Inter-Island Environment Meeting

Sark

Investigating the presence of invasive non-native species in Alderney's inter-tidal and biosecurity measures to adopt.

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Research Project

MSc Marine Environmental Management - University of Exeter

Supported by

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Mr & Mrs Moerman

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Le Vallon d'Or Holidays

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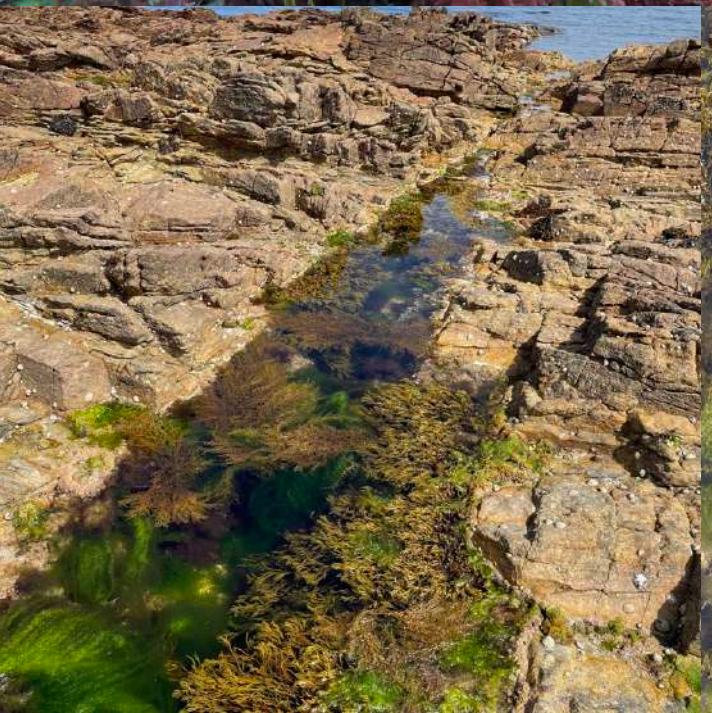


What is a non-native species?

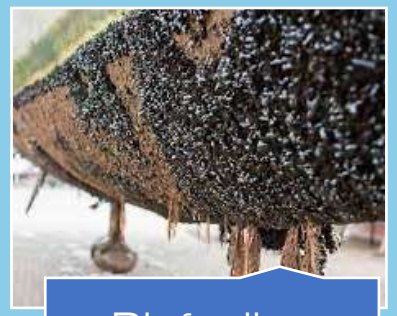
Non-native species are organisms which have been introduced deliberately or unintentionally by human activities, into environments outside their natural range.

What is an invasive non-native species ?

… which negatively impact native biodiversity, ecosystem services or human well-being (IUCN 2000).

Methods of arrival:

Ballast Water



Biofouling

Aquaculture

Aquarium Trade

Potential impacts of Invasive species:

