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Technology & Innovation Centre, Glasgow, 3-4 October 2019

Klaipeda University
Marine Research Institute

DECOMMISSIONED MARINE INFRASTRUCTURES: A STEPPING STONE FOR MARINE INVASIVE SPECIES

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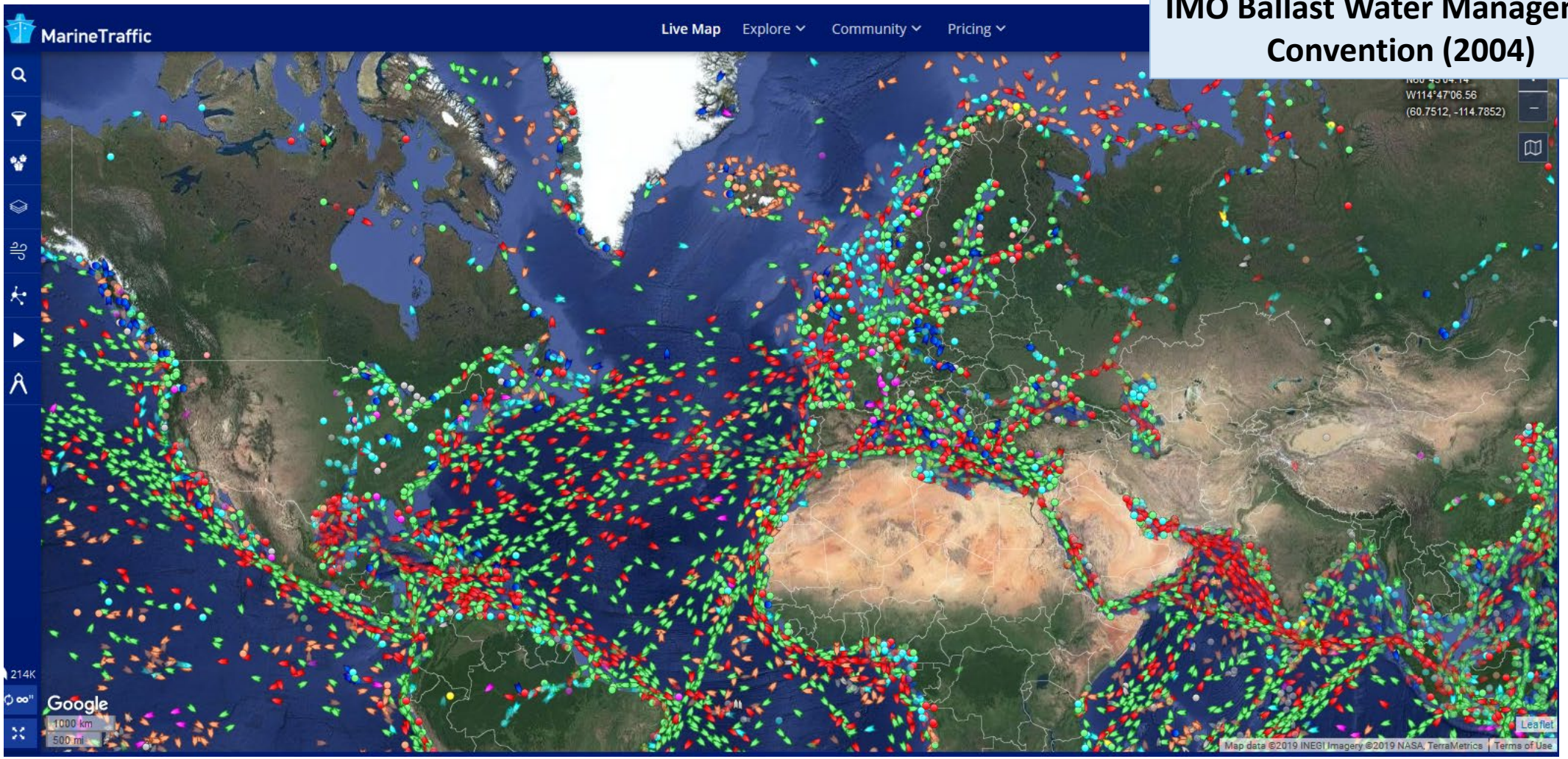
Outline:

- Global spread of marine biota and the stepping stone effect
- Invasive species and biosecurity risks
- “Rigs-to-reefs” programme and management of marine biofouling

The ecological roulette:
many ways of moving aquatic species

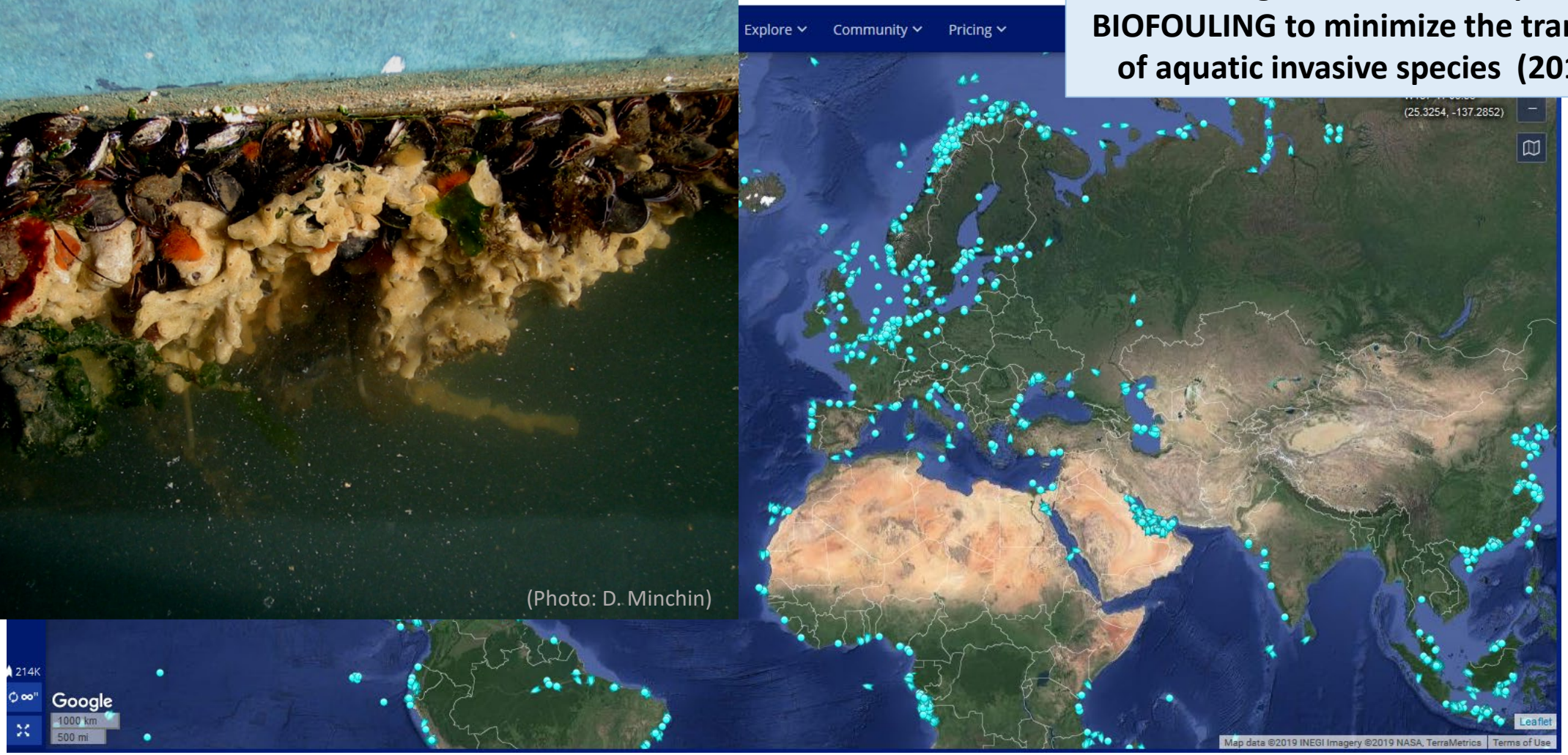
IMO Ballast Water Management Convention (2004)



