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Victorian Translocation Protocol for Commercial Freshwater Open Aquaculture Systems on Private Land

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Draft Victorian Translocation Protocol for Commercial Freshwater Open Aquaculture Systems on Private Land

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Introduction

Purpose

The purpose of this translocation protocol is to mitigate the risks associated with the translocation of salmonids and endemic species of fish into, out of, or between commercial freshwater open aquaculture systems on private land in Victoria. The protocol considers the environmental risks associated with translocations and aims to improve the efficiency of the application and approval process.

Consistent with the *Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria* (Department of Primary Industries 2009), development of this protocol has been guided by a risk assessment. This protocol details that process and documents recommended translocation controls.

Scope

Commercial freshwater open aquaculture systems on private land in Victoria are used for a broad range of species and purposes. This protocol addresses the risks and documents risk management strategies for repeated translocations to these systems.

For the purposes of this protocol, commercial freshwater open aquaculture systems are separated into two categories based on water-use (i.e. flow-through or static). The controls established in the protocol manage the environmental risks of the following translocations:

- salmonids to commercial flow-through aquaculture systems; and
- salmonids and endemic species to commercial static aquaculture systems.

This protocol addresses the range of activities associated with the translocation of live aquatic organisms, including all stages of the organism's lifecycle, and specifies the conditions under which live aquatic organism can be translocated to these systems.

This protocol addresses translocations that require authorisation under the *Fisheries Act 1995* and are facilitated through appropriate conditions in aquaculture licences, general permits and other authorisations to stock commercial freshwater open aquaculture systems on private land in Victoria.

This protocol considers only translocations of salmonid and endemic species that require authorisation under the *Fisheries Act 1995*. It does not consider translocations:

- for the purposes of restocking public waters that are addressed in the *Protocols for the Translocation of Fish in Victorian Inland Public Waters* (Department of Primary Industries 2005);
- for the purpose of stocking non-commercial open aquaculture systems on private land;
- of shortfin and longfin eels to RAS systems that are addressed in the *Victorian Protocol for the Translocation of Eels* (Department of Primary Industries 2006a);
- associated with recirculating aquaculture systems that are addressed in the *Victorian Protocol for the Translocation of Aquatic Animals Grown in Recirculating Aquaculture Systems* (Department of Primary Industries 2008b);
- of ornamental fish;
- of genetically modified organisms;
- of noxious species declared under the *Fisheries Act 1995*; or
- of fish sourced from overseas.

Proposed translocations of other species will be considered in accordance with the *Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria*.

Definitions

For the purposes of this translocation protocol, the following terms are defined:

Broodstock: Animals used for the purposes of breeding.

Commercial: All the activities of business, industry and trade, having profit or other financial benefit as the primary aim.

Commercial flow-through systems: Open aquaculture systems that use water diverted from an adjacent waterway and is discharged to a waterway after use, for the purpose of growing fish for sale or other commercial purposes.

Commercial static systems: Open aquaculture systems that use water that is not routinely discharged, for the purpose of growing fish for sale or other commercial purposes.

Competent veterinarian authority: The National Veterinary Services or other authority of a Member Country having the responsibility and competence for ensuring or supervising the implementation of the aquatic animal health measures recommended in the *Aquatic Animal Health Code* (OIE 2006a).

Disease: Clinical or non-clinical infection where one or more of the causative agents of the diseases is listed in the *Aquatic Animal Health Code* (OIE 2006a).

Endemic fish: Fish species that occur naturally within Victoria are considered endemic. This includes Murray cod (*Maccullochella peelii peelii*), golden perch *(Macquaria ambigua),* silver perch (*Bidyanus bidyanus*), Australian bass *(Macquaria novemaculeata)*, catfish (*Tandanus tandanus*) and common yabby (*Cherax destructor*).

Established species: An endemic fish or salmonid species is deemed established if it has a recent (1995 onwards) documented history of being stocked in a public waterway by Fisheries Victoria or other government documented evidence of a self-reproducing population in the waterway.

Fish: As defined in the *Fisheries Act 1995*. This includes: all species of vertebrate aquatic fauna (other than mammals, reptiles, birds and amphibians); sharks, rays, lampreys and other cartilaginous fish; oysters and other aquatic molluscs; crustaceans; echinoderms; and any species of aquatic invertebrate declared to be a fish by the Governor in Council.

Introduced species: A species that is not endemic to Australia.

Natural range: Natural range will mean the natural distribution as outlined in Appendix J or as determined by the Executive Director Fisheries Victoria.

Office International des Epizooties (OIE): Also known as World Organisation for Animal Health, an international inter-governmental organisation that collates and disseminates information on animal diseases and develops health standards for international trade in animals and animal products.

Open aquaculture system: An aquaculture system typically exposed to external environmental factors where there is control over the movement of organisms and some control over water flow.

Potential receiving waters: Any public water into which fish or disease may reach as a result of an adverse event (e.g. flood, inundation, levee breach, overflow, facility accident, system failure etc.).

Protected waters: As defined in the *Fisheries Act 1995*, are Victorian waters and any aquarium or hatchery or any other waters in Victoria whether or not it is private property. Note: To *stock* protected waters without authorisation is an offence under the *Fisheries Act 1995*.

Risk: The chance of undesirable events, expressed as a function of the likelihood and consequence of such events.

Risk assessment: Process where estimates of the likelihood and consequence of an event are combined to arrive at a level of risk.

Risk rating: A measurement that incorporates the likelihood of occurrence and consequence of an event.

Salmonid: For the purposes of this document, salmonids are defined as rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta)*, Atlantic salmon (*Salmo salar*), brook trout (*Salvelinus fontinalis*) and chinook salmon *(Oncorhynchus tshawytscha).*

Translocation: Translocation is a process that has been approved by the Secretary, DPI, or delegate for the deliberate, human-assisted movement of live aquatic organisms to protected waters under the *Fisheries Act 1995.*

Translocation Evaluation Panel (TEP): Expertise-based panel, established under the *Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria* which provides advice on proposed translocations and translocation protocols.

Stock: In relation to fish, includes the releasing, putting or introducing of fish into waters.

Legislation

Translocation pathways described in this protocol are those that may be authorised in accordance with the *Fisheries Act 1995* and subject to the *Fisheries Regulations*. It is an offence to stock fish into protected waters unless authorised to do so under the *Fisheries Act 1995*.

Key Victorian legislation surrounding the translocation of aquatic organisms includes the:

- *Fisheries Act 1995*
- *Flora and Fauna Guarantee Act 1988*; and
- *Livestock Disease Control Act 1994*

Policy

The *National Policy for the Translocation of Aquatic Animals – Issues, Principles and Implementation* (Bureau of Rural Sciences 1999) provides a risk assessment framework for adoption by all states and territories to assist in managing the risks associated with translocation. The *Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria (the Victorian Translocation Guidelines)* provides the framework for implementing this policy in Victoria.

Where translocations are likely to be repeated and have similar characteristics (e.g. species, associated media and source and destination locations), preference will be given to the development of translocation protocols that are consistent with the Victorian Translocation Guidelines. The Department of Primary Industries has the lead role in developing protocols for translocations of live aquatic animals in Victoria.

Applications to undertake a translocation will be considered on a case-by-case basis. Proponents must demonstrate compliance with an appropriate protocol through application for authorisation under the *Fisheries Act 1995*, i.e. a licence, permit or other authorisation.

In providing advice on proposed translocations, the Translocation Evaluation Panel, a cross-agency expertise-based forum, reserves the right to consider information that is not provided by the proponent.

The Victorian inland aquaculture industry

The data used in the following discussion is extracted primarily from the *Fisheries Victoria Commercial Fish Production Information Bulletin* for the year 2006/07 (Department of Primary Industries 2008).

