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WILD SEAWEED HARVESTING AS A DIVERSIFICATION OPPORTUNITY FOR FISHERMEN

KELP ATLAS

A report for Highlands and Islands Enterprise **May 2018**



EUROPEAN UNION EUROPEAN MARITIME AND FISHERIES FUND Scottish Government Riaghaltas na h-Alba gov.scot





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This report should be cited as: Burrows M.T. & Allen, C.J. (2018) . A report by SRSL for HIE, pp. 406

1 SUMMARY

This report is a supplementary document that accompanies the report 'Wild Seaweed Harvesting as a Diversification Opportunity for Fishermen', which was undertaken by SAMS Research Services Ltd. (SRSL) for Highlands and Islands Enterprise (HIE) (Burrows *et al.*, 2018)¹.

Part of the project work undertaken for that report was the development of a spatial model that predicts the locations around the Scottish Coast where the habitat is suitable for four species of kelp to grow: *Laminaria hyperborea, Saccharina latissima, Laminaria digitata* and *Saccorhiza polyschides*.

The main report contains details of how the predictive model was constructed and validated, and the outputs will be made available for Marine Science via the National Marine Plan interactive website (<u>https://marinescotland.atkinsgeospatial.com/nmpi/</u>). However, in order to make some of the outputs of the modelling accessible, this supplementary 'Kelp Atlas' has been created.

For this Kelp Atlas, the coastline of Scotland is divided into 49 x 50 km squares. Each of these 50 km squares is displayed as a zoomed in map for the four kelp species examined during the project, showing where the model predicted habitat suitable for that specific kelp species to grow. Map legends show the 'confidence' that kelp will be found in a given location, which follows the criteria given below:

- -3 ~5% Likelihood of kelp species being present
- -2 ~10% Likelihood of kelp species being present
- -1 ~25% Likelihood of kelp species being present
- 0 ~50% Likelihood of kelp species being present
- 1 ~75% Likelihood of kelp species being present
- 2 ~90% Likelihood of kelp species being present
- 3 ~95% Likelihood of kelp species being present

For *Laminaria hyperborea* and *Saccharina latissima* additional maps have been added that show the predicted biomass of kelp. These were not able to be produced for *Laminaria digitata* and *Saccorhiza polyschides* due to insufficient data being available to create biomass estimates.

Additionally, the biomass maps for *Laminaria hyperborea* and *Saccharina latissima* have also been overlaid with records of Priority Marine Features in Scottish Waters. This gives an indication of likely areas where kelp harvesting activities may be under higher scrutiny due to the presence of species and habitats of conversation importance for Scotland.

¹ Burrows M.T., Fox, C.J., Moore, P., Smale, D., Sotheran, I., Benson, A., Greenhill, L., Martino, S., Parker, A., Thompson, E., Allen, C.J. (2018) Wild Seaweed Harvesting as a Diversification Opportunity for Fishermen. *A report by SRSL for HIE*, pp. 171

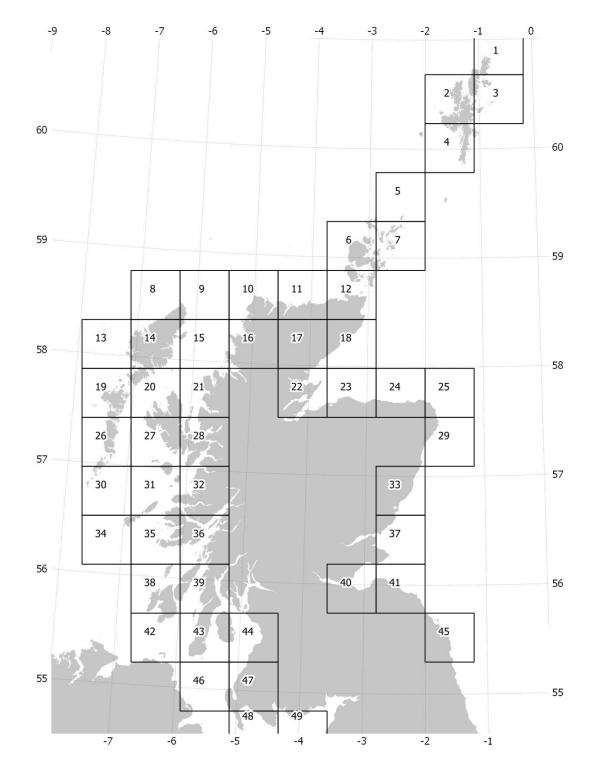


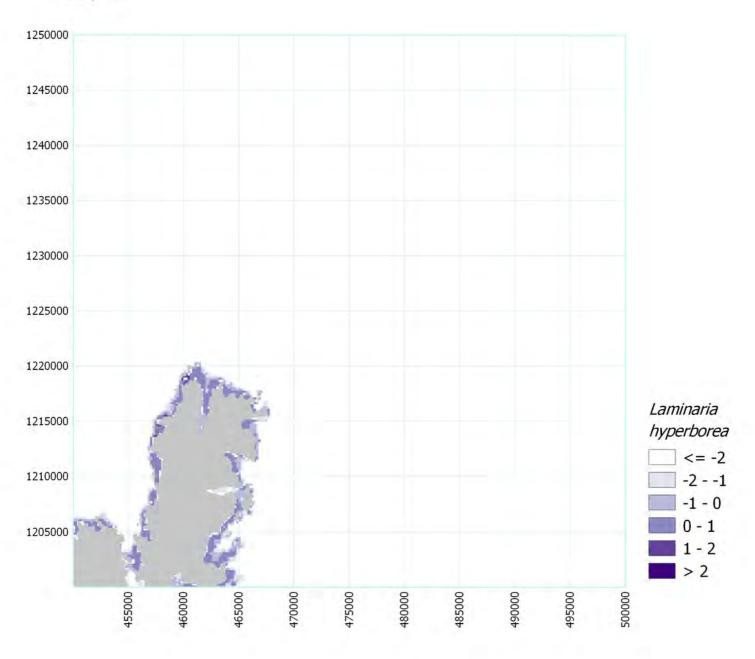
Figure 1. Scottish coastline split into 50 km squares. Each square is numbered, which is repeated on each map within this Kelp Atlas

2 KELP ATLAS

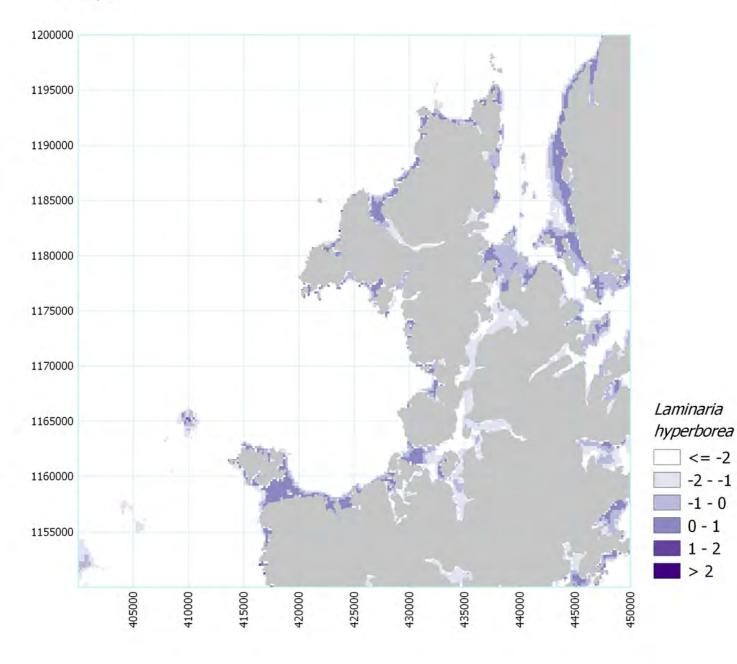
2.1 Laminaria hyperborea

The following pages show first the habitat suitability for *Laminaria hyperborea*, followed by maps showing predicted biomass, and finally maps showing the overlap between kelp habitats and Priority Marine Features.

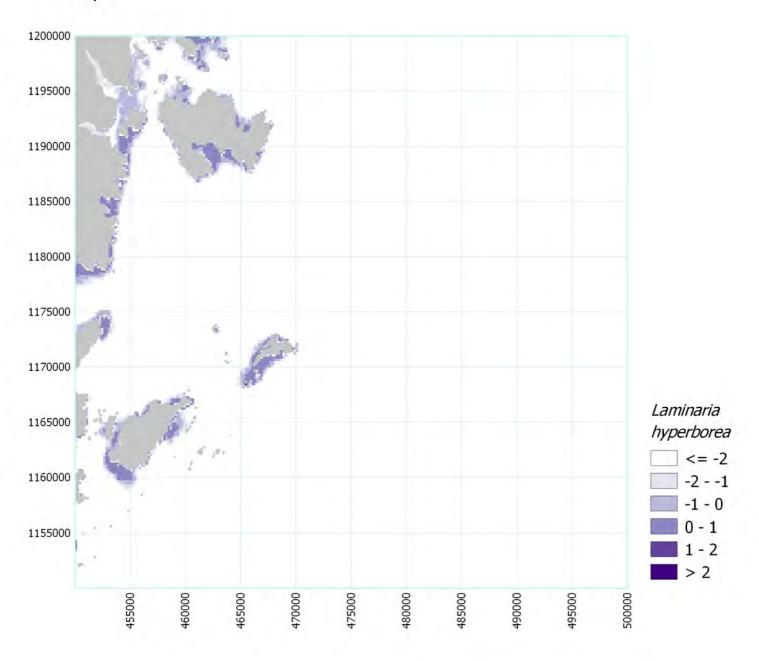




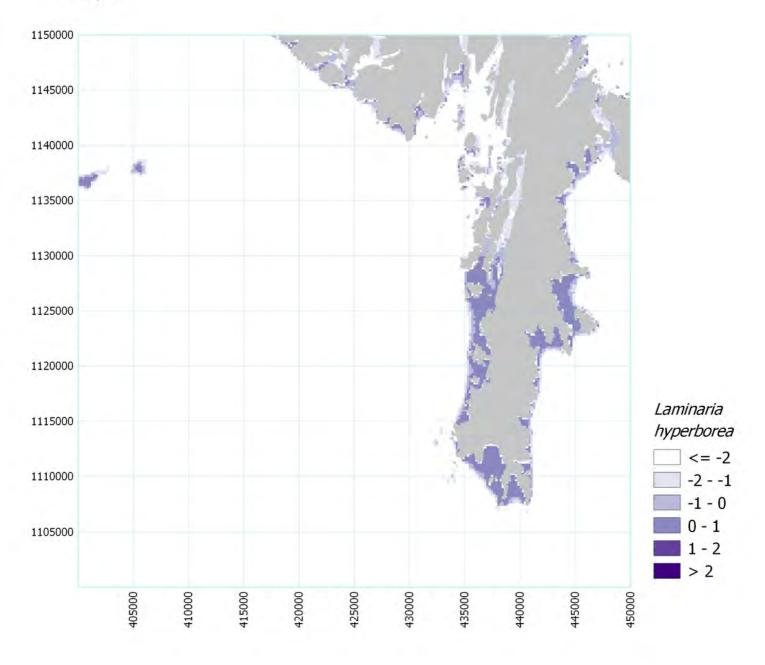




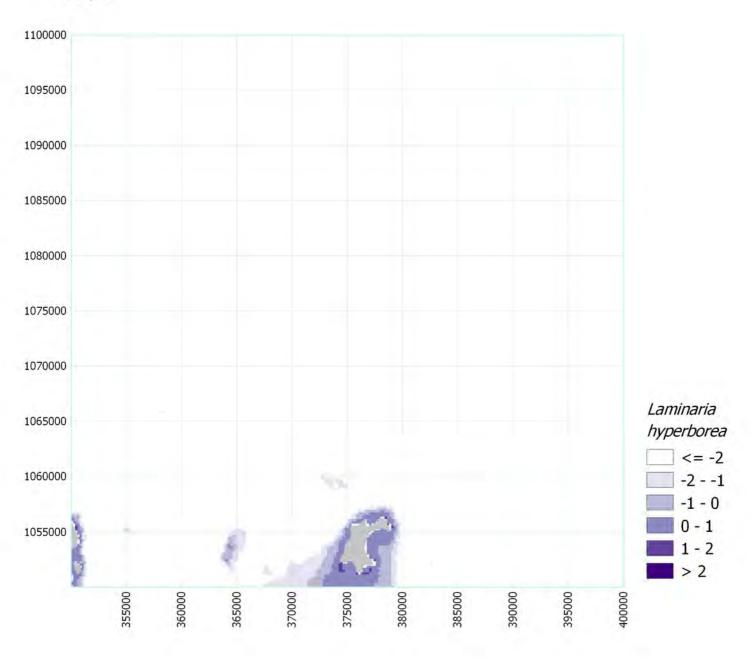




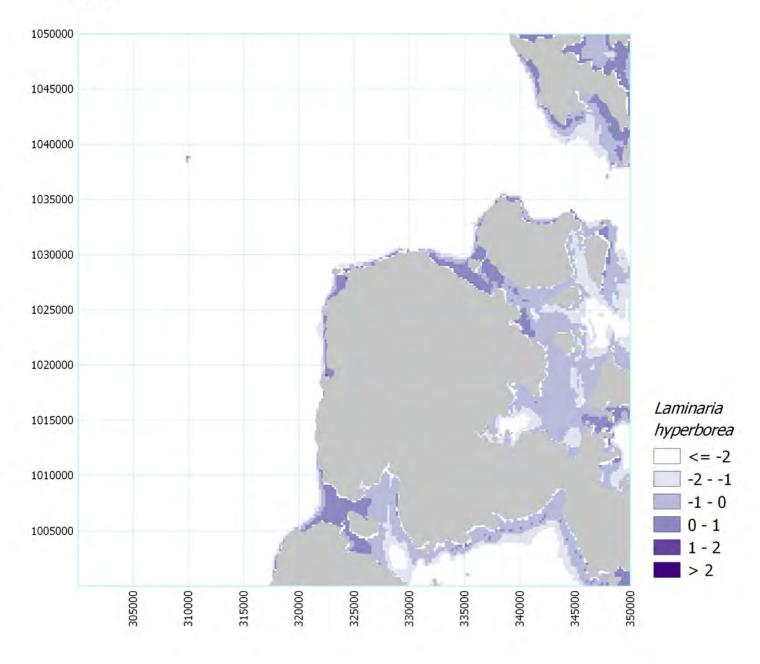




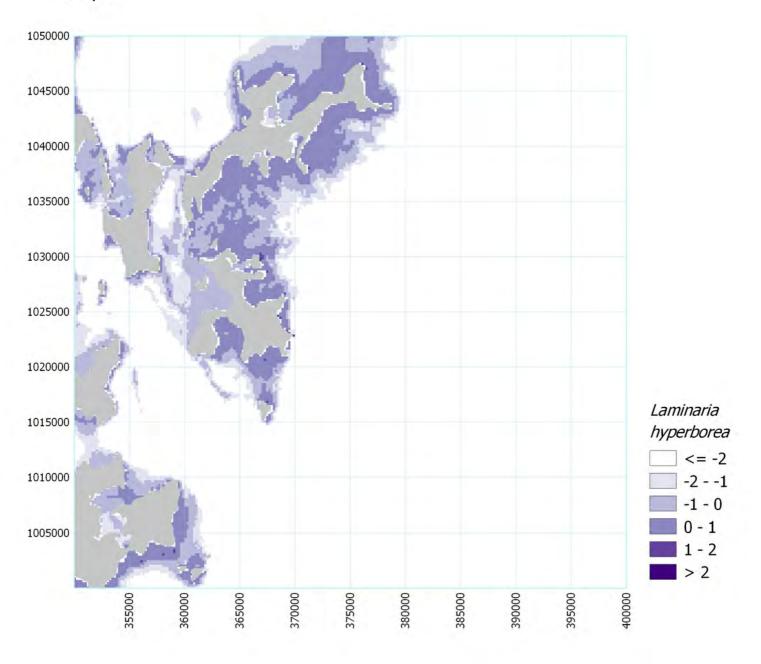
Map 5



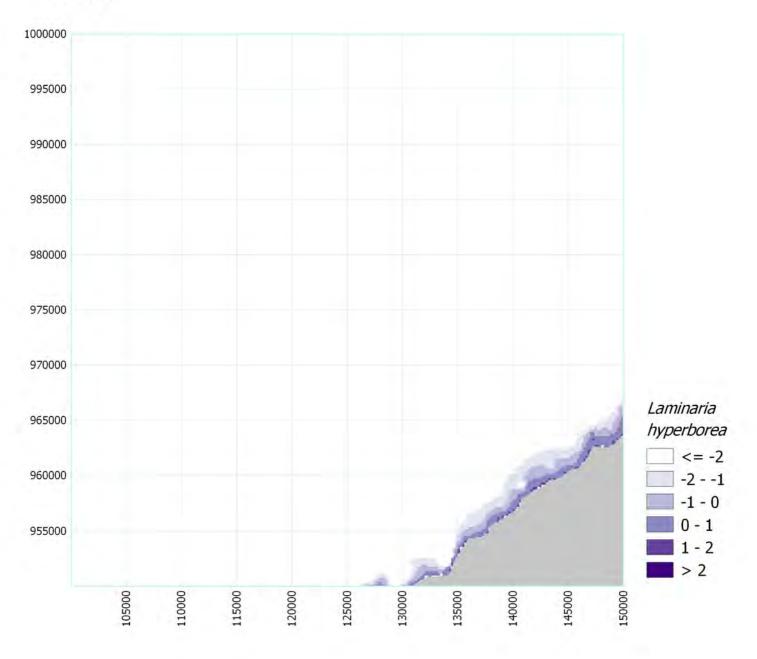




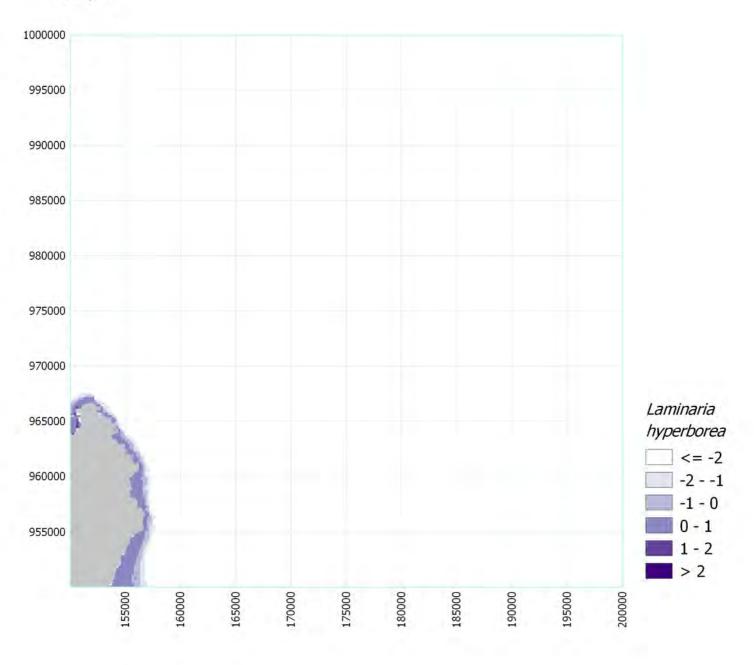
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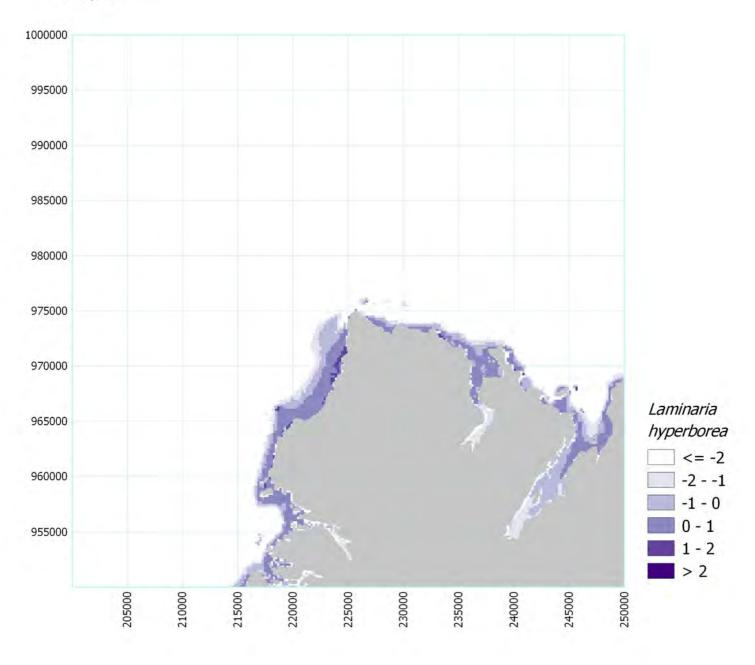




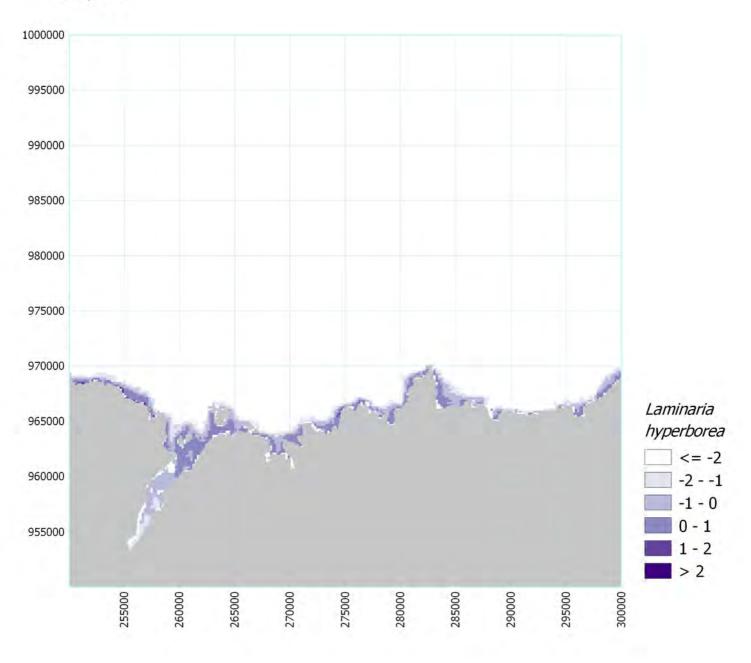




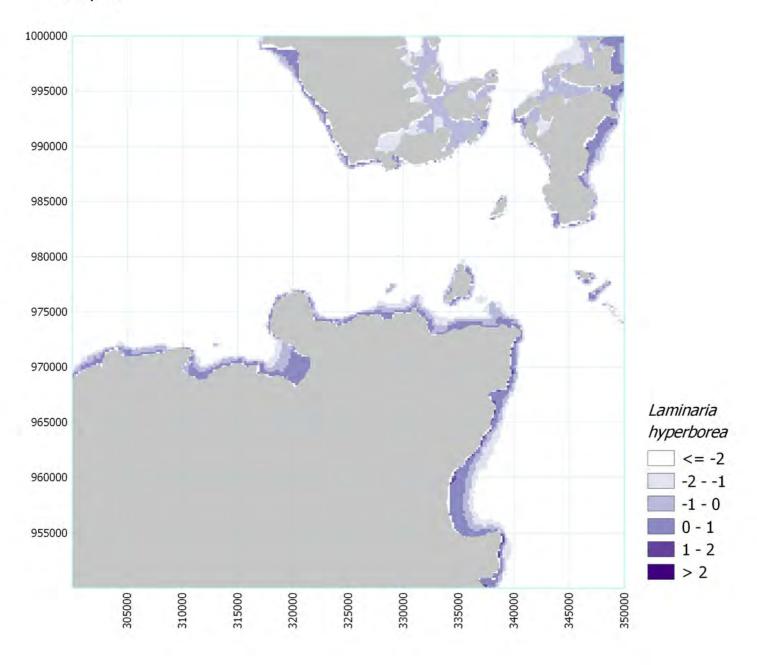
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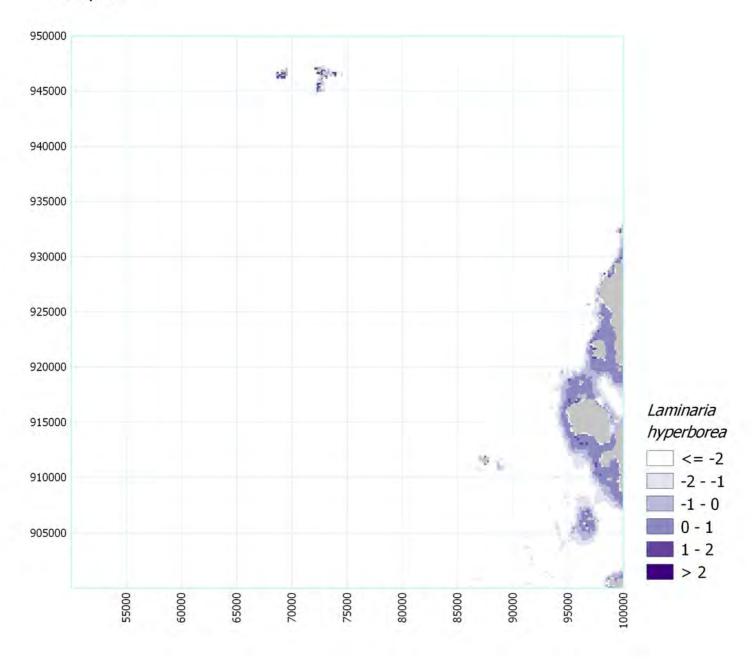




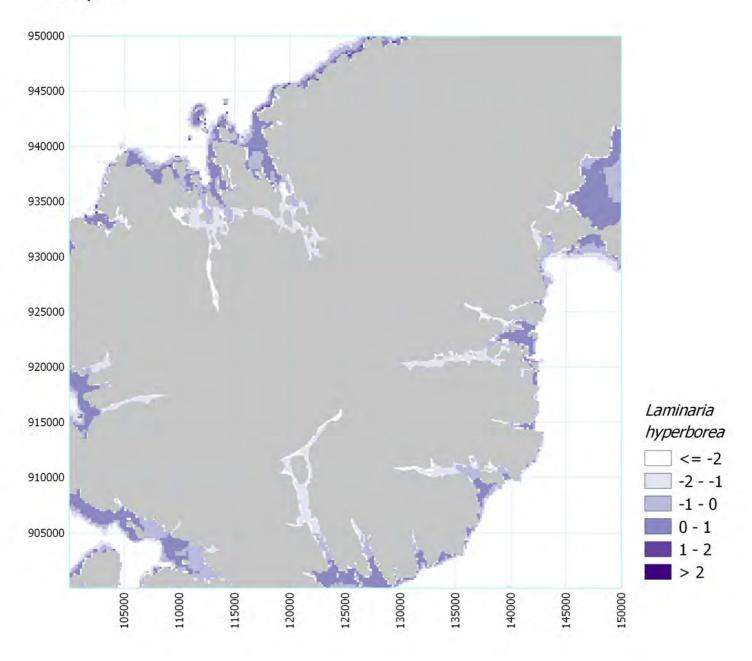
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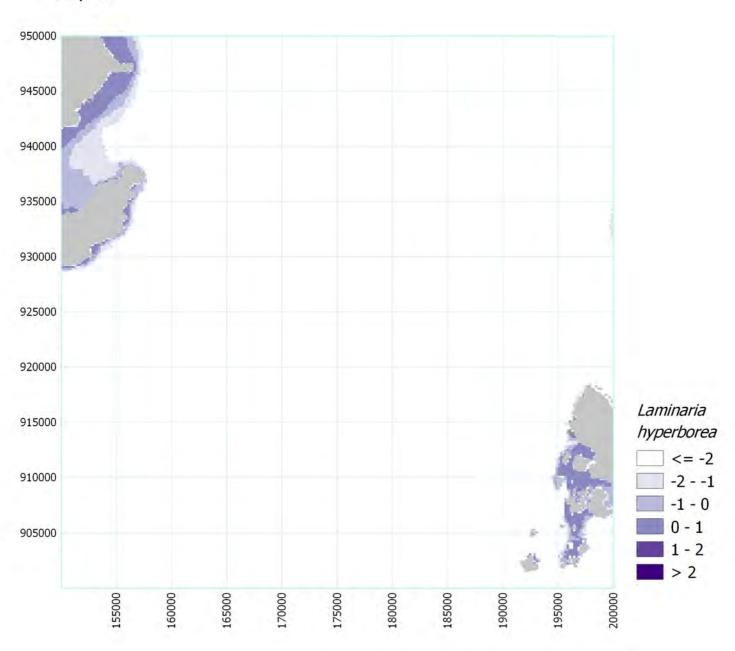


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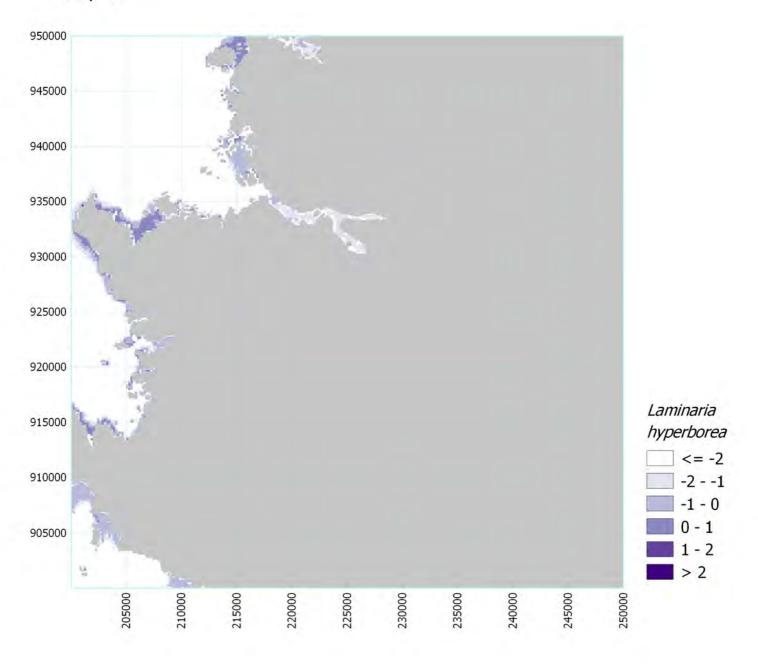
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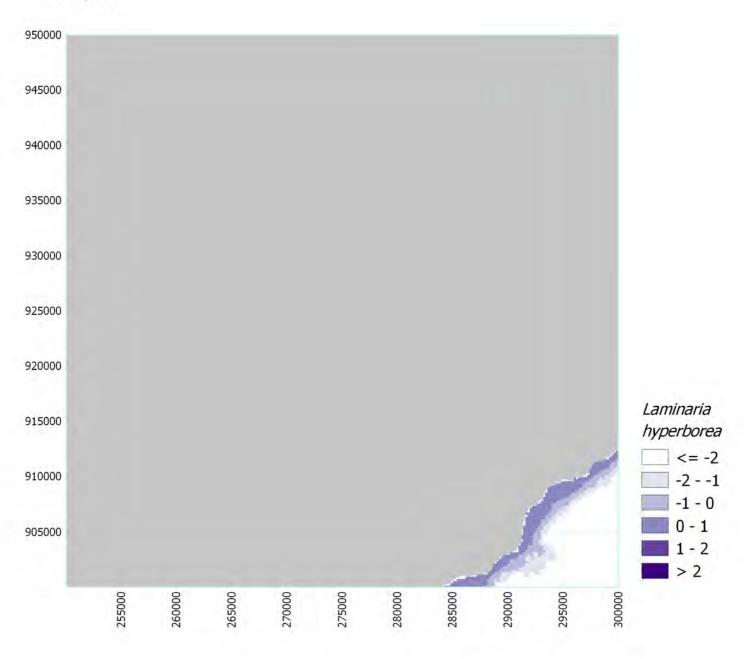


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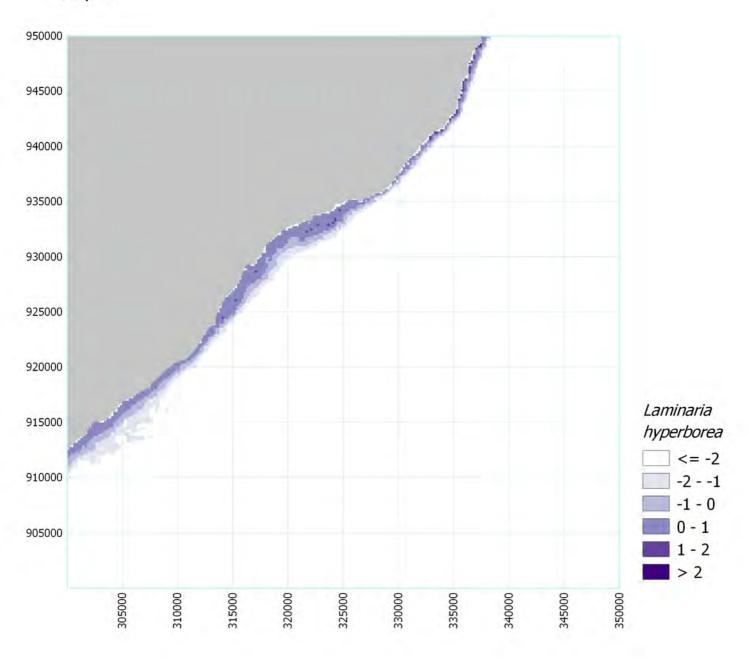
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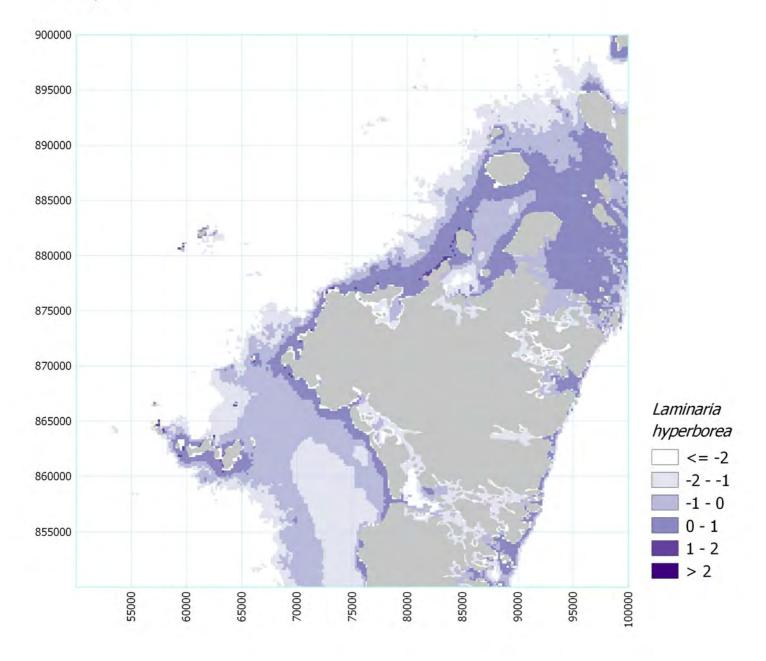
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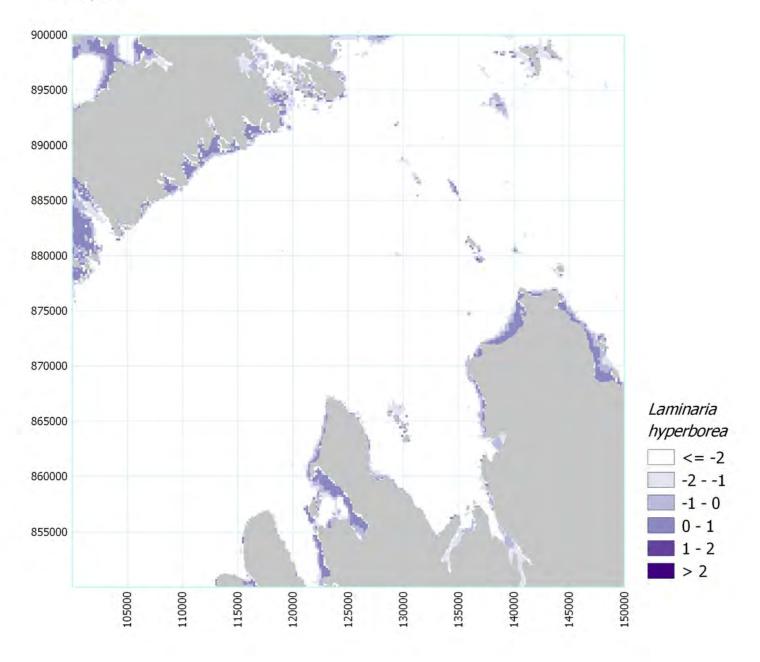




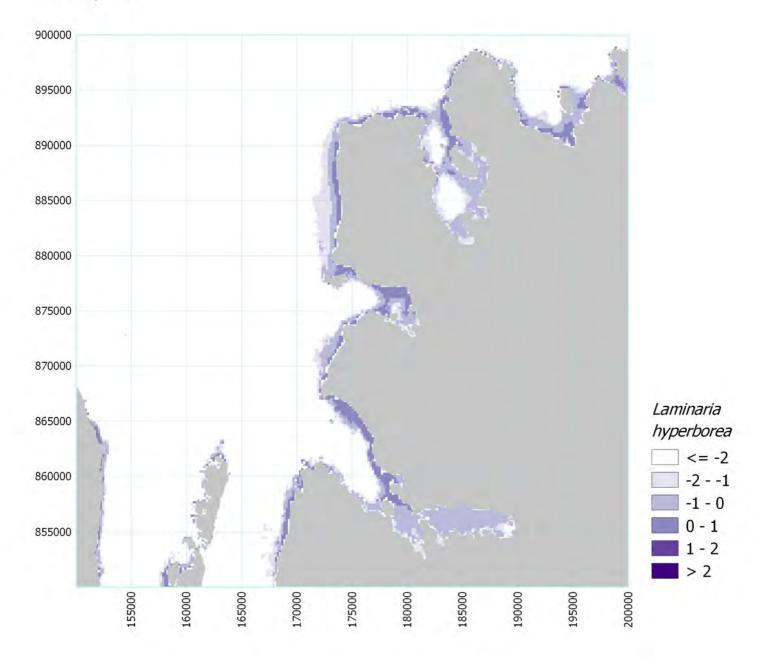




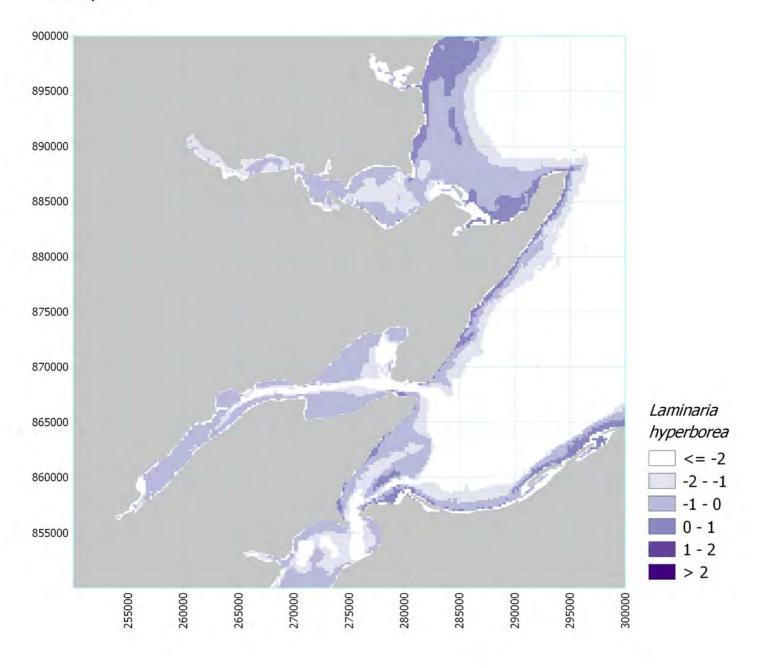
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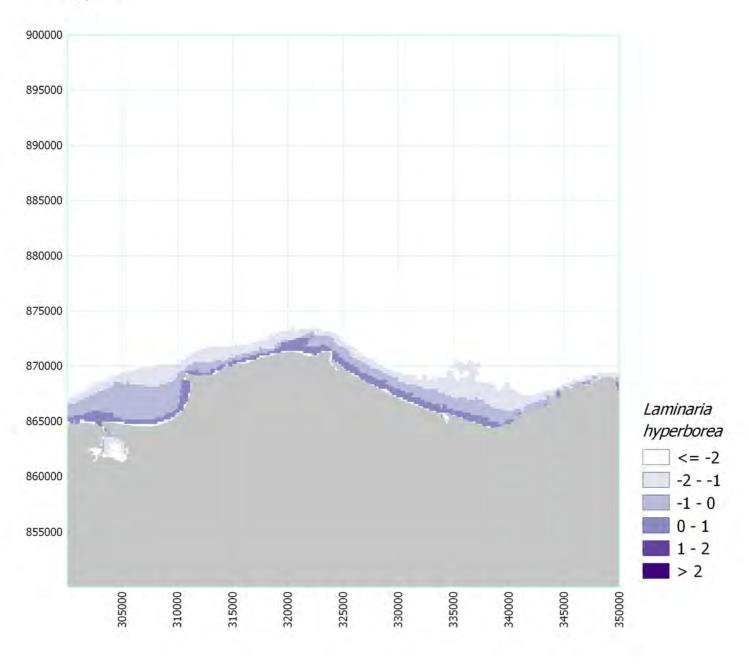




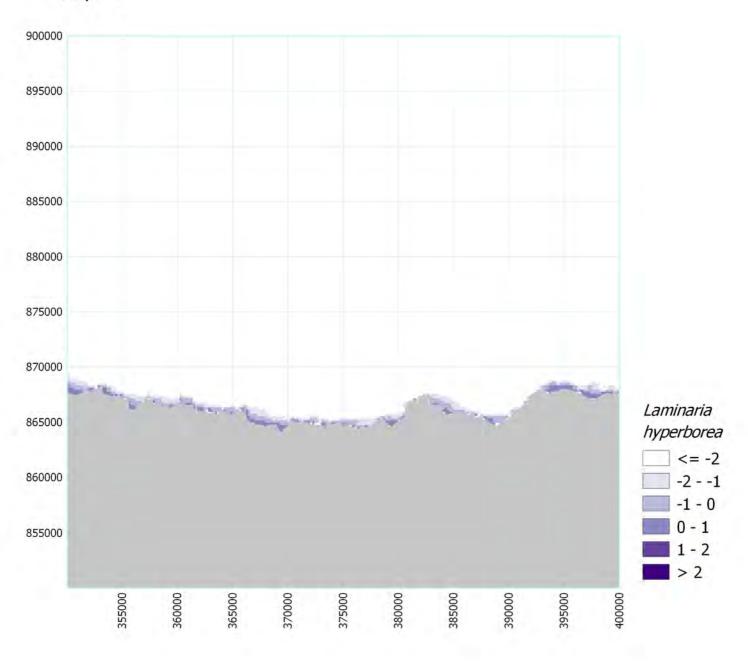
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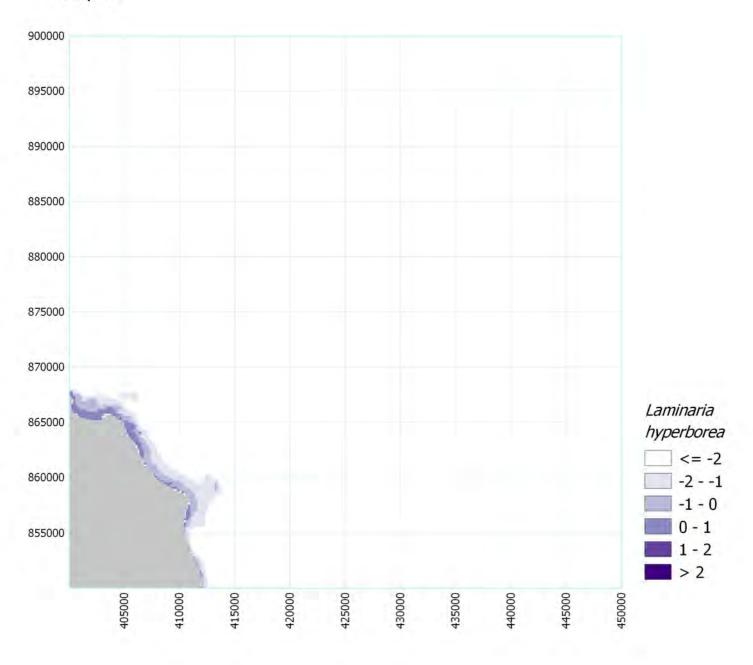




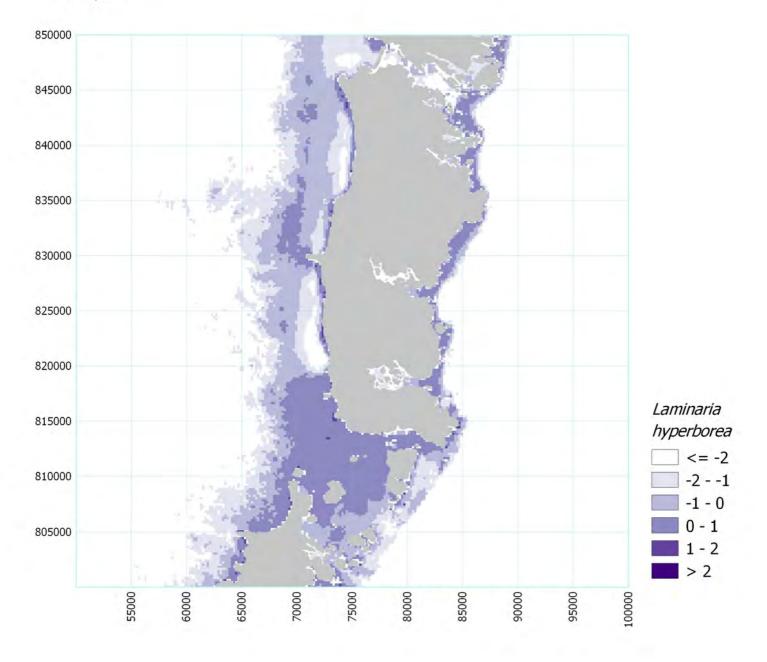
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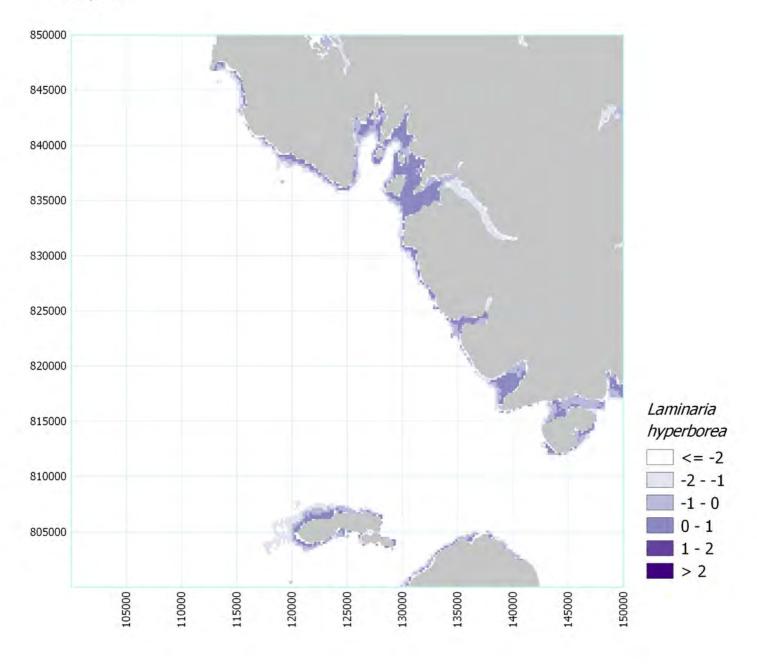
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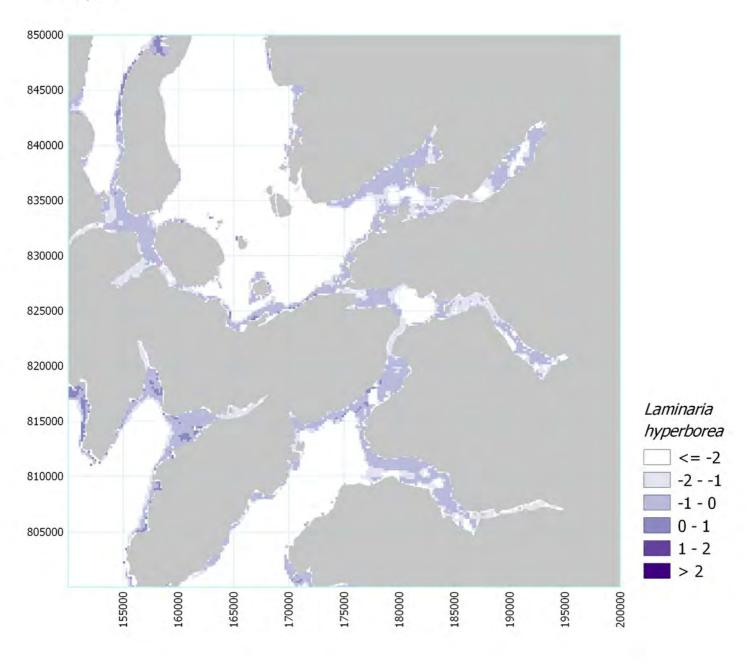




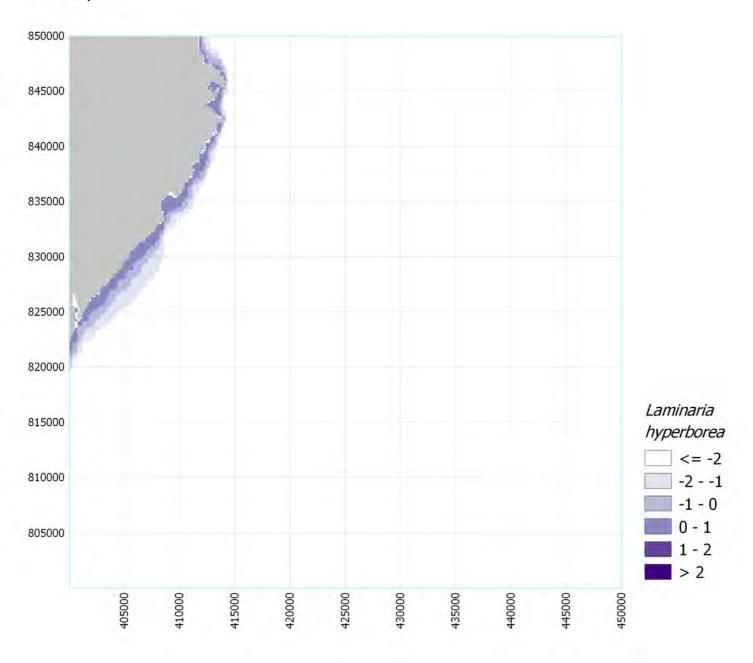
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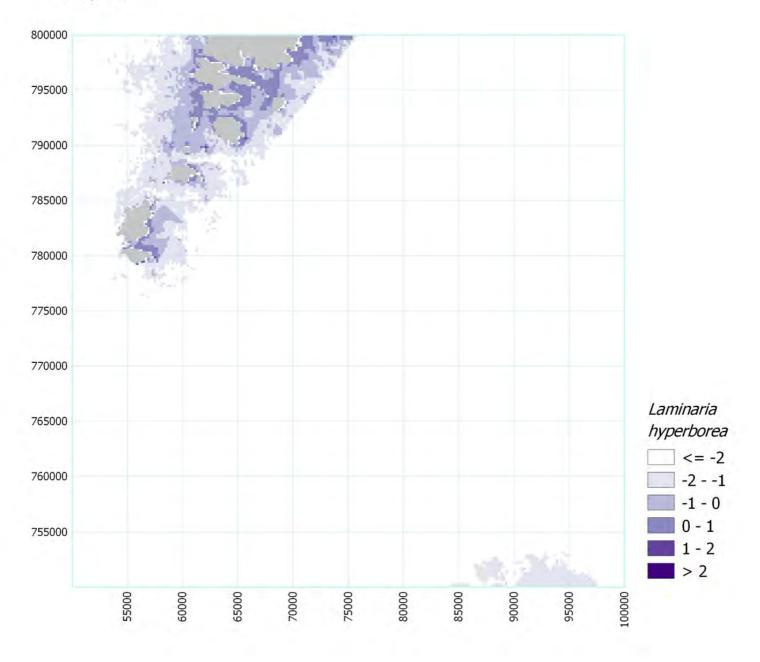




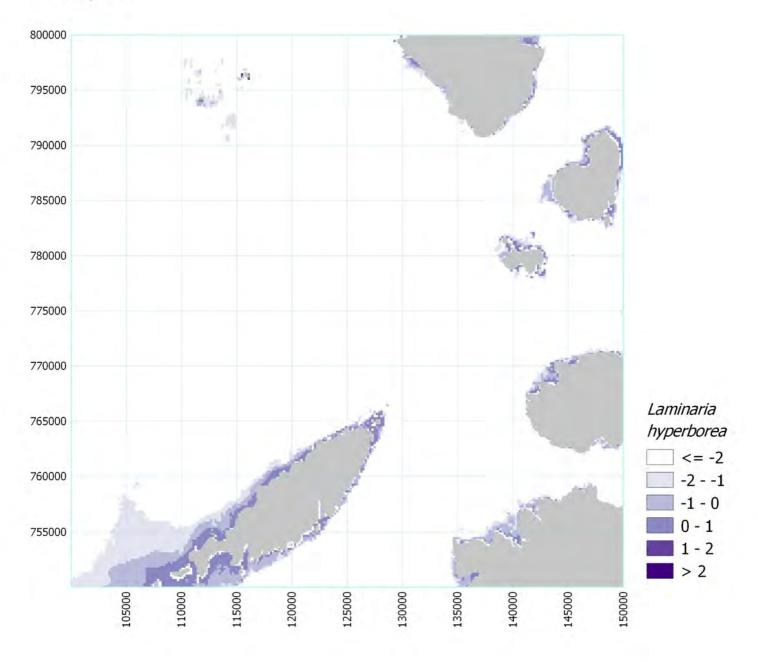
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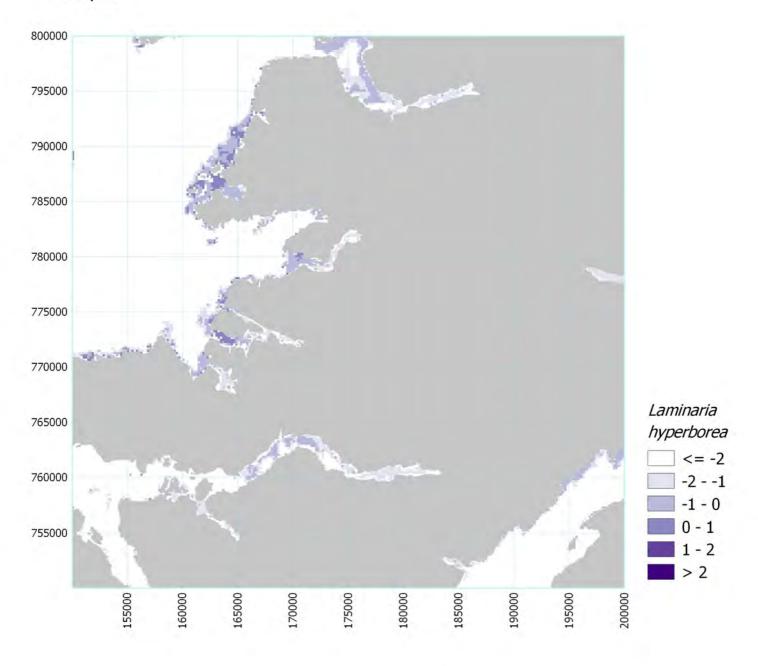
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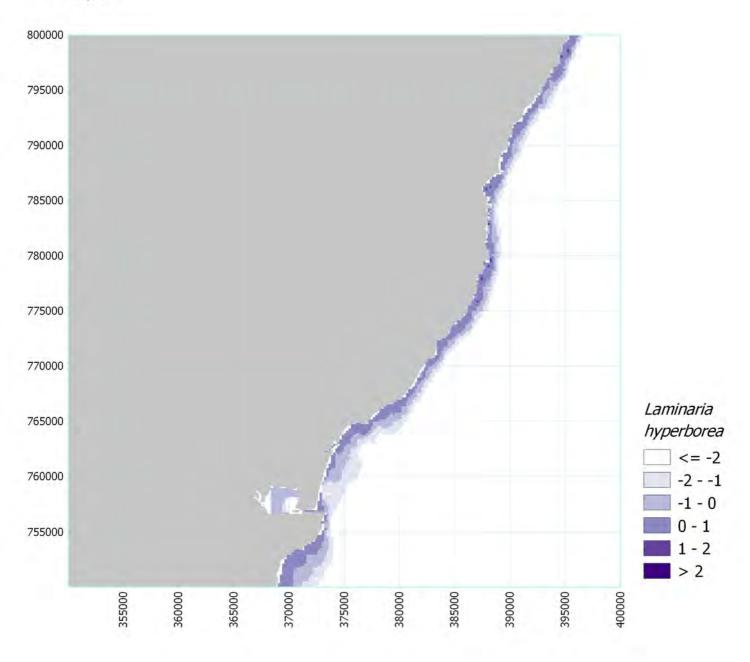
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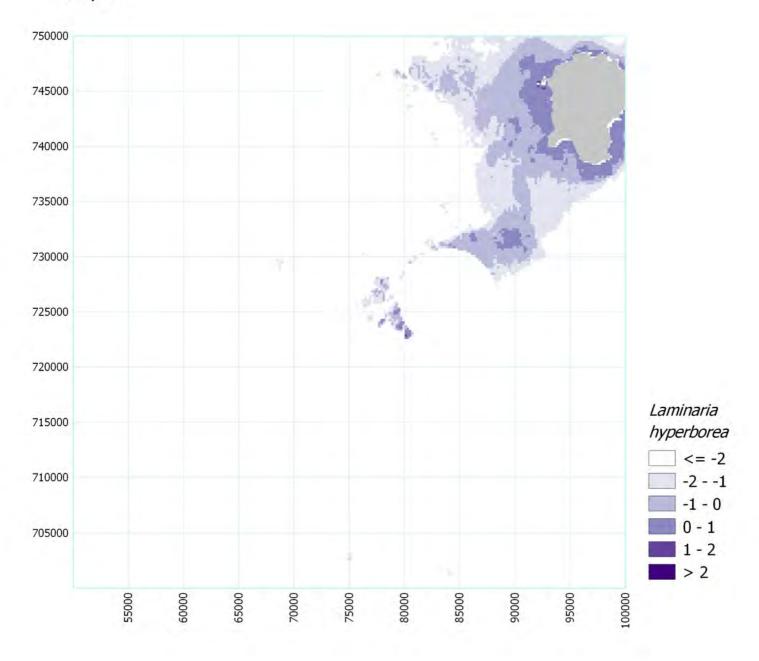
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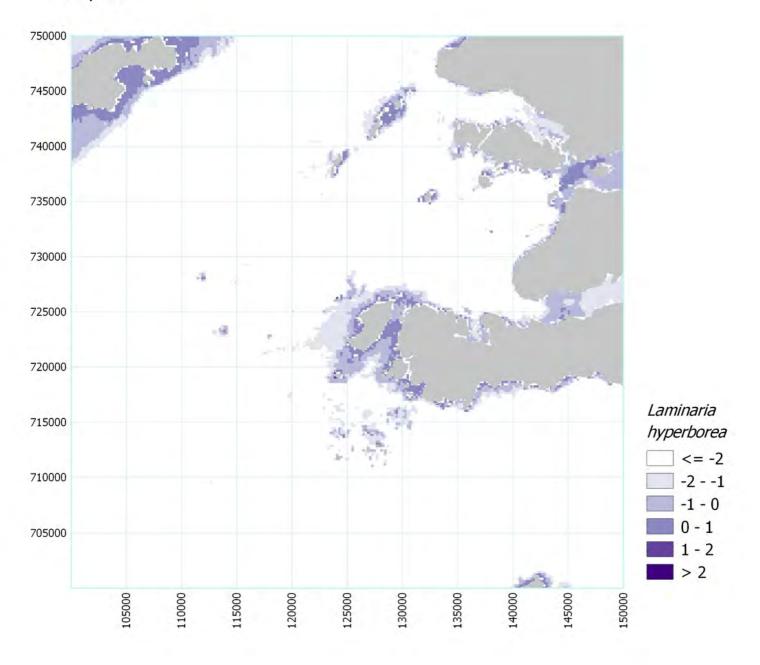




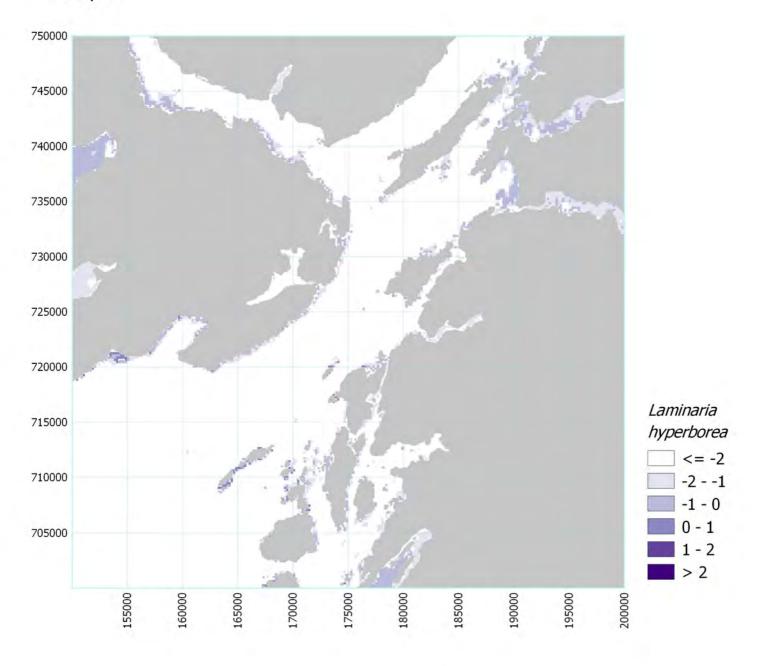
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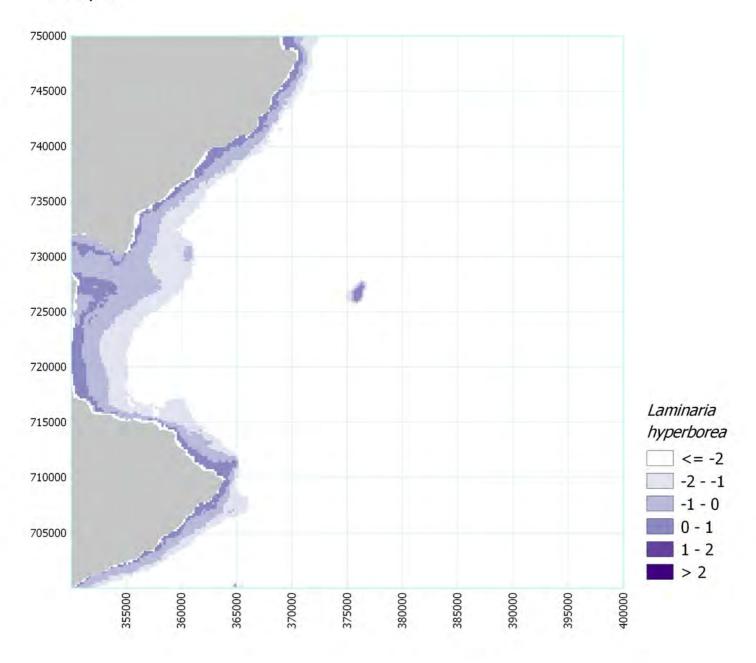
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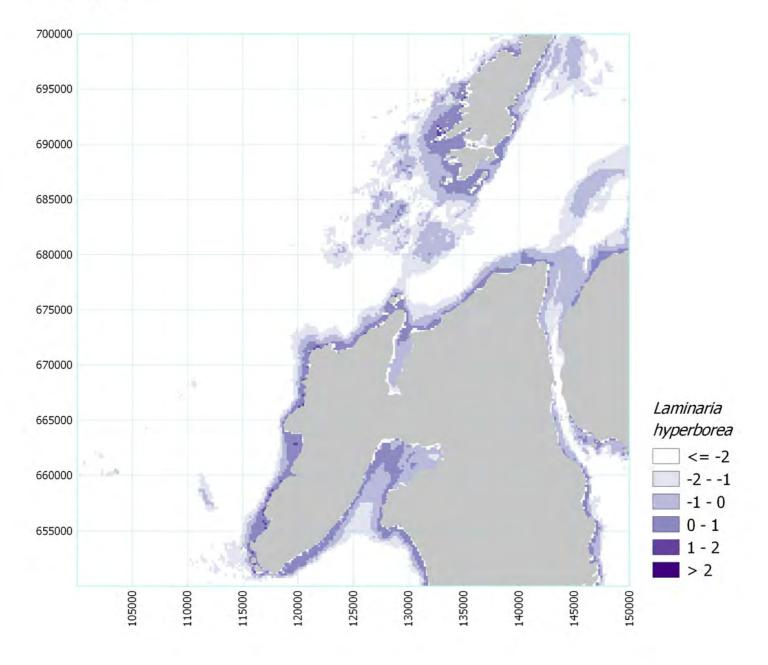
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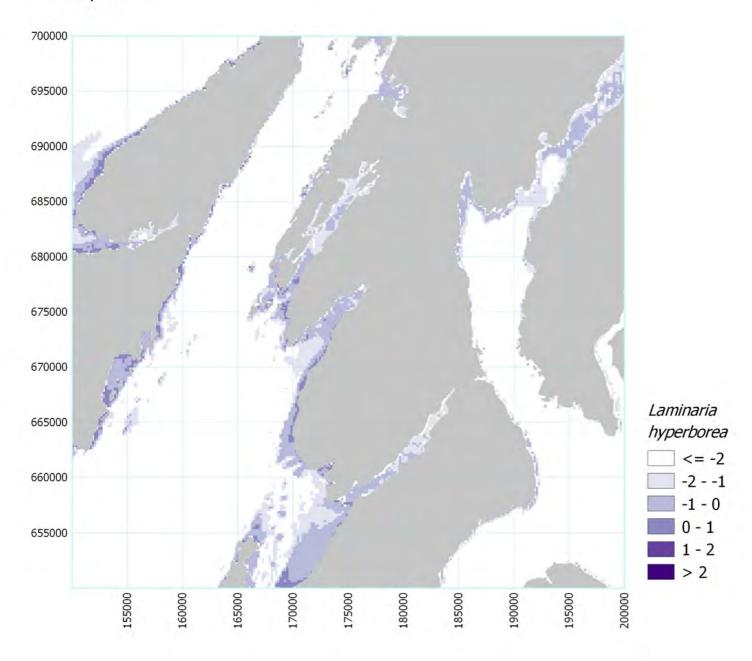
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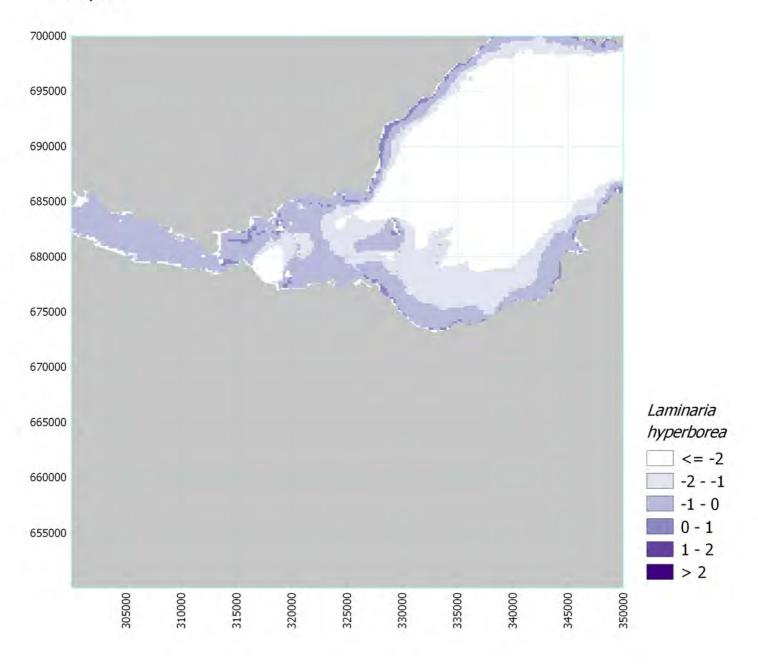




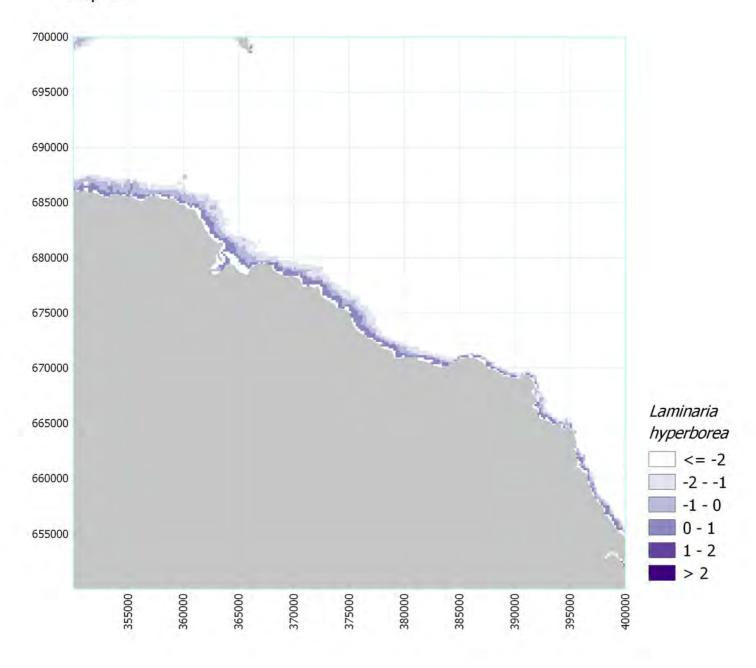
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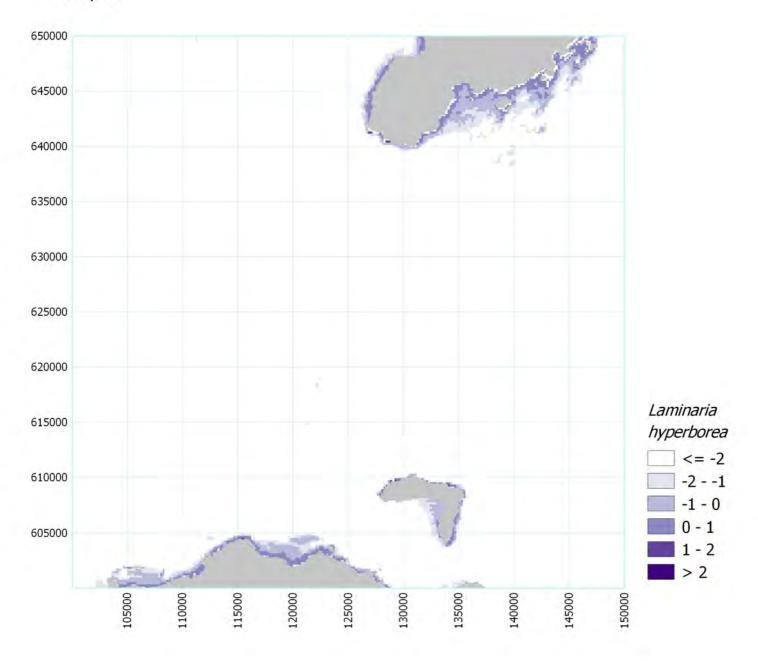




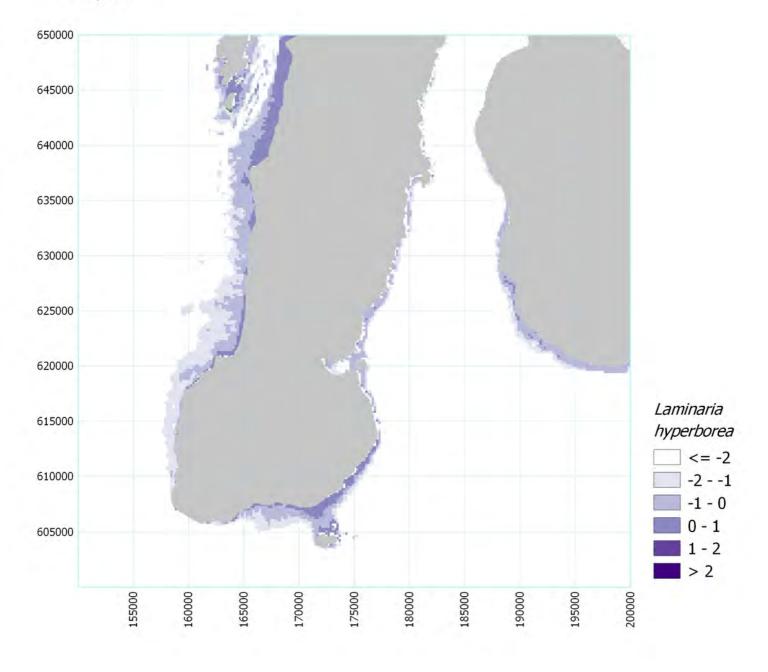
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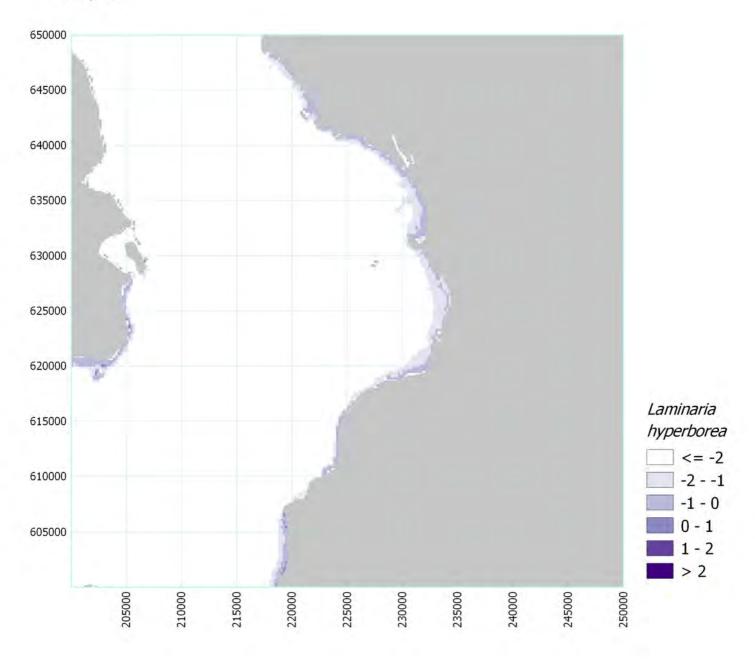
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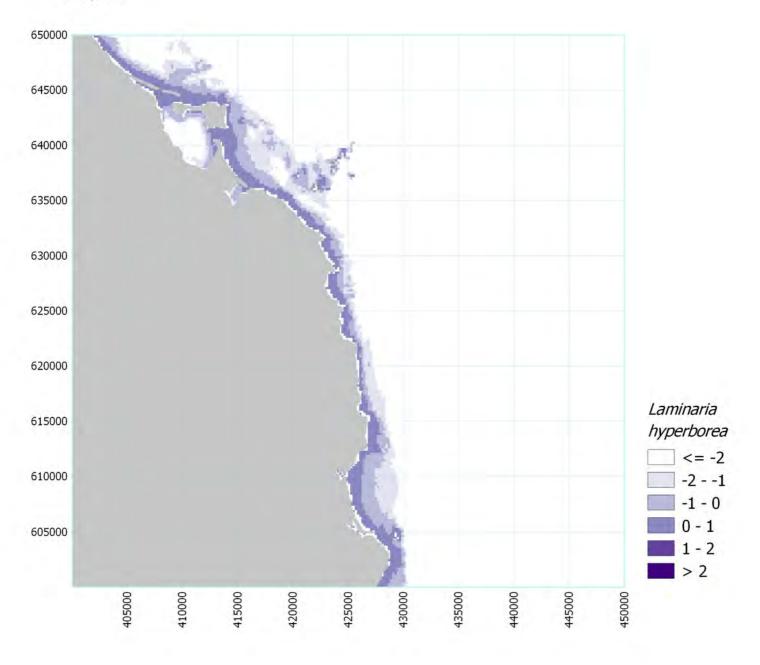
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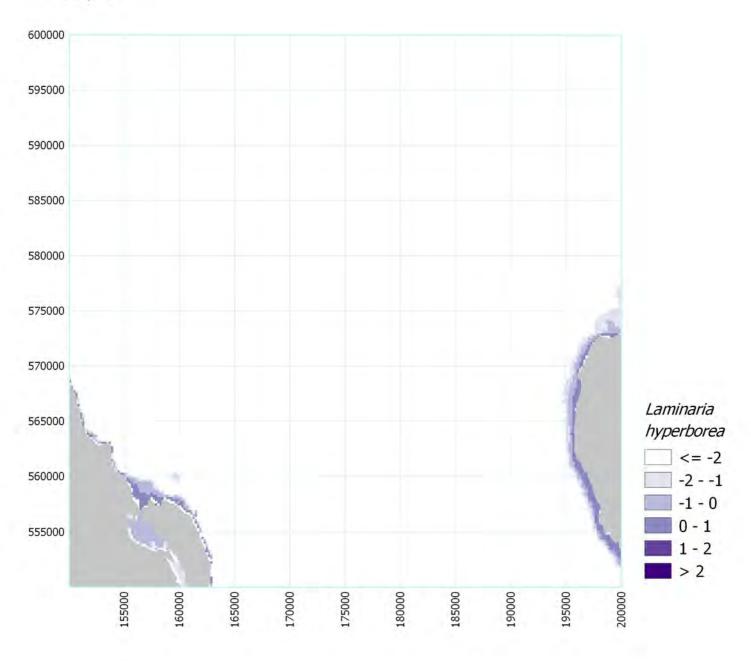




