussed on still water-bodies with fishing effort in rivers quite limited. Less than 1% of all rivers are permitted to be fished (Boxall 2003).

Over the last five years fishing the majority of fishing effort has occurred in the following waters: Lake Trevallyn, Woods Lake, Craighourne Dam, Four Springs Lake, Brushy Lagoon, Lake Mikany and farm dams. Fishing effort shifts according to water level, weather and harvesting success. Significant fishing effort is expended in farm dams around the State. Proposed improvements in logbook data management will facilitate more precise reporting on fishing effort at a finer scale.

**g. Allocation between sectors.**

There are two sectors participating in eel fishing – commercial fishers and recreational fishers. There is no specific allocation or allocation methodology applied to the fishery overall or in relation to these sectors. The commercial sector is the predominant sector characterised by contributing the majority of fishing effort and harvest. Their activity is constrained spatially as defined by the commercial fishing licence.

The targeted recreational fishery effort is considered small although total annual harvest estimates are in the vicinity of 8 250 eels (4 000 – 5 000 kg) in 2000-01 (Henry and Lyle 2003). Based on this estimate the harvest of eels from the recreational fishery as a proportion of commercial harvest for 2000-/01 was 10.6%. The recreational eel fishing activity is more dispersed and is less intense at a single location compared to commercial fishers. The level of recreational participation is generally considered low. Statistics on recreational eel fishing are not routinely gathered.

The recreational fishing statistics are difficult to gather and derive due to the small number of participants and because fishers do not necessarily require a licence to fish for eels. Fishers can target indigenous fish with a bush pole without a requirement for a recreational inland fishing licence.

There is no indigenous sector within the fishery.

**h. Governing legislation/fishing authority.**

The Inland Fisheries Service manages fisheries in inland waters in Tasmania.

The powers for the management of fisheries and the eel fishery are provided by *Inland Fisheries Act 1995* and subordinate legislation, specifically the *Inland Fisheries (Commercial Nets and Fees) Regulations 1999*, *Inland Fisheries (Recreational Fishing) Regulations 1999* and *Inland Fisheries (Seaward Limits) Order 2004*.

The fishery is subject to other legislation such as the *Environmental Protection and Biodiversity Conservation Act 1999*.

**i. Status of export approval/accreditation under the Environmental Protection and Biodiversity Conservation Act 1999.**

Following an assessment of the Tasmanian freshwater eel fishery in 2003 under the *EPBC Act 1999*, DEWHA amended the list of exempt native specimens, to include specimens that are or are derived from fish taken in the Tasmanian freshwater eel fishery, excluding specimens that are listed under Part 13 of the EPBC Act, for a period of five years.

DEWHA were satisfied that for the purposes of the wildlife trade provisions in part 13A of the EPBC Act, the management arrangements for the fishery provided the basis for the fishery to be managed in an ecologically sustainable way.

The management arrangements for the fishery met the Australian Government's *Guidelines for the Ecologically Sustainable Management of Fisheries*. The fishery was assessed to be well managed under a comprehensive, adaptable, precautionary and ecologically based regime capable of controlling, monitoring and enforcing the level of take from the fishery. The combination of these management arrangements, data gathering, proposed research and nature of the fishery provided greater confidence that the fishery will maintain low by-catch levels, minimise interaction with protected species and manage impacts on the wider ecosystem.

## **2. Management**

### **a. Changes to management arrangements (if applicable).**

There have been no changes to management arrangements to the eel fishery.

### **b. A statement of the performance of the fishery against objectives, performance indicators and performance measures.**

The Service submitted a response to the DEWHA recommendations in December 2005 that were based on concerns on the onerous nature of the recommendations in relation to the size of the fishery, the existing adequacy of sustainable management, and doubts about the degree of positive influence these recommendations would have on the sought outcomes, particularly given the cross - jurisdictional and (national/international) management and the lack of common goals for the fishery. The Service has maintained its level of sustainable management given these issues.

The lack of change in the fishery and in the fishery's environmental footprint since the initial assessment has shaped the Service's response since 2005.

Slower than expected progress in developing performance measures and indicators has meant the Service has been unable to complete the establishment of fishery specific objectives linked to performance indicators and performance measures for target, by-catch, protected species or impacts on the environment.

However, despite the absence of a formal suite of stated measures and indicators, the Service continually manages the fishery in an adaptive manner to ensure that target species are harvested within historical limits, by-catch is minimised and protected species by-catch is avoided, and the environmental footprint of the fishery is negligible.

The Service expects to have completed this recommendation during 2009-2011.

### **c. Compliance risks present in the fishery and actions taken to reduce these risks.**

The Service maintains a close and effective relationship with the small number of commercial eel fishers in the industry. Outstanding or emerging issues are dealt with timely, effectively and often on a one to one basis in the field.

