Applying AIS Data for Operational Biosecurity Risk Assessment from Hitchhiker Pests to Biofouling

Clear Seas Webinar
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Dr. Moritz Lehmann
Senior Scientist
Starboard Maritime Intelligence
Aotearoa New Zealand

Starboard Maritime Intelligence

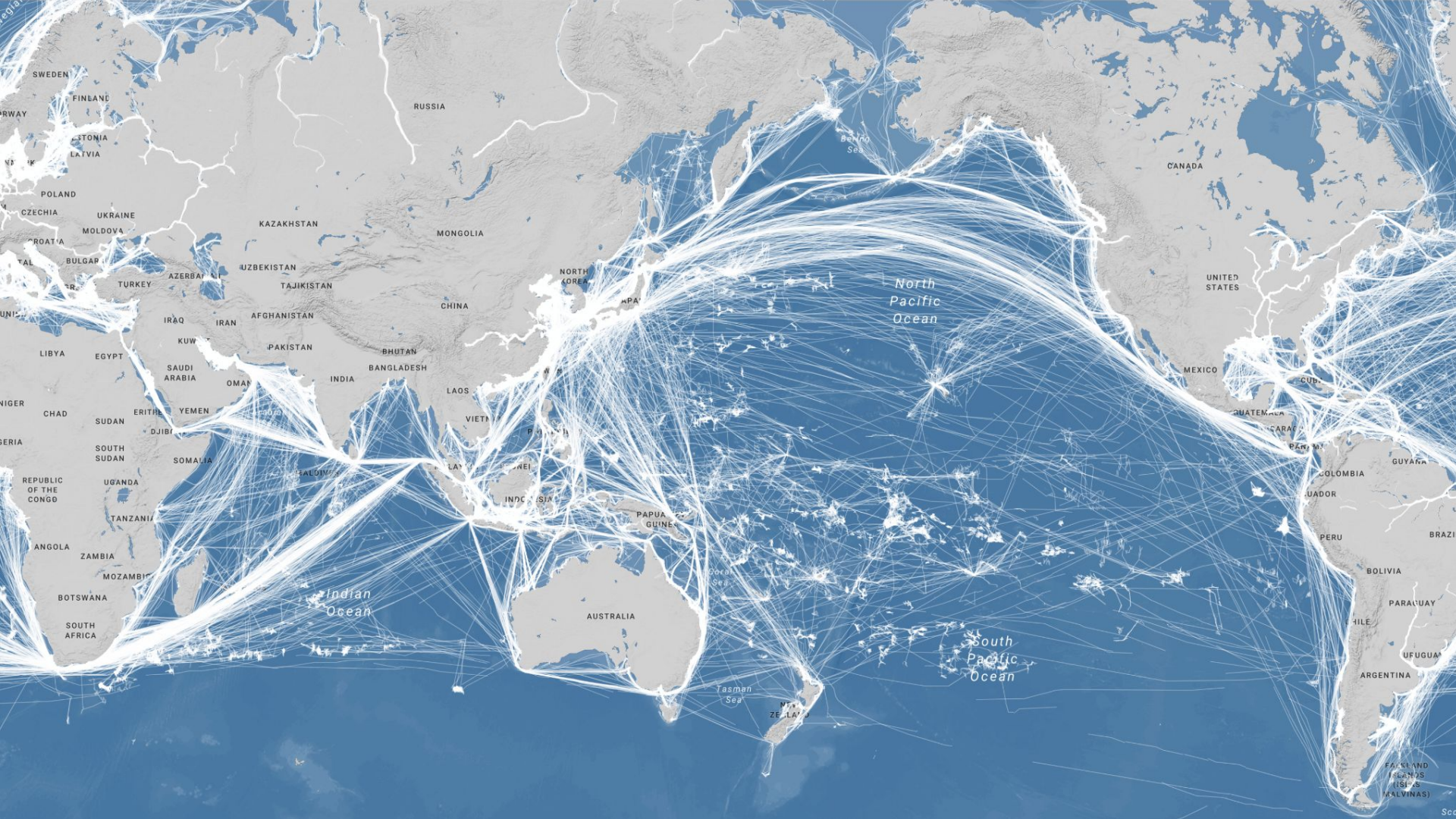
Biosecurity in Aotearoa New Zealand

Unwanted pests and diseases can damage New Zealand's economy, environment and way of life.

Ministry for Primary Industries (MPI) is lead organisation.