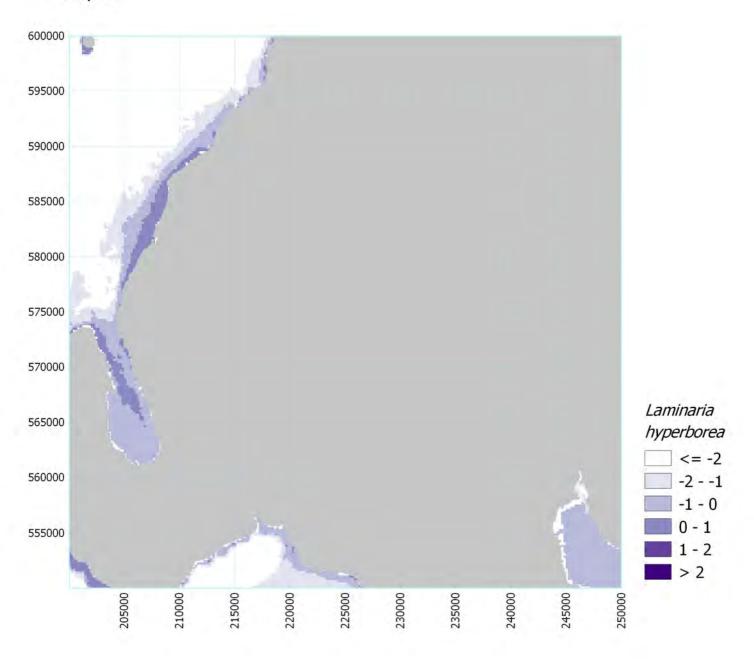




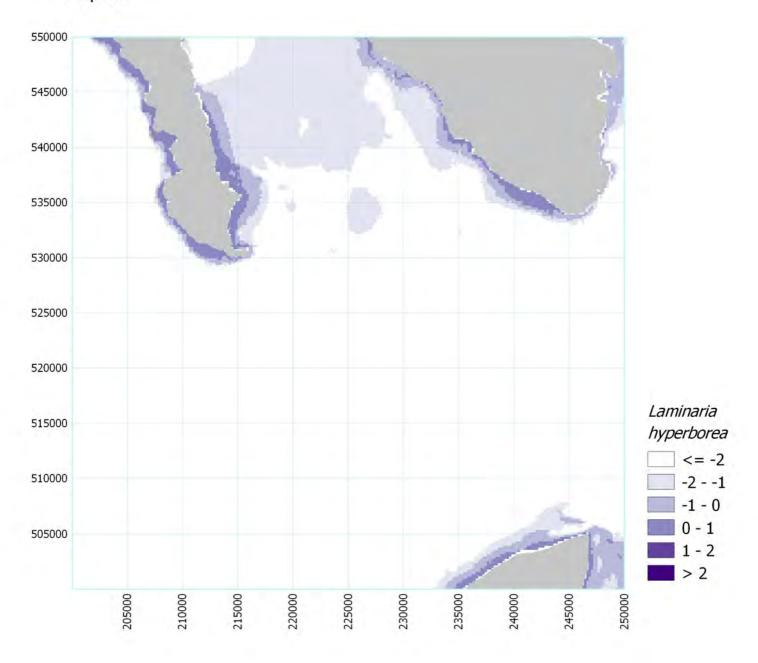
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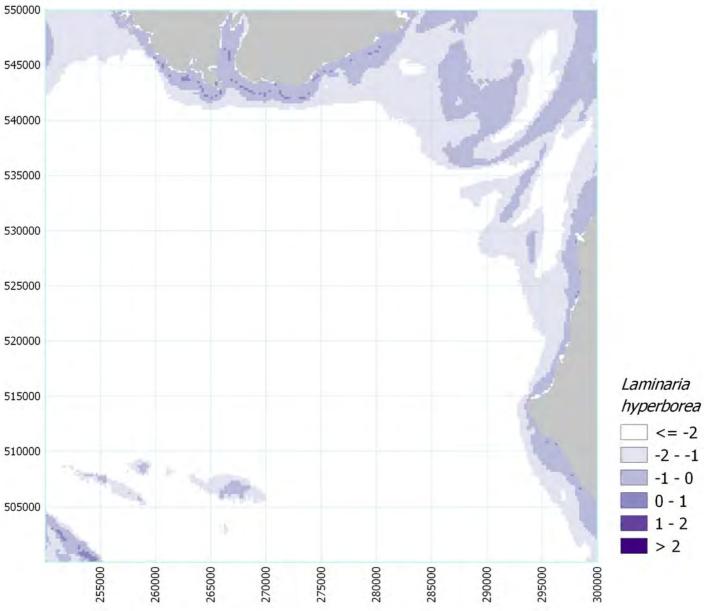
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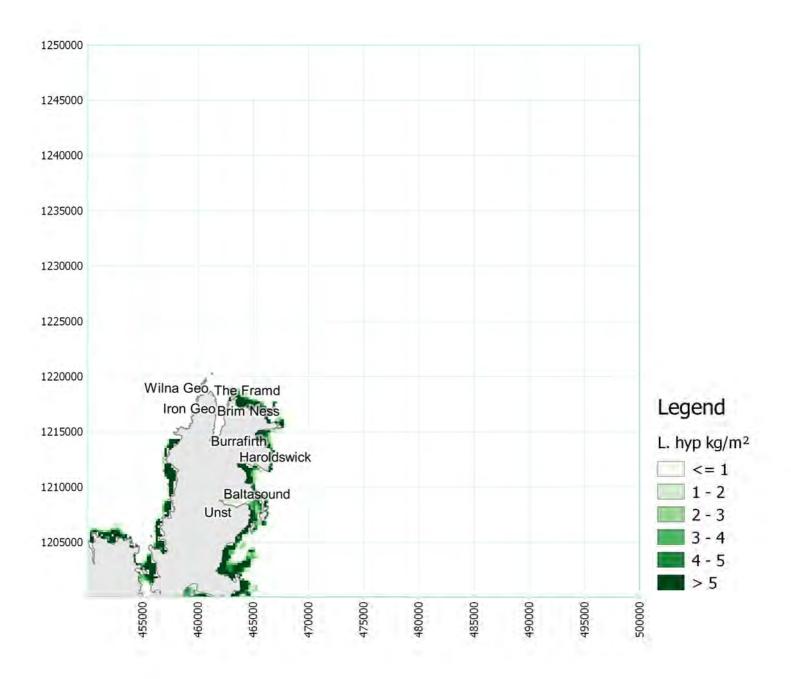


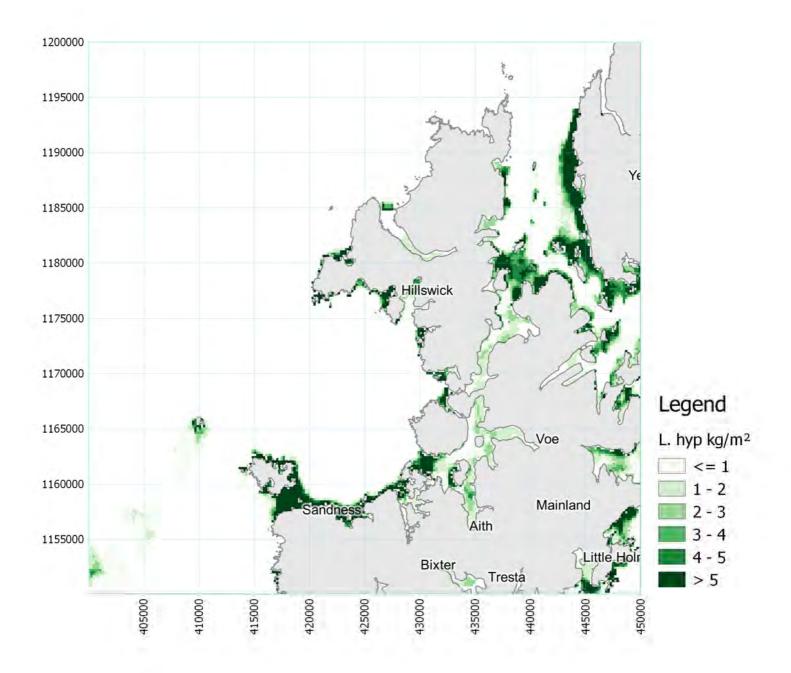
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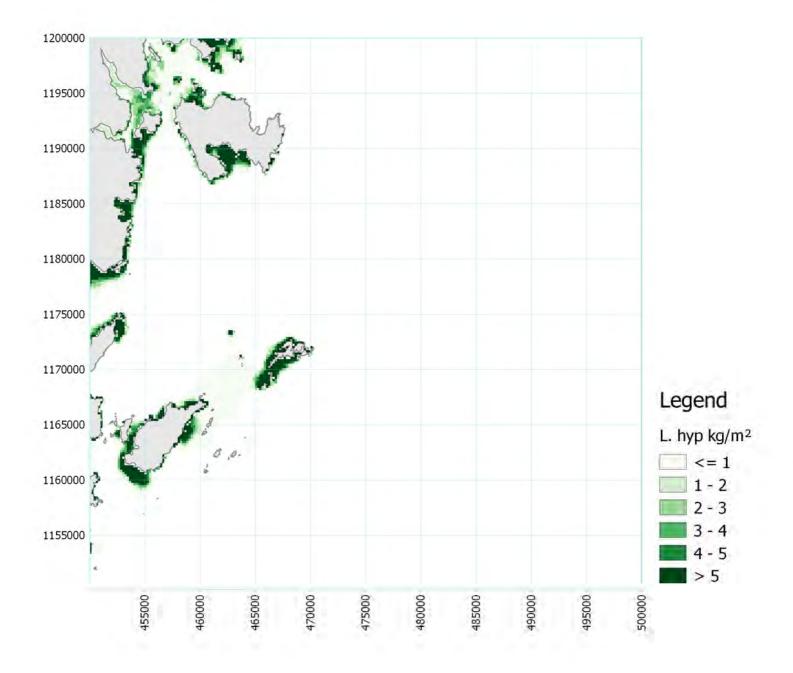


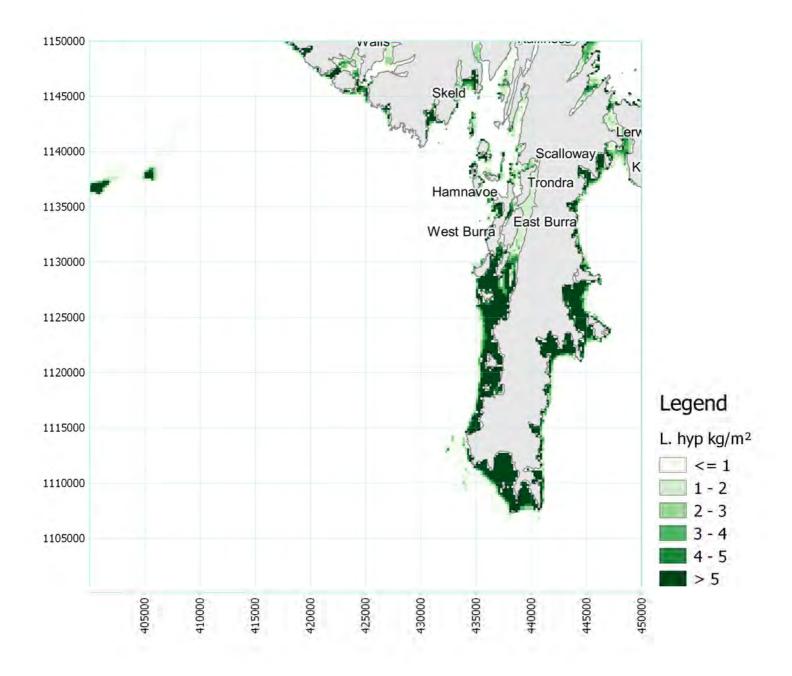
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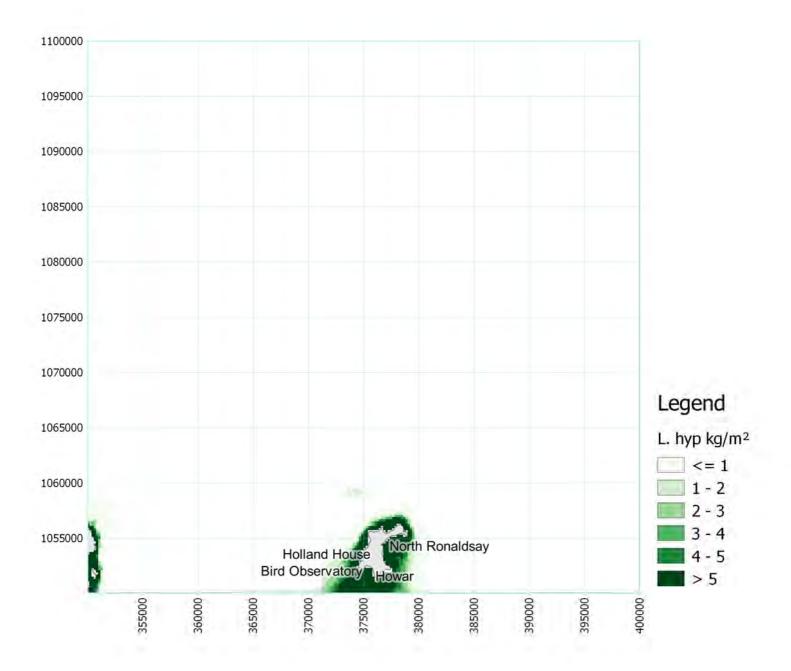


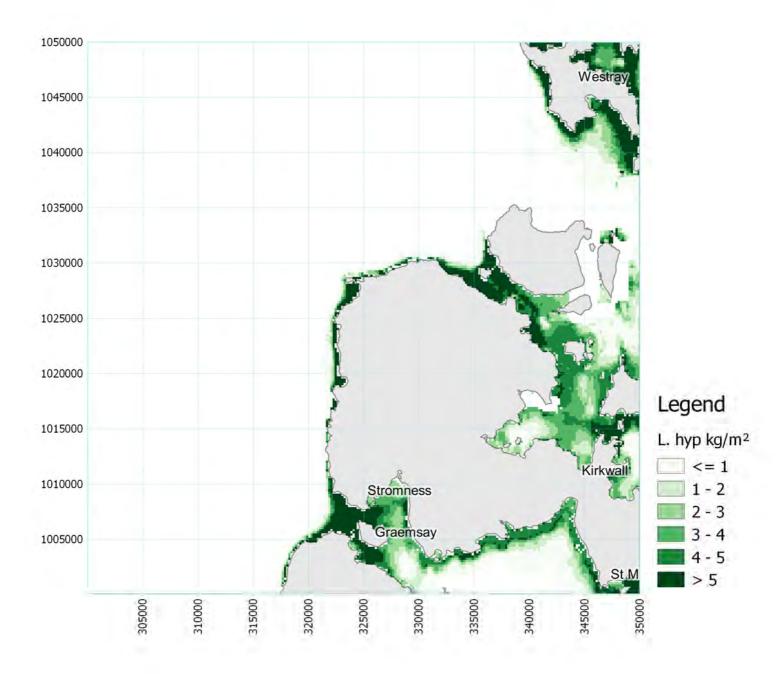


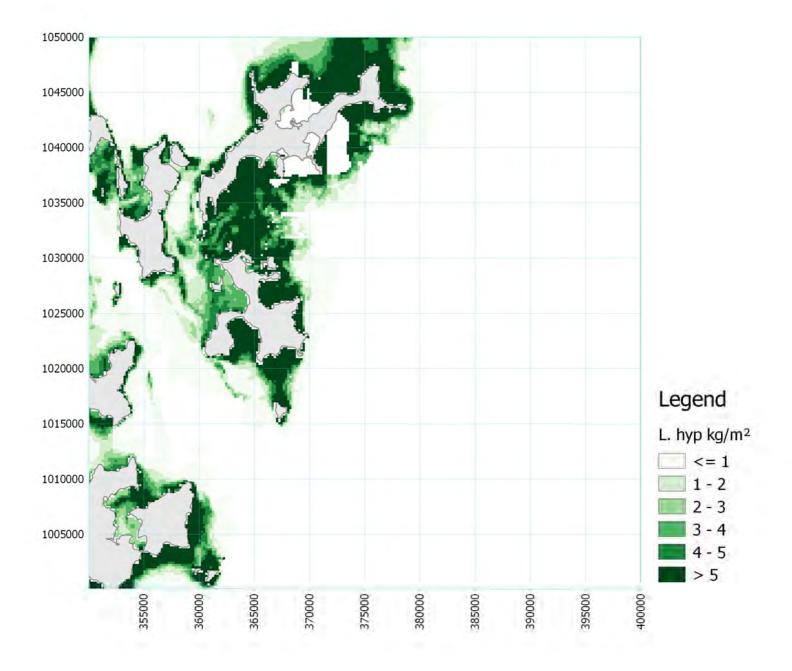


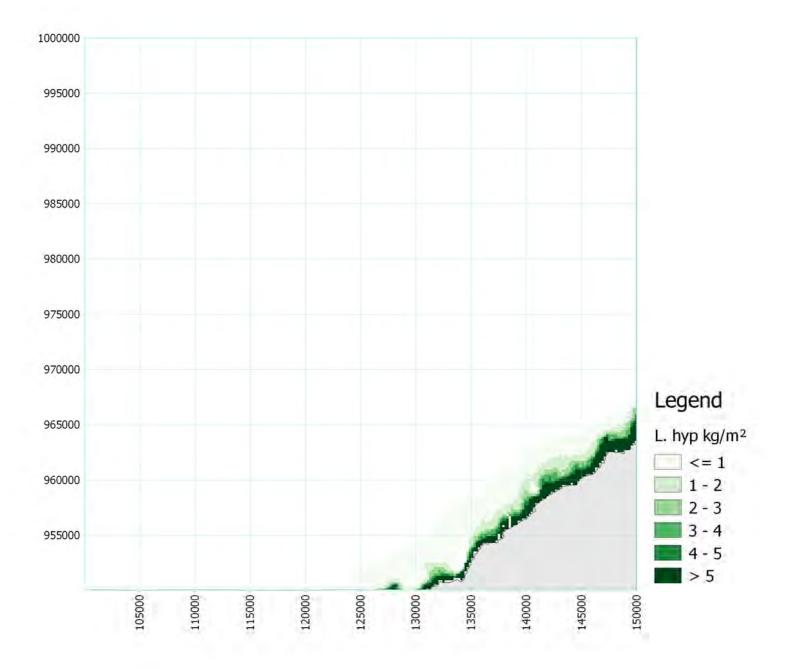


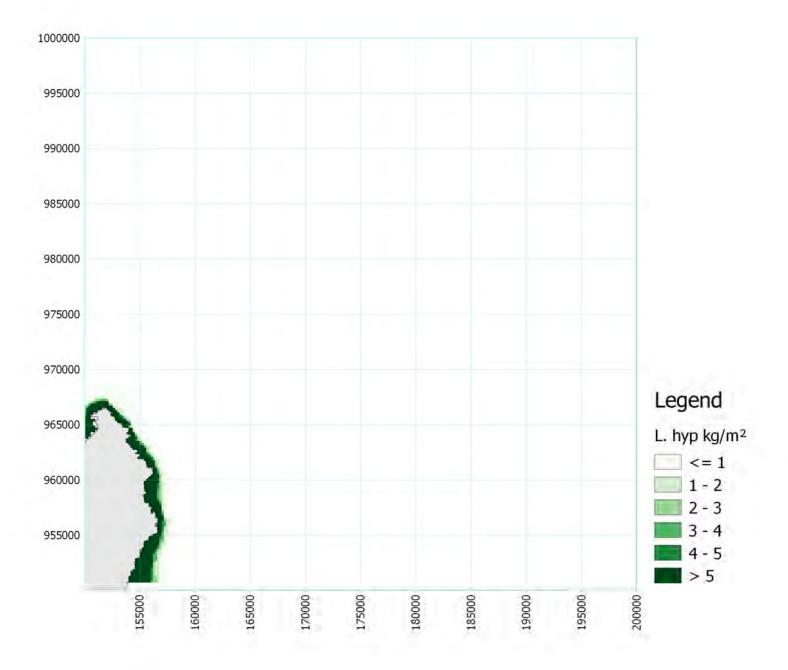


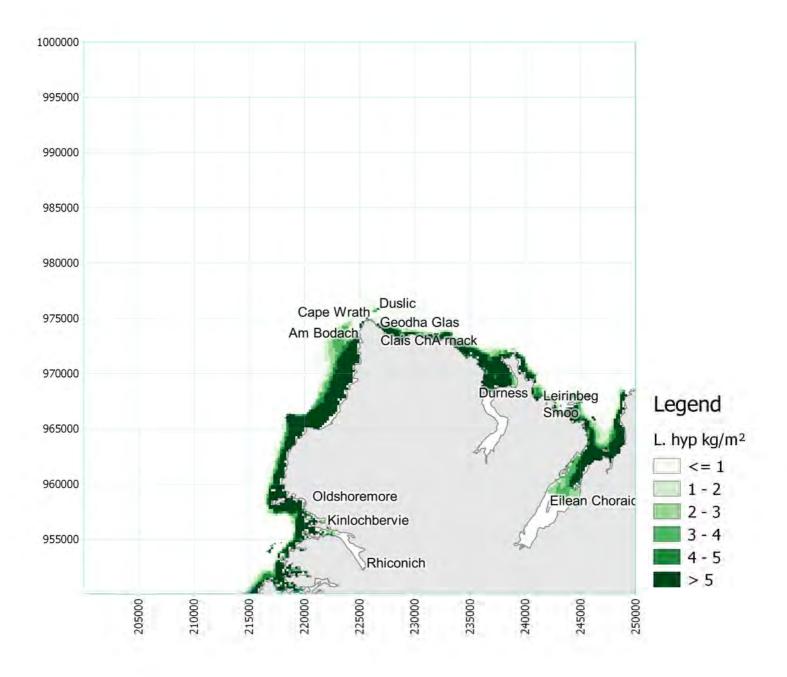


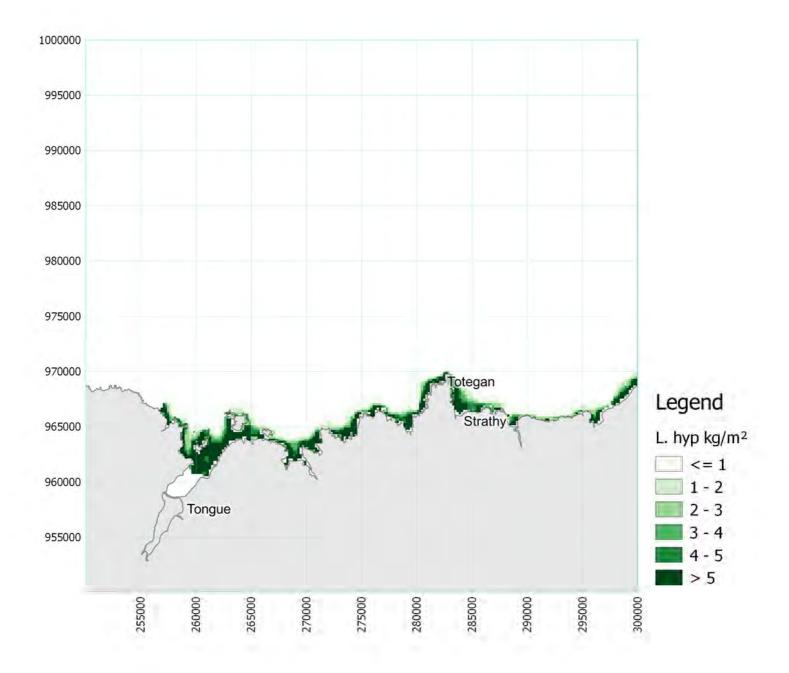


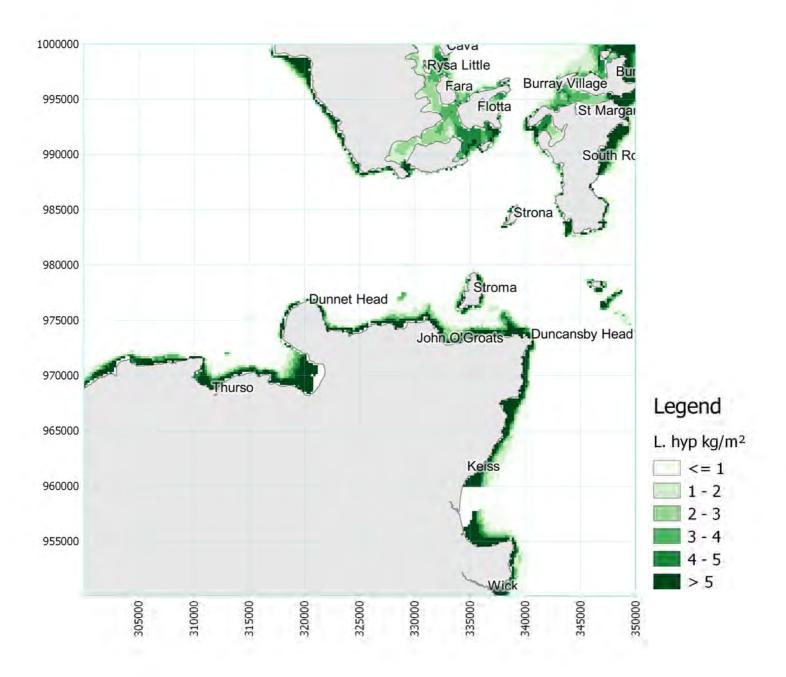


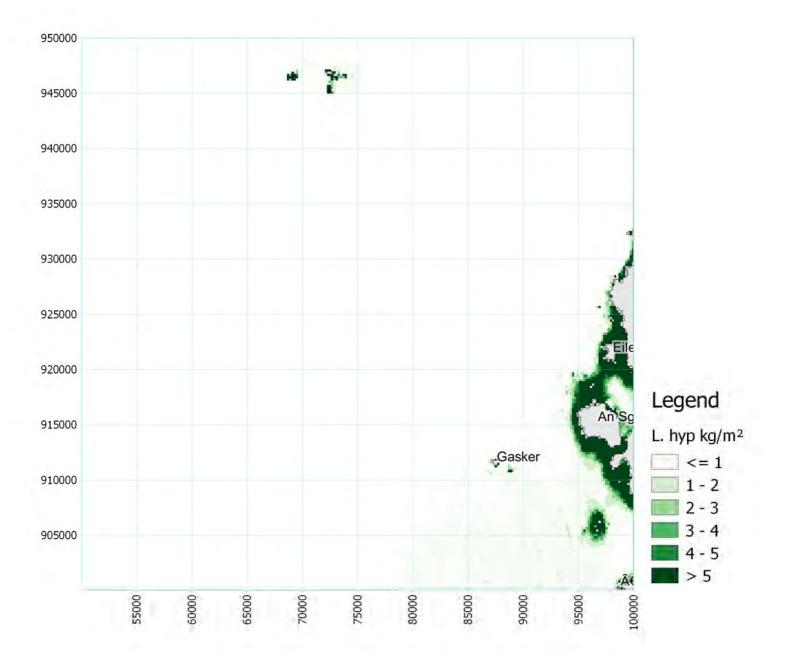


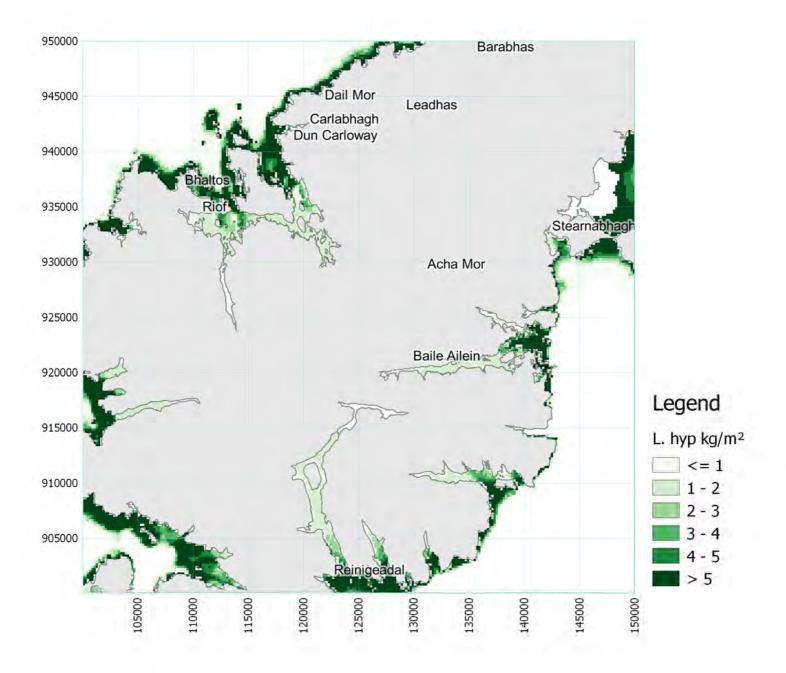


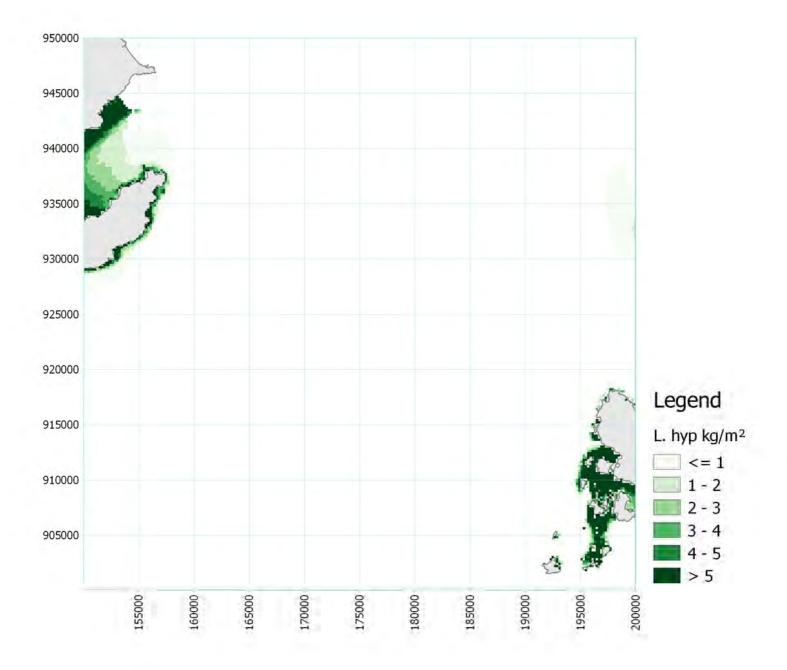


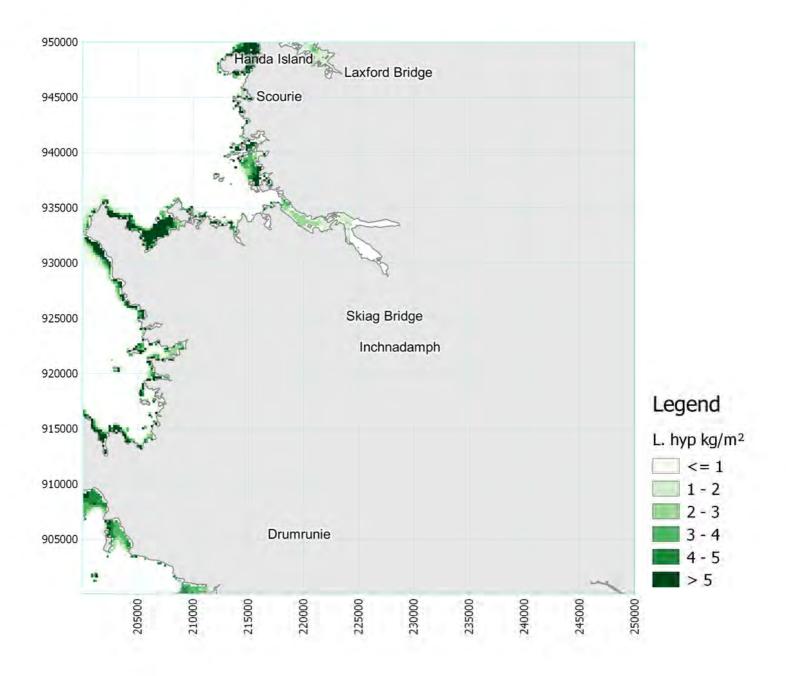


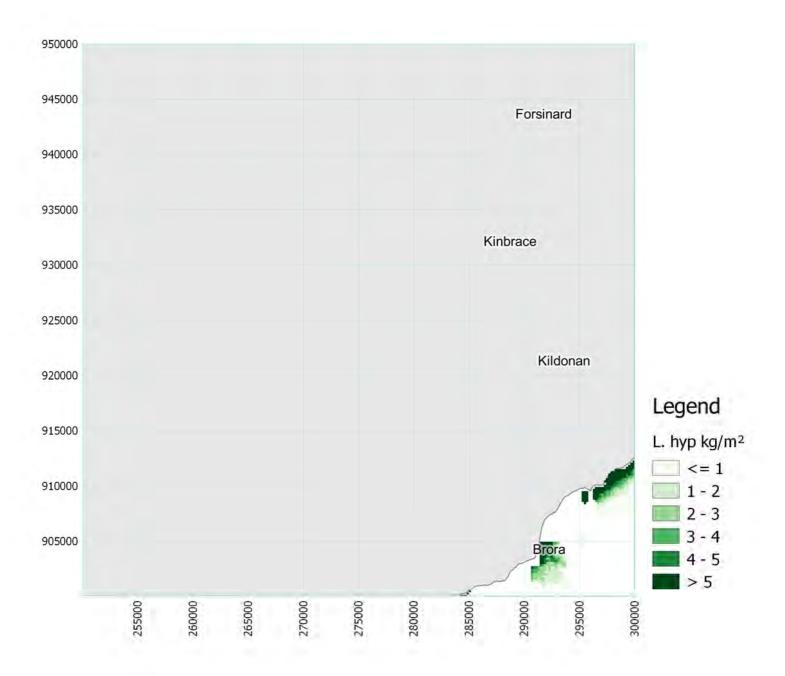


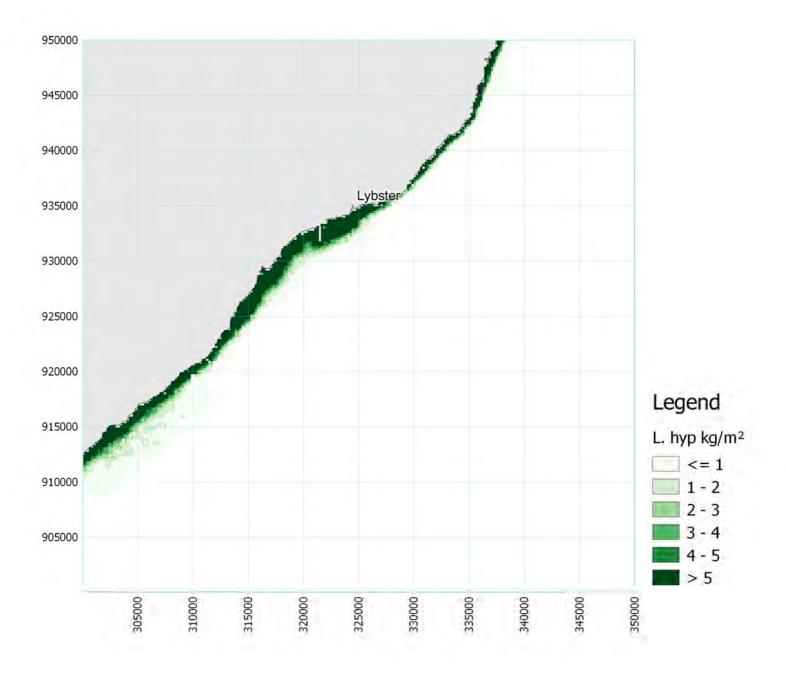


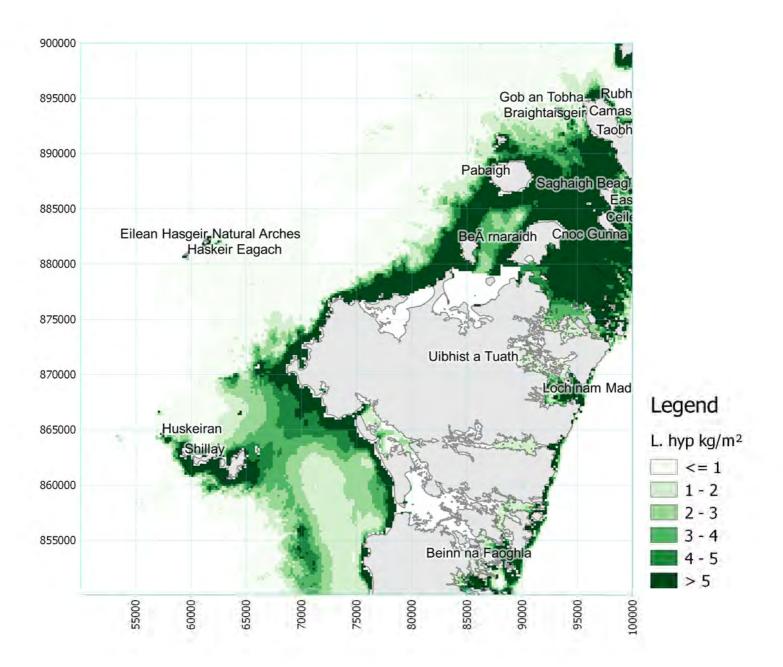


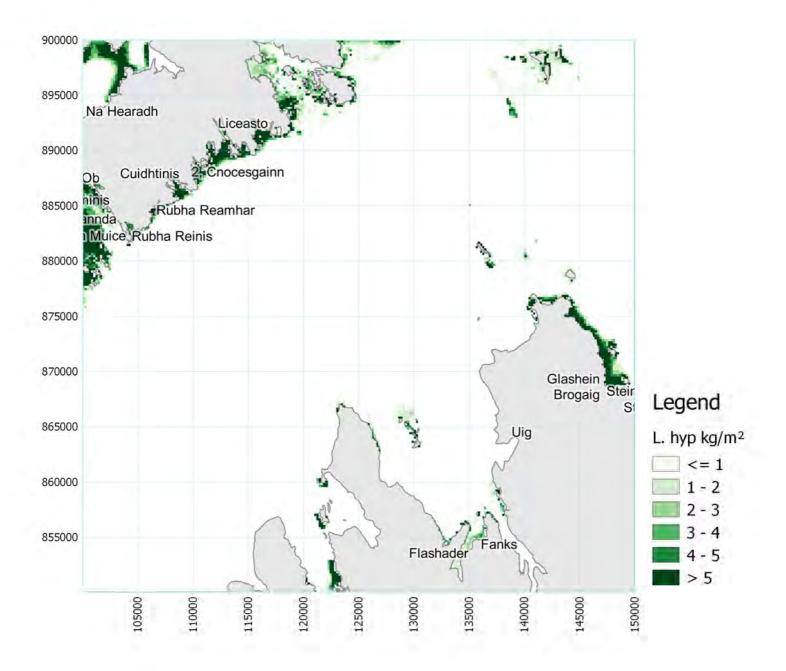


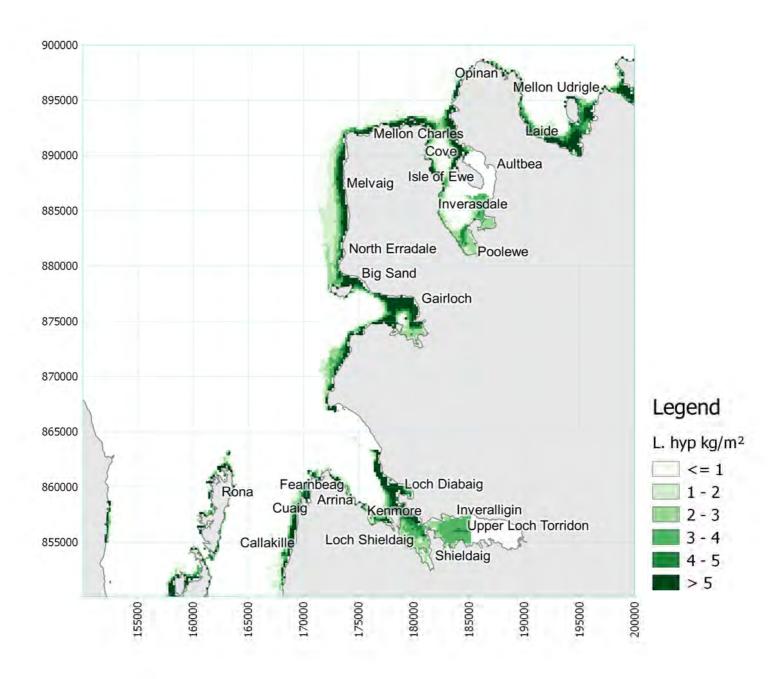


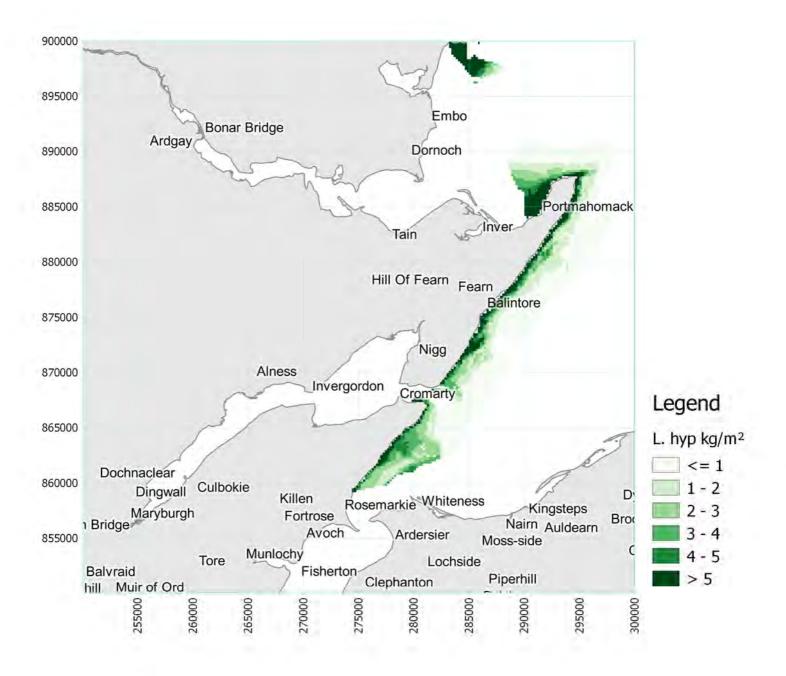


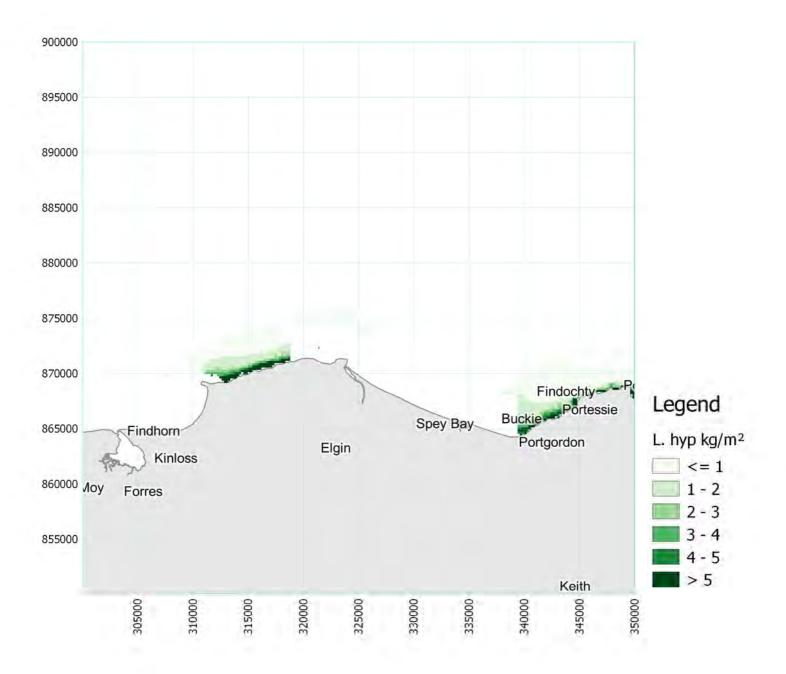


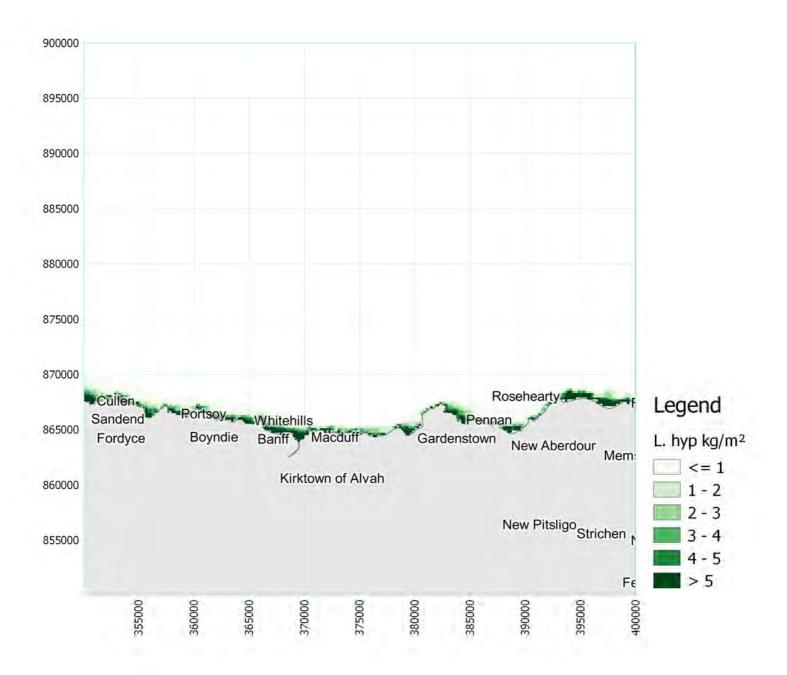


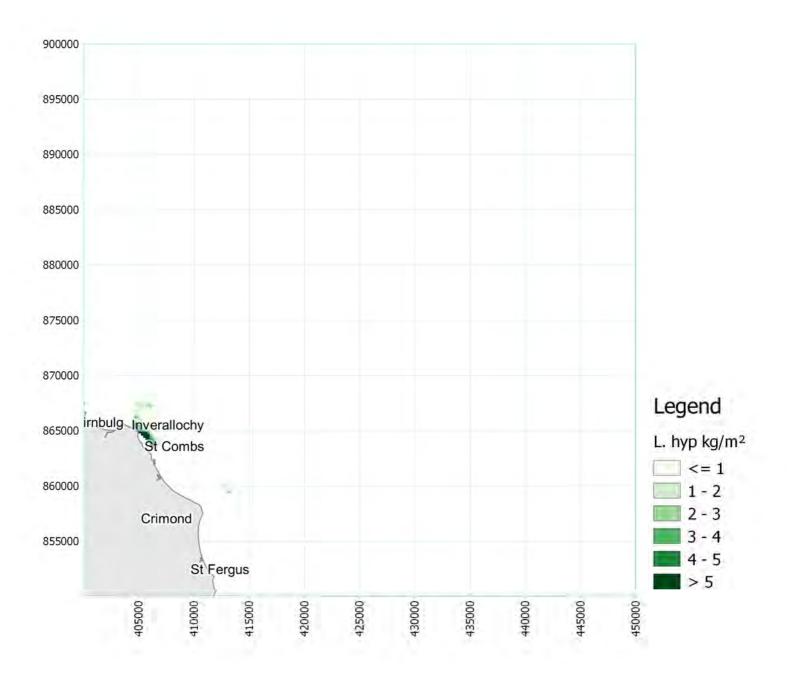


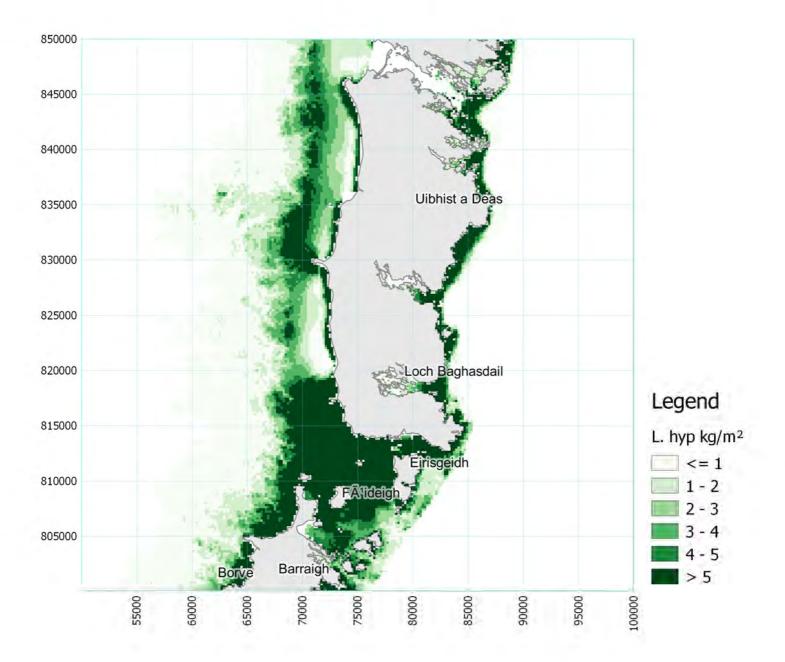


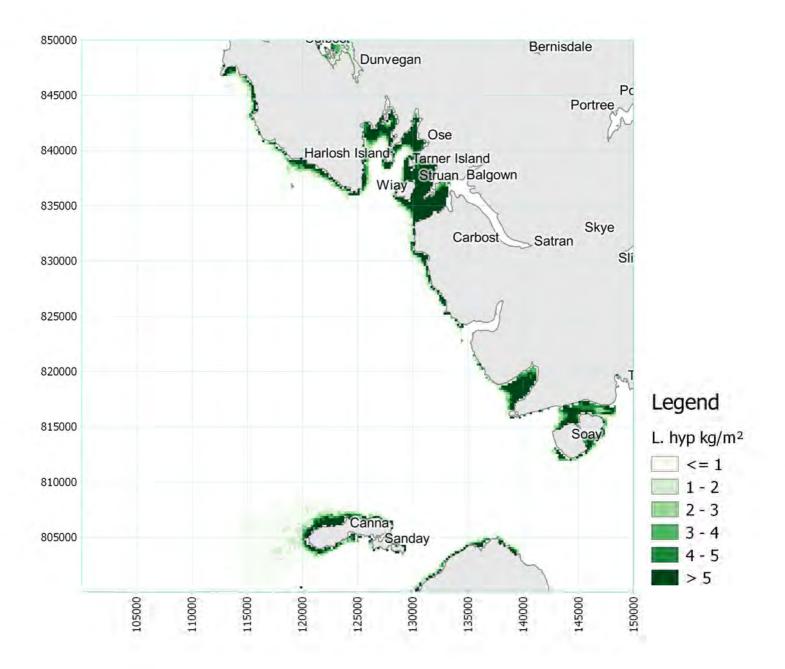


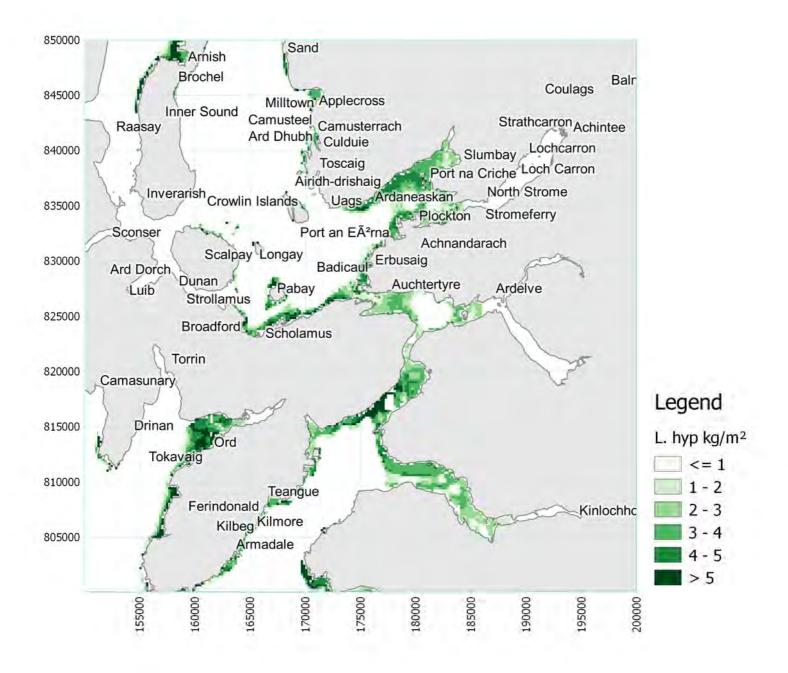


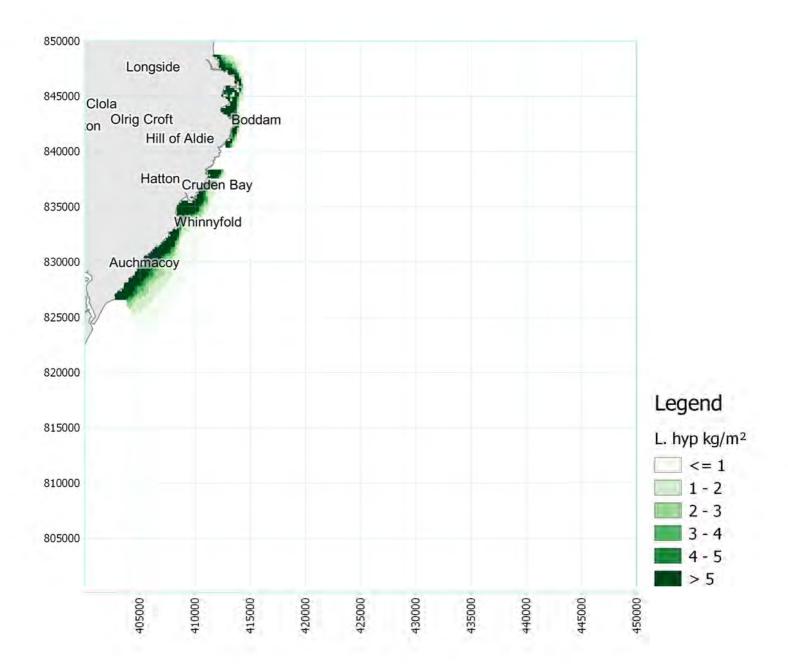


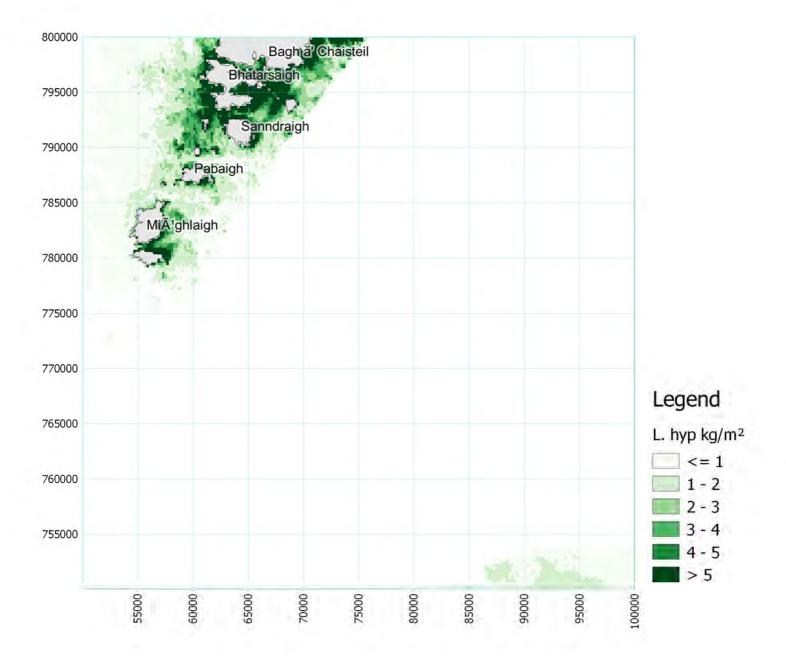


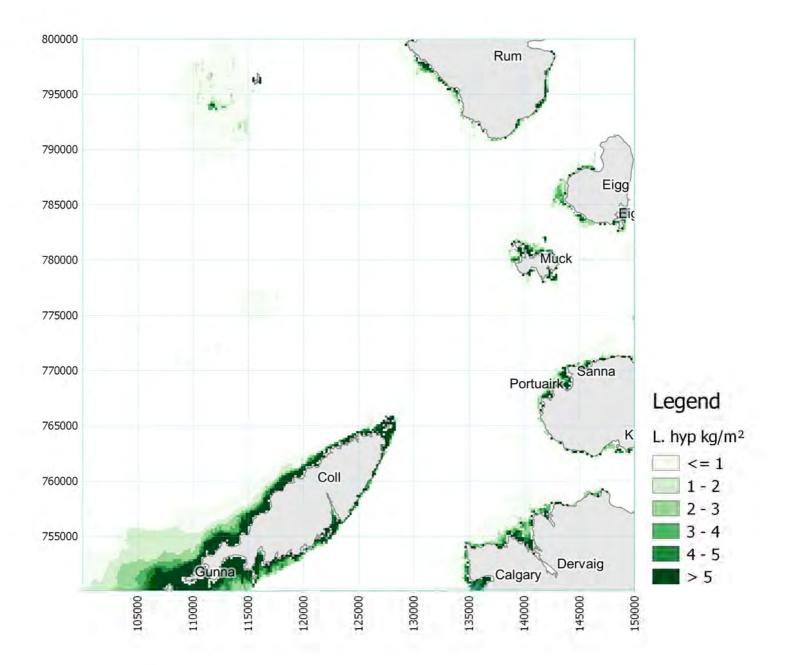


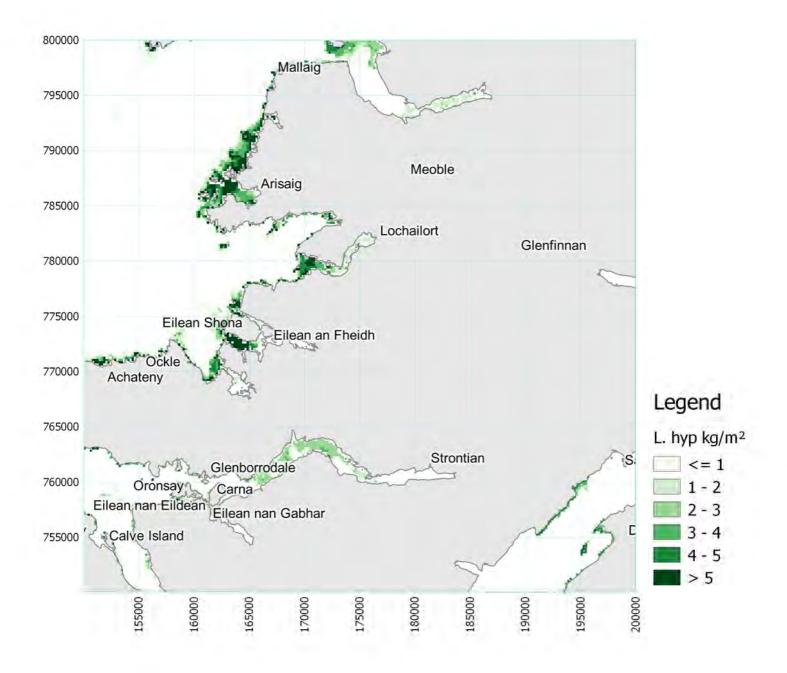


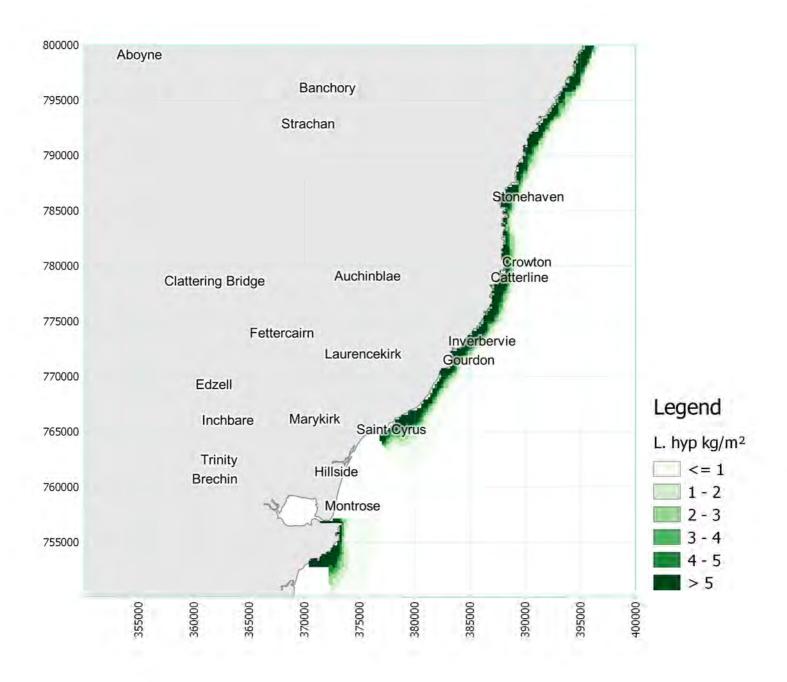


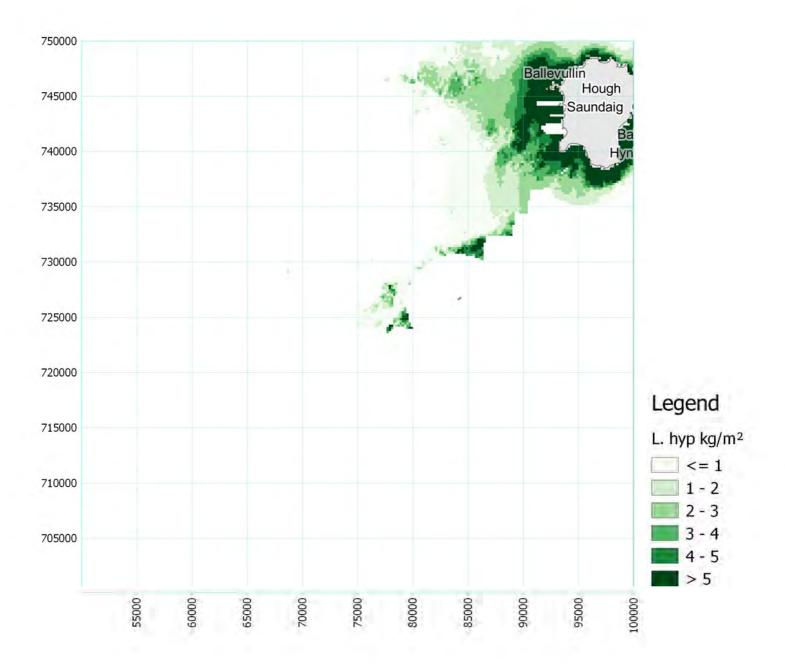


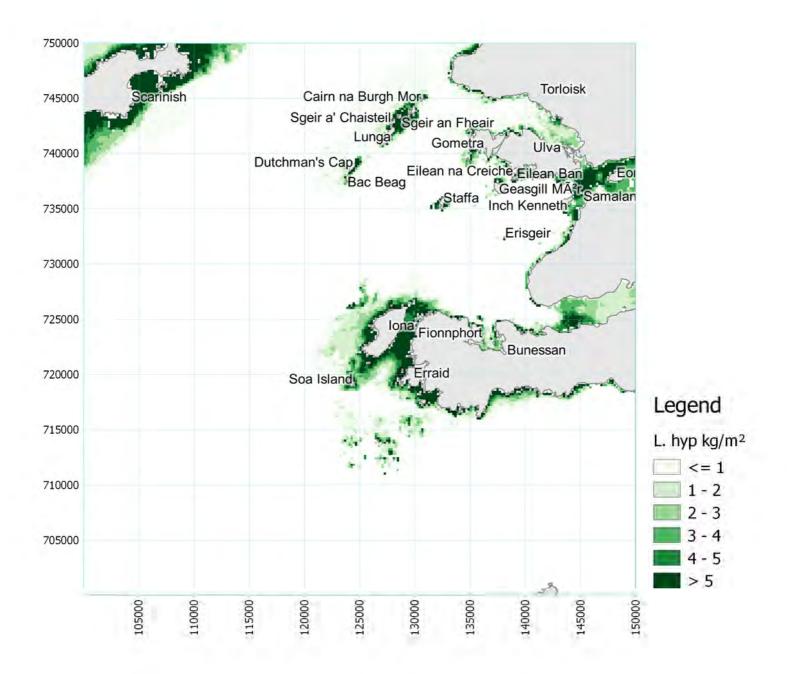


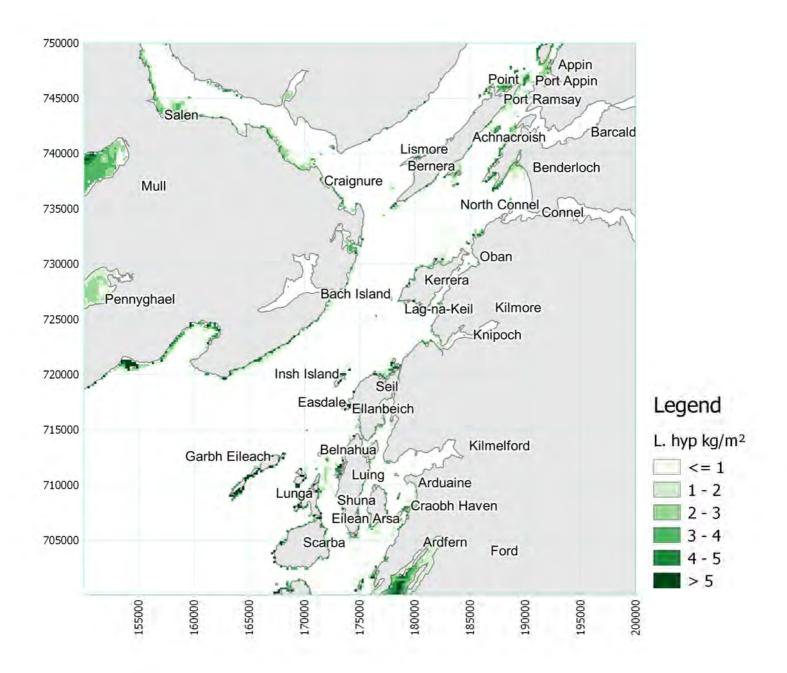


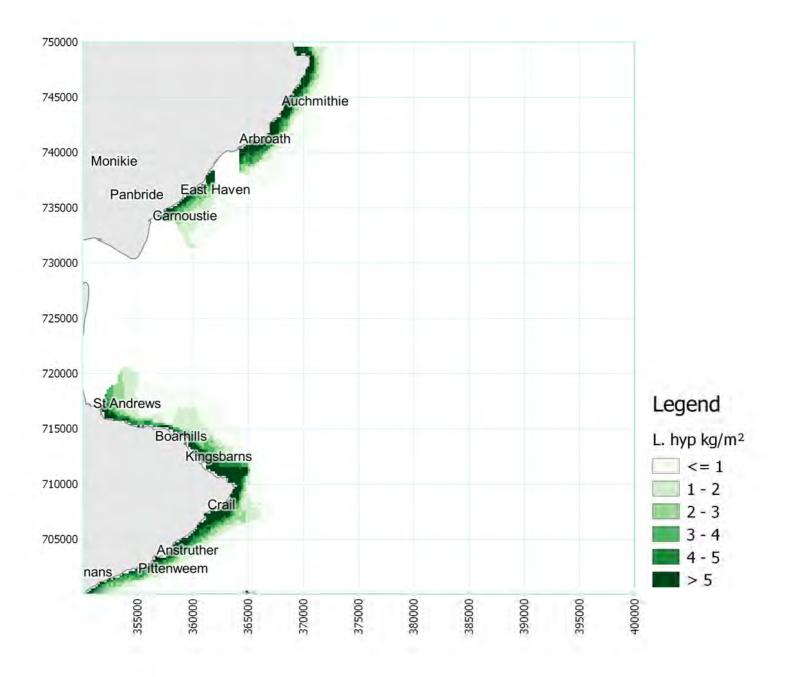


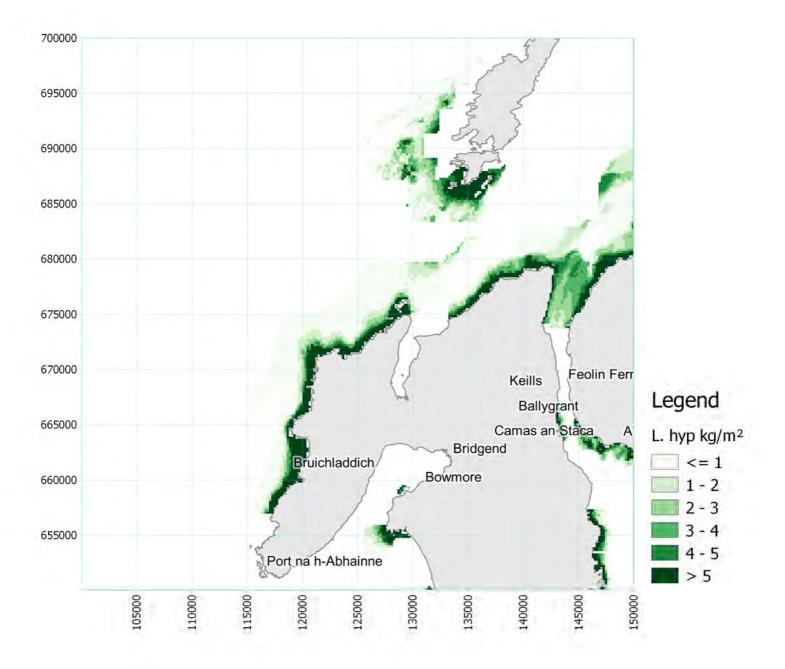


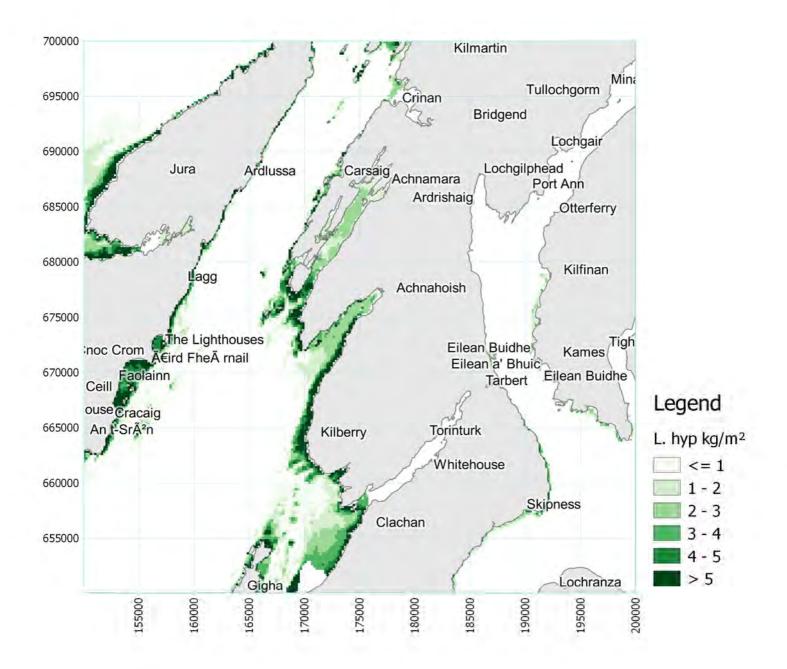








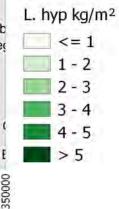


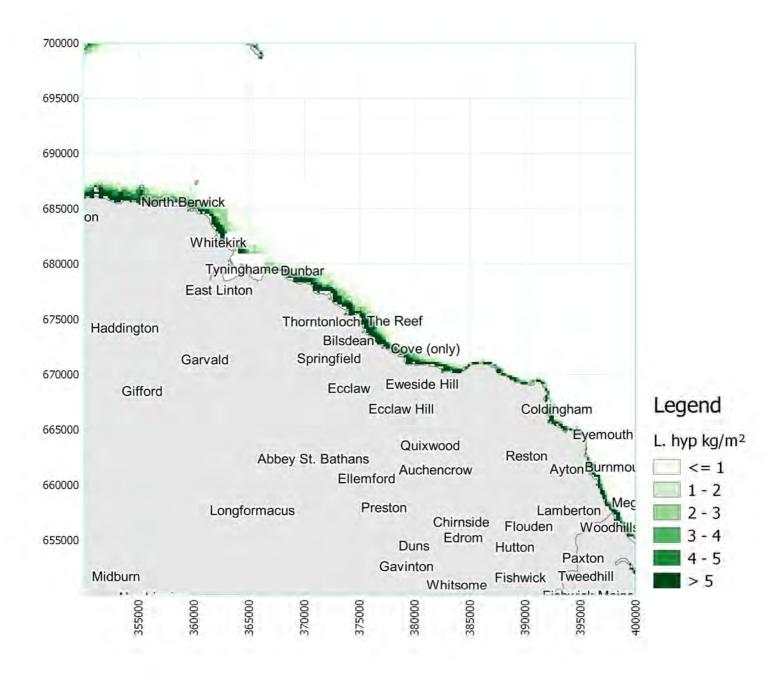


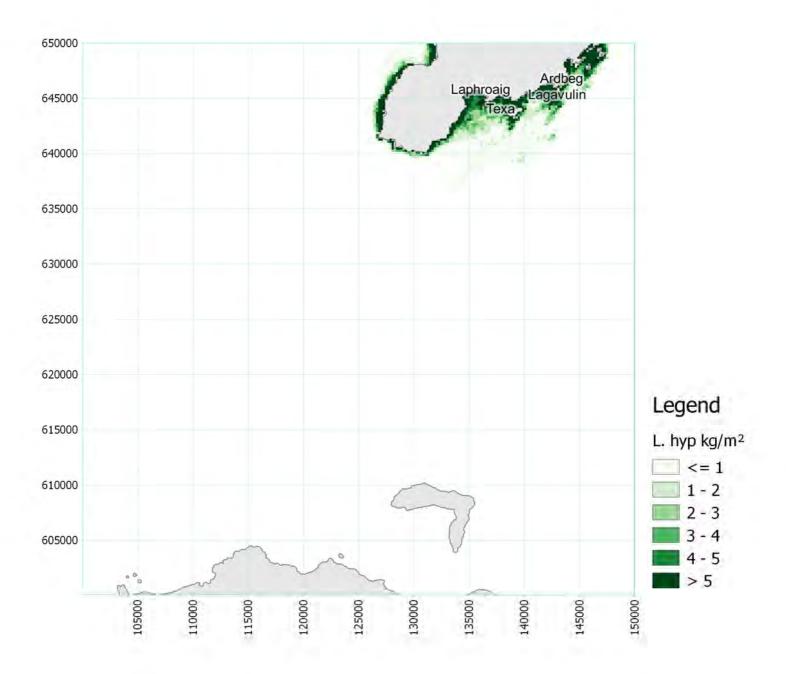
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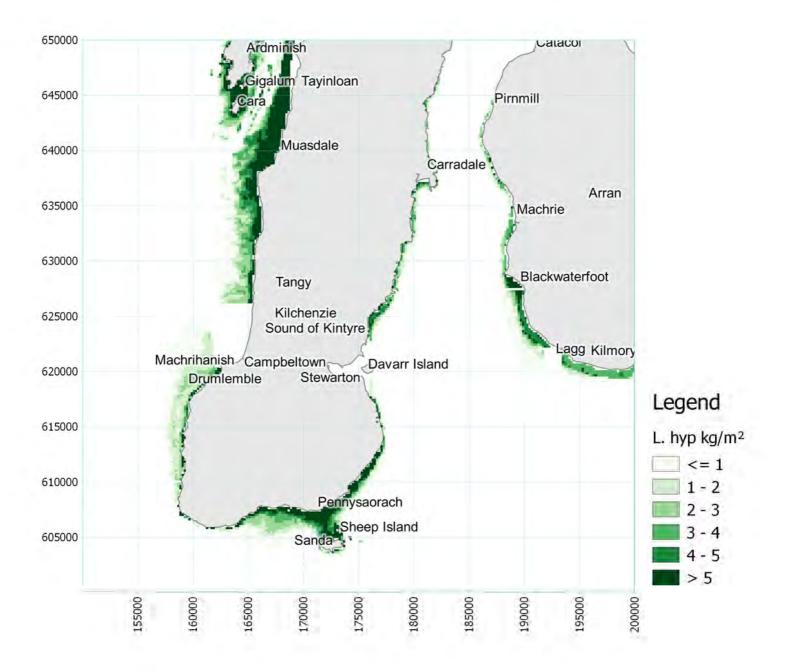
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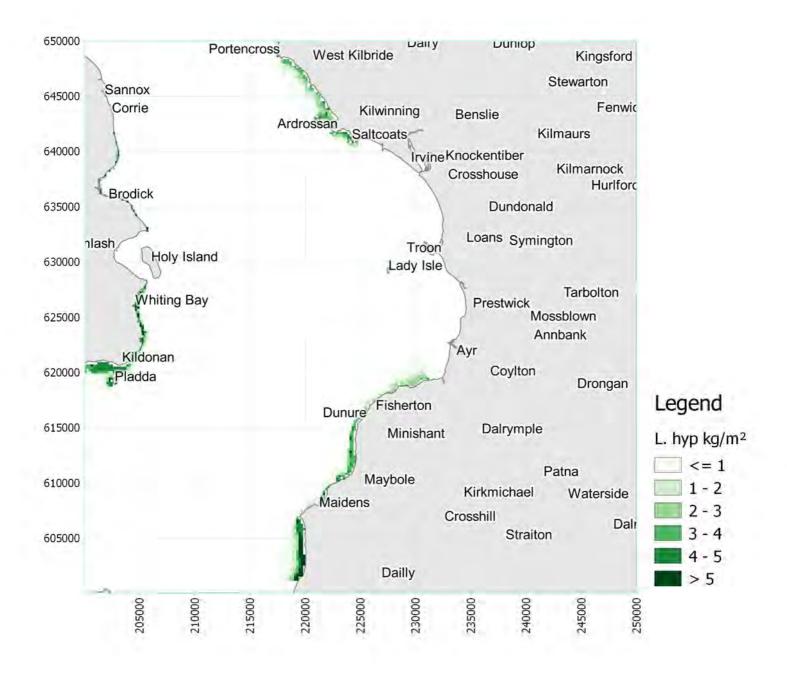
Legend