Approximately eighteen species of aquatic animals are produced by licensed Victorian aquaculture producers. Key species groups include salmonids, warm water finfish, eels, yabbies, ornamental fish, greenlip and blacklip abalone and blue mussels. Approximately 70 per cent of the aquaculture licences issued under the *Fisheries Act 1995* authorise aquaculture on private land at inland locations.

During 2006/07, 2,561 tonne of aquaculture product valued at $20 million was produced in Victoria. During the same period, inland aquaculture producers contributed 1,616 tonnes of product valued at $12 million or 63 and 60 per cent of total Victorian aquaculture production and value, respectively.

The majority of inland aquaculture production is from the salmonid sector that, in 2006/07, produced 5.2 million seedstock (i.e. fry and fingerlings) and 1,361 tonnes of whole fish valued at $6.9 million. The majority of salmonid production is rainbow trout (*Oncorhynchus mykiss)* from commercial flow-through systems.

During the years 2002/03 to 2006/07, 95 per cent of the salmonid seedstock produced was used on the farm where it originated while two per cent was translocated to other farms and three per cent was used for stocking public waters.

In 2006/07, the warm water finfish sector produced 112 tonnes of aquaculture product valued at $1.6 million. Warm water finfish species include Murray cod (*Maccullochella peelii peelii*), silver perch (*Bidyanus bidyanus)* and barramundi (*Lates calcarifer*) of which a significant amount of production is from recirculating aquaculture systems.

In the same period, 874,000 warm water finfish were produced in Victorian hatcheries. Of the fish produced between 2002/03 and 2006/07, at least 26 per cent were stocked into public waters, with the remainder transferred to other farms or maintained on-farm.

In 2006/07, two tonnes of common yabby (*Cherax destructor*) valued at $26,000 were produced in Victoria. Around 86,000 seedstock were produced during this period, the majority of which is used on-farm.

Freshwater open aquaculture systems on private land

The following sections provide an overview of the two types of commercial freshwater open aquaculture systems (i.e. commercial flow-through and commercial static) addressed in this translocation protocol (Table 1).

Authorisation under the *Fisheries Act 1995* is required to stock fish in these facilities and stocking must be conducted in accordance with this translocation protocol and the *Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria.*

Commercial flow-through systems

Commercial flow-through systems are typically used by the salmonid aquaculture sector. The primary product of commercial flow-through systems is rainbow trout (*Oncorhynchus mykiss*) with lesser amounts of brown trout (*Salmo trutta)*, Atlantic salmon (*Salmo salar*), chinook salmon *(Oncorhynchus tshawytscha)* and brook trout (*Salvelinus fontinalis*) for food and stocking. A detailed description of commercial flow-through systems in Victoria is provided in the *Best Practice Environmental Management Guidelines for the Salmonid Aquaculture Industry* (Department of Primary industries 2006).

Commercial flow-through systems use a considerable amount of relatively clean, cool water diverted by pump or gravity from an adjacent waterway and passed through the aquaculture facility before being discharged to the waterway (Figure 1). Most commercial flow-through systems are located in upland areas of Victoria, predominantly in the Goulburn River catchment.

Victorian salmonid farms divert about 0.35 mega-litres per day (range 0.2-0.8 ML/day) for each tonne of product produced per annum. Culture units include fibreglass and concrete tanks, troughs, earthen ponds and raceways. Settlement ponds are often used prior to discharge to trap suspended solids.

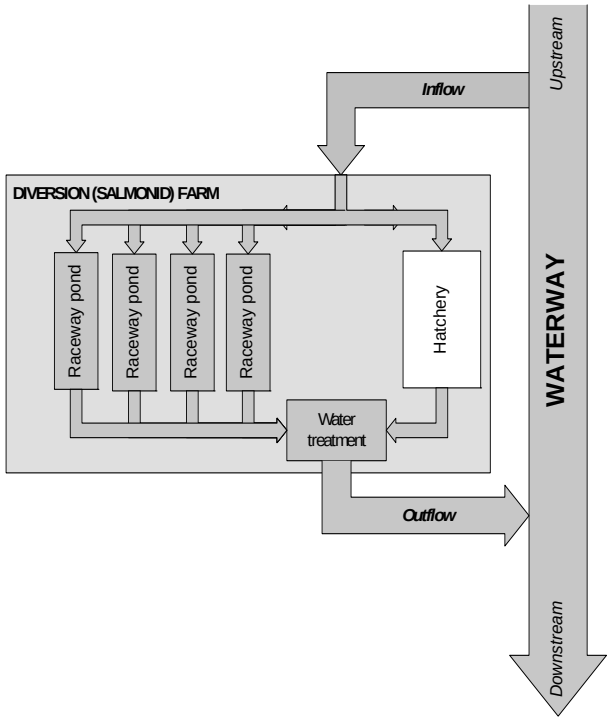

Figure 1. Commercial flow-through aquaculture system, e.g. salmonid farm.

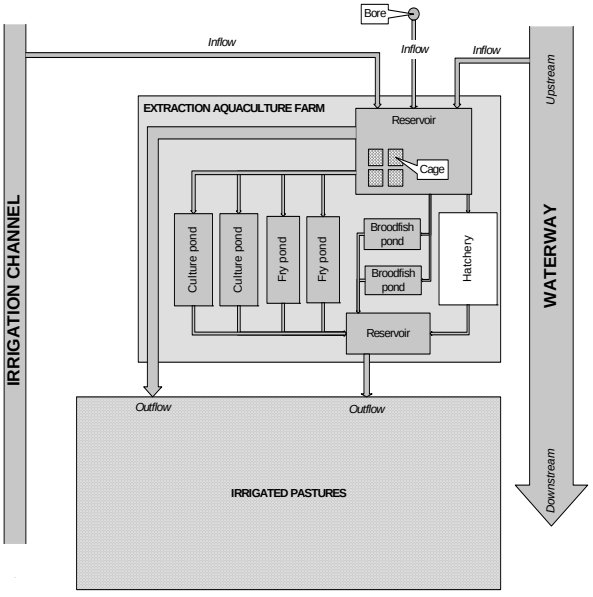

Figure 2. Commercial static aquaculture system, e.g. pond-based Murray cod farm.

Commercial static systems

Commercial static systems are used to produce salmonid and endemic species including Murray cod (*Maccullochella peelii peelii),* silver perch (*Bidyanus bidyanus*) and common yabby (*Cherax destructor*) for on-growing, food and stocking (Figure 2).

Commercial static systems usually source water from streams, irrigation channels, bores, dams, rainwater run-off or a water authority. Water is generally added to replace that lost through seepage and evaporation, used for irrigation or used to manage water quality. Culture units include dams, ponds and tanks that may contain suspended cages and floating raceways.

In some cases, artificial or naturally-occurring ponds, dams, lakes or reservoirs on private land may be used for non-intensive aquaculture activities, including enhanced recreational activities where a commercial entry or catch-related fee is charged.

Table 1. Typical features of commercial lfreshwater open aquaculture systems on private land.