Three layers of protection

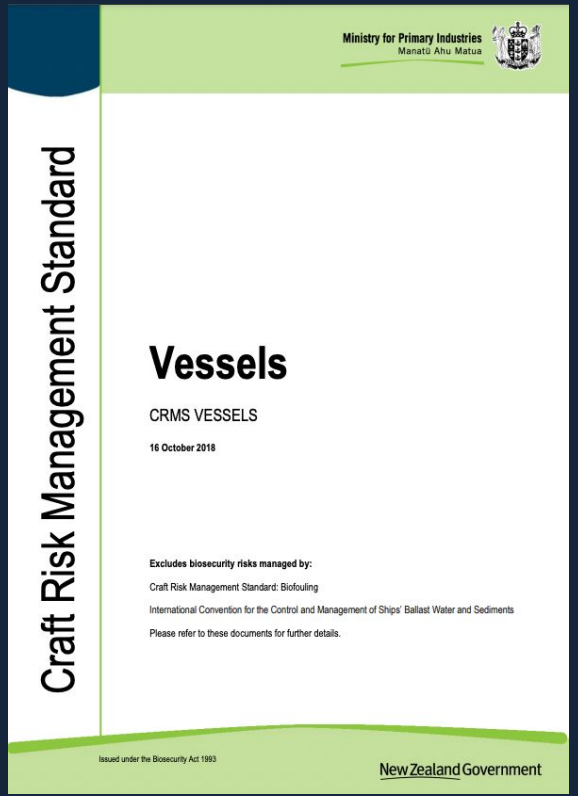
1. Pre-border
2. Border
3. Within Aotearoa NZ


SWEDEN
FINLAND
RUSSIA
LATVIA
POLAND
CZECHIA
UKRAINE
MOLDOVA
KAZAKHSTAN
MONGOLIA
BULGARIA
UZBEKISTAN
TURKEY
TAJIKISTAN
CHINA
IRAQ
IRAN
AFGHANISTAN
PAKISTAN
LIBYA
EGYPT
SAUDI ARABIA
BHUTAN
BANGLADESH
INDIA
LAOS
CHAD
SUDAN
YEMEN
SOUTH SUDAN
SOMALIA
REPUBLIC OF THE CONGO
UGANDA
TANZANIA
ANGOLA
ZAMBIA
BOTSWANA
SOUTH AFRICA
Indian Ocean
AUSTRALIA
Tasman Sea
North Pacific Ocean
South Pacific Ocean
CANADA
UNITED STATES
MEXICO
COLOMBIA
PERU
BOLIVIA
PARAGUAY
ARGENTINA


MIZUSHIMA, JAPAN – BMSB RISK VISIT
ENCOUNTER
MISSING AIS DATA
LOITERING
ANOMALOUS MOVEMENT
AREA ALERT (NZ EEZ ENTRY)
TAGGED ‘CHECK BMSB DETAILS’ BY MPI NZ
PA
CARGO VESSEL – BMSB RISK

Craft Risk Management Standard (CRMS)

- **Biosecurity Act 1993:** prescribes requirements for the exclusion, eradication and effective management of pests and unwanted organisms in New Zealand
- **CRMS 2018**: specify the requirements needed to manage biosecurity risks
  - Above water, biofouling, ballast water, Import Health Standard
- Pathway approach:
  - Vessels have to be clean
  - Two regulated risk species

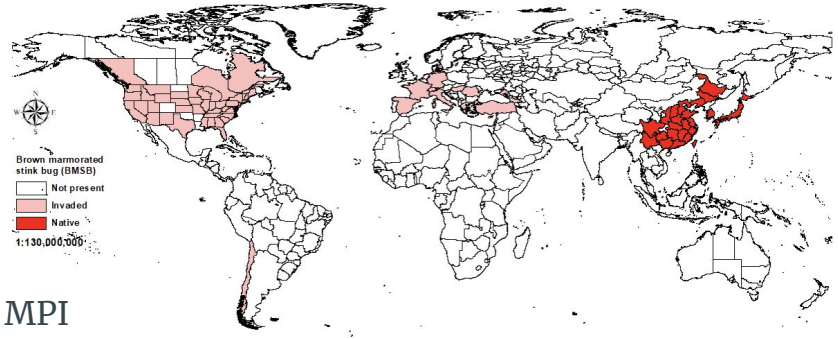


Start with two regulated hitchhiker pests

Spongy moth (formerly AGM)

USDA

Brown marmorated stink bug



MPI

Spongy moth

‘At risk’: Vessels arriving in New Zealand that have visited a risk area during the last 12 months, during a risk period for the area in question.

Risk area	Risk is assigned upon visit to any port in these sub-areas	Risk period
Russian far east	South of 60 ˚N and west of 147 ˚E (excluding those ports on the Kamchatka Peninsula)	1 July to 30 September
China	North of latitude of 31.25 ˚N (excluding Shanghai)	1 June to 30 September
Republic of Korea	All areas	1 June to 30 September
Japan – northern	Prefectures of Hokkaido, Aomori, Iwate, Miyagi, Fukushima	1 July to 30 September
Japan – western	Prefectures of Akita, Yamagata, Niigata, Toyama, Ishikawa	25 June to 15 September
Japan – eastern	Prefectures of Fukui, Ibaraki, Chiba, Tokyo, Kanagawa, Shizuoka, Aichi, Mie	20 June to 20 August
Japan – southern	Prefectures of Wakayama, Osaka, Kyoto, Hyogo, Tottori, Shimane, Okayama, Hiroshima, Yamaguchi, Kagawa, Tokushima, Ehime, Kochi, Fukuoka, Oita, Saga, Nagasaki, Miyazaki, Kumamoto, Kagoshima	1 June to 10 August
Japan – far southern	Prefecture of Okinawa	25 May to 30 June

Brown marmorated stink bug

The BMSB management measures apply to risk goods (vehicles, machinery, and parts) originating from or passing through BMSB risk countries.
Arrival date in NZ From 1 September to 30 April.

