

# Monitoring of Marine INNS Using Submerged Settlement Panels

Stranraer Marina and Portpatrick Harbour

May to September 2023

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*Solway Firth Partnership September 2023*

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***Stranraer Marina***

**Solway Firth**  
  
**Partnership**

## Table of Contents

<b>1. Introduction.....</b>	<b>3</b>
<b>2. Method .....</b>	<b>4</b>
<b>3. Results.....</b>	<b>8</b>
Stranraer Marina.....	8
Portpatrick Harbour .....	12
<b>4. Conclusion .....</b>	<b>14</b>
<b>5. References .....</b>	<b>15</b>
<b>Appendix 1 – List of Species Recorded .....</b>	<b>16</b>
STRANRAER MARINA .....	16
PORTPATRICK MARINA .....	20

## 1. Introduction

The GB non-native species secretariat defined 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.” (GB NNSS, 2023) Globally, 84% of marine ecoregions have reported marine invasion (Molnar, et al., 2008). Whilst INNS have played a key role in 60% of global plant and animal extinctions and are recognised as one of the 5 main drivers of biodiversity loss. (IPES, 2023)

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. GB NNSS (GB Non-Native Species Secretariat) is a focal point for communication and co-ordinating reporting of INNS. (GB NNSS , n.d.)

Known impacts of INNS on native biodiversity are the spread of disease, competition for habitat and food and direct predation. (GB NNSS, 2023) As well as these serious and potentially irreversible environmental problems, they can also interfere with recreational and commercial activities by clogging propellers, damaging boats, blocking up waterways, and increasing the risk of flooding. (GB NNSS, 2017)

Direct biological 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.

Further details can be found in Solway Firth Partnership’s report on INNS and their impact in the Solway Firth (Solway Firth Partnership, 2021)

## 2. Method

Six settlement panels (Photo 1) were attached to pontoons within Stranraer Marina on 10 May 2023 at the same locations as previous years (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.

