

Evolutionary aspects of Selenium Binding Protein (SBP)

Irene Dervisi¹, Chrysanthi Valassakis¹, Katerina Koletti², Vassilis N. Kouvelis³, Emmanouil Flemetakis², Christos A. Ouzounis^{4,5} and Andreas Roussis¹

¹Section of Botany, Department of Biology, National & Kapodistrian University of Athens, 15701 Athens, Greece

²Department of Biotechnology, School of Applied Biology and Biotechnology, Agricultural University of Athens, 11855, Athens, Greece.

³Section of Genetics and Biotechnology, Department of Biology, National & Kapodistrian University of Athens, 15701 Athens, Greece

⁴Biological Computation & Process Laboratory, Chemical Process & Energy Resources Institute, Centre for Research & Technology Hellas, Thessalonica GR-54124, Greece

⁵Biological Computation & Computational Biology Group, AIIA Lab, School of Informatics, Aristotle University of Thessalonica, Thessalonica GR-57001, Greece

Corresponding author. Email: aroussis@biol.uoa.gr

Table S1: Selenium binding proteins representatives used in the phylogenetic analysis categorized by Species, Accession Number, Query Identity (%), Protein Length (aa) and Classification.

Species	Accession No.	Identity (%)	Protein Length (aa)	Kingdom	Phylum	Class	Order	Family
<i>Gorilla gorilla gorilla</i>	XP_004026685.1	61.064	514	Animalia	Chordata	Mammalia	Primates	Hominidae
<i>Pongo abelii</i>	XP_009242677.1	61.064	514	Animalia	Chordata	Mammalia	Primates	
<i>Nomascus leucogenys</i>	XP_030680407.1	60.851	514	Animalia	Chordata	Mammalia	Primates	Hylobatidae
<i>Homo sapiens</i>	NP_003935.2	61.064	472	Animalia	Chordata	Mammalia	Primates	Hominidae
<i>Macaca mulatta</i>	XP_015007568.1	61.064	472	Animalia	Chordata	Mammalia	Primates	Cercopithecidae
<i>Callithrix jacchus</i>	XP_002759958.1	60.213	472	Animalia	Chordata	Mammalia	Primates	Callitrichidae
<i>Rhinolophus ferrumequinum</i>	XP_032949704.1	61.277	472	Animalia	Chordata	Mammalia	Chiroptera	Rhinolophidae
<i>Mustela putorius furo</i>	XP_004776779.1	59.574	472	Animalia	Chordata	Mammalia	Carnivora	Mustelidae
<i>Myotis lucifugus</i>	XP_023615033.1	61.064	477	Animalia	Chordata	Mammalia	Chiroptera	Vespertilionidae
<i>Ailuropoda melanoleuca</i>	XP_034510167.1	59.787	472	Animalia	Chordata	Mammalia	Carnivora	Ursidae
<i>Canis lupus familiaris</i>	XP_005630863.2	60.000	502	Animalia	Chordata	Mammalia	Carnivora	Canidae

