

Table S1. Relative gene expression profiling of anterior intestine in gilthead seabream juveniles fed experimental diets for 2 weeks. Data are the mean \pm SEM (n=9). All data values for each tissue were in reference to the expression level of *cldn12* of CTRL fish with an arbitrary assigned value of 1.

	CTRL	MG	Phaco21	Phaco37	P-value ¹
<i>pcna</i>	10.22 \pm 0.97 ^{ab}	9.59 \pm 0.45 ^{ab}	12.99 \pm 1.14 ^a	9.49 \pm 0.56 ^b	0.028
<i>hes1-b</i>	2.37 \pm 0.30	1.86 \pm 0.17	2.17 \pm 0.18	1.88 \pm 0.13	0.287
<i>klf4</i>	3.48 \pm 0.23	4.24 \pm 0.59	2.91 \pm 0.29	3.03 \pm 0.14	0.201
<i>cldn12</i>	1.00 \pm 0.04	0.98 \pm 0.10	1.01 \pm 0.06	0.96 \pm 0.05	0.350
<i>cldn15</i>	17.96 \pm 1.81	15.40 \pm 1.75	18.87 \pm 1.28	15.33 \pm 1.22	0.215
<i>cdh1</i>	20.23 \pm 0.96	19.45 \pm 1.14	19.24 \pm 1.13	18.33 \pm 1.03	0.647
<i>cdh17</i>	90.58 \pm 4.54	84.13 \pm 4.45	89.38 \pm 3.25	77.46 \pm 2.93	0.084
<i>tjp1</i>	0.76 \pm 0.03	0.74 \pm 0.04	0.74 \pm 0.03	0.76 \pm 0.04	0.942
<i>dsp</i>	7.51 \pm 0.42	7.12 \pm 0.64	8.10 \pm 0.41	6.35 \pm 0.28	0.060
<i>cx32.2</i>	95.30 \pm 9.78	80.92 \pm 8.33	68.93 \pm 10.83	68.20 \pm 8.00	0.160
<i>cxadr</i>	5.02 \pm 0.34	4.25 \pm 0.46	4.66 \pm 0.24	4.00 \pm 0.16	0.108
<i>alpi</i>	67.89 \pm 9.78	61.19 \pm 10.40	55.41 \pm 9.12	65.75 \pm 10.49	0.777
<i>fabp1</i>	119.10 \pm 7.40	112.74 \pm 11.75	109.79 \pm 5.30	101.19 \pm 6.01	0.211
<i>fabp2</i>	835.42 \pm 131.39	772.79 \pm 119.22	891.79 \pm 119.74	702.29 \pm 71.58	0.780
<i>fabp6</i>	0.13 \pm 0.06	0.03 \pm 0.01	0.03 \pm 0.01	0.02 \pm 0.01	0.863
<i>muc2</i>	36.90 \pm 2.25	34.90 \pm 1.36	37.06 \pm 3.94	31.92 \pm 4.55	0.456
<i>muc13</i>	117.68 \pm 7.82	101.79 \pm 8.13	114.59 \pm 9.31	104.98 \pm 3.14	0.423
<i>tnf-alpha</i>	0.21 \pm 0.02	0.21 \pm 0.02	0.18 \pm 0.02	0.18 \pm 0.02	0.396
<i>il1b</i>	0.18 \pm 0.02	0.19 \pm 0.02	0.15 \pm 0.01	0.18 \pm 0.02	0.471
<i>il6</i>	0.03 \pm 0.00	0.04 \pm 0.01	0.03 \pm 0.00	0.03 \pm 0.00	0.227
<i>il7</i>	0.82 \pm 0.07	0.93 \pm 0.07	0.84 \pm 0.06	0.88 \pm 0.05	0.634
<i>il8</i>	0.22 \pm 0.02	0.27 \pm 0.03	0.26 \pm 0.03	0.24 \pm 0.03	0.440
