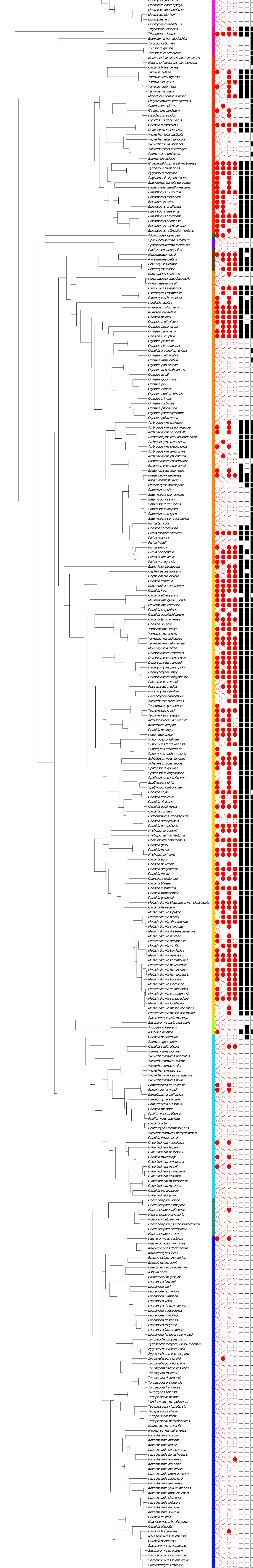
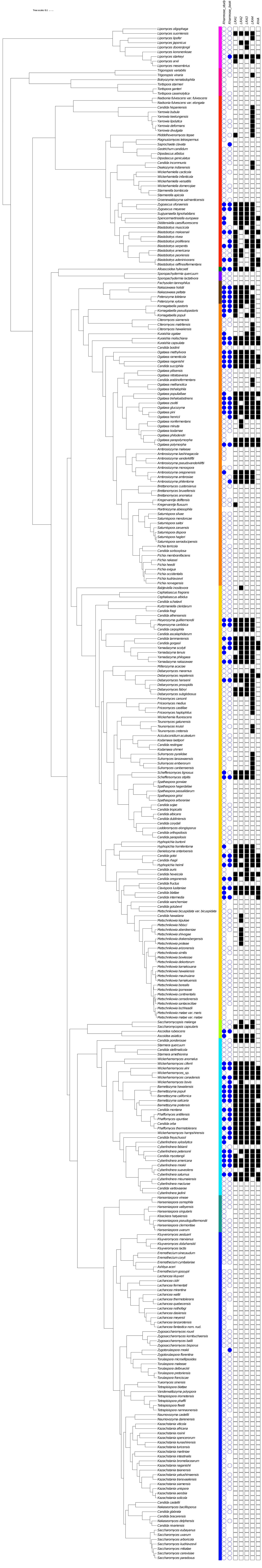


Additional Figure 42. Phylogenetic distribution of D-glucosamine (GlcN) and N-acetyl-D-glucosamine (GlcNAc) assimilation and associated genes. Major clades are color-coded as in Figure 2. Circles report assimilation data from Tables S4 (*study*) and (*book*). Squares report the presence of associated genes from Figure 4B and Table S5. Filled circles and squares correspond to positive, open to negative, and empty to no data. See additional Figure 44 for ancestral trait reconstruction of the traits. Note that the phylogenetic distribution supports multiple losses of the traits and their associated genes.

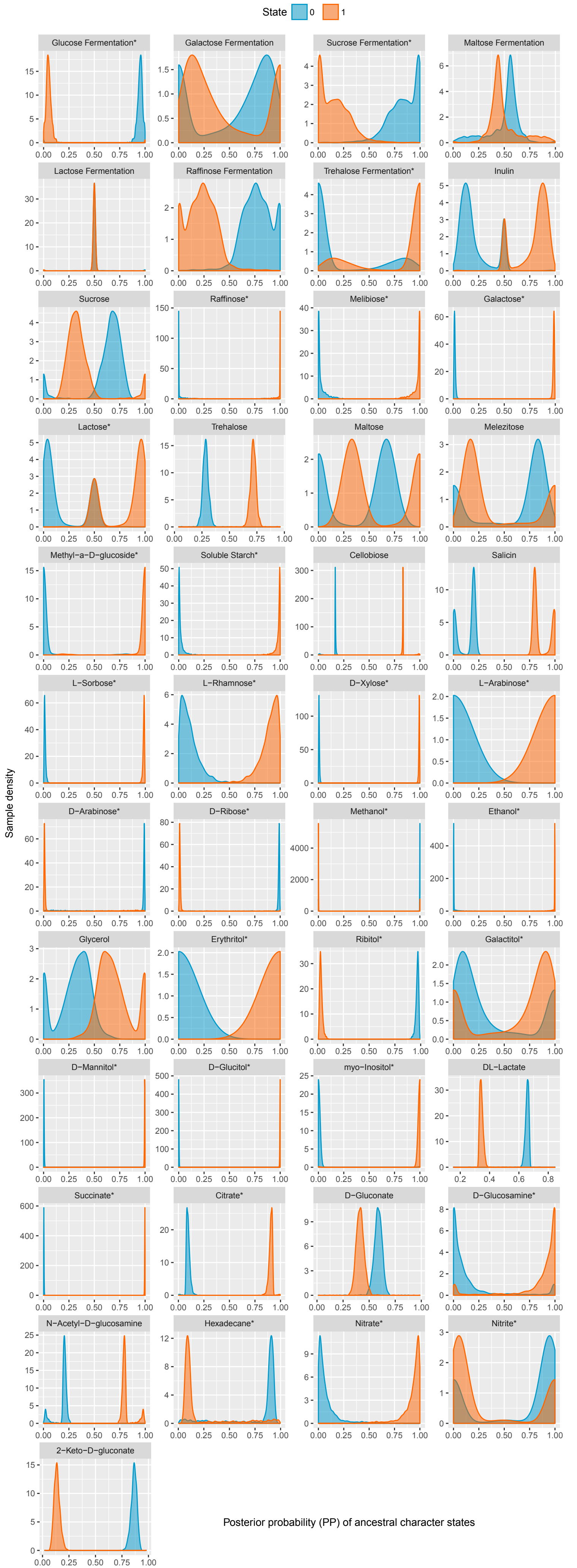
Tree scale: 0.1



Additional Figure 43. Phylogenetic distribution of L-rhamnose assimilation and associated genes. Major clades are color-coded as in Figure 2. Circles report assimilation data from Tables S4 (*study*) and (*book*). Squares report the presence of associated genes from Figure 4B and Table S5. Filled circles and squares correspond to positive, open to negative, and empty to no data. See additional Figure 44 for ancestral trait reconstruction of the traits. Note that the phylogenetic distribution supports multiple losses of the traits and their associated genes.