Category	*Authorisation*	*Water source and discharge*	*Production intensity*	*Aquaculture activities*	*Culture units*	*Species*
Commercial flow-through systems	**Aquaculture licence issued under the *Fisheries Act 1995***	**Diverted from waterways and discharged to the source**	**High**	**Hatchery, grow-out and fish-outs**	**Tanks, raceways, ponds and dams**	**Rainbow trout, brown trout, Atlantic and chinook salmon**
Commercial static systems	**Aquaculture licence issued under the *Fisheries Act 1995***	**Waterways, private dams, irrigation channels, bores, mains, rainwater run-off and natural springs; water is generally not returned to source after use**	**Low-High**	**Hatchery, grow-out and fish-outs**	**Tanks, raceways, ponds, dams and associated cages and floating raceways**	**Rainbow trout, brown and brook trout, Atlantic and chinook salmon, Murray cod, silver perch, golden perch, Australian bass, catfish, yabby**

Risks associated with translocations to freshwater open aquaculture systems on private land

Translocation of aquatic organisms is recognised as a potentially threatening process to the environment particularly where species are translocated outside their natural range.

In preparing this translocation protocol, a comprehensive assessment of the environmental risks of translocating live aquatic organisms to freshwater open systems was undertaken by an expertise-based risk assessment panel.

The results of this risk assessment are summarised in the following section and fully described in Appendix A.

In general, risks associated with the translocation of aquatic organisms relate to:

- the escape of translocated species;
- establishment of populations of introduced and non-endemic species;
- genetic shifts in wild populations;
- disease and parasite introduction; and
- chemical release.

As aquaculture in open systems presents opportunities to utilise a range of species, often outside of their natural range, it is important to identify and manage the risks associated with this activity. Aquaculture and fishing industries should take a pro-active role in managing this issue to ensure risks are appropriately managed and community confidence is maintained.

The number and diversity of species grown and the range of systems used in Victoria makes assessment of the specific risks associated with individual translocations complex. While risk profiles associated with each species vary, species may be grouped into similar risk categories for management purposes:

- translocations of endemic species;
- translocations of established species; and
- translocations of non-established species.

These categories are based on an assessment of environmental risks including disease, genetic impact and history of establishing populations in Victoria and elsewhere.

There are several key translocation pathways through which stock are moved into and out of commercial flow-through, commercial static and non-commercial static aquaculture systems (Figure 3):

- environment to aquaculture system;
- aquaculture system to aquaculture system; and
- aquaculture system to non-commercial private waters.

This protocol only considers the environmental (i.e. ecological, genetic, disease and parasite) risks associated with translocations to commercial systems. An extensive range of pathways and species may be the subject of translocation applications. Persons seeking authorisation to stock must demonstrate their ability to undertake the proposed translocation in accordance with this protocol.

This process begins with the submission of an application in line with the process described in the *Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria*. In providing advice on a proposed translocation, the Translocation Evaluation Panel reserves the right to consider information that is not provided by the proponent.

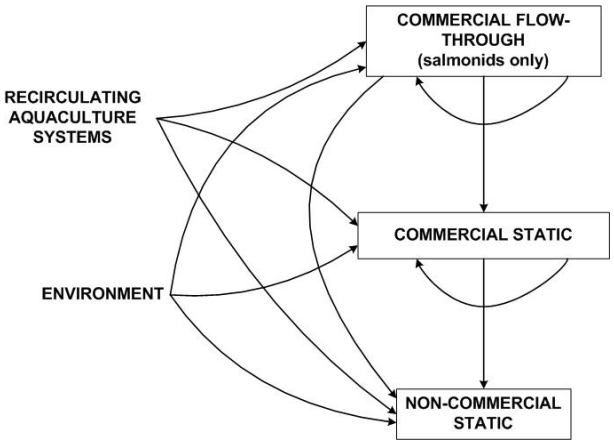

Figure 3. Pathways for translocating aquaculture stock into and between freshwater open aquaculture systems.

Analysis of risk assessment results

The risk-assessment base-case

In assessing the risks of a proposed translocation, it is necessary to characterise the aquaculture system into which aquatic animals will be stocked. The following characteristics broadly represent commercial flow-through systems and commercial static systems in Victoria and thus provide the base cases for risk-assessment.

In considering the associated risks with translocations to commercial freshwater open systems on private land, the base-case was based on naked risks i.e. worst case scenarios and no controls in place.

Risk assessment methods and results

The methods and results of the risk assessment are detailed in Appendix A and summarised below.

Commercial flow-through systems

Eight specific risks were identified for commercial flow-through systems.

Of these, the establishment of endemic or introduced species of fish or infectious disease or pathogen outside of their natural or established range, are considered *high* risk.

The risk of a species being introduced outside of its natural range but not becoming established is considered to be *significant* risk.

The risks of an introduced species being released within its established range, release/ establishment of an infectious disease or pathogen within its known range and the release of an infectious disease or pathogen outside of its known range are considered *moderate* risks.

Commercial static systems

Twelve specific risks were identified for commercial static systems.

Of these, the risk of an introduced species or infectious disease or pathogen becoming established outside of its established range and selected or domesticated endemic species interbreeding with a local population are considered *high* risk.

Establishment of an endemic species outside its natural range is considered to be *significant* risk.

Escape of an introduced species within its established range, the escape of endemic or introduced species outside of natural or established range without becoming established, and interbreeding of endemic species with the local population are considered *moderate* risks.

Risks common across systems

Ten risks common to commercial flow-through systems and commercial static systems were identified.

Establishment of infectious diseases and pathogens and non-target organisms through the discharge of transport water, use of live feeds, inappropriate disposal of mortalities or on equipment and personnel are considered to be *high* risk.

Release of chemicals, pollutants, or domesticated endemic, non-endemic or introduced species during the translocation are considered *moderate* risks.

Aquatic animal disease

The introduction into Victoria of any of the notifiable diseases listed in Appendix B could cause severe biological and economic consequences to aquaculture and recreational fisheries.

Two Office International des Epizooties (OIE) notifiable diseases are known to occur in Victorian waters: epizootic haematopoietic necrosis virus and goldfish ulcerative disease.

The fungal disease, epizootic ulcerative syndrome (EUS), which infects fish in freshwater and estuarine systems, has been detected on one occasion in Victoria and eradicated. Outbreaks of EUS in New South Wales, east of the Great Dividing Range (Callinan et al. 1999), have caused significant economic damage.

Introduced and non-endemic species

Populations of introduced and non-endemic fish can result from escape or release of these species. Twelve introduced species, including European carp and mosquitofish (i.e. *Gambusia* sp.), both declared as noxious species in Victoria, have become established in Victoria (Arthington 1991). Both species have expanded well beyond the initial points of stocking or escape.

Endemic species may also become established in areas where they are not naturally found. For example, Murray-Darling Basin species, including Murray cod, golden perch, silver perch, trout cod and Macquarie perch, have established populations outside of their natural range but have not extended significantly beyond the point of the original translocation (Cadwallader and Backhouse 1983).

Following escape or release, the establishment of an aquatic species depends upon its ability to survive, grow, reach reproductive maturity and successfully reproduce in the new environment. Factors that affect the likelihood of establishment include the presence of environmental requirements to complete the species' life cycle and its food and habitat requirements.

Prevention of escape is the most effective method for preventing the establishment of such populations.

Development of controls to manage or mitigate risks

In accordance with the principles of risk assessment and management, controls were developed that are considered commensurate to the level of risk. To facilitate this, risks were first examined for each of a number of open aquaculture production systems:

- commercial flow-through
- commercial static
- non-commercial static.

Further pathways were then identified:

- Species e.g. Salmonids vs. endemic fish
- Supply source e.g. interstate vs. within State
- Fish distribution e.g. endemic fish within or outside of natural range,
- Presence of established populations in potential receiving waters.

The combination of these pathways provide a number of risk scenarios. Scenarios with a common risk profile were then aggregated and a range of specific controls developed across each scenario group.

Wherever possible, controls were developed to be outcome orientated rather than prescriptive in nature. Notwithstanding the above, some controls are detailed in order to be clearly measurable.

Biosecurity controls have been developed to reflect best practice operational standards and as such also serve to assist management of business or enterprise risk.