<i>il10</i>	0.17 \pm 0.02	0.14 \pm 0.02	0.16 \pm 0.02	0.13 \pm 0.01	0.264
<i>il12b</i>	0.63 \pm 0.05	0.59 \pm 0.05	0.68 \pm 0.08	0.53 \pm 0.04	0.277
<i>il15</i>	0.59 \pm 0.03	0.60 \pm 0.05	0.69 \pm 0.04	0.60 \pm 0.03	0.295
<i>il34</i>	2.66 \pm 0.12	2.62 \pm 0.12	2.45 \pm 0.11	2.71 \pm 0.13	0.491
<i>cd4-full</i>	0.59 \pm 0.11	0.54 \pm 0.08	0.56 \pm 0.05	0.52 \pm 0.07	0.925
<i>cd8b</i>	0.06 \pm 0.01	0.09 \pm 0.01	0.07 \pm 0.01	0.06 \pm 0.00	0.431
<i>ccr3</i>	1.68 \pm 0.17	1.84 \pm 0.25	1.39 \pm 0.08	1.72 \pm 0.14	0.292
<i>ccr9</i>	1.21 \pm 0.10	1.24 \pm 0.12	1.14 \pm 0.06	1.17 \pm 0.10	0.962
<i>ccr11</i>	4.65 \pm 0.72	3.31 \pm 0.41	4.34 \pm 0.50	3.25 \pm 0.25	0.125
<i>ck8 / ccl20</i>	6.57 \pm 0.43	6.94 \pm 0.67	8.15 \pm 0.96	7.65 \pm 0.37	0.414
<i>csflr1</i>	1.06 \pm 0.07	1.15 \pm 0.08	1.03 \pm 0.09	0.95 \pm 0.06	0.308
<i>Igm</i>	3.77 \pm 0.66	4.05 \pm 0.74	3.67 \pm 0.94	3.92 \pm 1.24	0.928
<i>igt-m</i>	0.36 \pm 0.04	0.37 \pm 0.06	0.39 \pm 0.07	0.29 \pm 0.05	0.409
<i>Igals1</i>	13.55 \pm 1.58	12.45 \pm 1.51	13.27 \pm 1.59	11.60 \pm 1.20	0.762
<i>Igals8</i>	2.84 \pm 0.16	2.50 \pm 0.18	2.94 \pm 0.26	2.66 \pm 0.18	0.420
<i>tlr2</i>	0.54 \pm 0.04	0.47 \pm 0.03	0.48 \pm 0.03	0.45 \pm 0.03	0.349
<i>tlr5</i>	0.06 \pm 0.01	0.05 \pm 0.01	0.06 \pm 0.01	0.04 \pm 0.00	0.148
<i>tlr9</i>	0.06 \pm 0.01	0.06 \pm 0.01	0.06 \pm 0.01	0.05 \pm 0.01	0.881
<i>cd209d</i>	0.16 \pm 0.02	0.15 \pm 0.03	0.12 \pm 0.02	0.13 \pm 0.02	0.724
<i>cd302</i>	8.40 \pm 0.32	7.91 \pm 0.43	8.41 \pm 0.58	7.53 \pm 0.43	0.437
<i>mrc1</i>	1.60 \pm 0.09	1.94 \pm 0.27	1.64 \pm 0.11	1.63 \pm 0.10	0.738
<i>fcl</i>	7.32 \pm 3.06	4.82 \pm 1.59	4.41 \pm 1.59	1.38 \pm 0.97	0.107

¹P values result from one-way ANOVA. Different superscript letters in each row indicate significant differences among dietary treatments (Tukey post-hoc test $P < 0.05$).

Table S2. Relative gene expression profiling of anterior intestine in gilthead seabream juveniles fed experimental diets for 8 weeks. Data are the mean \pm SEM (n=9). All data values for each tissue were in reference to the expression level of *cldn12* of CTRL fish with an arbitrary assigned value of 1.

