



Australian Government

Department of the Environment and Heritage

Assessment of the
Victorian Eel Fishery

APPROVALS AND WILDLIFE DIVISION

March 2004

© Commonwealth of Australia 2004

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Australian Government, available from the Department of Environment and Heritage. Requests and inquiries concerning reproduction and rights should be addressed to:

Assistant Secretary
Wildlife Trade and Sustainable Fisheries Branch
Department of Environment and Heritage
GPO Box 787
Canberra ACT 2601

ISBN: 0 642 55017 4

Disclaimer

This document is an assessment carried out by the Department of Environment and Heritage of a commercial fishery against the Australian Government Guidelines for the Ecologically Sustainable Management of Fisheries. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Parts 13 and 13A of the Environment Protection and Biodiversity Conservation Act 1999. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Australian Government.

While reasonable efforts have been made to ensure that the contents of this report are factually correct, the Australian Government does not accept responsibility for the accuracy or completeness of the contents, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this report. You should not rely solely on the information presented in the report when making a commercial or other decision.

**Assessment of the ecological sustainability of management arrangements for the
Victorian Eel Fishery**

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	4
Background.....	4
Overall assessment.....	7
Recommendations.....	8
PART I - MANAGEMENT ARRANGEMENTS	9
Conclusion.....	13
PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES.....	14
Stock Status and Recovery	14
Maintain ecologically viable stocks.....	14
Information requirements.....	14
Assessment.....	15
Management response.....	18
Promote recovery to ecologically viable stock levels.....	20
Conclusion.....	20
Ecosystem impacts	20
Bycatch protection	21
Information requirements.....	21
Assessment.....	21
Management response.....	22
Conclusion.....	24
Protected species and threatened ecological community protection.....	24
Information requirements.....	24
Assessment.....	25
Management response.....	25
Conclusion.....	25
Minimising ecological impacts of fishing operations	25
Information requirements.....	25
Assessment.....	26
Management response.....	27
Conclusion.....	27
References	27
List of Acronyms	28

EXECUTIVE SUMMARY

Background

Fisheries Victoria of the Department of Primary Industries (DPI), Victoria, has submitted a document for assessment under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document *Assessment of the ecological sustainability of the Victorian Eel Fishery for exemption from export controls under the Environment Protection and Biodiversity Conservation Act 1999 – A report to Environment Australia* (the submission) was received by the Department of Environment and Heritage (DEH)¹ on 4 June 2003. The submission was released for a twenty-day public comment period that expired on 9 July 2003. Two public representations were received. DPI provided a response to the issues raised. No changes were made to the submission as a result of public comment.

Accompanying the submission were three documents: the *Victorian Eel Fishery Management Plan* (EFMP), the *Draft Victorian Eel Fishery Bycatch Action Plan* (BAP), and the *Draft Victorian Protocol for the Translocation of Eels*.

The submission reports on the Victorian Eel Fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission, associated documents, public comments and DPI response to the comments.

Table 1: Summary of the Victorian Eel Fishery

Area	Allocated and permitted Victorian waters (rivers, creeks, channels and drains)
Fishery status	Fully fished ²
Target Species	Shortfinned eel (<i>Anguilla australis</i>) Longfinned eel (<i>A. reinhardtii</i>)
Gear	Fyke nets, small quantities taken in estuarine haul seine operations
Value of commercial harvest	\$1.4 – 4.7 M annually
Five year trend and average (commercial):	Total production range 125-450 tonnes (280 t average) Shortfinned eels comprise 95% of harvest. Of this, up to 40% is comprised of stock-enhanced or cultured shortfinned eel.
Recreational harvest	Limited information
Commercial licences issued:	18 Eel Fishery Access Licences (EFAL)
Management arrangements Commercial:	<u>Adult eel</u> Input restrictions, closed access to significant proportion of the fishable waters, water allocation arrangements in place. <u>Glass eel</u> ³ Permit conditions, closed access to a significant proportion

¹ The Department of Environment and Heritage was known formerly as Environment Australia.

² Kailola, P.J., Williams, M.J., Stewart, P.C. , Reichelt, R.E., McNee, A. and Grieve, C. (1993) Australian Fisheries Resources Bureau of Resource Sciences, Canberra, Australia

	of the fishable waters, waterway limits in place
Management arrangements Recreational:	Bag limit of 10 per day per recreational fishing licence
Export	Almost all product destined for export markets
Bycatch	Bycatch is low. <u>Adult eel</u> Potential for interactions with Platypus, water rats, tortoises and water birds, Australian native fish. <u>Glass eel</u> - interactions with juveniles of many commercial and some threatened species.
Interaction with Threatened Species	Considered minimal - possibly some interactions with platypus and some native spp of fish.

The Victorian eel fishery takes place in estuarine and freshwater reaches, and natural and artificial impoundments in Victoria. The fishery is based on two species, the shortfinned eel (*Anguilla australis*) and the longfinned eel (*A. reinhardtii*) with the shortfinned eel comprising approximately 95% of the annual take. The longfinned eel is restricted in its distribution to the east of the State. Fishers are required to retain carp, tench and roach, all of which are introduced and which have little or no recreational or other value. Carp is declared a noxious species in Victoria.

The commercial value of the fishery varies from \$1.4 M to \$4.7 M annually. Production is closely linked to seasonal factors and averages around 280 tonnes per year. Approximately 40% of the total commercial catch is produced from stock-enhanced shortfinned eels. Stock enhancement is the process of taking elvers (juvenile eels greater than 2 grams) and undersized adult eels and stocking them (under a Victorian Aquaculture Licence with an eel endorsement) in selected lakes and dams for grow-out under natural conditions. For descriptive purposes, the fishery can be divided in two: adult eels (wild shortfinned eels, wild longfinned eels, stock-enhancement/aquaculture of shortfinned eels) and newly recruited or glass eels.

The Victorian eel fishery is highly susceptible to short term and seasonal environmental variations in temperature, salinity and river flow. Victoria has faced drought conditions since 1994. These conditions have led to a decrease in the commercial harvest of shortfinned eels, largely as a result of a decrease in available water-bodies for stock-enhanced production. An apparent recovery in the wild shortfinned eel sector in 2001 suggests that the effects of the drought may have begun to be mitigated. The take from the wild longfinned eel sector has been stable since approximately 1999.

Current knowledge of the biology and life history of the two commercially caught eel species is limited. Eels are known to be catadromous (migrate from freshwater to salt water to breed), semelparous (breed only once during their lifetime) and are assumed to be a panmictic stock (free interchange of genes within an interbreeding population). An Australian study is underway to investigate the panmixia assumption for longfinned eels and preliminary results from this work indicate support for the panmixia hypothesis. While this research is focused on the longfinned eel and not the predominantly caught shortfinned eel it is likely that results will indicate whether more species-specific studies are needed.

Scientists assume that breeding takes place somewhere in the Coral Sea with the larval stage, the leptocephali, carried towards eastern Australia on the South Equatorial

³ Glass eels – generally less than 2 grams.

