Monitoring of Marine INNS using Submerged Settlement Panels

Whitehaven Marina - May to September 2024

Solway Firth Partnership - September 2024

Whitehaven Marina

Solway Firth Partnership

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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 biological indices displaying lower scores where INNS are present. Indirect impacts include where INNS densities are so high that there is 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, 2024)

2. Method

Four settlement panels (Photo 1) were attached to pontoons within Whitehaven Marina on 8 May 2024 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 still orange because Ferrous Oxide (Iron (11)Oxide, FeO) reacts with oxygen and formings Ferric Oxide (Iron (111)Oxide, Fe_2O_3). This results in reduced oxygen levels in the water. This situation at Queens Marina has now been apparent for over 1 year.

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 fourth year that SFP had monitored the marina.

Figure 1: Whitehaven Marina. Location of panels

At the end of the summer (18 September 2024), 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

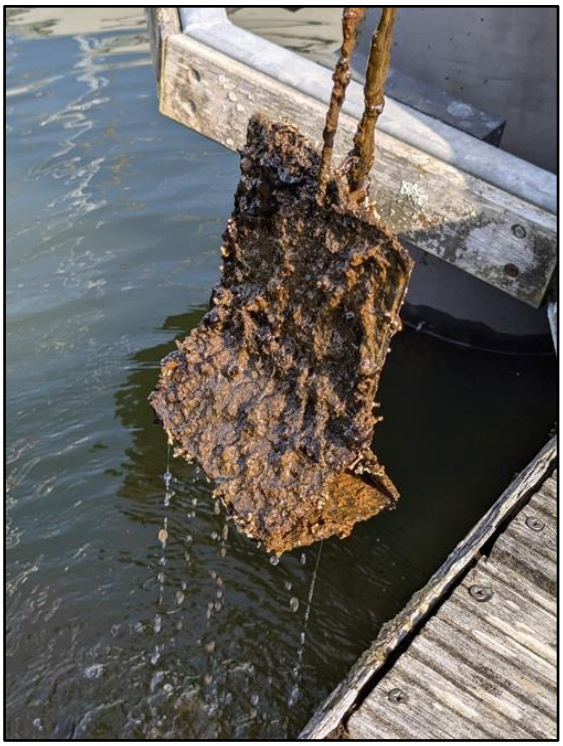

Photo 4 – Collecting panels

3. Results

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

As this was the fourth 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, more than twelve months after first being reported.

The most noticeable feature this year was the reduced occurrence of all species across all panel locations and most notably, the trumpet tubeworm, *Fipimactus enigmaticus* (Photos 5 and 6) which was the dominant species in 2023. Last year there was a distinct orange colour to the tubeworm within Queens Marina (Photo 5), coloured by the iron in the water. However, in 2024 this species has gone from being super abundant to completely absent in this part of the marina potentially due to the low levels of oxygen in the water resulting from the high level of iron (Photo 6). The only species noted in this location was a patch of the bryozoan, *Conopodium reticulum* (Photo 7). The trumpet tubeworm, *Fipimactus enigmaticus* was present in other parts of the marina although at a much lower level than in 2023 (Photo 8). Other species noted across the rest of the marina included the bryozoan, *Conopodium reticulum* (Photos 9 and 10) which was found on all panels although at a low level*;* the green algae, *Cladophora rupestris*; and occasional common mussel, *Mytilus edulis* (Photo 11); common prawn, *Palaemon serratus* (Photo 12)*;* shrimp sp, *Gammarus sp*; and the tubeworm, *Pomatoceros triqueter*. There was also an unidentified red algae present on two panels (Photo 13). It was not possible to photograph all the mobile species and the silty material covering the green seaweed, *Cladophora rupestris* on the panels made it difficult to capture the other species present.

A buoy was also inspected at Lowther Marina. It was dominated by the green algae, *Cladophora rupestris and* trumpet tubeworm, *Fipimactus enigmaticus* (Photo 14).

A full species list is found at Appendix 1.

Photo 5 – 2023 Orange Trumpet tubeworm

Photo 6 – 2024 Orange but no Trumpet tubeworm

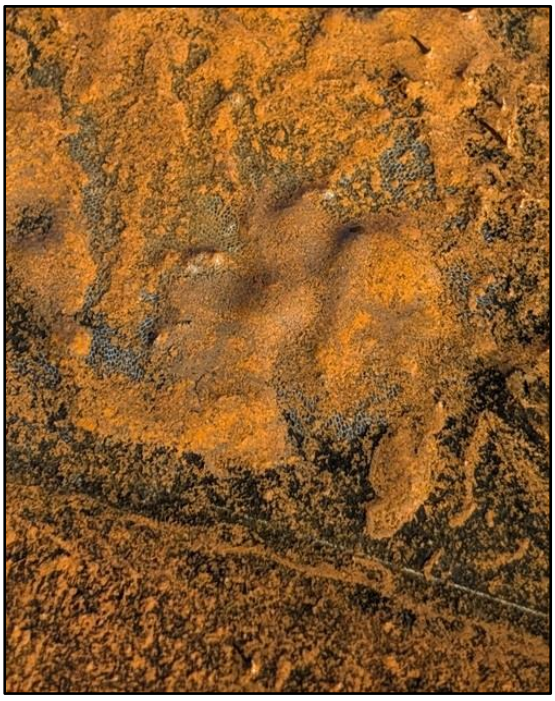

Photo 7 – Bryozoan, *Conopeum reticulum*

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Photo 8 – Trumpet tubeworm, *Fipimactus enigmaticus*