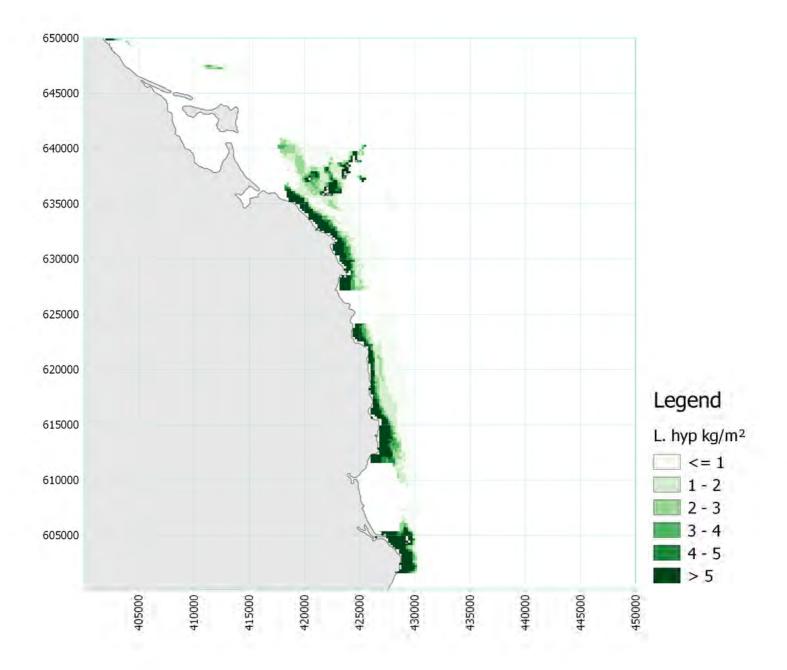


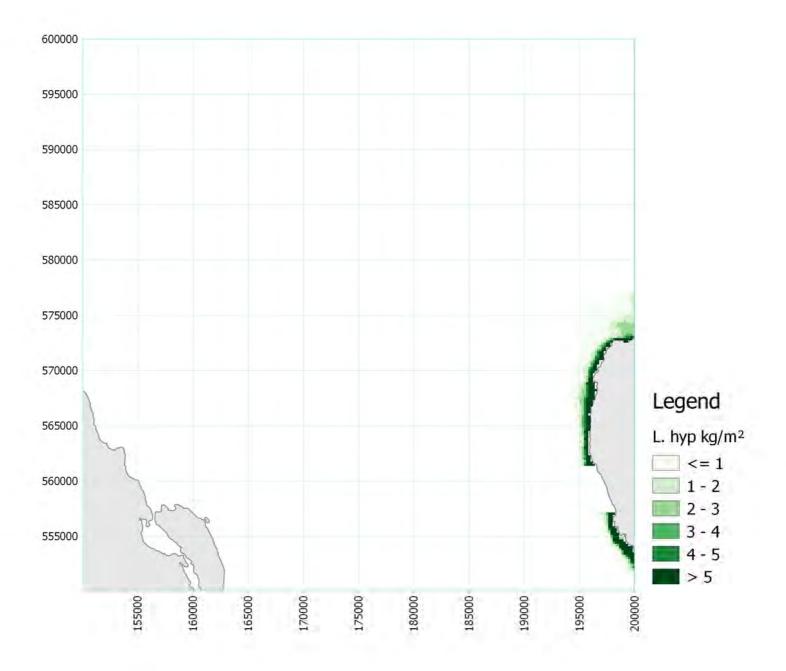


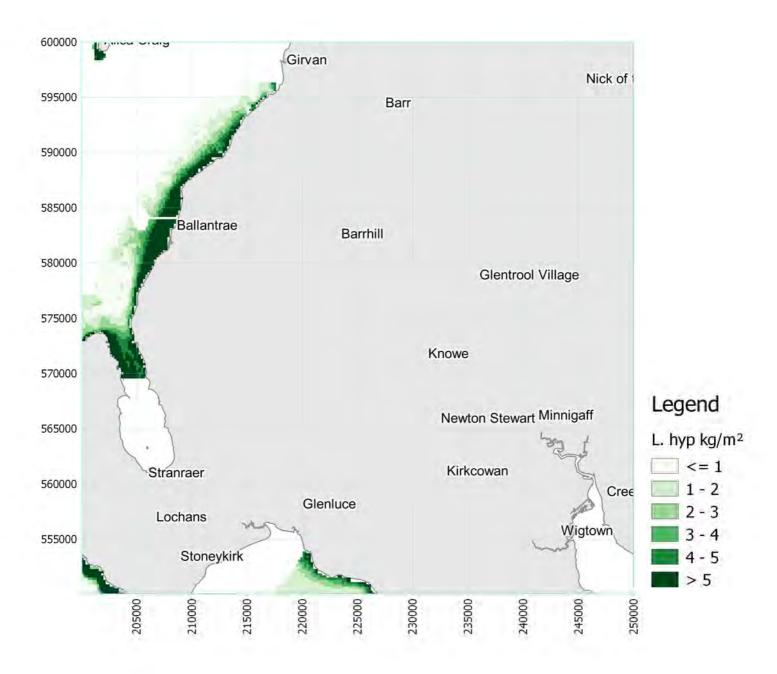


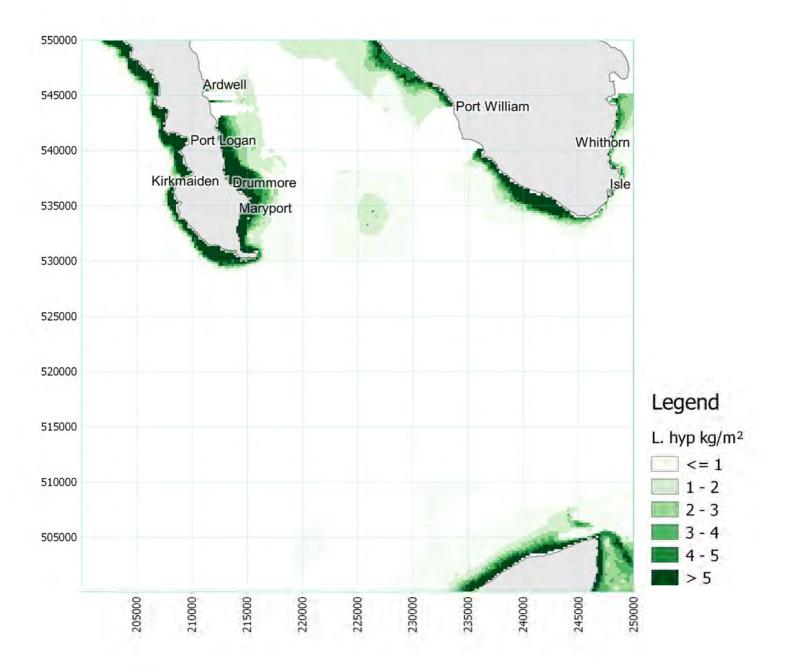


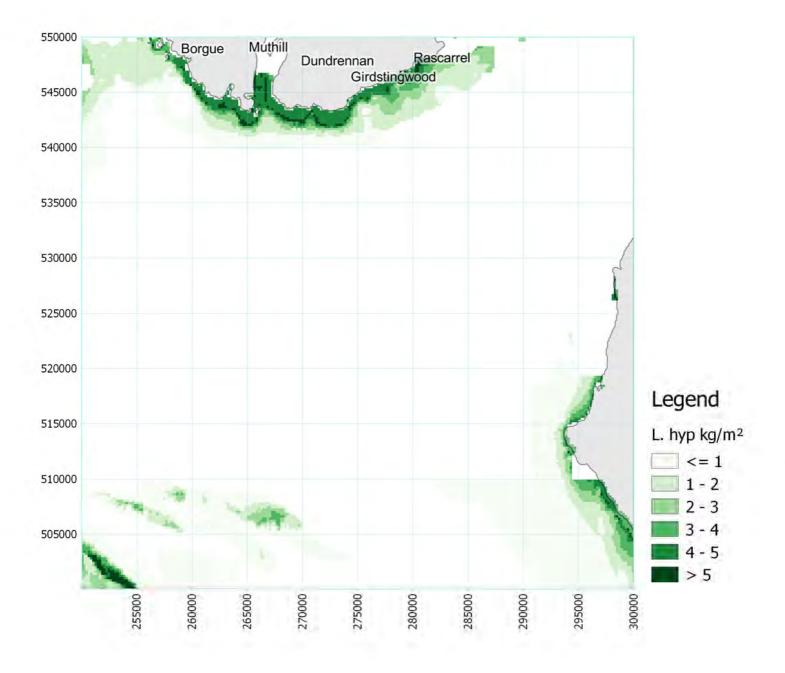




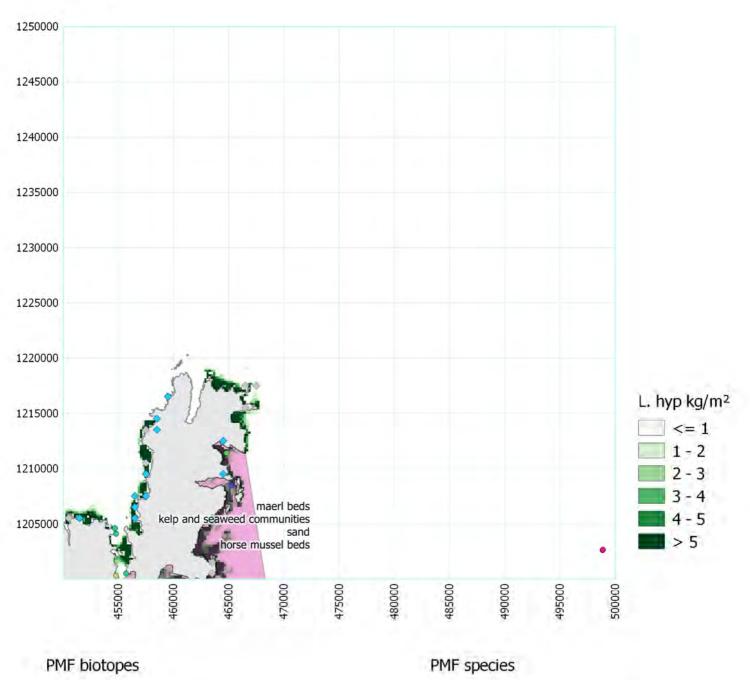












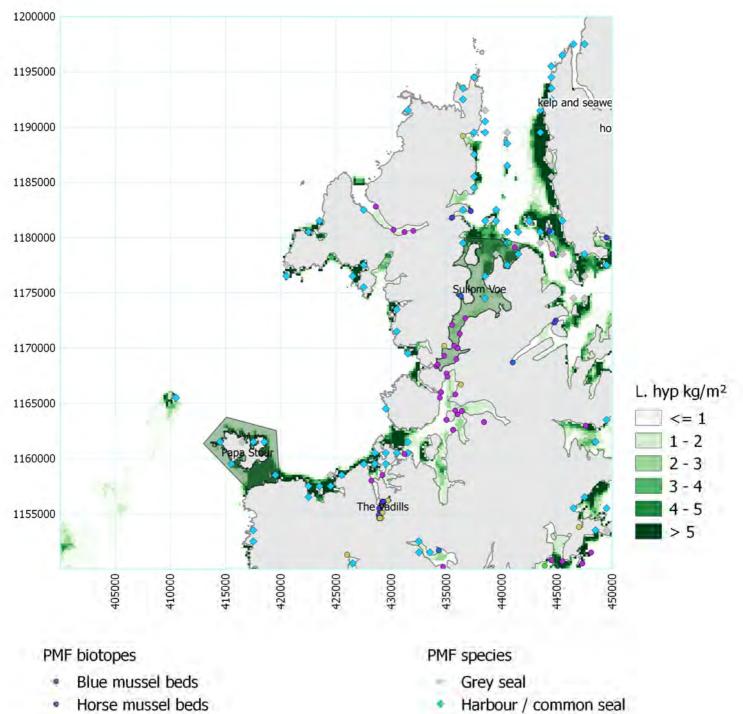
Grey seal

MPA

Harbour / common seal

- Maerl beds
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves



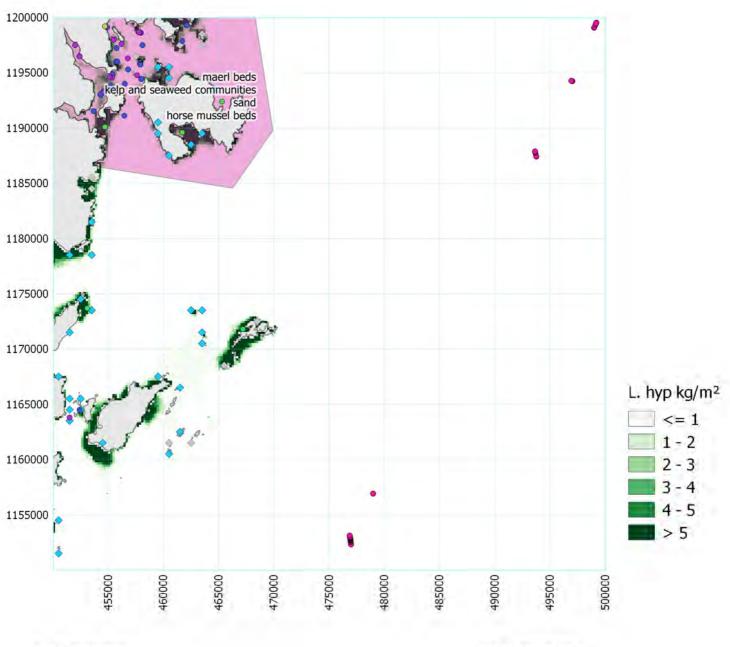


MPA

SAC

- Maerl beds
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves

Map 3

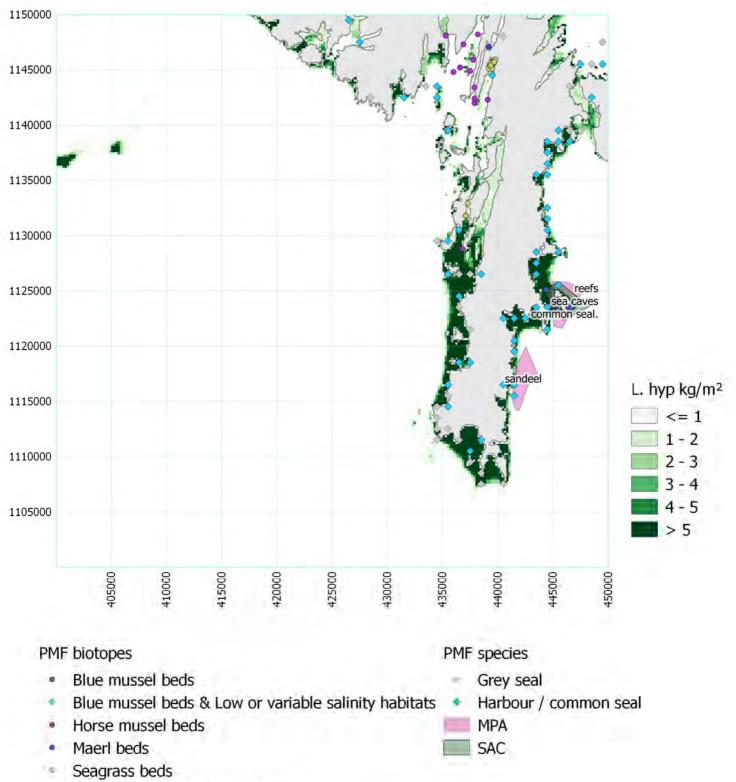


PMF biotopes

- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities
 - Tide-swept coarse sands with burrowing bivalves

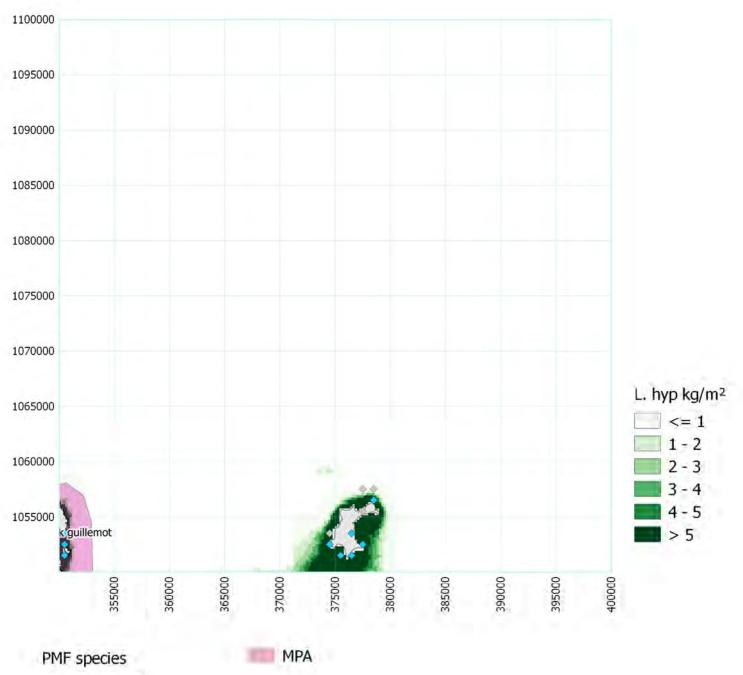
- **PMF** species
 - Grey seal
- Harbour / common seal
- MPA





- Tide-swept algal communities
- Tide-swept coarse sands with burrowing bivalves

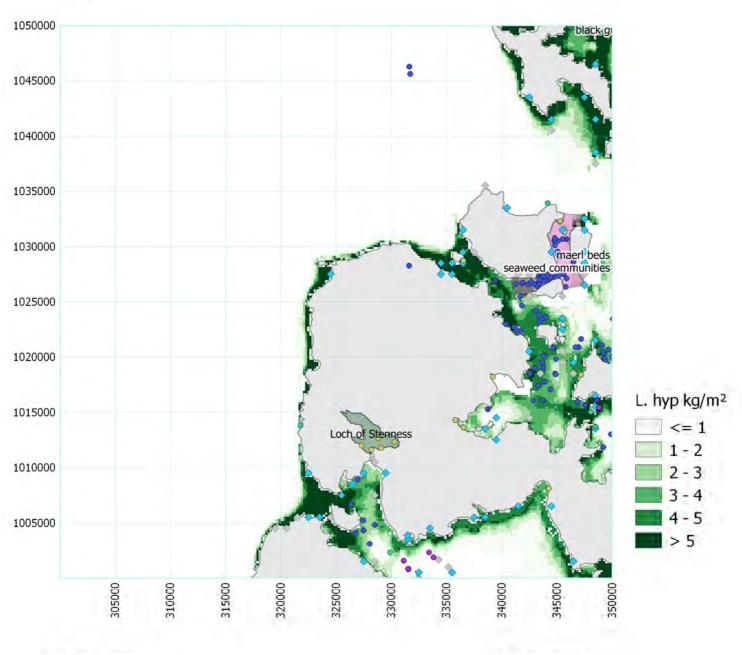




Grey seal

Harbour / common seal

Map 6

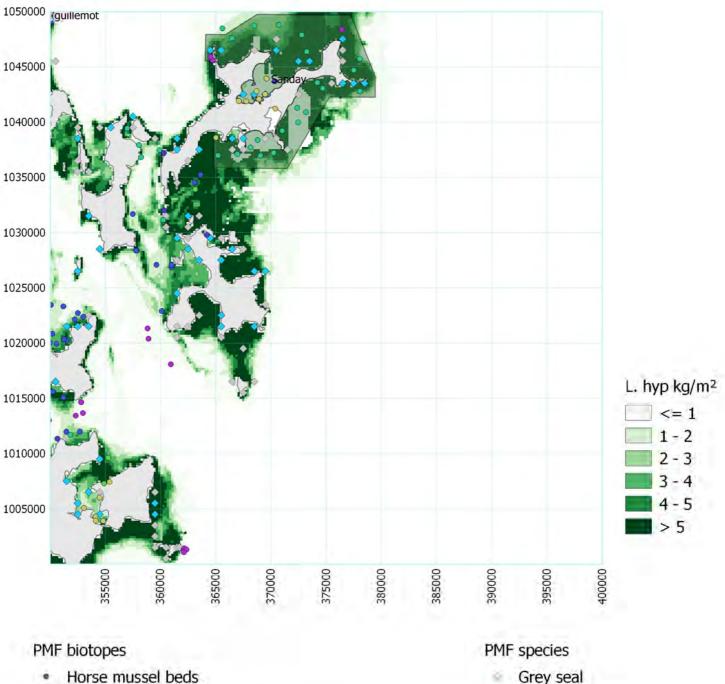


- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

PMF species

- Grey seal
- Harbour / common seal
- MPA SAC

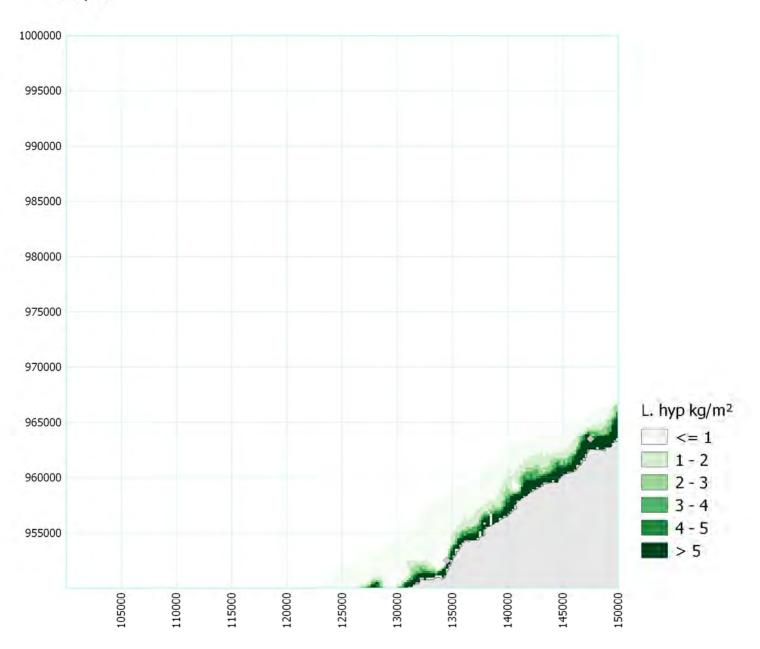
Map 7



- Maerl beds 0
- Maerl or coarse shell gravel with burrowing sea cucumbers 0
- Seagrass beds .
- Tide-swept algal communities ie.
- Tide-swept algal communities and Kelp beds 1.4
 - Tide-swept coarse sands with burrowing bivalves 4

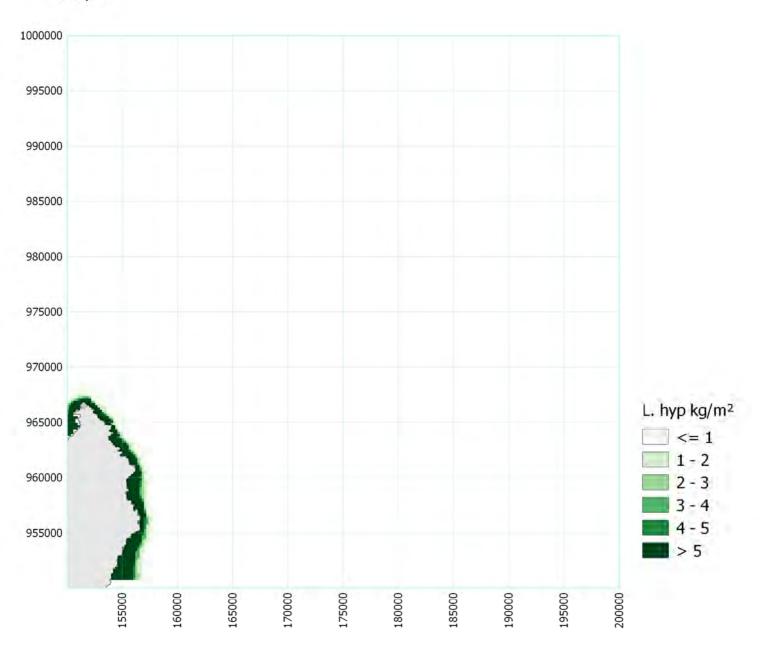
- Grey seal 10 I I
- Harbour / common seal ٠
- MPA SAC

Map 8



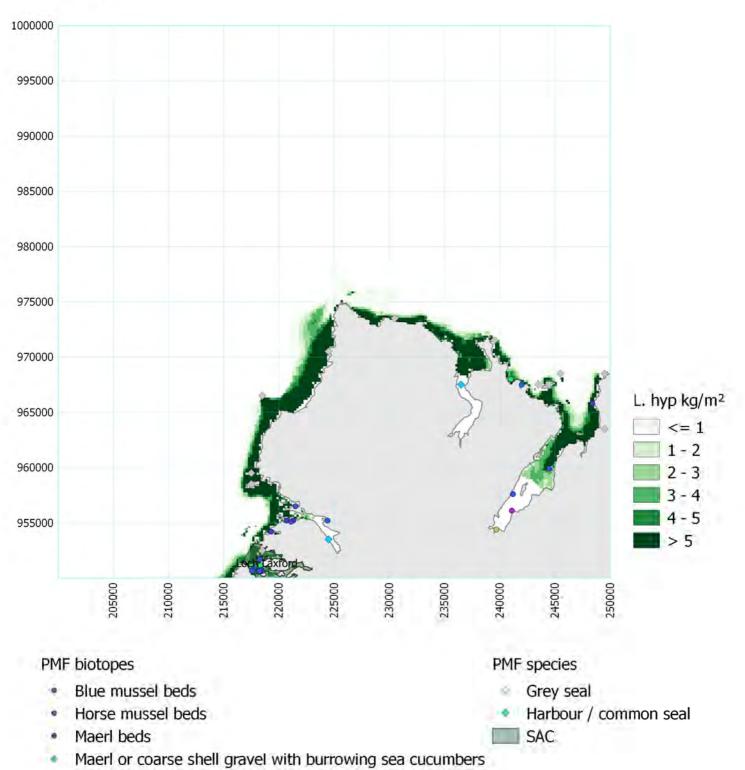
Grey seal

Map 9



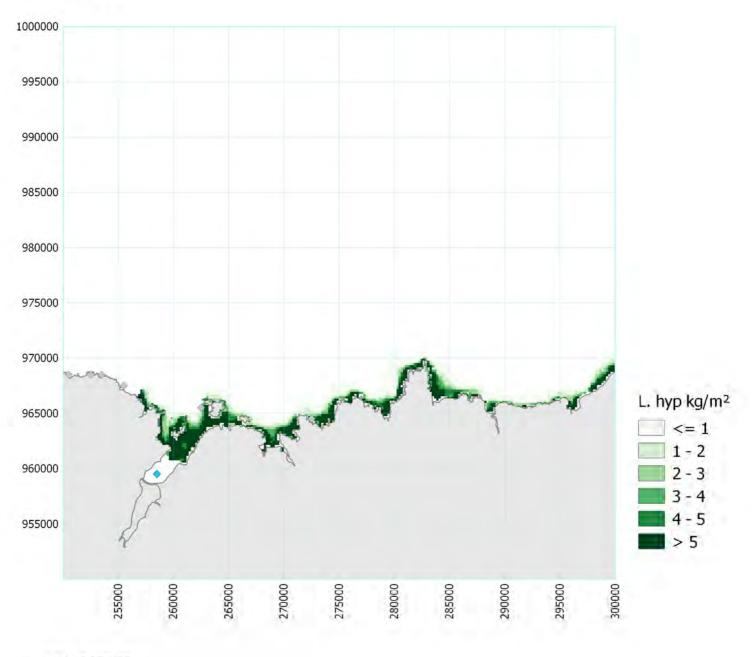
Grey seal

Map 10



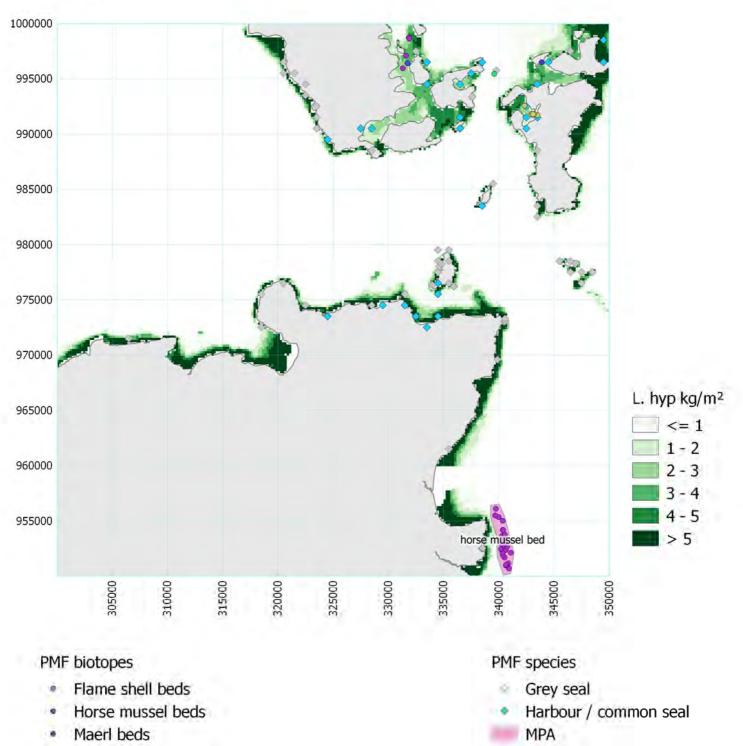
- Seagrass beds
- Tide-swept algal communities





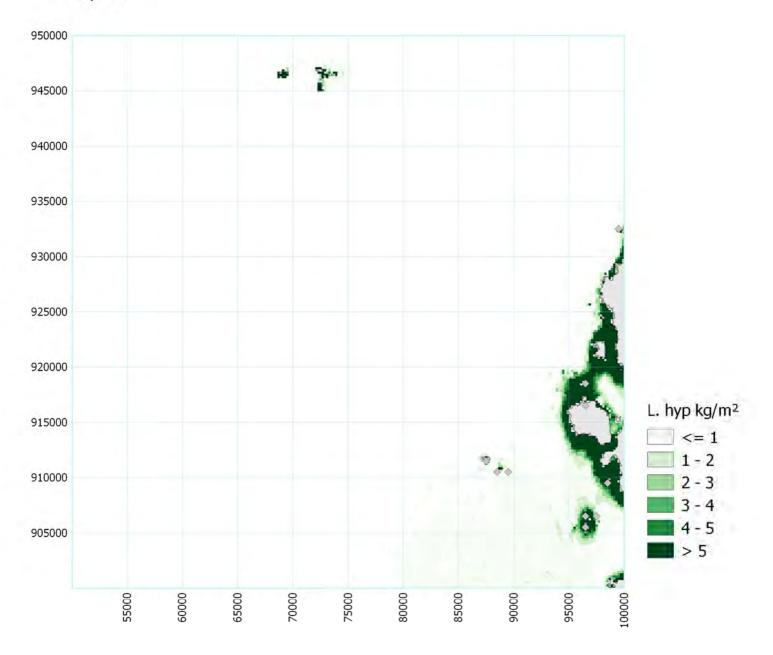
Grey seal

Map 12



- Maerl or coarse shell gravel with burrowing sea cucumbers
- Seagrass beds
- Tide-swept algal communities

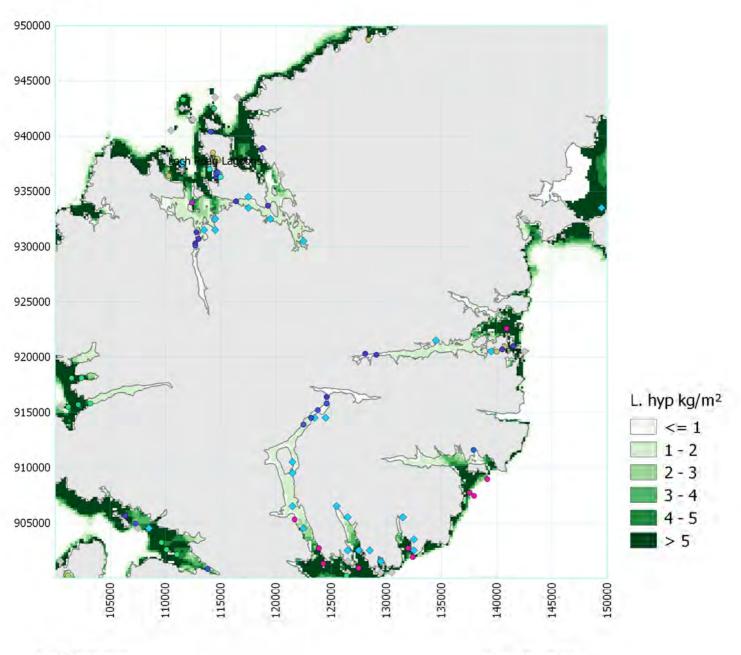
Map 13



PMF species

Grey seal

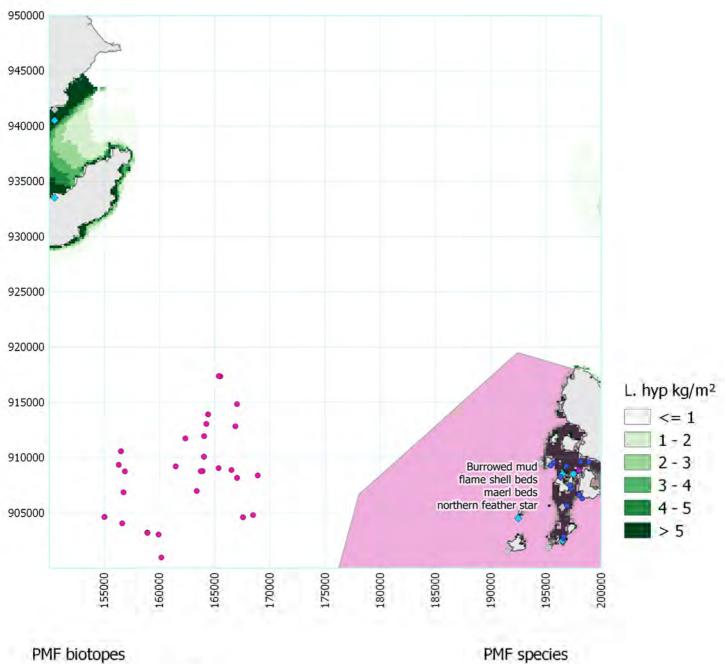
Map 14



- Blue mussel beds
- Blue mussel beds & Low or variable salinity habitats
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
 - Tide-swept algal communities
 - Tide-swept algal communities and Kelp beds

- **PMF** species
 - Grey seal
 - Harbour / common seal
 SAC





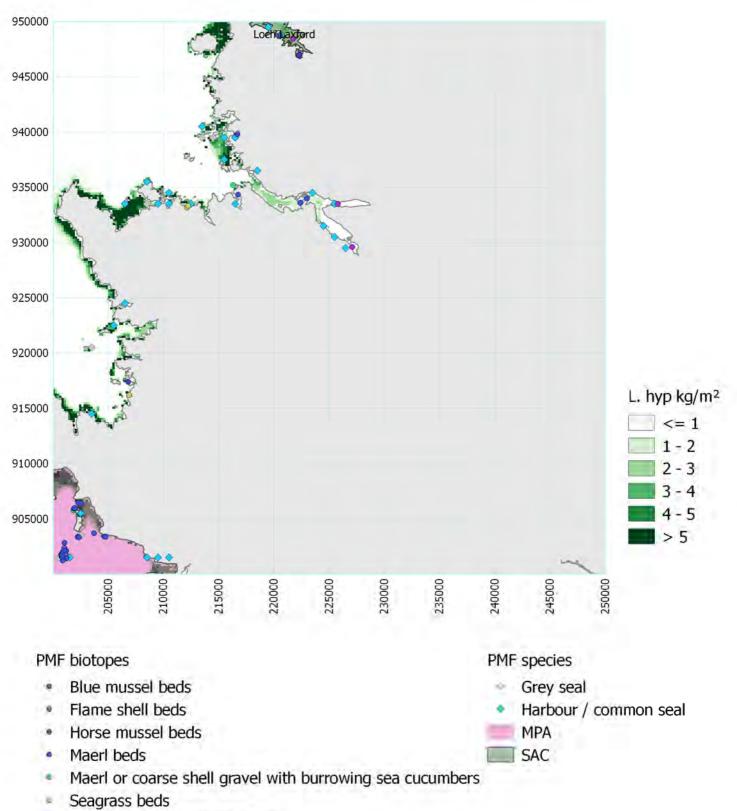
- Horse mussel beds ÷
- Maerl beds .

Maerl or coarse shell gravel with burrowing sea cucumbers ÷

Northern sea fan and sponge communities ٠

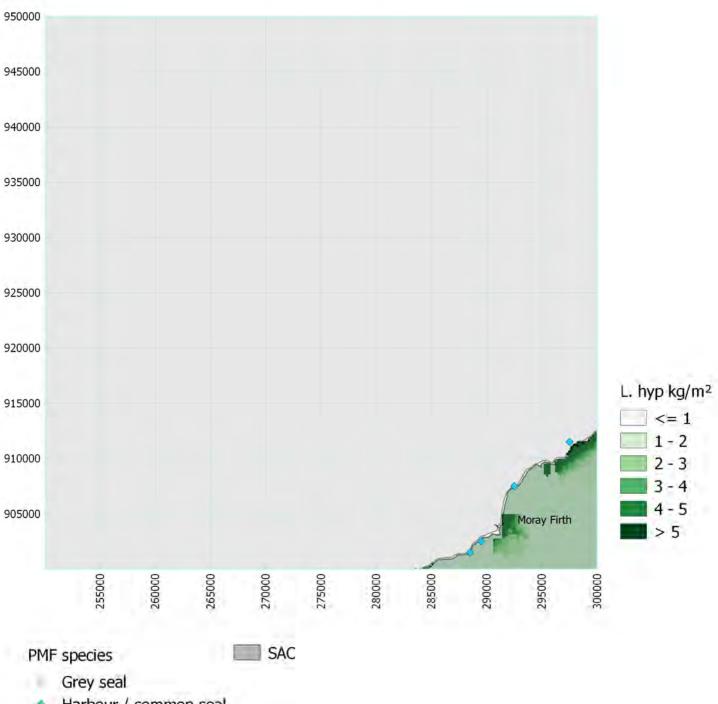
- 10
 - Grey seal
- Harbour / common seal
- MPA

Map 16

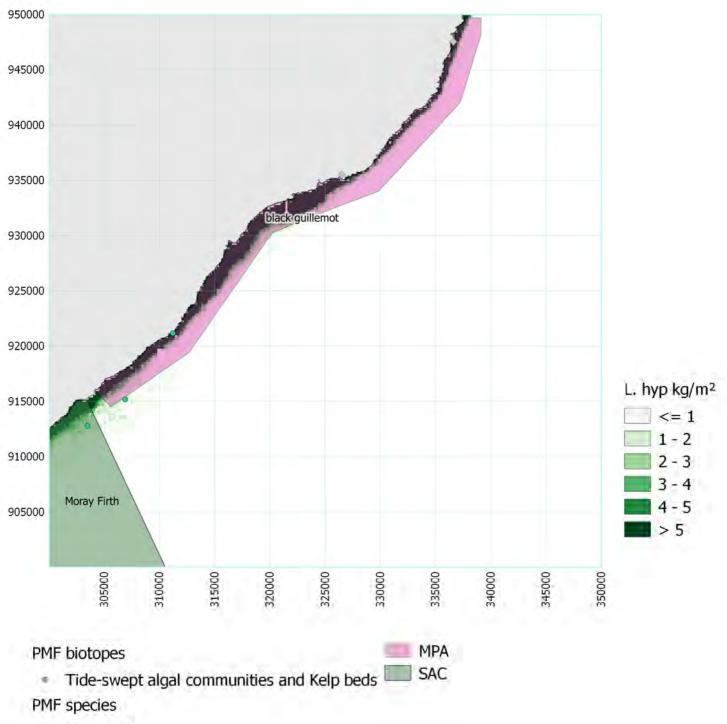


- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

Map 17

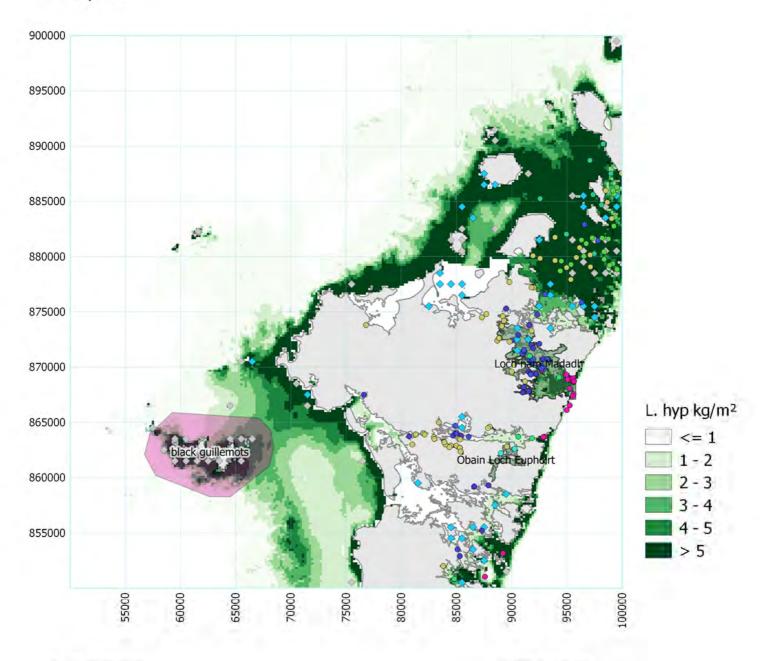






Grey seal

Map 19

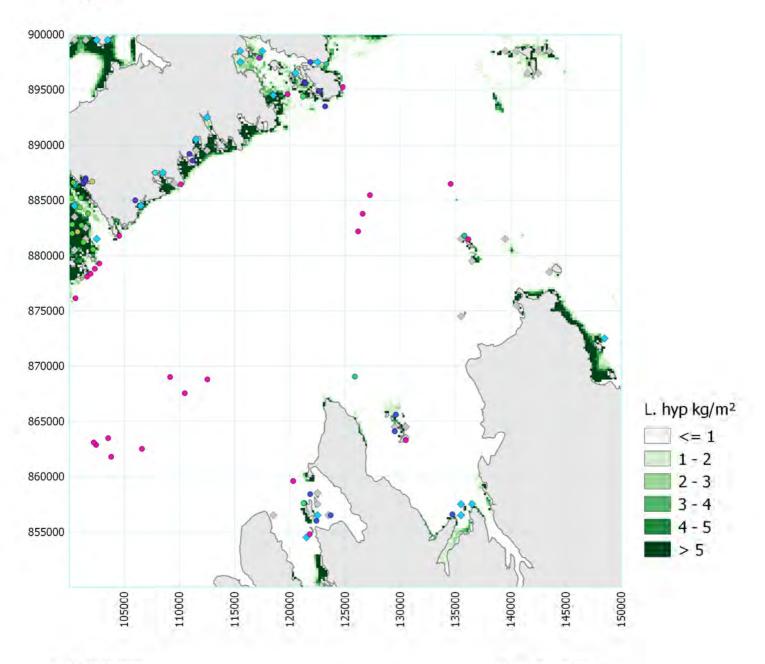


- Blue mussel beds & Low or variable salinity habitats
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves

PMF species

- Grey seal
- Harbour / common seal
- MPA SAC

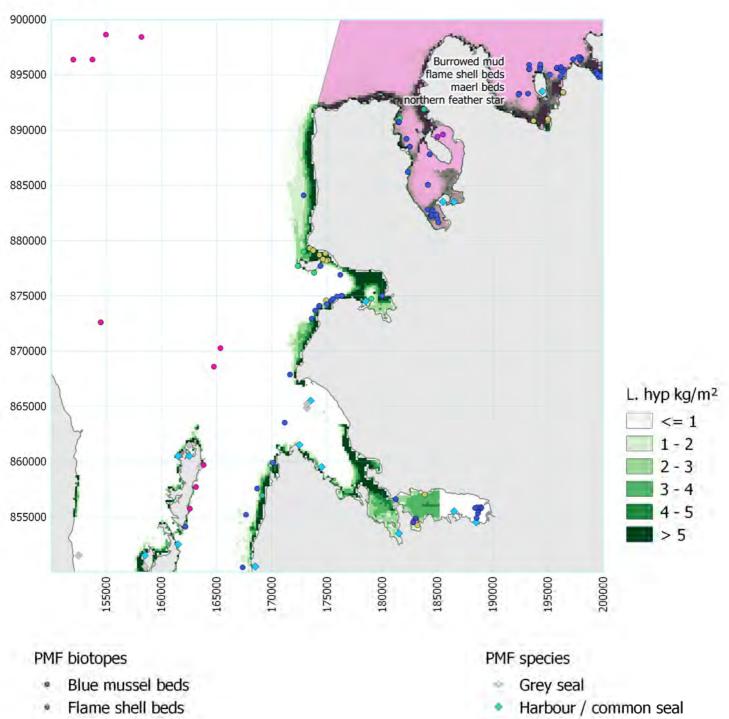
Map 20



- Blue mussel beds & Low or variable salinity habitats
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves

- PMF species
 - Grey seal
 - Harbour / common seal

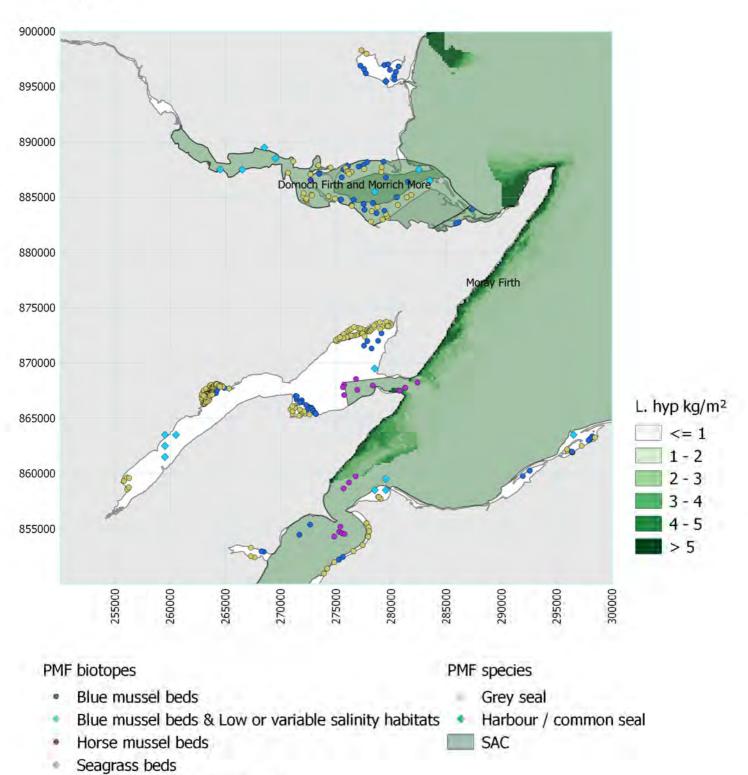
Map 21



MPA

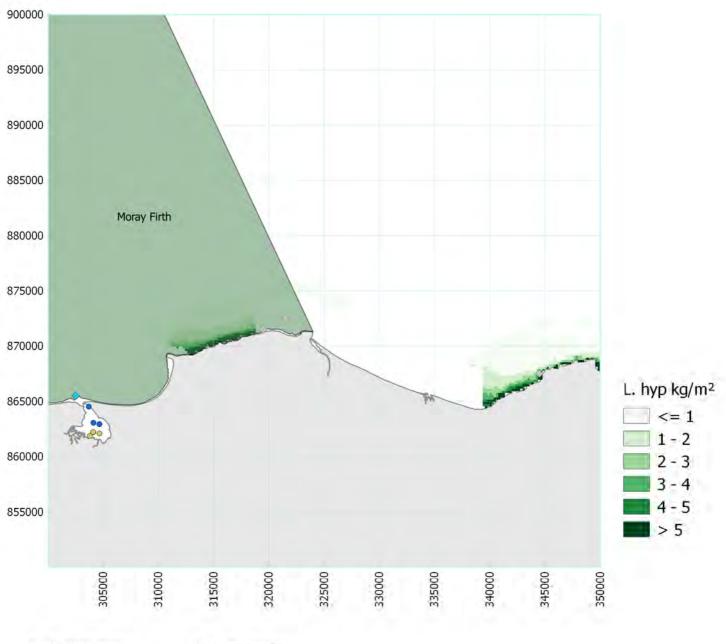
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
 - Tide-swept algal communities
 - Tide-swept algal communities and Kelp beds

Map 22



Tide-swept algal communities



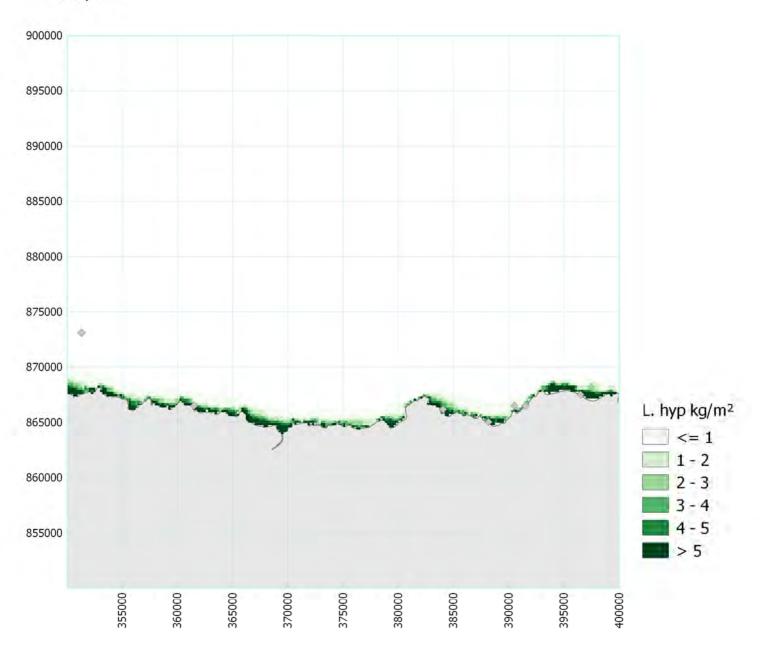


PMF biotopes PMF species

Blue mussel beds
 Grey seal

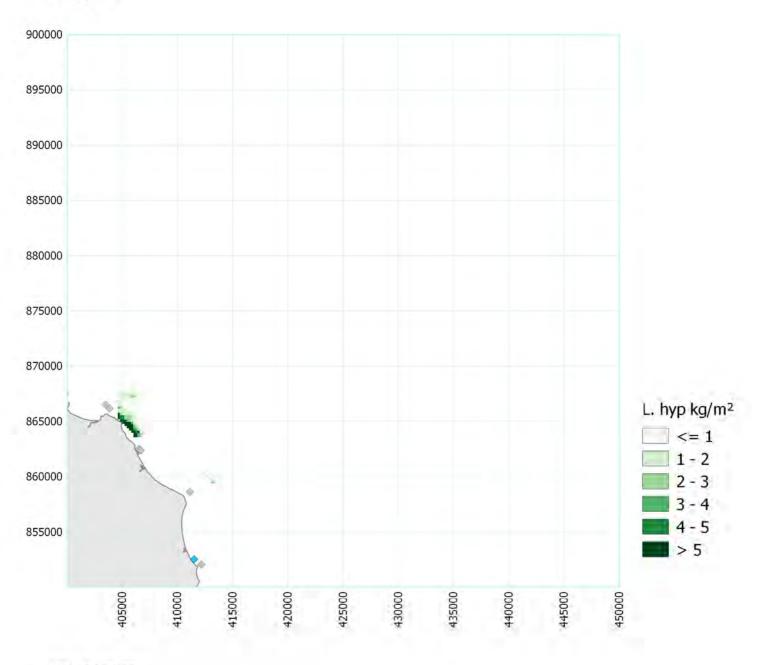
- Seagrass beds
 Harbour / common seal
 - SAC

Map 24



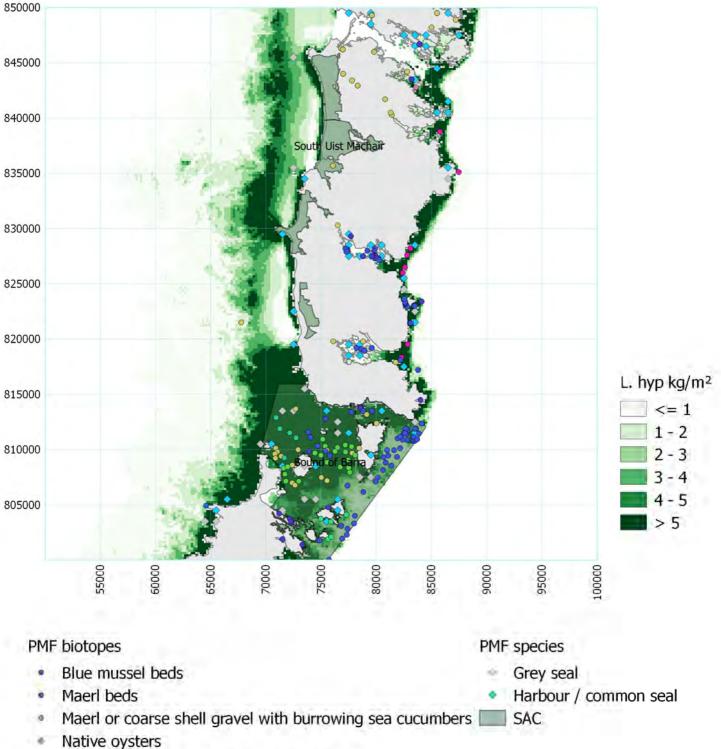
Grey seal

Map 25



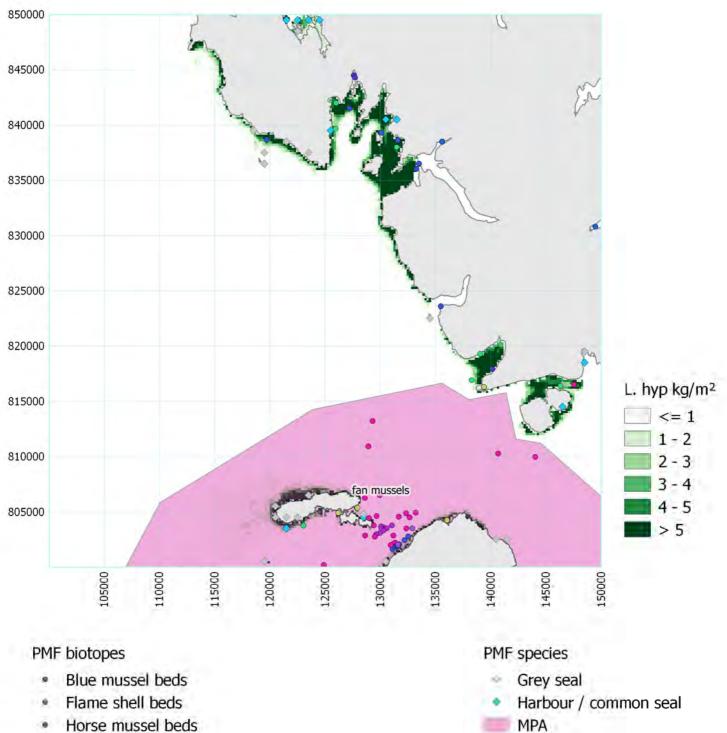
Grey seal





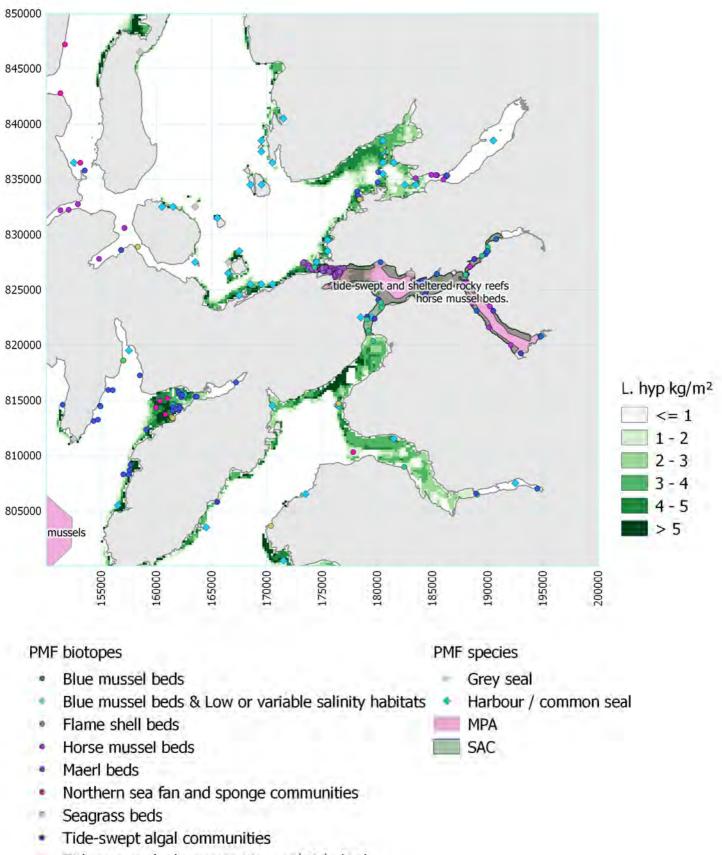
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves

Map 27



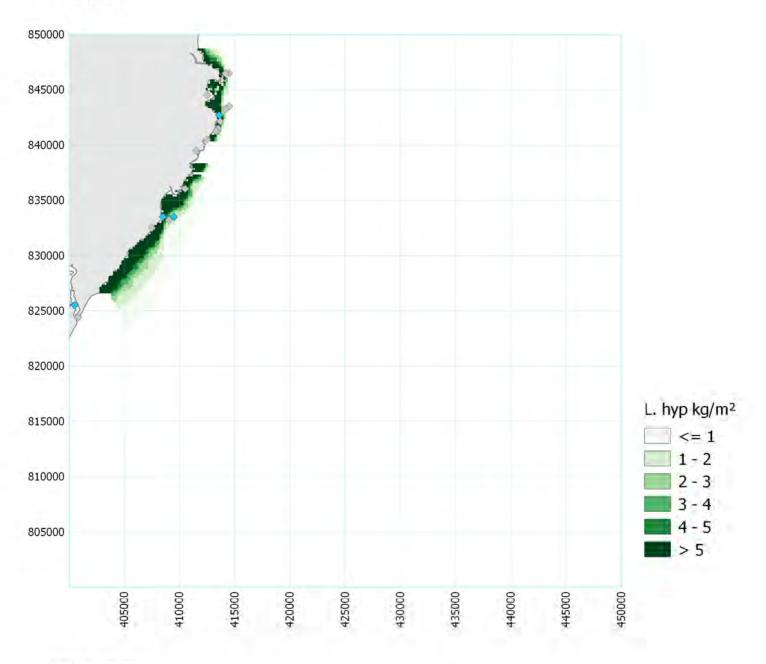
- Horse mussel beds .
- Maerl beds •
- Maerl or coarse shell gravel with burrowing sea cucumbers .
- Northern sea fan and sponge communities
- Seagrass beds 10
 - Tide-swept algal communities ٠
 - Tide-swept algal communities and Kelp beds ٠

Map 28



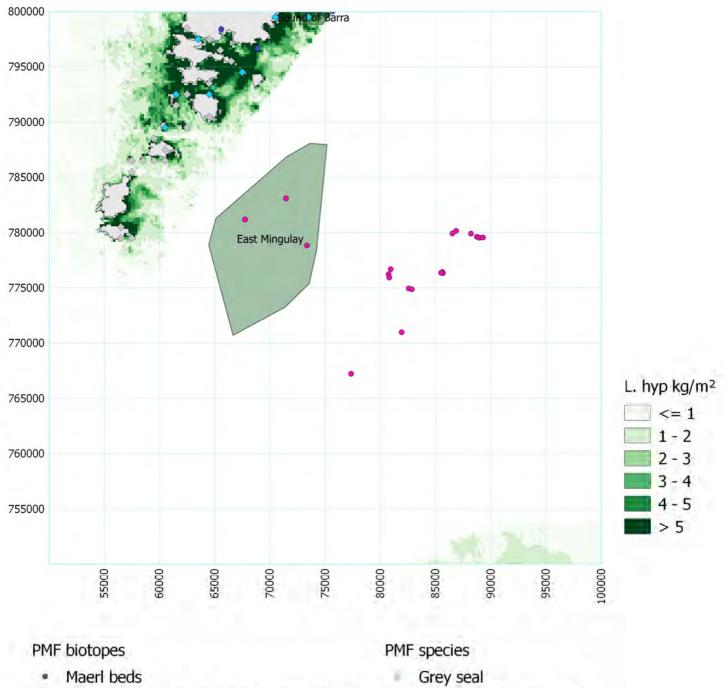
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves





- PMF species
 - Grey seal
 - Harbour / common seal

Map 30

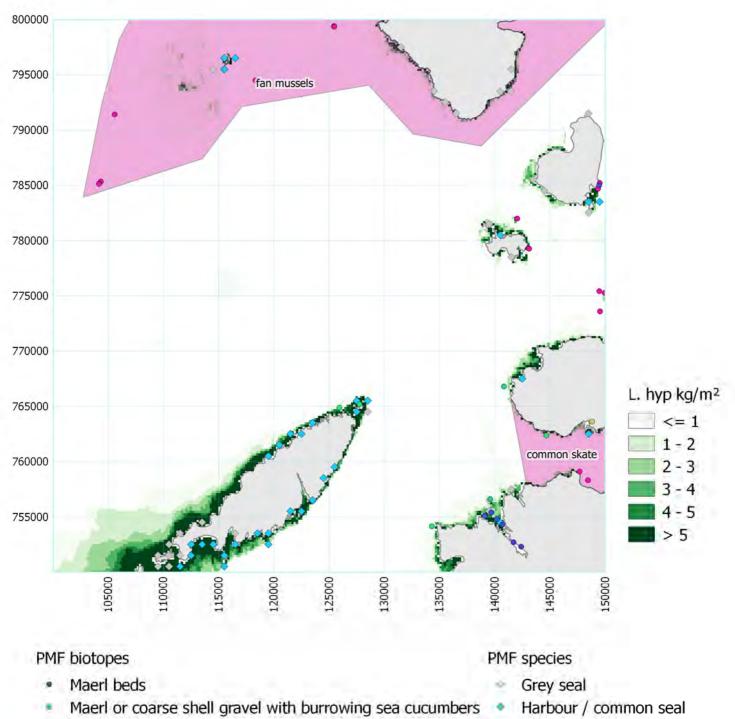


Harbour / common seal

SAC

- Northern sea fan and sponge communities
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

Map 31

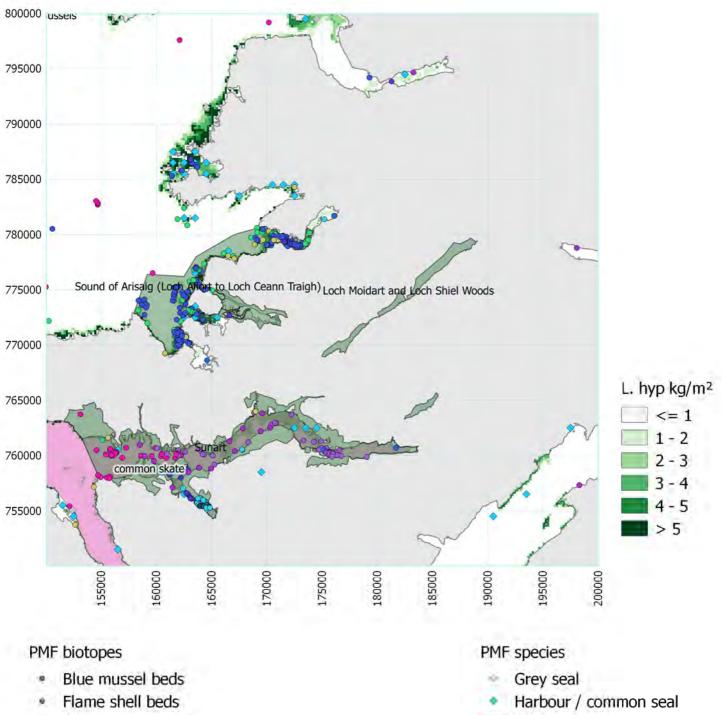


٠

MPA

- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds 0
- Tide-swept algal communities .
- Tide-swept algal communities and Kelp beds

Map 32

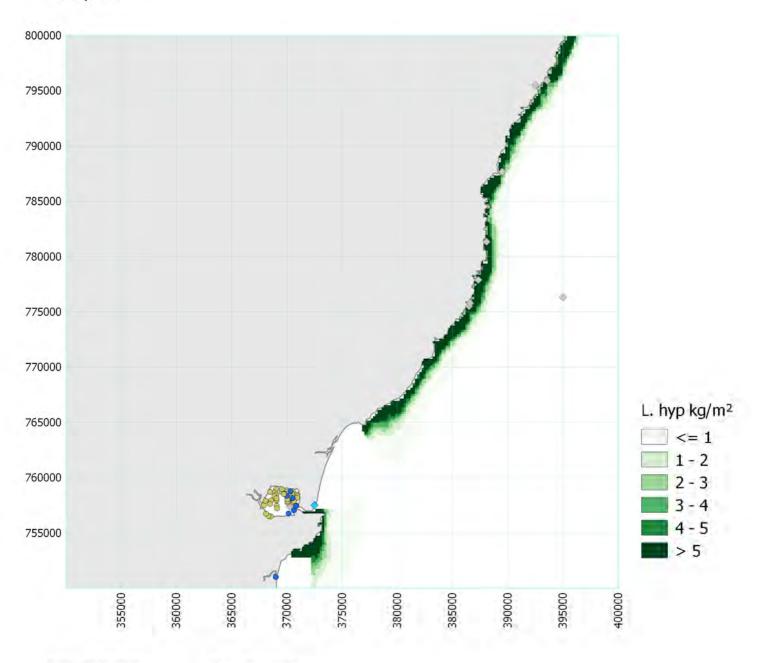


MPA

SAC

- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Serpulid aggregations
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

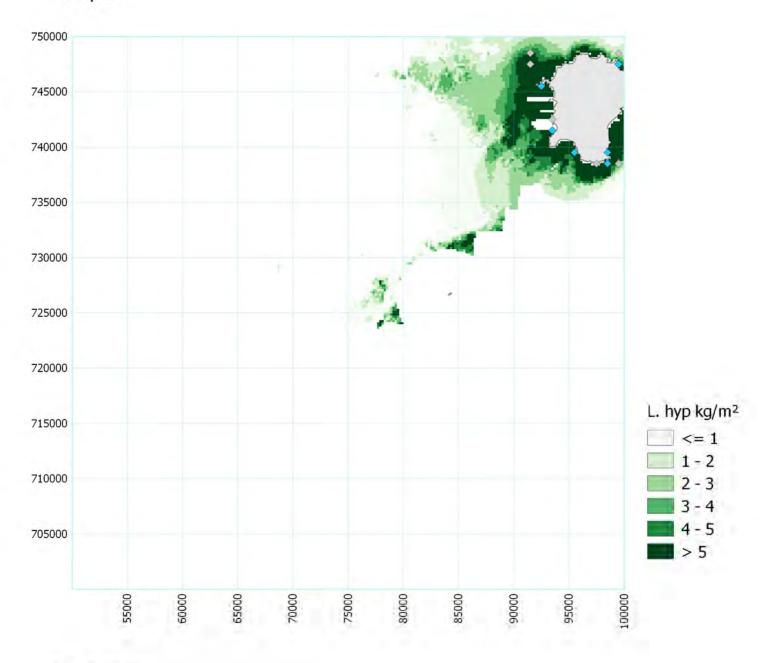
Map 33



PMF biotopes PMF species

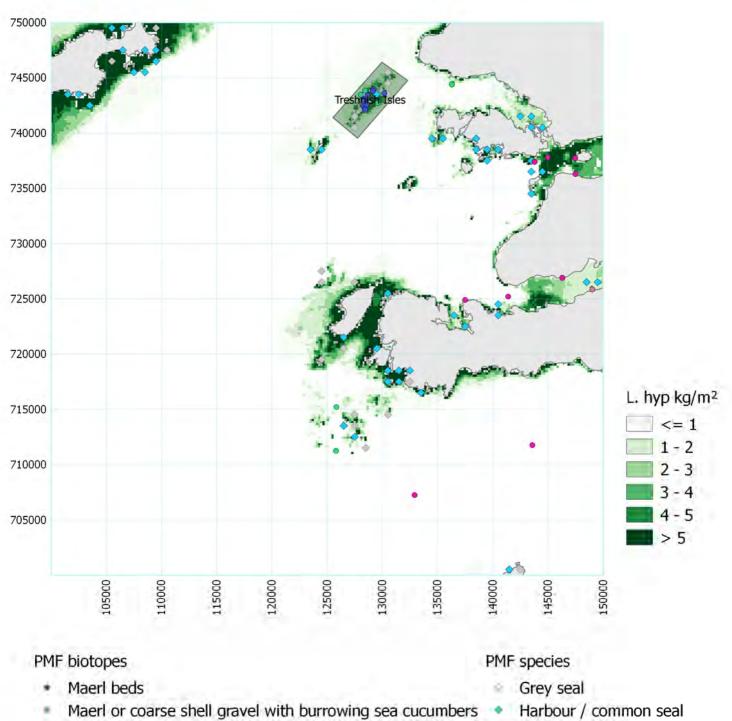
- Blue mussel beds
 Grey seal
- Seagrass beds
 Harbour / common seal

Map 34



Grey seal

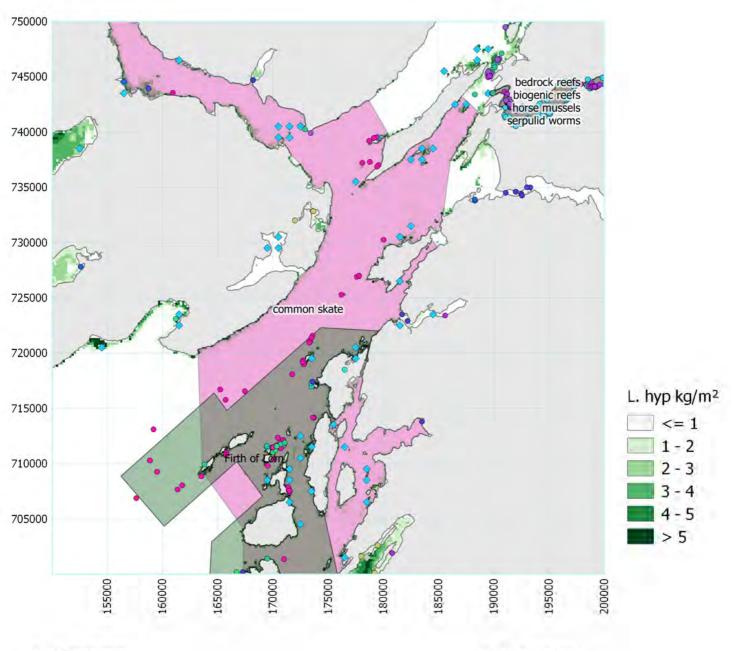
Map 35



SAC

- Native oysters
 - Northern sea fan and sponge communities
 - Seagrass beds
 - Tide-swept algal communities and Kelp beds

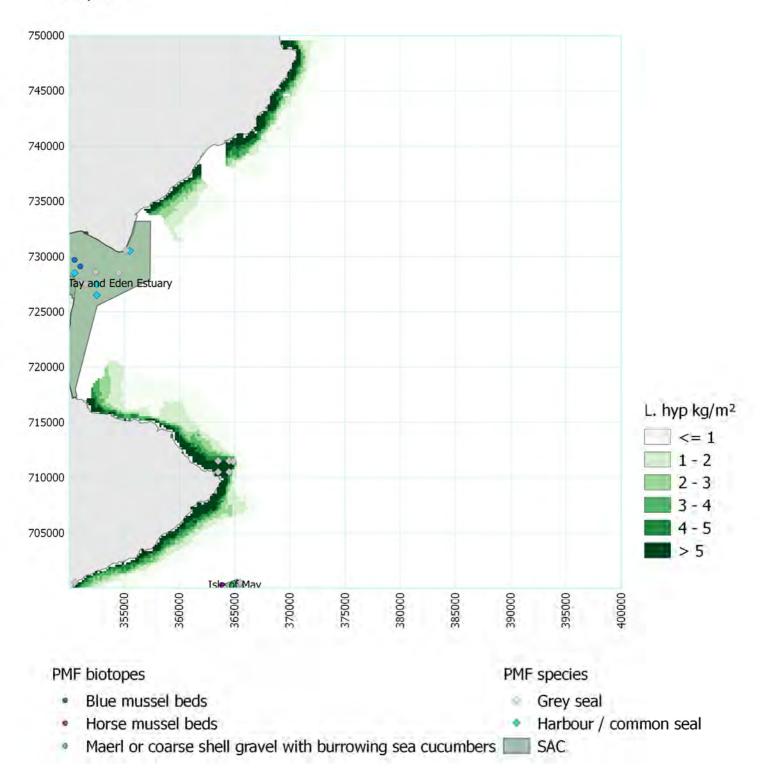
Map 36



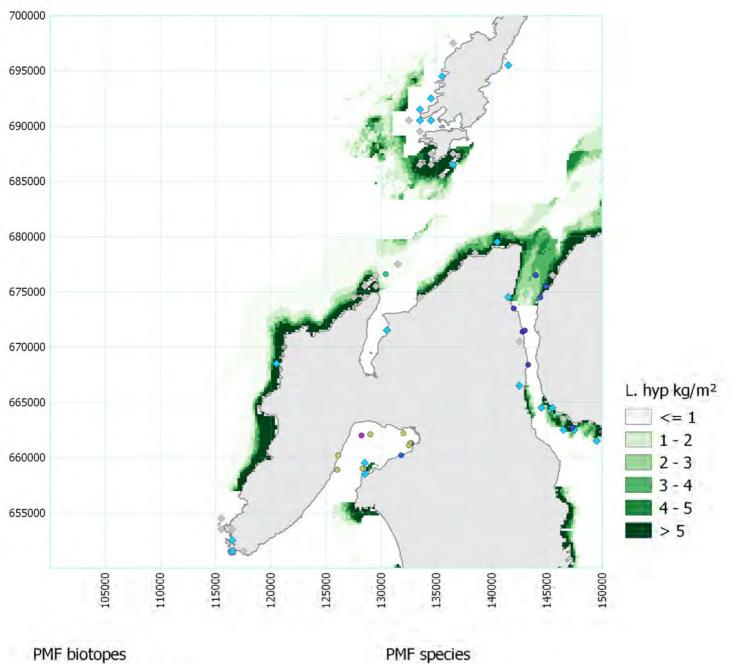
- Blue mussel beds
- Blue mussel beds & Low or variable salinity habitats
- Flame shell beds
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Serpulid aggregations
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

- **PMF** species
 - Grey seal
- Harbour / common seal
- MPA SAC

Map 37



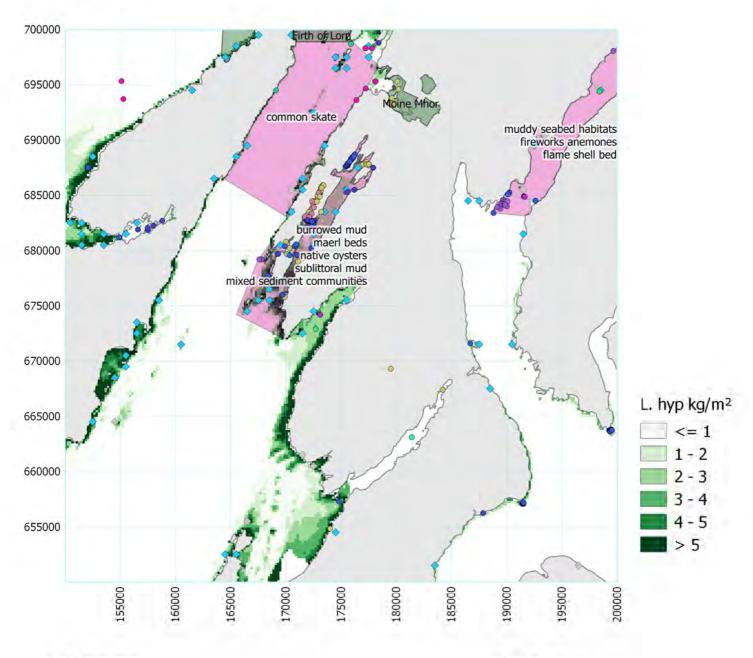
Map 38



Grey seal

- Blue mussel beds
- Horse mussel beds
- Maerl beds
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

Map 39



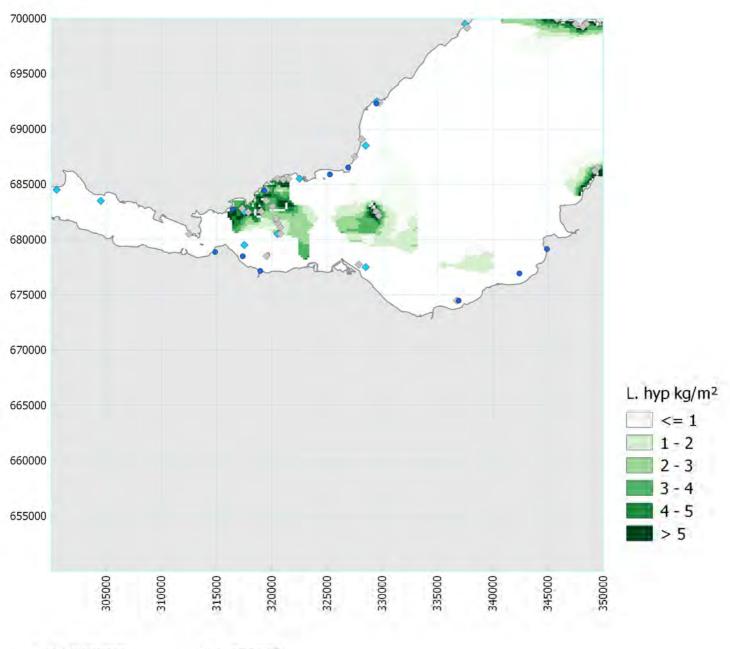
- Blue mussel beds
- Blue mussel beds & Low or variable salinity habitats
- Flame shell beds
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Native oysters
- Northern sea fan and sponge communities
- Seagrass beds
- Serpulid aggregations
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

PMF species

- Grey seal
- Harbour / common seal
- MPA

SAC

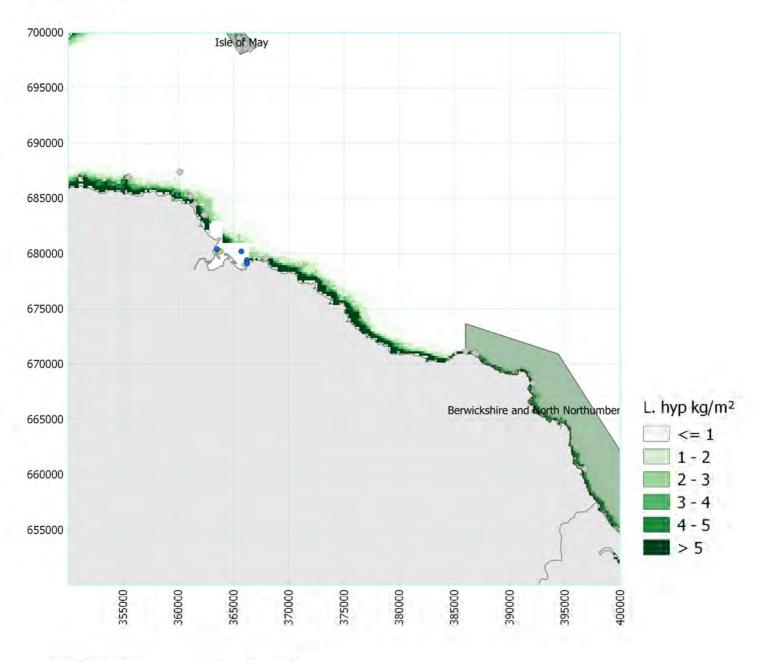




PMF biotopes PMF species

Blue mussel beds Grey seal

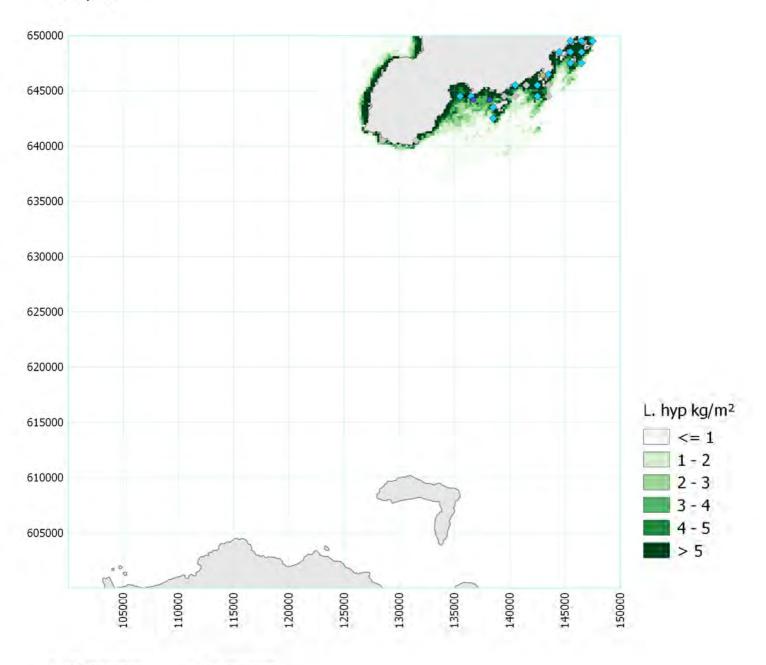
Map 41



PMF biotopes PMF species

- Blue mussel beds
 Grey seal
- Seagrass beds SAC

Map 42

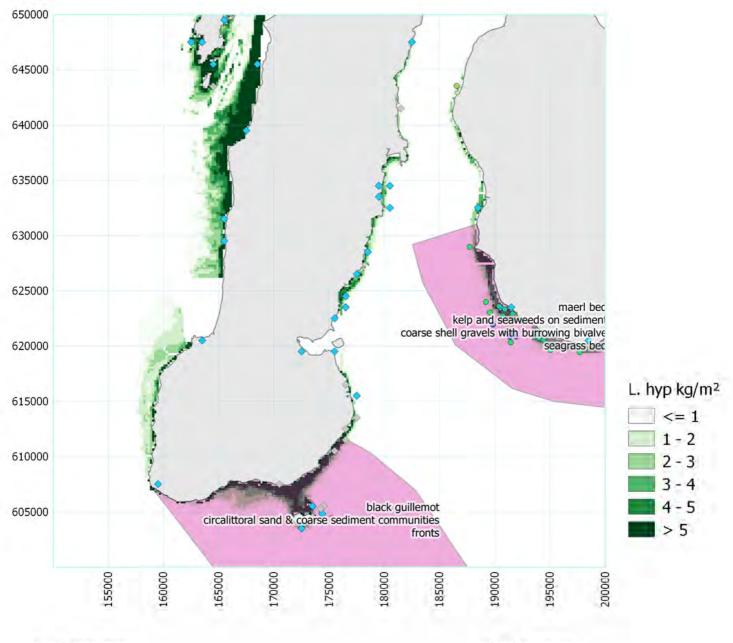


PMF biotopes PMF species

Maerl beds
 Grey seal

us Grey sear

Seagrass beds * Harbour / common seal



PMF biotopes

Maerl beds ٠

PMF species

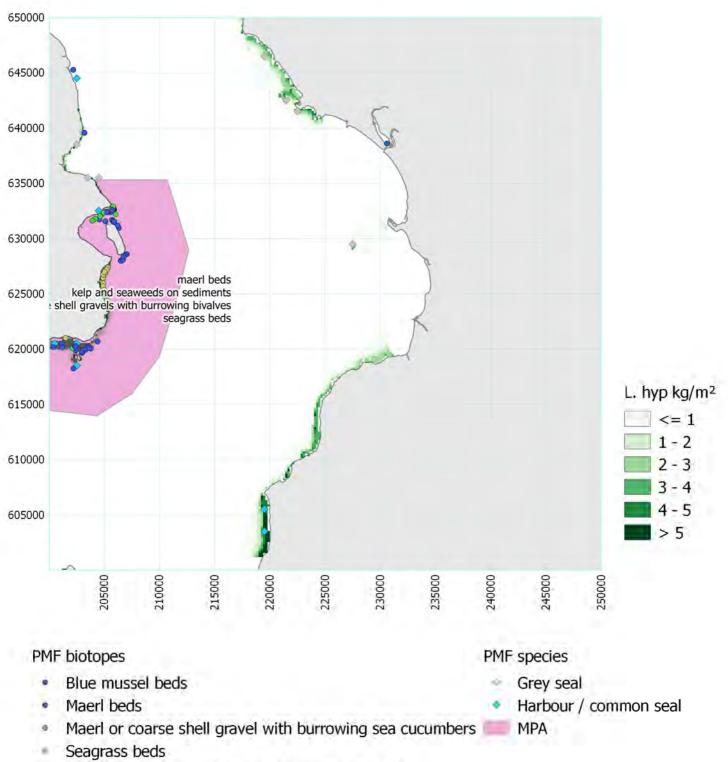
Grey seal ĕ

٠

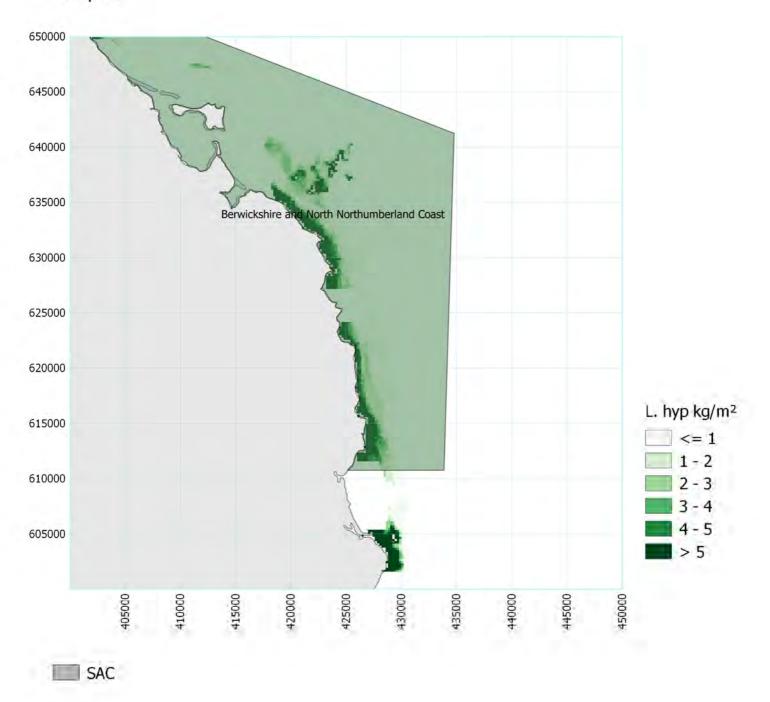
- Maerl or coarse shell gravel with burrowing sea cucumbers ٠
- Seagrass beds 8
- Tide-swept algal communities and Kelp beds ٠

Harbour / common seal MPA

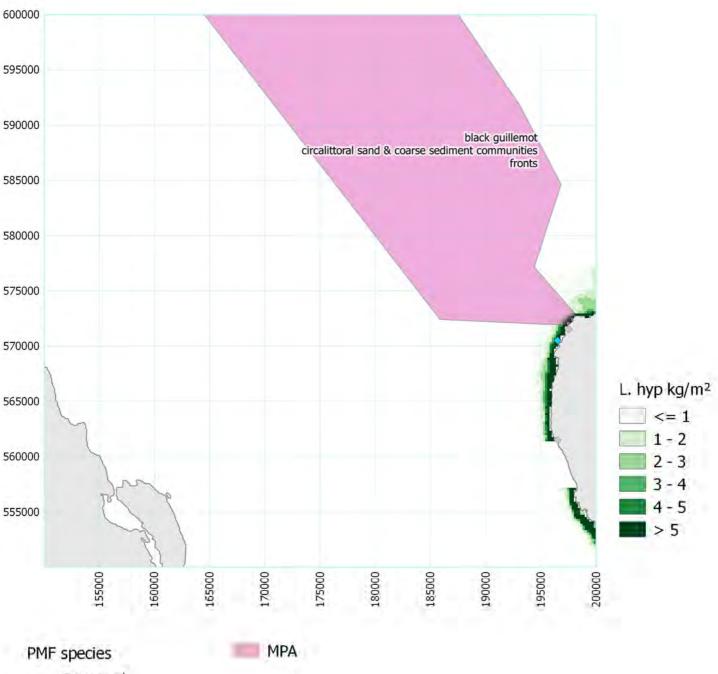
Map 44



Tide-swept coarse sands with burrowing bivalves



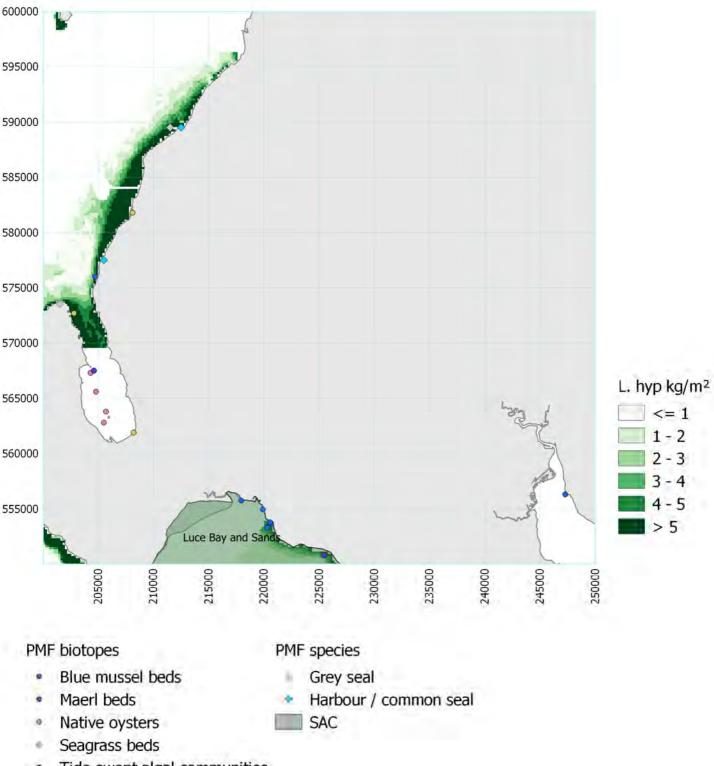
Map 46



Grey seal

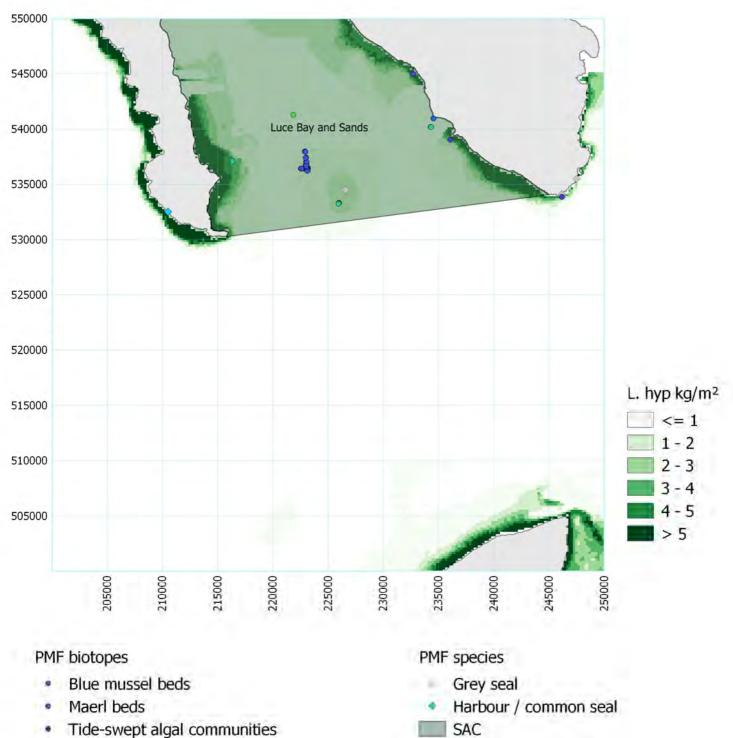
Harbour / common seal

Map 47

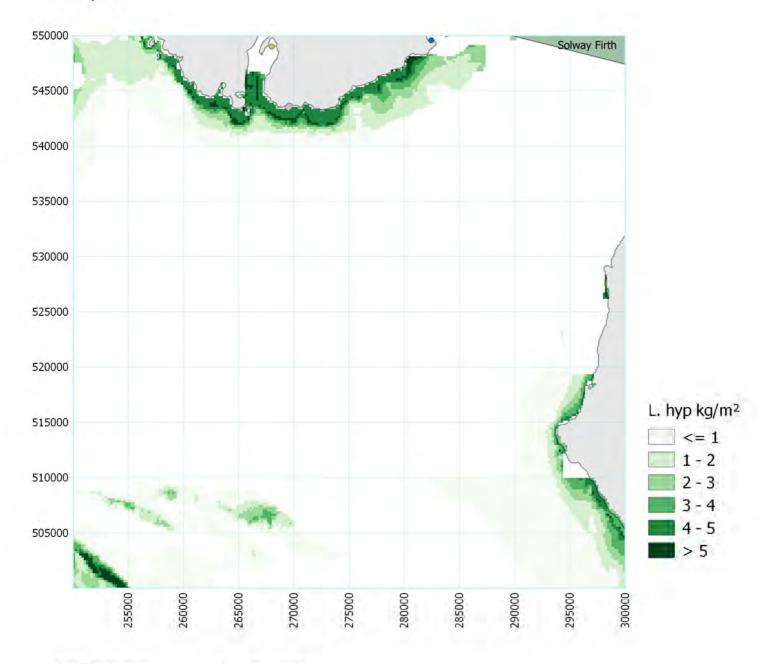


Tide-swept algal communities

Map 48



- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves



PMF biotopes PMF species

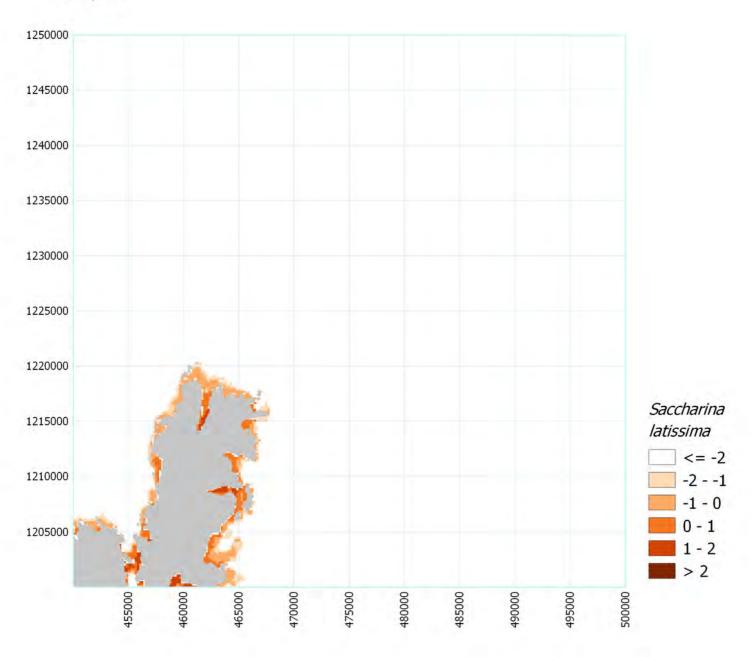
Blue mussel beds Grey seal

Seagrass beds SAC

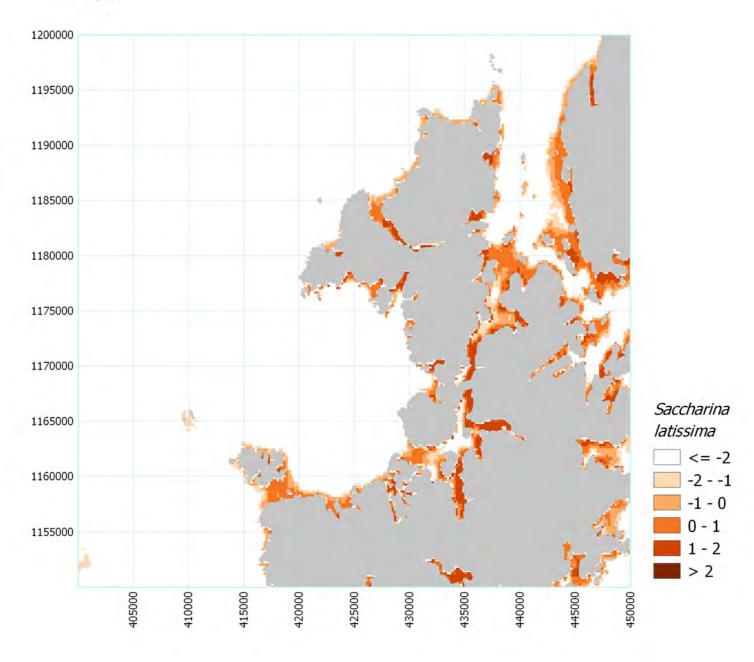
2.2 Saccharina latissima

The following pages show first the habitat suitability for *Saccharina latissima*, followed by maps showing predicted biomass, and finally maps showing the overlap between kelp habitats and Priority Marine Features.

