Monitoring of Marine INNS Using Submerged Settlement Panels

Stranraer Marina and Portpatrick Harbour

May to September 2021

Solway Firth Partnership October 2021

Stranraer Marina

Solway Firth Partnership

Table of Contents

1. Introduction

The GB non-native species secretariat (2015a) defines an invasive non-native species (INNS) as “any non-native animal or plant that has the ability to spread causing damage to the environment, the economy, our health and the way we live.” Globally, 84% of marine ecoregions have reported marine invasion (Molnar *et al*., 2008). In the UK marine environment INNS have the potential to pose a significant threat to native marine biodiversity and commercial interests. NatureScot is the overarching coordinator for NNS in Scotland and lead for terrestrial habitats and wetlands, whilst Marine Scotland lead for marine habitats.

Known impacts of INNS on native biodiversity are the spread of disease, competition for habitat and food and direct predation (GB NNSS, 2015b). Direct impacts include where biological indices display lower scores where INNS are present. Indirect impacts include where INNS densities are so high that a reduction in abundance of other taxa is observed (SEPA, 2013). The major pathways by which marine INNS are introduced include shipping, recreational boating, aquaculture stock movements and natural dispersal (GB NNSS, 2015c). Once INNS have established in a marine ecoregion, they are very difficult or even impossible to eradicate as many filter-feeding marine invertebrate animals live attached to solid surfaces and, along with algae, may be spread along coastlines marina-to-marina as fouling growth on the hulls of leisure craft. For this reason, early detection and monitoring of marine INNS is crucial.

2. Method

Six settlement panels (Photo 1) were attached to pontoons within Stranraer Marina on 4 May 2021 (Figure 1). A further two panels, at separate locations were attached to the RNLI pontoon at Portpatrick Harbour (Figure 2) on the same day.

Photo 1– Complex Correx panel structure

Photo 2 - Attaching panels

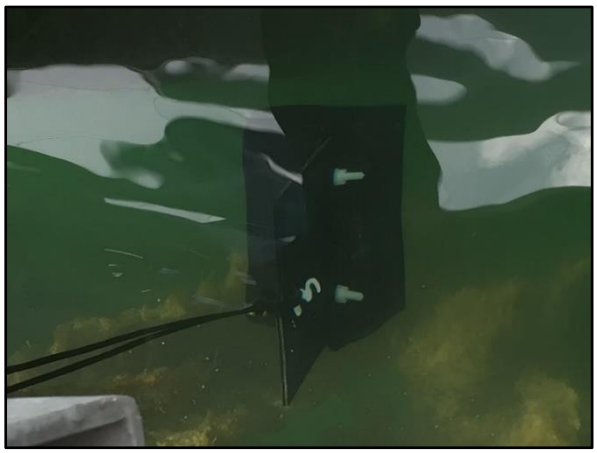

Photo 3 - Submerged complex Correx panel

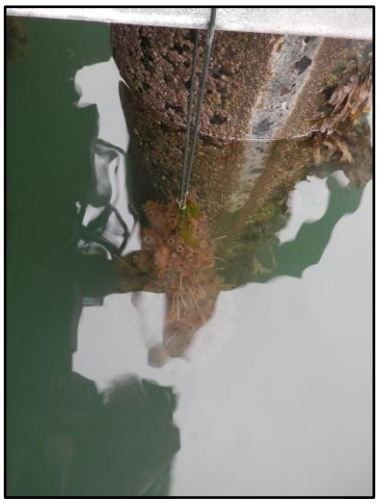

Photo 4 – Colonised panel

The panels were attached to the underside of the pontoons (Photos 2) and submerged to around one metre depth using strong paracord or twine and weighed down with 6 oz fishing weights (Photo 3). The panels provided a substrate for growth (Photo 4).

Stranraer was chosen as a repeat site for monitoring due to the ease of installing the panels and because the site is active with both recreational and fishing boats using the port. Portpatrick was also chosen as an active harbour used by mostly small recreation, tourism and fishing boats.