(All ship types @ marinetraffic.com)

The ecological roulette:
many ways of moving aquatic species

IMO GUIDELINES for the Control and Management of the Ships' BIOFOULING to minimize the transfer of aquatic invasive species (2011)



(Tugs & Special Craft, incl. platforms and drill ships types @ marinetraffic.com)

Find 10 differences: **Biofouling of ships and oil platforms/rigs**

(safety4sea.com/)

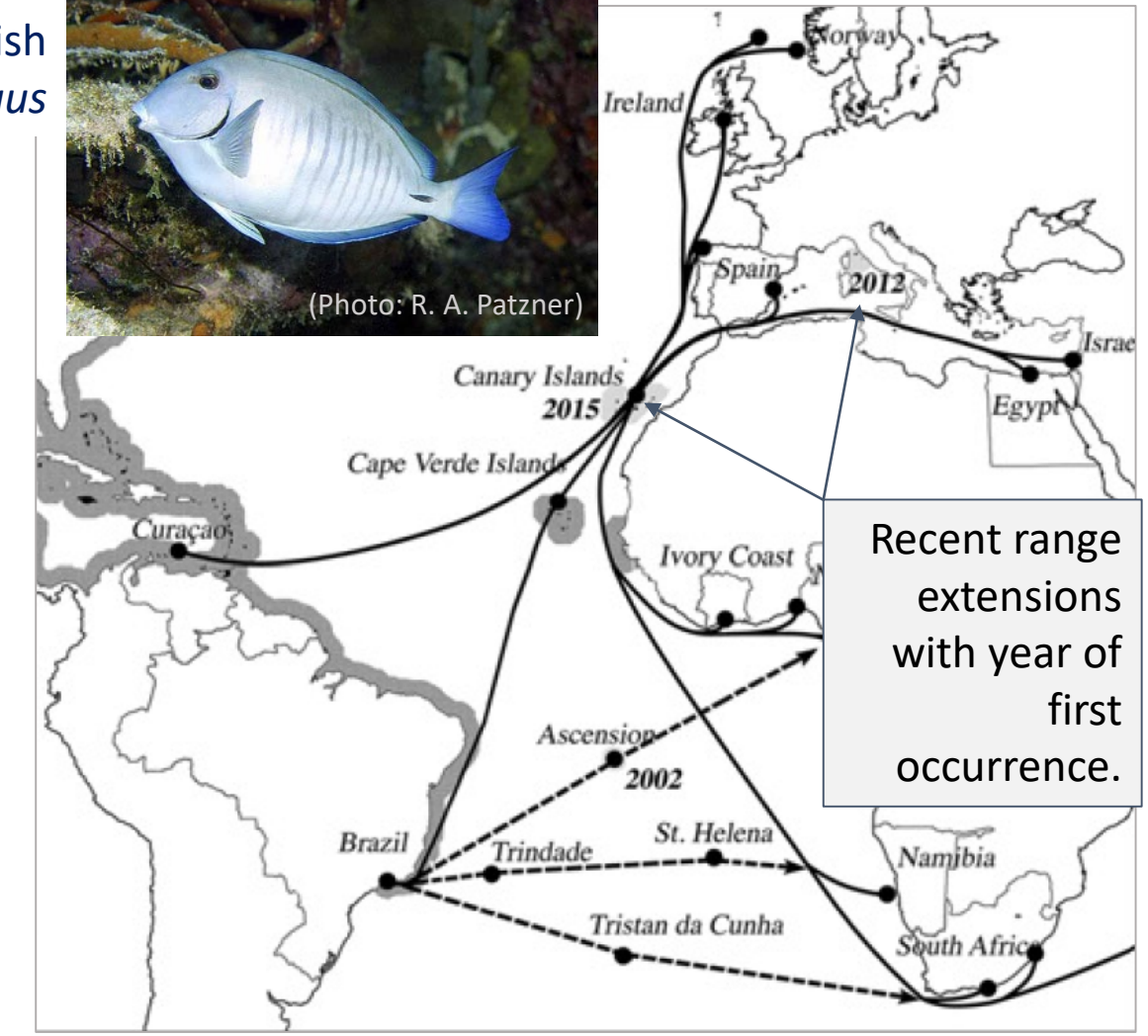
(www.nytimes.com)

