

## Atlantic salmon raised with diets low in long-chain polyunsaturated n-3 fatty acids in freshwater have a *Mycoplasma* dominated gut microbiota at sea

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**Table S1. Composition of high- and low LC-PUFA diets.**

Stage Feed type	Fresh water														Sea water	
	High LC-PUFA							Low LC-PUFA							Fish oil	
Initial fish weight (g)	0.2	0.4	1	5	15	30	50	0.2	0.4	1	5	15	30	50	80	200
Feed size (mm)	0.6	0.9	1.3	1.7	2.2	2.8	3.5	0.6	0.9	1.3	1.7	2.2	2.8	3.5	3.5	4.9
North Atlantic fishmeal (%)	41	40	40	40	40	30	30	41	40	40	40	40	30	30	35	25
Plant meals (%)	46	45	45	42	40	49	48	46	45	45	42	40	49	48	39	46
Additives (%)	3.3	3.2	3.2	3.5	3.3	3.4	3.9	3.3	3.2	3.2	3.5	3.3	3.4	3.9	2.6	3.3
North Atlantic fish oil (%)	9.9	12	12	15	16	17	18	0	0	0	0	0	1.2	1.2	23	26
Linseed oil (%)	0	0	0	0	0	0	0	6.8	8.1	8.1	9.7	11	10	11	0	0
Palm oil (%)	0	0	0	0	0	0	0	3.2	3.8	3.8	5.4	5.9	5.8	5.9	0	0
Protein (%)	56	55	55	51	49	47	47	56	55	55	51	49	47	47	44	41
Fat (%)	16	18	18	21	22	22	22	16	18	18	21	22	22	22	28	31
EPA+DHA (% diet)	2.2	2.4	2.4	2.9	3.1	3.1	3.1	0.7	0.7	0.7	0.7	0.7	0.7	0.7	4	4.2

**Table S2. Weight (g) of salmon after first-feeding of low LC-PUFA and high LC-PUFA**

Day after feeding	0	65	100	150 (157)	205	320 (Sea)
High LC-PUFA		4.48±0.9	14.3±2.2	46.6±7.3	107±13	598±184
Low LC-PUFA	0.14±0.01	2.67±0.5*	10.7±1.7*	40.1±5.7	77.0±11*	662±145

\* significantly (p<0.05) different weight between high LC-PUFA and low LC-PUFA groups

**Table S3.** Overview of metagenome samples. Readpairs is the number of readpairs after discarding host (salmon) reads. The numbers of classified contigs have the accumulated lengths (basepairs) in parentheses.

Sample	LC-PUFA	Readpairs	Contigs, <i>Mycoplasma</i>	Contigs, <i>Photobacterium</i>
Kyrk.C4	High	8243	-	-
Kyrk.C5	High	1550929	25 (656283)	92 (4460936)
Kyrk.E3	Low	2628217	46 (729852)	1336 (2943033)
Kyrk.E5	Low	167871	58 (720488)	-