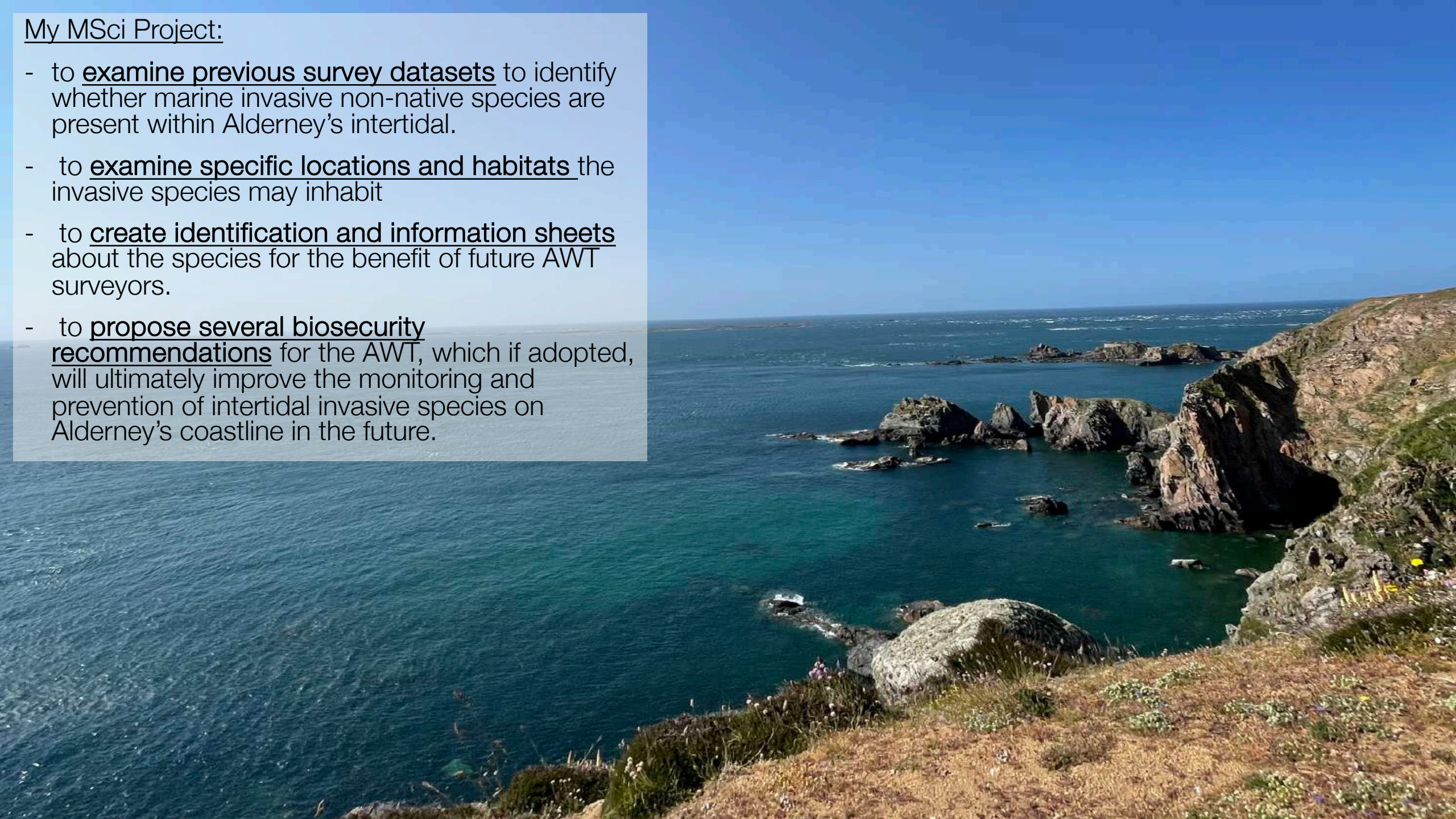
Competition

Predation

Habitat Alteration

Disease transmission

Economic impacts



My MSci Project:

- to examine previous survey datasets to identify whether marine invasive non-native species are present within Alderney's intertidal.
- to examine specific locations and habitats the invasive species may inhabit
- to create identification and information sheets about the species for the benefit of future AWT surveyors.
- to propose several biosecurity recommendations for the AWT, which if adopted, will ultimately improve the monitoring and prevention of intertidal invasive species on Alderney's coastline in the future.

Historic Datasets:

Seasearch (Marine Conservation Society):

- Volunteer-based underwater survey initiative to document intertidal and subtidal marine habitats and their associated biodiversity.
- Recreational swimmers, snorkellers and divers can all be involved.
- The survey collects qualitative data on the habitat and species present as well as placing species abundances into a SACFOR scale.

Surveys began on Alderney in 2007 and a total of 51 surveys have taken place.

Shoresearch (Wildlife Trust):

- Shoresearch Walkover surveys was initially developed by the Kent Wildlife Trust in 2003.
- The survey has been developed specifically for shorelines with hard substrates, such as rocks, pebbles, shingle, and bedrock.
- Qualitative data is gathered on the species encountered within a designated section of the intertidal zone.

Surveys began on Alderney in 2020 and a total of 21 surveys have taken place.

New Intertidal Survey:

- The aim of this new quadrat survey is to collect both presence and abundance data of invasive non-native species.
- 3 survey sites were chosen.
- Surveys were conducted at low-tides and randomly sampled over each bay.

Invasive Species Quadrat Survey		
Site name =	**Date =**	**Start / End Time =** /
Cloud Cover (eg. 1/8, 2/8) =	**Visibility** = Excellent / Very Good / Good / Moderate / Poor / Haze / Mist	
Time of low tide =	**Height of low water =**	**No. of participants =**
Habitat Categories = Rockpools / Rockyshore / Mudflat / Sandy Beach / Green Seaweed zone / Brown Seaweed zone / Red Seaweed zone / Kelp zone / Other		
Substrate Categories = Bedrock / Artificial / V.L.Boulders (<1m) / L.Boulders (0.5-1m) / S.Boulders (0.25-0.5m) / Cobbles (Head-fist) / Pebbles (50p - fist) / Gravel (stone) / Gravel (shell) / Sand / Mud / Silt / Other		

