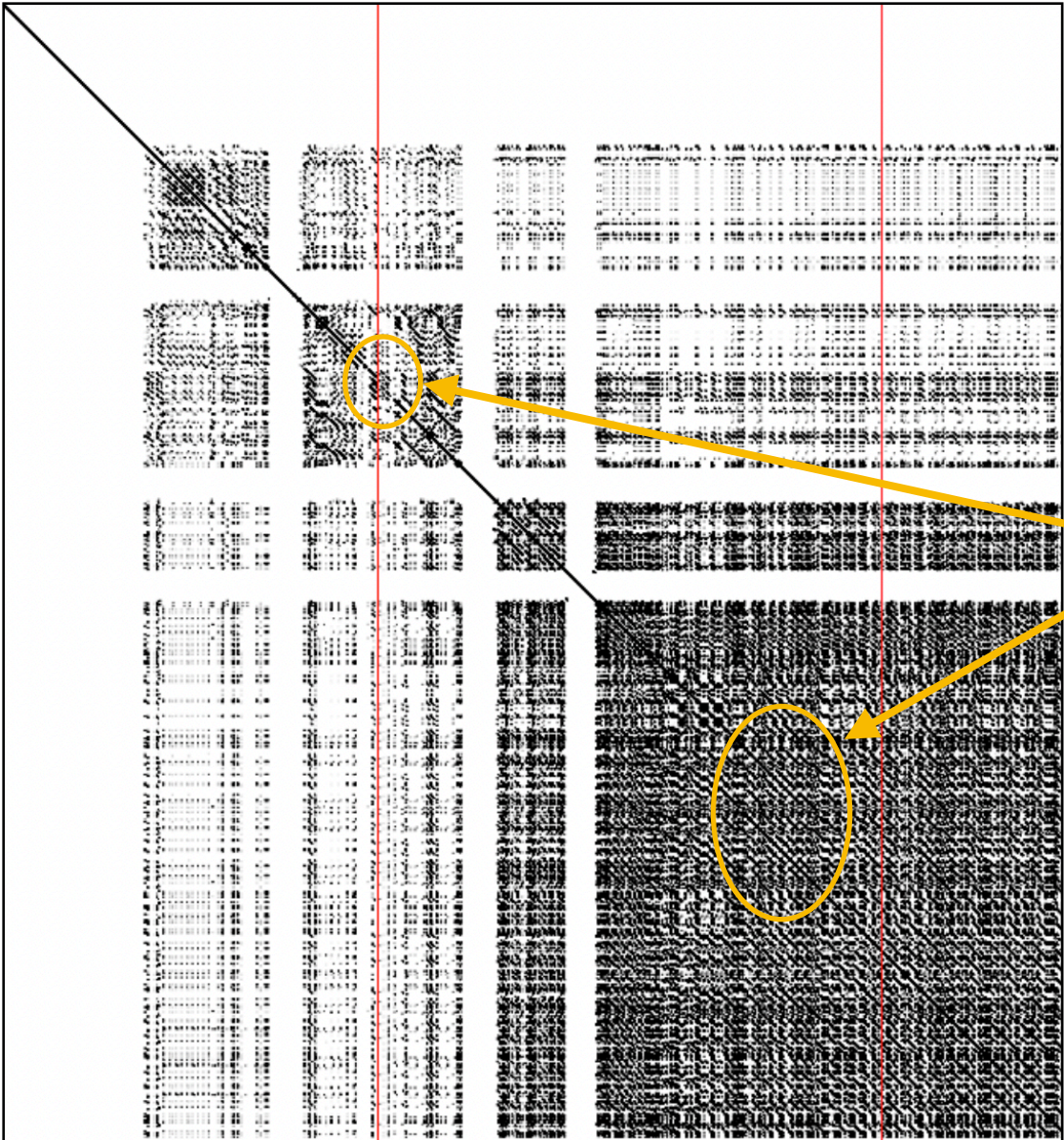


Extended Data Figure 1

initial Hifiasm assembly at centromere
(chr1:28,899,699-29,012,364)

