

Supplement to Bloecher et al.: Testing of novel net cleaning technologies for finfish aquaculture

Background to statistical tests

Table S1: Overview of the data that was analysed and the number of replicates in the individual tests.

Experiment	Cleaning technology	Cleaning frequency	Net coating	Number of replicate nets	Samples per replicate	Tests per sample
Cleaning efficacy	High pressure	1x	Uncoated	6	1	1 (wet weight)
	Low pressure		Notorius A			
	Cavitation		Notorius 3			
	Suction					
Cleaning waste	High pressure	1x	Uncoated	4	1	1 (Particle composition and dry weight)
	Low pressure		Notorius A			
	Cavitation		Notorius 3			
	Suction					
Net strength	High pressure	35x	Uncoated	3*	4	5, averaged (mesh breaking force)
	Cavitation		Notorius A			
	Suction		Notorius 3			
Coating integrity	High pressure	1x, 35x	Notorius A	3	4	1 (coated surface area)
	Low pressure		Notorius 3			
	Cavitation					
	Suction					

* High-pressure cleaning of uncoated samples was conducted for two replicates.

Statistical results of PERMANOVA analyses

Cleaning efficacy

Permanova table of results

Source	df	SS	MS	Pseudo-F	P(perm)
Cleaning technology	3	3,6967	1,2322	195,8	0,0001
Coating	2	0,035158	0,017579	2,7933	0,0724
Cleaning technology x Coating	6	0,47979	0,079964	12,706	0,0001
Residuals	60	0,3776	0,006293		
Total	71	4,5892			

PAIR-WISE TESTS

Term 'Cleaning technology x Coating' for pairs of levels of factor 'Coating'

Within level 'Low pressure' of factor 'Cleaning technology'

Groups	t	P(MC)
Uncoated, Notorius A	0,72027	0,4901
Uncoated, Notorius 3	0,28565	0,7778
Notorius A, Notorius 3	1,0372	0,3163

Within level High pressure' of factor 'Cleaning technology'

Groups	t	P(MC)
Uncoated, Notorius A	4,3262	0,0017
Uncoated, Notorius 3	4,1338	0,0022
Notorius A, Notorius 3	0,53651	0,6052

Within level 'Cavitation' of factor 'Cleaning technology'

Groups	t	P(MC)
Uncoated, Notorius A	8,3623	0,0001
Uncoated, Notorius 3	10,304	0,0001
Notorius A, Notorius 3	5,1315	0,0007

Within level 'Suction' of factor 'Cleaning technology'

Groups	t	P(MC)
Uncoated, Notorius A	1,4286	0,1769
Uncoated, Notorius 3	0,62131	0,5468
Notorius A, Notorius 3	1,8535	0,0936

PAIR-WISE TESTS

Term 'Cleaning technology x Coating' for pairs of levels of factor 'Cleaning technology'

Within level 'Uncoated' of factor 'Coating'

Groups	t	P(MC)
Low pressure, High pressure	8,2938	0,0001
Low pressure, Cavitation	2,3203	0,0445
Low pressure, Suction	4,3147	0,0009
High pressure, Cavitation	14,492	0,0001
High pressure, Suction	26,514	0,0001
Cavitation, Suction	13,37	0,0001

Within level 'Notorius A' of factor 'Coating'

Groups	t	P(MC)
Low pressure, High pressure	3,2146	0,0087
Low pressure, Cavitation	5,8322	0,0001
Low pressure, Suction	7,3491	0,0002
High pressure, Cavitation	1,4614	0,1733
High pressure, Suction	11,595	0,0001
Cavitation, Suction	32,662	0,0001

Within level 'Notorius 3' of factor 'Coating'

Groups	t	P(MC)
Low pressure, High pressure	4,6723	0,0018
Low pressure, Cavitation	8,5356	0,0001
Low pressure, Suction	3,3915	0,0078
High pressure, Cavitation	4,3112	0,0012
High pressure, Suction	10,382	0,0001
Cavitation, Suction	16,762	0,0001