In the past the Service has planned to provide a certain compliance effort within a holistic compliance strategy across several areas of responsibility for the Service. The strategy is based on a number of random field inspections. The purpose of these visitations is to ensure compliance with licence conditions including by-catch and measures to protect protected species, logbook checks, awareness of translocation protocols and fishing gear hygiene. Implementation of this strategy has varied over the past several due to operational priorities and constraints.

**d. Consultation issues.**

The lack of change of change in the eel fishery has not necessitated consultation about management arrangements in recent times.

The Inland Fisheries Advisory Council remains the statutory advisory body for the provision of advice for the Minister of Inland Fisheries and is also used by the Service for consultation on a range of matters. This body has statutory requirements for representation across several interest areas in inland waters including importantly the commercial sector. Similarly the Tasmanian Professional Eel Fishers Association remains an important body for consultation for the Service.

Additionally any significant changes to the management arrangements would be referred to DEWHA (as a requirement of the export permit).

**e. Description of cross-jurisdictional management arrangements.**

Commercial freshwater eel fisheries exist in Tasmania, Victoria, New South Wales, Queensland and New Zealand. The fisheries in Australia and New Zealand only share two species of eels (*A. australis* and *A. reinhardtii*) whilst additionally a significant fishery exists for *A. dieffenbachii* in New Zealand.

The coordination of cross-jurisdictional management arrangements is primarily achieved through the Australian and New Zealand Eel Research Group (ANZERG). This group to meets discuss research and management on a needs basis. Research, information sharing and management updates are a major focus of the group. Other informal avenues are more frequently used to address cross-jurisdictional matters and sharing of information and knowledge.

**f. Outcomes of review processes (if applicable).**

Not applicable since review processes have not been conducted.

**g. Demonstration of compliance with threat abatement plans, recovery plans etc and also relevant domestic and international agreements (where applicable).**

Not applicable.

### **3. Research and Monitoring**

**a. Results of any research completed relevant to the fishery, including how results will be incorporated into management of the fishery.**

Some research into heavy metal loadings in short-finned eels has been proposed as part of a wider study on heavy metals in fish in the Derwent estuary. Presently this specific estuary is closed to commercial fishing because of heavy metal contamination concerns and other management policies. Further research and greater knowledge may support this closure or indicate a change in

management. The Service has maintained the closure of fishing in all catchments on the western half of Tasmania because of heavy metal contamination in eels.

Hydro Tasmania is maintaining research interests in eel passage although no research project is being undertaken or proposed. Specific areas of interest are increasing escapement of spawning eels specifically at Lake Trevallyn Dam and Lake Meadowbank Dam and other dams, increasing passage of elvers over dams and promoting ecological processes to mitigate impacts of barriers. Specific enhancements of an elver migration pathway have been implemented within the structure of the Trevallyn Dam in the South Esk River.

**b. Description of monitoring programs used to gather information on the fishery (such as validated logbook programs, observer programs, long-term monitoring programs etc) and results of these.**

The primary source of information on the eel fishery is gathered through a fishery dependant logbook program. Logbooks form a mandatory part of the administrative responsibilities of each fisher. These are to be completed on a daily fishing basis and submitted to the Service each month. Data to be recorded, but not limited to, includes date, water fished, species, effort, catch, released quantity, sale quantity, details of eel transfers and details of by-catch.

Any issues of concern (eg discrepancies, by-catch issues) detected from logbook submissions are addressed immediately.

A regular and systematic fishery independent program to collect information on the eel fishery is not undertaken due to considerations of cost-benefits and the relatively small size of the fishery, and importantly, concerns about the value of data in a local and wider context.

**c. Results of any collaborative research undertaken for the fishery.**

No collaborative research has been undertaken on the eel fishery.

