

Supplementary data

Table 1. Liver genes of juvenile brown trout expressed differently up- or down due to 10-day caging at various distances from the pulp and paper mill “Kaukas”, Southern Lake Saimaa (Finland) or at two depths of water, in contact to sediment and three meters from the water surface, in comparison with the reference site 10 km upstream. Data are $\log_2(\text{expression ratio})$, NS – not significant.

Accession	Gene	Bottom	Bottom	Bottom	Bottom	Surface	Surface	Surface	Surface
		5 km	8 km	14 km	17 km	5 km	8 km	14 km	17 km
CA371480	60S acidic ribosomal protein P2	NS	NS	0.27	0.50	NS	NS	0.59	-0.72
CA381199	94 kDa glucose-regulated protein	NS	NS	-0.54	NS	-0.23	NS	-0.39	0.64
DY737446	Apolipoprotein A-IV	NS	-0.41	NS	NS	0.84	NS	NS	1.26
CA348325	BAG-family molecular chaperone regulator-4	NS	-0.36	NS	-0.44	0.65	NS	-0.19	0.81
CF753046	Cytochrome b-1	NS	NS	1.02	NS	NS	NS	0.55	0.82
CA358725	Cytosolic nonspecific dipeptidase	NS	-1.12	-0.31	0.26	0.71	NS	-0.41	0.90
DV200529	Fructose-bisphosphate aldolase A	NS	-0.51	-0.69	NS	0.75	-0.27	-0.92	0.70
CU071907	Fumarate hydratase, mitochondrial precursor	NS	0.36	NS	0.65	-0.36	0.63	0.39	-0.30
CA353121	GRB2-related adaptor protein 2	NS	-1.21	-0.35	0.33	0.85	NS	-0.77	1.14
CA381971	Histone H33-1	NS	NS	NS	NS	-0.51	NS	0.45	-0.54
CA372743	Hypothetical-fish 1	NS	NS	-0.40	NS	0.63	NS	-0.67	0.48
CA375247	Hypothetical-fish 36	NS	-0.62	-0.24	-0.51	NS	NS	-0.76	NS
BX076136	Hypoxanthine-guanine phosphoribosyltransferase	NS	-0.34	-0.46	NS	0.73	NS	-0.56	NS

CA372588	Inhibitor of apoptosis protein 2	NS	NS	NS	-1.19	0.44	NS	NS	NS
ES325958	Lysozyme cluster	NS	-0.44	NS	0.77	0.61	-0.23	NS	1.04
CX151724	Macrophage receptor MARCO	NS	-1.23	-0.81	NS	0.77	NS	-1.03	1.30
CA346979	MAPK/ERK kinase kinase 5-1	NS	NS	-0.50	0.25	NS	NS	-0.75	0.62
BX859583	Megakaryocyte stimulating factor	NS	-0.21	NS	-1.26	0.81	NS	NS	0.52
CA368716	Membrane-bound transcription factor site 2	NS	-0.31	-0.24	-0.42	0.44	NS	-0.73	0.97
CF752699	Metallothionein A	NS	0.48	NS	0.56	-0.36	0.74	0.33	NS
CB492144	Myristoylated alanine-rich protein kinase C	NS	0.48	NS	0.37	-0.55	0.78	NS	-0.39
EG756231	NADH dehydrogenase subunit 5-2	NS	-0.52	NS	NS	0.61	NS	NS	0.69
CA385900	Nonhistone chromosomal protein HMG-17	NS	0.43	NS	NS	-0.44	0.69	NS	-0.91
CA357173	Peptidyl-prolyl cis-trans isomerase 2-2	NS	-0.75	-0.32	NS	1.07	-0.47	-0.79	1.05
BX084567	PEST-containing nuclear protein	NS	-0.55	-0.45	NS	0.70	NS	-0.78	0.75
CX147525	Prostaglandin D synthase homolog	NS	0.52	0.15	0.26	NS	0.36	0.37	-0.51
CB496708	TATA-binding protein associated factor 2N	NS	0.78	NS	0.19	-0.91	0.61	NS	-0.67
BX883521	T-cell lymphoma associated antigen se33-1	NS	-0.29	NS	-0.35	0.64	NS	-0.29	0.66
BX078840	T-cell receptor alpha chain V region	NS	0.22	NS	0.66	-0.47	0.50	NS	-0.61
CX262645	Unknown-121	NS	0.46	0.15	NS	-0.85	NS	NS	-0.78
BX882217	Unknown-132	NS	-0.43	-0.46	-0.42	0.78	-0.31	-0.64	0.87
CX256045	Unknown-197	NS	0.63	0.20	NS	-0.68	NS	0.53	-0.57
CX247269	Unknown-198	NS	0.63	0.11	0.41	-0.44	0.54	0.19	NS
CA387618	Unknown-223	NS	-0.72	NS	NS	0.47	NS	NS	0.56
utu01b01	Unknown-230	NS	0.80	NS	0.24	-0.86	0.64	NS	-0.57
utu02d01	Unknown-241	NS	NS	-0.17	-1.58	0.76	-0.69	-0.72	0.70