Albania
Andorra
Armenia
Austria
Azerbaijan
Belgium
Bosnia and Herzegovina
Bulgaria
Canada
Croatia
Czechia
France
Georgia
Germany
Greece
Hungary
Italy
Japan
Kazakhstan
Kosovo
Liechtenstein
Luxemburg
Republic of North Macedonia
Moldova
Montenegro
Netherlands
Poland
Portugal
Romania
Russia
Serbia
Slovakia
Slovenia
Spain
Switzerland
Turkey
Ukraine
USA (excludes Alaska and Hawaii)

Analysis: Hitchhiker pest risk (AGM, BMSB) | Time: 27 Jun 2021, 00:00 NZST – 30 Sep 2021, 14:41 NZDT | Area: New Zealand EEZ | Vessels: Selected vessel only | Vessel type: Cargo or Cargo - Hazard A or 10 others | Add filter

Analysis results

1 vessel selected

NS BURGAS

Overview | Track history

95 days | Filter & sort

- **Marsden Point, New Zealand**
  30 Sep 2021, 14:41 – 2 Oct 2021, 11:45
  1d 21h 3m in port

  29d 4h 2m at sea
  Loitering (1d 2h 16m)
- **Jebel Ali, United Arab Emirates**
  1 Sep 2021, 09:08 – 09:39
  30m in port

  17h 51m at sea
- **Ruwais, United Arab Emirates**
  31 Aug 2021, 11:39 – 15:17
  3h 8m total in port

  1h 30m at sea
- **Jabal Az Zannah/ruways, United Arab Emirates**
  30 Aug 2021, 17:27 – 31 Aug 2021, 10:09
  16h 42m in port

  5d 21h 21m at sea
- **Fujairah, United Arab Emirates**
  24 Aug 2021, 07:42 – 20:05
  12h 23m in port

  13d 12h 27m at sea
- **Singapore, Singapore**
  10 Aug 2021, 05:11 – 19:14
  14h 2m in port

  13d 9h 46m at sea
- **Tianjin, China, AGM risk**
  25 Jul 2021, 20:13 – 27 Jul 2021, 19:24