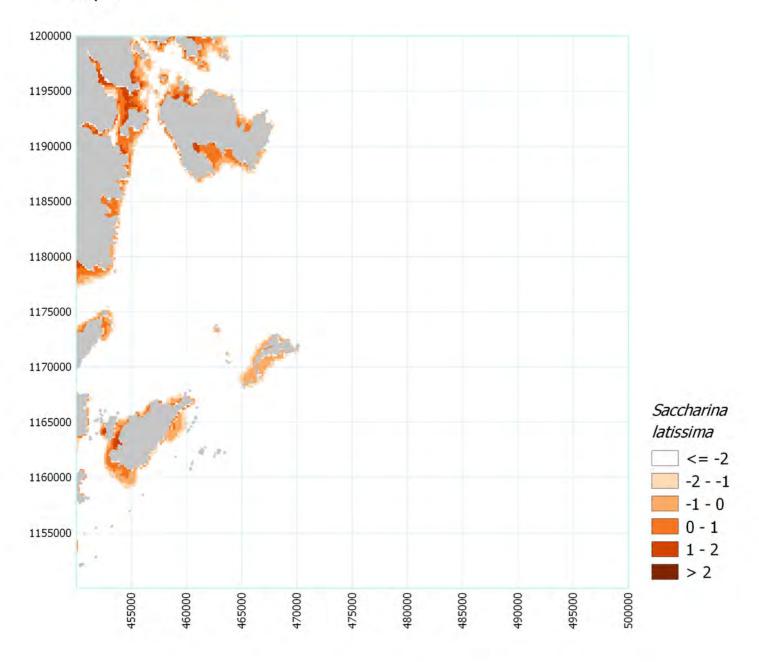




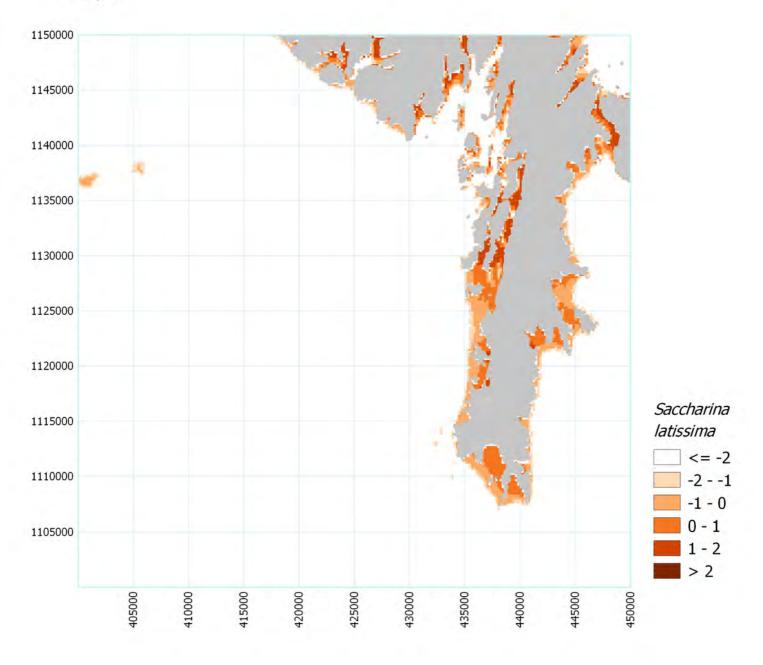




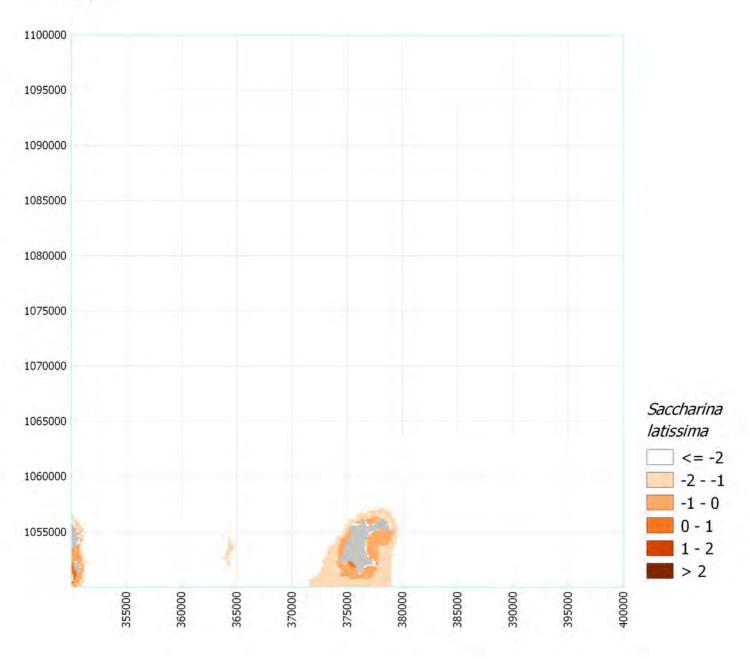




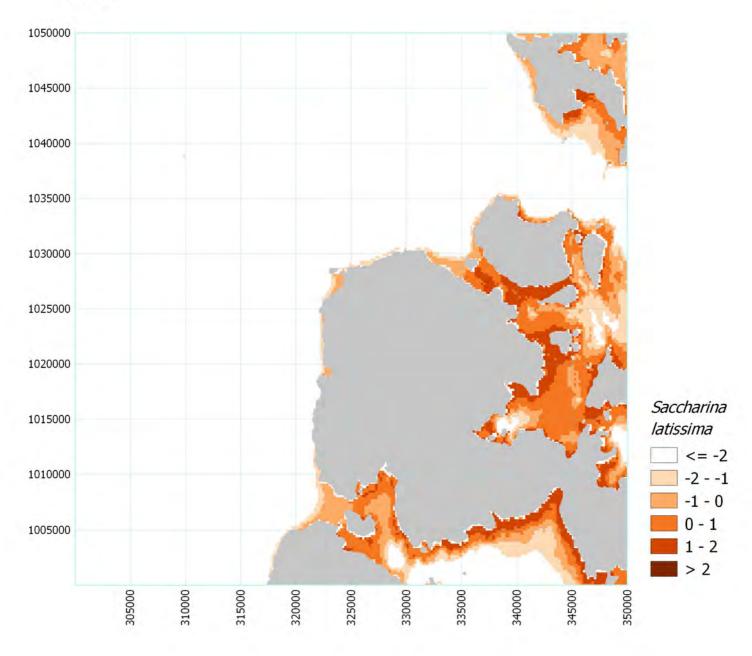




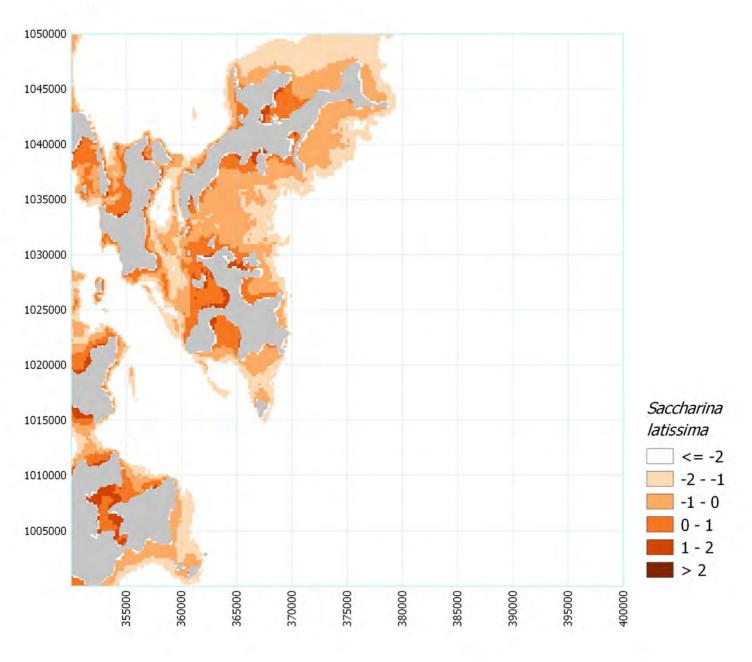
Map 5



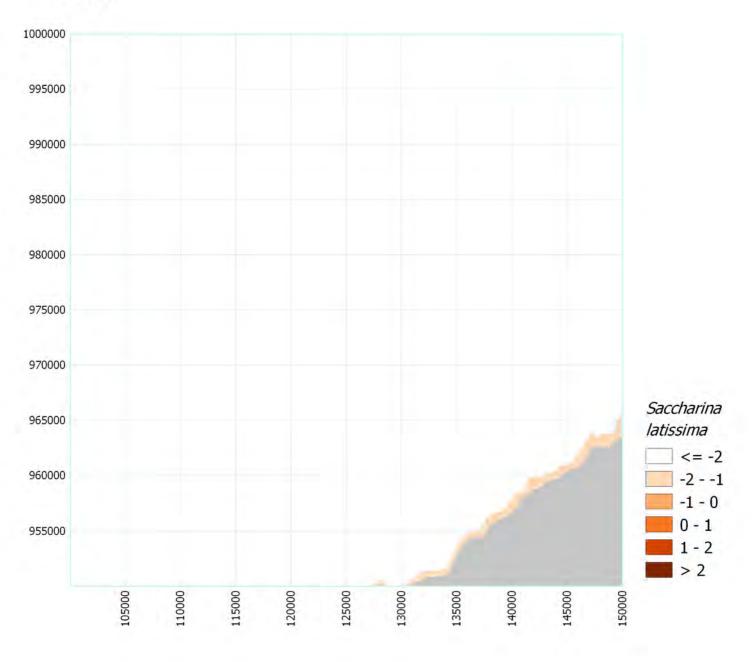




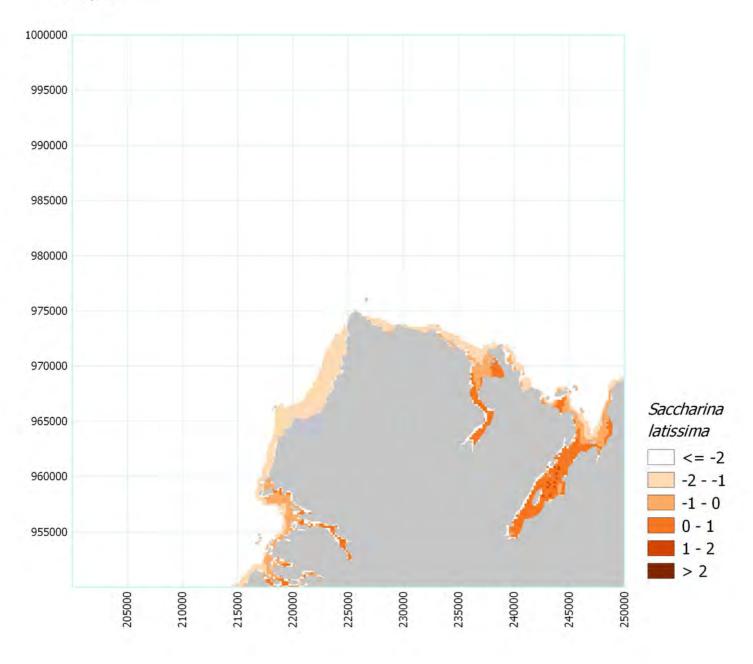




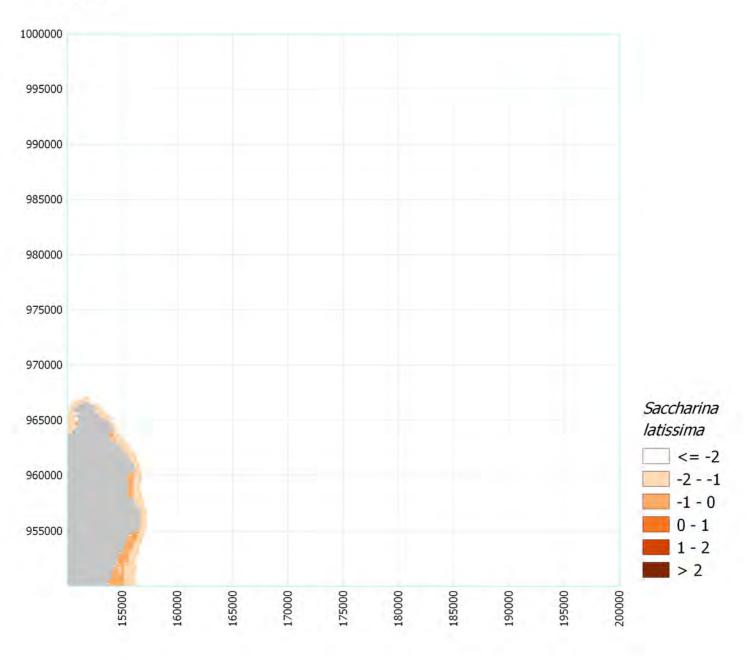




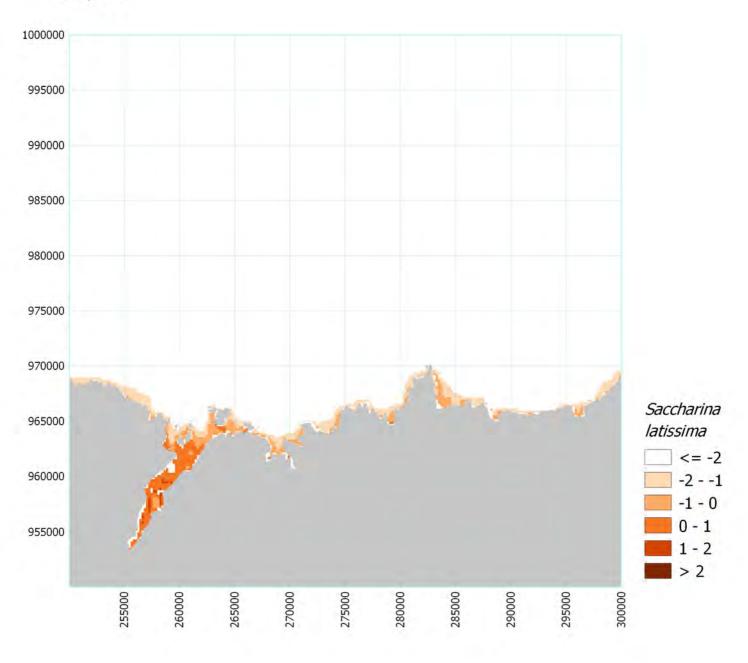
Map 10



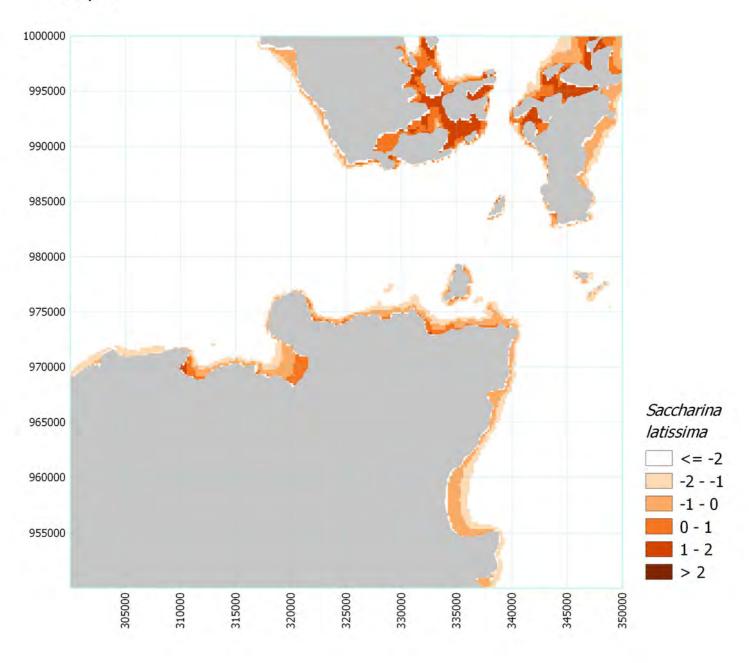




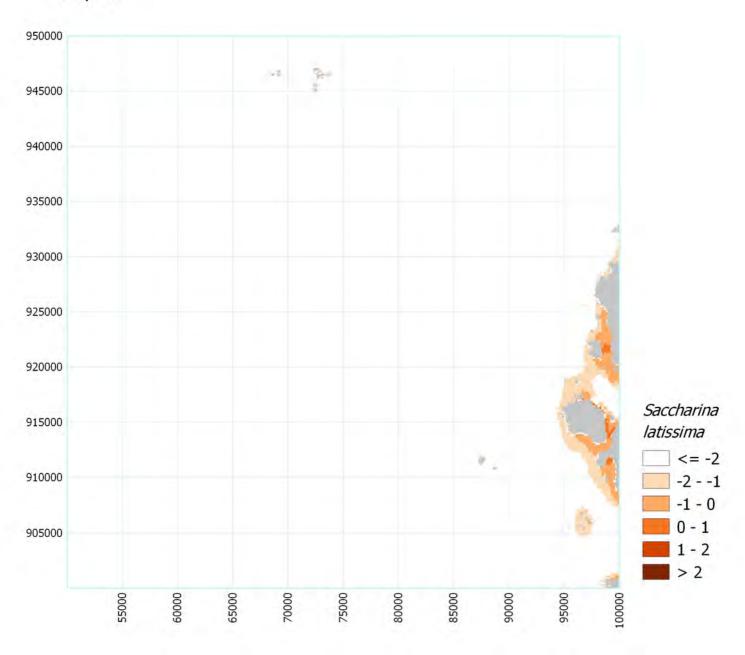




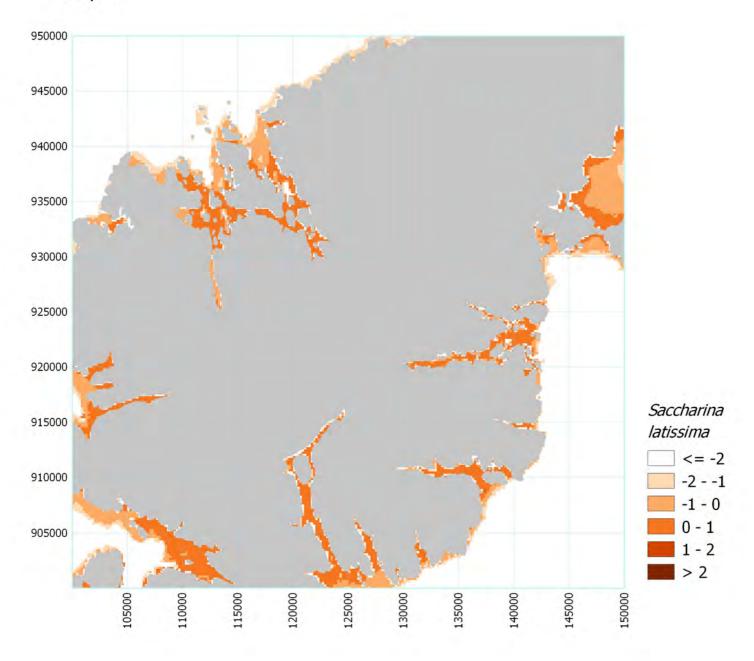
Map 12

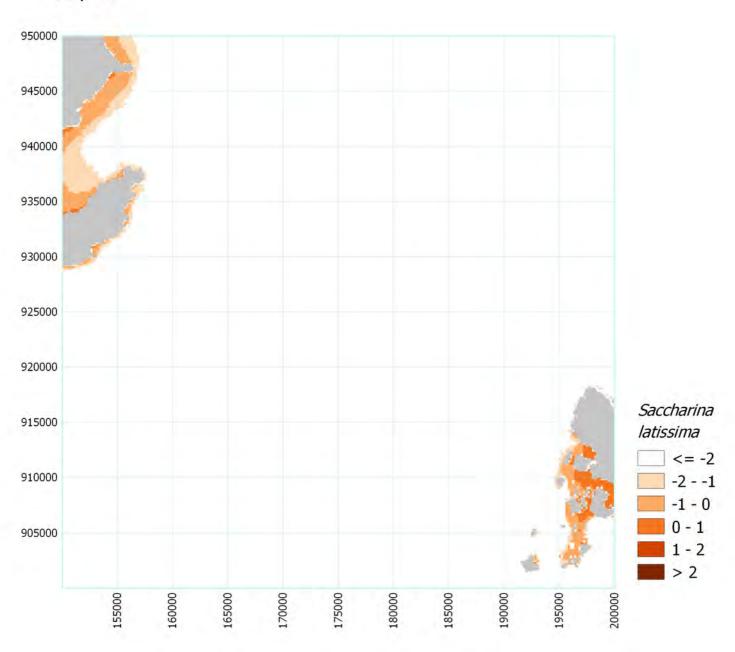


Map 13

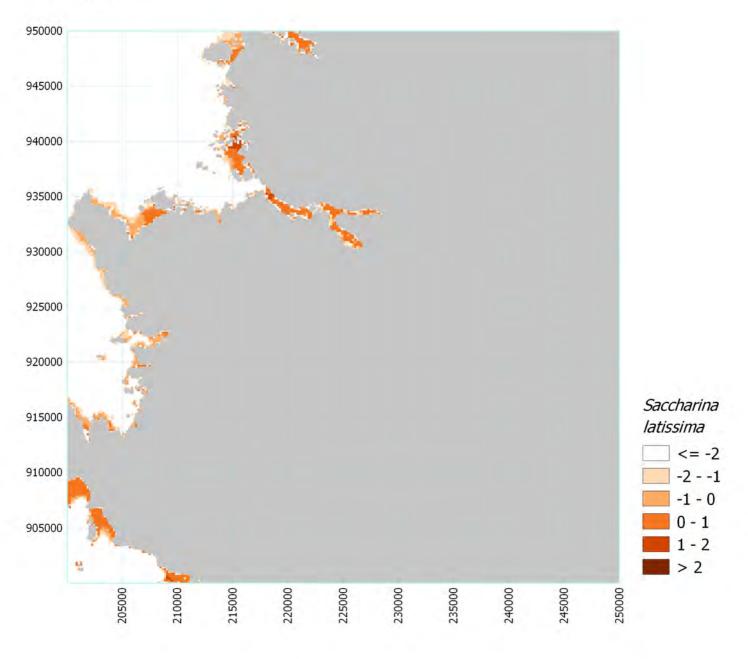


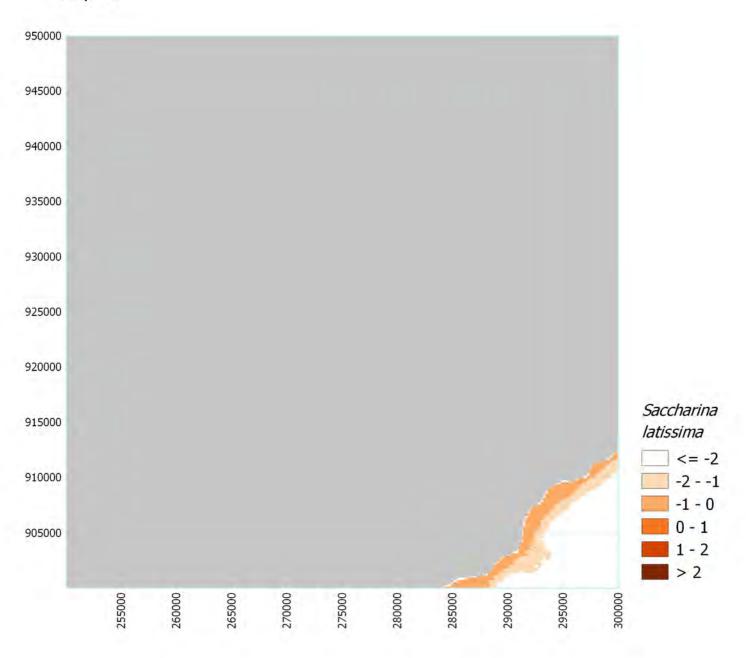
Map 14



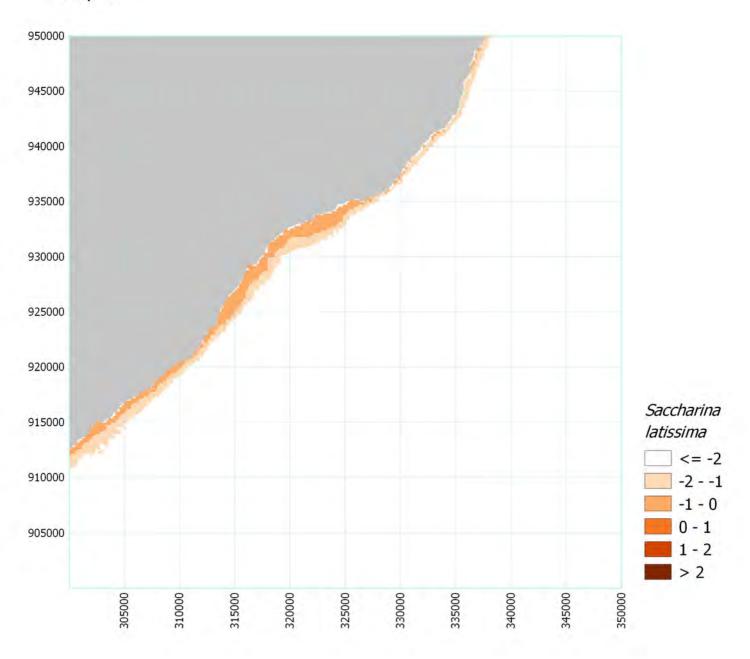


Map 16

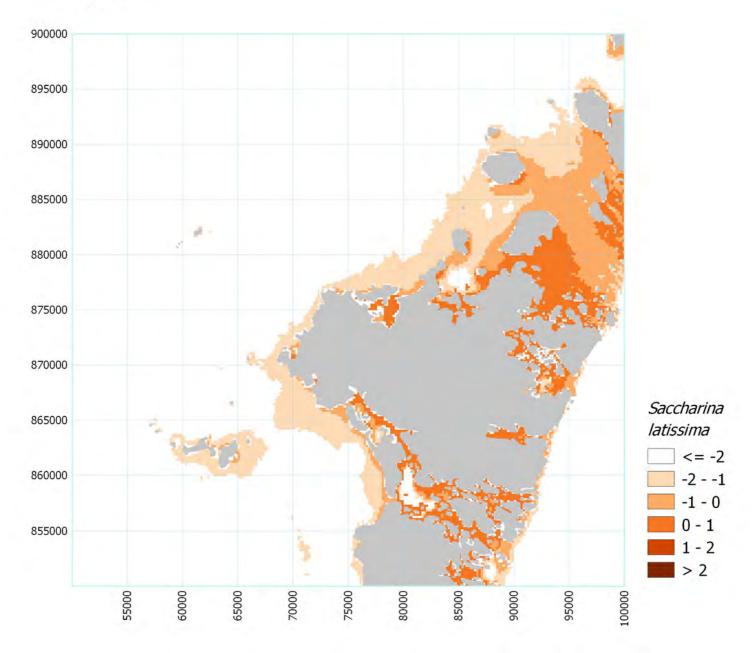




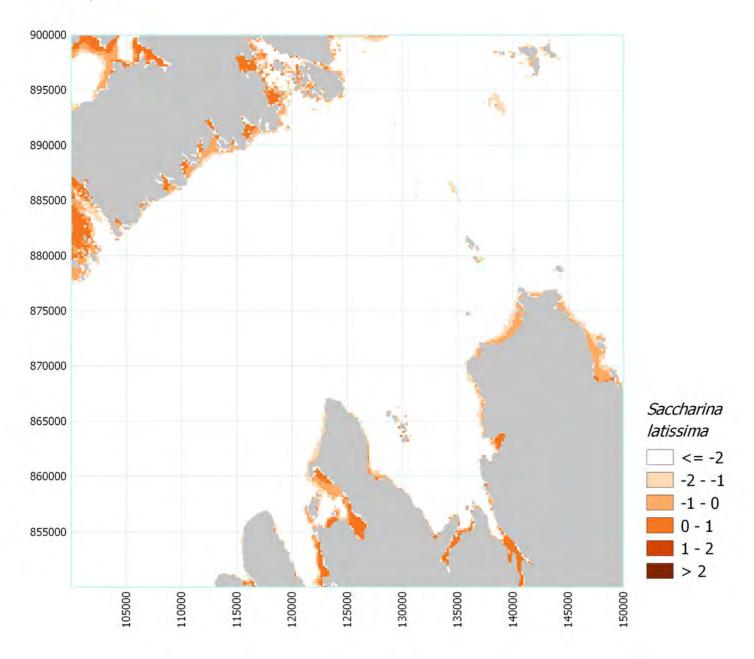




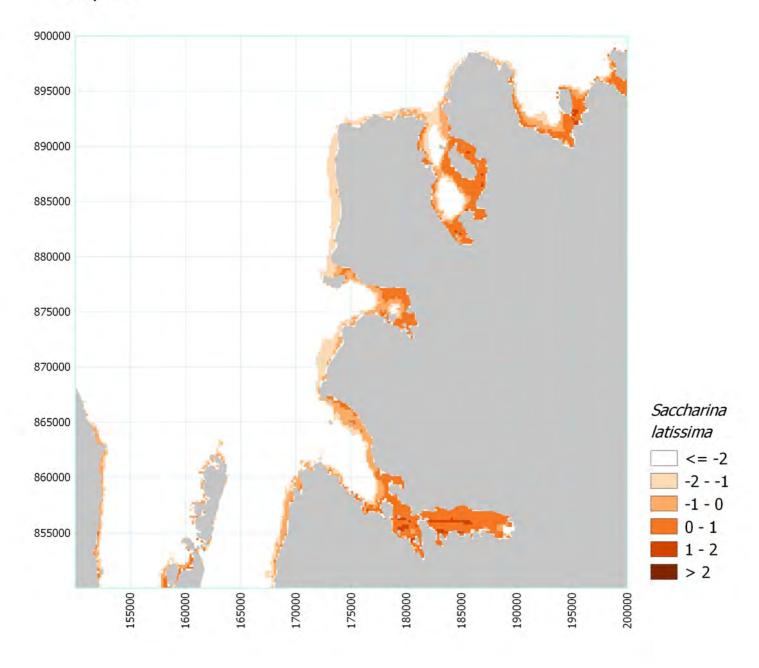




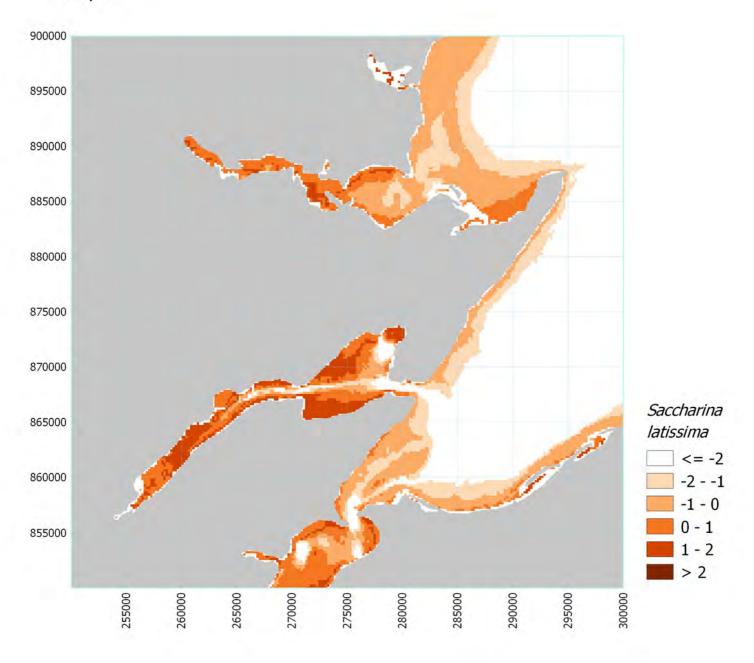
Map 20



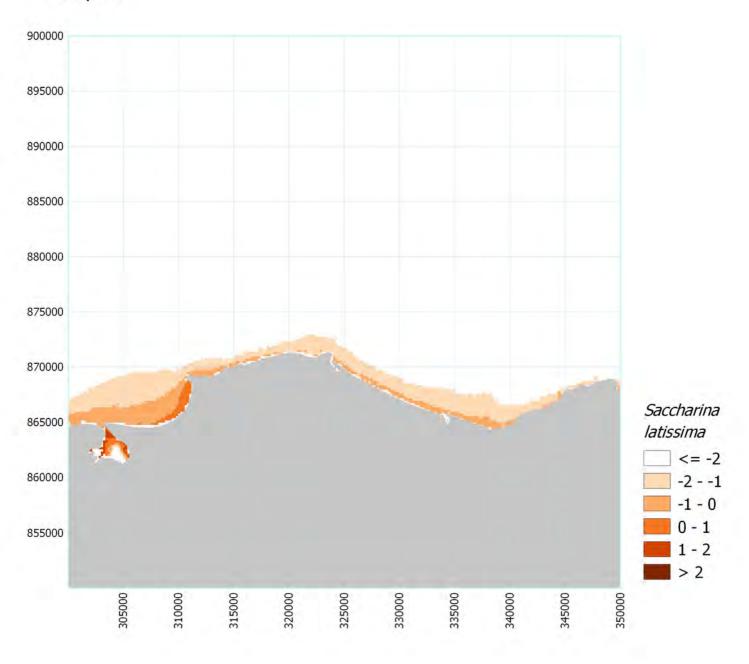
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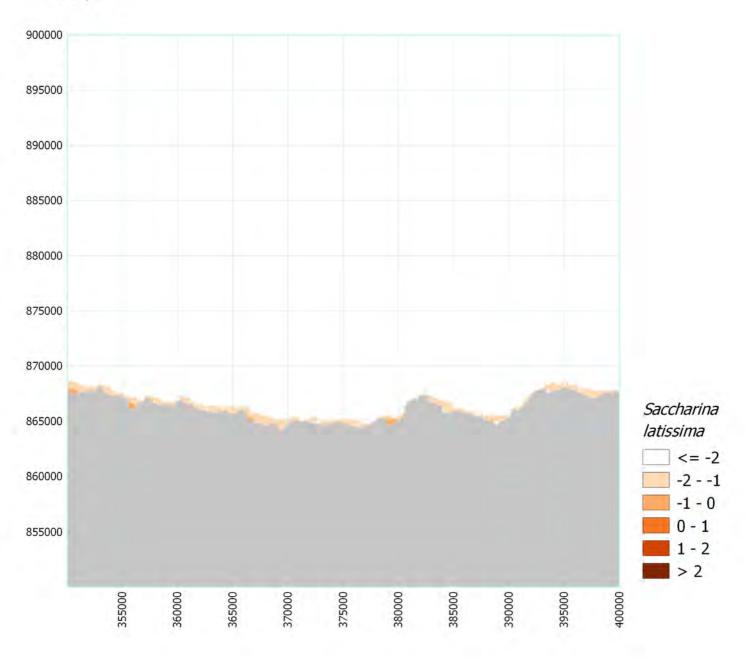
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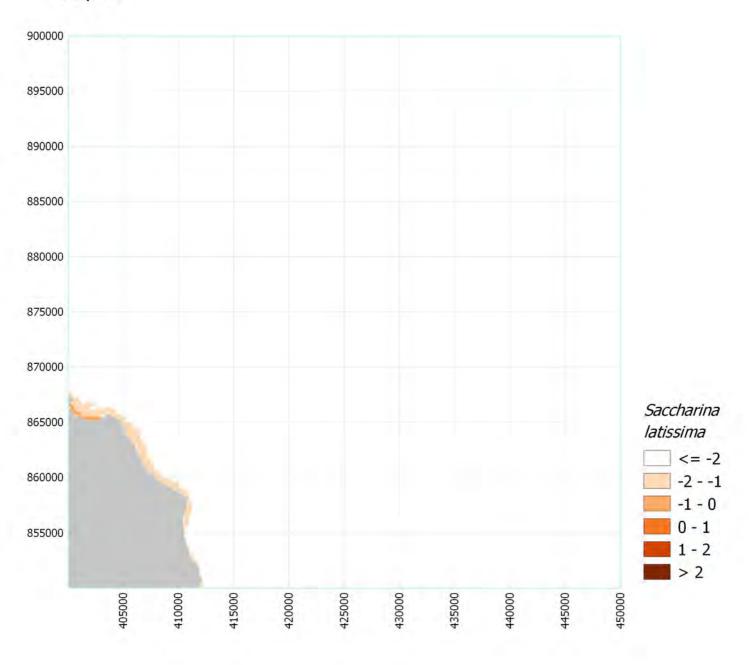
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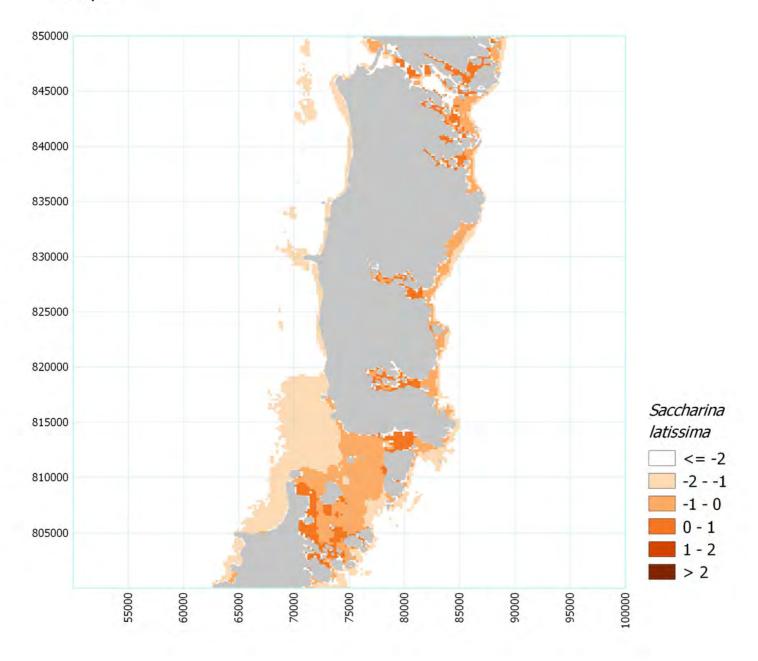
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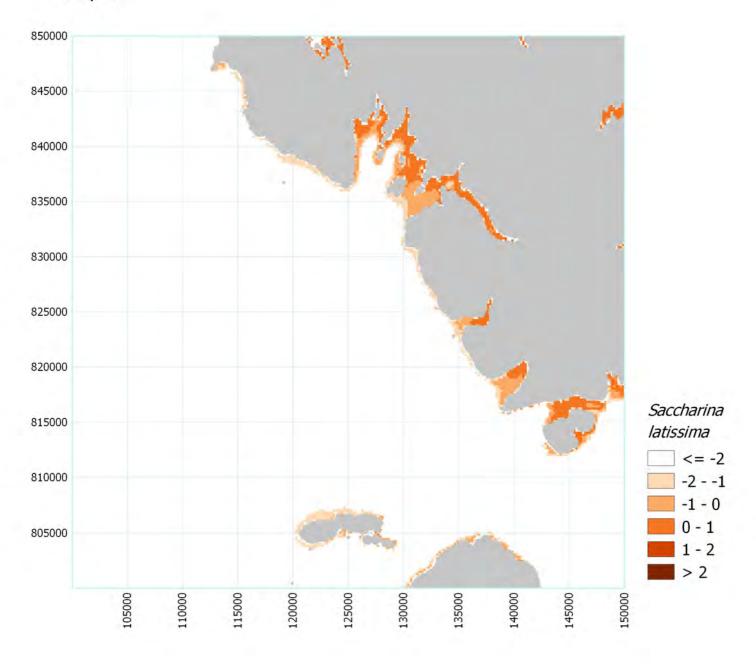
Map 25



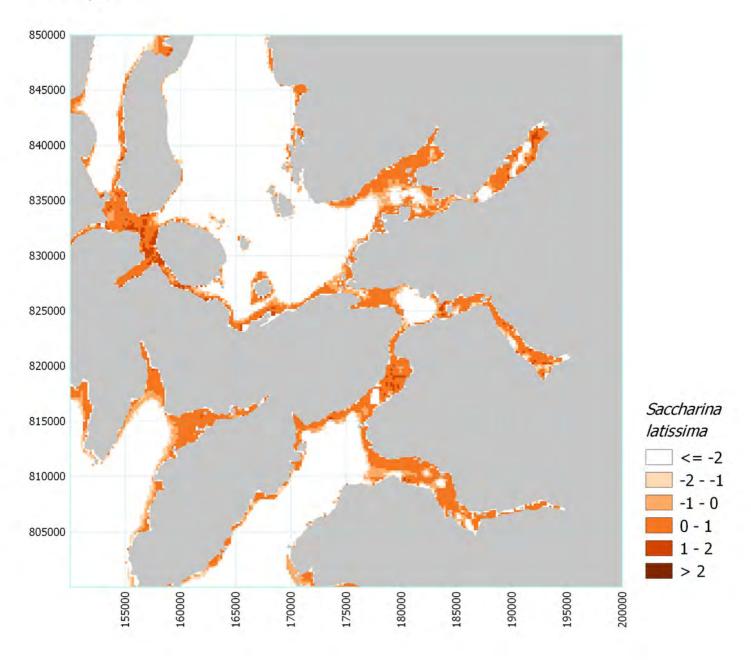
Map 26



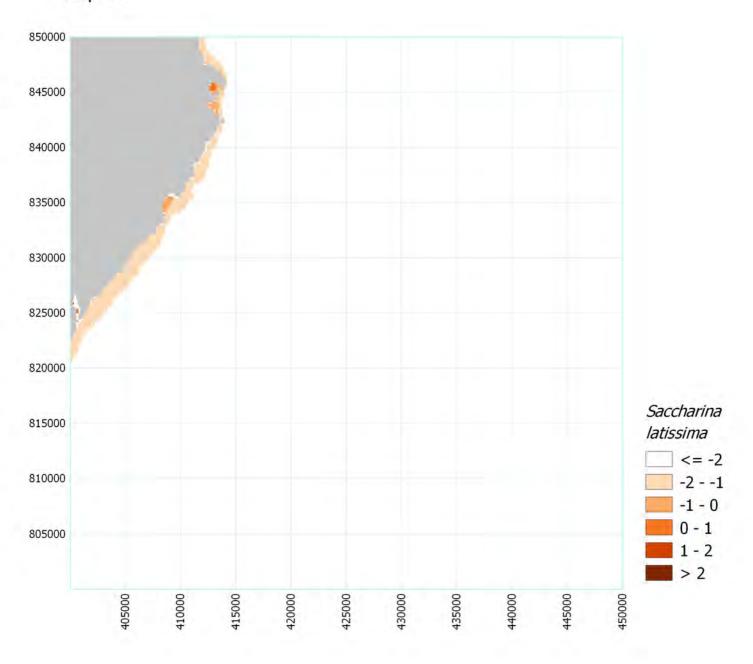
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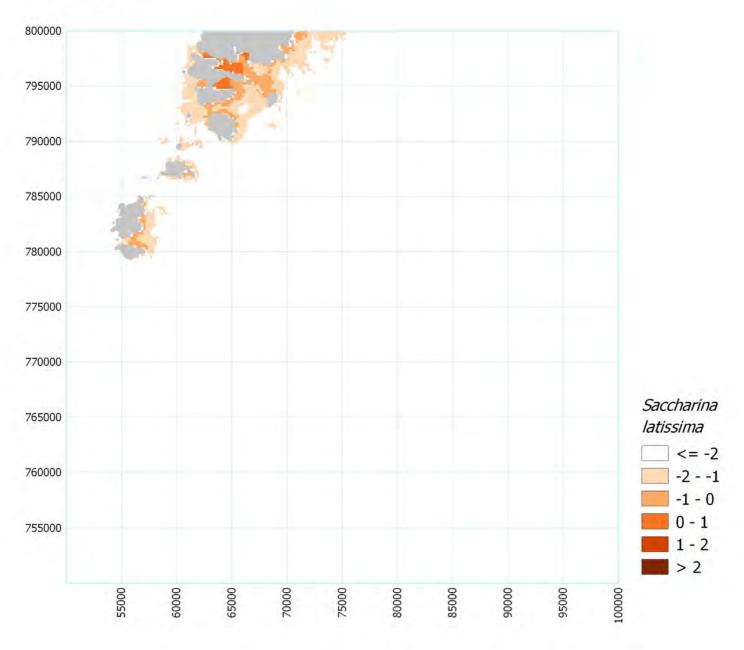




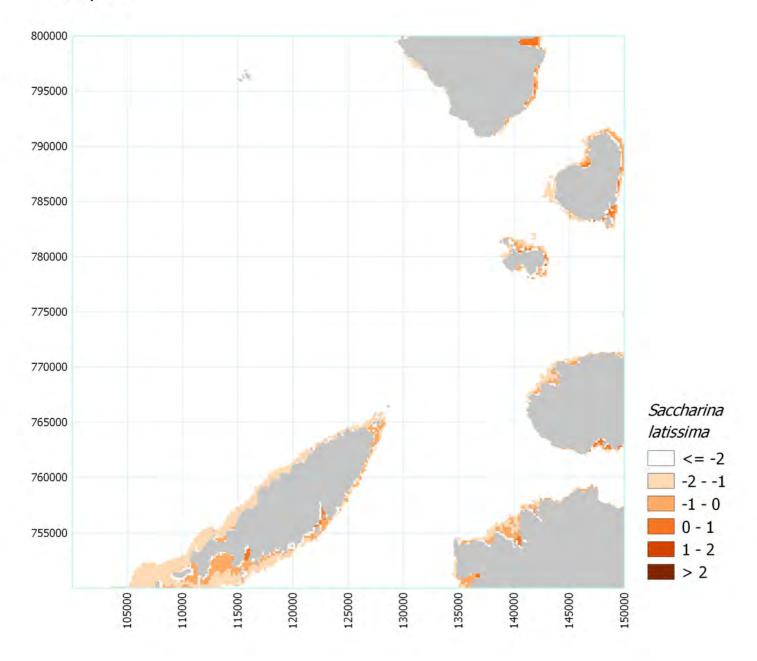
Map 29



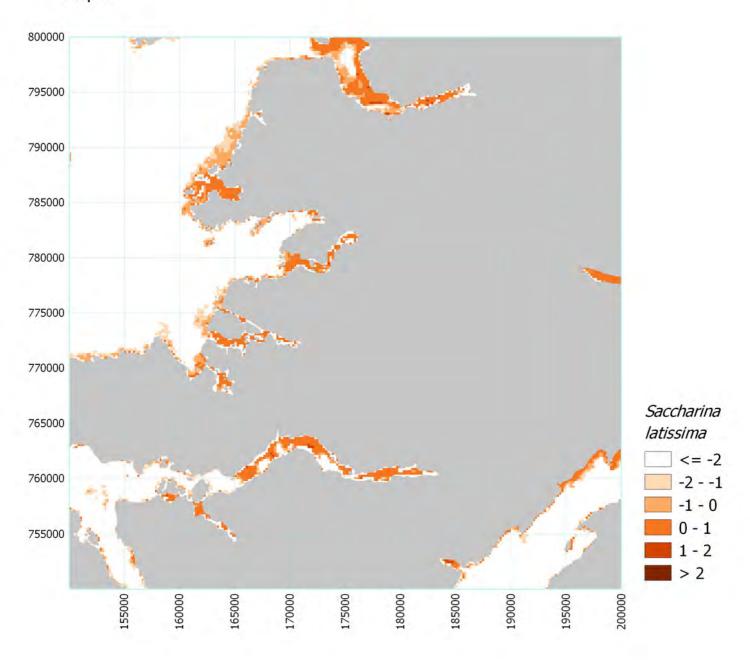
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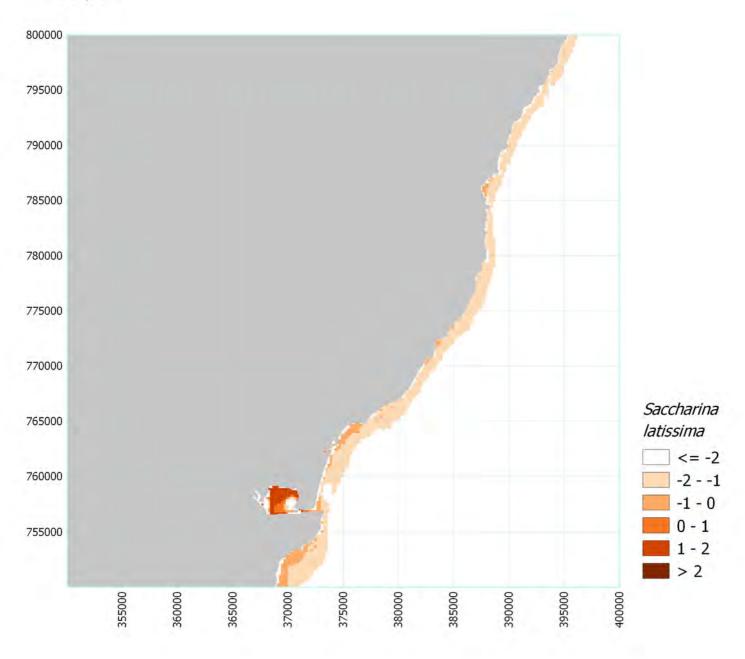
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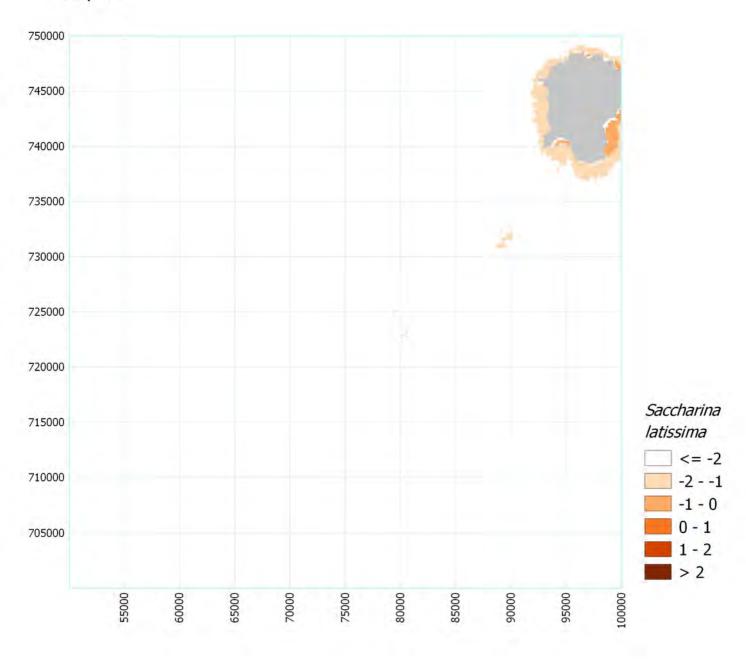
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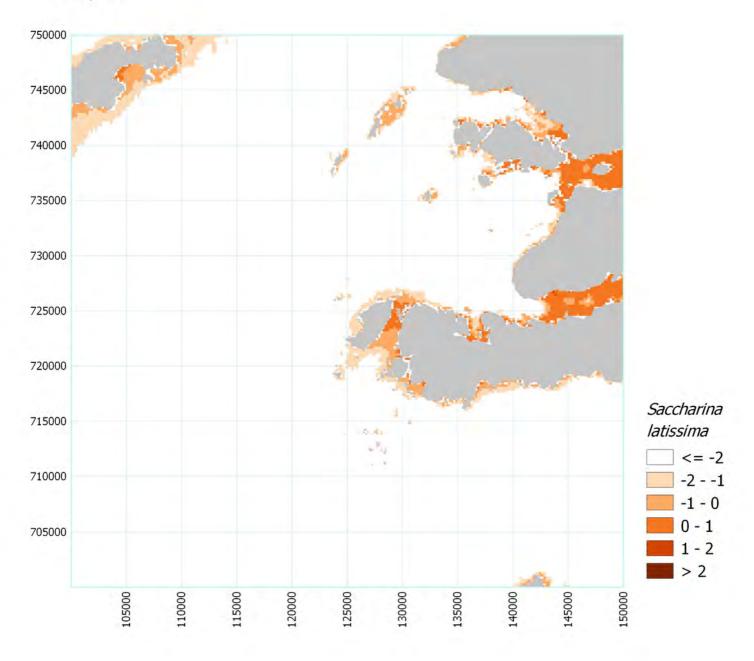




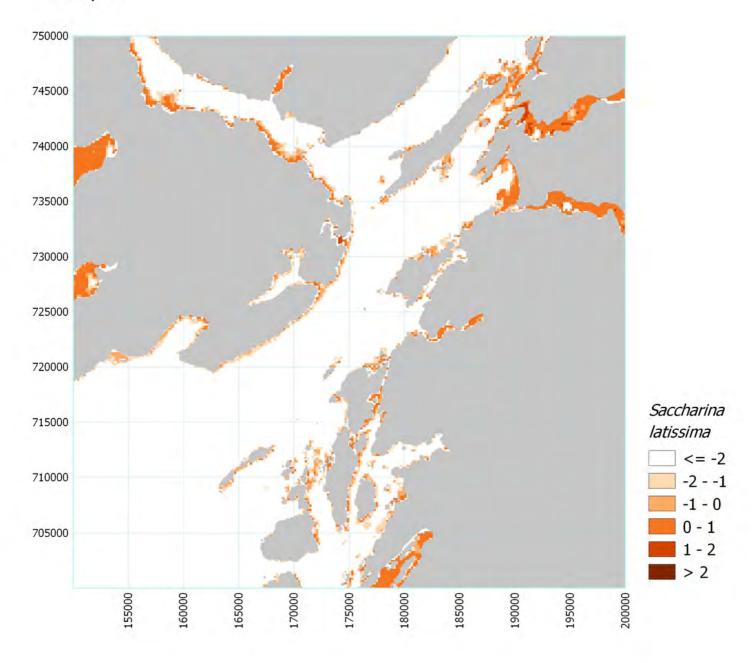
Map 34



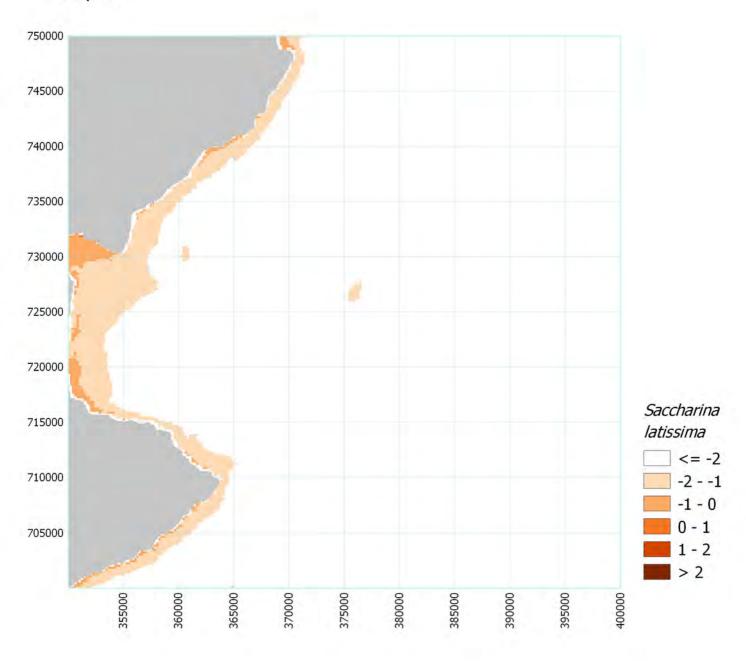




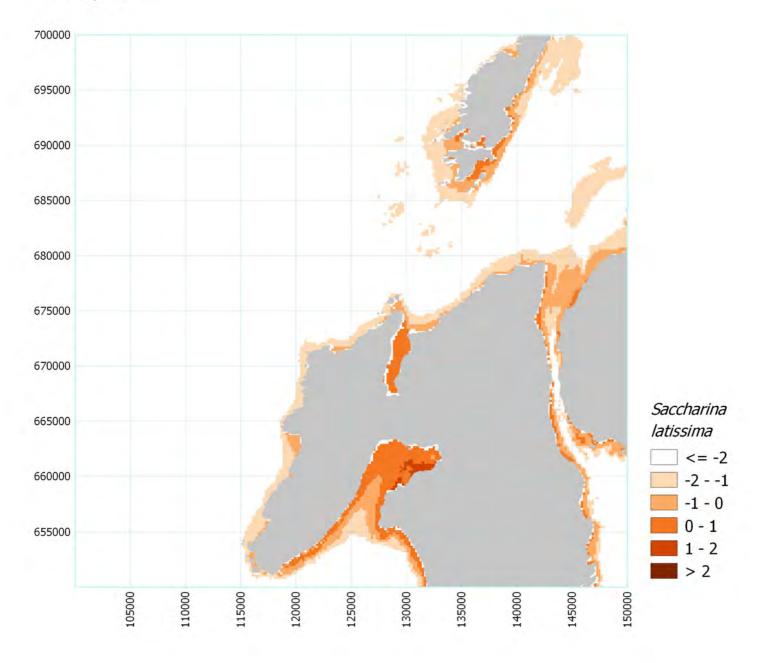




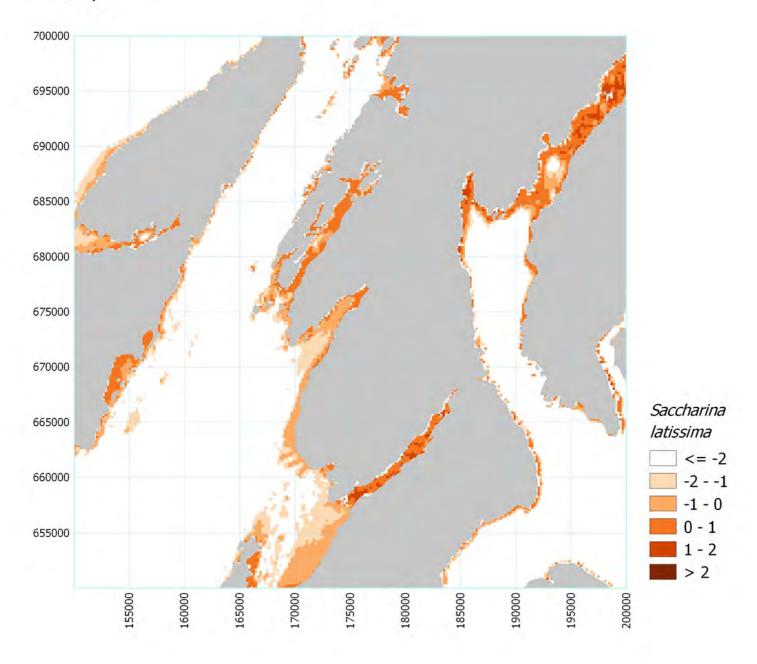
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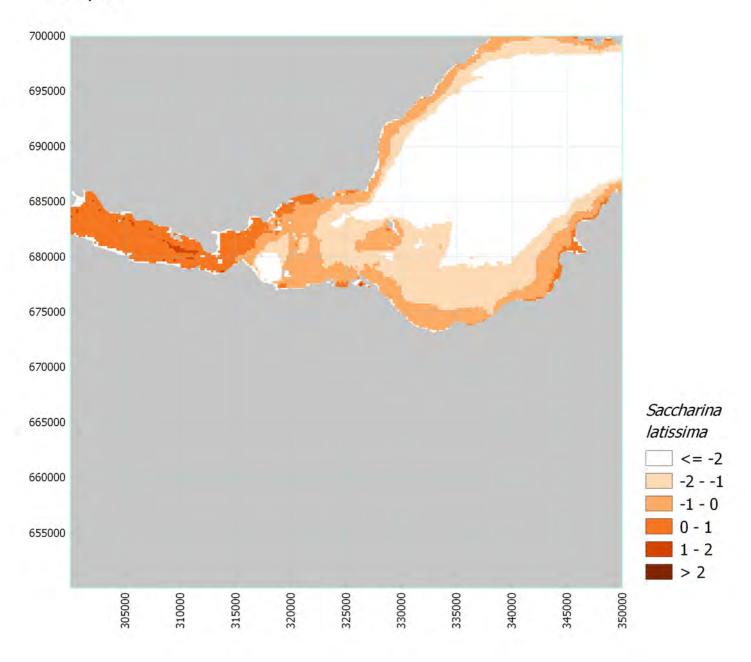




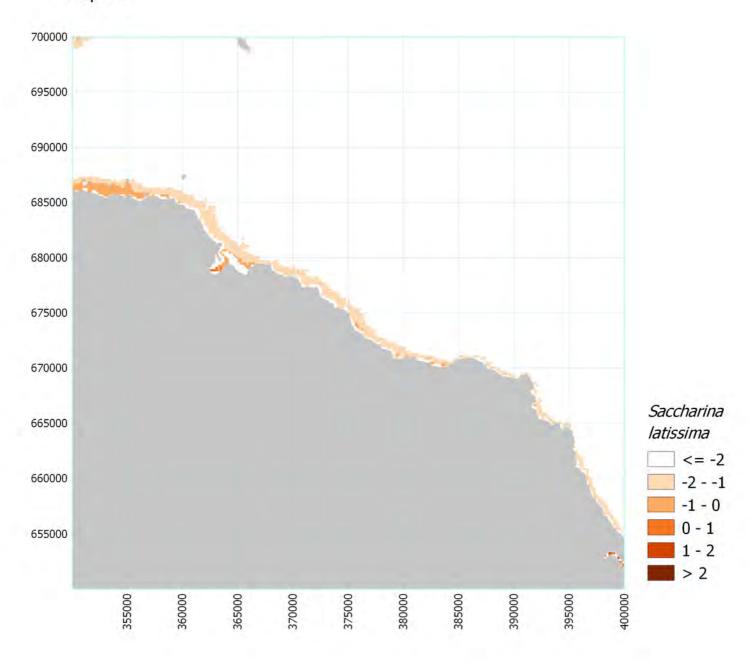
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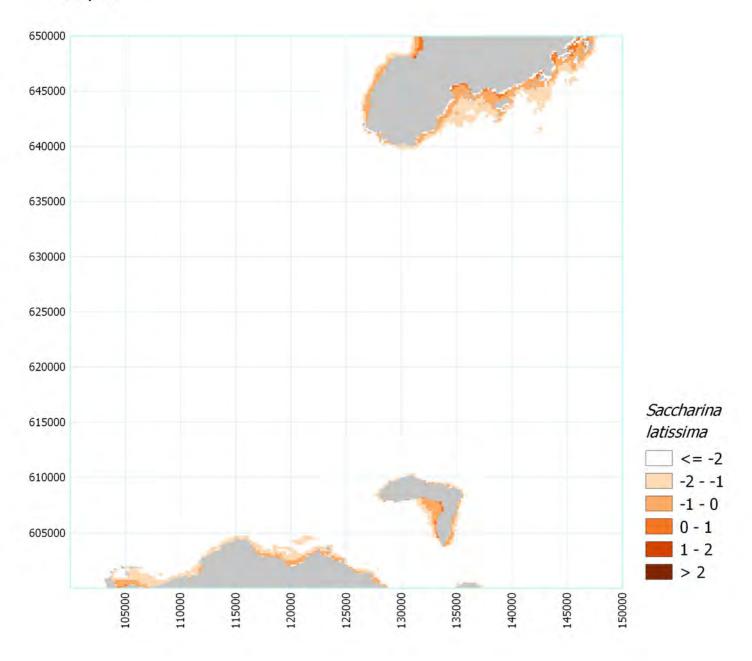




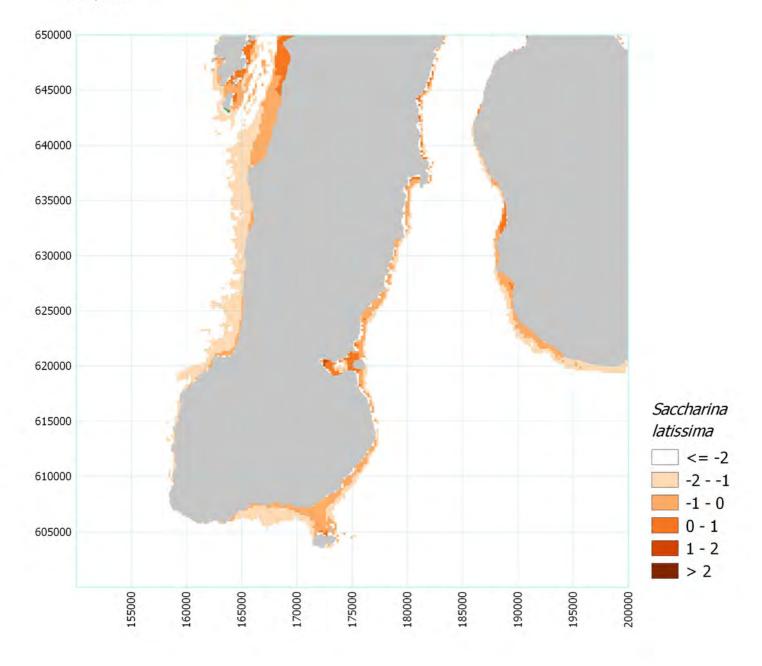
Map 41



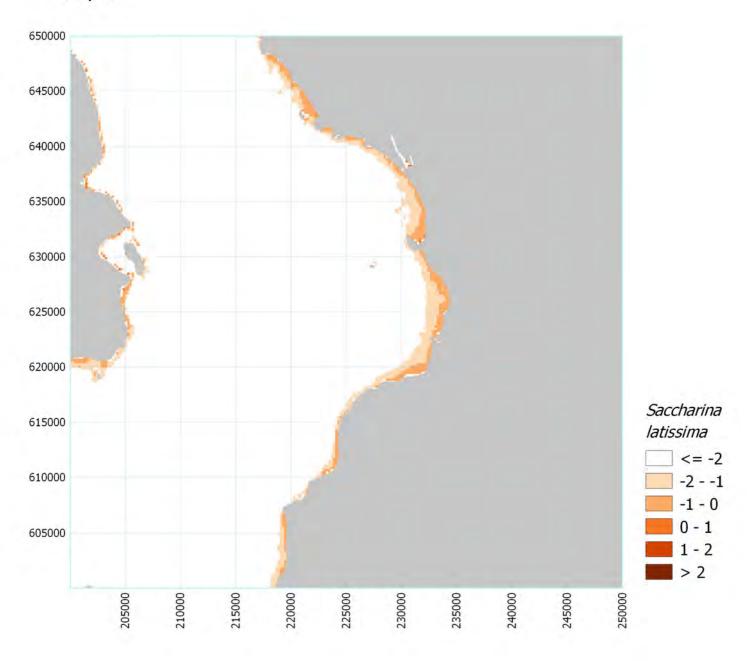
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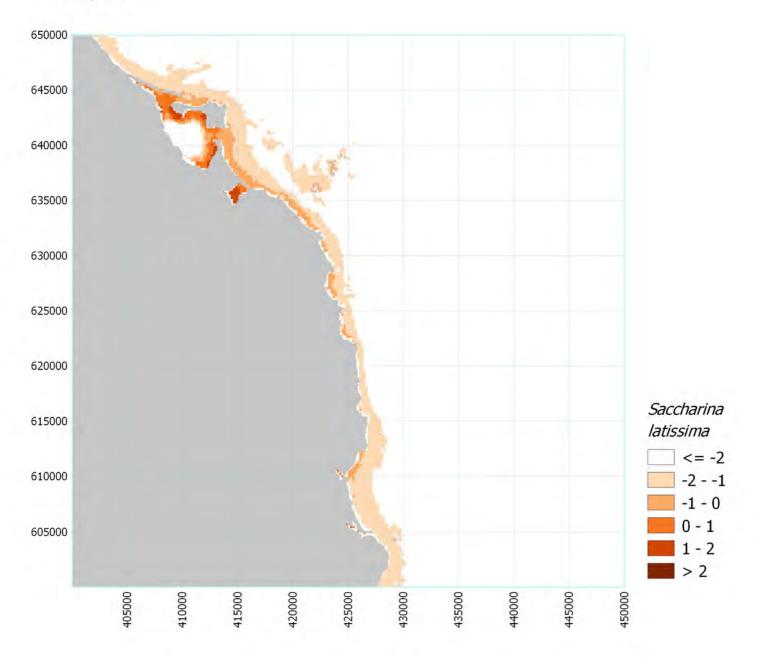
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Map 43
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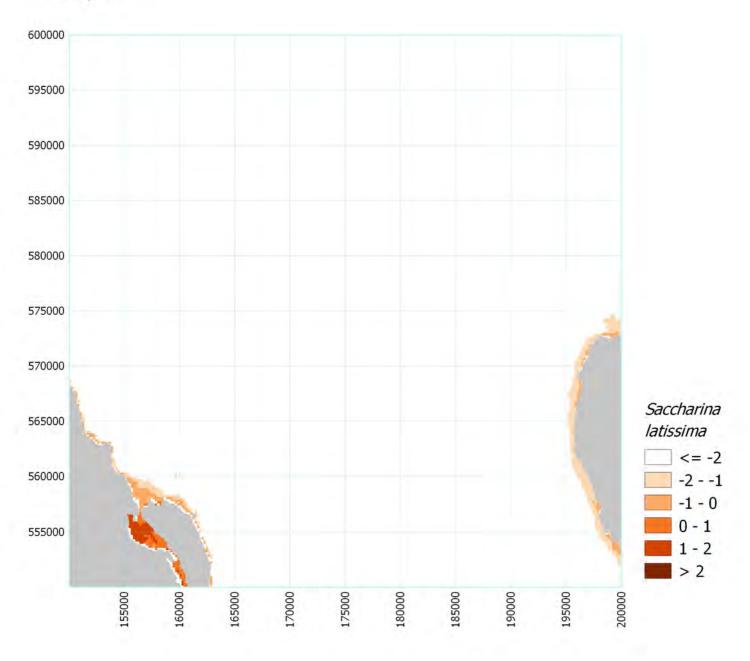