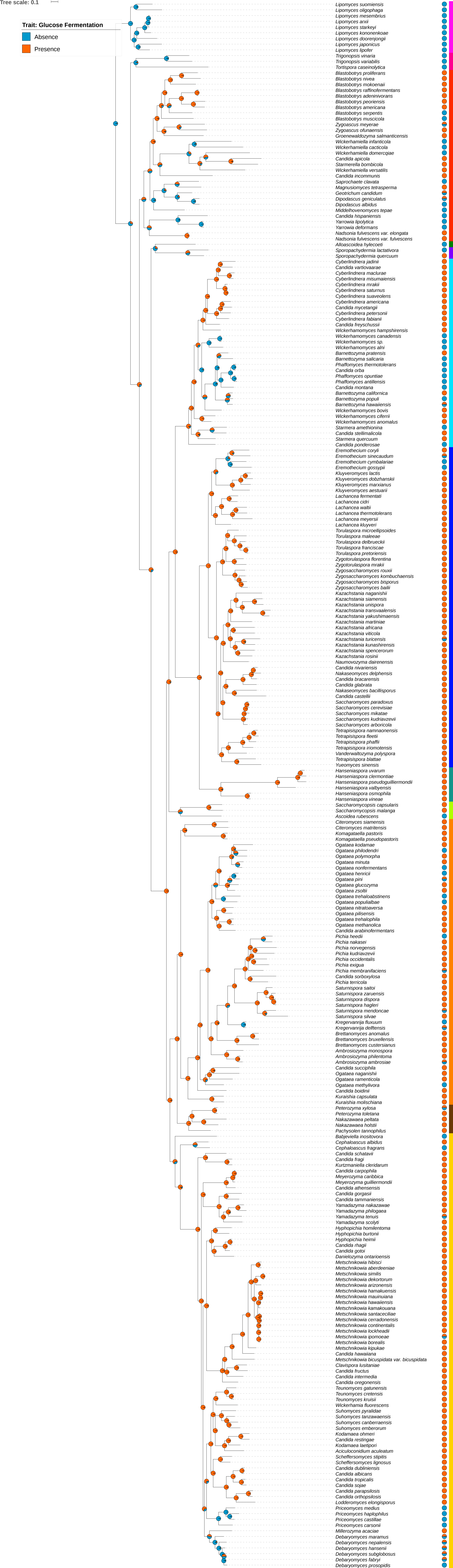


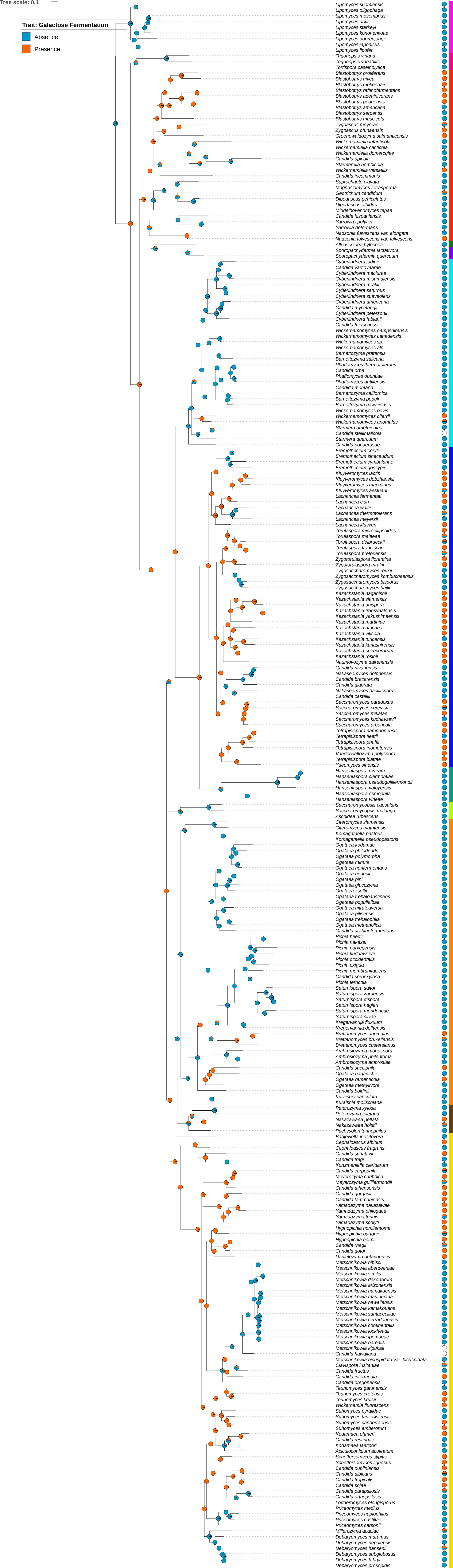
Additional Figure 44. Posterior distribution of presence / absence of 45 metabolic traits in the Budding Yeast Common Ancestor (BYCA). State 0: posterior probability that trait was absent in BYCA. State 1: posterior probability that trait was present in BYCA. Each of the panels corresponds to a different metabolic trait. All metabolic trait data were obtained from *The Yeasts: A Taxonomic Study* and pertain to budding yeasts’ abilities to grow on different substrates (Kurtzman et al. 2011). Ancestral state inference was conducted using the Bayes MultiState module in the BayesTraits, version 3, using the budding yeast species phylogeny shown in Figure 2 after it was pruned to keep the 274 budding yeast species for which there are metabolic trait data. Traits that exhibited significantly different distributions of presence and absence in BYCA (i.e., the posterior probabilities of the largest peaks of presence and absence in BYCA are ≥ 0.9 and ≤ 0.1 , respectively) are indicated by asterisks (*).

