Import risk analysis: Tropical, subtropical and temperate freshwater and marine ornamental fish and marine molluscs and crustaceans

REVIEW OF SUBMISSIONS AND SUPPLEMENTARY RISK ANALYSIS

ISBN 978-0-478-33888-1 (Print)
ISBN 978-0-478-33889-8 (Online)

29 June 2009

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Approved for general release

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Contents

1. Executive summary

In November 2005 MAF released for public consultation a risk analysis on the eligible genera list from the import health standard for the importation of ornamental freshwater and marine animals. The risk analysis presented a number of measures to manage the risks posed by the 13 hazards identified. These included a ban on temperate cyprinids, improved laboratory submissions for mortalities above 10-20%, and suggestions for improved education of holders of imported fish. Eight submissions were received, and while no stakeholders questioned the hazards identified in the risk analysis or suggested additional organisms that should be considered to be hazards, a number of issues were raised regarding risk management options. In particular, submissions indicated an unwillingness to accept a ban on temperate cyprinid importation and a request for supervisor discretion on the mortality trigger level. Stakeholders also indicated that the 6 week quarantine period for freshwater fish was excessive.

MAF's review of submissions on the 2005 ornamental fish risk analysis is included as Appendix 1 of this document.

Meanwhile, the list of eligible species was reviewed under the Hazardous Substances and New Organisms (HSNO) Act, to include only those species present in New Zealand before 1 July 1998. Those species not present at that time were thus considered "new organisms" under the HSNO Act, which meant that their importation would require a full ERMA approval in addition to an import health standard based on a MAF Biosecuirty New Zealand risk analysis. The amended eligible list was finalised in March 2007. Moreover, consultation on MAF's 2005 risk analysis revealed that a number of genera of animals had not been included on the agreed list, and as a result, it became necessary to conduct a supplementary risk analysis on a further 158 genera of aquatic animals.

This document begins with a supplementary risk analysis on the 158 new genera. Of these new genera, 30 had published literature reports of 42 additional disease agents associated with them, and therefore required further analysis. As a result of this analysis, eight of the 42 additional disease agents were considered to require full risk assessments. Following these risk assessments it was concluded that six organisms should be classified as actual hazards in the commodities in addition to the 13 already described in the 2005 risk analysis. The additional hazards were cyprinid herpesvirus-3 (koi herpesvirus), spring viraemia of carp virus, *Aeromonas salmonicida, Flavobacterium psychrophilum, Hoferellus carassii* and white spot syndrome virus.

This document continues with a consideration of options for managing the risks in imported ornamental freshwater and marine animals, taking into account the conclusions of the 2005 risk analysis, the public submissions on that risk analysis and the conclusions from the supplementary risk analysis. Potential measures are evaluated from the point of view of the characteristics of an imported animal in conjunction with the hazard that it potentially carries. As a result the majority of species (approximately 1300 species) on the proposed new eligible list are classified as low risk species for which a simplified three-week quarantine period may be appropriate. The remaining 179 species are classified as high risk species for which more stringent risk management conditions can be justified.

SUPPLEMENTARY RISK ANALYSIS

2. Introduction

Live ornamental aquatic animal imports represent a known pathway for the introduction of both exotic pathogens and invasive pest species. To afford some level of control over this pathway import health standards (IHS) were introduced that covered the importation into New Zealand of ornamental fish and marine invertebrates from all countries. The IHS included a list of, mainly, genera of fish and marine invertebrates permitted to be imported.

MAF issued a risk analysis (*Import risk analysis*: Ornamental fish) for public consultation on 7 November 2005, with submissions closing 21 December 2005. Eight submissions were received.

The Hazardous Substances and New Organisms (HSNO) Act 1996 was enacted to prevent the intentional importation and release of organisms regarded as being exotic to New Zealand. As a result of this legislation a list of ornamental fish known to be present in New Zealand prior to 29 July 1998 was developed in association with the Federation of New Zealand Aquatic Societies (FNZAS) and ornamental fish importers. This list was finalised and came into force on 21 March 2007 as an amendment to the IHS (fisornic.all).

It was apparent during the development of the amended permitted list, that there were a number of genera of ornamental fish that had not been fully considered in the risk analysis published for public consultation at the end of November. In addition, there had been no consideration of disease risks posed by marine invertebrates.

It was decided that the review of submissions, the consideration of disease risks from novel genera of fish and marine invertebrates and a consideration of final risk management options would be most efficiently presented in a single document, thus completing the analysis of the risk of disease and pest invasion posed by the importation of live ornamental fish and marine invertebrates.

Therefore this document begins with an examination of any supplementary potential hazards identified from a literature review of the novel genera and the marine invertebrates. This includes, where appropriate, risk risk assessments covering entry, exposure and establishment and consequence on any organisms considered to be a potential hazards. Risk management options are developed for those that are considered to pose actual hazards in these commodities.

The conclusions of MAF's 2005 risk analysis, including the organisms concluded as representing actual hazards and risk management recommendations, are summarised for information. Submissions received during the public consultation phase of the primary risk analysis are summarised and then individually addressed.

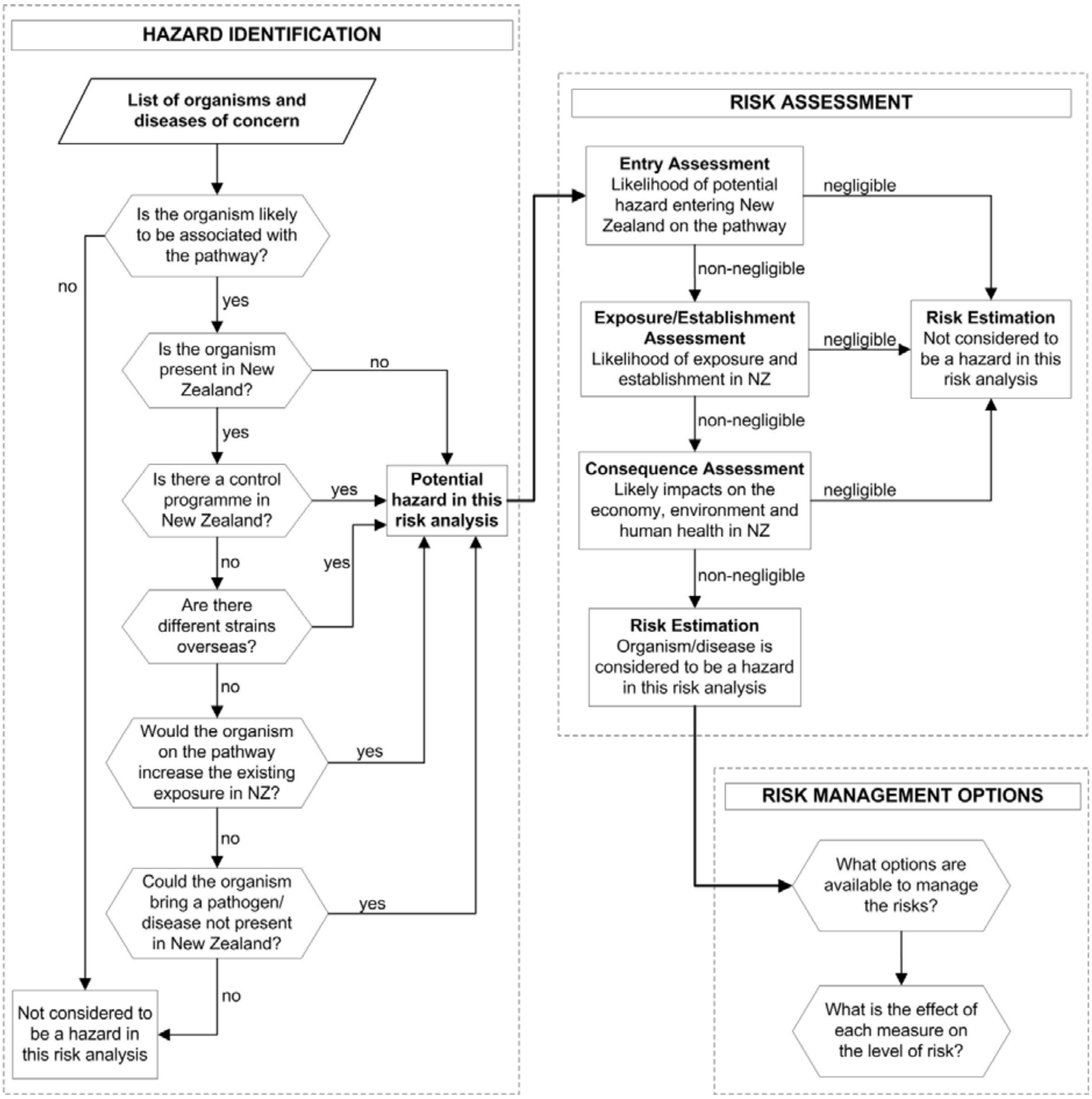
A series of risk management measures are then examined. This includes, as appropriate, an examination of global biosecurity practice in live fish imports, biosecurity best-practice in live animal movements, practicalities of the import pathway, options to address specific, actual hazards, principal risk factors associated with the host animals and the hazard organisms.

3. Risk Analysis Methodology

The methodology used in this supplementary risk analysis is described in MAF Biosecurity New Zealand's Risk Analysis Procedures – Version 1 (Biosecurity New Zealand 2006) and is consistent with the guidelines in the OIE Terrestrial Animal Health Code ("the Code") and the OIE Handbook on Import Risk Analysis (OIE 2004).

The risk analysis process used by the MAF is summarised in Figure 1.

Figure 1. The risk analysis process.



3.1. PRELIMINARY HAZARD LIST

The hazard identification process begins with the collation of a list of organisms likely to be associated with the commodity. Table 1 in section 3.1 of this document shows the additional organisms that were considered and justification of considering them to be of potential concern. Each of these organisms is considered in a separate chapter of this supplementary risk analysis.

3.2. HAZARD IDENTIFICATION

For each organism identified in Table 1 as requiring further consideration, the epidemiology is discussed, including a consideration of the following questions:

1. Whether the imported commodity could act as a vehicle for the introduction of the organism?
2. If the organism requires a vector, whether competent vectors might be present in New Zealand?
3. Whether the organism is exotic to New Zealand but likely to be present in exporting countries?
4. If it is present in New Zealand,
    i. whether it is "under official control", which could be by government departments, by national or regional pest management strategies or by a small-scale programme, or
    ii. whether more virulent strains are known to exist in other countries?

For any organism, if the answer to question one is “yes” (and the answer to question 2 is “yes” in the cases of organisms requiring a vector) and the answers to either questions three or four are “yes”, it is classified as a potential hazard requiring risk assessment.

Under this framework, organisms that are present in New Zealand cannot be considered as potential hazards unless there is evidence that strains with higher pathogenicity are likely to be present in the commodity to be imported. Therefore, although there may be potential for organisms to be present in the imported commodity, the risks to human or animal health are no different from risks resulting from the presence of the organism in this country already.

If importation of the commodity is considered likely to result in an increased exposure of people to a potentially zoonotic organism already present in New Zealand, then that organism is also considered to be a potential hazard.

3.3. RISK ASSESSMENT

In line with the MAF Biosecurity New Zealand and OIE risk analysis methodologies, for each potential hazard requiring risk assessment the following analysis is carried out:

Risk Assessment

a)	Entry assessment -	the likelihood of the organism being imported in the commodity.
b)	Exposure assessment -	the likelihood of animals or humans in New Zealand being exposed to the potential hazard.
c)	Consequence assessment -	the consequences of entry, establishment or spread of the organism.

d) Risk estimation - a conclusion on the risk posed by the organism based on the release, exposure and consequence assessments. If the risk estimate is non-negligible, then the organism is classified as a hazard.

It is important to note that all of the above steps may not be necessary in all risk assessments. The MAF Biosecurity New Zealand and OIE risk analysis methodologies make it clear that if the likelihood of release is negligible for a potential hazard, then the risk estimate is automatically negligible and the remaining steps of the risk assessment need not be carried out. The same situation arises where the likelihood of release is non-negligible but the exposure assessment concludes that the likelihood of exposure to susceptible species in the importing country is negligible, or where both release and exposure are non-negligible but the consequences of introduction are concluded to be negligible.

3.4. RISK MANAGEMENT

For each organism classified as a hazard, a risk management step is carried out, which identifies the options available for managing the risk. Where the *Code* lists recommendations for the management of a hazard, these are described alongside options of similar, lesser, or greater stringency where available. In addition to the options presented, unrestricted entry or prohibition may also be considered for all hazards. Recommendations for the appropriate sanitary measures to achieve the effective management of risks are not made in this document. These will be determined when an import health standard (IHS) is drafted.

As obliged under Article 3.1 of the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement) the measures adopted in IHSs will be based on international standards, guidelines and recommendations where they exist, except as otherwise provided for under Article 3.3 (where measures providing a higher level of protection than international standards can be applied if there is scientific justification, or if there is a level of protection that the member country considers is more appropriate following a risk assessment).

3.5. RISK COMMUNICATION

MAF releases draft import risk analyses for a six-week period of public consultation to verify the scientific basis of the risk assessment and to seek stakeholder comment on the risk management options presented. Stakeholders are also invited to present alternative risk management options that they consider necessary or preferable.

Following public consultation on the draft risk analysis, MAF produces a review of submissions and determines whether any changes need to be made to the draft risk analysis as a result of public consultation, in order to make it a final risk analysis.

Following this process of consultation and review, the Imports Standards team of MAF Biosecurity New Zealand decides on the appropriate combination of sanitary measures to ensure the effective management of identified risks. These are then presented in a draft IHS which is released for a six-week period of stakeholder consultation. Stakeholder submissions in relation to the draft IHS are reviewed before a final IHS is issued.

This document comprises a supplementary risk analysis as well as a review of submission of the MAF risk analysis that was released for consultation in November 2005, prior to changes in risk analysis procedures that resulted in risk analyses being issued for public consultation in draft form and containing options rather than recommendations for risk management for the identified hazards.

The aquatic animal species that were assessed in the 2005 risk analysis were those listed in the IHS that was current at that time (for the sake of this discussion, List A). MAF releases draft import risk analyses for a six-week period of public consultation to verify the scientific basis of the risk assessment and to seek stakeholder comment on the risk management options presented. Stakeholders are also invited to present alternative risk management options that they consider necessary or preferable. Following public consultation on the draft risk analysis, MAF produces a review of submissions and determines whether any changes need to be made to the draft risk analysis as a result of public consultation, in order to make it a final risk analysis.

Although public consultation of the 2005 risk analysis did not result in any dispute on the scientific content, a number of stakeholders pointed out that the species list was incomplete, and that a number of fish had not been assessed in that risk analysis. As a result, MAF did further work (a supplementary risk analysis) on these missing species and concluded that some of them did not pose additional risks (List B), but others did (List C).

Under these unusual circumstances, it has been decided to release this document as a combined review of submissions of the 2005 risk analysi as supplementary risk analysis on the new genera of aquatic animals. MAF invites public submissions on the supplementary risk analysis and the discussion on risk management. Following this consultation, MAF will produce a review of submissions on the supplementary risk analysis and produce a final risk analysis which would comprise the initial RA as well as the supplementary.

Following this process of consultation and review, the Import Standards Group of MAF Biosecurity New Zealand decides on the appropriate combination of sanitary measures to ensure the effective management of identified risks. These are then presented in a draft IHS which is released for a six-week period of stakeholder consultation. Stakeholder submissions in relation to the draft IHS are reviewed before a final IHS is issued.

References

Biosecurity New Zealand (2006). Risk analysis Procedures. Version 1, Ministry of Agriculture and Forestry, Wellington, New Zealand.

OIE (**2004).** Handbook on Import Risk Analysis for Animals and Animal Products Pp. OIE, Paris.

4. Supplementary hazard identification

4.1. ADDITIONAL ORGANISMS OF POTENTIAL CONCERN

As a result of taxonomic changes, the list of fish eligible for importation into New Zealand contains 100 new genera of freshwater fish, 40 new genera of marine fish and 18 genera of marine molluscs and crustacea. These 158 genera were subjected to a literature search which resulted in the identification of reports of diseases or parasites in 29 genera (19 freshwater fish, 7 marine fish, 2 marine mollusc and 1 marine crustacean), as shown in Table 1.

Organisms highlighted require further consideration
Organisms ***underlined*** were identified as hazards in MAFs 2005 risk analysis (the 'original RA').

Table 1. Results of literature search for diseases of 158 genera of aquatic animals eligible for importation

Freshwater genera	Pathogen/parasite	Potential concern?
Archocentrus	*Sciadicleithrum meekii, S. bicuense*	Covered in original RA
Baryancistrus	*Branchiomyces* sp.	Ubiquitous organism – excluded
	Sphaerospora sp.	Requires consideration
Carassius (auratus)	*Ichthyophthirius multifiliis*	Covered in original RA
	cyprinid herpesvirus -2	Found in NZ – excluded
	cyprinid herpesvirus -3	Requires consideration
	dactylogyridae	Covered in original RA
	gyrodactylidae	Covered in original RA
	Lernaea cyprinacea	Found in NZ – excluded
	Vibrio fluvialis, V. furnissii	Found in NZ – excluded
	Aeromonas hydrophila	Covered in original RA
	A. salmonicida atypical ssp.	Requires consideration
	Flavobacterium psychrophilum	Requires consideration
	Spring viraemia of carp virus (SVCV)	Requires consideration
	Chloromyxum auratum	Requires consideration
	Myxobolus spp.	Covered in original RA
	Achlya spp.	Covered in original RA
	Centrocestus formosanus	Covered in original RA
	Mycobacterium spp.	Covered in original RA
	Trichodina spp.	Covered in original RA
	Argulus foliaceus	Covered in original RA
	Goussia sp.	Requires consideration
	Flavobacterium columnare	Covered in original RA
	Saprolegnia spp.	Covered in original RA

Freshwater genera	Pathogen/parasite	Potential concern?
	Lactobacillus spp.	Ubiquitous organism – excluded
	Clonorchis sinesis	Requires consideration
	Posthodiplostomum spp.	Requires consideration
	Dermocystidium sp.	Requires consideration
	Aphanomyces invadans	Covered in original RA
	Bothriocephalus acheilognathi	Covered in original RA
	Pythium sp.	Requires consideration
	Metagonimus sp.	Requires consideration
	Hoferellus carassii	Requires consideration
	Trypanosoma danilewskyi	Covered in original RA
Chitala	*Glugea anomala*	Covered in original RA
Colossoma	*Anacanthorus* sp.	Requires consideration
	Myxobolus *spp.*	Covered in original RA
	Henneguya spp.	Covered in original RA
	Trichodina spp.	Covered in original RA
	Epistylis spp.	Ubiquitous organism – excluded
	Ergasilus spp.	Covered in original RA
	Piscinoodinium pillulare	Covered in original RA
	Ichthyophthirius multifiliis	Covered in original RA
	Neoechinorhynchus sp.	Covered in original RA
	Aeromonas hydrophila	Covered in original RA
	Lernaea cyprinacea	Found in NZ – excluded
	Linguadactyloides spp.	Requires consideration
	Posthodiplostomum spp.	Requires consideration
	dactylogyridae	Covered in original RA
	Cryptobia spp.	Covered in original RA
	Costia necatrix	Ubiquitous organism – excluded
Hemiodus	*Rondotrema microvitellarum*	Requires consideration
	Spirocamallanus sp. (paraguayensis)	Covered in original RA
Labidochromis	*Mycobacterium* spp.	Covered in original RA
Lamprologus	*Streptococcus* spp.	Covered in original RA
Loricariichthys	*Clinostomum* spp. & *Trypanosoma* spp.	Covered in original RA
Microctenopoma	Trichodinids	Covered in original RA
Macropodus	Lymphocystis	Covered in original RA
	Mycobacterium spp.	Covered in original RA
	Gnathostoma spp.	Requires consideration
	Transversotrema spp.	Covered in original RA
	Centrocestus formosanus	Covered in original RA
Nandopsis	*Contracaecum* spp.	Covered in original RA
Parachromis	*Gnathostoma* spp.	Requires consideration
	Culuwiya cichlidorum	Requires consideration
	Sciadicleithrum spp.	Covered in original RA

Freshwater genera	Pathogen/parasite	Potential concern?
Parambassis	Lymphocystis	Covered in original RA
Polyacanthus	Trichodinids	Covered in original RA
Polypterus	*Camallanus* spp.	Covered in original RA
	Gyrodactylus spp.	Covered in original RA
	Callodistomum spp.	Requires consideration
	Polyonchobothrium spp.	Requires consideration
	Proteocephalus spp.	Covered in original RA
	Spirocamallanus spp.	Covered in original RA
Satanoperca	*Diplostomum* spp.	Covered in original RA
Semaprochilodus	*Myxobolus* spp.	Covered in original RA
Tanichthys	*Mycobacterium* spp.	Covered in original RA
	Streptococcus spp.	Covered in original RA
Vieja spp.	*Atractis vidali*	Requires consideration
	Orientatractis spp.	Requires consideration
	Gnathostoma spp.	Requires consideration
Marine	**Pathogen/parasite**	**Potential concern?**
Chrysyptera	*Kudoa* spp.	Covered in original RA
Cirrhilabrus	*Diplosentis ikedai* sp. nov.	Requires consideration
Ctenochaetus	*Spirocamallanus* spp.	Covered in original RA
Diagramma	*Paramonorcheides pseudocaranx* sp. nov.	Requires consideration
	Metabenedeniella parva sp. nov.	Requires consideration
	Gigantolina magna	Requires consideration
Gobiosoma	*Paravortex* spp.	Requires consideration
	Diphtherostomum sp.	Requires consideration
Lipophrys	*Haemogregarina* spp.	Requires consideration
	Loma dimorpha	Requires consideration
	Lecithochirium furcolabiatum	Requires consideration
	Helicometra fasciata	Requires consideration
	Paucivitellosis fragilis	Excluded – snail host only found in Kermadec Islands
Xanthichthys	*Exophiala* sp.	Requires consideration
Marine Invertebrate	**Pathogen/parasite**	**Potential concern?**
Cypraea	*Sulcascaris sulcata*	Requires consideration
Artemia (salina)	MrNV & XSV	Requires consideration
	Cestoidea cysticercoids (Hymenolepididae):	
	Flamingolepis spp.	Exclude – flamingo def. host
	Confluaria spp.	Requires consideration
	Wardium spp.	Requires consideration
	Cestoidea cysticercoids (Dilepididae):	
	Eurycestus spp.	Requires consideration
	Anomotaenia spp.	Requires consideration

Freshwater genera	Pathogen/parasite	Potential concern?
	Cestoidea cysticercoids (Progynotaeniidae):	
	Gynandrotaenia spp.	Exclude – flamingo def. host
	White spot syndrome virus	Requires consideration
	Vibrio alginolyticus, V. splendidus, V. harveyi	Found in NZ - excluded
Tridacna	Unidentified apicomplexan	Requires consideration
	Turbonilla sp.	Requires consideration
	Perkinsus olseni	Requires consideration
	Curvularia sp.	Requires consideration
	Exserohilum (=Setosphaeria) sp.	Requires consideration
	Marteilia-like infection	Requires consideration
	Bucephalidae	Requires consideration
	Urastoma cyprinae	Requires consideration

Note: As the OIE considers all decapod crustaceans as susceptible to white spot syndrome virus (WSSV) it is necessary to include the following species for further consideration in association with WSSV, despite there being no specific literature reports:

- *Enoplometopus occidentalis*
- *Lysmata grabhami, L. amboinensis, L. debelius*
- *Periclimenes brevicarpalis*
- *Stenopus hispidus, S. cyanoscelis*
- *Rhynchocinetes uritai*
- *Saron marmoratus*

4.2. IDENTIFICATION OF ADDITIONAL POTENTIAL HAZARDS

In Table 1, 51 organism/host species combinations of potential concern were identified warranting further consideration. Where an organism was found in more than one host species or where very similar organisms could be considered together, organisms were grouped for this further consideration. This resulted in the 42 groups of organisms considered in this section of the supplementary risk analysis.

In summary, the conclusion of this section is that the following eight organisms should be considered to be additional potential hazards in ornamental fish and that supplementary risk assessments are therefore required :

- Cyprinid herpesvirus-3
- *Aeromonas salmonicida*
- *Flavobacterium psychrophilum*
- Spring viraemia of carp virus (SVCV)
- *Hoferellus carassii*
- *Gnathostoma* spp.
- *Macrobrachium rosenbergii* nodavirus (*Mr*NV) and extra small virus (XSV)
- White spot syndrome virus

The following 42 subsections deal with the organisms in the order in which they are presented in Table 1.

4.2.1. Sphaerospora sp.

These myxosporeans generally have a two host life cycle (Feist and Longshaw 2006), including *Branchiura sowerbyi* and *Tubifex tubifex,* both present in New Zealand (Cowie 1983). The *Sphaerospora* sp. reported from *Baryancistrus* sp. displayed extrasporogenic stages in the blood, with sporogenic stages in the glomeruli of the kidney (Paperna and Di Cave 2001), indicating that spores are likely to be shed in the urine. *Sphaerospora* spp. are reported in New Zealand (Hine *et al.* 2000), although not in freshwater. However, *Baryancistrus* spp. are tropical, there are no confamilial Loricariidae catfish in New Zealand, there has only been one report of the organism and it is unlikely to result in significant disease. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.2. Cyprinid herpesvirus–3 (CyHV-3)

CyHV-3, also referred to as koi herpesvirus (KNV), is an OIE listed disease exotic to New Zealand. Although the virus was previously thought not to infect goldfish, recent positive polymerase chain reaction (PCR) tests from goldfish (*Carassius auratus*) cohabiting with infected koi (*Cyprinus carpio koi*) (El-Matbouli *et al.* 2007, Sadler *et al.* 2008) indicates the potential for this species to act as a carrier or vector of the virus. Therefore this organism is regarded as an additional potential hazard in the commodity and a supplementary risk assessment is required.

4.2.3. Aeromonas salmonicida

Atypical subspecies of *Aeromonas salmonicida* are well reported in goldfish (*Carassius auratus*), producing a syndrome known as goldfish ulcer disease (GUD). Typical

A. salmonicida has been reported from both salmonids and non-salmonids, including Cyprinidae (Hiney and Olivier 1999). Both typical and atypical strains of *A. salmonicida* are exotic to New Zealand. Therefore this organism is regarded as an additional potential hazard in the commodity and a supplementary risk assessment is required.

4.2.4. Flavobacterium psychrophilum

This bacterium, which is the cause of coldwater bacterial disease and rainbow trout fry syndrome, has been reported from goldfish in Oregon, USA (Hallett *et al.* 2006), where it was implicated in an epizootic. It has not been detected in New Zealand (Duignan *et al.* 2003, Stone 2005) and can cause serious disease in salmonids. Therefore this organism is regarded as an additional potential hazard in the commodity and a supplementary risk assessment is required.

4.2.5. Spring viraemia of carp virus (SVCV)

The OIE lists *Carassius auratus* (goldfish) as a susceptible host for SVCV (OIE 2006b). In addition, SVCV has recently been isolated in the United Kingdom from a shipment of goldfish from Hong Kong. It has not been detected in New Zealand. Therefore this organism is regarded as an additional potential hazard in the commodity and a supplementary risk assessment is required.

4.2.6. Chloromyxum auratum

This myxosporean was discovered in goldfish from a reservoir in Oregon, USA during an epizootic of *Flavobacterium psychrophilum*. Whilst the finding of this myxosporean was incidental, it was consistent in all the fish examined. Free spores were found in the lumen of the gall bladder, with plasmodia in the gall bladder wall. There was no indication of a pathological reaction to the myxosporean (Hallett *et al.* 2006) and it can be concluded that infection is non-pathogenic. The *C. auratum* type host is *Carassius auratus* with *Cyprinus carpio* an alternative susceptible host. Bluegill (*Lepomis macrochirus*), cutthroat trout (*Oncorhynchus clarki clarki*), brown bullhead (*Ameiurus nebulosus*), largemouth bass (*Macropterus salmoides*) and white crappie (*Pomoxis annularis*) did not become infected (Hallett *et al.* 2006), indicating a restricted host range.

It is likely that either *Limnodrilus hoffmeisteri* or *Lumbriculus variegatus* acted as an oligochaete intermediate host for the development of antonoactinospores (Atkinson *et al.* 2007). Both species have been found in New Zealand freshwaters (Timms 1983). It is possible that *C. auratum* in infected goldfish could establish in New Zealand, but it appears to be restricted to cyprinids and does not cause disease. Therefore this organism is not regarded as an additional potential hazard in the commodity and therefore it does not require a supplementary risk assessment.

C. obliquum and *Chloromyxum* sp. have been identified in New Zealand (Hine *et al.* 2000).

4.2.7. Goussia sp.

G. auxidis has been reported from New Zealand (Hine *et al.* 2000). Both *G. trichogasteri* and *G. carpelli* were considered in MAF's 2005 risk analysis, and whilst *G. trichogasteri* was not considered a potential hazard, a risk assessment for *G. carpelli* concluded that it posed a negligible risk. That assessment concluded that the likelihood of exposure and establishment of *G. carpelli* was low, partly due to goldfish not being permitted for import. It also concluded that the consequence of introduction would also be low as it was unlikely to affect other species.

There is recent evidence to show that *Goussia* spp. in general, and especially *G. carpelli*, have extremely high host specificity. *G. carpelli* isolated from goldfish was unable to infect even the closely related common carp (*Cyprinus carpio*) and vice versa (Molnar *et al.* 2005). The 2005 risk estimate of negligible therefore remains valid, despite the consideration of goldfish for import. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.8. Clonorchis sinensis

Clonorchis sinensis is a zoonotic digenean parasite, whose larval stages may be found encysted in the musculature of freshwater fish (Paperna and Dzikowski 2006). Mammals and birds are the definitive hosts of *C. sinensis* and it can cause liver disease in humans as a result of flukes infecting the bile ducts. *C. sinensis* is known to utilise the mollusc *Melanoides tuberculata*, which is present in New Zealand (Spencer *et al.* 2002, Ko 2006) as an intermediate host. Whilst *C. sinensis* was not directly considered in MAF's 2005 risk analysis, helminths that cycle through *M. tuberculata* were considered including the zoonotic *Centrocestus formosanus*, *Haplorchis* spp. and *Haplorchoides* species. The MAF 2005 analysis concluded that the overall risk from this group of digeneans was negligible. There is no new information that warrants questioning the validity of this conclusion in regard to *C. sinensis*. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.9. Posthodiplostomum spp.

The larvae of the digenean, *Posthodiplostomum* spp., may be found encysted in the viscera of fish (Paperna and Dzikowski 2006). Birds are the definitive host and it is likely that planorbid snails act as intermediate hosts. *P. cuticola* cercariae have been found in *Planorbis planorbis* (Faltynkova 2005). It is likely, therefore, that the endemic planorbid snails in New Zealand could also act as intermediate hosts. Whilst *Posthodiplostomum* spp. were not directly considered in the risk analysis, their life cycle is very similar to those of *Diplostomum pseudospathaceum* and *D. spathaceum*, which utilise lymnaeid snails and other endemic gastropods as intermediate hosts. The risk analysis concluded there was negligible risk from the *Diplostomum* spp. and there is no evidence to suggest that the risk from *Posthodiplostomum* spp. would be different. Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.10. Rondotrema microvitellarum

There has been one taxonomic report only in the literature regarding this digenean, which did not appear to cause any pathological changes in the host fish (Thatcher 1999). Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.11. Dermocystidium sp.

Dermocystidium spp. have been implicated in cutaneous (Ehab *et al.* 2002) and systemic (Landsberg and Paperna 1992, Paperna and Kim 1996) infections in goldfish in Israel and in fish imported into Egypt. *Dermocystidium* spp. are known to infect salmonid fish (Olson *et al.*

1991) and koi carp (Wildgoose 1995). A survey in New Zealand failed to find any evidence of dermocystidium infection (Duignan *et al.* 2003). Investigation of a case of visceral granulomata in farmed goldfish failed to find any sign of infection in cohabitant common and koi carp, indicating host specificity of the agent for goldfish (Landsberg and Paperna 1992). In addition, despite being dermocystidium like in appearance, the pathology was related to amoebic granulomatosis (Landsberg and Paperna 1992). Further investigation of this goldfish dermocystidium-like condition has revealed the presence of hartmanellid amoebae, as opposed to *Dermocystidium* species. Amoebic granulomata are already reported from New Zealand (Diggles *et al.* 2002). Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.12. Pythium sp.

This oomycete fungus in the family Pythiaceae has been infrequently reported from diseased tropical fish and as a saprophyte on dead fish eggs (Bruno and Wood 1999). There are more than 40 species of this fungus already present in New Zealand (Anonymous 2007). Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.13. Metagonimus sp.

The genus *Metagonimus* is a digenean trematode, and a member of the Heterophyidae family. These parasites have birds and mammals as definitive hosts and are zoonotic (Paperna and Dzikowski 2006). Whilst *Metagonimus* spp. are reported to mainly rely on *Semisulcospira* spp., an exotic genus of snail, there remains a possibility that they could utilise the endemic *M. tuberculata* and *Hydrobia* spp. snails as intermediate hosts. However, the risk analysis considered a similar group of digeneans with known endemic snail intermediate hosts and concluded that the risk from introduction was negligible. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.14. Hoferellus carassii

The myxozoan parasite *H. carassii* can cause severe disease in goldfish (*C. auratus*) and utilises, as an intermediate host, the tubificid oligochaete worm *Branchiura sowerbyi* (Feist and Longshaw 2006), which has been reported from New Zealand (Cowie 1983). This parasite is well known to occur in goldfish and could use endemic intermediate hosts to help establish in New Zealand. Therefore this organism is regarded as an additional potential hazard in the commodity and a supplementary risk assessment is required.

4.2.15. Anacanthorus sp. & Linguadactyloides spp.

Anacanthorus sp. and *Linguadactyloides* spp. may be considered together, as they are both monogeneans. They belong to the dactylogyridae, a family the risk analysis concluded to pose negligible risk. In addition most monogeneans display very high host specificity (Whittington *et al.* 2000) and thus it is highly unlikely that suitable hosts would exist in New Zealand. Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.16. Gnathostoma spp.

The definitive hosts of *Gnathostoma* spp. are pigs, cats, boar and weasels, but they utilise cyclopoid copepods and freshwater fish or frogs as intermediate hosts. It is recognised that they have a low host specificity and can be found encysted in the musculature of goldfish (Ko 2006). *Gnathostoma* spp. are exotic to New Zealand. Therefore this group of organisms is regarded as an additional potential hazard in the commodity and a supplementary risk assessment is required.

4.2.17. Culuwiya cichlidorum

There has been one taxonomic report only in the literature regarding this digenean, which did not appear to cause any pathological changes in the host fish (Aguirre-Macedo and Scholz 2005). Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.18. Callodistomum spp.

This digenean is a member of the gorgoderoidea superfamily and infects the liver and gall bladder of fish (teleostei and chondrichthys) and amphibians. *C. diaphenum* has been reported from *Polypterus bichir, P. endlicheri* and *Ctenopoma kingsleyae* (Shotter and Medaiyedu 1977); none of which is included on the permitted list of fish species.

Gorgoderoidea require two intermediate hosts to complete the life cycle. The first is a gastropod or bivalve mollusc; the second may be a fish, mollusc, arthropod or annelid worm.

As detailed in MAF's 2005 risk analysis, the likelihood of successful establishment of a parasite is inversely proportional to the number of intermediate hosts required in the life-cycle. There are no reports of disease associated with this parasite and no recent reports of its identification either. The likelihood of entry, exposure and establishment is considered to be very low and the consequence of infection is considered to be low.

Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.19. Polyonchobothrium spp.

This cestode, which requires a copepod intermediate host, was reported from *Polypterus endlicheri* (Shotter and Medaiyedu 1977). It has not been reported from *Polypterus* spp. on the permitted list.

The majority of cestodes are incidental findings in their hosts. Those that do have an adverse effect, such as *Bothriocephalus* spp., are well reported. In the case of *Polyonchobothrium* spp. there have been no such reports. Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.20. Atractis vidali & Orientatractis spp.

These nematodes, found in the intestine of freshwater fish, have only been reported as taxonomic findings, in both cases there was no indication of pathology associated with their presence (Gonzalez-Solis and Moravec 2002). Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.21. Diplosentis ikedai sp. nov.

This acanthocephalan worm has only been reported from tropical fish species that have little chance of establishment in New Zealand. Reports of this parasite are limited to discussions about its taxonomic status (Pichelin and Cribb 2001) and, as such, it is highly unlikely to cause a disease problem. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.22. Paramonorcheides pseudocaranxi sp. nov.

Similarly to *Callodistomum* spp., this digenean requires multiple intermediate hosts with the associated low likelihood of successful exposure and establishment. In addition, reports of this parasite are limited to taxonomic discussions only (Dove and Cribb 1998), indicating that it is highly unlikely to cause disease in its host. Digeneans with identical characteristics were not considered further in MAF's 2005 risk analysis. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.23. Metabenedeniella parva sp. nov.

Metabenedeniella spp. are capsalid monogeneans, parasitizing the external surface of fish. This proposed novel species of *Metabenedeniella* sp. was reported from *Diagramma pictum*, a tropical species unlikely to survive in the waters of New Zealand. There is no indication that the parasite caused disease in the fish and they are generally host specific. There is no indication in the literature of multispecies involvement in this case of *M. parva* sp. nov. (Horton and Whittington 1994).