**Table S4. Unique genes in Mycoplasma groups****Unique genes salmon Mycoplasma**

Membrane protein insertase MisCA  
Ribosomal protein L4/L1 family protein  
Virulence transcriptional regulatory protein PhoP  
Aliphatic sulfonates import ATP-binding protein SsuB  
Bacterial non-heme ferritin  
GTP pyrophosphokinase rsh  
Fructokinase  
Putative glycosyltransferase EpsH  
Electron transport complex subunit RsbB  
Minor cardiolipin synthase ClsB  
PTS system oligo-beta-mannoside-specific EIIB component  
Lichenan-specific phosphotransferase enzyme IIA component  
PTS system N<sup>6</sup>-diacetylchitobiose-specific EIIC component  
putative polyketide biosynthesis zinc-dependent hydrolase PksB  
ABC-2 type transporter  
Thiosulfate sulfurtransferase GlpE  
DNA-binding protein HRm  
drrA: daunorubicin resistance ABC transporter ATP-binding protein  
putative glycosyltransferase EpsJ  
3<sup>6</sup>-anhydro-alpha-L-galactose dehydrogenase  
Replication initiation and membrane attachment  
reco: DNA repair protein RecO  
Error-prone DNA polymerase  
5'-3' exonuclease  
putative protease YhbU  
Ribonucleoside-diphosphate reductase 1 subunit beta  
Ribonucleoside-diphosphate reductase 1 subunit alpha  
L-lactate dehydrogenase 1  
Ankyrin repeats (3 copies)  
Nicotinamidase  
MG423: beta-CASP ribonuclease RNase J family  
thrS: threonine--tRNA ligase  
DNA polymerase III subunit gamma/tau  
DNA replication and repair protein RecF  
Sigma 54 modulation protein / S30EA ribosomal protein  
hsdR: type I site-specific deoxyribonuclease HsdR family  
Putative heavy-metal-binding protein  
GIY-YIG catalytic domain protein  
Methionine import ATP-binding protein MetN  
Fe(3+) ions import ATP-binding protein FbpC 2  
pro\_imino\_pep\_2: proline-specific peptidase  
Transketolase 2  
dnaq: exonuclease DNA polymerase III epsilon subunit family  
GTP cyclohydrolase-2  
Bacteriophage Gp15 protein  
Vitamin B12 import system permease protein BtuC  
FecCD transport family protein  
Ferric enterobactin transport ATP-binding protein FepC  
putative siderophore transport system ATP-binding protein YusV  
AAA domain putative AbiEii toxin Type IV TA system  
Type IIS restriction enzyme Eco57I  
cello\_pts\_IIC: PTS system cellobiose-specific IIC component  
tsf: translation elongation factor Ts  
putative propionate kinase

rimI: ribosomal-protein-alanine acetyltransferase  
UDP-glucose/GDP-mannose dehydrogenase family%2C NAD binding domain  
DNA polymerase type B%2C organellar and viral  
Ribitol-5-phosphate cytidyltransferase 2  
RecBCD enzyme subunit RecB  
ATP-dependent helicase/nuclease subunit A  
Modification methylase MboII  
Bacteriophage replication gene A protein (GPA)  
PTS system oligo-beta-mannoside-specific EIIC component  
putative siderophore transport system permease protein YfhA  
phosphate\_pstC: phosphate ABC transporter%2C permease protein PstC  
CRISPR-associated endonuclease Cas9 1  
Phage Terminase  
Phage portal protein

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### **Unique genes Penetrans group**

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putative multidrug resistance ABC transporter ATP-binding/permease protein YheI  
Glycerol facilitator-aquaporin gla  
putative glycerol uptake facilitator protein  
D-amino acid dehydrogenase  
GMP synthase [glutamine-hydrolyzing]  
Mycoplasma MG185/MG260 protein  
L-arabinose transport system permease protein AraP  
3a0107s02c: phosphate ABC transporter%2C permease protein PstA  
Ribonucleoside-diphosphate reductase 2 subunit alpha  
Protein NrdI  
Ribonucleoside-diphosphate reductase subunit beta nrdF2  
L6\_bact: ribosomal protein uL6  
Ribosomal L18 of archaea%2C bacteria%2C mitoch. and chloroplast  
DnaJ-like protein MG200  
sigma70-ECF: RNA polymerase sigma factor%2C sigma-70 family  
DNA translocase SftA  
Peptidase family M50  
TIGR00376: putative DNA helicase  
Subtilase family protein  
Propionyl-CoA:succinate CoA transferase  
putative protease YdcP  
NAD/NADP-dependent betaine aldehyde dehydrogenase  
Telomere recombination  
DNA-binding protein HRL53  
MatE  
Cytadherence high molecular weight protein 3  
3-deoxy-D-manno-octulosonic acid kinase  
Cytadhesin P30/P32  
termin\_org\_P1: adhesin P1  
Adhesin P1  
Mgp-operon protein 3  
Trypsin-sensitive surface-exposed protein  
FIVAR domain protein  
Mycoplasma haemagglutinin  
GA module  
Extracellular matrix-binding protein ebh  
Deoxyuridine 5'-triphosphate nucleotidohydrolase  
Glycoprotease family protein  
2-hydroxyruconate semialdehyde hydrolase  
DegV: EDD domain protein%2C DegV family  
Calcium-transporting ATPase  
2-C-methyl-D-erythritol 4-phosphate cytidyltransferase