Invasive Species to search for	Abbreviation
Harpoon weed *(Asparagopsis armata)*	AA
Wireweed *(Sargassum muticum)*	SM
Oyster Thief *(Colpomenia peregrina)*	CP
Hook Weed *(Bonnemaisonia hamifera)*	BH
Red Ripple Bryozoan *(Watersipora subatra)*	WS
Pacific Oyster *(Magallana gigas)*	MG

Quadrat No.	Latitude	Longitude	Habitat Type	Substrate Type	Species	Count	Notes

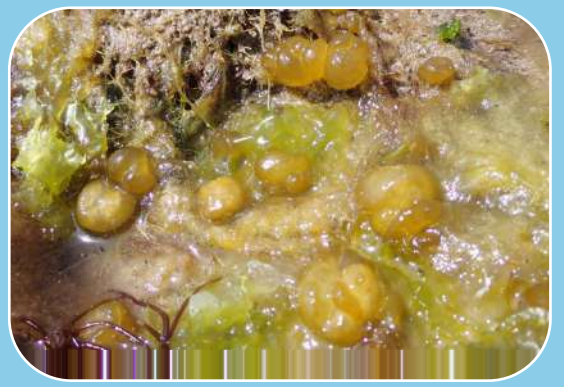
Results: Invasive non-native species found on the intertidal surveys

Harpoon Weed
(Asparagopsis armata)

Total number of individuals counted: 1

Japanese Wireweed
(*Sargassum muticum*)

Total number of individuals counted: 235



Oyster Thief
(Colpomenia peregrina)

Total number of individuals counted: 469

Hook Weed
(Bonnemaisonia hamifera)

Total number of individuals counted: 20

Red Ripple Bryozoan
(Watersipora subatra)

Total number of individuals counted: 41

Pacific Oyster
(Magallana gigas)