Protocol A: Translocating salmonids to commercial flow-through systems

Pathway A1: Translocation within Victoria of salmonid species that are established in the potential receiving waters

A1.1. Meet commercial open system biosecurity standards as described in Appendix C.

A1.2. Salmonids must be sourced from an aquaculture facility authorised under the Victorian *Fisheries Act 1995* or equivalent authorisation elsewhere.

A1.3. Obtain a declaration issued by the supplier that there have been no notifiable diseases (*Livestock Disease Control Act 1994*) or unexplained disease outbreaks at the source facility in the past 24 months (Appendix E);
or

Obtain a certificate of stock health in accordance with Appendices F and G;

or

Demonstrate that the receiver or the supplier participates in an ongoing stock health surveillance program that meets DPI requirements in accordance with Appendix D and there have been no unexplained disease outbreaks at the source facility in the past 24 months.

Pathway A2: Translocation within Victoria of salmonid species that are not established in the potential receiving waters

A2.1. This translocation pathway is outside the scope of this protocol (a risk assessment will be required).

Pathway A3: Translocation from interstate of salmonid species that are not established in the potential receiving waters

A3.1. This translocation pathway is outside the scope of this protocol (a risk assessment will be required).

Pathway A4: Translocation from interstate of salmonid species that are established in the potential receiving waters

A4.1. Same requirements as Pathway A1.

Pathway A5: Translocation of salmonid species sourced from the wild

A5.1. This translocation pathway is outside the scope of this protocol (a risk assessment will be required).

Pathway A6: Disposal of fish and remaining water following the translocation

A6.1. Disposal of water discharged during or following a translocation event must be undertaken in accordance with Appendix H; and

A6.1. Disposal of aquatic species during or following a translocation event must be undertaken in accordance with relevant legislation and Appendix H.

Protocol B: Translocating endemic fish and salmonids to commercial static systems

Pathway B1: Translocation within Victoria of endemic fish within natural range

B1.1. Meet commercial open system biosecurity standards as described in Appendix C.

B1.2. Fish that will be stocked must be sourced from an aquaculture facility authorised under the *Fisheries Act 1995* or equivalent authorisation elsewhere.

B1.3. Obtain a declaration issued by the supplier that there have been no notifiable diseases (*Livestock Disease Control Act 1994*) or unexplained disease outbreaks at the source facility in the past 24 months (Appendix E);
or

Obtain a certificate of stock health in accordance with Appendices F and G;

or

Demonstrate that the receiver or the supplier participates in an ongoing stock health surveillance program that meets DPI requirements in accordance with Appendix D and there have been no unexplained disease outbreaks at the source facility in the past 24 months.

Pathway B2: Translocation from interstate of endemic fish within natural range

B2.1. Same requirements as Pathway B1.

Pathway B3: Translocation within Victoria of salmonid species or endemic fish established in the potential receiving waters

B3.1. Same requirements as Pathway B1.

Pathway B4: Translocation from interstate of salmonid species or endemic fish that are established in the potential receiving waters

B4.1. Same requirements as Pathway B1.

Pathway B5: Translocation of salmonid species or endemic fish that are not established in the potential receiving waters

B5.1. This translocation pathway is outside the scope of this protocol (a risk assessment will be required).

Pathway B6: Translocation of endemic fish and salmonid species sourced from the wild

B6.1. This translocation pathway is outside the scope of this protocol (a risk assessment will be required).

Pathway B7: Disposal of fish and remaining water following the translocation

B7.1. Disposal of water discharged during or following a translocation event must be undertaken in accordance with Appendix H; and

B7.2. Disposal of aquatic species during or following a translocation event must be undertaken in accordance with relevant legislation and Appendix H.

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Appendices

Appendix A: Risks assessment methods and results

The key objectives in the formulation of this translocation protocol is to preserve the natural and farmed stocks of Victorian aquatic animals and to ensure that translocation activities do not adversely impact Victorian inland aquaculture and non-commercial private waters.

In accordance with the *Guidelines for Assessing Translocation of Live Aquatic Organisms in Victoria*, a risk assessment was conducted to define the ecological/environmental, disease/pathogens, genetic, and other risks and to quantify their level of effect in the translocation pathways.

Risk assessment method

A risk assessment was conducted according to the Department of Primary Industries *Strategic Enterprise Risk Management Framework* which is based on the Australian/New Zealand Standard for Risk Management (Department of Primary Industries 2004; Australia/New Zealand Standards Committee 1995).

An expertise-based panel with knowledge of the risks and control measures necessary to address translocation to open systems was assembled and included:

- Mr Bill Bardsley. New South Wales Department of Primary Industries (*Aquatic biosecurity*);
- Mr Travis Beasely. Company Director, Thurla Farms (*Warm water finfish industry representative*);
- Mr Christopher Collins. Executive Officer, VRFish (*Recreational fisheries*);
- Mr Anthony Forster. Manager Aquaculture, Fisheries Victoria, DPI (*Fisheries policy*);
- Mr Robert Gibb. Inland fisheries, Fisheries Victoria, DPI (*Recreational fisheries*);
- Dr Jeffrey Go. New South Wales Department of Primary Industries (*Aquatic animal health*);
- Dr Paul Hardy-Smith. Panaquatic Health Solutions Pty Ltd (*Aquatic animal health*);
- Mr Hui King Ho. Scientist, Fisheries Research Branch, DPI (*Aquaculture research*).
- Dr Brett Ingram. Senior Scientist, Fisheries Research Branch, DPI (*Aquaculture research*);
- Mr Bill Lussier. Aquaculture Policy Officer (Inland), Fisheries Victoria (*fisheries policy*);
- Mr Craig Murdoch. Senior Fisheries Management Officer, Fisheries Victoria, DPI (*Fisheries management)*;
- Ms. Meaghan Rourke. Scientist, Animal Genetics and Genomics, DPI (*Genetics research*); and
- Mr Brett Stephens. Company Director, Aquatic Solutions Australia (*Salmonid industry representative*).

The evaluation of specific risks associated with the translocation of aquatic animals grown in open systems was undertaken using standard risk assessment criteria as shown in the following tables. Risks were numerically ranked according to their likelihood and consequences and the numbers added to produce a risk rating.

Likelihood

Score	*Definition*	*Likelihood of occurrence*
1	**Rare**	**Event may occur only in exceptional circumstances.**
2	**Unlikely**	**The event may occur at some time, say once in 10 years.**
3	**Moderate**	**The event should occur at some time, say once in three years.**
4	**Likely**	**The event will probably occur in most circumstances, say once a year.**
5	**Almost certain**	**The event is expected to occur in most circumstances, say many times a month.**

Consequence

Score	*Definition*	*Consequence of occurrence*
1	**Insignificant**	**No serious consequences or brief environmental harm with effective remediation**
2	**Minor**	**Transient environmental harm. Localised consequences.**
3	**Moderate**	**Moderate harm with mid-term recovery. Regional/state (catchment-wide) consequences**
4	**Major**	**Significant environmental harm with long-term recovery. Regional/state (catchment-wide) consequences.**
5	**Catastrophic**	**Serious long-term or widespread environmental harm. State/interstate (basin-wide) consequences.**

Risk ranking

Risk Rating	*Score*	*Management action*
High	≥ 8	Requires detailed research, planning and decision making at senior levels of management
Significant	7	Senior management attention and action needed
Moderate	5-6	Management responsibility may be specified
Low	< 5	No major concern

Results of risk assessment

The results obtained address worst-case scenarios in order to mitigate any potential impacts onto the receiving environment. The nominated risk and ratings are presented below.