prot\_M\_MG281: IgG-blocking protein M  
 Deoxyribose-phosphate aldolase  
 Signal peptidase IB  
 NADPH-dependent FMN reductase  
 HAD-SF-IIB: HAD hydrolase%2C family IIB  
 Arsenical resistance operon trans-acting repressor ArsD  
 Lipopolysaccharide export system ATP-binding protein LptB  
 ABC-2 family transporter protein  
 Organic hydroperoxide resistance protein OhrB  
 Tyrosine--tRNA ligase 1  
 Bifunctional PGK/TIM  
 Flavodoxin domain protein  
 Flavodoxin  
 Fibronectin-binding protein PlpA  
 Cytadherence high molecular weight protein 2  
 Ferredoxin--NADP reductase 2  
 termin\_org\_DnaJ: terminal organelle assembly protein TopJ  
 Beta-phosphoglucomutase  
 Kojibiose phosphorylase  
 ABC-type transporter ATP-binding protein EcsA  
 butyr\_acet\_CoA: butyryl-CoA:acetate CoA-transferase  
 Succinyl-CoA:coenzyme A transferase  
 putative glycerol-3-phosphate acyltransferase  
 RNA polymerase sigma factor RpoD  
 type\_I\_sec\_PrtD: type I secretion system ATPase  
 1-acyl-sn-glycerol-3-phosphate acyltransferase  
 Nicotinate-nucleotide adenylyltransferase  
 Phosphatidylethanolamine-binding protein  
 Morphine 6-dehydrogenase  
 putative oxidoreductase YtbE  
 Glyoxal reductase  
 Aminopeptidase C  
 Aminopeptidase E  
 Aminopeptidase  
 Cyclic di-AMP synthase CdaS  
 Putrescine transport system permease protein PotH  
 60 kDa chaperonin  
 10 kDa chaperonin  
 PDH\_E1\_alpha\_x: pyruvate dehydrogenase (acetyl-transferring) E1 component%2C alpha subunit  
 Potassium/sodium uptake protein NtpJ  
 Hemolysin C  
 CBS domain protein  
 Chaperone protein ClpB 1  
 Ribosomal large subunit pseudouridine synthase C  
 putative tRNA/rRNA methyltransferase  
 Enriched in aromatic and glycine Residues box  
 mycoplas\_twoTM: two transmembrane protein  
 IncA protein  
 Voltage-gated potassium channel Kch  
 Large-conductance mechanosensitive channel  
 Regulatory protein Spx  
 Cytadherence high molecular weight protein 1  
 UDP-Glc:alpha-D-GlcNAc-diphosphoundecaprenol beta-1%2C3-glycosyltransferase WfgD  
 ABC transporter substrate-binding protein PnrA-like protein  
 Nicotinate phosphoribosyltransferase (NAPRTase) family protein  
 Mg296 protein  
 Mycoplasma MFS transporter

cas\_Csn1: CRISPR subtype II RNA-guided endonuclease Cas9  
 Aldehyde dehydrogenase  
 NAD(P)-dependent benzaldehyde dehydrogenase  
 Peptide methionine sulfoxide reductase MsrA  
 Procyclic acidic repetitive protein (PARP)  
 dnan: DNA polymerase III%2C beta subunit  
 MG010: DNA primase-like protein  
 Ribosomal protein S6--L-glutamate ligase  
 rimK\_fam: alpha-L-glutamate ligase%2C RimK family  
 Beta-(1-->2)glucan export ATP-binding/permease protein NdvA  
 Proline iminopeptidase  
 pro\_imino\_pep\_1: prolyl aminopeptidase  
 Putative cysteine protease YraA  
 MG032/MG096/MG288 family 2  
 FAD dependent oxidoreductase  
 PhnU2: putative 2-aminoethylphosphonate ABC transporter%2C permease protein  
 putative phosphomannomutase  
 TIGR00096: 16S rRNA (cytidine(1402)-2'-O)-methyltransferase  
 Ribosomal protein S2  
 Dipeptide transport system permease protein DppC  
 MG032/MG096/MG288 family 1  
 Glutamyl-tRNA(Gln) amidotransferase subunit C  
 CinA-like protein  
 Nucleoid-associated protein YbaB  
 MgpC protein precursor  
 RNA-binding riboflavin kinase RibR  
 30S ribosomal protein S14  
 Peptidase family M3  
 putative lipoprotein MG186  
 Type 2 topoisomerase subunit A  
 Div11A\_domain: DivIVA domain protein  
 2A0306: amino acid transporter  
 Thymidylate synthase 2  
 pcrA: ATP-dependent DNA helicase PcrA  
 rRNA\_methyl\_3: RNA methyltransferase%2C TrmH family%2C group 3  
 lipoyltrans: lipoyltransferase and lipoate-protein ligase  
 Dehydrogenase E1 component  
 putative iron export ATP-binding protein FetA  
 ABC\_phnC: phosphonate ABC transporter%2C ATP-binding protein  
 alaS: alanine--tRNA ligase  
 tRNA synthetases class II (A)  
 Major Facilitator Superfamily protein  
 Putative HMP/thiamine permease protein YkoC  
 putative lipoprotein MG321  
 Processive diacylglycerol beta-glycosyltransferase  
 Chromate reductase  
 ileS: isoleucine--tRNA ligase  
 TIGR00091: tRNA (guanine-N(7)-)-methyltransferase  
 nadE: NAD+ synthetase  
 urea\_trans\_UrtD: urea ABC transporter%2C ATP-binding protein UrtD  
 cytosol aminopeptidase  
 Peptidase S7%2C Flavivirus NS3 serine protease  
 Septation ring formation regulator%2C EzrA  
 DEAD-box ATP-dependent RNA helicase CshA  
 50S ribosomal protein L28  
 Hydroperoxide reductase  
 Putative type-1 restriction enzyme specificity protein MG438