#	Ships	Oil platforms/rigs
1	Normally within 10 m depth immersion	Immersion > 10 m
2	Mostly flat/curved surfaces	Complex 3D structures
3	Mostly in transit	Once established stationary
4	When underway > 10 knots	When under tow < 5 knots
5	Settlement of organisms unlikely when in transit	Settlement of organisms unavoidable when on-site
6	Exposed to a wide range of salinities and temperatures on transit	Exposed to more stable conditions at moored site
7	Specified inter-docking period	Long-term inter-docking period, if any. Usually no biofouling removal before towing
8	Antifouling (toxic) paints applied	Paint applications unclear
9	No known associated fishes, except in ballast water	Examples of fish associated with towed structures
10	Inoculations of alien species in ports	May act as a hub (stepping stone) from service vessels

Introduction of non-native marine fish species
to the Canary Islands waters through oil platforms

Doctorfish
Acanthurus chirurgus

The docking area of oil rigs in the port of Gran Canaria



(Pajuelo et al. 2016. Journal of Marine Systems 163: 23–30)

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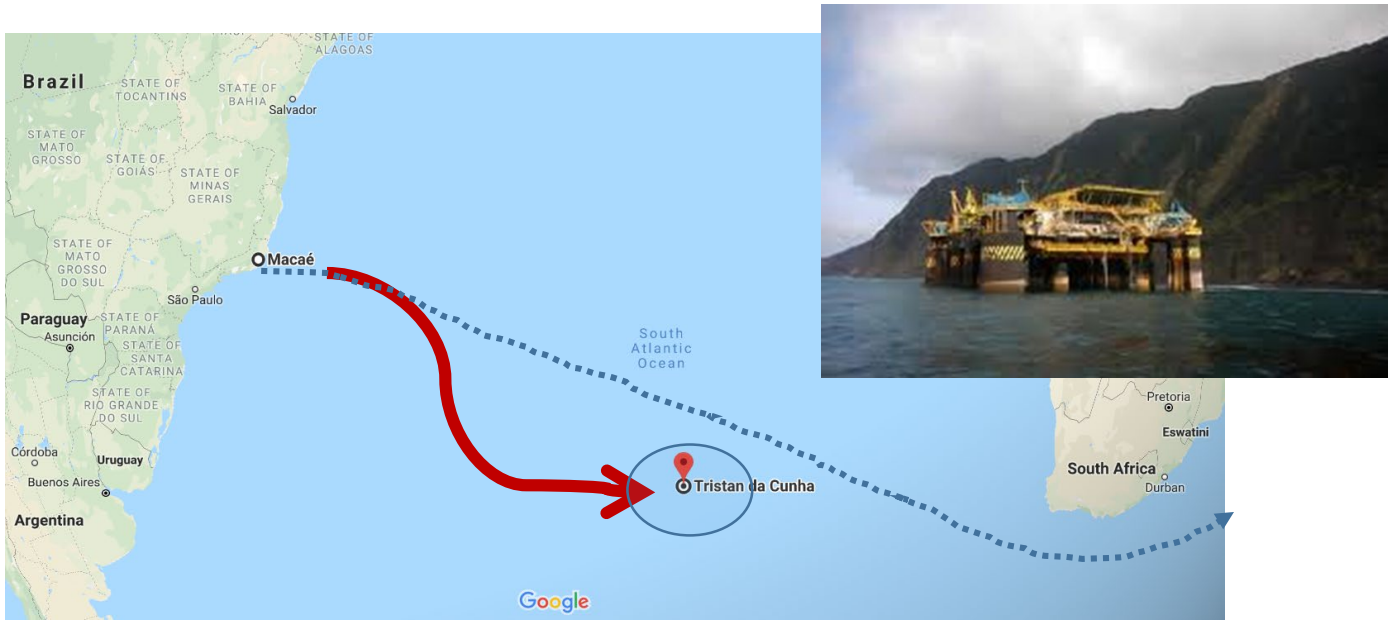
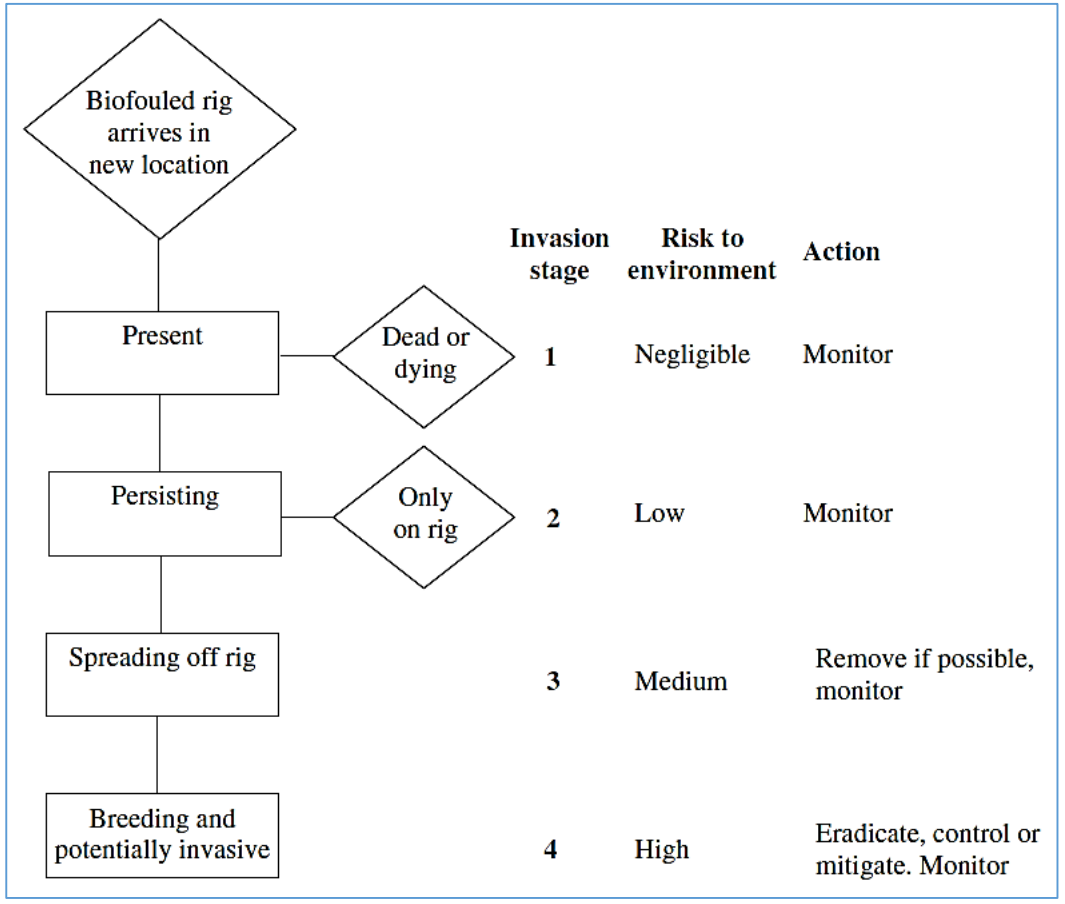
Lost & found:
an oil platform in the South Atlantic