Benedenia spp., also capsalid monogeneans, were considered in MAF's 2005 risk analysis but discounted as they only caused disease in close confinement, treatment is possible and there are already endemic capsalid monogeneans in New Zealand waters.

Capsalid monogeneans are highly host-specific (Whittington *et al.* 2000), there is no history of disease resulting from *M. parva* sp. nov. infection and the host species are considered unlikely to be able to survive in New Zealand marine waters. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.24. Gigantolina magna

This cestode has been reported from *Diagramma pictum* from the Great Barrier Reef, Australia. It has not been reported to be associated with disease. *G. magna* has been reported from both *Diagramma* spp. and *Plectorhinchus* spp., but appears to be restricted to the Haemulidae family of the Percoidei (Cribb and Pichelin 1992).

The host species for this organism are tropical fish that are unlikely to survive in New Zealand marine waters, and there are no reported endemic Haemulidae in New Zealand. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.25. Paravortex spp.

This turbellarian flatworm is a parasite of the digestive tract and gills of bivalve and gastropod molluscs with a juvenile lifestage occasionally being detected on the skin and fins of marine fish where it causes minor tissue reactions but no significant disease. *Paravortex* spp. have also been detected in scallops (*Pecten novaezelandiae*) and greenshell mussels (*Perna canaliculus*) in New Zealand (Hine 2002). The prevalence in fish appears to be low, and the consequences appear to be minimal. *Paravortex* spp. are present in New Zealand. Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.26. Diphtherostomum sp.

There has been one report of *Diphtherostomum* sp. detection in the rectum of *Gobiosoma* species. This was a taxonomic report only; there was no evidence to suggest it causes disease (Sogandares-Bernal and Hutton 1959). *Diphtherostomum* spp. have been reported in New Zealand native fish (Hine *et al.* 2000). Digenean parasites present in the gastrointestinal tract as adults do not cause disease in their hosts. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.27. Haemogregarina spp.

Haemogregarina bigemina was reported from *Lipophrys* spp. in intertidal waters of Portugal. The same parasite has also been reported from a number of fish species in New Zealand (Hewitt and Hine 1972, Hine *et al.* 2000). Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.28. Loma dimorpha

This microsporidian parasite has only been reported from the digestive tract of *Gobius* spp. and *Lipophrys* spp. (Abollo *et al.* 1998, Arias *et al.* 1999). There was no evidence of an adverse effect on the host. Although the disease-causing microsporidian, *Loma salmonae,* has low host specificity (Dykova 2006), there have been no reports of *L. dimorpha* causing disease outbreaks and it is thought to be highly host-specific (Arias *et al.* 1999). Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.29. Lecithochirium furcolabiatum

L. furcolabiatum is a digenean parasite, encysting in the mesenteries, reported from a number of fish species. It has a four-host life cycle (Santos and Eiras 1995), which makes the likelihood of successful establishment from an imported fish negligible. At least 5 species of *Lecithochirium* have also been reported from New Zealand waters (Hine *et al.* 2000) and it is known that natural infection has no adverse effect on the host (Santos and Eiras 1995). Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.30. Helicometra fasciata

Lipophrys spp. are a definitive host of *H. fasciata*, with the adult digenean parasites being found in the digestive tract. Their presence does not cause any adverse effect on the host and the infection is self-limiting, of up to 8 months duration (Santos and Eiras 1995). At least 81 fish species have been reported to be susceptible to *H. fasciata* and a *Helicometra* species has been reported from New Zealand (Hewitt and Hine 1972). Infections are self-limiting, and they do not cause any adverse effects on the host. Moreover, *Helicometra* sp. can be found in New Zealand waters. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.31. Exophialia sp.

Exophiala spp. (black moulds) may cause systemic mycosis under suitable conditions. Some *Exophiala* spp. are present in New Zealand and are not under official control; they are considered to be widespread in marine fish.

Exophiala pisciphila, E. psychrophila and *E. salmonis* have been reported to cause mortality events in cultured fish in the Northern hemisphere and their status in New Zealand is unknown.

Exophiala spp. have been reported from *Xanthichthys ringens, Hippocampus hudsonius* and *Amphiprion sebae* in the USA (Blazer and Wolkw 1979). All three genera are included on the permitted species list, although only *A. sebae* is specifically permitted. *Xanthichthys* spp. are members of the Balistoidei, a suborder containing the native filefish *Meuschenia scaber*, although the two genera lie in different families and are not necessarily equally susceptible. *Hippocampus* spp. are present in New Zealand marine waters and would appear susceptible. *Chromis dispulis* is a native Pomacentridae, lying in the same family as *Amphiprion* spp. and may be susceptible to the fungus.

The fungus is known to affect the lake trout (*Salvelinus namaycush*) (Gaskins and Cheung 1986), a fish endemic to New Zealand. However these authors also point out that it is likely to be an opportunistic pathogen as only individual fish have been affected. Those that are infected develop clinical signs including skin lesions, swollen abdomen and uncoordinated behaviour.

In summary, *Exophiala* spp. are considered to be widespread and infections are thought to be purely opportunistic and are rarely reported. Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.32. Sulcascaris sulcata

This nematode infects the stomach of turtles as a definitive host, with bivalve molluscs as intermediate hosts. It appears to establish and mature only in turtles, and has been shown to be unable to infect teleost fish, elasmobranchs, chickens or cats. The life cycle is believed to take 2 years (Berry and Cannon 1981). To date there has only been one report of a single 4^{th} stage larva in one tiger cowrie (*Cypraea tigris*) (Cannon 1978). The other reported major intermediate hosts (*Amusium* spp., *Chlamys* spp. & *Spondylus* spp.) (Cannon 1978) are not on the permitted list. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.33. MrNV & XSV

Macrobrachium rosenbergii nodavirus (*Mr*NV) is the causative agent of white tail disease (WTD) in the freshwater prawn, *Macrobrachium rosenbergii*. In 2003, an additional virus, called extra small virus (XSV) was also reported from prawns with WTD (Sudhakaran *et al.* 2006). Artemia have been suggested as potential vectors for the transmission of these two viruses to freshwater prawns because artemia are used as a live feed in the aquaculture of *M. rosenbergii*. There is a small *M.* rosenbergii aquaculture industry in New Zealand. Therefore this organism is regarded as an additional potential hazard in the commodity and a supplementary risk assessment is required.

4.2.34. Cestoidea cysticercoids

Cysticercoids of *Confluaria* spp., *Wardium* spp., *Eurycestus* spp. and *Anomotaenia* spp. have been reported from artemia. *Confluaria* spp. infect grebes as definitive hosts, *Wardium* spp. infect gulls and the other two infect wading birds (Georgiev *et al.* 2005). Reports regarding these parasites relate to their taxonomy and their presence appears incidental to the host. It is worthy of note that the presence of cysticercoids is limited to wild caught artemia. Imports of dried artemia cysts derived from cultured artemia would be extremely unlikely to contain cestode cysticercoids. Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.35. White spot syndrome virus

White spot syndrome virus (WSSV) is a serious disease of all aquatic decapod crustaceans. WSSV is regarded as exotic to New Zealand. *Artemia salina* is listed by the OIE as a vector of WSSV, as are all decapod crustaceans (OIE 2006b). It is assumed that decapod crustaceans in New Zealand would be susceptible to infection with WSSV. Therefore this organism is regarded as an additional potential hazard in the commodity and a supplementary risk assessment is required.

4.2.36. Unidentified apicomplexan of tridacnid clams

A parasite was an incidental finding during an investigation of the haemocytes of the giant clam (*Tridacna crocea*). It was identified as an apicomplexan by electron microscopy. Analysis of the 18s rRNA sequences indicated that was clearly distinct from *Perkinsus* spp., being more closely related to the Eimeriorina (*Eimeria, Sarcocystis* and *Toxoplasma*) and the Piroplasmorida (*Babesia, Cytauxzoon* and *Theilelia*). It appeared to have no significant effect on the health of the molluscs, as they remained healthy in the laboratory for several months (Nakayama *et al.* 1998). This parasite is therefore regarded as an incidental finding. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.37. Turbonilla sp.

Turbonilla are large pyramidellid gastropods, visible to the naked eye, that move on and off their tridacnid hosts, most often feeding on mantle tissue at the edge of the shell. Numerous similar pyramidellid gastropods have been reported from the waters of New Zealand. Their presence is only an issue to the survival of clams when held in closed aquaria. Pyramidellids appear to be rare or absent in benthic ocean nurseries of juvenile clams. Larvae do not appear to swim away from the clam of origin thus leading to an aggregation of juveniles on the infested clam (Cumming 1988). Similar organisms are found in New Zealand. Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.38. Perkinsus olseni

P. olseni is regarded as a serious disease of a range of molluscs including venerid clams (OIE 2006a, OIE 2006b). It has also been reported from New Zealand (Hine 2002), where infection is restricted to the northern region of the North Island, probably due to environmental reasons (Hine 2002). There are no internal controls on *P. olseni* in New Zealand. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.39. Curvularia sp. & Exserohilum (=Setosphaeria) sp.

The fungi *Curvularia* sp. and *Exserohilum* sp. are both found in New Zealand (Anonymous 2007). Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.40. *Marteilia*-like infection

This infection was found during routine dissections of giant clams in Fiji for anatomical studies. One clam was observed to have chalk-white foci throughout the kidney. The animal appeared normal in all other respects. Microscopic examination revealed the presence of a *Marteilia*-like organism within the ciliated epithelium of the proximal tubules of the kidney, causing dilation of the tubules (Norton *et al.* 1993). However, this finding was restricted to one animal held on-shore in tanks with other broodstock and there have been no further reports. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.41. Bucephalidae

These digenean trematodes utilise bivalve molluscs as a first intermediate host and fish as both second intermediate host (e.g. Gobiidae) and definitive host (e.g. *Dicentrarchus labrax*) (Paperna and Dzikowski 2006). Larvae of *Bucephalus* spp. can be found in large numbers in bivalve hosts where they may cause castration of the host (Bower 2006). *B. longicornutus* is reported from New Zealand (Hine *et al.* 2000) where it has caused castration and mortalities of dredge oysters (*Ostrea chilensis*) (Bower 2006). The complexity of the life cycle reduces the likelihood of establishment of the parasite and that a pathogenic *Bucephalus* sp. is already present in New Zealand waters. Therefore this group of organisms is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

4.2.42. Urastoma cyprinae

This turbellarian has been reported from European, North American, Brazilian and Australian coastal waters (Goggin and Cannon 1989, Bower and McGladdery 2003) and is presumed to have a global distribution. This organism may represent a transitional stage between parasite and endocommensal (Bower and McGladdery 2003), being reported in association with lamellibranch molluscs and free-living (Goggin and Cannon 1989). The presence of this organism is not accompanied by pathological changes and it appears to be an incidental finding in the tridacnid clams. Therefore this organism is not regarded as an additional potential hazard in the commodity and it does not require a supplementary risk assessment.

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5. Supplementary risk assessments

As discussed in the previous section of this document, a preliminary assessment of organisms of potential concern in the commodity concluded that supplementary risk assessments were required for the following organisms:

- Cyprinid herpesvirus-3
- *Aeromonas salmonicida*
- *Flavobacterium psychrophilum*
- Spring viraemia of carp virus (SVCV)
- *Hoferellus carassii*
- *Gnathostoma* spp.
- *Macrobrachium rosenbergii* nodavirus (*Mr*NV) and extra small virus (XSV)
- White spot syndrome virus

In the following eight sections, individual risk assessments are carried out for each of these organisms. Each risk assessment begins with an examination of the epidemiology of the organism, with particular emphasis on routes of transmission. The entry assessment then considers the likelihood of the organism entering New Zealand in the commodity, taking into account such factors as the initial prevalence of infection, the effects of handling, transporting and storing the commodity and the environmental susceptibility of the organism.

If the entry assessment concludes there is a non-negligible likelihood of entry, then an exposure and establishment assessment is carried out. There may be consequences associated with exposure alone, or it may be determined that the organism needs to establish to have consequences. If the assessment determines there is a non-negligible likelihood of either of the above then a consequence assessment is carried out. All the above steps are summarised in the risk estimation statement.

For organism where the risk estimate is non-negligible, risk management measures are presented and evaluated.

6. Cyprinid herpesvirus-3

6.1. HAZARD IDENTIFICATION

6.1.1. Aetiological agent

Cyprinid herpesvirus-3 (CyHV-3), also known as koi herpesvirus (KHV), is a herpesvirus in the family Herpesviridae.

6.1.2. OIE List

Koi herpesvirus is an OIE listed disease.

6.1.3. New Zealand status

Not reported, considered exotic.

6.1.4. Epidemiology

Koi herpesvirus is serious disease of koi carp (*Cyprinus carpio koi*), which has spread globally with the trade in live koi carp. It was first reported in Germany in 1997, followed by the USA and Israel in 1998. Since then it has affected most of Europe, China, Taiwan, Indonesia, South Africa and Japan. Infection with KHV in naïve populations produces massive mortalities.

Koi carp are not permitted to be imported into New Zealand, however there have been reports that viral DNA could be identified from goldfish (*Carassius auratus*) leucocytes following experimental infection, and also from the tissues of healthy goldfish cohabiting with infected koi carp (El-Matbouli *et al.* 2007, Sadler *et al.* 2008).

At this time it is unknown if the detection of KHV (CyHV-3) genome in goldfish represents live, viable virus or whether it is infectious to other carp species if such goldfish were exposed to a naïve carp population.

6.2. RISK ASSESSMENT

6.2.1. Entry assessment

Goldfish that have been cohabiting with infected *Cyprinus carpio* could potentially act as carriers or vectors of KHV. As reports indicate such goldfish are clinically normal the likelihood is that such goldfish would survive importation and carry KHV into New Zealand. The likelihood of entry is therefore considered to be non-negligible.

6.2.2. Exposure and establishment assessment

The OIE lists common carp (*Cyprinus carpio carpio*), koi carp (*C. carpio koi*), ghost carp (*C. carpio goi*) and hybrids of these as susceptible. Both grass carp (*Ctenopharyngodon idella*) and silver carp (*Hypophthalmichthys molitrix*) are regarded as refractory (OIE 2006b), although there are early indications that this may be reviewed. However, data on the susceptibility of other New Zealand resident fish species are lacking. As goldfish are routinely kept outdoors, in ponds, which may be subject to predation or flooding an exposure pathway between imported goldfish and native fish does exist, thus the likelihood of exposure is non-negligible. In the absence of data on susceptibility of freshwater native fish species, a conservative position should be taken on the likelihood of establishment and thus it is also considered to be low, but non-negligible.

6.2.3. Consequence assessment

Whilst it is likely that grass and silver carp, used to control weed in waterways, would not be affected by the establishment of KHV in New Zealand, there is lack of data on the consequence to other native fish species. It is therefore appropriate, at this time, to consider that a non-negligible consequence could result.

6.2.4. Risk estimation

The likelihood of introduction of KHV in clinically healthy goldfish is non-negligible. There is a low likelihood exposure pathway to native freshwaters, and there is a low likelihood of negative consequences resulting from such exposure in common and koi carp as well as in native freshwater fish. As a result, the risk estimate for KHV is non-negligible and it is classified as a hazard in imported goldfish. Therefore risk risk management measures for CyHV-3 (KHV) can be justified.

6.3. RISK MANAGEMENT:

6.3.1. Risk species

Risk management options relate to the importation of *Carassius auratus* only.

6.3.2. Options

Presence is clinically inapparent in goldfish, and can be detected for periods of up to one year in leucocytes (El-Matbouli *et al.* 2007) and more than two months in fish (Sadler *et al.* 2008). The risk would not, therefore, be mitigated by pre- or post-border clinical inspections, nor by reasonable quarantine periods.

> Sourcing fish from a country declared free of KHV would mitigate against the risk to an extremely high degree. This would be minimally trade restrictive for countries with an appropriate surveillance programme and demonstrable freedom.
>
> Elimination of exposure of goldfish to a source of KHV (CyHV-3) in the exporting country would prevent the entry of goldfish carrying the virus. Exporting countries could be asked to certify that goldfish had not been cohabiting with *Cyprinus carpio* species. This is currently a requirement for entry into Australia. The efficacy of this measure is dependent on the ability of the Competent Authority in the exporting country to accurately determine if cohabitation with carp has occurred, but at best could be considered effective. This measure would be minimally trade restrictive.

Testing of a closed, source population of goldfish, or batch testing of imported goldfish by PCR for the virus with negative results would be extremely effective in mitigating the risk from this pathogen. This measure would be trade restrictive to a higher degree, in that it would add considerably to the costs of the fish, especially if each batch was tested.

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7. *Aeromonas salmonicida* (typical and atypical strains)

7.1. HAZARD IDENTIFICATION

7.1.1. Aetiological agent

Aeromonas salmonicida bacteria are gram negative, coccoid to rod shaped members of the Aeromonadaceae family. There are at least 7 different recorded subspecies of *A. salmonicida* regarded as being "atypical" despite having phenotypical characteristics similar to the "typical" strain of *A. salmonicida* that causes classical furunculosis (Hiney and Olivier 1999).

The following represent the current classification of subspecies of atypical *A. salmonicida* (Buller 2004): -

- *A. salmonicida* ssp. *achromogenes* – widespread globally, causing skin lesions in cod, silver bream, perch, roach, goldfish (goldfish ulcer disease, GUD) and flounder.
- *A. salmonicida* ssp. *masoucida* – reported from salmonids in Japan.
- *A. salmonicida* ssp. *nova* – reported from goldfish (GUD), eels, carp and marine fish from UK, Japan, USA and Australia.
- *A. salmonicida* ssp. *smithia* – caused superficial skin lesions in UK, and presumptive identification in China (Wang and Huang 2006).
- *A. salmonicida* ssp. "Atypical strains" – wide range of fish species and global distribution
- *A. salmonicida* ssp. "Atypical strains; oxidase negative" – isolated from skin ulcers of turbot and flounder in the Baltic, Denmark and USA.
- *A. salmonicida* ssp. "Atypical strains; growth at 37°C" – isolated from skin ulcers in UK.

7.1.2. OIE List

Not listed

7.1.3. New Zealand status

Not reported, considered exotic. A study of 624 farmed fish and 253 wild fish failed to isolate any *A. salmonicida* (Anderson *et al.* 1994). Repeated surveys have similarly not detected the bacteria here (Anonymous 2000, Anonymous 2001, Duignan *et al.* 2003). Therefire all strains of *A. salmonicida* are considered to be exotic.

7.1.4. Epidemiology

In an earlier MAF risk analysis (MacDiarmid 1994), Dr Trevor Evelyn was reported as discussing the host range of *A. samonicida*. Evelyn noted that whilst non-salmonids may be clinically affected by atypical *A. salmonicida* subspecies, they may also be covertly infected with typical *A. salmonicida*. Typical *A. salmonicida* is, however, still primarily a disease of salmonids and maintained in salmonid reservoirs (Hiney and Olivier 1999, Raidal *et al.* 2004). Similarly atypical strains of *A. salmonicida* have been noted from a wide range of salmonid and non-salmonid fish species in both freshwater and seawater (Bernoth 1997, Hiney and Olivier 1999).

The bacterium does not tend to persist in the water to any great degree. D-values for typical *A.salmonicida* have been estimated at 4 days in freshwater and 2 days in seawater (Enger 1997), and it has been clearly stated that freshwater transport of the bacterium is of little significance in the spread of furunculosis (Morgan *et al.* 1992). The main source of the bacterium is release from dead, moribund and live infected fish (Austin and Austin 1993, Enger 1997). It has been estimated that between 10^5 and 10^8 CFU are released from a dead or moribund fish each hour (Rose *et al.* 1989).

There is strong evidence to suggest that atypical *A. salmonicida* was introduced into Australia in subclinically infected goldfish (Humphrey and Ashburner 1993).

Transmission of the bacterium is horizontal in the water column. Vertical transmission is not significant (Austin and Austin 1993). Uptake from the water column is rapid, with the bacterium detectable in the blood and kidney within five minutes of immersion in a bath containing 10^5CFU/ml. The bacterium was detectable in the viscera (skin, gills, spleen) and in the faeces within four hours (Austin and Austin 1993).

7.2. RISK ASSESSMENT

7.2.1. Entry assessment

A number of fish species, including *Carassius auratus*, are known to carry both typical and atypical subspecies of *A. salmonicida*. As infection may be subclinical (Humphrey and Ashburner 1993, Hiney and Olivier 1999), the likelihood of clinically normal imported goldfish being infected is non-negligible.

7.2.2. Exposure and establishment assessment

As goldfish are routinely kept outdoor ponds which may be subject to predation or flooding, an exposure pathway between imported goldfish and native fish does exist. It is therefore necessary to examine the likelihood of establishment of the pathogen. There are few reports of non-salmonid strains of the bacterium causing natural infection and disease in salmonids, and isolates tend to be more virulent to their host species. However, initially at least one strain isolated from goldfish was reported to be highly virulent to salmonids either by intraperitoneal injection or bath challenge, with an LD_{50} of 10^2-10^3 CFU by injection (Hiney and Olivier 1999). This initial finding has been confirmed by further experimental work. An atypical subspecies isolated from skin ulcers on a goldfish was shown to have an LD_{50} by injection of 3 CFU for Atlantic salmon (*Salmo salar*). This is obviously not a natural route of infection; however, a bath challenge at 8 x 10^5 CFU/mL resulted in mortalities (Carson and Handlinger 1988). A similar study showed that injection of fewer than 10 CFU of atypical *A. salmonicida* could result in significant mortalities in *S. salar* (Whittington and Cullis 1988), although, of the salmonids tested, rainbow trout were the most resistant. Given the susceptibility of salmonid species to *A. salmonicida* subspecies isolated from goldfish and that goldfish may carry typical *A. salmonicida*, there is a non-negligible likelihood of establishment of the bacterium in New Zealand following exposure. However, the likelihood is still low, given the infectious dose necessary in immersion challenge as compared with injection challenge.

7.2.3. Consequence assessment

Freshwater bodies in New Zealand are important living and breeding habitats for wild salmonids. In addition salmonid hatcheries may take water supplies from natural waterways.

The release of *A. salmonicida* infected goldfish into the environment could, therefore, result in the establishment of infection in wild and farmed populations of salmonids, which are considered naïve to the infection. Mortalities could be severe, and the loss of our status of freedom from *A. salmonicida* would impact salmonid exports. The consequence of establishment is therefore very high.

7.2.4. Risk estimation

The likelihood of introduction of *A. salmonicida* in imported goldfish is non-negligible. There is a potential exposure pathway to native freshwaters, and a low likelihood of establishment in salmonids as a result of exposure. The consequences of establishment are likely to be very high. As a result, the risk estimate for *A. salmonicida* is non-negligible and it is classified as a hazard in imported goldfish. Therefore risk management measures can be justified.

7.3. RISK MANAGEMENT

7.3.1. Risk species

Risk management options relate to the importation of *Carassius auratus* only.

7.3.2. Options

Clinical infection with atypical *A. salmonicida* may be apparent in goldfish, in which case pre- and post-border inspections and a suitable quarantine period may result in the identification of clinical signs of skin ulceration. Clinically inapparent infections could, however, occur. These would not be apparent at pre- and post- border inspections, nor would clinical signs necessarily appear during quarantine. This measure would thus only address clinical atypical infections.

> It has been necessary to utilise stress testing to detect carrier populations. This has involved an injection of prednisolone acetate, combined with increased water temperatures of 18°C or above (Austin and Austin 1993).
>
> Sourcing fish from a country declared free of all strains of *A. salmonicida* would mitigate against the risk to an extremely high degree. This would be minimally trade restrictive for countries with appropriate surveillance programmes and demonstrable freedom.
>
> Elimination of exposure of goldfish to a source of typical *A. salmonicida* in the exporting country would prevent the entry of goldfish carrying this bacterium. Exporting countries could be asked to certify that goldfish had not been cohabiting with salmonid species. This is currently a requirement for entry into Australia. The efficacy of this measure is dependent on the ability of the Competent Authority in the exporting country to accurately determine if cohabitation with salmonids has occurred, but at best could be considered to be moderately effective. This measure would be minimally trade restrictive. However, it should be noted that atypical *A. salmonicida* infection may still be enzootic in the source population.
>
> Testing of a closed, source population of goldfish, or batch testing of imported goldfish for all strains of the bacterium with negative results would be extremely effective in mitigating the risk from this pathogen. This measure would be trade

restrictive to a higher degree, in that it would add considerably to the costs of the fish, especially if each batch was tested. However, given the seriousness of the potential consequences it may be appropriate to require testing.

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8. Flavobacterium psychrophilum

8.1. HAZARD IDENTIFICATION

8.1.1. Aetiological agent

Flavobacterium psychrophilum is a filamentous, gram negative bacterium, in the family Flavobacteriaceae.

8.1.2. OIE List

Not listed

8.1.3. New Zealand status

Surveys here have failed to isolate *F. psychrophilum* (Duignan *et al.* 2003) and it is considered exotic.

8.1.4. Epidemiology

This bacterium has been reported from many countries, including Australia, Canada, Chile, Europe, Japan, Korea and the USA (Buller 2004). It is primarily a serious disease of salmonids (Holt *et al.* 1993, Shotts and Starliper 1999). It usually causes disease at water temperatures below 12-15°C (Shotts and Starliper 1999, Buller 2004). Vertical transmission is likely in *Salmo salar* (Cipriano 2005) and *Oncorhynchus* spp. (Taylor 2004). Infection is not limited to salmonids. Eels and cyprinids have been infected (Buller 2004), and there have been reports of up to 77 strains from 10 species, including *Carassius* spp., *Plecoglossus* spp. and *Acipenser* spp. (Ramsrud *et al.* 2007). There is one specific report of infection in *Carassius auratus* in the USA (Hallett *et al.* 2006), relating to an epizootic of clinical disease in a reservoir.

8.2. RISK ASSESSMENT

8.2.1. Entry assessment

Whilst *C. auratus* may be infected with *F. psychrophilum*, the majority of reports relate to infections in salmonids, with only one incidental report of clinical disease in goldfish (Hallett *et al.* 2006). It is, therefore, possible that infected goldfish might be imported into New Zealand. The likelihood is considered to be low, but non-negligible.

8.2.2. Exposure and establishment assessment

As many goldfish are kept in outdoor ponds and are thus susceptible to predation and flooding, it is apparent that a potential pathway exists whereby goldfish infected with *F. psychrophilum* could enter waterways here. As the bacterium is primarily one of salmonids, it would be expected to establish in wild salmonid populations. The likelihood of this occurring, however, is considered to be low, but non-negligible.

8.2.3. Consequence assessment

Infection of native salmonids with the exotic bacterium *F. psychrophilum* would be expected to produce serious disease, with skin ulceration, erosion of peduncles and septicaemia (Buller 2004). It is likely to be vertically transmitted (Taylor 2004, Cipriano 2005) and thus establish in the breeding population, resulting in increased mortalities in fry and fingerlings. The consequence would therefore be non-negligible.

8.2.4. Risk estimation

The likelihood of introduction in imported goldfish and the likelihood of exposure to native freshwaters are both non-negligible, and the consequence of establishment in native salmonids is considered to be non-negligible. As a result, the risk estimate for *F. psychrophilum* is non-negligible and it is classified as a hazard in imported goldfish. Therefore risk management measures can be justified.

8.3. RISK MANAGEMENT

8.3.1. Risk species

Risk management options relate to the importation of *Carassius auratus* only; given that none of *Plecoglossus* spp., *Acipenser* spp. or salmonids are permitted to be imported.

8.3.2. Options

Clinical disease in *C. auratus* was characterised by skin ulceration, haemorrhagic and frayed fins and mortality (Hallett *et al.* 2006). Given this clinical picture, it is suggested that visual inspection of goldfish for fin and skin lesions pre- or post-border, and maintenance in quarantine for observation would be effective in mitigating against this risk. Stressed, immersion challenged rainbow trout (*Oncorhynchus mykiss*) displayed clinical signs and mortality from day 8 post infection to day 25 post infection (Madsen and Daalsgard 1999). It seems reasonable to conclude that quarantine for up to 4 weeks would ensure the clinical expression of infection.

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9. Spring viraemia of carp virus (SVCV)

9.1. HAZARD IDENTIFICATION

9.1.1. Aetiological agent

SVCV is a member of the Vesiculovirus genus in the Rhabdoviridae family. It is a negative sense, single stranded RNA virus (Ahne *et al.* 2002).

9.1.2. OIE List

Listed

9.1.3. New Zealand status

Not reported, considered exotic.

9.1.4. Epidemiology

SVCV causes a haemorrhagic septicaemia in *Cyprinus carpio*, resulting in mortalities. The clinical effects of infection are determined by the water temperature. Temperatures of 10-12°C producing 90% mortalities, whilst no mortalities result at temperatures of 20-22°C. This difference is due to antibody production being rapid at higher water temperatures. Overall the lethal effect on carp is most rapid at 10-17°C (Ahne *et al.* 2002).

A SVCV-like virus has also been implicated in mortalities in Hawaiian prawns (*Penaeus stylirostris*) (Ahne *et al.* 2002).

Transmission is horizontal via the gills, with infected fish shedding viral particles in urine, faeces and from skin lesions (Ahne *et al.* 2002). The virus will survive for up to four weeks in water (Ahne *et al.* 2002). The virus is susceptible to bile salts; experimental *per* os dosing has failed to result in transfer of infection (Fijan 1999). Other routes of transmission also exist; these include freshwater lice (*Argulus foliaceus*), the leech (*Piscicola geometra*) and virus has been found to survive for up to two hours in the intestinal tract of piscivorous birds (OIE 2006b). Survivors of an outbreak remain carriers of the virus (Fijan 1999, Ahne *et al.* 2002). Although virus shedding from carriers has not been satisfactorily demonstrated, carriers remain important for the survival of the virus in fish populations (Fijan 1999). Vertical transmission is not considered to be of significance.

While goldfish have been regarded as refractory to infection (Wolf 1988), there is now evidence of natural infection in goldfish (OIE 2006b). There have been recent reports of SVCV being detected in clinically normal goldfish imported into the United Kingdom from Hong Kong. In addition both zebra danio (*Danio rerio*) and guppies (*Poecilia reticulata*) are listed as susceptible to the virus (OIE 2006b), however there have been no reports of natural infection in these species.

9.2. RISK ASSESSMENT

9.2.1. Entry assessment

As goldfish can act as asymptomatic carriers of SVCV, there is a non-negligible likelihood that imported goldfish may contain SVCV. There have been no reports of natural infection of *D. rerio* and *P. reticulate,* which are tropical fish species; SVCV is considered a virus of colder waters. Therefore, it is considered unlikely for these species to be carrying the virus on entry to New Zealand.

9.2.2. Exposure and establishment assessment

As goldfish are routinely kept outdoors, in ponds, which may be subject to predation or flooding an exposure pathway between imported goldfish and native fish does exist, thus the likelihood of exposure is non-negligible. Freshwaters in New Zealand are known to contain carp, which are exquisitively sensitive to SVCV. The virus has been experimentally exposed to rainbow trout (*Oncorhynchus mykiss*) at $10^{5.8}$ $TCID_{50}$/mL for 1 hour. No disease or pathology was detected. Virus was detectable at $<10^{1.6}$ $TCID_{50}$/mL of tissue suspension for only 2 days post exposure (Haenen and Davidse 1993). It is unlikely therefore that the virus would pose a risk to salmonids in New Zealand waterways.

9.2.3. Consequence assessment

Cyprinids in New Zealand would be susceptible to introduction of the virus. It would be expected to severely affect populations of koi carp, grass carp, silver carp, orfe (*Leuciscus idus*) and tench (*Tinca tinca*). Both grass carp and silver carp are routinely used to reduce weed populations in waterways. The consequence is therefore considered to be non-negligible.

9.2.4. Risk estimation

The likelihood of introduction in imported goldfish and the likelihood of exposure to native freshwater fish are both non-negligible, and the consequence of establishment in cyprinids is considered to be non-negligible. As a result, the risk estimate for SVCV is non-negligible and it is classified as a hazard in imported goldfish. Therefore risk management measures can be justified.

9.3. RISK MANAGEMENT

9.3.1. Risk species

Risk management options relate to the importation of *Carassius auratus* only.

9.3.2. Options

Infection is clinically inapparent in goldfish, and it does not appear to be possible to induce clinical signs. The risk would not, therefore, be mitigated by pre- or post-border clinical inspections, nor by reasonable quarantine periods.

Sourcing fish from a country declared free of SVCV would mitigate against the risk to an extremely high degree. This would be minimally trade restrictive for countries with an appropriate surveillance programme and demonstrable freedom.

Elimination of exposure of goldfish to a source of SVCV in the exporting country would prevent the entry of goldfish carrying the virus. Exporting countries could be asked to certify that goldfish had not been cohabiting with *Cyprinus carpio* species. This is currently a requirement for entry into Australia. The efficacy of this measure is dependent on the ability of the Competent Authority in the exporting country to accurately determine if cohabitation with carp has occurred, but at best could be considered effective. This measure would be minimally trade restrictive.

Testing of a closed, source population of goldfish, or batch testing of imported goldfish by PCR for the virus with negative results would be extremely effective in mitigating the risk from this pathogen. This measure would be trade restrictive to a higher degree, in that it would add considerably to the costs of the fish, especially if each batch were tested.

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10. Hoferellus carassii

10.1. HAZARD IDENTIFICATION

10.1.1. Aetiological agent

Hoferellus carassii is a myxosporean in the Sphaerosporidae family.

10.1.2. OIE List

Not listed

10.1.3. New Zealand status

Not reported, considered exotic.

10.1.4. Epidemiology

H. carassii is the causative agent of kidney enlargement disease in goldfish. Clinical disease is characterised by abdominal distension, scale protrusion and loss of equilibrium (Feist and Longshaw 2006). Initial infection localises to the renal tubules where the parasite develops to the spore stage (Yokoyama *et al.* 1990). Histopathologically there is cystic papillomatous hyperplasia of renal tubule epithelium; spores are shed in the urine (Feist and Longshaw 2006).

The life cycle requires an intermediate host. This is an oligochaete worm, which may be *Nais* spp. (Trouillier 1994, Feist and Longshaw 2006), *Tubifex* spp. (El-Matbouli *et al.* 1992) or *Branchuria sowerbyi* (Feist and Longshaw 2006), all of which are present in New Zealand (Cowie 1983).

H. carassii appears consistent globally, being specific to *Carassius* species (Lom 1986). The lifecycle and development of clinical disease is slow. Infection could be detected in goldfish 130 days post exposure to infected *Tubifex tubifex* oligochaetes (El-Matbouli *et al.* 1992) in one study. In another 4 months exposure to infected *Nais elinguis* oligochaetes was required to transmit infection to goldfish (Yokoyama *et al.* 1993). It has been estimated that there is a prepatent period of 6 months from initial infection settling in the renal tubules until spore formation (Yokoyama *et al.* 1990).

10.2. RISK ASSESSMENT

10.2.1. Entry assessment

Goldfish are known hosts of *H. carassii*, and, as there is a prepatent period of 6 months, infected golfish may present as clinically normal on import. There is, therefore, a non-negligible likelihood of entry of the pathogen in imported goldfish.

10.2.2. Exposure and establishment assessment

H. carassii appears consistent globally, with good host specificity, limiting infection to *Carassius* species. For infection to establish in New Zealand would require spores, released from an imported infected goldfish, to infect native oligochaetes, with a susceptible *Carassius* species population in the same waterway at the time of release of the actinomyxon spores from the infected oligochaetes. This required sequence of events proportionately reduces the likelihood of exposure leading to establishment. Of concern is the likelihood that released goldfish would survive in the freshwaters of New Zealand, and thus the likelihood of exposure and establishment is considered to be low, but non-negligible.

10.2.3. Consequence assessment

Consequences would be restricted to feral goldfish populations and the goldfish breeding industry. There is little risk to other fish species. Infection, once established, may be eradicated by draining and disinfection of ponds, and may be prevented by raising fish in tanks with treated water. The consequences are therefore considered to be low to all but the ornamental fish industry.

10.2.4. Risk estimation

The likelihood of introduction in imported goldfish and the likelihood of exposure to native freshwater fish are both non-negligible, and the consequence of establishment in the goldfish breeding industry is considered to be non-negligible. As a result, the risk estimate for *H. carassii* is non-negligible and it is classified as a hazard in imported goldfish. Therefore risk management measures can be justified.

10.3. RISK MANAGEMENT

10.3.1. Risk species

Risk management options relate to the importation of *Carassius auratus* only.

10.3.2. Options

Given the limited, but non-negligible, consequence for this organism it seems appropriate to suggest that pre- and post- border inspections preclude the issuance of a biosecurity clearance to any batch of goldfish with distended abdomens, and that any goldfish submitted for diagnostic testing from the transitional facilities should also be screened for *H. carassii* by histopathology. This would address the risk to a moderate degree and would be minimally trade restrictive.

To address the risk to a higher degree would require the importation of goldfish from closed breeding populations, demonstrably free of *H. carassii* or the compulsory batch testing of goldfish entering New Zealand. Either would however prove to be more trade restrictive than the preliminary option.

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11. Gnathostoma spp.

11.1. HAZARD IDENTIFICATION

11.1.1. Aetiological agent

Gnathostoma spp. are nematodes in the family Gnathostomatidae.

11.1.2. OIE List

Not listed

11.1.3. New Zealand status

Not reported, considered exotic.