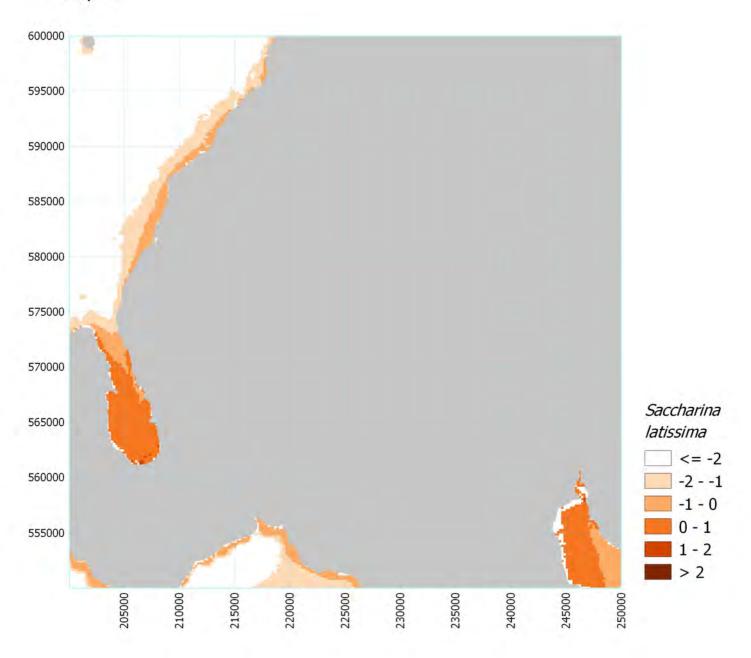




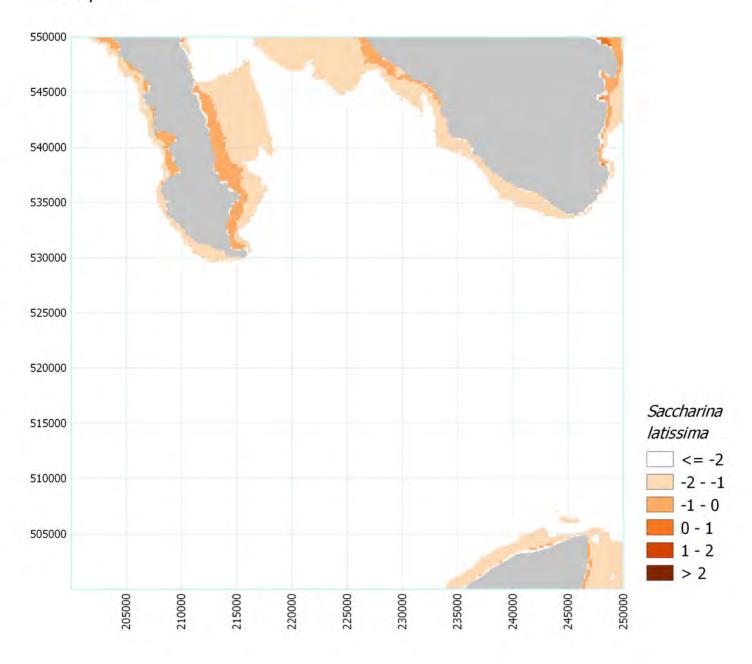
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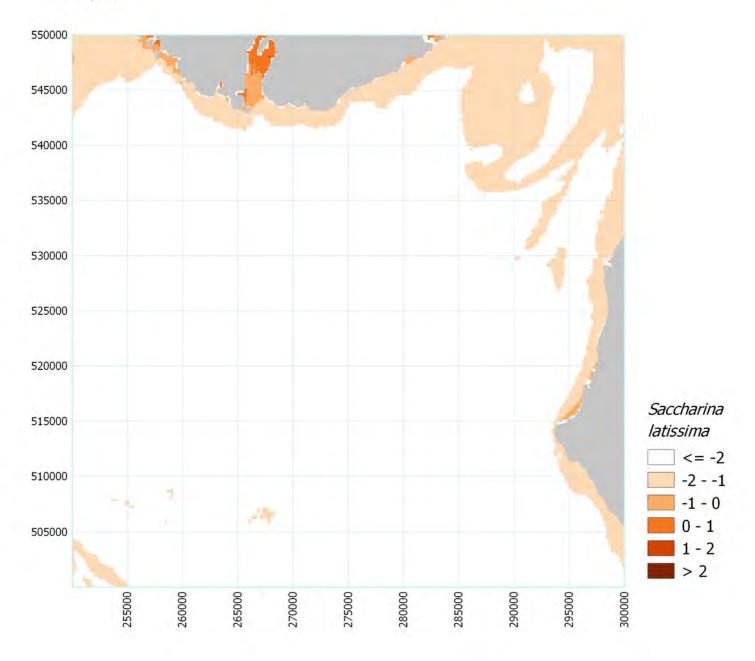
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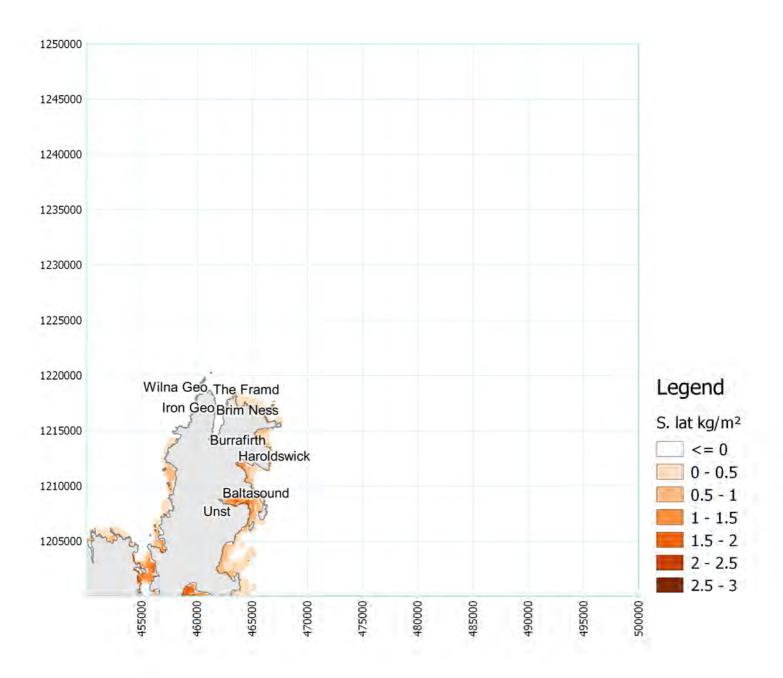


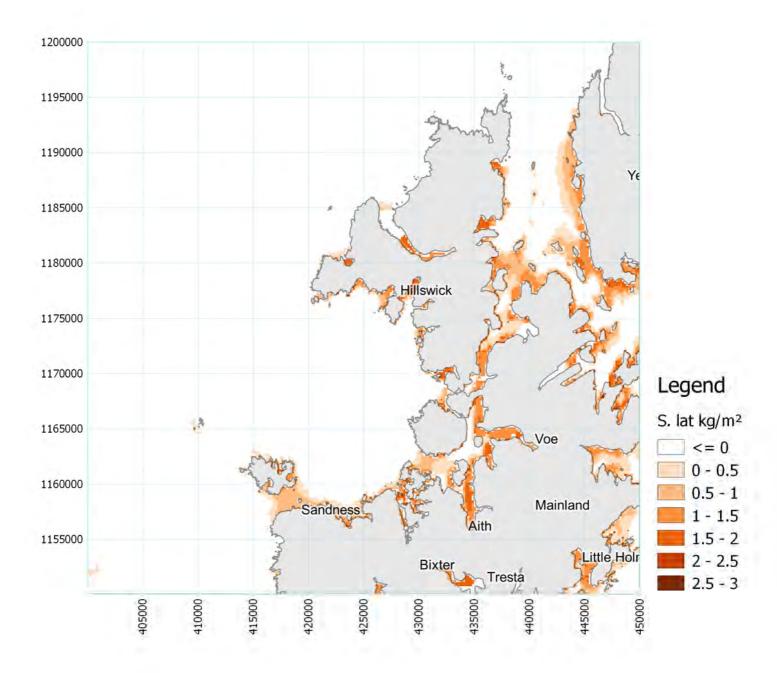
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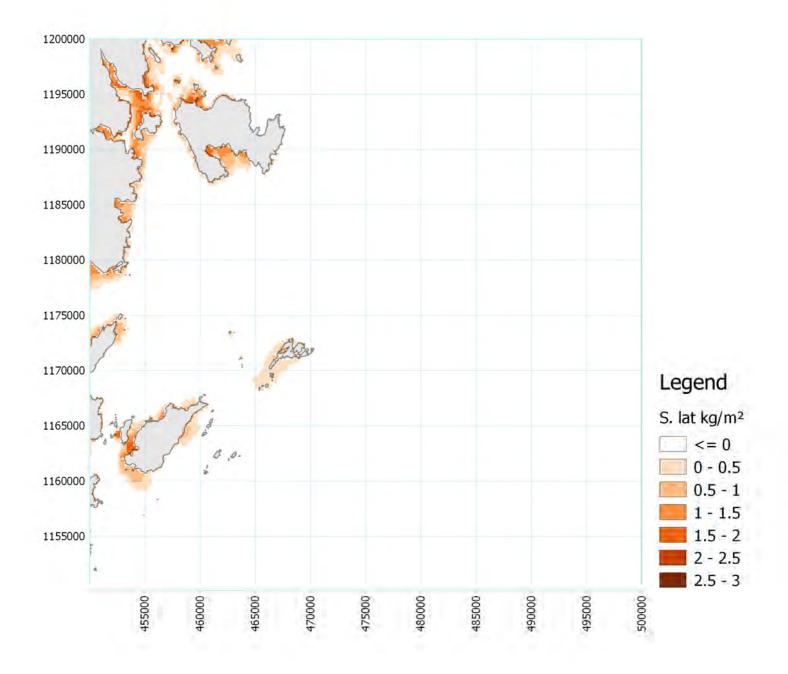


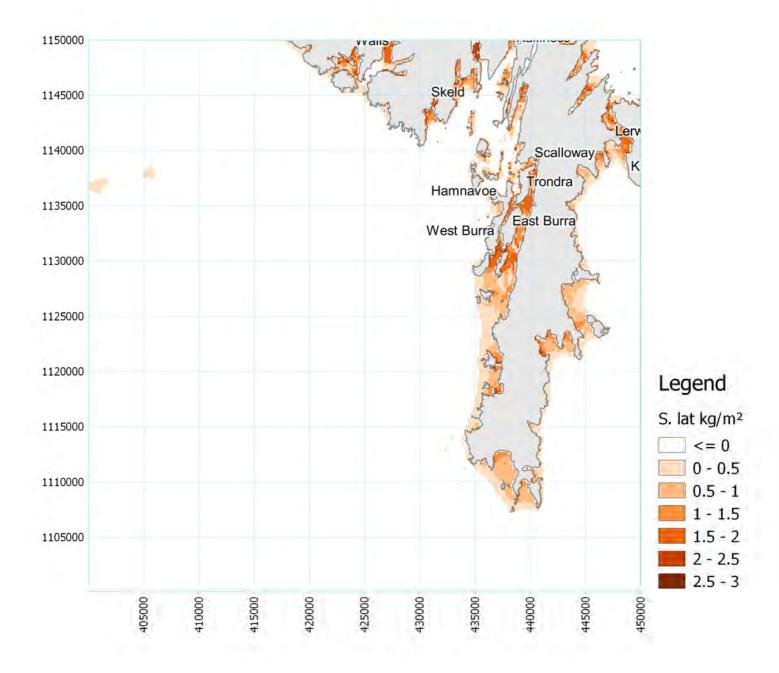


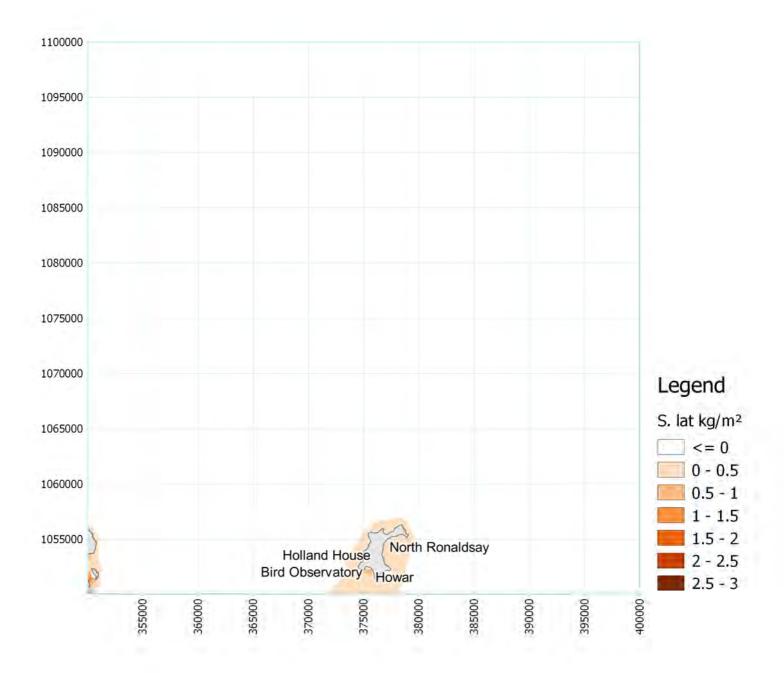


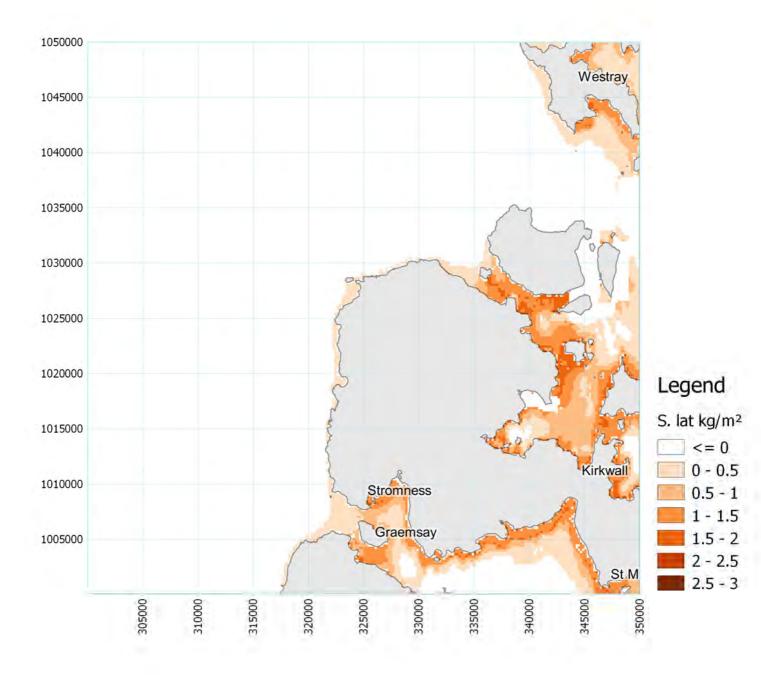


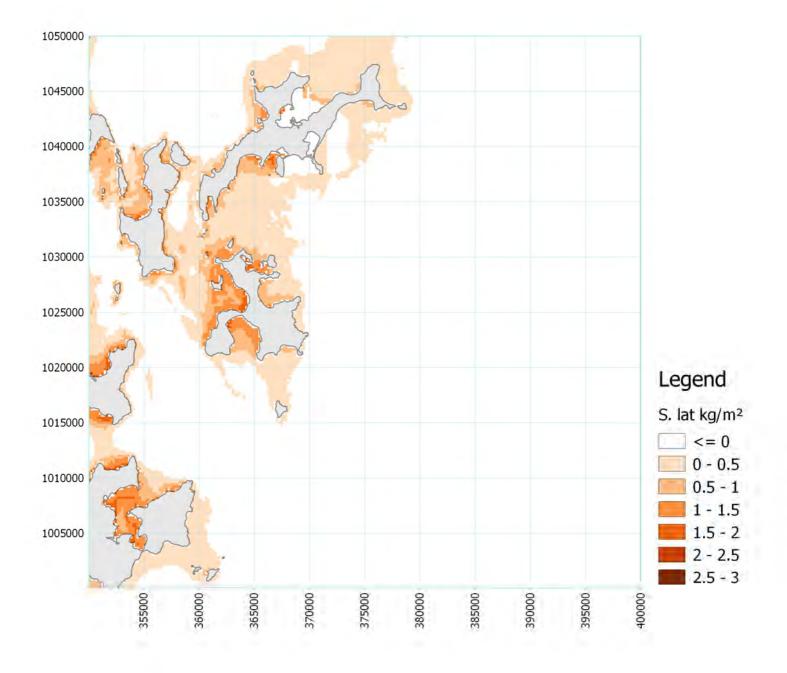


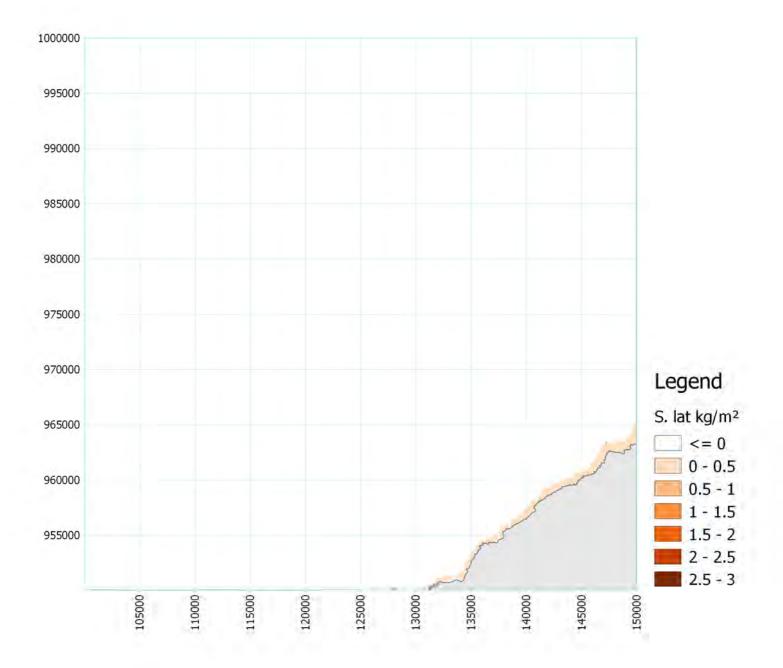


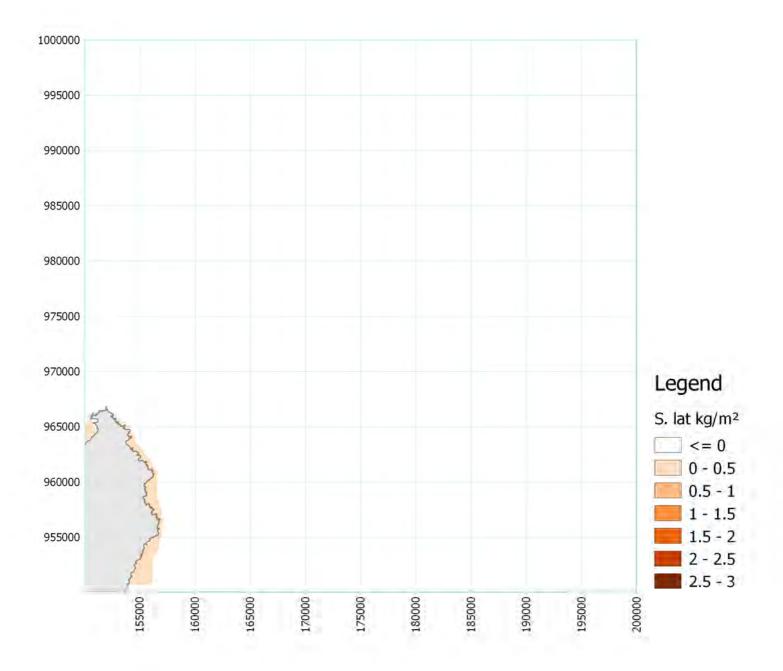


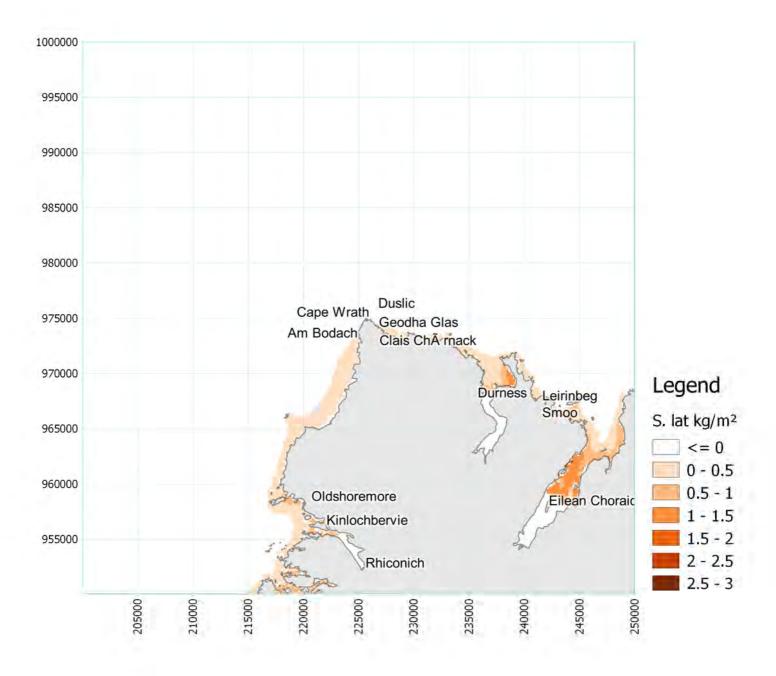


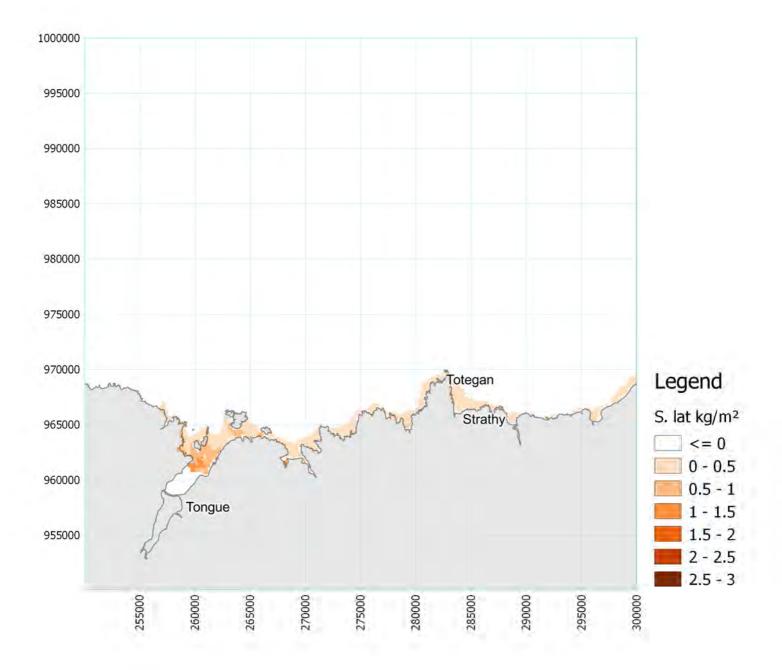


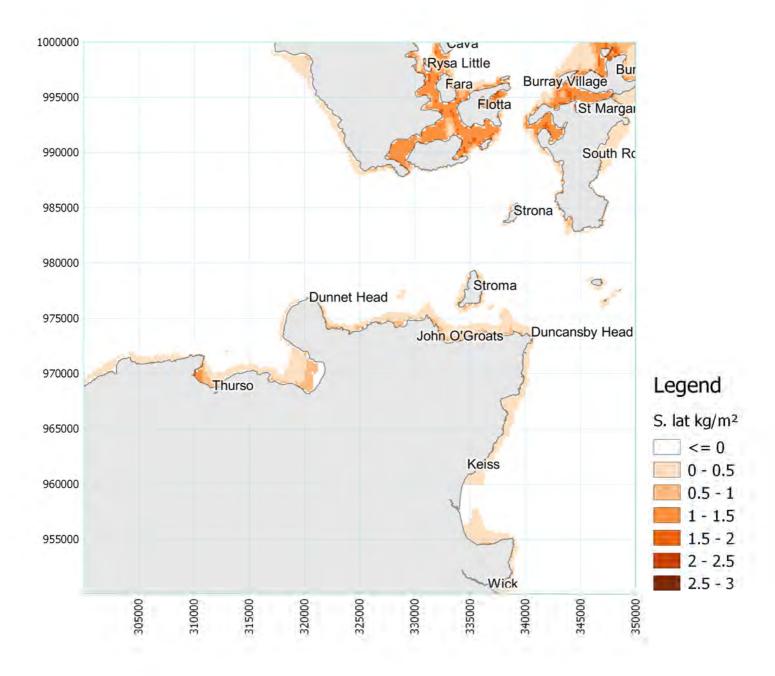


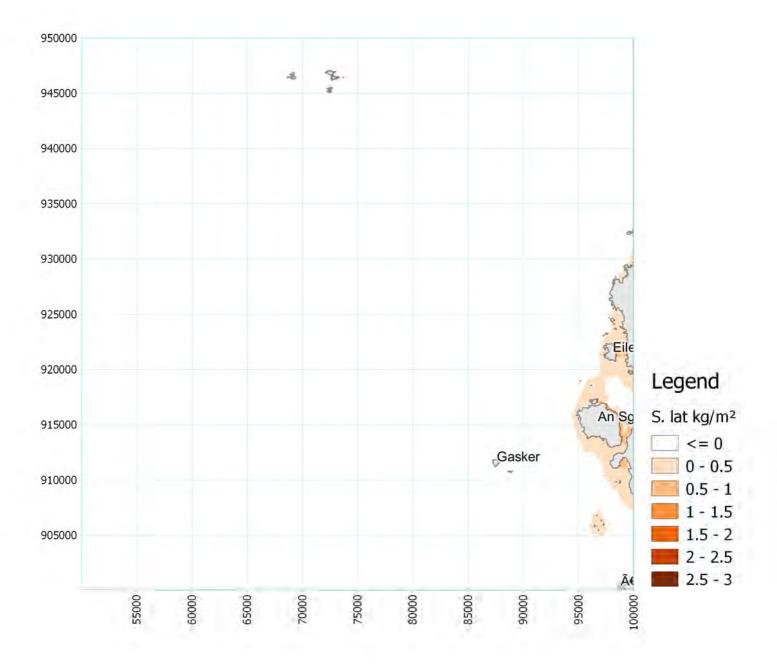


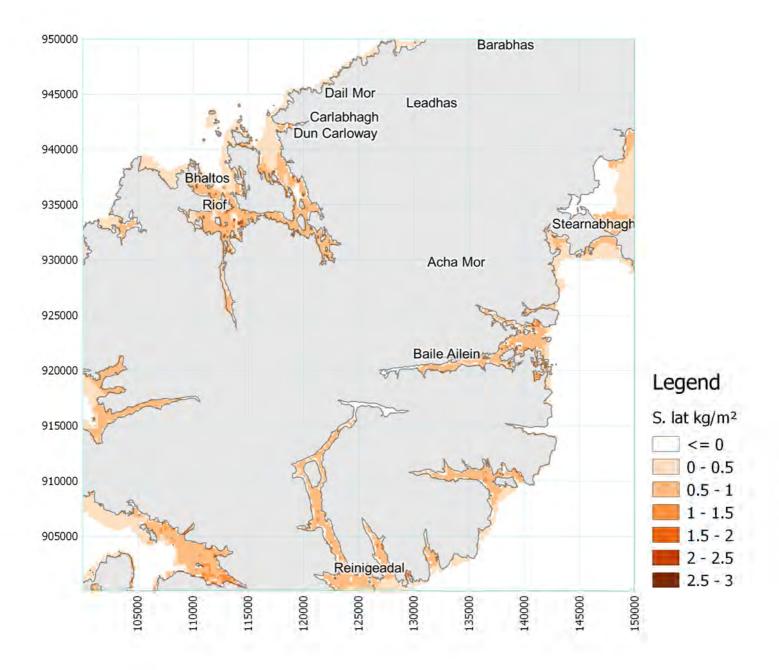


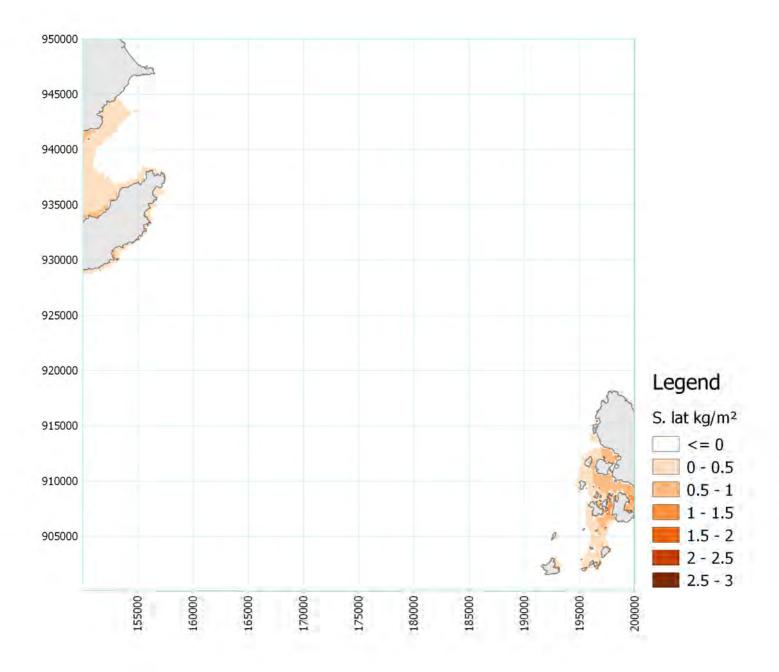


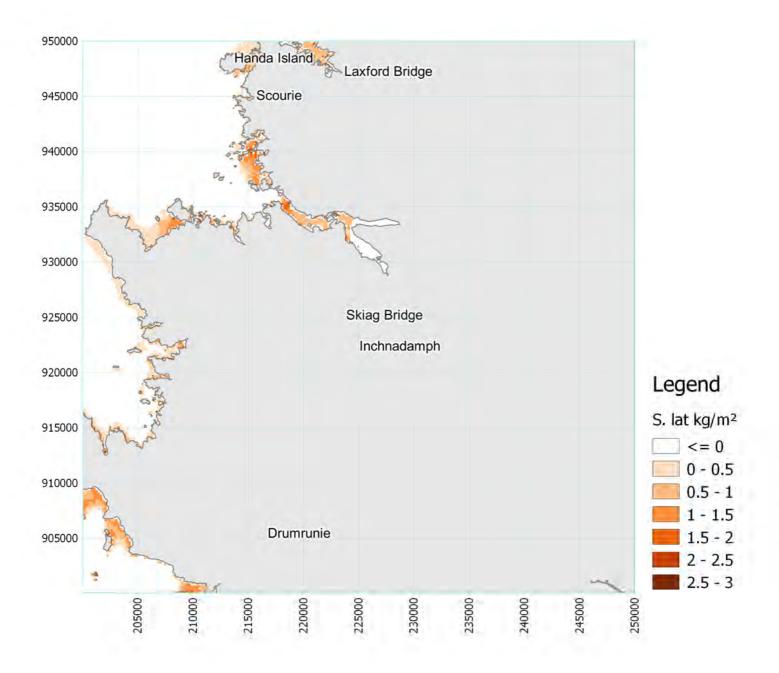


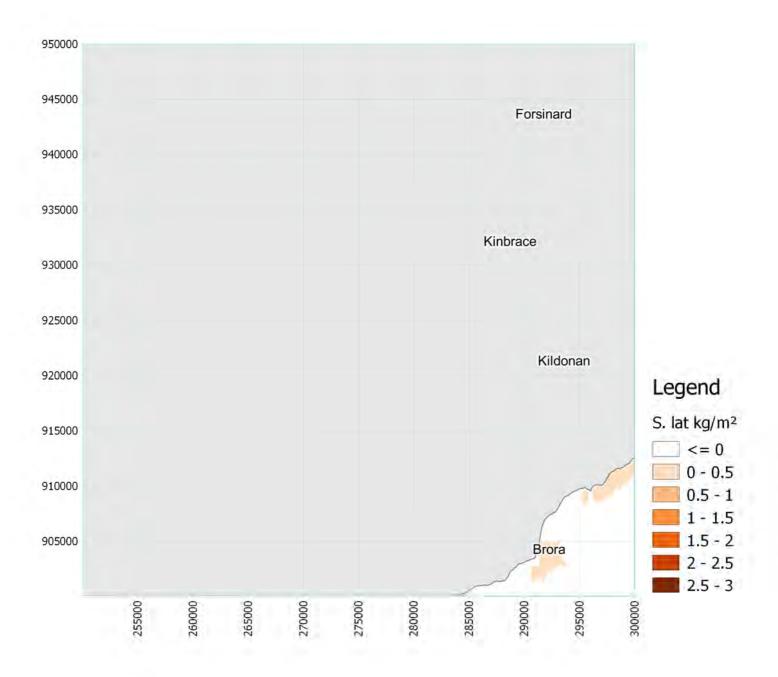


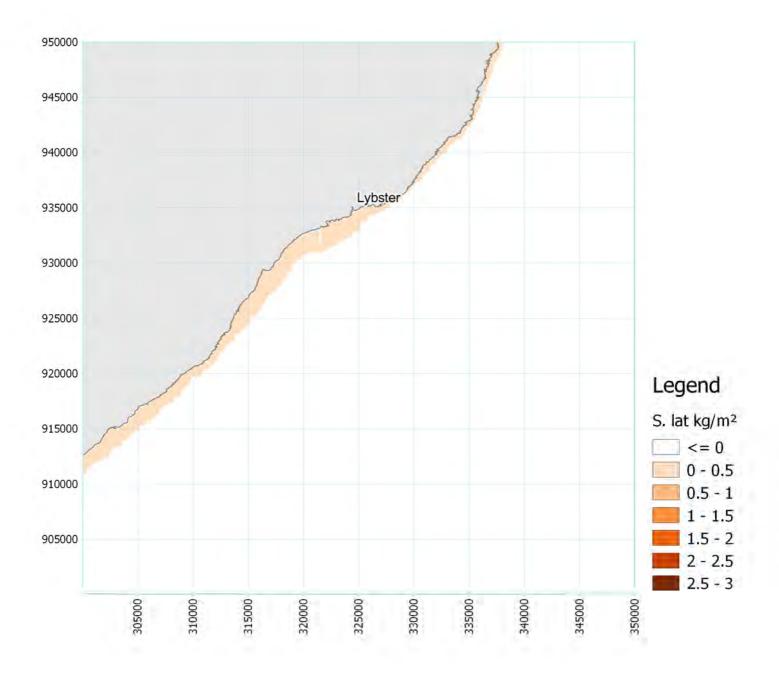


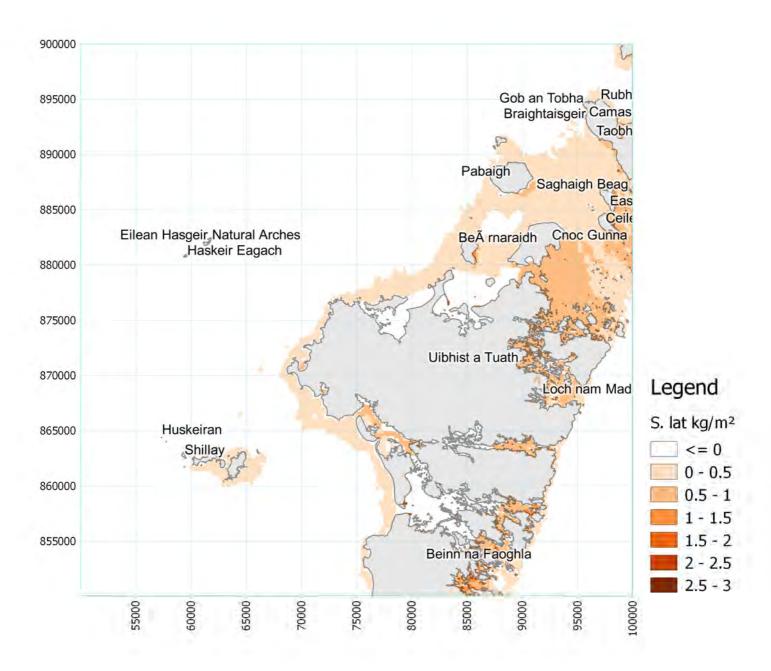


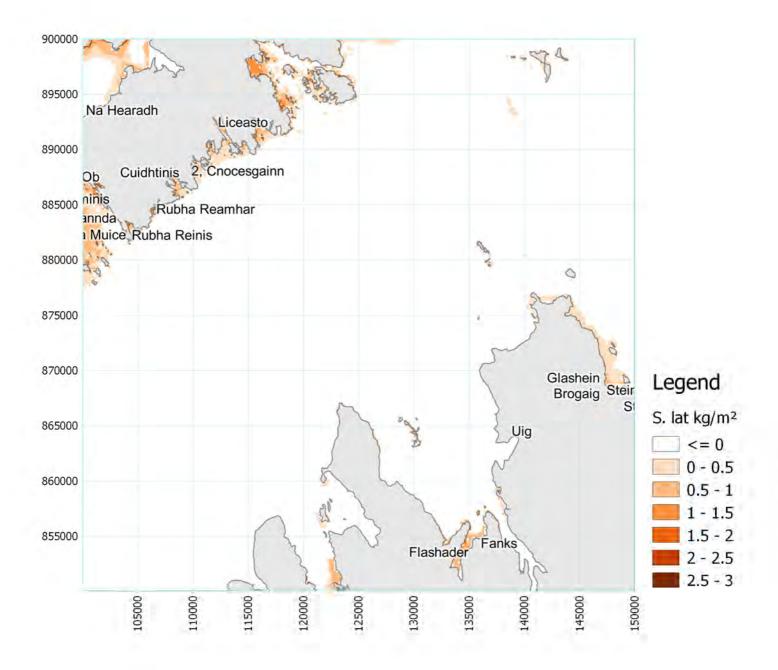


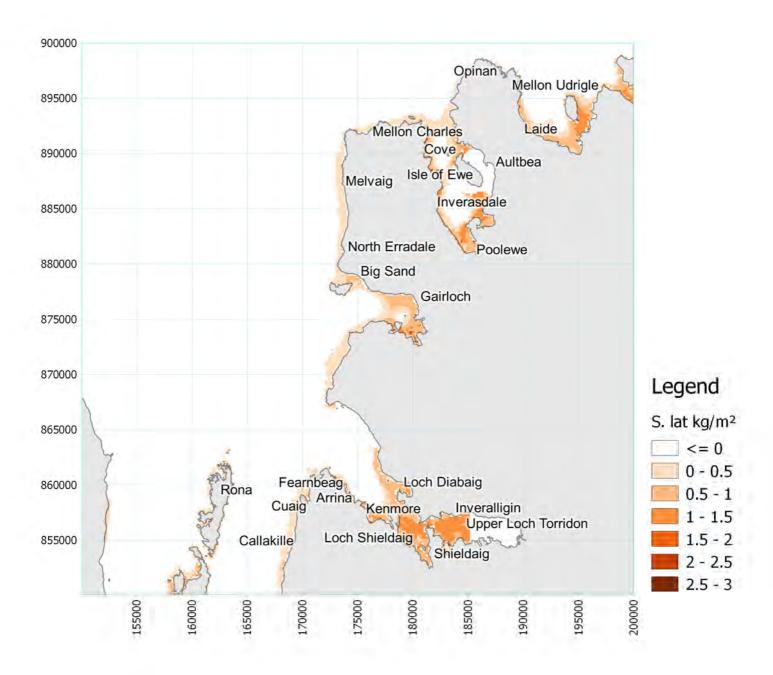


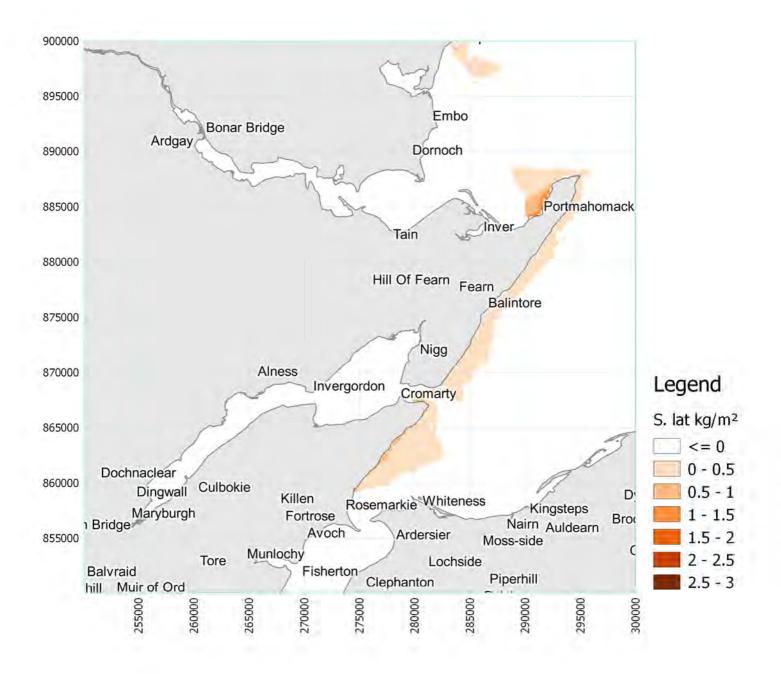


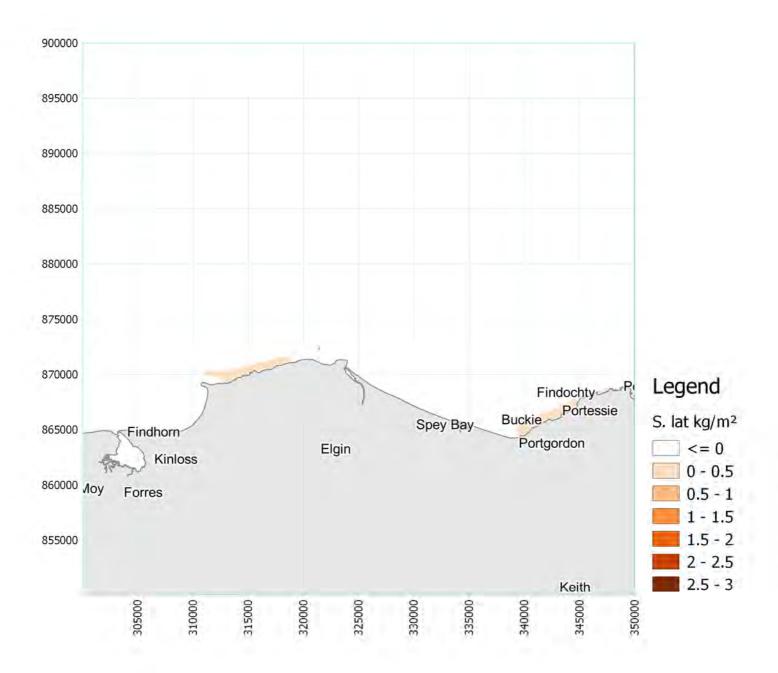


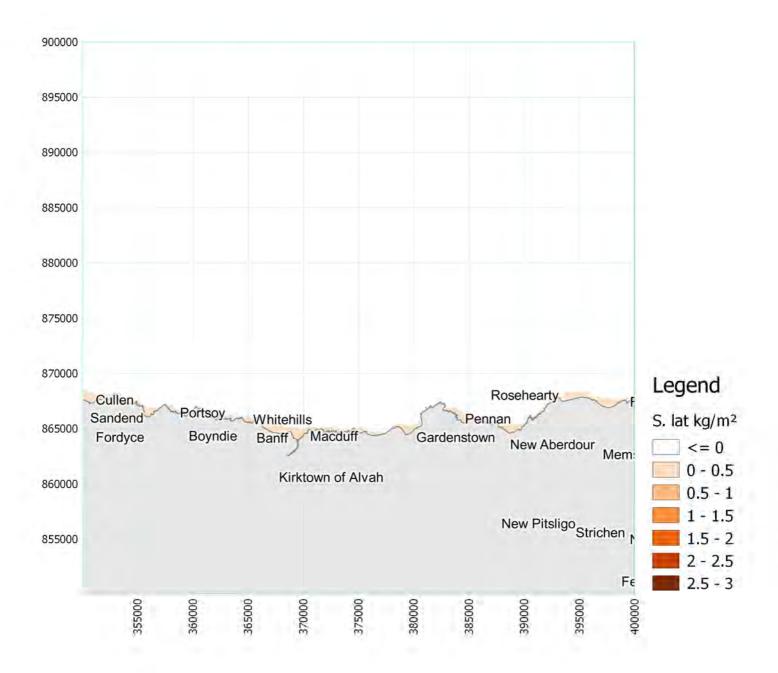


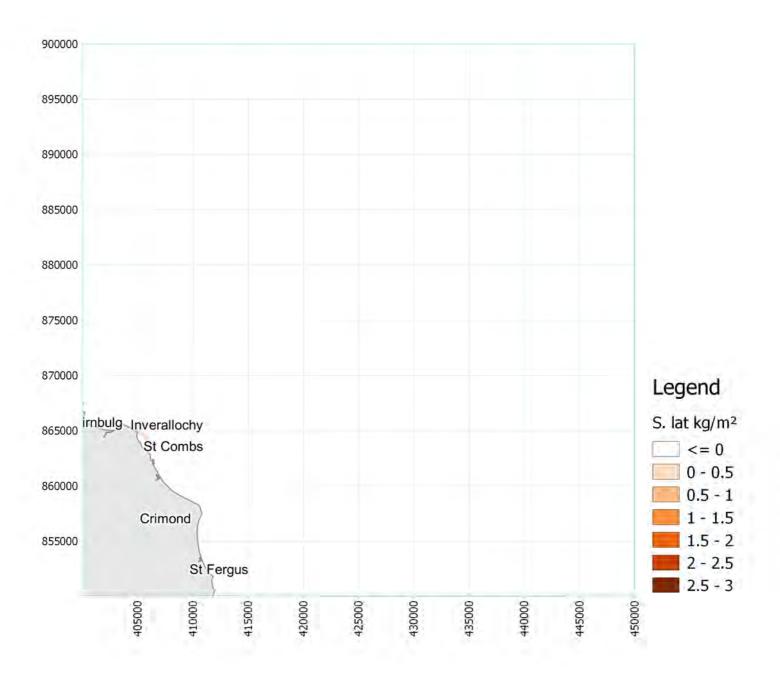


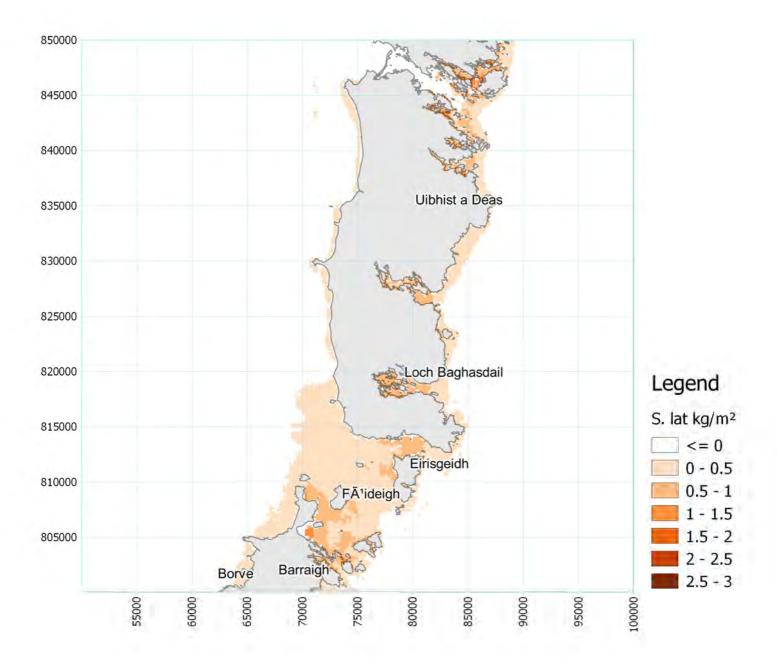


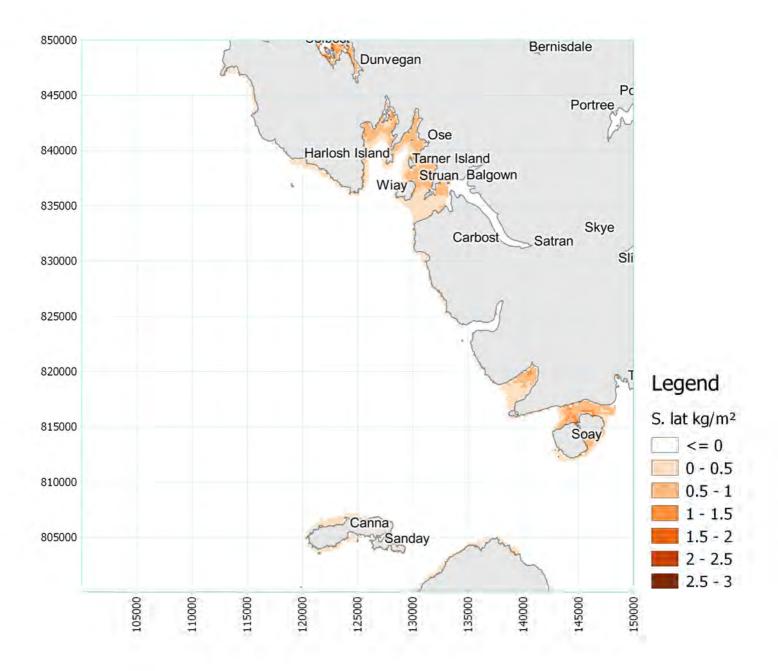


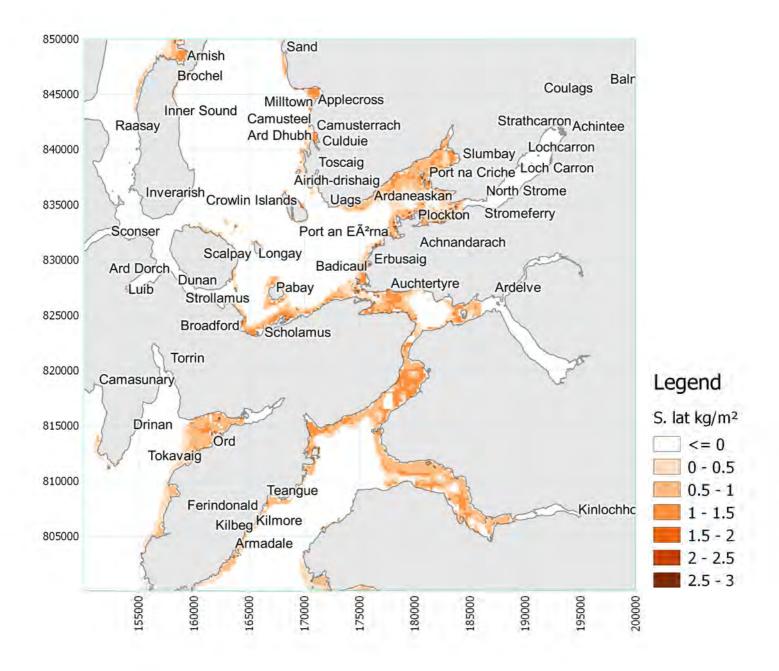


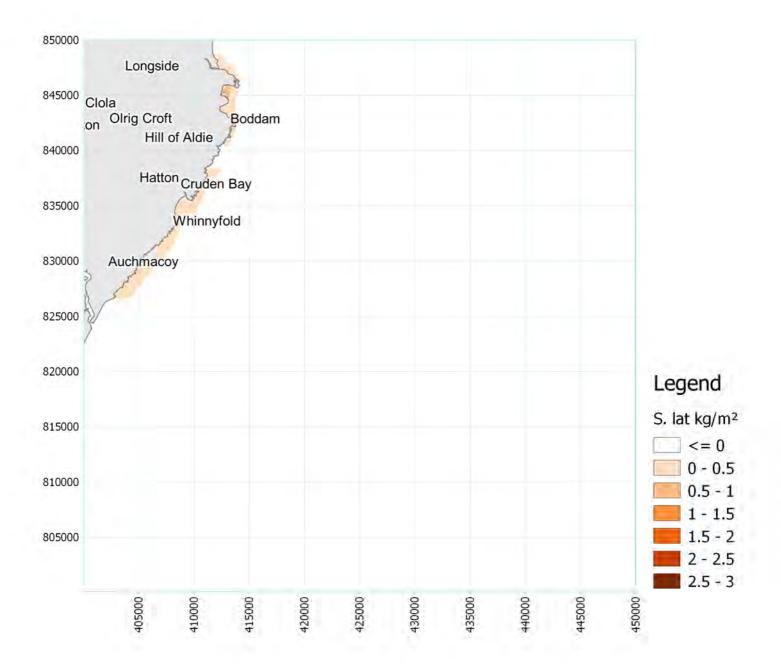


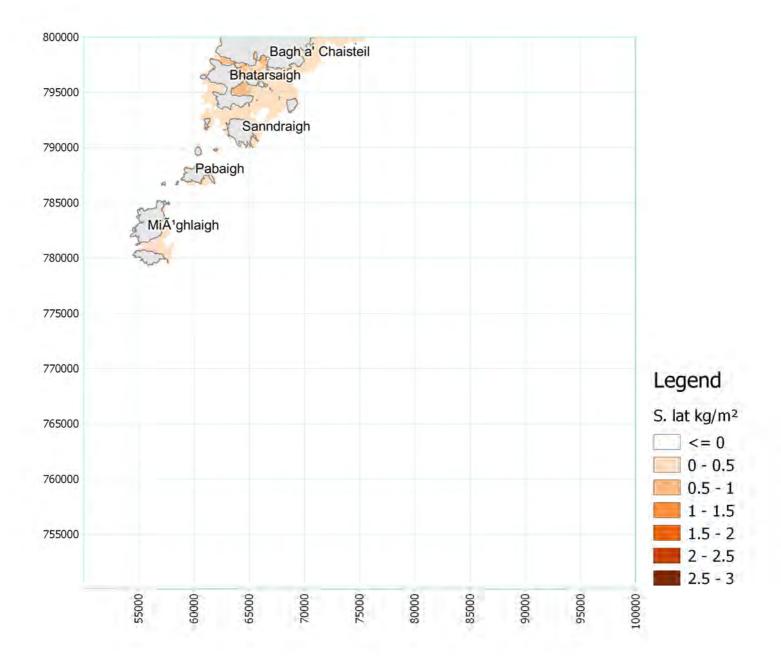


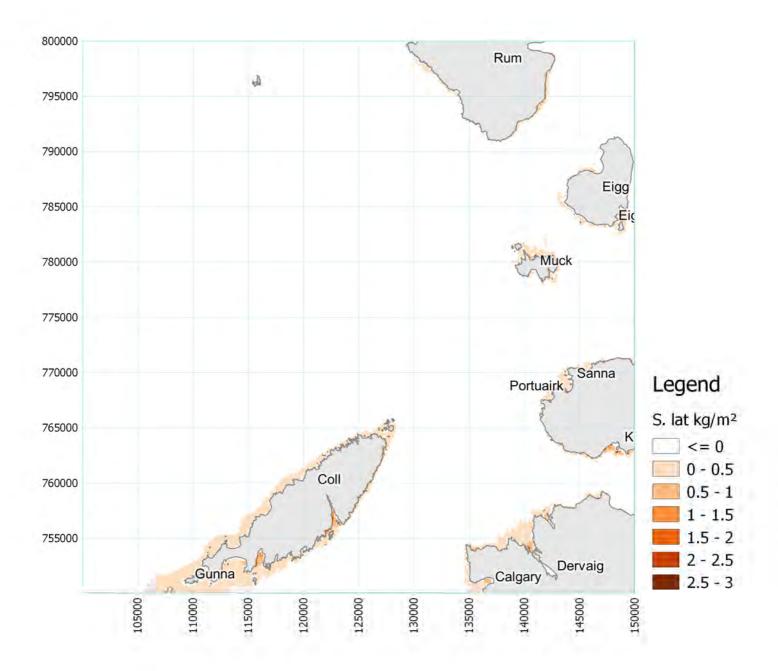


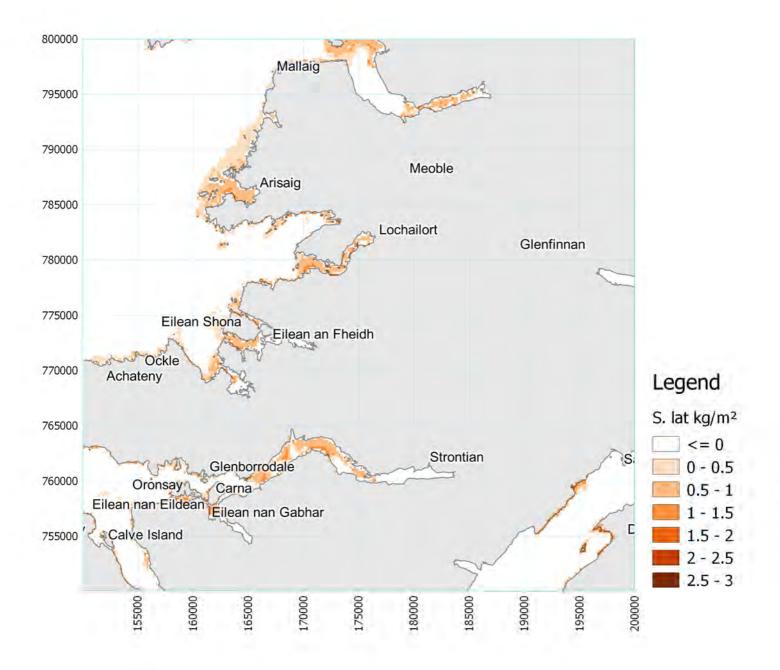


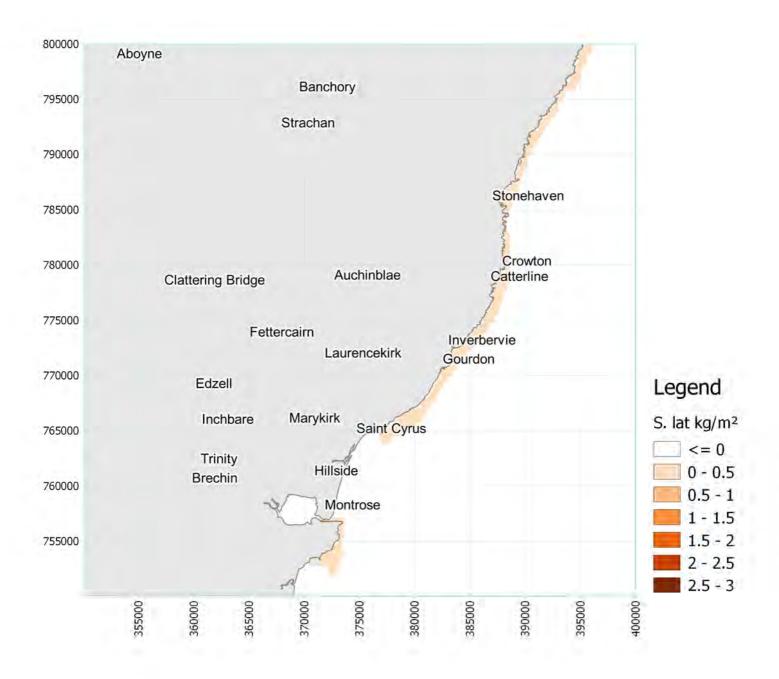


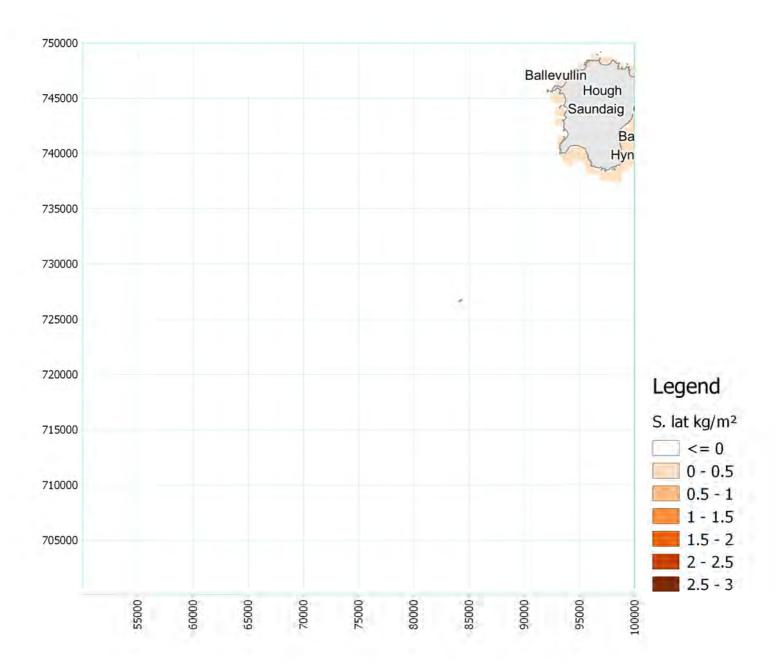


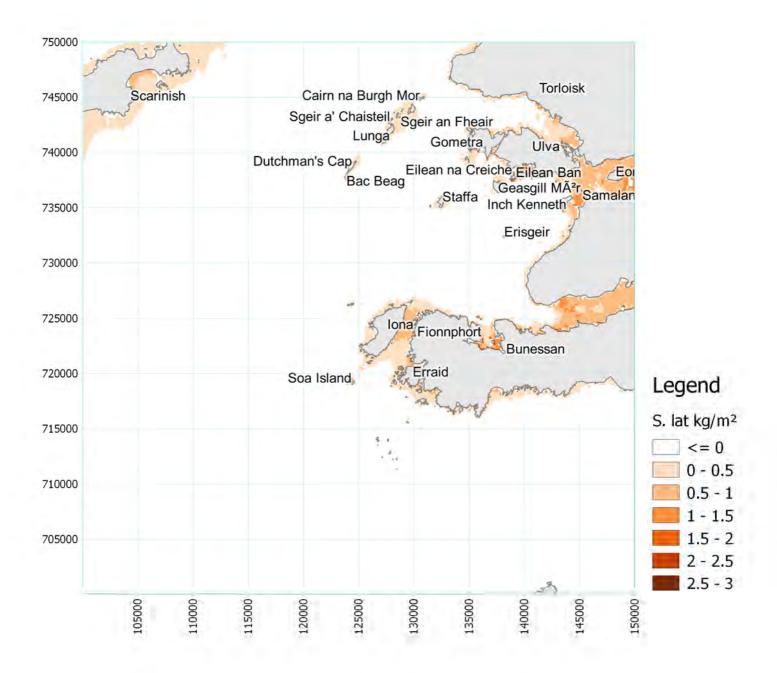


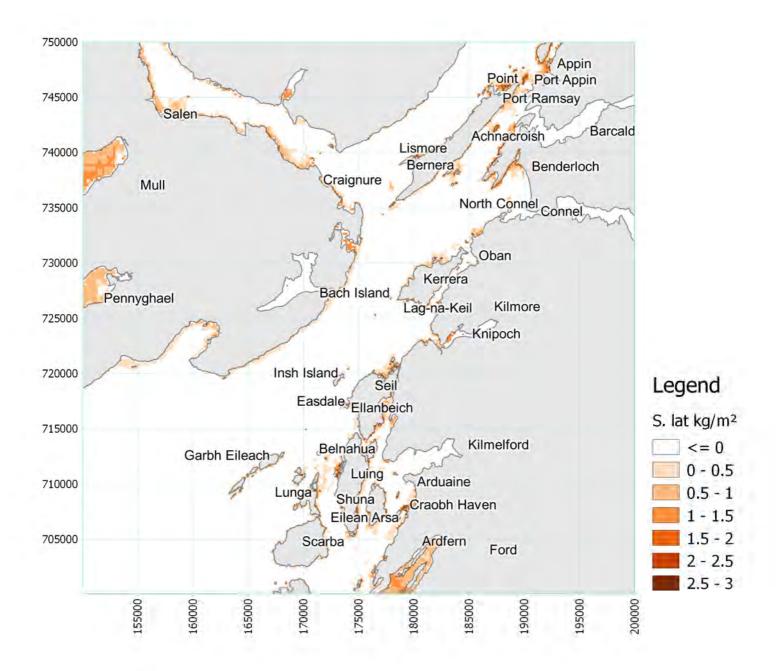


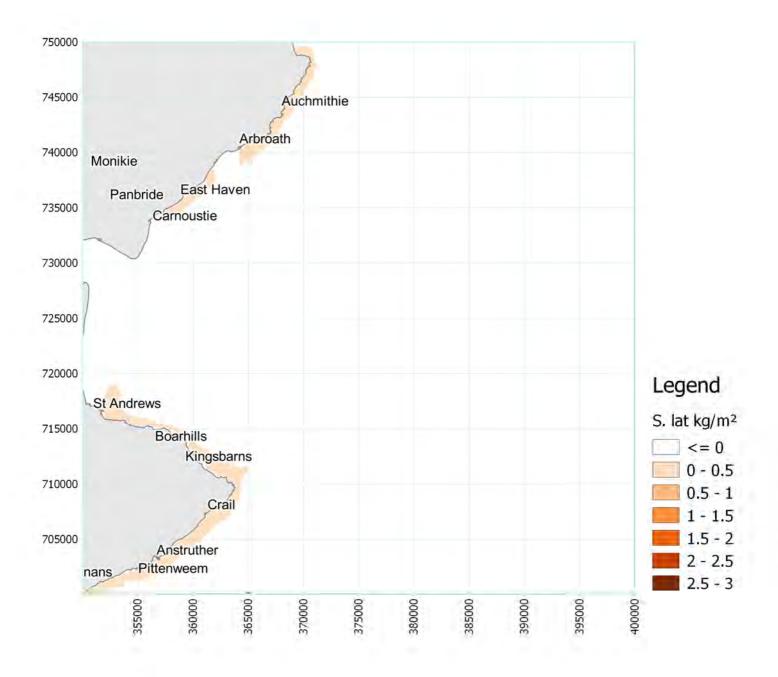


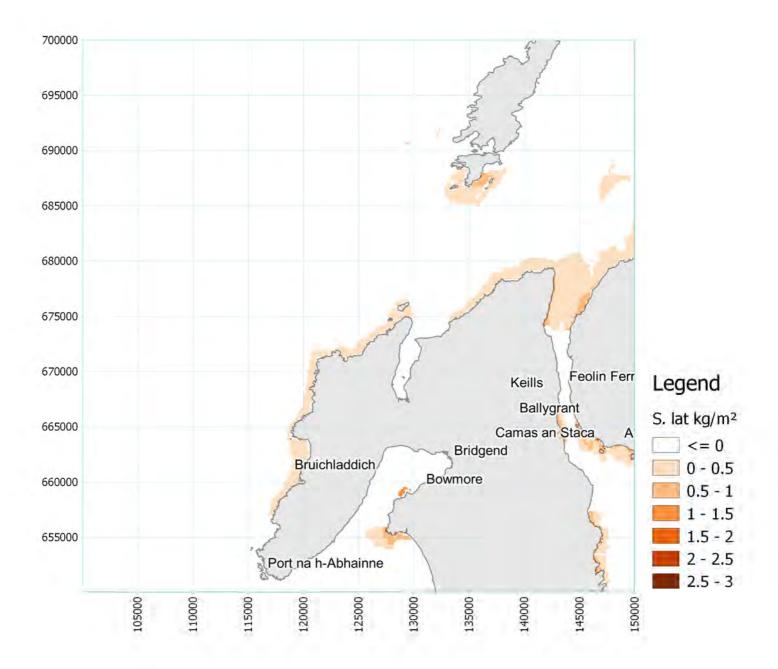


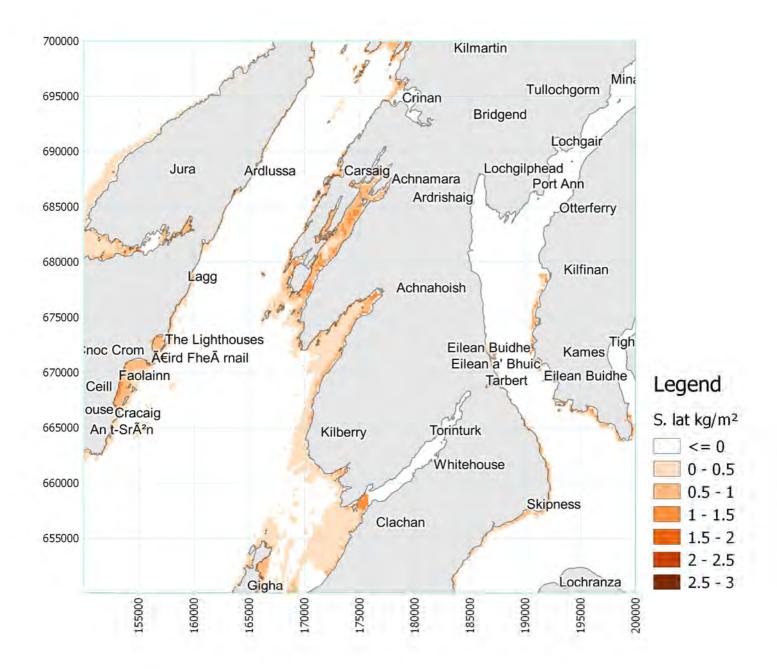








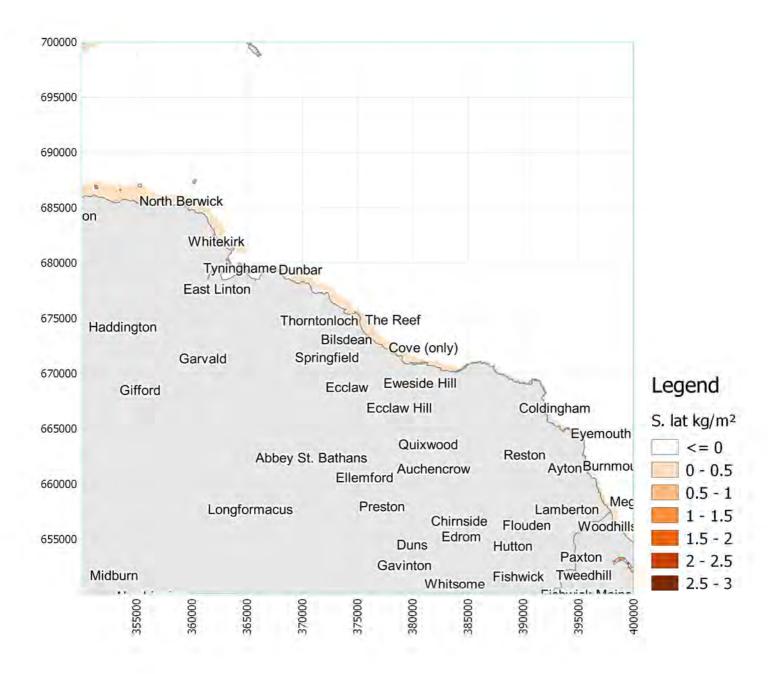


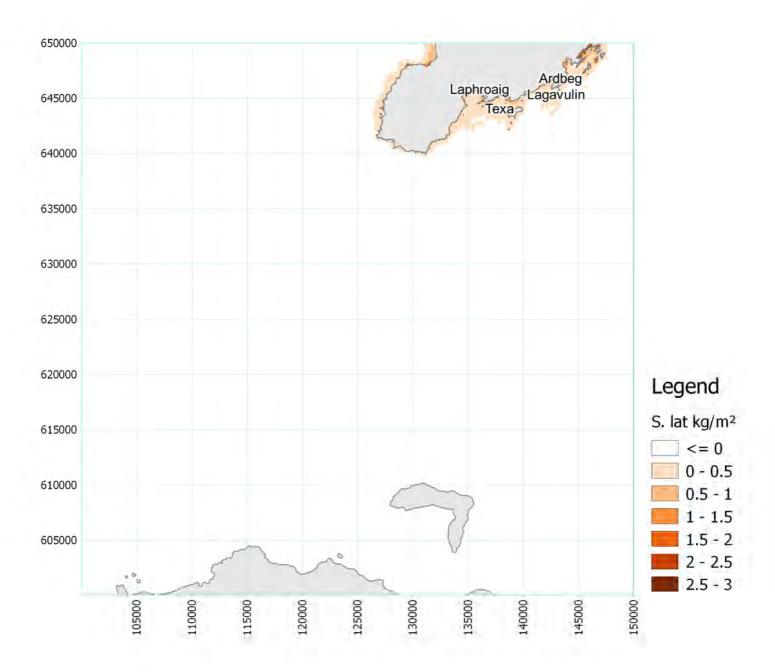


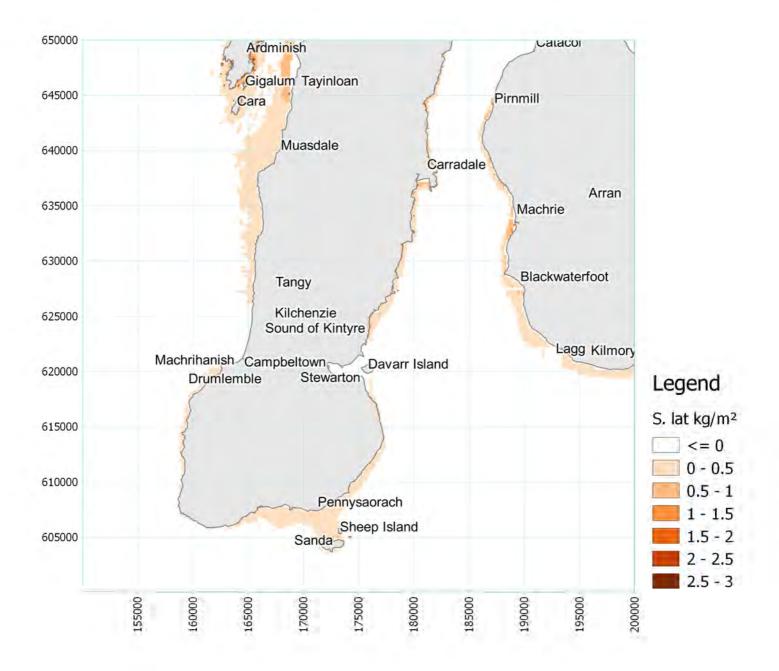
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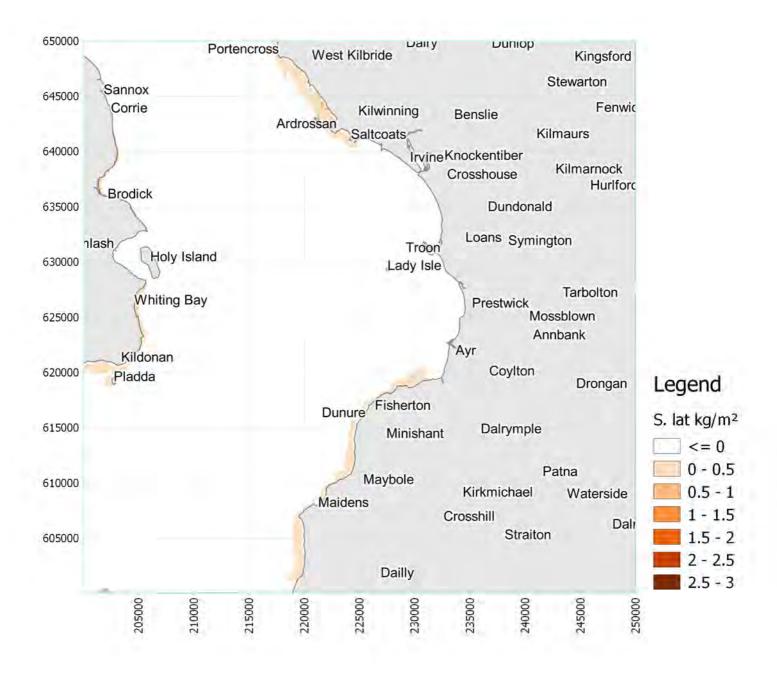
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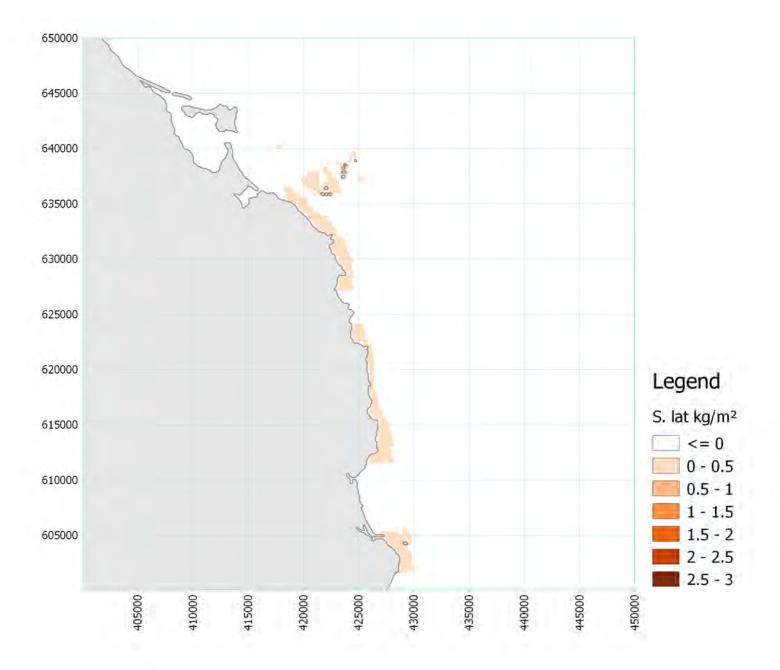
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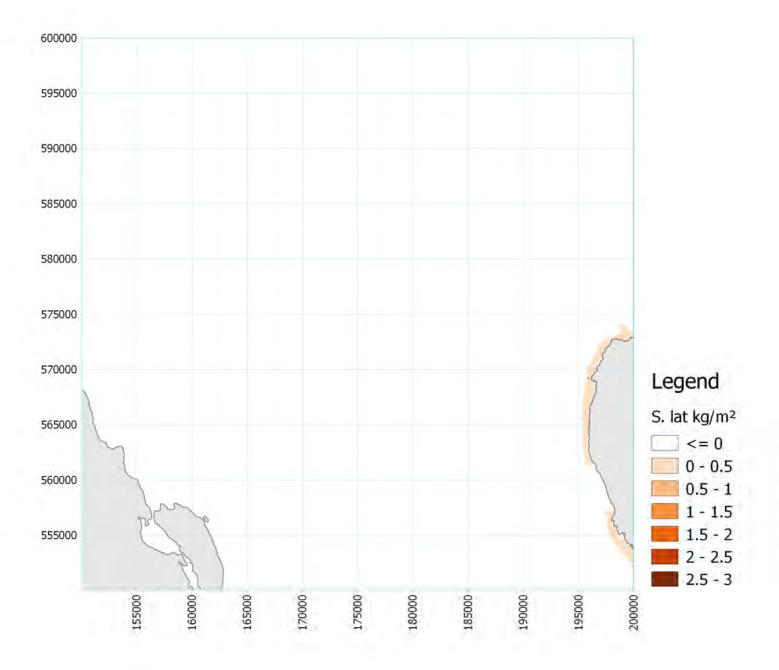


