

## Potential of the polychaete *Hediste diversicolor* fed on aquaculture and biogas side streams as an aquaculture food source

Haiqing Wang\*, Andreas Hagemann, Kjell Inge Reitan, Jørgen Ejlertsson, Håvard Wollan, Aleksander Handå, Arne Malzahn

\*Corresponding author: [haiqing.wang@ntnu.no](mailto:haiqing.wang@ntnu.no)

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**Table S1** Water quality parameters during the experiment

	Date	FF	SS100	SS66	SS33	SS0
O sats (%)	6	91.15±2.57	98.05±0.61	98.55±0.52	98.35±0.39	98.55±0.31
	8	85.25±8.95	97.18±1.77	97.00±1.96	96.65±1.71	97.43±1.03
	10	90.83±3.51	96.05±2.67	95.88±0.76	93.48±4.86	95.50±2.08
	12	95.08±1.4	97.98±1.43	97.98±0.56	97.43±1.50	98.03±0.62
	14	95.00±1.36	96.33±1.30	95.95±0.53	95.10±2.04	97.70±0.94
	16	96.40±0.64	96.88±0.95	97.38±0.49	96.95±1.08	98.00±0.63
	18	93.98±1.74	95.53±2.03	95.53±1.60	95.88±1.18	96.83±0.56
	21	96.05±0.96	96.68±1.04	97.60±0.12	97.58±0.43	97.45±0.94
	25	94.58±1.26	95.2±1.66	95.45±0.40	95.48±0.56	96.35±1.32
	29	96.45±1.36	96.6±1.94	98.53±0.30	98.05±1.94	98.53±1.37
pH	6	7.37±0.17	7.6±0.00	7.56±0.03	7.59±0.01	7.59±0.03
	8	7.42±0.12	7.56±0.02	7.53±0.04	7.53±0.04	7.56±0.02
	10	7.35±0.02	7.42±0.01	7.39±0.03	7.41±0.03	7.34±0.01
	12	7.67±0.03	7.76±0.02	7.74±0.02	7.76±0.01	7.78±0.01
	14	7.65±0.01	7.57±0.02	7.63±0.02	7.66±0.02	7.68±0.02
	16	7.64±0.05	7.82±0.15	7.78±0.00	7.79±0.01	7.79±0.00
	18	7.72±0.02	7.75±0.01	7.74±0.02	7.75±0.01	7.74±0.01
	21	7.61±0.16	7.81±0.01	7.78±0.02	7.8±0.02	7.82±0.01
	25	7.69±0.09	7.73±0.02	7.76±0.01	7.79±0.01	7.75±0.02
	29	7.60±0.10	7.73±0.03	7.76±0.02	7.79±0.01	7.80±0.01
Sal (‰)	6	33.98±0.13	34.16±0.14	34.31±0.05	34.27±0.11	34.08±0.23
	8	34.39±0.03	34.38±0.03	34.28±0.19	34.15±0.35	34.29±0.19
	10	34.38±0.12	34.45±0.02	34.40±0.10	34.32±0.24	34.44±0.02
	12	34.43±0.01	34.02±0.50	34.14±0.34	34.41±0.06	34.38±0.11
	14	34.47±0.28	34.65±0.05	34.53±0.17	34.52±0.19	34.61±0.01
	16	34.71±0.32	34.78±0.11	34.86±0.04	34.83±0.04	34.81±0.07
	18	34.85±0.18	34.74±0.42	34.82±0.20	34.96±0.02	33.62±2.23
	21	35.01±0.09	34.85±0.10	34.79±0.30	34.84±0.21	34.79±0.26
	25	34.81±0.49	34.91±0.12	34.64±0.61	34.93±0.03	34.73±0.33
	29	34.94±0.09	34.61±0.27	34.83±0.09	34.70±0.12	34.63±0.27

O sats: abbreviation of oxygen saturation

**Table S2** Total amino acid (mg/g DM, means  $\pm$  SD) and amino acid composition (% of TAA, means  $\pm$  SD) of the experimental diets (n=3 replicates). FF = Fish Feed, SS= Smolt Sludge, SBD = Solid Biogas Digestate. TAA=total amino acids, EAA=essential amino acids, NEAA=nonessential amino acids, ARG=arginine, HIS=histidine, ILE=isoleucine, LEU=leucine, LYS=lysine, MET=methionine, PHE=phenylalanine, THR=threonine, TRP=tryptophan, VAL=valine, ALA=alanine, ASP=asparagine/aspartic acid, CYS= cystine (Cys-Cys), GLU= glutamine/glutamic acid, GLY=glycine, PRO=proline, SER=serine, TYR= tyrosine, TAU=taurine. Superscript a, b and c denotes statistical significant differences between FF, SS100 and SS0.

