

Biofouling risk management for the importation of Ichthys Venturer (FPSO) and Ichthys Explorer (CPF), the world's largest semi-submersible platform.

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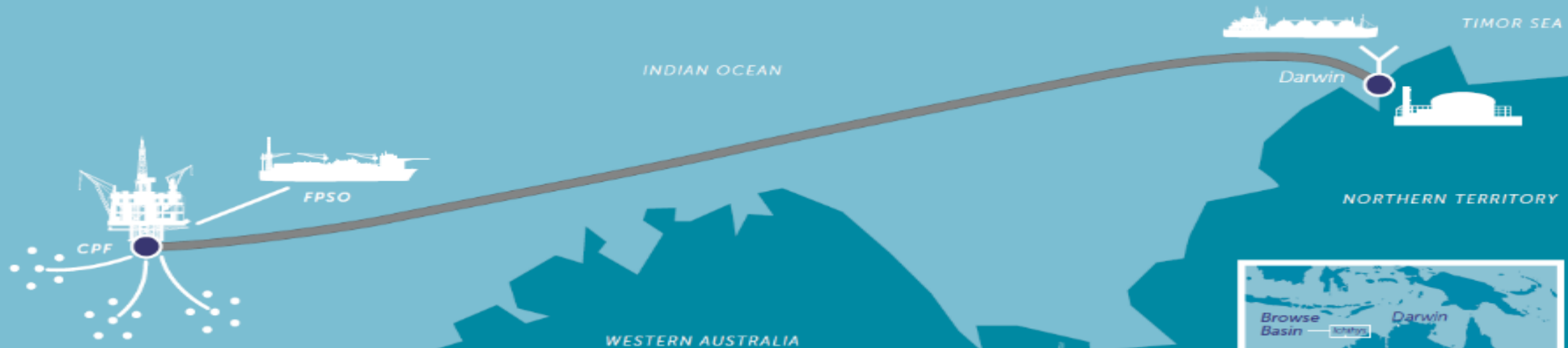
OFFSHORE



PIPELINE



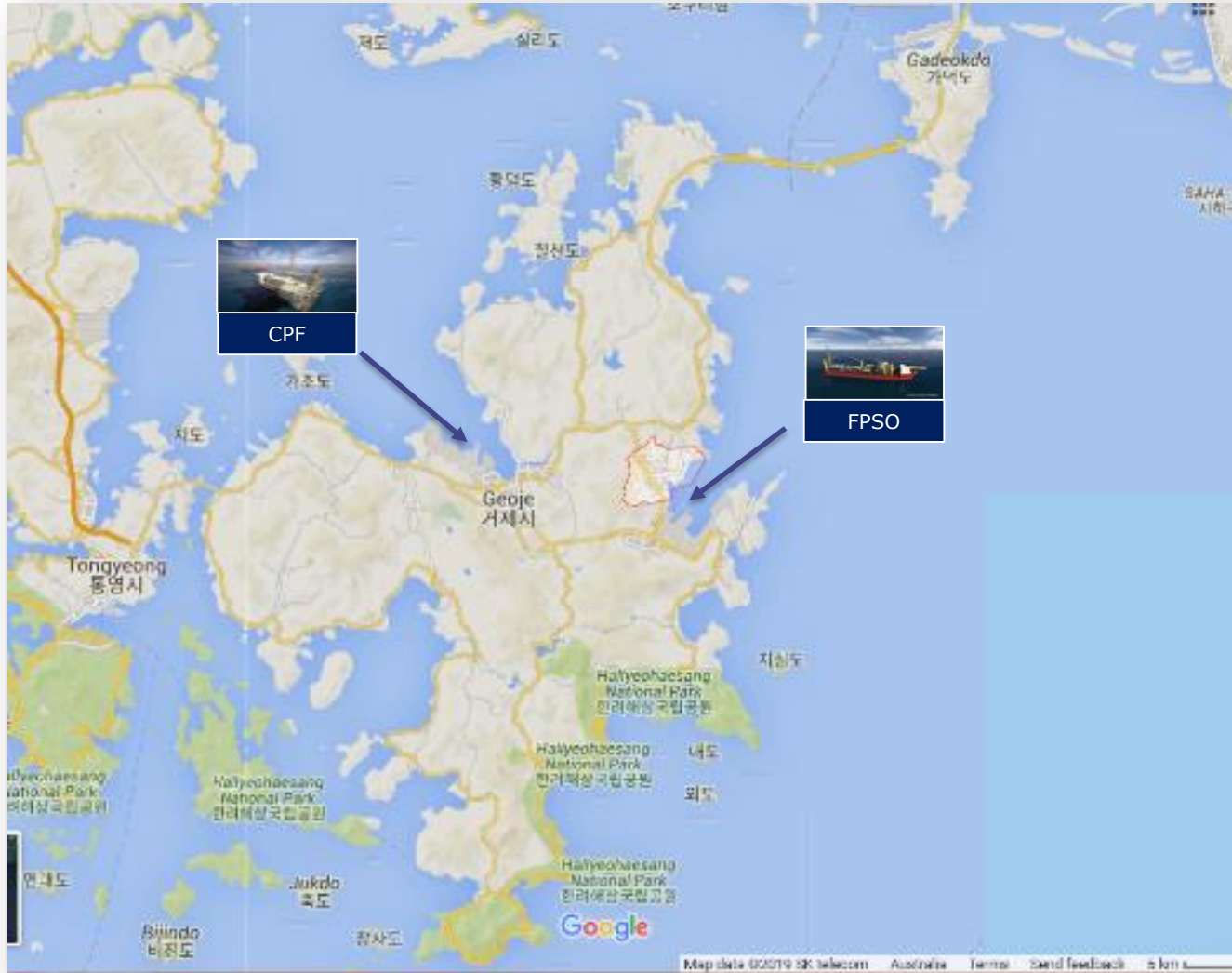
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The Ichthys Field (discovered in 2000) remains Australia's largest discovery of hydrocarbon liquids in nearly 50 years.



