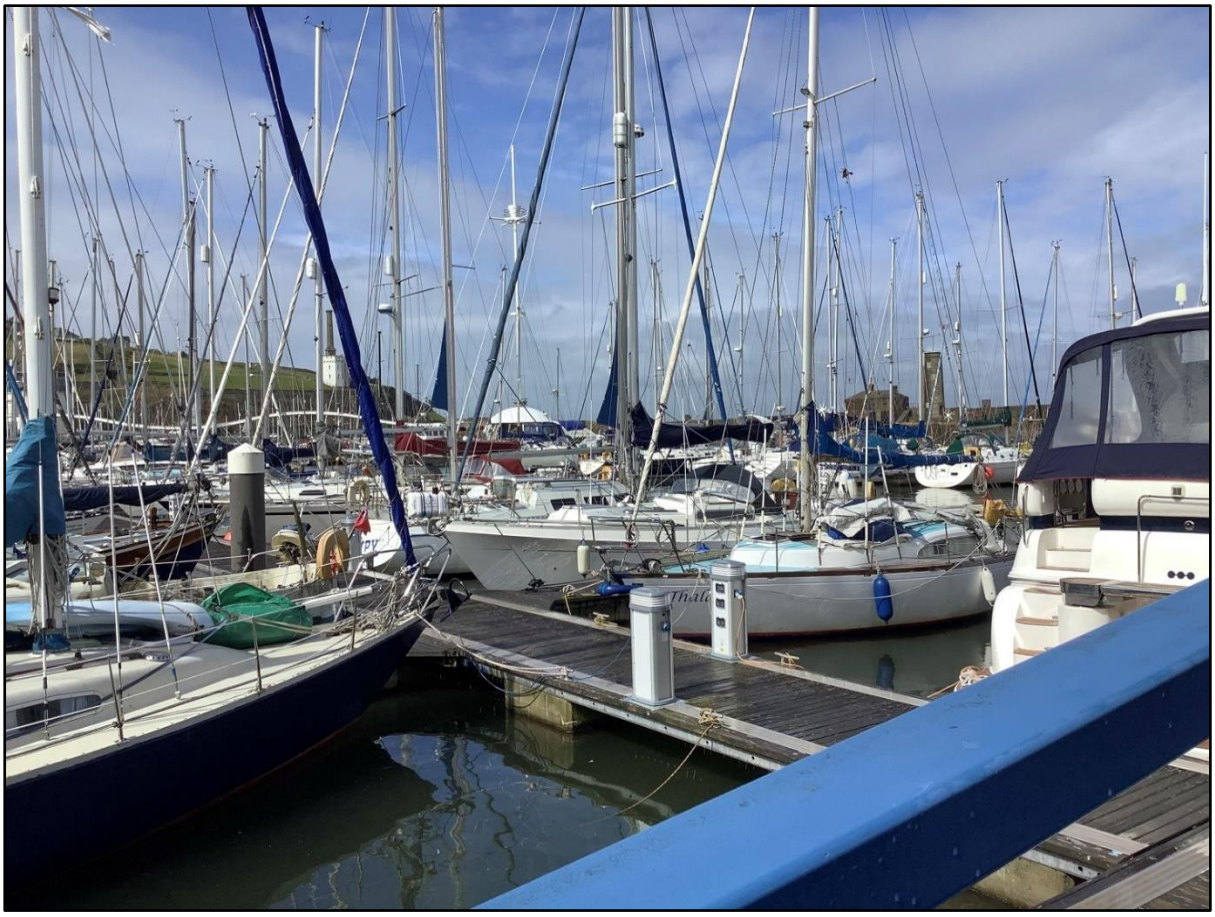
Monitoring of Marine INNS using Submerged Settlement Panels

Whitehaven Marina - May to September 2023

Solway Firth Partnership - September 2023



Whitehaven Marina

Solway Firth Partnership

Table of Contents

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. DEFRA (Department for Environment, Food and Rural Affairs) is the overarching coordinator for INNS in England with the GB NNSS (GB Non-Native Species Secretariat) being 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

Four settlement panels (Photo 1) were attached to pontoons within Whitehaven Marina on 17 May 2023 by SFP staff, locations shown at Figure 1. The panels were attached to the underside of the pontoons and submerged to around one metre depth using strong paracord and weighed down with 6 oz fishing weights (Photo 2).