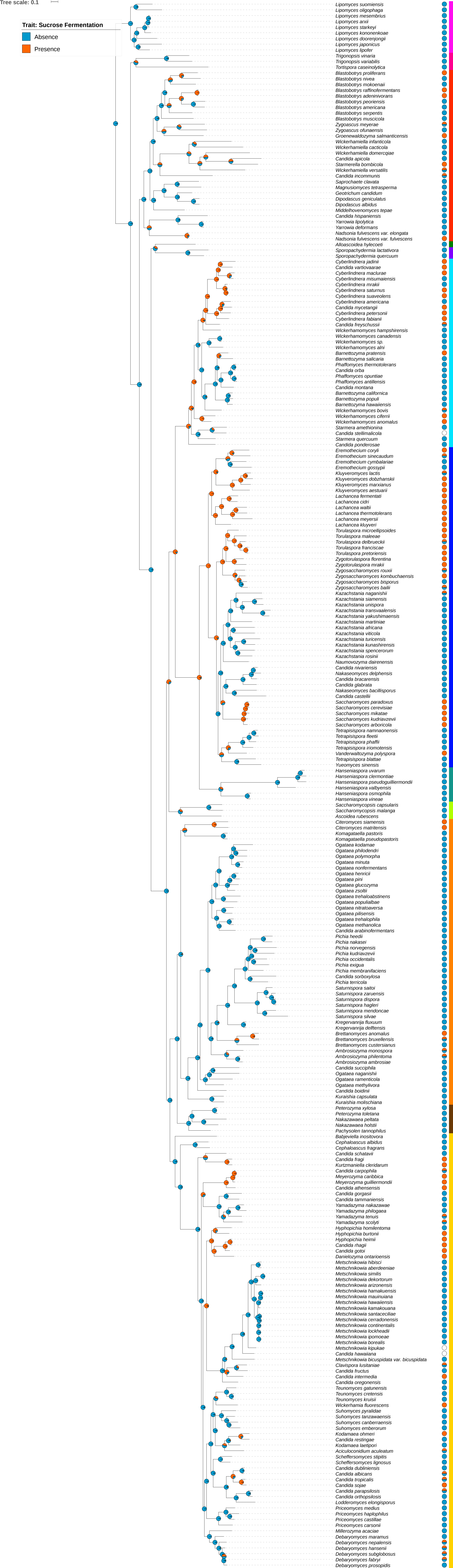


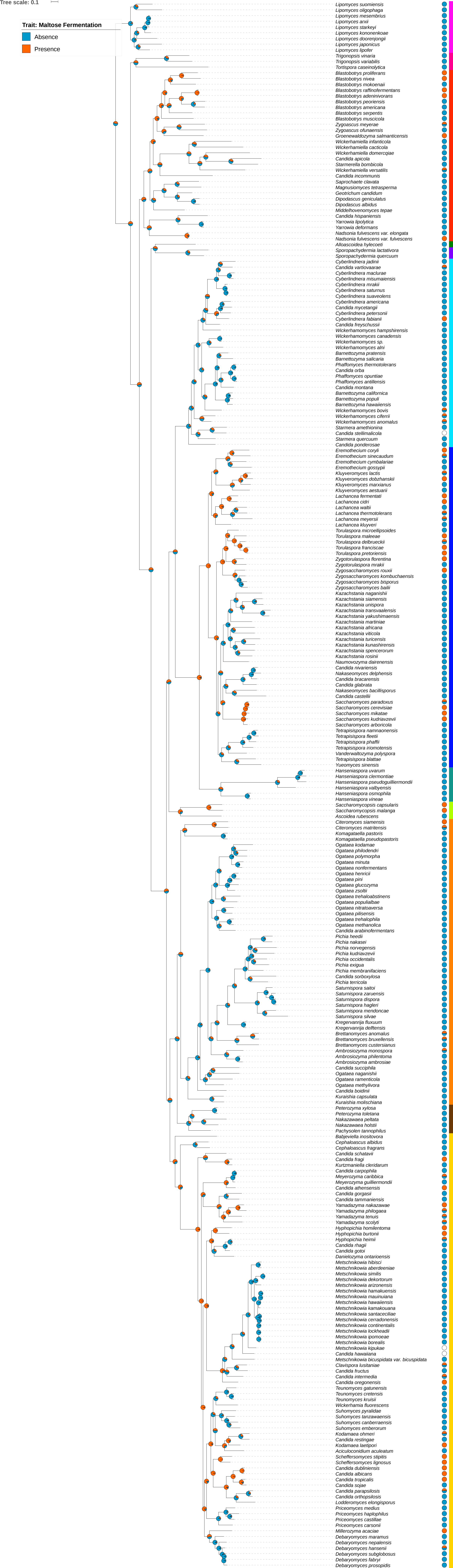
Additional Figure 45. Trait evolution and ancestral state reconstruction for each of the 45 metabolic traits across the budding yeast phylogeny. Pie charts at the end of each internal branch denote the proportional value of the posterior probability (PP) of each state (blue: absence; orange: presence). Four types of circles next to species names are used to code trait data: circles filled with blue denote absence of trait (i.e., 0); circles filled with orange denote presence of trait (i.e., 1); circles filled with half blue and half orange denote that trait was variable across different strains (i.e., V); and circles filled with white denote that trait was not tested (i.e., N). The list of the 45 metabolic traits analyzed is provided in the table at the top of the figure; trait evolution and ancestral state reconstruction of each trait can be quickly identified by searching the pdf for “Trait: TRAITNAME”. All metabolic trait data were obtained from *The Yeasts: A Taxonomic Study* and pertain to budding yeasts’ abilities to grow on different substrates (Kurtzman et al. 2011). Analyses of trait evolution and ancestral state reconstruction were conducted using the Bayes MultiState module in the BayesTraits, version 3. Trait evolution was reconstructed on the budding yeast species phylogeny shown in Figure 2 after it was pruned to keep the 274 budding yeast species for which there are metabolic trait data.

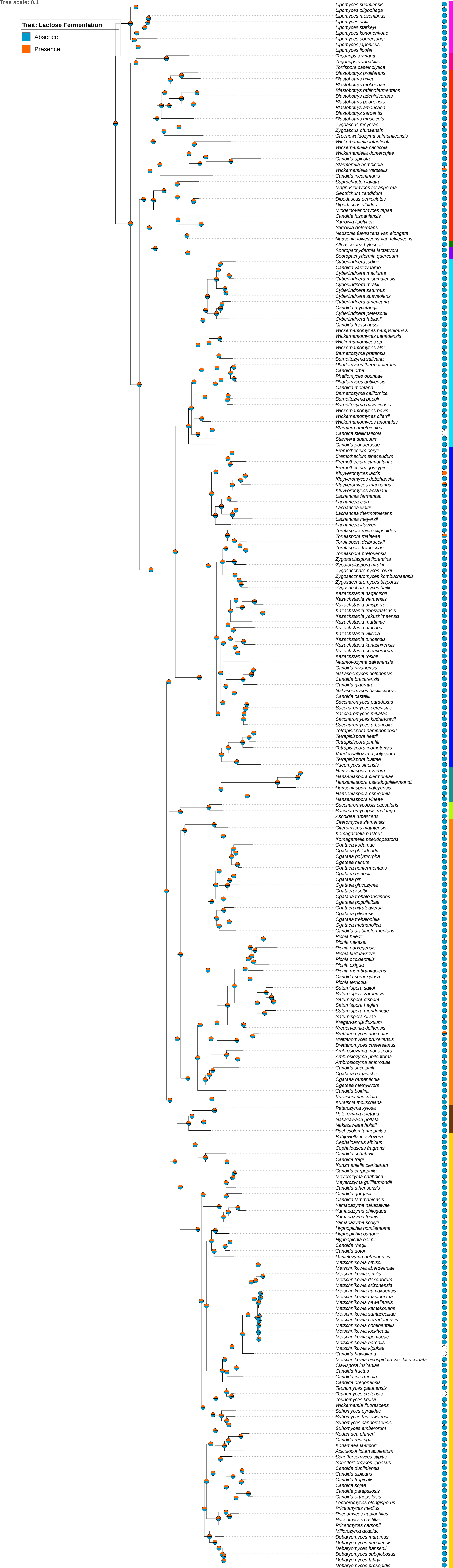
Order	Trait	Order	Trait
1	Glucose Fermentation	24	L-Arabinose
2	Galactose Fermentation	25	D-Arabinose
3	Sucrose Fermentation	26	D-Ribose
4	Maltose Fermentation	27	Methanol
5	Lactose Fermentation	28	Ethanol
6	Raffinose Fermentation	29	Glycerol
7	Trehalose Fermentation	30	Erythritol
8	Inulin	31	Ribitol
9	Sucrose	32	Galactitol
10	Raffinose	33	D-Mannitol
11	Melibiose	34	D-Glucitol
12	Galactose	35	myo-Inositol
13	Lactose	36	DL-Lactate
14	Trehalose	37	Succinate
15	Maltose	38	Citrate
16	Melezitose	39	D-Gluconate
17	Methyl-alpha-D-glucoside	40	D-Glucosamine
18	Soluble Starch	41	N-Acetyl-D-glucosamine
19	Cellobiose	42	Hexadecane
20	Salicin	43	Nitrate
21	L-Sorbose	44	Nitrite
22	L-Rhamnose	45	2-Keto-D-gluconate
23	D-Xylose		