11.1.4. Epidemiology

Gnathostoma spp. have a multi-host lifecycle. The definitive hosts are cats, pigs, wild boar and weasels, the adult worm forming nodules in the stomach and oesophagus. In humans infection may result in visceral larva migrans, producing iritis and eosinophilic encephalomyelitis, which can be serious or even fatal. Definitive hosts pass eggs in their faeces. The eggs embryonate in freshwater and infect copepods (Ko 2006). Development within the copepods is dependent on water temperatures in excess of 15°C (Ando *et al.* 1989). Infected copepods are, in turn, ingested by fish and amphibians, where the parasite develops to 3rd stage larvae. Infections have been reported for South East Asia, China, Japan, Korea, the Indian subcontinent, Middle East and Mexico (Ko 2006). An early study (Wang *et al.* 1976) indicated that *G. hispidum* penetrated the intestinal wall of goldfish following ingestion, but died within 2 weeks. Other, more recent studies report that infection of goldfish does result in larvae penetrating the internal organs (Akahane *et al.* 1983, Oyamada *et al.* 1997). In addition to goldfish, infection with *Gnathostoma* spp. has been reported from *Vieja* spp., *Parachromis* spp. and *Macropodus* spp. (Ando *et al.* 1989).

11.2. RISK ASSESSMENT

11.2.1. Entry assessment

As species of fish listed above can act as intermediate hosts of the 3rd stage larvae, with no clinical signs it is possible that imported fish may enter New Zealand infected with these parasites.

11.2.2. Exposure and establishment assessment

The likelihood of the successful establishment of an organism is inversely proportional to the number of essential variables in its life history. As *Gnathostoma* spp. require primary and secondary intermediate hosts, there is a concomitantly lower likelihood that the required conditions will be present at the point of release of infected fish. Of the potential hosts, only goldfish are likely to survive. They would need to be consumed by a definitive host to present any chance of perpetuating the lifecycle. Thus it is considered that the likelihood of exposure and establishment in New Zealand is so low as to be negligible.

11.2.3. Risk estimation

Although *Gnathostoma* spp. might be introduced on clinically normal imported ornamental fish of several species, the likelihood of exposure and establishment is considered to be negligible. As a result, the risk estimate for *Gnathostoma* spp. is negligible and it is not classified as a hazard in the commodity. Therefore risk management measures are not justified.

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12. *Macrobrachium rosenbergii* nodavirus (MrNV) and extra small virus (XSV)

12.1. HAZARD IDENTIFICATION

12.1.1. Aetiological agent

Macrobrachium rosenbergii nodavirus (MrNV), an non-enveloped icosahedral particle 26-27 nm in diameter (Bonami *et al.* 2005) with a 2 piece single stranded RNA genome, and its associated extra small virus (XSV), an icosahedral particle 15 nm in diameter with a single strand RNA genome.

12.1.2. OIE List

Listed

12.1.3. New Zealand status

Not recorded, considered exotic.

12.1.4. Epidemiology

This is a disease primarily of the freshwater prawn, *Macrobrachium rosenbergii*. Of relevance to this risk analysis is the potential for these viruses, especially MrNV, to utilise *Artemia salina* as a vector for infection. *Artemia* spp. nauplii have previously been considered not to pose a risk because experimental infection with nodavirus failed to produce a persistent infection (Skliris and Richards 1998). However, it has since been demonstrated that exposure of a number of developmental stages of *A. salina* to MrNZ/XSV, followed by feeding of those exposed stages to *M. rosenbergii* post-larvae resulted in 100% mortality in post-larvae. The post-larvae were positive to MrNV/XSV by reverse transcriptase-PCR (Sudhakaran *et al.* 2006). In this case, however, cysts of *A. salina* were not challenged. This was addressed in a later study, where adult *A. salina* were exposed to MrNV/XSV and reproductive cysts harvested. These cysts were positive by RT-PCR for MrNV/XSV. Nauplii hatched from these infected cysts were fed to *M. rosenbergii* post-larvae, resulting in 100% mortality within 9 days (Sudhakaran *et al.* 2007).

12.2. RISK ASSESSMENT

12.2.1. Entry assessment

It is apparent that viable cysts, and all other lifestages, of *A. salina* could be infected with MrNV/XSV and imported into New Zealand. In addition, as MrNV/XSV infection of *A. salina* lifestages does not result in increased mortality (Sudhakaran *et al.* 2006, Sudhakaran *et al.* 2007), such infection would not be clinically apparent at the time of importation. Thus there is a non-negligible likelihood of the entry of MrNV/XSV within *A. salina*.

12.2.2. Exposure and establishment assessment

A. salina infected with MrNV/XSV would have to be exposed, in sufficient numbers, to a susceptible freshwater crustacean. This would only occur upon release of the *A. salina*. The only susceptible host listed by the OIE is *Macrobrachium rosenbergii*, which would not be found wild in New Zealand. There is no evidence to suggest that MrNV/XSV would cycle through successive *A. salina* populations in the absence of the susceptible host. The only route of exposure in New Zealand would be for the infected *A. salina* to be used as feed for *M. rosenbergii*. A separate import health standard covers the importation of *A.salina* for use as feed. The likelihood of exposure of a susceptible host, leading to establishment of the infection is so low as to be negligible.

12.2.3. Risk estimation

Although there is a non-negligible likelihood of the entry of MrNV/XSV within *A. salina*, the likelihood of exposure of a susceptible host, leading to establishment of the infection is so low as to be negligible. As a result, the risk estimate for MrNV/XSV is negligible and it is not classified as a hazard in the commodity. Therefore risk management measures are not justified.

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13. White spot syndrome virus (WSSV)

13.1. HAZARD IDENTIFICATION

13.1.1. Aetiological agent

White Spot Syndrome Virus (WSSV), a double-stranded DNA virus of the genus Whispovirus within the family Nimaviridae.

13.1.2. OIE List

Listed

13.1.3. New Zealand status

Not recorded, considered exotic

13.1.4. Epidemiology

WSS is primarily a disease of crabs and penaeid shrimp, but other species have been shown to be infected both naturally and experimentally by injection and by feeding (Flegel 1997). These include freshwater crayfish, crabs, lobsters, penaeid shrimp and freshwater prawns (Peng *et al.* 1998, Wang *et al.* 1998, Rajendran *et al.* 1999). In fact, all decapod crustaceans from marine, brackish water, or freshwater sources are considered to be potential hosts for WSS (OIE 2006a), hence once the disease agent is introduced, there are many species which can act as carriers and vectors (OIE 2006a). However, other crustacean species tend to be less susceptible than penaeid shrimps to WSS. The virus may be transmitted horizontally via food or in the water column and vertically (OIE 2006b).

This assessment relates to the potential for imported *A. salina, Enoplometopus occidentalis, Lysmata grabhami, L. amboinensis, L. debelius, Periclimenes brevicarpalis, Stenopus hispidus, S. cyanoscelis, Rhynchocinetes uritai* and *Saron marmoratus* to introduce WSSV to New Zealand.

The risk from *A.* salina will be considered first as this is a common import in cyst form as aquarium feed. For *A. salina* to introduce WSSV, it would need to be exposed to WSSV potentially at any lifestage, and such infection would need to establish in the lifestage and be capable of being transmitted to a decapod crustacean. Initial studies with immersion and oral challenge of *Artemia* spp. adult and nauplii did not result in either infection, nor passage to other crustaceans (Hameed *et al.* 2002, Lei *et al.* 2002). One study did detect WSSV in dry packed *Artemia* sp. cysts by nested PCR, but hatched nauplii were negative for the virus, and external contamination was assumed to be the cause (Chang *et al.* 2002). *A. franciscana* adults orally challenged with WSSV showed increased mortality compared with controls and produced PCR positive cysts; however, once again, the hatched nauplii were negative (Li *et al.* 2003). In contrast, WSSV positive wild *Artemia* sp. were shown to produce WSSV positive offspring when tested by nested PCR (Deng *et al.* 2005). No attempt was made to infect highly susceptible crustaceans from the offspring. A later study failed to transmit WSSV via *Artemia* sp. to *Penaeus monodon* (Waikhom *et al.* 2006), and this result together with the indicated previous studies (Chang *et al.* 2002, Hameed *et al.* 2002, Li *et al.* 2003) suggests that the transmission of WSSV between generations of wild caught *Artemia* sp. was not true vertical transmission, but potentially DNA template contamination, or environmental contamination.

There is a considerable body of literature available on WSSV in association with penaeid shrimp, but much less on the behaviour of WSSV in non-penaeid decapod crustaceans. The penaeid shrimps belong to the suborder Dendrobranchiata, whereas the decapod crustaceans on the draft import list belong to the Pleocyemata suborder. Members of the Astacidea and Caridea, within the Pleocyemata, are known to be susceptible to infection with WSSV (Corbel *et al.* 2001, Lei *et al.* 2002). Infection rates in wild caught decapods are considered to be 1% or lower (OIE 2006b). Mortality rates following infection with WSSV vary widely from 0% in *Macrobrachium rosenbergii* (Yoganandhan and Hameed 2007) to 100% in *Palaemon* spp. (Corbel *et al.* 2001). Of direct relevance to the draft import list is the report of *Lysmata* sp. susceptibility to WSSV with 60% mortality over 11-27 days (Laramore 2007). Mortalities for other species occur over a variable time period, from 7 to 21 days (Corbel *et al.* 2001). *Enoplometopus occidentalis* lies within the same superfamily as the susceptible *Oronectes* spp. (Corbel *et al.* 2001) and *Procambarus* spp. (Lei *et al.* 2002). *Periclimenes brevicarpalis* lies with in the Palaemonidae family, which contains the susceptible *Palaemon* spp. (Corbel *et al.* 2001) and *Macrobrachium* spp. (Yoganandhan and Hameed 2007). Of concern is the potential for non-penaeid decapods to show no clinical signs of infection, as is the case with *Macrobrachium rosenbergii*; this remained infectious to penaeid shrimp for a period of 90 days without showing clinical signs (Yoganandhan and Hameed 2007). However, *Macrobrachium* spp. are not eligible for importation as ornamental fish but are dealt with under a separate import health standard. There is also evidence to show that infected Palaemonidae develop clinical signs under the stress of translocation (Lo *et al.* 1996).

13.2. RISK ASSESSMENT

13.2.1. Entry assessment

The studies detailed above indicate a negligible likelihood of *Artemia* sp. nauplii derived from infected cysts carrying WSSV. There is a low, but non-negligible likelihood, that *Artemia* sp. adults could be infected with WSSV, if they were imported live (which is unlikely).

The other decapod crustaceans listed would be imported as live free-swimming stages only. Given the epidemiological information above and considering that all decapod crustaceans are most likely susceptible to WSSV there is a non-negligible likelihood that *Enoplometopus occidentalis, Lysmata grabhami, L. amboinensis, L. debelius, Periclimenes brevicarpalis, Spirobrachus gigantus, Stenopus hispidus, S. cyanoscelis, Rhynchocinetes uritai* and *Saron marmoratus* would be carrying WSSV and so require further consideration.

13.2.2. Exposure and establishment assessment

There is good evidence to suggest that the likelihood of *Artemia salina* passing WSSV infection onto native decapod crustaceans is so low as to be negligible. Challenge experiments failed to produce positive cysts (Chang *et al.* 2002, Lei *et al.* 2002, Li *et al.* 2003) and *Artemia* sp. exposed to WSSV failed to pass infection to highly susceptible *Penaeus* spp. (Hameed *et al.* 2002, Waikhom *et al.* 2006). It is not necessary to consider this pathogen further as a risk associated with the importation of *Artemia salina*.

WSSV infected decapod crustaceans would need to be released into waters here containing susceptible species. New Zealand has native freshwater and marine decapod crustaceans that are of economic, environmental, social and cultural significance. There is good evidence to support an assumption that they would be susceptible to WSSV (Wang *et al.* 1998, Corbel *et al.* 2001, Lei *et al.* 2002, Hameed *et al.* 2003).

Exposure could occur through the shedding of virus from live animals, or by the consumption of live or dead imported animals. Whilst the imported decapods would be tropical and it is likely that, if they were released, they would enter colder water, it is known that cold water conditions can trigger a clinical outbreak (OIE 2006b). Release into freshwater could result in their consumption as food after death. Passaging WSSV through non-penaeid hosts may cause changes in virus pathogenicity, which may include a decrease in pathogenicity (Waikhom *et al.* 2006), however there is clear evidence that pathogenicity can be retained (Yoganandhan and Hameed 2007).

In conclusion therefore there is a low, but non-negligible, likelihood that infected, imported decapod crustaceans could transmit WSSV to New Zealand's waters. It is likely that species here would act as reservoirs of infection and allow the establishment of WSSV.

13.2.3. Consequence

There is sufficient evidence to suggest that the naïve decapod crustaceans endemic in New Zealand's waters would be susceptible to WSSV infection with a resulting serious mortality of up to 100% (Corbel *et al.* 2001, OIE 2006b, Laramore 2007, EscobedoBonilla *et al.* 2008). At risk is fishing for freshwater crayfish, mainly recreational, and commercial and recreational crab and lobster fisheries worth more than $120 million.

13.2.4. Risk estimation

There is a non-negligible likelihood of entry, exposure and establishment and there would potentially be serious consequences if WSSV were introducted to New Zealand. As a result, the risk estimate for WSSV is non-negligible and it is classified as a hazard in the commodity. Therefore risk management measures can be justified.

13.3. RISK MANAGEMENT

13.3.1. Risk species

Risk management options relate to the importation of *Enoplometopus occidentalis, Lysmata grabhami, L. amboinensis, L. debelius, Periclimenes brevicarpalis, Stenopus hispidus, S. cyanoscelis, Rhynchocinetes uritai, Saron marmoratus*

13.3.2. Options

There are a number of risk management options that address the risk from WSSV to varying degrees.

Prevention of importation of the listed species would be easy to implement and would address the risk completely. As the animals would no longer be permitted entry, this option would be trade restrictive.

Health certification of freedom from WSSV or batch testing of imported animals for WSSV with negative results would be difficult to implement. It is unclear how certification of freedom from WSSV could be achieved for anything other than biosecure farm raised animals. The animals listed are most likely wild caught. Batch testing to 95% confidence of point prevalence of $\leq$ 2% infection would require batches to consist of approximately 100 animals at the minimum, whereupon 87 animals would require destructive testing. This is obviously impractical.

Requiring that animals are not sourced from a farm containing penaeid prawns would reduce the potential infection pressure on the imported animals, rendering them less likely to be carriers of WSSV on entry to New Zealand. This would address the risk to a moderate degree; however, it would be difficult to provide adequate certification of their origin to make this option practical.

The available literature suggests that translocation can cause clinical expression of WSS in covertly infected animals, and that clinical WSS in non-penaeid decapod crustaceans results in mortalities over a period of up to 27 days (Lo *et al.* 1996, Corbel *et al.* 2001, Laramore 2007). It would therefore be possible to require that batches of marine decapod crustaceans should not be suffering clinical disease at the point of despatch, should enter post-entry quarantine for a period of 4 weeks, during which time mortalities should be notified and tested for WSSV. This would address the risk to a high degree. This regime would also be trade restrictive to a degree, in that it would increase the cost of importation.

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14. Conclusions from supplementary risk assessments

Changes to the permitted species list came into effect after MAF's 2005 risk analysis had been completed. This resulted in the identification of 42 supplementary organisms of potential concern. Eight of these were considered to be potential hazards and supplementary risk assessments were carried out. Of these, two were determined not to be actual hazards and were discounted after the more detailed assessment. The following six organisms were considered to be hazards in the commodity, for which risk management measures can be justified:

- Cyprinid herpesvirus-3 (koi herpesvirus) in goldfish (*Carassius auratus*)
- *Aeromonas salmonicida* in *C. auratus*
- *Flavobacterium psychrophilum* in *C. auratus*
- Spring viraemia of carp virus in *C. auratus*
- *Hoferellus carassii* in *C. auratus*
- White spot syndrome virus (WSSV) in *Enoplometopus occidentalis, Lysmata grabhami, L. amboinensis, L. debelius, Periclimenes brevicarpalis, Stenopus hispidus, S. cyanoscelis, Rhynchocinetes uritai* and *Saron marmoratus*

Risk management options were identified for each of the above organisms and potential measures can be summarised as:

- CyHV-3 (KHV)
    - sourcing fish from countries free of CyHV-3 (KHV)
    - sourcing fish raised without contact with carp
    - source population testing
    - imported batch testing

- *A. salmonicida* (atypical strains)
    - pre- and post- border inspections and quarantine to identify clinical infections
    - sourcing fish from countries free of atypical *A. salmonicida*
    - source population testing
    - imported batch testing

- *A. salmonicida* (typical strains)
    - sourcing fish from countries free of typical *A. salmonicida*
    - sourcing fish raised without contact with salmonids
    - source population testing
    - imported batch testing

- *F. psychrophilum*
    - pre- and post- border inspections and quarantine for 4 weeks to identify clinical infections

- Spring viraemia of carp virus (SVCV)
    - sourcing fish from countries free of SVCV
    - sourcing fish raised without contact with carp
    - source population testing
    - imported batch testing

- *H. carassii*
    - pre- and post- border inspections and quarantine
    - histopathology screening of any fish submitted for disease testing
    - source population testing
    - imported batch testing

- WSSV
    - pre- and post- border inspections, quarantine for 4 weeks with testing of mortalities for WSSV

These measures will be further addressed in Section 10.3 (Risk management options by hazard).

15. Revised hazard list and species of concern

15.1. SUMMARY FROM MAF'S 2005 RISK ANALYSIS

MAF's 2005 ornamental fish risk analysis identified 13 hazards that warranted risk management and listed particular species of interest for each hazard. These are summarised below in Table 2.

Table 2. Organisms considered to be hazards in MAF's 2005 risk analsis.

Disease agent	Host species
VIRUSES	
Aquabirnaviruses (including IPNV)	*Apistogramma ramirezi*, *Barbus graellsii*, *Brachydanio rerio*,*Colisa lalia*, *Epinephelus* spp., *Pterophyllum scalare*, *Scleropages formosus*, *Symphosydon discus*, *Xiphophorus xiphidium*, *Zanclus cornutus*
Iridoviruses	*Apistogramma ramirezi*, *Aplocheilichthys normani*, *Colisa lalia*, *Epinephelus* spp., *Etroplus maculates*, *Helostoma* spp., *Labroides dimidiatus*, *Parapocryptes serperaster*, *Poecilia reticulata*, *Pterophyllum scalare*, *Trichogaster* spp., *Xiphophorus helleri*
Grouper nervous necrosis virus	*Epinephelus* spp., *Cephalopholis* spp., *Cromileptes* spp.
Viral haemorrhagic septicaemia virus	Barbus graellsii
BACTERIA	
Edwardsiella ictaluri	*Danio devario*, *Puntius conchonius*
Edwardsiella tarda	*Betta splendens, Hyphessobrycon spp., Metynnis schreitmuelleri, Pterophyllum spp., Rhamdia (Pimelodus) quelen, Trichogaster spp.*
Lactococcus garvieae	*Coris aygula*
FUNGI	
Aphanomyces invadans	*Barbodes gonionotus*, *Colisa lalia*, *Etroplus suratensis*, *Osphronemus gouramy*, *Puntius conchonius*, *P. gonionotus*, *P. sarana*, *P. schwanenfeldii*, *P. sophore*, *P. ticto*, *Trichogaster* spp.
MYXOZOA	
Enteromyxum leei	Amphiprion frenatus, Coris □quabi, Chromis chromis, *other members of the Labridae, Blennidae, and Sparidae*
MICROSPORIDIA	
Glugea heraldi	*Hippocampus* spp.
NEMATODA	
Capillaria philippinensis	*Puntius gonionotus*
CESTODA	
Bothriocephalus acheilognathi	*Barbus brachycephalus*, *B. barbus*, *B. bynni*, *B. capito*, *B. trimaculatus*, *B. sharpeyi*, *B. luteus*, *B. esocinus*, *Puntius binotatus*
CRUSTACEA	
Argulus foliaceus	*Barbus grypus*, *B. esocinus,* Acipenserids,Cyprinids,Gobiids Gasterosteids, Salmonids

Although goldfish were not on the permitted list that was the focus of MAF's 2005 risk analysis, that document noted that goldfish would constitute a known risk of carrying aquatic birnaviruses (Hedrick *et al.* 1985) and iridoviruses (Berry *et al.* 1983) if they were to be imported.

To address these 13 hazards, MAF's 2005 risk analysis presented a number of risk management measures:

1. That temperate and sub-tropical cyprinids (the genera *Barbus, Puntius, Varicorhinus, Barbodes* and *Capoeta*) should no longer be eligible for import.

2. That Biosecurity New Zealand and ERMA determine which species of ornamental fish were in New Zealand before July 1998. Those not present before July 1998 should not be eligible for import unless approved by ERMA as a new organism.

3. That the post-arrival quarantine period should be consistent for both freshwater and marine species.

4. That Biosecurity New Zealand develop appropriate training resources about the identification of fish species and the diagnosis of key diseases for MAF Quarantine Services Biosecurity Officers, supervisors and operators of Transitional Facilities.

5. That Biosecurity New Zealand work with the Department of Conservation to inform the Federation of New Zealand Aquatic Societies of the need to actively discourage their members from releasing unwanted fish into the wild.

6. That Biosecurity New Zealand work with the Ministry of Health to inform retail outlets selling ornamental fish of potential public health issues.

7. That targeted passive surveillance be conducted for the following disease agents: aquabirnaviruses, iridoviruses, grouper nervous necrosis virus, viral haemorrhagic septicaemia, *Edwardsiella ictaluri, Edwardsiella tarda, Lactococcus garvieae*, *Aphanomyces invadans, Enteromyxum leei, Glugea heraldi*, *Bothriocephalus acheilognathi*, *Capillaria philippinensis* and *Argulus foliaceus*.

8. That when cumulative mortalities of 20% or greater occur among any species of imported ornamental fishes during quarantine, suitable samples (moribund, freshly dead, or 10% formalin-fixed) must be sent to the Investigation and Diagnostic Centre (IDC) of Biosecurity New Zealand, or a laboratory regarded by them as competent.

9. That the post-arrival quarantine period may be reduced for both freshwater and marine fish from 6 weeks to 4 weeks, provided that consignments are accompanied by an international aquatic animal health certificate for live fish, signed by the competent authority in the exporting country, stating that the fish are free from specified disease agents or are sourced from populations or zones free from specified disease agents.

10. That for consignments where the post arrival quarantine period is reduced to 4 weeks, the cutoff cumulative mortality rate for the taking of samples be reduced to 10%.

11. That aquarium water from the quarantine period must be disinfected prior to disposal.

15.2. COMBINED CONCLUSIONS OF SUPPLEMENTARY RA AND MAF'S 2005 RA

Before considering risk factors and suggesting and assessing risk management measures it is necessary to amalgamate the list of hazards identified in MAF's original risk analysis of 2005 and those identified in the supplementary risk assessments in this document. It is also necessary to reassess the list of species of concern for each hazard. In some cases the species that are listed against a particular hazard in the original risk analysis are no longer eligible for importation and therefore need to be removed from consideration. In other cases, additional scientific evidence suggests further species should be considered as susceptible to particular hazards and these species must be included in the determination of suggested risk management measures.

Table 3. Combined list of hazards from MAFs 2005 RA and this supplementary RA

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
1. Aquabirnaviruses			
Anguilidae	Other sources	No	
Apistogramma ramirezi	Risk analysis	Yes	Now *Mikrogeophagus ramirezi*
Atherinidae	Other sources	No	
Barbodes spp.	Risk analysis	No	
Barbus spp	Risk analysis	No	
Bothidae	Other sources	No	
Brachydanio rerio	Risk analysis	Yes	Now *Danio rerio*
Capoeta spp.	Risk analysis	Yes	
Carangidae	Other sources	Yes	*Gnathodon* spp.
Carassius auratus	Risk analysis	Yes	
Catostomidae	Other sources	No	
Cephalopholis spp.	Risk analysis	Yes	
Cichlidae	Other sources	Yes	Numerous species
Clupeidae	Other sources	No	
Cobitidae	Other sources	Yes	*Acantopsis* spp., *Syncrossus* spp., *Pangio* spp. and *Botia* spp.
Colisa lalia	Risk analysis	Yes	
Coregonidae	Other sources	No	
Cromileptes spp.	Risk analysis	Yes	
Cyprinidae	Other sources	Yes	Numerous species, including

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
			Tanichthys albonubes
Epinephelus spp.	Risk analysis	Yes	
Esocidae	Other sources	No	
Moronidae	Other sources	No	
Paralichthyidae	Other sources	No	
Percidae	Other sources	No	
Plecoglossus spp.	Risk analysis	No	
Pleuronectidae	Other sources	No	
Poecilidae	Other sources	Yes	*Poecilia* spp., *Xiphophorus* spp., *Aplocheilichthys* spp. and *Lacustricola* spp.
Pterophyllum scalare	Risk analysis	Yes	
Puntius spp.	Risk analysis	Yes	
Sciaenidae	Other sources	Yes	*Pareques* spp.
Scleropages formosus	Risk analysis	No	
Soleidae	Other sources	No	
Symphysodon discus	Risk analysis	Yes	
Thymallidae	Other sources	No	
Varicorhinus spp.	Risk analysis	No	
Xiphophorus xiphidium	Risk analysis	No	Other *Xiphophorus* spp. on list
Zanclus cornutus	Risk analysis	Yes	
2. Iridoviruses			
Acipenser spp.	Other sources	No	
Apistogramma ramirezi	Risk analysis	Yes	Now *Mikrogeophagus ramirezi*
Aplocheilichthys normani	Risk analysis	Yes	
Carassius auratus	Risk analysis	Yes	
Cephalopholis spp.	Risk analysis	Yes	
Colisa lalia	Risk analysis	Yes	
Cromileptes spp.	Risk analysis	Yes	

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
Epinephelus spp.	Risk analysis	Yes	
Etroplus maculatus	Risk analysis	Yes	
Galaxias spp.	Other sources	No	
Gambusia spp.	Other sources	No	
Girella spp.	Other sources	No	
Helostoma spp.	Risk analysis	Yes	
Ictalurus melas	Other sources	No	Otherwise known as *Ameiurus melas*
Labroides dimidiatus	Risk analysis	Yes	
Lateolabrax spp.	Other sources	No	
Lethrinus spp.	Other sources	No	
Micropterus spp.	Other sources	No	
Morone spp.	Other sources	No	
Oncorhynchus mykiss	Other sources	No	
Oplegnathus spp.	Other sources	No	
Pagrus spp.	Other sources	No	
Paralichthys spp.	Other sources	No	
Parapocryptes serperaster	Risk analysis	No	
Parapristipoma spp.	Other sources	No	
Perca fluviatilis	Other sources	No	
Plectorynchus spp.	Other sources	No	
Poecilia reticulata	Risk analysis	Yes	
Pseudocaranx spp.	Other sources	No	
Pseudosciaena spp.	Other sources	No	
Pterophyllum scalare	Risk analysis	Yes	
Rachycentron spp.	Other sources	No	
Sciaenops spp.	Other sources	No	
Scophthalmus maximus	Other sources	No	
Sebastes spp.	Other sources	No	
Seriola spp.	Other sources	No	
Siluris glanis	Other sources	No	

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
Trachinotus spp.	Other sources	No	
Trachurus spp.	Other sources	No	
Trichogaster spp.	Risk analysis	Yes	
Xiphophorus helleri	Risk analysis	Yes	
3. Grouper Nervous Necrosis Virus			
Cephalopholis spp.	Risk analysis	Yes	
Cromileptes spp.	Risk analysis	Yes	
Dicentrarchus labrax	Other sources	No	
Epinephelus spp.	Risk analysis	Yes	
Hippoglossus hippoglossus	Other sources	No	
Lates calcarifer	Other sources	No	
Oplegnathus fasciatus	Other sources	No	
Paralichthys olivaceus	Other sources	No	
Pseudocaranx dentex	Other sources	No	
Scophthalmus maximus	Other sources	No	
Takifugu rubripes	Other sources	No	
Verasper moseri	Other sources	No	
4. Viral Haemorrhagic Septicaemia Virus			
Ammodytes spp.	Other sources	No	
Anguilla spp.	Other sources	No	
Anoplopoma spp.	Other sources	No	
Aplodinotus spp.	Other sources	No	
Aulorhynchus spp.	Other sources	No	
Barbodes spp.	Risk analysis	No	
Barbus graellsii	Risk analysis	No	
Barbus spp.	Risk analysis	No	
Capoeta spp.	Risk analysis	Yes	
Clupea spp.	Other sources	No	

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
Coregonus spp.	Other sources	No	
Cymatogaster spp.	Other sources	No	
Dicentrarchus spp.	Other sources	No	
Dorosoma spp.	Other sources	No	
Esox spp.	Other sources	No	
Fundulus spp.	Other sources	No	
Gadus spp.	Other sources	No	
Gasterosteus spp.	Other sources	No	
Hypomesus spp.	Other sources	No	
Lepomis spp.	Other sources	No	
Melanogramma spp.	Other sources	No	
Merlangius spp.	Other sources	No	
Merluccius spp.	Other sources	No	
Micropterus spp.	Other sources	No	
Morone spp.	Other sources	No	
Moxostoma spp.	Other sources	No	
Neogobius spp.	Other sources	No	
Oncorhynchus spp.	Other sources	No	
Paralichthys olivaceus	Other sources	No	
Pomatoschistus spp.	Other sources	No	
Pomoxis spp.	Other sources	No	
Puntius spp.	Risk analysis	Yes	
Salmo spp.	Other sources	No	
Salvelinus spp.	Other sources	No	
Sardinops spp.	Other sources	No	
Scomber spp.	Other sources	No	
Scophthalmus maximus	Other sources	No	
Scophthalmus spp.	Other sources	No	
Sebastes spp.	Other sources	No	
Sprattus spp.	Other sources	No	
Thaleichthys spp.	Other sources	No	

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
Theragra spp.	Other sources	No	
Thymallus spp.	Other sources	No	
Trisopterus spp.	Other sources	No	
Varicorhinus spp.	Risk analysis	No	
5. Cyprinid herpesvirus-3 (koi herpesvirus)			
Carassius auratus	Supplementary assessment	Yes	There are other susceptible species, but they are not on the eligible list, and for brevity are not included
6. Spring viraemia of carp virus			
Carassius auratus	Supplementary assessment	Yes	There are other susceptible species, but they are not on the eligible list, and for brevity are not included
7. Edwardsiella ictaluri			
Ameiurus catus	Other sources	No	
Ameiurus nebulosus	Other sources	No	Not imported but is endemic in areas of north
Anguilla japonica	Other sources	No	
Clarias batrachus	Other sources	No	
Danio devario	Risk analysis	No	Now *Devario devario*. Other *Devario* spp. on list
Eigemannia viriscens	Other sources	Yes	
Ictalurus furcatus	Other sources	No	
Ictalurus punctatus	Risk analysis	No	
Oncorhynchus spp.	Other sources	No	Experimental infection
Pangasius hyophthalmus	Other sources	No	
Puntius conchonius	Risk analysis	Yes	
8. Edwardsiella tarda			
Anguilla spp.	Other sources	No	
Apistogramma	Other sources	Yes	Now *Mikrogeophagus ramirezi*

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
ramirezi			
Betta splendens	Risk analysis	Yes	
Carassius auratus	Other sources	Yes	
Cyprinus carpio	Other sources	No	
Dicentrarchus labrax	Other sources	No	
Evynnis japonica	Other sources	No	
Hyphessobrycon spp.	Risk analysis	Yes	
Ictalurus spp.	Other sources	No	
Metyynis schreitmuelleri	Risk analysis	No	2 other *Metynnis* spp. on list
Micropterus salmoides	Other sources	No	
Morone saxitilis	Other sources	No	
Mugil cephalus	Other sources	No	
Oncorhynchus mykiss	Other sources	No	
Oreochromis niloticus	Other sources	No	
Oxyeleotris marmoratus	Other sources	No	
Pagrus major	Other sources	No	
Paralichthys olivaceus	Risk analysis	No	
Paralichthys spp.	Other sources	No	
Pimelodus quelen	Risk analysis	No	2 other *Pimelodus* spp. on list
Pterophyllum scalare	Risk analysis	Yes	
Puntius conchonius	Other sources	Yes	Other *Puntius* spp. also on list
Salmo salar	Other sources	No	
Salvelinus fontinalis	Other sources	No	
Seriola gaingu	Other sources	No	
Tilapia mossambica	Other sources	No	
Trichogaster trichopterus	Risk analysis	Yes	

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
9. Lactococcus garviae			
Coris aygula	Risk analysis	Yes	Only ornamental species from which bacteria isolated Causes disease in eels, flatfish, rainbow trout, sturgeon, turbot, and yellowtail and is found in intestines of wild fish.
10. Aeromonas salmonicida			
Carassius auratus	Supplementary assessment	Yes	There are other susceptible species, but they are not on the eligible list, and for brevity are not included
11. Flavobacterium psychrophilum			
Carassius auratus	Supplementary assessment	Yes	There are other susceptible species, but they are not on the eligible list, and for brevity are not included
12. Aphanomyces invadans			
Acantopagrus australis	Other sources	No	
Alosa sapidissima	Other sources	No	
Anabas testudineus	Other sources	No	
Archosargus probatocephalus	Other sources	No	
Bagridae	Other sources	Yes	*Mystus* spp. and *Pseudomystus* spp. on list
Bairdiella chrysoura	Other sources	No	
Barbonymus gonionotus	Risk analysis	No	Other *Barbonymus* spp. on list
Bidyanus bidyanus	Other sources	No	
Breevortia tyrannus	Other sources	No	
Carassius auratus	Supplementary assessment	Yes	
Catla catla	Other sources	No	
Channa striatus	Other sources	No	
Chrysichthys	Other sources	No	

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
nigrodigitatus			
Cirrhinus mrigala	Other sources	No	
Clarias batrachus	Other sources	No	
Colisa lalia	Risk analysis	Yes	
Epinephelus spp.	Other sources	Yes	
Esomus sp.	Other sources	Yes	
Etroplus suratensis	Risk analysis	Yes	
Fluta alba	Other sources	No	
Glossogobius spp.	Other sources	No	
Heteropneustes fossilis	Other sources	No	
Johnius spp.	Other sources	No	
Labeo rohita	Other sources	No	Other *Labeo* spp. on list
Lates calcarifer	Other sources	No	
Lepomis macrochirus	Other sources	No	
Liza spp.	Other sources	No	
Macquaria ambigua	Other sources	No	
Macropodus opercularis	Supplementary assessment	Yes	
Mastacembelus spp.	Other sources	Yes	*M. armatus* and *M. erythrotaemia* listed
Micropterus salmoides	Other sources	No	
Mugil spp.	Other sources	No	
Mystus spp.	Other sources	Yes	*M. micracanthus, M. tengara* and *M. vittatus* listed
Osphronemus goramy	Risk analysis	Yes	
Oxyeleotris mormoratus	Other sources	No	
Platycephalus fuscus	Other sources	No	
Plecoglossus altivelis	Other sources	No	
Pogonias cromis	Other sources	No	
Psettodes spp.	Other sources	No	

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
Puntius *spp.*	Risk analysis	Yes	*P. conchonius, gonionotus, sarana, schwanfeldii, sophore* and *ticto* specifically named
Rhodeus ocellatus	Other sources	No	
Rohtee sp.	Other sources	No	
Scardinius erythrophthalmos	Other sources	No	
Scatophagus argus	Other sources	Yes	
Sillago ciliate	Other sources	No	
Siluridae	Other sources	Yes	*Kryptopterus* spp. & *Ompok* spp. listed
Terapon sp.	Other sources	No	
Toxotes chatareus	Other sources	No	Other *Toxotes* sp. on list
Trichogaster spp.	Risk analysis	Yes	*T. trichopterus* & *T. pectoralis* named
Upeneus bansai	Other sources	No	
Valamugil spp.	Other sources	No	
Wallago atul	Other sources	No	
Xenentodon cencila	Other sources	No	
13. Enteromyxum leei			
Amphiprion frenatus	Risk analysis	Yes	
Blenniidae	Risk analysis	Yes	*Lipophrys nigriceps, Escenius* spp. & *Meiacanthus* spp. on list
Chromis chromis	Risk analysis	No	Other *Chromis* spp. on list
Coris julius	Risk analysis	No	Other *Coris* spp. on list
Sparus aurata	Other sources	No	
Takifugu rubripes	Other sources	No	
Thalassoma spp.	Other sources	Yes	Padros et al (2001)
14. Hoferellus carassii			
Carassius auratus	Supplementary assessment	Yes	There are other susceptible species, but they are not on the eligible list, and for brevity are not included

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
15. Bothriocephalus acheilognathi			
Alburnus alburnus	Risk analysis	No	
Astyanax fasciatus	Other sources	Yes	1 other *Astyanax* sp. on list also.
Barbodes spp.	Risk analysis	No	
Barbus spp.	Risk analysis	No	
Capoeta spp.	Risk analysis	Yes	
Carassius auratus	Supplementary assessment	Yes	
Carassius carassius	Risk analysis	No	
Chondrostoma nasus	Risk analysis	No	
Ctenopharyngodon idella	Risk analysis	No	
Cyprinus carpio	Risk analysis	No	
Fundulus zebrinus	Risk analysis	No	
Gambusia spp.	Risk analysis	No	
Gila cypha	Risk analysis	No	
Herichthys cyanoguttatum	Other sources	Yes	Salgado-Maldondo et al (2003)
Herichthys labridens	Other sources	No	
Hypseleotris klunzingeri	Risk analysis	No	
Lepomis gibbosus	Risk analysis	No	
Leuciscus cephalus	Risk analysis	No	
Pimephales promelas	Risk analysis	No	
Poecilia spp.	Risk analysis	Yes	*P. reticulata* named and on list
Puntius spp	Risk analysis	Yes	*P.binotatus* named but not on list
Retropinna semoni	Risk analysis	No	
Rhinichthys osculus	Risk analysis	No	
Varicorhinus spp.	Risk analysis	No	
Xiphophorus spp.	Risk analysis	Yes	*X. maculatus* named and on list
16. Argulus foliaceus			
Acipenseridae	Risk analysis	No	

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
Barbus esocinus	Risk analysis	No	
Barbus grypus	Risk analysis	No	
Cyprinidae	Risk analysis	Yes	Twenty one genera on list, includes *Carassius auratus*
Gasterosteidae	Risk analysis	No	
Gobiidae	Risk analysis	Yes	Three freshwater genera on list, includes *Elacatinus oceanops*
Salmonidae	Risk analysis	No	
17. Glugea heraldi			
Hippocampus spp.	Risk analysis	Yes	
18. Capillaria philippinensis			
Cyprinus carpio	Risk analysis	No	
Puntius gonionotus	Risk analysis	No	Other *Puntius* spp. on list
Hypseleotris spp.	Other sources	No	
Ambassis spp.	Other sources	No	
Eleotris spp.	Other sources	No	
Aplocheilichthys panchax	Other sources	Yes	
Gambusia holbrookii	Other sources	No	Bhaibulaya et al(1979)
Rasbora borapetensis	Other sources	Yes	
Trichopsis vittata	Other sources	Yes	
19. White spot syndrome virus			
Enoplometopus occidentalis	Supplementary assessment	Yes	
Lysmata grabhami, L. amboinensis, L. debelius	Supplementary assessment	Yes	
Periclimenes brevicarpalis	Supplementary assessment	Yes	

Host	Source data	Present on proposed permitted list?	Additional information (if applicable)
Stenopus hispidus, S. cyanoscelis	Supplementary assessment	Yes	
Rhynchocinetes uritai	Supplementary assessment	Yes	
Saron marmoratus	Supplementary assessment	Yes	
All other freshwater, marine and brackishwater decapoda	Other	No	

"Other sources" used to derive hosts lists include:

- OIE aquatic animal health code and Manual of diagnostic tests for aquatic animals
- Woo PTK (ed.) (2006), Fish Diseases and Disorders Volume 1 Protozoan and Metazoan Infections. *CABI Publishing*, Wallingford, Oxon
- Woo, PTK and Bruno DW (Eds.) (1999), Fish Diseases and Disorders Volume 3 Viral, Bacterial and Fungal Infections. *CABI Publishing*, Wallingford, Oxon
- Buller, NB (2004), Bacteria from Fish and Other Aquatic Animals: A Practical Identification Manual. *CABI Publishing*, Wallingford, Oxon
- Scientific Opinion of the Panel on Animal Health and Welfare on a request from the Commission on possible vector species and live stages of susceptible species not transmitting disease as regards certain fish diseases, The EFSA Journa (2007) 584, 1-163
- Previous diagnostic submissions to the MAFBNZ Animal Health Laboratory, Wallaceville
- Selected peer reviewed papers as indicated in the table.