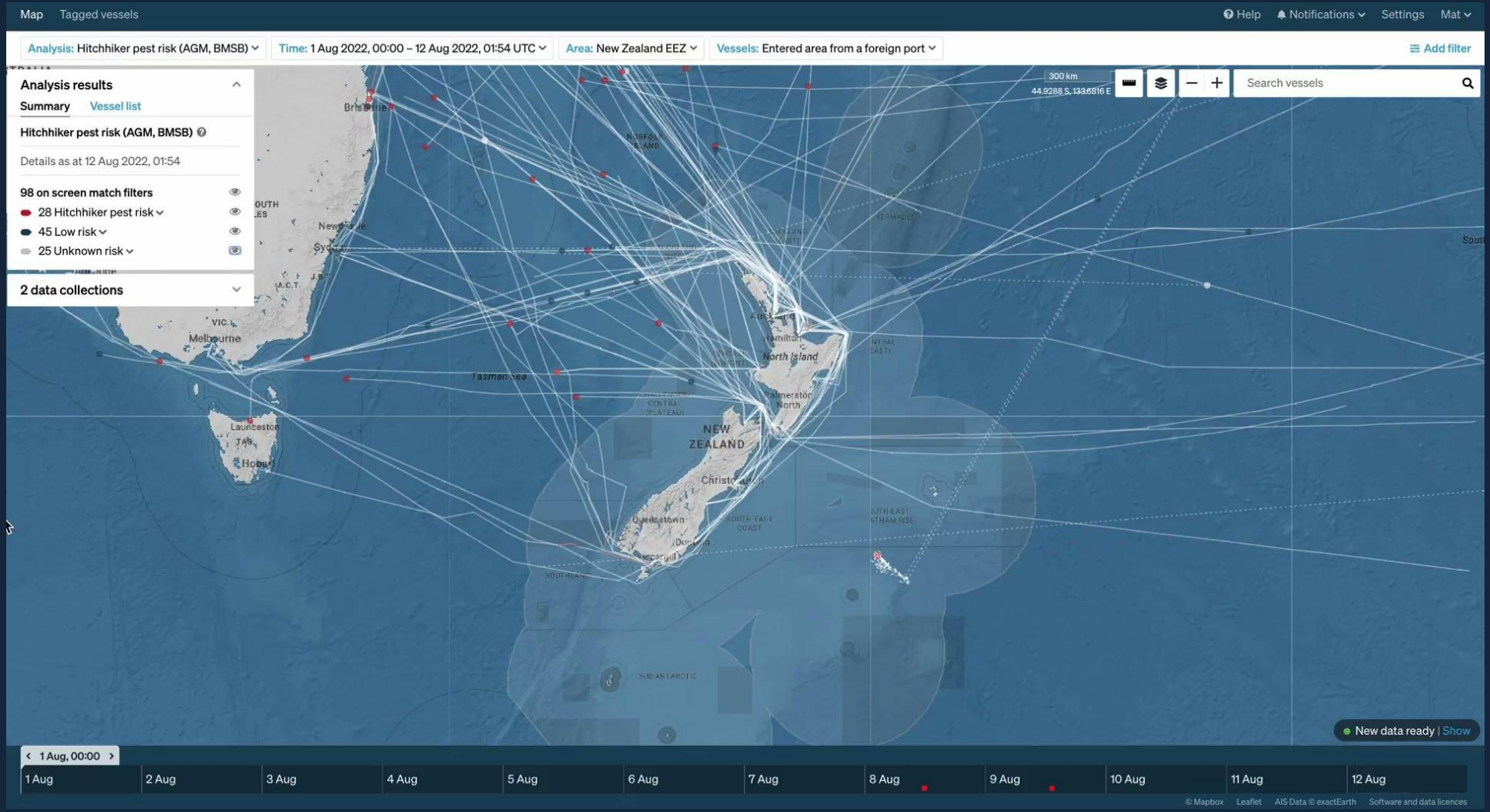
Open vessel report | Actions

Show other vessels

Search vessels

27 Jun 2021, 02:00

27 Jun | 1 Jul | 5 Jul | 9 Jul | 13 Jul | 17 Jul | 21 Jul | 25 Jul | 29 Jul | 2 Aug | 6 Aug | 10 Aug | 14 Aug | 18 Aug | 22 Aug | 26 Aug | 30 Aug | 3 Sep | 7 Sep | 11 Sep | 15 Sep | 19 Sep | 23 Sep | 27 Sep


Map
Tagged vessels
Help
Notifications
Settings
Mat
Analysis: Hitchhiker pest risk (AGM, BMSB)
Time: 1 Aug 2022, 00:00 – 12 Aug 2022, 01:54 UTC
Area: New Zealand EEZ
Vessels: Entered area from a foreign port
Add filter
Analysis results
Summary
Vessel list
Hitchhiker pest risk (AGM, BMSB)
Details as at 12 Aug 2022, 01:54
98 on screen match filters
28 Hitchhiker pest risk
45 Low risk
25 Unknown risk
2 data collections
300 km
44.9288 S, 133.6816 E
Search vessels
Brisbane
Sydney
Melbourne
Hobart
Launceston
Tasman Sea
Hamilton
North Island
Palmerston North
NEW ZEALAND
Queenstown
Dunedin
Invercargill
SUBANTARCTIC
New data ready | Show
1 Aug, 00:00
1 Aug
2 Aug
3 Aug
4 Aug
5 Aug
6 Aug
7 Aug
8 Aug
9 Aug
10 Aug
11 Aug
12 Aug
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AIS Data © exactEarth
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Developing a biofouling risk indicator

Organisms attached to a ship's hull below the waterline are collectively referred to as biofouling. Biofouling has been demonstrated to be a mechanism leading to the introduction of non-indigenous marine organisms into environments around the world.

Image credit: Oli Floerl

CRMS Biofoul

CRMS is based on work published in the MPI report *The Biosecurity Risks Associated with Biofouling on International Vessels Arriving in New Zealand: Summary of the patterns and predictors of fouling* (Inglis et al. 2010)

- 508 vessels surveyed between 2004-2007
- Vessel details, voyage history and maintenance regime analysed to identify risk factors.
- BRT analysis to describe patterns has limited predictive ability