Risk category	***Specific risk***	***System type***	***Likelihood***	***Consequence***	***Risk rating***	***Comments***
Ecological/ environmental	Endemic species escapes within natural range	Commercial extraction	3	1	4 (low)	Endemic species are defined as species that occur naturally within Victoria. The consequence of escape of such species within their natural range is therefore low although it could be affected by the number of animals that escape, the frequency of escape and the longevity of the escaped animals.
		Non-commercial	4	1	5 (moderate)	Compared to commercial dams, the quality of construction of non-commercial farm dams and their placement (e.g. on flood plains) can increase the likelihood that they will flood or breach. Whilst the likelihood of animals escaping from non-commercial dams is therefore greater than from commercial dams, the consequences are similar.

Risk category	*Specific risk*	*System type*	*Likelihood*	*Consequence*	*Risk rating*	*Comments*
Ecological/ environmental	Introduced species escapes within established range	Commercial diversion	4	2	6 (moderate)	Introduced species are found within Australia but are not endemic to the country. Species that are introduced and maintain a self-reproducing population are termed established. Establishing likelihood ratings depends on system design, management (e.g. presence of escape barriers, screens, etc.) and the number of animals that may escape (e.g. the likelihood of a small number escaping is 4 whilst the likelihood of a mass escape is 1. Consequences of escape are dependent upon are the species and number (e.g. biomass) of animals escaping. E.g. Consequence of small numbers of animals escaping is 1 whilst the consequence of large numbers escaping is 2. Note there may be socio-economic impacts on recreational anglers.
		Commercial extraction	3	2	5 (moderate)	Establishing likelihood ratings depends on system design, management (e.g. presence of escape barriers, screens, etc.) and the number of animals that may escape (e.g. the likelihood of a small number escaping is 4 whilst the likelihood of a mass escape is 1. Consequences of escape are dependent upon are the species and number (e.g. biomass) of animals escaping. E.g. Consequence of small numbers of animals escaping is 1 whilst the consequence of large numbers escaping is 2.
		Non-commercial	4	1	5 (moderate)	Likelihood of escape from non-commercial facilities depends upon its facility location relative to waterways and probability it will overflow or have its bank breached by flooding. In general, non-commercial ponds are likely to have fewer controls preventing stock escapes than commercial farms.

Risk category	*Specific risk*	*System type*	*Likelihood*	*Consequence*	*Risk rating*	*Comments*
Ecological/ environmental	Endemic species, translocated outside its natural range, escapes, survives but does not reproduce	Commercial extraction	3	2	5 (moderate)	
		Non-commercial	4	2	6 (moderate)	
	Introduced species, translocated outside its established range, escapes, survives but does not reproduce	Commercial diversion	4	3	7 (significant)	e.g. Atlantic salmon, Chinook salmon, brook trout Establishing likelihood ratings depends on system design, management (e.g. presence of escape barriers, screens, etc.) and the number of animals that may escape (e.g. the likelihood of a small number escaping is 4 whilst the likelihood of a mass escape is 1. Consequences of escape are dependent upon are the species and number (e.g. biomass) of animals escaping. E.g. consequence of small numbers of animals escaping is 3 whilst the consequence of large numbers escaping is 2.
		Commercial extraction	3	3	6 (moderate)	e.g., inland saline aquaculture, black bream etc. Establishing likelihood ratings depends on system design, management (e.g. presence of escape barriers, screens, etc.) and the number of animals that may escape (e.g. the likelihood of a small number escaping is 3 whilst the likelihood of a mass escape is 1. Consequences of escape are dependent upon are the species and number (e.g. biomass) of animals escaping. E.g. consequence of small numbers of animals escaping is 2 whilst the consequence of large numbers escaping is 3.
		Non-commercial	4	2	6 (moderate)	Non-commercial facilities will generally have a fewer number of animals at reduced stocking densities. The consequence small numbers is 2.

Risk category	*Specific risk*	*System type*	*Likelihood*	*Consequence*	*Risk rating*	*Comments*
Ecological/ environmental	Endemic species, translocated outside natural range, escapes and establishes self-sustaining population	Commercial diversion	4	4	8 (high)	e.g. Atlantic salmon, Chinook salmon, brook trout Establishing likelihood ratings depends on system design, management (e.g. presence of escape barriers, screens, etc.) and the number of animals that may escape (e.g. the likelihood of a small number escaping is 4 whilst the likelihood of a mass escape is 1. Consequences of escape are dependent upon are the species and number (e.g. biomass) of animals escaping. E.g. consequence of small numbers of animals escaping is 2 whilst the consequence of large numbers escaping is 3. Note there was some debate regarding the attributes of introduced species (both introduced and endemic) in new environments.
		Commercial extraction	3	4	7 (significant)	
	Endemic species, translocated outside natural range, escapes and establishes self-sustaining population	Non-commercial	4	4	8 (high)	
	Introduced species, translocated outside established range, escapes and establishes self-sustaining population	Commercial diversion	4	5	9 (high)	Note there was some debate over whether the attributes of introduced species in new environments warranted a consequence rating of 4 or 5.
		Commercial extraction	3	5	8 (high)	
		Non-commercial	4	5	9 (high)	
Diseases/ pathogens	Release of infectious disease/pathogen into environment within known range of the occurrence of the disease/pathogen	Commercial diversion	5	1	6 (moderate)	A primary assumption in assigning likelihood and consequence values in this section is that a known disease is present.
		Commercial extraction	3	1	4 (low)	
		Non-commercial	4	1	5 (moderate)	

Risk category	*Specific risk*	*System type*	*Likelihood*	*Consequence*	*Risk rating*	*Comments*
	Establishment of infectious disease/pathogen into environment within known range of the occurrence of the disease/pathogen	Commercial diversion	3	2	5 (moderate)	
		Commercial extraction	2	2	4 (low)	
		Non-commercial	2	2	4 (low)	
	Release of infectious disease/pathogen into environment outside known range of the occurrence of the disease/pathogen	Commercial diversion	5	1	6 (moderate)	
		Commercial extraction	3	1	4 (low)	
	Release of infectious disease/pathogen into environment outside known range of the occurrence of the disease/pathogen	Non-commercial	4	1	5 (moderate)	Worst-case scenario is a farm dam located near a watercourse that is subject to periodic flooding.
Diseases/ pathogens	Establishment of infectious disease/pathogen into environment outside known range of the occurrence of the disease/pathogen	Commercial diversion	5	5	10 (high)	A primary assumption in assigning likelihood and consequence values are the wild population in adjacent waters is susceptible to the disease and the worst-case scenario is an outbreak of an exotic disease.
		Commercial extraction	4	5	9 (high)	
		Non-commercial	4	5	9 (high)	
	Disposal/discharge of transport water (directly into environment) results release of infectious disease/pathogen to the environment.	All sectors	5	1	6 (moderate)	Likelihood and consequence values are identical across all sectors.
	Disposal/discharge of transport water (directly into environment) results in release and establishment of infectious disease/pathogen to the environment.	All sectors	3	5	8 (high)	Likelihood and consequence values are identical across all sectors.

