

Using risk perception to
determine if *Didymosphenia
geminata* poses a risk to
Tasmania, Australia

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Risk Perception

- People perceive things differently
- Lots of different models and disciplines
 - Environmental psychology
 - Conservation psychology



Risk perception

- Why care?
 - Reduce and mitigate risk
 - Understand the drivers
 - Why do people ignore quarantine?
 - Why do people spread diseases?
 - Cause behavioural change
 - Reduce risky behaviours
 - Education (people can be unaware; or just don't care)
 - Increase risk management efficacy

Risk perception

- What controls our perceptions
 - Douglas and Wildavsky (1982) – 4 types of individuals:
 - **Egalitarians** - technology and the environment
 - **Individualists** - war and other threats to the markets
 - **Hierarchists** - law and order
 - **Fatalists** – associate with none of the above

Risk perception

- What controls our perceptions
 - Sjoberg's (2000) psychometric model
 - New-old
 - Dread
 - Number of exposed individuals
 - Morality (questionable)

Risk perception

- What controls our perceptions
 - Value-Belief-Norm Theory (VBN)
 - Personal values
 - General set of beliefs or worldviews
 - Awareness of consequences
 - Ascription of responsibility
 - Personal norms

Risk perception

- What controls our perceptions
 - Leiserowitz (2005) public risk perception
 - Imagery
 - Trust
 - Values
 - Worldview
 - Personal experience
 - Emotion

Risk perception in biosecurity

- Test case: *Didymosphenia geminata*
 - Freshwater diatom
 - Introduced to New Zealand in 2004
 - Not introduced to Australia (yet)
 - Concern introduction to Australia from NZ
 - NZ and Tasmania (Australia) are linked:
 - **Socially** – people travel between the regions for recreational activities; and
 - **Environmentally** – similar environments and ecological niches

Risk model

- Determine the **likelihood** that *D. geminata* could arrive in Tasmania
 - Surveyed airport arrivals
- Determine the **consequence** of such an arrival
 - Surveyed recreational users (fishers, hikers, kayakers)
- Derive a **risk** rating

Likelihood

- $L = ((P_{RE}) \times (P_{RA})) - (P_M)$
 - Where
 - L = likelihood
 - P_{RE} = probability of risk region exposure
 - P_{RA} = probability of risk activity
 - P_M = probability of mitigation (equipment cleaning activity)

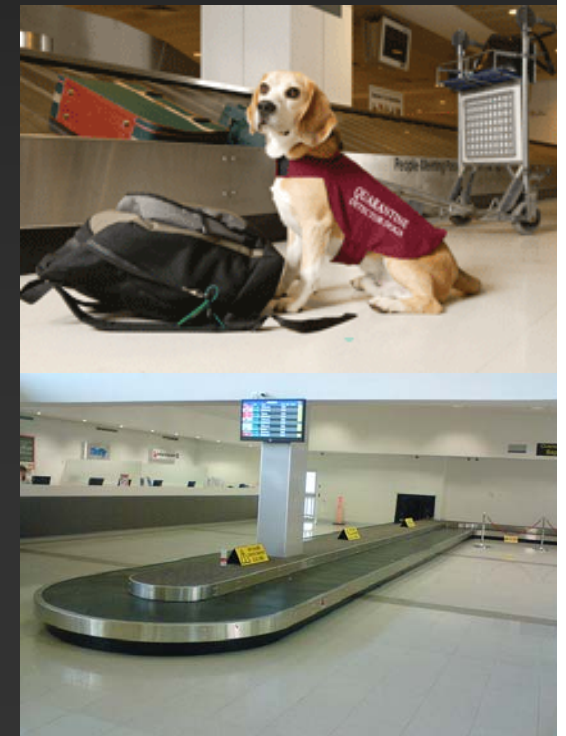


Descriptor	Description	Probability
Rare	Incursion only in exceptional circumstances	>1%
Unlikely	Incursion could occur but not expected	1-4%
Possible	Incursion could occur	5-24%
Likely	Incursion probable in most circumstances	25-50%
Almost certain	Incursion expected in most circumstances	>50%

Likelihood

- Questionnaire 1

- Launceston Airport (northern Tasmania)
 - >900,000 people into Tasmania per annum
 - Response of 194 people during our sampling period
- Public (arrivals)
- Targeted questions related to
 - Travel overseas in past fortnight?
 - Visited risk locations (global)?
 - Undertook risk activities?
 - Cleanliness of equipment?