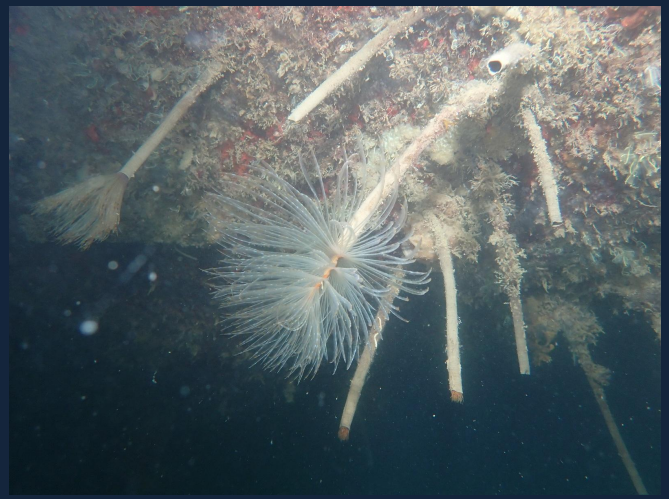
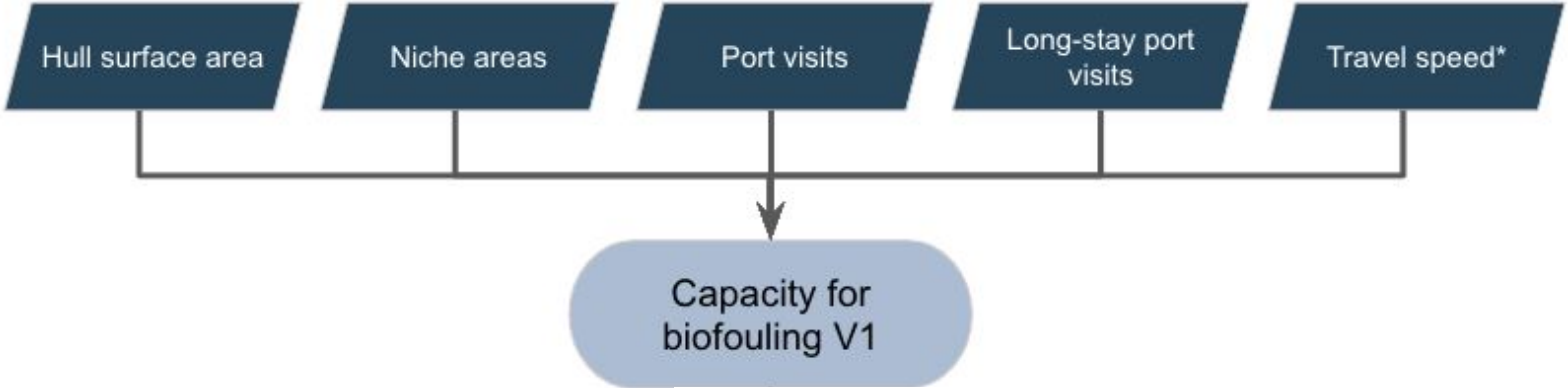


Table 2-2: Description of the scale used to estimate the level of fouling (LOF) on the vessels. (Source: Floerl et al. 2005a).

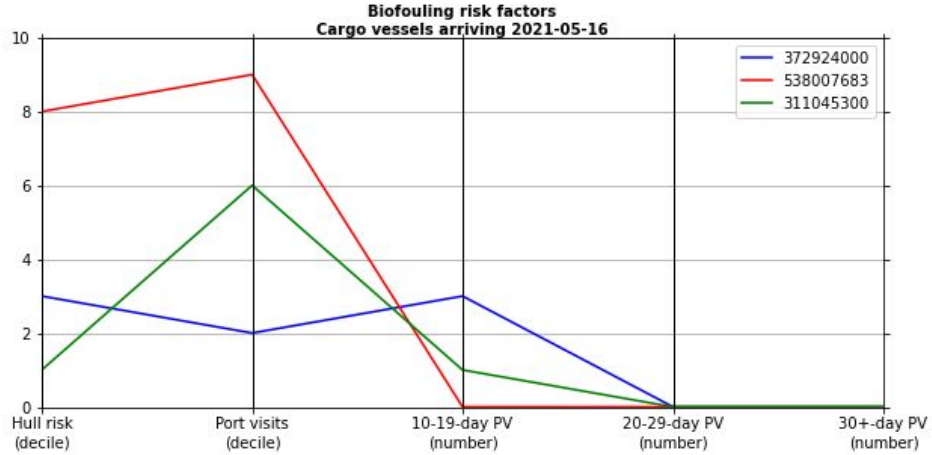
Rank	Description	Visual estimate of fouling cover
0	No visible fouling. Hull entirely clean, no biofilm† on visible submerged parts of the hull.	Nil
1	Slime fouling only. Submerged hull areas partially or entirely covered in biofilm, but absence of any macrofouling.	Nil
2	Light fouling. Hull covered in biofilm and 1–2 very small patches of macrofouling (only one taxon).	1–5 % of visible submerged surfaces
3	Considerable fouling. Presence of biofilm, and macrofouling still patchy but clearly visible and comprised of either one single or several different taxa.	6–15 % of visible submerged surfaces
4	Extensive fouling. Presence of biofilm and abundant fouling assemblages consisting of more than one taxon.	16–40 % of visible submerged surfaces
5	Very heavy fouling. Diverse assemblages covering most of visible hull surfaces.	41–100 % of visible submerged surfaces

†Biofilm: Thin layer of bacteria, microalgae, detritus and other particulates that is required for settlement of the larvae of many species of marine invertebrates; see Todd & Keough 1994, Keough & Raimondi 1995.