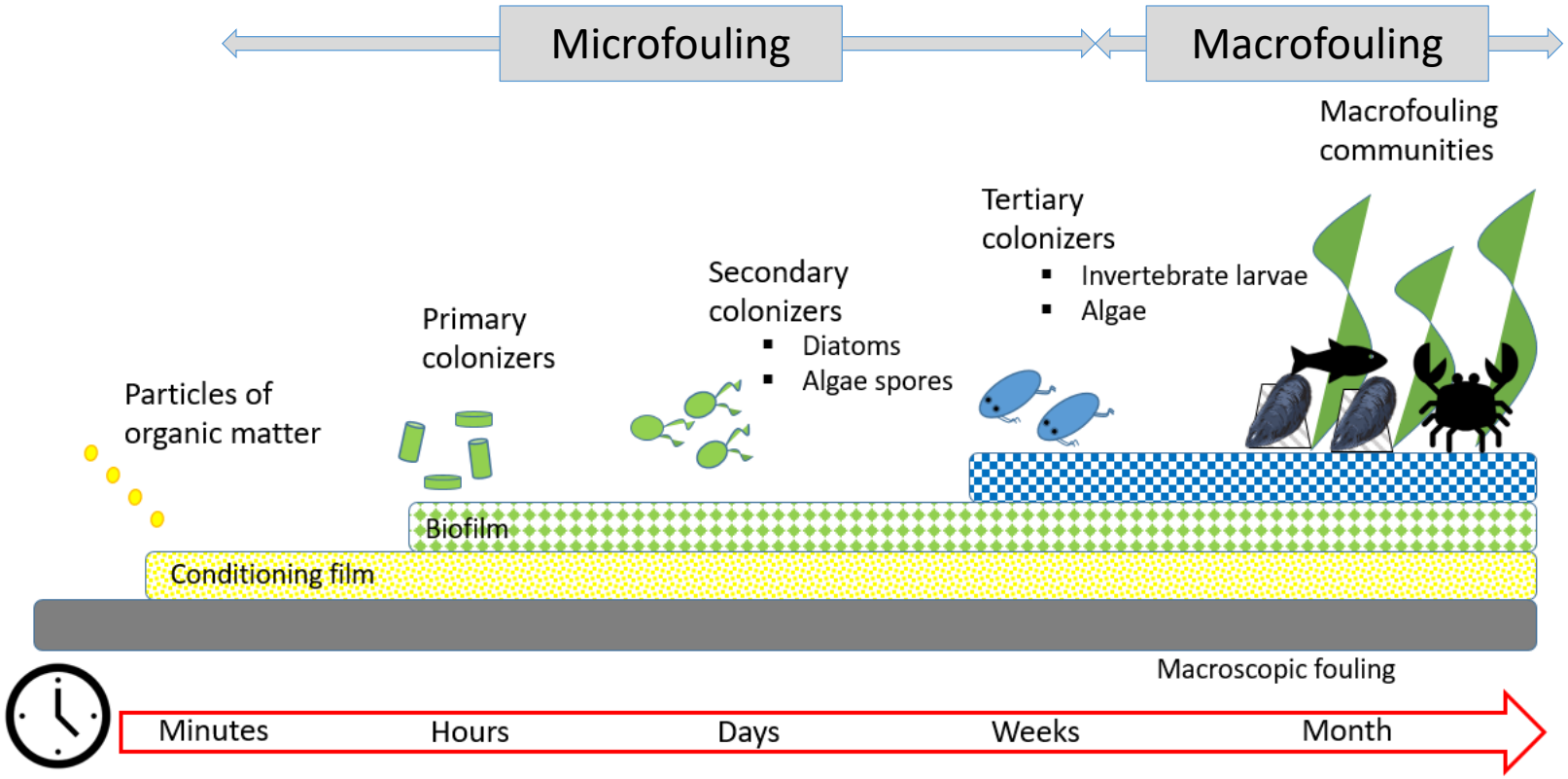


- A rig under tow in storm breaks free from ocean tug heading form Brazil tor Singapore.
- Platform is lost; but found on Tristan da Chuna.
- Heavily fouled with species alien to Tristan, fishes and vertebrates survive journey.
- Platform towed and sunk in deep water.