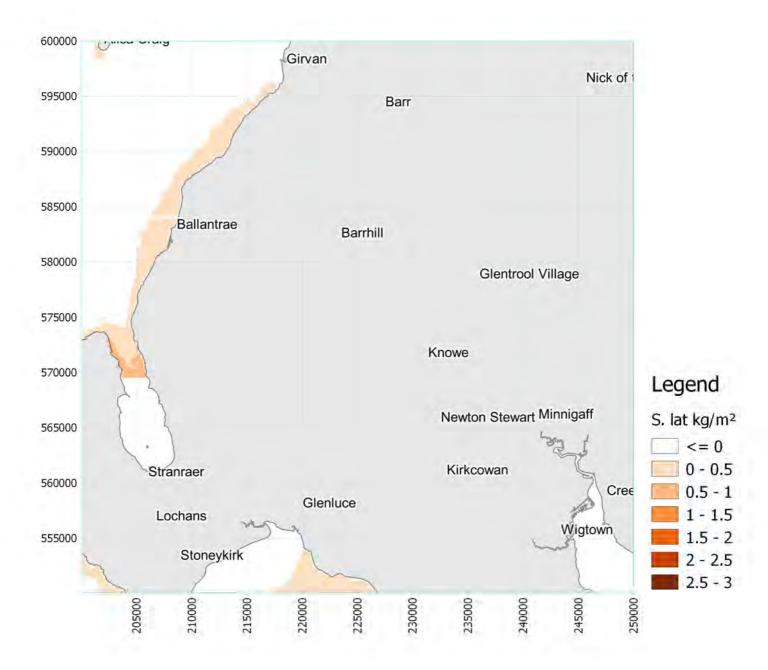


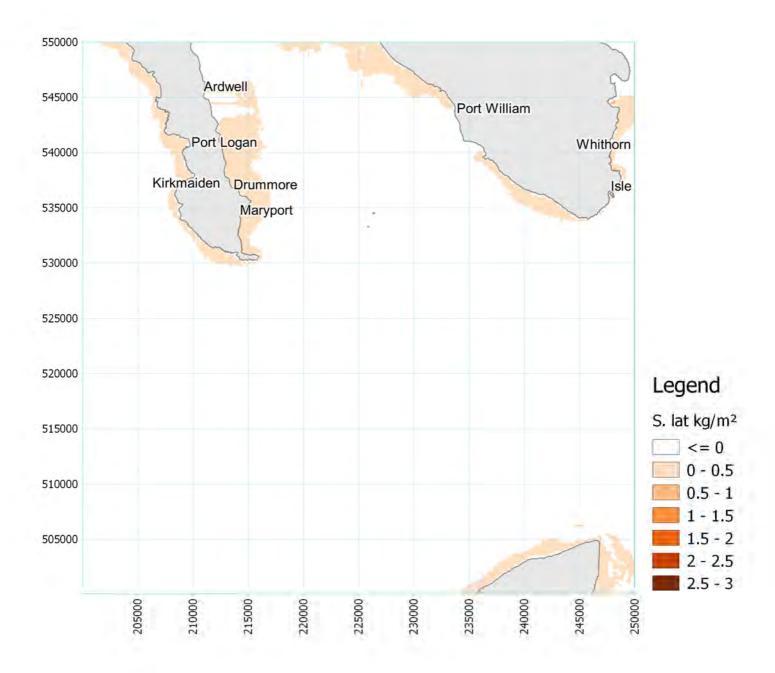


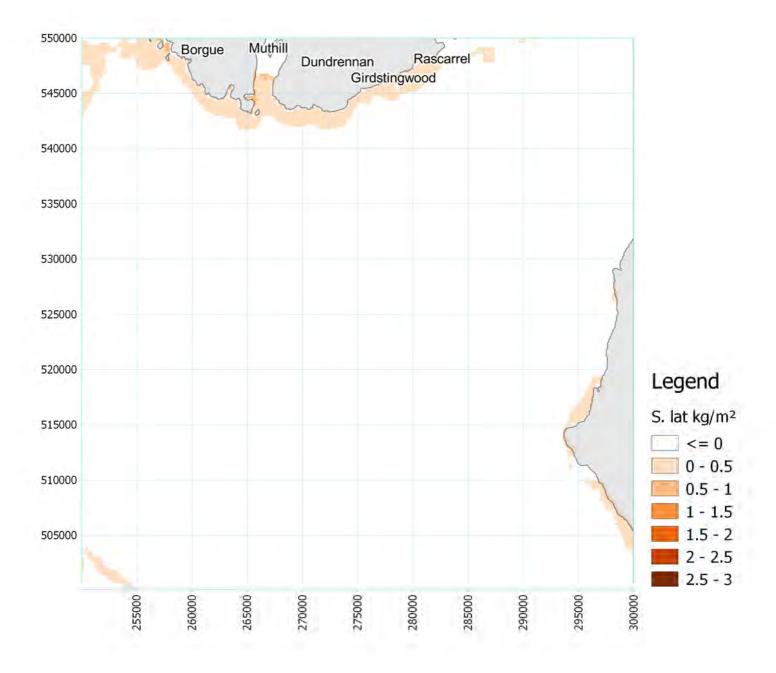




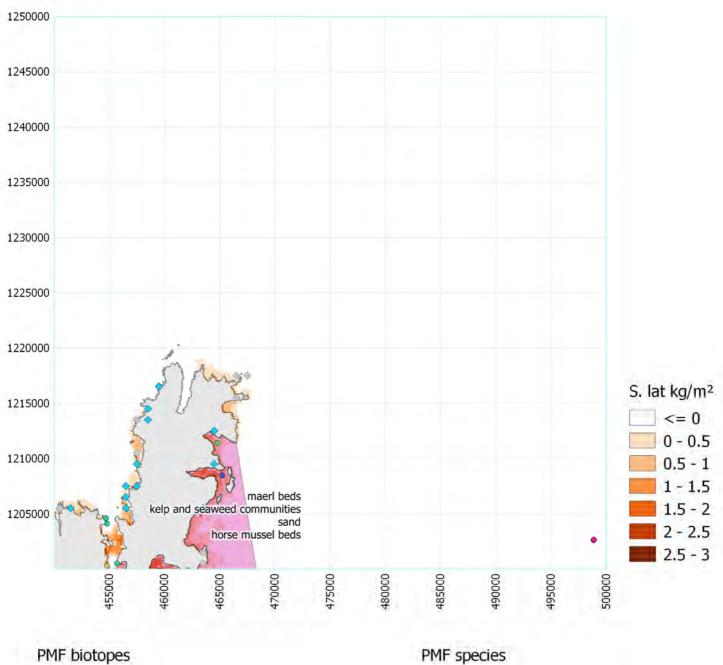












Grey seal

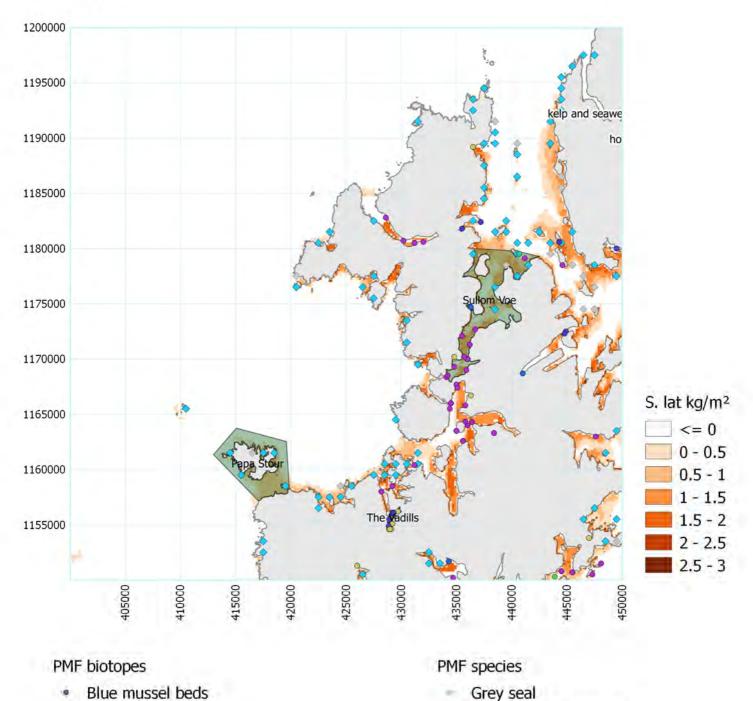
MPA

Harbour / common seal

PMF biotopes

- Maerl beds .
- Northern sea fan and sponge communities .
- Seagrass beds 80
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves ٠





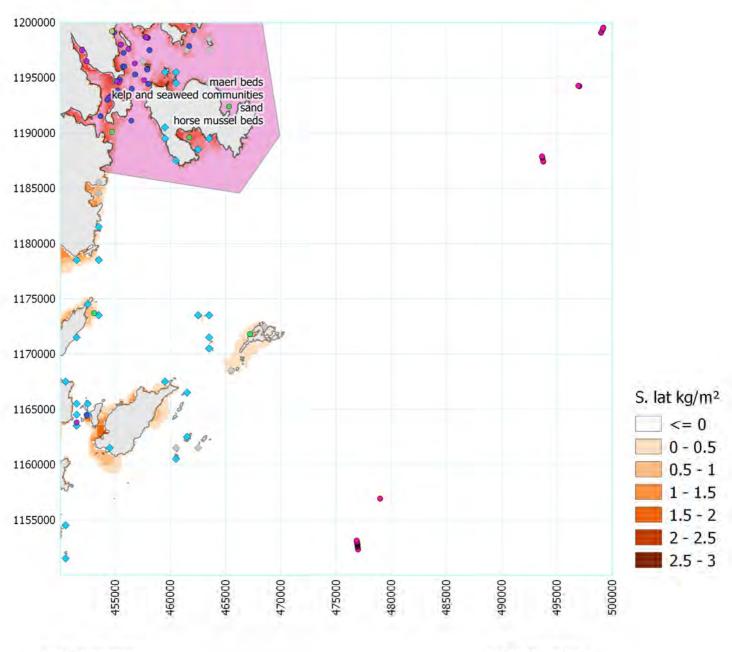
Harbour / common seal

MPA

SAC

- Blue mussel beds
- Horse mussel beds 0
- Maerl beds
- Seagrass beds .
- Tide-swept algal communities .
- Tide-swept algal communities and Kelp beds *
- Tide-swept coarse sands with burrowing bivalves 40

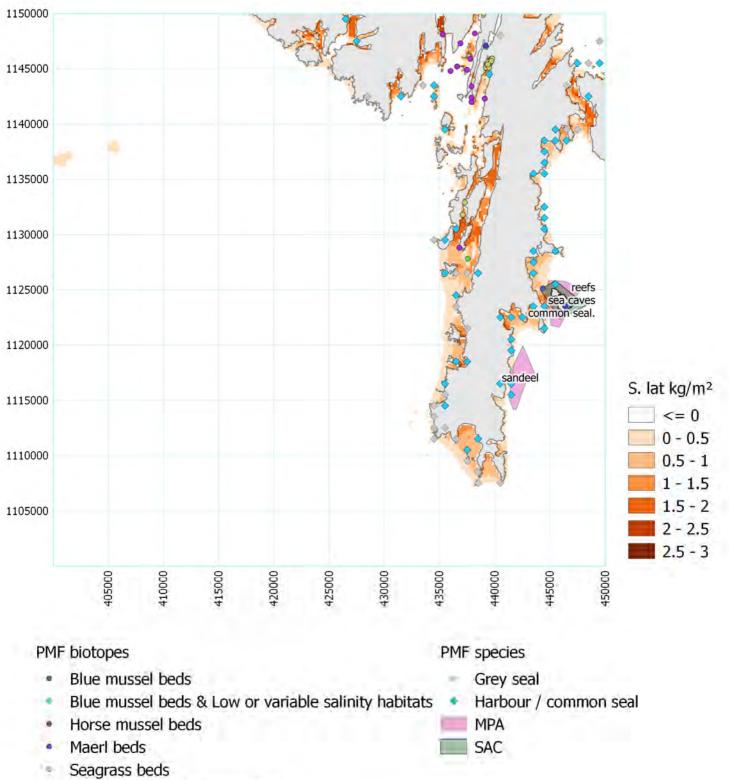
Map 3



- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities
- Tide-swept coarse sands with burrowing bivalves

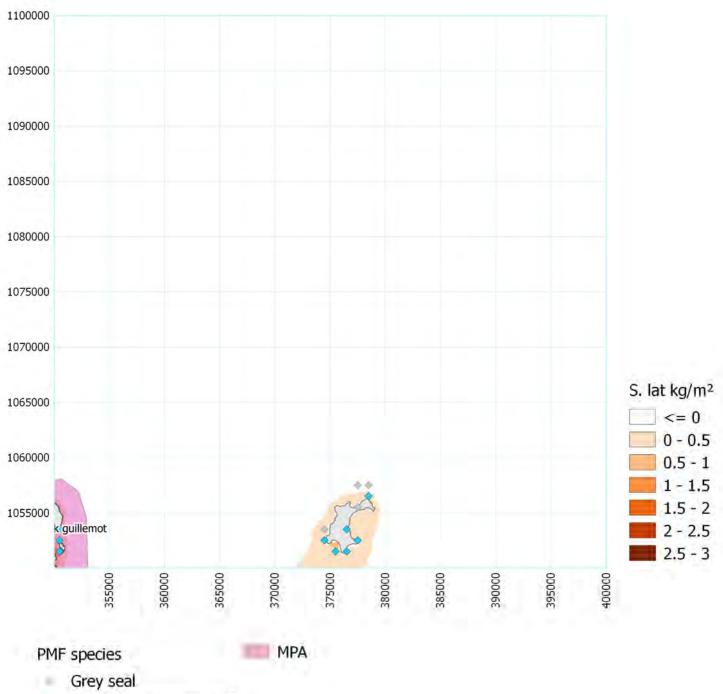
- **PMF** species
 - Grey seal
- Harbour / common seal
- MPA



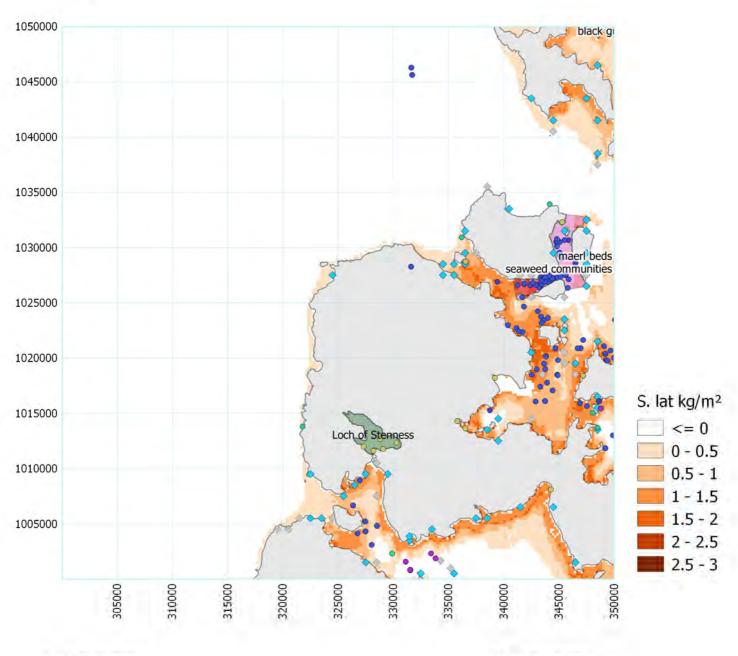


- Tide-swept algal communities
- Tide-swept coarse sands with burrowing bivalves

Map 5



Map 6

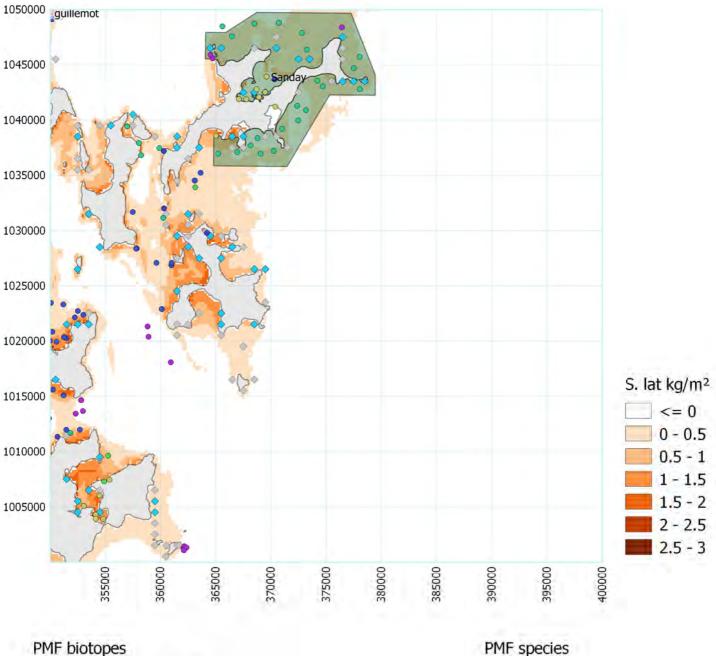


- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

PMF species

- Grey seal
- Harbour / common seal
- MPA SAC

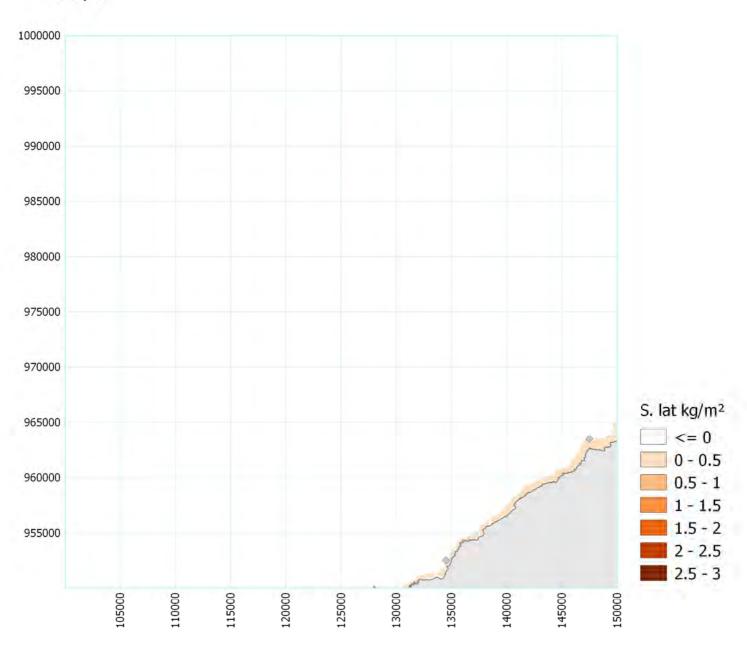
Map 7



- Horse mussel beds ė
- Maerl beds 0
- Maerl or coarse shell gravel with burrowing sea cucumbers 0
- Seagrass beds *
- Tide-swept algal communities ie.
- Tide-swept algal communities and Kelp beds 1.4
 - Tide-swept coarse sands with burrowing bivalves 4

- **PMF** species
 - Grey seal ÷.
 - Harbour / common seal
 - MPA SAC

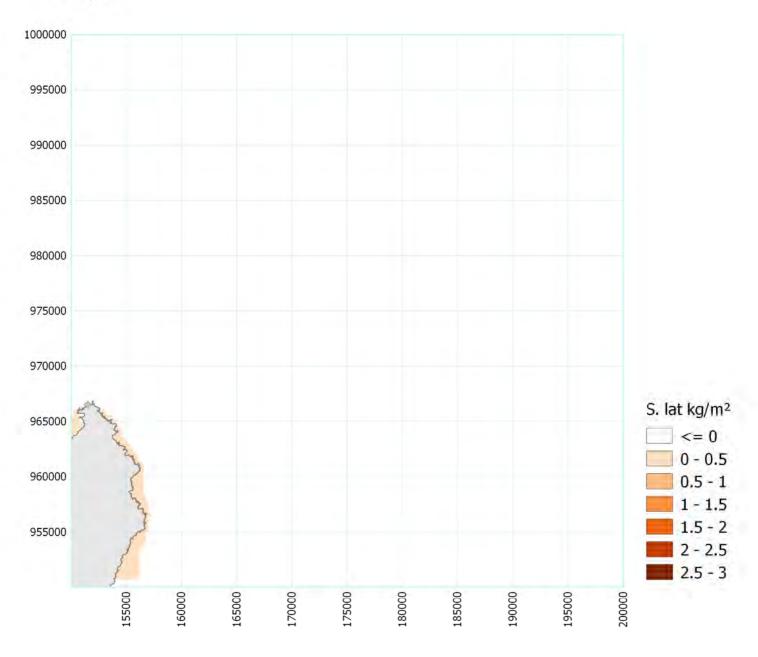
Map 8



PMF species

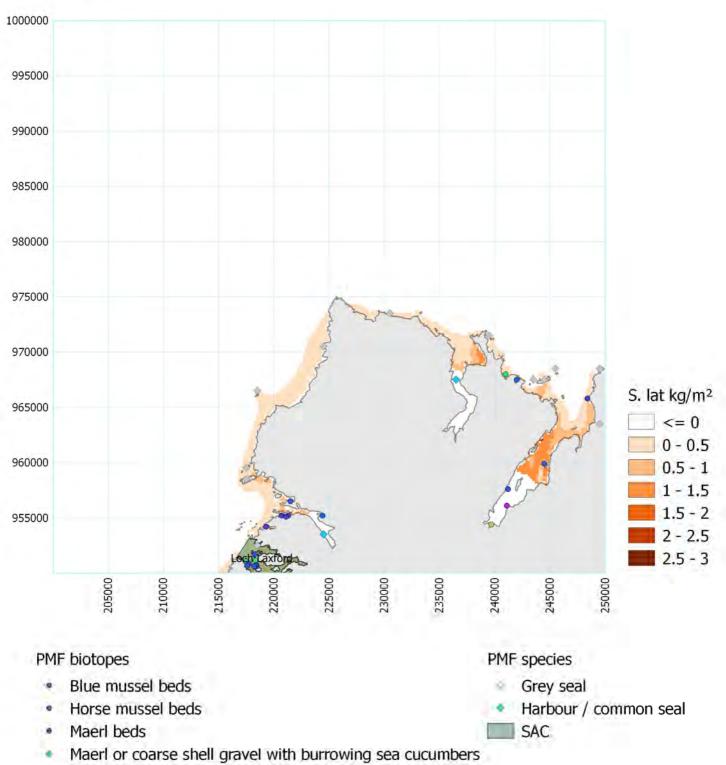
Grey seal





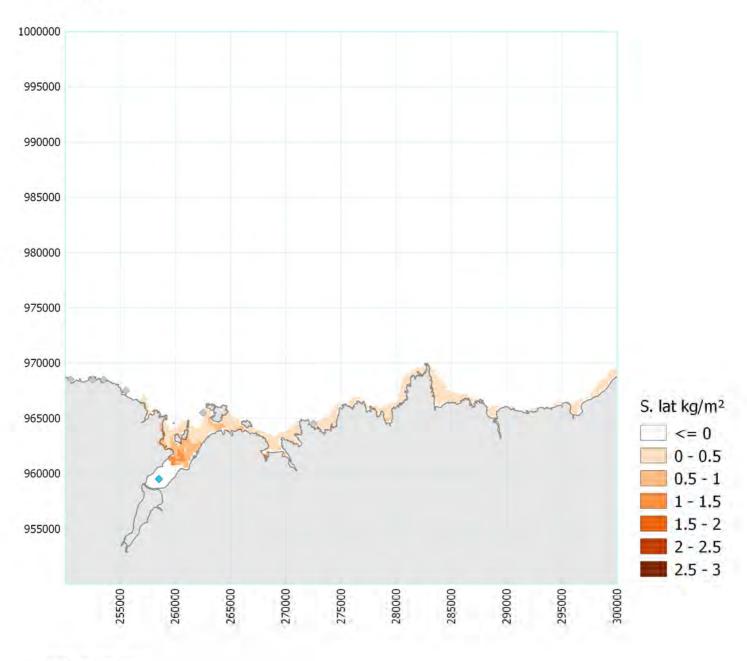
Grey seal

Map 10



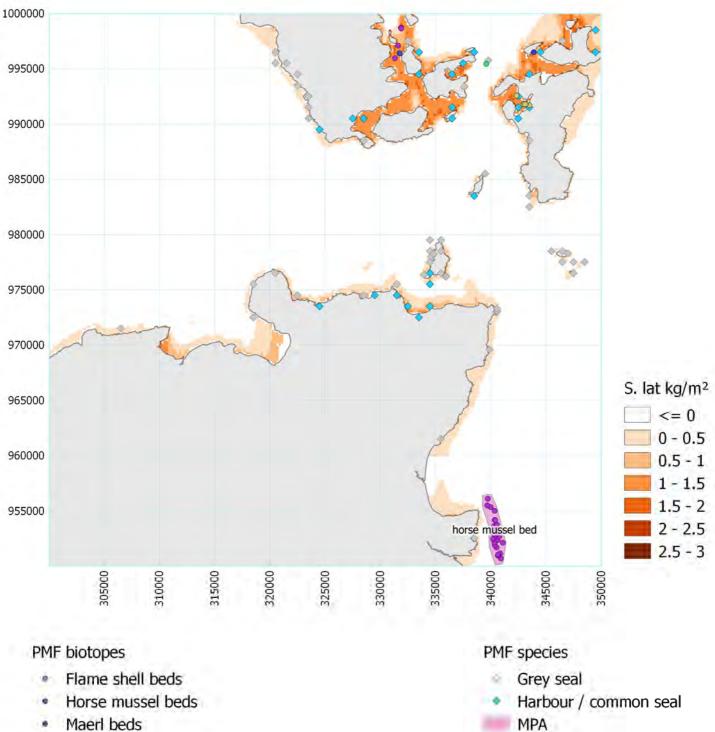
- Seagrass beds
- Tide-swept algal communities

Map 11



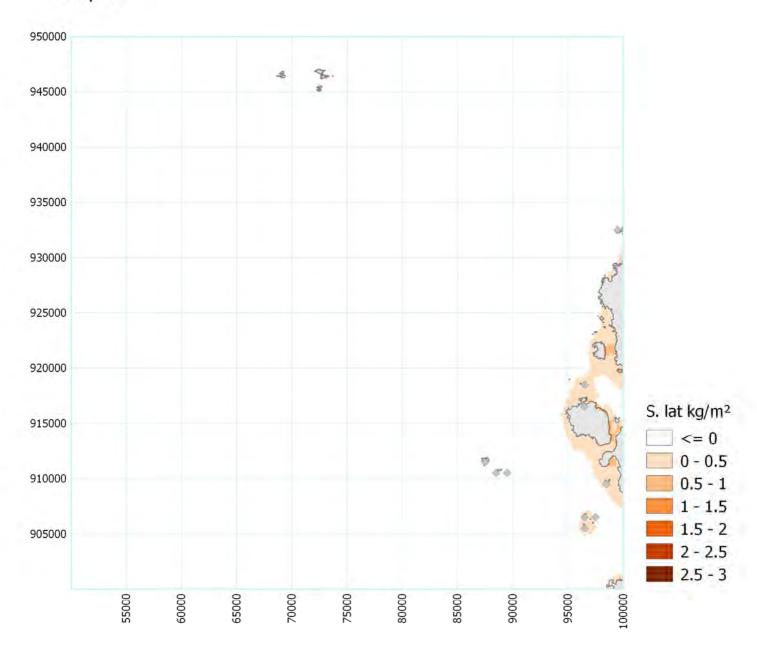
Grey seal

Map 12



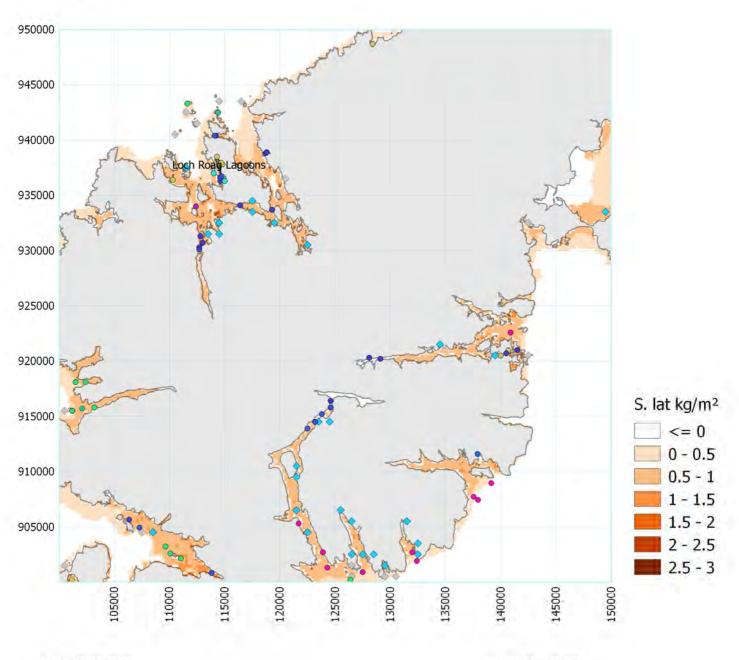
- Maerl beds ÷
- Maerl or coarse shell gravel with burrowing sea cucumbers .
- Seagrass beds 14-3
- Tide-swept algal communities ٠

Map 13



Grey seal

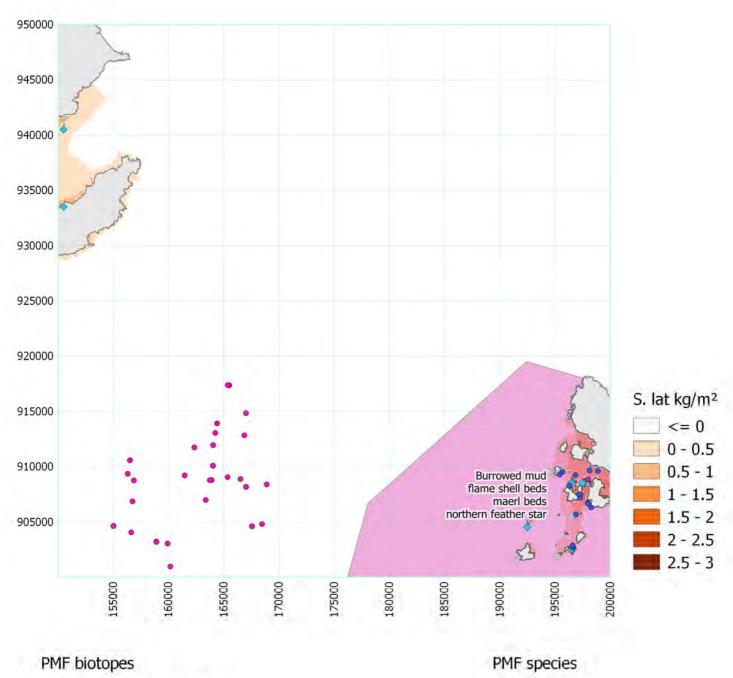
Map 14



- Blue mussel beds
- Blue mussel beds & Low or variable salinity habitats
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
 - Tide-swept algal communities
 - Tide-swept algal communities and Kelp beds

- **PMF** species
 - Grey seal
 - Harbour / common seal
 SAC





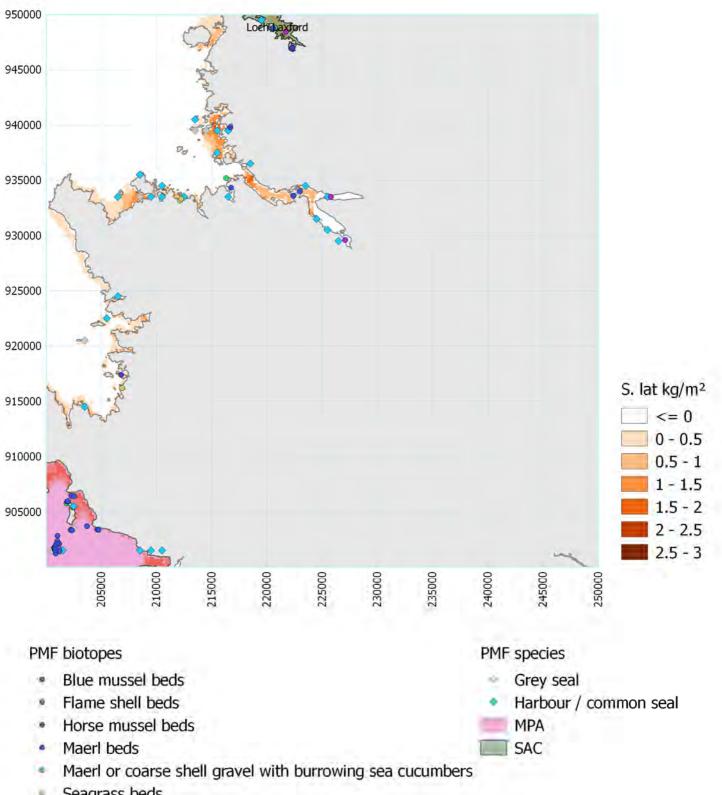
- Horse mussel beds
- Maerl beds

Maerl or coarse shell gravel with burrowing sea cucumbers

Northern sea fan and sponge communities

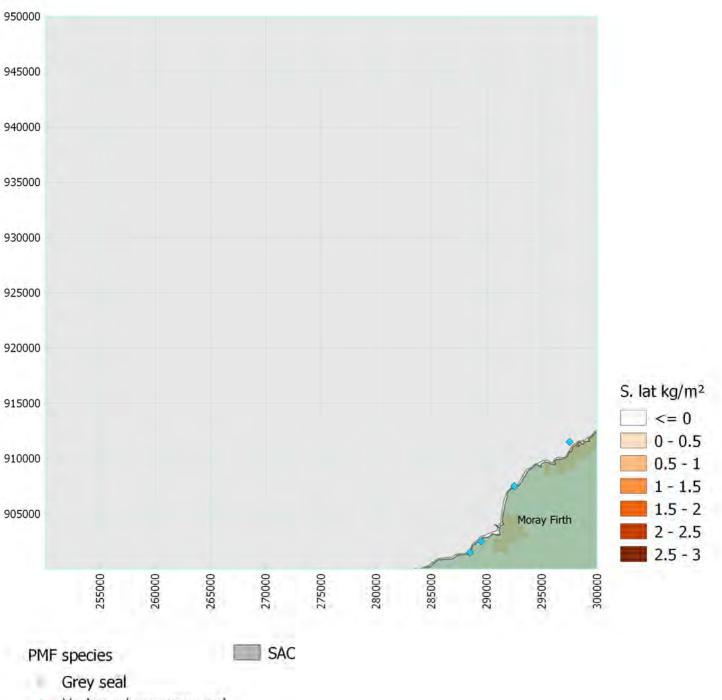
- Grey seal
- Harbour / common seal
 - MPA