Phylum: Chordata								
Class: Mammalia								
<i>Felis catus</i>	XP_019693399.1	60.213	500	Animalia	Chordata	Mammalia	Carnivora	Felidae
<i>Loxodonta africana</i>	XP_010587740.1	62.128	472	Animalia	Chordata	Mammalia	Proboscidea	Elephantidae
<i>Oryctolagus cuniculus</i>	XP_008262672.1	60.000	472	Animalia	Chordata	Mammalia	Lagomorpha Perissodactyla	Leporidae
<i>Equus caballus</i>	XP_023496950.1	61.064	472	Animalia	Chordata	Mammalia		Equidae
<i>Bos taurus</i>	NP_001039513.1	60.000	472	Animalia	Chordata	Mammalia	Artiodactyla	Bovidae
<i>Sus scrofa</i>	XP_020945522.1	59.044	506	Animalia	Chordata	Mammalia	Artiodactyla	Suidae
<i>Ictidomys tridecemlineatus</i>	XP_005331271.1	61.489	472	Animalia	Chordata	Mammalia	Rodentia	Sciuridae
<i>Cavia porcellus</i>	XP_003478942.2	61.373	471	Animalia	Chordata	Mammalia	Rodentia	Caviidae
<i>Heterocephalus glaber</i>	XP_004854049.1	59.362	471	Animalia	Chordata	Mammalia	Rodentia	Bathyergidae
<i>Mus musculus</i>	NP_033176.2	60.213	472	Animalia	Chordata	Mammalia	Rodentia	Muridae
<i>Rattus norvegicus</i>	NP_001316822.1	61.702	472	Animalia	Chordata	Mammalia	Rodentia	
<i>Monodelphis domestica</i>	XP_007485480.1	59.787	471	Animalia	Chordata	Mammalia	Didelphimorp hia	Didelphidae
<i>Sarcophilus harrisii</i>	XP_031823380.1	60.127	511	Animalia	Chordata	Mammalia	Dasyuomorp hia	Dasyuridae
Class: Reptilia								
<i>Pelodiscus sinensis</i>	XP_006114005.1	55.745	472	Animalia	Chordota	Reptilia	Testudines	
<i>Gallus gallus</i>	NP_001264739.1	58.723	471	Animalia	Chordata	Aves	Galliformes	Phasianidae
<i>Taeniopygia guttata</i>	XP_041577115.1	60.000	509	Animalia	Chordata	Aves	Passeriformes	Estrildidae
<i>Molothrus ater</i>	XP_036254012.1	60.169	472	Animalia	Chordata	Aves	Passeriformes	Icteridae
Class: Actinopterygii								
<i>Oryzias latipes</i>	XP_023820002.1	60.638	472	Animalia	Chordata	Teleostei	Beloniformes	Adrianichthyidae
<i>Oreochromis niloticus</i>	XP_019220298.1	57.637	484	Animalia	Chordata	Teleostei	Perciformes Salmoniforme s	Cichlidae
<i>Salmo salar</i>	XP_014006033.2	58.936	473	Animalia	Chordata	Teleostei		Salmonidae
<i>Danio rerio</i>	XP_005158264.1	58.599	473	Animalia	Chordata	Teleostei	Cypriniformes	Cyprinidae
Class: Cephalochordata								
<i>Branchiostoma floridae</i>	XP_035657836.1	56.364	493	Animalia	Chordata	Leptocardii	Amphioxiform es	Branchiostomatidae
<i>Scyliorhinus canicula</i>	XP_038643176.1	60.426	517	Animalia	Chordata	Chondrichthe s	Carcharhinifor mes	Scyliorhinidae
<i>Carcharodon carcharias</i>	XP_041037600.1	59.574	472	Animalia	Chordata	Chondrichthe s	Lamniformes	Lamnidae
<i>Amblyraja radiata</i>	XP_032871739.1	58.298	473	Animalia	Chordata	Chondrichthe s	Rajiformes	Rajidae
<i>Callorhinchus milii</i>	NP_001279677.1	59.787	472	Animalia	Chordata	Chondrichthe s	Chimaeroifor mes	Callorhinchidae
Class: Anura								
<i>Xenopus tropicalis</i>	NP_001016750.1	61.064	472	Animalia	Chordata	Amphibia	Anura	Pipidae
<i>Xenopus laevis</i>	NP_001089396.1	61.489	472	Animalia	Chordata	Amphibia	Anura	Pipidae
<i>Rana temporaria</i>	XP_040189352.1	58.936	472	Animalia	Chordata	Amphibia	Anura	Ranidae
<i>Bufo gargarizans</i>	XP_044131996.1	59.236	473	Animalia	Chordata	Amphibia	Anura	Bufonidae
Phylum: Cnidaria								
<i>Acropora millepora</i>	XP_029189081.2	61.684	472	Animalia	Cnidaria	Anthozoa	Scleractinia	Scleractinia
<i>Pocillopora damicornis</i>	XP_027046902.1	59.667	474	Animalia	Cnidaria	Anthozoa	Scleractinia	Pocilloporidae

