

**Additional table 1.** Yeast strains used in this study.

Strain	Genotype	Source <sup>a</sup>
JRY2334	W303-1a <i>Mata</i> <i>ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1</i>	R. Rothstein
JRY4125	<i>Mata</i> <i>ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 orc2-1</i>	
JRY4250	<i>Mata</i> <i>ade2-1 leu2-3,112 his3-11,15 trp1-1 ura3-1 orc5-1</i>	
JRY4553	<i>Mata</i> <i>lys2Δ leu2-112 his3-11,15 trp1-1 ura3-1 cdc7-1</i>	
JRY5128	<i>Mata</i> <i>lys2Δ leu2-112 his3-11,15 trp1-1 ura3-1 hat1::HIS3 hmrΔ::URA3</i>	
JRY6413	<i>Mata</i> <i>bar1::hisG lys2::hisG his3-11,15 leu2-3,112 trp1-1 ura3-1 orc1::hisG leu2::orc1-161-LEU2</i>	S. Bell
PGY974	<i>Mata</i> <i>ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 mcm2-1</i>	P. Garber
UCC1111	<i>Mata</i> <i>ade2::hisG his3Δ200 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 adh4::URA3-TEL(VII-L) hhf1-hht1::LEU2 hhf2-hht2::MET15 pRS412 (ADE2 CEN ARS – HHF2(WT)-HHT2(WT))</i>	M. Parthun
MPY1	UCC1111 <i>hat1::HIS3</i>	M. Parthun
AP121	UCC1111 <i>orc5-1::natMX4</i>	
AP123	UCC1111 <i>orc5-1::natMX4 hat1::HIS3</i>	
AP182	UCC1111 <i>Mata</i> <i>adh4::LYS2-TEL(VII-L)</i>	

AP183 UCC1111 *Mata adh4::LYS2-TEL(VII-L) hat1::HIS3*

YSB0133 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 orc1::TRP1 LEU2::ORC1 ( $\Delta$ 1-235) HIS3::HMR $\alpha$ (-RAP1)* S. Bell

YSB0135 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 orc1::TRP1 LEU2::ORC1 ( $\Delta$ 1-235)/SIR3 HIS3::HMR $\alpha$ (-RAP1)* S. Bell

BSY029 UCC1111 *pMP3 [pRS314 TRP1 ARS – HHF2 (WT)-HHT2(WT)]*

BSY030 UCC1111 *pMP8 [pRS314 TRP1 ARS – HHF2 (WT)-HHT2(K9, 14, 18, 23, 27R)]*

BSY031 UCC1111 *pMP110 [pRS314 TRP1 ARS – HHF2 (K5, 12R)-HHT2(WT)]*

BSY032 *Mata $\alpha$  ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 mcm2-1 hat1::HIS3*

BSY033 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 mcm2-1 hat1::HIS3*

BSY044 BSY029 *orc5-1::natMX4*

BSY045 BSY030 *orc5-1::natMX4*

BSY070 BSY031 *orc5-1::natMX4*

BSY528 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 hat1::HIS3*

BSY535 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 orc5-1*

BSY538 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 orc5-1 hat1::HIS3*

BSY539 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 hat1Δ::kanMX4*

BSY540 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 hat2Δ::kanMX4*

BSY550 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 hat2Δ::kanMX4 bar1::HIS3*

BSY551 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 bar1::HIS3*

BSY568 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 orc2-1*

BSY569 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 orc2-1 hat1Δ::kanMX4*

BSY572 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 orc2-1 hat2Δ::kanMX4*

BSY589 *Mata ade2-1 lys2::hisG his3-11,15 leu2-3,112 trp1-1 ura3-1 orc1::hisG leu2::orc1-161-LEU2*

BSY590 *Mata $\alpha$  ade2-1 lys2::hisG his3-11,15 leu2-3,112 trp1-1 ura3-1 orc1::hisG leu2::orc1-161-LEU2*

BSY591 *Mata ade2-1 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc1::hisG leu2::orc1-161-LEU2*

BSY594 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 hif1Δ::kanMX4*

BSY595 *Mata $\alpha$  ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1 hif1Δ::kanMX4*

BSY602 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1 hat2Δ::kanMX4*

BSY603 *Mata $\alpha$  ade2-1 lys2Δ his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1 hat2Δ::kanMX4 hat1::HIS3*

BSY604 *Mata ade2-1 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1 hat2Δ::kanMX4 hat1::HIS3*

BSY612 *Mata ade2-1 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1 hat1Δ::kanMX4 rad9::HIS3 rad24::TRP1*

BSY613 *Mata ade2-1 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1 rad9::HIS3 rad24::TRP1*

BSY614 *Mata ade2-1 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1*

BSY615 *Mata ade2-1 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1 hat1::kanMX4*

BSY616 *Mata ade2-1 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1*

BSY617 *Mata ade2-1 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc5-1 hat1Δ::kanMX4*

BSY619 *Mata lys2Δ leu2-112 his3-11,15 trp1-1 ura3-1 cdc7-1 hat1Δ::kanMX4*

BSY629 *Mata his3Δ1 leu2Δ0 met15Δ0 ura3Δ0 ORC1-TAP::TRP1*

BSY630 *Mata his3Δ1 leu2Δ0 met15Δ0 ura3Δ0 ORC2-TAP::TRP1*

BSY631 *Mata his3Δ1 leu2Δ0 met15Δ0 ura3Δ0 ORC4-TAP::TRP1*

BSY632 *Mata his3Δ1 leu2Δ0 met15Δ0 ura3Δ0 ORC5-TAP::TRP1*

BSY633 *Mata his3Δ1 leu2Δ0 met15Δ0 ura3Δ0 ORC6-TAP::TRP1*

BSY675 *Mata his3Δ1 leu2Δ0 met15Δ0 ura3Δ0 HIF1-TAP::TRP1*

BSY676 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 HAT1-13myc::kanMX6*

BSY677 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 ORC5-13myc::kanMX6*

BSY679 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 HAT1-TAP::TRP1*

BSY680 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 CDC45-TAP::TRP1*

BSY681 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 HIF1-TAP::TRP1 hat1Δ::kanMX4*

BSY682 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 HAT1-TAP::TRP1 hat2Δ::kanMX4*

BSY691 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 HAT2-13myc::kanMX6*

BSY692 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 HIF1-13myc::kanMX6*

BSY699 *Mata ade2-1 LYS2 his3-11,15 leu2-3,112 trp1-1 ura3-1 orc2-1 HAT1-TAP::TRP1*

BSY700 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 ORC5-TAP::TRP1*

BSY701 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 ORC5-TAP::TRP1 hat1Δ::natMX4*

BSY702 *YSB0133 HAT1-13myc::kanMX6*

BSY703 *YSB0135 HAT1-13myc::kanMX6*

BSY720 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 1 HAT1-TAP::TRP1 hif1Δ::natMX4*

BSY734 *Mata ade2-1 leu2-112 his3-11,15 trp1-1 ura3-1 1 HAT1-TAP::TRP1 cdc7-1*

“Strains that were not constructed in our laboratories are indicated.