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Map 16
```

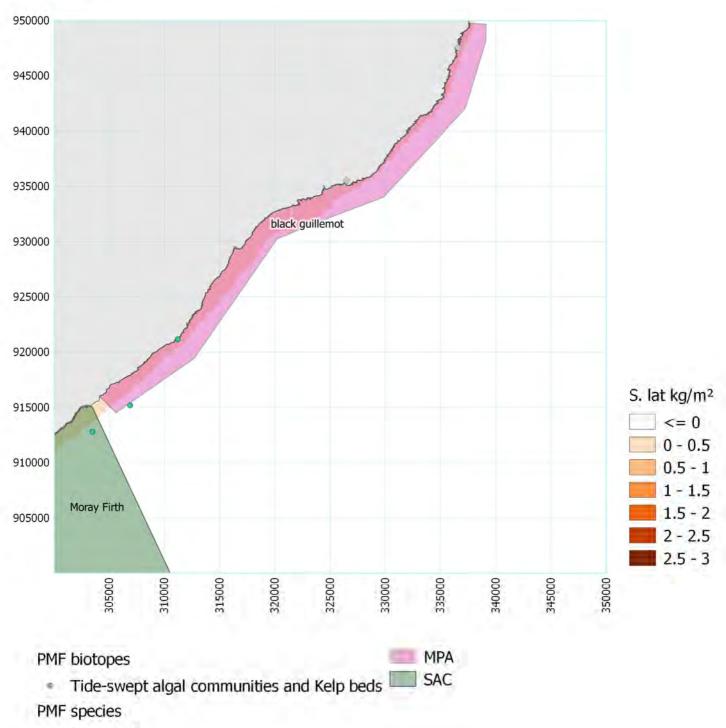


- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds ٠

Map 17

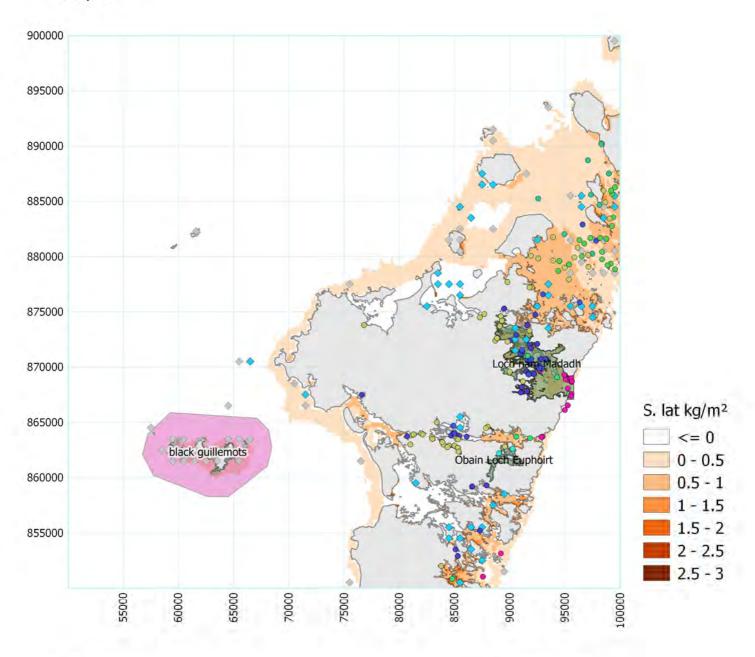






Grey seal

Map 19



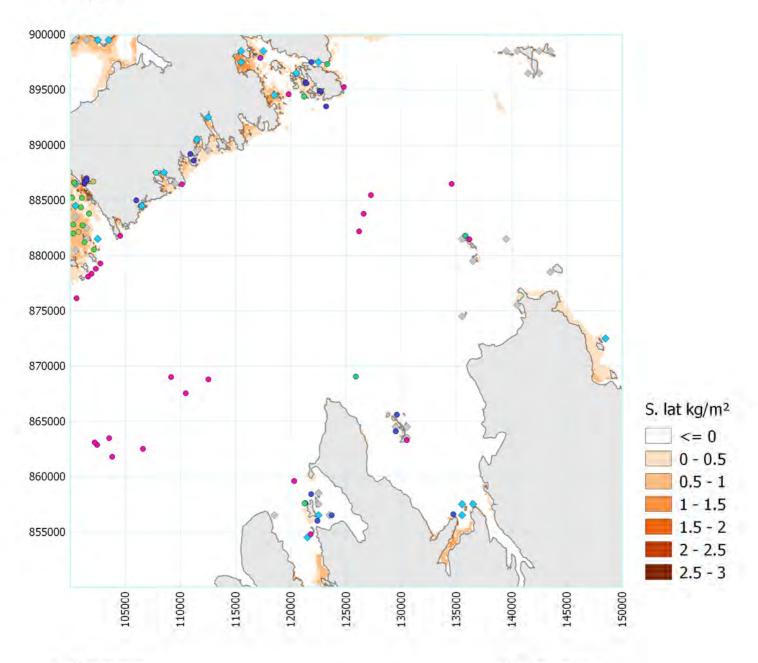
- Blue mussel beds & Low or variable salinity habitats
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves

PMF species

- Grey seal
- Harbour / common seal
- MPA

SAC

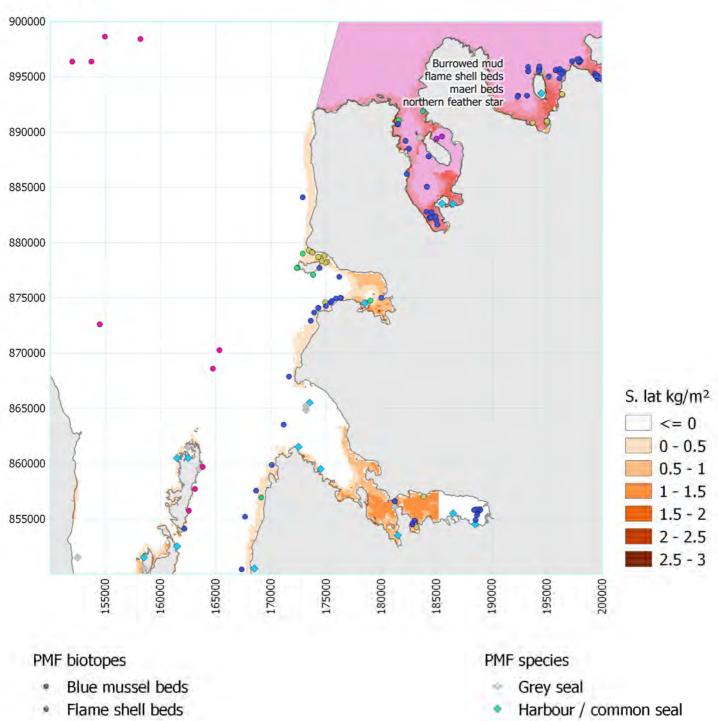
Map 20



- Blue mussel beds & Low or variable salinity habitats
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves

- PMF species
 - Grey seal
 - Harbour / common seal

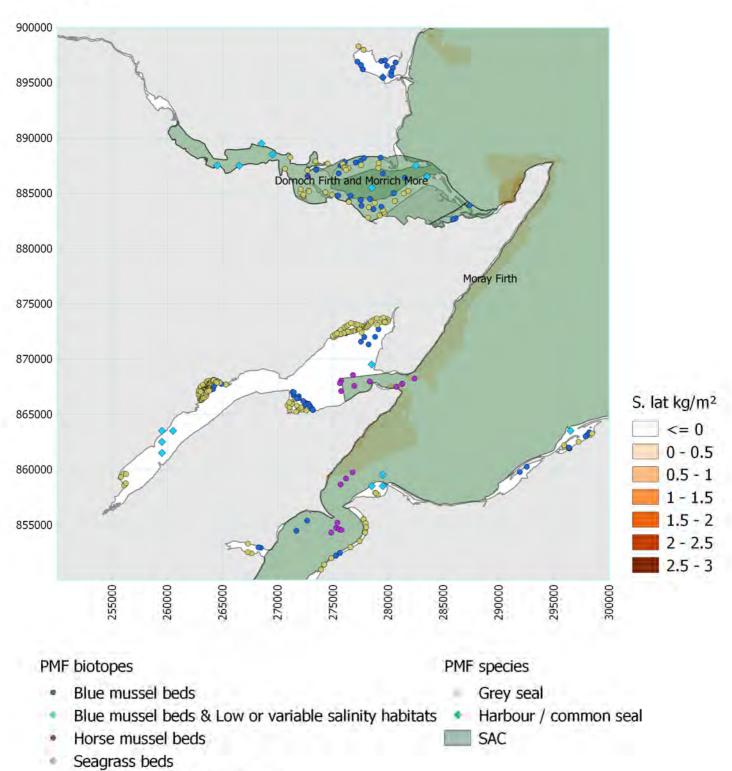
Map 21



MPA

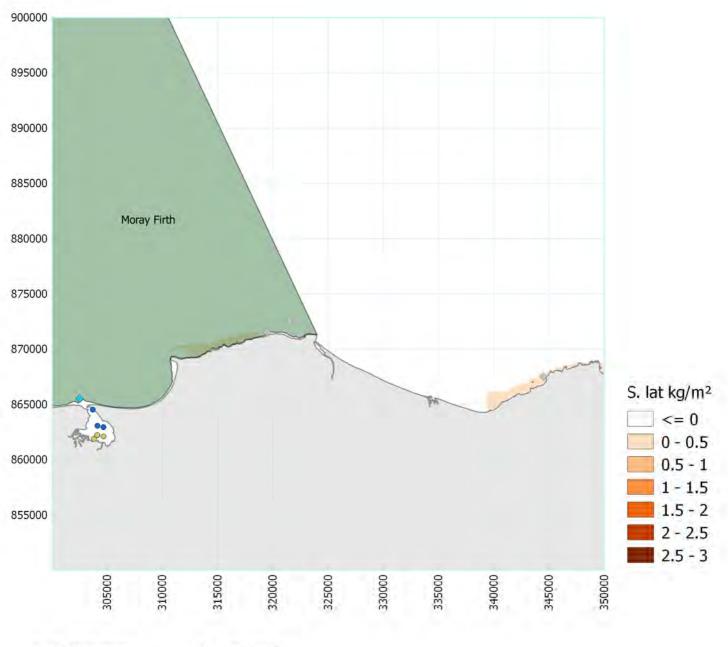
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
 - Tide-swept algal communities
 - Tide-swept algal communities and Kelp beds

Map 22



Tide-swept algal communities



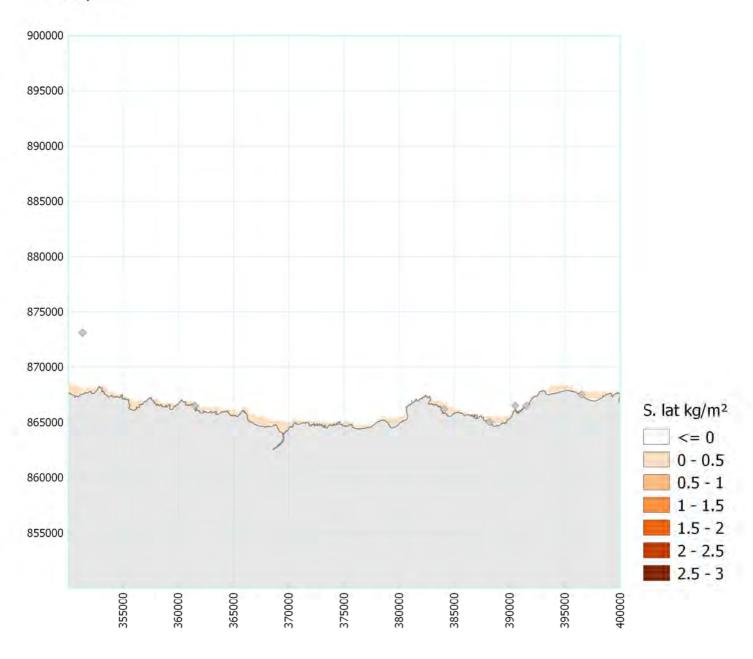


PMF biotopes PMF species

Blue mussel beds
 Grey seal

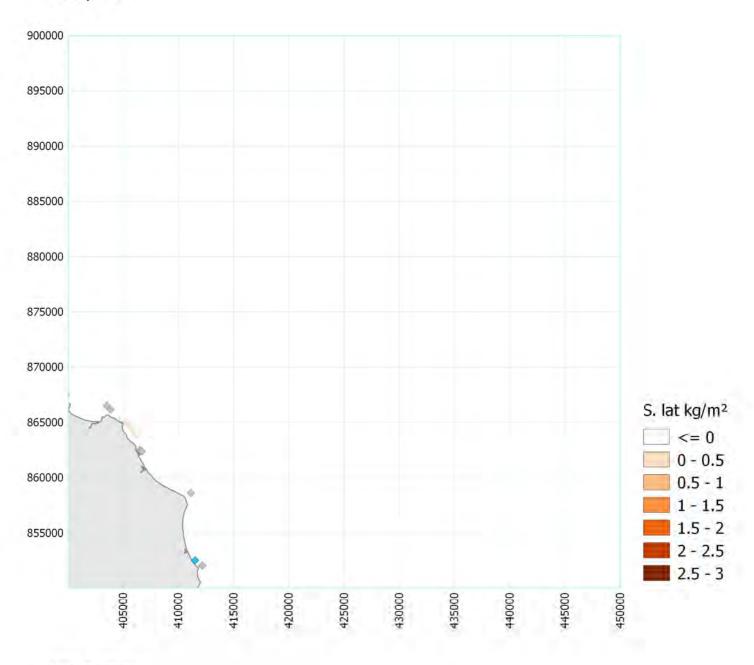
- Seagrass beds
 Harbour / common seal
 - SAC

Map 24



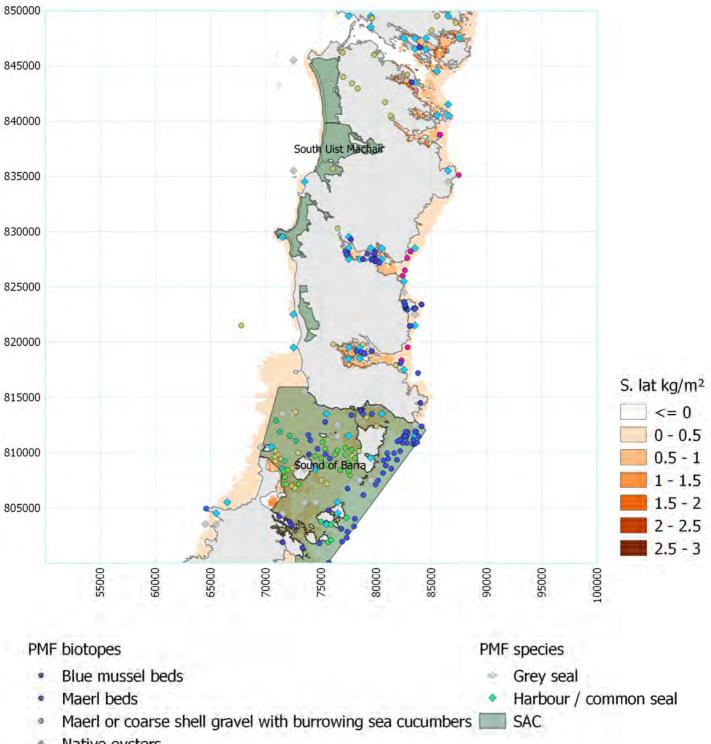
Grey seal

Map 25



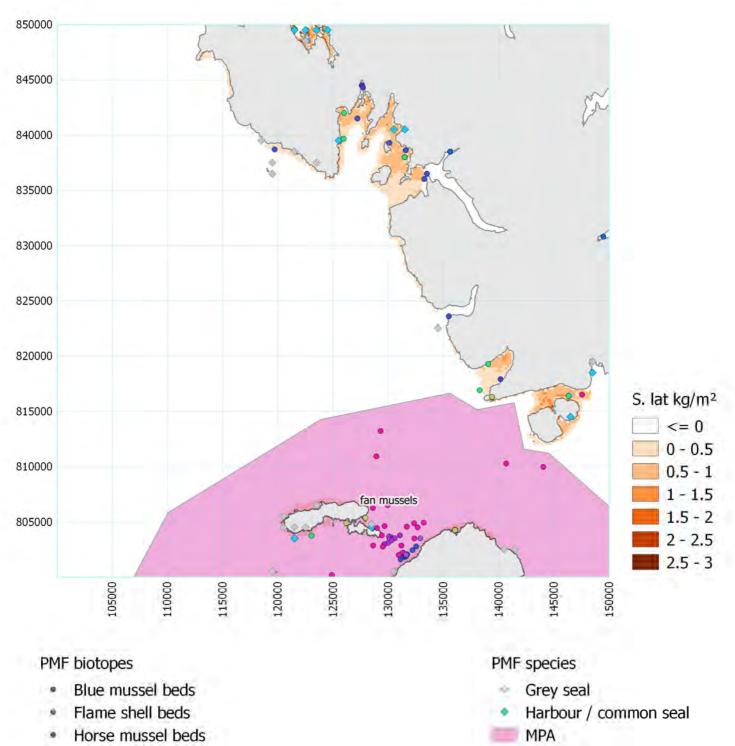
Grey seal





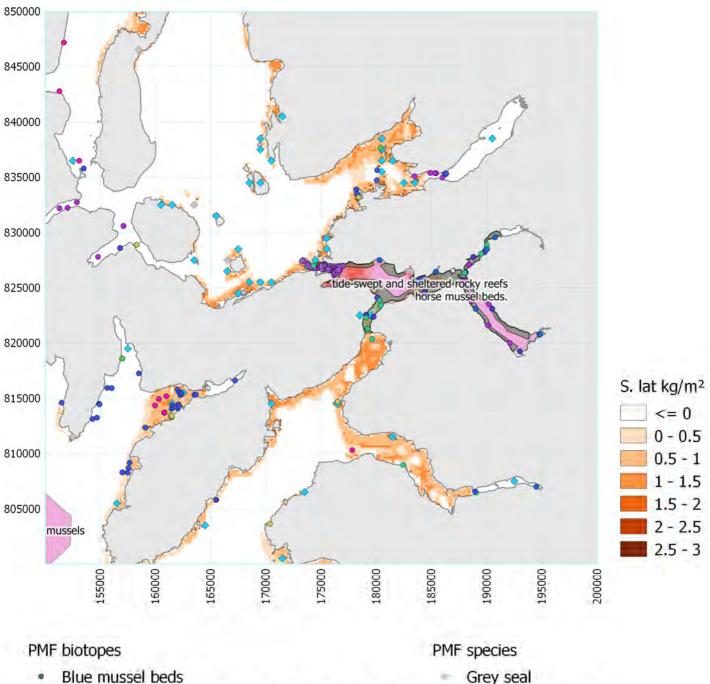
- Native oysters
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves

Map 27



- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
 - Tide-swept algal communities
 - Tide-swept algal communities and Kelp beds

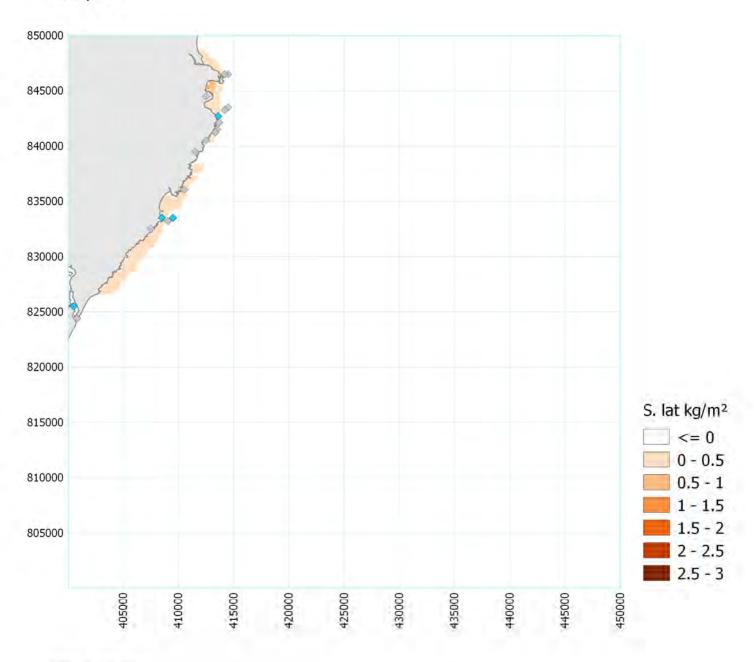
Map 28



- Blue mussel beds & Low or variable salinity habitats
- Flame shell beds 0
- Horse mussel beds
- Maerl beds .
- Northern sea fan and sponge communities .
- Seagrass beds 1.0
 - Tide-swept algal communities ٠
 - Tide-swept algal communities and Kelp beds
 - Tide-swept coarse sands with burrowing bivalves .

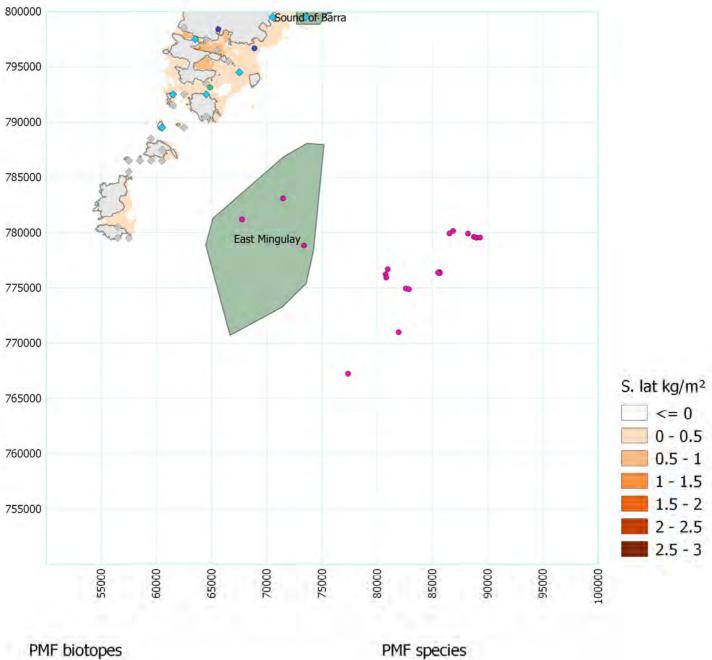
- Grey seal
- Harbour / common seal
- MPA SAC

Map 29



Grey seal

Map 30



Maerl beds ø

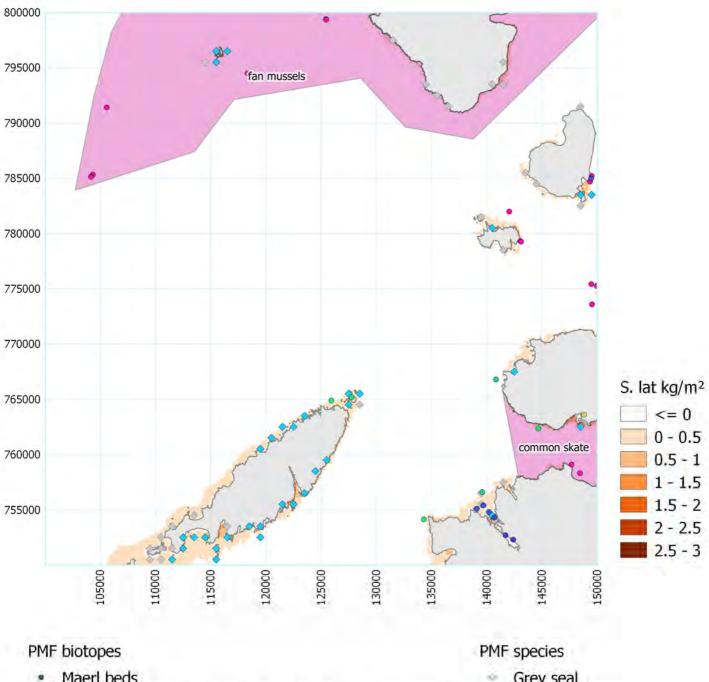
PMF species

SAC

Grey seal

- Northern sea fan and sponge communities .
- Tide-swept algal communities ٠
- Tide-swept algal communities and Kelp beds ٠

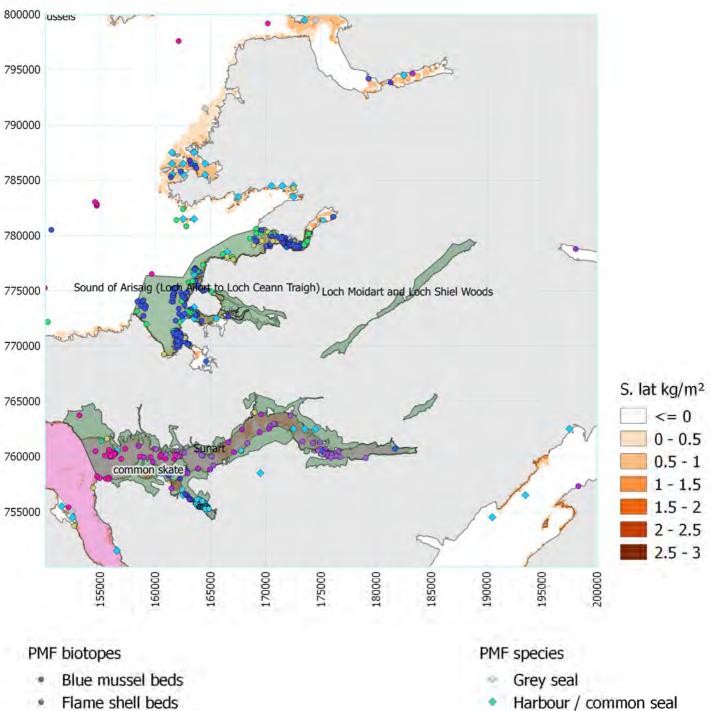
Map 31



- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

- Grey seal
- Harbour / common seal MPA

Map 32

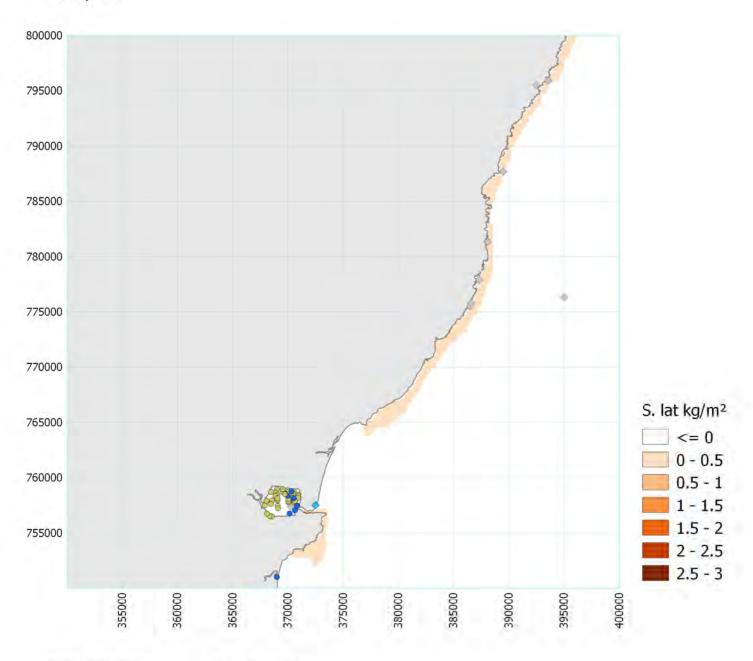


MPA

SAC

- Flame shell beds
- Horse mussel beds 10
- Maerl beds ٥
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities .
- Seagrass beds ×
- Serpulid aggregations
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

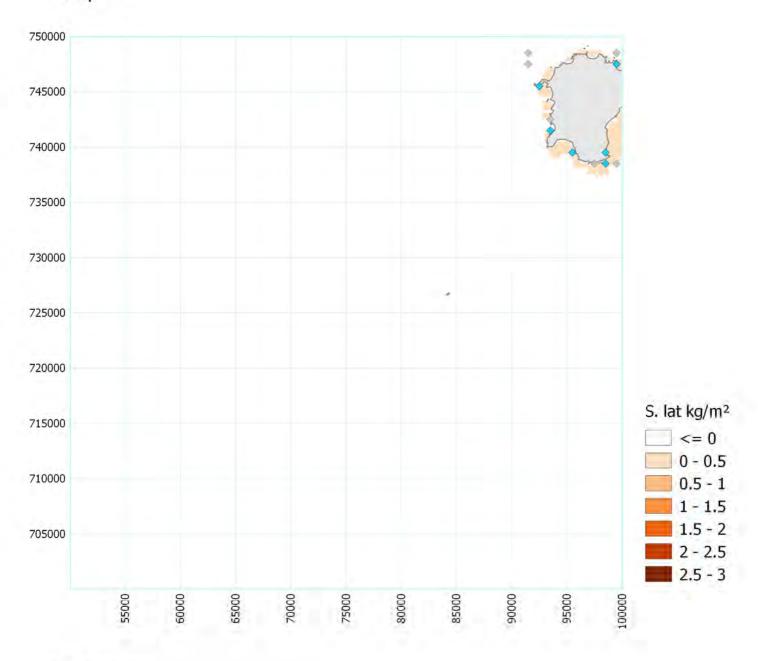
Map 33



PMF biotopes PMF species

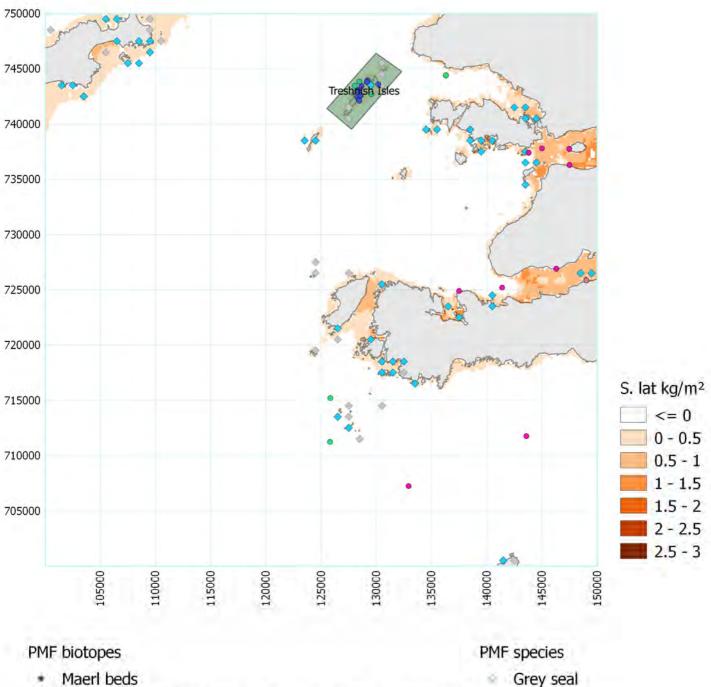
- Blue mussel beds
 Grey seal
- Seagrass beds
 Harbour / common seal

Map 34



Grey seal

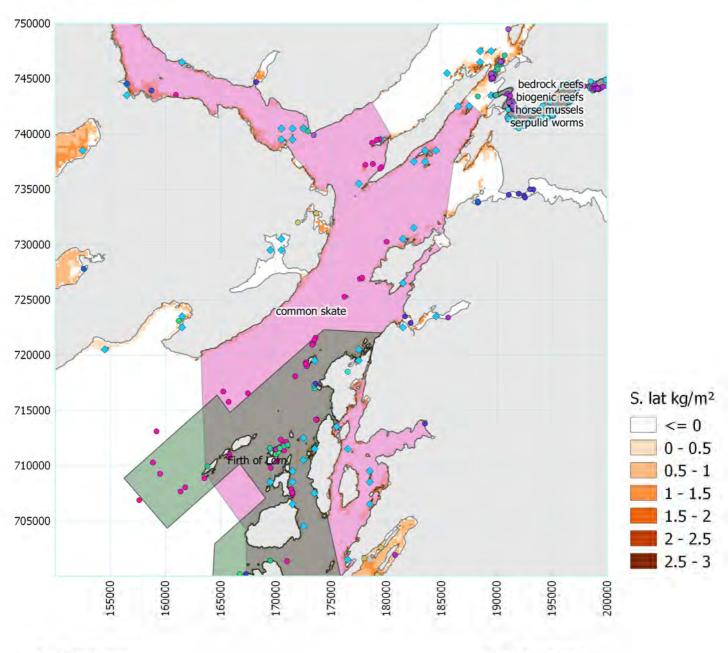
Map 35



SAC

- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers Harbour / common seal ٠
- Native oysters . .
 - Northern sea fan and sponge communities
 - Seagrass beds
 - Tide-swept algal communities and Kelp beds

Map 36



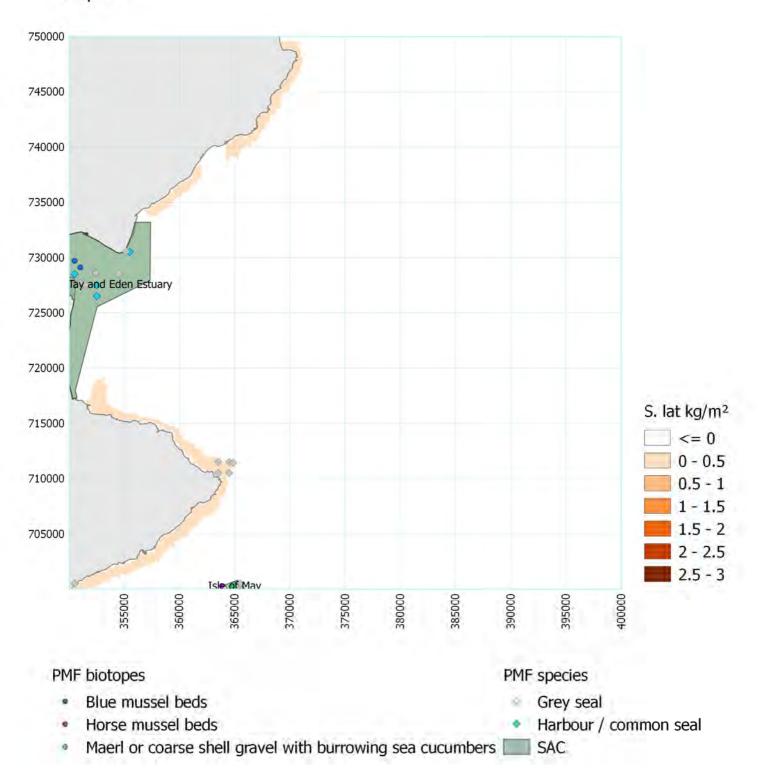
- Blue mussel beds
- Blue mussel beds & Low or variable salinity habitats
- Flame shell beds
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Northern sea fan and sponge communities
- Seagrass beds
- Serpulid aggregations
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

PMF species

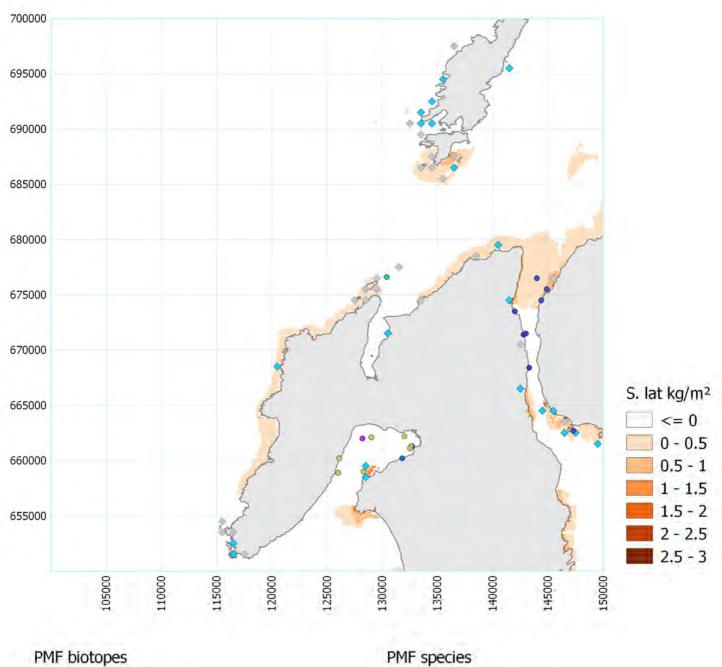
- Grey seal
- Harbour / common seal
- MPA

SAC

Map 37



Map 38



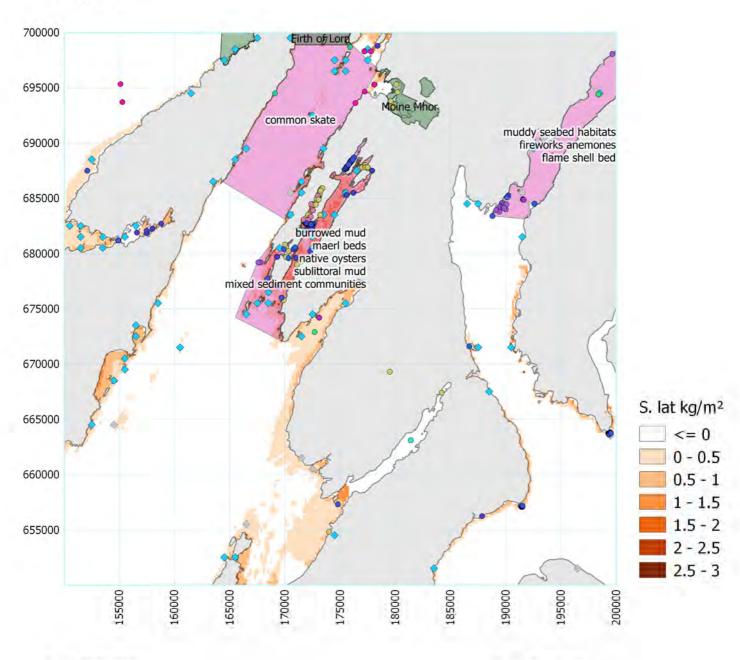
Grey seal

Harbour / common seal

PMF biotopes

- Blue mussel beds ø
- Horse mussel beds 0
- Maerl beds ŵ.
- Seagrass beds 6
- Tide-swept algal communities .
- Tide-swept algal communities and Kelp beds ۰

Map 39



PMF biotopes

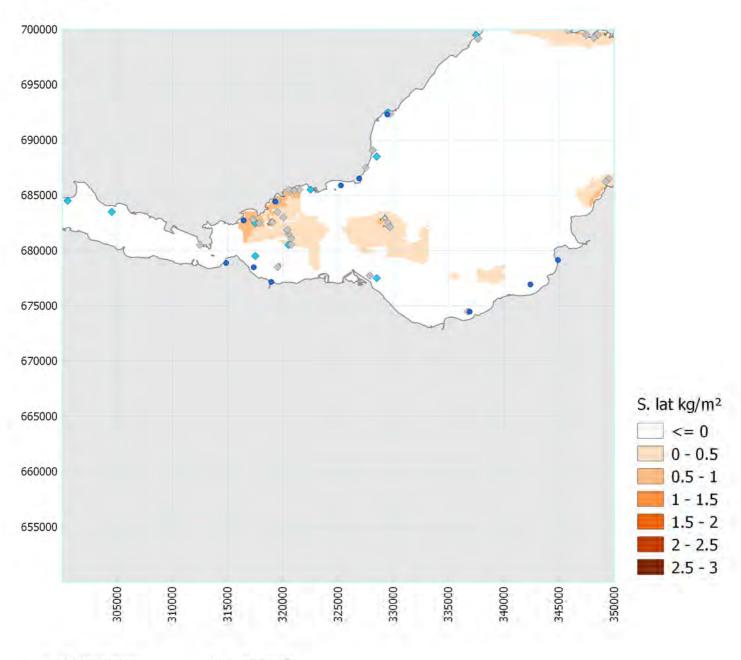
- Blue mussel beds
- Blue mussel beds & Low or variable salinity habitats
- Flame shell beds
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Native oysters
- Northern sea fan and sponge communities
- Seagrass beds
- Serpulid aggregations
- Tide-swept algal communities
- Tide-swept algal communities and Kelp beds

PMF species

- Grey seal
- Harbour / common seal
- MPA

SAC



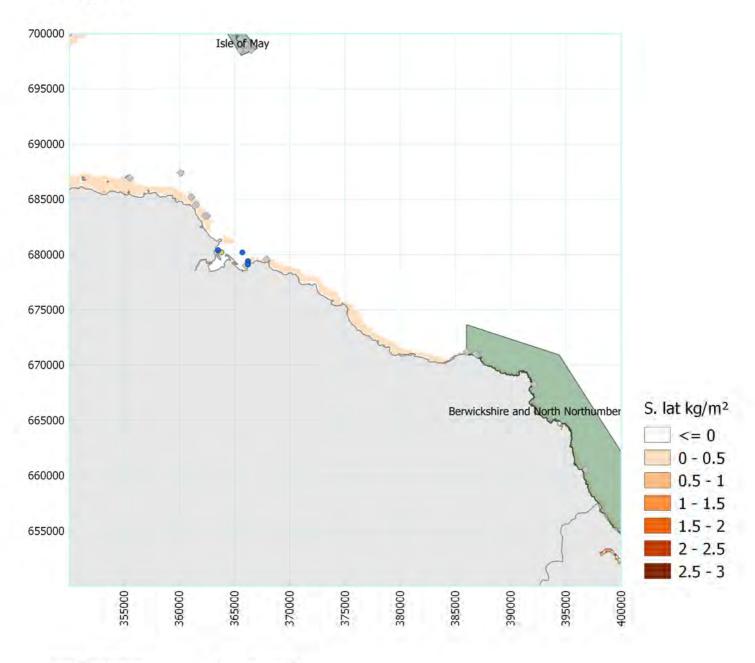


PMF biotopes PMF species

Blue mussel beds
 Grey seal

Harbour / common seal

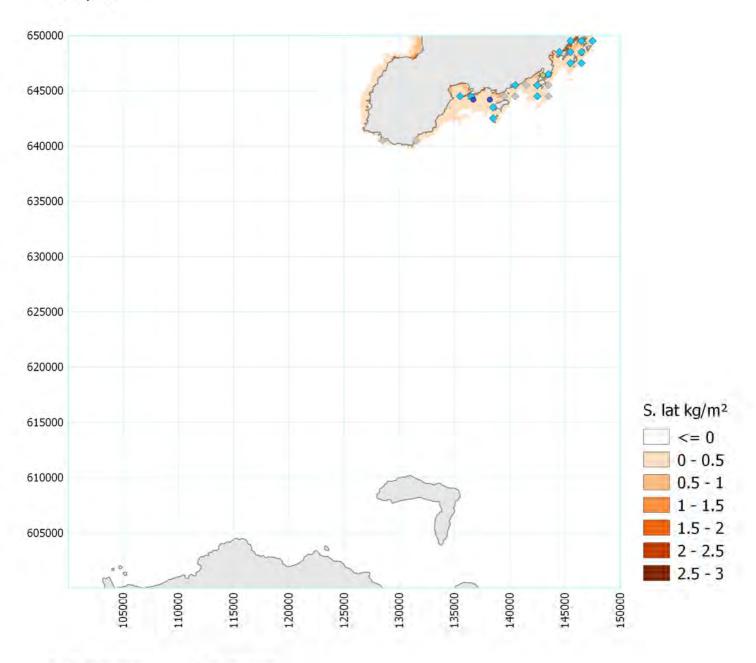
Map 41



PMF biotopes PMF species

- Blue mussel beds
 Grey seal
- Seagrass beds SAC

Map 42



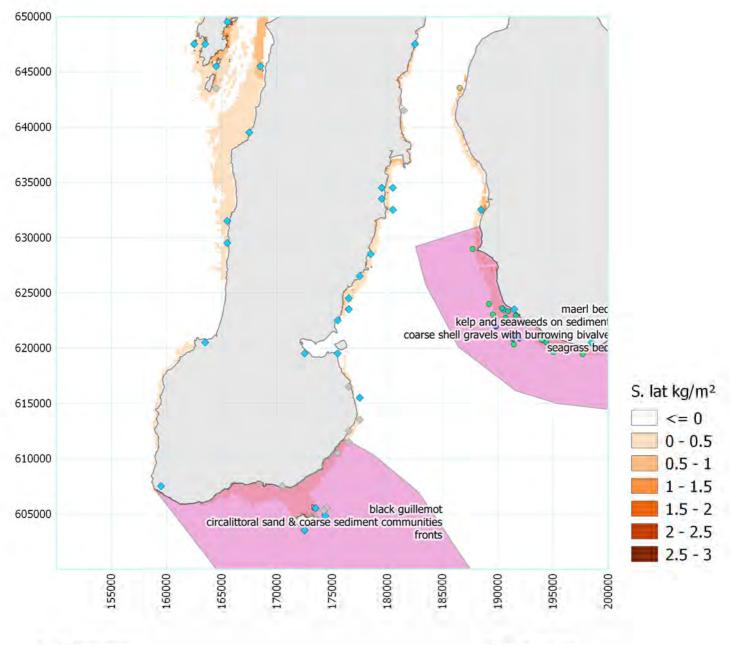
PMF biotopes PMF species

Maerl beds

Grey seal

Seagrass beds

 Harbour / common seal



PMF biotopes

Maerl beds ٠

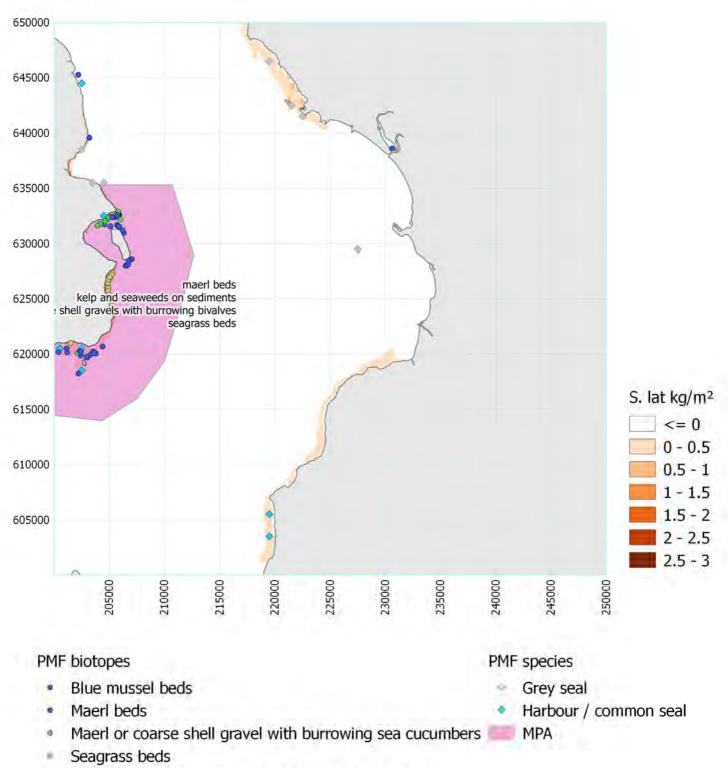
PMF species

Grey seal

- Maerl or coarse shell gravel with burrowing sea cucumbers ٠
- Seagrass beds 8
- Tide-swept algal communities and Kelp beds ٠

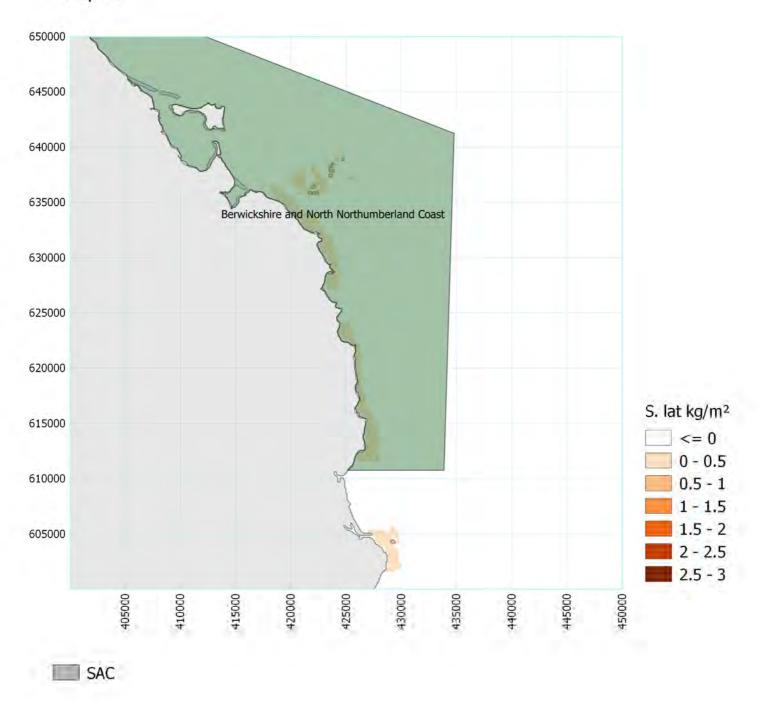
Harbour / common seal MPA



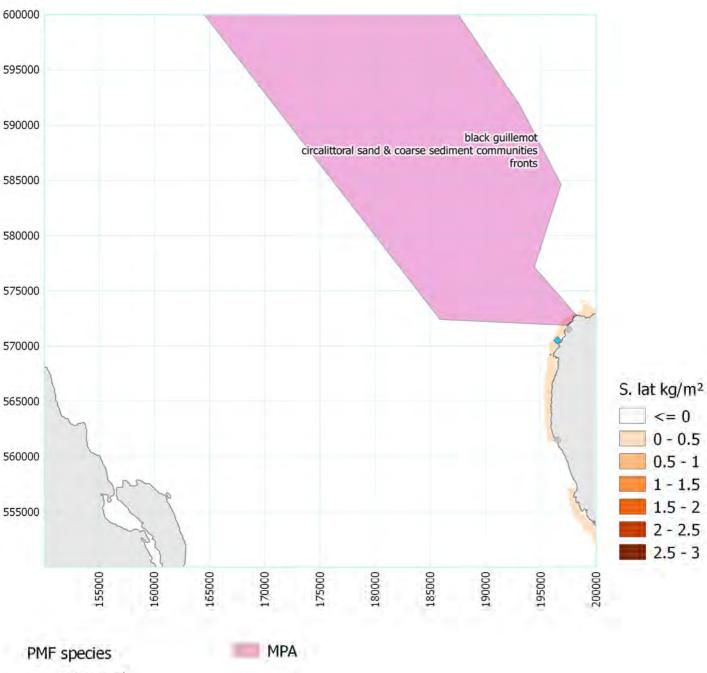


Tide-swept coarse sands with burrowing bivalves

Map 45



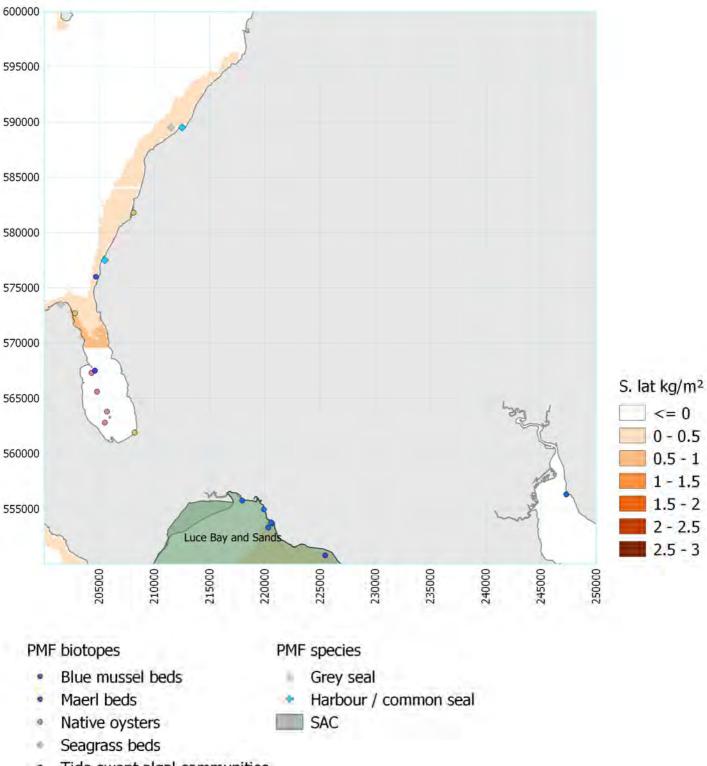
Map 46



Grey seal

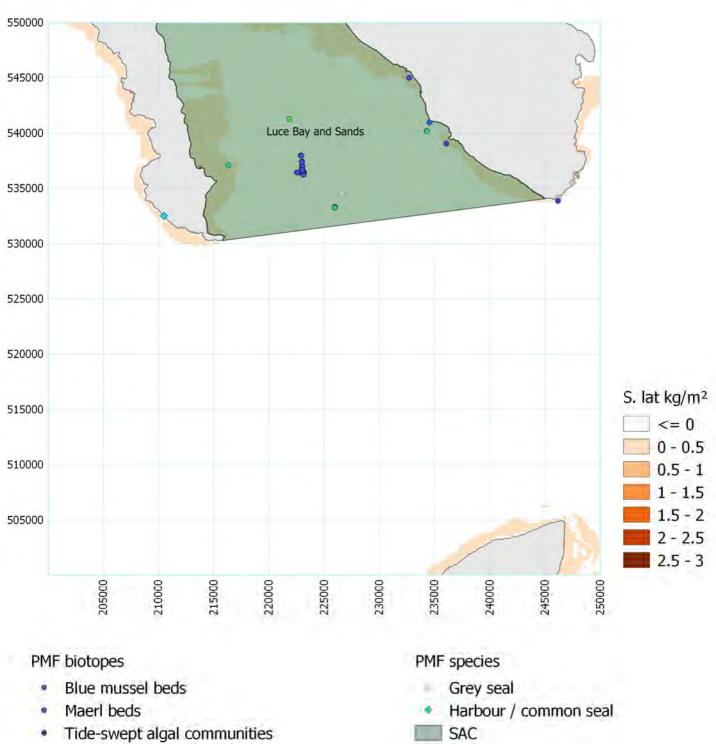
Harbour / common seal

Map 47



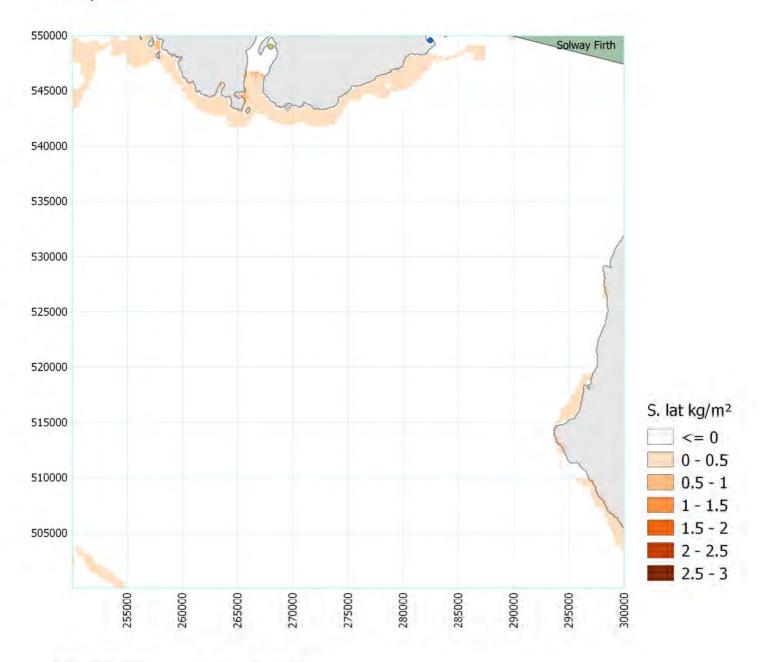
Tide-swept algal communities

Map 48



- Tide-swept algal communities and Kelp beds
- Tide-swept coarse sands with burrowing bivalves

Map 49



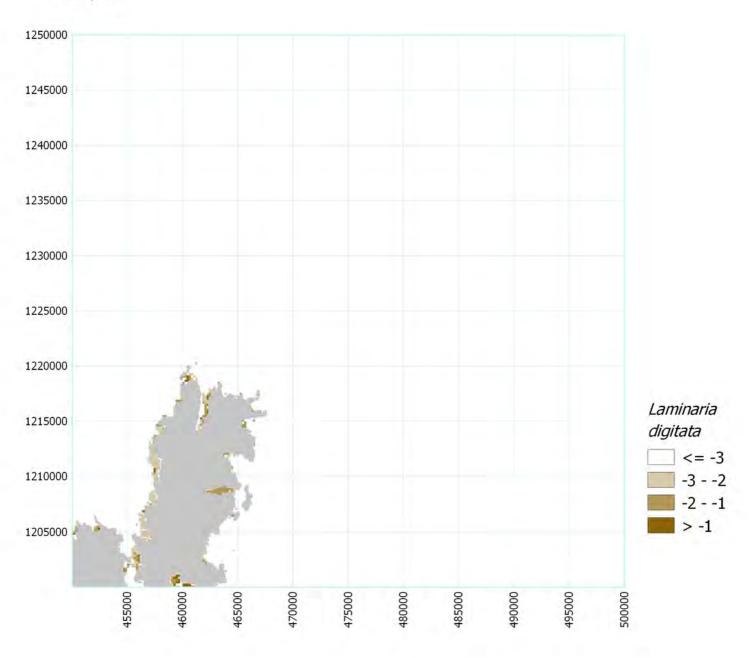
PMF biotopes PMF species

- Blue mussel beds
 Grey seal
- Seagrass beds SAC

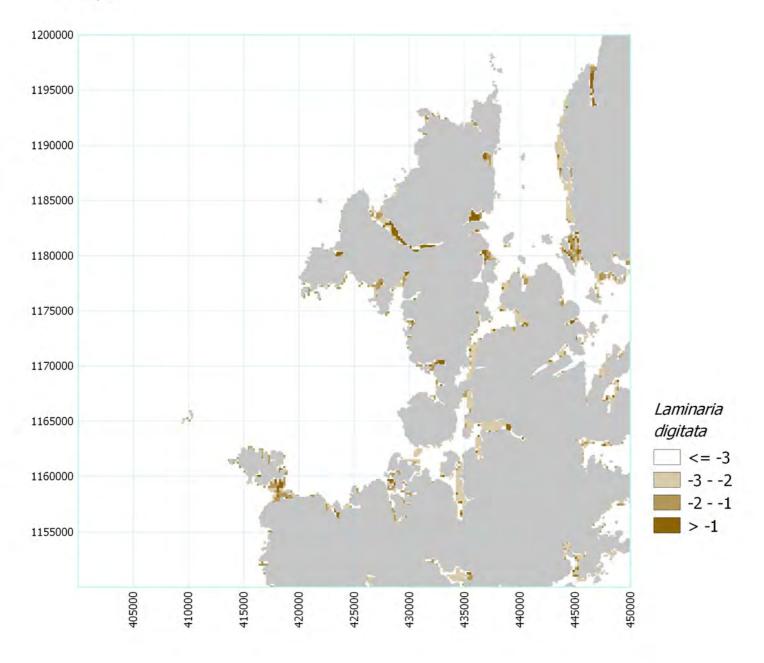