ONT-UL read spanning the region
polished with other ONT-UL reads



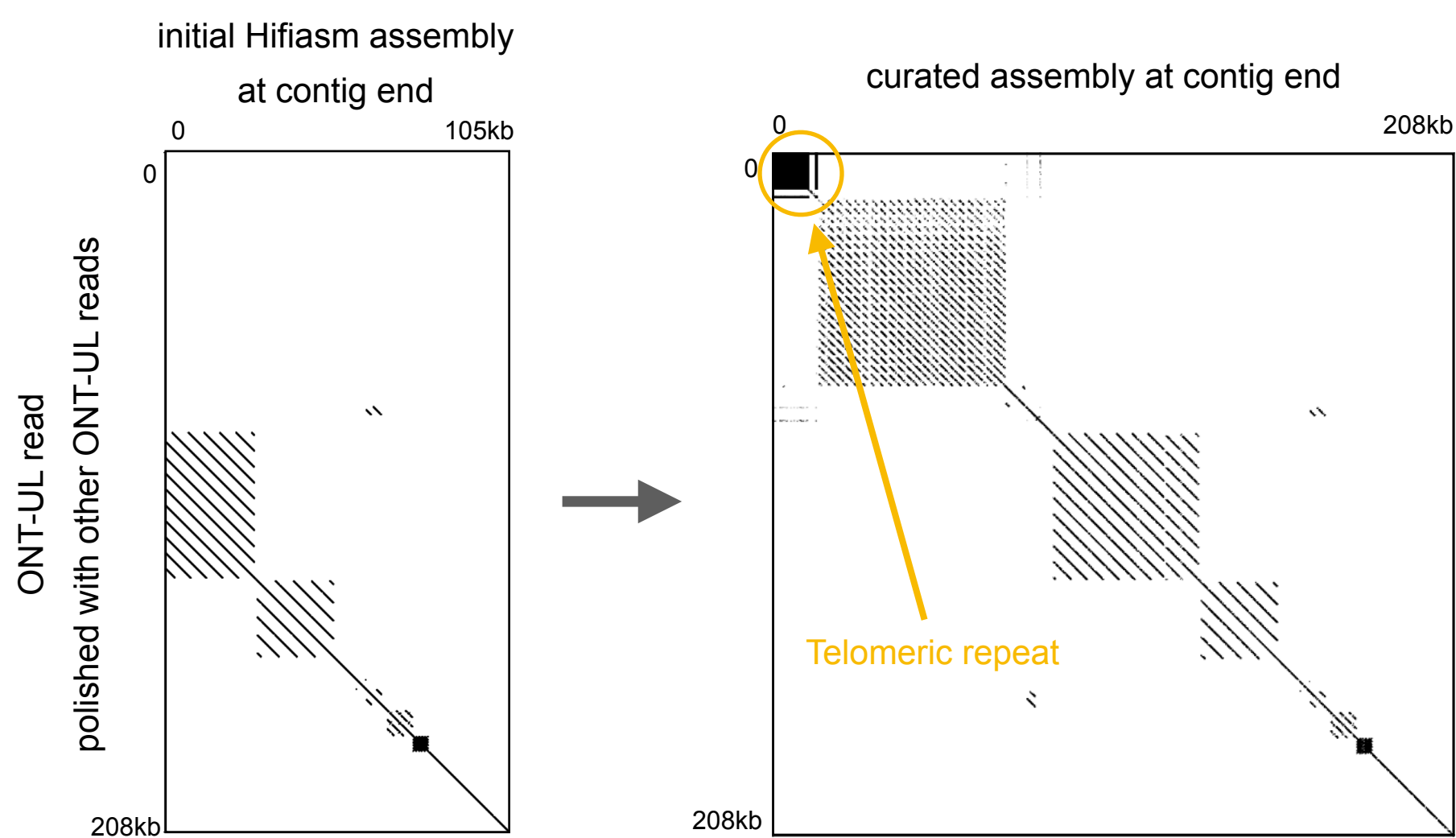
False contraction of
centromere repeats
in Hifiasm assembly