Overview – Construction Location



Ichthys Explorer - central processing facility (CPF)



Ichthys Venturer - floating production, storage and offloading facility (FPSO)



Biofouling

Growth on the wet sides of a vessel - algae, slime, barnacles, oysters etc.

Invasive marine species (IMS)

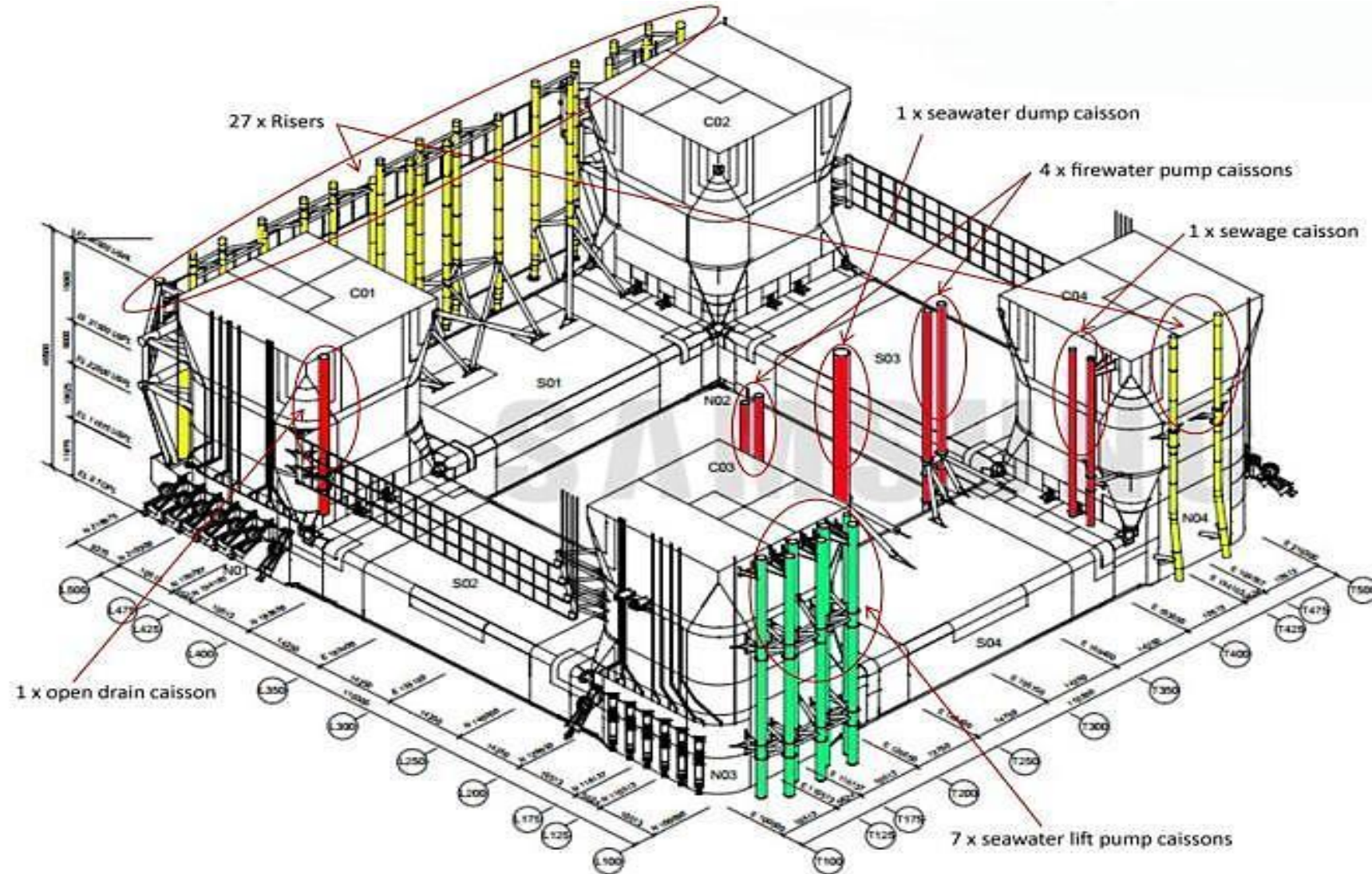
- Species which have evolved in one location and introduced to another
- Native predators left behind
- Some become problematic causing unwanted economic, environmental, social, cultural and human health impacts.