It was noted that at this time in May, the water entering the Queens Marina was orange because of soluble Ferrous Oxide (Iron(11)Oxide, FeO) reacting with oxygen and forming the insoluble Ferric Oxide (Iron (111)Oxide, Fe_2O_3). This results in reduced oxygen levels in the water.

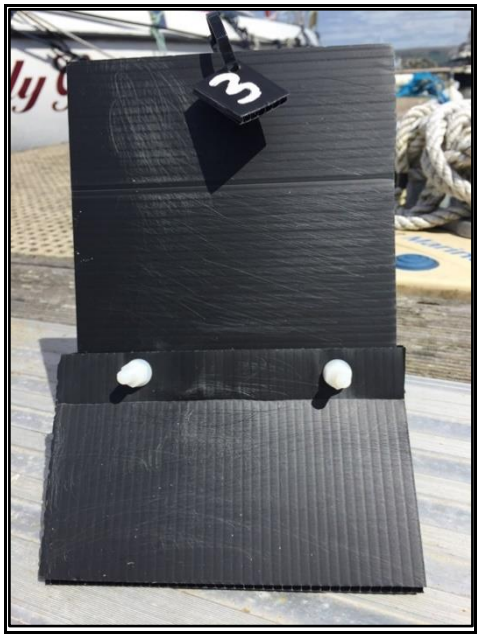


Photo 1 - Correx panel structure

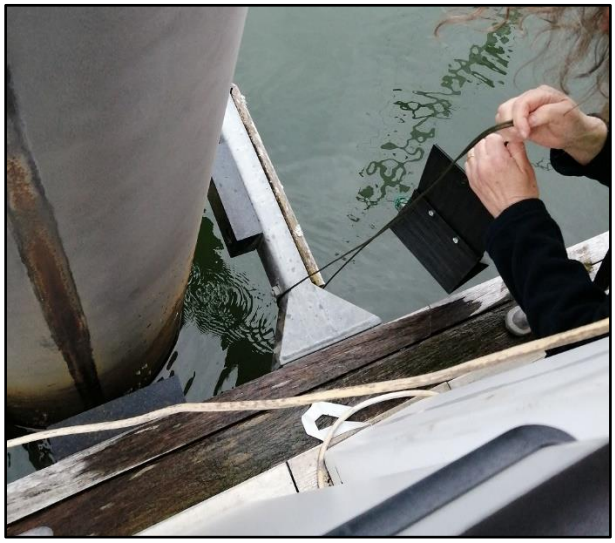


Photo 2 – Attaching the Correx panel

Whitehaven was chosen as a relatively large and active but protected marina. This was the third year that SFP had monitored the marina. Cumbria Wildlife Trust (CWT) had also carried out monitoring using settlement panels in 2015 as part of a national monitoring project. The national monitoring project was repeated in July 2023. The SFP Manager joined the Natural England (NE) survey at Whitehaven, carried out by John Bishop and Christine Wood from the Marine Biological Association and Jan Maclennan from NE.