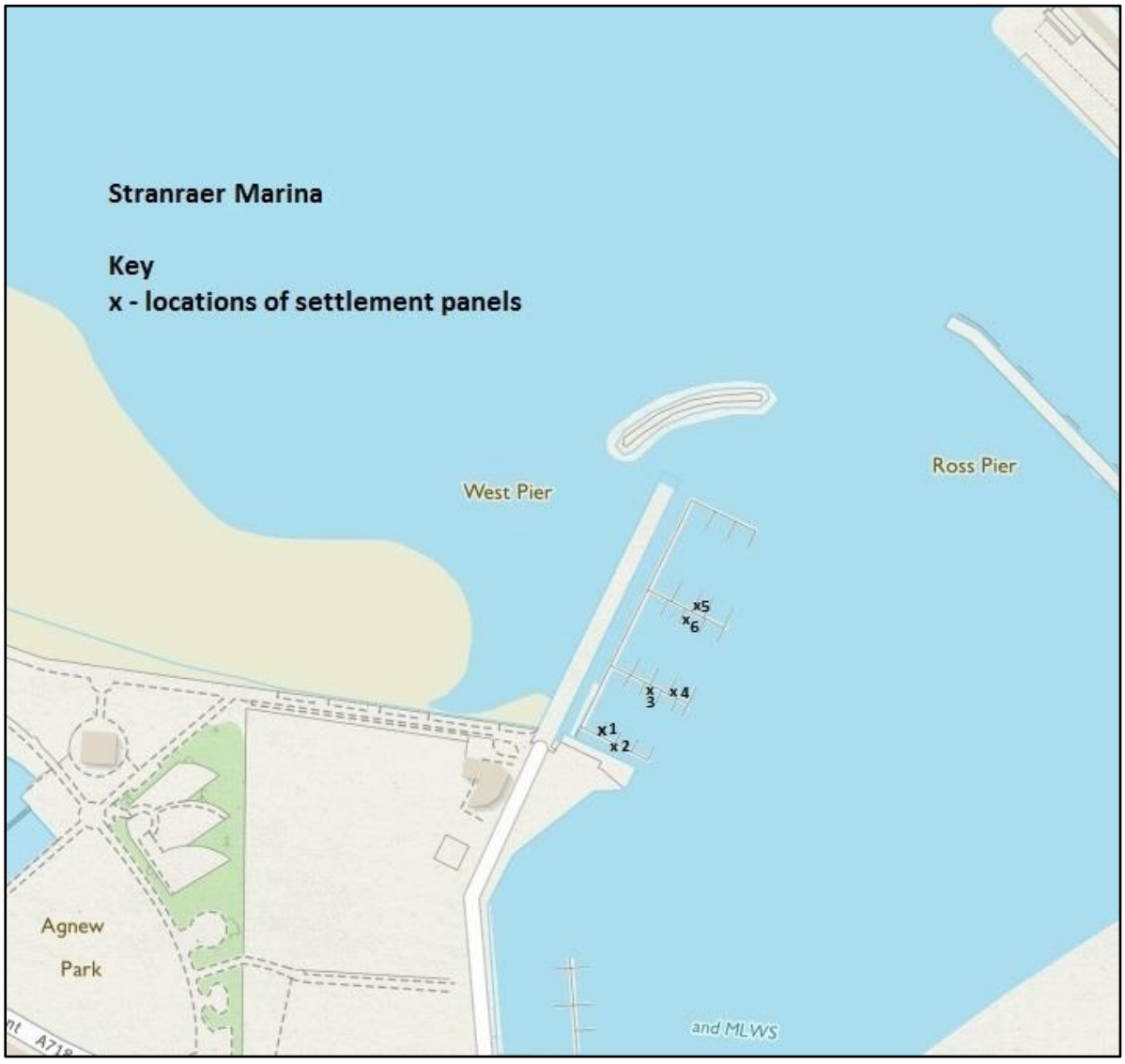

Figure 1 - Stranraer Marina, Location of Settlement Panels, 1 – 6

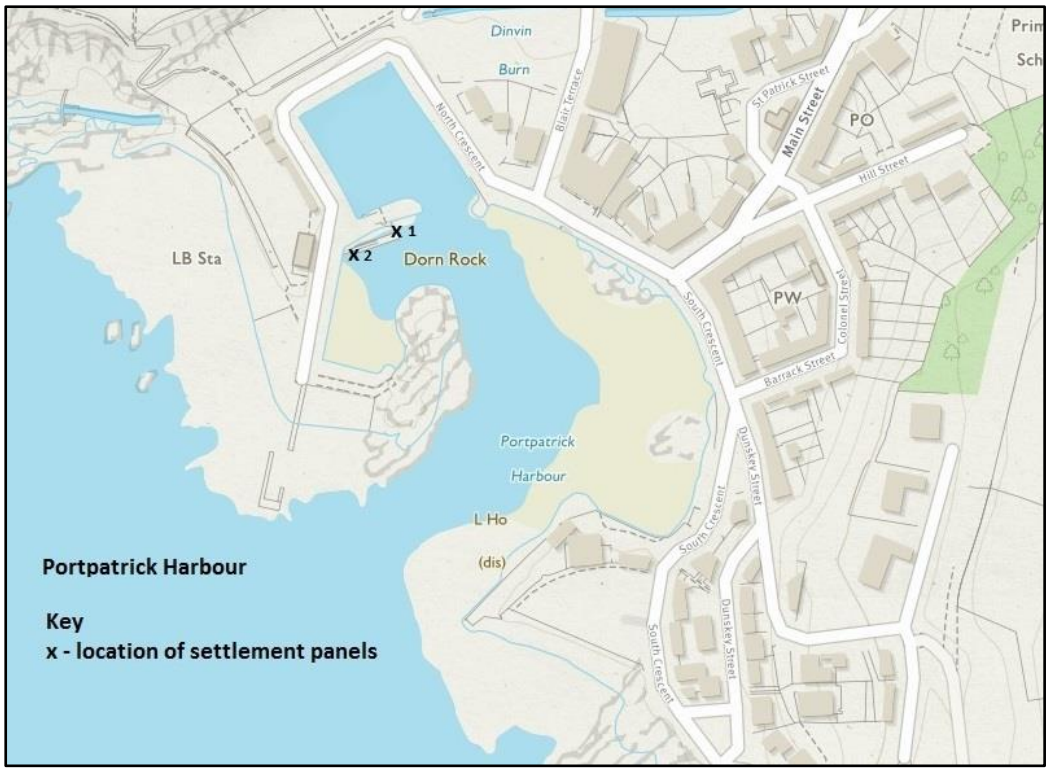

Figure 2 - Portpatrick Harbour, Location of Settlement Panels, 1 – 2

At the end of summer (24 September 2021) the panels at Stranraer were collected, photographed (Photos 5 and 6), scored for percentage cover of surface species and then appropriately discarded. Mobile organisms, including barnacle cyprids and crabs were counted individually.

Photo 5 – Panel, Stranraer

Photo 6 – Panel, Portpatrick

In addition, other species present on buoys and on the underside of the pontoon were noted (Photos 7,8,9,10).

Photos 7 & 8 – Underside of pontoons with growth, Stranraer

Photo 9 – Growth on boat

Photo 10 - Unidentified species from harbour

3. Results

All six panels installed at Stranraer were successfully recovered and assessed. Both of the panels installed in Portpatrick marina were recovered.

Stranraer Marina

Due to the covid pandemic the settlement panels were not installed over summer 2020 and so it was not possible to make a comparison to growth in 2020. The species diversity was similar to that recorded in the 2019 survey but with much higher levels of coverage of some species such as sea squirts. The harbour master reported that algal blooms had been present within the harbour area over summer 2020 and may explain the higher levels of growth on the panels. The community was again representative of a west coast harbour environment, with many individuals at a mature stage of development.

In Stranraer marina, the native tunicate, *Ascidiella aspersa* (Photo 11), appeared to dominate the assemblage of most recovered panels. There appeared to be a higher coverage of the sea squirt, *Ciona intestinalis* than noted previously. The peacock worm, *Sabella pavonina*, was much less prevalent than in 2018 and less than in 2019. The green algae, *Cladophora rupestris,* was also apparent on all panels.