CR372483	Unknown-33	NS	0.38	NS	-0.87	0.55	-0.22	-0.66	0.84
DW536441	Unknown-40	NS	-0.90	0.14	-1.66	1.47	-0.20	-0.64	1.22
EST1-3AG03	Unknown-74	NS	-2.03	-0.55	NS	1.40	-0.91	-1.06	NS
EXOB3_E03	Unknown-114	2.43	1.31	NS	-2.42	1.88	-0.33	-1.23	1.36
CA382570	Mitogen-activated protein kinase 13	2.18	0.53	-0.27	-0.94	1.44	NS	-1.38	1.00
DY737056	Transposase-1	2.07	0.36	NS	-0.75	0.86	-0.32	-1.08	NS
P_57	RIB700	2.04	1.11	0.26	-2.23	0.59	NS	NS	0.80
CA040613	Transposase-4	2.02	0.92	0.15	-1.75	0.94	-0.35	-0.97	0.65
EG896573	Unknown-30	1.94	1.03	0.13	-1.16	1.13	NS	-0.92	NS
DY720828	Unknown-70	1.75	0.69	NS	-2.11	1.15	NS	-0.89	1.14
CA346691	ReO_6-1	1.74	1.20	0.19	-3.09	0.86	NS	NS	NS
DY710914	Peptidyl-prolyl cis-trans isomerase-7	1.60	0.99	0.15	-0.92	1.13	NS	-0.71	NS
KVkm2_F01	Unknown-224	1.46	0.45	NS	-1.16	1.00	-0.33	-0.68	0.67
CA383564	Coatmer epsilon subunit 1	1.43	0.66	0.21	-1.62	0.90	-0.40	-0.85	0.41
CR370883	Hpa repeat-2	1.40	0.29	NS	-0.94	1.24	NS	-1.15	0.92
CK873537	Unknown-220	1.37	NS	NS	-0.65	1.63	-0.43	-1.05	1.17
CX717338	Transposase-5	1.36	0.78	0.35	-1.38	1.29	NS	-0.73	NS
CA038503	Unknown-218	1.34	0.87	NS	-0.55	0.81	0.32	-0.78	NS
EL558025	Unknown-75	1.28	0.48	0.24	-1.43	0.55	NS	-0.38	NS
DW564653	Hpa repeat-1	1.27	NS	NS	-1.57	1.44	-0.73	-1.44	1.67
CA357217	Ubiquitin ligase protein CHFR	1.08	0.82	NS	-1.05	0.63	NS	NS	0.57
CA357104	Ubiquitin-conjugating enzyme E2-18 kDa	1.05	0.55	NS	-0.41	0.63	NS	NS	NS
CU070548	Glucose-6-phosphatase	1.03	0.42	NS	-0.23	0.76	NS	-0.81	0.99

CA380185	ERO1-like protein alpha precursor	0.98	NS	0.41	NS	NS	NS	NS	0.51
CX723308	10 kDa heat shock protein, mitochondrial	0.98	0.35	NS	-0.75	0.50	NS	NS	NS
EXOB1_F02	Transcription regulator protein BACH1	0.93	NS	-0.29	-0.63	1.11	NS	-1.27	1.14
EG847896	Transposase-6	0.92	NS	-0.14	-1.59	NS	NS	-1.40	0.90
CU066444	Caspase recruitment domain protein 4	0.92	0.63	0.38	NS	0.51	NS	NS	NS
CX136217	ReO_6-2	0.91	0.42	0.20	-2.63	1.06	NS	-0.61	0.91
CA042733	Unknown-226	0.87	0.91	NS	NS	NS	NS	-0.51	NS
CA346769	Transposase-3	0.85	0.37	NS	-0.98	NS	NS	NS	NS
CX354900	Transposase-59	0.84	0.47	NS	-1.22	0.65	NS	-0.36	NS
CB485825	Unknown-173	0.82	NS	NS	NS	0.64	0.16	-0.55	0.82
CB510677	Endoplasmic reticulum calcium ATPase	0.79	0.76	NS	-1.21	0.45	NS	-0.64	0.37
CA342691	Lanosterol synthase	0.76	NS	0.21	-1.03	NS	NS	NS	NS
DW537469	Transposase-7	0.76	NS	NS	-0.41	1.16	NS	-0.69	0.59
CA354715	Membrane copper amine oxidase	0.74	NS	0.17	-0.94	NS	NS	NS	NS
CA381625	Zinc finger protein 148	0.73	0.25	0.21	-1.61	0.50	NS	-0.33	NS
CA366462	Apoptosis regulator Bcl-X	0.70	0.27	NS	NS	0.51	NS	NS	NS
EG902807	Unknown-29	0.70	NS	NS	-0.72	-0.23	NS	NS	NS
CA376978	CD2 binding protein 1-2	0.67	NS	0.45	-0.82	NS	NS	NS	NS
DY695669	Unknown-259	0.66	0.33	NS	-1.65	0.46	NS	NS	0.50
EL554139	Unknown-65	0.64	0.76	NS	-0.69	NS	NS	NS	-0.50
EXOB3_A11	Unknown-107	0.64	0.36	NS	NS	NS	NS	NS	0.65
CT571685	Unknown-188	0.63	NS	NS	-1.48	0.55	NS	-0.32	NS
EG771865	Unknown-4	0.60	-0.28	0.42	0.67	0.48	-0.52	NS	0.60