	FF	SS100 (1:0 SS:SBD)	SS66 <sup>A</sup> (2:1 SS:SBD)	SS33 <sup>B</sup> (1:2 SS:SBD)	SS0 (0:1 SS:SBD)
TAA (mg/g DM)	399.0 $\pm$ 6.00 <sup>a</sup>	189.5 $\pm$ 2.00 <sup>b</sup>	189.57 $\pm$ 1.55	189.63 $\pm$ 1.73	189.7 $\pm$ 2.40 <sup>b</sup>
% of the total AA					
ARG	7.28 $\pm$ 0.13 <sup>a</sup>	3.27 $\pm$ 0.07 <sup>c</sup>	3.71 $\pm$ 0.06	4.16 $\pm$ 1.24	4.60 $\pm$ 0.12 <sup>b</sup>
HIS	2.76 $\pm$ 0.16 <sup>a</sup>	2.49 $\pm$ 0.06 <sup>b</sup>	2.33 $\pm$ 0.04	2.18 $\pm$ 0.78	2.02 $\pm$ 0.03 <sup>c</sup>
ILE	4.54 $\pm$ 0.19 <sup>c</sup>	6.83 $\pm$ 0.48 <sup>a</sup>	6.45 $\pm$ 0.32	6.08 $\pm$ 2.15	5.70 $\pm$ 0.12 <sup>b</sup>
LEU	8.17 $\pm$ 0.46 <sup>b</sup>	11.82 $\pm$ 0.39 <sup>a</sup>	10.88 $\pm$ 0.29	9.95 $\pm$ 3.64	9.01 $\pm$ 0.38 <sup>b</sup>
LYS	7.51 $\pm$ 0.39 <sup>a</sup>	6.53 $\pm$ 0.14 <sup>b</sup>	6.61 $\pm$ 0.13	6.68 $\pm$ 2.21	6.76 $\pm$ 0.27 <sup>b</sup>
MET	2.49 $\pm$ 0.02 <sup>ab</sup>	2.90 $\pm$ 0.30 <sup>a</sup>	2.64 $\pm$ 0.20	2.37 $\pm$ 0.88	2.10 $\pm$ 0.07 <sup>b</sup>
PHE	4.95 $\pm$ 0.23 <sup>c</sup>	5.42 $\pm$ 0.14 <sup>b</sup>	5.75 $\pm$ 0.09	6.09 $\pm$ 1.92	6.43 $\pm$ 0.02 <sup>a</sup>
THR	3.29 $\pm$ 0.39 <sup>b</sup>	4.07 $\pm$ 0.53 <sup>ab</sup>	4.23 $\pm$ 0.37	4.39 $\pm$ 1.42	4.55 $\pm$ 0.31 <sup>a</sup>
VAL	5.52 $\pm$ 0.38 <sup>c</sup>	9.07 $\pm$ 0.32 <sup>a</sup>	8.51 $\pm$ 0.23	7.96 $\pm$ 2.84	7.40 $\pm$ 0.22 <sup>b</sup>
EAA (% of the total AA)	46.50 $\pm$ 1.60 <sup>b</sup>	52.39 $\pm$ 1.20 <sup>a</sup>	51.21 $\pm$ 0.81	50.03 $\pm$ 0.47	48.58 $\pm$ 0.38 <sup>b</sup>
ALA	6.16 $\pm$ 0.65 <sup>b</sup>	8.98 $\pm$ 0.50 <sup>a</sup>	9.24 $\pm$ 0.45	9.50 $\pm$ 3.13	9.75 $\pm$ 0.88 <sup>a</sup>
ASP	6.87 $\pm$ 0.64	7.77 $\pm$ 1.14	7.99 $\pm$ 0.89	8.22 $\pm$ 2.82	8.45 $\pm$ 1.40
CYS	0.15 $\pm$ 0.21	2.12 $\pm$ 1.36	1.85 $\pm$ 0.98	1.57 $\pm$ 0.97	1.94 $\pm$ 0.00
GLU	18.83 $\pm$ 2.13 <sup>a</sup>	10.32 $\pm$ 0.29 <sup>b</sup>	10.65 $\pm$ 0.23	10.98 $\pm$ 3.56	11.32 $\pm$ 0.37 <sup>b</sup>
GLY	5.21 $\pm$ 0.43 <sup>b</sup>	5.01 $\pm$ 0.29 <sup>b</sup>	5.48 $\pm$ 0.20	5.96 $\pm$ 1.83	6.44 $\pm$ 0.21 <sup>a</sup>
PRO	6.94 $\pm$ 0.78 <sup>a</sup>	3.83 $\pm$ 0.77 <sup>b</sup>	4.10 $\pm$ 0.58	4.38 $\pm$ 1.47	4.65 $\pm$ 0.79 <sup>b</sup>
SER	5.81 $\pm$ 0.50	6.34 $\pm$ 0.49	6.33 $\pm$ 0.34	6.32 $\pm$ 2.12	6.31 $\pm$ 0.24
TYR	3.29 $\pm$ 0.06	3.16 $\pm$ 0.07	3.18 $\pm$ 0.05	3.19 $\pm$ 1.06	3.21 $\pm$ 0.08
TAU	0.31 $\pm$ 0.11 <sup>a</sup>	0.24 $\pm$ 0.00 <sup>b</sup>	0.05 $\pm$ 0.09	0.03 $\pm$ 0.02	-
NEAA (% of total AA)	53.50 $\pm$ 1.60 <sup>a</sup>	47.61 $\pm$ 1.20 <sup>b</sup>	48.88 $\pm$ 0.81	50.15 $\pm$ 0.47	51.42 $\pm$ 0.38 <sup>a</sup>

