

Additional File 4. Centromeres

In *A. adenivorans*, a conspicuous GC bias is observed once per chromosome defining ~6 kb GC-troughs, with a GC-content of 31-33% vs. 48% for the whole genome (Fig. S4A). These troughs contain large stretches of polyA (~50 residues or more), are gene-free but not associated to inverted repeats or transposons. They resemble those found in *Y. lipolytica* CEN regions (Fig. S4B), even so gene-neighborhood around these regions is not conserved between the two species. A search on the 6 kb putative CEN regions identified a degenerate motif (NTTCCNATTNNGGNA) present once or twice in each putative CEN region and distantly related to the *Y. lipolytica* CEN consensus (TTTCCNAATTNNGGAAA), see Fig. S4C. Although conserved motifs were thus predicted in these putative CENs, contrary to regional CENs, no match was found in the *A. adenivorans* genome for the 11 proteins that were defined as specific of species having point centromeres (Table S4). Matches were however predicted for two genes, which are absent from the genomes of yeasts species having point centromeres: *SIM4* of *S. pombe* (ARAD1A14256g) and *FTA3* of *A. nidulans* (ARAD1D46310g). Taken together, these results confirm that regional centromeres are ancestral in hemiascomycetes and suggest in addition that they evolved following different paths in pre-CTG, CTG and post-CTG clades.

Figure S4A Putative CEN regions in *A. adenivorans*.

The mean GC content (left axis) along each chromosome (window size: 2,000 nt) is depicted: conspicuous GC troughs are proposed as centromeric regions.

Figure S4B Centromeric regions are gene-free in *Y. lipolytica* and *A. adenivorans*.

Chromosomal regions predicted (*A. adenivorans*, left panels) or known (*Y. lipolytica*, right panels) are compared for CDS distribution (blue arrows), presence of repeats (dark blue arrows) and variation in GC content (wavy line on top of each panel, GC content with a 2.5 SD cutoff; Window size: 2000 nt). The position of the *Y. lipolytica* CEN sequences was defined by a functional test^{7,8} and is indicated by green arrows as well as the position of the 16 bp consensus.

Figure S4C Conserved motifs in the centromeric regions in *Y. lipolytica* and *A. adenivorans*.

The *Y. lipolytica* consensus (right) was derived from the 10 bp consensus defined by⁹ on 5 chromosomes and extended to the 6 chromosomes using MEME¹⁰. The *A. adenivorans* CEN consensus was identified through MAST searches¹¹ on the four chromosomes using the MEME derived PSSM from the *Y. lipolytica* consensus. All sequences occur only once in each species.

