

## Supporting Information

# Tri-variate relationships among vegetation, soil, and topography along the gradient of fluvial biogeomorphic succession

Daehyun Kim · John A. Kupfer

**S2 Table. Average values of surface elevation, distance to the creek, soil properties, and all plant species abundance (% frequency) at each study site of the Skallingen salt marsh, Denmark.**

|   | Point bar<br>(n <sup>a</sup> = 26) | Platform<br>(n = 41) | Levee<br>(n = 35) | F-value <sup>b</sup> |
|---|------------------------------------|----------------------|-------------------|----------------------|
| Surface elevation (m DNN <sup>c</sup> )   | 0.7 ± 0.1 <sup>d</sup>             | 0.8 ± 0.1            | 0.9 ± 0.1         | 28.96***             |
| Distance to the creek (m)                 | 1.7 ± 1.2                          | 18.7 ± 6.3           | 6.9 ± 2.7         | 140.47***            |
| Soil pH                                   | 6.9 ± 0.4                          | 6.0 ± 0.4            | 6.4 ± 0.5         | 36.50***             |
| Bulk density (g cm <sup>-3</sup> )        | 1.0 ± 0.3                          | 0.8 ± 0.2            | 0.9 ± 0.3         | 8.77***              |
| EC <sup>e</sup> (umhos cm <sup>-1</sup> ) | 7499.2 ± 1904.6                    | 9344.1 ± 1227.5      | 7978.6 ± 2827.5   | 7.48**               |
| Nitrate (mg kg <sup>-1</sup> )            | 19.5 ± 29.8                        | 106.5 ± 101.0        | 110.1 ± 99.9      | 9.80***              |
| P (mg kg <sup>-1</sup> )                  | 84.1 ± 29.1                        | 105.8 ± 65.5         | 96.3 ± 45.4       | 1.42                 |
| K (mg kg <sup>-1</sup> )                  | 583.3 ± 313.3                      | 1007.5 ± 348.6       | 786.5 ± 387.2     | 11.71***             |
| Ca (mg kg <sup>-1</sup> )                 | 2499.2 ± 980.5                     | 1373.8 ± 371.9       | 1502.6 ± 657.3    | 24.98***             |
| Mg (mg kg <sup>-1</sup> )                 | 1172.6 ± 596.3                     | 2095.6 ± 691.8       | 1691.2 ± 807.3    | 13.42***             |
| S (mg kg <sup>-1</sup> )                  | 740.3 ± 404.0                      | 1158.9 ± 501.3       | 964.9 ± 507.6     | 6.08**               |
| Na (mg kg <sup>-1</sup> )                 | 7482.5 ± 3970.6                    | 11731.8 ± 4129.3     | 9154.0 ± 4636.4   | 8.41***              |

|   |             |             |             |          |
|---|-------------|-------------|-------------|----------|
| <i>Puccinellia maritima</i> (P <sup>f</sup> ) | 63.9 ± 30.7 | 52.9 ± 21.3 | 22.7 ± 21.1 | 25.54*** |
| <i>Suaeda maritima</i> (P)                    | 84.4 ± 23.4 | 25.8 ± 28.5 | 16.2 ± 24.1 | 59.03*** |
| <i>Salicornia herbacea</i> (P)                | 59.9 ± 36.9 | 18.0 ± 28.4 | 4.3 ± 10.1  | 34.45*** |
| <i>Spartina anglica</i> (P)                   | 20.1 ± 25.5 | 1.5 ± 4.8   | 0.5 ± 1.6   | 20.32*** |
| <i>Spergularia media</i> (M)                  | 0.0 ± 0.0   | 1.0 ± 3.4   | 0.3 ± 1.2   | 1.90     |
| <i>Aster tripolium</i> (M)                    | 18.2 ± 16.5 | 22.7 ± 19.2 | 5.1 ± 7.8   | 12.71*** |
| <i>Limonium vulgare</i> (M)                   | 32.9 ± 19.4 | 47.5 ± 26.4 | 15.7 ± 19.2 | 18.92*** |
| <i>Triglochin maritima</i> (M)                | 0.0 ± 0.0   | 13.4 ± 17.5 | 2.2 ± 6.7   | 13.36*** |
| <i>Plantago maritima</i> (M)                  | 0.9 ± 2.3   | 21.7 ± 22.0 | 7.9 ± 10.1  | 16.33*** |
| <i>Atriplex portulacoides</i> (M)             | 36.2 ± 33.1 | 99.0 ± 4.7  | 87.7 ± 28.0 | 59.96*** |
| <i>Festuca rubra</i> (H)                      | 0.1 ± 0.4   | 0.0 ± 0.3   | 21.0 ± 35.9 | 11.39*** |
| <i>Artemisia maritima</i> (H)                 | 1.5 ± 4.4   | 8.6 ± 22.2  | 36.2 ± 35.8 | 16.97*** |
| <i>Juncus gerardii</i> (H)                    | 0.0 ± 0.0   | 0.3 ± 1.4   | 22.9 ± 38.7 | 11.51*** |

<sup>a</sup> number of plots in the corresponding site

<sup>b</sup> estimated by one-way analysis of variance

<sup>c</sup> Danish Ordnance Zero

<sup>d</sup> standard deviation

<sup>e</sup> electrical conductivity

<sup>f</sup> general classification of the species at Skallingen based on each species's elevation ranges and successional stages

(Kim 2014; Kim *et al.* 2012; P = pioneer plants, M = mid-marsh plants, H = high-marsh plants)

\*\*\* significant at the level of 0.1% probability (two-tailed;  $P < 0.001$ )

\*\* significant at the level of 1% probability (two-tailed;  $P < 0.01$ )

\* significant at the level of 5% probability (two-tailed;  $P < 0.05$ )