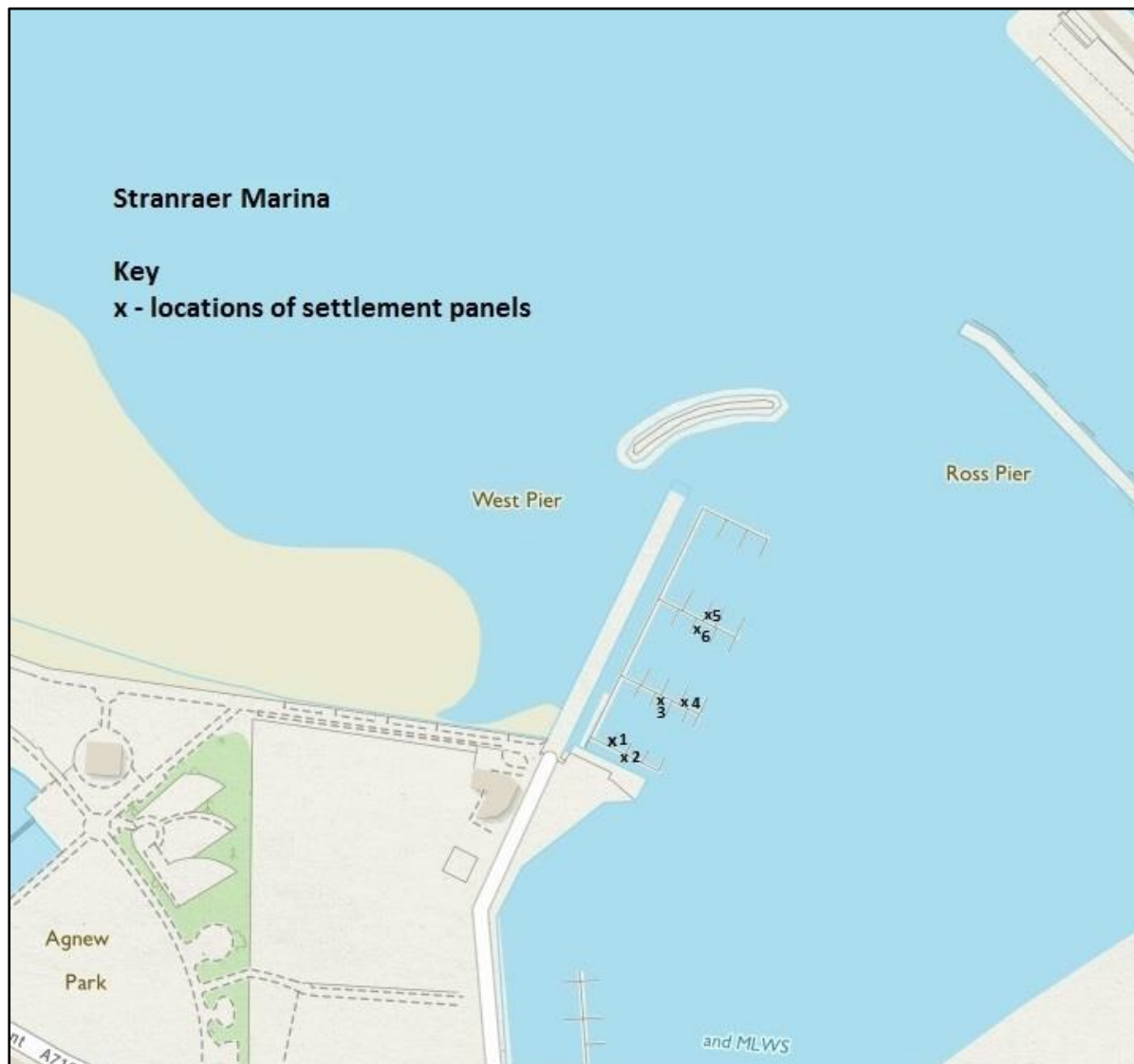
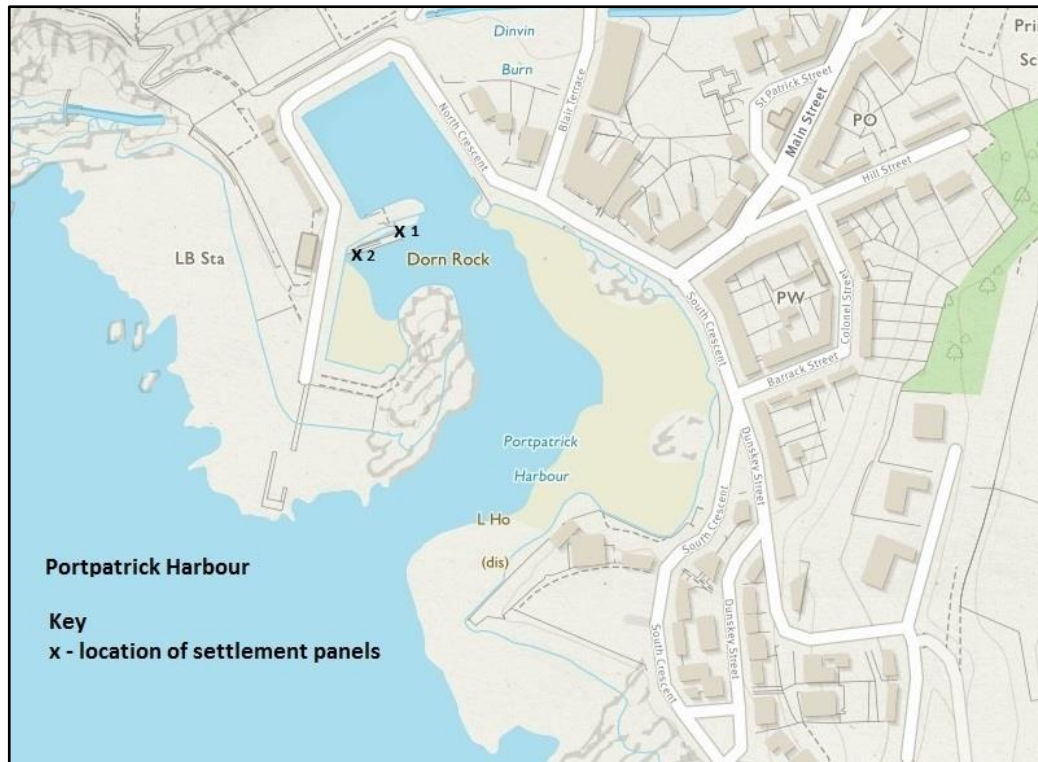


Figure 1 - Stranraer Marina, Location of Settlement Panels, 1 – 6





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

At the end of summer (11 September 2023) the panels at Stranraer and Portpatrick were collected, photographed (Photos 5 and 6), scored for percentage cover of surface species and then appropriately discarded. Mobile organisms such as crabs were also noted.