Lipoprotein  
 gltX\_bact: glutamate--tRNA ligase  
 putative ABC transporter ATP-binding protein YknY  
 Chromosome partitioning protein ParA  
 S4 domain protein  
 putative peroxiredoxin  
 Lipoprotein associated domain protein  
 Leucine rich repeats (6 copies)  
 Sugar phosphatase YbiV  
 matE: MATE efflux family protein  
 Phosphoglucomutase/phosphomannomutase%2C alpha/beta/alpha domain III  
 Acetyltransferase (GNAT) family protein  
 Apolipoprotein A1/A4/E domain protein  
 RNA methyltransferase  
 nagA: N-acetylglucosamine-6-phosphate deacetylase  
 Modification methylase FokI  
 AlwI restriction endonuclease  
 Methylated-DNA--protein-cysteine methyltransferase  
 FMN-dependent NADH-azoreductase 2  
 Cyclic di-AMP synthase CdaA  
 Insertion sequence IS5376 putative ATP-binding protein  
 Voltage-dependent anion channel  
 Multidrug resistance-like ATP-binding protein MdlB  
 Integration host factor subunit alpha  
 Lipoprotein p35  
 Ribitol-5-phosphate cytidyltransferase  
 Tyrosine recombinase XerC  
 HTH-type transcriptional regulator MhqR  
 N-substituted formamide deformylase  
 Putative HTH-type transcriptional regulator YwnA  
 Inosine-5'-monophosphate dehydrogenase  
 2-hydroxy-3-oxopropionate reductase  
 Pyridoxal phosphate phosphatase YbhA  
 DNA-3-methyladenine glycosylase 1  
 PTS-dependent dihydroxyacetone kinase%2C ADP-binding subunit DhaL  
 Undecaprenol kinase  
 Lipoprotein leucine-zipper  
 putative hydrolase YxeP  
 Negative regulator of genetic competence ClpC/MecB  
 L-hydantoinase  
 Allantoinase  
 ATPase RavA  
 Protein ViaA  
 modC\_ABC: molybdate ABC transporter%2C ATP-binding protein  
 Archaea bacterial proteins of unknown function  
 ATPase domain predominantly from Archaea  
 Transcriptional regulator ManR  
 Ascorbate-specific PTS system EIIA component  
 PTS-IIBC-Tre: PTS system%2C trehalose-specific IIBC component  
 Aryl-phospho-beta-D-glucosidase BglC  
 putative oxidoreductase/MSMEI\_2347  
 Anaerobic ribonucleoside-triphosphate reductase  
 NrdD: anaerobic ribonucleoside-triphosphate reductase  
 PRD domain protein  
 Dihydropolyllysine-residue acyltransferase component of branched-chain alpha-ketoacid dehydrogenase complex  
 DHAK\_reg: probable dihydroxyacetone kinase regulator  
 2A0308: L-type amino acid transporter