CX260228	Hypothetical-fish 5	0.58	NS	0.49	-0.65	0.73	NS	NS	0.39
BX859475	Unknown-146	0.57	0.44	NS	NS	NS	NS	-0.58	NS
BX084962	HIRA-interacting protein 5	0.57	0.44	NS	NS	-0.56	NS	0.33	NS
CA344201	Peroxisomal targeting signal 2 receptor	0.57	NS	NS	-1.00	0.97	NS	-0.75	0.52
EL552294	ADP,ATP carrier protein 3	0.56	NS	-0.50	-0.94	0.55	NS	NS	0.35
BX076826	Unknown-113	0.55	-0.19	NS	-1.33	0.58	NS	-0.29	0.56
CA384452	Heat shock protein HSP 90-alpha	0.55	-0.21	NS	-1.03	0.71	NS	-0.28	NS
CA361342	Orphan nuclear receptor NR4A2	0.54	NS	NS	-0.65	NS	NS	NS	0.24
CA376574	Peptidyl-prolyl cis-trans isomerase 1	0.53	0.42	NS	NS	NS	NS	NS	-0.69
CF752415	Cytochrome c oxidase subunit I-2	0.52	NS	0.89	-0.28	NS	0.39	0.62	NS
CA358266	T-cell, immune regulator 1, isoform a	0.50	NS	NS	-0.69	0.60	NS	NS	NS
CA376803	Serine protease-like protein-2	0.49	0.77	0.18	NS	-0.26	0.69	NS	NS
CR370121	Axonal transporter of synaptic vesicles	0.39	NS	NS	NS	0.73	NS	-0.49	0.61
EG814116	Cytochrome oxidase subunit III-2	0.37	-0.20	1.02	-0.51	NS	0.44	0.45	0.78
EG814116	Cytochrome oxidase subunit III-3	0.37	NS	1.00	-0.83	-0.42	NS	0.46	NS
CA037544	Transposase-58	0.32	NS	NS	-0.42	0.50	NS	-0.53	0.34
CU070060	Unknown-191	0.32	0.58	NS	NS	-0.56	0.27	0.29	-0.43
HK0003_D02	Unknown-192	0.30	0.63	NS	0.37	-0.28	NS	0.35	-1.01
CA354833	Anti-silencing function 1B	0.30	NS	0.30	-0.68	0.55	NS	NS	NS
CB489166	Unknown-164	0.28	0.45	NS	0.50	-0.53	0.39	0.31	-0.70
CX026828	Cathepsin C-3	0.27	0.77	0.25	NS	NS	0.56	NS	-0.52
CX153181	Nucleoside diphosphate kinase, mitochondrial	0.25	-0.55	0.16	-1.61	1.25	NS	-0.76	1.05
BX079000	T-complex protein 1, gamma subunit	0.21	0.55	0.29	NS	NS	0.79	0.26	NS