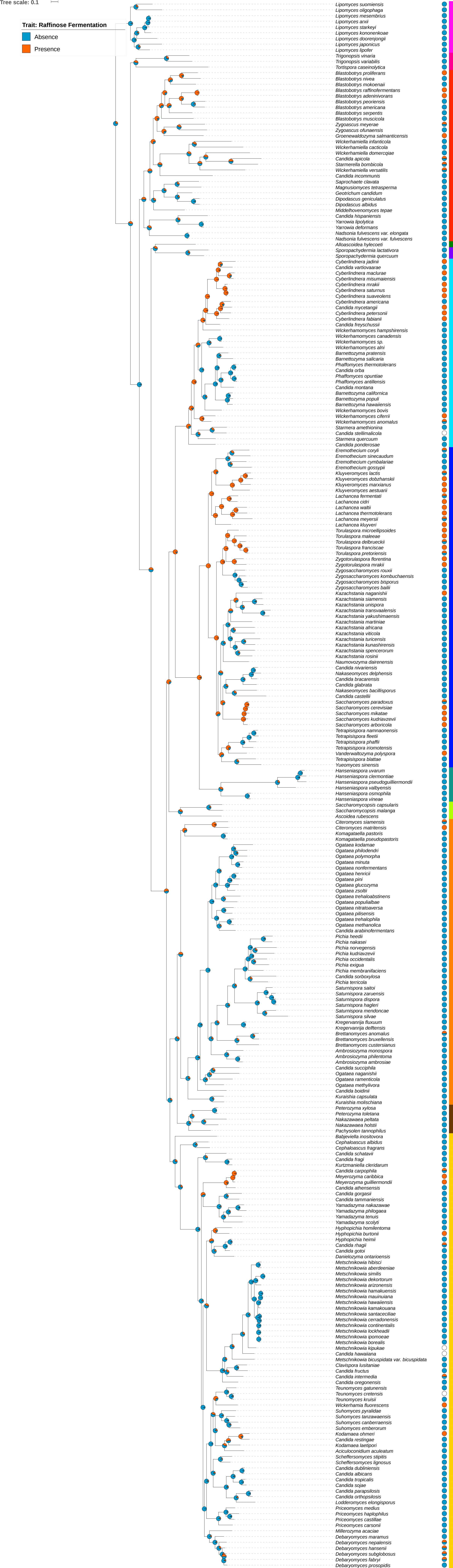


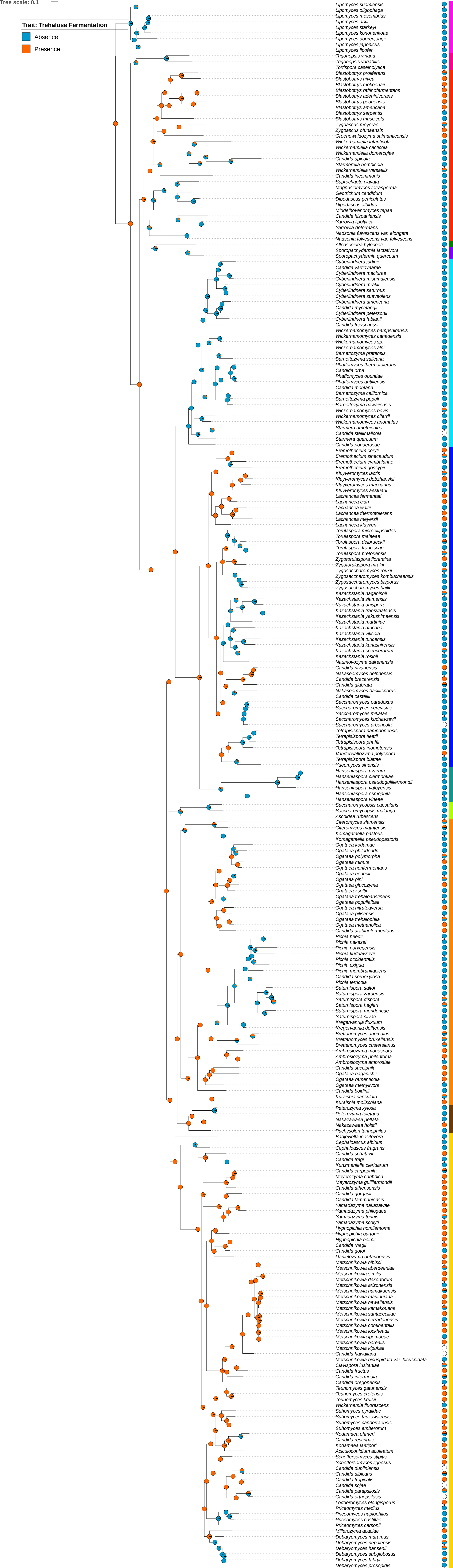


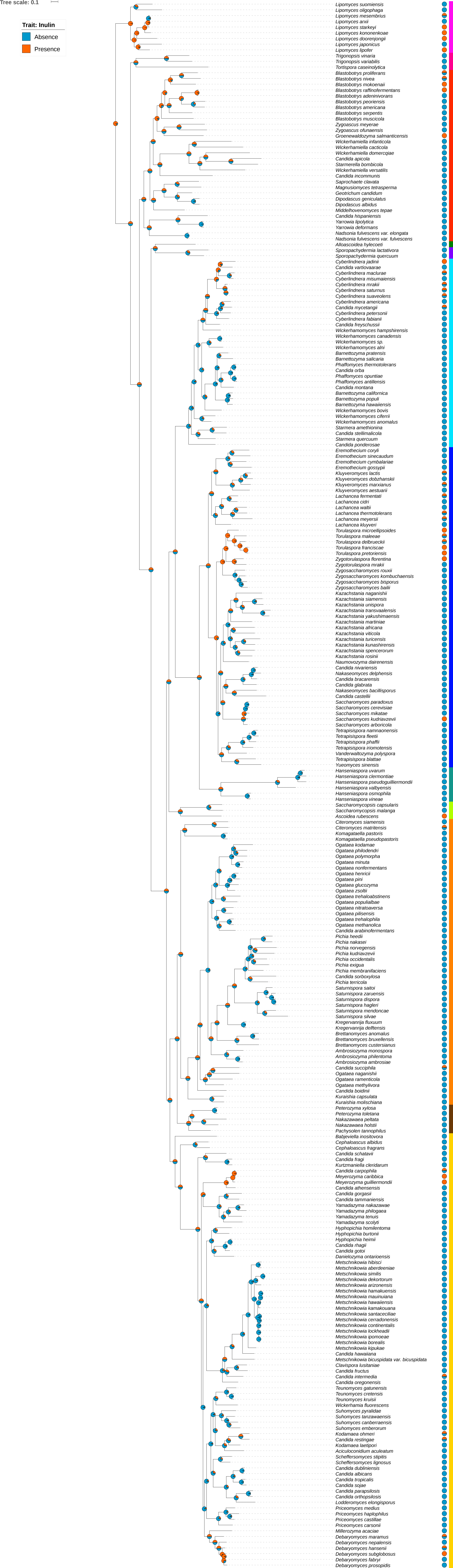


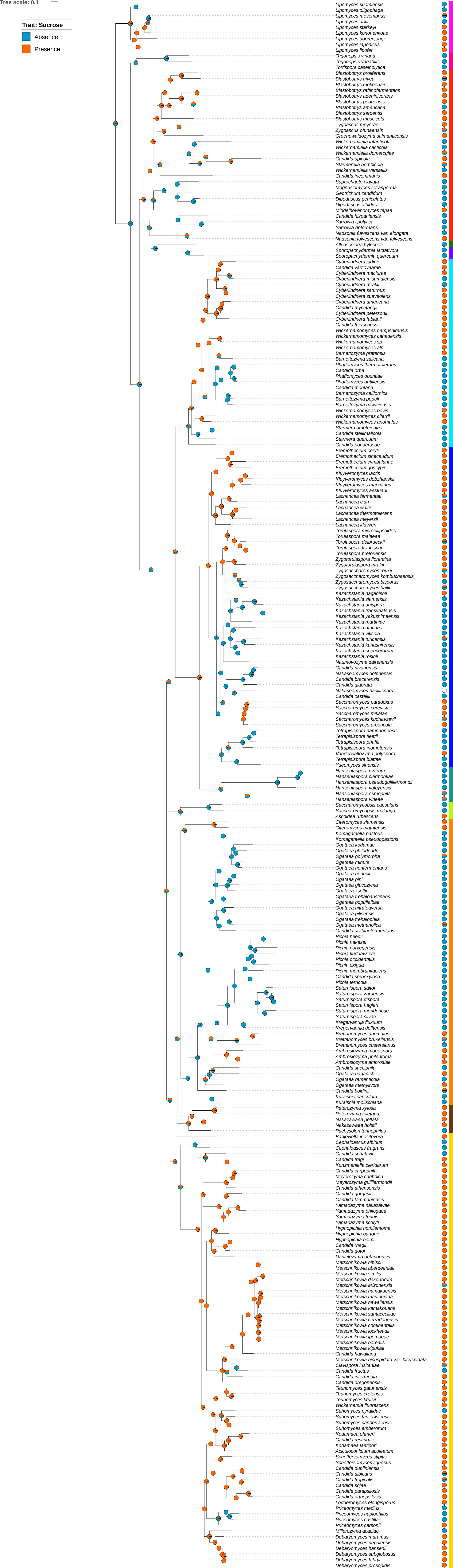


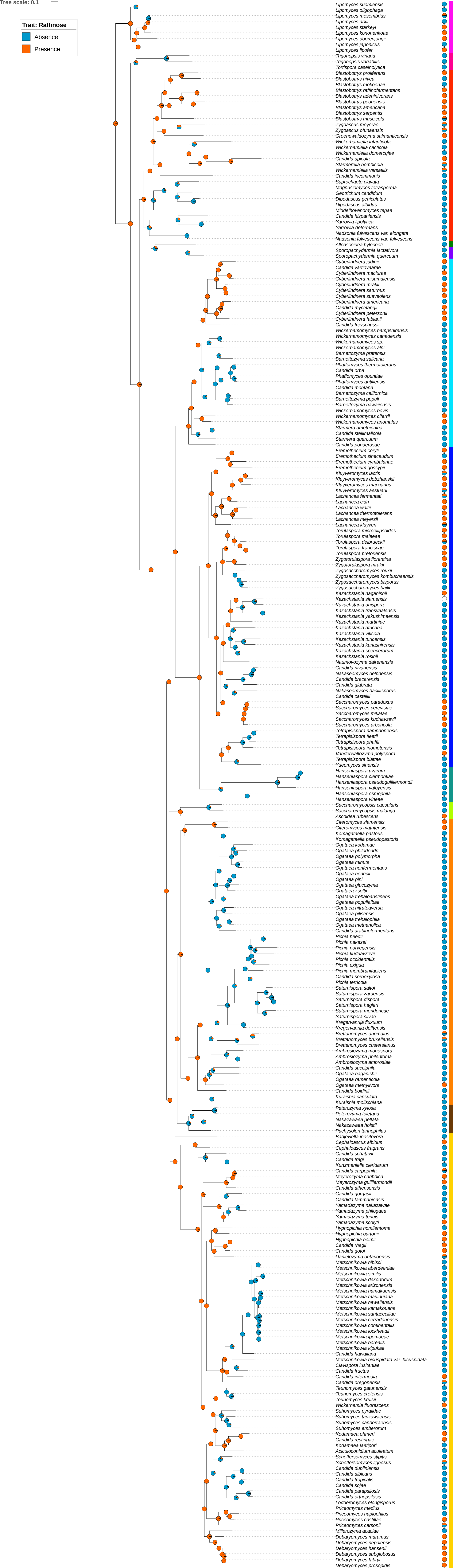


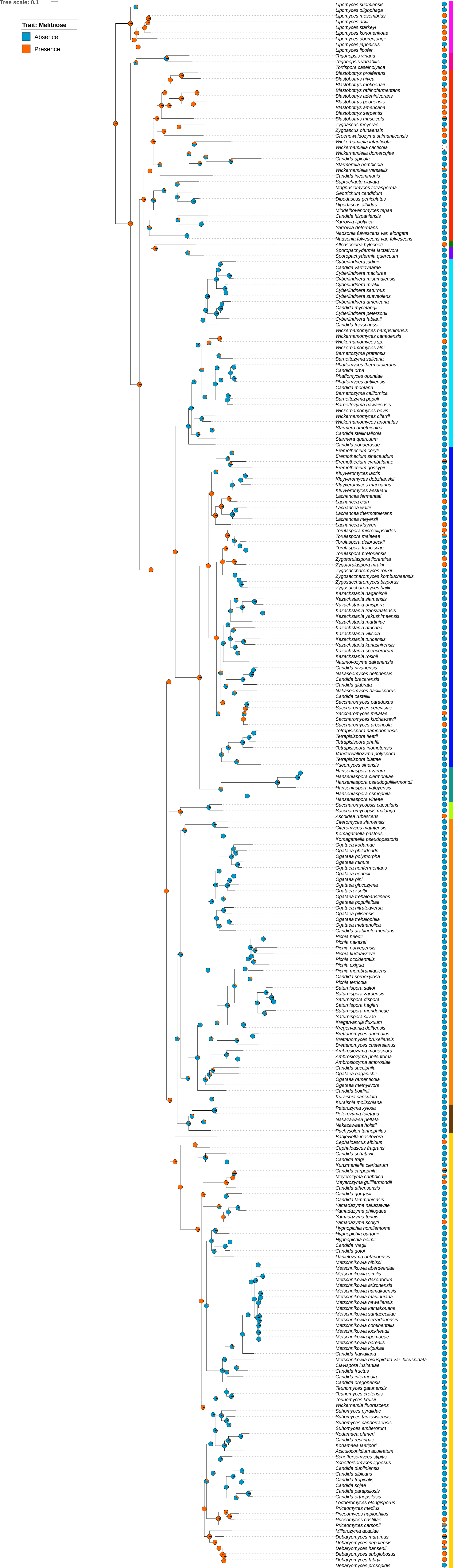


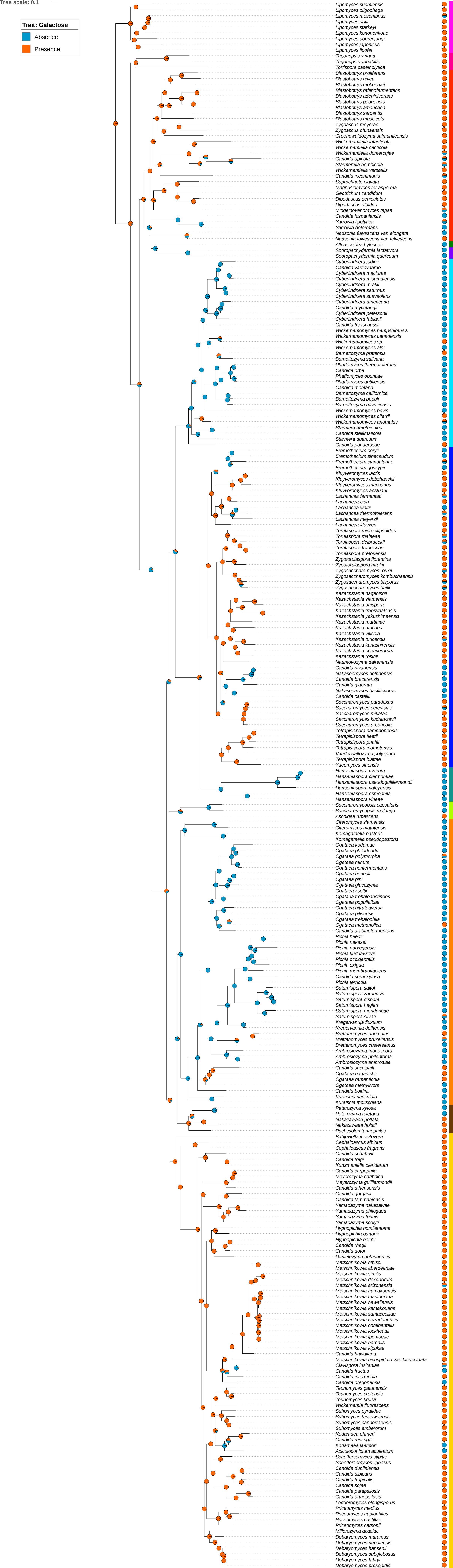


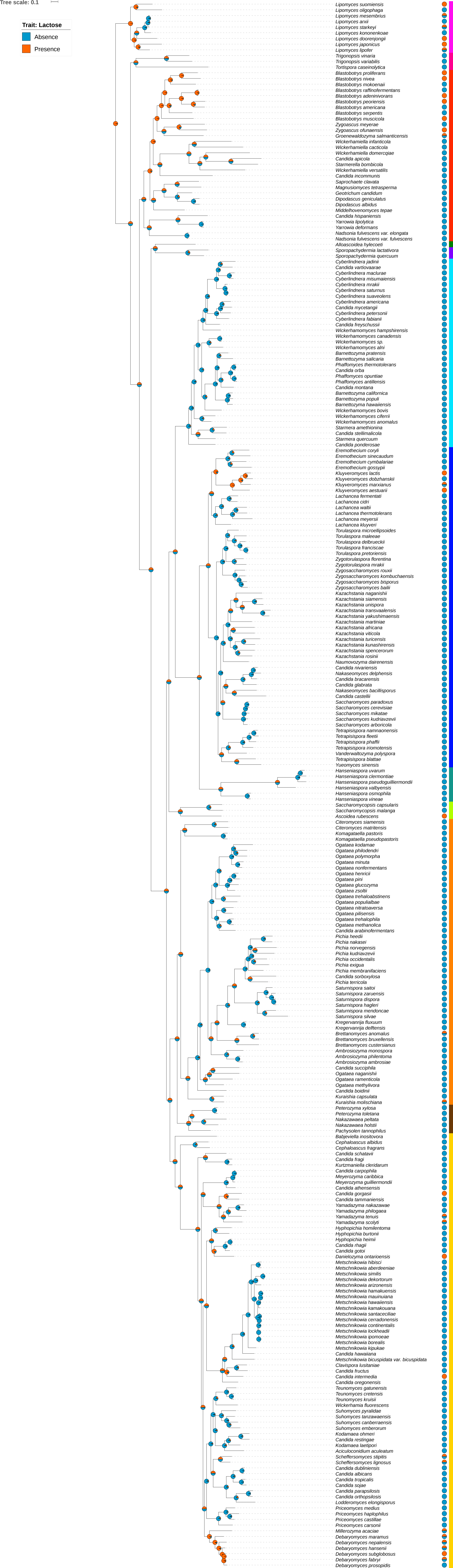


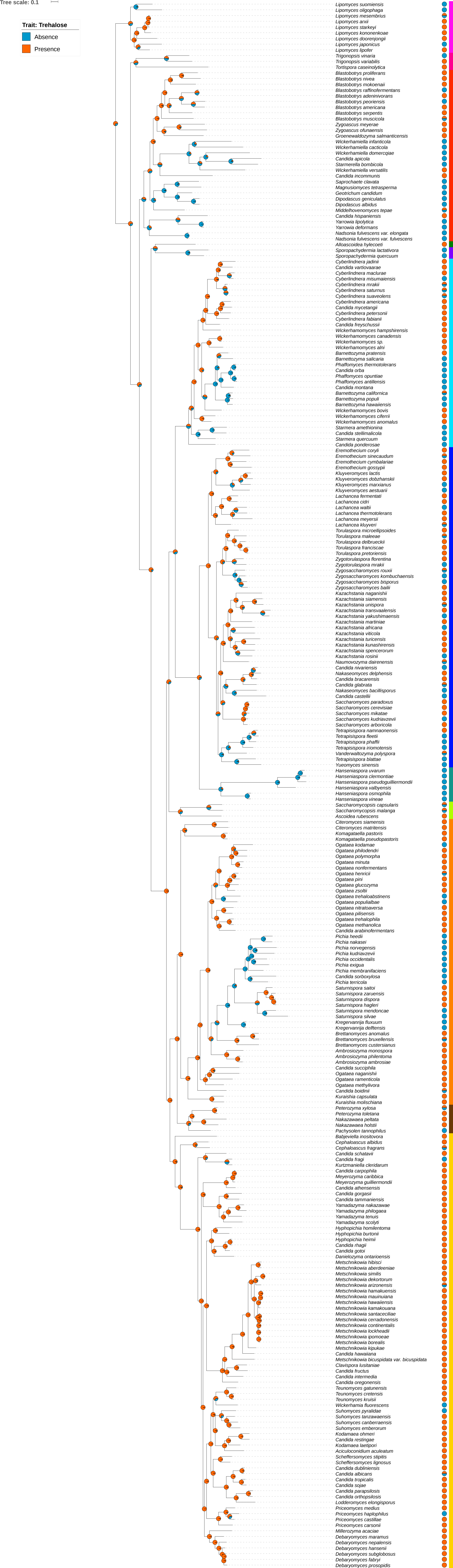


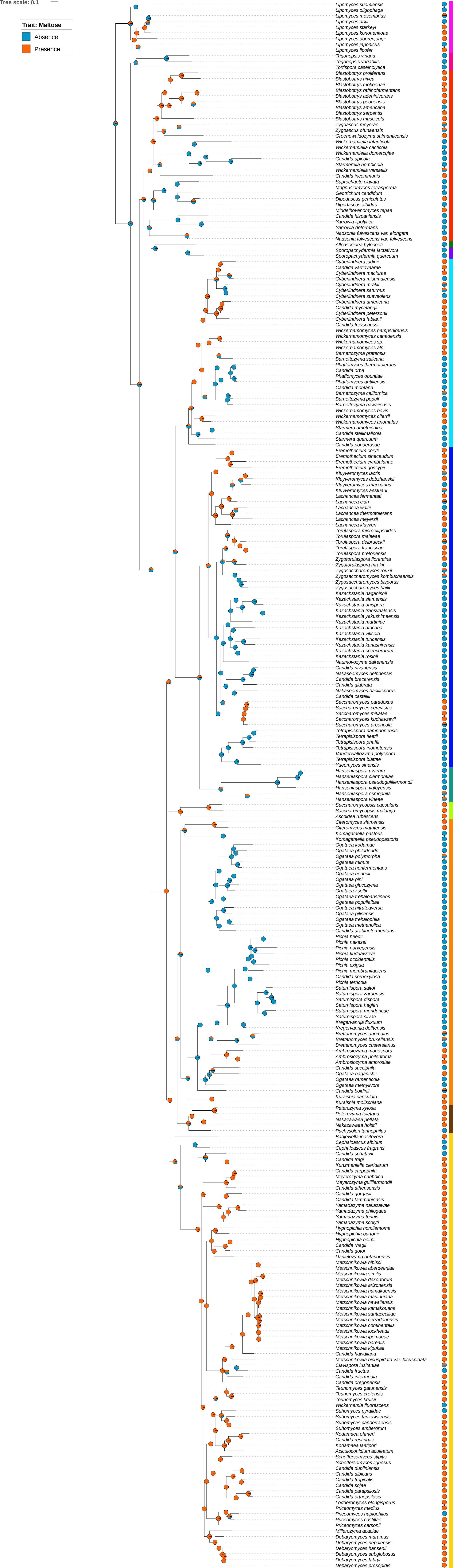


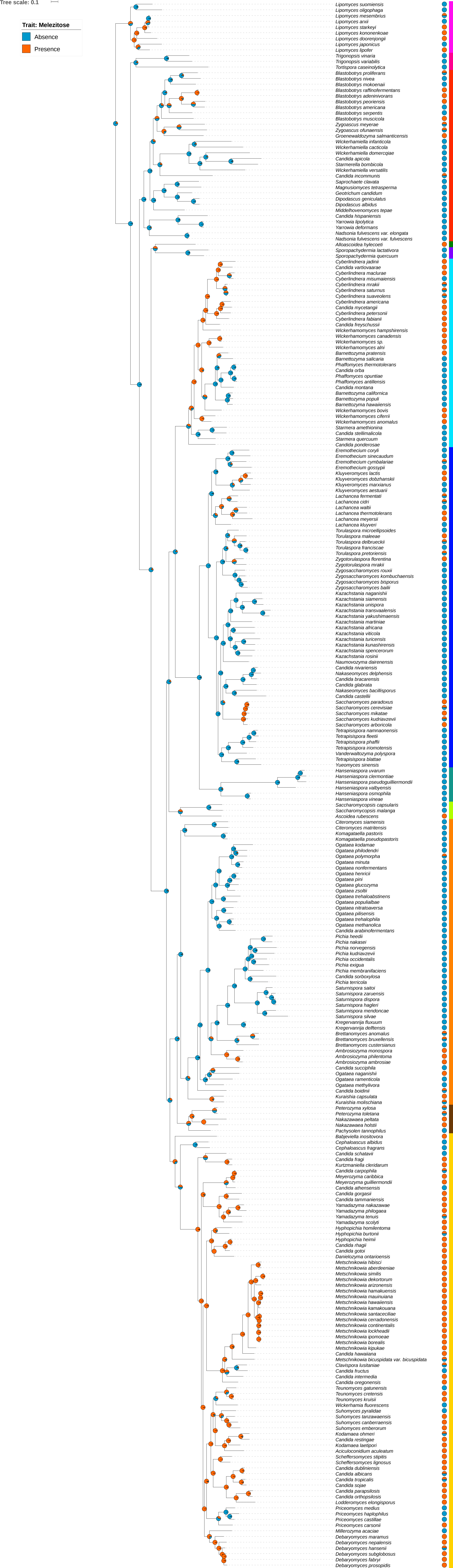








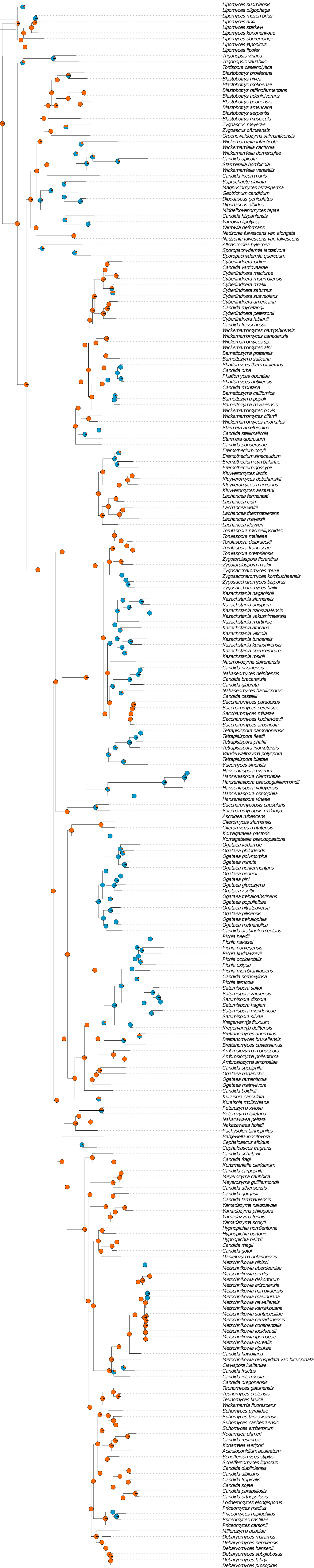




scale: 0.1

Trait: Methyl-alpha-D-glucoside

- Absence
- Presence



Lipomyces suomensis
Lipomyces oligophaga
Lipomyces mesembrius
Lipomyces arxii
Lipomyces starkeyi
Lipomyces kononenkoae
Lipomyces doorenjongii
Lipomyces japonicus
Lipomyces lipofer
Trigonopsis vinaria
Trigonopsis variabilis
Tortispora caseinolytica
Blastobotrys proliferans
Blastobotrys nivea
Blastobotrys mokenaii
Blastobotrys raffinofementans
Blastobotrys adeninivorans
Blastobotrys peoriensis
Blastobotrys americana
Blastobotrys serpentis
Blastobotrys muscicola
Zygoascus meyeriae
Zygoascus ofunaensis
Groenewaldozyma salmanticensis
Wickerhamiella infanticola
Wickerhamiella cacticola
Wickerhamiella domercqiae
Candida apicola
Stamerella bombicola
Wickerhamiella versatilis
Candida incommunis
Saprochaete clavata
Magnusiomyces tetrasperma