putative formaldehyde dehydrogenase AdhA  
 NADP-dependent alcohol dehydrogenase C 1  
 Peptide transport system ATP-binding protein SapD  
 Oligopeptide transport system permease protein OppC  
 Eco57I restriction-modification methylase  
 TM2 domain protein  
 ATPase family associated with various cellular activities (AAA)  
 Hypoxanthine phosphoribosyltransferase  
 phosphoenolpyruvate-dependent sugar phosphotransferase system%2C EIIA 1  
 putative HTH-type transcriptional regulator  
 GDSL-like Lipase/Acylhydrolase family protein  
 Putative hydrolase YdeN  
 Alpha-acetolactate decarboxylase  
 2%2C5-dichloro-2%2C5-cyclohexadiene-1%2C4-diol dehydrogenase  
 Peroxide stress protein YaaA  
 Glycosyl hydrolase family 53  
 Arabinogalactan endo-beta-1%2C4-galactanase  
 Glucans biosynthesis glucosyltransferase H  
 Nicotinamide-nucleotide amidohydrolase PncC  
 Alpha-keto-acid decarboxylase  
 Indole-3-pyruvate decarboxylase  
 L-ribulose-5-phosphate 4-epimerase  
 L-ribulose-5-phosphate 4-epimerase SgbE  
 L-ribulose-5-phosphate 3-epimerase UlaE  
 3-keto-L-gulonate-6-phosphate decarboxylase UlaD  
 Ascorbate-specific PTS system EIIB component  
 Phosphotriesterase family protein  
 sufB: FeS assembly protein SufB  
 Vegetative protein 296  
 Orotate phosphoribosyltransferase  
 Orotidine 5'-phosphate decarboxylase  
 Dihydroorotate dehydrogenase B (NAD(+))%2C catalytic subunit  
 Dihydroorotate dehydrogenase B (NAD(+))%2C electron transfer subunit  
 Dihydroorotase  
 Aspartate carbamoyltransferase  
 Bifunctional protein PyrR  
 Nucleoid-associated protein EbfC  
 dnaX\_nterm: DNA polymerase III%2C subunit gamma and tau  
 Tyrosine recombinase XerD  
 O-methyltransferase  
 Trehalose import ATP-binding protein SugC  
 Formate--tetrahydrofolate ligase 1  
 Formate--tetrahydrofolate ligase  
 Zinc-transporting ATPase  
 Copper-exporting P-type ATPase A  
 putative copper-importing P-type ATPase A  
 Heavy-metal-associated domain protein  
 Putrescine export system ATP-binding protein SapD  
 NusG\_myc: NusG family protein  
 Putative teichuronic acid biosynthesis glycosyltransferase TuaG  
 Low molecular weight protein-tyrosine-phosphatase PtpA  
 Low molecular weight protein-tyrosine-phosphatase YfkJ  
 NADPH dehydrogenase  
 ATP-dependent RNA helicase RhlB  
 Serine/threonine-protein kinase PK-1  
 Alpha/beta hydrolase family protein  
 Phosphate transport system permease protein PstC

Purine catabolism protein PucG  
Phosphoenolpyruvate carboxylase  
Nicotinate phosphoribosyltransferase pncB1  
Ditrans%2Cpolycis-undecaprenyl-diphosphate synthase ((2E%2C6E)-farnesyl-diphosphate specific)  
L-lactate dehydrogenase 2  
Sucrose-6-phosphate hydrolase  
dcm: DNA (cytosine-5-)-methyltransferase  
Z1 domain protein  
Peptidase C1-like family protein  
ATP-dependent RNA helicase DbpA  
rnpA: ribonuclease P protein component  
IgA FC receptor  
RimK-like ATP-grasp domain protein  
putative fructose-bisphosphate aldolase  
General stress protein 18  
Malate:quinone oxidoreductase  
Protein translocase subunit SecE  
Chondroitin synthase  
Inner membrane protein YqcE  
Choline/Carnitine o-acyltransferase  
sn-glycerol-3-phosphate transport system permease protein UgpA  
trehalos\_R\_Bsub: trehalose operon repressor  
Holo-[acyl-carrier-protein] synthase  
Segregation and condensation protein ScpA  
pyruv\_kin: pyruvate kinase  
Restriction enzyme BglI subunit alpha  
ADP-ribosylating toxin CARDS  
Glutamine transport ATP-binding protein GlnQ  
putative ATP-dependent RNA helicase YfmL  
ComEC\_N-term: ComEC/Rec2-related protein  
Iron-sulfur cluster assembly scaffold protein IscU  
Phosphotriesterase homology protein  
L-ribulose-5-phosphate 4-epimerase AraD  
Type IV secretion-system coupling protein DNA-binding domain protein  
TIGR00342: tRNA sulfurtransferase ThiI  
NADP-dependent isopropanol dehydrogenase  
Phosphate transport system permease protein PstC 2