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Bhaibulaya, M., Indra-Ngarm, S., Ananthapruti, M. (1979). Freshwater fishes of Thailand as experimental intermediate hosts for *Capillaria philippinensis*. *Int. J. Parasit.* **9:** 105-108

Padros, I., Palenzuela, O., Hispano, C., Tosas, O., Zarza, C., Crespo, S., Alvarez-Pellitero, P. (2001). *Myxidium leei* (myxozoa) infections in aquarium reared Mediterranean fish species, *Dis. Aquat. Org* **47:** 57-62.

Salgado-Maldondo, G., Pineda-Lopez, R.F. (2003). The Asian fish tapeworm *Bothriocephalus acheilognathi*: a potential threat to native freshwater fish species in Mexico. *Biological Invasions* **5:** 261-268.

16. Risk management

16.1. INTRODUCTION

There is broad agreement amongst scientists and regulatory authorities that the biosecurity standards associated with the importation of live ornamental fish need to be improved. However, the commodity is broad in its definition; the proposed permitted import list covers many freshwater and marine species of fish. This wide range of potential hosts results in some complexity in the risk management measures. Complex risk management measures may be difficult to adhere to, which poses implementation risks.

The ultimate aim of risk management is to produce a demonstrable reduction in risk. This is best achieved by developing a process that is understandable and effective in theory and in practice.

One way to approach risk management of such a complex commodity is to determine key component risk factors that may be used to define broad statements of risk. These statements can be used to identify groups of fish that represent different levels of risk, or the conditions under which hazards represent either a significant or insignificant risk. Having defined these broad risk factors it is possible to suggest measures to mitigate the risks posed by hazards or species of fish. These measures may include a prohibition on the entry of some species of fish or the requirement to meet specific standards on entry.

Given the huge host range and the evident amount of uncertainty regarding some pathogens it is advisable to retain a period of compulsory quarantine on importation. In addition, it is good zoosanitary practice to require the inspection of consignments of live animals at the time of export to ensure that the fish are free of clinical signs of pest or disease. This is routine for live terrestrial animals.

16.2. DEFINING RISK FACTORS

Two components of risk are considered here in regard to the organisms identified as hazards in the 2005 risk analysis and in the supplementary risk assessments in this document:

- host factors
- hazard factors

16.2.1. Host factors

16.2.1.1. Climate range of the fish

Fish species have been assigned to temperate, subtropical or tropical on the basis of geographic and water temperature ranges as detailed on fishbase (www.fishbase.org). Tropical fish are much less likely to survive and/or establish in New Zealand than subtropical fish, whilst temperate fish are likely to survive and establish in New Zealand. Survival and establishment greatly increases the likelihood of pathogens being released into the New Zealand environment and establishing in native species. Subtropical fish may survive for extended periods in the warmer Northern regions of the country or in restricted geothermal areas. In a precautionary approach both temperate and subtropical fish are generally considered as higher risk fish species and tropical fish are generally considered as lower risk fish species.

16.2.1.2. Value of the fish

High value tropical species, especially marine specimens, are considered to be much less likely to be inappropriately released into the environment than low cost, frequently freshwater, species. The inappropriate release of ornamental fish is a necessary step if exposure and establishment of pathogens are to occur. The value of the fish is generally inversely proportional to the volume imported, so it is necessary to take a more precautionary approach with low value, high volume fish species. This is generally an insensitive factor as good information on volume of trade is lacking, but a ballpark estimate of "high individual value" or "low individual value" can be made.

16.2.1.3. Relationship to native or endemic fish species

A close genetic relationship between imported fish and native or endemic fish means a higher risk of pathogen or parasite transfer between the two populations. The exact level of taxonomic relationship that constitutes a risk will vary according to the pathogen or parasite considered but generally those imported fish in the same genus or family will be of higher risk than fish with a more distant relationship.

16.2.2. Pathogen factors

16.2.2.1. Organism characteristics

An exotic pathogen known to be associated with a particular species, genus or family obviously represents a greater risk than an endemic pathogen, however both exotic pathogens and those endemic pathogens subject to official control are characteristics that should be considered in the determination of potential hazards. We can, however, also consider the apparent host specificity, pathogenicity and transmissibility of the organism in this section. Pathogens of low host specificity are considered higher risk than organisms of high host specificity. Those organisms of high transmissibility represent a higher risk than those of low transmissibility. Similarly, organisms of high pathogenicity are more likely to cause adverse consequences and are thus considered to be higher risk.

16.2.2.2. Disease characteristics

This is examined separately to the characteristics of the causative agent and represents a consideration of the disease process, epidemiology and ease of detection. Ease of detection could be considered an organism characteristic, but here it is considered as part of the disease process as it is all part of the presentation in the live fish. Macroscopic ectoparasites are generally easily seen and represent a low risk due to the ease of identification. Similarly peracute, highly pathogenic diseases are of lower risk because they will usually occur during transport and handling of the fish and result in major mortalities which are easily recognised. The highest risk is in diseases that present sub-clinically or in a true latent or carrier state and where detailed laboratory tests are required to identify the agent.

16.2.2.3. Treatment potential

Those conditions where treatment is not available or inefficient may result in latency or carrier status of survivors, with the fish shedding pathogen continually or able to recrudesce under stress at a later time. This represents the highest risk. Where a condition is verifiably treatable it may be possible to introduce effective risk management measures and thus lower risk to an acceptable level.

16.3. APPLYING THE RISK FACTORS

It would be ideal to be able to consider all the risk factors detailed above for each species eligible for importation and for each hazard. However, all the information is not available for all the species and all the hazards. In general, it is hard, if not impossible, to obtain accurate import volumes for the different species. Similarly data on host specificity, transmissibility and infectious dose are available in greater detail for some organisms than others. It should still be possible, regardless, to broadly classify the principal risks.

16.3.1. Host factors

16.3.1.1. Climate range

Each species of aquatic animal eligible for import has been broadly classified into tropical, sub-tropical or temperate groups. It is recognised that data on this could be better but it does provide for a valid broad classification. In general, tropical species will be regarded as low risk, unless there is specific epidemiological data to suggest otherwise for a particular hazard. Concomitantly, subtropical and temperate species will be regarded as higher risk.

16.3.1.2. Value of the animal

The value of the fish and the volume imported are valid considerations. However, poor availability of data, and the greater significance of climate tolerance to survivability of released animals, means that this factor is not considered other than broadly. In this case it is assumed that marine ornamental imports will be of greater individual value than freshwater and thus less likely to be released. This assumption, in conjunction with a lower likelihood of successful establishment after release means that fewer hazards are attributable to marine animals than freshwater animals.

16.3.1.3. Relationship to native or endemic species

An examination of the taxonomy of the fish species eligible for import reveals a few groups of fish of particular importance with respect to their close relationship with aquatic animals native to, or endemic in, New Zealand. These families are Poecilidae, Sygnathidae, Hemiraphidae, Pomacentridae, Monacanthidae, Labridae, Serranidae and Cyprinidae. Where imported fish fall into these families a more conservative approach may be warranted.

16.3.2. Hazard factors and identification of high risk species

The specific epidemiological factors associated with each hazard will determine which host characteristics are significant. Table 4 details the hazard factor considerations.

Table 4. Hazard factor considerations

	Hazard	Risk Analysis – Risk Estimation ♣		Hazard characteristics	Treatment potential	Fish characteristics making associated hazard significant (i.e. high risk species)
		Exposure/Establishment	Consequence			
1	Aquabirnaviruses	Moderate (low if tropical fish only)	High	▪ Wide range of hosts; ▪ Horizontal and vertical transmission; ▪ Pathogenicity varies with strain but can cause disease in susceptible tropical fish; ▪ Carrier state recognised, especially in temperate cyprinids; ▪ Transmission appears to require reasonably high dose; ▪ Virus survives well in environment.	N/A	▪ Susceptible eligible temperate and subtropical freshwater and marine fish of the genera listed in Section 8 – hazard 1
2	Iridoviruses	Moderate	Catastrophic	▪ Very wide host range; ▪ Horizontal transmission appears simple; ▪ Pathogenicity ranges from low to severe; ▪ Carrier state likely; ▪ Can survive in environment for extended periods at low temperatures, but more susceptible to heat than ectoparasiticide.	N/A	▪ Susceptible eligible temperate, subtropical and tropical freshwater and marine fish of the genera listed in Section 8 – hazard 2

	Hazard	Risk Analysis – Risk Estimation ♣		Hazard characteristics	Treatment potential	Fish characteristics making associated hazard significant (i.e. high risk species)
		Exposure/Establishment	Consequence			
3	Grouper Nervous Necrosis Virus	Low	Moderate	▪ Restricted host range (GNNV) but cross pathogenicity possible with other nodaviruses; ▪ Horizontal and vertical transmission; ▪ Pathogenicity varies inversely with age (juveniles more severely affected than adults), adults may become carriers; ▪ Variable shedding of virus by carriers; ▪ Infectious dose unknown; ▪ Adult fish may be carriers; ▪ Virus survives well at temperatures ≤ 15 °C, and is progressively inactivated at higher temperatures.	N/A	▪ Susceptible eligible temperate, subtropical and tropical freshwater and marine fish of the genera listed in Section 8 – hazard 3
4	Viral Haemorrhagic Septicaemia Virus (VHSV)	Moderate	High	▪ Numerous strains and wide host range; ▪ Horizontal transmission; ▪ Pathogenicity varies with genotypes and inversely with age; ▪ Survival outside host strain dependent and temperature dependent (progressively inactivated at higher temperatures) ▪ Carrier status well recognised	N/A	▪ Susceptible eligible temperate and subtropical freshwater and marine fish of the genera listed in Section 8 – hazard 4 (although VHSV is a serious pathogen tropical fish not included because of the temperature tropism of the virus)
5	Cyprinid herpesvirus -3 (koi herpesvirus)	Low	Low	▪ Carrier status reported ▪ No clinical signs ▪ Potential for horizontal transmission ▪ Clinically affects *Cyprinus carpio* subsp.	N/A	▪ Susceptible eligible temperate cyprinids listed in Section 8 – hazard 5

	Hazard	Risk Analysis – Risk Estimation ♣		Hazard characteristics	Treatment potential	Fish characteristics making associated hazard significant (i.e. high risk species)
		Exposure/Establishment	Consequence			
6	Spring viraemia of carp virus (SVCV)	Low	Moderate	▪ Carrier status reported ▪ No clinical signs ▪ Potential for horizontal transmission ▪ Clinically affects *Cyprinus carpio* subsp.	N/A	▪ Susceptible eligible temperate cyprinids listed in Section 8 – hazard 6
7	*Edwardsiella ictaluri*	Low	Moderate	▪ Host range can be defined (narrower than *E. tarda*); ▪ Primary pathogen (high virulence), 5-7 days incubation at 25°C; ▪ Carrier status well recognised; ▪ Survives in environment, reaches high levels around the carcases of fish that have died of *E. ictaluri;* ▪ Horizontal transmission ▪ Disease occurs at warm water temperatures in warm water fish	Antibiotics can help clinical outbreaks but carriers remain (up to 80% of fish)	▪ Susceptible eligible subtropical and temperate fish of the genera listed in Section 8 – hazard 7 (Tropical fish are unlikely to survive for longer than the incubation period in New Zealand waters, in addition incubation period is less than proposed standard quarantine. The risk lies in subtropical fish that could establish a population if released)

	Hazard	Risk Analysis – Risk Estimation ♣		Hazard characteristics	Treatment potential	Fish characteristics making associated hazard significant (i.e. high risk species)
		Exposure/Establishment	Consequence			
8	*Edwardsiella tarda*	Low	Moderate	▪ Wider host range than *E. ictaluri*; ▪ Present in environment – causes disease in susceptible species when stressed ▪ Carrier state recognised; ▪ Horizontal transmission; ▪ Disease of warm water fish at warm water temperatures; ▪ Zoonosis.	Antibiotics can help clinical outbreaks but carriers remain (up to 80% of fish)	▪ Susceptible eligible subtropical and temperate fish of the genera listed in Section 8 – hazard 8 (Tropical fish are unlikely to survive for longer than the incubation period in New Zealand waters, in addition incubation period is less than the proposed standard quarantine. The risk lies in temperate and subtropical fish that could establish a population if released)
9	*Lactococcus garviae*	Low	Moderate	▪ Opportunistic pathogen – causes disease in stressed animals; ▪ Wide host range; ▪ Horizontal transmission; ▪ Can have sub-clinical infection	Antibiotics can control epizootics.	▪ Susceptible eligible temperate and subtropical fish of the genera listed in Section 8 – hazard 9
10	*Aeromonas salmonicida*	Moderate	High	▪ Atypical strains may cause clinical disease ▪ Covertly infected status reported ▪ Evidence of introduction into Australia via goldfish ▪ Horizontal transmission ▪ Broad host range especially salmonids, flatfish	Antibiotics can control epizootics, but carriers expected to remain	▪ Susceptible eligible temperate cyprinids listed in Section 8 – hazard 10
11	*Flavobacterium psychrophilum*	Low	Moderate	▪ Horizontal transmission ▪ Broad host range, especially salmonids ▪ Clinical disease evident	Antibiotics can control epizootics	▪ Susceptible eligible temperate cyprinids listed in Section 8 – hazard 11

	Hazard	Risk Analysis – Risk Estimation ♣		Hazard characteristics	Treatment potential	Fish characteristics making associated hazard significant (i.e. high risk species)
		Exposure/Establishment	Consequence			
12	*Aphanomyces invadans*	Moderate	Moderate	▪ Primary pathogen; ▪ Highly pathogenic, especially in handled or damaged fish; ▪ Horizontal transmission; ▪ Wide host range; ▪ Sub-clinical infection possible, but likely to be variable incubation times; ▪ Disease mainly of warm water fish, but at low water temperatures; ▪ Infectious dose unknown, but may not be large (110 zoospores/mL water caused 32% incidence of lesions in undamaged fish)	N/A	▪ Susceptible eligible temperate, subtropical and tropical fish of genera listed in Section 8, hazard 12
13	*Enteromyxum leei*	Low	Moderate	▪ Causes clinical disease at high infection rates (enteritis); ▪ Horizontal transmission; ▪ Narrow host range (direct life cycle); ▪ Restricted to Mediterranean region, possible USA involvement (other *Enteromyxum* sp.?); ▪ Establishment of host is probably needed to establish infection	N/A	▪ Susceptible eligible temperate and subtropical fish of the genera listed in Section 8 – hazard 13
14	*Hoferellus carassii*	Low	Low	▪ Long prepatent/incubation period ▪ Infection may be subclinical initially ▪ Horizontal infection ▪ Fish are 2° intermediate hosts ▪ Apparently high host specificity	N/A	▪ Susceptible eligible temperate cyprinids listed in Section 8 – hazard 14

	Hazard	Risk Analysis – Risk Estimation ♣		Hazard characteristics	Treatment potential	Fish characteristics making associated hazard significant (i.e. high risk species)
		Exposure/Establishment	Consequence			
15	*Bothriocephalus acheilognathi*	High	High	▪ Generally sub-clinical infection unless severe infestation; ▪ Reasonably wide host range; ▪ Utilises ubiquitous cyclopoid intermediate host; ▪ Generally found in warm water fishes, but ability to survive in New Zealand would greatly increase chance of establishment	Bath treatment (praziquantel)	▪ Susceptible eligible temperate, subtropical and known tropical hosts of fish of genera listed in Section 8 – hazard 15
16	*Argulus foliaceus*	Moderate	Moderate	▪ Moderately wide host range, but tend to be temperate freshwater species; ▪ Horizontal transmission – direct life cycle; ▪ Life stages generally easy to see, unless very early stages; ▪ Development time depends on water temperature but generally microscopic stages should be visible after 2 weeks development under careful examination. ▪ Difficult to control if established in wild	Bath treatment (ectoparasiticide e.g. organophosphate)	▪ Susceptible eligible temperate and subtropical fish of the genera listed in Section 8 – hazard 16
17	*Glugea heraldi*	Low	Moderate	▪ Direct horizontal transmission; ▪ Slow disease course; ▪ Narrow host range	N/A	▪ Susceptible eligible temperate and subtropical fish of the genera listed in Section 8 – hazard 17

	Hazard	Risk Analysis – Risk Estimation ♣		Hazard characteristics	Treatment potential	Fish characteristics making associated hazard significant (i.e. high risk species)
		Exposure/Establishment	Consequence			
18	*Capillaria philippinensis*	Very low	High	▪ Zoonosis; ▪ Primarily found in tropical fish; ▪ Infective stages encyst in fish muscle; ▪ Requires piscivorous birds to become infected and shed eggs that infect fish used for human consumption;	Bath treatment (levamisole) possible but not validated.	▪ Susceptible eligible subtropical fish of the genera listed in Section 8 – hazard 18 (Not a parasite of temperate fish; tropical fish unlikely to establish)
19	White spot syndrome virus	Low	High	▪ Wide host range ▪ Horizontal and vertical transmission ▪ High mortality in clinical disease ▪ Non-clinical infection possible ▪ Cold water enhances clinical disease ▪ Difficult to control if established in wild	N/A	▪ Susceptible marine, brckish and freshwater crustacea listed in Section 8 – hazard 19

♣ - Qualitative ratings taken from original risk analysis or supplementary assessments

16.4. RISK MANAGEMENT OPTIONS

16.4.1. Introduction

Having identified the species of fish for which advanced risk management measures are required, it is necessary to define the measures required to reduce the risk to an acceptable level whilst minimising any restrictions on trade.

It is suggested that the fish species on the *draft* permitted import list not identified for advanced risk management are allowed entry subject to ***standard live ornamental aquatic animal import requirements.***

The 179 remaining species could be:

- denied entry to New Zealand through the imposition of an importation ban. This would keep the import health standard straightforward and easy to understand; or
- permitted entry under specific additional measures. For some species the additional measures will be relatively easy to meet, however there will be species where the entry requirements will be complicated and potentially costly. This may make importation of anything other than high-value broodstock economically non-viable and it is possible that large-scale importation of those species will cease purely through financial pressures.
- permitted entry subject to MAFBNZ accepting an Importation and Quarantine Plan that details alternative ways of mitigating the risks and could include supplier accreditation, offshore audits etc.

16.4.2. Standard live ornamental aquatic animal import requirements

It is undesirable for fish that are clinically affected with ubiquitous or opportunist pathogens or parasites to be imported into New Zealand from a biosecurity, economic and welfare position. Therefore Biosecurity New Zealand should require import shipments to be certified as “free of clinical signs of pest or disease” at the time of despatch. This inspection and certification should be carried out no more than 24 hours before despatch, by an individual authorised by the competent authority of the despatching country. The signing officer must be satisfied that a representative number of fish have been inspected to enable them to sign off the entire shipment.

On arrival at the transitional facility the shipment should be visually inspected by the facility supervisor and the declaration and any associated laboratory reports or health certificates inspected.

Routine shipments of lower risk fish species should undergo quarantine for three weeks, during which time careful records of water quality, fish behaviour and mortalities (with apparent cause) should be recorded by the facility operator and kept available for inspection by the supervisor at all times.

The operator of the transitional facility should inform the supervisor within 24 hours of becoming aware of health problems in any shipment.

At the end of the quarantine period, or at any time within it if warranted, the supervisor should determine the total number of sick and dead fish per species from facility records and physical inspection. Percentages of affected fish should be calculated; these must include sick and dead fish. Sick fish include those displaying the following signs: -

- moribund fish – floating listlessly in the tank
- loss of equilibrium or abnormal buoyancy
- skin lesions (ulceration, rash, haemorrhage at base of fins)
- exophthalmos (abnormally protruding eyes) ± ocular haemorrhage
- swollen abdomen
- rapid opercular movements or mouth gaping
- unusual colouration (darker or paler than normal)
- unusual behaviour (corkscrewing, flashing, rubbing etc.)

If the number of affected fish is determined to be significant then the consignment should be investigated for the cause of mortality. If there are no significant health events the fish may be released. Submissions to the original risk analysis from the ornamental industry requested that this level of significance be at the discretion of the supervisor. This seems an appropriate suggestion as it is not possible to set a fixed level that would be appropriate in all scenarios.

Guidelines could be developed to ensure a uniform approach, and an example of such guidelines is included in Appendix 2 of this document. As the species covered by this section have been determined to be inherently lower risk, it is the intent that disease investigation should only be necessary in cases of serious clinical disease.

Should a disease investigation be warranted, i.e. there is no clear environmental cause for the health problems and the condition appears to be due to a serious systemic infectious disease, the importer should be given the option to test the fish (at importer's expense) or destroy the whole batch of affected species and cohabitants. Should the fish be tested and a diagnosis of low regulatory significance obtained then the fish may be released, otherwise the batch should be destroyed.

Direct entry of aquatic organisms into, and lifelong holding in, suitably approved and inspected containment facilities should negate the requirement for either standard import requirements or specified risk management options for high risk species.

16.4.3. Risk management options for high risk species by hazard

In table 5, the potential risk management measures for high risk species are summarised by hazard and climate range of susceptible fish.

Table 5: Potential risk management measures

Hazard number	Hazard	Laboratory tests [A]	Health certification [B]	Quarantine [C]	Treatment [D]
1	Aquabirnaviruses	Virus isolation on BF2, CHSE214 or RTG2 cell lines, followed by confirmation by VN, IFAT or ELISA (as per OIE manual).	Possible for IPNV, but many strains of aquabirnavirus so not complete management.	Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia. Not suitable for less susceptible carriers	No treatment possible.
	Suggested for	*TEMPERATE*		*SUBTROPICAL*	

Hazard number	Hazard	Laboratory tests [A]	Health certification [B]	Quarantine [C]	Treatment [D]
2	Iridoviruses	Virus isolation on BF2, CHSE214, FHM or EPC cell lines, followed by confirmation by immunoperoxidase staining, ELISA or PCR-REA (as per OIE manual)	Possible (EHNV, RSIV etc.) but range of iridoviruses limits the management possible.	Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia. Not suitable for less susceptible carriers	No treatment possible
	Suggested for	*TEMPERATE/SUBTROPICAL*		*TROPICAL*	
3	Grouper Nervous Necrosis virus	Nested RT-PCR **or** Virus isolation on SSN1 or E11 cell line, followed by confirmation by ELISA or RT-PCR;	Possible for VER, but may not encompass all nodaviruses or species affected	Quarantine for 4 weeks with investigation of batches displaying clinical neurological signs. Adults may be non-clinical.	No treatment possible
	Suggested for	*TEMPERATE/SUBTROPICAL*		*TROPICAL*	
4	Viral Haemorrhagic Septicaemia Virus	Virus isolation on BF2 or RTG2 cell lines, followed by confirmation by VN, IFAT, ELISA or RT-PCR (as per OIE manual).	Possible for freshwater and/or farmed species if suitable surveillance program. Difficult for marine species, especially wild caught	Chronic sub-clinical carriers highly likely, therefore quarantine ineffective	No treatment possible
	Suggested for	*TEMPERATE/SUBTROPICAL*			
5	Cyrinid herpesvirus-3 (KHV)	PCR test, with negative results, source population or batches entering New Zealand	Country, zone, compartment freedom OR verifiable continuous separation from *Cyprinus carpio*	Quarantine ineffective – infection subclincial	No treatment possible
	Suggested for	*TEMPERATE*	*TEMPERATE*		
6	Spring viraemia of carp virus	VI or PCR test with negative results, source population or batches entering New Zealand	Country, zone, compartment freedom OR verifiable continuous separation from *Cyprinus carpio*	Quarantine ineffective – infection subclinical	No treatment possible
	Suggested for	*TEMPERATE*	*TEMPERATE*		
7 **8**	*Edwardsiella ictaluri* *Edwardsiella tarda*	Bacterial culture and identification, with negative results, on source population or batches entering New Zealand	Only likely for *E. ictaluri*	Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia.	Antibiotic treatment effective in clinical outbreaks but carriers remain
	Suggested for	*TEMPERATE*		*SUBTROPICAL*	

Hazard number	Hazard	Laboratory tests [A]	Health certification [B]	Quarantine [C]	Treatment [D]
9	*Lactococcus garviae*	Bacterial culture and identification, with negative results, on source population or batches entering New Zealand	Not practical	Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia.	Antibiotic treatment effective in clinical outbreaks
	Suggested for	*TEMPERATE*		*TROPICAL/SUBTROPICAL*	
10	*Aeromonas salmonicida*	Bacterial culture and identification, with negative results, on source population or batches entering New Zealand	Country, zone, compartment freedom OR verifiable continuous separation from salmonids (only for typical strains)	Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia. (However, could still carry typical *A. salmonicda* or subclinical atypical strains)	N/A –carrier state
	Suggested for	*TEMPERATE*			
11	*Flavobacterium psychrophilum*	Unlikely to be practical in absence of clinical disease	Unlikely to be practical	Quarantine for 4 weeks with investigation of batches displaying clinical signs including skin ulceration, haemorrhage and fin rot.	Treatment possible – antibiotics and surfactants, to eliminate clinical disease
	Suggested for			*TEMPERATE*	
12	*Aphanomyces invadans*	Histopathology not effective for surveillance. PCR screening of populations possible (as per OIE manual).	Compartment freedom may be possible to establish to OIE principles and would be acceptable	Quarantine for 4 weeks with investigation of batches displaying clinical signs of congested skin lesions	No treatment possible
	Suggested for			*TEMPERATE /SUBTROPICAL /NAMED TROPICAL*	
13	*Enteromyxum leei*	Testing not effective for surveillance, merely to confirm presumptive diagnosis	Health certification unlikely to be practical due to difficulty with surveillance	Quarantine period ineffective, unless extended period (≥ 6 weeks) OR certified as not sourced from Mediterranean	No treatment possible
	Suggested for			*ONLY PRACTICAL MEASURE*	
14	*Hoferellus carssii*	Screening of any diagnostic samples for *H. carassii*, regardless of reason for submission.		Quarantine for 4 weeks with investigation of batches displaying clinical signs of enlarged abdomen.	No treatment possible

Hazard number	Hazard	Laboratory tests [A]	Health certification [B]	Quarantine [C]	Treatment [D]
	Suggested for	*TEMPERATE*		*TEMPERATE*	
15	*Bothriocephalus acheilognathi*	Testing not effective for surveillance, merely to confirm presumptive diagnosis	Health certification unlikely to be practical due to difficulty with surveillance	Quarantine period likely to be ineffective as infestations do not produce clinical signs unless intense.	Bath treatment with praziquantel possible at $\geq$ 1 mg/L for 24 hrs or $\geq$ 4 mg/L for 12 hours to be completed 96 hrs before despatch OR 40mg/kg fenbendazole orally on two occasions 4 days apart. [Note 1]
	Suggested for				*TEMPERATE /SUBTROPICAL /LISTED TROPICAL*
16	*Argulus foliaceus*	Not applicable, but visual examination of fish would reveal most life-stages.	Health certification extremely unlikely to be practical.	Quarantine for 4 weeks followed by visual inspection would ensure smallest life-stages at time of despatch had developed in size.	Ectoparasiticide use possible if parasites detected.
	Suggested for			*COMBINATION OF THESE 2 FOR TEMPERATE /SUBTROPICAL [Note 2]*	
17	*Glugea heraldi*	Destructive sampling of *Hippocampus* spp. unlikely to be practical.	Health certification unlikely to be practical due to difficulty with surveillance	Quarantine for 4 weeks with investigation of batches displaying clinical signs of grey, proliferative skin lesions	No treatment possible.
	Suggested for			*TEMPERATE /SUBTROPICAL*	
18	*Capillaria philippinensis*	Destructive sampling of fish unlikely to be practical as parasitic larvae encyst in muscle tissue	Health certification unlikely to be practical due to difficulty with surveillance	Ineffective as infestation will remain occult.	Treatment unproven but possible with levamisole (bath treatment at 1 mg/L for 24 hours) [Note 3]
	Suggested for				*SUBTROPICAL*
19	White spot syndrome virus	Batch testing, or source population testing possible by nested PCR, although unlikely to be practical given volume of imports	Health certification unlikely to be practical due to difficulty with surveillance	Quarantine for 4 weeks with testing of mortalities for WSSV. Mortalities can be frozen and pooled for nested PCR.	No treatment possible
	Suggested for			*ALL*	

Abbreviations:

VI – virus isolation; VN- virus neutralisation; IFAT – indirect fluorescent antibody test; ELISA – enzyme-linked immunosorbent assay; PCR – polymerase chain reaction; REA- restriction endonuclease analysis; RT-PCR – reverse transcriptase PCR;

[Note 1]: Mitchell (2004) indicates that bath treatment of consignments of fish with praziquantel is a potential pre-export mechanism to allow movement of fish from *B. acheilognathi* infected areas to areas considered free of the parasite. It was demonstrated that bath treatment using ≥ 0.7 mg/L (24 hours) or ≥ 2.8 mg/L (12 hours) resulted in complete elimination of *B. acheilognathi* within 96 hours. The paper also indicated that increasing the density of fish within the treatment tanks had a negative effect on efficacy, therefore a safety margin of 50% is appropriate to ensure adequate dosages. Thus, a bath treatment with praziquantel at ≥ 1mg/L for 24 hours or ≥ 4 mg/L for 12 hours to be completed at least 96 hours before despatch would address the risk of entry of infected fish to a very high degree. Treves-Brown (2000) indicates that fenbendazole orally at 40/mg/kg on two occasions four days apart is effective against *B. acheilognathi* in cyprinids.

[Note 2]: The time required by *Argulus foliaceus* to moult between life stages is not well defined, however Pasternak *et al.* (2004) indicated that growth of a different *Argulus* spp. to 3.5mm length, a stage where it is visible to the naked eye, took 2 weeks. Lester and Roubal (1995) indicate that *A. foliaceus* develops through a series of 5 to 6 moults at intervals of 2 to 6 days, maturing in approximately 4 weeks. It is reasonable to assume that a period of 4 weeks quarantine would allow an appropriate safety margin that would account for variations in water temperatures. The detection of *Argulus foliaceus* during quarantine would necessitate treatment until the fish were found to be clear of infestation. Yildiz and Kumantas (2002) attempted treatment of *Argulus* infected goldfish (*Carassius auratus* Linnaeus 1759) with organophosphates, potassium permanganate and diflubenzuron. They recommended 3 repeat treatments (trichlorphon 0.25 mg/L at temperatures < 27°C or 0.50 mg/L at temperatures ≥ 27°C) at weekly intervals, on a background of cleaning and disinfection of holding tanks to ensure that emerging juveniles were treated.

[Note 3]: Both Taraschewski et al. (1988) and Treves-Brown (2000) indicate that immersion in levamisole at 1 mg/L for 24 hours was indicated for nematode infections. This prophylaxis is primarily designed to kill adults, however Schlotfeld and Alderman (1995) indicate that this treatment is also effective against sub-adults and larval nematodes, thus it would be expected to have an effect on larval *Capillaria philippinensis.* The benzimidazoles have been used in terrestrial animals to treat encysted nematode larvae and thus oral dosing with fenbendazole may also be considered.

References:

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Mitchell AJ (2004). Effectiveness of Praziquantel Bath Treatments against *Bothriocephalus acheilognathi* in Grass Carp. *J. Aq. An. Health* 16(3): 130-136

Pasternak A, Milheev V and Valtonen ET (2004). Growth and development of *Argulus coregoni* (Crustacea: Branchuria) on salmonid and cyprinid hosts. *Dis. Aq. Org.* 58: 203-207

Schlotfeld HJ, Alderman DJ (1995) What Should I Do? A Practical Guide for the Fresh Water Fish Farmer. *Supplement to Bulletin of The European Association of Fish Pathologists* 15(4), 60pp.

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Treves-Brown KM (2000). Applied Fish Pharmacology, *Kluwer Academic Publishers*, Dordrecht, The Netherlands.

Yildiz K and Kumantas A (2002). *Argulus foliaceus* infection on a goldfish (*Carassius auratus*). *Israel J. Vet. Med.* 57(3): http://www.isrvma.org/article/57_3_6.htm

17. Summarised risk management options for specified high risk species

In addition to the caveat of direct entry to, and lifelong holding in, containment facilities; if any country is able to demonstrate, to the satisfaction of New Zealand, compartment, zone or country freedom from any of the 19 actual hazards listed via the provision of an acceptable zoosanitary health certificate, that should negate the requirement for any import requirement specific for that hazard.

It is undesirable for fish clinically affected with ubiquitous or opportunist pathogens or parasites to be imported into New Zealand from a biosecurity, economic and welfare position. Therefore Biosecurity New Zealand should require import shipments to be certified as "free of clinical signs of pest or disease" at the time of despatch. This inspection and certification should be carried out no more than 24 hours before despatch, by an individual authorised by the competent authority of the despatching country. The signing officer must be satisfied that a representative number of fish have been inspected to enable them to sign off the entire shipment.

On arrival at the transitional facility the shipment should be visually inspected by the facility supervisor and the declaration and any associated laboratory reports or health certificates inspected.

In addition to the above, high risk species should be subject to further specific requirements (depending on species and climate range) as detailed below and summarised in Table 7.

17.1. SUMMARISED RISK MANAGEMENT MEASURES BY HIGH RISK SPECIES

Table 7 . Suggested import requirements by high risk species

Note: Hazard numbers in column 5 refer to sections 17.2.1 to 17.2.19 below.