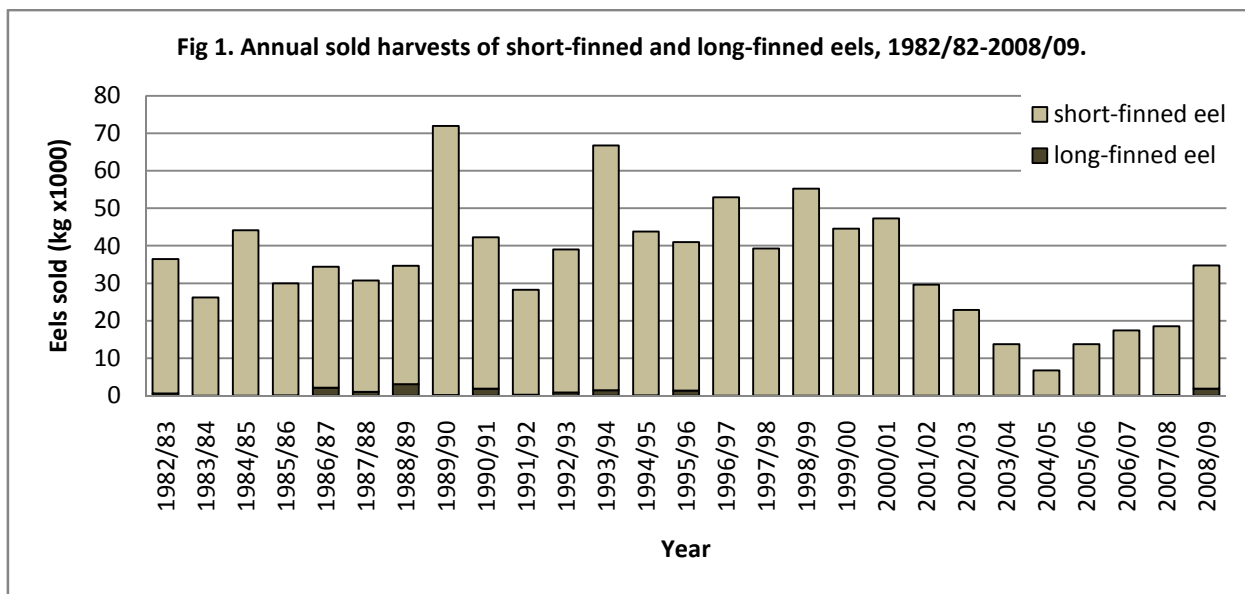
## **4. Catch Data**

**a. Total catch of target species (including retained and any discarded data).**

The unit of data to indicate quantity of eels consumed by the fishery is the weight of eels sold. Catch (kg) is also recorded in logbooks but is not used for the purposes of this report as a proportion of these eels are returned to the water due to size (less than 300 mm) or they are transferred to another water body to supplement eel stocks.

Data from logbook returns indicate that sold harvest has declined since 2001/02 with a minima reached in 2004/05 (Fig. 1). Since 2004/05 there has been a steady increase in annual sales during this period but these have not reached the pre-2001/02 long-term average in annual sales. This increasing trend in sold harvests is occurring despite drought conditions.

In Tasmania fishing activity has shown to be heavily influenced by eel price and market demand. Eel fishers will cease or reduce fishing effort if eel prices are too low for a commercial benefit. Therefore given the historical behaviour of fishers it is reasonable to expect that eel price is an important factor driving fishing effort. Last season in 2008/09 fishers reported that prices were higher than previous years but demand eased significantly and this caused a cessation of fishing effort.



Fishing effort data although being held by the Service has not yet been analysed and reported. This and other fishery data is awaiting the development of an improved catch management database for the fishery. Fishing effort for three licences is expected to have increased slightly as new inexperienced fishers explored their fishery. This dynamic may contribute to slightly reduced catch per unit effort for the fishery as a whole but may have been balanced by other efficiency gains such as eels being concentrated in water bodies with receding water levels. Certainly, fishing effort has been continually re-directed as drought reduced the availability and suitability of water bodies for fishing and fishers have sought for fishable water. It is expected that catch per unit effort has remained within bounds of historical limits and in recent years may be slightly higher because drought conditions concentrated eels and created fishing efficiencies. A more detailed analysis of these aspects of the fishery will be provided in the near future.

**b. Total catch of target species taken in other fisheries (if applicable).**

Freshwater eels are not taken in other commercial fisheries. There is a small recreational harvest (see section 1.g.).

**c. Catch of by-product species (reported by species).**

Not applicable because there is no by-product species harvest.

**d. Total catch of by-catch species (reported by species if possible).**

Two aspects of the fishery are reported in relation to by-catch – fishery management and commercial fisheries.

### *Eel Fishery Management*

The composition of by-catch is largely determined by the location of the activity (eg distance inland and other related factors), tides, temperature, seasonal influences and river flow and importantly operations of power generation infrastructure. The latter factor is important because it influences catch efficiencies and aggregations of species in a local context at the dam infrastructure.

Harvests of juvenile eels are undertaken at Meadowbank Dam (River Derwent) and the Trevallyn tailrace (Tamar River). A juvenile eel trap is used to catch lampreys and eels at the Meadowbank Dam. The design of the trap entrance is fish selective and reduces by-catch. Fish that have a climbing capacity such as eels, lampreys and the climbing galaxiid are able to negotiate the inclined entrance ramp. Other fish species are unable to enter the trap and therefore are passively excluded from the catches. The trap markedly reduces fish by-catch. At the Trevallyn tailrace elvers are caught by large fine-meshed fyke nets. By-catch is characterised by a wider range of fish and greater numbers than compared to the elver trap.