2.3 Laminaria digitata

The following pages show the habitat suitability for Laminaria digitata.

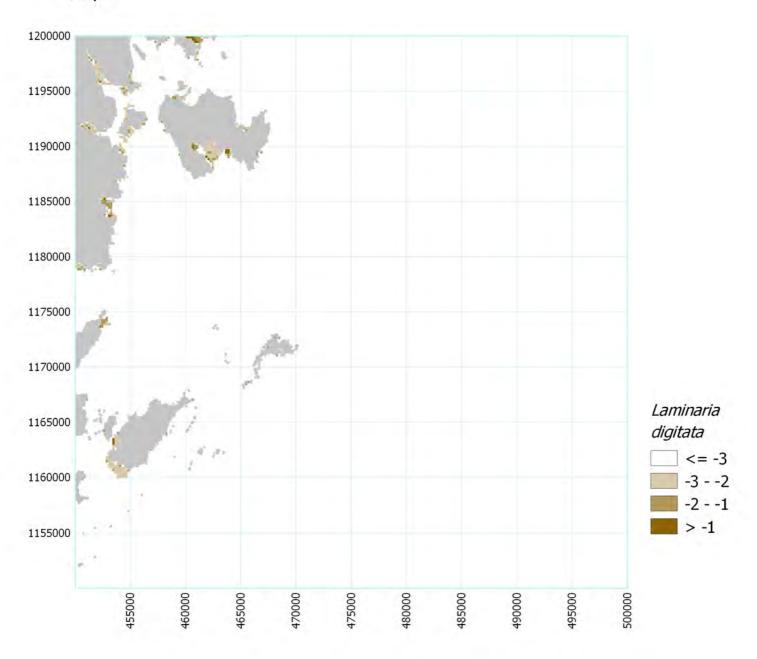




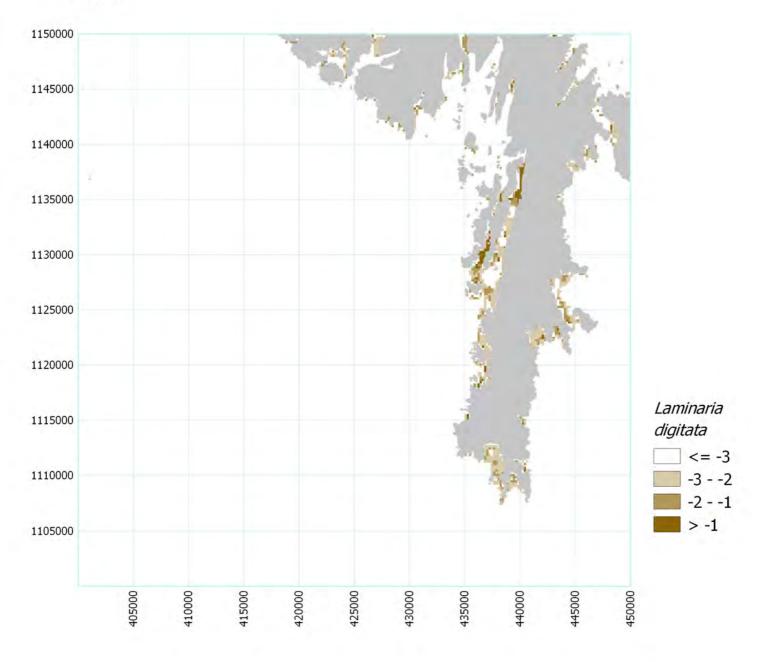




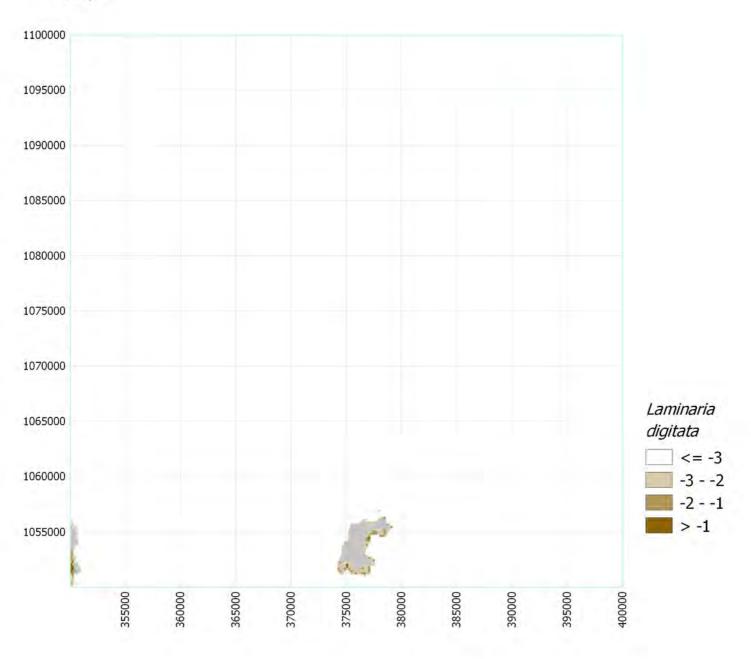




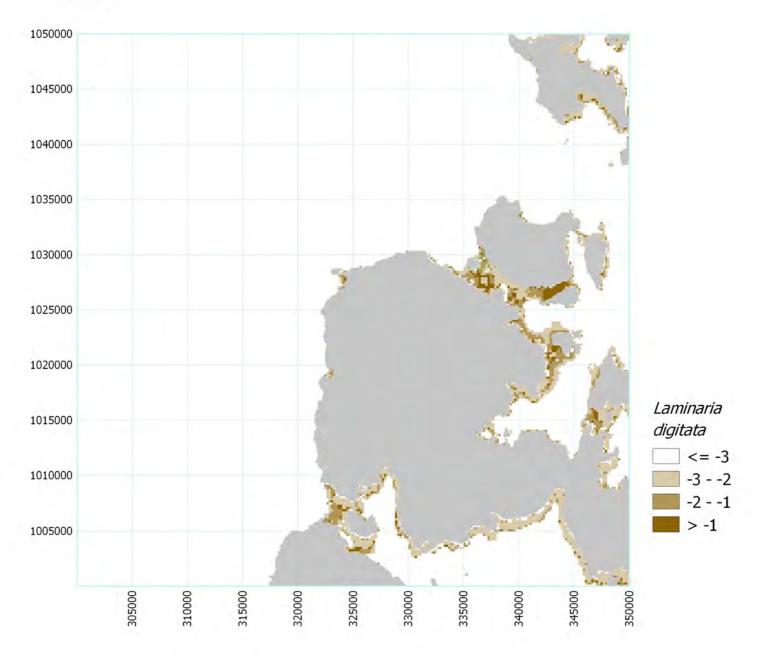




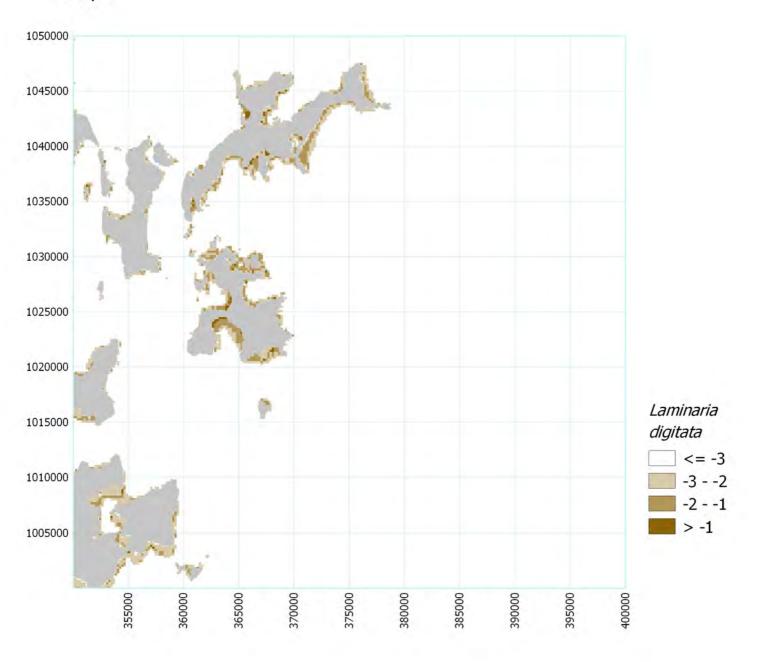
Map 5



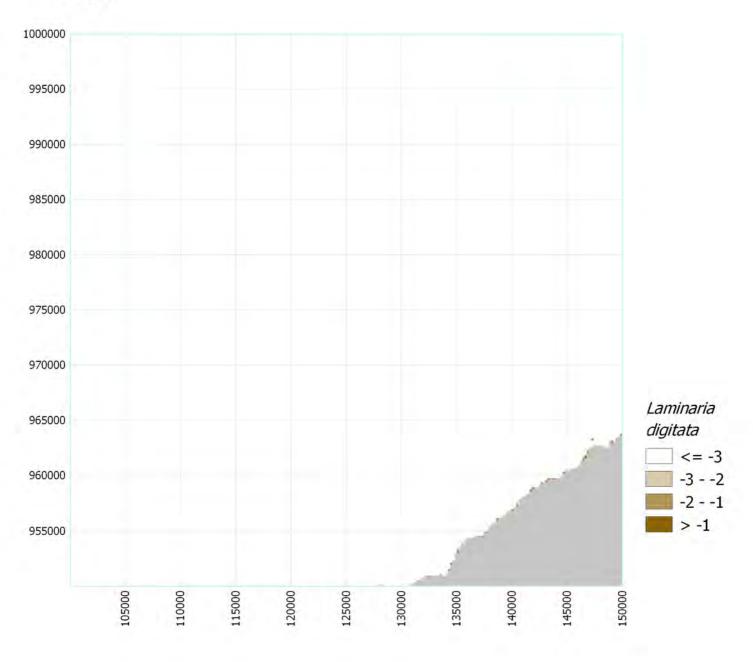




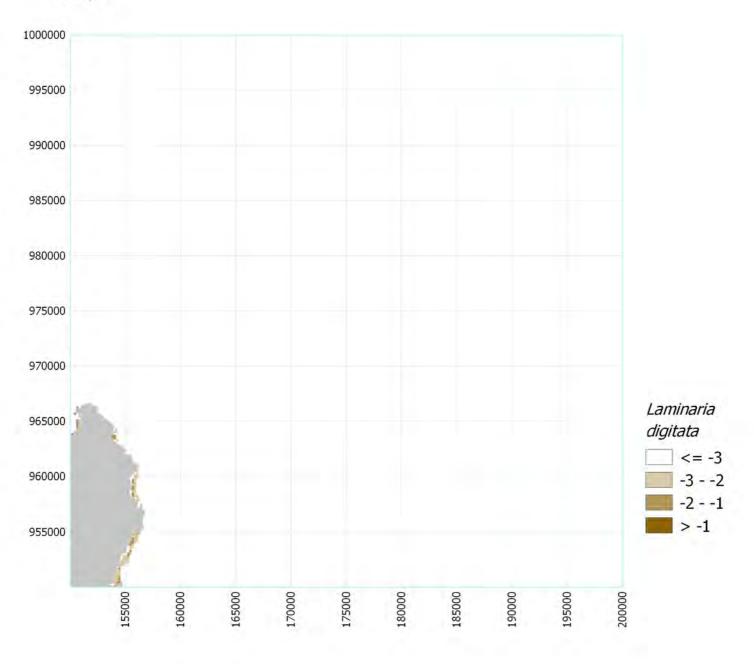
Map 7



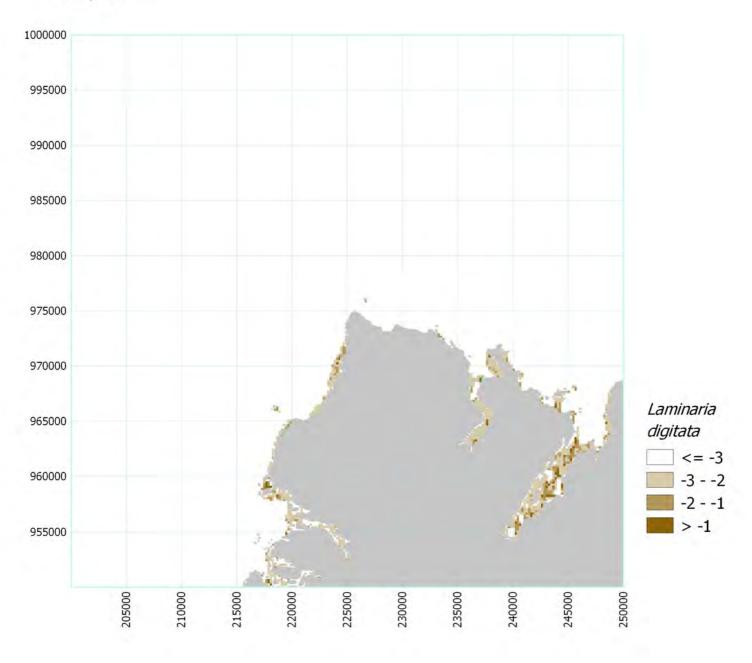




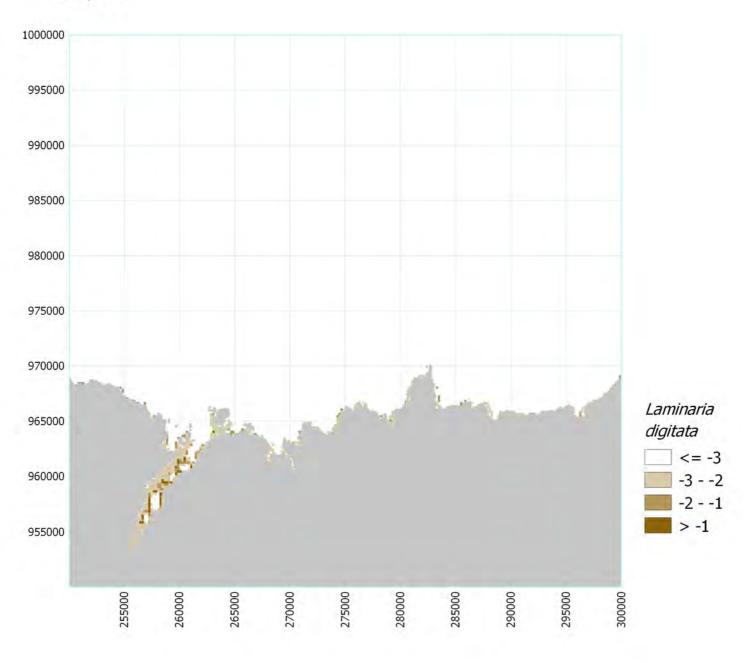




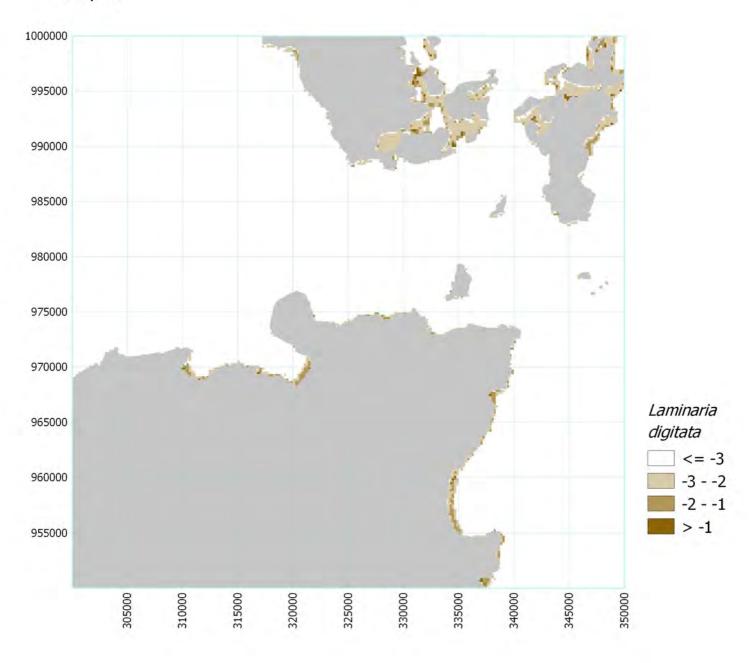
Map 10



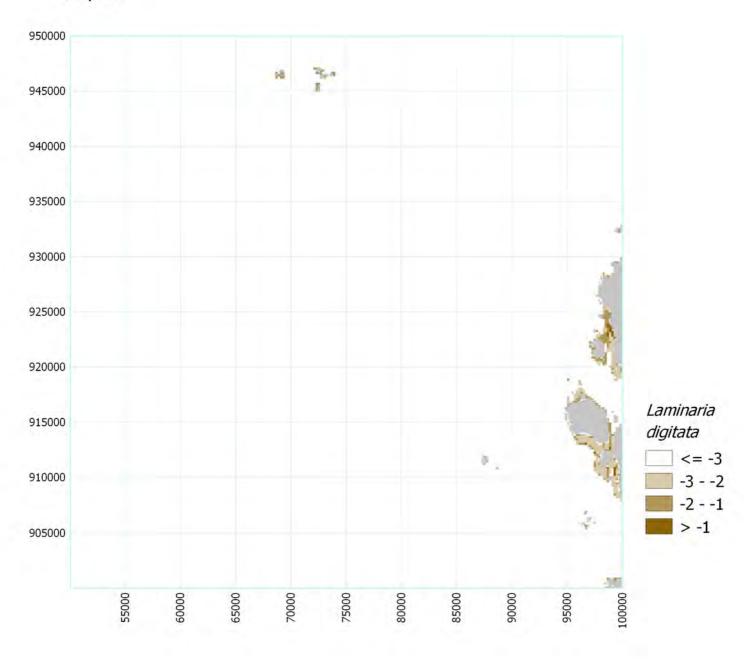




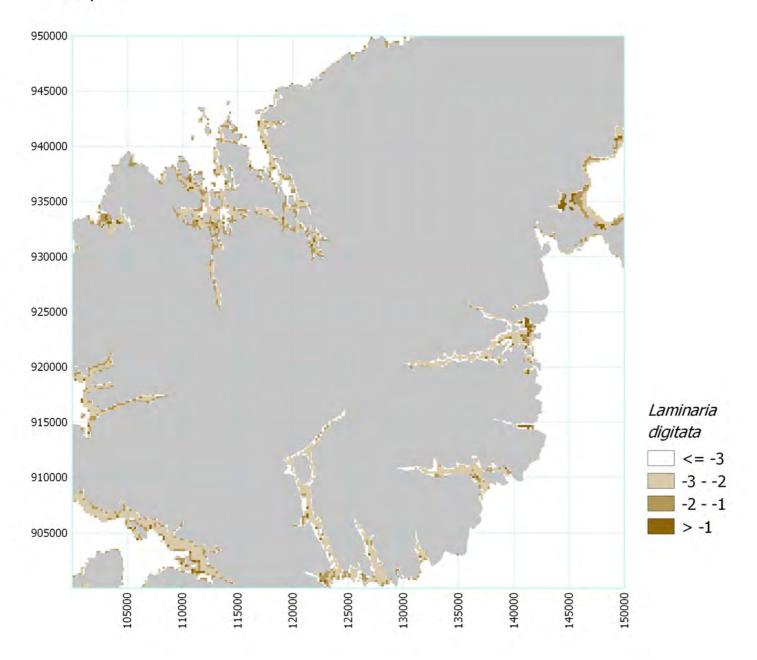
Map 12

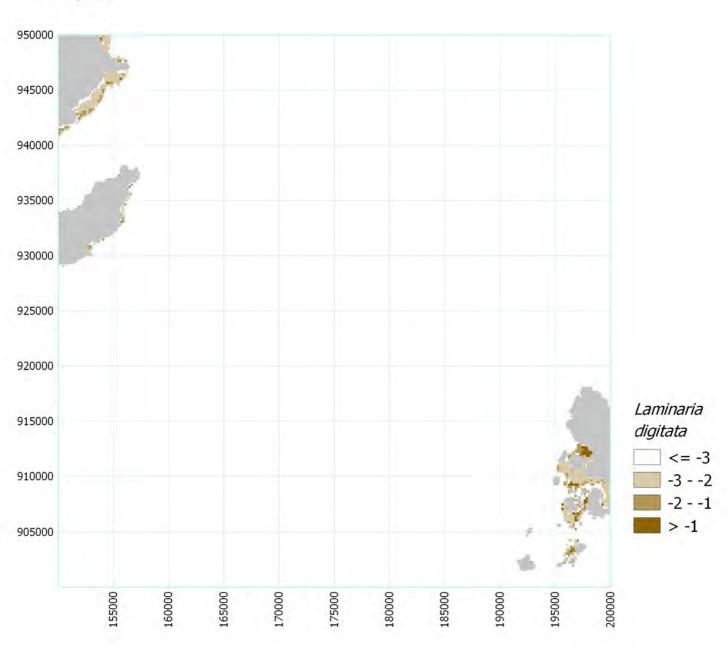


Map 13



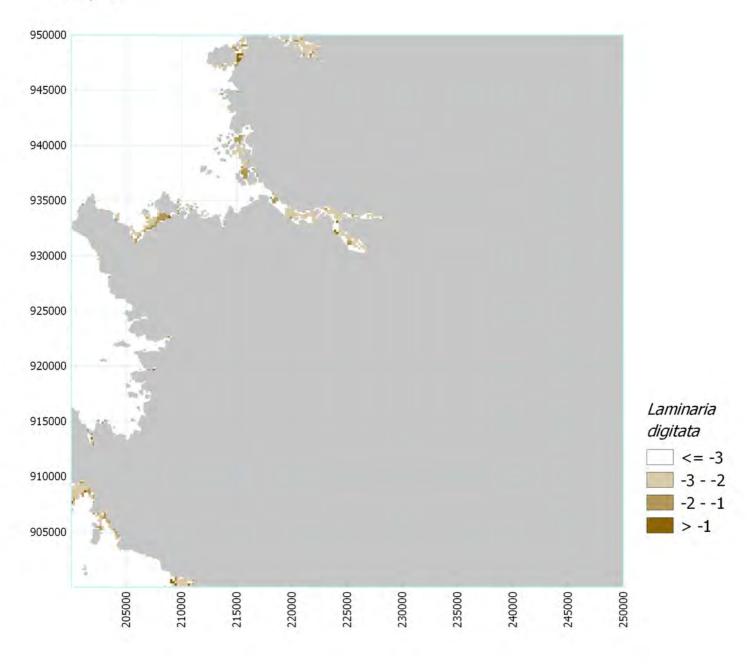
Map 14



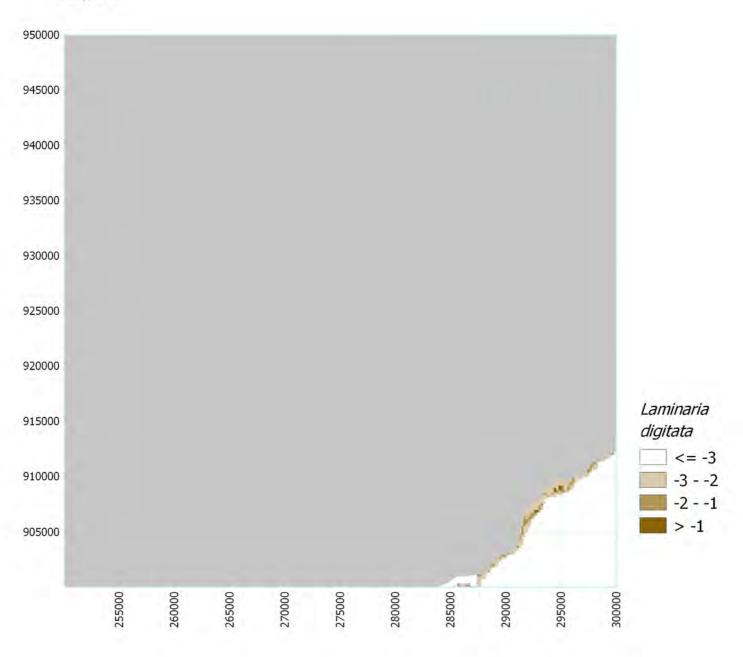


Map 15

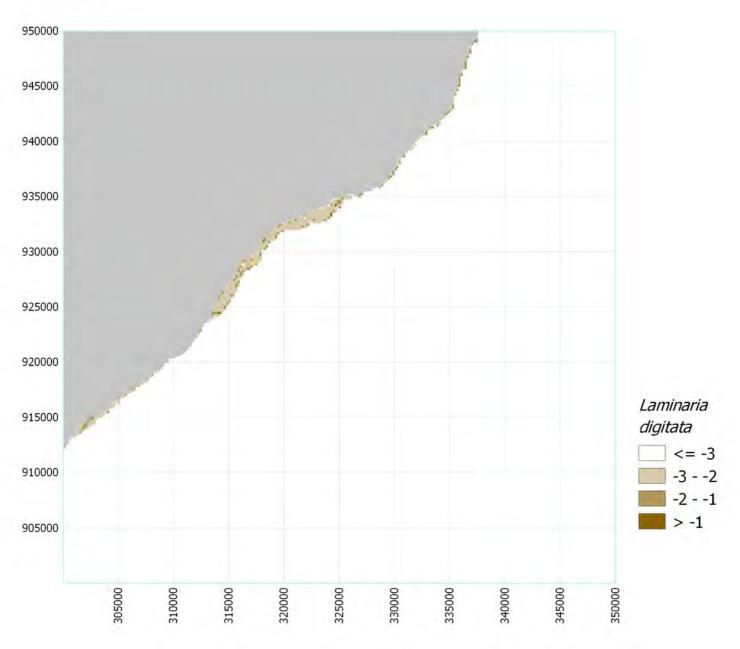
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Map 16
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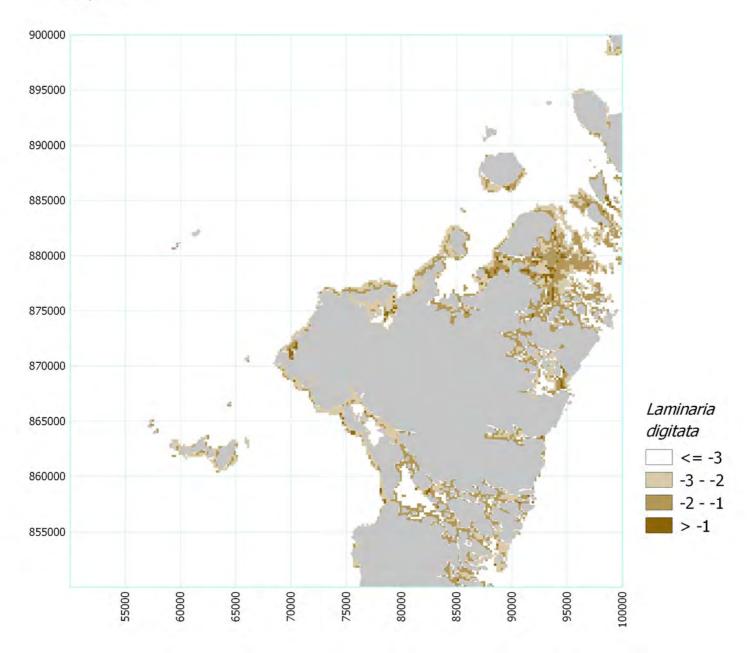
Map 17



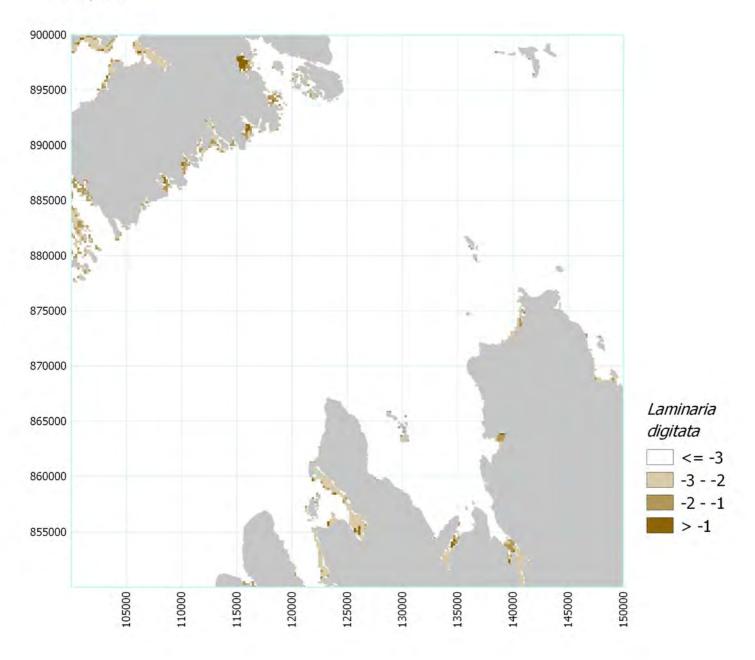




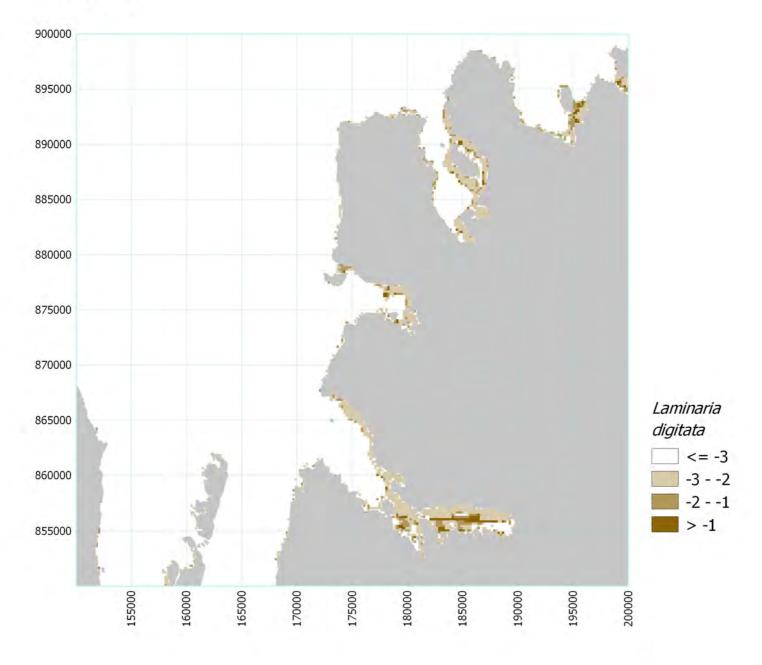




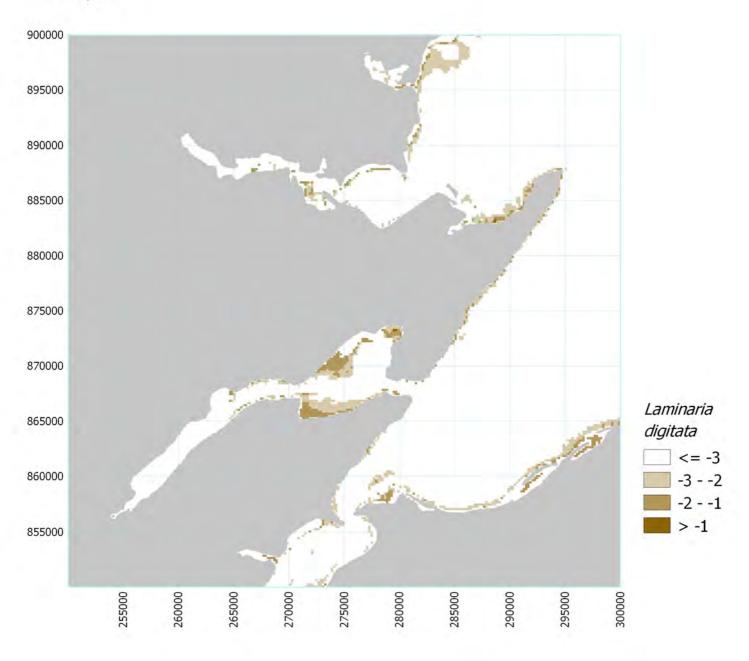
Map 20



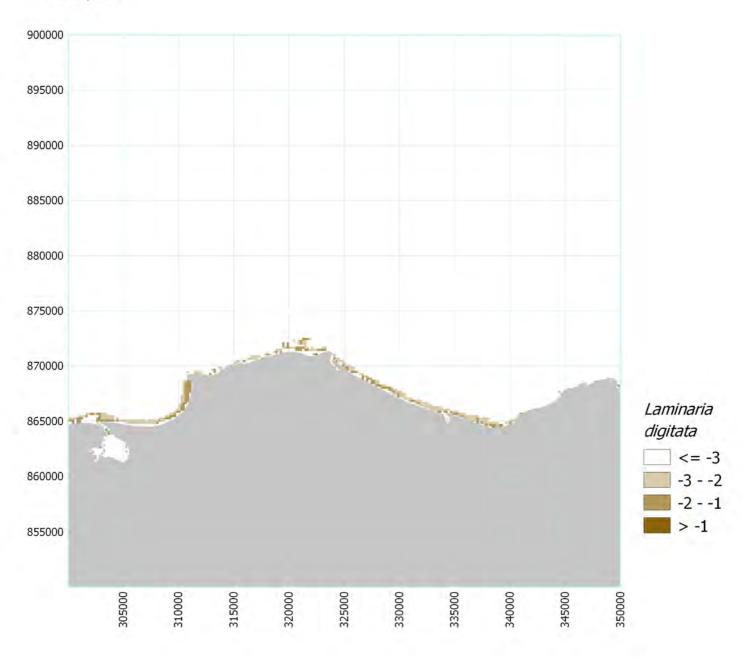




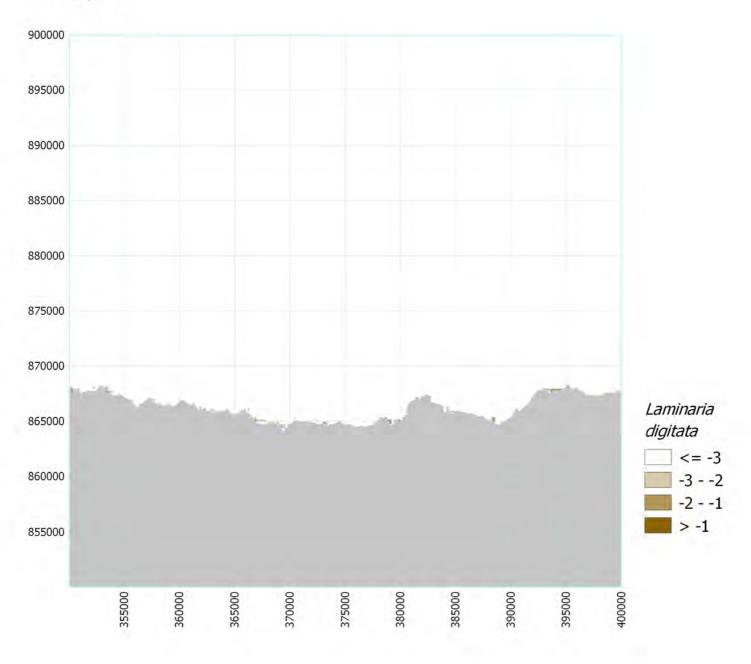




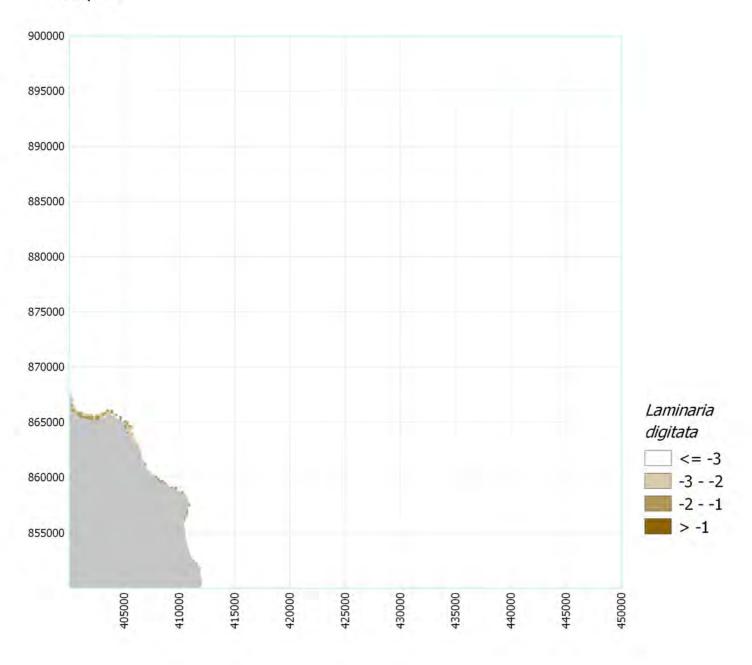
Map 23



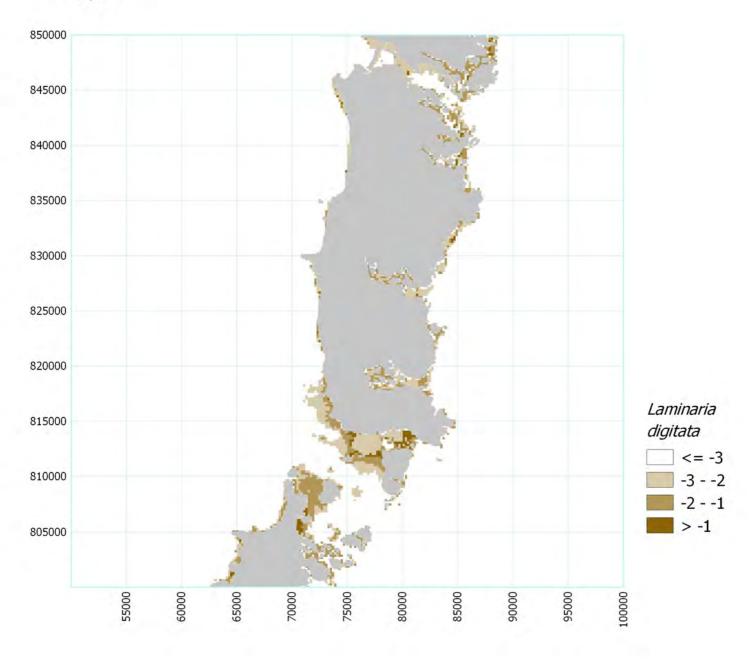




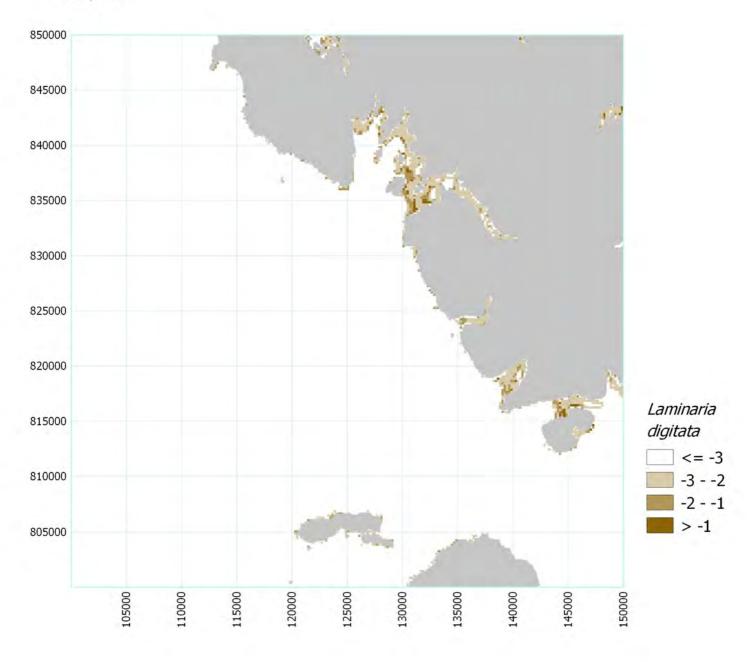
Map 25



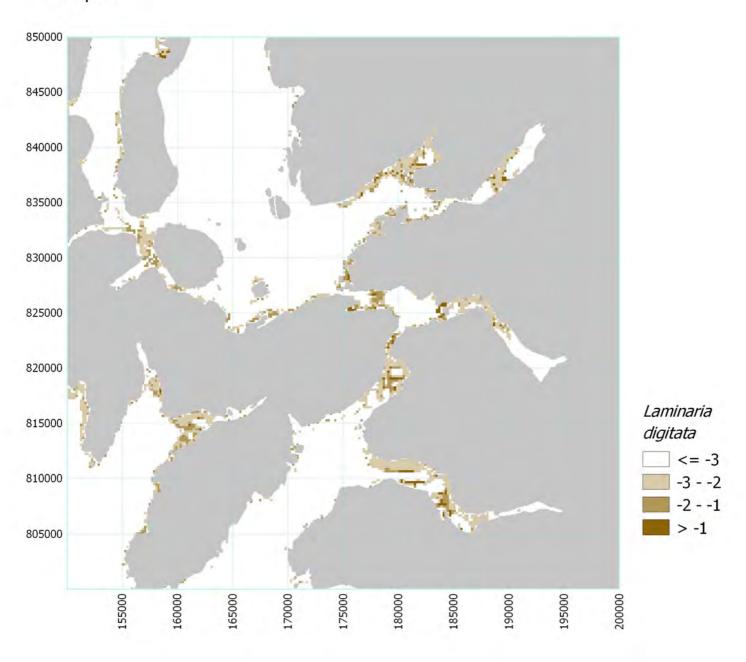
Map 26



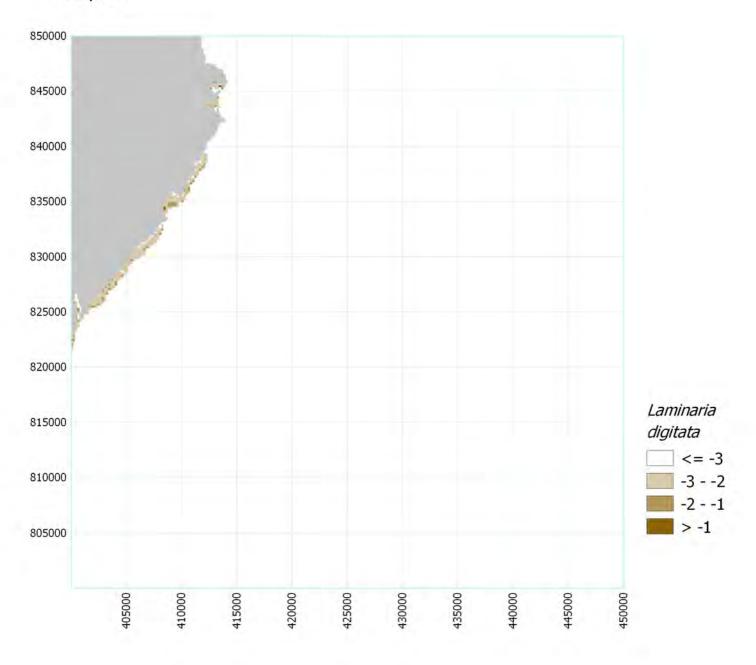
Map 27



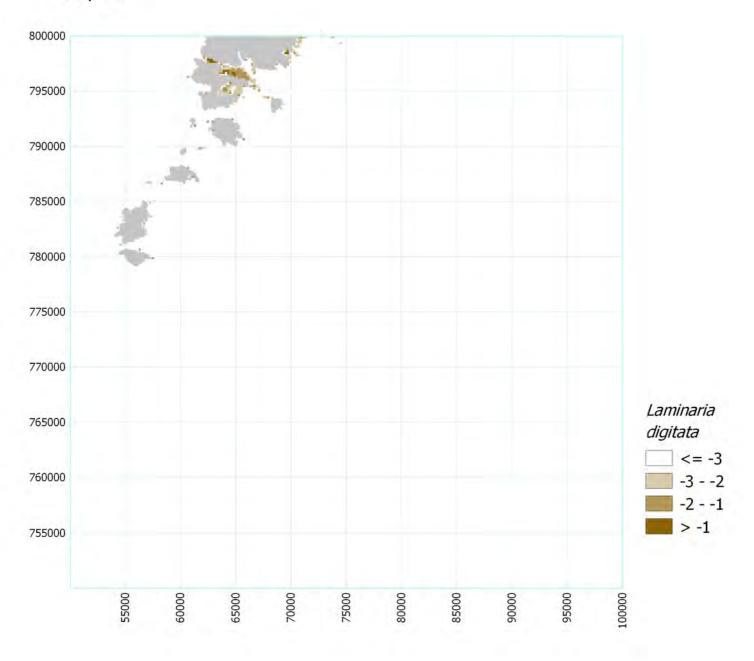
Map 28



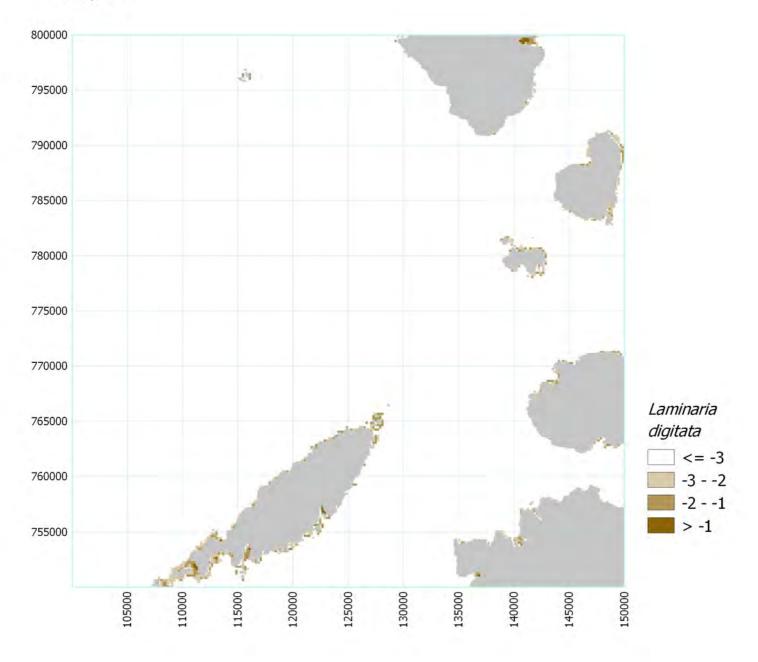
Map 29



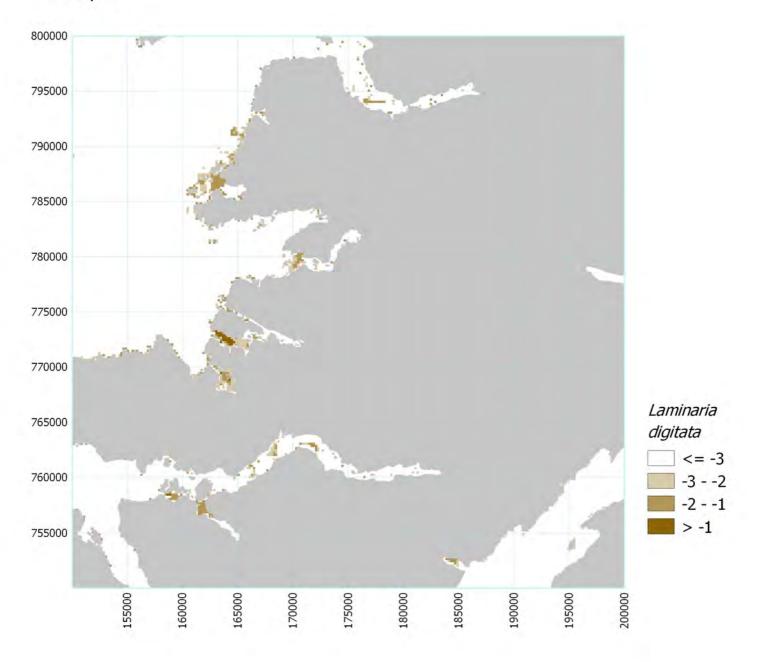
Map 30



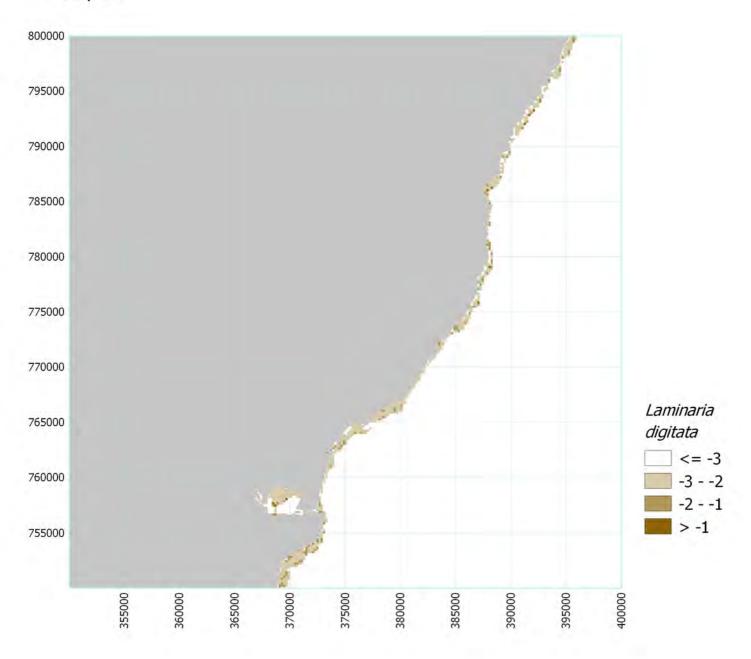
Map 31



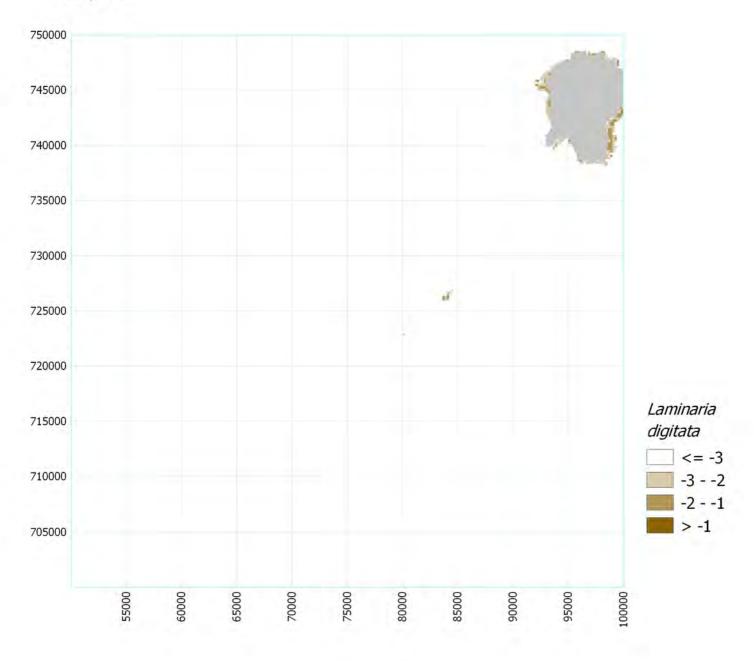
Map 32



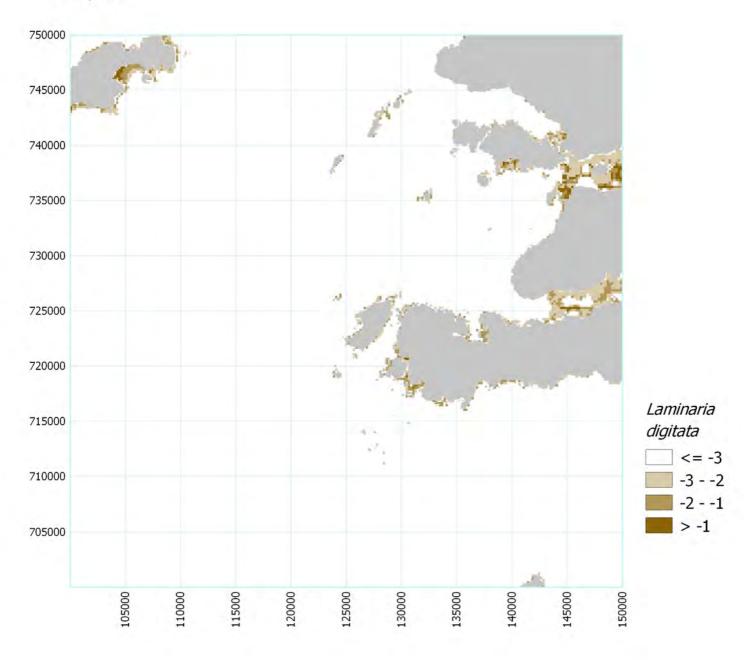




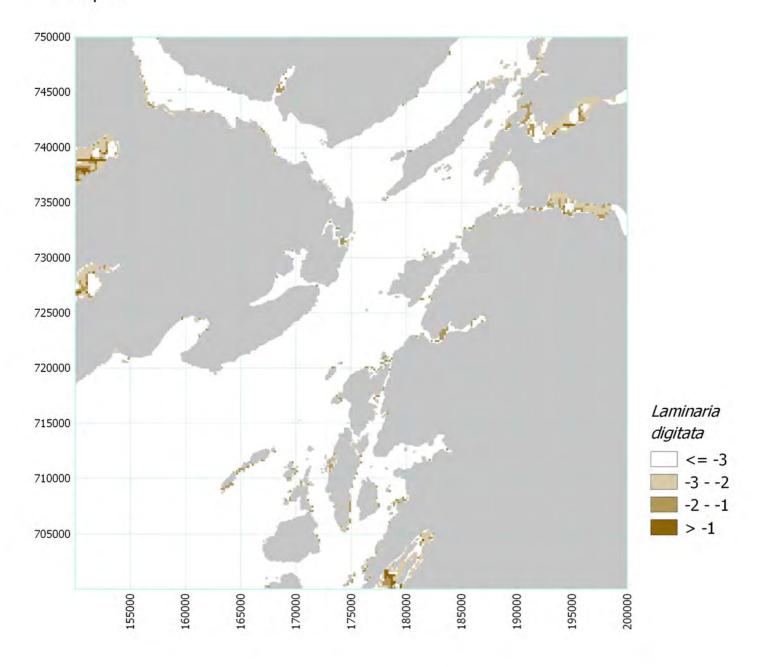




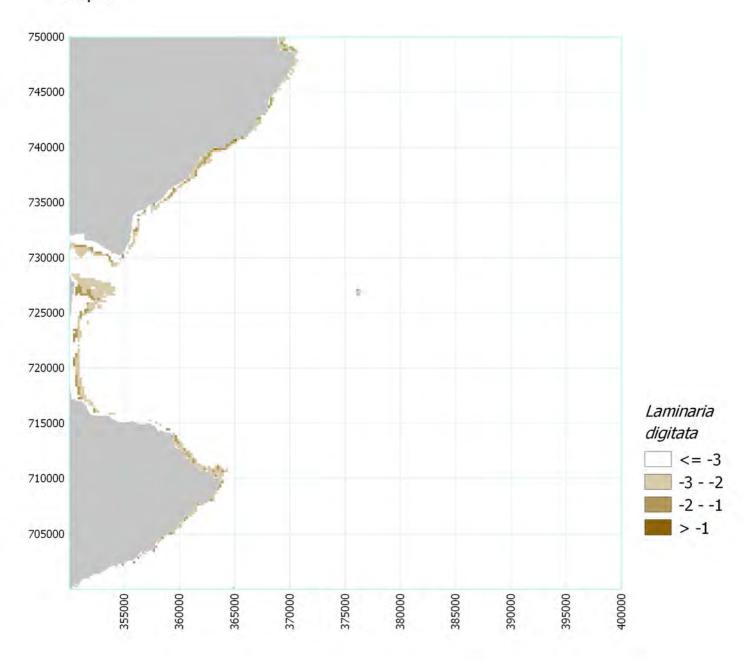




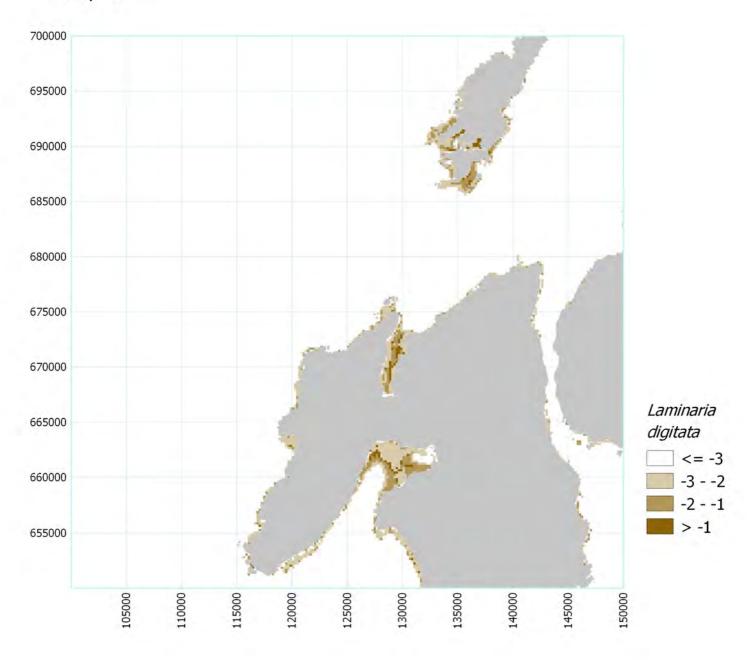
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Map 36
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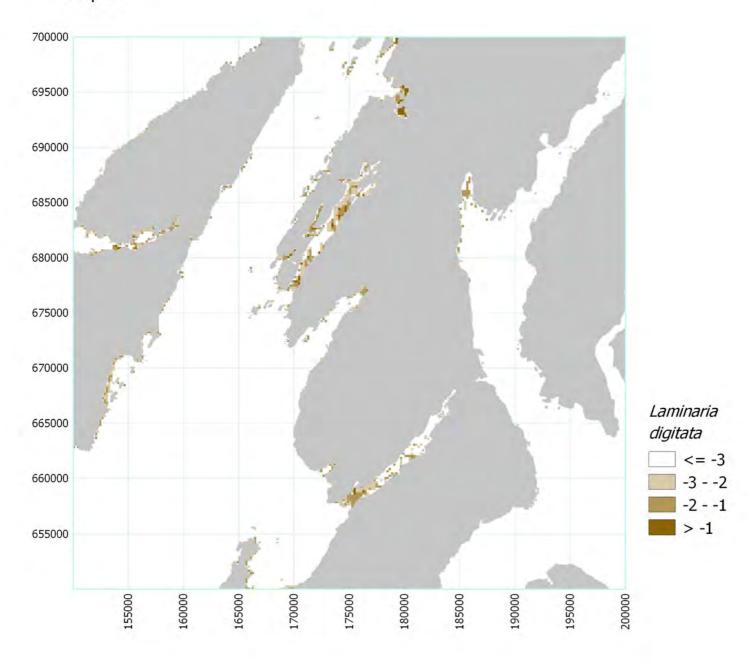
Map 37



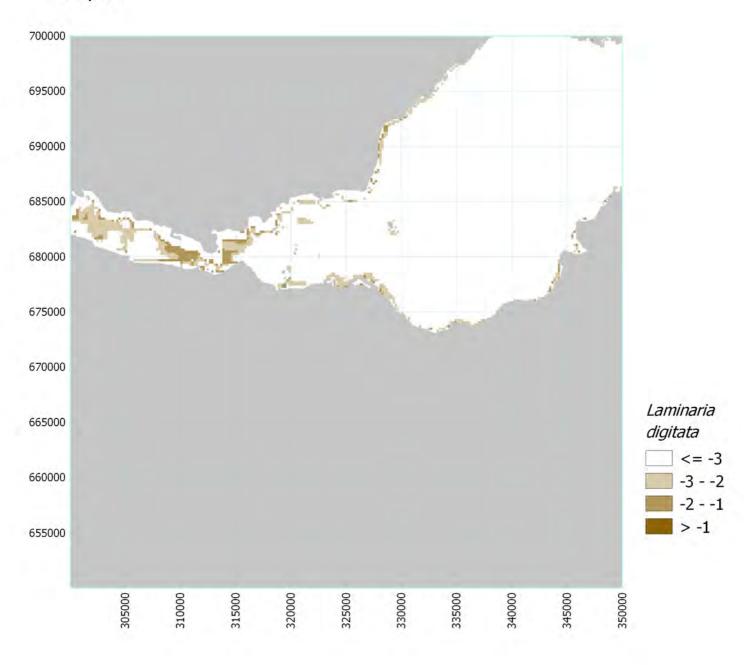
Map 38



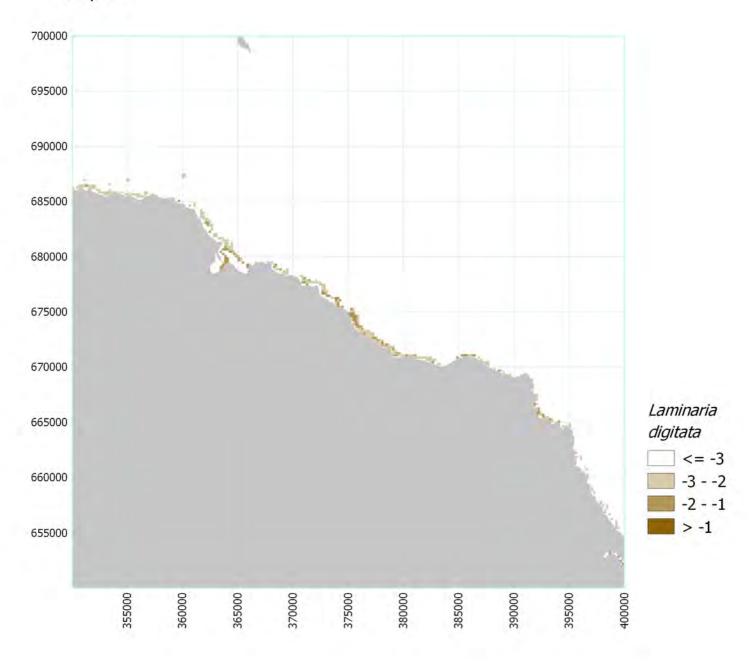
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Map 39
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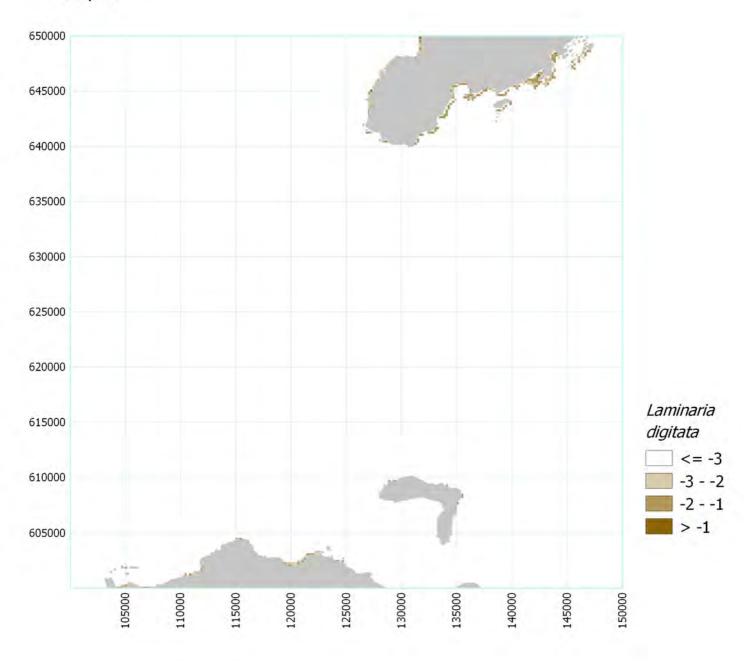




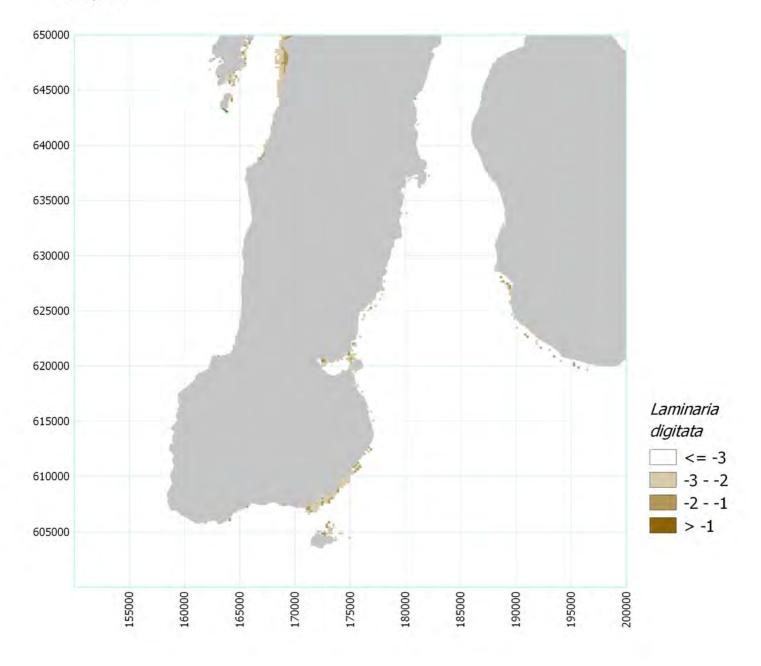
Map 41



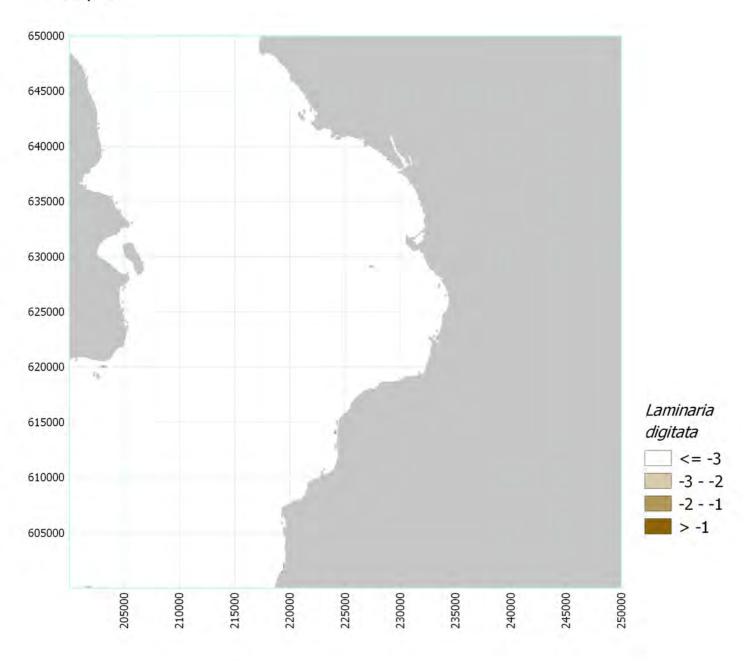
Map 42



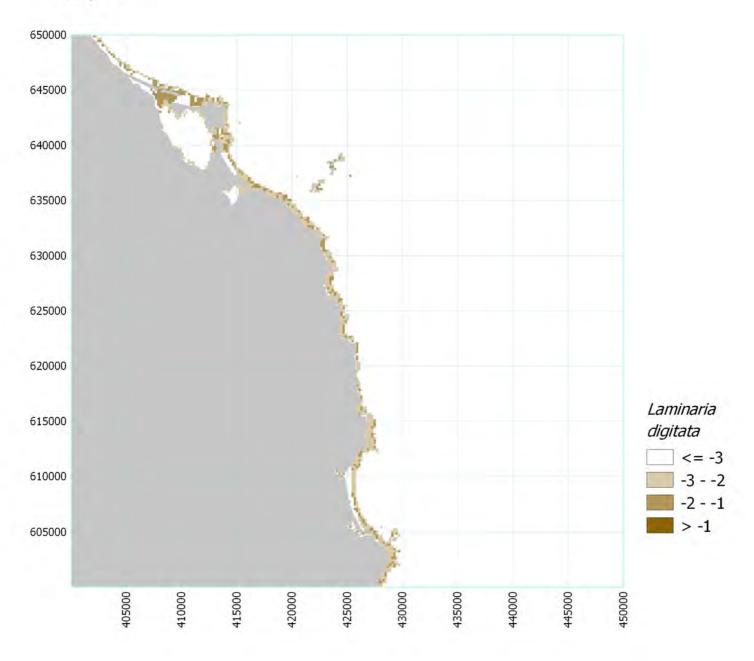
Map 43



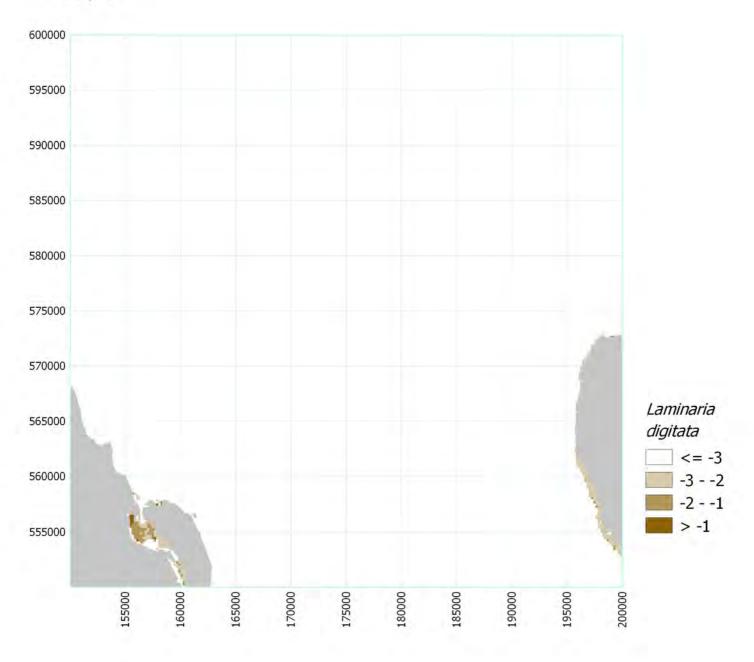




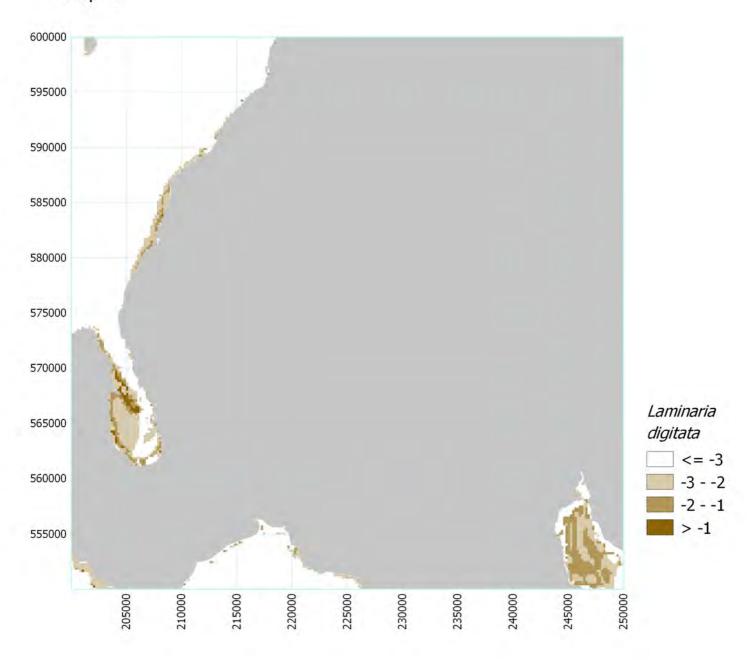




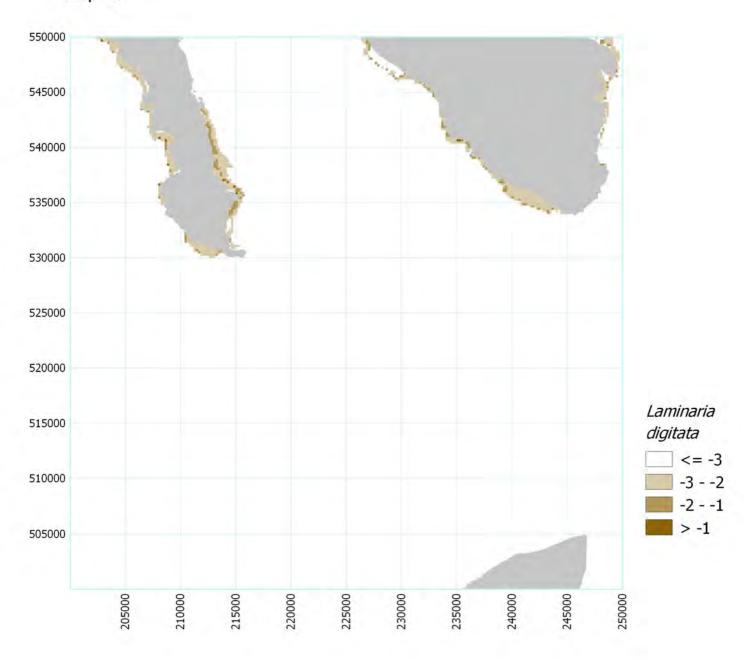
Map 46



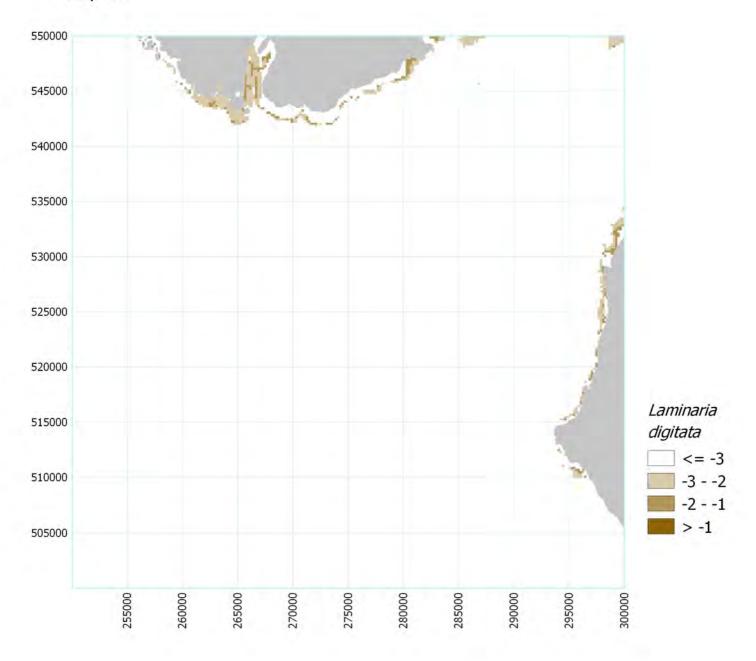
Map 47



Map 48



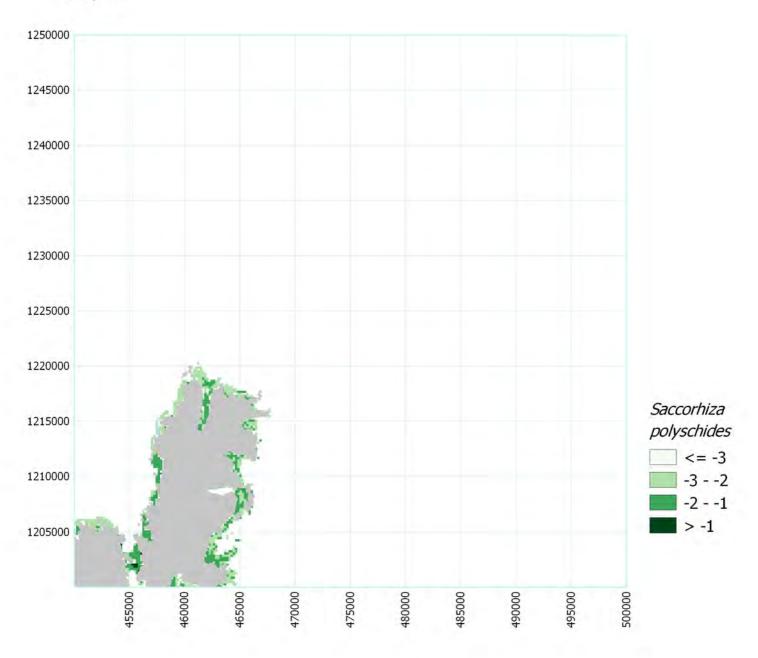
Map 49



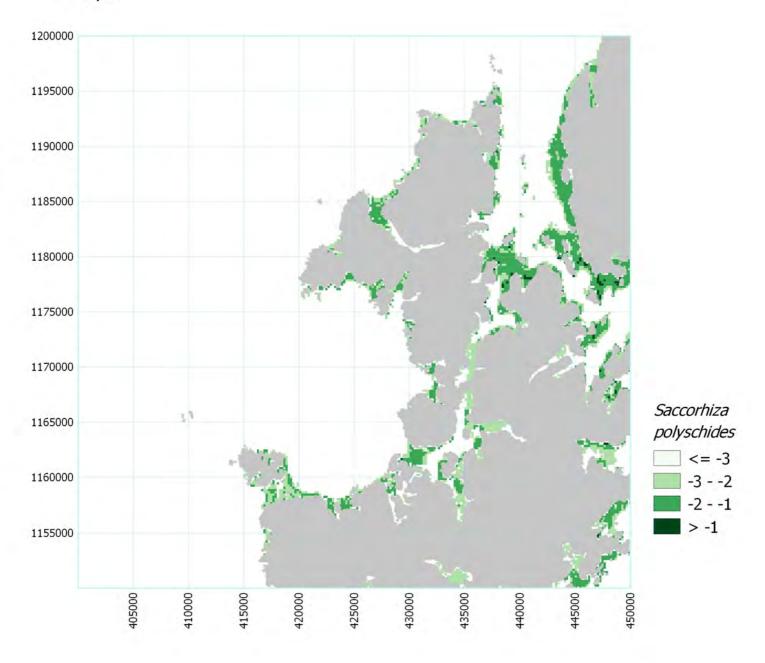
2.4 Saccorhiza polyschides

The following pages show the habitat suitability for *Saccorhiza polyschides*.

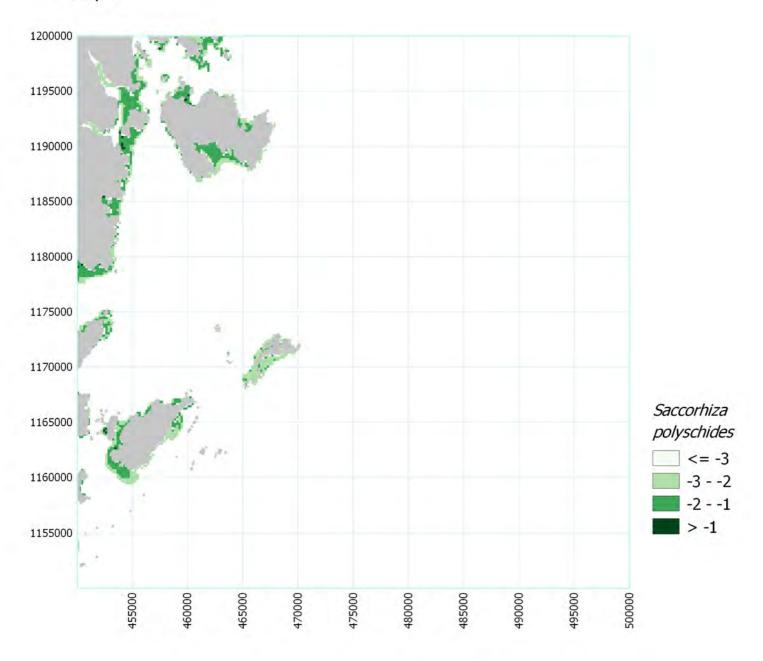




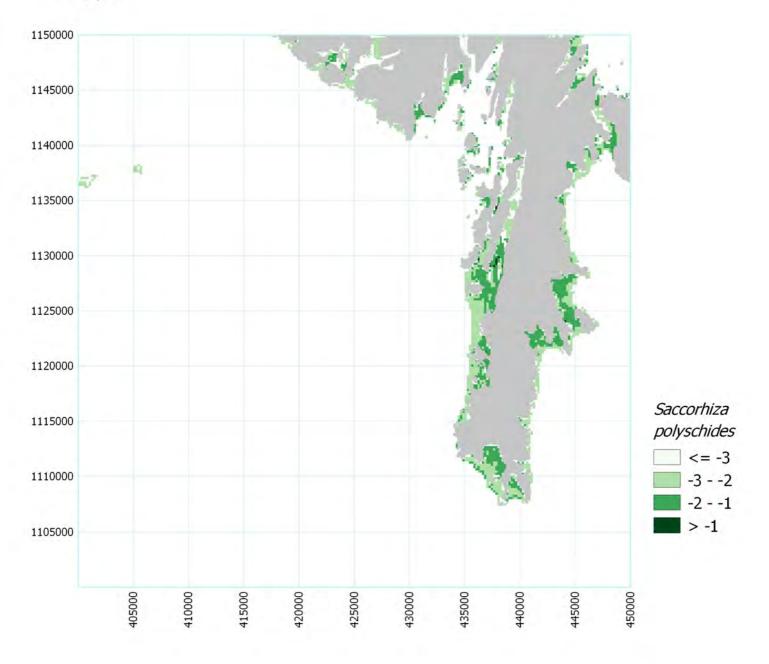
Map 2



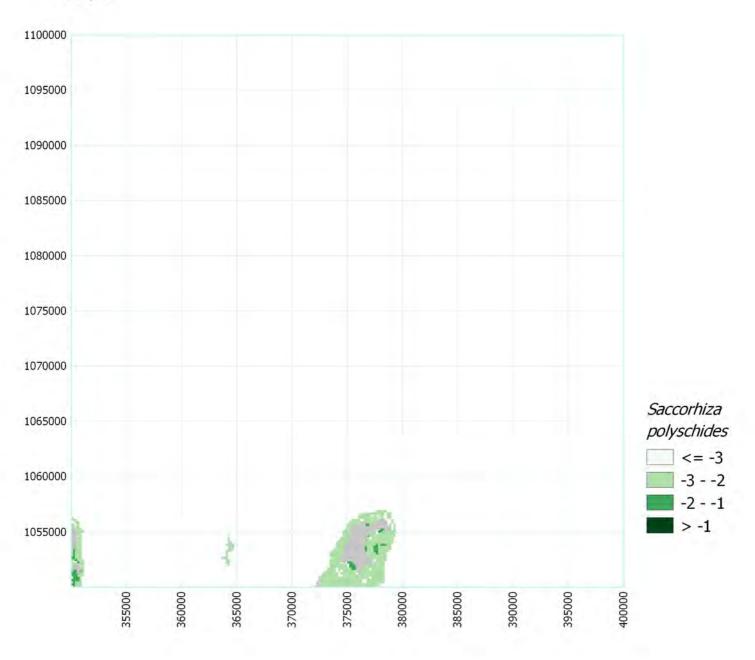




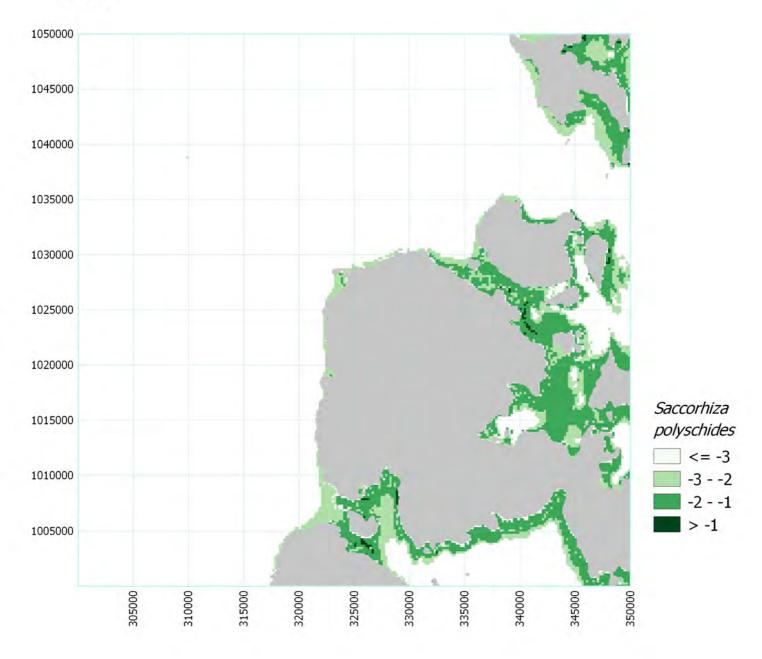




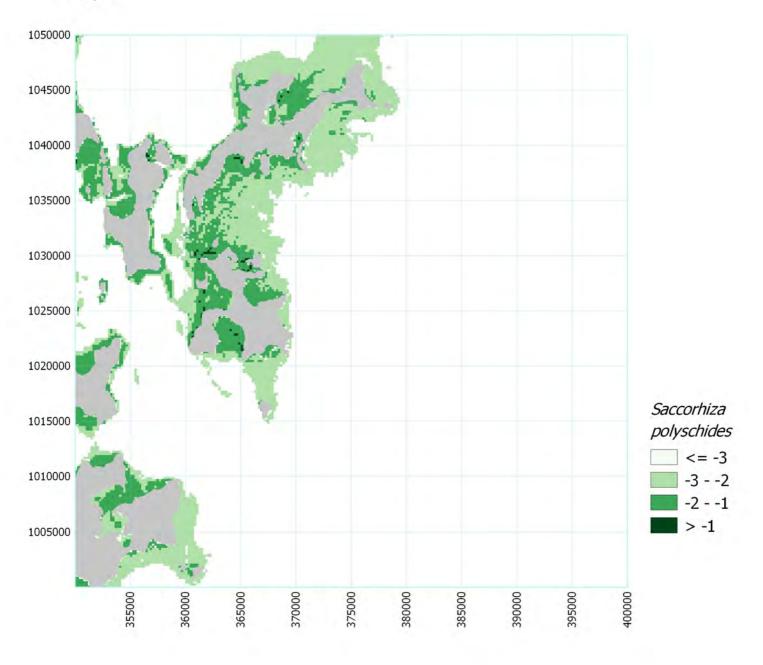
Map 5



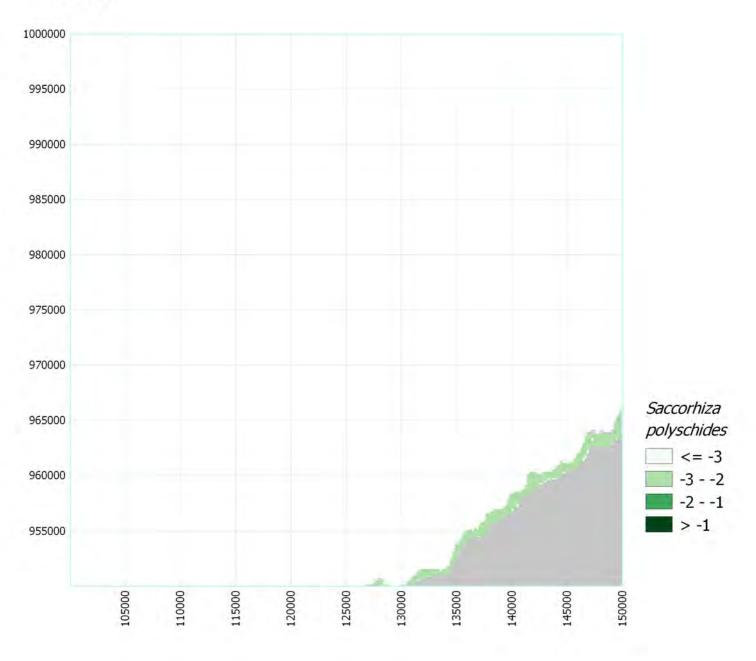




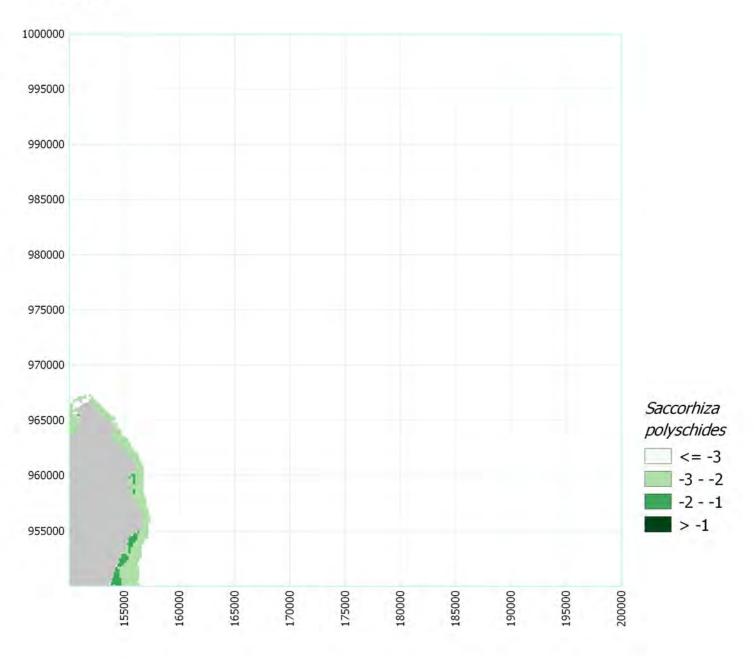
Map 7



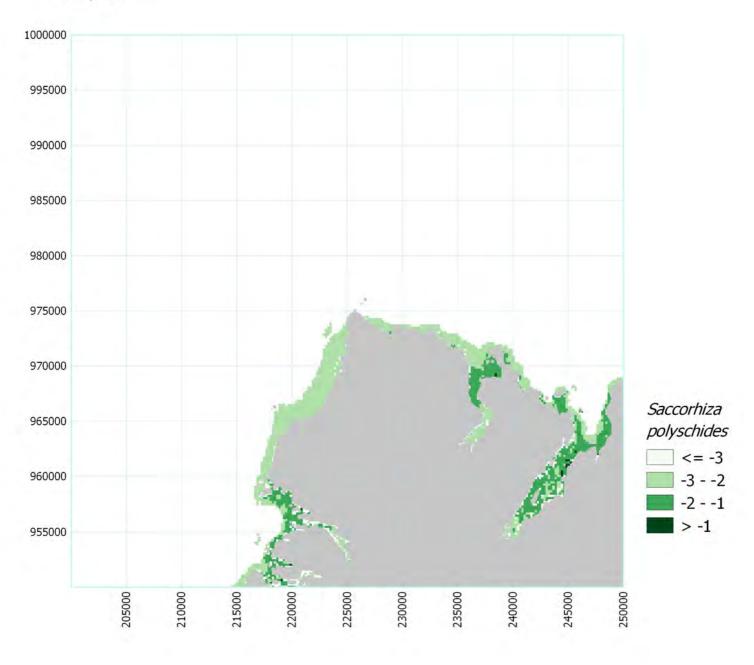




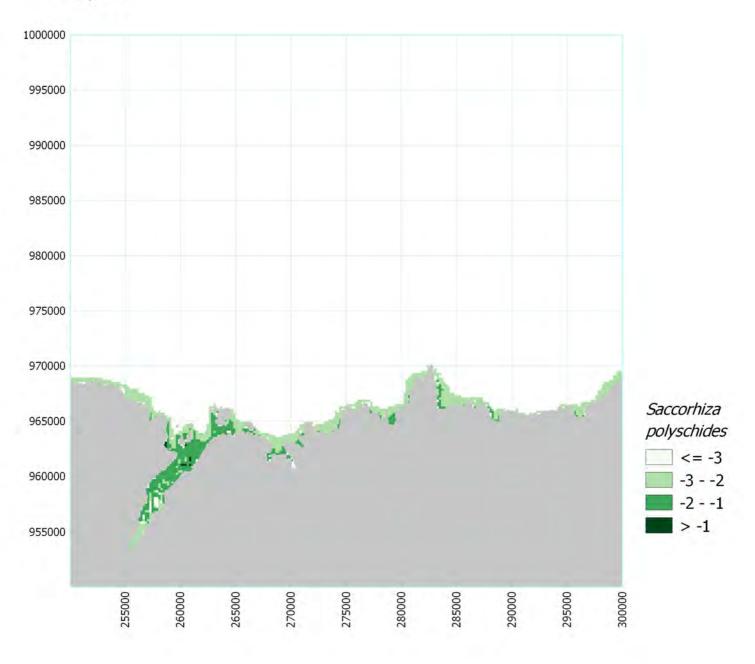




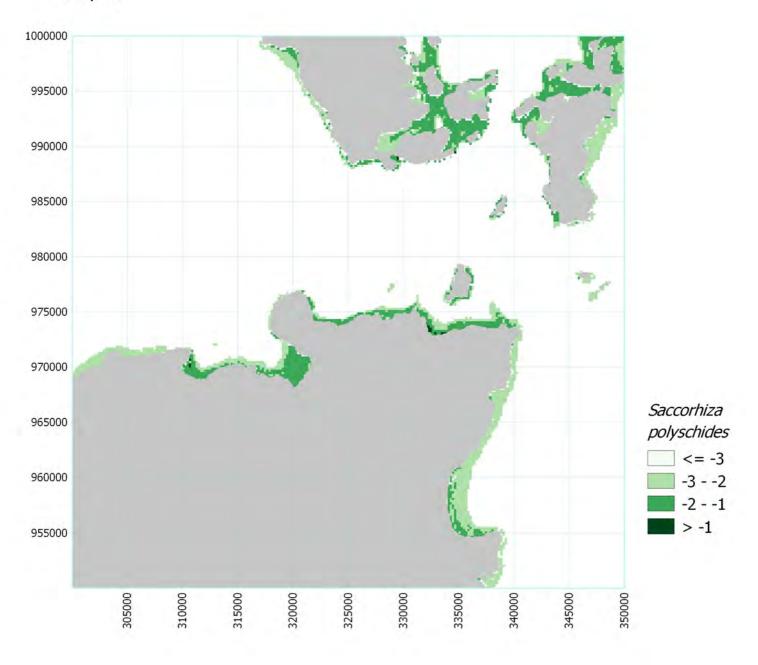
Map 10



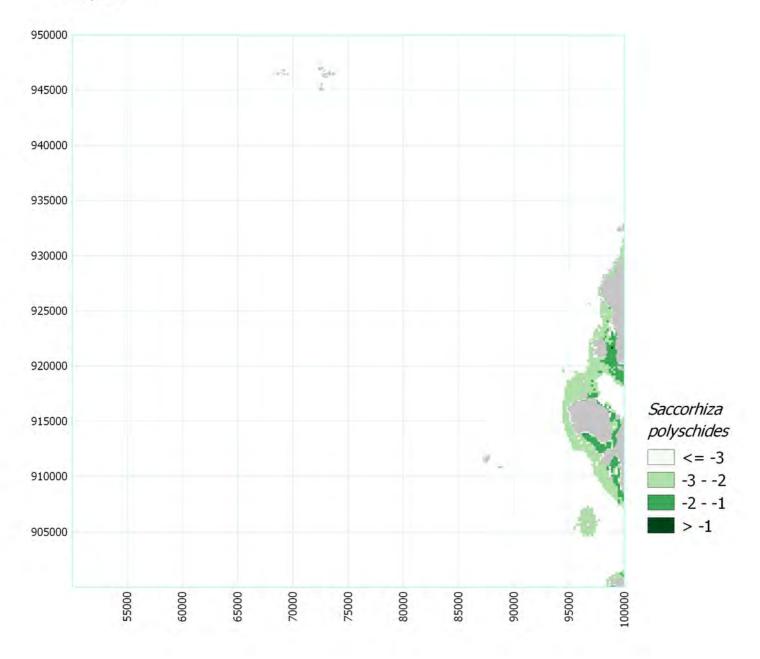




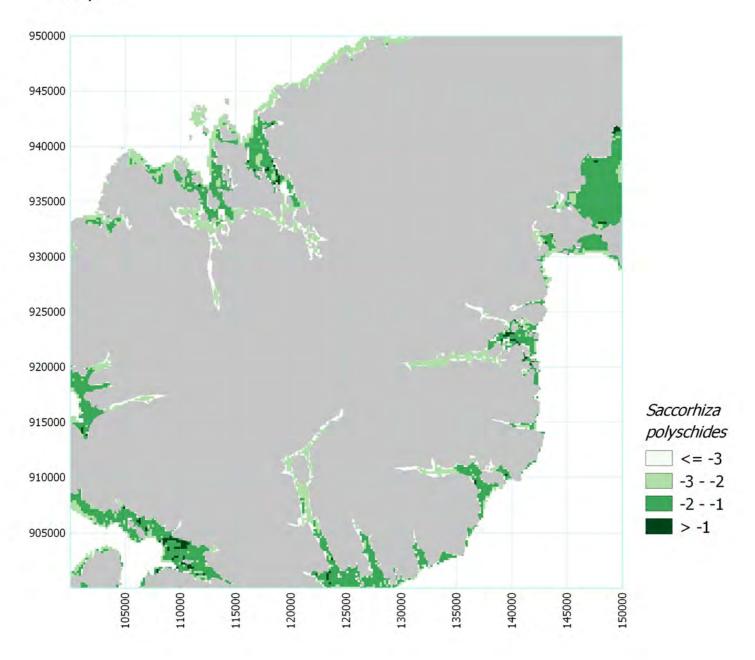
Map 12

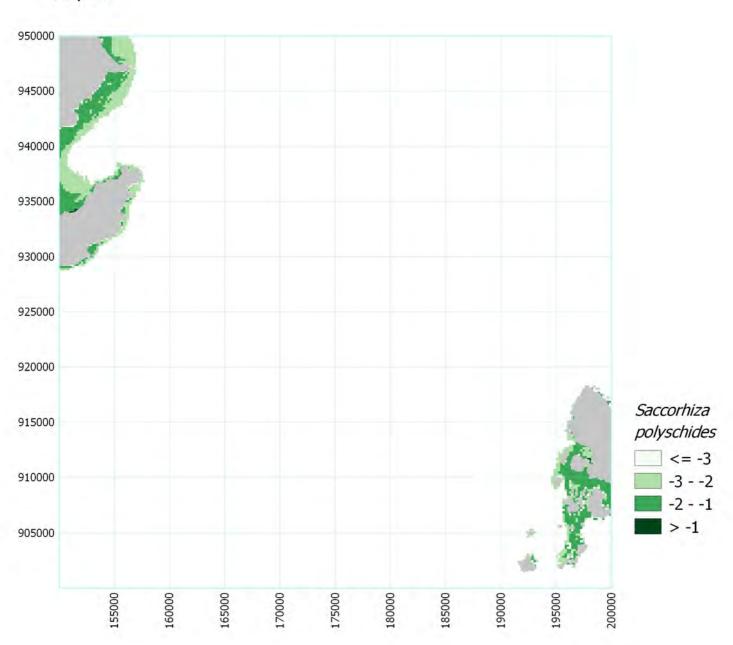


Map 13



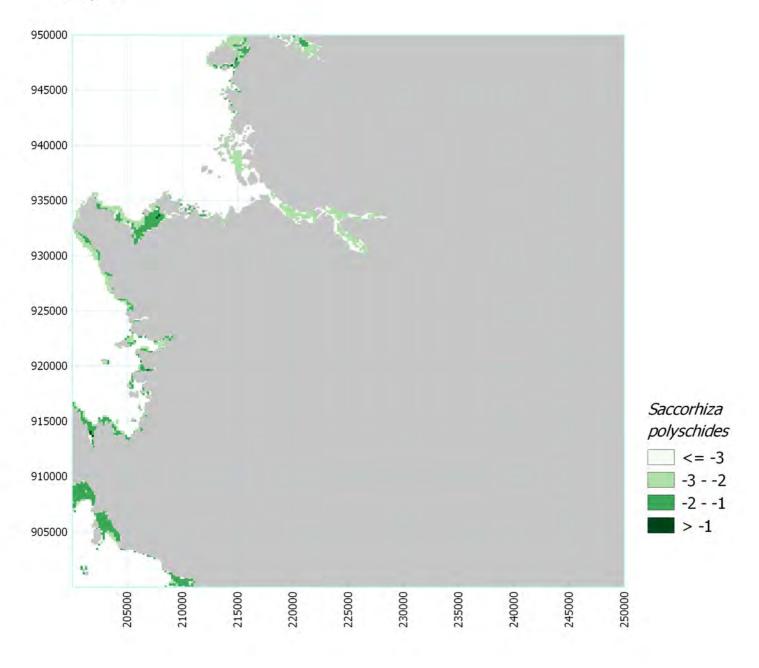
Map 14



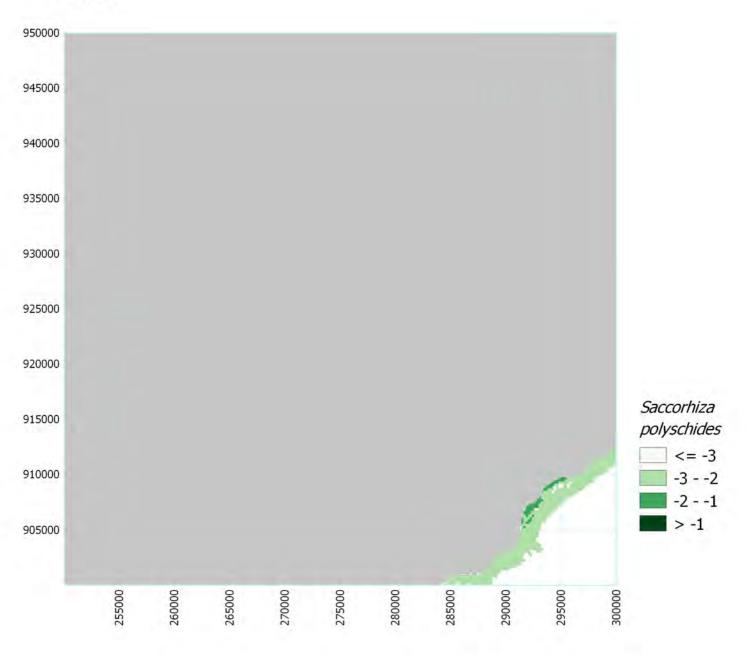


Map 15

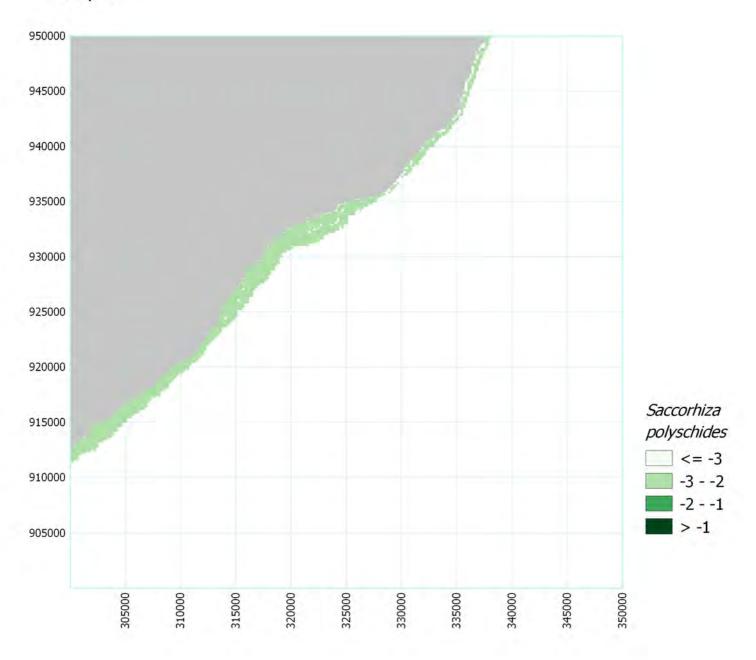
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Map 16
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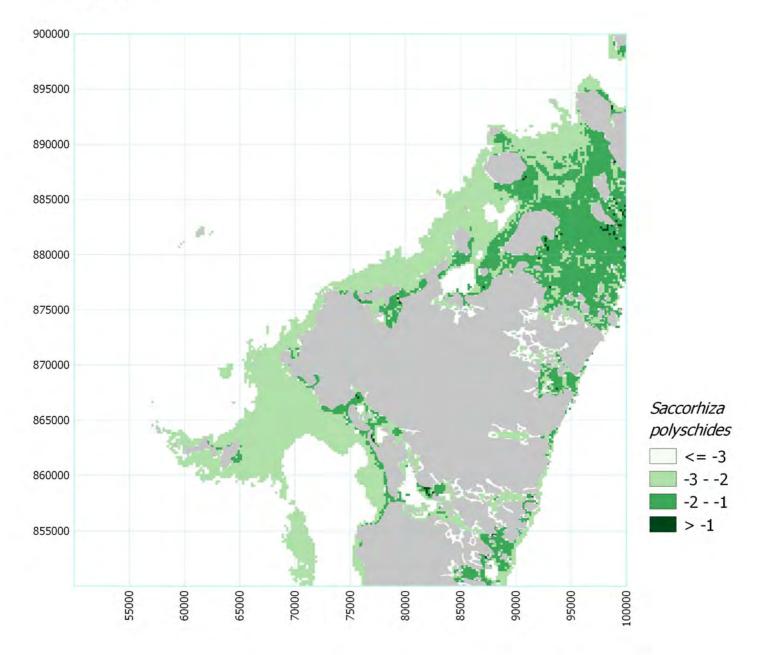
Map 17



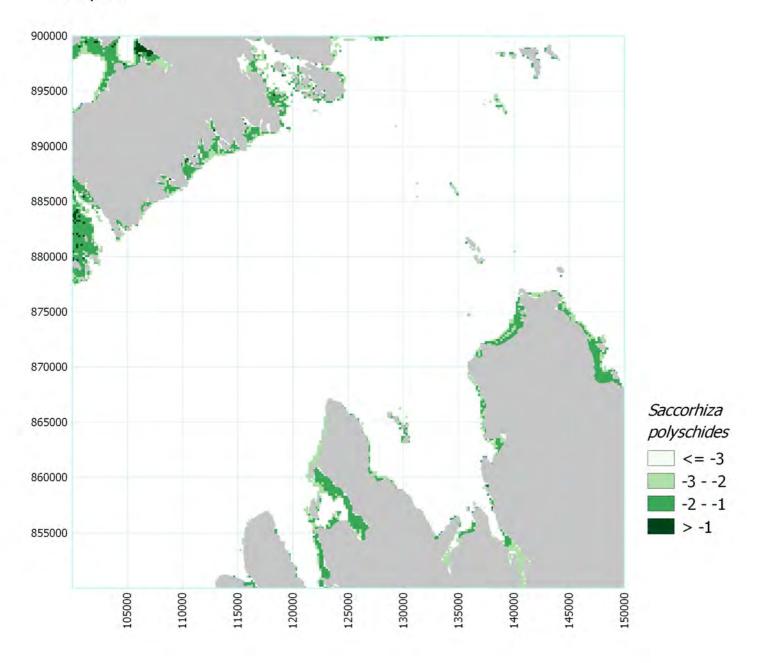




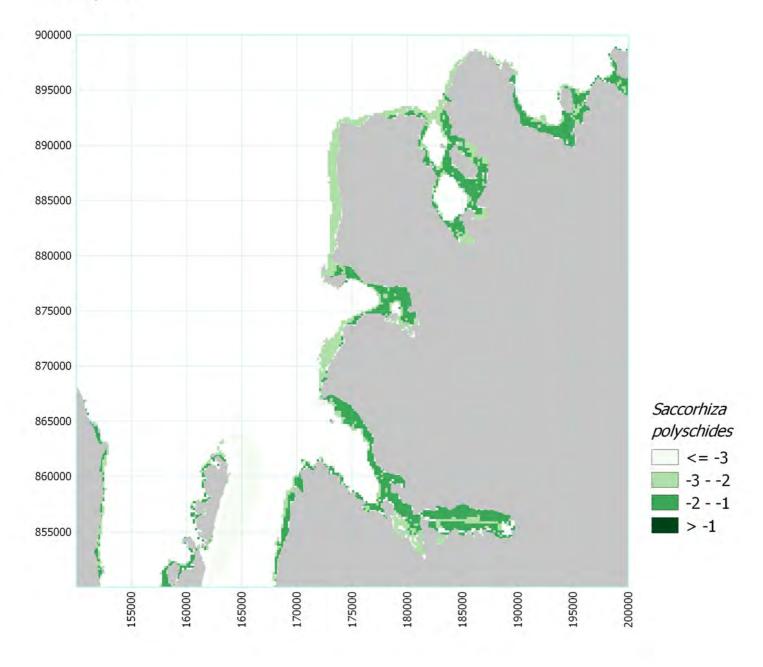




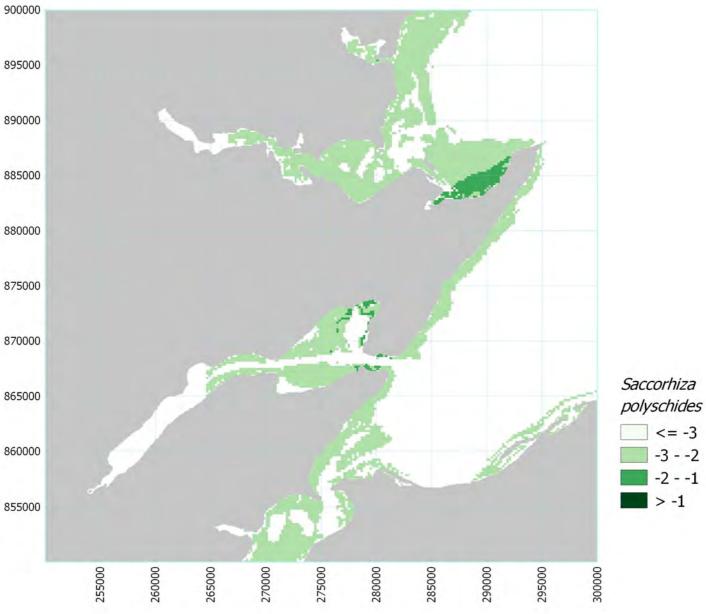
Map 20



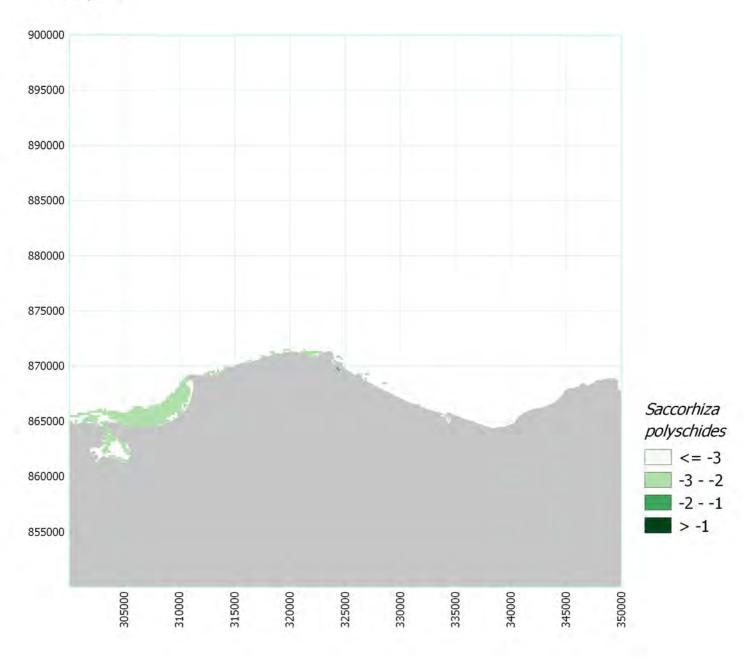




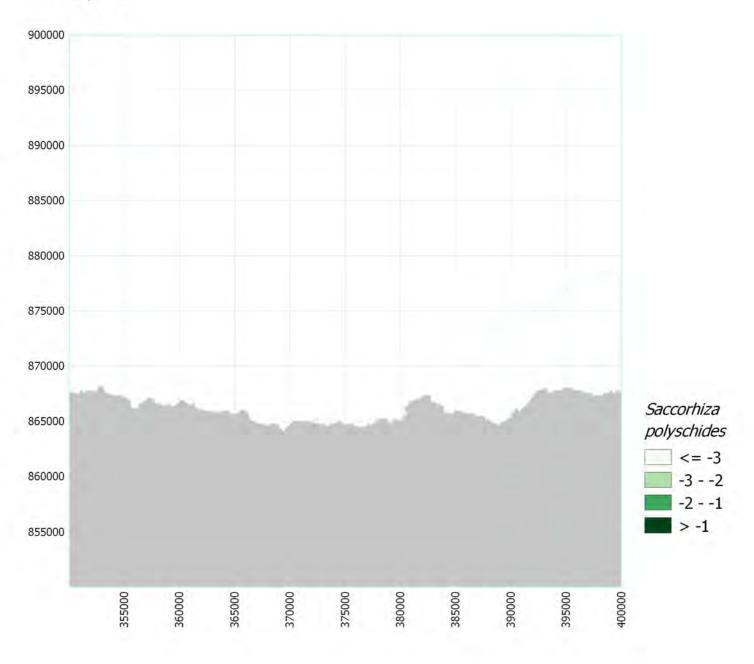
Map 22



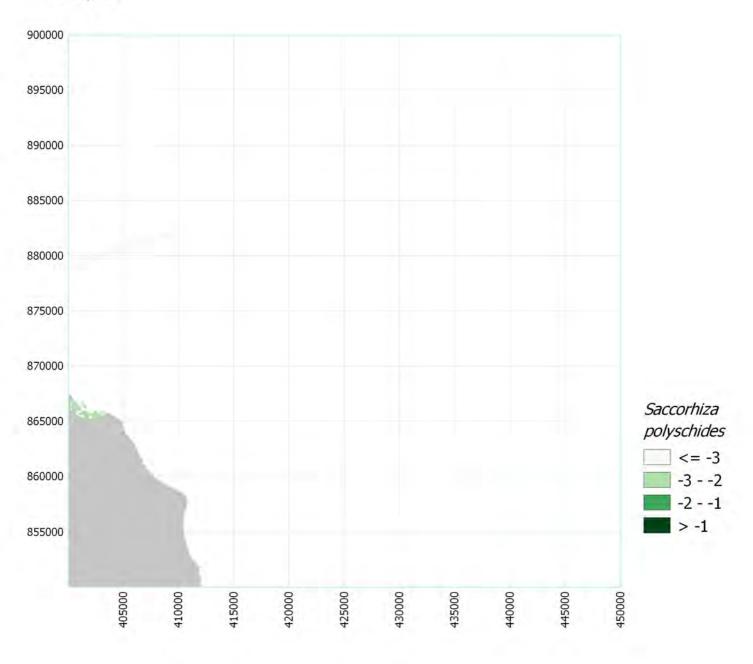
Map 23



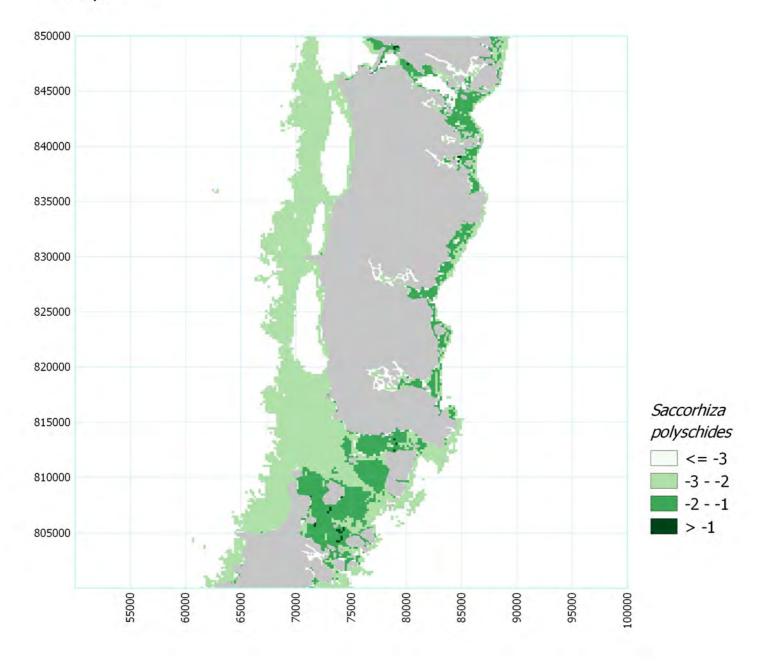




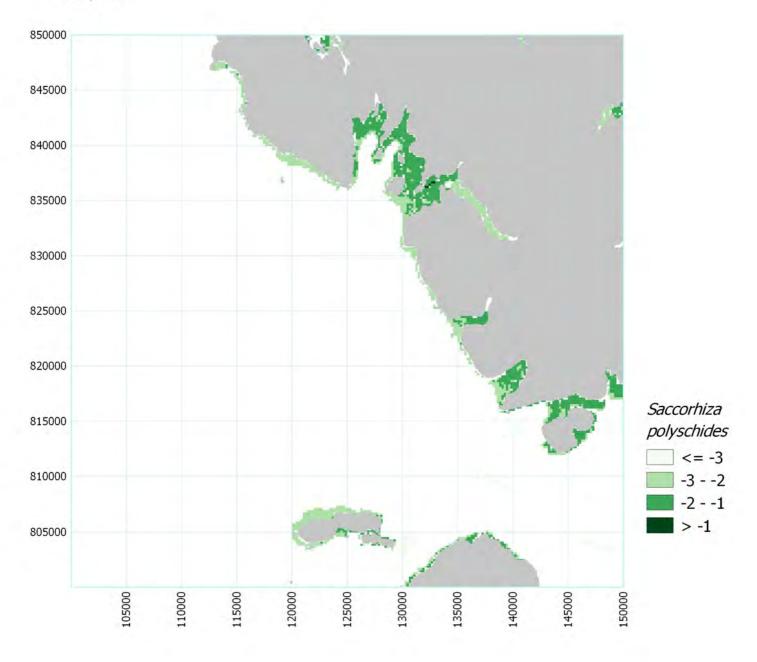
Map 25



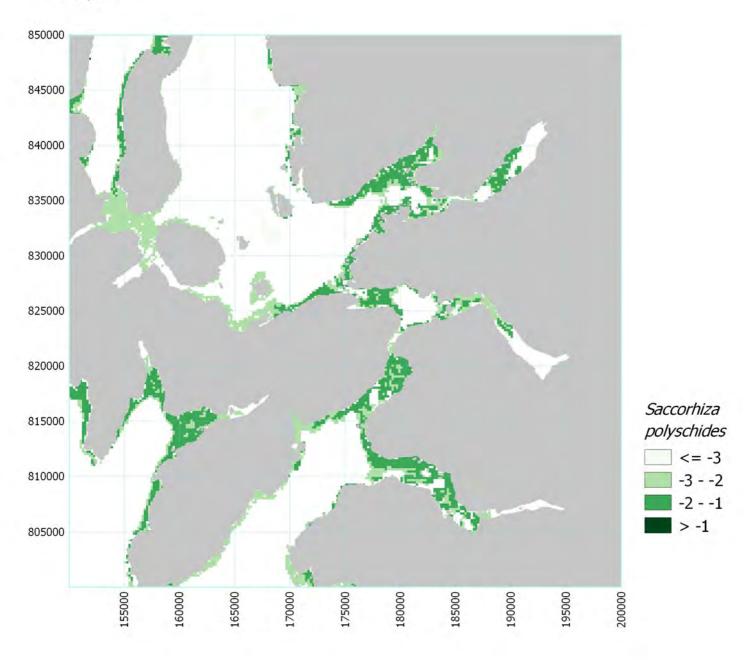
Map 26



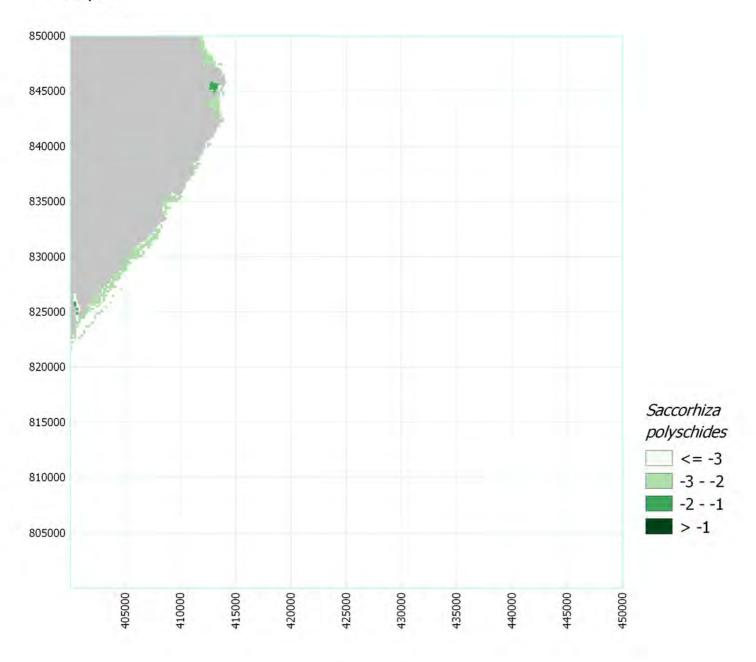
Map 27



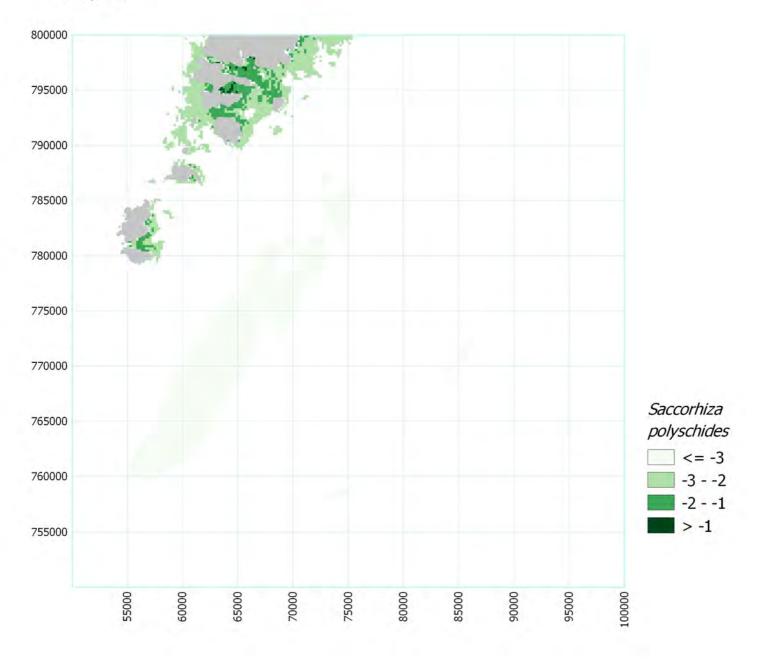




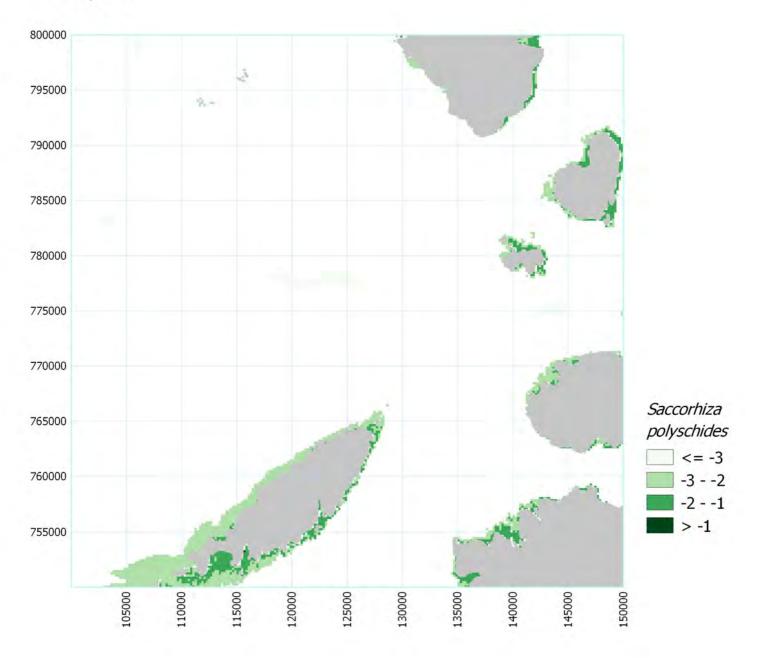
Map 29



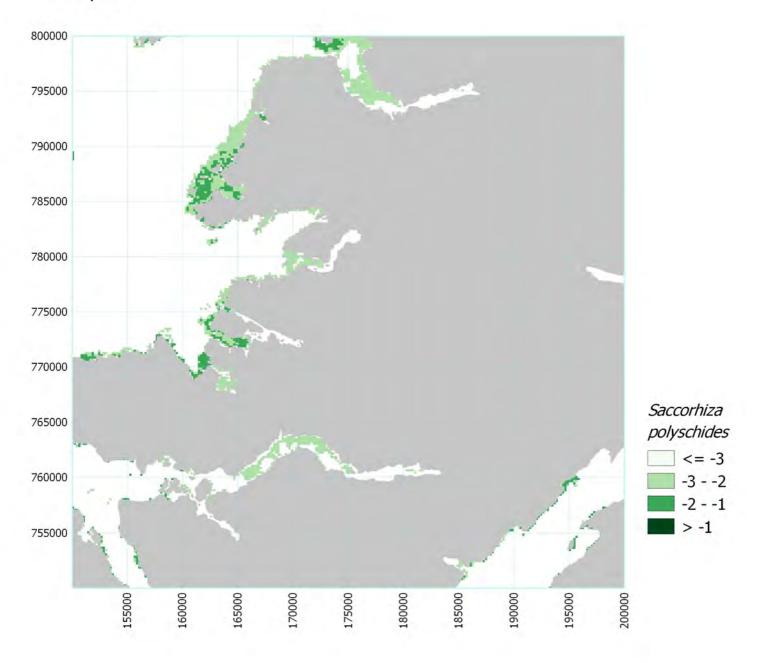
Map 30



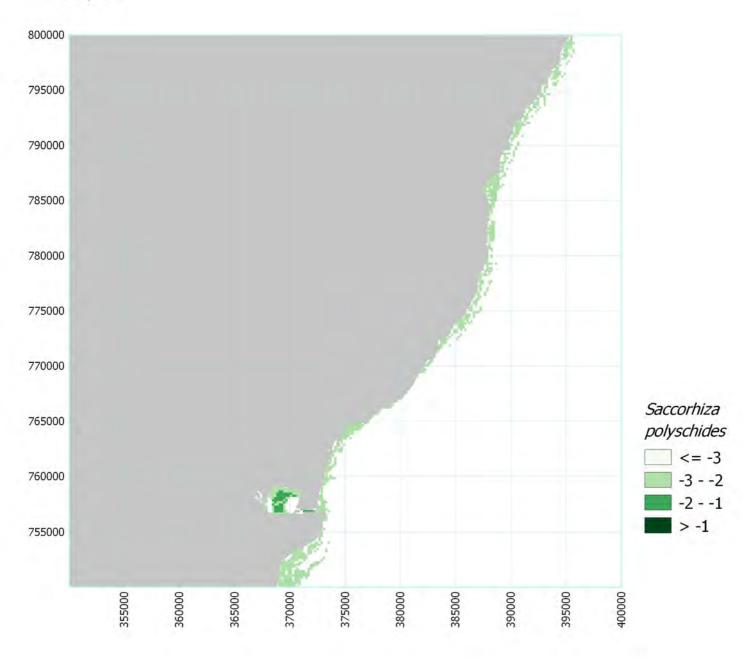
Map 31



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Map 32
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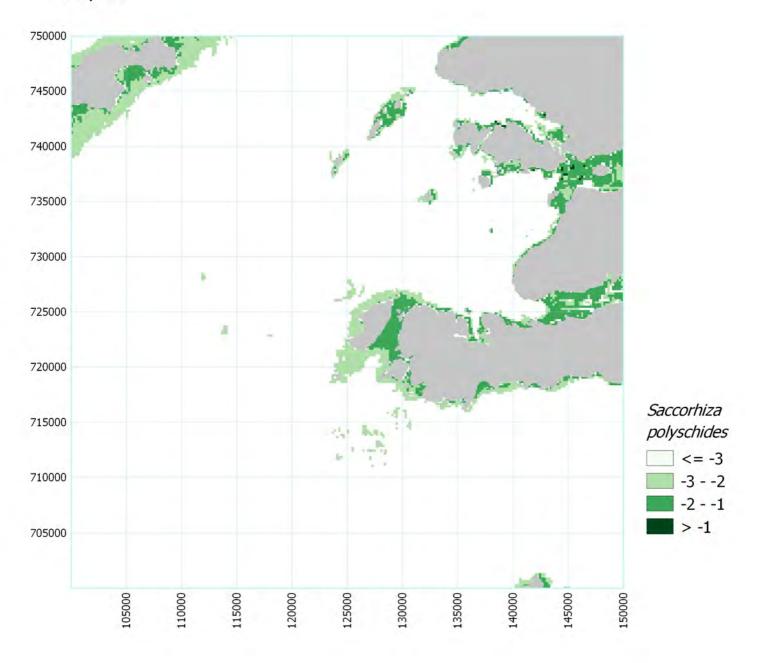




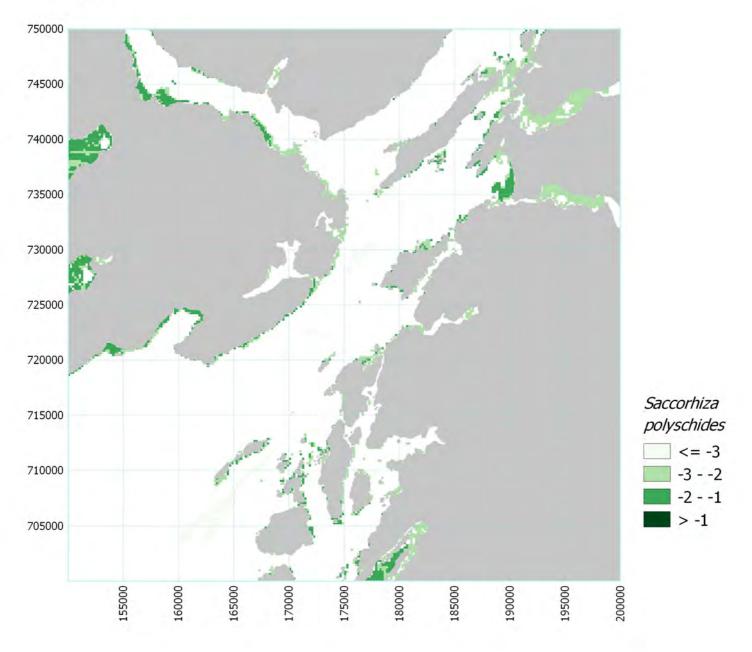
Map 34



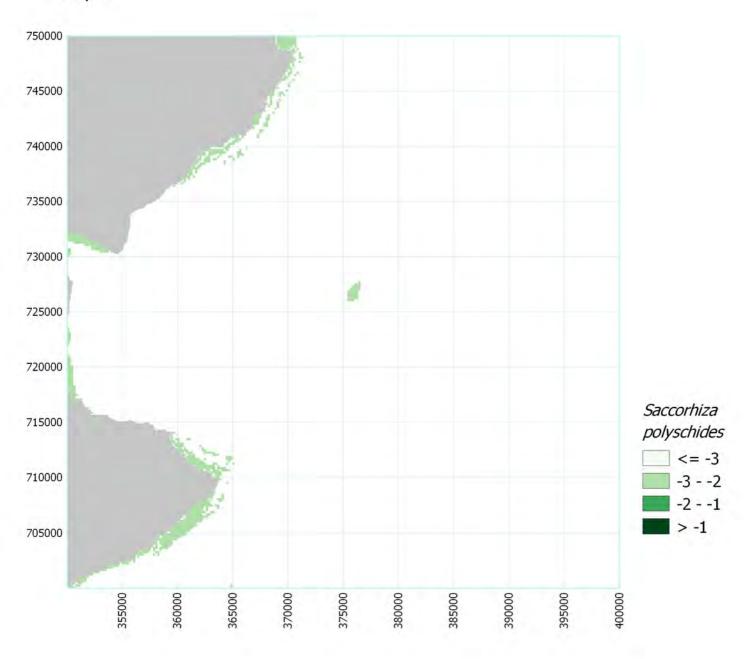
Map 35



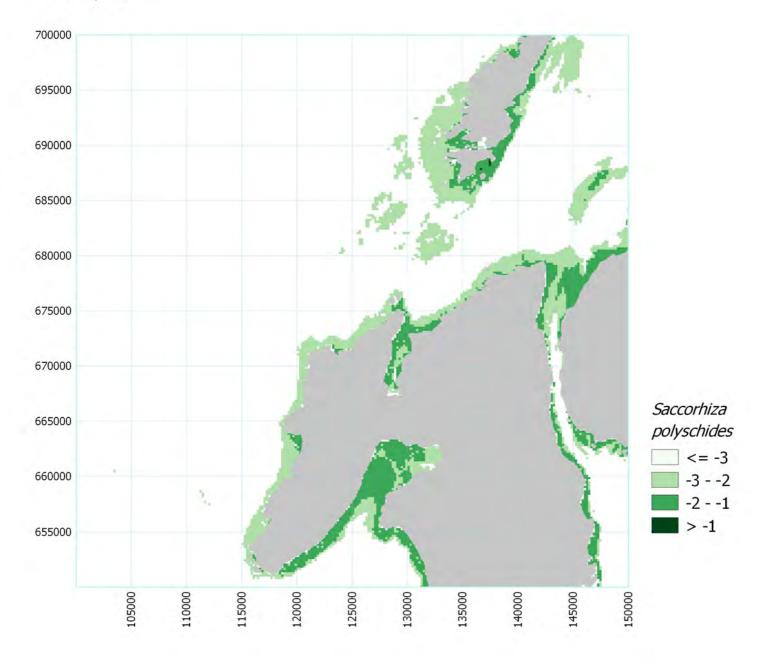




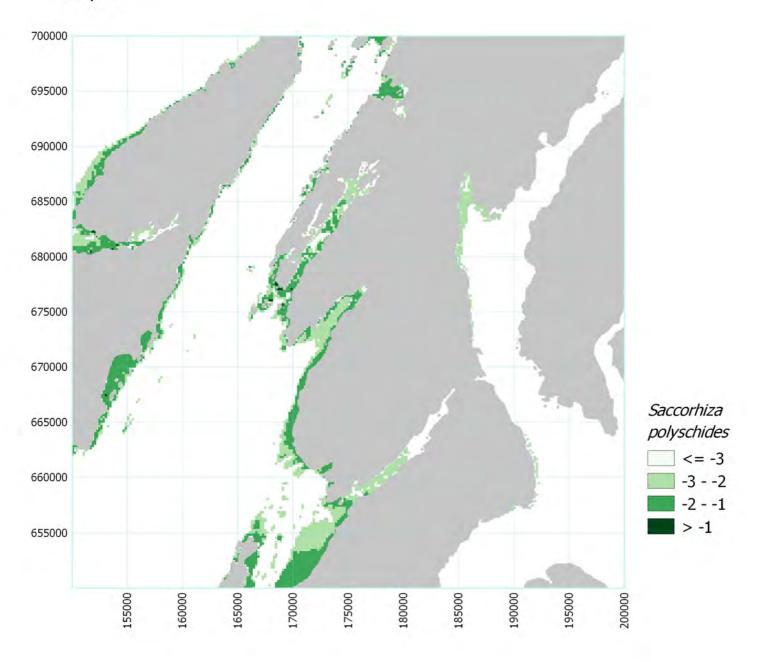
Map 37



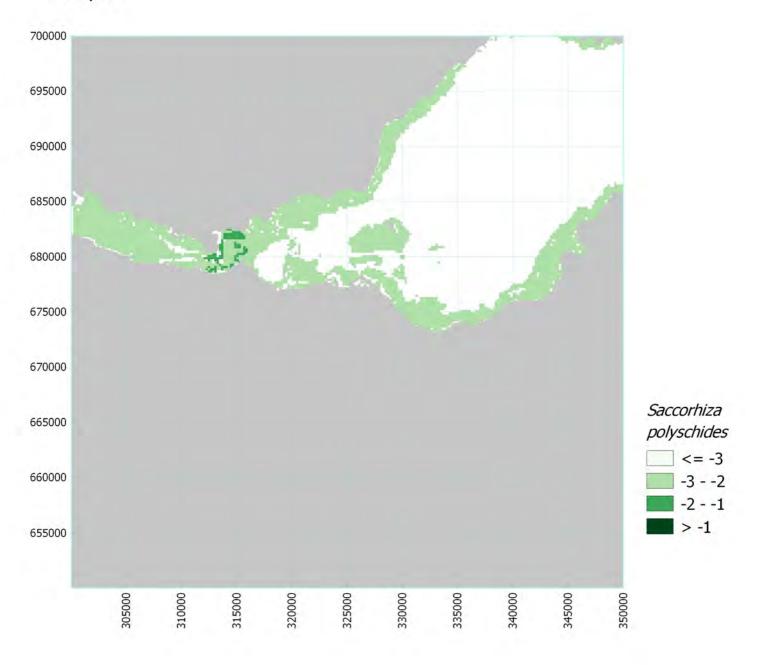




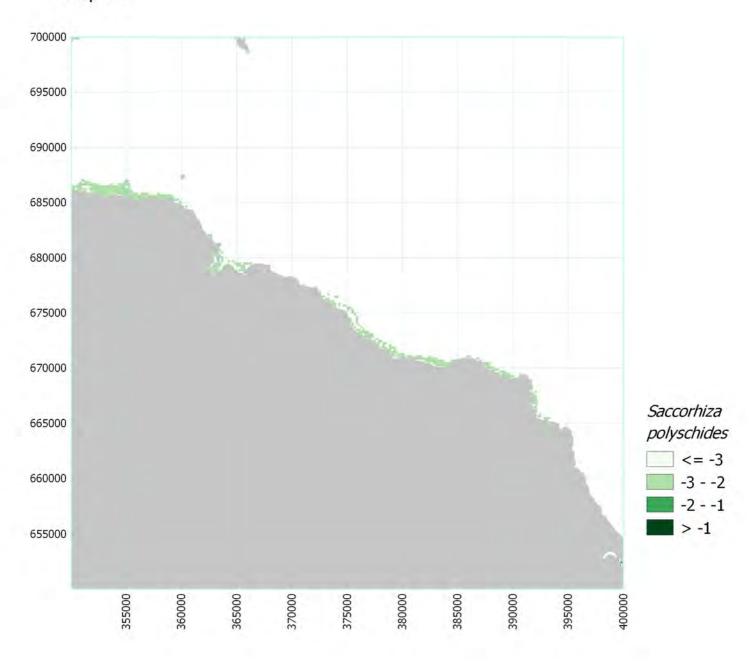
Map 39



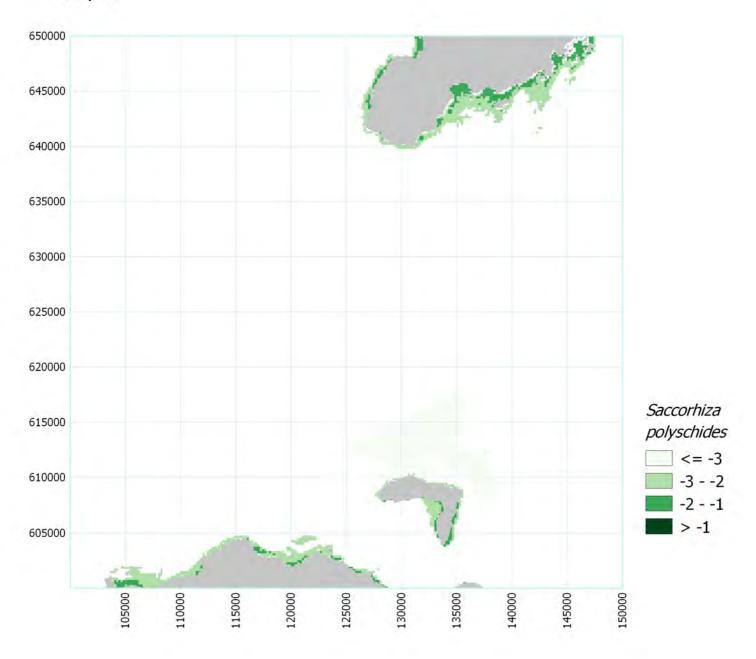




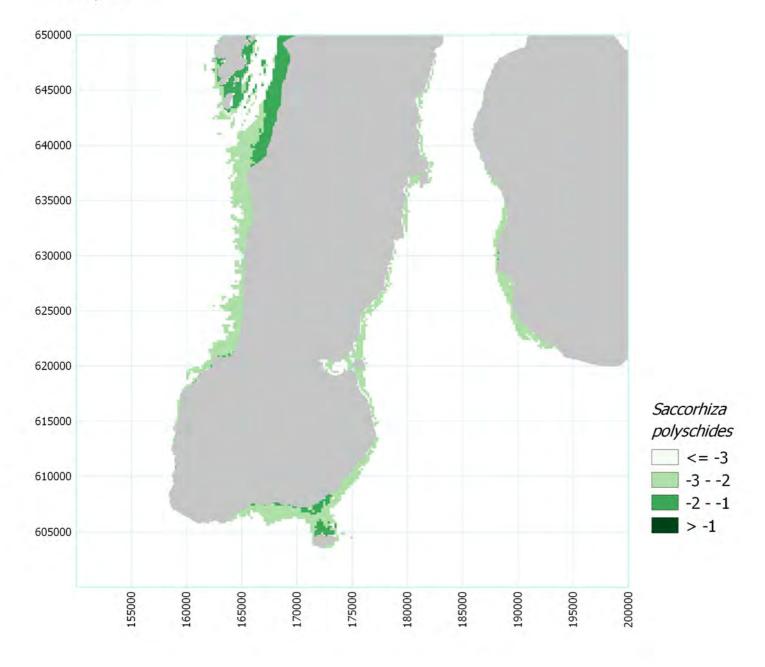
Map 41



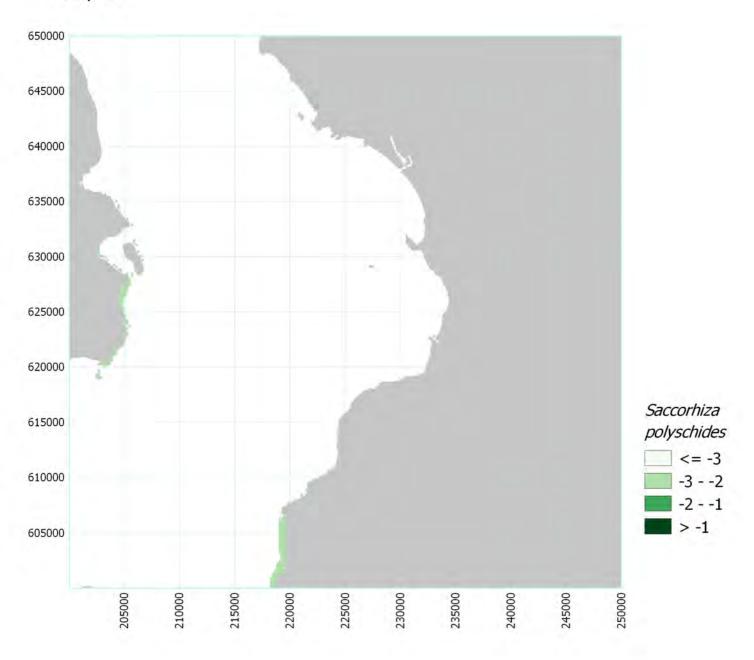
Map 42



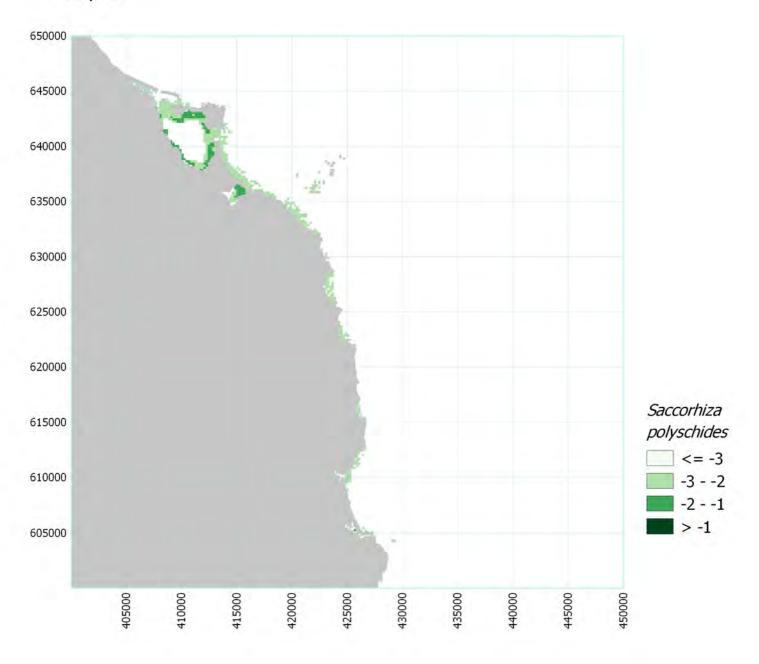
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Map 43
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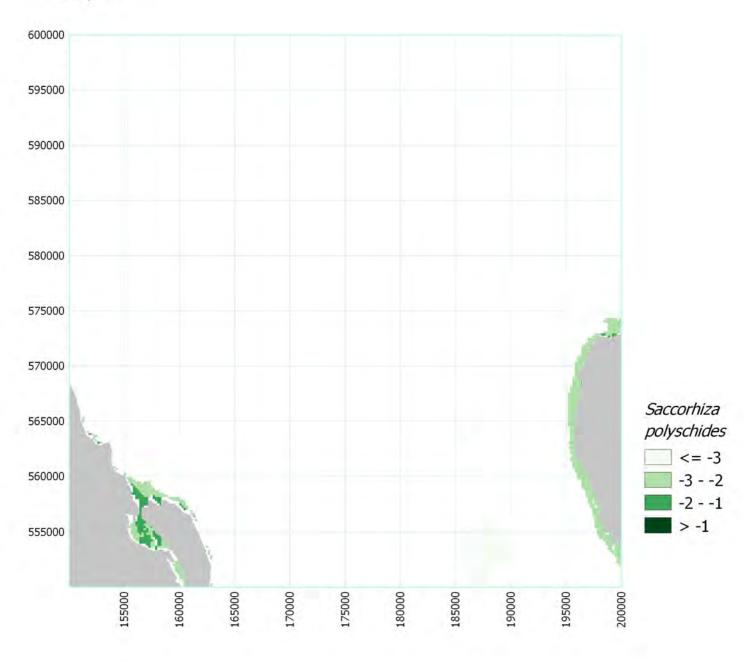




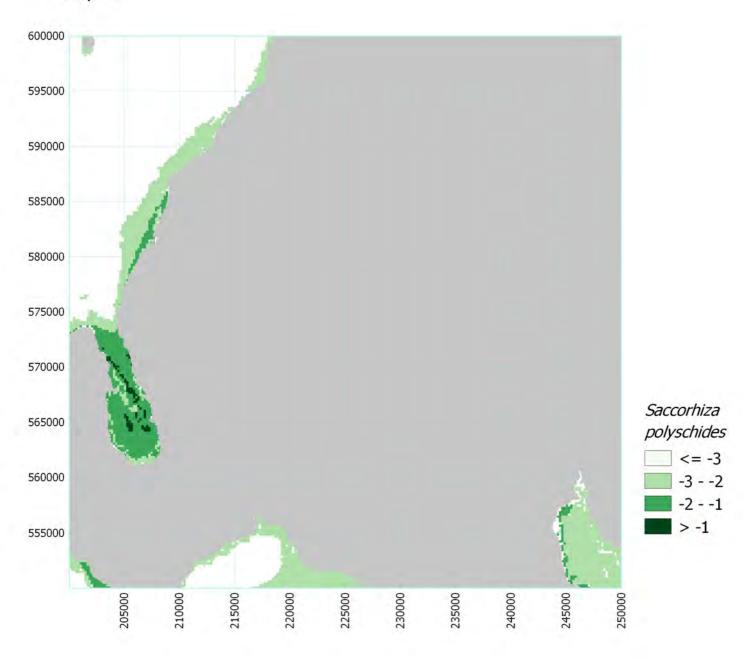




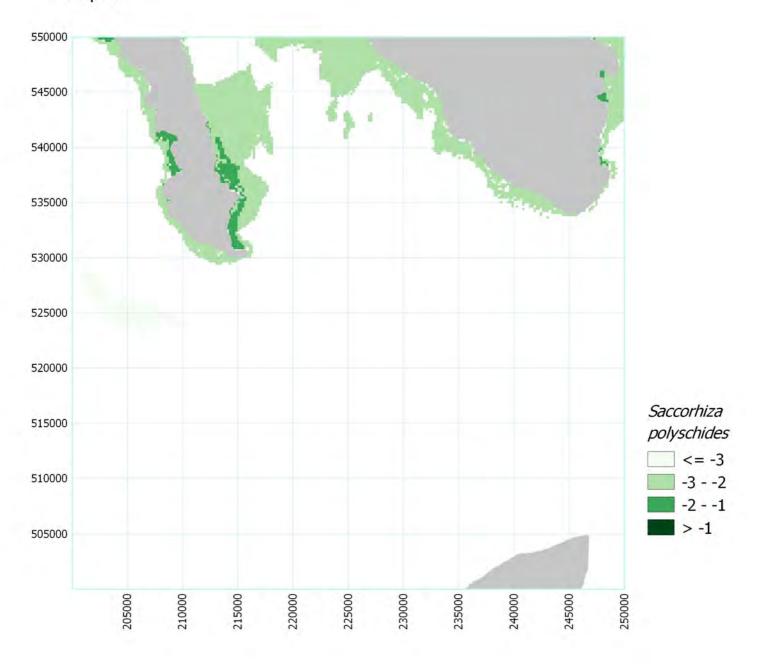
Map 46



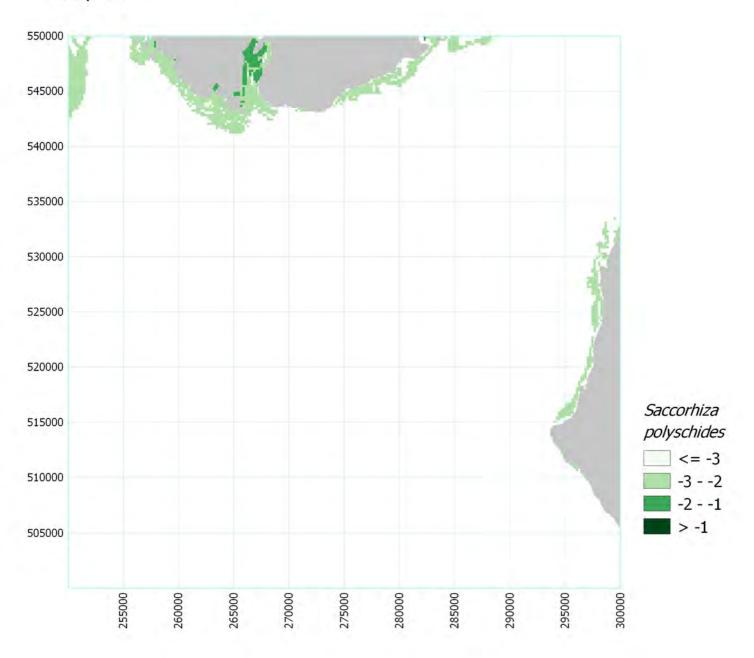
Map 47



Map 48



Map 49



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