FAMILY	GENUS	SPECIES	CLIMATE	HAZARDS REQUIRING MANAGEMENT (17.2.x)		
POECILIDAE	*Poecilia*	*latipinna*	subtropical	1	2	15
		reticulata	tropical		2	15
		sphenops	tropical		2	
		velifera	tropical		2	
	Xiphophorus	*hellerii*	tropical		2	15
		maculatus	tropical		2	15
	Aplocheilichthys	*normani*	tropical		2	
	Lacustricola	*pumulis*	tropical		2	
SYGNATHIDAE	*Hippocampus*	*coronatus*	subtropical	17		
		reidi	subtropical	17		
		spinosissimus	subtropical	17		
		whitei	temperate	17		

FAMILY	GENUS	SPECIES	CLIMATE	HAZARDS REQUIRING MANAGEMENT (17.2.x)
ZANCLIDAE	*Zanclus*	*cornutus*	subtropical	1
SCATOPHAGIDAE	*Scatophagus*	*argus*	tropical	12
POMACENTRIDAE	*Chromis*	*viridis*	subtropical	13
	Amphiprion	*akindynos*	subtropical	13
LABRIDAE	*Coris*	*aygula*	tropical	9
		caudimacula	tropical	9
		cuvieri	tropical	9
		flavovittata	tropical	9
		gaimard	tropical	9
		venusta	tropical	9
	Labroides	*bicolor*	tropical	2
		dimidiatus	tropical	2
		pectoralis	tropical	2
		phthirophagus	tropical	2
	Thalassoma	*lunare*	subtropical	13
		lutescens	subtropical	13
CICHLIDAE	*Apistogramma*	spp. (74)	tropical	2
		brellii	subtropical	1 2
		commbrae	subtropical	1 2
		pleurotaenia	subtropical	1 2
	Etroplus	*maculatus*	tropical	2 12
		suratensis	tropical	2 12
	Pterophyllum	*altum*	tropical	2
		leopoldi	tropical	2
		scalare	tropical	2
	Herichthys	*cyanoguttatus*	subtropical	15
HELOSTOMATIDAE	*Helostoma*	*rudolfi*	tropical	2
		temminkii	tropical	2
OSPHRONEMIDAE	*Osphronemus*	*goramy*	tropical	12
	Macropodus	*opercularis*	subtropical	12
BELONTIIDAE	*Colisa*	*chuna*	tropical	2 12
		lalia	tropical	2 12
	Trichogaster	*chuna*	tropical	2 12
		labiosus	tropical	2 12

FAMILY	GENUS	SPECIES	CLIMATE	HAZARDS REQUIRING MANAGEMENT (17.2.x)
		leerii	tropical	2 12
		microlepis	tropical	2 12
		pectoralis	tropical	2 12
		trichopterus	tropical	2 12
SERRANIDAE	*Cephalopholis*	*miniata*	tropical	2 3
		urodeta	tropical	2 3
	Chromileptes	*altivelis*	tropical	2 3
	Epinephelus	*merra*	tropical	2 3 12
TOXOTIDAE	*Toxotes*	*jaculatrix*	tropical	12
CYPRINIDAE	*Danio*	*kyathit*	subtropical	1 16
	Esomus	*danricus*	tropical	12
	Labeo	*chrysophekadion*	tropical	12
		erythropterus	tropical	12
	Capoeta	*semifasciolatus*	subtropical	1 4 15 16
	Puntius	spp. (16)	tropical	12
		conchonius	subtropical	1 4 7 8 12 15 16 18
		denisonii	subtropical	1 4 7 8 12 15 16 18
		gelius	subtropical	1 4 7 8 12 15 16 18
		ticto	subtropical	1 4 7 8 12 15 16 18
	Tanichthys	*albonubes*	subtropical	1
	Carassius	*auratus*	temperate	1 2 5 6 10 11 12 14 15 16
TERNOPYGIDAE	*Eigenmannia*	*viriscens*	subtropical	7
CHARACIDAE	*Astyanax*	*fasciatus*	subtropical	15
		mexicanus	subtropical	15
	Hyphessobrycon	*anisitsi*	subtropical	8
		luetkenii	subtropical	8
BAGRIDAE	*Mystus*	*micracanthus*	tropical	12
		tengara	tropical	12
		vittatus	tropical	12
	Pseudomystus	*siamensis*	tropical	12
SILURIDAE	*Kryptopterus*	*bicirrhis*	tropical	12
	Ompok	*bimculatus*	tropical	12
		sabanus	tropical	12

FAMILY	GENUS	SPECIES	CLIMATE	HAZARDS REQUIRING MANAGEMENT (17.2.x)
BLENIIDAE	*Lipophrys*	*nigriceps*	subtropical	13
GOBIIDAE	*Elacatinus*	*oceanops*	subtropical	16
MASTACEMBELIDAE	*Mastacembelus*	*armatus*	tropical	12
		erythrotaenia	tropical	12
DECAPODA	*Enoplometopus*	*occidentalis*	tropical	19
	Lysmata	*grabhami*	subtropical	19
		amboinensis	tropical	19
		debelius	tropical	19
	Periclimenes	*brevicarpalis*	tropical	19
	Stenopus	*hispidus*	tropical	19
		cyanoscelis		19
	Rhynchocinetes	*uritai*	tropical	19
	Saron	*marmoratus*	tropical	19

17.2. SUMMARISED RISK MANAGEMENT MEASURES BY HAZARD

17.2.1. Aquabirnaviruses

SUBTROPICAL – Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia or sudden unexplained mortality.
TEMPERATE – Batch or source population testing for aquabirnaviruses with negative results.

17.2.2. Iridoviruses

TROPICAL - Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia or sudden unexplained mortality.
SUBTROPICAL & TEMPERATE - Batch or source population testing for iridoviruses with negative results.

17.2.3. Grouper nervous necrosis virus

TROPICAL - Quarantine for 4 weeks with investigation of batches displaying nervous signs, colour change or behavioural abnormalities.
SUBTROPICAL & TEMPERATE - Batch or source population testing for nodavirus with negative results.

17.2.4. Viral haemorrhagic septicaemia virus

SUBTROPICAL & TEMPERATE - Batch or source population testing for VHSV with negative results.

17.2.5. *Cyprinid herpesvirus*-3 (koi herpesvirus)

TEMPERATE – Verifiable certification of continuous separation from *Cyprinus carpio* species; ***otherwise*** batch or source population testing with negative results.

17.2.6. Spring viraemia of carp virus

TEMPERATE – Verifiable certification of continuous separation from *Cyprinus carpio* species; ***otherwise*** batch or source population testing with negative results.

17.2.7. Edwardsiella ictaluri

SUBTROPICAL – Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia or sudden unexplained mortality.
TEMPERATE – Batch or source population testing for *E. ictaluri* with negative results.

17.2.8. Edwardsiella tarda

SUBTROPICAL – Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia or sudden unexplained mortality.
TEMPERATE – Batch or source population testing for *E. tarda* with negative results.

17.2.9. Lactococcus garviae

TROPICAL/SUBTROPICAL – Quarantine for 4 weeks with investigation of batches displaying clinical signs of septicaemia or sudden unexplained mortality.
TEMPERATE – Batch or source population testing for *L. garviae* with negative results.

17.2.10. Aeromonas salmonicida

TEMPERATE – Batch or source population testing for *A. salmonicida* with negative results.

17.2.11. Flavobacterium psychrophilum

TEMPERATE - Quarantine for 4 weeks with investigation of batches displaying clinical signs of skin ulceration, haemorrhage and fin rot.

17.2.12. Aphanomyces invadans

NAMED TROPICAL/SUBTROPICAL/TEMPERATE - Quarantine for 4 weeks with investigation of batches displaying clinical signs of ulcerated or congested skin lesions.

17.2.13. Enteromyxum leei

NAMED SPECIES – Quarantine for 6 weeks with investigation of batches displaying clinical signs of enteritis.

17.2.14. Hoferellus carassii

TEMPERATE – Quarantine for 4 weeks with investigation of batches displaying clinical signs of enlarged abdomen ***and*** ad-hoc screening of any samples submitted to the diagnostic laboratory for other reasons.

17.2.15. Bothriocephalus acheilognathi

NAMED TROPICAL/SUBTROPICAL/TROPICAL – Pre-biosecurity clearance treatment with praziquantel at ≥ 1 mg/L for 24 hrs or ≥ 4 mg/L for 12 hours to be completed 96 hrs before clearance ***or*** 40mg/kg fenbendazole orally on two occasions 4 days apart.

17.2.16. Argulus foliaceus

SUBTROPICAL/TEMPERATE – Quarantine for 4 weeks, with visual inspection. If inspection reveals infestation, ectoparasiticide to be used, and fish visually inspected to be clear before biosecurity clearance issued. Quarantine period may be extended if required until fish are free of parasites.

17.2.17. Glugea heraldi

SUBTROPICAL/TEMPERATE - Quarantine for 4 weeks with investigation of batches displaying clinical signs of grey, proliferative skin lesions.

17.2.18. Capillaria philippinensis

SUBTROPICAL – Pre-biosecurity clearance treatment with levamisole bath (1 mg/L) for 24 hours.

17.2.19. White spot syndrome virus

ALL – Quarantine for 4 weeks. All mortalities to be recorded and notified to the supervisor. All mortalities to be retained (frozen) and representative number subjected to nested PCR test for WSSV. Samples may be pooled if required. Nested PCR test to be negative before biosecurity clearance.

18. Appendix 1: Review of submissions – Import Risk Analysis: Ornamental Fish

18.1. EXECUTIVE SUMMARY

Following public consultation in November and December 2005, eight submissions were received regarding the import risk analysis on ornamental fish. MAFBNZ thanks the submitters for taking the time to provide their information and views during the consultation process.

A number of specific areas of concern were highlighted. It should also be noted that no submissions contested the 13 actual hazards as being of significance to New Zealand, nor did they suggest valid additional organisms of concern. The identified issues arose from the risk management measures being considered.

It was argued, that for research species, entry could be directly into containment facilities without significant risk to the country. This was accepted and it is proposed that an appropriate condition be developed to allow this to happen. Fish regarded as “new organisms” under the HSNO Act will still require ERMA approval before importation into containment.

Comments on the process of including or eliminating fish from the list of eligible species, and the requirement for educational resources on fish identification, problems associated with the release of imported fish and public health concerns were noted. It was, however, indicated that these issues lie outside the direct applicability of an import health standard and would need to be considered in the larger context, rather than at the specific import health standard conditions level.

Similarly, issues around the disinfection of water effluent from transistional facilities were noted. The transitional faciltity standard does cover this requirement, and it was determined that it need not be addressed in any import health standard.

The opinion was expressed that the cost of diagnostic testing for the 13 actual hazards should be borne by MAFBNZ. However, the testing for pathogens of concern to New Zealand is an integral component of any risk mitigation programme associated with the import of many animals and animal products into New Zealand. In addition, the importer gains from the importation, thus it is appropriate and consistent across species that the costs of specified diagnostic testing be borne by the importer as a direct cost of the ability to import.

There were numerous comments on the suitablility and consistency of quarantine periods and mortality trigger levels for diagnostic testing. Some argued for the retention of *status quo*, some favoured a significant reduction and others called for the transitional faciltity supervisor to have ultimate discretion over testing. These comments have all been noted and the bridging document for ornamental aquatic animals will consider the appropriateness of quarantine periods and testing triggers in greater detail.

18.2. INTRODUCTION

The completed risk analysis on ornamental fish was released for public consultation on 2 November 2005, and submissions closed 6 weeks later on 16 December 2005.

Biosecurity New Zealand received submissions from the following entities:

Name	Organisation	Date Received
Dr Peter Cattin	University of Auckland	06/12/2005
Phillip Collis	NZ Discus	05/12/2005
Warren Garrett	Brooklands Aquarium Ltd.	21/12/2005 *
Robert Johnston	Ministry of Fisheries	21/12/2005 *
Steve Walls	Aquarius Imports	16/12/2005
Bob Ward	Redwood Aquatics Fish Farm	16/12/2005
Alois Wolloner		20/12/2005 *
Richard Woolley	Highway Fisheries Ltd.	19/12/2005 *

Late submissions were accepted from 4 individuals *.

This document reviews each submission in turn. The full text of each submission is included in Appendix 2.

18.3. SUBMISSION 1 – DR PETER CATTIN, UNIVERSITY OF AUCKLAND

This submission contends that imports of zebrafish into research containment facilities pose an extremely low level of risk, as they are subject to considerable regulation already as regards the operation of the containment facility, the source of the stock and current arrangements for import permits.

> ***MAFBNZ response:*** It is recognised that entry of fish directly into, and lifelong retention in, appropriately approved and inspected containment facilties would address the identified hazards to an extremely high degree. It is therefore proposed that, subject to meeting all other legislative requirements (such as ERMA approval, CITES etc.) that aquatic animals are permitted to be directly imported into, and held for their entire lifespan in, suitably approved and inspected containment facilities.

18.4. SUBMISSION 2 – PHILLIP COLLIS, NZ DISCUS

1. Dont agree..Thousand have already been imported by us even from Brazil.Just a few areas of thermal water have been id as where they could live.There is not a serious problem that i have heard of the justify this.

> ***MAFBNZ response:*** This submission refers to recommend measure 1 from the import risk analysis, which suggested that temperate and sub-tropical cyprinids should no longer be eligible for import. It is unclear as to the relevance of the reference to thermal water, however as an alternative to a complete ban a number of other import measures for identified high risk species will be suggested. The presentation of a number of alternatives does not preclude the removal of the species form the permitted list, should that prove to be the only viable option.

2. Dont agree as there is total no need. Many fish have no second name except .spp it should be the general family so Maf Erma must look at latin names here on permitted list and if any name is put forward for Free of Charges. More important is water it lives in.
If entrys are lodged to import a fish under new or old name then that if person is charged then they should have all rights to importing.No one else. I have put forward pages and pages of what i have imported covering about 11 years.I cant be expected to remember all,nor can others as New Zealand Law only insists records held for 7 years.

But also imposible to transfer old names in to new. i cannot yet find actually who gives names or Changes names..
I have in list to Erma noted many changes and double ups.
Even when new list is completed it will still be out of date unless you find name changes that apply. Overseas lists actually are using names that show no where that i have found so must have had name changes while i was not importing..And possibley even fish base is totally out of date.

> ***MAFBNZ response:*** This submission refers to recommended measure 2 from the import risk analysis, which suggested that those species not present in New Zealand before July 1998 should not be eligible for import. As regards this point, the submitters views are noted, however, there are clear legislative requirements whereby new species require an approval from ERMA before being eligible for import. A disease based risk analysis cannot alter that requirement.

3. Yes. agree

> ***MAFBNZ response:*** This submission refers to recommended measure 3 from the import risk analysis, which suggested that quarantine periods for freshwater andmarine fish should be consistent. Agreement with this sentiment is noted. Quarantine periods should be no more than is justifiable, and where there are variations these should have scientific evidence to support them. This is the approach suggested for any amendment to the import health standard as a result of this document.

4. There is only a need to identify if actually Tropical Fish..Cold water cannot be imported now. Is more relevant whats its natural requirements. ie amazon river has only warm water fish that die with out warm water
Diseaes are so low that they dont really warrant millions of dollars. Fish Disease experts are Just not available in nz .

> ***MAFBNZ response:*** This submission refers to recommended measure 4 from the import risk analysis, which suggested that training resources in fish identification should be developed for quarantine supervisors and operators. Ideally a comprehensive resource would be made available to all persons involved in the importation of ornamental aquatic animals to assist in the identification of species. The importance of this resource is recognised, however, it is impossible to address this directly in an import health standard and instead all stakeholders should be aware that the issue is recognised as an operational issue and DNA/molecular tools are planned to assist in the identification of high priority species.

5. That statement is totally out of line..!!! True Fish people do not dump fish into nature..!!
Doubt if any member of NZFAS would even think of doing that.Breeders sell surplus to cover costs.I am a member of NZFAS and have been in fish business over 30 years.
It can be said that a lot of nz problems were from others even the interduction of many fish were done legally but still caused problems.Course fishmen that are not of nz origion have released most fish to catch and let go to catch another day. Look i have white tip spiders ,south african praying mantis,aussie parrots and swallows.paper wasps,germany wasps,possums,rabbits.all in my back yard...they did not get here with out help. Wind blows ,we travel the planet,ships,planes.So time to get on to the correct issues to remove all those pests.

> ***MAFBNZ response:*** This submission refers to recommended measure 5 from the import risk analysis, which suggested that government agencies should work with the Federation of New Zealand Aquatic Societies (FNZAS) to discourage their members from releasing fish. This is, as always, a contentious issue. It is recognised that responsible aquarists understand the importance of not releasing imported aquatic animals. There are, however, populations of feral animals that must have been released from captivity at some time, and thus there is evidence that the practice occurs. However, once again, this is not an issue that can be addressed directly by an import health standard. MAFBNZ notes the submitters views in this case.

6. Already done.months age [sic]

> ***MAFBNZ response:*** This submission refers to recommended measure 6 from the import risk analysis, which suggested that government inform retail outlets selling ornamental fish of potential public health issues. As above this issue cannot be addressed directly in an import health standard.

7. No 4 actually covers that..

> ***MAFBNZ response:*** This submission refers to recommended measure 7 from the import risk analysis, which suggested that passive surveillance be conducted for the selected 13 hazards. Contrary to the submitter’s view, this recommendation involves not only the awareness of important clinical signs by

quarantine supervisors and operators, but also involves diagnostic laboratories being aware of and ruling out the significant hazards during any diagnostic testing. The importance of diagnostic capacity should not be underestimated. It is likely that passive surveillance will always play an important role in preventing the entry of exotic pathogens into New Zealand.

8. Deaths of fish after arrival a most likely to be packing problems..in the first week no disease is the cause..ok in week two..yes..but once again back to no.4.we all have our tricks to keep fish alive.. But if we cant keep them alive ..then thats what quarantine is about.. Also it can not be expected of us or others to send samples other than to where your Maf N Z Quarantine Visiting inspecter is based. Refers to 4

MAFBNZ response: This submission refers to recommended measure 8 from the import risk analysis, which suggested that cumulative mortalities of 20% or greater should be subject to diagnostic investigation at an approved diagnostic laboratory. It is recognised that poor transport conditions may directly contribute to mortality rates. Quarantine periods are, however, specific risk management measures designed to maximise the chances of exotic diseases appearing clinically in the imported animals and thus prevent their entry into New Zealand. The function of quarantine is not necessarily to maximise the survival of the imported fish. The submission of diagnostic samples forom moribund fish or mortalities will remain an important part of quarantine.

9. Actuall 3 weeks is plenty. Has worked well with salt fish so should be no difference with water.

MAFBNZ response: This submission refers to recommended measure 9 from the import risk analysis, which suggested that quarantine periods for marine and freshwater fish could be standardised and adjusted according to presence or otherwise of a health certificate. The submitter's views on the length of the quarantine periods are noted. The suggested quarantine period length will be derived from epidemiological data relating to the identified hazards.

10. Back to 4.. Whats the point .if dead means we just loose money..And often we dont buy from that suppliers again.

MAFBNZ response: This submission refers to recommended measure 10 from the import risk analysis, which suggested that where a quarantine period is reduced, the mortality cutoff point should be reduced to 10%. The submitter's views are noted and will be considered when formulating the final quarantine period and sampling measures.

11. Not possible.. Most and Including mine are effectively built to discharge to City treatment plants that use Uv as final treatment to bathing standards..
Well my room could only dose water with clorine to out line and that will kill off Watercare plant bacteria.

MAFBNZ response: This submission refers to recommended measure 11 from the import risk analysis, which dealt with disinfection of water from the facility. This is adequately covered by the Transitional Facility Standard. In addition, such a requirement is difficult to directly address in an import health standard, but MAFBNZ thanks the submitter for raising the issues.

MAFBNZ response: Submission 3 – Warren Garrett, Brooklands Aquarium Ltd.

5.3.1 *That temperate and sub-tropical cyprinids (the genera Barbus, Puntius, Varicorhinus, Barbodes and Capoeta) should no longer be eligible for import.*

- We do not agree with the suggestion that all barbs (Barbus, Puntus, Varicorhinus, Barbodes and Capoeta) should be omitted from the permitted entry list. The barbs represent a vast range of fish, which we have been importing now for over 30 years and have had no significant disease outbreak to date. To remove all barbs is a drastic measure, which would have significant commercial impact on the tropical fish industry.
  Are the references to diseases noted current and what is the true risk these fish represent as a group? MAF need to be more specific in identifying exactly which disease agents and corresponding host species are indeed high risk. The barbs we import are domestically raised rather than wild caught. This also needs to be taken into consideration in making this decision.

  MAFBNZ response: MAFBNZ thanks the submitter for their information. Unrelated to disease risks, the *Barbus* spp., *Varicorhinus* spp. and *Barbodes* spp. have been removed from the list of species eligible for importation. This followed extensive consultation on the permitted list within government, and with external stakeholders. The species were removed for environmental reasons. As an alternative to a complete ban on *Puntius* spp. and *Capoeta* spp. a number of other import measures for identified high risk species will be suggested. The presentation of alternatives does not preclude the removal of the species from the permitted list, should that prove to be the only viable option.

5.3.2 *That Biosecurity New Zealand and ERMA determine which species of ornamental fish were in New Zealand before July 1998. Those not present before July 1998 should not be eligible for import unless approved by ERMA as a new organism.*

- Provision needs to be made for importers and other interested parties to submit new species for addition to the permitted entry list even after the current review has taken place. We would suggest that an opportunity be given on an annual basis for any new submissions to be made. The current ERMA provisions are not practical and a workable solution needs to be found. Because the cost of a new species is not high, no importer is going to pay the fees required to have a new fish or group of fish added to the permitted list.

  Also with the work that has been done on the permitted list we would like to see a 6-month period whereby importers and other interested parties can make further submissions, as this list is still far from complete. With the permitted list revision from Genus to Species-specific listings the allowable list stands to be reduced dramatically.

  MAFBNZ response: This submission refers to recommended measure 2 from the import risk analysis, which suggested that those species not present in New Zealand before July 1998 should not be eligible for import. As regards this point, the submitters views are noted, however, there are clear legislative requirements whereby new species require an approval from ERMA before being eligible for import. A disease based risk analysis cannot alter that requirement.

***5.3.3** That the post-arrival quarantine period should be consistent for both freshwater and marine species.*

- New Zealand operates a much longer quarantine period than other countries. Because the risks involved with tropical marine imports are significantly less than with freshwater we think that marine and freshwater species should be treated separately. We believe marine imports should be subject to a 2-week quarantine. In Australia where the risk is far greater than in New Zealand, marines are subject to a 1-week quarantine as they recognise marines pose minimal risk. With marine imports the main reason for moralities are factors such as starvation and water quality issues. Marine fish are very sensitive and difficult to maintain in the aquarium for this reason.

- For freshwater imports we would support a 4-week quarantine period. Australia has a one to three week quarantine for freshwater fish depending on the species. With their tropical climate in northern territories the risk is far greater for them. In my 20 years experience any disease outbreak or significant mortalities in freshwater fish tend to occur within the first 10 days of quarantine. With a 4-week quarantine this gives the importer and the inspector plenty of time to take action should a disease outbreak occur. If there is any concern the MAF Inspector has the authority to extend the quarantine period at his or her discretion.

MAFBNZ response: MAFBNZ thanks the submitter for their views on the appropriate length of the quarantine period, which will be taken into consideration when risk management measures are suggested. Quarantine periods should be no more than is justifiable, and where there are variations from a standard period, these should have scientific evidence to support them. This is the approach suggested for any amendment to the import health standard as a result of this document.

***5.3.4** That Biosecurity New Zealand develop appropriate training resources about the identification of fish species and the diagnosis of key diseases for MAF Quarantine Services Biosecurity Officers, supervisors and operators of Transitional Facilities.*

- Any training in this area is currently up to the individual importer or MAF officer to undertake independently. Most MAF officers are under trained in the area of fish and disease recognition. To date it has generally been up to the importer to assist in training the MAF officers in this field when the responsibility for this training should be on MAF. Any assistance that MAF can give importers to keep them up to date with key disease management would be well received.

MAFBNZ response: It is gratifying to see the submitter indicate that the supply of resource material and/or intelligence on current key disease issues would be well received. Ideally a comprehensive resource would be made available to all persons involved in the importation of ornamental aquatic animals to assist in the identification of species. The importance of this resource is recognised, however, it is impossible to address this directly in an import health standard and instead all stakeholders should be aware that the issue is recognised as an operational issue and DNA/molecular tools are planned to assist in the identification of high priority species.

5.3.5 *That Biosecurity New Zealand work with the Department of Conservation to inform the Federation of New Zealand Aquatic Societies of the need to actively discourage their members from releasing unwanted fish into the wild.*

- We support any efforts by MAF or DOC to assist in education of retailers and aquarists. However these must be positive steps to work with rather than against the industry. Without the support and trust of all parties involved such measures are indeed counter productive. It would be worth liasing with the Pet Industry Association (PIA) as they may be able to assist in networking with member retail stores.

MAFBNZ response: This is, as always, a contentious issue. It is recognised that responsible aquarists understand the importance of not releasing imported aquatic animals. There are, however, populations of feral animals that must have been released from captivity at some time, and thus there is evidence that the practice occurs. However, once again, this is not an issue that can be addressed directly by an import health standard. MAFBNZ notes the submission in this instance.

5.3.6 *That Biosecurity New Zealand work with the Ministry of Health to inform retail outlets selling ornamental fish of potential public health issues.*

- Same as above (5.3.5)

MAFBNZ response: The submission is noted.

5.3.7 *That targeted passive surveillance be conducted for the following disease agents: aquabirnaviruses, iridoviruses, grouper nervous necrosis virus, viral haemorrhagic septicaemia, Edwardsiella ictaluri, Edwardsiella tarda, Lactococcus garvieae, Aphanomyces invadans, Enteromyxum leei, Glugea heraldi, Bothriocephalus acheilognathi, Capillaria philippinensis and Argulus foliaceus.*

- Our main concern with this is who would be expected to fund this testing and where would sample populations be taken from? The importers cannot be expected to fund these activities should MAF wish to undertake them.

MAFBNZ response: The requirement for passive surveillance in the diagnostic laboratory for the listed hazards is a risk management measure suggested by the risk analysis. It is a requirement that samples are submitted when certain mortality levels are reached. This measure was designed to guide the diagnostic laboratory in the range of significant exotic pathogens that required to be ruled out. As diagnostic testing is an integral part of risk management associated with the import of live animals, the cost lies with the importer. This is completely consistent with all other live animal imports.

***5.3.8** That when cumulative mortalities of 20% or greater occur among any species of imported ornamental fishes during quarantine, suitable samples (moribund, freshly dead, or 10% formalin-fixed) must be sent to the Investigation and Diagnostic Centre (IDC) of Biosecurity New Zealand, or a laboratory regarded by them as competent.*

- The suggestion that it should be necessary to submit samples if the cumulative mortality of any species exceeds 20% during the 6-week quarantine period is not practical. Losses of 20% or greater can be incurred due to stresses in shipping, water chemistry changes, poor water quality along with many other simply explained scenarios. Any such testing should certainly not be mandatory but <u>at the discretion of the MAF Inspector</u>. This is because it is important to weigh up the circumstances in making up such a decision. In our past experience any such testing has been non productive. Such testing would be at a significant cost, which of course would be passed on to the importer. Have the logistics and costs of introducing such measures really been thought through? Will this testing serve any real purpose and are there persons truly qualified in this specialised field of research at IDC?

- If this mandatory mortality rate was set at 20%, would this mean that if we brought in 5 show size discus worth $250 wholesale and 1 was DOA due to a punctured bag we would have to send samples away for testing? Or if we brought in 2 clown triggers worth $300 wholesale and 1 was to die after 7 days quarantine due to ammonia poisoning/water quality issues we would then have to send the other away for lab testing? From a commercial perspective the importer would incur both the expense of the fish lost as well as those fish sent for testing along with associated costs. Unless the MAF Inspector decides that lab testing is necessary we cannot see the point in sending samples for testing in such a situation.

> ***MAFBNZ response:*** MAFBNZ thanks the submitter for their views on the trigger levels for diagnostic testing. It is agreed that it is virtually impossible to set a mortality level that will be both sensitive and specific for exotic disease. The idea of inspector discretion is particularly interesting, as this must form some basis for making a decision to sample or otherwise, however, it is also useful to have broad guidelines, which would include mortality rates. The intent is not to force testing where there are clear and documented environmental issues. The onus, in that case, must, however, be on the facility operator to run their facility and keep such records/samples that can adequately demonstrate that mortalities are due to environmental factors.

***5.3.9** That the post-arrival quarantine period may be reduced for both freshwater and marine fish from 6 weeks to 4 weeks, provided that consignments are accompanied by an international aquatic animal health certificate for live fish, signed by the competent authority in the exporting country, stating that the fish are free from specified disease agents or are sourced from populations or zones free from specified disease agents.*

- We certainly agree that the quarantine period for freshwater fish should be reduced from 6 to 4 weeks. However the suggestion that a health certificate should accompany all imports is commendable in theory, but this certificate is generally not worth the piece of paper it is written on. In the Asian markets these certificates are easily obtained, and are simply an additional cost to the importer. Issue of such health certificates has more to do with bureaucrats collecting revenue than with the health and well being of the fish. As an importer we have a business to run and it is in our best interests if we wish to succeed to deal with those exporters who offer fish of the highest health standard.

- Regarding the pre-export isolation of 2 weeks. To be honest such measures would be detrimental to the health of the fish rather than beneficial. To hold fish in crowded aquariums, without food and in poor water conditions for an additional 2 weeks is going to have a negative impact on their health. The best chance of survival these fish have is to move them out quickly to minimise stress. Again many exporters would issue such a certificate stating they had been quarantined for 2 weeks, without actually holding the fish for 2 weeks.

MAFBNZ response: As above, the submitters views on the length of quarantine is noted gratefully, as are the views on the significance of health certification. For health certification to provide significant risk management, it is necessary that pre-export handling of the fish is well understood and that fish populations are controlled appropriately, either in closed populations or in separate batches from the time of sampling until export. This needs to be assessed by MAFBNZ in any decision to use health certificates.

5.3.10 *That for consignments where the post arrival quarantine period is reduced to 4 weeks, the cutoff cumulative mortality rate for the taking of samples be reduced to 10%.*

- A 10% cut-off for cumulative losses is unrealistic. Losses as high as this can occur in shipping and stresses in transit with some shipments. Such measures would create logistical nightmares for not only the facility Operator but also the MAF Inspectors. Do IDC have the resources to undertake this testing nationwide? There is also the question of who will pay the costs involved and more importantly will it actually serve any real benefit to the industry? Again we say that the MAF Inspector must have some discretion in making any such decision given the circumstances.

MAFBNZ response: See the response to 5.3.8 above.

5.3.11 *That aquarium water from the quarantine period must be disinfected prior to disposal.*

- The treatment and disposal of wastewater is a difficult area to cover. Firstly once the quarantine period is over, and the fish have been moved from the quarantine area, why is it necessary to disinfect the water in the holding tanks or the water sent to waste? Surely the fish released from quarantine in themselves pose an equal if not greater risk of carrying disease agents than the water itself? Also one must remember that we are dealing with fish – not poultry, sheep or cattle. An aquarium and its fixtures are populated with vast populations of beneficial nitrifying bacteria responsible for breaking down toxins in the aquarium. Fish simply cannot live under the sterile conditions, which one would create if they were to disinfect all aquariums filters and other equipment in between shipments.

- In theory the treatment of wastewater with disinfectants such as chlorine may seem a good option but it is not a practical solution when dealing with large volumes of water. The current standard allows wastewater to enter directly into an approved municipal sewerage system, approved septic tank, or other approved disposal system. Alternatively, wastewater shall be treated by chlorination or with ultra-violet light.

  MAFBNZ response: This submission refers to recommended measure 11 from the import risk analysis, which dealt with disinfection of water from the facility. This is adequately covered by the Transitional Facility Standard. In addition, such a requirement is difficult to directly address in an import health standard, but MAFBNZ thanks the submitter for raising the issues.

18.5. SUBMISSION 4 – ROBERT JOHNSTON, MINISTRY OF FISHERIES

Thank you for providing an opportunity for the Ministry of Fisheries, as an interested party, to comment on this risk analysis.

I sought comment on the analysis from a number of business groups within MFish. The following submission draws on comments from Steve Pullan, Fisheries Analyst in our Operations group, and Julie Hills, Senior Scientist. Steve and Julie have both had extensive involvement in aquaculture issues. Steve also has a background in ornamental and tropical fish identification.

I understand that Julie has spoken to Mike Hine about this issue and that she supports his recommendations in the report. Mike has taken Julie's concerns about marine stocks into account. She fully supports the document and its recommendations.

Following are some specific comments provided by Steve Pullan on the recommendations. Steve was a senior member from 1972 to 1990 of the MAF Exotic Fish Unit, which was responsible for identifying imported fish species and identifying disease problems during quarantine of ornamental fish and recommending a course of action.

That temperate and sub-tropical cyprinids no longer be eligible for import

This recommendation relates to a group of fish that hobbyists collectively call Barbs. These are a hardy group of fish and because of that they are part of the bread-and-butter species importers and pet shops like to deal in, as they are relatively cheap and easy to maintain. It is likely ornamental fish enthusiasts will strongly object to this recommendation, as these species represent a significant portion of popular species. However, cyprinids are well known to harbour a large range of diseases, and this group may have the potential to survive in the warmer climates of New Zealand. They are not a difficult group to breed, and stopping their importation will provide an opportunity for these species to be bred and sold here, although they will become significantly more expensive. Some of these species are bred with elaborate finnage or exaggerated colouration. If importation of this group is prohibited, these variants may no longer be available as the embellishments are more difficult to maintain.

MFish supports this recommendation as it avoids the risk of disease being introduced into NZ waters and the species will not be totally lost to the industry, as they are not difficult to breed.

> ***MAFBNZ response:*** Unrelated to disease risks, the *Barbus* spp., *Varicorhinus* spp. and *Barbodes* spp. have been removed from the list of species eligible for importation. This followed extensive consultation on the permitted list within government, and with external stakeholders. The species were removed for environmental reasons. As an alternative to a complete ban on *Puntius* spp. and *Capoeta* spp. a number of other import measures for identified high risk species will be suggested. The presentation of a number of alternatives does not preclude the removal of the species form the permitted list, should that prove to be the only viable option.

That BNZ and ERMA determine which species were in New Zealand before July 1998

The list of approved species maintained by the MAF Exotic Fish Unit was developed through considering those species importers wanted to import since 1972, and would be a useful starting point. However, the list should be checked for any dubious species. MFish supports a species-level list and additions only added once they assessed by ERMA. The final list is likely to be identical to the one MFish needs to gazette under s 307 of the Fisheries Act 1996.

MAFBNZ response: This submission refers to recommended measure 2 from the import risk analysis, which suggested that those species not present in New Zealand before July 1998 should not be eligible for import. As regards this point, the submitters views are acknowledged. There are clear legislative requirements whereby new species require an approval from ERMA before being eligible for import. A disease based risk analysis cannot alter that requirement.

The post arrival quarantine period should be consistent for marine and freshwater species

Our understanding is that the quarantine period for marine species is shorter as they are generally more expensive and are not as geographically constrained as freshwater species are. However, the risk of disease transfer is equally as great, and while the transfer of pathogens to the marine environment would be less likely than for freshwater species (given hobbyists are unlikely to discharge fish and aquarium waste directly to the sea), any disease problem would be difficult to resolve in the marine environment. MFish supports this recommendation.

MAFBNZ response: This submission refers to recommended measure 3 from the import risk analysis, which suggested that quarantine periods for freshwater andmarine fish should be consistent. Agreement with this sentiment is noted. Quarantine periods should be no more than is justifiable, and where there are variations these should have scientific evidence to support them. This is the approach suggested for any amendment to the import health standard as a result of this document.

BNZ develop training courses

The Exotic Fish Unit did run such courses to help quarantine officers identify fish and to recognise a disease problem. However, given the large number of approved species (over 1000) from a wide range of countries, the courses were only limited to identifying the common genera. Specialised people need to be employed in this area, as they must have an interest in ornamental fish, a good grounding in taxonomy and a good knowledge of fish diseases. With the large number of species imported, many with colour variants and enhanced physical features (large fins etc), and fish often being imported in the juvenile stage (to minimise freight costs), fish identification becomes a specialised skill. Often fish are imported from key collecting countries (eg, Singapore and Hong Kong), thus even the country of origin could be uncertain. For disease issues, an inspector must be familiar with the habits of the various species and so recognise when fish are not in a healthy state. They must also be familiar with environmental factors that can stress fish. Often fish quarantine operators do not recognise fish under stress from hypoxic conditions or have a poor knowledge of “new tank” syndrome etc. Our recommendation is that only persons with an interest in ornamental fish be trained and that those persons should be considered as specialists, and routinely inspect consignments during quarantine.

MAFBNZ response: This submission refers to recommended measure 4 from the import risk analysis, which suggested that training resources in fish identification should be developed for quarantine supervisors and operators. Ideally a comprehensive resource would be made available to all persons involved in the importation of ornamental aquatic animals to assist in the identification of species. The importance of this resource is recognised, however, it is impossible to address this directly in an import health standard and instead all stakeholders should be aware that the issue is recognised as an operational issue and

DNA/molecular tools are planned to assist in the identification of high priority species.

DOC and BNZ work with the Federation of NZ Aquatic Societies

The Federation has always taken a responsible attitude to importation and quarantine. There will always be a faction who will not obey the law, as a prohibited fish can fetch good prices on the black market, simply because of its status. MFish strongly supports this recommendation.

MAFBNZ response: Acknowledged, however, this is cannot be directly addressed in an import health standard.

BNZ work with Ministry of Health

There are human health issues relating to quarantine of ornamental fish. Piscine tuberculosis can affect humans and there have been reports of New Zealanders contracting this disease. MFish supports this recommendation.

MAFBNZ response: This submission refers to recommended measure 6 from the import risk analysis, which suggested that government inform retail outlets selling ornamental fish of potential public health issues. As above this issue cannot be addressed directly in an import health standard.

Targeting disease agents

MFish supports this recommendation.

MAFBNZ response: Agreement to target disease agents of significance is noted.

Samples taken when 20% mortalities occur

MFish supports this recommendation. However, the importer may wish to destroy the whole consignment as an option as the remaining fish may be also be infected and it may not be worth the cost of inspection or treatment. Also, some diseases may be evident (particularly parasites), but not be causing significant mortalities. An inspector should be able to take samples in these instances.