<i>Stylophora pistillata</i>	XP_022797692.1	59.875	474	Animalia	Cnidaria	Anthozoa	Scleractinia	Pocilloporidae
<i>Nematostella vectensis</i>	XP_032238128.1	58.051	484	Animalia	Cnidaria	Anthozoa	Actiniaria	Edwardsiidae
<i>Actinia tenebrosa</i>	XP_031566459.1	58.475	480	Animalia	Cnidaria	Anthozoa	Actiniaria	Actiniidae
<i>Exaiptasia diaphana</i>	XP_020898889.1	57.203	480	Animalia	Cnidaria	Anthozoa	Actiniaria	Aiptasiidae
<i>Amphimedon queenslandica</i>	XP_019849180.1	60.169	475	Animalia	Porifera	Demospongiae	Haplosclerida	Niphatidae
<i>Caenorhabditis elegans</i>	NP_001255777.1	48.408	471	Animalia	Nematoda	Chromadorea	Rhabditida	Rhabditidae
<i>Strongyloides ratti</i>	XP_024502420.1	44.075	474	Animalia	Nematoda	Chromadorea	Rhabditida	Strongyloididae
<i>Arabidopsis thaliana</i>	NP_001190723.1	100.000	490	Plantae	Streptophyta	Magnoliopsida	Brassicales	Brassicaceae
<i>Eutrema salsugineum</i>	XP_006414821.1	92.653	487	Plantae	Streptophyta	Magnoliopsida	Brassicales	Brassicaceae
<i>Arabidopsis thaliana</i>	NP_193140.1	88.776	487	Plantae	Streptophyta	Magnoliopsida	Brassicales	Brassicaceae
<i>Eutrema salsugineum</i>	XP_006414820.1	87.347	487	Plantae	Streptophyta	Magnoliopsida	Brassicales	Brassicaceae
<i>Arabidopsis thaliana</i>	NP_189022.1	80.000	480	Plantae	Streptophyta	Magnoliopsida	Brassicales	Brassicaceae
<i>Eutrema salsugineum</i>	XP_006418837.1	78.333	478	Plantae	Streptophyta	Magnoliopsida	Brassicales	Brassicaceae
<i>Medicago truncatula</i>	XP_003601694.1	79.668	488	Plantae	Streptophyta	Magnoliopsida	Fabales	Fabaceae
<i>Glycine max</i>	XP_003552370.1	80.084	484	Plantae	Streptophyta	Magnoliopsida	Fabales	Fabaceae
<i>Lotus japonicus</i>	Q93VA1	79.873	487	Plantae	Streptophyta	Magnoliopsida	Malpighiales	Euphorbiaceae
<i>Glycine max</i>	XP_003531213.1	78.038	484	Plantae	Streptophyta	Magnoliopsida	Fabales	Fabaceae
<i>Glycine max</i>	XP_003524921.1	75.975	488	Plantae	Tracheophyta	Magnoliopsida	Fabales	Fabaceae
<i>Prunus persica</i>	XP_007221280.1	78.659	491	Plantae	Tracheophyta	Magnoliopsida	Rosales	Rosaceae
<i>Ricinus communis</i>	XP_002520613.1	79.574	475	Plantae	Tracheophyta	Magnoliopsida	Malpighiales	Euphorbiaceae
<i>Punica granatum</i>	XP_031405541.1	77.917	479	Plantae	Streptophyta	Magnoliopsida	Myrtales	Lythraceae
<i>Hordeum vulgare</i>	KAE8800473.1	75.751	498	Plantae	Tracheophyta	Liliopsida	Poales	Poaceae
<i>Triticum aestivum</i>	KAF7025350.1	74.895	494	Plantae	Tracheophyta	Liliopsida	Poales	Poaceae
<i>Triticum aestivum</i>	KAF7039369.1	74.788	494	Plantae	Tracheophyta	Liliopsida	Poales	Poaceae
<i>Triticum aestivum</i>	KAF7032295.1	74.686	494	Plantae	Tracheophyta	Liliopsida	Poales	Poaceae
<i>Oryza sativa subsp. japonica</i>	XP_015621286.1	76.445	482	Plantae	Tracheophyta	Liliopsida	Poales	Poaceae
<i>Zea mays</i>	NP_001131338.2	76.000	493	Plantae	Tracheophyta	Liliopsida	Poales	Poaceae