Potentially Misassembled Region (PMR)
with 118 inconsistent bases



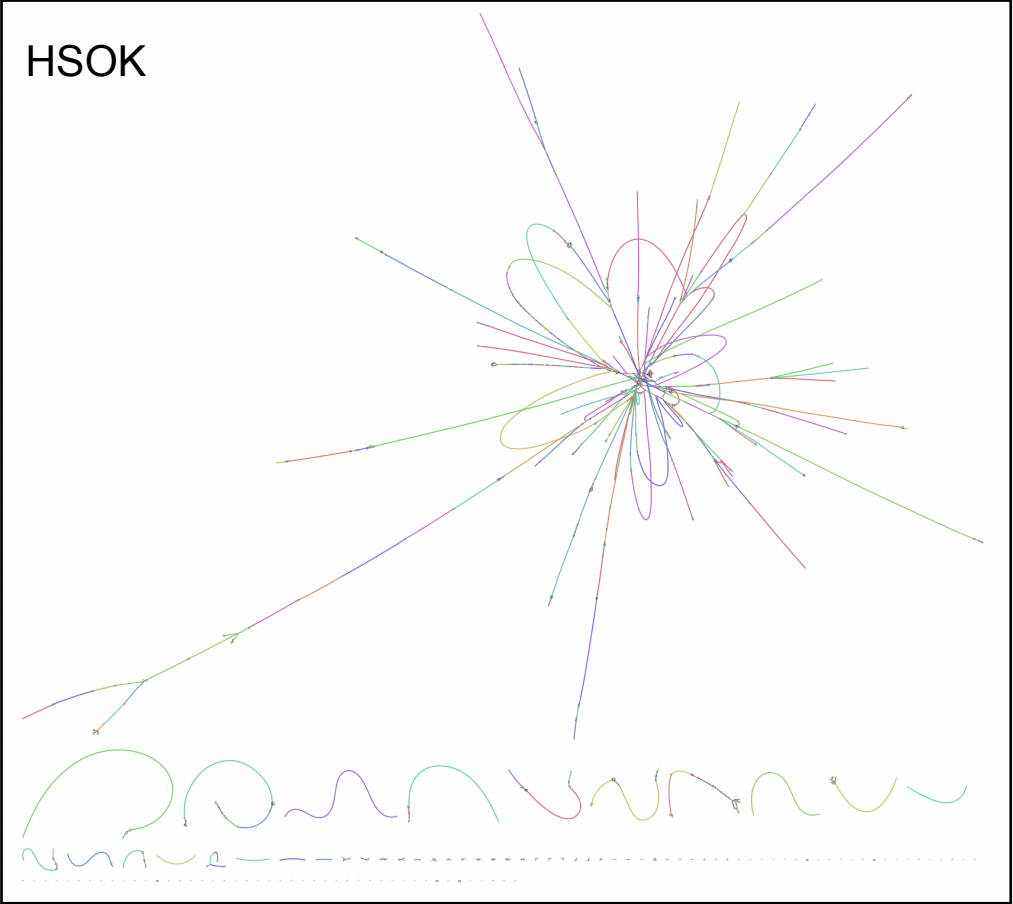
