Marine non-native species in north Scotland and the implications for the marine renewable industry - The baseline survey

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Background: Renewable industry

- Rapidly developing industry in Scotland - rich in resources + government targets
- North Scotland:
  Pentland Firth and Orkney Waters Marine Energy Park
  World’s largest planned development of wave and tidal energy

  Considerable marine development and anthropogenic activity
  installation of devices and support technologies, harbour expansion, increased vessel traffic
Background: Non-native species

Marine renewable industry may promote NNS invasion

How?

• Artificial habitat

devices, support technologies and harbour extensions
- provides favourable habitat for NNS to establish
Background: Non-native species

Marine renewable industry may promote NNS invasion

How?
• Artificial habitat
• Increased Dispersal
  - Vessel traffic and wet movement of devices

Vectors for the introduction and spread of NNS

Source: Bayview Slipway Marine Services
Source: invasions.si.edu
Background: Non-native species

Marine renewable industry may promote NNS invasion

How?

• Artificial habitat
• Increased Dispersal
  - Vessel traffic and wet movement of devices
  - Network of suitable habitats

Network of device arrays could act as ‘stepping stones’ for NNS dispersal

NNS could spread across previous biogeographical barriers
Background: Non-native species

Marine renewable industry may promote NNS invasion

Why is this a problem?

• Ecological and economic consequences of NNS invasion

*Didemnum vexillum* smothering mussels
Source: USGS
NNS presence and distribution data required to monitor impact of MREI

**Purpose of study:**

Baseline survey of marine fouling NNS in North Scotland

Marine fouling species:

- **Sessile species**
- **Clinging species**

Source: www.nhm.ac.uk

Source: © Hans Hillewaert
Survey of North Scotland for NNS

Targeted NNS known in Scotland

Centralised Scottish NNS records

Scotland:
- 1000+ records of fouling NNS
- 23 species known in Scotland
- Uneven distribution

North Scotland survey area:
- Small proportion of records (9% of all the records)
- 10 species
- Low number of previous records
  - Limited survey effort
  - No specific surveys in area
Survey of North Scotland for NNS

Methods:

Site Selection:
- Harbours/marinas
- Prioritised harbours used by the wave and tidal industry
Survey of North Scotland for NNS

Methods:

• **Rapid assessment survey**
  – Inspection of fouling assemblages on harbour structures for targeted species
  – 1-2 hour searches
  – Samples preserved and identified

• **Variables recorded**
  – Harbour properties: structures present and vector activity indices (Size of harbour and No. of boats)
Survey of North Scotland for NNS - Results/ Discussion

• 9 targeted NNS

Austrominius modestus (5)
Botrylloides violaceus (7)
Corella eumyota (6)
Tricellaria inopinata (3)
Neosiphonia harveyi (2)

Caprella mutica (12)
S. japonica (8)
C. fragile (11)
H. japonica (9)

• 1st records for 5 NNS in the survey area
• Also found:

Non-native bryozoan *Bugula simplex*

– 1\textsuperscript{st} record in Scotland

• Range expansions north (7/10 species)

  - poleward shift, limited survey effort before survey

Look out for this!
Ryland et al 2011
Survey of North Scotland for NNS - Results/ Discussion

- Stromness, Kirkwall and Cromarty marina had the most NNS (7-6)

- Positive relationship between No. NNS and activity indices
  \[ r = 0.528, \ n = 21, \ p = 0.014 \]
  - Consistent with Floerl et al. 2009

- ↑ No. NNS in harbours with floating structures (not pontoons)
  \[ t = 4.950, \ df = 18.491, \ p < 0.001 \]
  - NNS preference for floating structures, Dafforn et al. 2009
Initial species which may interact with MREI
- establish on devices
- spread further by MREI

Species of concern
- A. modestus, C. mutica, C. fragile ssp. fragile, H. japonica and T. inopinata are invasive
- S. japonica could be of concern
Schizoporella japonica on Orkney Pier, 2012
• Wave and tidal energy industry may facilitate the invasion of non-native species

• Extensive baseline dataset of North Scotland
Thank you for your attention

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What else I am doing?

• Comparing methodologies for surveying fouling NNS in marinas

• Characterising biofouling assemblages on wave energy devices – a possible refuge for NNS

• Effect of paint colour and paint type on biofouling assemblage and NNS cover – prevention for NNS invasion?