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### **Unique genes Yeatsii group**

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SMC\_prok\_A: chromosome segregation protein SMC  
tRNA-specific adenosine deaminase  
tRNA1(Val) (adenine(37)-N6)-methyltransferase  
Helix-turn-helix domain%2C rpiR family  
Mycopla\_NOT\_gsn: STREFT protein  
33 kDa chaperonin  
FMN-dependent NADH-azoreductase 1  
Single-stranded DNA-binding protein A  
PTS system mannitol-specific EIICBA component  
Sorbitol-6-phosphate 2-dehydrogenase  
HTH-type transcriptional regulator MurR  
Mycoplas\_LppA: mycoides cluster lipoprotein%2C LppA/P72 family  
Xylose import ATP-binding protein XylG  
Mollicu\_LP: MOLPALP family lipoprotein  
SIR2-like domain protein  
tly: TlyA family rRNA methyltransferase/putative hemolysin  
Exodeoxyribonuclease 7 small subunit  
Exodeoxyribonuclease 7 large subunit  
Cellulose synthase catalytic subunit [UDP-forming]



Magnesium-transporting ATPase%2C P-type 1  
 Ornithine carbamoyltransferase  
 C4-dicarboxylate anaerobic carrier  
 D-allose kinase  
 Beta-lactamase  
 Preprotein translocase SecE subunit  
 50S ribosomal protein L33 2  
 ABC transporter ATP-binding protein uup  
 L-threonine dehydratase catabolic TdcB  
 Glucosamine-6-phosphate deaminase  
 PTS system N-acetylglucosamine-specific EIICBA component  
 Peptide chain release factor RF1  
 PTS system maltose-specific EIICB component  
 Glycosyl hydrolases family 31  
 Neopullulanase  
 Cyclomaltodextrinase  
 Maltose transport system permease protein MalG  
 Maltose/maltodextrin import ATP-binding protein MalK  
 sn-glycerol-3-phosphate import ATP-binding protein UgpC  
 Maltose phosphorylase  
 Oligo-1%2C6-glucosidase  
 Bacterial regulatory proteins%2C gntR family  
 Chromate transporter  
 Abi-like protein  
 Chromosome-partitioning ATPase Soj  
 Spermidine/putrescine-binding periplasmic protein  
 Ribosomal RNA small subunit methyltransferase D  
 Ribosomal RNA small subunit methyltransferase B  
 Eco47II restriction endonuclease  
 GTP-binding protein TypA/BipA  
 Pyruvate kinase I  
 NADH peroxidase  
 Propionate kinase  
 PTS system glucose-specific EIIA component  
 putative CtpA-like serine protease  
 Enoyl-(Acyl carrier protein) reductase  
 NADP-dependent 3-hydroxy acid dehydrogenase YdfG  
 thi\_PPkinase: thiamine pyrophosphokinase  
 PP2C-family Ser/Thr phosphatase  
 Putative protein phosphatase 2C-type  
 DOC\_P1: death-on-curing family protein  
 e3 binding domain protein  
 tRNA threonylcarbamoyladenosine biosynthesis protein TsaE  
 Peptidase family S41  
 Ribosomal protein L7Ae/L30e/S12e/Gadd45 family protein  
 Ribosome maturation factor RimP  
 Putative NAD(P)H nitroreductase  
 putative peptidase  
 Adenosine monophosphate-protein transferase NmFic  
 Mycoplasma virulence signal region (Myco\_arth\_vir\_N)  
 dITP/XTP pyrophosphatase  
 Cell division protein SepF  
 Cytidine and deoxycytidylate deaminase zinc-binding region  
 AGP\_acyltrn: 1-acylglycerol-3-phosphate O-acyltransferases  
 N-acetylneuraminase lyase  
 sss: transporter%2C solute:sodium symporter (SSS) family  
 Sodium:solute symporter family protein