Total number of individuals counted: 2

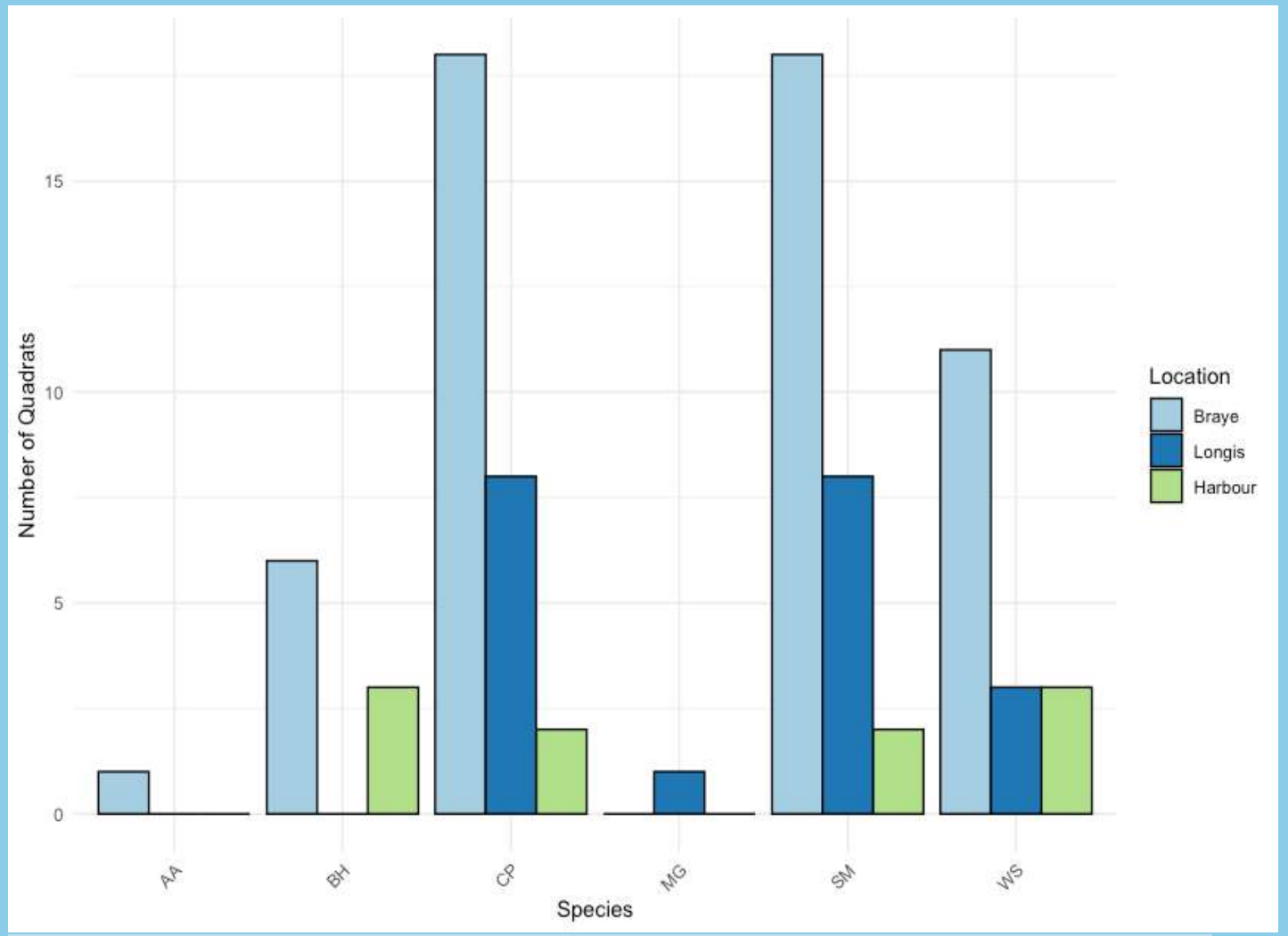
Location matters…

- Most invasive species were found at Braye
- Location-specific vessel activity may be a crucial element

Braye

Longis

Braye Harbour



Barplot to illustrate the number of quadrats where species were identified to be present on the 3 survey sites.

Substrate type matters…

- Most invasive species were found on bedrock substrate types.
- All substrate types contained suitable conditions for at least one invasive species to inhabit.