Geotrichum candidum
Dipodascus geniculatus
Dipodascus albidus
Middelhovenomyces tepae
Candida hispaniensis
Yarrowia lipolytica
Yarrowia deformans
Nadsonia fulvescens var. elongata
Nadsonia fulvescens var. fulvescens
Alloascoidea hylecoeti
Sporopachydermia lactivora
Sporopachydermia quercuum
Cyberlindnera jadinii
Candida vartiovaarae
Cyberlindnera macluriae
Cyberlindnera misurmaiensis
Cyberlindnera mrakii
Cyberlindnera satunus
Cyberlindnera suaveolens
Cyberlindnera americana
Candida mycetangii
Cyberlindnera petersonii
Cyberlindnera fabianii
Candida freyschussii
Wickerhamomyces hampshirensis
Wickerhamomyces canadensis
Wickerhamomyces sp.
Wickerhamomyces alni
Bamettozyma pratensis
Bamettozyma salcaria
Phaffomyces thermotolerans
Candida orba
Phaffomyces opuntiae
Phaffomyces antillensis
Candida montana
Bamettozyma californica
Bamettozyma populi
Bamettozyma hawaiiensis
Wickerhamomyces bovis
Wickerhamomyces cifemii
Wickerhamomyces anomalus
Stammer amethionina
Candida stellimalicola
Stammera quercuum
Candida ponderosae
Eremothecium coryli
Eremothecium sinecaudum
Eremothecium cymbalariae
Eremothecium gossypii
Kluyveromyces lactis
Kluyveromyces dobzhanskii
Kluyveromyces marxianus
Kluyveromyces aestuarii
Lachancea fermentati
Lachancea cidri
Lachancea waltii
Lachancea thermotolerans
Lachancea meyersii
Lachancea kluyveri