<i>Theobroma cacao</i>	A0A061EKF5	80.632	476	Plantae	Tracheophyta	Magnoliopsida	Malvales	Malvaceae
<i>Citrus clementina</i>	XP_006421033.1	77.143	487	Plantae	Tracheophyta	Magnoliopsida	Sapindales	Rutaceae
<i>Selaginella moellendorffii</i>	XP_002987612.1	71.338	477	Plantae	Tracheophyta	Lycopodiopsida	Selaginellales	Selaginellaceae
<i>Selaginella moellendorffii</i>	XP_002983337.2	70.913	570	Plantae	Tracheophyta	Lycopodiopsida	Selaginellales	Selaginellaceae
<i>Physcomitrium patens</i>	XP_024388851.1	71.548	495	Plantae	Bryophyta	Bryopsida	Funariales	Funariaceae
<i>Chlamydomonas reinhardtii</i>	XP_001703358.1	55.625	477	Plantae	Chlorophyta	Chlorophyceae	Volvocales	Chlamydomonadaceae
<i>Geminicoccus roseus</i>	WP_027132785.1	56.383	457	Bacteria	Proteobacteria	Alphaproteobacteria	Geminoccales	Geminicoccaceae
<i>Aurantimonas coralicida</i>	WP_228241075.1	54.255	454	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobias	Phizobiaceae
<i>Paracoccus seriniphilus</i>	WP_089345033.1	53.125	454	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae
<i>Sulfitobacter brevis</i>	WP_093924074.1	54.043	454	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae
<i>Pseudaestuariivita atlantica</i>	WP_050531472.1	53.191	449	Bacteria	Proteobacteria	Alphaproteobacteria		Rhodobacteraceae
<i>Mesorhizobium amorphae</i>	WP_006201402.1	52.766	451	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobias	Phizobiaceae
<i>Candidatus Rhodobacter lobularis</i>	WP_049644243.1	53.830	448	Bacteria				
<i>Ruegeria pomeroyi</i>	WP_011048093.1	53.830	449	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae
<i>Thalassobium sp. R2A62</i>	WP_009158083.1	52.340	452	Bacteria				
<i>Octadecabacter arcticus</i>	WP_015494695.1	52.229	452	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae
<i>Tolypothrix bouiteillei</i>	WP_038086674.1	58.351	450	Bacteria	Cyanobacteria	Cyanobacteriales	Cyanobacteriales	Nostocaceae
<i>Microseira wollei</i>	WP_226587261.1	57.928	450	Bacteria	Cyanobacteria	Cyanobacteriales	Cyanobacteriales	Oscillatoriaceae
<i>Hassallia byssoidea</i>	WP_039740169.1	57.505	450	Bacteria	Cyanobacteria	Cyanobacteriales	Cyanobacteriales	Nostocaceae
<i>Chroococcidiopsis cubana</i>	WP_106168649.1	57.872	451	Bacteria	Cyanobacteria	Cyanobacteriales	Cyanobacteriales	Chroococcidiopsidae
<i>Gloeocapsopsis dulcis</i>	WP_105219090.1	58.774	457	Bacteria	Cyanobacteria	Cyanobacteriales	Cyanobacteriales	Chroococcidiopsidae
<i>Ktedonosporobacter rubrisoli</i>	WP_129889517.1	56.838	456	Bacteria	Chloroflexi	Ktenobacteria	Ktenobacteriales	Ktenobacteraceae
<i>Dictyobacter formicarum</i>	WP_201362033.1	56.559	453	Bacteria	Chloroflexi	Ktenobacteria	Ktenobacteriales	Ktenobacteraceae
<i>Reticulibacter mediterranei</i>	WP_220210928.1	55.484	459	Bacteria	Chloroflexi	Ktenobacteria	Ktenobacteriales	Ktenobacteraceae
<i>Galdieria sulphuraria</i>	XP_005706028.1	52.155	451	Plantae	Rhodophyta	Cyanidiophyceae	Cyanidiales	Galdieriaceae

<i>Mariniblastus fucicola</i>	WP_084417348.1	52.866	478	Bacteria	Planctomy cetota	Planctomycetes	Pirellulales	Pirellulaceae
<i>Lignipirellula cremea</i>	WP_145056384.1	51.919	480	Bacteria	Planctomy cetota	Planctomycetes	Pirellulales	Pirellulaceae
<i>Bythopirellula goksoyrii</i>	WP_210417703.1	50.847	481	Bacteria	Planctomy cetota	Planctomycetes	Pirellulales	Pirellulaceae
<i>Bythopirellula polymerisocia</i>	WP_146447520.1	49.372	476	Bacteria	Planctomy cetota	Planctomycetes	Pirellulales	Pirellulaceae
<i>Gemmata massiliana</i>	WP_162666735.1	54.968	473	Bacteria	Planctomy cetota	Planctomycetes	Gemmatales	Gemmataceae
<i>Gemmata palustris</i>	WP_210660059.1	54.184	475	Bacteria	Planctomy cetota	Planctomycetes	Gemmatales	Gemmataceae
<i>Thermogemmata fonticola</i>	WP_194536478.1	49.478	493	Bacteria	Planctomy cetota	Planctomycetes	Gemmatales	Gemmataceae
<i>Haloferax mediterranei</i>	WP_004056264.1	46.352	464	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Haloferacaceae
<i>Halogeometricum borinquense</i>	WP_006057024.1	45.161	463	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Natronorubrum sulfidifaciens</i>	WP_008162880.1	46.022	467	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Natronococcus amylolyticus</i>	WP_005555130.1	48.712	466	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Natronorubrum bangense</i>	WP_006065239.1	47.845	467	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Haloterrigena turkmenica</i>	WP_012944756.1	47.537	465	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Haloarcula marismortui</i>	WP_011224072.1	48.498	463	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Haloterrigena turkmenica</i>	WP_012945293.1	48.932	462	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Haladaptatus paucihalophilus</i>	WP_018128659.1	49.571	466	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Halococcus hamelinensis</i>	WP_007693083.1	48.333	463	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Halogranum salarium</i>	WP_009374922.1	47.537	472	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Natronococcus amylolyticus</i>	WP_049892000.1	45.203	469	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Halorubrum aidingense</i>	WP_007997729.1	46.581	466	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Natronorubrum bangense</i>	WP_006065829.1	46.581	466	Archaea	Euryarchaeota	Halobacteria	Halobacteriales	Halobacteriaceae
<i>Thermobaculum terrenum</i>	WP_012875254.1	48.380	446	Bacteria	Chloroflexi	Chloroflexia	Thermomicrobiales	Thermomicrobiaceae
<i>Sulfurisphaera tokodaii</i>	WP_010977998.1	37.632	457	Archaea	Thermoproteota	Thermoproteia	Sulfolobales	Sulfolobaceae
<i>Edaphobacter modestus</i>	WP_130420317.1	38.397	457	Bacteria	Acidobacteria	Vicinamibacteria	Acidobacteriales	Acidobacteriaceae
<i>Luteitalea pratensis</i>	WP_110168895.1	36.952	462	Bacteria	Acidobacteria		Acidobacteriales	Vicinamibacteraceae
<i>Granulicella sp. dw_53</i>	WP_213804695.1	38.316	457	Bacteria	Acidobacteria			Acidobacteriaceae