Current. Once on the continental shelf, metamorphosis to the glass eel stage is thought to occur. The East Australian Current transports glass eels southwards. Glass eels are also likely to actively swim towards estuaries and embayments where their recruitment is believed to be random. Glass eels are between 50-60 mm in length and weigh approximately 0.1-0.2 g each. Glass eels of each species may continue to arrive at some estuaries throughout the year (McKinnon *et al.* 2002). Shortfinned eels reach a length of 110 cm (females) and a maximum weight of 6.8 kg.

The distribution of the two species tends to be separated latitudinally with the longfinned eel inhabiting tropical and semi-tropical waters ranging from Cape York to eastern Victoria and Tasmania. This species is also common throughout the South Pacific. The shortfinned eel appears to inhabit more temperate waters with southeast Queensland generally being the northern limit. The species is common in NSW through to southeast South Australia. New Zealand also has a significant fishery (11 000 tonnes per annum) based on both the shortfinned eel (North Island) and the longfinned eel (both North and South Island and the Chatham Islands).

Despite such a broad distribution, the panmixia hypothesis is generally accepted. Thus, fishing mortality in any one catchment is not expected to affect the long-term viability of the eel population within that catchment. Investigations into the panmixia hypothesis will help to refine management approaches.

There are 18 Eel Fishery Access Licences (EFAL) in the commercial fishery. Each licence entitles the holder to fish in specified Crown waters allocated to that licence, in certain unspecified Crown waters, and in private waters. Crown waters in which stock enhancement occurs are fished by EFAL holders under a Victorian aquaculture licence. The waters in which fishers may enhance eel stocks are specified on the Aquaculture licence. All licences are renewable annually.

The management regime for the developmental glass eel fishery differs from that of the adult eel component of the fishery. Collection of glass eels is permitted only in allocated waters and in the Snowy River in East Gippsland, which is otherwise closed to commercial eel fishing. The gear used includes glass eel nets, dip nets, stow nets and Japanese glass eel nets. Nets must be constantly supervised and cleared at least once per hour; a detailed inventory must be kept of the number of glass eels caught and a minimum of 10% by number of glass eels must be returned as on-grown elvers to the waters from which they were taken. This must take place under the supervision of departmental officers. All bycatch must be recorded to the lowest taxonomic level possible. Generally it is only possible to get this level of bycatch data when departmental officers are involved in the collection of glass eels.

The recreational component of the fishery has not been quantified although there is anecdotal evidence that the recreational take of both species of eel could be significant. Management of the recreational fishery includes a bag limit of 10 eels per fisher per day. Recreational eel fishing is permitted in all Crown waters that are open to recreational angling, including waters that are stock enhanced by the commercial sector.

The DPI submission states that there is almost no by-product taken in the fishery but that the possibility exists for the incidental capture of species, including some protected

species. This is particularly the case for the glass eel sector. Waters in which some interactions with a protected species (eg platypus) have been recorded have been closed to the fishery. Bycatch and protected species interactions are discussed under Principle 2 of this report.

The Victorian Eel Fishery Management Plan, under which the fishery operates, came into effect in July 2002 and has a life of five years. The management plan and the *Fisheries Act 1995* provide for the management of this resource.

Overall assessment

The material submitted by DPI indicates that the fishery operates in accordance with the Australian Government's *Guidelines for the ecologically sustainable management of fisheries*. DEH considers that the Victorian Eel Fishery is a well managed fishery that is unlikely to have an unacceptable or unsustainable impact on the environment in the short to mid term. Recommendations have been developed to ensure that the risk of impact is minimised in the longer term. Overall, the management regime appears capable of controlling, monitoring and enforcing the level of take from the fishery, suggesting that the fishery is being managed in an ecologically sustainable way.

In making its assessment, DEH is satisfied that the management arrangements and objectives as described in the Victorian Eel Fishery Management Plan (EFMP) are sufficient to ensure the fishery is conducted in a manner that does not lead to over-fishing and that stocks are not currently overfished. The EFMP describes a range of tools and strategies to ensure the sustainability of Victorian eels stocks. It also contains a series of performance measures, performance criteria against which these measures may be assessed, and environmental requirements of individuals operating in the fishery. These elements of the Plan are crucial to the overall environmental performance of the fishery and strongly influenced the ecological assessment of this fishery.

DEH is satisfied that fishing operations are managed so as to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. The potential for the Victorian Eel Fishery to pose a threat to some iconic species of bycatch such as the platypus and several species of native freshwater fishes was recognized in developing the management plan. Those water bodies where the risk of bycatch of these species was considered greater than 'low' were closed to the fishery. DPI, in its management of this fishery, has a history of reacting appropriately to threats to sustainability and DEH is confident that this high quality management will continue.

The assessment finds that the fishery is managed in an ecologically sustainable way and its operation is consistent with the objects of Part 13A of the EPBC Act. DEH recommends that the export of species taken in the fishery should be exempt from the export requirements of Part 13A of the EPBC Act and that the exemption should be reviewed in five years. DEH is satisfied that the fishery, as managed in accordance with EFMP is not likely to cause serious or irreversible ecological damage over this period.

The assessment also considered the possible impacts on the ecological character of the Western Districts Lakes and Gippsland Lakes Ramsar sites in which some eel fishery

operations are conducted. It found that the management regime in place was consistent with the values for which the sites were listed.

On this basis DEH considers that an action taken by an individual fisher, acting in accordance with the Eel Fishery Management Plan, would not be expected to have a significant impact on a matter protected by the EPBC Act.

To further strengthen the effectiveness of the management arrangements for the Victorian Eel Fishery, and to contain the environmental risks in the medium to long term, DEH has developed a series of recommendations. The implementation of these and other commitments made by DPI both in their submission, in the Eel Fishery Management Plan and in the Bycatch Action Plan, will be monitored and reviewed by DEH in five years time.

Recommendations

DEH recommends that:

1. DPI to inform DEH of any future amendments to the Eel Fishery Management Plan or managerial commitments made in the submission.
2. DPI to investigate the feasibility and need for research to test the panmixia assumption in *Anguilla australis*. Should the Australian study on *A. reinhardtii* determine that eel stocks harvested in the fishery are not panmictic, DPI to develop and implement management measures to ensure that catchment fidelity is adequately taken into account and that objectives can still be achieved;
3. DPI to collect information on the recreational and indigenous harvest of eels to ensure that all removals of eels are accounted for in the overall management of the fishery.
4. To control the level of harvest and the potential impacts on bycatch species and the ecosystem in the glass eel sector, DPI to develop and implement within the life of the Victorian Eel Fishery Management Plan (by July 2007) a precautionary management strategy for this sector. The strategy is to be reviewable and include performance measures linked to defined management triggers and responses. It should also include mechanisms to enable ongoing monitoring of the fishery and take into account the impact of environmental conditions on the fishery;
5. DPI to develop and implement a strategy to monitor and minimize the impact on bycatch and protected species of the glass eel sector of the fishery. DPI to develop a robust system for validating bycatch data in the adult and glass eel sectors of the fishery. DPI to also develop and implement an education program to complement the recent introduction of bycatch reporting requirements on logbooks in an effort to enhance data reliability; and
6. In the process of conducting a risk assessment of the adult eel fishery, DPI to investigate the potential impact of fyke nets on air-breathing bycatch. Where the likelihood of capture is medium or high risk, DPI to require all fishers operating in those waters to create an opportunity for air breathing animals to breathe/escape.