**Photo 5 – Panel, Stranraer**



**Photo 6 – Panel, Portpatrick**

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



**Photo 7 – Growth on buoy, Stranraer**



**Photo 8 – Growth on rope, Stranraer**

A scientist from the Marine Directorate of Scottish Government accompanied SFP staff on site visits to Stranraer and Portpatrick. Samples were taken for eDNA analysis and species identification. Further results will be added to this report once they are available.



### 3. Results

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

#### Stranraer Marina

The species diversity was similar to that recorded in the 2022 survey but with a higher percentage coverage of some species such as sea squirts and less of other species such as peacock worms. Anecdotal evidence from the Harbourmaster suggested that the calm weather conditions over summer had led to the denser colonisation of a variety of sea squirts. However, the community was again representative of a west coast harbour environment, with many individuals at a mature stage of development.

In Stranraer marina, there were several native tunicates noted, the sea squirt, *Ascidella aspersa* (Photos 9, 10); sea vase, *Ciona intestinalis* (Photos 7, 11, 12, 21); and the lightbulb sea squirt, *Clavelina lepadiformis* (Photo 9). There appeared to be a higher coverage of sea squirts than noted in previous years including an unidentified pink sea squirt which may be *Ascidia mentula*. The peacock worm, *Sabella pavonine* (Photo 11) was less prevalent than in previous years. The green algae, *Cladophora rupestris*, was apparent on all panels although at a lower density.

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 13); the bryozoan, *Conopeum reticulum* (Photo 14); the feather star, *Antedon bifida* (Photo 15); various crabs, including the shore crab, *Carcinus maenas* which was noted with the parasite, *Sacculina carcini* attached (Photo 16); and a sea slug, *Polycera quadrilineata* (Photo 17). Several barnacles were noted, including Darwin barnacle, *Elminius modestus* and another species, possibly perforated barnacle, *Perforatus perforatus* (both on Photo 18). Star ascidian, *Botryllus shlosseri* (Photo 19) was found on most panels, as was the tube worm, *Pomatoceros triqueter* (Photo 20).

There appeared to be fewer marine invasive species in Stranraer on the settlement panels than the previous recording in 2022 – there was occasional Japanese skeleton shrimp, *Caprella mutica*, and Darwin's barnacle, *Elminius modestus*. There were no orange-tipped sea squirt, *Corella eumyota*; recorded on the panels at Stranraer Marina. Two additional invasive species were recorded while placing the panels in May 2023. These were the leathery sea squirt, *Styela clava* (Photo 21) and Japanese wakame, *Undaria pinnatifida* (Photo 22).



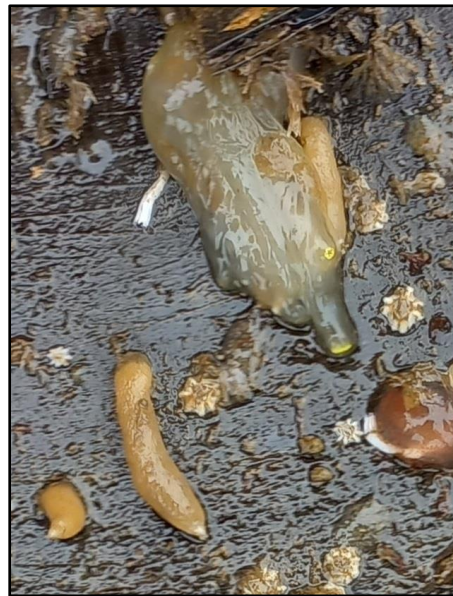
A complete species list is found at Appendix 1.