<i>Lasiodiplodia theobromae</i>	XP_035371643.1	36.122	470	Fungi	Ascomycota	Dothideomycetes	Botryosphaeriales	Botryosphaeriaceae
<i>Diplodia corticola</i>	XP_020132237.1	33.398	563	Fungi	Ascomycota	Dothideomycetes	Botryosphaeriales	Botryosphaeriaceae
<i>Rhinocladiella mackenziei</i> CBS 650.93	XP_013272585.1	35.908	459	Fungi	Ascomycota	Eurotiomycetes	Chaetothyriales	Herpotrichiellaceae
<i>Fonsecaea multimorphosa</i> CBS 102226	XP_016629787.1	34.855	458	Fungi	Ascomycota	Eurotiomycetes	Chaetothyriales	Herpotrichiellaceae
<i>Fonsecaea erecta</i>	XP_018694030.1	35.983	458	Fungi	Ascomycota	Eurotiomycetes	Chaetothyriales	Herpotrichiellaceae
<i>Exophiala aquamarina</i> CBS 119918	XP_013254020.1	35.095	460	Fungi	Ascomycota	Eurotiomycetes	Chaetothyriales	Herpotrichiellaceae
<i>Kocuria</i> sp. cx-455	WP_190807968.1	35.685	462	Bacteria	Acidobacteria		Acidobacteriales	Micrococcaceae
<i>Hyphomicrobium</i> sp	A0A291P0C1.1	23.400	416	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	

Table S2: Presence of SBPs characteristic motifs of the representatives used for the construction of the phylogenetic tree.

Accession No.	Species	CxxC	CC	GDEL	HH	GWN	CSSC	HxD	HxxHC	W	HxD	C
XP_004026685.1	<i>Gorilla gorilla gorilla</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_009242677.1	<i>Pongo abelii</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_030680407.1	<i>Nomascus leucogenys</i>	+	-	KDEL	+	+	+	-	+	+	+	+
NP_003935.2	<i>Homo sapiens</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_015007568.1	<i>Macaca mulatta</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_002759958.1	<i>Callithrix jacchus</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_032949704.1	<i>Rhinolophus ferrumequinum</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_004776779.1	<i>Mustela putorius furo</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_023615033.1	<i>Myotis lucifugus</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_034510167.1	<i>Ailuropoda melanoleuca</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_005630863.2	<i>Canis lupus familiaris</i>	+	-	RDEL	+	+	+	-	+	+	+	+
XP_019693399.1	<i>Felis catus</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_010587740.1	<i>Loxodonta africana</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_008262672.1	<i>Oryctolagus cuniculus</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_023496950.1	<i>Equus caballus</i>	+	-	KDEL	+	+	+	-	+	+	+	+
NP_001039513.1	<i>Bos taurus</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_020945522.1	<i>Sus scrofa</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_005331271.1	<i>Ictidomys tridecemlineatus</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_003478942.2	<i>Cavia porcellus</i>	-	-	KDEL	+	+	+	-	+	+	+	+
XP_004854049.1	<i>Heterocephalus glaber</i>	-	-	KDEL	+	+	+	-	+	+	+	+
NP_033176.2	<i>Mus musculus</i>	+	-	KDEL	+	+	+	-	+	+	+	+
NP_001316822.1	<i>Rattus norvegicus</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_007485480.1	<i>Monodelphis domestica</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_031823380.1	<i>Sarcophilus harrisii</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_006114005.1	<i>Pelodiscus sinensis</i>	+	-	RDEL	+	+	CSSS	-	+	+	+	+
NP_001264739.1	<i>Gallus gallus</i>	+	-	KDEL	+	+	+	-	+	+	+	-
XP_041577115.1	<i>Taeniopygia guttata</i>	+	-	GDEL	+	+	+	+	+	+	+	+
XP_036254012.1	<i>Molothrus ater</i>	+	-	GDEL	+	+	+	+	+	+	+	+
XP_023820002.1	<i>Oryzias latipes</i>	+	-	RDEL	+	+	+	-	+	+	+	+
XP_019220298.1	<i>Oreochromis niloticus</i>	+	-	RDEL	+	+	+	-	+	+	+	+
XP_014006033.2	<i>Salmo salar</i>	+	-	NDEL	+	+	+	-	+	+	+	+