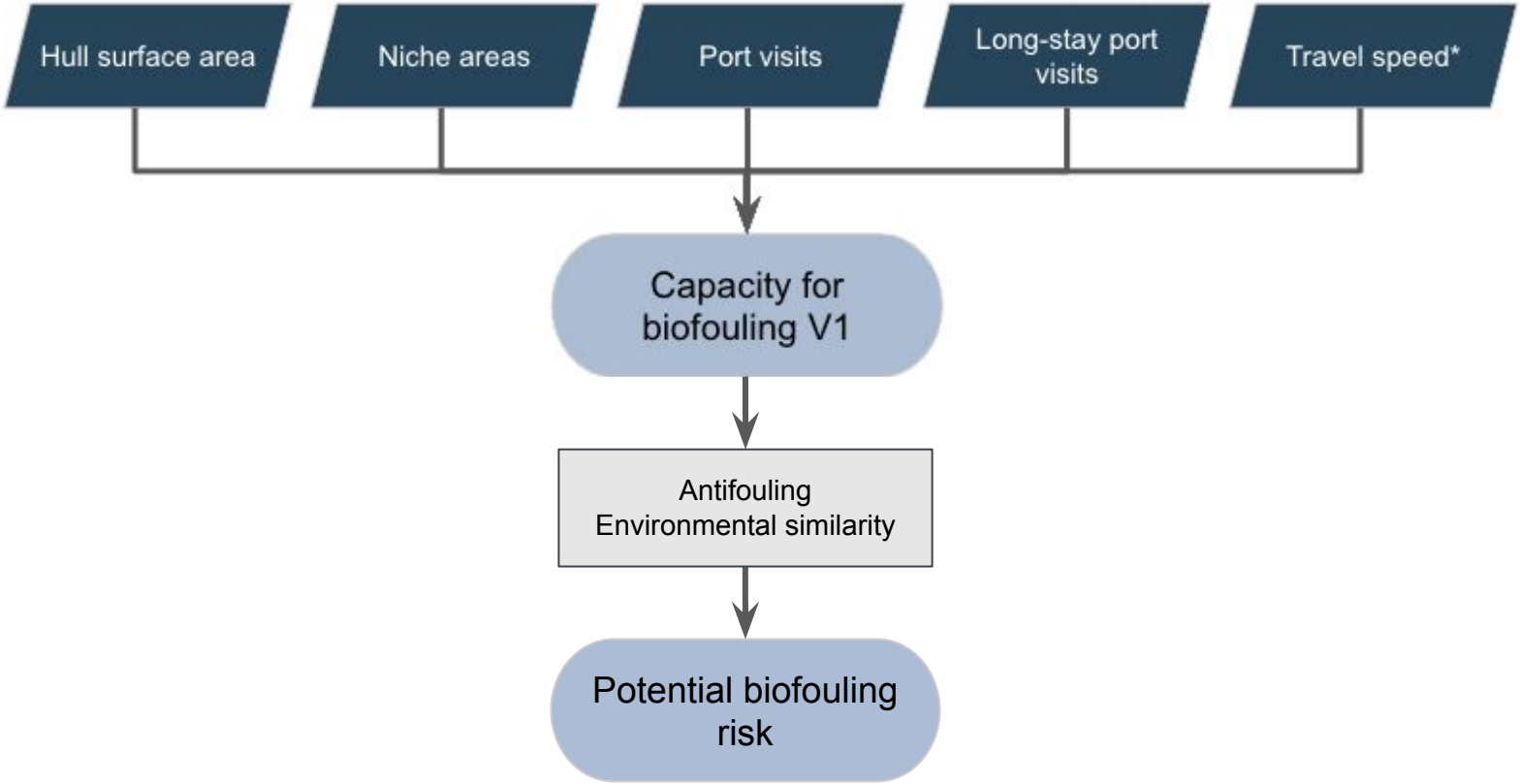
Biofouling risk factors



Risk factor summary for three cargo vessels that came into a New Zealand port from overseas on 16 May 2021.