	CTRL	MG	Phaco21	Phaco37	P-value ¹
<i>pcna</i>	6.48 \pm 0.58	7.08 \pm 0.42	7.01 \pm 0.59	6.99 \pm 0.59	0.788
<i>hes1-b</i>	0.71 \pm 0.17	0.63 \pm 0.04	0.70 \pm 0.05	1.02 \pm 0.23	0.402
<i>klf4</i>	2.40 \pm 0.23	2.17 \pm 0.21	2.70 \pm 0.35	2.08 \pm 0.15	0.448
<i>cldn12</i>	0.92 \pm 0.08	0.85 \pm 0.07	0.93 \pm 0.08	0.91 \pm 0.06	0.868
<i>cldn15</i>	36.90 \pm 3.93	39.04 \pm 3.47	44.59 \pm 3.52	42.56 \pm 2.86	0.397
<i>cdh1</i>	21.37 \pm 1.03	22.56 \pm 0.83	20.94 \pm 1.56	19.93 \pm 1.14	0.471
<i>cdh17</i>	67.56 \pm 2.31	69.25 \pm 2.03	69.82 \pm 4.91	66.67 \pm 3.73	0.937
<i>tjp1</i>	0.50 \pm 0.02	0.47 \pm 0.03	0.50 \pm 0.05	0.41 \pm 0.03	0.202
<i>dsp</i>	4.31 \pm 0.28	3.58 \pm 0.27	4.38 \pm 0.44	4.20 \pm 0.34	0.308
<i>cx32.2</i>	123.59 \pm 16.89 ^a	66.78 \pm 8.39 ^b	68.64 \pm 10.75 ^{ab}	64.56 \pm 6.85 ^b	0.034
<i>cxadr</i>	5.02 \pm 0.41	4.46 \pm 0.46	5.16 \pm 0.43	4.23 \pm 0.39	0.296
<i>alpi</i>	79.98 \pm 11.58	83.98 \pm 12.39	68.88 \pm 10.80	67.95 \pm 7.74	0.798
<i>fabp1</i>	220.17 \pm 24.84	180.66 \pm 15.00	203.05 \pm 16.45	164.57 \pm 14.70	0.162
<i>fabp2</i>	1144.00 \pm 114.86	931.28 \pm 93.59	879.36 \pm 61.09	786.87 \pm 67.85	0.094
<i>fabp6</i>	0.03 \pm 0.01	0.05 \pm 0.02	0.04 \pm 0.02	0.03 \pm 0.01	0.049
<i>muc2</i>	21.84 \pm 2.71	17.65 \pm 2.57	19.77 \pm 4.03	18.13 \pm 2.64	0.737
<i>muc13</i>	127.18 \pm 5.91	126.41 \pm 7.70	117.73 \pm 8.32	114.57 \pm 9.25	0.516
<i>tnf-alpha</i>	0.19 \pm 0.03	0.19 \pm 0.01	0.21 \pm 0.02	0.17 \pm 0.02	0.534
<i>il1b</i>	0.13 \pm 0.02	0.13 \pm 0.01	0.12 \pm 0.02	0.10 \pm 0.01	0.628
<i>il6</i>	0.02 \pm 0.00	0.02 \pm 0.00	0.02 \pm 0.00	0.02 \pm 0.00	0.461
<i>il7</i>	2.58 \pm 0.72	2.50 \pm 0.99	1.94 \pm 0.56	1.35 \pm 0.41	0.558
<i>il8</i>	0.24 \pm 0.05	0.17 \pm 0.03	0.22 \pm 0.04	0.17 \pm 0.02	0.584
<i>il10</i>	0.10 ^a \pm 0.01	0.06 ^b \pm 0.01	0.09 ^{ab} \pm 0.01	0.08 ^{ab} \pm 0.01	0.042