Torulaspora microellipsoides
Torulaspora maleae
Torulaspora delbrueckii
Torulaspora franciscae
Torulaspora pretoriensis
Zygotorulaspora florentina
Zygotorulaspora mrakii
Zygosaccharomyces rouxii
Zygosaccharomyces kombuchaensis
Zygosaccharomyces bisporus
Zygosaccharomyces bailii
Kazachstania naganishii
Kazachstania siamensis
Kazachstania unispora
Kazachstania transvaalensis
Kazachstania yakushimaensis
Kazachstania martiniae
Kazachstania africana
Kazachstania viticola
Kazachstania turicensis
Kazachstania kunashirensis
Kazachstania spencerorum
Kazachstania rosinii
Naumovozyma dairenensis
Candida nivariensis
Nakaseomyces delphensis
Candida braccensis
Candida glabrata
Nakaseomyces bacillisporus
Candida castellii
Saccharomyces paradoxus
Saccharomyces cerevisiae
Saccharomyces mikatae
Saccharomyces kudriavzevii
Saccharomyces arboricola
Tetrapisispora namnaonensis
Tetrapisispora fleetti
Tetrapisispora phaffii
Tetrapisispora inotomensis
Vanderwaltozyma polyspora
Tetrapisispora blattae
Yueomyces sinensis
Hanseniaspora uvarum
Hanseniaspora clemontiae
Hanseniaspora pseudoguilliermondii
Hanseniaspora valbyensis
Hanseniaspora osmophila
Hanseniaspora vineae
Saccharomycopsis capsularis
Saccharomycopsis malanga
Ascoidea rubescens
Citeromyces rubescens
Citeromyces matritensis
Komagataella pastoris
Komagataella pseudopastoris
Ogataea kodamae