Consequence (risk perception)

- Utilised perception
- Targeted 3 user groups:
 - Fishers
 - Hikers
 - Kayakers

Descriptor	Impact
Insignificant	
Concern	There is minimal (<10%) concern about <i>Didymosphenia</i> entering Tasmania's environment
Behaviour Modification	If <i>Didymosphenia</i> was introduced in an area <10% of people would change their behaviour
Minor	
Concern	There is an increase (<20%) in concern about <i>Didymosphenia</i> entering Tasmania's environment
Behaviour Modification	If <i>Didymosphenia</i> was introduced in an area <20% of people would change their behaviour
Moderate	
Concern	There is an increase (<30%) in concern about <i>Didymosphenia</i> entering Tasmania's environment
Behaviour Modification	If <i>Didymosphenia</i> was introduced in an area <30% of people would change their behaviour.
Major	
Concern	There is an increase (<70%) in concern about <i>Didymosphenia</i> entering Tasmania's environment
Behaviour Modification	If <i>Didymosphenia</i> was introduced in an area, <70% of people would change their behaviour.
Catastrophic	
Concern	There is an increase (>70%) in concern about <i>Didymosphenia</i> entering Tasmania's environment
Behaviour Modification	If <i>Didymosphenia</i> was introduced in an area, >70% of people would change their behaviour.

Consequence (risk perception)

- Questionnaire 2
 - Liawenee, Cradle Mountain- Lake St Clair National Park, & electronic surveys
 - Questions related to
 - Level of concern about *Didymosphenia* in Tasmania
 - Change in behaviour if *Didymosphenia* was introduced



Risk rating

- $R = L \times C$
- Where **R** = Risk; **L** = Likelihood; **C** = Consequence

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	Negligible	Low	Low	Medium	Medium
Unlikely	Negligible	Low	Medium	High	High
Possible	Negligible	Low	High	High	Extreme
Likely	Negligible	Medium	High	Extreme	Extreme
Almost certain	Negligible	Medium	Extreme	Extreme	Extreme

Risk outcomes: likelihood

- N = 194 respondents (air travellers)
- Travelled overseas in past fortnight **25 respondents**
- Visit risk locations **(16/25 = 0.64)**
- Undertook risk activities **(12/16 = 0.06195)**
- Undertook risk activities at risk region **(2/16 = 0.0103)**
- $L = ((P_{RE}) \times (P_{RA})) - (P_M)$
 - $((0.64 * 0.06195) - 0) = 0.039648$ (~4%)
 - Therefore probability = **Unlikely**

Descriptor	Description	Probability
Rare	Incursion only in exceptional circumstances	>1%
Unlikely	Incursion could occur but not expected	1-4%
Possible	Incursion could occur	5-24%
Likely	Incursion probable in most circumstances	25-50%
Almost certain	Incursion expected in most circumstances	>50%

Risk outcomes: consequence

- N = 200 respondents (recreational users)
- Risk perception of *Didymosphenia* in Tasmania (Concern)= **catastrophic**
- Change in behaviour if *Didymosphenia* was introduced (Behavioral change) = **moderate – major**
- Total consequence = **moderate - catastrophic**

Concern of *Didymosphenia*

Group	n*	Actual threshold values*	Consequence
Fish/hike/kayak	193	0.8705	Catastrophic
Fishers	117	0.8376	Catastrophic
Hikers	62	0.9032	Catastrophic
Kayakers	14	1	Catastrophic