<i>il12b</i>	0.59 \pm 0.08	0.48 \pm 0.04	0.56 \pm 0.04	0.42 \pm 0.04	0.107
<i>il15</i>	4.06 \pm 1.26	2.57 \pm 1.19	2.84 \pm 0.81	1.33 \pm 0.37	0.324
<i>il34</i>	3.65 \pm 0.39	3.78 \pm 0.59	3.82 \pm 0.33	2.77 \pm 0.30	0.186
<i>cd4-full</i>	0.34 \pm 0.02	0.28 \pm 0.02	0.35 \pm 0.04	0.35 \pm 0.04	0.406
<i>cd8b</i>	0.09 \pm 0.01	0.10 \pm 0.03	0.08 \pm 0.01	0.08 \pm 0.01	0.906
<i>ccr3</i>	2.52 \pm 0.51	2.00 \pm 0.71	1.87 \pm 0.40	1.43 \pm 0.25	0.325
<i>ccr9</i>	3.24 \pm 0.35	2.79 \pm 0.16	2.93 \pm 0.42	2.45 \pm 0.24	0.329
<i>ccr11</i>	6.23 \pm 1.09	7.70 \pm 1.49	8.40 \pm 1.48	7.40 \pm 0.88	0.695
<i>ck8 / ccl20</i>	7.74 \pm 0.62	5.90 \pm 0.60	6.89 \pm 0.50	6.10 \pm 0.50	0.068
<i>csflr1</i>	1.12 \pm 0.08	1.18 \pm 0.09	1.28 \pm 0.08	1.14 \pm 0.08	0.594
<i>igm</i>	5.09 \pm 0.54	4.21 \pm 0.67	5.40 \pm 1.03	5.73 \pm 0.59	0.221
<i>igt-m</i>	0.41 \pm 0.08	0.24 \pm 0.04	0.35 \pm 0.04	0.23 \pm 0.02	0.039
<i>lgals1</i>	11.38 \pm 1.25	8.56 \pm 0.52	9.60 \pm 0.97	8.71 \pm 0.89	0.240
<i>lgals8</i>	7.34 \pm 1.59	5.56 \pm 0.82	5.12 \pm 0.72	6.11 \pm 1.01	0.698
<i>tlr2</i>	3.23 \pm 1.08	3.75 \pm 1.62	2.83 \pm 0.83	2.10 \pm 1.03	0.737
<i>tlr5</i>	0.06 \pm 0.01	0.06 \pm 0.01	0.05 \pm 0.01	0.06 \pm 0.01	0.844
<i>tlr9</i>	0.09 \pm 0.01	0.08 \pm 0.01	0.10 \pm 0.01	0.06 \pm 0.01	0.046
<i>cd209d</i>	1.54 \pm 0.55	1.38 \pm 0.65	0.76 \pm 0.27	0.37 \pm 0.15	0.361
<i>cd302</i>	15.69 \pm 2.22	13.96 \pm 1.79	14.11 \pm 1.54	11.63 \pm 1.50	0.401
<i>mrc1</i>	3.25 \pm 0.81	3.22 \pm 1.26	2.54 \pm 0.67	1.29 \pm 0.27	0.290
<i>fcl</i>	8.61 ^a \pm 3.22	13.40 ^{ab} \pm 7.50	8.10 ^a \pm 3.53	0.38 ^b \pm 0.11	0.019

¹P values result from one-way ANOVA. Different superscript letters in each row indicate significant differences among dietary treatments (Tukey post-hoc test $P < 0.05$).

Table S3. Primers for qPCR amplification in seabream.