The native tunicates ranged in size from 1 cm to >10 cm across all recovered panels. Other commonly observed species included the sponge, *Sycon ciliatum* (Photo 12). The bryozoan, *Conopeum reticulum* (Photo 13), was recorded along with the feather star, *Antedon bifia* (Photo 14); and various crabs including the edible crab, *Carcinus pagurus* (Photo 15); and a sea slug, *Polycera quadrilineata* (Photo 16, also showing Darwins barnacle, *Elminius modestus*).

There appeared to be fewer marine invasive species in Stranraer on the settlement panels than the previous recording in 2019 – there was occasional Japanese skeleton shrimp, *Caprella mutica,* and Darwin's barnacle, *Elminius Modestus*. It was not possible to positively identify orange-tipped sea squirt, *Corella eumyota*; although it could have been missed due to the extensive coverage of sea squirts on the panels.

A complete species list is found at Appendix 1.

Photo 11 - Native tunicate, *Ascidiella aspersa*

Photo 12 – Sponge, *Sycon ciliatum*

Photo 13 – Bryozoan, *Conopeum reticulum*

Photo 14 – Feather star, *Antedon bifia*

Photo 15 – Edible crab, *Carcinus pagurus*

Photo 16 – sea slug, *Polycera quadrilineata*

Portpatrick Harbour

Due to the covid pandemic the settlement panels were not installed over summer 2020 and so it was not possible to make a comparison to growth in 2020. In addition, neither of the two panels placed in 2019 were recovered that year.

The two panels in Portpatrick had less growth than in Stranraer (Photos 17 and 18).

Photo 17 - Panel 1, Portpatrick

Photo 18 - Panel 2, Portpatrick

The panels both showed growth of several species of sea squirt including occasional orange-tipped sea squirt, *Corella eumyota* (Photo 19). Other species noted included a velvet swimming crab, *Necora puber* (Photo 20), Coralweed, *Corallina officinalis* (Photo 21); sea lettuce, *Ulva lactuca,* and Darwin's barnacles, *Elminius Modestus* (both on Photo 22). The bryozoan, *Conopeum reticulum,* was also noted (Photo 23) and an unidentified mat forming species, possibly also a bryozoan (Photo 24).

Photo 19 – Orange tipped sea squirt

Photo 20 – Velvet swimming crab

Photo 21 – Coralweed

Photo 22 – sea lettuce, Darwin's barnacles

Photo 23 – Bryozoan

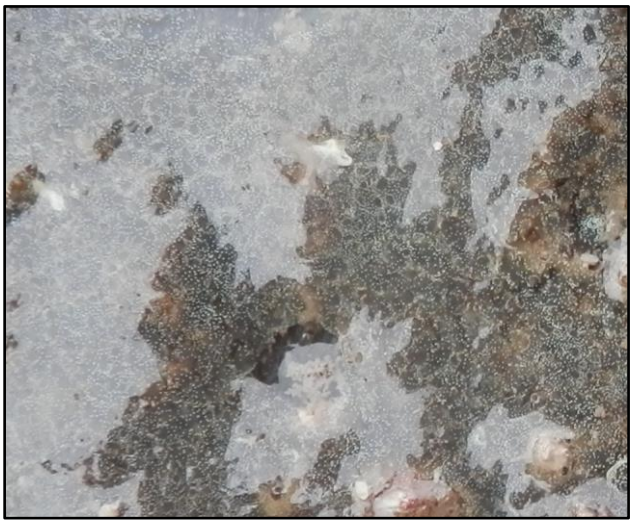

Photo 24 – Unidentified species

4. Conclusion

Both the invasive Japanese skeleton shrimp, *Caprella mutica*, and the orange-tipped sea squirt, *Corella eumyota,* were found in the current study, although in much lower numbers than in previous years.

The current study suggests re-visiting both marinas again in the growing season of 2022 to see if species assemblage or if the spread of INNS has changed. Both sites would also benefit from another rapid site assessment, to allow for a more thorough INNS assessment, beyond the area in which the panels had been deployed.

