

**Supplementary Table 13: GO profiling of non-essential orthologous pairs in fission yeast and budding yeast**

GO ID	GO term	Corrected <i>P</i> -value	Non-essential pair gene annotation	Total gene annotation
<b>1. DNA damage</b>				
GO:0006281	DNA repair	0.0001	68	147
GO:0006974	response to DNA damage stimulus	0.0027	87	215
<b>2. Golgi/ER related processes</b>				
GO:0006623	protein targeting to vacuole	7.35e-10	36	47
GO:0016197	endosome transport	1.81e-09	40	56
GO:0007034	vacuolar transport	1.20e-08	54	90
GO:0045324	late endosome to vacuole transport	7.73e-05	25	36
GO:0046907	intracellular transport	0.0006	185	521
GO:0016192	vesicle-mediated transport	0.0012	107	273
GO:0032511	late endosome to vacuole transport via multivesicular body sorting pathway	0.0027	15	19
GO:0043328	protein targeting to vacuole during ubiquitin-dependent protein catabolic process via the MVB pathway	0.0003	13	14
<b>3. Catabolic processes</b>				
GO:0043162	ubiquitin-dependent protein catabolic process via the multivesicular body pathway	4.87e-05	16	18
GO:0009056	catabolic process	0.0005	173	480
GO:0043285	biopolymer catabolic process	0.0010	112	288
GO:0044248	cellular catabolic process	0.0014	169	474
<b>4. Miscellaneous</b>				
GO:0006119	oxidative phosphorylation	0.0037	21	32
GO:0043412	biopolymer modification	9.51e-05	232	666
GO:0006400	tRNA modification	0.0008	33	58

Fission yeast annotations are used. The number of non-essential orthologous pairs is 1,312 and the total number of genes is 4,836.