PART I - MANAGEMENT ARRANGEMENTS

The Victorian Eel Fishery is managed by the Department of Primary Industries (DPI), Victoria. It is a limited entry, input controlled fishery, with enforceable restrictions on effort, gear construction and use, and waters able to be fished. For the purposes of assessment, the fishery has been considered in two parts: the adult eel fishery (stock enhanced shortfinned eel, wild shortfinned eel, wild longfinned eel) - and the glass eel (<2 g) developmental fishery). Unless a differentiation is made between adult and glass eel components, the discussion in this report should be taken as applying to both.

The management regime is described in the following documents, all of which are, or will be publicly available:

- The *Victorian Eel Fishery Management Plan 2002*;
- The *Victorian Fisheries Act 1995*;
- The *Fisheries Regulations 1998*;
- Eel fishery access licence conditions;
- Aquaculture licence conditions (juvenile fishery);
- The Victorian Eel Fishery Bycatch Action Plan, and
- The draft Victorian Protocol for the Translocation of Eels.

The Victorian Eel fishery is managed under the Victorian Fisheries Act (1995) and the Victorian Fisheries Regulations (1998). The Victorian Eel Fishery Management Plan, 2002 (EFMP), is the policy document that describes the detail of the eel fishery management regime. The EFMP has an expected life of five years and its implementation will be reviewed annually.

The EFMP is given its head of power under Sections 28 and 29 of the Victorian *Fisheries Act 1995* and through *Fisheries Regulations (1998)*, which are enforceable under the Fisheries Act. Any amendments to Fisheries Regulations recommended by the EFMP will require a Regulatory Impact Statement which itself is subject to extensive public consultation under the *Fisheries Act 1995*.

DEH considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Due to the importance of the EFMP and Regulations to DEH's assessment of the fishery, and in light of commitments made in the submission, DPI should notify DEH of any changes to management arrangements. Notification of changes would allow DEH to be certain that elements critical to this assessment have not been changed in such a way that would impact on the outcomes of this assessment.

Recommendation 1. *DPI to inform DEH of any future amendments to the Eel Fishery Management Plan or managerial commitments made in the submission.*

The EFMP was developed through an extensive consultation process, overseen by the Victorian Fisheries Co-Management Council (FCC), and included a statutory 60-day public comment period. The FCC comprises representatives with knowledge and experience in commercial fishing, fish processing, marketing, recreational fishing and traditional fishing, aquaculture, conservation and fisheries science. Its role includes providing advice to the Victorian Minister on all matters relating to fisheries in general.

The FCC has a number of subsidiary committees. Of relevance to the eel fishery is the Inland Waters Committee which is comprised of representatives of the general community, peak bodies for the commercial and recreational fishing industries and conservation/environmental interests. Further, any interested party, even though not represented on FCC, may make individual representations to the Minister on any aspect of the eel fishery management regime. Any submissions relevant to the management of the eel fishery must be considered in the annual reviews of the EFMP.

DPI officers attend regular bi-monthly meetings held by the Victorian Eel Fishers' Association. At these meetings consultations with the fishers on the progress of implementation of the EFMP are held.

DPI is also engaged in cross-jurisdictional consultation on eel management through the Australian and New Zealand Eel Reference Group (ANZERG). The role of ANZERG is to develop a coordinated approach to eel management throughout the region, and to provide direction and consistency for all relevant jurisdictions in the management of eel stocks and the ecologically sustainable development of eel fishing and aquaculture industries. ANZERG met most recently on 10 December 2003 to discuss matters relating to eel fishing around the country and across the Tasman Sea. Representatives from each of Tasmania, Victoria, and New South Wales were present along with scientific researchers and stakeholders.

DEH strongly encourages the effective use of ANZERG to ensure that cross-jurisdictional issues relating to eel harvesting are appropriately managed. It urges the ANZERG to ensure that appropriate representation is achieved so that cross-jurisdictional issues can be fully addressed.

The EFMP sets out the strategic direction for the eel fishery. Specifically, it contains objectives and performance criteria by which the effectiveness of the management arrangements can be assessed. It documents the management tools and strategies necessary to achieve the stated objectives and addresses the 'ecosystem-critical' components and threats to, and as a result of, the fishery.

The EFMP also reiterates the Victorian DPI's position that, with regard to glass eel stocks, the objective is to pursue the ecologically sustainable harvest and utilization of both longfinned and shortfinned glass eels. This is to be done in the manner that is considered to be in the best interests of the eel fishery and aquaculture sectors.

The EFMP requires an annual review of the performance of management arrangements and implementation targets in this fishery. An assessment of the key components of the fishery (stock enhanced shortfinned eel, wild shortfinned eel, wild longfinned eel and glass eels) is also made annually.

The management review panel comprises fisheries and regional managers within DPI. The review covers an analysis of the production of each sector and the total fishery production in comparison to the average production over the preceding three years. An arbitrarily established trigger point of 20% variation in this three-year average elicits a review of the respective fishery component. The review committee will comprise fisheries and regional managers within DPI, industry representatives and the FCC. The FCC will seek input from key stakeholders depending on the substance of the review.

The fishery is managed primarily through input restrictions. Closed entry, gear restrictions and water body allocations are the primary tools. Fyke nets are the only gear permitted for use by licence holders for the adult eel component of the Victorian eel fishery. It is illegal to own or possess a fyke net unless an EFAL is also held. A fyke net, when set, must not occupy more than half of the width of a watercourse, and may not be within 5 m of another net. No more than 3 nets may be used to form a fleet. Restrictions on the dimensions and mesh size of fyke nets are in place. Some EFAL holders are permitted to use oversize fyke nets specifically for targeting migrating sea run eels. Currently three permits for oversize gear have been issued accounting for a total of 30 oversize nets.

The cap on number of nets able to be used under an individual EFAL can be negotiated and depends on a number of factors including the type of waterway fished and any other uses of that waterway. DPI states that as well as allowing for more appropriate use of waterways, negotiating individual caps will give form to the EFMP vision of achieving greater levels of self-regulation and stewardship for individual EFAL holders.

The current management regime for the adult fishery aims to maintain ecologically viable stock levels through a range of input controls, including:

- Limited entry - Fishery closed to new applicants. Licences are transferable;
- Gear type and design restrictions;
- Fixed number of fyke nets per Eel Fishery Access Licence (EFAL);
- Waters allocated to an individual EFAL;
- Restrictions on the number and placement of nets in a waterway; and
- Nets must be checked at least once in every 48-hour period.

The glass eel fishery is managed through a range of controls including:

- Only specified waters may be fished for glass eels;
- Fishing nets must not be left unattended at any time;
- Nets must be hauled and cleared at least once every hour;
- A detailed inventory of all stocks must be kept and made available to an authorised person if required;
- A minimum of 10% by number of glass eels harvested under the permit must be returned to the waters from which they were taken as advanced pigmented elvers (minimum average size 2 g), under the supervision of DPI officers; and
- All non-target species (except noxious fish) are to be returned to the water as soon as possible.

Bag limits of 10 eels per fisher per day are also in place for the recreational sector.

Fishery-dependent data relating to the target species is collected on a regular basis in the fishery. Some fishery independent information is also collected. Discussion of the information collection system can be found in Part II of this report.