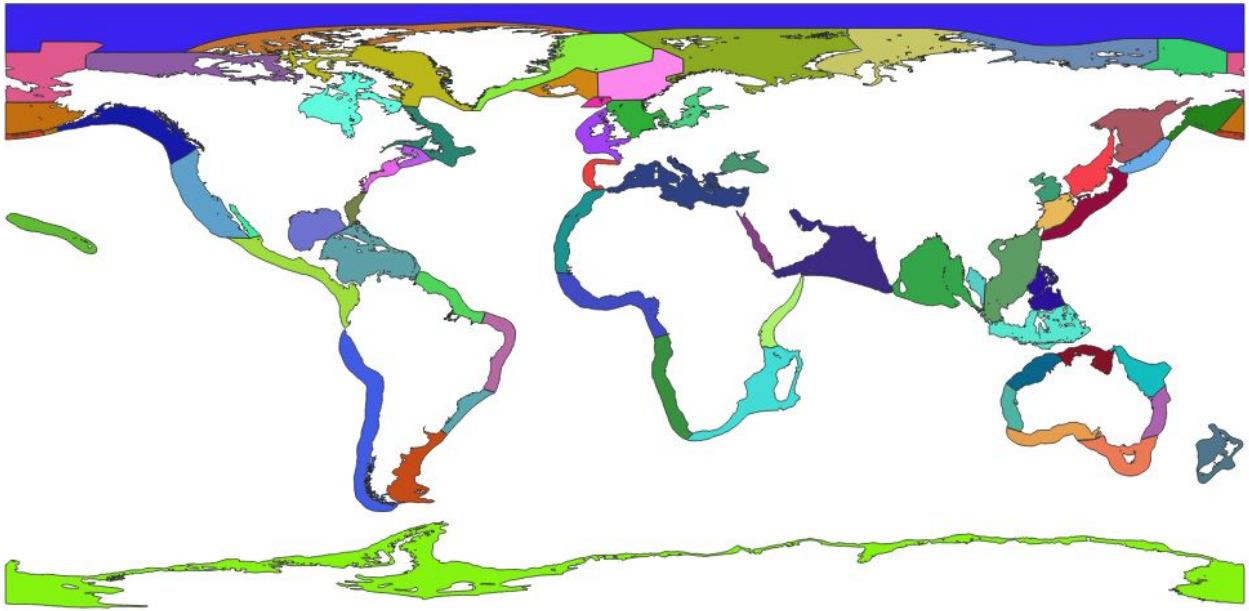


Biofouling risk factors



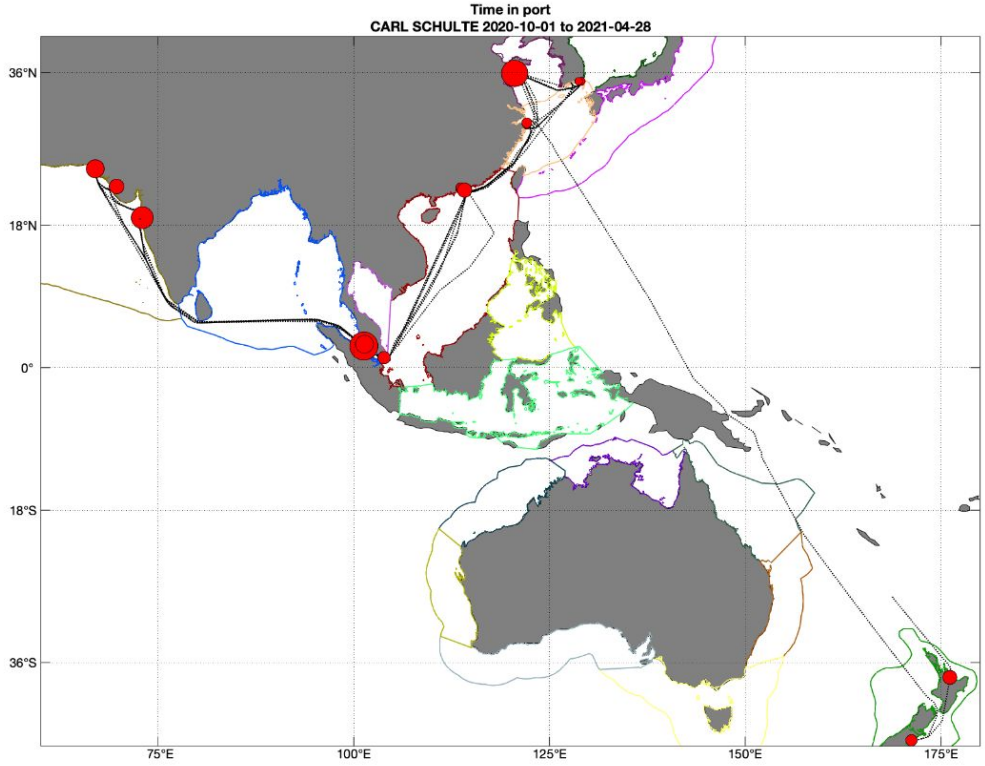
Marine ecoregions of the world

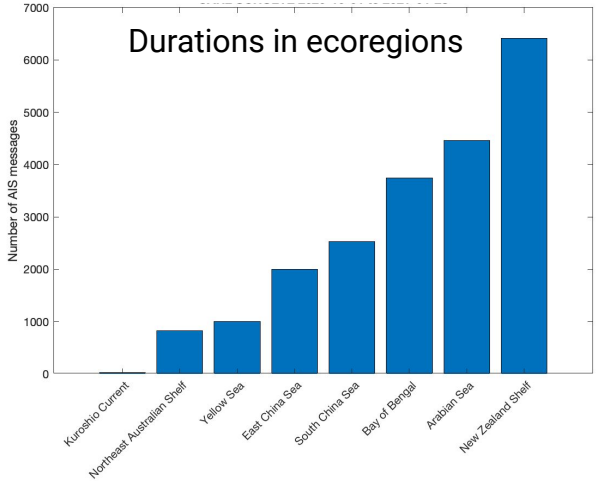
A biogeographic classification of the world's coastal and continental shelf waters following a nested hierarchy of realms, provinces and ecoregions. (The Nature Conservancy)