Gene	Symbol	GenBank	Primer sequence
Proliferating cell nuclear antigen	<i>pcna</i>	KF857335	F: CGT ATC TGC CGT GAC CTG T R: AGA ACT TGA CTC CGT CCT TGG
Transcription factor HES-1-B	<i>hes1-b</i>	KF857344	F: GCC TGC CGA TAT GAT GGA A R: GGA GTT GTG TTC ATG CTT GC
Krueppel-like factor 4	<i>klf4</i>	KF857346	F: ACA TCA CCG CAC GCA CAC R: AAC CAC AGC CCT CCC AGT C
Claudin-12	<i>cldn12</i>	KF861992	F: CTC TCA GGG CTA CAC ATC TAC CTA TGC R: ACA TTC GTG AGC GGC TGG AG
Claudin-15	<i>cldn15</i>	KF861993	F: CCG ATT GTG GAA GTA GTG GCT CTG GT R: CAG CAT CAC CCA ACC GAC GAA CC
Cadherin-1	<i>cdh1</i>	KF861995	F: TGC TCC ATA CAG CGT CAC CTT ACA R: CTC GTT CAT CCT AGC CGT CCA GTT
Cadherin-17	<i>cdh17</i>	KF861996	F: GAT GCC CGC AAC CCA GAG R: CCG TTG ATT CAC TGC CGT AGA C
Tight junction protein ZO-1	<i>tjp1</i>	KF861994	F: AAG CAG TAT TAC GGT GAC TCA R: TGC ATC CCT GGC TTG TAG
Desmoplakin	<i>dsp</i>	KF861999	F: GCA GAA GGA GCA CGA GAC CATC R: GGG TGT TCT TGT CGC AGG TGA A
Gap junction Cx32.2 protein	<i>cx32.2</i>	KF862000	F: CGA GGT GTT CTA TCT GCT CTG TA R: CTT GTG GGT GCG AGT CCT
Coxsackievirus and adenovirus receptor homolog	<i>cxadr</i>	KF861998	F: CAT CAG AGG ACT ACG AGA GG R: CAT CTT GGC AGC ATT TGG T
Intestinal-type alkaline phosphatase	<i>alpi</i>	KF857309	F: CCG CTA TGA GTT GGA CCG TGA T R: GCT TTC TCC ACC ATC TCA GTA AGG G
Liver type fatty acid-binding protein	<i>fabp1</i>	KF857311	F: GTC CTC GTC AAC ACC TTC ACC AT R: CGC CTT CAT CTT CTC GCC AGT
Intestinal fatty acid-binding protein	<i>fabp2</i>	KF857310	F: CGA GCA CAT TCC GCA CCA AAG R: CCC ACG CAC CCG AGA CTT C
Ileal fatty acid-binding protein	<i>fabp6</i>	KF857312	F: ACC CAG GAC GGC AAT ACC R: CGA CGG TGA AGT TGT TGG T

Mucin 2	<i>muc2</i>	JQ277710	F: ACG CTT CAG CAA TCG CAC CAT R: CCA CAA CCA CAC TCC TCC ACA T
Mucin 13	<i>muc13</i>	JQ277713	F: TTC AAA CCC GTG TGG TCC AG R: GCA CAA GCA GAC ATA GTT CGG ATA T
Tumor necrosis factor-alpha	<i>tnf-alpha</i>	AJ413189	F: CAG GCG TCG TTC AGA GTC TC R: CTG TGG CTG AGA GCT GTG AG
Interleukin-1 beta	<i>il1b</i>	AJ419178	F: GCG ACC TAC CTG CCA CCT ACA CC R: TCG TCC ACC GCC TCC AGA TGC
Interleukin-6	<i>il6</i>	EU244588	F: TCT TGA AGG TGG TGC TGG AAG TG R: AAG GAC AAT CTG CTG GAA GTG AGG
Interleukin 7	<i>il7</i>	JX976618	F: CTA TCT CTG TCC CTG TCC TGT GA R: TGC GGA TGG TTG CCT TGT AAT
Interleukin-8	<i>il8</i>	JX976619	F: CAG CAG AGT CTT CAT CGT CAC TAT TG R: AGG CTC GCT TCA CTG ATG G
