

From RA to IHS

Principal risk factors in standard setting for the importation of ornamental fish



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Background

- globally - billions of individual animals shipped every year
- New Zealand – 1.2 million “tails” (individual fish) enter every year
- Permitted import list
 - 1362 species (93% tropical, 6% subtropical, 1% temperate)
 - 938 freshwater species, 424 marine species



Issues?

- live animals – inherent biosecurity risk
- scale – numbers of imported animals
- scale – risk management requirements
- currently –
 - freshwater fish → 6 weeks quarantine
 - marine fish → 3 weeks quarantine
 - mortalities $\geq 20\%$ → samples to diagnostic laboratory (NCDI – Wallaceville)
- seems straightforward...

Narrowing the field

- Initially: 394 genera of fish & ≥ 500 organisms of potential concern
- HSNO Act \rightarrow 1386 species & ≥ 500 organisms of potential concern
- Hazard identification \rightarrow 1386 species & 171 potential hazards
- Risk assessment \rightarrow 1362 species & 17 actual hazards
 - aquabirnaviruses, iridoviruses, grouper nervous necrosis virus, VHSV
 - atypical furunculosis, *Flavobacterium psychrophilum*, *Edwardsiella ictaluri*, *E. tarda*, *Lactococcus garviae*
 - *Aphanomyces invadans*
 - dermocystidium
 - *Glugea heraldi*, *Hoferellus carassii*, *Enteromyxum leei*, *Bothriocephalus achielognathi*, *Capillaria philippinensis*, *Argulus foliaceus*

Now, let's go back again

- 1362 species, 1.2 million fish
- 20% mortality → laboratory
- Screen against 17 hazards – viruses, bacteria, fungi, mesomycetozoea, parasites
- logistical and diagnostic nightmare
- still seem straightforward?

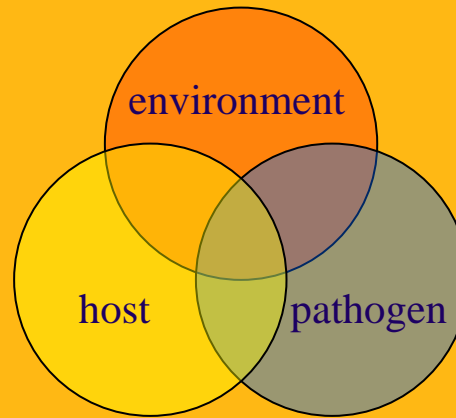


Planned approach

1. reassess quarantine period requirement
2. target highest risk species of fish
3. define pathogens of interest for exclusion purposes primarily

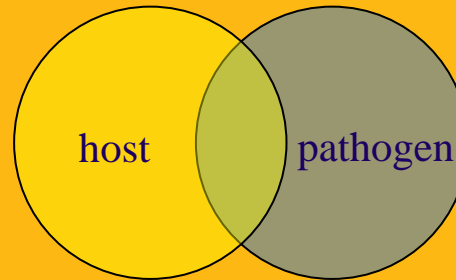
Principal risk factors

risk of disease \approx



Sniezko (1973) Adv.
Vet. Sci. Comp. Med.

risk of disease \propto



Looking more closely at risk factors

- What are we primarily worried about?

pathogens that could have adverse consequences on New Zealand endemic fauna, ecosystems or people

- Less worried about pathogens that: -
 - might affect only a few animals and fail to establish
 - are easily controlled or treated
- Degrees of concern

Host factors

- climate range of the fish – affects ability to survive if released
 - tropical → likely to die quickly
 - sub-tropical → could survive, but not over winter
 - temperate → could survive and establish
- relationship to endemic fish – taxonomic relationship, closer = higher risk
- value of fish – lower value = greater volume, increased release probability
- salinity tolerance – risk: freshwater > estuarine > marine
- known pathogen status
 - numerous, consistent reports → high risk
 - reported carrier status → high risk
 - isolated / few reports → lower risk

Pathogen factors

- host specificity – the greater the host specificity the lesser the risk
- transmissibility – risk will vary according to ease of transmission, number of intermediate hosts
- environmental persistence – ability to survive in the environment, reservoirs, carriers
- pathogenicity – complicated factor
 - consequences proportional to pathogenicity
 - extremely pathogenic agents could be of low risk
- presentation – two sub-factors
 - clinical presentation (recognisable clinical signs vs subclinical)
 - ease of diagnosis (gross characteristics e.g ectoparasite → virological techniques)
- “treatability” – is pre-clearance Rx possible? Effective? – risk management

Putting the factors together

- how can we approach this?
- weighted matrices or questionnaires?
 - Bomford & Glover (2004) “Risk assessment model for the import and keeping of exotic freshwater and estuarine fish”, Bureau of rural sciences, Canberra
 - Copp *et al.* (2005) “Risk identification and assessment of non-native freshwater fishes: Concepts and perspectives on protocols in the UK” Science series technical report No. 129, CEFAS, Lowestoft
 - Screening tools: assess a range of traits and characteristics
 - subjective (based on previous experience)
 - semi-quantitative
 - primarily designed to look at 1 major issue: Invasiveness

Simple(st) approach?

- the risk analysis process narrowed the field to 1362 species and 17 pathogens
- let's work on the 17 pathogens...
- what characteristics of the hazards make them a risk? Can we determine fish species characteristics that make that risk significant to New Zealand?
 - host lists
 - taxonomic relationship to endemic fish
 - temperature tolerance of the fish
 - temperate fish → survive & establish → reservoirs of infection, continual shedding
 - subtropical → survive until winter → potential for shedding over a period of months
 - tropical → unlikely to survive

Some examples...

- iridoviruses

risk estimation		pathogen factors	important host factors
exposure & establishment	MODERATE	<ul style="list-style-type: none">•very wide host range•simple, direct, efficient horizontal transmission•carrier status•pathogenicity low → severe	<ul style="list-style-type: none">•known hosts•related fish in same family•temperate, subtropical & tropical fish
consequence	CATASTROPHIC		

Target – temperate, subtropical and tropical species of known hosts and related genera in families where there is a New Zealand endemic fish.

Measures – virus testing of source population / each batch ??

Some examples...

- *Glugea heraldi*

risk estimation		pathogen factors	important host factors
exposure & establishment	LOW	<ul style="list-style-type: none">• well defined host range (<i>Hippocampus</i> spp.)• simple, direct, horizontal transmission• subclinical → clinical• pathogenicity low	<ul style="list-style-type: none">• <i>Hippocampus</i> spp. only• temperate, subtropical fish
consequence	MODERATE		

Target – temperate and subtropical species of *Hippocampus* only.

Measures – extended quarantine, clinical examination ??

...and our frustrated diagnostician?

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- Risk assessment \rightarrow 1362 species & 17 actual hazards

Principal risk factors

Most tropical fish \rightarrow standard, reassessed & shortened quarantine procedures

168 species & 17 hazards

Specific testing, treatments &/or longer quarantine



Thank you