N-acetylmannosamine kinase  
 Putative dipeptidase  
 putative pyridine nucleotide-disulfide oxidoreductase RclA  
 Glycine cleavage system H-like protein  
 Lipoate--protein ligase 2  
 mtlA: PTS system%2C mannitol-specific IIC component  
 6-phosphogluconate dehydrogenase%2C NAD(+)-dependent%2C decarboxylating  
 putative cysteine desulfurase  
 3'-5' exoribonuclease YhaM  
 Methylenetetrahydrofolate--tRNA-(uracil-5-)-methyltransferase TrmFO  
 Copper homeostasis protein CutC  
 Phosphate transport system permease protein PstA 2  
 Asp23 family%2C cell envelope-related function  
 YloV: DAK2 domain fusion protein YloV  
 Deoxyadenosine/deoxycytidine kinase  
 membra\_charge: integral membrane protein  
 Sulphur transport  
 Ribosome maturation factor RimM  
 Putative competence-damage inducible protein  
 DnaD\_Mollicutes: DnaD family protein  
 Ribulose-phosphate 3 epimerase family protein  
 Surf\_Exclu\_PgrA: SEC10/PgrA surface exclusion domain protein  
 Ribosomal large subunit pseudouridine synthase B  
 D-tagatose-1%2C6-bisphosphate aldolase subunit GatY  
 Lactose phosphotransferase system repressor  
 PTS-II-BC-sucr: PTS system%2C sucrose-specific IIBC component  
 Tagatose-6-phosphate kinase  
 Replication initiation and membrane attachment protein  
 Peroxide operon regulator  
 Agmatine deiminase  
 agmatine\_aguA: agmatine deiminase  
 Putrescine carbamoyltransferase  
 KOW motif protein  
 Tetraspanin family protein  
 TrkA-N domain protein  
 TrkA-C domain protein  
 RNA pseudouridylate synthase  
 CAAX protease self-immunity  
 Peptide methionine sulfoxide reductase MsrA/MsrB 1  
 5-amino-6-(5-phospho-D-ribitylamino)uracil phosphatase YcsE  
 Cystathionine beta-lyase PatB  
 2-iminobutanoate/2-iminopropanoate deaminase  
 Phosphoglucomutase/phosphomannomutase%2C alpha/beta/alpha domain II  
 MgtE intracellular N domain protein  
 Liste\_lipo\_26: bacterial surface protein 26-residue repeat protein  
 putative metal-dependent hydrolase TatD  
 Folylpolyglutamate synthase  
 SIS domain protein  
 ATPase-IIIIB\_Mg: magnesium-translocating P-type ATPase  
 DNA-binding protein HU 1  
 ABC transporter%2C phosphonate%2C periplasmic substrate-binding protein  
 Phosphate-import permease protein PhnE  
 ComE operon protein 3  
 Metallo-beta-lactamase superfamily protein  
 Pyridoxal phosphate phosphatase YigL  
 tRNA-dihydrouridine synthase B  
 EcfS\_MSC\_0063: putative energy coupling factor transporter S component