MAFBNZ response: The issue of inspector discretion as regards sampling triggers has been raised by industry submitters. The option to destroy whole batches as opposed to testing is operated in Australia. Invariably batches are destroyed without diagnostic testing being undertaken, leading to a lack of intelligence as regards disease status of exporting countries and/or wholesalers.

Quarantine period reduced to 4 weeks with appropriate certification.

MFish supports this recommendation, as it encourages overseas countries to monitor the health of fish farms. Exporting countries are now moving towards providing certification. However, in the past, when this requirement was proposed, exporters would have stopped supplying a small market like New Zealand.

MAFBNZ response: For health certification to provide significant risk management, it is necessary that pre-export handling of the fish is well understood and that fish populations are controlled appropriately, either in closed populations or in separate batches from the time of sampling until export. This needs to be assessed by MAFBNZ in any decision to use health certificates.

Reduction of mortality rates to 10% for consignments undergoing the shorter 4-week period

MFish supports this recommendation, but note our comments in regard to taking samples when 20% mortalities occur.

MAFBNZ response: Noted

Aquarium water disinfected

MFish supports this recommendation, but we propose that it be imposed immediately if no disinfection is currently taking place.

MAFBNZ response: This submission refers to recommended measure 11 from the import risk analysis, which dealt with disinfection of water from the facility. This is adequately covered by the Transitional Facility Standard. In addition, such a requirement is difficult to directly address in an import health standard, but MAFBNZ thanks the submitter for raising the issues.

18.6. SUBMISSION 5 – STEVE WALLS, AQUARIUS IMPORTS

1. The recommendation that temperate and sub-tropical cyprinids should no longer be eligble for import.
Although history is not necessarily a complete response to this issue it should be noted that cyprinids have been imported into New Zealand for a great number of years and it should be pointed out they are imported in large numbers. This group of fish represent a very high prpotion of the aquarium trade as they are easy fish to care for, colourful and active and as such very popular with fish hobbyists. To date, this group of fish have not posed any risk.
To give you an overview ftom an importers perspective I have listed the percentage this group represents of the total heads imported in the last three shipments.
25 Oct 12040 tails imported
22 Nov 19865 tails imported
13 Dec 13219 tails imported
including 1180 cyprinids
including 1605 cyprinids
including 2080 cyprinids
=9.8%
=8.1%
=15.7%
As you can see this category of fish averages over 10% of our volume and would cause a severe impact on the trade in two respects.
1) The hobbysists would lose a significant area of fish keeping
2) The importers would lose a significant percentage of income given they represent a large percentage of the fish we import. During the seven years that I have operated a quarantine facility for tropical fish and marines, I would have to say that the cyprinids are the easiest and most disease ftee of the fish that we import. Mortality records verify this.
I understand that future risk is the purpose of your risk analysis but feel that history also has a valuable contibution to the argument. Further argument against precluding this group ftom the permitted list is the length of quarantine. Currently six weeks (or the proposed 4 weeks) gives a reasonable amount of time in containment to ensure there are no disease outbreaks. The disease agents listed as requiring additional risk management in the report have exposure/ infection periods well within the current six week quarantine period. I have argued for maintaining the six week quarantine (see 3 & 9) and suggest that this would further avoid the necessity of deleting cyprinids from the import list by providing a substantial period of time to recognise any potential diease agents.
To further assist the prevention of potential disease agents, this group offish could be restricted to importation from specific countries that have low risk.

> ***MAFBNZ response:*** Unrelated to disease risks, the *Barbus* spp., *Varicorhinus* spp. and *Barbodes* spp. have been removed from the list of species eligible for importation. This followed extensive consultation on the permitted list within government, and with external stakeholders. The species were removed for environmental reasons. As an alternative to a complete ban on *Puntius* spp. and *Capoeta* spp. a number of other import measures for identified high risk species will be suggested. The presentation of a number of alternatives does not preclude the removal of the species form the permitted list, should that prove to be the only viable option.

2)The recommendation that ornamanetal fish not present before July 1998 should not be eligible for import unless approved etc. I find this a bit ambiguous. Does this mean that species illegally imported by some earlier unscrupulous operators would be eligble for import. Including fish like mountain minnows (currently prolific in the trade and for sale in most pet shops COLD WATER tanks) / red tail cats etc. It would be my suggestion that fish identified as present in New Zealand that do not meet the current import lists be evaluated and either added to the list were appropriate or noted as a risk and treated accordingly. I would hope that when direction is ascertained in this area, that a second round of submissions of fish be asked for, where all affected parties can inspect the list compliled to date. There are a large number of retailers that are very knowledgeable in the trade and have not been invited to make any submission. (Submissions at this stage have been restricted to importers and fish clubs). Of further concern in this area is that this would preclude the importation of fish that are within the same genus as an allowable import. This creates anomoly in the process of risk management when a genus is recognised as acceptable but because a species within that genus hasnt been imported then it is not acceptable. I would suggest that where a species is part of an allowable genus there be a simplified process to have it added to the list of allowable imports

> ***MAFBNZ response:*** This submission refers to recommended measure 2 from the import risk analysis, which suggested that those species not present in New Zealand before July 1998 should not be eligible for import. As regards this point, the submitters views are acknowledged. There are clear legislative requirements whereby new species require an approval from ERMA before being eligible for import. A disease based risk analysis cannot alter that requirement.

3) I can see no worthwhile reason to make the importation of freshwater and marine fish identical in quarantine periods for the sake of making them identical. The reason for quarantine is surely to isolate/ identify risk and as such should be considered on a risk factor alone. The information on risk evaluation in the report would tend to suggest that some disease agents in marine fish would be better identified by a six week quarantine. I feel that this item needs to be addressed entirely under item 9 in the context of risk management.

> ***MAFBNZ response:*** This submission refers to recommended measure 3 from the import risk analysis, which suggested that quarantine periods for freshwater andmarine fish should be consistent. The submitter correctly points out that quarantine periods exist to maximise the chance of exotic disease expressing if the fish are infected. Quarantine periods should be no more than is justifiable, and where there are variations these should have scientific evidence to support them. This is the approach suggested for any amendment to the import health standard as a result of this document.

9) The recommendation that quarantine be reduced from 6-4 in freshwater and increased from 3-4 in marines provided they are accompanied by an international health certificate. Let me address this in two parts. (Refer to the argument above in 3). There is no necessity to have identical quarantines for the sake of convenience. The shipments are kept in isolation from each other and different time frames are of little consequence. Of importance is the requirement that disease agents are able to develop/ be identified within a suitable quarantine period to enable the effective management of risk. Past experience has shown to me that the issue of an international health certificate is little more than a rubber stamping exercise. I have received shipements both with and without certificates from various countries and wonder how they could be justified by the state of the fish that arrive The fish are not kept in a conditions prior to shipping that facilitates easy identification of potential disease. Disease agents that may be present would show little indication other than the presence of dying! dead fish. I appreciate that some countries like Singapore have a certification process to maintain

some standards to protect the country's exports but invite you to take a look at fish prior to export and see if you could identify fish with disease agents. The time taken for disease agents to manifest themselves by incubation or transfer further makes this an impossible task. The storeage of fish prior to export is in many cases in bags on racks. The discoloration of the water alone would seem to prohibit good observation of the fish. This is further hampered by the crowding within the container that makes observation near impossible. In some cases fish are stored Gust prior to packing) in tanks, but a large number of these have no glass front so observation of the fish is from the top. Again, near impossible to observe the condition of the fish. I have no axe to grind on this matter as my suppliers are all able to provide health certs. I merely stand by my comment that a health cert is little more than a rubber stamping exercise and will have no great benefit in the risk management. I would suggest that a system of supplier certification be more appropriate. Suppliers that have a history of supplying stock to New Zealand importers could be "certified" by the history of previous imports. This could be verified at a local level by MAF inspectors. All new suppliers of fish to New Zealand importers could be subjected to random sampling of the first few shipments until MAF certifies their quality. I would also like to suggest that fish are prohibited imports from countries that have high prevalence of the disease agents of major concern. The current regime of a six week quarantine for fresh water has served the industry well. Our incidence of notifiable diseases has been extremely low. The health of our fish in the trade is good and we have not had the incidents that they have had in Australia where they have a shorter quarantine. I fully endorse your comments on page 142 of your report stating that While the increased incursion rate in Australia may be Clueto climate! volumesl surveilance, it is possible that a six week quarantine provides additional protection against those disease agents which could not be disclosed in a three week quarantine paeriod. In the same section on quarantine period you mention that there is the possibility that a blanket six week quarantine may be too onerous for industry to maintain. The majority of imports are freshwater and as such industry has lived and worked within this time frame for years. The only area that could then be considered onerous is the increase in marine quarantine. Options here are that they do not need to have an identical quarantine period unless risk requires it. (potentail disease agents would suggest that six weeks would be a good precaution on marines). The volume is light and as such would have minor impact. The suggestion that a 20% vs 10% mortality tradeoff with the reduction from 6 to 4 weeks qauarantine may be valid when discussing freshwater mortality, but due to the low stocking volumes of marine fish and the fact that transfer of disease is possible, how do you effectively measure either of these percentages when you have single figure imports items of a particular species? (If you have eight yellow tangs in a tank and one dies, is that an outbreak?) The only endorsement I could make for reducing the quarantine period is for financial gain. However I endorse the six week period to ensure the industry I have invested in maintains a high level of health and compliance within the environment of New Zealand and as such is recognised as extremely low risk. This factor alone will insure the fish importing industry has a future in this country.

> ***MAFBNZ response:*** The submitters views on the length of quarantine is noted gratefully, as are the views on the significance of health certification. For health certification to provide significant risk management, it is necessary that pre-export handling of the fish is well understood and that fish populations are controlled appropriately, either in closed populations or in separate batches from the time of sampling until export. This needs to be assessed by MAFBNZ in any decision to use health certificates.

11) I agree that water should be treated prior to disposal but ask that the use of ultra violet sterilisers be
considered as a non toxic method of disinfection without adding more contaminents into the

environment.

MAFBNZ response: This submission refers to recommended measure 11 from the import risk analysis, which dealt with disinfection of water from the facility. This is adequately covered by the Transitional Facility Standard. In addition, such a requirement is difficult to directly address in an import health standard, but MAFBNZ thanks the submitter for raising the issues.

18.7. SUBMISSION 6 – BOB WARD, REDWOOD AQUATICS FISH FARM

Recommendation 1 – To Discontinue Importation of Barbs and Capoeta Species

I simply do not see the rational in this. Whilst Dr McDowell suggested to me that there were species of Barbs that may survive in the environment and procrastinated as to the thousands of species in existence, only a very few Barbs are available to the trade in reality. I enclose a typical catalogue from the largest company in Singapore (by e-mail attachment – copy of their full product range for 2006). Please review the number of fish available, all have entered the over the years and have never been a problem – and not likely to be so. Listing these at specific level should surely solve this concern.

> ***MAFBNZ response:*** Unrelated to disease risks, the *Barbus* spp., *Varicorhinus* spp. and *Barbodes* spp. have been removed from the list of species eligible for importation. This followed extensive consultation on the permitted list within government, and with external stakeholders. The species were removed for environmental reasons. As an alternative to a complete ban on *Puntius* spp. and *Capoeta* spp. a number of other import measures for identified high risk species will be suggested. The presentation of a number of alternatives does not preclude the removal of the species form the permitted list, should that prove to be the only viable option.

Recommendation 5 – Releasing fish into the Wild

I do not see the New Zealand Fish Clubs being the ideal source for education of fishkeepers. They would represent only a small percentage of the total number of people keeping fish. If real concerns can be produced, advertising like I saw in the local newspaper where a whole page was used for a small message asking the public for help over the Didymo Algae situation should be used. If education as to environmental risk is to be advertised it should follow the same pathway as noxious plants and weed using schools, news media and compulsory posters at pet specialist fish centres (for the want of examples). I feel the DOC have more to concern themselves with in retaining the indigenous wildlife and in respect to justify such concerns about the release of tropical fish species. They would have to address the presence of the trout and this would be somewhat paralleled with the recent upsurge of concern over the importation of organisms on corals etc including the ongoing destruction of this very small and seemingly harmless activity where the material is in total isolation from the natural environment throughout its life time. The concept of some aquarist taking an invertebrate to the sea and releasing it – the risk would have to be measured against the real threats such as shipping birds, natural global changes and especially the total unknown quantity of what is present in existing marine environments. Anyway, I support this with the knowledge of recent research vessels operating off the New Zealand coast discovering 300 new species of fish and invertebrates. Also a Fiordland marine reserve house countless exotic invertebrates that were not classified as pest organisms but more so as a rare niche – to be protected!

> ***MAFBNZ response:*** This is, as always, a contentious issue. It is recognised that responsible aquarists understand the importance of not releasing imported aquatic animals. There are, however, populations of feral animals that must have been released from captivity at some time, and thus there is evidence that the practice occurs. However, once again, this is not an issue that can be addressed directly by an import health standard. MAFBNZ notes the submission in this instance.

Recommendation 8 – Cumulative Mortalities of 20% or greater occur

Would need to be evaluated as to the cause of the mortality before dispatching for analysis. A lingering loss rate of far less than the percentage loss required could be of more concern. For example: a sudden water change on a tank system would create an ionic change, pH rise from say pH5 to pH7 – the shift in NH4+ to NH3 would represent on of the most significant killers of fish in long periods of containment. By definition, this could be described as a disease requiring notification. Compare the mortality with a tank of Ramirezi, I will use this fish as an example as it's mentioned in the risk analysis. Over a period of six weeks you may lose one fish a day. There may be periods where no fish are lost but the loss rate is sometimes seen to be 99% never 100%. Over the years and having listened to my customers as a base for information, I have been able to trace such fish losses back to suppliers. This surveillance has worked very well in establishing whether fish have been retained for the quarantine required period of six weeks or showing that shipments have been milked over that period do not see the customary six weeks. This sadly has been the case over all these years. After recent criticism with the local inspector I was able to demonstrate this very clearly at the Christchurch Port of Entry where basic procedures were not being conducted.

> ***MAFBNZ response:*** MAFBNZ thanks the submitter for their views on the trigger levels for diagnostic testing. It is agreed that it is virtually impossible to set a mortality level that will be both sensitive and specific for exotic disease. The idea of inspector discretion is particularly interesting, as this must form some basis for making a decision to sample or otherwise, however, it is also useful to have broad guidelines, which would include mortality rates. The intent is not to force testing where there are clear and documented environmental issues. The onus, in that case, must, however, be on the facility operator to run their facility and keep such records/samples that can adequately demonstrate that mortalities are due to environmental factors. However, disease testing is an important part of building up a critical mass of intelligence on the health if animals being imported from various suppliers outside New Zealand.

Recommendation 9 – Increasing the Containment Period to four weeks for Marine Fish & Accompanying Health Certificate.

I do not read anywhere the reasons why obviously little consideration would be given as to nutritional requirements and system management. Also to hold corals for four weeks when no other country in the world has this requirement only shows the contemptuous ability to over react to other issues. It's interesting to note when all the work was done in assessing the conditions for import in the formation of the NASS standard that it was decided in the wisdom of the regulations not to require the holding of invertebrates on entry. They could be released on arrival and it was only three months down the tract that they changed their minds, largely because of one Auckland importer who considered he could import what he liked into the country anyway.

The reference to Health Certificate is an interesting one. These documents normally accompany shipments but have been discredited by the authorities here. I see little point in accepting them now to justify a reduction in the containment period. Companies, such as the one I am supplying a catalogue from (by e-mail attachment), operate to ISO Standards (ISO14001, ISO9001) which may improve the ability for a shipper to transmit livestock in better condition reducing mortalities. At the end of the day one would expect to have live healthy fish available at the end of the containment period not fish that were prone to percentile loss factors.

> ***MAFBNZ response:*** The submitters views on the length of quarantine is noted gratefully, as are the views on the significance of health certification. For

health certification to provide significant risk management, it is necessary that pre-export handling of the fish is well understood and that fish populations are controlled appropriately, either in closed populations or in separate batches from the time of sampling until export. This needs to be assessed by MAFBNZ in any decision to use health certificates.

Page 28-29. Pseudogastromyxon is entering the country and is not listed in the import standard. It is also listed on the provisional list for evaluation. I made reference to this some years ago and a letter was suppose to be forth coming from Import Management to importers relating to gift additions. I was unsure what the reference meant and assumed that this was the importers reason for importation. This fish was to continue being imported right up until recently. This is an example of a fish species, which would be of interest to DOC, as people who keep goldfish bowls use this fish as a cleaner fish – it survives to low temperatures.

MAFBNZ response: *Pseudogastromyxon* sp. is included in the new list.

Page 30. 3.3 - "From taxonomic paper only" – this statement also would at previously mentioned cover the inadequate surveillance over the years for internal assessment of disease risk.

MAFBNZ response: This statement relates to organisms that have not been a cause of clinical disease, however their presence is being reported. As reports on individual organisms are invariably few in number, and the aquatic animals are not apparently disadvantaged by the presence of the organism, it is appropriate to note these facts in assessing the significance of the organism.

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Page 36. 3.3.4 - Whilst Hexmita, Icth, Tetrahymin, Trichodina are deemed not to be of concern, they represent a significant threat to the fish keeper. Brooklynella is a serious problem in marine Clown species.

The reference to goldfish and the significant threat to the environment is worthy of mention. I had applied to import brood stock in the 1980's proceeding with rigorous enquiries with various countries to support my application. This ended up being chastised by the New Zealand Embassy in Japan for submitting draft regulatory documents. For assessments at this point I was advised to leave it to the regulatory authority to do the necessary enquiries. Sadly, that was the end of it, no conclusion to the application was ever forthcoming. The proceeding years simply saw goldfish entering the country through the importation of tropical fish. I did notify MAF on occasions regarding this but little was ever done about it. I still work with my original goldfish stock for our humble number of varieties, as I am of the opinion, due to the induction of un-monitored fish coming into the country over the years I am somewhat suspicious that Furunculosis is now present in the country.

Page 41, 3.3.6 – Reference to Benidenia should be of concern to the marine specialist. It represents a significant pest and is difficult to detect. It is difficult to eradicate being a monogeneon. In recent time I have had the help in identifying the particular species, Liaising with Dr Ian D. Whittington (Senior Research Scientist, Parasitology Section, The South Australian Museum).
Grynodactilids and Dactyloayroids would be the scourge of the goldfish supplies in this country following by Costia and Trichodenia. The reference to being treatable is, from my experience, incorrect to the point that it is impossible to eradicate it but it may be controlled.

The best solution is not to have it in the first place. Hence, the need for good animal husbandry through the breeding and containing process.

> ***MAFBNZ response:*** The organisms listed in this part of the submission are ubiquitous agents, already present in New Zealand. As such they cannot be considered in a risk analysis, nor be a subject of import health conditions unless there is a control programme in place in New Zealand. None of the agents listed is under official control, thus they cannot be considered in the import risk analysis. As regards furunculosis, there is ongoing testing for this bacterium in samples submitted within New Zealand, and it has never been isolated.

18.8. SUBMISSION 7 – ALOIS WOLLONER

1 Introduction
This submission is in response to the "Import Risk Analysis: Ornamental Fish" published by the Ministry of Agriculture and Forestry, 2nd November 2005. In particular it discusses the realities of the industry from the perspective of importers, retailers, as well as hobbyists in general, focusing exclusively on ornamental marine fish.
It is my view that the prepared analysis and accompanying recommendations with regard to marine ornamentals are unjustified and would certainly result in further unnecessary losses during the importation of ornamental marine fish, while providing little improvement to the detection and prevention of the spread of new organisms into New Zealand.
One important consideration in analysing the risk of new organisms entering the New Zealand environment, is that the animals imported in the industry are exclusively tropical species. None of which can survive the temperate waters around New Zealand, even in the far north of the North Island.
The fact that importation of ornamental marine fish has occurred for over thirty years, at times virtually unregulated, without a single recorded incursion, is a strong indication of the low risk that this industry poses to the New Zealand environment.

> ***MAFBNZ response:*** The submitter's views are noted. The points raised have been taken into consideration in the preparation of the risk analysis. the risk analysis has been founded on robust scientific data to meet our obligations under the SPS Agreement.

2 Inaccuracies and Contentions
This section will correct and clarify some information included in the published risk analysis based on my experience and knowledge of the industry.
Pre Export Measures (Section 5.2.2)
"One of these is a requirement that all ornamental fish undergo a period of preexport isolation for a period of 2 weeks, as is required for imports into Australia."
This is impossible to regulate, and not a reliable way of reducing unwanted organisms entering the country.
Exporters don't have the facilities, nor incentive to hold fish for that period of time. Most marine fish are held for three to four days in order to clear their digestive system, to minimise fouling of the bag water during transport, and then exported [1]. I import from Indonesia, Vanuatu, Solomon island, Fiji, USA, and Tonga, and would be sceptical that even if pre-export isolation period was required, that it would be implemented by overseas exporters.
"To be consistent with the recommendations of the OIE Aquatic Animal Health Code (OIE, 2005), ornamental fish should be accompanied by an international aquatic animal health certificate for live fish, signed out by the exporting countries competent authority, which indicates the fish are free from specified disease agents and are sourced from populations or zones free from specified disease agents."
Health certificates occasionally accompany marine shipments, however this information is not necessarily available upon shipment arrival, nor is it necessarily an accurate reflection of the health of the arriving fish. It is an unnecessary requirement, as importers are not going to continue to use exporters whose stock is not in good health. It only adds to their expenses due to increases in mortality rates. Health certificates in themselves are meaningless, they are simply signed on export at the originating country irrespective of the health of the fish set for export. In general trying to implement pre export measures will more than likely be

ineffective in achieving the desired aims, unless approached as a multi country industry movement.

> ***MAFBNZ response:*** The submitter's views are noted. For health certification to provide significant risk management, it is necessary that pre-export handling of the fish is well understood and that fish populations are controlled appropriately, either in closed populations or in separate batches from the time of sampling until export. This needs to be assessed by MAFBNZ in any decision to use health certificates.

Mortality Rate Cuttoff in Quarantine (Section 5.2.3)
"It is suggested that the mortality level at which it is necessary to submit samples be set at 20% cumulative mortality for any fish species during the 6 week quarantine period (including deaths on arrival)."
Sending marine fish for testing for species with mortality rates over 20% is not feasible. Marine fish are not imported in large numbers and most of the time only 2-3 fish per species are imported. Therefore if we import 2 fish and lose 1, then it will bring the mortality rate to 50% for that species so we would have to send the fish away to be tested. This is not practical as it would cost hundreds of dollars per shipment. Charges for the service will have to be covered by the importer who will have add the charges on before selling to retail stores. The impact is that fish prices will be unrealistic high and unsaleable, essentially killing the hobby. Most importers import marine fish as a service, as it is combined with freshwater to offset the costs. I specialise in marine fish only, and to pass the charges on would be unrealistic as mentioned above. Importers profit on marine fish is very low and any further charges are unsustainable as we already pay high MAF cost for no added value. My MAF cost are around $1000 per month which is excessive for the services provided (essentially nothing more than checking fish on entry and exit from quarantine).
A more acceptable recommendation would be to average the mortality rate over the total number of fish in the shipment, rather than over individual species, and testing be performed at the discretion of the inspecting MAF officer.

> ***MAFBNZ response:*** MAFBNZ thanks the submitter for their views on the trigger levels for diagnostic testing. It is agreed that it is virtually impossible to set a mortality level that will be both sensitive and specific for exotic disease. The idea of inspector discretion is particularly interesting, as this must form some basis for making a decision to sample or otherwise, however, it is also useful to have broad guidelines, which would include mortality rates.

Quarantine Period (Section 5.2.4)
"Marine fish in NZ are subject to 3-week quarantine in line with recommendation by authorities in other countries."
This is incorrect. Australia has a one week quarantine period for fish [2]. No other major country has any sort of quarantine period requirements [1]. Fish arrive at a wholesalers and are immediately available for sale. They can be in an aquarists tank within hours of entering the country.
"Indeed, as a precautionary measure it could reasonably be argued that the current 3 week quarantine period for marine fish should be extended to match the 6 weeks for freshwater fish, particularly when considering the low probability of severe pathogens such as Enteromyxum leei being detected in 3 weeks in the absence of an active surveillance programme. However, while there may be some evidence that a longer quarantine period provides additional protection against incursion of some disease agents, if a blanket 6 week quarantine period for both freshwater and marine fish

were too onerous for industry to maintain, consideration could be made to reduce it to 4 weeks for both freshwater and marine fish. ”

Extending the quarantine period for marine ornamentals from three weeks to four weeks is not viable. It may be counteractive to the goals to be achieved. Extending the quarantine period unnecessarily stresses the fish (due to bare tanks and high stocking densities) and makes them more susceptible to disease, and will result in higher mortality rates.
Being the largest importer of marine ornamentals, I have reasonable handle on diseases and my mortality rates are generally under 25%. Other quarantine facilities run around 30% to 50% mortality rate. A significant factor in this is inadequate filtration equipment combined with a limited understanding of keeping marine fish.

> ***MAFBNZ response:*** This submission refers to recommended measure 3 from the import risk analysis, which suggested that quarantine periods for freshwater andmarine fish should be consistent. Quarantine periods should be no more than is justifiable, and where there are variations from a standard minimum period, these should have scientific evidence to support them. This is the approach suggested for any amendment to the import health standard as a result of this document.

Recommended Measures (Section 5.3)
“That Biosecurity New Zealand and ERMA determine which species of ornamental fish were in New Zealand before July 1998. Those not present before July 1998 should not be eligible for import unless approved by ERMA as a new organism.”
The proposal to remove the genus groups and adhere to species is a major ask, as it will remove a large number of fish, which are available to import at present.
I have been working with Jennie Brunton on completing a species list and have found that many fish are missing, as it has not been possible to find all invoices to prove that the fish have previously entered the country. With the permitted list being revised from genus to species specific listings, the availability of a variety of species will be reduced dramatically. This will have a significant negative impact on the hobby in New Zealand.It is concerning that it is easy for MAF/ERMA to revise the allowable list and impractical for importers to add species due to various reasons outlined.I also note that there are many fish that are on the current allowable list that have not been imported as taxonomic classifications of many species have changed, and many importers did not realise that they could be imported.
Could it not be viable that a six month grace period be placed so importers can list more fish that arrive prior to the new list which is currently being formed? This will give importers more time to list current allowable species as it will only be evident that the fish are missing when they go to import the fish concerned. As we all understand it is a tedious and expensive job to list any additional species on the permitted list.It would be appreciated if MAF/ERMA could provide an easy and cost effective solution to add species to the new allowable list, when fish become available by exporters. It will be near impossible to add them back onto the list once removed using the current processes.
Most fish in a genus share similar traits, so it does not make sense that one species be allowed in while another is not. If they share similar traits, then there should be an easy method to get these fish on the new allowable list. I think there is plenty of evidence that the tropical marine species imported for the hobby would not survive in New Zealand waters. Even in the warmer parts of Northland. Most temperature maps I have seen are taken at the surface where water is the warmest, the fact is that most species would have to live 5-10 meters down in New Zealand waters were the temperature is much cooler which means there is even lower probability that they would survive in even the warmer waters around New Zealand. Another

example would be fish that are exported to Australia from Hawaii. Some of these fish are endemic to Hawaii (Yellow Tangs) and I have not seen any recordings of these species living on reef in Australia.

This would suggest that it is more than temperature which would allow a species to survive. Marine fish have been imported into New Zealand for more than 30 years, and to date I am not aware of any tropical species living in New Zealand waters, which would suggest that adding new tropical species is very low risk. Therefore I am in favour of making the whole process of adding new species far easy then the current un workable process.
Some fish are rarely seen on exporters lists due to a number of reasons, and should they become available from any exporter, I would like to order these fish. Currently they are on the allowable list but I am unable to find any invoices for them as for some species it has been two or more years since they were imported. So based on the revised list which has been compiled by invoice evidence, it will not be possible to bring these fish in should I see one on a exporters list as they will not be on the revised allowable list. I would like to know how this will be addressed as it would not be possible to obtain approval in the future due to the current process and costs which are not recoverable.
An idea I have to overcome this is to review the allowable list annually and allow importers to
add species to list which then can be reviewed by ERMA prior to any approval. It also would make any such review easier if maybe FNZAS make the submission on behalf of importers. ERMAs work load will be reduced as they will only be dealing with one entity. If this was not possible I would like to assist in this area as I have vast amount of experience and expertise and this is highlighted by the fact that I am the only person to add additional species to the allowable list as it is daunting process for most. I have given Jennie Brunton a list of all Marine species which are not on the current permitted list. I have found that many species are not new species as I have found them on importers invoices dated prior to 1998 and believe they should be added to the allowable list and not be listed as a new species.
In terms of any new species found in the country at present, I propose that they be also added to the list if photographic evidence is available to prove that they are in New Zealand.
In terms of identifying all the species of Marine fish I am happy to provide my expertise by forming a catalogue on all allowable species with photographs so that fish can be easy identified and provide clarity to all importers. It would be a good idea if we have a alphabetical list and a list which list fish in there common family name, eg, tangs, angels etc. The reason for this is that most overseas exporters list fish in these groups so it will be easy to identify if these fish are allowed in or not.
Could it be possible that the whole allowable list be redone in a common sense approach. As mentioned, I don’t have any idea why we are allowed some species and not others. Does it really matter that they have never been in before? Especially if they are the same genus and share the same traits.
I understand that the current list was just made up from someone coping an old book which overlooked numerous species which are now not allowed in, there is no logical reason why they are not allowed in.
Surly MAF/ERMA and importers could worked together on this to come to some common sense approach. Having a disallowed list would be more proactive and the focus can be on stopping unwanted species from arriving.

> ***MAFBNZ response:*** This submission refers to recommended measure 2 from the import risk analysis, which suggested that those species not present in New Zealand before July 1998 should not be eligible for import. As regards this point, the submitters views are noted, however, there are clear legislative requirements

whereby new species require an approval from ERMA before being eligible for import. A disease based risk analysis cannot alter that requirement.

3 Quarantine Period

In reading the review I see no compelling reason which would support a case to increase the quarantine period for marines from three weeks to four weeks. Other countries in the world are at more risk due to their climate and local water temperatures. Even Australia which has tropical reefs which could potentially be compromised only require a seven day quarantine period. The United States have tropical reefs which are also likely to be at higher risk than New Zealand waters, yet they have no quarantine period at all. Even with the volumes they are importing (many thousands of fish per week), no impact has been felt by reefs or surrounding waters, even those close to high population area, such as the Florida Keys.

Would it not be more informative to approach countries like Australia and USA and find out why they have such short quarantine periods as the risks posed to the tropical reefs around those countries is surely far significant, than the risks posed to the temperate marine waters around New Zealand. I envisage MAF would have contacts in these countries to support a reduction rather than increase in quarantine period for marine fish in New Zealand. I would recommend that the quarantine for marines be reduced to two weeks, and if the mortality rate after two weeks is greater than 25% then fish should then be required to remain in quarantine for a further week, bring the period to three weeks in total in such a case. The rational behind this is that many quarantine facilities are sub standard and do run the risk of higher diseases. I am sure this can be verified by MAF as mortality rates are reported monthly. With this in mind, more facilities would spend the money required to bring facilities up to acceptable standards, or alternatively halt importation of marine fish and concentrate on freshwater with it's larger market and higher margins.Marine fish are individually bagged which results in far higher freight costs than freshwater fish which could have over 100 fish in a bag thus reducing overall price of the fish. Increasing the quarantine for marine fish is likely to prove too onerous for the industry in terms of additional losses and cost, such that it becomes impractical to import. Effectively killing the hobby in New Zealand. Already we are faced with higher freight cost, and MAF costs which have put pressure on the market. Any further significant costs in the importation will make it not longer viable.

MAFBNZ response: See response above regarding quarantine periods..

Some factors which affect mortality rates have been omitted from the analysis. Many fish die of starvation as housing them in bare tanks is not practical for such a period, especially smaller fish that live in sand like gobies, blennies etc.

In terms of my disease control it is very frustrating that MAF have a concern for diseases but have no interest in how they are treated. There are a very limited number of treatments available as the cost to get treatments approved is ridiculous and the fees are unrecoverable in a market as small as the marine ornamental fish market is. Most treatments currently available form retail stores don't have a licence to be sold so it means we don't have any approved treatments available. Any there are many common medications which can not be obtained here due to excessive and impractical regulation. This is a serious matter, which needs to be addressed by MAF.To further protect New Zealand from diseases I would recommend that MAF do random visit to retail stores every month. With the possibility of data collection of mortality records for retail stores. This will just be another way to prevent the spread of diseases or at least be identified early.

MAFBNZ response: MAFBNZ understands that a lack of efficacious medicines may be a source of frustration to the industry, however, the unpermitted use of medicines in a quarantine period is contrary to the purpose of the quarantine, in that treatment may result in carrier animals being released from quarantine. MAFBNZ is not responsible for approval of veterinary medicines. The submitter is referred to the New Zealand Food Safety Authority. In addition, under a code of practice, registered veterinarians may prescribe compounds for use in aquatic animals, especially ornamental species, that are not specifically licensed for their use.

4 MAF Inspections
The current system with pickup from Auckland airport involves all containers being sealed by MAF staff with official MAF sealing tape. They are not opened at the airport due to time constraints and staff limitations at MAF. These containers are then transferred to our facility in an approved vehicle. On arrival at our facility a MAF Inspector is present to check the integrity of all seals and witness the shipment being unpacked. MAF staff again checks the fish prior to release. The whole process is not cost effective and seems little value to all concerned.
A suggestion would be once import facilities have established credibility with MAF (say 2-3 years) that the process becomes stream lined, thus allowing MAF to focus on more important issues and making if far more cost efficient for importers. I could see more value if MAF would inspect the fish only prior to being released as at this time they can check the fish condition and identify fish etc. During the two week proposed quarantine period, MAF could also check invoices and cover any issues with importers. MAF could also do random checks, and I would be in favour of harsh penalties should any major discrepancies accrue. I do import a number of dry goods and I dont see customs checking the goods at the airport and them coming to my house to inspect them once I take them out of the box. Another important consideration would be to make the allowable list more workable as outlined, and detail major species which are not wanted, for example moray eels, sharks and other invasive species. This would cut out a lot of red tape, while maintaining the security of New Zealand's natural environment.

MAFBNZ response: The requirement for the inspection of aquatic animals on arrival in New Zealand is consistent with the treatment of all live animal imports.

5 The Use Of Natural Seawater
There are a large number of quarantine facilities and retail outlets using natural seawater (NSW) collected from the beach. In terms of disease risk and control it would be prudent to ban this practice and require all facilities to use artificial salt water (ASW). This would reduce the risk of pathogens and bacteria entering and exiting quarantine facilities.
I have done a few experiments using NSW. When using NSW I found that fish would often develop either bacteria problems or parasites. In view of this, it would be prudent for MAF to ban the practice of using NSW in quarantine facilities or retail outlets.

MAFBNZ response: The purpose of the import risk analysis, and import health standards resulting from it, is to reduce the likelihood of an exotic disease entering and establishing in New Zealand. Any diseases or parasites picked up from the use of natural sea water will already be present in New Zealand. It would be inappropriate for the risk analysis to comment on these conditions. However, it si noted that a best practice operation would not use unsterilised natural sea water.

6 Education
Education is an important factor which at this stage is not existent. Diseases are difficult at

times to detect and information on them is very limited.
It is proposed that an annual seminar is held in Auckland, or other main centre, which would entail discussing fish diseases and treatments. It could cover both retail shops and quarantine facilities. Currently there is nothing available in New Zealand to educate quarantine owners and retail keepers.

MAFBNZ response: MAFBNZ notes the submitters views with interest, however, this issue cannot be directly addressed in an import health standard.

18.9. SUBMISSION 8 – RICHARD WOOLLEY, HIGHWAYS FISHERIES LTD.

1. *That temperate and sub-tropical cyprinids (the genera Barbus, Puntius, Varicorhinus, Barbodes and Capoeta) should no longer be eligible for import.*

That was easy. It is noted that the references to the disease agents found are quite old. Is this because the diseases have not been causing problems or were they isolated occurrences?

Try & narrow the list down at least instead of scrubbing a good chunk off our business.

> ***MAFBNZ response:*** Unrelated to disease risks, the *Barbus* spp., *Varicorhinus* spp. and *Barbodes* spp. have been removed from the list of species eligible for importation. This followed extensive consultation on the permitted list within government, and with external stakeholders. The species were removed for environmental reasons. As an alternative to a complete ban on *Puntius* spp. and *Capoeta* spp. a number of other import measures for identified high risk species will be suggested. The presentation of a number of alternatives does not preclude the removal of the species form the permitted list, should that prove to be the only viable option.

2. *That Biosecurity New Zealand and ERMA determine which species of ornamental fish were in New Zealand before July 1998. Those not present before July 1998 should not be eligible for import unless approved by ERMA as a new organism.*

This comment is totally irrelevant. How can a date (1998) cause a risk of introduction of disease?

> ***MAFBNZ response:*** This submission refers to recommended measure 2 from the import risk analysis, which suggested that those species not present in New Zealand before July 1998 should not be eligible for import. As regards this point, the submitters views are acknowledged. There are clear legislative requirements whereby new species require an approval from ERMA before being eligible for import. A disease based risk analysis cannot alter that requirement.

