**Supplementary Information 3**

For models looking at the red algae in a potential cultivation set-up in Irish waters, the PCA identified eight environmental variables which were not too collineated and which contribute to the overall environmental variation. These were then used for the SDM modelling of *A.armata* (*Fig*.SI3.1). The following were considered: (1) Nitrate, (2) Phosphate, (3) Dissolved Oxygen, (4) Mean of Diffuse attenuation, (5) Sea surface salinity, (6) Sea surface temperature range, (7) Sea surface temperature Max and (8) ph.

The distribution of the species was visualized (*Fig.* SI3.2-4.3). Suitable environmental conditions when looking at the median ensemble model projections for the cultivation of *A.armata* are predicted with high habitat suitability (hs>750) (*Fig*. SI3.2d), off the northern part of the Mayo coast all along the west coast of Ireland as far as west Cork. With smaller areas of highly suitable environmental conditions off the coast of Sligo to the northern point of Donegal. Also, some areas of lower habitat suitability can be found in the same areas (*Fig*. SI3.2d).

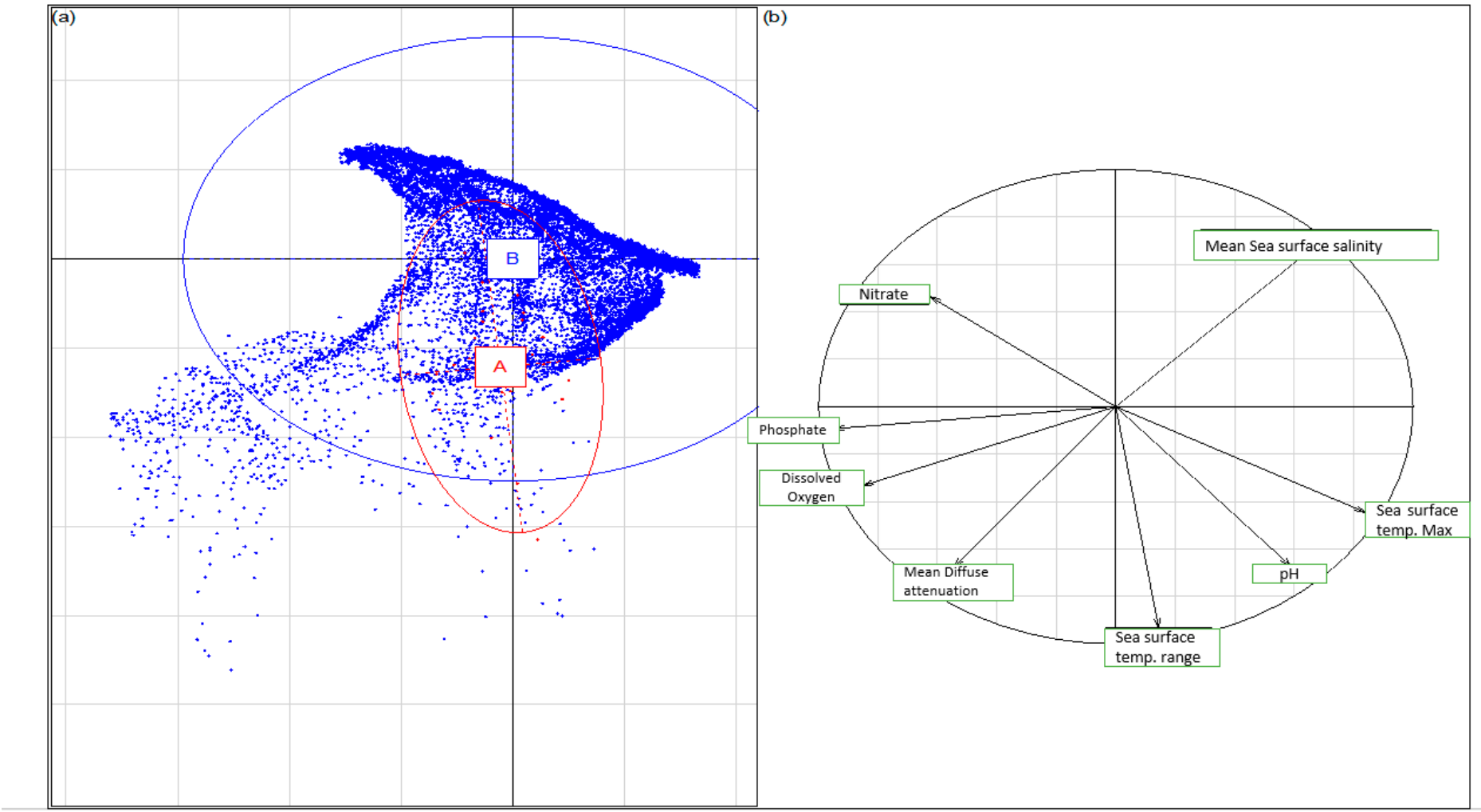


*Figure SI3.1:* Distribution points of *Asparagopsis armata* (A) in the environmental space defined by the first two PCA axes (a) and correlation circle of the selected environmental variables (see full names Table 1) as a function of the same first two PCA axes (b).

