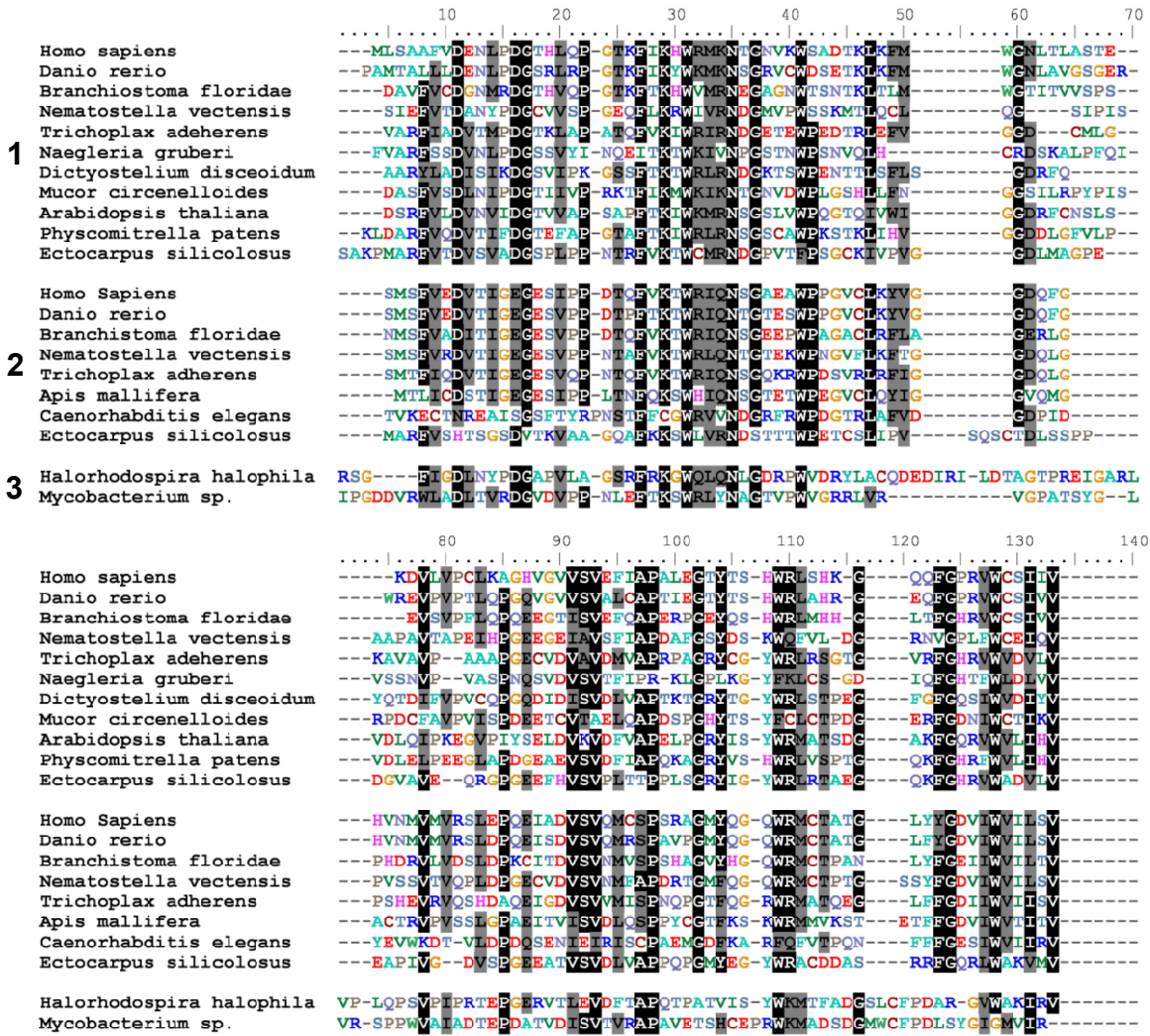