Superscript A, B was SS100 and SS66 were not analyzed but calculated according to the value and standard deviation of SS and SBD composition. "-" means not detected.

**Table S3** Total lipid content, fatty acid content and fatty acid composition (% of total FA, mean±SD, n=3 replicates) of the experimental diets SFA=saturated fatty acids, MUFA=monounsaturated FA and PUFA=polyunsaturated FA. FF = Fish Feed, SS= Smolt Sludge, SBD = Solid Biogas Digestate. Superscript a, b and c denotes statistical significant differences between FF, SS100 and SS0.

Diet	FF	SS100 (1:0 SS:SBD)	SS66 <sup>a</sup> (2:1 SS:SBD)	SS33 <sup>b</sup> (1:2 SS:SBD)	SS0 (0:1 SS:SBD)
Total lipid (mg/g DM)	228.61±5.01 <sup>a</sup>	201.03±31.49 <sup>a</sup>	162.93±21.28	124.82±12.59	86.71±10.44 <sup>b</sup>
FA content (% of lipid)	32.39±0.81 <sup>a</sup>	29.05±4.06 <sup>b</sup>	44.32±0.65	31.1±0.76	20.85±3.24 <sup>c</sup>
FA composition (% of total FA)					
C14:0	7.49±0.04 <sup>a</sup>	4.52±0.00 <sup>b</sup>	3.89±0.02	3.26±0.05	2.63±0.07 <sup>c</sup>
C15:0	0.36±0.02 <sup>a</sup>	0.33±0.00 <sup>a</sup>	0.24±0.01	0.15±0.02	0.07±0.03 <sup>b</sup>
C16:0	20.95±0.04 <sup>b</sup>	16.49±0.05 <sup>c</sup>	20.86±0.07	25.23±0.13	29.59±0.19 <sup>a</sup>
C18:0	3.35±0.02 <sup>b</sup>	2.93±0.02 <sup>b</sup>	8.45±0.10	13.97±0.20	19.48±0.30 <sup>a</sup>
C20:0	0.26±0.01 <sup>c</sup>	0.45±0.01 <sup>b</sup>	0.97±0.01	1.50±0.01	2.02±0.02 <sup>a</sup>
C22:0	0.11±0.02 <sup>c</sup>	0.22±0.01 <sup>b</sup>	0.73±0.01	1.23±0.02	1.73±0.04 <sup>a</sup>
C14:1n-5	0.03±0.00	0.02±0.00	0.02±0.01	0.01±0.01	-
C16:1n-7	7.79±0.10 <sup>a</sup>	4.47±0.10 <sup>b</sup>	3.28±0.10	2.10±0.14	0.91±0.21 <sup>c</sup>
C18:1n-9	13.5±0.05 <sup>b</sup>	26.64±0.06 <sup>a</sup>	22.09±0.11	17.54±0.19	12.99±0.29 <sup>c</sup>
C18:1n-7	3.35±0.01 <sup>b</sup>	2.75±0.01 <sup>c</sup>	8.69±0.07	14.63±0.14	20.57±0.20 <sup>a</sup>
C20:1n-9	0.26±0.11	0.26±0.11	0.17±0.07	0.09±0.04	-
C20:1n-7	4.61±0.25 <sup>b</sup>	5.87±0.10 <sup>a</sup>	5.01±0.13	4.15±0.21	3.29±0.32 <sup>c</sup>
C20:3n-4	0.58±0.01 <sup>b</sup>	4.16±0.03 <sup>a</sup>	2.78±0.02	1.39±0.01	-
C22:1n-9	2.19±0.29 <sup>a</sup>	0.20±0.01 <sup>b</sup>	0.29±0.01	0.39±0.02	0.49±0.02 <sup>b</sup>