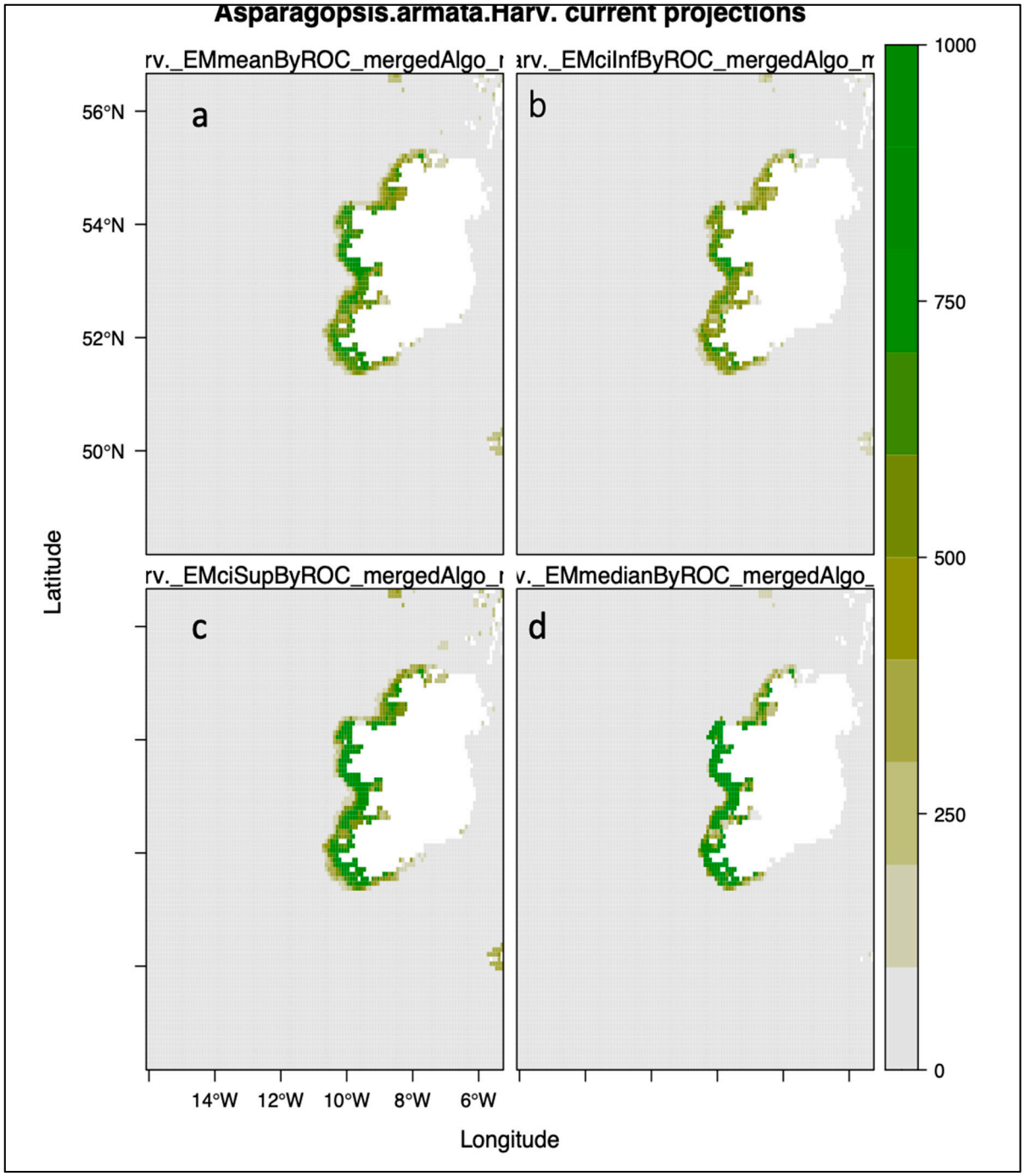


*Figure SI3.2:* Plot showing the geographic projections using (a) mean, (b) confidence interval inferior, (c) confidence interval superior and (d) median for ensemble model contain occurrences from Ireland only (non-native).

When using occurrences from both the native and non-native ranges. The suitable environmental conditions for the cultivation of *A.armata* when looking at the median ensemble model projection (Fig. SI3.3d), are predicted in much smaller areas. They are predicted with a high habitat suitability (hs>= 750) in an area off the coast of Galway and small areas off the coast of north-west Kerry and off the coast of the Iveragh peninsula in west Kerry. Other areas of lower habitat suitability (hs<400), occur

all along the west coast of Mayo as far as the southern part of the Cork coast and smaller areas occur at the northern part of Donegal (*Fig*. SI3.3d).