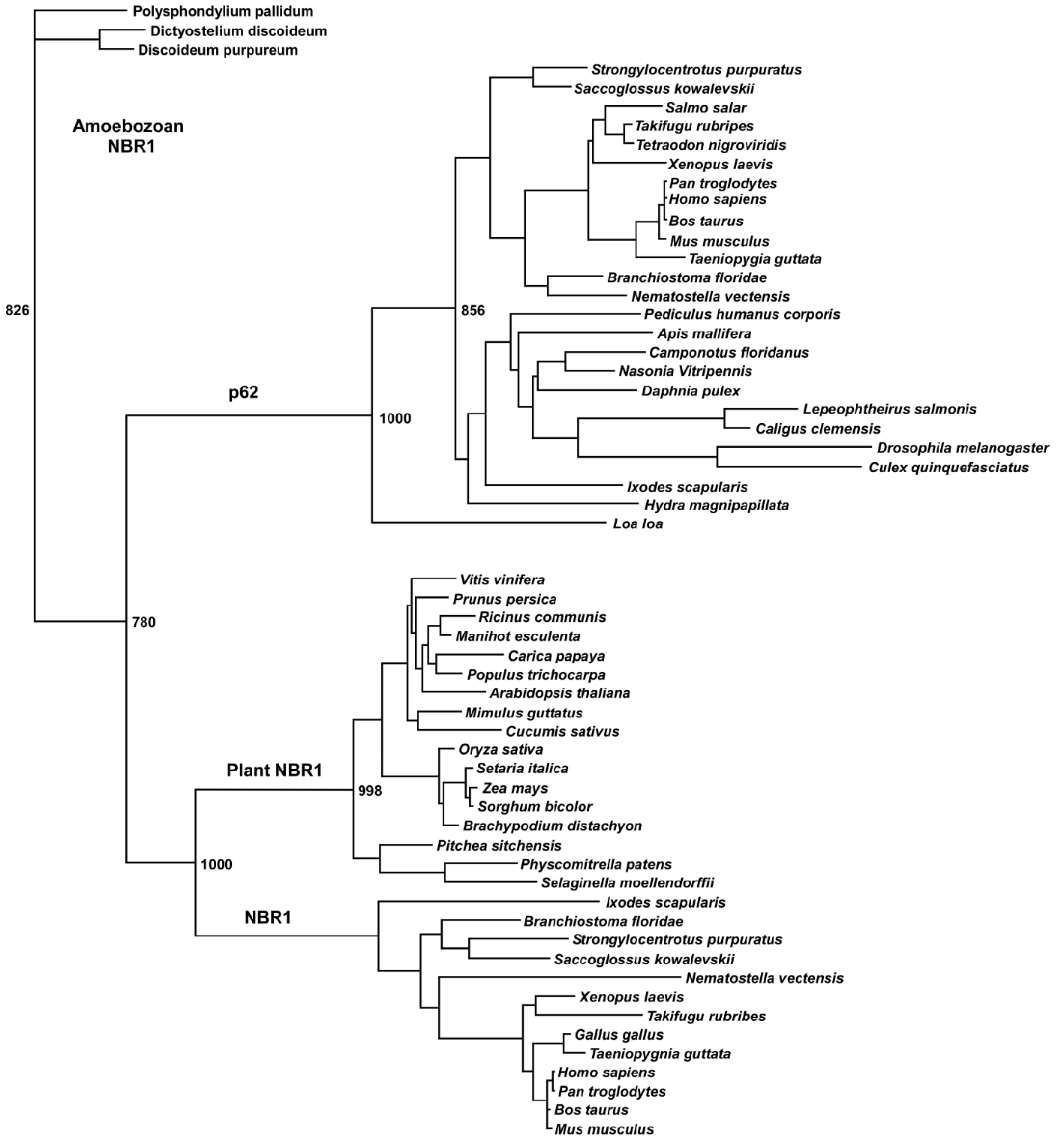