XP_005158264.1	<i>Danio rerio</i>	+	-	KDEL	+	+	+	-	+	+	+	+
XP_035657836.1	<i>Branchiostoma floridae</i>	-	+	KDEL	+	+	+	-	+	+	+	+
XP_038643176.1	<i>Scyliorhinus canicula</i>	+	-	NDEL	+	+	+	+	+	+	+	+
XP_041037600.1	<i>Carcharodon carcharias</i>	-	-	KDEL	+	+	+	+	+	+	-	+
XP_032871739.1	<i>Amblyraja radiata</i>	+	-	NDEL	+	+	+	-	+	+	+	+
NP_001279677.1	<i>Callorhinchus milii</i>	+	-	GDEL	+	+	+	+	+	+	+	+
NP_001016750.1	<i>Xenopus tropicalis</i>	+	-	NDEL	+	+	+	-	+	+	+	+
NP_001089396.1	<i>Xenopus laevis</i>	+	-	NDEL	+	+	+	-	+	+	+	+
XP_040189352.1	<i>Rana temporaria</i>	+	-	NDEL	+	+	+	-	+	+	+	+
XP_044131996.1	<i>Bufo gargarizans</i>	CRSSC	-	DDEL	+	+	+	-	+	+	+	+
XP_029189081.2	<i>Acropora millepora</i>	-	+	GDEL	+	+	+	-	+	+	+	+
XP_027046902.1	<i>Pocillopora damicornis</i>	CxC		GDEL	+	+	+	-	+	+	+	+
XP_022797692.1	<i>Stylophora pistillata</i>	CxC		GDEL	+	+	+	-	+	+	+	+
XP_032238128.1	<i>Nematostella vectensis</i>	CxC	-	GDEL	+	+	+	-	+	+	-	+
XP_031566459.1	<i>Actinia tenebrosa</i>	-	-	GDEL	+	+	+	-	+	+	-	+
XP_020898889.1	<i>Exaiptasia diaphana</i>	-	-	GDEL	+	+	+	-	+	+	-	+
XP_019849180.1	<i>Amphimedon queenslandica</i>	-	+	EDEI	+	+	+	-	+	+	+	+
NP_001255777.1	<i>Caenorhabditis elegans</i>	CXXXC	-	GDEV	+	+	+	-	+	+	+	+
XP_024502420.1	<i>Strongyloides ratti</i>	-	+	NDEV	+	+	+	-	+	+	+	+
NP_001190723.1	<i>Arabidopsis thaliana</i>	-	+	GDEL	+	+	+	+	+	+	+	+
XP_006414821.1	<i>Eutrema salsugineum</i>	-	+	GDEL	+	+	+	+	+	+	+	+
NP_193140.1	<i>Arabidopsis thaliana</i>	-	+	GDEL	+	+	+	+	+	+	+	+
XP_006414820.1	<i>Eutrema salsugineum</i>	-	+	GDEL	+	+	+	+	+	+	+	+
NP_189022.1	<i>Arabidopsis thaliana</i>	-	+	EDEL	+	+	+	-	+	+	+	+
XP_006418837.1	<i>Eutrema salsugineum</i>	-	+	GDEL	+	+	+	-	+	+	+	+
XP_003601694.1	<i>Medicago truncatula</i>	-	+	GDEL	+	+	+	+	+	+	+	+
XP_003552370.1	<i>Glycine max</i>	-	+	GDEL	+	+	+	+	+	+	+	+
Q93VA1	<i>Lotus japonicus</i>	-	+	GDEL	+	+	+	+	+	+	+	+
XP_003531213.1	<i>Glycine max</i>	-	-	GDEL	+	+	+	-	+	+	+	+
XP_003524921.1	<i>Glycine max</i>	-	-	GDEL	+	+	+	-	+	+	+	+
XP_007221280.1	<i>Prunus persica</i>	-	+	GDEL	+	+	+	-	+	+	+	+
XP_002520613.1	<i>Ricinus communis</i>	-	+	GDEL	+	+	+	+	+	+	+	+
XP_031405541.1	<i>Punica granatum</i>	-	+	GDEL	+	+	+	+	+	+	+	+