C22:2n-9	0.01±0.01	0.02±0.01	0.01±0.01	0.01±0.00	-
C24:1	0.64±0.05 <sup>c</sup>	1.05±0.03 <sup>b</sup>	1.84±0.06	2.63±0.12	3.42±0.18 <sup>a</sup>
C18:2n-6	7.77±0.05 <sup>b</sup>	13.14±0.06 <sup>a</sup>	9.09±0.05	5.04±0.06	0.99±0.08 <sup>c</sup>
C20:2n-6	0.16±0.01 <sup>b</sup>	0.22±0.00 <sup>a</sup>	0.2±0.01	0.18±0.03	0.16±0.04 <sup>b</sup>
C20:4n-6	0.90±0.05	0.14±0.02	0.09±0.01	0.05±0.01	-
C18:3n-3	1.34±0.01 <sup>b</sup>	4.44±0.05 <sup>a</sup>	3.12±0.06	1.80±0.10	0.48±0.15 <sup>c</sup>
C20:6n-3	0.08±0.01	0.17±0.01	0.11±0.00	0.06±0.00	-
C20:3n-3	0.08±0.01	0.12±0.01	0.08±0.00	0.04±0.00	-
C20:5n-3	14.17±0.12 <sup>a</sup>	2.63±0.01 <sup>b</sup>	1.75±0.01	0.88±0.00	-
C22:5n-3	1.30±0.04 <sup>b</sup>	4.55±0.02 <sup>a</sup>	3.03±0.01	1.52±0.01	-
C22:6n-3	8.72±0.04 <sup>a</sup>	4.20±0.04 <sup>b</sup>	3.19±0.03	2.17±0.04	1.16±0.05 <sup>c</sup>
SFA	32.53±0.15 <sup>b</sup>	24.95±0.05 <sup>c</sup>	35.14±0.14	45.33±0.27	55.53±0.41 <sup>a</sup>
MUFA	32.36±0.46 <sup>b</sup>	41.26±0.06 <sup>a</sup>	41.40±0.15	41.54±0.30	41.68±0.45 <sup>a</sup>
PUFA	35.11±0.31 <sup>a</sup>	33.79±0.00 <sup>b</sup>	23.46±0.03	13.13±0.07	2.80±0.10 <sup>c</sup>
n-3	25.69±0.23 <sup>a</sup>	16.11±0.02 <sup>b</sup>	11.29±0.05	6.47±0.10	1.65±0.15 <sup>c</sup>
n-6	8.83±0.10 <sup>b</sup>	13.50±0.05 <sup>a</sup>	9.38±0.04	5.27±0.04	1.15±0.05 <sup>c</sup>
n--3/n-6	2.91±0.03 <sup>a</sup>	1.19±0.01 <sup>b</sup>	1.27±0.06	1.35±0.13	1.43±0.19 <sup>b</sup>

Superscript a, b was SS100 and SS66 were not analyzed calculated according to the value and standard deviation of SS and SBD composition. "-" means not detected.

**Table S4** Amino acid composition (% of total AA, means±SD, n=4 replicates) of *H.diversicolor* under different food regimes: FF, SS100, SS66, SS33, SS0, and the worm from field P0 (n=3 replicates). ARG=arginine, HIS=histidine, ILE=isoleucine, LEU=leucine, LYS=lysine, MET=methionine, PHE=phenylalanine, THR=threonine, TRP=tryptophan, VAL=valine, ALA=alanine, ASP=asparagine/aspartic acid, CYS= cystine (Cys-Cys), GLU= glutamine/glutamic acid, GLY=glycine, PRO=proline, SER=serine, TYR= tyrosine, TAU=taurine. Superscript from a to d denotes statistical significant differences among treatments.