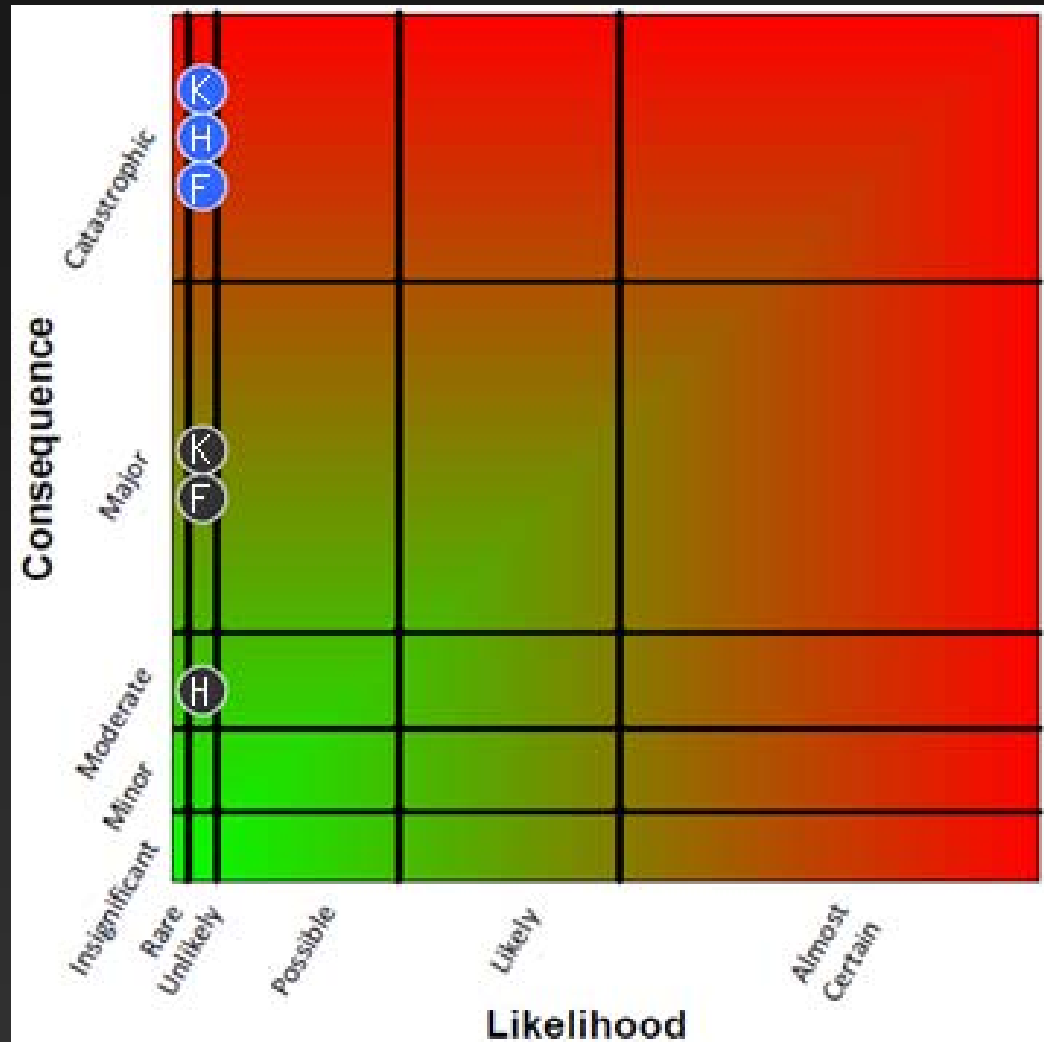
*Respondents who chose 'medium' were removed from the assessment

Behavioural change

Group	n	Return to site?		Probability of Behaviour change (Not returning)	Consequence
		No	Yes		
Fish/hike/kayak	184	94	90	0.5109	Major
Fishers	112	67	44	0.5982	Major
Hikers	56	16	40	0.2857	Moderate
Kayakers	16	11	5	0.6875	Major

Derived risk

- Total risk of *Didymosphenia* entering Tasmania = medium-high



	Likelihood	Consequence	Total Risk
Total risk*	Unlikely	Major- Catastrophic	High
Fishers	Unlikely	Major- Catastrophic	High
Hikers	Unlikely	Moderate- Catastrophic	Med-High
Kayakers	Unlikely	Major- Catastrophic	High

Risk management factoids

- Annual incursion risk (gross estimate) = 4,676 people [4% of total entries into Tasmania]
- Total survey numbers $n=391$
- 31 respondents had never heard of introduced species
 - 1 out of 12
- 907,200 travel into Tasmania
 - 75,600 have no knowledge

Ignorance = vectors for *Didymosphenia*

How You Can Help

- Don't bring used fishing gear or other freshwater recreational equipment into Tasmania like you or borrow your gear locally whether in Tasmania or when travelling overseas.
- If you do travel with used fishing gear (or other freshwater recreational equipment) you must declare it upon entry to Australia. Ensure that it is cleaned and completely dried prior to travelling.
- Be aware of the threat your used gear poses as a carrier of algae between waterways, particularly those that may remain damp for long periods. Check the best treatment for decontamination.
- Check Clean Dry all your freshwater sporting and recreational equipment between waterways. This includes gear used for fishing, hunting, camping, hiking, boating and kayaking.
- Never release any freshwater animal or plant species, alive or dead, into Tasmanian waterways. Dispose of ornamental plants or animal material, including potentially contaminated water used in cleaning equipment, away from waterways.
- Report any suspicious algal sightings in Tasmanian waterways. Callers a species in a container with water, note the exact location and contact the Inland Fisheries Service immediately on (01) 4261 8000.

How to identify Didymo

Didymo may be confused with Tasmanian native species of algal but can be distinguished by:

- Shape - although it looks slimy it doesn't feel slimy, but rather spongy and scratchy like cotton wool.
- Strength - didymo attaches very securely to river stones and does not fall apart when rubbed between your fingers.
- Colour - didymo is beige/brown/white but not green.
- Odour - live didymo has no distinctive odour.
- Microscope - definitive identification requires microscopic analysis.

For further information

- Quarantine Tasmania - (01) 4333 3352
- Inland Fisheries Service - (01) 4261 8000
- www.dia.gov.au

Keep Out Didymo!
Check Clean Dry
anything that's been in freshwater

Check - your gear before leaving the waterway and remove visible clumps of algae or other weeds. Dispose of the unwanted material later in a rubbish bin or landfill away from waterways.

