

The Dynamic nature of carbon and oxygen benthic fluxes in seagrass habitats

Élise Lacoste^{1*}, Nicolas Desroy², Aline Blanchet-Aurigny³, Guillaume Bernard⁴, Touria Bajjouk³,
Marie-Noelle de Casamajor⁵, Nicolas Cimiterra¹, Amelia Curd³, Lauriane Derrien¹, Stanislas F. Dubois³, Élodie
Foucault¹, Gregory Messiaen¹, Loïc Rigouin³, Laura Soissons⁶, Aurélien Tancray³, Vincent Ouisse¹

¹ MARBEC, Univ Montpellier, CNRS, Ifremer, IRD, Sète, France

² Ifremer, LITTORAL, F-35800 Dinard, France

³ Ifremer, DYNECO, F-29280 Plouzané, France

⁴ Ifremer, LITTORAL, F-33120 Arcachon, France

⁵ Ifremer, LITTORAL, F-64600 Anglet, France

⁶ DECOD (Ecosystem Dynamics and Sustainability), INRAE, Institut Agro, IFREMER, France

*Present: CEPRALMAR, Sète, France

For all Tables: A: Absence, S: Stable meadow, D: Dynamic meadow ; DN: Dinard, GM: Gulf of Morbihan, TH: Thau
Degrees-of-freedom method: kenward-roger
P value adjustment: tukey method for varying family sizes

Table S2. Results of the pairwise comparisons following the overall linear mixed effect models testing the effect of Site (N=4), Modality (N=3) and their interaction on **community respiration (CR)** during immersion in **Z. marina** habitat (Table 4 of the main manuscript).

Difference between sites within each modality	Difference between modalities within each site
MODALITY = A: contrast estimate SE df t.ratio p.value DN - GM -2.774 1.14 86 -2.434 0.0784 DN - AC -0.661 1.14 86 -0.580 0.9378 DN - TH -5.040 1.14 86 -4.422 0.0002 GM - AC 2.113 1.14 86 1.853 0.2559 GM - TH -2.266 1.14 86 -1.988 0.2005 AC - TH -4.379 1.14 86 -3.842 0.0013 MODALITY = D: contrast estimate SE df t.ratio p.value DN - GM -0.777 1.14 86 -0.682 0.7748 DN - AC nonEst NA NA NA NA DN - TH -3.671 1.14 86 -3.221 0.0051 GM - AC nonEst NA NA NA NA GM - TH -2.894 1.14 86 -2.539 0.0342 AC - TH nonEst NA NA NA NA MODALITY = S: contrast estimate SE df t.ratio p.value DN - GM -2.550 1.14 86 -2.237 0.1215 DN - AC -1.671 1.14 86 -1.466 0.4626 DN - TH -3.700 1.14 86 -3.246 0.0089 GM - AC 0.879 1.14 86 0.771 0.8672 GM - TH -1.150 1.14 86 -1.009 0.7446 AC - TH -2.029 1.14 86 -1.780 0.2898	SITE = DN: contrast estimate SE df t.ratio p.value A - D -1.627 1.14 86 -1.428 0.3312 A - S -0.986 1.14 86 -0.865 0.6636 D - S 0.641 1.14 86 0.563 0.8403 SITE = GM: contrast estimate SE df t.ratio p.value A - D 0.369 1.14 86 0.324 0.9438 A - S -0.762 1.14 86 -0.669 0.7823 D - S -1.131 1.14 86 -0.993 0.5835 SITE = AC: contrast estimate SE df t.ratio p.value A - D nonEst NA NA NA NA A - S -1.996 1.14 86 -1.751 0.0836 D - S nonEst NA NA NA NA SITE = TH: contrast estimate SE df t.ratio p.value A - D -0.258 1.14 86 -0.227 0.9721 A - S 0.354 1.14 86 0.311 0.9483 D - S 0.612 1.14 86 0.537 0.8533

Table S3. Results of the pairwise comparisons following the overall linear mixed effect models testing the effect of Site (N=4), Modality (N=3) and their interaction on **community respiration (CR)** during immersion in *N. noltei* habitat (Table 4 of the main manuscript).

Difference between sites within each modality	Difference between modalities within each site
MODALITY = A: contrast estimate SE df t.ratio p.value DN - GM -2.411 0.796 84 -3.028 0.0169 DN - AC -0.212 0.796 84 -0.266 0.9934 DN - TH -0.594 0.821 84 -0.723 0.8877 GM - AC 2.199 0.796 84 2.762 0.0349 GM - TH 1.817 0.821 84 2.213 0.1281 AC - TH -0.382 0.821 84 -0.465 0.9665 MODALITY = D: contrast estimate SE df t.ratio p.value DN - GM -1.064 0.796 84 -1.336 0.3791 DN - AC nonEst NA NA NA NA DN - TH -2.454 0.796 84 -3.083 0.0077 GM - AC nonEst NA NA NA NA GM - TH -1.390 0.796 84 -1.746 0.1943 AC - TH nonEst NA NA NA NA MODALITY = S: contrast estimate SE df t.ratio p.value DN - GM 0.540 0.821 84 0.657 0.9128 DN - AC -0.646 0.796 84 -0.812 0.8488 DN - TH 0.400 0.796 84 0.503 0.9582 GM - AC -1.186 0.821 84 -1.444 0.4759 GM - TH -0.139 0.821 84 -0.170 0.9983 AC - TH 1.046 0.796 84 1.314 0.5564	SITE = DN: contrast estimate SE df t.ratio p.value A - D -1.807 0.796 84 -2.269 0.0658 A - S -4.162 0.796 84 -5.228 <.0001 D - S -2.355 0.796 84 -2.958 0.0111 SITE = GM: contrast estimate SE df t.ratio p.value A - D -0.460 0.796 84 -0.577 0.8325 A - S -1.211 0.821 84 -1.475 0.3080 D - S -0.752 0.821 84 -0.915 0.6322 SITE = AC: contrast estimate SE df t.ratio p.value A - D nonEst NA NA NA NA A - S -4.596 0.796 84 -5.773 <.0001 D - S nonEst NA NA NA NA SITE = TH: contrast estimate SE df t.ratio p.value A - D -3.667 0.821 84 -4.465 0.0001 A - S -3.168 0.821 84 -3.858 0.0006 D - S 0.499 0.796 84 0.627 0.8058