3. *That the post-arrival quarantine period should be consistent for both freshwater and marine species.*

I disagree. The period for marines should be reduced to 2 weeks. The main cause of mortalities in marine fish is actually the stress caused by shipping & the vast variations in water parameters. Reducing the period from 3 to 2 weeks would actually increase the survival rate as water quality would improve.

> ***MAFBNZ response:*** MAFBNZ thanks the submitter for their views on the appropriate length of the quarantine period, which will be taken into consideration when risk management measures are suggested. Quarantine periods should be no more than is justifiable, and where there are variations from a standard period, these should have scientific evidence to support them. This is the approach suggested for any amendment to the import health standard as a result of this document. The submitter should also note however, that the purpose of quarantine is to maximise the chances of an exotic disease being clinically expressed, rather than maximising the survival rate of the imported fish *per se*.

4. *That Biosecurity New Zealand develop appropriate training resources about the identification of fish species and the diagnosis of key diseases for MAF Quarantine Services Biosecurity Officers, supervisors and operators of Transitional Facilities.*

Long overdue.

> ***MAFBNZ response:*** This submission refers to recommended measure 4 from the import risk analysis, which suggested that training resources in fish identification should be developed for quarantine supervisors and operators. Ideally a comprehensive resource would be made available to all persons involved in the importation of ornamental aquatic animals to assist in the identification of species. The importance of this resource is recognised, however, it is impossible to address this directly in an import health standard and instead all stakeholders should be aware that the issue is recognised as an operational issue and DNA/molecular tools are planned to assist in the identification of high priority species.

5. *That Biosecurity New Zealand work with the Department of Conservation to inform the Federation of New Zealand Aquatic Societies of the need to actively discourage their members from releasing unwanted fish into the wild.*

Good luck.

> ***MAFBNZ response:*** This submission refers to recommended measure 5 from the import risk analysis, which suggested that government agencies should work with the Federation of New Zealand Aquatic Societies (FNZAS) to discourage their members from releasing fish. This is, as always, a contentious issue. It is recognised that responsible aquarists understand the importance of not releasing imported aquatic animals. There are, however, populations of feral animals that must have been released from captivity at some time, and thus there is evidence that the practice occurs. However, once again, this is not an issue that can be addressed directly by an import health standard. MAFBNZ notes the submitters views in this case.

6. *That Biosecurity New Zealand work with the Ministry of Health to inform retail outlets selling ornamental fish of potential public health issues.*

You will never stop a two year old from putting their hand in their mouths.

> ***MAFBNZ response:*** This submission refers to recommended measure 6 from the import risk analysis, which suggested that government inform retail outlets selling ornamental fish of potential public health issues. As above this issue cannot be addressed directly in an import health standard.

7. *That targeted passive surveillance be conducted for the following disease agents: aquabirnaviruses, iridoviruses, grouper nervous necrosis virus, viral haemorrhagic septicaemia, Edwardsiella ictaluri, Edwardsiella tarda, Lactococcus garvieae, Aphanomyces invadans, Enteromyxum leei, Glugea heraldi, Bothriocephalus acheilognathi, Capillaria philippinensis and Argulus foliaceus.*

This sounds like a fishing expedition and should be at MAFs expense.

MAFBNZ response: The requirement for passive surveillance in the diagnostic laboratory for the listed hazards is a risk management measure suggested by the risk analysis. It is a requirement that samples are submitted when certain mortality levels are reached. This measure was designed to guide the diagnostic laboratory in the range of significant exotic pathogens that required to be ruled out. As diagnostic testing is an integral part of risk management associated with the import of live animals, the cost lies with the importer. This is completely consistent with all other live animal imports.

8. *That when cumulative mortalities of 20% or greater occur among any species of imported ornamental fishes during quarantine, suitable samples (moribund, freshly dead, or 10% formalin-fixed) must be sent to the Investigation and Diagnostic Centre (IDC) of Biosecurity New Zealand, or a laboratory regarded by them as competent.*

I have tried this testing approach & the results have returned as No Significant Finding. I have also been told that the nearest diagnostic vet trained in ornamental fish is in Australia so I fail to see where the benefit of this suggestion.

With the blink of the eye, one can experience a total loss in a tank within 24 hours. The cause of death can be painfully obvious.
Are we expected to submit these fish for testing & waste the time of the IDC staff?

MAFBNZ response: MAFBNZ thanks the submitter for their views on the trigger levels for diagnostic testing. It is agreed that it is virtually impossible to set a mortality level that will be both sensitive and specific for exotic disease. The idea of inspector discretion is particularly interesting, as this must form some basis for making a decision to sample or otherwise, however, it is also useful to have broad guidelines, which would include mortality rates. The intent is not to force testing where there are clear and documented environmental issues. The onus, in that case, must, however, be on the facility operator to run their facility and keep such records/samples that can adequately demonstrate that mortalities are due to environmental factors.

9. *That the post-arrival quarantine period may be reduced for both freshwater and marine fish from 6 weeks to 4 weeks, provided that consignments are accompanied by an international aquatic animal health certificate for live fish, signed by the competent authority in the exporting country, stating that the fish are free from specified disease agents or are sourced from populations or zones free from specified disease agents.*

Hooray.

MAFBNZ response: Agreement noted.

10. *That for consignments where the post arrival quarantine period is reduced to 4 weeks, the cutoff cumulative mortality rate for the taking of samples be reduced to 10%.*

Does the IDC have the resources available for the onslaught of testing they will have?
This will basically destroy the ornamental fish industry which could be classed as obstructing our business to which we would have strong objections.

MAFBNZ response: Noted. See response to 9. above.

11. *That aquarium water from the quarantine period must be disinfected prior to disposal.*

It would be great if you could spell it out & be specific.

MAFBNZ response: This submission refers to recommended measure 11 from the import risk analysis, which dealt with disinfection of water from the facility. This is adequately covered by the Transitional Facility Standard. In addition, such a requirement is difficult to directly address in an import health standard, but MAFBNZ thanks the submitter for raising the issues.

19. Appendix 2: Copies of submissions

19.1. SUBMISSION 1: DR PETER CATTIN, UNIVERSITY OF AUCKLAND

Submission by the University of Auckland to the MAF Import Risk Analysis: Ornamental Fish

Date: 25 November 2005

Submitters:
Dr Peter Cattin, School of Biological Sciences (SBS)
Associate-Professor Don Love, School of Biological Sciences
Associate Professor Phil Crosier, Faculty of Medical and Health Sciences (FMHS)
David Jenkins, Biological; Safety Officer, University of Auckland
Richard Swain, Operator, FMHS Containment Facility
Sandra Jones, Operator, SBS Containment Faciliy

A. Preamble

1. Zebrafish (*Danio rerio*) is used as a vertebrate model to analyse the role of genes that control development and disease. The ability to produce large numbers of fertilised ova, the translucent embryo, its rapid growth and the fact that it does not require stringent conditions for survival make it an ideal organism to study the role of a gene expression in vertebrate development and disease.
2. The relative ease of generation of transgenic, 'knock down', 'knockout', 'knockin' fish as well as the ability to study the effect of morpholino oligonucleotides, si RNA and Peptide Nucleic Acid on gene expression on a 'real time' basis, make the zebrafish an ideal model for study.
3. The relatively small size of the zebrafish embryo, and for the reasons outlined above, it is it is also possible to use zebrafish embryos in automated screening arrays.

B. Recommendations of the MAF Import Risk Analysis

1. The Import Risk Analysis examined the disease agents that met a variety of criteria to classify them as risk agents and then examined whether the ornamental fish species were probable vectors.
2. The Import Risk Analysis noted that freshwater tropical fish are often sourced from developing countries and may undergo considerable stress as a result of overcrowding, extended periods of travel in confinement and poor handling practices. Such fish may be prone to becoming vectors for a variety of disease agents.
3. Recommendation 1 of the Import Risk Analysis proposes that temperate and subtropical cyprinids would no longer be eligible for importation.
4. MAF has confirmed that the descriptor 'temperate and subtropical cyprinids' would include *Danio rerio.*

5. This recommendation is based on a number of assumptions. Firstly, that imported ornamental fish will inevitably be released (s 5.2.5), secondly that the identification of high risk species at the border would be difficult (s 5.1) and finally that pre-export measures would be too onerous to ensure proper compliance (s 5.2.2).
6. That quarantine periods be shortened where appropriate.
7. That aquarium water be disinfected prior to disposal.

C. University of Auckland Zebrafish Facilities

1. The University of Auckland has 2 zebrafish facilities. One facility has a 2000 tank capacity and the other a 300 tank capacity. The typical number of fish per tank is 10. These facilities are therefore capable of housing 20,000 and 3,000 fish, respectively.
2. Water quality is assured by passing tank water up to 20 times an hour through a variety of depth filters and final treatment by UV sterilisers. UV sterilisers have audible and visible alarms monitoring the status of the UV tubes.
3. Additionally, pH and salinity are regularly monitored.
4. In the case of zebrafish nursery system, the water is continuously filtered to 0.2 microns absolute.
5. The facilities are sealed and bunded to prevent escape of water. Entry to each facility is controlled by way of swipe card or individual lock with access restricted to trained personnel only.
6. These two facilities are world class and have cost $500,000 and $200,000 respectively, to construct. Both facilities are operated by experienced full time staff.
7. The facilities are registered against ERMA/MAF Containment Standard for vertebrate GMOs (154.03.03) and MAF Quarantine Standard 154.02.06.
8. The facilities are audited against these standards every 3 months, either as part of an internal audit or as part of the 6 monthly external audit by the MAF Quarantine Service.

D. Importation of Zebrafish into the University of Auckland

1. Transgenic, chemically mutagenised zebrafish or zebrafish embryos are imported into containment from reputable overseas research laboratories typically in the United Kingdom, Australia, Germany and the USA. Each of these facilities operates to a high standard and goes to considerable lengths to ensure the health of their colonies (see 5 below)
2. Each shipment is quarantined, inspected and released as per 154.02.06.
3. Fish are maintained in containment for their entire lives – if the fish are imported, they are released from quarantine into containment, where they remain for the rest of their entire lives.
4. Any diseased fish (imported or otherwise) is immediately quarantined for treatment or it is culled. Considerable efforts are also taken to reduce any unnecessary stress to these fish in recognition of the fact that it leaves the colony susceptible to disease. We do not believe that it is hyberbole to state that because of the huge amount of work involved in generating transgenic fish (at least 100 hours work per strain) the health of the entire colony is zealously guarded!
5. Imported zebrafish are the basis upon which several large public and commercially biomedical research programs are funded.

E. MAF Quarantine Standard 154.02.06

1. Existing MAF Quarantine Standard 154.02.06 for ornamental fish allows for a six week quarantine period with periodic visits by the MAF supervisor (s 6.4). the quarantine facility must be secure (s 4.3 and 4.4, have a method of fish identification (s 4.6), have systems for disease identification (s 4.11, s 6.4.3 and s 6.4.4) and treat equipment (s 4.8).
2. Waste water must be treated by chlorination or UV treatment or discharged to municipal sewer (s 4.9).

F. Submission from the University of Auckland

Our submission is as follows:

1. That Import Risk Analysis should recognise current imports of zebrafish into containment pose very little risk as these fish are sourced from reputable suppliers and imports are approved by MAF on a case-by-case basis.
2. The majority of zebrafish imported into The University of Auckland originate from either the Zebrafish International Resource Centre (ZIRC) in Eugene, Oregon, USA (http://zfin.org/zirc/home/guide.php) or the Tübingen Zebrafish Stock Centre (TZSC; http://www.eb.tuebingen.mpg.de/services/stockcenter/zebraf_stockcenter.html). These centres are US federally-funded or EU-funded and operate under strict fish health operating guidelines. ZIRC and TZSC bleach all embryos that are shipped thus further reducing risk associated with such importation.
3. Any risk analysis should recognise that these zebrafish remain in containment within world class facilities. Fish health is constantly monitored.
4. Any risk analysis should recognise zebrafish importations into University facilities comprise a single species, unlike many ornamental fish imports. The fish can be unambiguously identified and are unlikely to contain adventitious risk organisms. (see B5 above).
5. Existing MAF quarantine standards are reasonably stringent. We support the ability of MAF to shorten quarantine periods where this is appropriate to the risk posed by a particular importation.
6. We believe that current requirements of MAF standard 154.02.06 to treat waste water by chlorination or UV treatment or discharge to sewer are adequate. We note that discharge to a municipal sewer is not the same as discharge to the environment.
7. Treatment options for waste water should allow for UV as per 154.02.06.
8. Any change to 154.02.06 as a consequence to the recommendations of this risk analysis should take into account existing water treatment within the facility (such as routine UV treatment of all water) and disposal to sewer. Any recommendation should allow the Chief Technical Officer to make exceptions rather than impose mandatory disinfection/chlorination of waste water on all facilities.

19.2. SUBMISSION 2: PHILLIP COLLIS: NZ DISUCS

From: "phillip collis" <phillipcollis@xtra.co.nz>
To: <vanginkelm@maf.govt.nz>
Date: 05/12/2005 12:08:33
Subject: Tropical fish Submission

Hi

Im going through AR60-350

Few Points..To Submit.

1. Dont agree..Thousand have already been imported by us even from Brazil.Just a few areas of thermal water have been id as where they could live.There is not a serious problem that i have heard of the justify this.

2. Dont agree as there is total no need. Many fish have no second name except .spp it should be the general family so Maf - Erma must look at latin names here on permitted list and if any name is put forward for Free of Charges. More important is water it lives in.

If entrys are lodged to import a fish under new or old name then that if person is charged then they should have all rights to importing.No one else. I have put forward pages and pages of what i have imported covering about 11 years.I cant be expected to remember all,nor can others as New Zealand Law only insists records held for 7 years.

But also imposible to transfer old names in to new. i cannot yet find actually who gives names or Changes names..
I have in list to Erma noted many changes and double ups.
Even when new list is completed it will still be out of date unless you find name changes that apply. Overseas lists actually are using names that show no where that i have found so must have had name changes while i was not importing..And possibley even fish base is totally out of date.

3. Yes. agree

4. There is only a need to identify if actually Tropical Fish..Cold water cannot be imported now. Is more relevant whats its natural requirements. ie amazon river has only warm water fish that die with out warm water
Diseaes are so low that they dont really warrant millions of dollars. Fish Disease experts are Just not available in nz .

5. That statement is totally out of line..!!! True Fish people do not dump fish into nature..!!

Doubt if any member of NZFAS would even think of doing that.Breeders sell surplus to cover costs..

I am a member of NZFAS and have been in fish business over 30 years.
It can be said that a lot of nz problems were from others even the interduction of many fish were done legally but still caused problems.
Course fishmen that are not of nz origion have released most fish to catch and let go to catch another day.
Look i have white tip spiders ,south african praying mantis,aussie parrots and swallows.paper wasps,germany wasps,possums,rabbits.all in my back yard...they did not get here with out help. Wind blows ,we travel the planet,ships,planes.
So time to get on to the correct issues to remove all those pests.

6. Already done.months age

7. No 4 actually covers that..

8. Deaths of fish after arrival a most likely to be packing problems..in the first week no disease is the cause..ok in week two..yes..but once again back to no.4.we all have our tricks to keep fish alive.. But if we cant keep them alive ..then thats what quarantine is about.. Also it can not be expected of us or others to send samples other than to where your Maf N Z Quarantine Visiting inspecter is based. Refers to 4

9. Actuall 3 weeks is plenty. Has worked well with salt fish so should be no difference with water.

10. Back to 4.. Whats the point .if dead means we just loose money..And often we dont buy from that suppliers again.

11. Not possible.. Most and Including mine are effectively built to discharge to City treatment plants that use Uv as final treatment to bathing standards..
Well my room could only dose water with clorine to out line and that will kill off Watercare plant bacteria.

This is my Submission to..Import risk analysis ; Oramental Fish 2 November 2005

Phillip G Collis

New Zealand Discus

19.3. SUBMISSION 3: WARREN GARRETT, BROOKLANDS AQUARIUM LTD.

19 December 2005

Martin Van Ginkel
Pre Clearance
Biosecurity New Zealand
Ministry of Agriculture & Forestry
PO Box 2526
WELLINGTON

Dear Mr Van Ginkel

RE: IMPORT RISK ANALYSIS: ORNAMENTAL FISH

Thank you for the opportunity to make our submission on the risk analysis study.

Brooklands Aquarium Ltd has been involved in importing tropical fish now for over 30 years. (I myself have been involved with importing fish for the past 20 years.) Over this period we have seen many changes within the industry, and the laws governing the importation of fish. The ornamental tropical fish business is unique and we realise that because of its specialised nature it is difficult for MAF to administer at times.

From a business perspective the ornamental fish industry is commercially significant for the vast number of importers, wholesalers, retail pet stores and aquatic specialist outlets throughout New Zealand. Also from a hobbyist and educational perspective the aquatic industry gives many hours of enjoyment to a vast number of aquarists nationwide.

Our comments regarding the measures recommended are as follows:

5.3 Recommended measures

5.3.1 *That temperate and sub-tropical cyprinids (the genera Barbus, Puntius, Varicorhinus, Barbodes and Capoeta) should no longer be eligible for import.*

- We do not agree with the suggestion that all barbs (Barbus, Puntus, Varicorhinus, Barbodes and Capoeta) should be omitted from the permitted entry list. The barbs represent a vast range of fish, which we have been importing now for over 30 years and have had no significant disease outbreak to date. To remove all barbs is a drastic measure, which would have significant commercial impact on the tropical fish industry.
  Are the references to diseases noted current and what is the true risk these fish represent as a group? MAF need to be more specific in identifying exactly which disease agents and corresponding host species are indeed high risk. The barbs we import are domestically raised rather than wild caught. This also needs to be taken into consideration in making this decision.

5.3.2 *That Biosecurity New Zealand and ERMA determine which species of ornamental fish were in New Zealand before July 1998. Those not present before July 1998 should not be eligible for import unless approved by ERMA as a new organism.*

- Provision needs to be made for importers and other interested parties to submit new species for addition to the permitted entry list even after the current review has taken place. We would suggest that an opportunity be given on an annual basis for any new submissions to be made. The current ERMA provisions are not practical and a workable solution needs to be found. Because the cost of a new species is not high, no importer is going to pay the fees required to have a new fish or group of fish added to the permitted list.

  Also with the work that has been done on the permitted list we would like to see a 6-month period whereby importers and other interested parties can make further submissions, as this list is still far from complete. With the permitted list revision from Genus to Species-specific listings the allowable list stands to be reduced dramatically.

5.3.3 *That the post-arrival quarantine period should be consistent for both freshwater and marine species.*

- New Zealand operates a much longer quarantine period than other countries. Because the risks involved with tropical marine imports are significantly less than with freshwater we think that marine and freshwater species should be treated separately. We believe marine imports should be subject to a 2-week quarantine. In Australia where the risk is far greater than in New Zealand, marines are subject to a 1-week quarantine as they recognise marines pose minimal risk. With marine imports the main reason for moralities are factors such as starvation and water quality issues. Marine fish are very sensitive and difficult to maintain in the aquarium for this reason.

- For freshwater imports we would support a 4-week quarantine period. Australia has a one to three week quarantine for freshwater fish depending on the species. With their tropical climate in northern territories the risk is far greater for them. In my 20 years experience any disease outbreak or significant mortalities in freshwater fish tend to occur within the first 10 days of quarantine. With a 4-week quarantine this gives the importer and the inspector plenty of time to take action should a disease outbreak occur. If there is any concern the MAF Inspector has the authority to extend the quarantine period at his or her discretion.

5.3.4 *That Biosecurity New Zealand develop appropriate training resources about the identification of fish species and the diagnosis of key diseases for MAF Quarantine Services Biosecurity Officers, supervisors and operators of Transitional Facilities.*

- Any training in this area is currently up to the individual importer or MAF officer to undertake independently. Most MAF officers are under trained in the area of fish and disease recognition. To date it has generally been up to the importer to assist in training the MAF officers in this field when the responsibility for this training should be on MAF. Any assistance that MAF can give importers to keep them up to date with key disease management would be well received.

5.3.5 *That Biosecurity New Zealand work with the Department of Conservation to inform the Federation of New Zealand Aquatic Societies of the need to actively discourage their members from releasing unwanted fish into the wild.*

- We support any efforts by MAF or DOC to assist in education of retailers and aquarists. However these must be positive steps to work with rather than against the industry. Without the support and trust of all parties involved such measures are indeed counter productive. It would be worth liasing with the Pet Industry Association (PIA) as they may be able to assist in networking with member retail stores.

5.3.6 *That Biosecurity New Zealand work with the Ministry of Health to inform retail outlets selling ornamental fish of potential public health issues.*

- Same as above (5.3.5)

5.3.7 *That targeted passive surveillance be conducted for the following disease agents:aquabirnaviruses, iridoviruses, grouper nervous necrosis virus, viral haemorrhagicsepticaemia, Edwardsiella ictaluri, Edwardsiella tarda, Lactococcus garvieae Aphanomyces invadans, Enteromyxum leei, Glugea heraldi, Bothriocephalus acheilognathi, Capillaria philippinensis and Argulus foliaceus.*

- Our main concern with this is who would be expected to fund this testing and where would sample populations be taken from? The importers cannot be expected to fund these activities should MAF wish to undertake them.

5.3.8 *That when cumulative mortalities of 20% or greater occur among any species of imported ornamental fishes during quarantine, suitable samples (moribund, freshly dead, or 10% formalin-fixed) must be sent to the Investigation and Diagnostic Centre (IDC) of Biosecurity New Zealand, or a laboratory regarded by them as competent.*

- The suggestion that it should be necessary to submit samples if the cumulative mortality of any species exceeds 20% during the 6-week quarantine period is not practical. Losses of 20% or greater can be incurred due to stresses in shipping, water chemistry changes, poor water quality along with many other simply explained scenarios. Any such testing should certainly not be mandatory but <u>at the discretion of the MAF Inspector</u>. This is because it is important to weigh up the circumstances in making up such a decision. In our past experience any such testing has been non productive. Such testing would be at a significant cost, which of course would be passed on to the importer. Have the logistics and costs of introducing such measures really been thought through? Will this testing serve any real purpose and are there persons truly qualified in this specialised field of research at IDC?

- If this mandatory mortality rate was set at 20%, would this mean that if we brought in 5 show size discus worth $250 wholesale and 1 was DOA due to a punctured bag we would have to send samples away for testing? Or if we brought in 2 clown triggers worth $300 wholesale and 1 was to die after 7 days quarantine due to ammonia poisoning/water quality issues we would then have to send the other away for lab testing? From a commercial perspective the importer would incur both the expense of the fish lost as well as those fish sent for testing along with associated costs. Unless the MAF Inspector decides that lab testing is necessary we cannot see the point in sending samples for testing in such a situation.

5.3.9 *That the post-arrival quarantine period may be reduced for both freshwater and marine fish from 6 weeks to 4 weeks, provided that consignments areaccompanied by an international aquatic animal health certificate for live fish,signed by the competent authority in the exporting country, stating that the fish are free from specified disease agents or are sourced from populations or zones free from specified disease agents.*

- We certainly agree that the quarantine period for freshwater fish should be reduced from 6 to 4 weeks. However the suggestion that a health certificate should accompany all imports is commendable in theory, but this certificate is generally not worth the piece of paper it is written on. In the Asian markets these certificates are easily obtained, and are simply an additional cost to the importer. Issue of such health certificates has more to do with bureaucrats collecting revenue than with the health and well being of the fish. As an importer we have a business to run and it is in our best interests if we wish to succeed to deal with those exporters who offer fish of the highest health standard.

- Regarding the pre-export isolation of 2 weeks. To be honest such measures would be detrimental to the health of the fish rather than beneficial. To hold fish in crowded aquariums, without food and in poor water conditions for an additional 2 weeks is going to have a negative impact on their health. The best chance of survival these fish have is to move them out quickly to minimise stress. Again many exporters would issue such a certificate stating they had been quarantined for 2 weeks, without actually holding the fish for 2 weeks.

-

5.3.10 *That for consignments where the post arrival quarantine period is reduced to 4 weeks, the cutoff cumulative mortality rate for the taking of samples be reduced to 10%.*

- A 10% cut-off for cumulative losses is unrealistic. Losses as high as this can occur in shipping and stresses in transit with some shipments. Such measures would create logistical nightmares for not only the facility Operator but also the MAF Inspectors. Do IDC have the resources to undertake this testing nationwide? There is also the question of who will pay the costs involved and more importantly will it actually serve any real benefit to the industry? Again we say that the MAF Inspector must have some discretion in making any such decision given the circumstances.

5.3.11 *That aquarium water from the quarantine period must be disinfected prior to disposal.*

- The treatment and disposal of wastewater is a difficult area to cover. Firstly once the quarantine period is over, and the fish have been moved from the quarantine area, why is it necessary to disinfect the water in the holding tanks or the water sent to waste? Surely the fish released from quarantine in themselves pose an equal if not greater risk of carrying disease agents than the water itself? Also one must remember that we are dealing with fish – not poultry, sheep or cattle. An aquarium and its fixtures are populated with vast populations of beneficial nitrifying bacteria responsible for breaking down toxins in the aquarium. Fish simply cannot live under the sterile conditions, which one would create if they were to disinfect all aquariums filters and other equipment in between shipments.

- In theory the treatment of wastewater with disinfectants such as chlorine may seem a good option but it is not a practical solution when dealing with large volumes of water. The current standard allows wastewater to enter directly into an approved municipal sewerage system, approved septic tank, or other approved disposal system. Alternatively, wastewater shall be treated by chlorination or with ultra-violet light.

5.2.1 *Rationalisation of the permitted species list*

- The suggestion that one or two Biosecurity NZ officers at Auckland and Christchurch airports should be trained to recognise many species on the permitted list sounds logical in theory, but is hardly a practical scenario. Shipments arrive at the airport in dark sealed polystyrene boxes. Firstly, the fish are stressed and will not be showing their true colouration. The water in the bags is often polluted and hard to see through. Even to an expert such as myself, with 20 years experience, identifying fish in this situation can be very difficult. I cannot see how a Biosecurity NZ officer can be trained to perform such random checks and accurately identify each species at the airport. Secondly, time is critical in fish transportation and any further delays such as these random checks will be detrimental to the well being of the shipment. To suggest that the FNZAS might assist with this training is unrealistic. They simply do not have the resources or expertise to conduct such training.

  Our current system with pickup from Auckland airport involves all containers being sealed by MAF staff with official MAF sealing tape. They are not opened at the airport due to time constraints and staff limitations at MAF. These containers are then transferred to our facility in an approved vehicle. On arrival at our facility a MAF Inspector is present to check the integrity of all seals and witness the shipment being unpacked. Once the fish have been released into their tanks and had time to acclimatize their colour will start to become apparent. At this point the MAF Inspector should identify and check the species imported.

Thank you for giving consideration to our views on the import risk analysis for ornamental fish.

Yours Sincerely

Warren Garrett
General Manager
Brooklands Aquarium Ltd

19.4. SUBMISSION 4: ROBERT JOHNSTON, MINISTRY OF FISHERIES

20 December 2005

File Ref: 25/7/1

Martin Van Ginkel
Pre Clearance
Biosecurity New Zealand
Ministry of Agriculture and Forestry
P O Box 2526
WELLINGTON

Dear Martin

Import Risk Analysis: Ornamental Fish

I refer to your letter dated 4 November 2005 requesting comment on an import risk analysis for ornamental fish.

Thank you for providing an opportunity for the Ministry of Fisheries, as an interested party, to comment on this risk analysis.

I sought comment on the analysis from a number of business groups within MFish. The following submission draws on comments from Steve Pullan, Fisheries Analyst in our Operations group, and Julie Hills, Senior Scientist. Steve and Julie have both had extensive involvement in aquaculture issues. Steve also has a background in ornamental and tropical fish identification.

I understand that Julie has spoken to Mike Hine about this issue and that she supports his recommendations in the report. Mike has taken Julie's concerns about marine stocks into account. She fully supports the document and its recommendations.

Following are some specific comments provided by Steve Pullan on the recommendations. Steve was a senior member from 1972 to 1990 of the MAF Exotic Fish Unit, which was responsible for identifying imported fish species and identifying disease problems during quarantine of ornamental fish and recommending a course of action.

That temperate and sub-tropical cyprinids no longer be eligible for import

This recommendation relates to a group of fish that hobbyists collectively call Barbs. These are a hardy group of fish and because of that they are part of the bread-and-butter species importers and pet shops like to deal in, as they are relatively cheap and easy to maintain. It is likely ornamental fish enthusiasts will strongly object to this recommendation, as these species represent a significant portion of popular species. However, cyprinids are well known to harbour a large range of diseases, and this group may have the potential to survive in the warmer climates of New Zealand. They are not a difficult group to breed, and stopping their importation will provide an opportunity for these species to be bred and sold here, although they will become significantly more expensive. Some of these species are bred with elaborate finnage or exaggerated colouration. If importation of this group is prohibited, these variants may no longer be available as the embellishments are more difficult to maintain.

MFish supports this recommendation as it avoids the risk of disease being introduced into NZ waters and the species will not be totally lost to the industry, as they are not difficult to breed.

That BNZ and ERMA determine which species were in New Zealand before July 1998

The list of approved species maintained by the MAF Exotic Fish Unit was developed through considering those species importers wanted to import since 1972, and would be a useful starting point. However, the list should be checked for any dubious species. MFish supports a species-level list and additions only added once they assessed by ERMA. The final list is likely to be identical to the one MFish needs to gazette under s 307 of the Fisheries Act 1996.

The post arrival quarantine period should be consistent for marine and freshwater species

Our understanding is that the quarantine period for marine species is shorter as they are generally more expensive and are not as geographically constrained as freshwater species are. However, the risk of disease transfer is equally as great, and while the transfer of pathogens to the marine environment would be less likely than for freshwater species (given hobbyists are unlikely to discharge fish and aquarium waste directly to the sea), any disease problem would be difficult to resolve in the marine environment. MFish supports this recommendation.

BNZ develop training courses

The Exotic Fish Unit did run such courses to help quarantine officers identify fish and to recognise a disease problem. However, given the large number of approved species (over 1000) from a wide range of countries, the courses were only limited to identifying the common genera. Specialised people need to be employed in this area, as they must have an interest in ornamental fish, a good grounding in taxonomy and a good knowledge of fish diseases. With the large number of species imported, many with colour variants and enhanced physical features (large fins etc), and fish often being imported in the juvenile stage (to minimise freight costs), fish identification becomes a specialised skill. Often fish are imported from key collecting countries (eg, Singapore and Hong Kong), thus even the country of origin could be uncertain. For disease issues, an inspector must be familiar with the habits of the various species and so recognise when fish are not in a healthy state. They must also be familiar with environmental factors that can stress fish. Often fish quarantine operators do not recognise fish under stress from hypoxic conditions or have a poor knowledge of "new tank" syndrome etc. Our recommendation is that only persons with an interest in ornamental fish be trained and that those persons should be considered as specialists, and routinely inspect consignments during quarantine.

DOC and BNZ work with the Federation of NZ Aquatic Societies

The Federation has always taken a responsible attitude to importation and quarantine. There will always be a faction who will not obey the law, as a prohibited fish can fetch good prices on the black market, simply because of its status. MFish strongly supports this recommendation.

BNZ work with Ministry of Health

There are human health issues relating to quarantine of ornamental fish. Piscine tuberculosis can affect humans and there have been reports of New Zealanders contracting this disease. MFish supports this recommendation.

Targeting disease agents

MFish supports this recommendation.

Samples taken when 20% mortalities occur

MFish supports this recommendation. However, the importer may wish to destroy the whole consignment as an option as the remaining fish may be also be infected and it may not be worth the cost of inspection or treatment. Also, some diseases may be evident (particularly parasites), but not be causing significant mortalities. An inspector should be able to take samples in these instances.

Quarantine period reduced to 4 weeks with appropriate certification.

MFish supports this recommendation, as it encourages overseas countries to monitor the health of fish farms. Exporting countries are now moving towards providing certification. However, in the past, when this requirement was proposed, exporters would have stopped supplying a small market like New Zealand.

Reduction of mortality rates to 10% for consignments undergoing the shorter 4-week period

MFish supports this recommendation, but note our comments in regard to taking samples when 20% mortalities occur.

Aquarium water disinfected

MFish supports this recommendation, but we propose that it be imposed immediately if no disinfection is currently taking place.

I hope these comments will be of interest and assistance.

Yours sincerely

Robert Johnston
Senior Policy Analyst

19.5. SUBMISSION 5: STEVE WALLS, AQUARIUS IMPORTS

Aquarius Imports Importers, *Wholesalers and Quarantine Operator*
P.O .Box 76015 Manukau City. Auckland. New Zealand.
Phone 09 2320011. Fax 09 2320051 email strike@xtra.co.nz
16th december 2005
Mr Martin Van Ginkel
Pre Clearance
Biosecurity New Zealand
Fax 04-8190733
Dear Mr Van Ginkel
Thankyou for your copy of the report on the 'Import risk analysis: Ornamental fish'
In response to your report, I would like to make the following submissions. I have addressed them with
corresonding numbers to your executive summary. Where I have not addressed one of your numbered
items, I am either in agreement or have no further comment to make.
1. The recommendation that temperate and sub-tropical cyprinids should no longer be eligble for
import.
Although history is not necessarily a complete response to this issue it should be noted that cyprinids
have been imported into New Zealand for a great number of years and it should be pointed out they are
imported in large numbers. This group of fish represent a very high prpotion of the aquarium trade as
they are easy fish to care for, colourful and active and as such very popular with fish hobbyists. To
date, this group of fish have not posed any risk.
To give you an overview ftom an importers perspective I have listed the percentage this group represents of the total heads imported in the last three shipments.
25 Oct 12040 tails imported
22 Nov 19865 tails imported
13 Dec 13219 tails imported
including 1180 cyprinids
including 1605 cyprinids
including 2080 cyprinids
=9.8%
=8.1%
=15.7%
As you can see this category of fish averages over 10% of our volume and would cause a severe impact
on the trade in two respects.
1) The hobbysists would lose a significant area of fish keeping
2) The importers would lose a significant percentage of income given they represent a large percentage of the fish we import. During the seven years that I have operated a quarantine facility for tropical fish and marines, I would have to say that the cyprinids are the easiest and most disease ftee of the fish that we import. Mortality records verify this. I understand that future risk is the purpose of your risk analysis but feel that history also has a valuable

contibution to the argument.
Further argument against precluding this group ftom the permitted list is the length of quarantine. Currently six weeks (or the proposed 4 weeks) gives a reasonable amount of time in containment to ensure there are no disease outbreaks. The disease agents listed as requiring additional risk management in the report have exposure/ infection periods well within the current six week quarantine period. I have argued for maintaining the six week quarantine (see 3 & 9) and suggest that this would further avoid the necessity of deleting cyprinids from the import list by providing a substantial period of time to recognise any potential diease agents. To further assist the prevention of potential disease agents, this group offish could be restricted to importation from specific countries that have low risk.
2)The recommendation that ornamanetal fish not present before July 1998 should not be eligible for import unless approved etc.
I find this a bit ambiguous. Does this mean that species illegally imported by some earlier unscrupulous operators would be eligble for import. Including fish like mountain minnows (currently prolific in the trade and for sale in most pet shops COLD WATER tanks) / red tail cats etc. It would be my suggestion that fish identified as present in New Zealand that do not meet the current import lists be evaluated and either added to the list were appropriate or noted as a risk and treated accordingly.
I would hope that when direction is ascertained in this area, that a second round of submissions of fish be asked for, where all affected parties can inspect the list compliled to date. There are a large number of retailers that are very knowledgeable in the trade and have not been invited to make any submission. (Submissions at this stage have been restricted to importers and fish clubs).Of further concern in this area is that this would preclude the importation of fish that are within the same genus as an allowable import. This creates anomoly in the process of risk management when a genus is recognised as acceptable but because a species within that genus hasnt been imported then it is not acceptable. I would suggest that where a species is part of an allowable genus there be a simplified process to have it added to the list of allowable imports
3) I can see no worthwhile reason to make the importation of freshwater and marine fish identical in quarantine periods for the sake of making them identical. The reason for quarantine is surely to isolate/ identify risk and as such should be considered on a risk factor alone. The information on risk evaluation in the report would tend to suggest that some disease agents in marine fish would be better identified by a six week quarantine. I feel that this item needs to be addressed entirely under item 9 in the context of risk management.
9) The recommendation that quarantine be reduced from 6-4 in freshwater and increased from 3-4 in marines provided they are accompanied by an international health certificate.
Let me address this in two parts. (Refer to the argument above in 3). There is no necessity to have identical quarantines for the sake of convenience. The shipments are kept in isolation from each other and different time frames are of little consequence. Of importance is the requirement that disease agents are able to develop/ be identified within a suitable quarantine period to enable the effective management of risk. Past experience has shown to me that the issue of an international health certificate is little more than a rubber stamping exercise. I have received shipements both with and without certificates from various countries and wonder how they could be justified by the state of the fish that arrive The fish are not kept in a conditions prior to shipping that facilitates easy identification of potential disease. Disease agents that may be present would show little indication other than the presence of dying! dead fish. I appreciate that some countries like Singapore have a certification process to maintain some standards to protect the country's exports but invite you to take a look at fish prior to export and see if you could identify fish with disease agents. The time taken for disease agents to manifest themselves by incubation or transfer further makes this an impossible task.