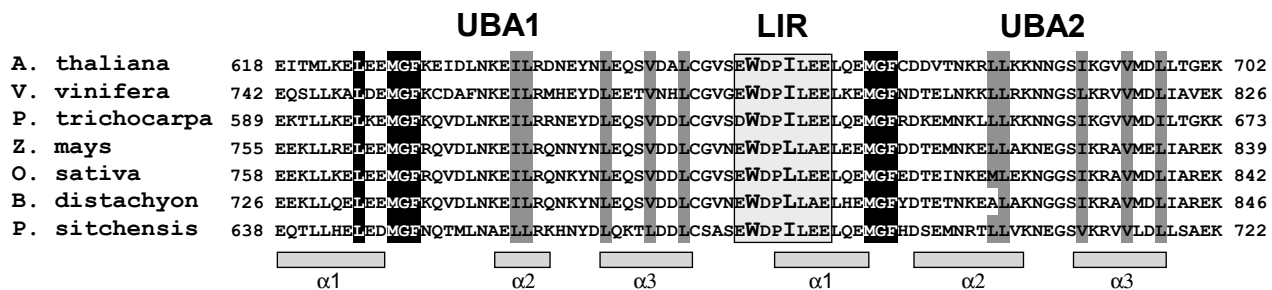
Supplemental Figure S1



Supplemental Figure S2



Supplemental Figure S3



Supplementary Figure 1. Multiple sequence alignment of FW domain sequences using ClustalW from (1) NBR1 homologs, (2) homologs of mammalian MGC4614, and (3) two bacterial proteins. The threshold for identity/similarity shading was set to 60%.

Supplementary Figure 2. Phylogenetic tree of NBR1- and p62 homologous amino acid sequences from metazoa, plants and amoebzoa constructed using the maximum likelihood method. The tree was produced using a Clustal W multiple alignment of conserved domains, PB1, ZZ, FW and UBA. Aligned sequences were analysed using phyML (maximum likelihood) with a bootstrap value of 1000. The tree has been rooted in the shared branch leading to amoebzoan homologs of NBR1. Essentially similar results were obtained when the FW domain sequences were excluded in the tree construction.

Supplementary Figure 3. Sequence alignment of the twin UBA domains and LIR of NBR1-homologs from higher plants. Conserved hydrophobic residues are indicated in grey for similar and black for identical residues. Grey boxes indicate the approximate localization of α -helices. The conserved LIR-motif is indicated.

Supplementary Table 1. Protein accession numbers for proteins used in Fig.1 and Supplemental Fig. S2.

Species	Homology	Accession number	Database
<i>Arabidopsis thaliana</i>	NBR1-like	Q9SB64	NCBI
<i>Apis mellifera</i>	p62-like	XP_392222.2	NCBI
<i>Brachypodium distachyon</i>	NBR1-like	Bradi3g47580.1	Phytozome
<i>Branchiostoma floridae</i>	NBR1-like	XP_002586952.1	NCBI
	p62-like	XP_002611408.1	NCBI
<i>Bos taurus</i>	NBR1-like	NP_001093837.1	NCBI
	p62-like	NP_788814.1	NCBI
<i>Caenorhabditis elegans</i>	p62-like	NP_502280.2	NCBI
<i>Caligus clemensi</i>	p62-like	ACO15675	NCBI
<i>Camponotus floridanus</i>	p62-like	EFN70930.1	NCBI
<i>Capsaspora owczarzaki</i>	NBR1-like	CAOG_01026	Origins of multicellularity
<i>Carica Papaya</i>	NBR1-like	evm.model.supercontig_159.27	Phytozome
<i>Ciona intestinalis</i>	NBR1-like	XP_002120066.1	NCBI
	p62-like	XP_002128445.1	NCBI
<i>Cryptococcus neoformans</i>	NBR1-like	XP_570947.1	NCBI
<i>Cucumis sativus</i>	NBR1-like	Cucsa.098760	Phytozome
<i>Culex quinquefasciatus</i>	p62-like	XP_001862557.1	NCBI
<i>Daphnia pulex</i>	p62-like	Dappu1 226413	JGI
<i>Dictyostelium discoideum</i>	NBR1-like	XP_646538.1	NCBI
<i>Discoideum purpureum</i>	NBR1-like	Dicpu1 91584	JGI
<i>Drosophila melanogaster</i>	p62-like	NP_476700.1	NCBI
<i>Ectocarpus siliculosus</i>	NBR1-like	CBJ31307.1	NCBI
<i>Gallus gallus</i>	NBR1-like	XP_418128.2	NCBI
	p62-like	XP_001233249.1	NCBI
<i>Homo sapiens</i>	NBR1	Q14596.3	NCBI
	p62-like	Q13501.1	NCBI
<i>Hydra magnipapillata</i>	p62-like	XP_002169119.1	NCBI
<i>Ixodes scapularis</i>	NBR1-like	XP_002413442.1	NCBI
	p62-like	XP_002433496.1	NCBI
<i>Lepeophtheirus salmonis</i>	p62-like	ACO12440.1	NCBI
<i>Loa Loa</i>	p62-like	EFO27080.1	NCBI
<i>Manihot esculenta</i>	NBR1-like	cassava4.1_002227m	Phytozome
<i>Mimulus guttatus</i>	NBR1-like	gene mgv1a001599m.g	Phytozome
<i>Monosiga brevicollis</i>	NBR1-like	XP_001742207.1	NCBI
<i>Mucor circinelloides</i>	NBR1-like	Mucci1 83756	JGI
<i>Mus musculus</i>	NBR1-like	CAM21031.1	NCBI
	p62-like	NP_035148.1	NCBI
<i>Nasonia vitripennis</i>	p62-like	XP_001608187.1	NCBI
<i>Naegleria gruberi</i>	p62-like (1)	XP_002682462.1	NCBI
	p62-like (2)	XP_002672654.1	NCBI
	NBR1-like	XP_002678176.1	NCBI
<i>Nematostella vectensis</i>	NBR1-like	XP_001634545.1	NCBI