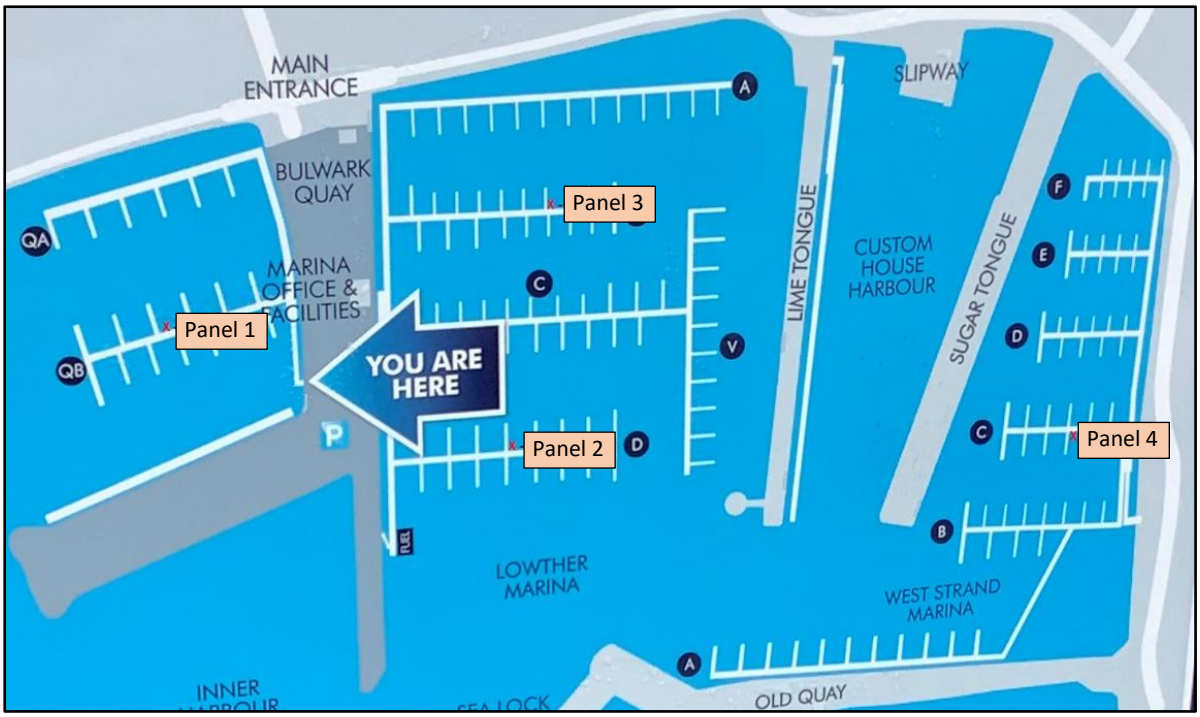


Figure 1: Whitehaven Marina. Location of panels

At the end of the summer (21 September 2023), the panels at Whitehaven were collected, photographed (Photos 3, 4), scored for percentage cover of surface species and then appropriately discarded. Mobile organisms, such as crabs were also noted and recorded.

Photo 3 – Collecting panels

Photo 4 – Collecting panels

3. Results

All four panels installed at Whitehaven were successfully recovered and assessed.

As this was the third year that SFP had monitored Whitehaven marina the previous year's results were consulted for comparison.

It was noted that the water within the Queens Marina was still orange, at least four months after first being reported.

The most commonly occurring species across all panel locations was the trumpet tubeworm, *Fipimactus enigmaticus* (Photos 5 and 6) which was also the dominant species in 2022. There was a distinct orange colour to the tubeworm within Queens Marina (Photos 3 and 6), coloured by the iron in the water. This species appeared to be super abundant with very few other species present in this part of the marina presumably due to the low levels of oxygen in the water. However, a few individuals of common mussel, *Mytilus edulis* (Photo 7), the sea squirt *Ascidiella aspersa* (Photo 8) and the invasive species, leathery sea squirt, *Styela clava* (Photo 9) were also noted in this location. Other species noted across the rest of the marina included the bryozoan, *Conopodium reticulum* (Photo 10) which was more widely spread than previous years*;* the green algae, *Cladophora rupestris*; shore crab, *Carcinus maenas* (Photo 11)*;* various barnacles including Darwin's barnacles, *Elminius modestus* although many were dead leaving just the shells (Photo 12); eel, *Anguilla anguilla* (photo 13) and a blenny, *Lipophrys pholis* (Photo 14).