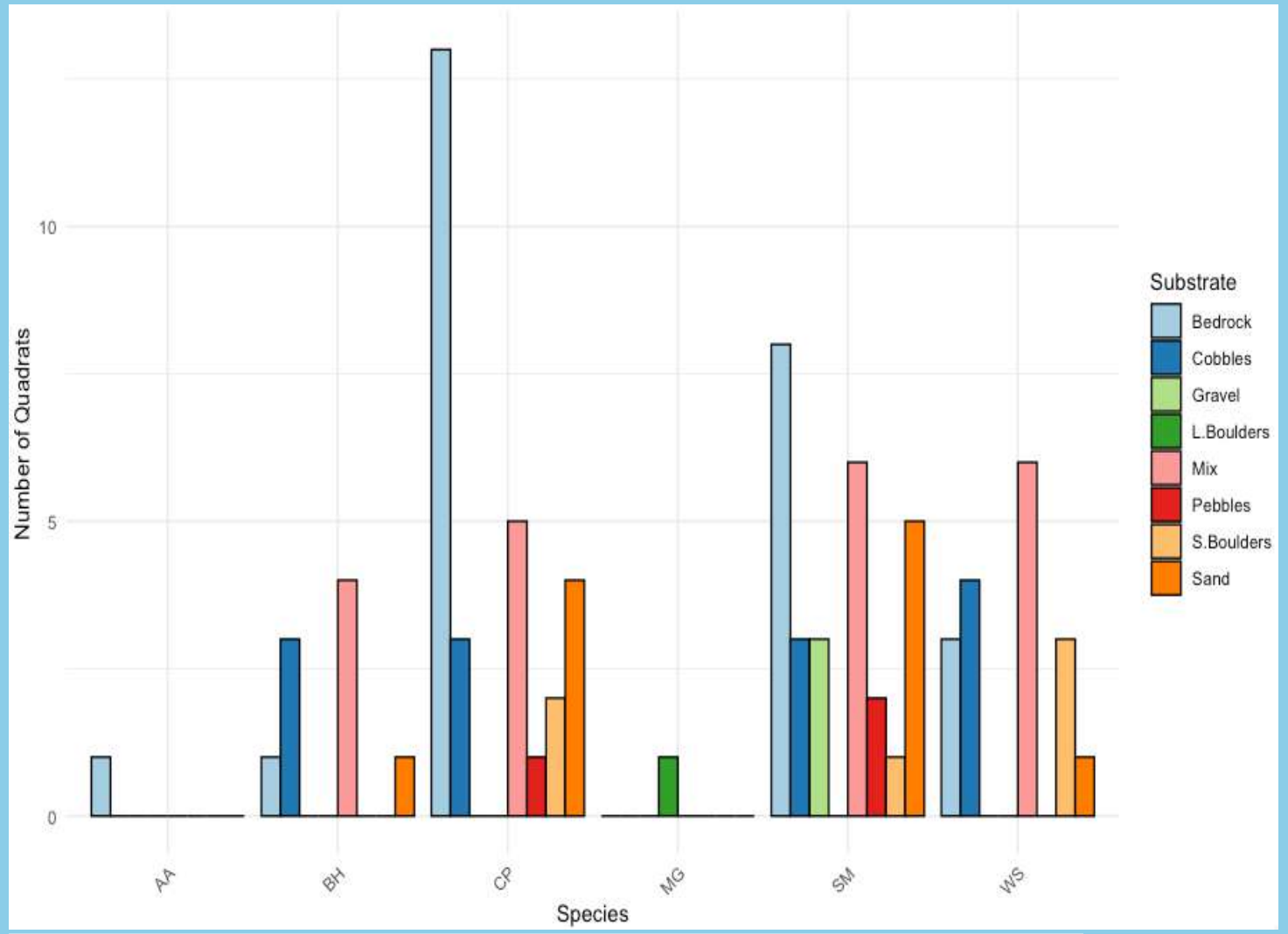
S.Boulder

Mix

Sand

Pebbles

L. Boulders



Barplot to illustrate the number of quadrats where species were identified to be present on different substrate types.

Results: Information sheets

Asparagopsis armata

Harpoon Weed (Red Algae)

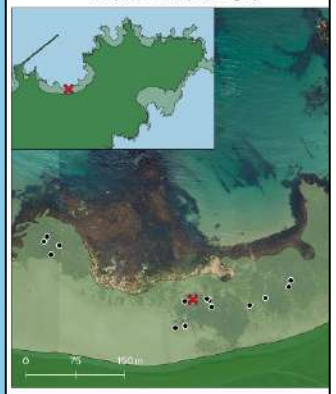


Figure 9a: Map showing the quadrat of where *Asparagopsis armata* was identi

Description:

Asparagopsis armata changes in appearance with li
September, and a diploid (asexual) phase outside thi
30 cm tall, has barbed branches and is rosy pink, or
more reddish. Characteristics of *A. armata* that mak
(fragment like bundles) that can reach new habitats,
attached to floating structures using barbed shaped p

Global / UK distribution:

First described in Australia, this red alga has also be
Middle East and within Mediterranean Sea (Guiry,
as far north as Shetland Islands, Scotland. However,
and in western Ireland but occur sporadically over d

Observed Habitat Preferences:

In Alderney, *A. armata* was only seen rooted in the
substrate types and amongst multiple other seaweed
shallow sublittoral or in deep littoral pools attached
is also typically found in the sublittoral and can be e

Potential threats to local native habitats and species:

The high surface-volume ratio of tetrasporophytes a
negative impact other local seaweed (Pinteus et al.,
produce brominated compounds, iodinated methane
other species, leading to weakening. This phenomen
organisms remain without water changes for several

Bonnemaisonia hamifera

Hook weed (Red Algae)

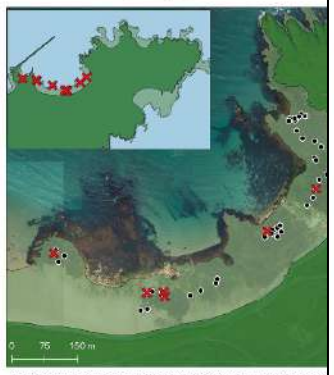


Figure 10a: Map showing the quadrats of where *Bonnemaisonia hamifera* were

Figure 10b: Close up of *B. hamifera*'s "hooked" branches

Description:

Bonnemaisonia hamifera, has a similar appearance to *A. ar*
cm high with a vertical axis 1mm in diameter. Its main disti
A small (2-3 cm) filamentous tetrasporophyte phase also oc

Global / UK distribution:

The plant is native to the Pacific Ocean, around Japan and t
how this was achieved. First recorded in the UK was on the
southwest but rare on the east coast of England (Morton and

Observed Habitat Preferences:

In Alderney, *B. hamifera* was only seen at fragments attach
tidal pools. Literature suggest it is usually found in the shall
rocks, or epiphytically on other seaweeds. The tetrasporoph
shore and in the subtidal zone (Breeman, Meulenhoff and G

Potential threats to local native habitats and species:

Unfortunately, due to the lack of literature, the invasive thre
comparable to *A. armata* due to the similarities in lifecycle
1972).