The storeage of fish prior to export is in many cases in bags on racks. The discoloration of the water alone would seem to prohibit good observation of the fish. This is further hampered by the crowding within the container that makes observation near impossible. In some cases fish are stored Gust prior to packing) in tanks, but a large number of these have no glass front so observation of the fish is from the top. Again, near impossible to observe the condition of the fish. I have no axe to grind on this matter as my suppliers are all able to provide health certs. I merely stand by my comment that a health cert is little more than a rubber stamping exercise and will have no great benefit in the risk management. I would suggest that a system of supplier certification be more appropriate. Suppliers that have a history of supplying stock to New Zealand importers could be "certified" by the history of previous imports.
This could be verified at a local level by MAF inspectors. All new suppliers of fish to New Zealand importers could be subjected to random sampling of the first few shipments until MAF certifies their quality.
I would also like to suggest that fish are prohibited imports from countries that have high prevalence of the disease agents of major concern.
The current regime of a six week quarantine for fresh water has served the industry well. Our incidence of notifiable diseases has been extremely low. The health of our fish in the trade is good and we have not had the incidents that they have had in Australia where they have a shorter quarantine. I fully endorse your comments on page 142 of your report stating that While the increased incursion rate in Australia may be Clueto climate! volumesl surveilance, it is possible that a six week quarantine provides additional protection against those disease agents which could not be disclosed in a three week quarantine paeriod.
In the same section on quarantine period you mention that there is the possibility that a blanket six week quarantine may be too onerous for industry to maintain. The majority of imports are freshwater and as such industry has lived and worked within this time frame for years. The only area that could then be considered onerous is the increase in marine quarantine. Options here are that they do not need to have an identical quarantine period unless risk requires it. (potentail disease agents would suggest that six weeks would be a good precaution on marines). The volume is light and as such would have minor impact. The suggestion that a 20% vs 10% mortality tradeoff with the reduction from 6 to 4 weeks qauarantine may be valid when discussing freshwater mortality, but due to the low stocking volumes of marine fish and the fact that transfer of disease is possible, how do you effectively measure either of these percentages when you have single figure imports items of a particular species? (If you have eight yellow tangs in a tank and one dies, is that an outbreak?)
The only endorsement I could make for reducing the quarantine period is for financial gain. However I endorse the six week period to ensure the industry I have invested in maintains a high level of health and compliance within the environment of New Zealand and as such is recognised as extremely low
risk. This factor alone will insure the fish importing industry has a future in this country.
11) I agree that water should be treated prior to disposal but ask that the use of ultra violet sterilisers be considered as a non toxic method of disinfection without adding more contaminents into the environment.
I thank you for the opportunity to make comment on the report and if you require clarification or elaboration on these comments, invite you to contact me.
Yours sincerely

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Steve Walls
owner Aquarius Imports

19.6. SUBMISSION 6: BOB WARD, REDWOOD AQUATICS FISH FARM

Redwood Aquatics Fish Farm

Importers & Breeders of Ornamental Fish & Plants

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P O Box 5114
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15th December 2005

Martin Van Ginkel
Technical Support Officer, Risk Analysis
Pre Clearance
Biosecurity New Zealand
Ministry of Agriculture and Forestry
PO Box 2526
Wellington

Dear Martin

Re: Import Risk Analysis – Ornamental Fish

To sum up 25 years working with the MAF service in respect to the quarantine process for tropical fish after having left 23 years in the public service. I reached a supervisors capacity, to turn a hobby into a business, was to be seen jumping out of the frying pan and into the fire, for surely the apathy with which I wished to leave behind became the burden of the future.

In the earlier days having attempted to hold small shipments in a backyard facility, and contend with the newly established requirement of six weeks containment, quickly saw the necessity for a proper facility to maintain fish for such a period. We put ourselves through a planning process with the authorities to establish such a facility, it was this process with the council that I was to become aware of those in the MAF and other services who have made attempts to impede or at most put down the application. Around the same time a person named Newstubs (spelling ?) was to establish a prawn farming operation in a geothermal area and saw the pathetic bureaucracy he faced over many years was incredible.

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By now you will want to know what all this has to do with responding to a risk analysis. Should this analysis be like all other assessments/conditions/standards set over the 23 years, sadly little has been accomplished! For people like myself who took the system seriously, would surely become disillusioned.

For spending 20 years of ones working life, creating a facility to meet the ever-changing demands of the Ministry, was to become a most unrewarding activity. The change to the user pay system was to be a most contemptuous period. Followed by the complete review in the form of the NASS standard, in all it's raff of conditions and requirements, had the requirements of this document been policed to any degree, I doubt there would be few tropical fish in the country today. If he regulators who drew up this document were envisaging subduing the importation of fish – they have done a good job!

However, the surveillance and auditing of the system was never there. Simply, had any of the diseases listed as notifiable (had they been prevalent over the past years) would have been in the country by now. All the relevant data listing in the analysis comes from abroad; little or no local research has been available. Especially from quarantine notes which was a requirement of the standard. Had this been done, some confidence could have been displayed in making correct and proper decisions in respect to bio-security and risk areas attended to based on evidence established in this country. MAF, these days, are keen to see themselves as firsts on a world basis, for bio-security had the fieldwork been done in this industry they would have had a first. As not any other country, to my knowledge, has ever asked for a six-week period of containment, such a documented system would have been a valuable tool for the future.

The writer is somewhat mystified as to the quarantine period in Australia. Yes, their borders are extremely large, they have states with separate regulations, and their climate conditions are from temperate to tropical, which makes their bio-security far more complex and difficult to monitor. The MAF responded to a question in the 2000 questionnaire regarding a review done by Australia for the importation of tropical fish and were to review their findings in the near future. Maybe, had this been done the answers might have been more apparent to their more logical system.

Please find my comments to the various pages:

Executive Summary: (page 1.)

The analysis covers fish and invertebrates but I do not see any submissions on invertebrates?

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Recommendation 1 – To Discontinue Importation of Barbs and Capoeta Species

I simply do not see the rational in this. Whilst Dr McDowell suggested to me that there were species of Barbs that may survive in the environment and procrastinated as to the thousands of species in existence, only a very few Barbs are available to the trade in reality. I enclose a typical catalogue from the largest company in Singapore (by e-mail attachment – copy of their full product range for 2006). Please review the number of fish available, all have entered the over the years and have never been a problem – and not likely to be so. Listing these at specific level should surely solve this concern.

Recommendation 5 – Releasing fish into the Wild

I do not see the New Zealand Fish Clubs being the ideal source for education of fishkeepers. They would represent only a small percentage of the total number of people keeping fish. If real concerns can be produced, advertising like I saw in the local newspaper where a whole page was used for a small message asking the public for help over the Didymo Algae situation should be used. If education as to environmental risk is to be advertised it should follow the same pathway as noxious plants and weed using schools, news media and compulsory posters at pet specialist fish centres (for the want of examples). I feel the DOC have more to concern themselves with in retaining the indigenous wildlife and in respect to justify such concerns about the release of tropical fish species. They would have to address the presence of the trout and this would be somewhat paralleled with the recent upsurge of concern over the importation of organisms on corals etc including the ongoing destruction of this very small and seemingly harmless activity where the material is in total isolation from the natural environment throughout its life time. The concept of some aquarist taking an invertebrate to the sea and releasing it – the risk would have to be measured against the real threats such as shipping birds, natural global changes and especially the total unknown quantity of what is present in existing marine environments. Anyway, I support this with the knowledge of recent research vessels operating off the New Zealand coast discovering 300 new species of fish and invertebrates. Also a Fiordland marine reserve house countless exotic invertebrates that were not classified as pest organisms but more so as a rare niche – to be protected!

Recommendation 8 – Cumulative Mortalities of 20% or greater occur

Would need to be evaluated as to the cause of the mortality before dispatching for analysis. A lingering loss rate of far less than the percentage loss required could be of more concern. For example: a sudden water change on a tank system would create an ionic change, pH rise from say pH5 to pH7 – the shift in NH_4^+ to NH_3 would represent on of the most significant killers of fish in long periods of containment. By definition, this could be described as a disease requiring notification. Compare the mortality with a tank of Ramirezi, I will use this fish as an example as it's mentioned in the risk analysis. Over a period of six weeks you may lose one fish a day. There may be periods where no fish are lost but the loss rate is sometimes seen to be 99% never 100%. Over the years and having listened to my customers as a base for information, I have been able to trace such fish losses back to suppliers.

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Recommendation 8 – Cumulative Mortalities of 20% or greater occur (cont)

This surveillance has worked very well in establishing whether fish have been retained for the quarantine required period of six weeks or showing that shipments have been milked over that period do not see the customary six weeks. This sadly has been the case over all these years. After recent criticism with the local inspector I was able to demonstrate this very clearly at the Christchurch Port of Entry where basic procedures were not being conducted.

Recommendation 9 – Increasing the Containment Period to four weeks for Marine Fish & Accompanying Health Certificate.

I do not read anywhere the reasons why obviously little consideration would be given as to nutritional requirements and system management. Also to hold corals for four weeks when no other country in the world has this requirement only shows the contemptuous ability to over react to other issues. It's interesting to note when all the work was done in assessing the conditions for import in the formation of the NASS standard that it was decided in the wisdom of the regulations not to require the holding of invertebrates on entry. They could be released on arrival and it was only three months down the tract that they changed their minds, largely because of one Auckland importer who considered he could import what he liked into the country anyway.

The reference to Health Certificate is an interesting one. These documents normally accompany shipments but have been discredited by the authorities here. I see little point in accepting them now to justify a reduction in the containment period. Companies, such as the one I am supplying a catalogue from (by e-mail attachment), operate to ISO Standards (ISO14001, ISO9001) which may improve the ability for a shipper to transmit livestock in better condition reducing mortalities. At the end of the day one would expect to have live healthy fish available at the end of the containment period not fish that were prone to percentile loss factors.

Page 28-29. Pseudogastromyxon is entering the country and is not listed in the import standard. It is also listed on the provisional list for evaluation. I made reference to this some years ago and a letter was suppose to be forth coming from Import Management to importers relating to gift additions. I was unsure what the reference meant and assumed that this was the importers reason for importation. This fish was to continue being imported right up until recently. This is an example of a fish species, which would be of interest to DOC, as people who keep goldfish bowls use this fish as a cleaner fish – it survives to low temperatures.

Page 30. 3.3 - "From taxonomic paper only" – this statement also would at previously mentioned cover the inadequate surveillance over the years for internal assessment of disease risk.

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Page 36. 3.3.4 - Whilst Hexmita, Icth, Tetrahymin, Trichodina are deemed not to be of concern, they represent a significant threat to the fish keeper. Brooklynella is a serious problem in marine Clown species.

The reference to goldfish and the significant threat to the environment is worthy of mention. I had applied to import brood stock in the 1980's proceeding with rigorous enquiries with various countries to support my application. This ended up being chastised by the New Zealand Embassy in Japan for submitting draft regulatory documents. For assessments at this point I was advised to leave it to the regulatory authority to do the necessary enquiries. Sadly, that was the end of it, no conclusion to the application was ever forthcoming. The proceeding years simply saw goldfish entering the country through the importation of tropical fish. I did notify MAF on occasions regarding this but little was ever done about it. I still work with my original goldfish stock for our humble number of varieties, as I am of the opinion, due to the induction of un-monitored fish coming into the country over the years I am somewhat suspicious that Furunculosis is now present in the country.

Page 41, 3.3.6 – Reference to Benidenia should be of concern to the marine specialist. It represents a significant pest and is difficult to detect. It is difficult to eradicate being a monogeneon. In recent time I have had the help in identifying the particular species, Liaising with Dr Ian D. Whittington (Senior Research Scientist, Parasitology Section, The South Australian Museum).
Grynodactilids and Dactyloayroids would be the scourge of the goldfish supplies in this country following by Costia and Trichodenia. The reference to being treatable is, from my experience, incorrect to the point that it is impossible to eradicate it but it may be controlled. The best solution is not to have it in the first place. Hence, the need for good animal husbandry through the breeding and containing process.

In conclusion, I should be retired but now still try to make my investment work for my employees and myself. It is obvious through my criticisms that there are people who try to intimidate me, examples of this was seen with the blatant destruction of our frozen food following the failure of the import standard covering such material to work for us. Also a recent audit of our facility attracted an account for one visit of $650.00 plus GST, where in the past it was $120.00 plus GST or the hourly rate allocated in the standards for vets etc. We have paid this account but queried several times the basis for charging but still have not had a reply to this matter.

Yours sincerely

Bob Ward
Director
Redwood Aquatics Aquarium & Water Garden Centre.

19.7. SUBMISSION 7: ALOIS WOLLONER

1 Introduction

This submission is in response to the "Import Risk Analysis: Ornamental Fish" published by the Ministry of Agriculture and Forestry, 2nd November 2005. In particular it discusses the realities of the industry from the perspective of importers, retailers, as well as hobbyists in general, focusing exclusively on ornamental marine fish.

It is my view that the prepared analysis and accompanying recommendations with regard to marine ornamentals are unjustified and would certainly result in further unnecessary losses during the importation of ornamental marine fish, while providing little improvement to the detection and prevention of the spread of new organisms into New Zealand.

One important consideration in analysing the risk of new organisms entering the New Zealand environment, is that the animals imported in the industry are exclusively tropical species. None of which can survive the temperate waters around New Zealand, even in the far north of the North Island.

The fact that importation of ornamental marine fish has occurred for over thirty years, at times virtually unregulated, without a single recorded incursion, is a strong indication of the low risk that this industry poses to the New Zealand environment.

2 Inaccuracies and Contentions

This section will correct and clarify some information included in the published risk analysis based on my experience and knowledge of the industry.

Pre Export Measures (Section 5.2.2)

"One of these is a requirement that all ornamental fish undergo a period of preexport isolation for a period of 2 weeks, as is required for imports into Australia."

This is impossible to regulate, and not a reliable way of reducing unwanted organisms entering the country.

Exporters don't have the facilities, nor incentive to hold fish for that period of time. Most marine fish are held for three to four days in order to clear their digestive system, to minimise fouling of the bag water during transport, and then exported [1]. I import from Indonesia, Vanuatu, Solomon island, Fiji, USA, and Tonga, and would be sceptical that even if pre-export isolation period was required, that it would be implemented by overseas exporters.

"To be consistent with the recommendations of the OIE Aquatic Animal Health Code (OIE, 2005), ornamental fish should be accompanied by an international aquatic animal health certificate for live fish, signed out by the exporting countries competent authority, which indicates the fish are free from specified disease agents and are sourced from populations or zones free from specified disease agents." Health certificates occasionally accompany marine shipments, however this information is not necessarily available upon shipment arrival, nor is it necessarily an accurate reflection of the health of the arriving fish. It is an unnecessary requirement, as importers are not going to continue to use exporters whose stock is not in good health. It only adds to their expenses

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due to increases in mortality rates. Health certificates in themselves are meaningless, they are simply signed on export at the originating country irrespective of the health of the fish set for export.

In general trying to implement pre export measures will more than likely be ineffective in achieving the desired aims, unless approached as a multi country industry movement.

Mortality Rate Cuttoff in Quarantine (Section 5.2.3)

"It is suggested that the mortality level at which it is necessary to submit samples be set at 20% cumulative mortality for any fish species during the 6 week quarantine period (including deaths on arrival)."

Sending marine fish for testing for species with mortality rates over 20% is not feasible. Marine fish are not imported in large numbers and most of the time only 2-3 fish per species are imported. Therefore if we import 2 fish and lose 1, then it will bring the mortality rate to

50% for that species so we would have to send the fish away to be tested. This is not practical as it would cost hundreds of dollars per shipment. Charges for the service will have to be covered by the importer who will have add the charges on before selling to retail stores. The impact is that fish prices will be unrealistic high and unsaleable, essentially killing the hobby. Most importers import marine fish as a service, as it is combined with freshwater to offset the costs. I specialise in marine fish only, and to pass the charges on would be unrealistic as mentioned above. Importers profit on marine fish is very low and any further charges are
unsustainable as we already pay high MAF cost for no added value. My MAF cost are around $1000 per month which is excessive for the services provided (essentially nothing more than checking fish on entry and exit from quarantine).
A more acceptable recommendation would be to average the mortality rate over the total number of fish in the shipment, rather than over individual species, and testing be performed at the discretion of the inspecting MAF officer.
Quarantine Period (Section 5.2.4)
“Marine fish in NZ are subject to 3-week quarantine in line with recommendation by authorities in other countries.”This is incorrect. Australia has a one week quarantine period for fish [2]. No other major country has any sort of quarantine period requirements [1]. Fish arrive at a wholesalers and are
immediately available for sale. They can be in an aquarists tank within hours of entering the country.
“Indeed, as a precautionary measure it could reasonably be argued that the current 3 week quarantine period for marine fish should be extended to match the 6 weeks for freshwater fish, particularly when considering the low probability of severe pathogens such as Enteromyxum leei being detected in 3 weeks in the absence of an active surveillance programme. However, while there may be some evidence that a longer quarantine period provides additional protection against incursion of some disease agents, if a blanket 6 week quarantine period for both freshwater and marine fish were too onerous for industry to maintain, consideration could be made to reduce
it to 4 weeks for both freshwater and marine fish. ”
2
Extending the quarantine period for marine ornamentals from three weeks to four weeks is not viable. It may be counteractive to the goals to be achieved. Extending the quarantine period unnecessarily stresses the fish (due to bare tanks and high stocking densities) and makes them more susceptible to disease, and will result in higher mortality rates.
Being the largest importer of marine ornamentals, I have reasonable handle on diseases and my mortality rates are generally under 25%. Other quarantine facilities run around 30% to 50%
mortality rate. A significant factor in this is inadequate filtration equipment combined with a limited understanding of keeping marine fish.
Recommended Measures (Section 5.3) “That Biosecurity New Zealand and ERMA determine which species of ornamental fish were in New Zealand before July 1998. Those not present before July 1998 should not be eligible for import unless approved by ERMA as a new organism.”
The proposal to remove the genus groups and adhere to species is a major ask, as it will remove a large number of fish, which are available to import at present.
I have been working with Jennie Brunton on completing a species list and have found that many fish are missing, as it has not been possible to find all invoices to prove that the fish have previously entered the country. With the permitted list being revised from genus to speciesspecific
listings, the availability of a variety of species will be reduced dramatically. This will have a significant negative impact on the hobby in New Zealand.
It is concerning that it is easy for MAF/ERMA to revise the allowable list and impractical for importers to add species due to various reasons outlined.

I also note that there are many fish that are on the current allowable list that have not been imported as taxonomic classifications of many species have changed, and many importers did not realise that they could be imported.
Could it not be viable that a six month grace period be placed so importers can list more fish that arrive prior to the new list which is currently being formed? This will give importers more time to list current allowable species as it will only be evident that the fish are missing when they go to import the fish concerned. As we all understand it is a tedious and expensive job to list any additional species on the permitted list. It would be appreciated if MAF/ERMA could provide an easy and cost effective solution to add species to the new allowable list, when fish become available by exporters. It will be near impossible to add them back onto the list once removed using the current processes.
Most fish in a genus share similar traits, so it does not make sense that one species be allowed in while another is not. If they share similar traits, then there should be an easy method to get these fish on the new allowable list. I think there is plenty of evidence that the tropical marine species imported for the hobby would not survive in New Zealand waters. Even in the warmerparts of Northland. Most temperature maps I have seen are taken at the surface where water is the warmest, the fact is that most species would have to live 5-10 meters down in New Zealand waters were the temperature is much cooler which means there is even lower probability that they would survive in even the warmer waters around New Zealand. Another example would be fish that are exported to Australia from Hawaii. Some of these fish are endemic to Hawaii (Yellow Tangs) and I have not seen any recordings of these species living on reef in Australia.
3This would suggest that it is more than temperature which would allow a species to survive. Marine fish have been imported into New Zealand for more than 30 years, and to date I am not aware of any tropical species living in New Zealand waters, which would suggest that adding new tropical species is very low risk. Therefore I am in favour of making the whole process of adding new species far easy then the current un workable process. Some fish are rarely seen on exporters lists due to a number of reasons, and should they become available from any exporter, I would like to order these fish. Currently they are on the allowable list but I am unable to find any invoices for them as for some species it has been two or more years since they were imported. So based on the revised list which has been cmpiled by invoice evidence, it will not be possible to bring these fish in should I see one on a exporters list as they will not be on the revised allowable list. I would like to know how this will be addressed as it would not be possible to obtain approval in the future due to the current process and costs which are not recoverable.
An idea I have to overcome this is to review the allowable list annually and allow importers to add species to list which then can be reviewed by ERMA prior to any approval. It also would make any such review easier if maybe FNZAS make the submission on behalf of importers. ERMAs work load will be reduced as they will only be dealing with one entity. If this was not possible I would like to assist in this area as I have vast amount of experience and expertise and this is highlighted by the fact that I am the only person to add additional species to the allowable list as it is daunting process for most. I have given Jennie Brunton a list of all Marine species which are not on the current permitted list. I have found that many species are not new species as I have found them on importers invoices dated prior to 1998 and believe they should be added to the allowable list and not be listed as a new species.
In terms of any new species found in the country at present, I propose that they be also added to the list if photographic evidence is available to prove that they are in New Zealand.
In terms of identifying all the species of Marine fish I am happy to provide my expertise by forming a catalogue on all allowable species with photographs so that fish can be easy identified
and provide clarity to all importers. It would be a good idea if we have a alphabetical list and a list which list fish in there common family name, eg, tangs, angels etc. The reason for this is that most overseas exporters list fish in these groups so it will be easy to identify if these fish
are allowed in or not. Could it be possible that the whole allowable list be redone in a common sense approach. As mentioned, I don’t have any idea why we are allowed some

species and not others. Does it really matter that they have never been in before? Especially if they are the same genus and share the same traits. I understand that the current list was just made up from someone coping an old book which overlooked numerous species which are now not allowed in, there is no logical reason why they are not allowed in. Surly MAF/ERMA and importers could worked together on this to come to some common sense approach. Having a disallowed list would be more proactive and the focus can be on stopping unwanted species from arriving.

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3 Quarantine Period

In reading the review I see no compelling reason which would support a case to increase the quarantine period for marines from three weeks to four weeks. Other countries in the world are at more risk due to their climate and local water temperatures. Even Australia which has tropical reefs which could potentially be compromised only require a seven day quarantine period. The United States have tropical reefs which are also likely to be at higher risk than New Zealand waters, yet they have no quarantine period at all. Even with the volumes they are importing (many thousands of fish per week), no impact has been felt by reefs or surrounding waters, even those close to high population area, such as the Florida Keys. Would it not be more informative to approach countries like Australia and USA and find out why they have such short quarantine periods as the risks posed to the tropical reefs around those countries is surely far significant, than the risks posed to the temperate marine waters around New Zealand. I envisage MAF would have contacts in these countries to support a reduction rather than increase in quarantine period for marine fish in New Zealand.

I would recommend that the quarantine for marines be reduced to two weeks, and if the mortality rate after two weeks is greater than 25% then fish should then be required to remain in quarantine for a further week, bring the period to three weeks in total in such a case. The rational behind this is that many quarantine facilities are sub standard and do run the risk of higher diseases. I am sure this can be verified by MAF as mortality rates are reported monthly. With this in mind, more facilities would spend the money required to bring facilities up to acceptable standards, or alternatively halt importation of marine fish and concentrate on freshwater with it's larger market and higher margins.

Marine fish are individually bagged which results in far higher freight costs than freshwater fish which could have over 100 fish in a bag thus reducing overall price of the fish. Increasing the quarantine for marine fish is likely to prove too onerous for the industry in terms of additional losses and cost, such that it becomes impractical to import. Effectively killing the hobby in New Zealand. Already we are faced with higher freight cost, and MAF costs which have put pressure on the market. Any further significant costs in the importation will make it not longer viable. Some factors which affect mortality rates have been omitted from the analysis. Many fish die of starvation as housing them in bare tanks is not practical for such a period, especially smaller fish that live in sand like gobies, blennies etc.

In terms of my disease control it is very frustrating that MAF have a concern for diseases but have no interest in how they are treated. There are a very limited number of treatments available as the cost to get treatments approved is ridiculous and the fees are unrecoverable in a market as small as the marine ornamental fish market is. Most treatments currently available form retail stores don't have a licence to be sold so it means we don't have any approved treatments available. Any there are many common medications which can not be obtained here due to excessive and impractical regulation. This is a serious matter, which needs to be addressed by MAF. To further protect New Zealand from diseases I would recommend that MAF do random visit to retail stores every month. With the possibility of data collection of mortality records for retail stores. This will just be another way to prevent the spread of diseases or at least be identified early.

5

4 MAF Inspections

The current system with pickup from Auckland airport involves all containers being sealed by MAF staff with official MAF sealing tape. They are not opened at the airport due to time constraints and staff limitations at MAF. These containers are then transferred to our facility in an approved vehicle. On arrival at our facility a MAF Inspector is present to check the integrity of all seals and witness the shipment being unpacked. MAF staff again checks the fish prior to release. The whole process is not cost effective and seems little value to all concerned. A suggestion would be once import facilities have established credibility with MAF (say 2-3 years) that the process becomes stream lined, thus allowing MAF to focus on more important issues and making if far more cost efficient for importers. I could see more value if MAF would inspect the fish only prior to being released as at this time they can check the fish condition and identify fish etc. During the two week proposed quarantine period, MAF could also check invoices and cover any issues with importers. MAF could also do random checks, and I would be in favour of harsh penalties should any major discrepancies accrue.

I do import a number of dry goods and I dont see customs checking the goods at the airport and them coming to my house to inspect them once I take them out of the box.

Another important consideration would be to make the allowable list more workable as outlined, and detail major species which are not wanted, for example moray eels, sharks and other invasive species. This would cut out a lot of red tape, while maintaining the security of New Zealand's natural environment.

5 The Use Of Natural Seawater

There are a large number of quarantine facilities and retail outlets using natural seawater (NSW) collected from the beach. In terms of disease risk and control it would be prudent to ban this practice and require all facilities to use artificial salt water (ASW). This would reduce the risk of pathogens and bacteria entering and exiting quarantine facilities. I have done a few experiments using NSW. When using NSW I found that fish would often develop either bacteria problems or parasites. In view of this, it would be prudent for MAF to ban the practice of using NSW in quarantine facilities or retail outlets.

6 Education

Education is an important factor which at this stage is not existent. Diseases are difficult at times to detect and information on them is very limited.It is proposed that an annual seminar is held in Auckland, or other main centre, which would entail discussing fish diseases and treatments. It could cover both retail shops and quarantine facilities. Currently there is nothing available in New Zealand to educate quarantine owners and retail keepers.

6

7 Summary of Recommended Measures

The following is a summary of measures which are recommended with respect to marine ornamentals:

1. Quarantine period be reduced to two weeks if mortality rates are lower than 25%. Higher losses would incur an additional week of quarantine.
2. MAF to place more resources in education by hosting an annual seminar for retail outlets/ facilities so that training can cover diseases and treatments.
3. Look at reviewing the concept of the allowed list, and instead look at developing a disallowed list as a replacement. This would be a more practical way of regulating tropical marine fish imports. Alternatively keep the current listing method of genus level identification. If this is absolutely not possible, look at simplifying and reducing the cost involved in adding additional species to the allowed list. Possibly have an annual review where the FNZAS can submit any species for addition to the list.
4. Given that species level identification is required, reduce the proof of existence in New Zealand requirement to photographic proof only. If this is not possible, a six month "grace" period for importers to try and obtain rarely available species such that invoice proof of existence in New Zealand can be gathered for species which are known to have been imported previously, but for which there are no invoice records available.
5. Streamline the inspection process for frequent importers with two to three years established credibility, by removing the requirement for airport and unpacking inspections, and leaving a single pre release inspection only.
6. The use of natural seawater to be banned in quarantine facilities and retail outlets as pathogens may be introduced, potentially increasing mortality rates.

7. Testing for diseases when mortality rates are above 25% (averaged over the total number of fish in a shipment), and at the discretion of the inspecting MAF officer.
8. MAF to approve treatments and medications (such as Mayacin, Mayacin 2, Neomycin, Kanacyn, K-Mycin, and Spectrogram) for quarantine facilities and retail outlets . The current practice of licensing treatments and medications is not practical due to cost involved. Making these unavailable is unacceptable and posses risk to New Zealand species if fish remain untreated.
9. Retail outlets be randomly checked every month for diseases and look at having some sort of broad spectrum medication in the sale aquariums to help minimise diseases being passed on.

References

[1] J. Baquero, “MARINE ORNAMENTALS TRADE: Quality and Sustainability for the Pacific Region,” Forum Secretariat and the Marine Aquarium Council, May 1999.
[2] “Australia quarantine and inspection service: Import conditions search,” http://www.aqis.gov.au/icon32/asp/ex querycontent.asp.
7

19.8. SUBMISSION 8: RICHARD WOOLLEY, HIGHWAY FISHERIES LTD.

15th December 2005

Martin Van Ginkel
Pre Clearance
Biosecurity New Zealand
Ministry of Agriculture and forestry
PO Box 2526
Wellington

Dear Sir

RE: IMPORT RISK ANALYSIS – ORNAMENTAL FISH

We operate a successful business supporting 6 people & our core business is importing and wholesaling ornamental fish to retail outlets.

Our experience has been learned through importing fish throughout the seasons of the last 13 years.

We have learned:

- That the health of a fish imported one week will be completely different the next week. This depends on the weather at the source as a lot of fish are still caught from the wild.
- That different suppliers offer different quality. This depends on the suppliers "ranking" in the industry.
- That the time of year can reduce the survival rate considerably. Singapore only has 3 seasons – hot, hotter & hottest
- That diseases of fish are always complex. There is always more than one problem to solve & there can be no hard and fast rules as there is always another parameter to consider.
- That the "mix" of stock imported can significantly increase the death rates. Welcome to the world of livebearers. 13 years ago guppies were easy to import (low mortalities). Today, one tank will be perfect & the second tank will be dead. WHY? No rhyme or reason springs to mind.
- That water parameters play a significant part in the survival of the fish. Acid rain for example
- That everyone has a bad day now and again. And we walk away in frustration.
- That you cannot do everything yourself. And training staff can be rather challenging.
- That we would be better off with a bookstore. Because there are less compliance costs.
- That if we send sick fish out the door, our business will fail

It is noted that there is no information about the skills of the authors other than their occupations as fish pathologists.

What experience do they have in (a) operating businesses & (b) keeping ornamental fish alive as saleable commodities?

Is this purely a technical document or is this based on experience of importing these animals.

I am pleased to present my thoughts on this publication as follows.

The main risk associated with the importation of ornamental fish into New Zealand is the issue of aquarists releasing livestock into (a) freshwater tributaries as a source of new, healthier and free stock and (b) directly into the ocean as a method of disposal.

This is New Zealand where no one wants to pay much for the fish. And if they do pay a lot for the fish, why would they go and release it into the ocean? But there is always a *risk*.

The purpose of a transitional facility is to isolate the new arrivals from any other livestock and the environment for a set period of observation & testing if required. This is achieved through processes outlined in the current standard for importing ornamental fish into New Zealand.

On to the executive summary.

***1.** That temperate and sub-tropical cyprinids (the genera Barbus, Puntius, Varicorhinus, Barbodes and Capoeta) should no longer be eligible for import.*

That was easy. It is noted that the references to the disease agents found are quite old. Is this because the diseases have not been causing problems or were they isolated occurrences?

Try & narrow the list down at least instead of scrubbing a good chunk off our business.

***2.** That Biosecurity New Zealand and ERMA determine which species of ornamental fish were in New Zealand before July 1998. Those not present before July 1998 should not be eligible for import unless approved by ERMA as a new organism.*

This comment is totally irrelevant. How can a date (1998) cause a risk of introduction of disease?

***3.** That the post-arrival quarantine period should be consistent for both freshwater and marine species.*

I disagree. The period for marines should be reduced to 2 weeks. The main cause of mortalities in marine fish is actually the stress caused by shipping & the vast variations in water parameters. Reducing the period from 3 to 2 weeks would actually increase the survival rate as water quality would improve.

***4.** That Biosecurity New Zealand develop appropriate training resources about the identification of fish species and the diagnosis of key diseases for MAF Quarantine Services Biosecurity Officers, supervisors and operators of Transitional Facilities.*

Long overdue.

__5.__ That Biosecurity New Zealand work with the Department of Conservation to inform the Federation of New Zealand Aquatic Societies of the need to actively discourage their members from releasing unwanted fish into the wild.

Good luck.

__6.__ That Biosecurity New Zealand work with the Ministry of Health to inform retail outlets selling ornamental fish of potential public health issues.

You will never stop a two year old from putting their hand in their mouths.

__7.__ That targeted passive surveillance be conducted for the following disease agents: aquabirnaviruses, iridoviruses, grouper nervous necrosis virus, viral haemorrhagic septicaemia, Edwardsiella ictaluri, Edwardsiella tarda, Lactococcus garvieae, Aphanomyces invadans, Enteromyxum leei, Glugea heraldi, Bothriocephalus acheilognathi, Capillaria philippinensis and Argulus foliaceus.

This sounds like a fishing expedition and should be at MAFs expense.

__8.__ That when cumulative mortalities of 20% or greater occur among any species of imported ornamental fishes during quarantine, suitable samples (moribund, freshly dead, or 10% formalin-fixed) must be sent to the Investigation and Diagnostic Centre (IDC) of Biosecurity New Zealand, or a laboratory regarded by them as competent.

I have tried this testing approach & the results have returned as No Significant Finding. I have also been told that the nearest diagnostic vet trained in ornamental fish is in Australia so I fail to see where the benefit of this suggestion.

With the blink of the eye, one can experience a total loss in a tank within 24 hours. The cause of death can be painfully obvious.
Are we expected to submit these fish for testing & waste the time of the IDC staff?

__9.__ That the post-arrival quarantine period may be reduced for both freshwater and marine fish from 6 weeks to 4 weeks, provided that consignments are accompanied by an international aquatic animal health certificate for live fish, signed by the competent authority in the exporting country, stating that the fish are free from specified disease agents or are sourced from populations or zones free from specified disease agents.

Hooray.

__10.__ That for consignments where the post arrival quarantine period is reduced to 4 weeks, the cutoff cumulative mortality rate for the taking of samples be reduced to 10%.

Does the IDC have the resources available for the onslaught of testing they will have?
This will basically destroy the ornamental fish industry which could be classed as obstructing our business to which we would have strong objections.

__11.__ That aquarium water from the quarantine period must be disinfected prior to *disposal.*

It would be great if you could spell it out & be specific.

Many Thanks for the opportunity to comment

Yours faithfully

Richard Woolley
Operator
Highway Fisheries LTD

20. Appendix 3: Guidelines for testing aquatic animals in quarantine

The following guidelines are designed to assist in determining whether mortality and moribund figures should be investigated clinically before a decision on release from quarantine is made. A trigger level of 20% mortalities over the quarantine period has previously been specified. Transitional facility operators must report mortalities of this level and above to the quarantine supervisor. Stakeholders however, during the recent public consultation on a revised ornamental fish risk analysis, requested the introduction of discretionary powers for the facility supervisors. As it is extremely difficult to recommend one particular mortality level that would be equally significant across all species and holding systems, it is appropriate that this discretionary power be introduced.

Supervisors become familiar with the systems, species, operators and survival rates of the transitional facilities they inspect, thus they are in a good position to assess the significance of the levels of recorded mortalities.

Inherent in this discretionary approach is access to good quality records maintained accurately by the transitional facility operator. Without access to these records, the supervisor will have to adopt a more precautionary approach.

When assessing if mortality levels are significant the following principles should be considered: -

- An inspection of the tanks should be carried out to estimate the number of moribund or sick fish. This number should be added to the mortalities to determine the total number of fish affected. Moribund and sick fish include those displaying the following signs: -
    - moribund fish – floating listlessly in the tank
    - loss of equilibrium or abnormal buoyancy
    - skin lesions (ulceration, rash, haemorrhage at base of fins)
    - exophthalmos (abnormally protruding eyes) ± ocular haemorrhage
    - swollen abdomen
    - rapid opercular movements or mouth gaping
    - unusual colouration (darker or paler than normal)
    - unusual behaviour (corkscrewing, flashing, rubbing etc.)
- Environmental causes should be considered. These will include lack of oxygen in the water (hypoxia), equipment failure (e.g. pumps), gas bubble disease (bubbles of gas in eyes, mouth and fins caused by pin-hole leaks in pipes) and poor water quality (murky water, high levels of ammonia or nitrites). The transitional facility operator should assist by providing records of water quality. Supervisors are also free to seek a second opinion from appropriate officers within Biosecurity New Zealand.
- Where an environmental cause is most likely (from inspection, examination of records and second opinion as required), or the condition is demonstrably due to e.g external parasitism (other than *Argulus foliaceus*) no further action is necessary. However, if it is not possible to establish an environmental or parasitic cause from independent analysis then it should be assumed that a pathogen is present.

- Some mortalities are to be expected and some fish may succumb to opportunist pathogens that are not of biosecurity concern and it is acceptable for low level mortalities to be ignored. The levels of mortality that might cause suspicion of a serious pathogen may be determined by experience with a particular facility; otherwise it is suggested that combined mortality/sick fish percentages of 10-15% might excite interest if clinical signs appear severe (rapid onset, rapid mortality, severe septicaemic signs, skin lesions etc.). Percentages of 20-25% could be considered suspicious in other cases (chronic, slower development and progression, fewer, less severe clinical signs). Rates of over 35% probably warrant immediate investigation if environmental causes cannot be proven.