	FF	SS100	SS66	SS33	SS0	P0
Total AA (mg/g DM)	417.5±8.2 <sup>a</sup>	378.8±13.2 <sup>b</sup>	397.9±16.2 <sup>ab</sup>	398.6±14.9 <sup>ab</sup>	422.5±13.1 <sup>a</sup>	407.7±16.4 <sup>ab</sup>
% of the total AA						
ARG	5.43±0.10 <sup>c</sup>	5.86±0.14 <sup>b</sup>	5.85±0.16 <sup>b</sup>	5.76±0.05 <sup>b</sup>	5.91±0.16 <sup>b</sup>	6.74±0.20 <sup>a</sup>
HIS	2.60±0.03 <sup>b</sup>	2.58±0.10 <sup>b</sup>	2.57±0.09 <sup>b</sup>	2.57±0.11 <sup>b</sup>	2.59±0.08 <sup>b</sup>	2.82±0.07 <sup>a</sup>
ILE	5.48±0.09 <sup>a</sup>	5.14±0.09 <sup>b</sup>	5.16±0.15 <sup>ab</sup>	5.15±0.08 <sup>b</sup>	5.23±0.24 <sup>ab</sup>	5.12±0.12 <sup>b</sup>
LEU	7.95±0.08 <sup>b</sup>	7.77±0.25 <sup>bc</sup>	7.34±0.12 <sup>d</sup>	7.33±0.07 <sup>d</sup>	7.38±0.20 <sup>c</sup>	8.52±0.24 <sup>a</sup>
LYS	8.68±0.13 <sup>a</sup>	8.00±0.38 <sup>bc</sup>	7.81±0.07 <sup>c</sup>	7.85±0.14 <sup>c</sup>	8.08±0.16 <sup>bc</sup>	8.46±0.28 <sup>ab</sup>
MET	2.47±0.07 <sup>a</sup>	2.14±0.06 <sup>bc</sup>	2.14±0.03 <sup>bc</sup>	2.12±0.05 <sup>bc</sup>	2.24±0.07 <sup>b</sup>	2.05±0.04 <sup>c</sup>
PHE	4.51±0.14 <sup>b</sup>	4.69±0.06 <sup>b</sup>	4.66±0.11 <sup>b</sup>	4.70±0.08 <sup>b</sup>	4.67±0.14 <sup>b</sup>	5.15±0.17 <sup>a</sup>
THR	3.38±0.22	3.63±0.02	3.10±0.26	3.28±0.18	3.24±0.34	3.29±0.41
VAL	5.79±0.06 <sup>b</sup>	5.98±0.26 <sup>ab</sup>	5.68±0.13 <sup>b</sup>	5.69±0.12 <sup>b</sup>	5.83±0.15 <sup>b</sup>	6.31±0.17 <sup>a</sup>
EAA (% of total AA)	46.29±0.13 <sup>b</sup>	45.80±1.13 <sup>b</sup>	44.32±0.52 <sup>b</sup>	44.44±0.33 <sup>b</sup>	45.19±1.43 <sup>b</sup>	48.46±0.93 <sup>a</sup>
ALA	6.42±0.20 <sup>c</sup>	7.24±0.75 <sup>bc</sup>	7.09±0.35 <sup>bc</sup>	7.11±0.21 <sup>bc</sup>	7.92±0.18 <sup>b</sup>	9.40±0.55 <sup>a</sup>
ASP	9.03±0.29	8.87±1.14	9.35±0.14	9.51±0.25	7.89±1.58	7.89±0.38
CYS	0.24±0.09	0.24±0.09	0.20±0.09	0.21±0.08	-	-
GLU	13.78±0.1 <sup>a</sup>	13.3±0.94 <sup>a</sup>	14.16±0.25 <sup>a</sup>	13.93±0.14 <sup>a</sup>	13.71±0.7 <sup>a</sup>	11.88±0.35 <sup>b</sup>
GLY	5.42±0.09 <sup>b</sup>	5.87±0.49 <sup>ab</sup>	6.29±0.05 <sup>a</sup>	6.52±0.11 <sup>a</sup>	6.42±0.42 <sup>a</sup>	5.14±0.23 <sup>b</sup>
PRO	8.85±0.36 <sup>a</sup>	8.35±0.72 <sup>a</sup>	8.75±0.59 <sup>a</sup>	8.49±0.28 <sup>a</sup>	8.22±0.28 <sup>a</sup>	6.39±0.20 <sup>b</sup>
SER	5.05±0.05 <sup>b</sup>	5.53±0.04 <sup>ab</sup>	5.57±0.22 <sup>ab</sup>	5.55±0.07 <sup>ab</sup>	5.85±0.06 <sup>a</sup>	6.21±0.81 <sup>a</sup>
TYR	4.02±0.11 <sup>a</sup>	3.81±0.20 <sup>ab</sup>	3.55±0.12 <sup>b</sup>	3.52±0.14 <sup>b</sup>	3.84±0.18 <sup>ab</sup>	3.78±0.07 <sup>ab</sup>
TAU	0.91±0.09 <sup>abc</sup>	0.99±0.09 <sup>a</sup>	0.70±0.10 <sup>d</sup>	0.71±0.03 <sup>cd</sup>	0.93±0.13 <sup>ab</sup>	0.75±0.02 <sup>b</sup>
NEAA (% of total AA)	53.71±0.13 <sup>a</sup>	54.20±1.13 <sup>a</sup>	55.68±0.52 <sup>a</sup>	55.56±0.33 <sup>a</sup>	54.81±1.43 <sup>a</sup>	51.54±0.93 <sup>b</sup>

Classification of AA as nutritionally “essential” or “nonessential” or “conditionally essential” follows Wu (2009). “-” means not detected.