Colpomenia peregrina

Oyster Thief (Brown Algae)

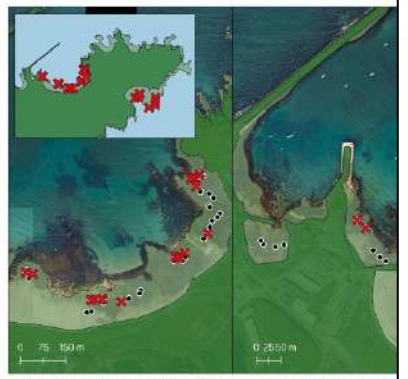


Figure 11a: Map showing the quadrats of where *Colpomenia peregrina* were identified at Braye Bay, the Harbour and at Lon

Figure 11b: Close up of multiple *C. peregrina* on a seaweed substrate

Figure 11c: Large *C. peregrina* in the low

Description:

Colpomenia peregrina is a non-gelatinous olive-green algae that takes t
diameters occasionally reaching over 20 cm but typically ranging from
like, later turning yellow-brown and contorted, and they collapse as the
texture, being filled with seawater when young and becoming hollow ar

Global / UK distribution:

Native to the Pacific Ocean, it is found in temperate coastal regions thro
introduced to France from the USA with imports of oysters at the end o
to Cornwall and Dorset from France in 1907, it now occurs over most o
the south west. *C. peregrina* was introduced to France from the USA wi
nineteenth century (Green et al., 2012).

Observed Habitat Preferences:

In Alderney, *C. peregrina* mostly occurred on the lower intertidal area,
pebbles. They also occurred frequently on the edge of rockpools and ver
occur in mid to lower shore rock pools and shallow subtidal waters, atta
Chapman, 1991; Oakley, 2008).

Potential threats to local native habitats and species:

C. peregrina could have the potential to smother species or cover areas
been reported on native species. *C. peregrina* earned its nickname "oyst
mussels or oysters' beds. As a result, when it became buoyant, it floated
Economic losses were reported from French oyster beds due to this proc

Magallana gigas

Pacific / Japanese Oyster

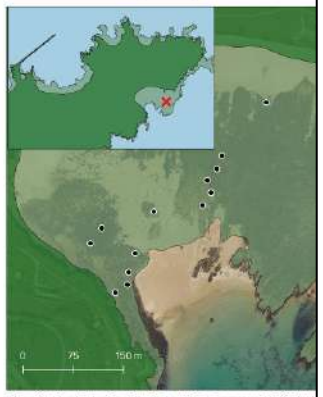


Figure 12a: Map showing the quadrat of where *Magallana gigas* was identified at

Description:

The shell of *Magallana gigas* can reach up to 18 cm,
often with deep purple patches. The left valve has a
edge a rough appearance. The right valve is either fla
left valve. Although similar to *Crassostrea virginica*,
2020).

Global / UK distribution:

Magallana gigas, also known as the Portuguese or Ja
Portugal along the Atlantic Coast. It occurs naturally
from Portugal to Essex in 1926, it has since become
Cornwall, Essex, and Wales, it is now farmed in arou
Ireland. Escaped oysters have formed established pop

Observed Habitat Preferences:

In Alderney, very few *M. gigas* have been found, wit
Naturally, this oyster is usually found on the lower sh
al., 2020).

Potential threats to local native habitats and species:

Oysters do have positive effects on coastline ecosyst
the density of oysters rises. Literature indicates that t
diversity, community structure, and ecosystem proce
oyster density. As they can grow on various hard sub
infrastructure (Wood et al., 2021).

Sargassum muticum

Wireweed (Brown Macroalgae)

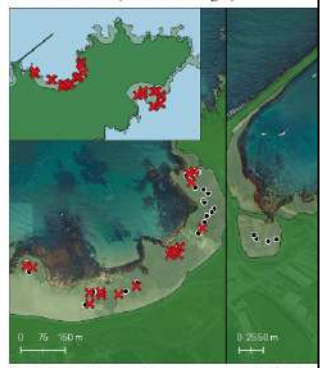


Figure 12a: Map showing the quadrats of where *Sargassum muticum* were identified at Braye

Figure 13b: Photo of *S. muticum* air bladders on the surface

Figure 13c: Fix sandy substrate

Description

Sargassum muticum is a large seaweed, recognized by its d
featuring fronds extending over 1 meter in length. Its stems
oval blades and spherical gas bladders along each side (Piz

Global / UK distribution:

Native to Asia, *S. muticum* was introduced in North Ameri
1990; Farnham, 1973), probably attached to imported *M. g*
UK was on the Isle of Wight in 1973, indicating its likely s
the Channel Isles earlier. Since then, *S. muticum* has expan
and along the Cornish coast to Lundy Island. Populations h
Ireland, and in Scotland (Wang and Hu, 2016).