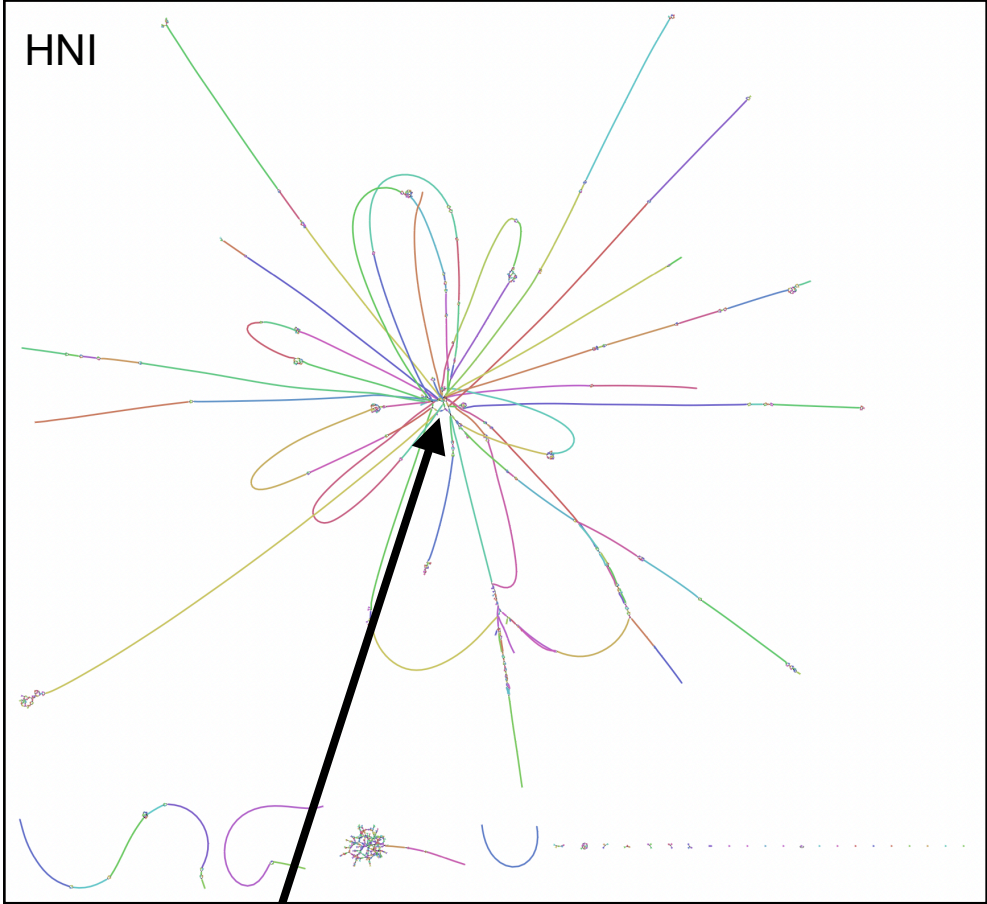
No inconsistent bases after
replacing with the ONT-UL read