**Table S5** Fatty acid composition (% of total FA, means±SD, n=4 replicates) of *H. diversicolor* under different dietary treatments: FF, SS100, SS66, SS33, SS0, and worms from the field (P0, (n=3 replicates)). Superscripts from a to d within the rows indicate significant descending concentration ( $p < 0.05$ ). SFA=saturated fatty acids, MUFA=monounsaturated FA and PUFA=polyunsaturated FA. Superscript from a to f denotes statistical significant differences among treatments.

Groups	FF	SS100	SS66	SS33	SS0	P0
Total lipid (mg/g DM)	154.3±9.4 <sup>ab</sup>	162.1±8.2 <sup>a</sup>	145.3±8.1 <sup>bc</sup>	131.7±4.4 <sup>cd</sup>	118.3±4.6 <sup>d</sup>	146.2±4.3 <sup>abc</sup>
Total FA (% of lipid)	24.5±1.1 <sup>b</sup>	26.9±0.7 <sup>a</sup>	25.2±0.8 <sup>b</sup>	24.4±1.5 <sup>b</sup>	20.8±0.6 <sup>c</sup>	22.6±0.6 <sup>b</sup>
% of total FA						
C14:0	2.91±0.11 <sup>a</sup>	1.57±0.02 <sup>b</sup>	1.51±0.06 <sup>b</sup>	1.49±0.02 <sup>b</sup>	1.54±0.14 <sup>b</sup>	1.60±0.03 <sup>b</sup>
C15:0	0.41±0.01 <sup>c</sup>	0.45±0.02 <sup>c</sup>	0.54±0.04 <sup>b</sup>	0.58±0.03 <sup>b</sup>	0.80±0.06 <sup>a</sup>	0.60±0.02 <sup>b</sup>
C16:0	17.01±0.46 <sup>bc</sup>	14.62±0.37 <sup>d</sup>	16.08±0.29 <sup>c</sup>	17.37±0.27 <sup>b</sup>	20.74±1.06 <sup>a</sup>	18.21±0.12 <sup>b</sup>
C18:0	3.07±0.10 <sup>e</sup>	3.06±0.15 <sup>e</sup>	3.75±0.10 <sup>d</sup>	4.26±0.15 <sup>c</sup>	5.35±0.25 <sup>a</sup>	4.70±0.07 <sup>b</sup>
C20:0	0.04±0.02 <sup>c</sup>	0.17±0.02 <sup>a</sup>	0.14±0.03 <sup>ab</sup>	0.18±0.02 <sup>a</sup>	0.11±0.02 <sup>b</sup>	0.05±0.02 <sup>c</sup>
C21:0	0.40±0.00 <sup>bc</sup>	0.33±0.01 <sup>d</sup>	0.34±0.01 <sup>cd</sup>	0.37±0.03 <sup>cd</sup>	0.52±0.05 <sup>a</sup>	0.44±0.01 <sup>b</sup>
C16:1n-7	6.17±0.15 <sup>a</sup>	3.87±0.14 <sup>c</sup>	3.55±0.21 <sup>d</sup>	3.27±0.14 <sup>d</sup>	4.47±0.16 <sup>b</sup>	6.18±0.04 <sup>a</sup>
C18:1n-9	10.71±0.44 <sup>d</sup>	15.37±0.56 <sup>a</sup>	13.74±0.37 <sup>b</sup>	12.00±0.53 <sup>c</sup>	6.74±0.25 <sup>f</sup>	8.46±0.10 <sup>c</sup>
C18:1n-7	5.74±0.23 <sup>b</sup>	4.32±0.13 <sup>d</sup>	4.58±0.10 <sup>d</sup>	5.08±0.10 <sup>c</sup>	7.14±0.25 <sup>a</sup>	5.95±0.08 <sup>b</sup>
C20:1n-9	2.79±0.19 <sup>b</sup>	2.62±0.28 <sup>b</sup>	2.89±0.11 <sup>b</sup>	3.20±0.32 <sup>b</sup>	4.46±0.66 <sup>a</sup>	4.40±0.10 <sup>a</sup>