CX151839	TGF beta-inducible nuclear protein 1	0.19	0.74	0.15	0.51	-0.45	0.87	0.20	-0.42
CA367029	Rho guanine nucleotide exchange factor 5	0.18	-0.60	0.19	-1.36	0.81	-0.16	NS	0.65
EV381307	Unknown-166	-0.16	0.41	NS	0.31	-0.53	NS	0.22	-0.88
CA363848	p53-regulated protein PA26	-0.17	-0.20	NS	-0.64	0.53	NS	NS	0.59
CX254566	Unknown-76	-0.24	-0.49	-0.36	NS	0.92	NS	-0.59	0.66
CX137254	Hyperosmotic protein 21	-0.28	0.37	NS	0.66	NS	0.69	NS	NS
CA374217	Alpha-globin 1-3 Omy 8146	-0.30	NS	NS	0.56	NS	NS	0.43	-0.55
BX082487	Unknown-182	-0.36	-0.81	-0.74	NS	1.25	NS	-1.32	1.58
EG355201	Stanniocalcin-1	-0.36	-0.90	-0.41	-0.38	0.76	-0.79	-0.90	1.21
EXOB3_A01	Unknown-103	-0.36	-1.15	-0.63	NS	1.39	-0.60	-1.14	0.99
EV378274	Adenosine deaminase 3	-0.38	-1.00	-0.68	NS	1.29	NS	-0.88	NS
CX138552	Histone 3A-ATP synthase F0 6	-0.39	0.38	NS	0.51	-0.35	NS	0.78	-0.42
CA358107	Ectonucleoside triphosphate diphosphohydrolase 1	-0.40	-1.08	-0.59	NS	1.19	-0.40	-0.95	1.26
est04c02	Unknown-53	-0.46	-1.24	-0.77	NS	1.23	-0.53	-1.20	1.48
BX082905	Splicing factor 3B subunit 1	-0.47	-1.07	NS	-0.27	0.66	NS	NS	NS
CX245881	Apolipoprotein A-I-1	-0.48	-0.78	-0.42	0.50	0.32	-0.50	-0.61	1.05
CX144622	Unknown-174	-0.53	NS	NS	0.47	-0.50	NS	0.43	-1.20
est04c10	Unknown-56	-0.55	-1.89	-0.35	0.37	1.10	-1.11	-0.80	1.47
CA368674	Organic anion transporter	-0.57	NS	NS	0.72	NS	0.44	0.55	-0.74
EG914743	Unknown-270	-0.60	NS	NS	0.90	NS	0.31	0.93	-0.67
DV191325	High-mobility group box 1	-0.61	-1.49	0.91	NS	NS	NS	NS	NS
BX307506	NADH-ubiquinone oxidoreductase 15 kDa subunit	-0.62	0.29	NS	0.56	NS	0.32	0.47	NS
CA366403	Heat shock 27 kDa protein-1	-0.71	-2.01	-0.43	0.31	1.69	-0.78	-0.79	1.40

EV378980	Alpha-2,8-sialyltransferase 8F	-0.72	-1.58	NS	NS	0.67	-0.30	-0.56	NS
EG841423	Chromosome segregation 1-like protein	-0.75	NS	NS	1.02	NS	0.50	0.57	-0.56
BX299891	Hypothetical-fish 9	-0.76	NS	NS	0.70	-0.38	0.28	0.62	NS
CX252245	Hypothetical-fish 34	-0.79	-0.71	NS	NS	0.54	-0.71	-0.57	0.75
CX144401	Proteasome subunit alpha type 6	-0.80	NS	NS	0.83	NS	NS	0.68	NS
EXOB1_D07	Unknown-84	-0.81	-0.78	NS	NS	0.72	NS	-0.33	0.53
CU063794	Unknown-85	-0.83	-0.55	-0.21	0.42	NS	NS	0.33	NS
CA366162	Ribosomal protein L35-1	-0.90	NS	NS	0.98	NS	NS	0.51	NS
EXOB3_E06	Unknown-115	-0.95	NS	-0.11	0.50	NS	NS	0.55	NS
P_8	Glutathione reductase, mitochondrial-1	-1.19	-0.61	-0.53	NS	NS	NS	-0.57	0.52
BX303958	SEC13-related protein	-1.36	-0.31	NS	0.81	NS	NS	0.67	-0.43
BX871577	Unknown-124	-1.38	NS	NS	0.82	NS	0.45	0.45	NS
DW540724	Fish-egg lectin	-1.42	-0.34	-0.38	1.18	NS	0.42	0.48	NS
BX875072	Fatty acid-binding protein-1	-1.47	NS	NS	1.11	NS	NS	0.71	NS
DW576495	Transposase-56	-1.56	-3.03	-0.16	NS	0.97	-1.03	-0.80	NS
P_17	Nitric oxide synthase 2 (NOS2)	-1.75	-1.09	-0.87	NS	0.39	-0.45	-0.67	NS
CV428774	Cytochrome c oxidase subunit II	-1.91	-0.57	0.50	0.77	NS	NS	0.66	NS