Observed Habitat Preferences:

In Alderney, *S. muticum* was seen rooted in fine substrates,
the roots had to be submerged for successful growth. It was
but in the sub-littoral zone this may have occurred. Literatu
shallow waters as well as tolerate estuarine conditions or fr

Potential threats to local native habitats and species:

S. muticum significantly influences water movement, light
(anoxia), directly impacting the growth of native organisms
photosynthetic activity, and high reproductive rates, *S. mut*
Additionally, its effective dispersion through fertile branch
mobile solid object, facilitates its widespread dispersal (Pi

Watersipora subatra

Red Ripple Bryozoan

Figure 14a: Map showing the quadrats of where *Watersipora subatra* were identified at Braye Bay, the Harbour and at Longis Bay

Figure 14b: Photo of *W. subatra* competing with similar sessile species

Figure 14c: Photo of *W. subatra* competing with other bryozoan species on a boulder

Figure 14d: Photo of *W. subatra* on a boulder

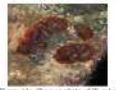


Figure 14e: Close up photo of *W. subatra*

Description:

Watersipora subatra, is an encrusting bryozoan which inhabits various hard substrates in shallow waters, ranging from rocks to boat hulls. Its growth form changes as the colony ages. Young colonies are small, flat, and nearly circular. As the colony develops, it may grow over itself, creating a rippled appearance. Well-established colonies can be vertical and leaf-like (foliaceous), with lobes and frills protruding from the substratum. The typical colour of *Watersipora subatra* is red or orange, although it can also be purplish-brown, black, or grey, with lighter edges where the younger sections are present (Wilson, 2017).

Global / UK distribution:

Globally, *Watersipora subatra* is not restricted to temperate waters, with colonies found in the Mediterranean, Indonesia, Africa, the USA, Australia and New Zealand. The Gulf of Mexico is currently the suggested as its possible native range and origin (McLachlan, 2017). It was formerly misidentified as *Watersipora subtorquata*, which is more common in the subtropical and tropical waters of the Mediterranean and Atlantic (Vieira et al., 2014). In the UK, *Watersipora subatra* was first detected in Guernsey in 2007, but in 2008, it was found in marinas in Plymouth and Poole. It is now found along the UK's south coast, Pembrokeshire and in Dublin, Ireland. (Ryland et al. 2009).

Observed Habitat Preferences:

In Alderney, *W. subatra* was always found on the darker, damper underside of rocks and hard substrates. Most commonly on the low intertidal zone. Literature evidence shows that *W. subatra* can colonise a variety of hard substrata, at depths to 10m or more (Wilson, 2017). Colonies establish on both natural and manmade surfaces including docks, vessel hulls, floating debris and rocks and shells (Wilson, 2017).

Potential threats to local native habitats and species:

W. subatra's rapid growth and efficient colonization of artificial structures can create competition for space and resources with native species, hindering their growth and survival. Additionally, the extensive growth of *W. subatra* can alter habitat structure, resulting in changes to species composition and overall ecosystem biodiversity (McLachlan, 2017).

My recommendations to the AWT:

Recommendation 1 - Supplement current monitoring with new methodology

- Continue and increase all intertidal surveying,
- Add new survey sites, especially around Braye Harbour and key sites for vessels

Recommendation 2 - Collect data on biofouling invasive species while vessels are being cleaned

- Record invasive species presence while vessels are being cleaned at Braye Harbour.

Recommendation 3 - Promote public awareness about the problem of marine invasive species