Extended Data Figure 2



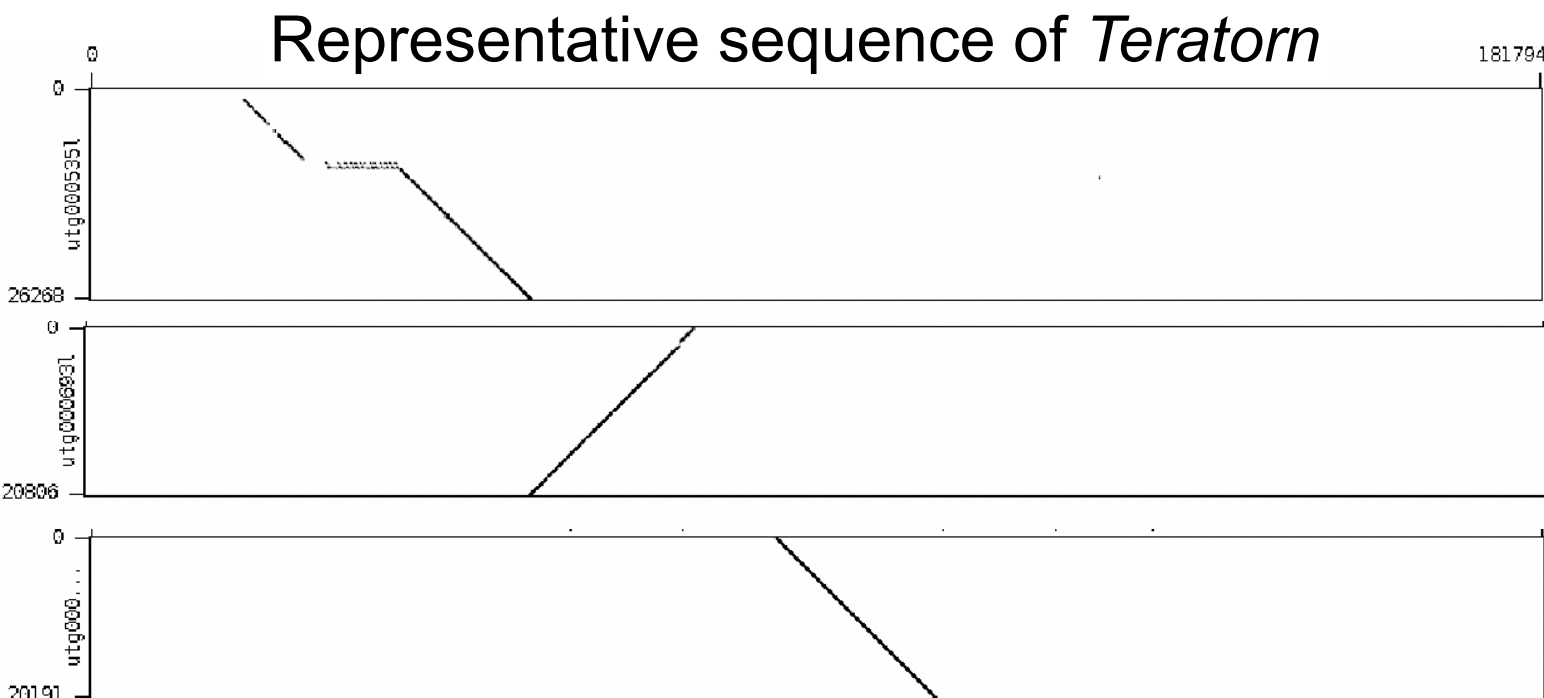
Extended Data Figure 3

a



b

Unitigs at the
center of the hairball



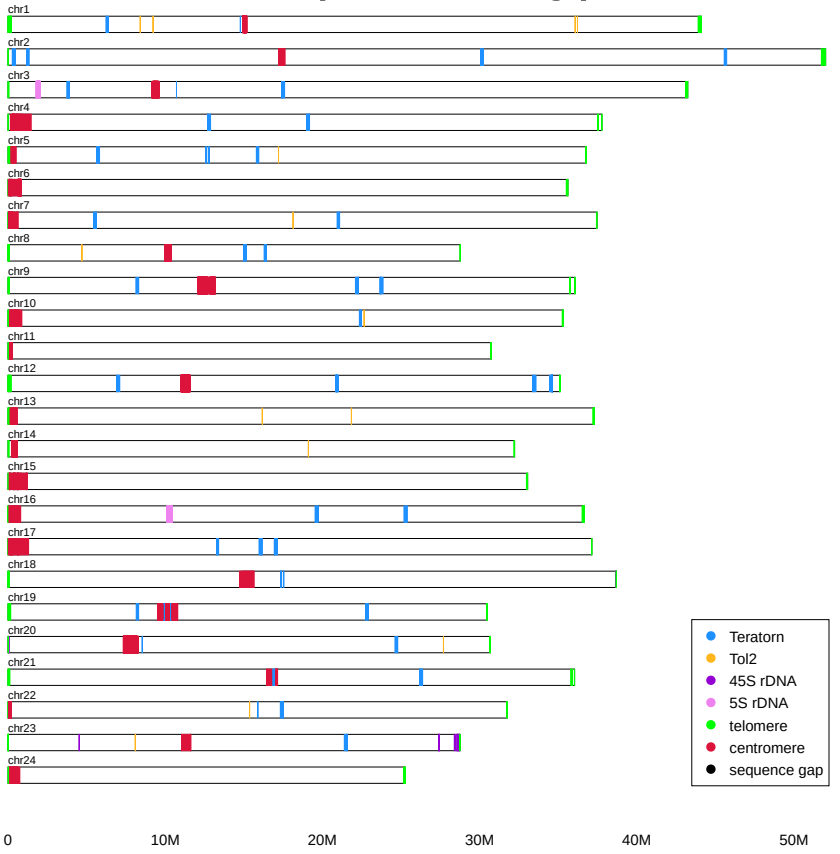
Extended Data Figure 4

v2.3 (in 2017)