Although the number of species found at Whitehaven was similar to previous years, the panel coverage was more dominated by trumpet tubeworm, *Fipimactus enigmaticus* than previously seen. This was the first year that the invasive species, leathery sea squirt, *Styela clava* was noted through settlement panel monitoring, although there was only one individual.

A full species list is found at Appendix 1.

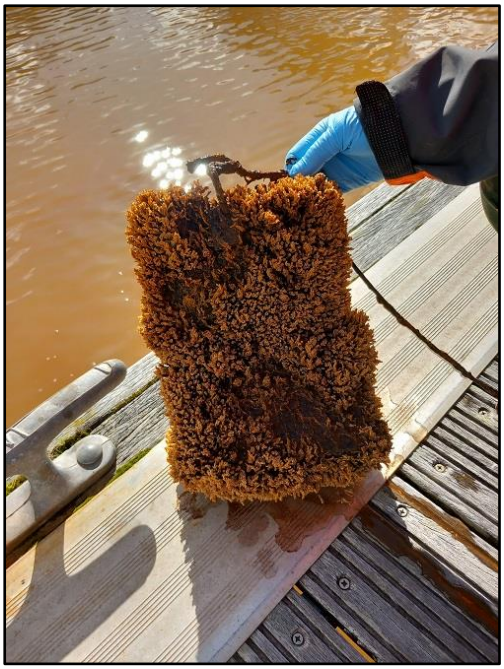


Photo 5 – *Fipimactus enigmaticus,* Trumpet tubeworm - orange

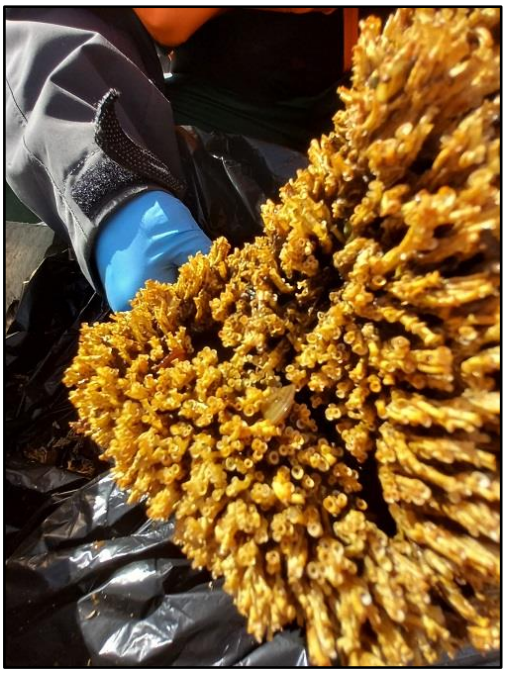


Photo 6 – *Fipimactus enigmaticus* Trumpet tubeworm - orange

Photo 7 – Occasional common mussel, *Mytilus edulis*

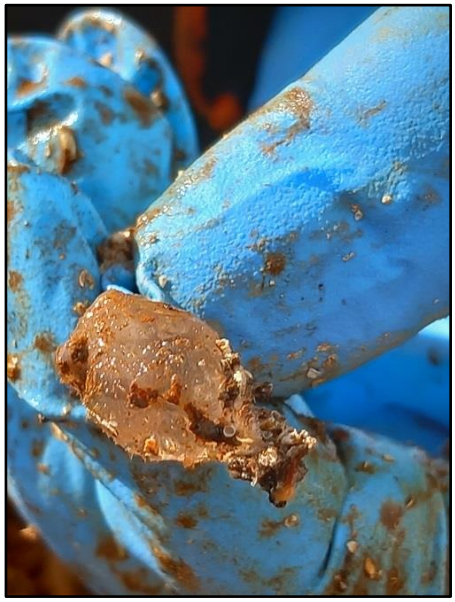


Photo 8 – Sea squirt, *Ascidiella aspersa*

Photo 9 – Leathery sea squirt, *Styela clava*

Photo 10 – Bryozoan, *Conopeum reticulum*