Ogataea philodendri
Ogataea polymorpha
Ogataea minuta
Ogataea nonfermentans
Ogataea henricii
Ogataea pini
Ogataea glucozyma
Ogataea zsoltyi
Ogataea trehalobaltensis
Ogataea populiabae
Ogataea nitratobversa
Ogataea pilisensis
Ogataea trehalophila
Ogataea methanolica
Candida arabinofementans
Pichia heedii
Pichia nakasei
Pichia norvegensis
Pichia kudriavzevii
Pichia occidentalis
Pichia exigua
Pichia membranifaciens
Candida sorboxylosa
Pichia terricola
Saturnispora saitoi
Saturnispora zaruensis
Saturnispora dispersa
Saturnispora hagleri
Saturnispora mendoncae
Saturnispora silvae
Kregervanrija fluxuum
Kregervanrija deliensis
Brettanomyces anomalus
Brettanomyces bruxellensis
Brettanomyces custersianus
Ambrosiozyma monospora
Ambrosiozyma philetoma
Ambrosiozyma ambrosiae
Candida succiphila
Ogataea naganishii
Ogataea ramenticola
Ogataea methylivora
Candida boldinii
Kuraishia capsulata
Kuraishia molischiana
Petrozyma xylosa
Petrozyma toletana
Nakazawaea peltata
Nakazawaea holstii
Pachysolen tannophilus
Babjeviella inositolovora
Cephaloascus albidus
Cephaloascus fragrans
Candida schatavii
Candida fragi
Kurtzmanella cleridarum
Candida carpophila
Meyerozyma caribbica
Meyerozyma guilliermondii
Candida athensensis
Candida gorgasii
Candida lammaniensis
Yamadazyma nakazawae
Yamadazyma philogaea
Yamadazyma tenuis
Yamadazyma scolyti
