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SUPPLEMENTARY MATERIAL

Discrete element modeling of bivalve *Mactra veneriformis*: parameter calibration and mechanized harvesting validation

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Table S1. Material properties of the mudflat sediment.

Material	Parameters	Value
Mudflat sediment	Density ρ_M /kg·m^{-3}	2034
	Poisson's ratio v	0.3
	Shear modulus G/kpa	1000
	Particle calibre d_m/mm	3.48

Table S2. DEM contact parameters for the mudflat sediment–*M. veneriformis* model.

Material	Contact model	Parameters	Value
Mudflat sediment-Mudflat sediment	EEPA	Constant Pull-off Force / N	-0.002
		Surface Energy JKR / J·m^{-2}	14.578
		Cotact Plasticity Ratio	0.436
		Slope EXP	1.5
		Tangential Stiff Multiplier	0.59
		Restitution Coefficient e'_{M-M}	0.37
		Static Friction Coefficient μ'_{s-M-M}	0.917
		Rolling Friction coefficient μ'_{r-M-M}	0.131
Mudflat sediment-Stainless steel	Hertz-Mindlin with JKR	Surface energy JKR/ J·m^{-2}	1.823
		Restitution coefficient e'_{M-S}	0.3
		Static friction coefficient μ'_{s-M-S}	0.862
		Rolling friction coefficient μ'_{r-M-S}	0.075
Mudflat sediment-*M. veneriformis*	EEPA	Constant Pull-off Force/N	0
		Surface Energy JKR / J·m^{-2}	16.819
		Contact plasticity ratio	0.483
		Slope EXP	1.5
		Tensile Exp	3
		Tangential Stiff Multiplier	0.6
		Restitution coefficient e'_{M-C}	0.3
		Static friction coefficient μ'_{s-M-C}	0.75
		Rolling friction coefficient μ'_{r-M-C}	0.15

Table S3. Design and results of the AOR PBD simulation.

Std	A	B	C	D	E	F	G	H	θ_S (°)
1	2.0	0.6	2	0.8	0.30	0.7	0.05	0.1	18.57
2	0.1	0.6	4	0.4	0.30	0.7	0.30	0.1	29.07
3	2.0	0.2	4	0.8	0.05	0.7	0.30	2.0	28.81
4	0.1	0.6	2	0.8	0.30	0.3	0.30	2.0	25.49
5	0.1	0.2	4	0.4	0.30	0.7	0.05	2.0	23.72
6	0.1	0.2	2	0.8	0.05	0.7	0.30	0.1	28.53
7	2.0	0.2	2	0.4	0.30	0.3	0.30	2.0	21.29
8	2.0	0.6	2	0.4	0.05	0.7	0.05	2.0	19.71
9	2.0	0.6	4	0.4	0.05	0.3	0.30	0.1	21.62
10	0.1	0.6	4	0.8	0.05	0.3	0.05	2.0	20.13
11	2.0	0.2	4	0.8	0.30	0.3	0.05	0.1	19.66
12	0.1	0.2	2	0.4	0.05	0.3	0.05	0.1	19.59