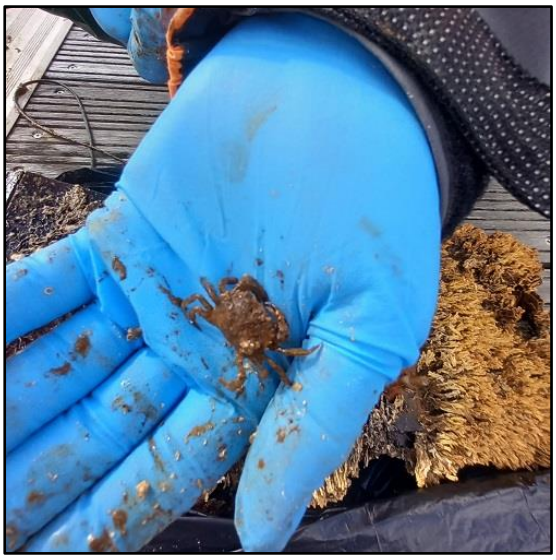


Photo 11 – Shore Crab, *Carcinus maenas*

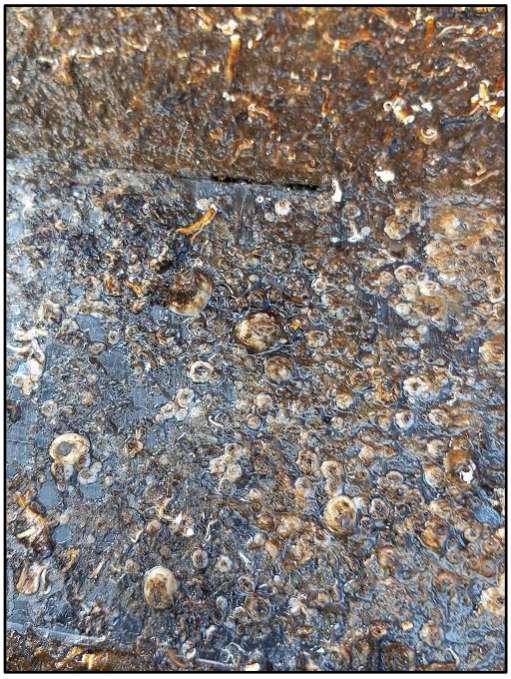


Photo 12 – Barnacle shells

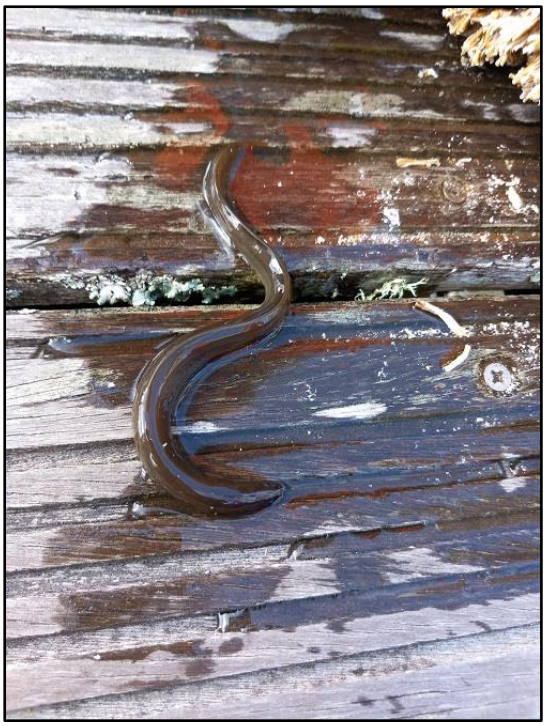


Photo 13 – Eel, *Anguilla anguilla*

Photo 14 – Blenny, *Lipophrys pholis*

4. Conclusion

The most commonly occurring species across all panel locations was the trumpet tubeworm, *Fipimactus enigmaticus.* This species continues to be an issue to boat owners as it encrusts the bottom of their boats. The common mussel, *Mytilus edulis* was rarely seen around the marina unlike previous years when it was more abundant. Barnacles, likely including Darwins barnacle, *Elminius modestus* were present on site but mostly dead, leaving shells on the panel. The sea squirt *Ascidiella aspersa*, was only noted on one panel, unlike previous years.