World's largest semisubmersible platform

Wetside hull area: 30,000m²

Biocidal antifouling coating (AFC)







Underwater fairlead chain stoppers



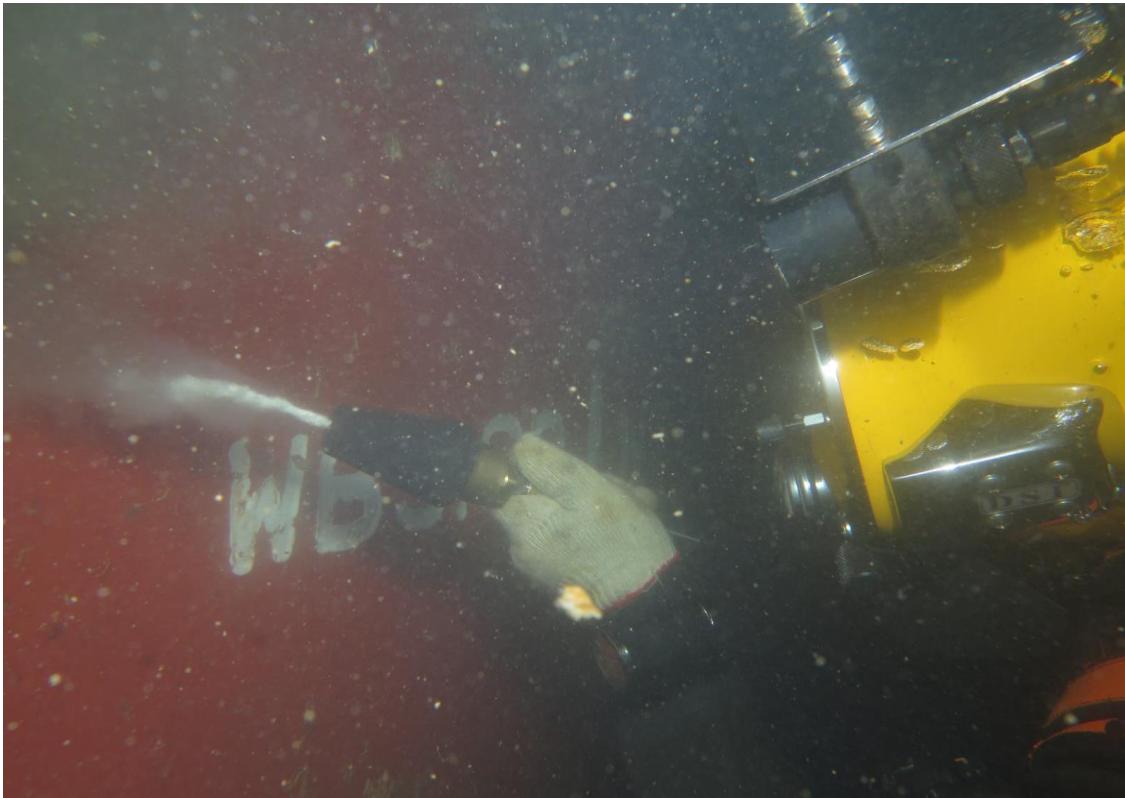
Anodes



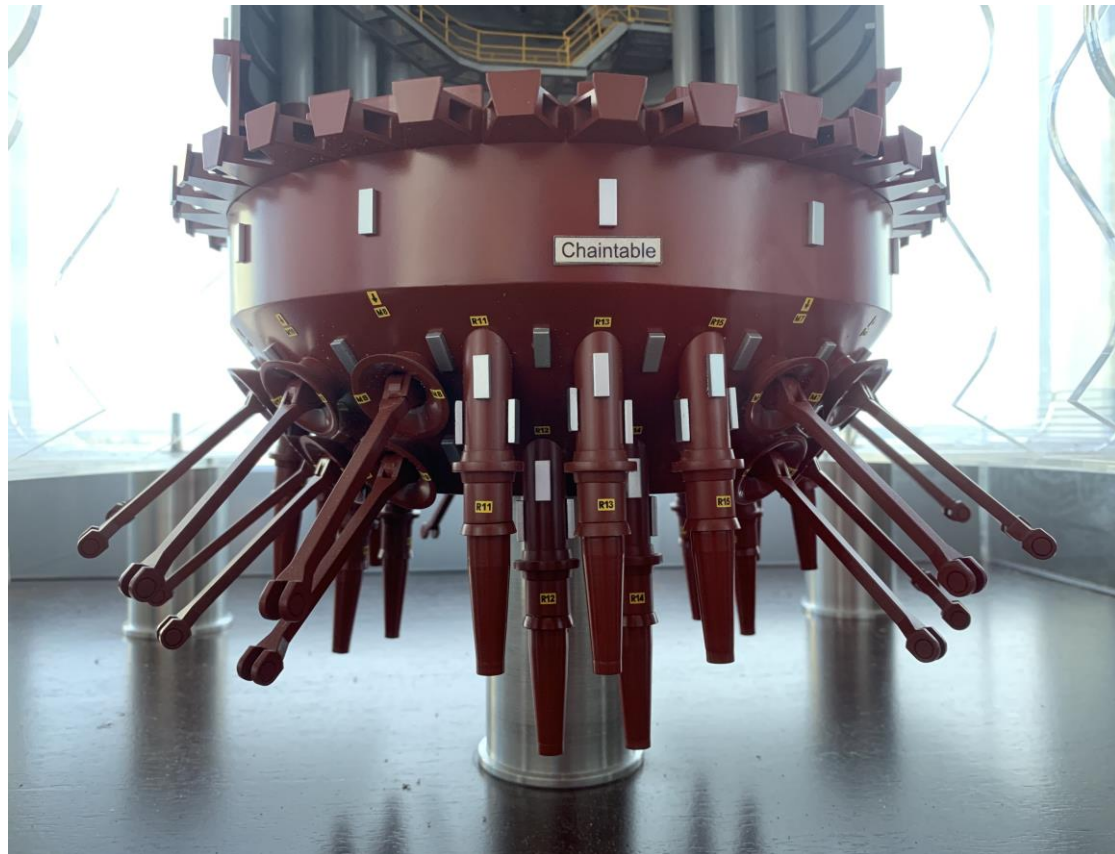
Wet side surface area: 20,000m²

Hull - **biocide-free** antifouling coating

Turret - **biocidal** antifoul coating (*same as CPF hull)



Over 1100 anodes- Evenly spaced



Lower turret and Diverless Base Stiffner Connections

Ichthys Gas Field Development Project
DRAFT ENVIRONMENTAL IMPACT STATEMENT



- Undertake a biofouling risk assessment for each facility
- Implement mitigation measures commensurate with the risk
- Reduce risk to as low as reasonably practicable (ALARP).

Biofouling management background



- Vessel biofouling: up to 69% of introductions
- Inadequate management threatens the critical path
- Australian management currently based on IMS lists
- IMS lists differ between regulators
- Legislation is changing
- Mandatory biofouling management from 2020?