Risk category	*Specific risk*	*System type*	*Likelihood*	*Consequence*	*Risk rating*	*Comments*
	Introduction of disease into private water bodies from use of translocated live feeds.	All sectors	5	5	10 (high)	Likelihood and consequence values are identical across all sectors. This translocation pathway considers risks associated with stocking live fish and crustaceans sourced from aquaculture systems or environment for the purposes of feeding primary stock. Note the risk assessment panel questioned whether this risk is within the scope of an open system translocation protocol.
	Inappropriate disposal of mortalities results in release and establishment of disease/pathogen to the environment	All sectors	4	5	9 (high)	Likelihood and consequence values are identical across all sectors.
Diseases/ pathogens	Transport equipment and personnel transfer disease/pathogen to the environment (release and establishment)	All sectors	3	5	8 (high)	i.e. nets, boots, vehicles Likelihood and consequence values are identical across all sectors.
Genetic	Escaped non-selected endemic species from a different "management unit" inter-breed with local population	Commercial extraction	4	2	6 (moderate)	In scoring the consequences of this risk pathway, it was assumed that escaped stock survives and interbreeds successfully with the local population and that progeny of wild broodstock (i.e. first generation, F1) are non-selected (i.e. genetically the same as wild, local population). Important factors to consider include the number of stock that escape and the frequency of escape events.
		Non-commercial	4	2	6 (moderate)	

Risk category	*Specific risk*	*System type*	*Likelihood*	*Consequence*	*Risk rating*	*Comments*
	Selected or domesticated endemic species escapes within natural range and inter-breeds with local population	Commercial extraction	3	5	8 (high)	In scoring the consequences of this risk pathway, it was assumed that escaped stock are progeny of parents bred in captivity and involved in a selective breeding program (i.e. they are 'selected' and F2 or greater). Does not include genetically modified animals. Although the likelihood score is lower than for non-selected stock because it is assumed survival in wild is reduced due to selection, consequence is scored higher because of a potentially greater genetic difference. Long-term genetic effects of escapes of 'selected' fish on local population are unknown.
		Non-commercial	3	5	8 (high)	
Genetic	Endemic species, translocated outside natural range, escapes and interbreeds with endemic species (e.g. interspecific hybridisation)	Commercial extraction	2	5	7 (significant)	The risk assessment panel acknowledges there are many unknown factors associated with this risk pathway including the fertility of hybrids. The worst case scenario is used in (i.e. hybrids are fertile and interbreed with endemic species) and the consequence is rated as 5. If hybrids are not fertile, the consequences can be rated as 2
		Non-commercial	2	5	7 (significant)	As above
	Escaped non-selected introduced species from a different "management unit" inter-breeds with local established population	All sectors			0 (low)	Not applicable to this risk assessment i.e. capture of wild-spawned brown trout in breeding programs is for stock enhancement rather than aquaculture.
	Selected or domesticated Introduced species escapes within established range and inter-breeds with local population	All sectors	4	1	5 (moderate)	
Other	Escape. Translocation results in transfer of non-endemic or Introduced non-target organisms to the environment	All sectors	5	1	6 (moderate)	Likelihood and consequence values are identical across all sectors. It is assumed that nuisance algae and macrophytes, invertebrates (i.e. planktonic invertebrates and macro-invertebrates), vertebrates (e.g. fish and amphibians) etc survive in the receiving environment

Risk category	*Specific risk*	*System type*	*Likelihood*	*Consequence*	*Risk rating*	*Comments*
	Escape and establishment. Translocation results in transfer of non-endemic or Introduced non-target organisms to the environment	All sectors	4	5	9 (high)	Likelihood and consequence values are identical across all sectors.
Other	Disposal/discharge of (transport and/or culture) water results in transfer of chemicals/pollutants to the environment.	All sectors	5	1	6 (moderate)	Likelihood and consequence values are identical across all sectors. It is assumed that chemicals registered and approved for use.
	Socio economic impacts					Note that other factors such as socio-economic impacts (not scored) should be considered in the risk assessment.

Appendix B: Notifiable diseases of fish

The following diseases of fish are notifiable and reportable under the Victorian *Livestock Disease Control Act 1994*. As this list may change from time to time, check the Department of Primary Industries website (www.dpi.vic.gov.au) for the most current list. DPI's disease watch hotline is 1800 675 888.

Finfish

Aeromonas salmonicida (atypical strains) (Goldfish Ulcerative Disease)
Bacterial kidney disease (*Renibacterium salmoninarum*)
Channel catfish virus diseases
Enteric redmouth disease (*Yersinia ruckeri*- Hagerman strain)
Enteric septicaemia of catfish (*Edwardsiella ictaluri*)
Epizootic ulcerative syndrome (EUS) *(Aphanomyces invaderis)*
Grouper iridoviral disease
Gyrodactylosis (*Gyrodactylus salaris*)
Infectious haematopoietic necrosis
Infectious pancreatic necrosis
Infectious salmon anaemia
Koi mass mortality
Koi herpesvirus infection
Piscirickettsiosis (*Piscirickettsia salmonis*)
Red sea bream iridoviral disease
Spring viraemia of carp
Viral encephalopathy and retinopathy
Viral haemorrhagic septicaemia
Whirling disease *(Myxobolus cerebralis)*

Crustacea

Baculoviral midgut gland necrosis
Crayfish plague (*Aphanomyces astaci*)
Gill-associated virus
Infectious hypodermal and haematopoietic necrosis
Infectious myonecrosis
Necrotising hepatopancreatitis
Spherical baculovirosis (*Penaeus monodon-type baculovirus*)
Taura syndrome
Tetrahedral baculovirosis (*Baculovirus penaei*)
White spot disease
White tail disease
Yellowhead disease

Appendix C: Biosecurity standards for commercial static and flow-through systems

Stock containment and effluent

C1. Farm screens, barriers, nets, sluices or other equipment designed to contain fish within the farm must be securely fastened in place, in proper working order and an appropriate size to prevent fish escape.

C2. Ensure mortalities that accumulate on farm screens, barriers, nets, sluices or other equipment are removed on a regular basis.

Disinfection/hygiene practices

C3. Ensure that accumulated organic matter (e.g. faeces, uneaten feed, mortalities) in culture units does not compromise stock health and contribute to an increased risk of spread of disease.

C4. Where practical, remove built-up pond sediment and dry or disinfected culture units between consignments of stock.

C5. Where practical, regularly inspect and, where warranted, clean wastewater outlet channels and pipes.

C6. Remove dead and moribund stock from culture units as soon as practical.

C7. Dispose of mortalities in a manner consistent with relevant legislation (Appendix H).

Equipment and staff movements

C8. Staff directly exposed to handling stock for extensive periods in close confinement (e.g. harvesting, transferring, stripping broodstock) are required to clean, dry and or disinfect equipment and protective clothing and footwear following use (refer Appendix H).

C9. Constrain the use of specialist and or dedicated equipment and or protective clothing to specific areas (e.g. broodstock, nursery, growout).

C10. Where staff operate in multiple areas, ensure their footwear and or protective clothing is adequately cleaned or disinfected before being moved into new areas.

C11. Restrict or control public access and movement throughout the aquaculture site.

Stock monitoring

C12. For a period of not less than two-weeks following receipt of translocated stock, undertake daily inspections of stock for disease, morbidity or unusual behaviour which may indicate the presence of disease.

C13. After the initial translocation period (refer C12) undertake regular but not less than twice weekly inspections of stock for disease, morbidity or unusual behaviour which may indicate the presence of disease.

Record keeping

C14. Retain accurate records including: the number and species of stock held in each culture vessel, stocking rates, mortalities, incidence of significant stressors and observations of fish health.

C15. Maintain an accurate record of all authorisations provided under the *Fisheries Act 1995* and translocation movements to and from the aquaculture site including the location and contact details of the supplier or receiver, date of supply and the numbers and species of stock translocated.

C16. Records must be kept for three years after the date of the last entry.

Reporting requirements

C17. In the event of significant mortality of unknown cause or suspected disease, the licence holder must inform DPI in accordance with the *Livestock Disease Control Act 1994* (Appendix B).

C18. On request, make available to DPI samples of infected stock for pathological examination.