C20:1n-7	5.81±0.37 <sup>a</sup>	5.38±0.26 <sup>ab</sup>	5.49±0.36 <sup>ab</sup>	4.99±0.19 <sup>b</sup>	2.91±0.60 <sup>c</sup>	2.99±0.11 <sup>c</sup>
C20:3n-4	0.91±0.03 <sup>d</sup>	2.79±0.16 <sup>a</sup>	2.30±0.18 <sup>b</sup>	1.83±0.12 <sup>c</sup>	0.86±0.09 <sup>d</sup>	0.78±0.02 <sup>d</sup>
C22:1n-9	1.46±0.16 <sup>a</sup>	1.44±0.09 <sup>a</sup>	1.30±0.11 <sup>a</sup>	0.07±0.01 <sup>b</sup>	0.04±0.00 <sup>b</sup>	0.19±0.01 <sup>b</sup>
C22:2n-9	0.83±0.04 <sup>bc</sup>	0.75±0.05 <sup>c</sup>	0.86±0.05 <sup>b</sup>	0.93±0.06 <sup>b</sup>	1.22±0.01 <sup>a</sup>	1.19±0.01 <sup>a</sup>
C24:1	0.17±0.02 <sup>d</sup>	0.36±0.04 <sup>bc</sup>	0.49±0.09 <sup>ab</sup>	0.50±0.03 <sup>a</sup>	0.34±0.04 <sup>c</sup>	0.11±0.10 <sup>d</sup>
C18:2n-6	5.97±0.19 <sup>d</sup>	8.90±0.35 <sup>a</sup>	7.83±0.14 <sup>b</sup>	6.98±0.25 <sup>c</sup>	4.84±0.36 <sup>c</sup>	5.81±0.04 <sup>d</sup>
C20:2n-6	4.32±0.21 <sup>b</sup>	4.35±0.20 <sup>b</sup>	4.29±0.07 <sup>b</sup>	4.32±0.06 <sup>b</sup>	4.83±0.17 <sup>a</sup>	4.88±0.03 <sup>a</sup>
C20:4n-6	2.12±1.09 <sup>ab</sup>	1.61±0.11 <sup>b</sup>	1.71±0.13 <sup>b</sup>	1.81±0.18 <sup>b</sup>	2.95±0.16 <sup>a</sup>	2.80±0.05 <sup>a</sup>
C18:3n-3	2.37±0.15 <sup>d</sup>	3.47±0.04 <sup>b</sup>	3.31±0.19 <sup>b</sup>	3.01±0.14 <sup>bc</sup>	3.43±0.26 <sup>b</sup>	4.48±0.10 <sup>a</sup>
C20:6n-3	0.64±0.26 <sup>b</sup>	0.62±0.03 <sup>b</sup>	0.68±0.07 <sup>b</sup>	0.76±0.08 <sup>b</sup>	1.10±0.14 <sup>a</sup>	0.71±0.01 <sup>b</sup>
C20:3n-3	0.56±0.05 <sup>de</sup>	0.54±0.05 <sup>e</sup>	0.64±0.03 <sup>cd</sup>	0.66±0.02 <sup>c</sup>	0.83±0.05 <sup>b</sup>	0.94±0.02 <sup>a</sup>
C20:5n-3	18.26±0.43 <sup>b</sup>	14.03±0.34 <sup>d</sup>	15.57±1.23 <sup>cd</sup>	16.05±0.59 <sup>c</sup>	19.49±0.73 <sup>ab</sup>	20.35±0.19 <sup>a</sup>
C22:5n-3	2.55±0.06 <sup>c</sup>	6.22±0.29 <sup>a</sup>	5.75±0.08 <sup>b</sup>	4.95±0.15 <sup>c</sup>	3.24±0.25 <sup>d</sup>	3.60±0.03 <sup>d</sup>
C22:6n-3	4.87±0.27 <sup>a</sup>	3.16±0.15 <sup>b</sup>	2.68±0.13 <sup>c</sup>	2.20±0.08 <sup>d</sup>	1.19±0.13 <sup>e</sup>	0.57±0.06 <sup>f</sup>
SFA	23.73±0.53 <sup>d</sup>	20.2±0.57 <sup>c</sup>	22.36±0.10 <sup>d</sup>	27.4±0.21 <sup>b</sup>	30.23±1.49 <sup>a</sup>	25.6±0.18 <sup>c</sup>