Minimise, not eliminate risk



Marine invasion biology and risk assessment process



Desktop assessments

- 41 species of concern in the bioregion



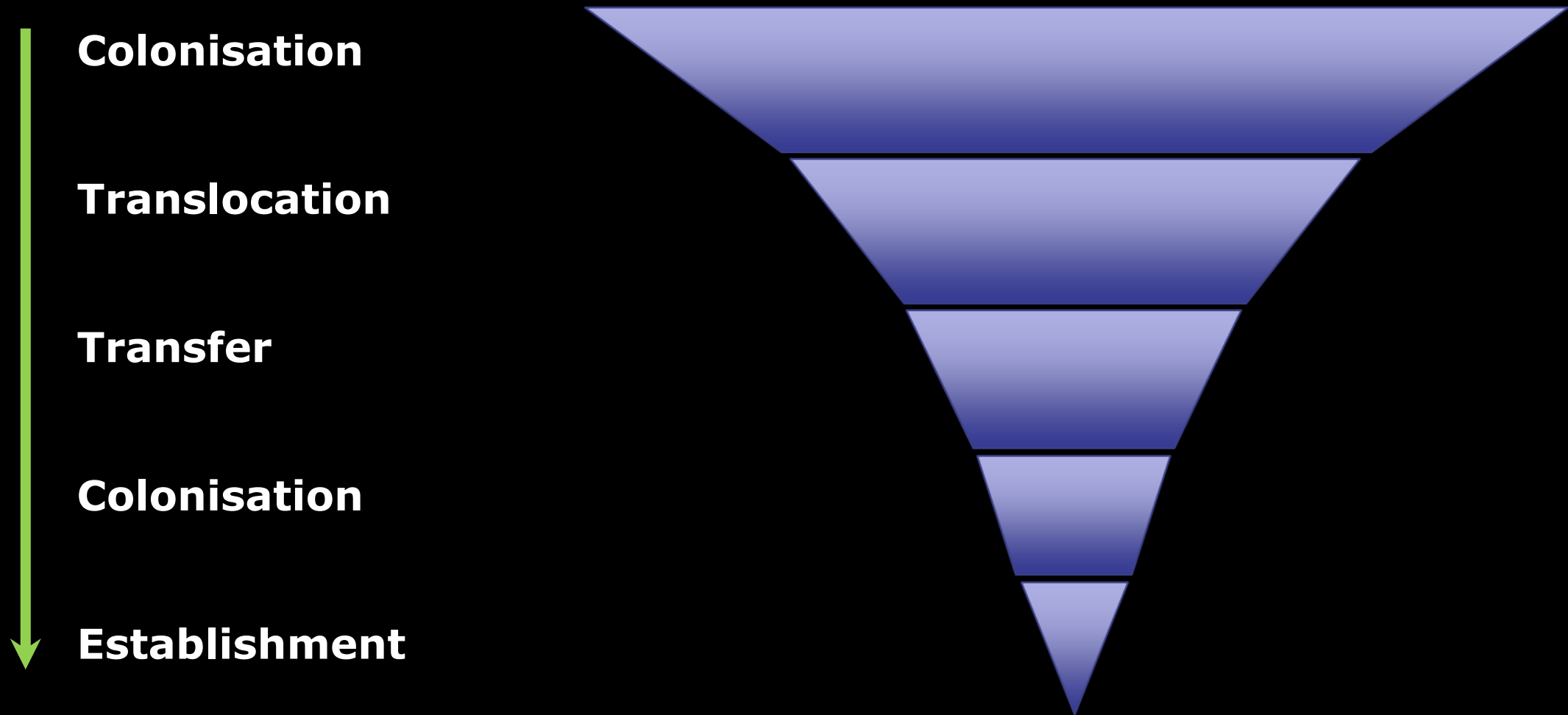
In-water surveys

- **Five** of the 41 IMS **confirmed**

Theoretical invasion pathway



No. Individuals



Compared the individual species risks between two theoretical scenarios:

'Do nothing management'

and

'ALARP cleaning'

Outcome - cleaning required



In-water cleaning would:
lower the risk for every invasive marine species



1. Prevent colonisation:

- Apply effective anti-fouling coating (AFC)
- Removable covers
- Chemical dosing (*Sodium hypochlorite*)

2. Remove biofouling:

- Trial and adopt the best cleaning methods
- Maximise spatial extent of cleaning
- Independent inspection and verification of cleaning

3. Minimise post cleaning colonisation:

- Clean in winter
- Short, intensive cleaning campaigns
- Mobilise post-cleaning as soon as practical

Were we successful?