An analysis of the fishery's capacity for assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates is contained under Principle 2 of this report.

DEH is satisfied that the current management arrangements comply with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. However, there is no mechanism in the arrangements requiring compliance with any future plans or policies.

Victorian government policy requires the Eel fishery to comply with the National Policy on Fisheries Bycatch, and bycatch action strategies have been developed under that policy. A draft BAP has been developed for the fishery, with clear objectives and strategies to deal with identified risks. The BAP identifies a number of recommendations that, in DEH's view, would considerably enhance the overall precautionary manner in which the fishery is conducted. These are discussed further in Part II of this report.

The draft Victorian Protocol for the Translocation of Eels has been prepared specifically to address the issue of translocation of juvenile eels (glass eels and elvers) both within Victoria and between Victoria and other Australian States. Risks of translocation include the establishment of feral populations, the introduction of disease and the introduction of aquatic pests. In DEH's opinion the draft protocol adequately identifies and proposes management solutions to these risks.

The submission describes how the Victorian Eel Fishery is guided by the ANZERG. It states that ANZERG is the appropriate body to ensure the conservation and management of eels as 'straddling stocks' in the South Pacific region. This arrangement is in accordance with the United Nations Agreement for the "Implementation of the Provisions of the United Nations Convention on the Law of the Sea of December 10, 1982, Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks". DEH is satisfied that while ANZERG is functional, its role and terms of reference are relevant to ensuring a sustainably managed eel fishing regime throughout the region. However, if ANZERG is unable to achieve its Terms of Reference, DEH suggests that DPI continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks.

The Victorian Eel Fishery has been operating within the area of two of Australia's Ramsar sites (Western District Lakes and Gippsland Lakes) since the 1950s. Under the EPBC Act, a person may not take an action that has, will have or is likely to have a significant impact on the ecological values of a declared Ramsar site. People who are taking actions that are a lawful continuation of a use of land, sea or seabed, which was occurring immediately before the commencement of the EPBC Act, may continue to take those actions. An enlargement, expansion or intensification of a use is not a continuation of a use. At the time of listing, the ecological values of the Ramsar sites included commercial eel fishing. For this reason, and the outcomes of the assessment as listed throughout Part II of this assessment report, DEH is satisfied that fishing activities as currently practiced in this fishery are unlikely to have a significant impact on the ecological values of these Ramsar sites over the next five years. Any change to existing practices that is likely to significantly impact on the ecological values of these two Ramsar sites, may require approval by the Commonwealth Minister for the Environment and Heritage and should be referred to DEH.

Other international regimes are applicable to fisheries management but do not explicitly involve this fishery, for example the 1992 Convention on Biological Diversity and in

particular the 1995 Jakarta Mandate requiring that, in relation to the sustainable use of marine and coastal biological diversity, the precautionary principle should apply in efforts to address threats to biodiversity. While these agreements are not specifically addressed in the Submission, the fishery's compliance with their requirements can be assessed by examination of Part II of this report.

DEH considers it is incumbent on all authorities to develop a thorough understanding of the framework of national, regional and international agreements and their applicability to export-based fisheries for which they are responsible.

Conclusion

DEH is satisfied that the management regime in the Victorian Eel Fishery is documented, publicly available and transparent, and is developed through a consultative process. The management arrangements are adaptable and underpinned by appropriate objectives and performance criteria by which the effectiveness of the management arrangements can be measured, enforced and reviewed.

The management arrangements are capable of controlling the harvest through a combination of input and output controls appropriate to the size of the fishery. Periodic review of the fishery is provided for, as are the means of enforcing critical aspects of the management arrangements.

The management regime takes into account arrangements in other jurisdictions, and adheres to arrangements established under Australian laws and international agreements.

PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

Stock Status and Recovery

Principle 1: *“A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover”*

Maintain ecologically viable stocks

Objective 1: *“The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability”*

Information requirements

Fishery dependent data for the management of the adult eel fishery has been collected since 1979. It is obtained from compulsory monthly logbook returns. Total landed weight of each species of eel, total effort expended, location of fishing activities, quantity of introduced (noxious) bycatch species caught, details of disposal of catch (domestic, export or as restock to stock-enhanced waters), and details of any eels retained under permit for restocking purposes are included. For glass eels, catch by number of eels from individual waterways is also recorded as are all species of bycatch.

Individually allocated waters are GIS coded and this information is also recorded in the logbook. Eel fishers maintain separate logbooks for allocated and for stock-enhanced waters. The four main eel processors and exporters in Victoria have voluntarily agreed to maintain records of eels received and disposed of. DPI believes that this system provides a paper trail from the catcher to the buyer, allowing validation of catch returns.

No specific long term, fishery-independent monitoring program exists for the Victorian Eel Fishery owing to its small size and relatively small contribution to the Victorian and national economies. However, a number of independent research projects have been undertaken that examine aspects of eel biology and industry development (eg McKinnon *et al*, 2002). Further, the Freshwater Fisheries Program of the Marine and Freshwater Research Institute (MAFRI) and the Freshwater Ecology Section of Parks, Flora and Fauna Division undertake regular surveys of coastal and inland waterways. These surveys have resulted in records of the distribution and an abundance index of both anguillid eel species in Victoria. While not used currently, DPI plans to use these data in conducting ecological risk assessments for both the adult and glass eel sectors of the fishery.

DPI collects data from a wide range of sources (logbooks, processor records, survey data and related research data) in an effort to counteract the lack of fishery-independent data. DEH considers this a useful approach given the economic and resource

constraints under which the fishery operates. Further data validation may be provided for by the four processors in Victoria. Together, these processors have voluntarily offered to provide data as a means of verifying overall catch.

DEH is concerned that the minimum number of visits by a Departmental officer proposed in the EFMP and the BAP may be unlikely to be sufficient to ensure that rare events (such as the accidental take of a protected species) are recorded or recorded with sufficient accuracy. DEH also recognises that the scale of the fishery and its economic importance are such that an overall increase in observer coverage is unlikely to be justifiable. The ecological risk assessments planned for the future should be able to assist the DPI to focus on those regions that may require more intensive monitoring. A rationalisation of monitoring should be possible as a result of the risk assessment process and DEH expects that this rationalisation would occur within a 12 month period from the completion of the risk assessments.

DEH's main concern is in regard to the information collection for the glass eel fishery. This component of the Eel Fishery is in a developmental stage in Victoria with several FRDC funded research projects indicating that capacity exists for expansion of this sector. DPI officers have noted very little activity in the sector in the last two to three years (pers. comm. Dr Lachlan McKinnon, MAFRI) and thus, few data have been collected. DEH is concerned that to be ecologically sustainable, any future expansion of this sector must be accompanied by a monitoring program that will inform the future management of this sector. A recommendation to this effect is made under the 'Management Response' section (Recommendation 4).

Overall, given the range of fishery dependent and other sources of data gathered by DPI and the mechanisms for regularly reviewing the data requirements, DEH is satisfied that there is a reliable information collection system in place for the adult eel fishery appropriate to the scale of the fishery. Recommendations on the need to enhance data collection for the glass eel component of the fishery should contribute to the sound management of the Victorian Eel Fishery as a whole.