Continued awareness of INNS gained from the use of the panels and the rapid site assessments will allow for improved biosecurity control of invasives at the two locations. It is recommended the use of the current 3D scratched surface panel design is continued, as this seems to encourage a representative level of growth.

Panels should also aim to be removed prior to any major storms, as even though this may result in a reduced soak time, it could prevent the loss of panels to the environment.

5. References

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Appendix 1 – List of Species Recorded

STRANRAER MARINA

Panel No	Grid Ref	Species - Common Name	Species - Latin Name	Abundance	Invasive sp	Abbrev	Scale	%
1	NX0587861181	Sea squirt	*Ascidiella aspersa*	A	N	S	Super Abundant	80 - 100
	NX0587861181	Sponge	*Sycon ciliatum*	F	N	A	Abundant	40 - 80
	NX0587861181	Peacock worm	*Sabella pavonina*	F	N	C	Common	20 - 40
	NX0587861181	Edible Crab	*Carcinus pagurus*	R	N	F	Frequent	10 - 20
	NX0587861181	Tube worm	*Pomatoceros triqueter*	R	N	O	Occasional	5 - 10
	NX0587861181	Star ascidian	*Botryllus shlosseri*	R	N	R	Rare	<5%
	NX0587861181	Bryozoan	*Conopeum reticulum*	R	N			
	NX0587861181	Green seaweed	*Cladophora rupestris*	O	N			
	NX0587861181	Saddle oyster	*Anomia ephippium*	O	N			
	NX0587861181	Darwin barnacle	*Elminius modestus*	O	Y			
	NX0587861181	Prawn sp	*Palaemon sp*	R	N			
	NX0587861181	Feather star	*Antedon bifida*	O	N			
	NX0587861181	Sea slug	*Polycera quadrilineata*	R	N			
2	NX0588561176	Sea squirt	*Ascidiella aspersa*	S	N			
	NX0588561176	Sponge	*Sycon ciliatum*	C	N			
	NX0588561176	Sea squirt	*Ciona intestinalis*	O	N			
	NX0588561176	Green seaweed	*Cladophora rupestris*	R	N			
	NX0588561176	Tube worm	*Pomatoceros triqueter*	O	N			
	NX0588561176	Peacock worm	*Sabella pavonina*	O	N			
	NX0588561176	Sea lettuce	*Ulva lactuca*	R	N			
3	NX0590261199	Sponge	*Sycon ciliatum*	O	N			

	NX0590261199	Sea squirt	*Ascidiella aspersa*	S	N
	NX0590261199	Green seaweed	*Cladophora rupestris*	O	N
	NX0590261199	Sea squirt	*Ciona intestinalis*	O	N
	NX0590261199	Sea lettuce	*Ulva lactuca*	R	N
	NX0590261199	Peacock worm	*Sabella pavonina*	O	N
	NX0590261199	Feather star	*Antedon bifida*	R	N
	NX0590261199	Annelid worm	*Eupolymnia nebulosa*	R	N
	NX0590261199	Star ascidian	*Botryllus shlosseri*	R	N
	NX0590261199	Brittlestar sp	*Unsure*	R	N
	NX0590261199	Shore crab	*Carcinus maenas*	R	N
	NX0590261199	Bryozoan	*Unsure*	R	N
	NX0590261199	Crab	*Unsure*	1	N
	NX0591261198	Sponge	*Sycon ciliatum*	F	N
	NX0591261198	Sea squirt	*Ascidiella aspersa*	S	N
	NX0591261198	Green seaweed	*Cladophora rupestris*	O	N
	NX0591261198	Sea squirt	*Ciona intestinalis*	O	N
4	NX0591261198	Sea lettuce	*Ulva lactuca*	R	N
	NX0591261198	Peacock worm	*Sabella pavonina*	F	N
	NX0591261198	Feather star	*Antedon bifida*	R	N
	NX0591261198	Darwin barnacle	*Elminius modestus*	O	Y
	NX0591261198	Star ascidian	*Botryllus shlosseri*	R	N
	NX0591261198	Oyster sp	*Unsure*	R	N
	NX0591261198	Crab sp	*Unsure*	R	N
	NX0591261198	Bryozoan sp	*Unsure*	R	N
5	NX0591961232	Sponge	*Sycon ciliatum*	O	N
	NX0591961232	Sea squirt	*Ascidiella aspersa*	S	N