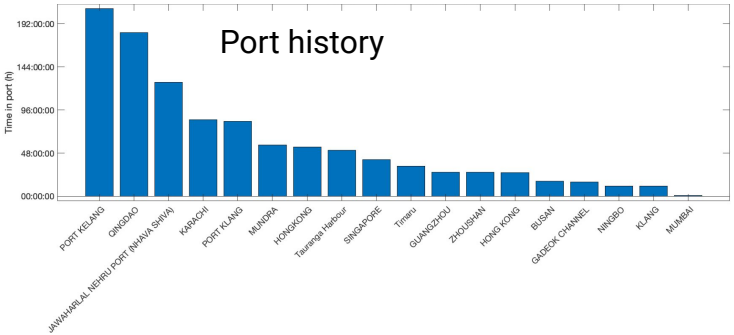


Spalding MD et al. (2007) Marine Ecoregions of the World: a bioregionalization of coast and shelf areas. BioScience 57: 573-583. https://databasin.org/datasets/3b6b12e7bcca419990c9081c0af254a2

Journey through marine ecoregions







Current example: Foot and mouth disease

- Foot-and-mouth disease (FMD) is a highly contagious animal virus that affects cattle, sheep, goats, deer, and pigs (animals with cloven hooves)
- FMD is Aotearoa's biggest biosecurity risk
- New Zealand is free from FMD and we have never had a case here
- FMD found recently in Indonesia – including Bali

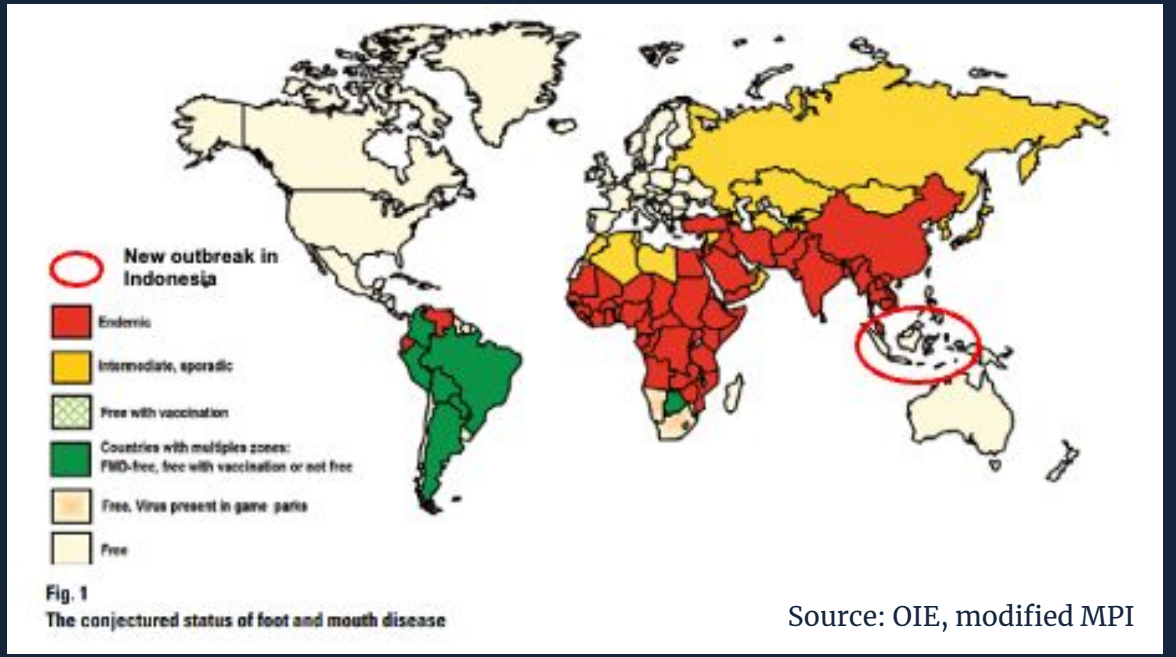


Fig. 1
The conjectured status of foot and mouth disease

Source: OIE, modified MPI

Indonesia port visits in last 30 days

Starboard as a Biosecurity tool

- ➜ Identify previously unknown behaviours increasing risk
- ➜ Evolving capability to allow include users to set up queries and set alerts
- ➜ Tags and alerts create operational efficiencies
- ➜ Collaborate across agencies in real-time
- ➜ Actionable insights

Tēnā koutou

Moritz Lehmann
moritz.lehmann@starboard.nz
@starboard_nz

Starboard
Maritime
Intelligence