Catches of non-target fish at the tailrace contain galaxiids (*Galaxias spp.* - mainly *Galaxias maculatus*), smelt (*Retropinna tasmanica*), the occasional Australian grayling (*Prototroctes maraena*) and freshwater shrimp (*Paratya australiensis*) (Table 1). These catches are screened on site for by-catch and specifically Australian grayling. Most by-catch is released prior to pest fish treatments.

A system of measures to address by-catch translocation issues has been implemented. The measures are applied according to assessments of fish translocation risks based on location of harvests, fish distributions, release destination and the final use of fish. The three protocols are (i) no treatment, (ii) screening, (iii) pest fish treatment and are applied according to the scenarios below (Table 2).

The most stringent process has been adopted for harvests at the Trevallyn tailrace because of the presence of the pest fish, Eastern gambusia (*Gambusia holbrooki*), in nearby tidal marshes.

**Table 1. Listing of fish (and invertebrates) by-catch caught during IFS juvenile eels activities at Meadowbank Dam and Trevallyn Tail Race.**

Common Name	Scientific Name	Meadowbank Dam	Trevallyn Tail Race
common galaxias	<i>Galaxias maculatus</i>	-	√
climbing galaxias	<i>Galaxias brevipinnis</i>	√	√
spotted mountain trout	<i>Galaxias truttaceus</i>	-	√
Tasmanian mudfish	<i>Neochanna cleaveri</i>	-	√
Tasmanian smelt	<i>Retropinna tasmanica</i>	-	√
Australian grayling	<i>Prototroctes maraena</i>	-	√
shortheaded lamprey	<i>Mordacia mordax</i>	√	-
pouched lamprey	<i>Geotria australis</i>		-
sandies	<i>Pseudaphritis urvillii</i>	-	√
freshwater shrimp	<i>Paratya australiensis</i>		√

The process follows a treatment designed to kill gambusia to eliminate the unwanted translocation of these pest fish. Other fish not screened will also be sacrificed during this process. This specific process is presently under review so some issues related to eel stress and eel survival can be minimised and improved, respectively.

**Table 2. A matrix of the of by-catch translocation measures applied to various harvesting and release situations.**

	Location of fishing activity and treatment protocols	
Final release destination	Meadowbank Dam	Trevallyn tailrace
Above barrier in same river	No treatment	Pest fish treatment
Other water in Tasmania	Screening	Pest fish treatment
Export from Tasmania	As determined*	As determined*

Note: \* = the treatment of fish is determined by the receiver or appropriate regulatory authority.

#### Commercial Eel Fishery

The commercial fishery reports by-catch through a mandatory logbook system. Reports are submitted each month. Although logbooks have been a regulatory aspect of the management of the fishery since 1996/95 (and in a more rudimentary form since 1967/68), it was only in 2005/06 provision was made for the collection of by-catch information. At least 8 species have been reported as by-catch over the previous four years (Table 3). All species are common and four are introduced fish. One water rat was reported as being caught and released during this period. *Galaxias spp* are native fish comprised of several species some of which are common or restricted and protected. Eel fisherman may not be able to distinguish species of galaxias due to limited knowledge and the taxonomic similarities between galaxiids. Most by-catch of *Galaxias* is likely to be common riverine galaxia such as the jollytail (*Galaxias maculatus*), spotted mountain trout (*G. truttaceus*), climbing galaxias (*G. brevipinnis*) or the mudfish (*N. cleaveri*). Some of these species are also encountered in farm dams during fishing activity.

Brown and rainbow trout are caught by some commercial eel fishers in specific waters particularly waters stocked with trout to support the trout fishery. These trout are released unharmed in accordance with licence conditions. Trout anglers are sensitive and watchful over this issue. Reports of concern or evidence about interactions with the trout fishery are extremely uncommon.

**Table 3. Commercial eel fishing by-catch as reported in logbooks, 2005/06 – 2008/09.**

By-catch species	Scientific name	2005/06	2006/07	2007/08	2008/09
brown trout	<i>Salmo trutta</i>	P	P	P	P
rainbow trout	<i>Oncorhynchus mykiss</i>	P	P	P	P
tench	<i>Tinca tinca</i>	P	0	P	131
redfin perch	<i>Perca fluviatilis</i>	P	PP	12	2 290
sandies	<i>Pseudaphritis urvillii</i>	9	10+	0	25+
blackfish	<i>Gadopsis marmoratus</i>	P	P	P	0
Galaxias spp	<i>Galaxias spp.</i>	P	P	PP	0
water rat	<i>Hydromys chrysogaster</i>	0	0	0	1

P = presence recorded in logbooks but numbers not recorded.

PP = present in catch and abundance given in weight.

Some fishers avoid by-catch by setting fyke nets at depth where possible. By-catch is more common where nets are set in shallow water.