Table S4. Results of the pairwise comparisons following the overall linear mixed effect models testing the effect of Site (N=4), Modality (N=3) and their interaction on **gross community production (GCP)** during immersion in *Z. marina* habitat (Table 4 of the main manuscript).

Difference between sites within each modality	Difference between modalities within each site
MODALITY = A: contrast estimate SE df t.ratio p.value DN - GM -8.920 2.17 83.2 -4.107 0.0005 DN - AC -0.700 2.17 83.2 -0.322 0.9883 DN - TH -9.029 2.17 83.2 -4.157 0.0004 GM - AC 8.220 1.92 83.0 4.277 0.0003 GM - TH -0.109 1.92 83.0 -0.056 0.9999 AC - TH -8.329 1.92 83.0 -4.333 0.0002 MODALITY = D: contrast estimate SE df t.ratio p.value DN - GM -6.644 1.92 83.0 -3.457 0.0025 DN - AC nonEst NA NA NA NA DN - TH -1.798 1.92 83.0 -0.935 0.6197 GM - AC nonEst NA NA NA NA GM - TH 4.847 1.92 83.0 2.522 0.0359 AC - TH nonEst NA NA NA NA MODALITY = S: contrast estimate SE df t.ratio p.value DN - GM -7.559 1.92 83.0 -3.933 0.0010 DN - AC -1.862 1.92 83.0 -0.969 0.7676 DN - TH -5.538 1.92 83.0 -2.881 0.0255 GM - AC 5.697 1.92 83.0 2.964 0.0203 GM - TH 2.021 1.92 83.0 1.051 0.7197 AC - TH -3.676 1.92 83.0 -1.912 0.2308	SITE = DN: contrast estimate SE df t.ratio p.value A - D -6.720 2.17 83.2 -3.094 0.0075 A - S -6.192 2.17 83.2 -2.851 0.0150 D - S 0.528 1.92 83.0 0.275 0.9593 SITE = GM: contrast estimate SE df t.ratio p.value A - D -4.444 1.92 83.0 -2.312 0.0596 A - S -4.831 1.92 83.0 -2.513 0.0366 D - S -0.387 1.92 83.0 -0.201 0.9779 SITE = AC: contrast estimate SE df t.ratio p.value A - D nonEst NA NA NA NA A - S -7.354 1.92 83.0 -3.826 0.0003 D - S nonEst NA NA NA NA SITE = TH: contrast estimate SE df t.ratio p.value A - D 0.511 1.92 83.0 0.266 0.9618 A - S -2.701 1.92 83.0 -1.405 0.3428 D - S -3.213 1.92 83.0 -1.671 0.2223

Table S5. Results of the pairwise comparisons following the overall linear mixed effect models testing the effect of Site (N=4), Modality (N=3) and their interaction on **gross community production (GCP)** during immersion in *N. noltei* habitat (Table 4 of the main manuscript).

Difference between sites within each modality	Difference between modalities within each site
MODALITY = A: contrast estimate SE df t.ratio p.value DN - GM -3.312 1.68 82 -1.970 0.2078 DN - AC 0.422 1.73 82 0.244 0.9949 DN - TH -0.645 1.73 82 -0.372 0.9824 GM - AC 3.735 1.73 82 2.153 0.1452 GM - TH 2.668 1.73 82 1.538 0.4197 AC - TH -1.067 1.79 82 -0.597 0.9327 MODALITY = D: contrast estimate SE df t.ratio p.value DN - GM -6.612 1.68 82 -3.932 0.0005 DN - AC nonEst NA NA NA NA DN - TH -7.109 1.73 82 -4.099 0.0003 GM - AC nonEst NA NA NA NA GM - TH -0.497 1.73 82 -0.287 0.9557 AC - TH nonEst NA NA NA NA MODALITY = S: contrast estimate SE df t.ratio p.value DN - GM -4.225 1.73 82 -2.436 0.0783 DN - AC -5.278 1.68 82 -3.139 0.0124 DN - TH -3.167 1.68 82 -1.884 0.2431 GM - AC -1.053 1.73 82 -0.607 0.9296 GM - TH 1.058 1.73 82 0.610 0.9286 AC - TH 2.111 1.68 82 1.255 0.5937	SITE = DN: contrast estimate SE df t.ratio p.value A - D -1.782 1.68 82 -1.060 0.5416 A - S -4.557 1.68 82 -2.710 0.0221 D - S -2.775 1.68 82 -1.651 0.2306 SITE = GM: contrast estimate SE df t.ratio p.value A - D -5.081 1.68 82 -3.022 0.0093 A - S -5.470 1.73 82 -3.154 0.0063 D - S -0.389 1.73 82 -0.224 0.9727 SITE = AC: contrast estimate SE df t.ratio p.value A - D nonEst NA NA NA NA A - S -10.258 1.73 82 -5.914 <.0001 D - S nonEst NA NA NA NA SITE = TH: contrast estimate SE df t.ratio p.value A - D -8.246 1.79 82 -4.614 <.0001 A - S -7.080 1.73 82 -4.082 0.0003 D - S 1.167 1.73 82 0.673 0.7801