Photo 9 – Sea squirt, *Clavelina lepadiformis*



Photo 10 – Sea squirts incl. unidentified pink



Photos11 / 12 – Sea squirt - Sea vase, *Ciona intestinalis*





Photo 13 – Sponge, *Sycon ciliatum*



Photo 14 – Bryozoan, *Conopeum reticulum*



Photo 15 – Feather star, *Antedon bifida*



Photo 16 – Shore crab with parasite



Photo 17 – Sea slug, *Polycera quadrilineata*



Photo 18 – Barnacles and oysters





Photo 19 – Star Ascidian, *Botryllus shlosseri*



Photo 20 – Tubeworm, *Pomatoceros triqueter*



Photo 21 – Underwater, Sea squirt, *Styella clava*, alongside Sea vase, *Ciona intestinalis*





Photo 22 - Japanese wakame, *Undaria pinnatifida*

#### Portpatrick Harbour

The species diversity of the two panels at Portpatrick was similar to that recorded in the 2022 survey.

The two panels in Portpatrick had much less growth than in Stranraer (Photos 23 and 24) with Panel 2 having less coverage of tunicates than Panel 1 although it did include the orange tipped sea squirt, *Corella eumyota*.



Photo 23 - Panel 1, Portpatrick



Photo 24 - Panel 2, Portpatrick



The panels both showed growth of several species of sea squirt including the tunicate, *Ascidiella aspersa*, the orange-tipped sea squirt, *Corella eumyota* and the sea squirt, *Ciona intestinalis* (Photo 25) and Star Ascidian, *Botryllus shlosseri* (Photo 29). Other species noted included the tubeworm, *Pomatoceros triqueter* (Photo 26); sea lettuce, *Ulva lactuca* (Photo 27); the sponge, *Sycon ciliatum* (Photo 28) and.



Photo 25 – Sea squirts inc. *Ascidiella aspersa*, *Ciona intestinalis*



Photo 26 – Tubeworm, *Pomatoceros triqueter*



Photo 27 – Sea lettuce, *Ulva lactuca*

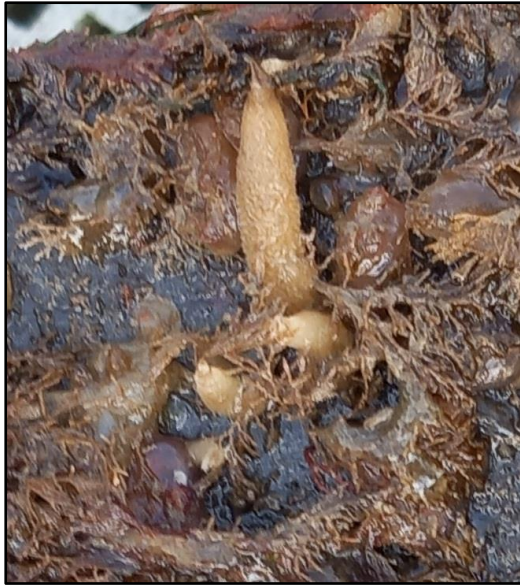


Photo 28 – Sponge, *Sycon ciliatum*



Photo 29 - Star Ascidian, *Botryllus shlosseri*

#### 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 both in much lower numbers than in previous years. In addition, the leathery sea squirt, *Styela clava*, was also noted in Stranraer marina.

Further information once the results of the eDNA results are obtained. This will be compared to the results from the settlement panels in future reports.

The current study suggests re-visiting both marinas again in the growing season of 2023 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.

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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	
S1	NX0587861181	Sea squirt	<i>Ascidella aspersa</i>	A	N	
	NX0587861181	Sea squirt (sea vase)	<i>Ciona intestinalis</i>	A	N	
	NX0587861181	Sponge	<i>Sycon ciliatum</i>	R	N	1
	NX0587861181	Spider Crab	<i>Macropodia rostrata</i>	R	N	1
	NX0587861181	Tube worm	<i>Pomatoceros triqueter</i>	R	N	
	NX0587861181	Star ascidian	<i>Botryllus shlosseri</i>	O	N	
	NX0587861181	Sea lettuce	<i>Ulva lactuca</i>	R	N	
	NX0587861181	Green seaweed	<i>Cladophora rupestris</i>	R	N	
	NX0587861181	Sugar Kelp	<i>Saccharina latissima</i>	R	N	
	NX0587861181	Darwin barnacle (?)	<i>Elminius modestus</i>	R	Y	<10
	NX0587861181	Feather star	<i>Antedon bifida</i>	R	N	3
	NX0587861181	Light bulb sea squirt	<i>Clavelina lepadiformis</i>	R	N	1
	NX0587861181	Peacock worm	<i>Sabella pavonina</i>	R	N	2