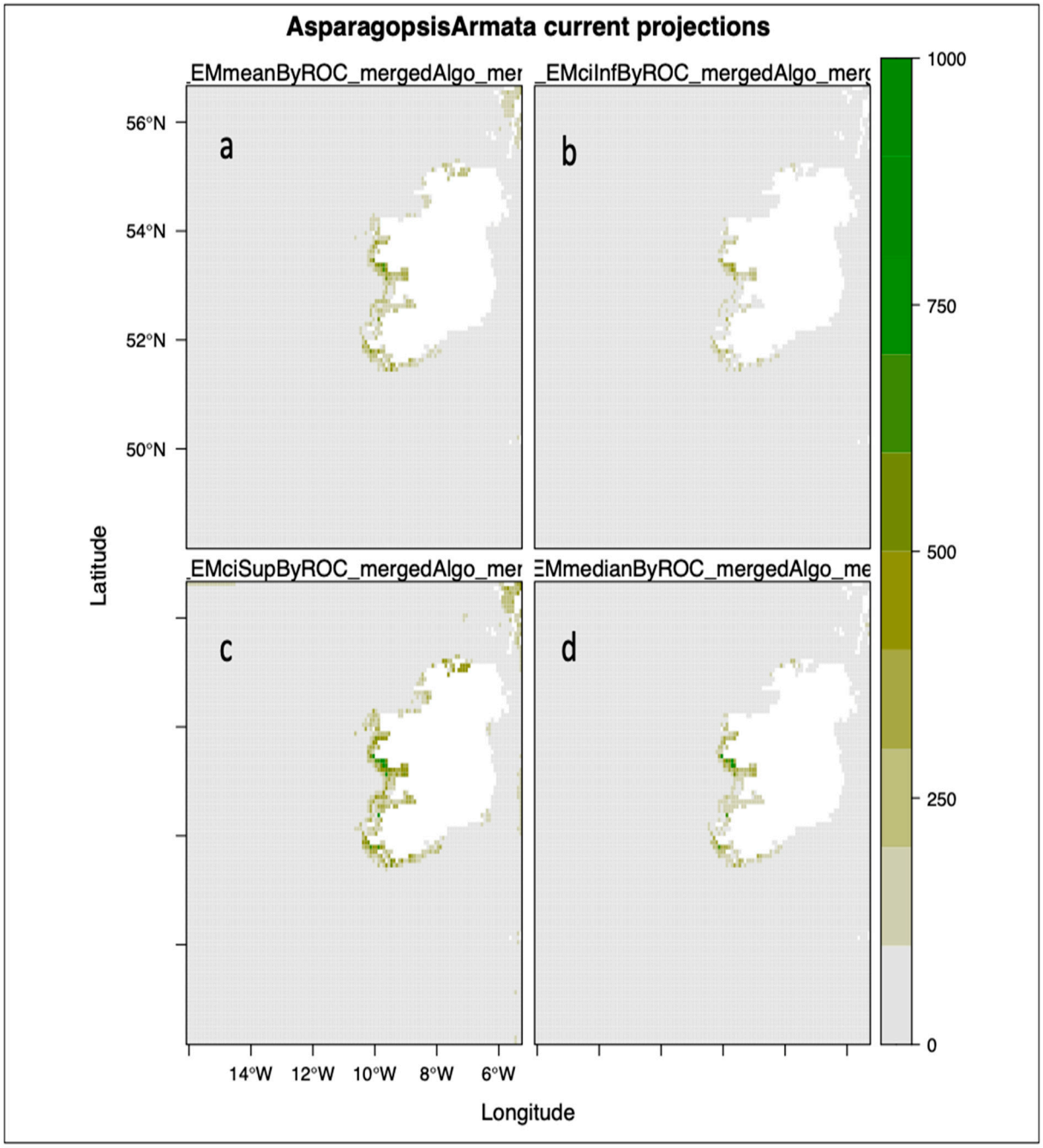


*Figure SI3.3:* Plot showing the geographic projections using (a) mean, (b) confidence interval Inferior, (c) confidence interval superior and (d) median for ensemble model contain occurrences from Ireland and New Zealand (non-native and native).

According to the models with occurrences from Ireland only, Mean of Diffuse attenuation is the most important variable in determining habitat suitability with a mean value of 0.71 ±0.04 (*Table* SI3.1). Sea surface temperature range was the second most important variable with a mean of 0.41 ±0.02, followed by Mean sea surface salinity (mean 0.33 ±0.02), Phosphate (mean 0.27 ±0.04) and Temperature of warmest month (mean 0.31 ±0.02) (*Table* SI3.1). Dissolved oxygen, Nitrate and pH variables had low importance with mean values of 0.06 ±0.04, 0.05±0.01 and 0.05 ±0,02 respectively (*Table* SI3.1).

*Table SI3.1:* Variables impact on habitat suitability (mean values with standard deviation across all RUNs and all PAs).

| **Environmental variables** | ***Asparagopsis armata* (Irish occurrences)** | ***Asparagopsis armata* (Irish and New Zealand occurrences)** |
|---|---|---|
| **Mean of Diffuse attenuation** | 0.71(±0.04) | 0.71(±0.05) |
| **Dissolved oxygen** | 0.06(±0.04) | 0.37(0.06) |
| **Nitrate** | 0.05(±0.01) | 0.21(±0.04) |
| **pH** | 0.06(±0.02) | 0.14(±0.04) |
| **Phosphate** | 0.27(±0.04) | 0.31(±0.09) |