Assessment

Eel stocks and the proportion of stocks that can be sustainably harvested are not assessed in this fishery. DEH recognizes the inherent difficulties in eel stock assessment and uncertainties surrounding population dynamics. The submission describes how the management of the fishery relies on precautionary measures to ensure that overfishing does not take place.

An overview of the status of the fishery, including an analysis of each of the components of the adult eel fishery (wild caught shortfinned eel, wild caught longfinned eel and stock-enhanced shortfinned eel) is made annually. While not a stock assessment *per se*, the fishery assessment includes an examination of the catch return data for each component of the fishery, and for the fishery as a whole.

There are no reliable biomass estimates for either species in Australia. This situation is the same in virtually all regions of the world where eels are harvested. No stock assessment has been conducted for either species and, given the eel's life history characteristics, it is unlikely that one could be undertaken that was commensurate with

the value and size of the fishery. Instead other management measures, based on a precautionary approach, have been employed to ensure sustainability of the fishery.

No stock assessment is likely to be conducted for the Victorian Eel Fishery due to the catadromous, semelparous life history strategy of anguillid eels. Further, the fact that approximately 40% of Victoria's commercial eel catch is sourced from stock-enhanced waters means that traditional stock assessment methods are simply an inappropriate tool with which to manage this fishery. Instead the fishery relies on a precautionary approach of ensuring adequate escapement on the conservative assumption that there is a spawner per recruit relationship.

The distribution of both species of anguillid eels in Victoria is well documented and understood. Geo-coding of all commercially fished waters has commenced with the 2003 fishing year and is likely to enable more accurate reporting of catch by water, improved monitoring of eels stocks and management of the fishery on a catchment basis.

A study in which the glass eel resources in southeastern Australia were compared across fished and unfished river systems found that recruitment of shortfinned glass eels is not significantly different between rivers (Gooley *et al* 1999). These findings indicate that the eels from unfished rivers are contributing to the overall recruitment and that biological diversity and reproductive capacity are unlikely to be affected by the level of fishing pressure in individual waters.

The management of the Victorian Eel Fishery is based on the assumption that both species of eels are from panmictic stocks. Recent work on European eels appears to cast some doubt on the validity of this assumption. Genetic studies underway at Southern Cross University to test the panmixia hypothesis may clarify the matter for longfinned eels.

Recommendation 2. *DPI to investigate the feasibility and need for research to test the panmixia assumption in Anguilla australis. Should the Australian study on A. reinhardtii determine that eel stocks harvested in the fishery are not panmictic, DPI to develop and implement management measures to ensure that catchment fidelity is adequately taken into account and that objectives can still be achieved.*

DPI has drafted a translocation policy, consistent with the National Policy for the Translocation of Life Aquatic Organisms (1999). The draft Victorian Protocol for the Translocation of Eels adopts a risk management approach which, in DEH's view, comprehensively identifies and addresses potential risks associated with translocation of glass eels both within and between Australian states.

Reliable estimates of removals from the adult eel sector are obtained through logbooks and validated through processor records. These data are included in the annual review of the fishery.

Anguillid eel stocks are also harvested by other States, namely, New South Wales, Tasmania and Queensland. At the July 2002 meeting of ANZERG at which all States, except Queensland were represented, a recommendation was made to integrate catch

and effort data from all sectors and start an ongoing program of comparing and validating State catch return data against Australian Quarantine Inspection Service export data. DEH strongly encourages uptake of this recommendation and believes that ensuring that multi-jurisdictional harvest of eels is adequately considered and validated by all sectors is an important step in the future management of all Australian eel fisheries.

DEH notes that information is not collected on the recreational and indigenous take of eels from the adult eel fishery. While fishery managers are confident that the precautionary manner in which the fishery operates will allow account to be taken of any recreational or indigenous take, DEH believes DPI should monitor in its annual review of the performance of the EFMP, data related to eel take outside of the commercial eel fishery.

Recommendation 3. *DPI to collect information on the recreational and indigenous harvest of eels to ensure that all removals of eels are accounted for in the overall management of the fishery.*

Catch data over the last two decades indicate that the Victorian Eel Fishery is operating at an optimal level. Production overall is heavily influenced by environmental factors with drought conditions in central and west Victoria primarily correlating with declines in total catch of the shortfinned eel found in this region. The recent (2001-2002) increase in total catch for shortfinned eels coincided with the alleviation of drought conditions particularly in central and western Victoria. In contrast, catches of longfinned eel have remained relatively stable throughout the drought period as their distribution is largely confined to the east of the state where drought effects were much less severe.

An analysis of the production of each sector and the total fishery production, based on commercial catch records, is undertaken in comparison with the average production over the preceding three years. A deviation of 20% or more from this average will trigger a review of the respective fishery component. This method was chosen because there are inherent problems for eel fisheries in general in defining reference points based on either biomass estimates or on mortality rates (the two main methods of establishing reference points). The submission states that the review panel would include fisheries and regional managers within DPI, industry representatives and the FCC. Any review would involve the input of key stakeholder groups.

The meeting of the ANZERG in December 2003 discussed the feasibility of developing a relative recruitment index for glass eels of both species. Representatives agreed to look at options for monitoring recruitment with a view to developing a standard index that could be applied nationally. The meeting agreed to report on options developed at the next meeting of ANZERG. DEH strongly supports the ANZERG in its attempts to monitor recruitment through the development of a recruitment index.

The DPI submission states that a key objective of the EFMP is to increase productivity through the use of sustainably harvested glass eel resources and the practices of stock enhancement. MAFRI has undertaken extensive research into the potential productivity of glass eel resources in Victoria (eg Gooley, *et al* 1999 and McKinnon *et al* 2002) and concludes that productivity of the eel fishery, through stock-enhancement,

could be increased significantly. Discussion of the need for a management strategy to manage the level of any future harvest is made in the following section.

Management response

The current management regime for the adult fishery aims to maintain ecologically viable stock levels through a range of input controls. These measures were outlined in Part I of this report.

The adult fishery is managed as a closed fishery with 18 EFAL in operation and no new licences may be issued. Waters allocated to individual licences are listed on each licence and may only be fished commercially by the holder of that EFAL (or the nominated operator). The sustainable management of the fishery relies heavily on these two measures.

Approximately 50% of the major coastal rivers in Victoria are closed to commercial eel fishing in order to avoid recruitment overfishing and to minimize the impact of the eel fishery on the wider ecosystem. Only the lower estuarine reaches of the remaining waters are made available to the fishery, resulting in approximately 5% of the potentially harvestable stream length being accessible to the commercial fishery. This results in a very high potential for escapement of spawning stock, while minimizing the risk of overfishing and stock collapse. DPI states, and DEH concurs, that this approach is considered highly precautionary.

DEH is aware that through stock enhancement and changes in market pressure, the level of harvest in the glass eel sector could considerably increase. While some measures are in place to control harvest (see Part I) no comprehensive strategy is in place for future management.

DEH believes that DPI should have a strategy in place to guide the development of this sector. Given the lack of data, a precautionary strategy should be articulated which would provide parameters for the expansion of the glass eel sector. DEH recognizes the currently held view that glass eel densities in donor areas are likely to be so high that most glass eels will die naturally when not fished (ICES 2002). However the FAO technical guidelines of the Precautionary Approach to Capture Fisheries (Garcia, 1996) call for, among other things, "prior identification of undesirable outcomes and of measures that will avoid or correct them". That is, fisheries managers should ideally have determined how they will react to a problem before it occurs and what strategies and actions will be taken if a reference point is reached. Without a predetermined strategy in place, there is a tendency to let social and economic justifications determine management actions, without due consideration of ecological factors.