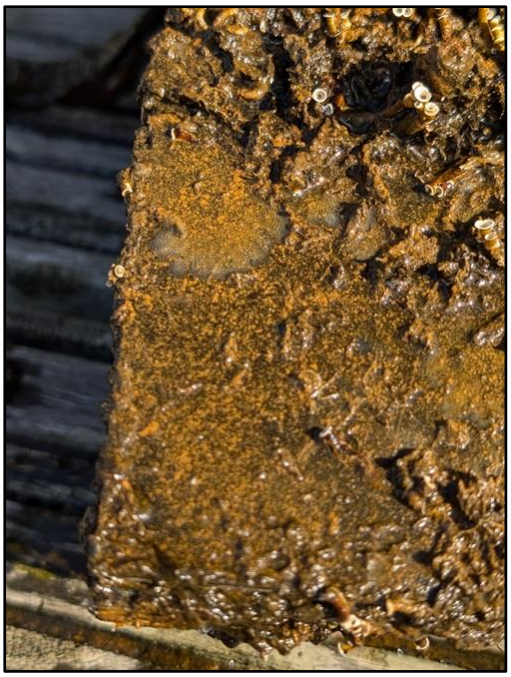

Photo 9 – Bryozoan, *Conopeum reticulum*

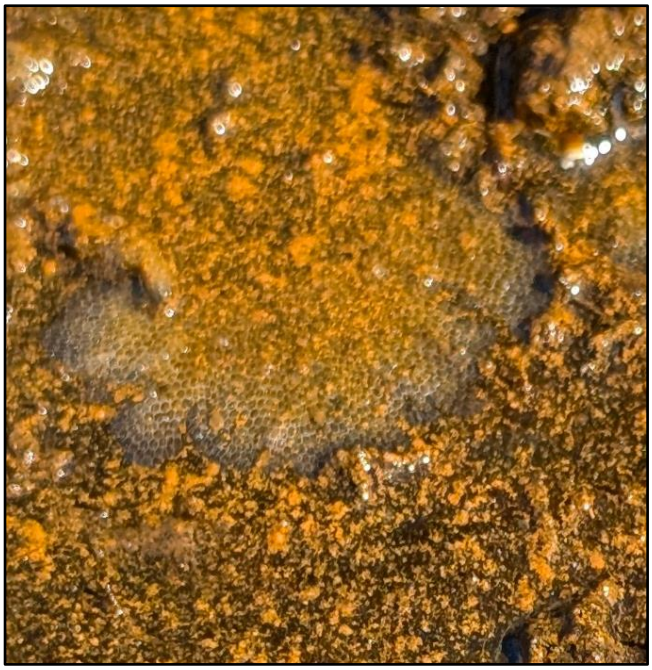

Photo 10 – Close up Bryozoan, *Conopeum reticulum*

Photo 11 – Blue Mussell with Bryozoan, *Conopeum reticulum* to right

Photo 12 – Common Prawn, *Palaemon serratus*

Photo 13 - Unidentified red algae

Photo 14 – Buoy with green algae, *Cladophora rupestris and* trumpet tubeworm, *Fipimactus enigmaticus*

4. Conclusion

There was a reduced number of species noted across all panel locations in 2024 compared to 2023. The trumpet tubeworm, *Fipimactus enigmaticus* was completely absent on the panel in Queens Marina. However, this species was present on the other panels although at a much lower level than at any time over the last 4 years of monitoring. The only species noted on all panels was the encrusting bryozoan, *Conopeum reticulum* with the green algae, *Cladophora rupestris* being common on most of the panels. Other species noted only occasionally were the common prawn, *Palaemon serratus* and shrimp, *Gammarus sp.*

Generally, it appears that the contamination of the marina from run-off has continued to influence species diversity / abundance and more seriously than in 2023. 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*

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Appendix 1: Whitehaven 2024 settlement panel results

WHITEHAVEN MARINA

Panel No	Grid Ref	Species - Common Name	Species - Latin Name	Abundance	Invasive sp
1	NX9727718436	Green seaweed	Cladophora rupestris	R	N
	NX9727718436	Encrusting bryozoan	Conopeum reticulum	O	N
2	NX9716018400	Green seaweed	Cladophora rupestris	C	N
	NX9716018400	Trumpet Tube worm	Fipimactus enigmaticus	C	Y
	NX9716018400	Encrusting bryozoan	Conopeum reticulum	O	N
	NX9716018400	Shrimp sp	Gammarus sp	R	N
	NX9716018400	Common Mussel	Mytilus edulis	R	N

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%

	NX9720018328	Green seaweed	Cladophora rupestris	A	N
	NX9720018328	Trumpet Tube worm	Fipimactus enigmaticus	O	Y
	NX9720018328	Encrusting bryozoan	Conopeum reticulum	R	N
3	NX9720018328	Shrimp sp	Gammarus sp	R	N
	NX9720018328	Tubeworm	Pomatoceros triqueter	R	N
	NX9720018328	Common Prawn	Palaemon serratus	R	N
	NX9698118259	Green seaweed	Cladophora rupestris	C	Y
	NX9698118259	Trumpet Tube worm	Fipimactus enigmaticus	A	N
4	NX9698118259	Encrusting bryozoan	Conopeum reticulum	A	N
	NX9698118259	Shrimp sp	Gammarus sp	R	N
	NX9698118259	Common Prawn	Palaemon serratus	R	N