| **Sea surface temperature range** | 0.41(±0.02) | 0.31(±0,05) |
| **Temperature of warmest month** | 0.26(±0.04) | 0.29(±0.06) |
| **Mean sea surface salinity** | 0.31(±0.02) | 0.09(±0.05) |

In terms of the model with occurrences from both Ireland and New Zealand, Mean of Diffuse attenuation was also the most important variable in determining habitat suitability with a mean value of 0.71 ±0.05. Dissolved oxygen was the second most important variable with a mean of 0.37 ±0.06, followed by Phosphate (0.31 ±0.09), sea surface temperature range (0.31 ±0.05), Temperature of warmest month (0.29± 0.06) and Nitrate (0.21± 0.04). pH and Mean sea surface salinity had lower importance with mean values of 0.14 ±0.04 and 0.09 ±0.05.

*Table SI3.2:* Evaluations of models for the different metrics. CI = confidence interval, AUC = Area Under the Curve, TSS = True Skill Statistic

| Model | Metric | Mean Ensemble | CI (lower) Ensemble | CI (upper) Ensemble | Median Ensemble |
|---|---|---|---|---|---|
| *A. armata (*non-native) | AUC | 0.999 | 0.999 | 0.999 | 0.996 |
| *A. armata (*non-native) | TSS | 0.991 | 0.992 | 0.99 | 0.986 |
| *A. armata (*non-native & native) | AUC | 0.997 | 0.945 | 0.997 | 0.991 |
| *A. armata (*non-native & native) | TSS | 0.966 | 0.916 | 0.972 | 0.91 |

Validation of the models show a good fit when the data is validated with TSS and ROC (*Table* SI3.2).