Hyphopichia homilientoma
Hyphopichia burtonii
Hyphopichia heimii
Candida rhagii
Candida gotoi
Daniellozyma ontarioensis
Metschnikowia hibisci
Metschnikowia aberdeeniae
Metschnikowia similis
Metschnikowia dekortorum
Metschnikowia arizonensis
Metschnikowia hamakuensis
Metschnikowia mauinuiana
Metschnikowia hawaiiensis
Metschnikowia kamakouana
Metschnikowia santaceliciae
Metschnikowia cerradonensis
Metschnikowia continentalis
Metschnikowia lockheadii
Metschnikowia ipomoeae
Metschnikowia borealis
Metschnikowia kipukae
Candida hawaiiensis
Metschnikowia bicuspidata var. bicuspidata
Clavispora lusitaniae
Candida fructus
Candida intermedia
Candida oregonensis
Teunomyces gatunensis
Teunomyces cretensis
Teunomyces kruisii
Wickerhamia fluorescens
Suhomyces pyralidae
Suhomyces tanzawaensis
Suhomyces canbenaensis
Suhomyces emberorum
Kodamaea ohmeri
Candida restingae
Kodamaea laetipori
Aciculiconidium aculeatum
Scheffersomyces stipitis
Scheffersomyces lignosus
Candida dubliniensis
Candida albicans
Candida tropicalis
Candida sojae
Candida parapsilosis
Candida orthopsilosis
Lodderomyces elongisporus
Priceomyces medius
Priceomyces haplophilus
Priceomyces castillae
Priceomyces carsonii
Milleriozyma acaciae
Debaryomyces maramus
Debaryomyces nepalensis
Debaryomyces hansenii
Debaryomyces subglobosus
Debaryomyces fabryi
Debaryomyces prosopidis