Putative peroxiredoxin  
 Serine aminopeptidase%2C S33  
 DeoR-like helix-turn-helix domain protein  
 HTH-type transcriptional repressor GlcR  
 Nitrogen regulatory protein  
 Sodium:dicarboxylate symporter family protein  
 Coenzyme A disulfide reductase  
 Mplasa\_alpha\_rch: helix-rich protein  
 D-lactate dehydrogenase  
 Esterase EstB  
 Ribonucleoside-diphosphate reductase subunit beta nrdF1  
 DALR domain protein  
 DNA polymerase IV 1  
 alpha/beta hydrolase fold protein  
 GTP cyclohydrolase 1 type 2  
 Lactococcin-G-processing and transport ATP-binding protein LagD  
 IstB-like ATP binding protein  
 putative ABC transporter ATP-binding protein YheS  
 Tat-linked quality control protein TatD  
 Inner membrane protein YihN  
 putative cardiolipin synthase YwiE  
 PTS-II-BC-unk1: PTS system%2C IIBC component  
 RelB antitoxin  
 PGMB-YQAB-SF: beta-phosphoglucomutase family hydrolase  
 N-acetylmuramic acid 6-phosphate etherase  
 HTH-type transcriptional regulator HexR  
 Enolase 2  
 aspS\_bact: aspartate--tRNA ligase  
 Septum formation initiator  
 Vitamin B12 import ATP-binding protein BtuD  
 PTS-II-ABC-beta: PTS system%2C beta-glucoside-specific IIABC component  
 RecBCD enzyme subunit RecD  
 NAPRTase\_put: nicotinate phosphoribosyltransferase  
 HTH-like domain protein  
 Trehalose-6-phosphate hydrolase  
 Bacterial regulatory proteins%2C lacI family  
 Modification methylase HaeIII  
 putative tRNA-dihydrouridine synthase  
 Alanine dehydrogenase 2  
 Alanine dehydrogenase  
 6-phospho-beta-glucosidase GmuD  
 Pyridine nucleotide-disulphide oxidoreductase%2C dimerisation domain  
 putative metal-dependent hydrolase YjjV  
 Nucleotidyl transferase AbiEii toxin%2C Type IV TA system  
 Transcriptional regulator%2C AbiEi antitoxin  
 ApaLI-like restriction endonuclease  
 VirB4\_CagE: type IV secretion/conjugal transfer ATPase%2C VirB4 family  
 PTS-dependent dihydroxyacetone kinase%2C phosphotransferase subunit DhaM  
 dha\_pts: dihydroxyacetone kinase%2C phosphotransfer subunit  
 tRNA threonylcarbamoyladenine biosynthesis protein TsaB  
 Deoxyadenosine kinase  
 Isonitrile hydratase  
 Protein export membrane protein  
 Fic/DOC family protein  
 Catabolite control protein B  
 Penicillin-binding protein 4\*  
 ROK\_glcA\_fam: ROK family protein (putative glucokinase)

ROK family protein  
 Carbamate kinase 2  
 E1-E2 ATPase  
 Carnitine transport ATP-binding protein OpuCA  
 Modification methylase BspRI  
 Modification methylase DpnIIB  
 ECF-type riboflavin transporter%2C S component  
 Dual specificity phosphatase%2C catalytic domain  
 nickel\_nike: nickel import ATP-binding protein Nike  
 Oligopeptide-binding protein AmiA  
 Peptide methionine sulfoxide reductase msrA/msrB  
 ATP-dependent DNA helicase Rep  
 tRNA 5-methylaminomethyl-2-thiouridine biosynthesis bifunctional protein MnmC  
 CoA\_CoA\_reduc: CoA-disulfide reductase  
 2-oxoisovalerate dehydrogenase subunit beta  
 NAD kinase 1  
 Filamentous hemagglutinin  
 TraM recognition site of TraD and TraG  
 dam: DNA adenine methylase  
 xseB: exodeoxyribonuclease VII%2C small subunit  
 xseA: exodeoxyribonuclease VII%2C large subunit  
 Putative NAD(P)H nitroreductase YodC  
 not\_thiJ: DJ-1 family protein  
 L-methionine gamma-lyase  
 PtsS\_plasma: phosphate ABC transporter substrate-binding protein  
 Choline transport ATP-binding protein OpuBA  
 Ribosomal RNA small subunit methyltransferase F  
 NusB family protein  
 DNA replication protein DnaC  
 polc: DNA polymerase III%2C alpha subunit  
 Helix-hairpin-helix motif protein  
 C\_S\_lyase\_PatB: putative C-S lyase  
 5-amino-6-(5-phospho-D-ribitylamino)uracil phosphatase YwtE  
 Luciferase-like monooxygenase  
 putative protein-export membrane protein SecG  
 PTS system fructose IIA component  
 3'-5' ssDNA/RNA exonuclease TatD  
 Modification methylase HpaII  
 Pal\_lipo: peptidoglycan-associated lipoprotein  
 Sulfatase  
 DNA helicase II  
 tktlase\_bact: transketolase  
 Guanosine-3'%2C5'-bis(diphosphate) 3'-pyrophosphohydrolase  
 3TM\_mycoplas: three transmembrane helix protein  
 Lipoate--protein ligase 1  
 putative mannose-6-phosphate isomerase GmuF  
 Thiamin pyrophosphokinase%2C vitamin B1 binding domain  
 Bsp6I restriction endonuclease  
 DEAD/DEAH box helicase  
 Helix-turn-helix  
 Type-2 restriction enzyme DpnII  
 Lipoate--protein ligase