Recommendation 4. *To control the level of harvest and the potential impacts on bycatch species and the ecosystem in the glass eel sector, DPI to develop and implement within the life of the Victorian Eel Fishery Management Plan (by July 2007) a precautionary management strategy for this sector. The strategy is to be reviewable and include performance measures linked to defined management triggers and responses. It should also include mechanisms to enable ongoing monitoring of the fishery and take into account the impact of environmental conditions on the fishery.*

Reference points are a key component in following a precautionary approach to fisheries management and implicit in their use is the assumption that there is a relationship between spawning stock and recruitment. Given that it is still not clear for eels whether the recruitment does depend on spawning stock size or on environmental conditions, the precautionary approach would mean adopting the most conservative assumption – that there is a relationship between spawning stock and recruitment. In data poor fisheries, such as the glass eel component of this fishery, ICES recommends a preliminary precautionary estimate for fishing mortality of 50% spawners per recruit (ICES 2001, p19).

DPI has taken a different approach in defining a limit reference point based on an index of relative abundance (CPUE) of adult eels. A moving average based on the previous three years total catch for each of the components of the fishery is calculated. A 20% reduction in the catch, based on this moving average, will trigger a review in the respective component of the fishery.

DPI acknowledges that this trigger point has been set arbitrarily. In a response to a public comment on this matter, DPI states, “It is suggested that trigger points may be revised over time during the management plan review process. The first review of the management plan is scheduled to be undertaken in early 2004, and will include input from the peak bodies, industry and fisheries managers. The potential for target and/or limit reference points to be set for the fishery is likely to be examined in the review. For information, the 20% trigger point was breached in five consecutive years between 1994 and the present [October 2003]. Had the management response been in place during this time, the ensuing review of the fishery in each of these years would have clearly identified the effects of the drought as the cause of the trigger point breach.”

DEH is satisfied that, given the nature of anguillid eel fisheries, such a reference point is not likely to lead to over-fishing in the short to mid term. It is also satisfied that DPI will undertake a review should the trigger be breached and that the review will be conducted in an open and transparent manner. DEH suggests that in the process of the annual review, consideration be given to the appropriateness of the trigger point itself.

Monitoring and management of by-product species in the eel fishery is conducted at a scale appropriate to the scale of the fishery and at a level of risk to by-product species. The EFMP prohibits the retention of species other than eels and three species of introduced fish (Carp (*Cyprinus carpio*), Tench (*Tinca tinca*) and Roach (*Rutilus rutilus*)). Carp is listed as noxious under Victorian legislation. DPI’s submission states that each of these species has low commercial and recreational value and that the take of each of these species is minimal (mean annual take between 1980-2000 of Carp was 1.5 tonnes, Roach, 10 tonnes and Tench, 6.5 tonnes).

All native species other than eels captured in the fishery must be released. Habitat of species of high conservation value (eg platypus) has been identified and closed to the eel fishery. Further detail on the management of these species is provided under Principle 2 of this report. Recommendations relating to collection of data and the development of an ecological risk assessment based on this data have been made in the BAP. DEH supports the direction of the BAP and urges DPI to continue to implement its recommendations.

Promote recovery to ecologically viable stock levels

Objective 2: *“Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes”*

This objective is not applicable to the eel fishery at this time. However, DPI have a system in place to address threats to sustainability.

Drought conditions prevailing since 1994, particularly in western Victoria, had resulted in a steady decline in the number of shortfinned eel being harvested. The submission notes that productive eel waters were reduced by approximately 60% during this period. Under the EFMP a reference point has been established (discussed previously) which will be applied to all components of the fishery. If the reference point is breached a review will be triggered. The review will examine the decline in the fishery and provide advice within a period of 3 months to the Minister, including recommendations and options for management. The review will be undertaken through the auspices of the FCC and include representatives of key stakeholder groups. The reference point has not been triggered since the commencement in June 2002 of the EFMP.

Management responses may include reduction in effort, closure of any component of the fishery including the closure of a water or catchment to eel fishing, or closure of the entire fishery. These responses would be implemented under s.152 of the Victorian Fisheries Act 1995 through publication of a Fisheries Notice in the Government Gazette, and delivered to the relevant peak body, which in the case of the Victorian eel fishery is Seafood Industry Victoria.

Conclusion

DEH is satisfied that the management regime in the Victorian Eel Fishery is appropriately precautionary and provides for the fishery to be conducted in a manner that does not lead to over-fishing. DEH is also satisfied that stocks are not currently overfished, but should that occur in the future, the fishery is conducted such that there is a high degree of probability the stocks would recover.

DEH is satisfied that the information collection system and stock assessment and management arrangements generally are sufficient to ensure that the fishery is conducted at catch levels that maintain ecologically viable stock levels with acceptable levels of probability.

DEH considers that there is scope to further refine the existing information collection system and the assessment and has provided a number of recommendations for improvements in the longer term.

Ecosystem impacts

Principle 2: “*Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem*”

Bycatch protection

Objective 1: “The fishery is conducted in a manner that does not threaten bycatch species”

Information requirements

In both the adult eel and glass eel components of the fishery, DPI acknowledges that reliable data on bycatch is sparse. In the glass eel fishery, this is largely a result of the relatively recent expansion in effort in this sector while in the adult eel fishery, limited data collection throughout the history of the fishery is the primary cause.

In trials for collection of glass eels, DPI acknowledges that the non-selectivity of the gear resulted in the bycatch of a diverse range of species of juvenile fish. The distribution of endangered, threatened or protected species, which may be susceptible as bycatch in the glass eel fishery, is yet to be investigated.

The BAP identifies, correctly in DEH’s view, the need to increase data collection on bycatch species in all components of the fishery. Provision for bycatch information has now been included in the compulsory logbooks for both adult and glass components of the eel fishery. DEH has concerns about whether the data, particularly from the glass eel sector, will be adequate to inform the ecological risk assessment process. The concern includes both the accuracy of the data (in the glass eel sector) and its validation (both adult and glass eel sectors).

Another issue that leads to concern is that of the level of taxonomic information that will be required to address bycatch issues in the glass eel sector. While DEH acknowledges the inclusion of species identification keys in the logbooks, it is of the view that accuracy in data reporting could be enhanced by an industry well informed of bycatch reporting needs and of the species of concern.

Recommendation 5. *DPI to develop and implement a strategy to monitor and minimize the impact on bycatch and protected species of the glass eel sector of the fishery. DPI to develop a robust system for validating bycatch data in the adult and glass eel sectors of the fishery. DPI to also develop and implement an education program to complement the recent introduction of bycatch reporting requirements on logbooks in an effort to enhance data reliability.*

Assessment

No bycatch assessment has been conducted in Victorian waters in relation to the eel fishery. A draft Bycatch Action Plan (BAP) for the fishery has been prepared and a number of recommendations are made in the draft BAP on the need to assess data as the database grows.