	p62-like	XP_001639077.1	NCBI
<i>Oryza sativa</i>	NBR1-like	NP_001047302.1	NCBI
Pan troglodytes	NBR1-like	XP_001155284.1	NCBI
	p62-like	XP_518154.2	NCBI
<i>Pediculus humanis corporis</i>	p62-like	XP_002428257.1	NCBI
<i>Physcomitrella patens</i>	NBR1-like	XP_001765979.1	NCBI
<i>Phytophthora infestans</i>	NBR1-like	XP_002908994	NCBI
	p62-like	XP_002908993.1	NCBI
<i>Picea sitchensis</i>	NBR1-like	ACN39846.1	NCBI
<i>Polysphondylium pallidum</i>	NBR1-like	EFA82588.1	NCBI
<i>Populus triochoarpa</i>	NBR1-like	XP_002321635.1	NCBI
<i>Prunus persica</i>	NBR1-like	ppa001688m	Phytozome
<i>Ricinus communis</i>	NBR1-like	XP_002511320.1	NCBI
<i>Saccoglossus kowalevskii</i>	NBR1-like	XP_002736671.1	NCBI
	p62-like	XP_002737463.1	NCBI
<i>Salmo salar</i>	p62-like	NP_001133813.1	NCBI
<i>Selaginella moellendorffii</i>	NBR1-like	XP_002993381.1	NCBI
<i>Setaria italica</i>	NBR1-like	SiPROV002006m	Phytozome
<i>Sorghum bicolor</i>	NBR1-like	XP_002454107.1	NCBI
<i>Strongylocentrotus purpuratus</i>	NBR1-like	XP_791508.1	NCBI
	p62-like	XP_795534.1	NCBI
<i>Taeniopygia guttata</i>	p62-like	XP_002195682.1	NCBI
	NBR1-like	XP_002195327.1	NCBI
<i>Takifugu rubripes</i>	NBR1-like	e_gw2.41.45.1	JGI
	p62-like	ESTEXT_GW.C_7170008	JGI
<i>Tetradon nigroviridis</i>	p62-like	CAF90222.1	NCBI
<i>Thecamonas traherens</i>	NBR1-like	AMSG_01102	Origins of multicellularity
<i>Trichoplax adhaerens</i>	NBR1-like	XP_002110305.1	NCBI
	p62-like	XP_002114993.1	NCBI
<i>Triticum aestivum</i>	NBR1-like	ABB18390.1	NCBI
<i>Vitis vinifera</i>	NBR1-like	CBI14950.3	NCBI
<i>Xenopus laevis</i>	NBR1-like	NP_001079967.1	NCBI
	p62-like	NP_001079920.1	NCBI
<i>Zea mays</i>	NBR1-like	ACN33320.1	NCBI