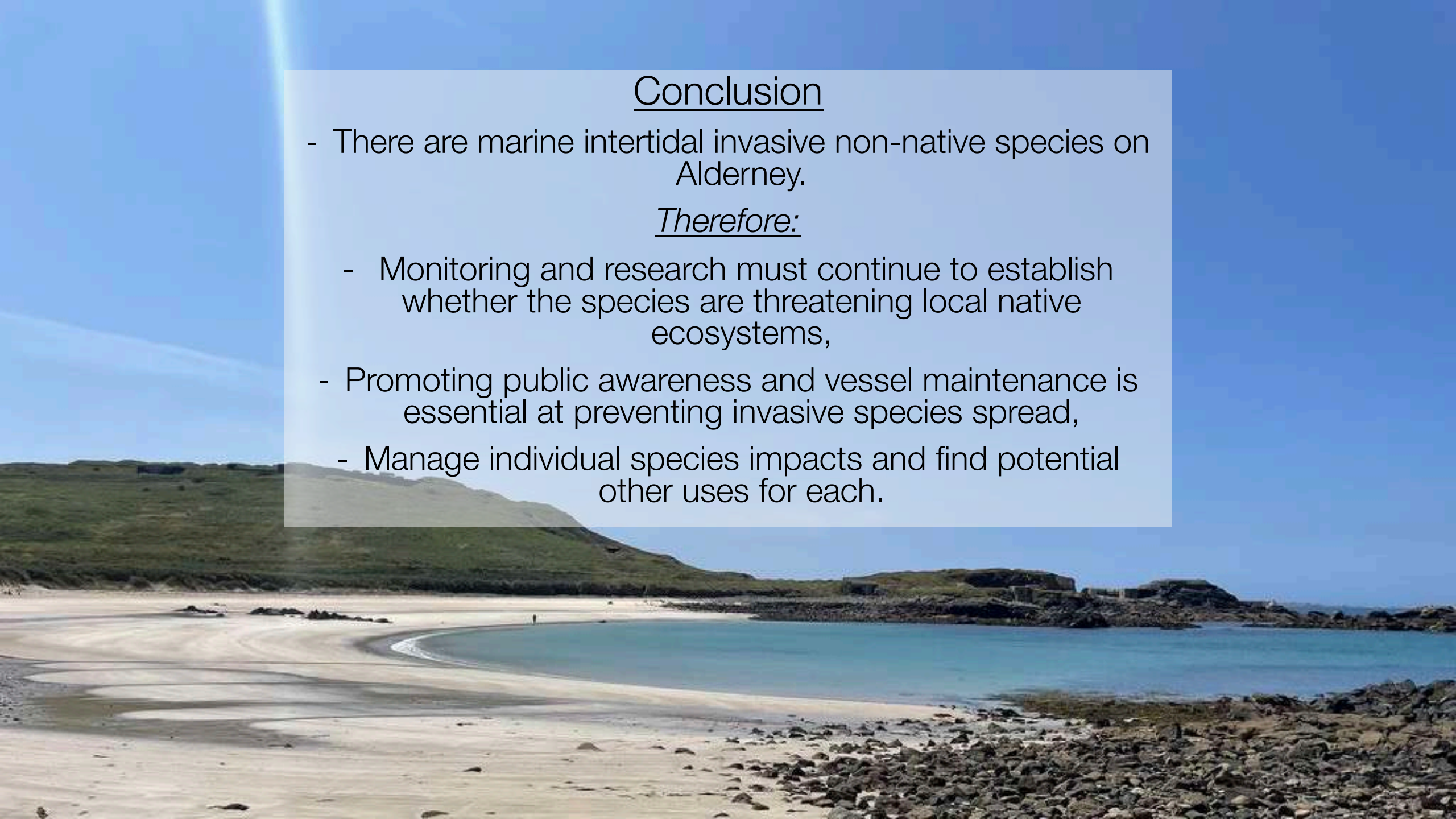
- Display invasive species information at entry points in Braye Harbour.
- Public forum (online or in-person)

My recommendations to the AWT:

Recommendation 4 - Create an interisland collaboration among stakeholders for specifically managing marine invasive species.

Recommendation 5 - Adopt species specific management:

Asparagopsis armata	*Sargassum muticum*	*Colpomenia peregrina*	*Bonnemaisonia hamifera*	*Watersipora subatra*	*Magallana gigas*
- Seasonal harvest completed by April/May (Kraan and Barrington, 2005). - Investigation into small scale use of A. armata to reduce methane emissions in cattle (Roque et al., 2020; 2021; Glasson et al., 2019).	- Seasonal harvest for fertilizer properties (Hardouin et al., 2014; Kraan 2008) - Investigation into whether S. muticum, can be used for animal feed, especially for sheep (Marín et al., 2009).	- Continue monitoring	- Continue monitoring	- Continue monitoring	- Exact location of identified oysters be recorded. - If abundance rates increase, removal and eradication projects should be considered. (Morgan et al., 2021)



Conclusion

- There are marine intertidal invasive non-native species on Alderney.

Therefore:

- Monitoring and research must continue to establish whether the species are threatening local native ecosystems,
- Promoting public awareness and vessel maintenance is essential at preventing invasive species spread,
- Manage individual species impacts and find potential other uses for each.

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Thank you for listening

Any questions?

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