	NX0587861181	Annelid worm (orange)	(??) <i>Eupolymnia nebulosa</i>	R	N	2
		Long Clawed Porcelain Crab				
	NX0587861181	Crab	<i>Pisidia longicornis</i>	R	N	3

	NX0588561176	Sea squirt	<i>Ascidiella aspersa</i>	C	N	
	NX0588561176	Sea squirt (sea vase)	<i>Ciona intestinalis</i>	C	N	
	NX0588561176	Sea squirt (pink)	<i>Ascidia mentula?</i>	R	N	7
	NX0588561176	Sponge	<i>Sycon ciliatum</i>	O	N	
	NX0588561176	Tube worm	<i>Pomatoceros triqueter</i>	R	N	6
	NX0588561176	Sea lettuce	<i>Ulva lactuca</i>	R	N	2
S2	NX0588561176	Green seaweed	<i>Cladophora rupestris</i>	O	N	
	NX0588561176	Peacock worm	<i>Sabella pavonina</i>	R	N	4
	NX0588561176	Feather star	<i>Antedon bifida</i>	R	N	2
	NX0588561176	Shore Crab	<i>Carcinus maenas</i>	R	N	2
	NX0588561176	Star ascidian	<i>Botryllus shlosseri</i>	R	N	1lrg
	NX0588561176	Darwin barnacle (?)	<i>Elminius modestus</i>	O	Y	50-100
	NX0588561176	Bryozoan	<i>Conopeum reticulum</i>	O	N	

	NX0588561176	Jelly (colonial sea squirt/ bryozoan??)	Unsure of species	F		see photo
S3	NX0590261199	Sea squirt	<i>Ascidella aspersa</i>	S	N	
	NX0590261199	Sea squirt (sea vase)	<i>Ciona intestinalis</i>	A	N	
	NX0590261199	Green seaweed	<i>Cladophora rupestris</i>	C	N	
	NX0590261199	Eel	<i>Anguilla anguilla</i>	R	N	1
	NX0590261199	Peacock worm	<i>Sabella pavonina</i>	R	N	5-10
	NX0590261199	Feather star	<i>Antedon bifida</i>	O	N	10-20
	NX0590261199	Star ascidian	<i>Botryllus shlosseri</i>	R	N	2lrg
	NX0590261199	Tube worm	<i>Pomatoceros triqueter</i>	R	N	
	NX0590261199	Shore Crab	<i>Carcinus maenas</i>	R	N	5
	NX0590261199	Parasite on crab	<i>Sacculina carcini</i>	R	N	
	NX0590261199	Bootlace weed	<i>Chorda filum</i>	R	N	
S4	This panel was lost					
S5	NX0591961232	Sponge	<i>Sycon ciliatum</i>	O	N	10-20

NX0591961232	Sea squirt	<i>Ascidrella aspersa</i>	A	N	
NX0591961232	Sea squirt (sea vase)	<i>Ciona intestinalis</i>	A	N	
NX0591961232	Green seaweed	<i>Cladophora rupestris</i>	C	N	
NX0591961232	Saddle oyster	<i>Anomia ephippium</i>	O	N	
NX0591961232	Peacock worm	<i>Sabella pavonina</i>	R	N	3
NX0591961232	Sea lettuce	<i>Ulva lactuca</i>	R	N	2
NX0591961232	Edible Crab	<i>Cancer pagurus</i>	R	N	1
NX0591961232	Tube worm	<i>Pomatoceros triqueter</i>	R	N	
NX0591961232	Star ascidian	<i>Botryllus shlosseri</i>	O	N	3lrg
	Long Clawed Porcelain		R		
NX0591961232	Crab	<i>Pisidia longicornis</i>		N	2
NX0591961232	Feather star	<i>Antedon bifida</i>	F	N	30-50
NX0591961232	Bryozoan	<i>Conopeum reticulum</i>	R	N	
NX0591961232	Darwin barnacle	<i>Elminius modestus</i>	R	Y	
NX0591961232	Barnacle	<i>Perforatus perforatus ?</i>	R	N	1
NX0591961232	Other barnacles	Unsure of species	O		
NX0591961232	Prawn sp	<i>Palaemon sp</i>	R	N	1