**e. Harvest by each sector (ie commercial, recreational, indigenous and illegal estimates if necessary).**

Commercial eel fishing remains the predominant sector of the fishery. The recreational sector remains largely insignificant. No annual or regular surveys or estimates of the recreational sector are undertaken. Previous statistics on the sector is based on the National Recreational and Indigenous Fishing Survey in 2000-01 (Henry and Lyle 2003). There is no specific indigenous sector and illegal fishing is probably non-existent or insignificant.

**f. Effort data including information on any trends.**

Effort data has been collected through eel fishers logbooks. The analysis and reporting of these data is awaiting the development of the improved eel fishery database. This will enable reporting on a licence basis as well as from a whole of fishery perspective on a number of aspects of the fishery.

**g. Spatial issues/trends.**

Not applicable.

## **5. Status of Target Stock.**

**a. Resource concerns.**

The true status of the Australian eel resource is difficult to ascertain although worldwide there is substantial evidence indicating downward trends and issues of sustainability of eel fisheries. In New Zealand there is concern about the sustainability of New Zealand long-finned eel resource. There is lesser concern in New Zealand about short-finned eel resources although the need for close monitoring of this fishery has been recommended (Jellyman 2007).

In Tasmania, it appears to be difficult to accurately determine the status of the eel resource. Several factors influence historical indicators and probably do not reflect in a meaningful context the position or trend of the resource. Eel recruitment remains variable but traditional indicators remain compounded by seasonal factors, rivers discharge, power station operations, fishing effort, and fishing experience. Adult fishery indicators such as harvests and effort are also not likely to accurately represent the status of the resource due to drought and loss of fishing areas, reductions of fishing effort, local re-stocking and a reduction of fishing experience. Fishing activity is also influenced by eel price and market demand. In 2009 low market demand reduced fishing activity.

Certainly climatic patterns have had an influence in Tasmania on the adult eel fishery with fishers being unable to access waters and quality fishing waters being limited in availability. Also importantly, the decline in five major lakes due to algal blooms and water levels has shaped fishing activity in recent years. Lakes Sorell, Crescent, Tooms and Leake and Lagoon of Islands were historically high yielding eel fisheries which have been unavailable to fishers. Fishing in farm dams has also suffered markedly due to the prevailing drought conditions.

Climatic change may have influenced eel recruitment although difficulties remain in confirming the influence due to limitations of data.

At present the Service does not have any resource concerns but acknowledges that data limitations and other major influences such as drought make it extremely difficult to make conclusions about the resource status. It is expected that other jurisdictions would have similar difficulties in making a meaningful determination on resource health.

**b. Results of any stock assessments.**

The fishery is not subjected to any stock assessments at a local level or from a single stock resource perspective integrated across jurisdictions. Logbook data are collected and assessed but probably have limited value in any robust and meaningful stock assessments.

The value of local stock assessments in Tasmania within the wider stock context is uncertain.

**c. Results of any stock recovery strategies (if applicable).**

Stock recovery strategies have not been implemented in Tasmania nor on a cross-jurisdictional basis.

## **6. Interactions with Protected Species.**

**a. Frequency and nature of interactions.**

The nature and frequency of interactions with protected species is dependant on the nature of the activity. These interactions are described within the context of these activities below (see Table 4).

*Eel management*

From a management perspective the Service harvests elvers annually at two locations – Trevallyn tailrace (Tamar River) and Meadowbank Dam (River Derwent). A trap is used to harvest at Meadowbank dam and the entry design prevents the capture of protected species ie Australian grayling. Large fine-meshed fyke nets are used to harvest elvers at the Trevallyn tailrace. The by-catch includes Australian grayling although the number caught is low over the duration of this activity. Manual grading procedures provide a mechanism and opportunity to return these fish to the water.

*Commercial fishing*

The commercial fishery also interacts with protected species although the nature of these interactions is determined by specific local circumstances. The interaction with protected species is generally limited. Considerable attention has been given to addressing interactions with platypus. Platypus are relatively common in inland waters in Tasmania and are known to have interactions with fishing gear. Significant effort and consultation has been expended on establishing the best measures to minimise interactions and to mitigate against the risk of harm to platypus. The Service mandates measures to address this impact through conditions on each eel fishing licence. Fyke nets must have platypus excluder screens or set to allow survival of platypus until the net is cleared.

Most of the commercial eel fishing effort is based in lentic systems, generally in created or modified by dam infrastructure. Interaction with protected fish is restricted to a few lakes and rivers. Whilst protected freshwater fish can be captured during fishing they must be released without harm back to the water. The large mesh size of fyke nets limits the interactions with small native fish (Table 4). These small fish can generally freely escape the net and avoid entrapment. Also, the interaction with

protected fish is very limited spatially being restricted to Woods Lake and in situations where fyke nets have been permitted in rivers (see Table 4).