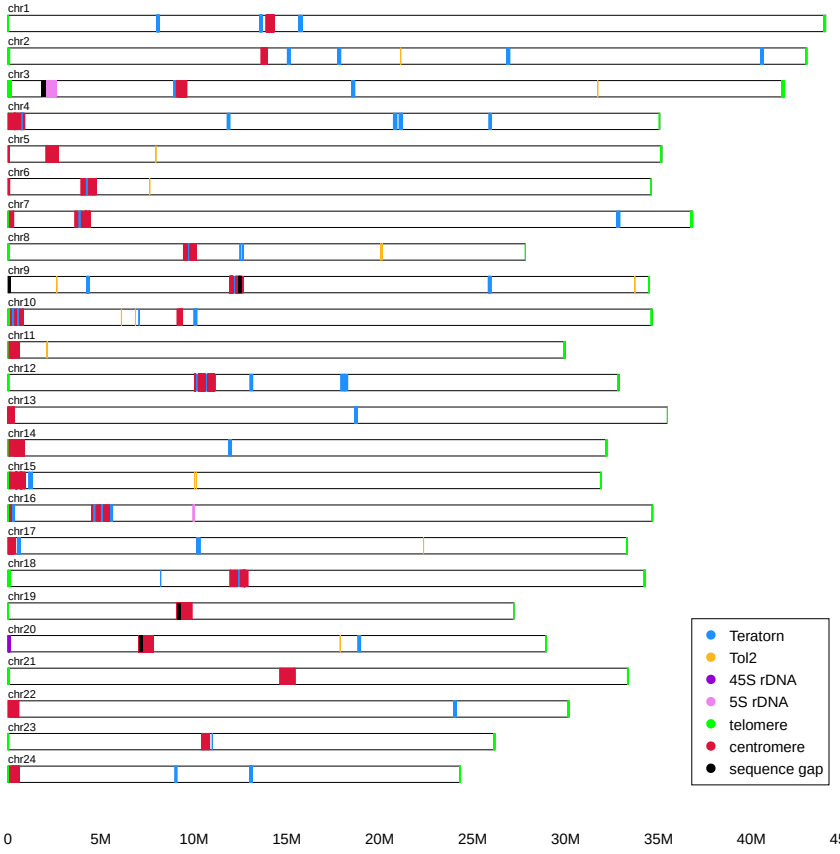
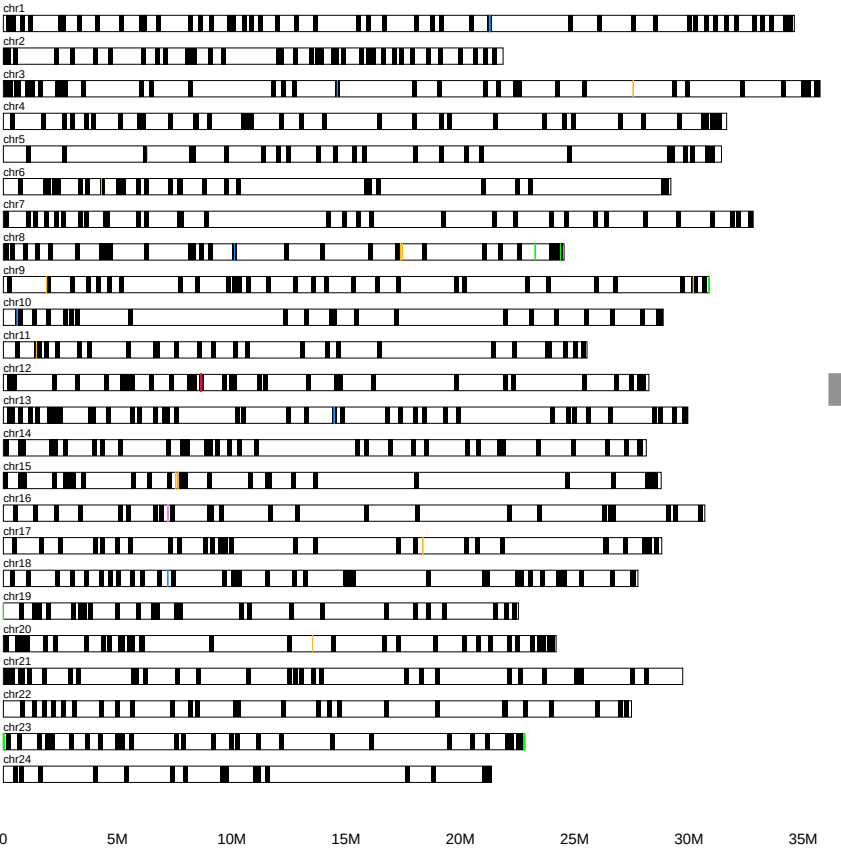
Hd-rR