Clean - your gear by scrubbing and soaking items for a minimum of 10 minutes in 2% household bleach (200 ml bleach with added water to make 10 litres) or a 2% salt, vinegar or ammonia cleaner or disinfecting detergent solution. As a greater precaution, use a hot water solution (maintained at 45°C or higher) and soak for 30 minutes. For items that are difficult to clean or dry (e.g. boat boots), soak for 45 minutes in water maintained at 45°C or higher containing 2% household bleach. Decontaminating liquid or vapor cleaner. Discharge cleaning waste away from waterways.

Dry - your gear completely and wait an additional 48 hours before contact or use in another waterway. Remember that some species such as fish control boats may need much longer time periods to avoid to dry treatment using heat at 45°C for at least 40 minutes is a better alternative when available.

Help Protect Tasmania's Freshwater Environment.

Keep-Out Didymo

One step at a time. Don't introduce it. One waterway at a time. Don't take it home. Don't spread it.

Don't take our world class fishery for granted. Don't bring used fishing gear into Tasmania. Declare all your equipment to Quarantine. Always Check, Clean & Dry your fishing equipment.

Photo credits: Great photographs of Didymo taken by Brad Harris. Researching Fresh, Coastal and Tidal Waters of Agriculture and Forestry.

Logos for Anglers, Inland Fisheries, and Tasmania Before the problem.



Risk mitigation: communication

- **Air and ferry travellers**
 - Targeted by quarantine upon entry
- **Fishers**
 - Targeted by Inland Fisheries and Quarantine with annual information flyers and surveys that arrive with fishing licences
 - Perceive themselves as linked to the threat
- **Kayakers**
 - Not targeted but should be
 - Perceive themselves as linked to the threat

Risk mitigation: communication

- Hikers

- Not targeted
- Major problem user group
- Less likely to change behaviours after an incursion
- Don't perceive themselves as linked to the threat
 - Terrestrial user group that "gets wet"
 - *Didymosphenia* incursion won't stop their activities
 - You can still hike if a river or lake is closed
 - No consideration of water in ditches, on shoes, gaitors etc

Risk mitigation: communication

- Quarantine needs to improve targeting hiker equipment, especially boots
- Recreational user groups need to be made aware of problem
- Play on emotions and world beliefs
 - Education
 - Awareness raising
 - Linking incursions to consequence to all user groups



Questions?

PROTECT OUR WATERWAYS

CHECK CLEAN DRY



NEW ZEALAND. IT'S OUR PLACE TO PROTECT.

BIOSECURITY NEW ZEALAND



WHAT WILL IT TAKE FOR YOU TO DO YOUR BIT?

BIOSECURITY NEW ZEALAND



HELP: IT'S WHAT WE NEED MOST.

BIOSECURITY NEW ZEALAND

IF YOU ARE MOVING ITEMS BETWEEN WATERWAYS, YOU MUST

CHECK CLEAN DRY

CHECK: Before you leave a car or boat, check items and leave debris at site. If you find any items, track and put in rubbish. Do not wash down items.

CLEAN: Items are covered eggs to kill spores. Choose the most practical treatment for your situation unless you are otherwise advised your gear.

Non-absorbent items

- Delicate tools or parts of surfaces for at least one minute in 2 percent dishwashing detergent in water (water level high side in 100 ml) with water added to make 10 litres. DR
- Durable tools or parts of surfaces for at least one minute in 2 percent household bleach (one level cap or 250 ml) with water added to make 10 litres. DR
- Hot water wash for at least one minute in very hot water (must exceed 60 °C). Higher than that the water DR for at least 30 minutes. If hot water (up to 40 °C) is unavailable to boot.

Absorbent items require longer soaking times to allow thorough saturation.

For example, hot water requires:

- Hot water wash for at least 40 minutes in hot water (not above 40 °C). DR
- Hot water plus detergent wash for at least 30 minutes in hot water (not above 40 °C) containing 1 percent dishwashing detergent or soap (above DR).

Pressing any items until solid will also kill oysters.

DRY: Drying will kill oysters, but slightly moist oysters can survive for months. To ensure oysters are dead, dry to 100 °C. The heat must be completely dry to the touch, inside and out. Items are dry for at least 48 hours. 48 hours before use.

If covering or drying is not practical, model equipment by a single entrance.

BIOSECURITY NEW ZEALAND

IF YOU ARE MOVING ITEMS BETWEEN WATERWAYS, YOU MUST

CHECK CLEAN DRY

CHECK: Before you leave a river or lake, check items and leave debris at site. If you find any items, track and put in rubbish. Do not wash down items.

CLEAN: Soak items in 5 percent dishwashing detergent for as long as it takes for the solution to thoroughly saturate the item, plus for at least an additional minute.

DRY: Items must be completely dry for at least 48 hours before use in another waterway.



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