Coating particles

Permanova table of results

Source	df	SS	MS	Pseudo-F	P(perm)
Cleaning technology	3	4880,2	1626,7	12,176	0,0001
Coating	2	1081,2	540,58	4,0464	0,0165
Cleaning technology x Coating	6	3564,8	594,14	4,4472	0,0009
Residuals	36	4809,5	133,6		
Total	47	14336			

PAIR-WISE TESTS

Term 'Cleaning technology x Coating' for pairs of levels of factor 'Coating'

Within level 'Notorius 3' of factor 'Coating'

Groups	t	P(MC)
High pressure, Low pressure	3,0825	0,0195
High pressure, Cavitation	2,5052	0,0457
High pressure, Suction	3,1975	0,0181
Low pressure, Cavitation	0,75107	0,469
Low pressure, Suction	1,6977	0,1417
Cavitation, Suction	1	0,3471

Within level 'Notorius A' of factor 'Coating'

Groups	t	P(MC)
High pressure, Low pressure	3,144	0,0187
High pressure, Cavitation	3,4348	0,0124
High pressure, Suction	3,4348	0,0166
Low pressure, Cavitation	1	0,347
Low pressure, Suction	1	0,3539
Cavitation, Suction	Denominator is 0	

Within level 'Uncoated' of factor 'Coating'

Groups	t	P(MC)
High pressure, Low pressure	0,37712	0,7132
High pressure, Cavitation	1,9703	0,0983
High pressure, Suction	0,2111	0,8409
Low pressure, Cavitation	1,9412	0,1028
Low pressure, Suction	0,49526	0,6303
Cavitation, Suction	1	0,3573

PAIR-WISE TESTS

Term 'Cleaning technology x Coating' for pairs of levels of factor 'Cleaning technology'

Within level 'High pressure' of factor 'Cleaning technology'

Groups	t	P(MC)
Notorius 3, Notorius A	1,8565	0,1149
Notorius 3, Uncoated	2,7565	0,0334
Notorius A, Uncoated	2,0557	0,0876

Within level 'Low pressure' of factor 'Cleaning technology'

Groups	t	P(MC)
Notorius 3, Notorius A	0,30861	0,7716
Notorius 3, Uncoated	1,4863	0,1879
Notorius A, Uncoated	1,5801	0,1646

Within level 'Cavitation' of factor 'Cleaning technology'

Groups	t	P(MC)
Notorius 3, Notorius A	1	0,3523
Notorius 3, Uncoated	1	0,3568
Notorius A, Uncoated	Denominator is 0	

Within level 'Suction' of factor 'Cleaning technology'

Groups	t	P(MC)
Notorius 3, Notorius A	Denominator is 0	
Notorius 3, Uncoated	1	0,3598
Notorius A, Uncoated	1	0,3606

Net strength

→ High pressure cleaning

Permanova table of results

Source	df	SS	MS	Pseudo-F	P(perm)
Cleaning technology	1	3861,1	3861,1	8,565	0,0326
Coating	2	3,66E+05	1,83E+05	42,311	0,0112
Net(Coating)	5	21642	4328,5	34,598	0,0001
Cleaning technology x Coating	2	885,63	442,82	0,9823	0,4299
Cleaning technology x Net(Coating)	5	2254	450,8	3,6032	0,0066
Residuals	48	6005,2	125,11		
Total	63	4,01E+05			

→ Cavitation and Suction cleaning

Permanova table of results

Source	df	SS	MS	Pseudo-F	P(perm)
Cleaning technology	2	6883,8	3441,9	3,6675	0,0586
* Cavitation	1	6805,6	6805,6	23,553	0,0039
* Suction	1	2392	2392	1,4842	0,2734
Coating	2	2,03E+06	1,01E+06	1539,7	0,0075
Net(Coating)	6	3953,3	658,88	1,3559	0,245
Cleaning technology x Coating	4	8435,6	2108,9	2,2471	0,1235
* Cavitation x Coating	2	7189,5	3594,8	12,441	0,0069
* Suction x Coating	2	4000,9	2000,4	1,2413	0,3632
Cleaning technology x Net(Coating)	12	11262	938,49	1,9313	0,0366
* Cavitation x Net(Coating)	6	1733,7	288,94	0,53238	0,7962
* Suction x Net(Coating)	6	9669,7	1611,6	3,2566	0,0039
Residuals	81	39360	485,93		
Total	107	2,10E+06			