**Table 4. Threatened freshwater fish likely to interact with commercial freshwater eel fishing.**

Common name	Scientific name	EPBC 1999	TSP 1995	Activity	Distribution
Australian grayling	<i>Prototroctes maraena</i>	V	V	Elver harvesting (IFS Management) Fishing (Commercial)	Low-mid reaches of coastal rivers and streams.
golden galaxias	<i>Galaxias auratus</i>	E	R	Fishing (Commercial)	Lake Sorell and Lake Crescent
Arthurs paragalaxias	<i>Paragalaxias mesotes</i>	E	E	Fishing (Commercial)	Arthurs Lake and Woods Lake
saddled galaxias	<i>Galaxias tanycephalus</i>	V	E	Fishing (Commercial)	Arthurs Lake and Woods Lake
dwarf galaxias	<i>Galaxiella pusilla</i>	V	R	Fishing (Commercial)	Limited wetlands and streams in NW and NW Tasmania.

Note: V = Vulnerable, R = Rare and E = Endangered

In some waters the interaction with protected fish is significantly influenced by drought. At lakes Sorell and Crescent, the interaction with protected species has ceased compared to several years ago. Since 2003/04 severe drought conditions and infestations of European carp have resulted in the cessation of eel fishing. To address the risks of carp capture and interactions with carp management activities, eel fishing in the lakes with fyke nets was prohibited. In compensation fishing activity was then directed at trapping fish moving downstream between the two lakes through water control structures. However, drought conditions and resulting low water has rendered the eel trap inoperable. Thus, in recent years the cessation of fishing activity at these lakes has meant there is no interaction with by-catch and threatened fish.

There are two threatened fish at Woods Lake (Table 4) which interact with eel fishing activity. However, in recent years the Arthurs paragalaxias has not been detected and conservation measures are being undertaken to restore the population. The reasons for the absence of this fish is not presently known but it is not considered to be related to eel fishing.

The other fish at Woods Lake, the saddled galaxias, is locally abundant and can be captured in fyke nets. The fyke net mesh size will influence the nature (ie fish size and fish numbers) of the capture and escapement. However, all fish are released alive when nets are checked and eels removed. There is no evidence of any negative interactions such as increased predation within the fyke net during this period of confinement.

The potential interaction between eel fishing and the dwarf galaxias is considered negligible. Fishing activity occurs within the broad range of the dwarf galaxias but the number of site specific interactions is extremely low. This is dependent on seasonal fishing activity, water level and dwarf galaxias presence and micro-habitat overlapping with netting activity. In addition, the dwarf galaxias is a small fish which is likely to escape the net because of the larger mesh size. It is considered unlikely that any fish would be trapped in the cod-end and if this was the case these fish could be

easily released. In summary, whilst the potential for interaction exists the probability of adverse interactions is negligible.

**b. Management action taken to reduce interactions and results of such action.**

The existing management of interactions is based on a sound understanding of the issues and knowledge of the fishery. The Service has managed the fishery adaptively addressing these issues on a case by case basis as they have arisen. The Service continues to monitor interactions and is committed to undertaking research and intervening with practical solutions as necessary. These interactions are described within the context of these activities.

*Eel management*

The Service generally only undertakes routine management on elvers and this involves harvesting for restocking within Tasmania, SE Australia, export or for aquaculture research or interest. These activities are undertaken at Meadowbank Dam and the Trevallyn tailrace using a trap and large fyke nets respectively.

The elver trap at Meadowbank Dam does not catch protected fauna. The fishing activity at the Trevallyn tailrace captures Australian grayling but these are released during grading/by-catch protocols. Other fish and freshwater shrimp are also released during grading operations. Some residual fish not extracted through grading will not survive the fish translocation protocols.

*Commercial fishing*

The Service has implemented effective measures to reduce harmful interactions with protected fauna. Significant improvements have been implemented to ensure fyke nets exclude by-catch such as platypus, waterbirds, mammals and large salmonids. Specifically, excluder screens (220 mm mesh size aperture – 110 mm stretched mesh) with specifications based on field trials must be installed in fyke nets however, in exceptional and reasonable circumstances, if an exemption is made then the cod-end must be raised a minimum of 300 mm above the surface of the water.

**7. Impacts of the fishery on the ecosystem in which it operates.**

**a. Results of any Ecological Risk Assessments.**

A formal ecological Risk Assessment (ERA) has not been conducted for the fishery. Areas of risks have already been identified and addressed outside this framework. No additional new areas of risk have been detected or prompted the Service into undertaking an ERA at present. There has been a refocussing on measures to address risks due to fish translocation as part of the elver re-stocking program to sustain eel populations for commercial and environmental purposes.