Interleukin-10	<i>il10</i>	JX976621	F: AAC ATC CTG GGC TTC TAT CTG R: GTG TCC TCC GTC TCA TCT G
Interleukin 12 subunit beta	<i>il12b</i>	JX976624	F: ATT CCC TGT GTG GTG GCT GCT R: GCT GGC ATC CTG GCA CTG AAT
Interleukin 15	<i>il15</i>	JX976625	F: GAG ACC AGC GAG CGA AAG GCA TCC R: GCC AGA ACA GGT TAC AGG TTG ACA GGA A
Interleukin 34	<i>il34</i>	JX976629	F: TCT GTC TGC CTG CTG GTA G R: ATG CTG GCT GGT GTC TGG
CD4	<i>cd4</i>	AM489485	F: TCCTCCTCCTCGTCCTCGTT R: GGTGTCTCATCTCCGCTGTCT
CD8 beta	<i>cd8b</i>	KX231275	F: CCGAAATGTGGAAGACTGGAACTC R: CTTTGGAGGTAAGGTTGGAGGGAT
C-C chemokine receptor type 3	<i>ccr3</i>	KF857317	F: CTA CAT CAG CAT CAC CAT ACG CAT CCT R: TGG CAC GGC ACT TCT CCTTCA
C-C chemokine receptor type 9	<i>ccr9</i>	KF857318	F: TCC CTG AGT TAA TCT TCG CCC AAG TG R: TGT TGT ATT CGT TGT TCC AGT AGA CCA GAG
	<i>ccr11</i>	KF857319	F: GCT ACG ATT ACA GTT ATG AA

C-C chemokine receptor type 11			R: TAG ATG ATT GGG AGG AAG
C-C chemokine CK8 / C-C motif chemokine 20	<i>ck8/ cl20</i>	GU181393	F: CCG TCC TCA TCT GCT TCA TAC T R: GCT CTG CCG TTG ATG GAA C
Macrophage colony-stimulating factor 1 receptor 1	<i>csf1r1</i>	AM050293	F: TTG CGT GTG GTG AGG AAG GAA GGT R: AGC AGG CAG GGC AGC AGG TA
Immunoglobulin M	<i>igm</i>	JQ811851	F: ACC TCA GCG TCC TTC AGT GTT TAT GAT GCC R: CAG CGT CGT CGT CAA CAA GCC AAG C
Immunoglobulin T membrane-bound form	<i>igt-m</i>	KX599201	F: AGA CGA TGC CAG TGA AGA GGA TGA GT R: CGA AGG AGG AGG CTG TGG ACC A
Galectin-1	<i>lgals1</i>	KF862003	F: GTG TGA GGA GGT CCG TGA TG R: ACT GTA GAG CCG TCC GAT AGG
Galectin-8	<i>lgals8</i>	KF862004	F: GGC GGT GAA CGG CGG TCA R: GCT CCA GCT CCA GTC TGT GTT GAT AC
Toll like receptor 2	<i>tlr2</i>	KF857323	F: CAT CTG CGA CTC TCC TCT CTT CCT R: ATT CAA CAA TGG AGC GGT GGA CTT
Toll like receptor 5	<i>tlr5</i>	KF857324	F: TCG CCA ATC TGA CGG ACC TGA G R: CAG AAC GCC GAT GTG GTT GTA AGA C
Toll like receptor 9	<i>tlr9</i>	AY751797	F: GCC TTC CTT GTC TGC TCT TTC T R: GCC GTA GAG GTG CTT CAG TAG
CD209 antigen-like protein D	<i>cd209d</i>	KF857327	F: CGC CAC GAG CAT GAG GAC AA R: TCT TGC CAG AAT CCA TCA CCA TCC A
CD302 antigen	<i>cd302</i>	KF857328	F: GGA CCA GAG GAA GAG CAC ATC R: GAC CAG GGC GGA CAT CAG
Macrophage mannose receptor 1	<i>mrc1</i>	KF857326	F: CTT CCG ACC GTA CCT GTA CCT ACT CA R: CGA TTC CAG CCT TCC GCA CAC TTA
Fucolectin	<i>fcl</i>	KF857331	F: CCA TAC TGC TGA ACA GAC CAA CC R: TGA TGG AGG TGA CGA TGT AGG A