(Wanless et al. 2010. Semi-submersible rigs: a vector transporting entire marine communities around the world. Biol. invasions, 12)

Biofouling stages and the stepping stone effect



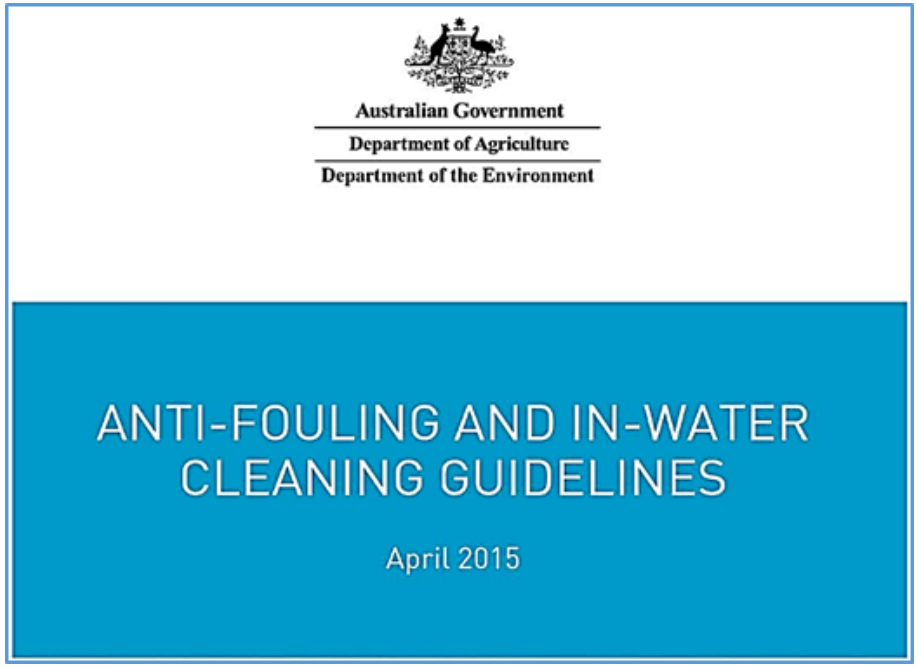
Stepping stone effect

(Scheme: courtesy Lukas Ritzenhofen.
Simplified and modified from Martín-Rodríguez et al. 2015 and Grzegorczyk et al. 2018)

Biosecurity risk

The potential harm to the economy, environment, human health and social and cultural values posed by pests and diseases entering, emerging, establishing or spreading in Australia and/or New Zealand

(Anti-fouling and in-water cleaning guidelines, 2015. NZ & AU)



- Cleaning method should ensure that release of biological material into the water column is minimized…
- Capture debris greater than 50 µm in diameter to minimize the release of viable adult, juvenile and larval stages of macrofouling

- **Domestic biofouling – no risk**

- **Regional / International biofouling – high risk**

Rigs-to-Reefs:
avoiding the stepping stone effect

Keep away from:

- Ships' ballast water operation (discharge and uptake) areas,
- Thermal discharge from power plants and other coastal industry
- Ports and marinas
- Ship repairing yards
- Aquaculture installations

(Photo:
Macreadie et al 2011. Rigs-to-reefs: will the deep sea benefit from artificial habitat? Front Ecol Environ; 9)

Conclusions

- The decommissioned marine infrastructures act as stepping stones for marine invasive species.
- Biofouling management of ships and oil rigs is different.
- A specialized legislation (rules, code of practice) is needed for management of oil platforms' biofouling.
- Biosecurity risks should be taken into account in the Rigs-to-Reefs programs.


(Photo: S. Olenin)

Thank you for your attention!

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Marine Research Institute previous biofouling studies: South China Seas, Mediterranean, Caribbean, Arctic