The risk is the translocation of the Eastern gambusia (*Gambusia holbrooki*) when elver harvests are conducted at the Trevallyn tailrace in the Tamar River. The Eastern gambusia inhabits tidal wetlands near the Trevallyn tailrace. The specific risk does not exist when harvests are conducted at Meadowbank Dam in the Derwent River. In Tasmania, Eastern gambusia has the same status as European carp and is classified as a “controlled fish” under the *Inland Fisheries Act 1995*.

The nature of interactions with by-catch and protected species has not changed since the initial ecological sustainability management assessment. All measures adopted then still apply.

**b. Nature of impacts on the ecosystem including impacts on any key conservation values.**

Elvers are harvested at the Trevallyn tailrace using large fine-meshed fyke nets. These are set at night during periods when incoming high tides coincide with full moon phases. Elvers and other fish are caught during operations. Some live grading occurs which permits some by-catch (eg smelt, *Galaxias spp.*) including protected species (ie Australian grayling) to be returned to the water. Not all by-catch is removed and some fish remain as a translocation risk. This risk is greater at the Trevallyn tailrace due to the presence of the Eastern gambusia in the system. Examinations of by-catch and other observations have never detected Eastern gambusia at this site so the risk is considered low but of high importance.

**c. Management action taken to reduce impacts and results of such action.**

This risk of the translocation of Eastern gambusia is considered low but significant enough to review the effectiveness of measures. The Service conducted a preliminary evaluation of the protocol in 2008 but will re-examine this issue during the 2009/10. This protocol must eliminate Eastern gambusia which is generally demonstrated to be more resilient to treatments than other fish.

Consequently, the entire harvest must be treated to eliminate these pest fish and to reduce the risk of translocation of other unwanted fish. In the past the Service has employed a variety of methods to address the risk of translocation. This has included visual inspections, grading and anaesthetising treatments.

There is some loss of by-catch because of the protocol.

**8. Consolidated detailed information outlining progress in implementing recommendations and conditions resulting from the Department of the Environment and Water Resources previous accreditation of the fishery.**

- a. Detailed description and explanation of progress in implementing each recommendation and condition.
- b. How the measures implemented to address the recommendations and/or conditions have improved management of the fishery.

**Recommendation 1.** Inland Fisheries Service to advise DEH of any material changes to fishery management arrangements that could affect the criteria on which EPBC decisions are based, within 3 months of that change being made.

The Inland Fisheries Service did not make any material changes to the management arrangements to the fishery that would have affect the criteria on which EPBC decisions are based.

**Recommendation 2.** By the end of 2005, IFS to develop fishery specific objectives linked to performance indicators and performance measures for target, by-catch and protected species and impacts on the ecosystem.

The Service submitted a response to the DEWHA recommendations in December 2005 that were based on concerns on the onerous nature of the recommendations in relation to the size of the fishery, the existing adequacy of sustainable management, and doubts about the degree of positive influence these recommendations would have on the sought outcomes, particularly given the cross-jurisdictional and (national/international) management and the lack of common goals for the fishery.

The lack of significant change in the management of the commercial fishery and in impacts on the environment (eg by-catch and protected species) since the initial assessment has shaped the Service's response to meeting permit recommendations during this period of financial and resourcing difficulties.

The fishery is subject to marked inter-annual variation with climate change considered a major external influence. The dynamics of the fishery has changed in response to drought conditions with fishers adjusting fishing activity in concert with difficult fishing conditions.

The relative influence of the fishery on the sustainability of the resource compared to factors such as drought and hydro infrastructure has not been established and this has made it difficult to establish meaningful objectives and performance measures. Performance indicators based on fishery dependant measures may not provide a clear and meaningful indication of the health of the resource nor trends. Consequently, addressing this complexity has delayed the Service implementing the requirements of this recommendation particularly whilst fishing activities and management were considered, on balance, to have little impact on the fishery or by-catch or protected species. Instead the Service has elected to transfer management effort to on-ground actions that address arising important issues eg fish translocation that make a difference to the local aspects of the sustainability of the fishery.

Unfortunately due to these difficulties and resourcing limitations, the Service has been unable to progress the establishment of fishery specific objectives linked to performance indicators and performance measures for target, by-catch, protected species or impacts on the environment.

However, despite the absence of a formal suite of stated measures and indicators of the performance of the fishery, the Service continually manages the fishery in a adaptive manner to ensure that target species are harvested within historical limits, by-catch is minimised and protected species by-catch is avoided, and the environmental footprints of the fishery are negligible.

The Service has determined that it will progress this recommendation during 2009-2011. A consolidated report will bring outstanding fishery data and analysis up to date and annual fishery status reports will then be produced. These reports will also be supplemented by ecological risk assessment for the fishery and a fishery performance plan. The performance plan will also define goals and objectives for the fishery to enable the linkage of meaningful performance measures.