**contrast analysis (washed samples vs. unwashed control)*

Coating integrity

Permanova table of results

Source	df	SS	MS	Pseudo-F	P(perm)
Coating	1	526,69	526,69	0,61602	0,4975
Cleaning technology	3	98636	32879	108,84	0,0001
Frequency	1	30654	30654	276,99	0,0017
Net(Coating)	4	3419,9	854,98	33,401	0,0001
Coating x Cleaning technology	3	620,1	206,7	0,68427	0,5743
Coating x Frequency	1	36,75	36,75	0,33208	0,5962
Cleaning technology x Frequency	3	28699	9566,3	74,616	0,0001
Net(Coating) x Cleaning technology	12	3624,9	302,08	11,801	0,0001
Net(Coating) x frequency	4	442,67	110,67	4,3234	0,0017
Coating x Cleaning technology x Frequency	3	467,79	155,93	1,2162	0,3423
Net(Coating) x Cleaning technology x Frequency	12	1538,5	128,21	5,0087	0,0001
Residuals	144	3686	25,597		
Total	191	1,72E+05			

Biofouling growth on experimental net panels

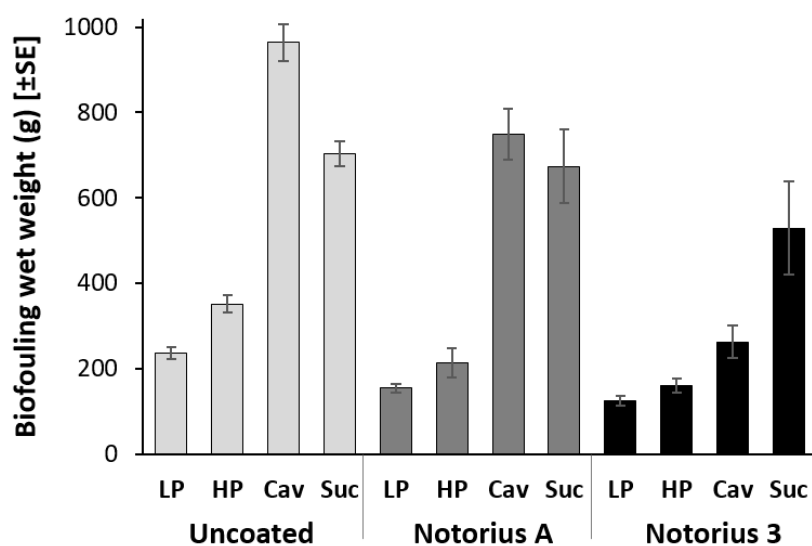


Figure S1: Average biofouling wet weight (g, $\pm$ standard error) prior to net cleaning on samples assigned to the four net cleaning treatments (low pressure (LP), high pressure (HP), cavitation (Cav) and suction (Suc)) to determine cleaning efficacy.

Species composition of the cleaning waste collected during washing of biofouled nets

All particles collected as cleaning waste were identified to broad taxonomic levels. Particles of the hydroid *Ectopleura larynx* were further classified into four main body parts (entire polyp, hydranth, hydrocaulus and hydrorhiza, gonophores).