The new species recorded which has not been seen on previous years was the sea squirt *Styela clava* with one individual being reported. However, one individual of this species was noted in a 2015 national survey. (Wood, et al., 2015).

Generally, it appears that the contamination of the marina from run-off has influenced species diversity / abundance. Further monitoring would have to take place to see whether this trend continues or whether changes to the quality of water input to the marina influences species diversity.

Continued awareness of INNS gained from the use of the panels and including future rapid site assessments will allow for improved biosecurity control of invasives species. 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.

Photo 15 - Trumpet Tubeworm, *Fipimactus enigmaticus*

5. References

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Appendix 1: Whitehaven 2023 settlement panel results

WHITEHAVEN MARINA

Panel No	Grid Ref	Species - Common Name	Species - Latin Name	Abundance	Invasive sp	Notes
1	NX9727718436	Trumpet Tube worm	*Fipimactus enigmaticus*	S	Y	
	NX9727718436	Bryozoan	*Conopeum reticulum*	R	N	
	NX9727718436	Barnacle sp	Unsure of species	R	N	most appeared dead
	NX9727718436	Mussel sp	Unsure of species	R	N	
	NX9727718436	Sea squirt	*Ascidiella aspersa*	R	N	1
	NX9727718436	Shore Crab	*Carcinus maenas*	R	N	2
	NX9727718436	Leathery Sea squirt	*Styela clava*	R	Y	1
2	NX9716018400	Green seaweed	*Cladophora rupestris*	C	N	
	NX9716018400	Trumpet Tube worm	*Fipimactus enigmaticus*	A	Y	Less deep as well as less abundant
	NX9716018400	Common Shore Crab	*Carcinus maenas*	R	N	1
	NX9716018400	Common Mussel	*Mytilus edulis*	O	N	
	NX9716018400	Shrimp sp	*Gammarus sp*	R	N	
	NX9716018400	Shore Crab	*Carcinus maenas*	R	N	2
	NX9716018400	Encrusting bryozoan	*Conopeum reticulum*	F	N	check photos
	NX9716018400	Barnacles	Unsure of species	O	N	unhealthy/dead
	NX9716018400	Common Blenny	*Lipophrys pholis*	R	N	1
3	NX9720018328	Green seaweed	*Cladophora rupestris*	A	N	
	NX9720018328	Trumpet Tube worm	*Fipimactus enigmaticus*	A	Y	
	NX9720018328	Shore Crab	*Carcinus maenas*	R	N	2

	NX9720018328	Common Mussel	*Mytilus edulis*	C	N	
	NX9720018328	Shrimp sp	*Gammarus sp*	R	N	
	NX9720018328	Encrusting bryozoan	*Conopeum reticulum*	C	N	
	NX9698118259	Eel	*Anguilla anguilla*	R	N	1
	NX9698118259	Trumpet Tube worm	*Fipimactus enigmaticus*	S	Y	deeper growth
	NX9698118259	Shore Crab	*Carcinus maenas*	R	N	3
	NX9698118259	Shrimp sp	*Gammarus sp*	R	N	
	NX9698118259	Common Mussel	*Mytilus edulis*	R	N	
	NX9698118259	Encrusting bryozoan	*Conopeum reticulum*	A	N	
	NX9698118259	Barnacle sp / Darwins barnacle	Unsure of species			not recorded - check photos

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