**Recommendation 3.** IFS to monitor the status of the fishery in relation to the performance measures once developed. Within 3 months of becoming aware of a performance measure not being met, IFS to finalise a clear timetable for the implementation of appropriate management responses.

The Service has yet to finalise meaningful performance measures and responses for the fishery. Once this has been completed the status of the fishery will be monitored within this performance framework and develop a clear timetable for a response to meet this recommendation. A fishery performance plan will be developed that will clearly define performance measures to be used in the monitoring of the fishery.

**Recommendation 4.** From 2005, IFS to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure once developed.

The Service has not reported on the specific performance measures that were recommended in 2005 although some information on the eel fishery has been made available through IFS annual reports presented to the Tasmanian Parliament and available on the IFS website.

The Service will be reporting on these performance measures through planned annual reports on the fishery.

**Recommendation 5.** Should the Australian study on *A. reinhardtii* determine that eel stocks harvested in the fishery are not panmictic, IFS to investigate the feasibility and need for research to test the panmixia assumption in *A. australis*. If it is found that the panmixia hypothesis is not true for *A. australis*, IFS to develop and implement management measures to ensure that catchment fidelity is adequately taken into account and that sustainability objectives for the stock can still be achieved.

A study of stock structure of the short-finned eel has yet to be conducted. The Australian and New Zealand Eel Reference Group (ANERG) considered this research issue in 1995 and noted various views on the value and immediate importance of stock structure determination. ANZERG acknowledged that this research was more important for the short-finned fishery than the long-finned eel fishery because short-finned were widely distributed and had a greater New Zealand component. Thus it would be worthwhile to support research to assist with cross jurisdictional management and national and international levels. However, funding opportunities were viewed as limiting given the relative importance of the eel fishery compared to other fisheries. ANZERG agreed to support and promote any research to investigate stock structure and, as a means to achieve this, would specifically encourage post-graduate student research.

**Recommendation 6.** In the event that commercial quantities of glass eels are able to be harvested from Tasmanian waters, IFS to develop and implement a precautionary management strategy to control the level of glass eel harvest and potential impacts on target and by-catch species and the ecosystem. The strategy is to be reviewable and include objectives linked to performance measures. It should also include mechanisms to enable ongoing monitoring of the fishery and take into account the impact of environmental conditions on the fishery.

There has not been any commercial or research harvesting of glass eels since the initial assessment of the ecological sustainable management of the fishery in 2003. Consequently, no action has been undertaken on this recommendation.

**Recommendation 7.** IFS to introduce a system sufficient to monitor by-catch, including protected species, in the Tasmanian Freshwater Eel Fishery and to identify changes in composition and abundance spatially and temporally.

The Service has implemented a logbook system to collect and provide a basis to monitor by-catch (including protected species). Prior to this system information on by-catch was not collected. This system continues to be the primary method to monitor by-catch including protected species. The Service also uses the system to monitor for incursion or occurrences of pest or other fish. The system is underpinned by random field inspections of nets and records by fishery inspectors.

Due to the small size of the fishery and administration/management costs, the Service has not supported the logbook system by maintaining the original and rudimentary electronic management system. Presently, a Commercial Eel Fishery database is planned to supersede manual collation and reporting to improve capabilities and provide efficiencies in the management and analysis of data. It is expected that this will be completed within 12 months.

By-catch dynamics have not appeared to have changed in nature since the initial ecological sustainable management assessment in 2003.

## **9. Key changes to the Tasmania Freshwater Eel Fishery since the last assessment**

There has been little change to the management of the fishery since the last ecological sustainable management assessment. The regulatory framework and policies have remained unchanged and exploitative activity has remained within historical parameters.

Fishery harvests, in terms of eels sold, have shown a general downward trend during the period 2000/01-2004/05 but since then there has been a slight improvement. Successive drought years, low water levels and poor spring rains have not provided ideal or preferred conditions for eels fishing. However refinements in fishing behaviour and new licensees (ie change in licence ownerships) have probably contributed to the improvement in this trend. The new licence holders are more enthusiastic about the fishery despite the environmental conditions and have increased activity.

## **10. Progress in Implementing the DEWHA recommendations from the previous assessment.**

Refer to Section 8 (a and b).

## References

Boxall, P. (2003) Assessing the ecological sustainability of the Tasmanian freshwater eel fishery. Inland Fisheries Service.

DPIWE (2000) Tasmanian Catchments – Land and Water Management, Department of Primary Industries, Water and Environment.

Henry, G. W. and Lyle, J. M. (2003) The National Recreational and Indigenous Fishing Survey. Final report to the Fisheries Research and Development Corporation. Project No. 1999/158, 188pp.

Jellyman, D. (2007) Status of New Zealand freshwater-eel stocks and management initiatives. ICES Journal of Marine Science, 64, 1379-1386.