MUFA	32.86±0.73 <sup>a</sup>	33.36±0.37 <sup>a</sup>	32.04±0.91 <sup>a</sup>	29.11±0.36 <sup>b</sup>	26.10±0.73 <sup>c</sup>	28.3±0.22 <sup>b</sup>
PUFA	43.41±1.00 <sup>b</sup>	46.44±0.67 <sup>a</sup>	45.60±0.82 <sup>a</sup>	43.50±0.25 <sup>b</sup>	43.67±0.82 <sup>b</sup>	46.10±0.18 <sup>a</sup>
<i>n</i> -3	29.26±0.38 <sup>ab</sup>	28.04±0.44 <sup>bc</sup>	28.62±0.98 <sup>bc</sup>	27.62±0.35 <sup>c</sup>	29.28±0.77 <sup>ab</sup>	30.64±0.23 <sup>a</sup>
<i>n</i> -6	12.41±0.9 <sup>c</sup>	14.86±0.30 <sup>a</sup>	13.82±0.25 <sup>ab</sup>	13.11±0.23 <sup>bc</sup>	12.62±0.51 <sup>c</sup>	13.49±0.07 <sup>bc</sup>
<i>n</i> -3/ <i>n</i> -6	2.37±0.18 <sup>a</sup>	1.89±0.05 <sup>d</sup>	2.07±0.09 <sup>cd</sup>	2.11±0.05 <sup>bcd</sup>	2.32±0.15 <sup>ab</sup>	2.27±0.03 <sup>abc</sup>
C18:1 <i>n</i> 9/						
C18:1 <i>n</i> 7	1.87±0.12 <sup>d</sup>	3.56±0.23 <sup>a</sup>	3.00±0.08 <sup>b</sup>	2.36±0.14 <sup>c</sup>	0.94±0.02 <sup>f</sup>	1.42±0.04 <sup>e</sup>

**Table S6** Dietary amino acids requirement of fish, shrimp and amino acids in tissues of our experimental polychaete

Nutrients	Fish <sup>a</sup>	Fish <sup>b</sup>	Shrimp	Experimental polychaete
Crude protein (g/100g DM)	24-40	25-55	25-55	53-56
Amino acids (g/100g DM)				
Arginine	1.0-2.4	1.07-2.37	1.36-2.98	2.2-2.5
Histidine	0.5-0.8	0.45-1.00	0.38-0.85	1.0-1.1
Isoleucine	0.6-1.5	0.70-1.54	0.59-1.31	1.9-2.3
Leucine	0.8-2.0	1.28-2.81	1.22-2.69	2.9-3.3
Lysine	1.2-2.2	1.49-3.25	1.29-2.83	3.0-3.6
Methionine	0.6-1.6	0.48-1.06	0.47-1.04	0.8-1.0
Phenylalanine	1.2-2.5	0.73-1.60	0.67-1.48	1.8-2.0
Threonine	0.5-1.5	0.80-1.77	0.84-1.85	1.2-1.4
Tryptophan	0.1-0.4	0.15-0.33	0.24-0.52	ND
Valine	0.7-1.5	0.83-1.83	0.74-1.64	2.3-2.5
Cysteine*	ND	0.17-0.38	0.24-0.52	0.06-0.1
Tyrosine*	ND	0.58-1.27	0.68-1.50	1.4-1.7
Reference	Hasan (2000)	Tacon (1987)	Tacon (1987)	

\*Nonessential amino acids, methionine requirement depend on amount of cysteine in the diet, while phenylalanine requirement depends on amount of tyrosine.

<sup>a</sup> some widely farmed fish species in the world, Chinook salmon, rainbow trout, Japanese eel, Channel catfish, Common carp, Tilapia

<sup>b</sup> EAA requirement of fish with different requirement of dietary protein level

**Table S7** Major polyunsaturated fatty acids (PUFA) content of feed lipid sources (% of total fatty acids, *Tacon et al. (2009)*) and polychaete in this study after dietary treatments

Fatty acids	Anchovy	Jack mackerel	Cod liver	Squid	Krill	Plant oil	Livestock	Experimental polychaete
18:2								
<i>n</i> -6	1	4	2	2	2	7-45	2-20	5-9
18:3								
<i>n</i> -3	1	1	1	2	2	0.56	0.2-4	2-3
20:4								
<i>n</i> -6	1	1	1	1	0.5	-	-	2-3
20:5								
<i>n</i> -3	12	13	9	11	22	-	-	14-19
22:5								
<i>n</i> -3	2	2	2	1	1	-	-	3-6
22:6								
<i>n</i> -3	12	8	9	12	13	-	-	1-5
SFA	36	26	23	28	32	9-94	29-50	20-30
MUF								
A	30	37	49	35	22	7-77	41-45	26-33
PUFA	34	37	28	37	46	0-75	2-22	43-46
<i>n</i> -3FA	30	26	24	31	43	0-56	0.2-4	28-29
<i>n</i> -6FA	2	5	3	3	3	0-73	2-20	12-15