	NX0591961232	Light bulb sea squirt	<i>Clavelina lepadiformis</i>	R	N	3
S6	NX0592661231	Sponge	<i>Sycon ciliatum</i>	R	N	5-10
	NX0592661231	Sea squirt	<i>Ascidrella aspersa</i>	S	N	
	NX0592661231	Sea squirt (sea vase)	<i>Ciona intestinalis</i>	A	N	
	NX0592661231	Green seaweed	<i>Cladophora rupestris</i>	F	N	
	NX0592661231	Peacock worm	<i>Sabella pavonina</i>	O	N	10-20
	NX0592661231	Other shrimp	<i>Gammarus sp</i>	R	N	
	NX0592661231	Feather star	<i>Antedon bifida</i>	F	N	15-25
	NX0592661231	Long Clawed Porcelain Crab		R	N	1
	NX0592661231	Sea slug	<i>Polycera quadrilineata</i>	R	N	
Other species on buoys		Japanese skeleton shrimp	<i>Caprella mutica</i>	C	Y	
		Bread crumb sponge	<i>Halichondria panicea</i>	O	N	
PORTPATRICK MARINA						
Panel No	Grid Ref	Species - Common Name	Species - Latin Name	Abundance	Invasive sp	
PP1	NW9979154137	Sponge	<i>Sycon ciliatum</i>	F	N	



	NW9979154137	Sea squirt	<i>Ascidrella aspersa</i>	F	N	
	NW9979154137	Green seaweed	<i>Cladophora rupestris</i>	C	N	
	NW9979154137	Tube worm	<i>Pomatoceros triqueter</i>	O	N	
	NW9979154137	Sea lettuce	<i>Ulva lactuca</i>	R	N	
	NW9979154137	Star ascidian	<i>Botryllus shlosseri</i>	R	N	
	NW9979154137	Orange-tipped sea squirt	<i>Corella eumyota</i>	O	Y	
	NW9979154137	Oyster sp	<i>Unsure (saddle?)</i>	O	N	mostly tiny but 10-20 larger
	NW9979154137	Sea squirt (sea vase)	<i>Ciona intestinalis</i>	R	N	check photos
	NW9979154137	Crab sp	<i>Unsure of species</i>	R	N	2
	NW9979154137	Peacock worm	<i>Sabella pavonina</i>	R	N	
	NW9979154137	Ragworm	<i>Nereis diversicolor</i>	R	N	
	NW9979154137	Bryozoan	<i>Conopeum reticulum</i>	R	N	
	NW9979154137	Sponge	<i>Sycon ciliatum</i>	O	N	
PP2	NW9979154137	Sea squirt	<i>Ascidrella aspersa</i>	O	N	
	NW9979154137	Green seaweed	<i>Cladophora rupestris</i>	O	N	

NW9979154137	Tube worm	<i>Pomatoceros triqueter</i>	R	N	
NW9979154137	Sea lettuce	<i>Ulva lactuca</i>	R	N	
NW9979154137	Star ascidian	<i>Botryllus shlosseri</i>	O	N	
NW9979154137	Orange-tipped sea squirt	<i>Corella eumyota</i>	O	Y	
NW9979154137	Oyster sp	Unsure	R	N	saddle?
NW9979154137	Crab sp	Unsure of species	R	N	2
NW9979154137	Bryozoan - branched	Unsure of species	R	N	check photo

Abbrev	Scale	%
S	Super Abundant	80 - 100
A	Abundant	40 - 80
C	Common	20 - 40
F	Frequent	10 - 20
O	Occasional	5 - 10
R	Rare	<5%