KAE8800473.1	<i>Hordeum vulgare</i>	-	+	GDEL	+	+	+	+	+	+	+	+
KAF7025350.1	<i>Triticum aestivum</i>	-	+	GDEL	+	+	+	+	+	+	+	+
KAF7039369.1	<i>Triticum aestivum</i>	-	+	GDEL	+	+	+	+	+	+	+	+
KAF7032295.1	<i>Triticum aestivum</i>	-	+	GDEL	+	+	+	+	+	+	+	+
XP_015621286.1	<i>Oryza sativa subsp. japonica</i>	-	+	GDEL	+	+	+	+	+	+	+	+
NP_001131338.2	<i>Zea mays</i>	-	+	GDEL	+	+	+	+	+	+	+	+
A0A061EKF5	<i>Theobroma cacao</i>	-	+	GDEL	+	+	+	+	+	+	+	+
XP_006421033.1	<i>Citrus clementina</i>	-	+	GDEL	+	+	+	-	+	+	+	+
XP_002987612.1	<i>Selaginella moellendorffii</i>	-	+	GDEL	+	+	+	-	+	+	+	+
XP_002983337.2	<i>Selaginella moellendorffii</i>	-	+	DDEL	+	+	+	-	+	+	+	+
XP_024388851.1	<i>Physcomitrium patens</i>	-	+	DDEI	+	+	+	+	+	+	+	+
XP_001703358.1	<i>Chlamydomonas reinhardtii</i>	-	+	GDEL	+	+	+	+	+	+	RGD	+
WP_027132785.1	<i>Geminicoccus roseus</i>	-	+	GDEL	+	+	+	+	+	+	+	+
WP_228241075.1	<i>Aurantimonas coralicida</i>	-	+	GDEL	+	+	+	-	+	+	+	+
WP_089345033.1	<i>Paracoccus seriniphilus</i>	-	+	GDEL	+	+	+	-	+	+	+	+
WP_093924074.1	<i>Sulfitobacter brevis</i>	-	+	GDEL	+	+	+	-	+	+	+	+
WP_050531472.1	<i>Pseudaestuariaivita atlantica</i>	-	+	GDEL	+	+	+	-	+	+	+	-
WP_006201402.1	<i>Mesorhizobium amorphae</i>	-	+	GDEL	+	+	+	+	+	+	+	+
WP_049644243.1	<i>Candidatus Rhodobacter lobularis</i>	-	+	GDEL	+	+	+	+	+	+	+	+
WP_011048093.1	<i>Ruegeria pomeroyi</i>	-	+	GDEL	+	+	+	+	+	+	+	+
WP_009158083.1	<i>Thalassobium sp. R2A62</i>	-	+	GDEL	+	+	+	+	+	+	+	+
WP_015494695.1	<i>Octadecabacter arcticus</i>	-	+	GDEL	+	+	+	+	+	+	+	+
WP_038086674.1	<i>Tolypothrix bouteillei</i>		+	GDEL	+	+	+	+	+	+	+	-
WP_226587261.1	<i>Microseira wollei</i>		+	GDEL	+	+	+	+	+	+	+	+
WP_039740169.1	<i>Hassallia byssoidea</i>		+	GDEL	+	+	+	+	+	+	+	+
WP_106168649.1	<i>Chroococcidiopsis cubana</i>		+	GDEL	+	+	+	+	+	+	+	+
WP_105219090.1	<i>Gloeocapsopsis dulcis</i>		+	GDEL	+	+	+	+	+	+	+	+
WP_129889517.1	<i>Ktedonosporobacter rubrisoli</i>	-	-	GDEL	+	+	+	+	+	+	+	+
WP_201362033.1	<i>Dictyobacter formicarum</i>	-	-	GDEL	+	+	+	+	+	+	+	+