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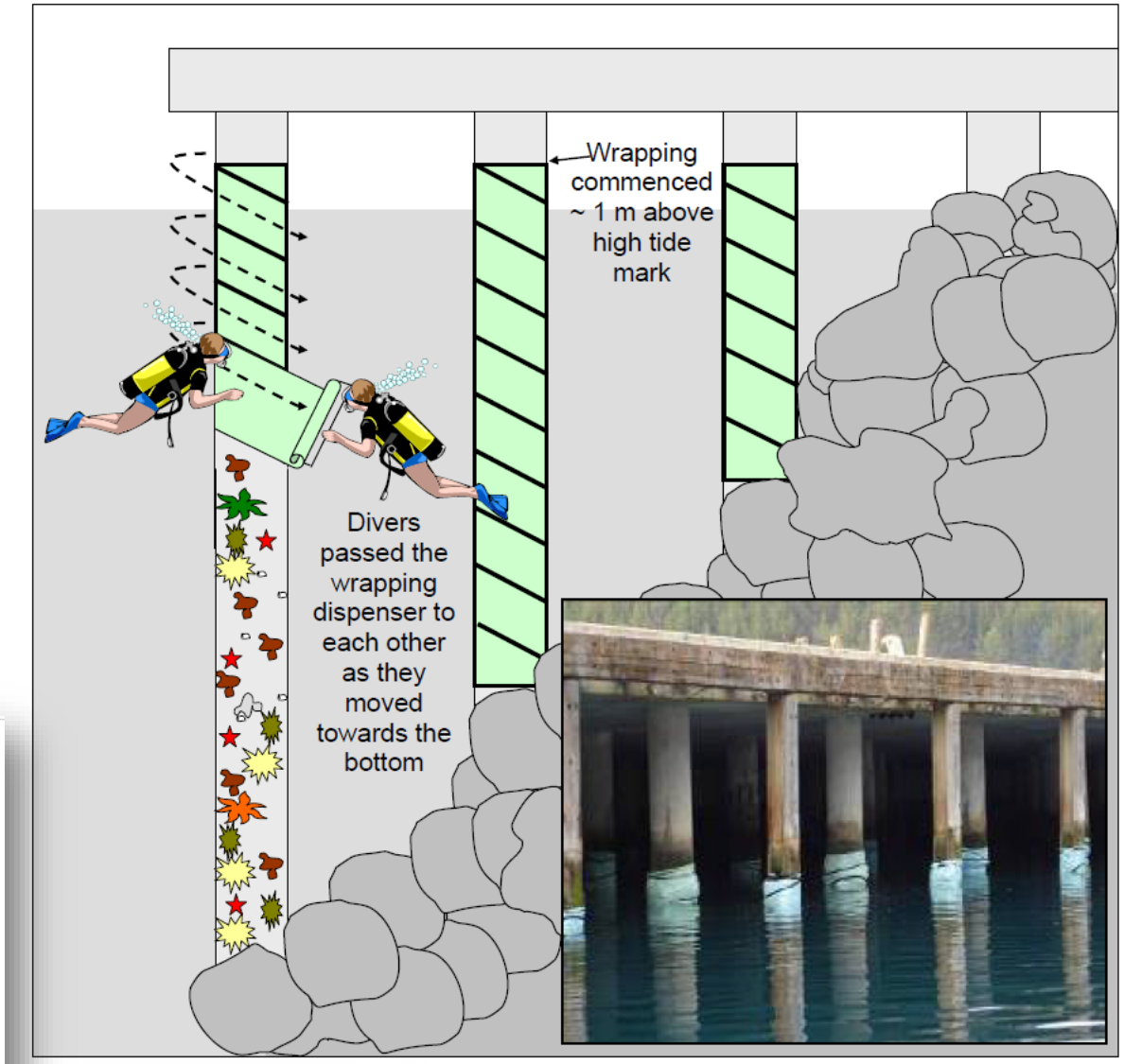
Marine Alliance for Science and Technology for Scotland
a marine partnership for Scotland

EU STRATEGY FOR THE BALTIC SEA REGION
FLAGSHIP

COMPLETE
Completing management options in the Baltic Sea Region to reduce risk of invasive species introduction by shipping

Management of biofouling for the Rigs-to-Reefs programme

- High-pressure water blasters and hand-held scrapers.
- Removal of biofouling on land.
- Prolonged air exposure onboard a heavy-lift vessel during transfers.
- Plastic encapsulation.



(Biosecurity New Zealand 2007. Treatment methods used to manage *Didemnum vexillum* in New Zealand)

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Viewpoint

Challenges associated with pre-border management of biofouling on oil rigs

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