Biocidal AFC relatively clean

Single 29 day campaign

~ 600 hrs diver cleaning

ALARP cleaning of ~ 100%

No IMS detected at sail-away



Non-biocidal AFC heavily fouled

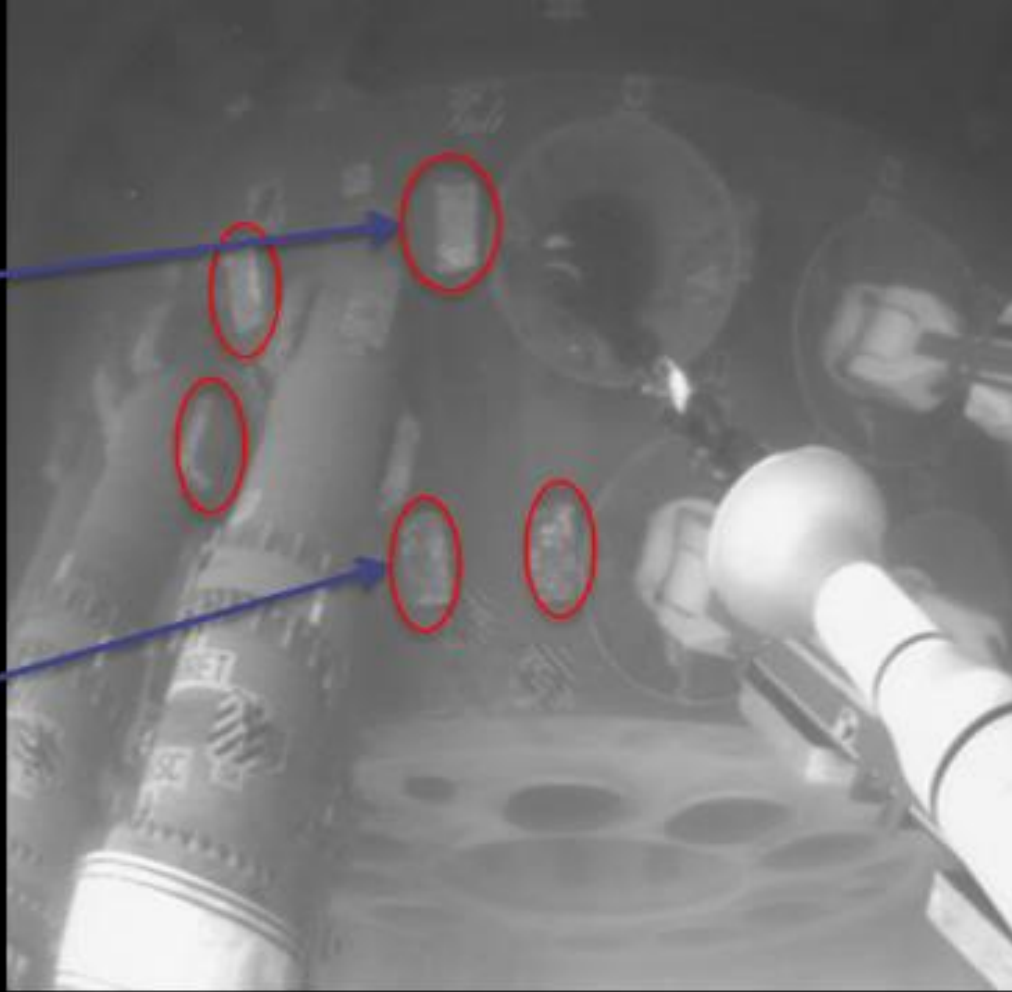
Two campaigns; 51 and 60 days

~ 2400 hrs diver cleaning

ALARP cleaning of > ~ 95%

3 IMS remained on < ~ 5%

Potential risk of three IMS at sail-away



Wouldn't survive or reproduce

Post arrival monitoring



Magallana gigas



Didemnum species

Offshore biofouling sampling



No evidence of any live introduced marine species from Korea



1. Don't underestimate the complexity

2. Long term planning required

3. Select the most appropriate anti-fouling coating

- Biocidal coatings vastly outperformed non-biocidal fluoropolymer for pre-mobilisation biosecurity

4. Conduct rigorous risk assessments and rely on quality science

- Reliable for decision making

5. Don't rely on post-arrival offshore sampling

- Weather dependent/ high risk / high cost

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