Post-translocation isolation

C19. Where ever practical, translocated stock should be kept separate from resident stock for a minimum period of two-weeks after arrival. Isolation involves; maintaining new stock in growing units that are not physically/hydrologically connected to resident stock; using dedicated equipment; and controlling access by personnel.

Appendix D: Health surveillance program for commercial static and flow-through systems

Health surveillance programs may be appropriate for some commercial aquaculture facilities. The following information will assist and promote the development of industry-wide health surveillance programs.

D1. A well-structured active surveillance program is an internationally recognised means of demonstrating the health status of both stock and aquaculture facilities. If endorsed, such a program will:

(i) enable market access and trade;

(ii) facilitate translocation of live product;

(iii) improve farm productivity and husbandry responsiveness; and

(iv) reduce potential impacts to the environment.

D2. All fish health surveillance program(s) referenced in this protocol refer to those that fulfill the requirements in AQUAPLAN (Department of Agriculture Fisheries and Forestry 2005) or World Organisation for Animal Health (OIE) manuals.

D3. It is recommended that licence holders wishing to prepare a fish health surveillance program seek endorsement of their program from DPI.

D4. AQUAPLAN is Australia's national strategic plan for aquatic animal health. It is a broad comprehensive strategy to build and enhance capacity for the management of aquatic animal health in Australia.

D5. The World Organisation for Animal Health provides internationally recognised standards for developing and implementing targeted fish health surveillance programs for aquaculture businesses.

D6. Prior to developing a fish health surveillance program, it is recommended that licence holders review AQUAPLAN and Chapter 1.1.4 "Requirements for surveillance for international recognition of freedom from infection" in the Manual of Diagnostic Tests for Aquatic Animals (OIE 2006b).

D7. Department of Primary Industries criteria for assessing fish health surveillance programs will be drawn from AQUAPLAN and World Organisation for Animal Health manuals.

Appendix E: Supplier notifiable disease declaration and statement of compliance - example form

I (Name): .....

Position: .....

of (Company): .....

Address: .....

declare* that there have been no notifiable diseases or unexplained disease outbreaks at the above facility during the past twenty-four months.

Signed): .....

Date: .....

I further declare that for the consignment of:

Species: .....

translocated to:

Company: .....

Address: .....

On (Date): .....,

the Company has taken the following steps to ensure that non-specified species have not been included on the stock or in the associated transport media:

.....

.....

.....

Signed: .....

Date .....

Please use extra paper if required

* Section 7 of the *Livestock Disease Control Act 1994* (the Act) provides that a person who knows or has reason to suspect that a disease is present in fish must notify an inspector of stock authorised under the Act. Penalty: 240 units or two years imprisonment or both, in the case of an exotic disease; 120 penalty units or one year imprisonment or both, in the case of any other disease.

Appendix F: Batch certification requirements for aquatic animals

Applicants who propose to translocate aquatic animals must meet or exceed the following requirements in order to achieve required DPI standards for batch certification

F1. Obtain a certificate of stock health from a suitably qualified veterinarian certifying that the proposed consignment of fish is free of notifiable diseases (*Livestock Disease Control Act 1994*; Appendix B). This certificate will be based on:

(i) A visit to the premises by the veterinarian to inspect the health status of the stock for the presence of clinically abnormal fish and a review of relevant farm records and farm biosecurity.

(ii) Where there has been no previous pathological testing of stock, pathological examination of stock that would enable, at the 95% confidence level, certification that a notifiable disease is not present in the population of animals tested, based on an assumed pathogen prevalence of 2% or above. Fish for this sampling must be collected by the veterinarian at the time of the visit to the premises. Bias in the sampling should be made towards animals showing clinical signs of disease or showing signs of weakness when handled (i.e. moribund). For a single batch test, the sample numbers required for these default values (i.e. 95% confidence, 2% prevalence) are provided in Table 1, Chapter I.1 and I.3 of the *OIE Manual of Diagnostic Tests for Aquatic Animals* (2006b), i.e. 150 animals for these parameters.

(iii) Historical pathological testing of stock can provide useful information and can be used as evidence in certifying freedom from disease. The usefulness of this information depends on several factors including the premises' biosecurity measures during the relevant historical period and whether the animal populations to be translocated were part of a formal health monitoring and surveillance program. The veterinarian may elect to reduce the number of stock sampled for pathological testing based on assessment of the historical information.

F2. Notifiable diseases (*Livestock Disease Control Act 1994)* may not be relevant to all of the species for which authority to translocate is sought. The veterinarian is required to identify the notifiable diseases relevant to the species for which the stock health certificate is issued and demonstrate that the sampling methodology is appropriate for those notifiable diseases.

F3. All stock, including larvae, to be translocated from licensed interstate aquaculture sites, must be accompanied by a statement from the supplier detailing the steps taken to eliminate non-specified species from the consignment and signed by the responsible licence holder or delegate.

F4. The certificate of stock health will be valid for a maximum period of two weeks from the date of issue and will be invalidated if there is evidence of disease, significant or unexplained mortality, and/or co-mingling with other stock that may compromise the health status of the batch.

Appendix G: Fish health batch certification- example form

Section 7 of the *Livestock Disease Control Act 1994* (the Act) provides that a person who knows or has reason to suspect that a disease is present in fish must notify an inspector of stock authorised under the Act. Penalty: 240 units or two years imprisonment or both, in the case of an exotic disease; 120 penalty units or one year imprisonment or both, in the case of any other disease. DPI's disease watch hotline is 1800 675 888.

1. **Destination of stock (full contact details, Fisheries Victoria licence or permit number):**

   _____

   _____

2. **Species:** ☐ Finfish ☐ Crustacean ☐ Other

   Common Name: _____
   Scientific Name: _____

3. **Age of stock:** Days post hatching _____ Other _____
4. **Size of stock:** _____
5. **Numbers of animals for shipment:** _____
6. **Batch identification number(s):** _____
7. **Supplier (name, address, telephone/fax contact details):**

   _____

   _____

8. **Place of production:** ☐ Hatchery ☐ Research ☐ Ornamental ☐ Other
9. **Date(s) of intended translocation to Victoria:**

   _____

   _____

10. **Purpose of translocation:**

    _____

    _____

The following sections should be completed and signed by the certifying veterinarian. Please use extra paper if required.

11. **Details of diseases testing including any diseases tested for, dates/results of testing, number of animals sampled, test methods or OIE references). Pathology report(s) to be attached for reference**

    _____

    _____

    _____

    _____

12. **Details of site inspections including dates that you have conducted or are aware of.**

_____

_____

_____

_____

13. **Details of facility aquatic animal health status including health surveillance during the previous two or more years and history of disease or eradication in the area.**

_____

_____

_____

_____

14. **Details of any quarantine/treatment/disinfection undertaken before shipment.**

_____

_____

_____

_____

15. **Details of disease zoning issues (e.g. zoogeographic area such as the Murray-Darling system) if present.**

_____

_____

_____

_____

16. **Health statement**

To the best of my knowledge, I certify that the proposed consignment of fish is free of notifiable diseases (*Livestock Disease Control Act 1994*).

Name: _____

Signature: _____

Date: _____

Company/ Organisation: _____

Address: _____

Telephone/ fax/ email: _____

Veterinary licence number: _____

Official stamp (if applicable):

Serial number of certificate (if applicable): _____

Please use extra paper if required

Appendix H: Disinfection, containment, transport and disposal procedures

Disinfection is an important operational control to manage the risks associated with infectious disease. Routine or targeted disinfection can assist with the eradication or exclusion of specific diseases associated with aquaculture establishments.