	NX0591961232	Green seaweed	*Cladophora rupestris*	O	N
	NX0591961232	Sea squirt	*Ciona intestinalis*	O	N
	NX0591961232	Peacock worm	*Sabella pavonina*	F	N
	NX0591961232	Sea lettuce	*Ulva lactuca*	R	N
	NX0591961232	Japanese skeleton shrimp	*Caprella mutica*	R	Y
	NX0591961232	Tube worm	*Pomatoceros triqueter*	O	N
	NX0591961232	Boot-lace weed	*Chorda filum*	R	N
	NX0591961232	Star ascidian	*Botryllus shlosseri*	R	N
	NX0591961232	Annelid worm	*Eupolymnia nebulosa*	R	N
	NX0591961232	Feather star	*Antedon bifida*	R	N
	NX0591961232	Bryozoan	*Conopeum reticulum*	R	N
	NX0591961232	Bladderwrack	Fucus vesiculosus	R	N
	NX0591961232	Darwin barnacle	*Elminius modestus*	R	Y
	NX0592661231	Sponge	*Sycon ciliatum*	F	N
	NX0592661231	Sea squirt	*Ascidiella aspersa*	S	N
	NX0592661231	Green seaweed	*Cladophora rupestris*	F	N
	NX0592661231	Peacock worm	*Sabella pavonina*	O	N
	NX0592661231	Sea lettuce	*Ulva lactuca*	R	N
	NX0592661231	Star ascidian	*Botryllus shlosseri*	R	N
6	NX0592661231	Annelid worm	*Eupolymnia nebulosa*	R	N
	NX0592661231	Bryozoan	*Conopeum reticulum*	R	N
	NX0592661231	Tube worm	*Pomatoceros triqueter*	R	N
	NX0592661231	Darwin barnacle	*Elminius modestus*	R	Y
	NX0592661231	Irish Moss	*Chondus crispus*	R	N
	NX0592661231	Crab sp	*Unsure*	R	N
	NX0592661231	Ragworm sp	*Unsure*	R	N

PORTPATRICK MARINA

Panel No	Grid Ref	Species - Common Name	Species - Latin Name	Abundance	Invasive sp
1	NW9981354146	Sponge	*Sycon ciliatum*	O	N
	NW9981354146	Sea squirt	*Ascidiella aspersa*	F	N
	NW9981354146	Green seaweed	*Cladophora rupestris*	R	N
	NW9981354146	Tube worm	*Pomatoceros triqueter*	O	N
	NW9981354146	Sea lettuce	*Ulva lactuca*	R	N
	NW9981354146	Bryozoan	*Conopeum reticulum*	O	N
	NW9981354146	Velvet swimming crab	*Necora puber*	1	N
	NW9981354146	Coralweed	*Corallina officinalis*	O	N
	NW9981354146	Darwin barnacle	*Elminius modestus*	R	Y
	NW9981354146	Oyster sp	*Unsure*	R	N
2	NW9979154137	Sponge	*Sycon ciliatum*	O	N
	NW9979154137	Sea squirt	*Ascidiella aspersa*	F	N
	NW9979154137	Green seaweed	*Cladophora rupestris*	R	N
	NW9979154137	Tube worm	*Pomatoceros triqueter*	O	N
	NW9979154137	Sea lettuce	*Ulva lactuca*	R	N
	NW9979154137	Bryozoan	*Conopeum reticulum*	R	N
	NW9979154137	Orange-tipped sea squirt	*Corella eumyota*	O	Y
	NW9979154137	Coralweed	*Corallina officinalis*	O	N
	NW9979154137	Darwin barnacle	*Elminius modestus*	R	Y
	NW9979154137	Prawn sp	*Unsure*	R	N
	NW9979154137	Bryozoan	*Unsure*	O	?