WP_220210928.1	<i>Reticulibacter mediterranei</i>	-	-	GDEL	+	+	+	-	+	+	+	+
WP_012875254.1	<i>Thermobaculum terrenum</i>	-	-	GDEL	+	-	CSSSAC	-	+	+	+	+
XP_005706028.1	<i>Galdieria sulphuraria</i>	-	-	GDEL	+	+	CCSS	-	+	+	+	+
WP_084417348.1	<i>Mariniblastus fucicola</i>	-	+	GDEL	+	+	+	-	+	+	+	+
WP_145056384.1	<i>Lignipirellula crenea</i>	-	+	GDEL	+	+	+	-	+	+	+	-
WP_210417703.1	<i>Bythopirellula goksoyrii</i>	-	-	GDEL	+	+	+	-	+	+	+	-
WP_146447520.1	<i>Bythopirellula polymerisocia</i>	-	-	GDEL	+	+	+	-	+	+	+	+
WP_162666735.1	<i>Gemmata massiliana</i>	-	-	GDEL	+	+	+	-	+	+	HGE	+
WP_210660059.1	<i>Gemmata palustris</i>	-	-	GDEL	+	+	+	-	+	+	HGE	+
WP_194536478.1	<i>Thermogemmata fonticola</i>	-	-	GDEL	+	+	+	-	+	+	HGR	+
WP_004056264.1	<i>Haloferax mediterranei</i>	-	-	GDEL	+	+	CSSSC	-	+	+	HGE	+
WP_006057024.1	<i>Halogeometricum borinquense</i>	-	-	GDEL	+	+	CSSSC	-	+	+	HGE	+
WP_008162880.1	<i>Natronorubrum sulfidifaciens</i>	-	-	GDEL	+	+	CSSSC	-	+	+	HGE	+
WP_005555130.1	<i>Natronococcus amylolyticus</i>	-	-	GDEL	+	+	CSSSC	-	+	+	HGE	+
WP_006065239.1	<i>Natronorubrum bangense</i>	-	-	GDEL	+	+	CSSSC	-	+	+	HGE	+
WP_012944756.1	<i>Haloterrigena turkmenica</i>	-	-	GDEL	+	+	CSSSC	-	+	+	HGE	+
WP_011224072.1	<i>Haloarcula marismortui</i>	-	-	GDEL	+	+	CSSSC	-	+	+	HGE	+
WP_012945293.1	<i>Haloterrigena turkmenica</i>	-	-	GDEL	+	+	CSSSC	-	+	+	-	+
WP_018128659.1	<i>Haladaptatus paucihalophilus</i>	-	-	GDEL	+	+	CSSSC	-	+	+	+	+
WP_007693083.1	<i>Halococcus hamelinensis</i>	-	-	GDEL	+	+	CSSSC	-	+	+	+	+
WP_009374922.1	<i>Halogramum salarium</i>	-	-	GDEL	+	+	CSSSC	-	+	+	+	+
WP_049892000.1	<i>Natronococcus amylolyticus</i>	-	-	GDEL	+	+	CSSSC	-	+	+	HGN	+
WP_007997729.1	<i>Halorubrum aidingense</i>	-	-	GDEL	+	+	CSSSC	-	+	+	+	+
WP_006065829.1	<i>Natronorubrum bangense</i>	-	-	GDEL	+	+	CSSSC	-	+	+	+	+
WP_010977998.1	<i>Sulfurisphaera tokodaii</i>	-	-	NDEL	+	+	CSS	-	+	+	-	+
WP_130420317.1	<i>Edaphobacter modestus</i>	-	-	GDEL	+	+	CSS	-	+	+	-	+

WP_110168895.1	<i>Luteitalea pratensis</i>	-	-	GDEL	+	+	+	-	+	+	-	+
WP_213804695.1	<i>Granulicella sp.</i> <i>dw_53</i>	-	-	GDEL	+	+	CSS	-	+	+	-	+
WP_190807968.1	<i>Kocuria sp. cx-455</i>	-	-	PDEF	+	+	CSS	-	+	+	-	+
XP_035371643.1	<i>Lasiodiplodia theobromae</i>	-	-	GSEV	+	+	CSS	-	+	+	-	+
XP_020132237.1	<i>Diplodia corticola</i>	-	-	GSEV	+	+	CSS	-	+	+	-	+
XP_013272585.1	<i>Rhinocladiella mackenziei</i> CBS 650.93	-	-	GDEL	+	+	CSS	-	+	+	-	+
XP_016629787.1	<i>Fonsecaea multimorphosa</i> CBS 102226	-	-	DEL	+	+	CSS	-	+	+	-	+
XP_018694030.1	<i>Fonsecaea erecta</i>	-	-	GDEL	+	+	CSS	-	+	+	-	+
XP_013254020.1	<i>Exophiala aquamarina</i> CBS 119918	-	-	GQEL	+	+	CSS	-	+	+	-	+
A0A291P0C1.1	<i>Hyphomicrobium sp</i>	-	-	-	+	-	-	-	-	+	-	-

Figure S1: The phylogenetic tree was generated using MrBayes software and the bacterial MTO as outgroup. FigTree v1.4.4 (<http://tree.bio.ed.ac.uk/software/figtree/>) was used for this presentation. All the Bayesian bootstrap values ranged from 54-100%.



Figure S2: Frequency distributions for the reported SBP homologs: (top panel) - sequence identity to the query *A. thaliana* SBP at % level, (bottom panel) - length of protein sequence in amino acid residues.