Chemicals must be used in accordance with the instructions provided by the manufacturer. Use of chemicals may be subject to Commonwealth (i.e. the Australian Pesticide and Veterinary Medicines Authority) and/or state (e.g. DPI Chemical Standards Branch, WorkSafe, Environment Protection Authority) legislation.

The following procedures and references are relevant where disinfection is required.

General arrangements

H1. Vehicles and fish transport equipment shall be thoroughly cleansed and disinfected before and after use according to the guidelines provided in the *Aquatic Animal Code* (OIE 2006a).

H2. Vehicles and/or containers in which aquatic animals are confined should be secured to maintain optimal conditions for the aquatic animals during transport and to allow easy access by the attendant.

Treatment of transportation water

H3. The waste and rinsing water should not be emptied into a drainage system that is directly connected to an aquatic environment where aquatic animals are present.

H4. The water from the tanks should be disinfected by a recognised process (OIE 2006a) and either discharged to mains sewer or sprayed over land that does not drain into waters containing aquatic animals.

H5. Following are some of the processes applicable to disinfecting aquaculture systems (modified from OIE 2006a). Other disinfecting agents may be suitable and should be used according the instructions of the manufacturer.

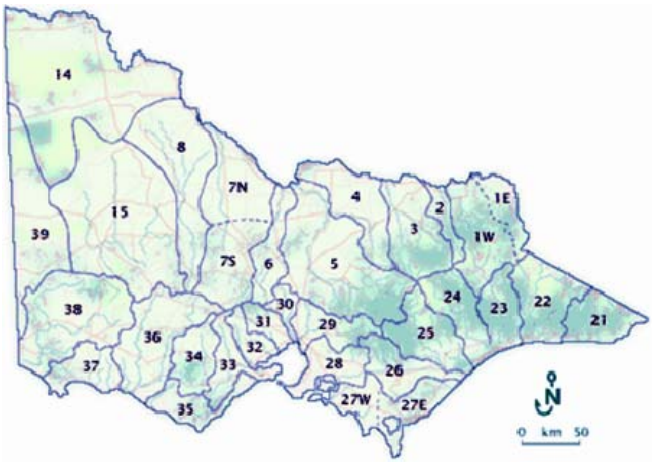
Disposal of fish

H6. It is an offence under the *Fisheries Act 1995*, to stock protected waters unless authorised under the Act. Live fish excess to translocation requirements should be returned to the supplier.

H7. Fish mortalities, including those remaining following translocation events, should be disposed of in accordance with relevant government legislation. The Environment Protection Authority (EPA) can provide current guidelines for disposing of stock mortalities (www.epa.vic.gov.au).

Processes	*Indications*	*Methods of Use*	*Comments*
Quartenary ammonia	Virus, bacteria, hands, plastic surfaces	0.1–1 g/litre for 1–15 minutes	IPN virus resistant
Calcium hypochlorite	Bacteria and viruses on all clean surfaces and in water	30 mg available chlorine/litre. Leave to inactivate for several days or neutralise with sodium thiosulfate after 3 hours	Can be neutralised with sodium thiosulfate.
Formalin	Fish pathogens in sealed premises	Released from formogenic substances, generally trioxymethylene. Comply with instructions	Nodavirus resistant
Hydrogen peroxide	ISA virus	0.02–0.06 per cent	
Iodine (iodophors	Bacteria, viruses on nets, boots and clothing	200 mg iodine/litre for a few seconds	
Iodine (iodophors)	Hands, smooth surfaces	>200 mg iodine/litre a few seconds	
Sodium hypochlorite	Bacteria and viruses on all clean surfaces and in water	30 mg available chlorine/litre. Leave to inactivate for a few days or neutralise with sodium thiosulfate after 3 hours.	Can be neutralised with sodium thiosulfate.
	Nets, boots and clothing	200 mg to 1 g available chlorine/litre for several minutes. Leave to inactivate for a few days or neutralise with sodium thiosulfate.	

Appendix I: Natural Range of endemic fish



No.	River Basin	NATURAL RANGE OF ENDEMIC FISH
(1E)	Upper Murray	Murray cod, common yabby *(C. destructor),* freshwater catfish *(T. tandanus)*
(1W)	Mitta Mitta	Murray cod, Macquarie perch, golden perch, silver perch, common yabby *(C.destructor),* freshwater catfish *(T. tandanus)*
(02)	Kiewa	Murray cod, Macquarie perch, golden perch, silver perch, common yabby *(C.destructor),* freshwater catfish *(T. tandanus)*
(03)	Ovens	Murray cod, Macquarie perch, golden perch, silver perch, common yabby *(C.destructor),* freshwater catfish *(T. tandanus)*
(04)	Broken	Murray cod, Macquarie perch, golden perch, silver perch, common yabby *(C.destructor),* freshwater catfish *(T. tandanus)*
(05)	Goulburn	Murray cod, Macquarie perch, golden perch, silver perch, common yabby *(C.destructor),* freshwater catfish *(T. tandanus)*
(06)	Campaspe	Murray cod, Macquarie perch, golden perch, silver perch, common yabby *(C.destructor),* freshwater catfish *(T. tandanus)*
(7N)	Loddon North	Murray cod, Macquarie perch, golden perch, silver perch, common yabby *(C.destructor),* freshwater catfish *(T. tandanus)*
(7S)	Loddon South	Murray cod, Macquarie perch, golden perch, silver perch**,** common yabby *(C.destructor),* freshwater catfish *(T. tandanus)*
(08)	Avoca	Murray cod, golden perch, silver perch, common yabby *(C destructor),* freshwater catfish *(T. tandanus)*
(14)	Mallee	Murray cod, golden perch, silver perch, common yabby *(C.destructor),* freshwater catfish *(T. tandanus)*
(15)	Wimmera	Common yabby *(C.destructor)*
(21)	East Gippsland	Estuary perch, Australian bass, short-finned eel, long finned eel
(22)	Snowy	Estuary perch, Australian bass, short-finned eel, long-finned eel
(23)	Tambo	Estuary perch, Australian bass, short-finned eel, long-finned eel, common yabby *(C.destructor)*
(24)	Mitchell	Estuary perch, Australian bass, short-finned eel, long-finned eel, common yabby *(C.destructor)*
(25)	Thomson	Estuary perch, Australian bass, short-finned eel, long-finned eel, common yabby *(C.destructor)*
(26)	Latrobe	Estuary perch, Australian bass, short-finned eel, long-finned eel, common yabby *(C.destructor)*
(27E)	South Gippsland East	Estuary perch, Australian bass, short-finned eel, long-finned eel, common yabby *(C.destructor)*
(27W)	South Gippsland West	Estuary perch, Short-finned eel, long-finned eel, common yabby *(C.destructor)*
(28)	Bunyip	Estuary perch, Short-finned eel, long-finned eel, common yabby *(C.destructor)*
(29)	Yarra	Short-finned eel, common yabby *(C.destructor)*
(30)	Maribyrnong	Short-finned eel, common yabby *(C.destructor)*
(31)	Werribee	Short-finned eel, common yabby *(C.destructor)*
(32)	Moorabool	Short-finned eel, common yabby *(C.destructor)*
(33)	Barwon	Short-finned eel, common yabby *(C.destructor)*
(34)	Corangamite	Short-finned eel, common yabby *(C.destructor)*
(35)	Otway	Estuary perch, Short-finned eel, common yabby *(C.destructor)*
(36)	Hopkins	Estuary perch, Short-finned eel, common yabby *(C.destructor)*
(37)	Portland	Estuary perch, Short-finned eel, common yabby *(C.destructor)*
(38)	Glenelg	Estuary perch, Short-finned eel, common yabby *(C.destructor)*
(39)	Millicent Coast	Common yabby *(C.destructor)*