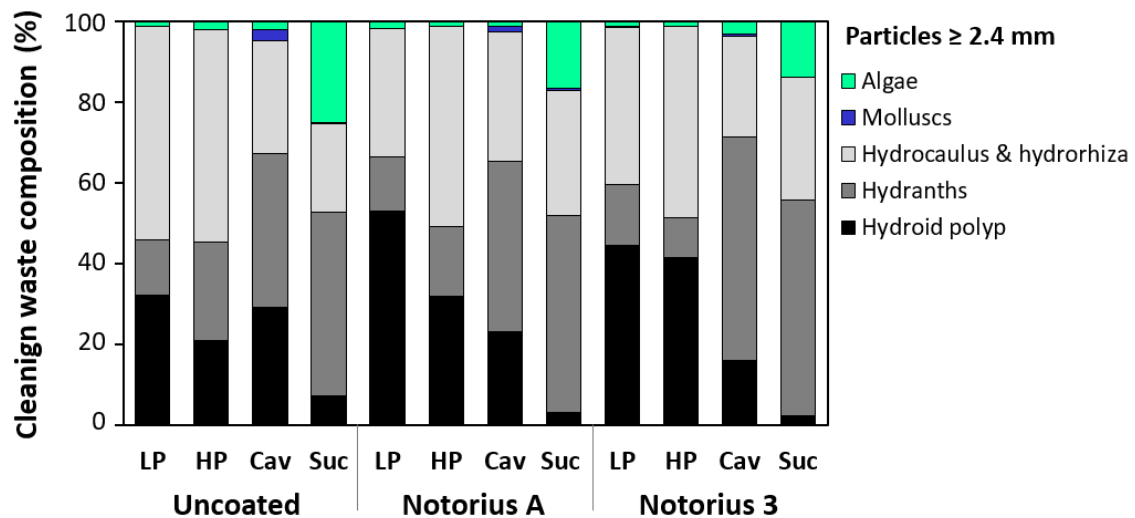


Figure S2: Composition of cleaning waste particles ≥ 2.4 mm (except hydroid colonies) based on abundance, containing algae and molluscs, as well as individual hydroid polyps and fragments thereof (hydranths, hydrocaulus and hydrorhiza).

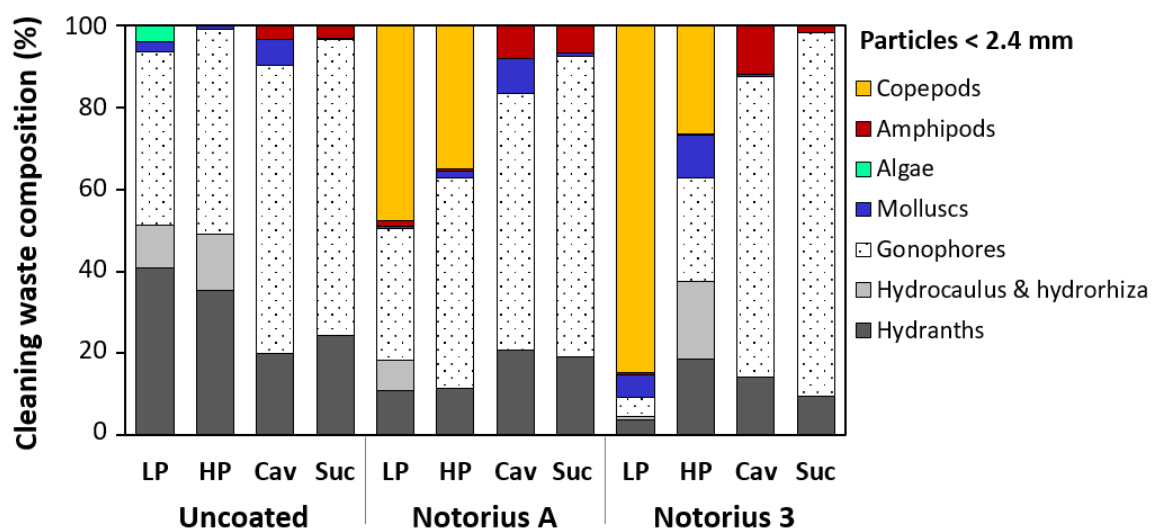


Figure S3: Composition of cleaning waste particles < 2.4 mm based on abundance, containing copepods (planktonic), amphipods (associated with the biofouling on the net), algae, and molluscs, as well as hydroid fragments (hydranths, hydrocaulus and hydrorhiza) and hydroid gonophores.