Figure S4A

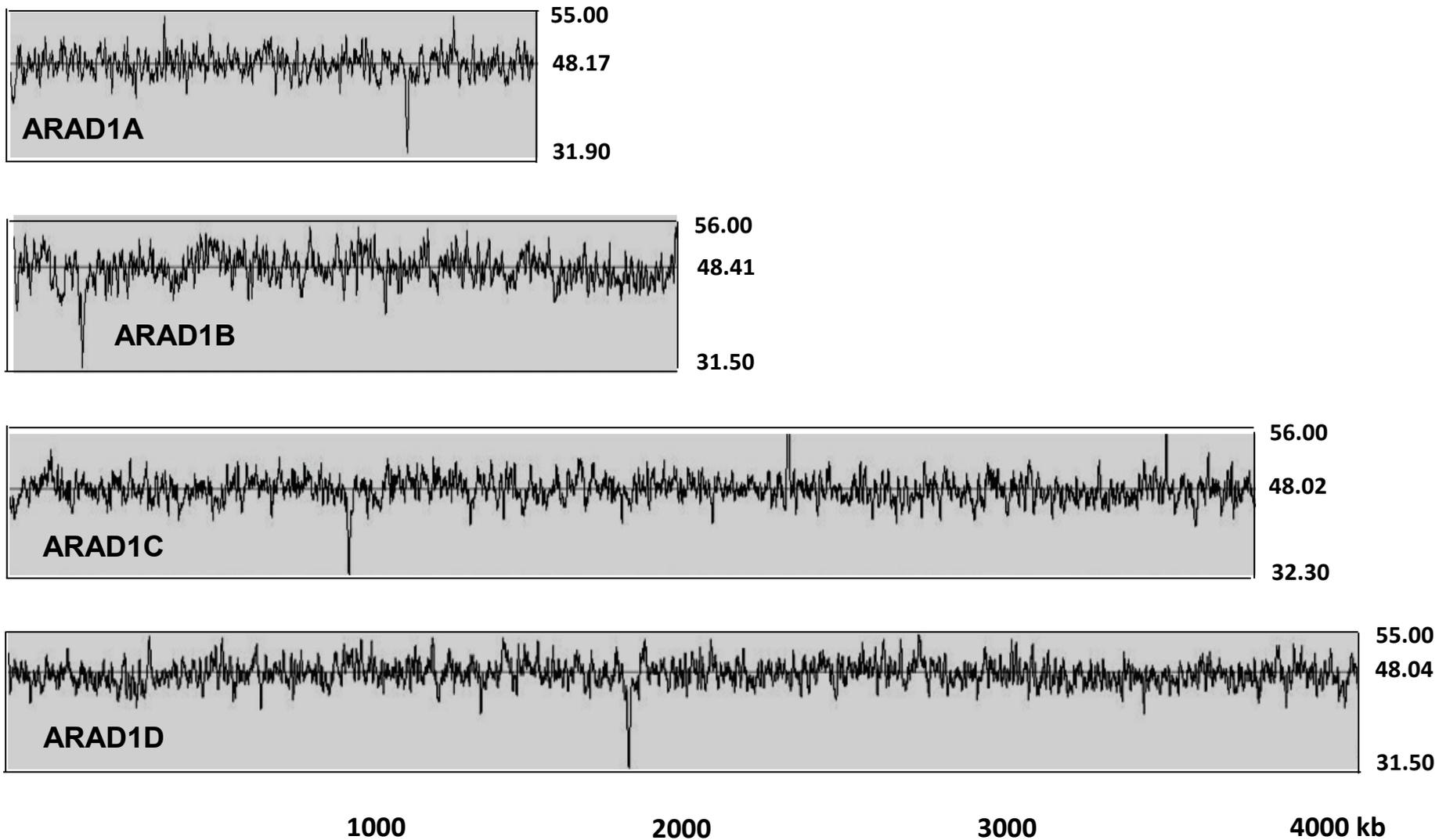
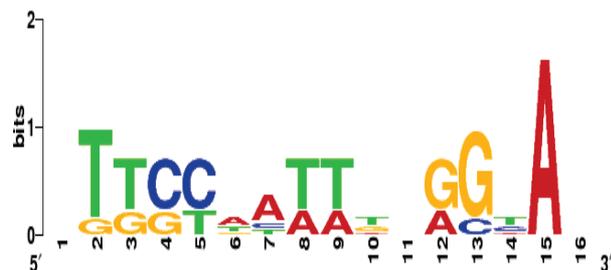


Figure S4C

A. adenivorans



Arad1A	TTTGCAATTAAGGTAT	1255073
	ATTCCTCTTTGGGCAG	1256851
Arad1B	CTTGCTTATTGAGTAA	207561
	CTGCTAATAGTGCAAA	207962
Arad1C	CTGCTAAATTAAGTAG	1041801
Arad1D	GGTCCGATAGTGGCAC	1925290

Y. lipolytica



CEN1-1	CTTCCTAAATTTGGAAA	1007727
CEN1-2	TTACCAAATTAGGTAA	1077356
CEN3-1	TTTCCTAAATAGGAAG	2137323
CEN6	TTTCCTAAATTTGGTAA	1945877
CEN5-1	TTGCCCTATTCTGGAAA	1837793
CEN2-2	ATGCCAAATATGGAAA	715804
CEN4-1	TTTGTTTCATGTGGAAA	1926501