Principally, the BAP calls for the development of a risk analysis tool such as that used by Stobutzki *et al* (2001) for the adult eel components of the fishery and an ecological risk assessment to determine the potential impacts of glass eel fishing on glass eel stocks and bycatch species in the developmental glass eel component of the fishery. It

recommends that a risk assessment on the adult eel fishery's impact on endangered, threatened or protected species be performed, using existing data. It further recommends that the risk assessment be incorporated into each annual review of the adult eel fishery.

The strategy identified in the BAP to address the overall paucity of bycatch data is a staged one, commensurate with the size and value of the fishery. First, logbooks were amended to facilitate provision of bycatch data (April 2003). This is to be enhanced by monitoring bycatch through random site visits by representatives of DPI (commencing in July 2004). A review of the bycatch data, and performance of the fishery in bycatch reduction will then form a part of the annual review of the entire fishery.

Finally, the BAP states that a risk assessment on both the adult and glass eel components of the Victorian eel fishery's impact on endangered, threatened or protected species will be undertaken, initially using existing data. The risk assessment process will also be incorporated into the annual fishery review, allowing DPI to build on an existing understanding of the impact of the fishery on bycatch species.

In DPI documents submitted for assessment, the initial risk assessment for the adult components of the fishery is proposed for June 2004 while that for the glass eel component is proposed to commence in December 2004. Given the staged approach to collection of data on which any risk assessment will rely, DEH is of the view that by delaying the risk assessments by 12 months, DPI may achieve a more robust and meaningful outcome for both the adult and glass eel components of the fishery.

Management response

A range of measures exists in the Victorian eel fishery to avoid the capture and mortality of bycatch species. DPI's submission states that the same regulations that control the level of take in the eel fishery also reduce the impact of fishing activities on bycatch (Fisheries Regulations 1998 and licence conditions). These regulations and conditions include:

- Use of fyke nets and a licence which only permit take of eel
- Individual limits on number of nets per EFAL (and thus per allocated waterway)
- Closure of approximately 50% of major Victorian rivers and streams to commercial eel fishing
- Closure to commercial eel fishing of waters containing known populations of indicator bycatch species at risk from eel fishing. Indicator species, in addition to those already protected by legislation, to be identified in the risk assessment process as described in the BAP.
- Restriction of fishing activities to lower estuarine sections of rivers
- Input controls on gear usage
 - No more than 3 nets used to form a fleet
 - No more than 50% of width of stream to be blocked by nets
 - No net or fleet of nets within 5m of another net or fleet
- Nets to be cleared at least once every 48 hours for the adult eel fishery
- Nets to be cleared at least once every hour for the glass eel fishery
- For the adult eel fishery, inclusion of bycatch reduction devices and/or fishing methods in Wildlife Reserves including:
 - Exclusion grids

- Cod end of net raised above water surface, or raised and open above water surface
- Escape tube(s)
- Clearing nets within 24 hours
- Immediate closure of waters where platypuses caught as bycatch (eg Barham River)
- All bycatch species to be returned to the water immediately (excluding noxious species)
- Reporting of bycatch on commercial eel fishing logbook returns to be introduced in 2003
- Independent random monitoring of bycatch in fishing operations to be introduced in 2003/04

Gear type and setting regulations detailed in the EFMP and Fisheries Regulations 1998 are designed to minimise the threat of capture to bycatch species. These regulations prevent fishing saturation of a watercourse by commercial fishers and the use of gear that has highly negative environmental impacts.

Commercial eel fishing is not permitted in waters in which populations of platypuses (*Ornithorhynchus anatinus*) and native fish species such as estuary perch (*Macquaria colonorum*), Australian grayling (*Prototroctes maraena*) and Australian bass (*Macquaria novemaculeata*) may be threatened by the practice of commercial eel fishing. The Victorian Eel Fishery BAP also raises the possibility of expanding this list of indicator species to include other endangered, threatened or protected species (eg the broad-finned galaxias, freshwater herring and the Tasmanian mudfish). It recommends a bycatch reduction workshop be conducted for all EFAL holders. DEH supports this recommendation and encourages DPI to undertake such a workshop at the next annual review of the fishery with a view to planning for the data requirements of the proposed ecological risk assessment.

Currently, all commercial licence holders permitted to fish in Wildlife Reserves in western Victoria are required to use bycatch reduction devices (BRDs). The practice of raising and/or opening the codend of a fyke net, thereby creating an opportunity for escape and/or to breathe for air breathing bycatch (i.e. birds, water rats and platypus.), is also mandatory. The BAP recommends the practice of raising and/or opening the codend of a fyke net to create an escape or breathing opportunity for air-breathing bycatch. DEH supports this recommendation and encourages DPI to develop an industry wide code of conduct, which includes this and other measures recommended in the BAP. The ecological risk assessment for the adult eel sector should allow DPI to determine which waterways, in addition to designated wildlife reserves, pose risks to air breathing animals.

Recommendation 6. *In the process of conducting a risk assessment of the adult eel fishery, DPI to investigate the potential impact of fyke nets on air-breathing bycatch. Where the likelihood of capture is medium or high risk, DPI to require all fishers operating in those waters to create an opportunity for air breathing animals to breathe/escape.*

A number of eel permits include seasonal closures as a condition. Such conditions aim to minimise conflicts between other resource users, and are a practical approach that can be used to minimise the impacts of eel fishing at specific times of the year, such as

during the migrations of species at risk of bycatch. DEH suggests that great flexibility is gained by including this measure as a management option and applauds DPI for its inclusion in the EFMP.

The DPI submission states that eel fishing is not permitted in waters where known populations of estuary perch (*Macquaria colonorum*), Australian bass (*M. novemaculeata*) or platypus (*Ornithorhynchus anatinus*) exist. Since April 2003 the logbooks have catered for the recording of fishery dependent bycatch data. The submission states that data validation will occur through the random visits of dedicated Victorian DPI compliance officers.

A phased approach to improving on this data collection system is proposed in the BAP whereby data held in existing fisheries and wildlife databases, data collected from fishery dependent sources and bycatch data independently collected by compliance officers will be analysed to provide input into management decisions and to provide data and information for a risk assessment. The risk assessment is expected to result in a refinement of the list of indicator species.

Both the submission and the BAP state that should significant numbers of bycatch indicator species be caught, an immediate review of the fishery would be triggered. It is not clear from either document what level “significant” would have to be to trigger such a review. The DPI submission then states that the ensuing review would determine the longer-term future of eel fishing in that water. DEH urges DPI to determine, as a priority, what constitutes “significant numbers of bycatch indicator species” in order to ensure clear and transparent management of the Victorian Eel Fishery.

Conclusion

DEH is satisfied that there is a high likelihood that the fishery is conducted in a manner that does not threaten bycatch species. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that DPI would undertake appropriate actions to ensure that this fishery does not threaten bycatch species.

Recommendations has been developed to ensure that the risk of unacceptable impacts on bycatch species is detected and minimised in the longer term.

Protected species and threatened ecological community protection

Objective 2: *“The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities”*

Information requirements

The DPI submission states that the distribution of endangered, threatened and protected species in Victoria is known. There are no known threatened ecological communities that overlap with the Victorian Eel Fishery.

Data on endangered, threatened and protected species in Victoria will be collected as part of the fishery logbook program. Random inspections of fishing sites by DPI compliance officers is expected to achieve some level of validation of this data.

The proposed risk assessment should identify the adequacy of the proposed inspection regime and the level of “significant” bycatch that would trigger a review.

Assessment

An assessment of the overlap in distribution of endangered, threatened and protected species in Victoria is proposed as part of the risk assessment process. The submission also states that potential impacts will be reviewed annually as part of the general review of the eel fishery. DEH is satisfied that the assessment of the potential impact of the eel fishery on endangered, threatened and protected species in Victoria should lead to adequate management measures, commensurate with the value of the fishery, being put in place. The risk assessment will lend additional confidence to DPI management of endangered, threatened and protected species by identifying those waters in which specific species management measures may be required. Recommendation 6 is an example of one such measure.

Management response

In addition to the measures described under Principle 2, Objective 1, DPI state that certain site-specific measures may be employed to ensure the integrity of areas of high conservation value or to protect endangered, threatened and protected species in Victoria. The DPI submission cites, by way of example, the requirement for a 14-day period to elapse between clearing nets and reusing them in two different wildlife reserves. This measure is designed to prevent translocation of fauna and flora between wetlands.

Other measures have been described under Principle 2, Objective 1.

Conclusion

DEH notes that there are minimal interactions with protected species in this fishery and is satisfied that the fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that DPI would undertake appropriate actions to ensure the fishery avoids mortality or injury to these species and avoids or minimises impacts on threatened ecological communities.

Minimising ecological impacts of fishing operations

Objective 3: *“The fishery is conducted in a manner that minimises the impact of fishing operations on the ecosystem generally”*

Information requirements

Information collection systems in place in the Victorian eel fishery have been described under Principle 1, Objective 1 and Principle 2, Objective 1. DEH is of the opinion that, while not directly addressing the impacts on the ecosystem, the generally precautionary

nature of the eel fishery combined with the information collected and the reviews in place and/or proposed are commensurate with the scale and value of the fishery and will result in minimal impacts of fishing operations on the ecosystem.

The MAFRI and also the Arthur Rylah Institute regularly collect fishery independent data on the composition of the aquatic community of some of Victoria's waterways. DPI has informed DEH that this data will be incorporated in the management of the fishery, both in the risk assessment process in order to establish the most appropriate list of indicator species and in annual reviews with the aim of beginning to quantify any possible impacts on the ecosystem generally.

DEH is concerned at the lack of information collection and research covering the fisheries impact on the ecosystem and environment generally. However, DEH understands that this lack of information is the case across a range of Australian and International fisheries and until appropriate research techniques and programs are developed and implemented this will continue to be the case. DEH strongly supports research in this area.

Assessment

The submission recognises that the most significant impact on the natural ecosystem is likely to be the exploitation of the target species and its impact on the size of the spawning biomass of eels. Throughout the submission however, DPI asserts that the impact of the fishery on the biomass is significantly reduced through the closure of some 50% of waterways to eel fishing, allowing fishing only in the lower reaches of those waterways, and placing a number of restrictions on gear, thus ensuring sufficient spawners remain to sustain the fishery. Ensuring that sustainable populations of eels remain was an issue discussed under Principle 1 of this report.

The submission provides some assessment of the perceived risks to ecological communities. It states that any possible impact on benthic communities is largely mitigated through the use of passive gear and the precautionary approach.

Food chain interactions may also be affected by operations of the fishery. The removal of a large predator from the system would be expected to result in some disturbance to food chains and the productivity of the environment. The submission contends, though, that in the majority of situations the disturbance is expected to be temporary, as riverine-based fishing tends to remove eels that would otherwise be removed from the fishery through migration. DEH supports this contention.

Productivity impacts may also be expected to result from the removal of glass eels from certain sections of those waters open to the glass eel component of the fishery. The estimated natural mortality of glass eels is assumed to be high, although in practice this has never been quantified. The BAP addresses this concern by stating that a minimum of 10% by number of glass eels harvested under the permit must be returned to waters from which they were taken as advanced pigmented elvers (minimum average size 2g), under the supervision of departmental officers.

The extensive range, complex life history, relatively long life span, age at sexual maturity and associated spatial and temporal variability of recruitment of glass eels of both species suggests the need for the establishment and maintenance of long term databases to develop effective management (Gooley and Ingram, 2002). DEH supports

this view and encourages DPI, through its own resources, and under the aegis of the ANZERG, to facilitate the establishment of such a long term database for both species of eels.

Impacts of the fishery on water quality are also expected to be minimal. Setting and retrieving of nets may stir up sediment, but given the small percentage of area impacted, the cumulative effects are not expected to be significant.

Management response

The primary management tool used in the Victorian eel fishery is the precautionary approach. The submission asserts that the main area of concern outside the stocks is the bycatch of threatened, endangered or protected species. Management responses to address these concerns have been described under Principle 2, Objectives 1 and 2.

Conclusion

DEH is satisfied that the fishery is conducted in a sufficiently precautionary manner to minimise the impact of fishing operations on the ecosystem generally.

References

Garcia, S.M. (1996) The precautionary approach to fisheries and its implications for fishery research, technology and management: An updated review. In: *FAO (1995) Precautionary Approach to Fisheries. Part 2. Scientific Papers. FAO Fisheries Technical Papers (350/2):1-76. FAO Rome.*

ICES/EIFAC (2002) ICES/EIFAC Report of the Working Group on Eels. ICES Headquarters, 28-31 August 2001. *International Council for the Exploration of the Seas. Palaegade 2-4 DK Copenhagen K Denmark*

McKinnon, L., Gasior, R., Collins, A., Pease, F. and Ruwald, F. (2002) Assessment of eastern Australian *Anguilla australis* and *A. reinhardtii* glass eel stocks. In '*Assessment of Eastern Australian Glass Eel Stocks and Associated Eel Aquaculture. Final Report to the Fisheries research and Development Corporation (Project No. 97/312)*' Eds G.J. Gooley, and B.A. Ingram) pp 11-72

Gooley, G.J., McKinnon, L.J., Ingram, B.A., Larkin, B., Collins, R.O. and De Silva, S.S. (1999) Assessment of juvenile eel resources in south-eastern Australia and associated development of intensive eel farming for local production. *MAFRI Final Report FRDC 94/067*

Gooley, G.J. and Ingram, B.A. (2002) Assessment of Eastern Australian Glass Eel Stocks and Associated Eel Aquaculture. *MAFRI Final Report FRDC 1997/312*

Stobutzki, I., Miller, M. and Brewer, D. (2001) Sustainability of fishery bycatch: a process for assessing highly diverse and numerous bycatch. *Environmental Conservation 28:167-181*

List of Acronyms

ANZERG	Australian and New Zealand Eel Reference Group
BAP	Bycatch Action Plan
BRD	Bycatch Reduction Device
DEH	Department of the Environment and Heritage
DPI	Department of Primary Industries (Victoria)
EFAL.....	Eel Fishery Access Licence
EFMP	Eel Fishery Management Plan
EPBC Act.....	Environment Protection and Biodiversity Conservation Act 1999
FCC	Fisheries Co-Management Council
FRDC	Fisheries Research and Development Corporation
MAFRI.....	Marine and Freshwater Resources Institute
NSW.....	New South Wales