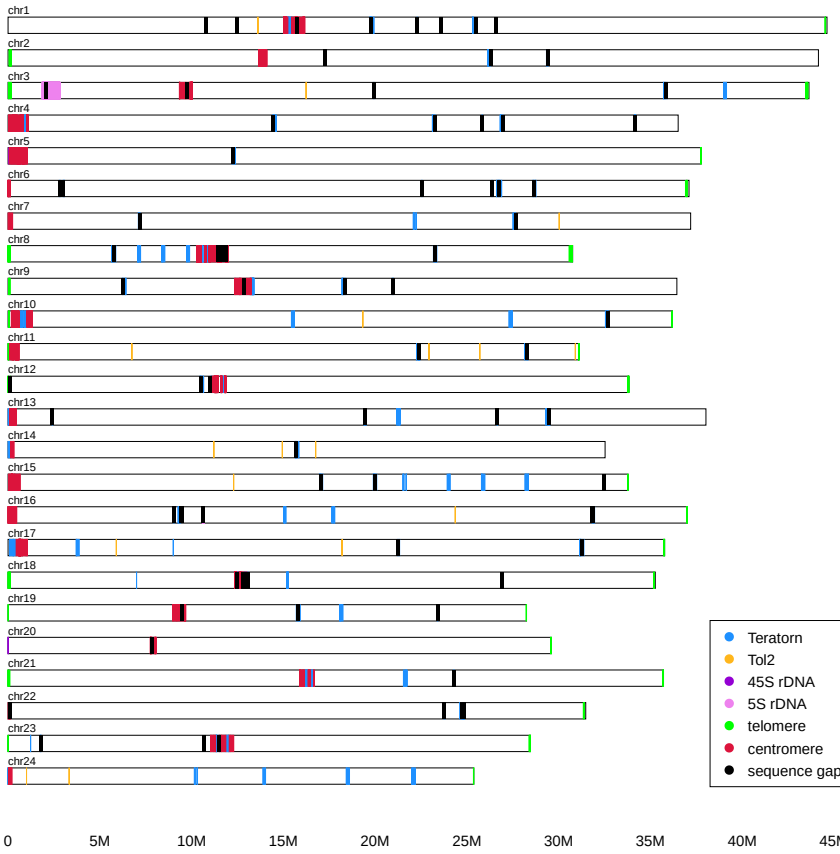
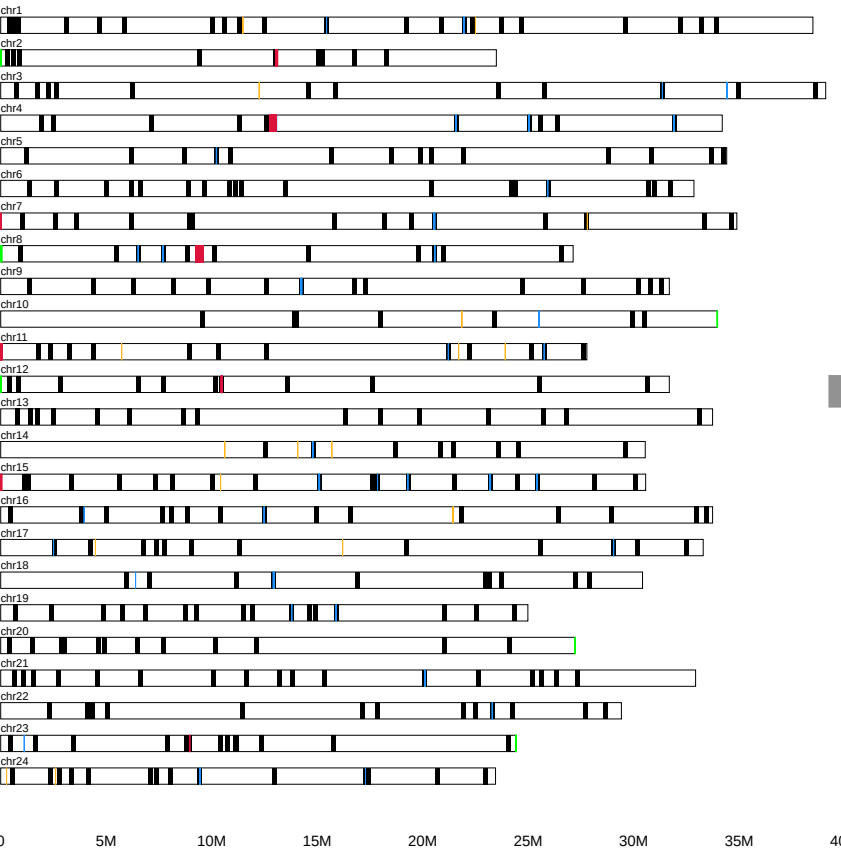
v3.1 (this study)



HNI

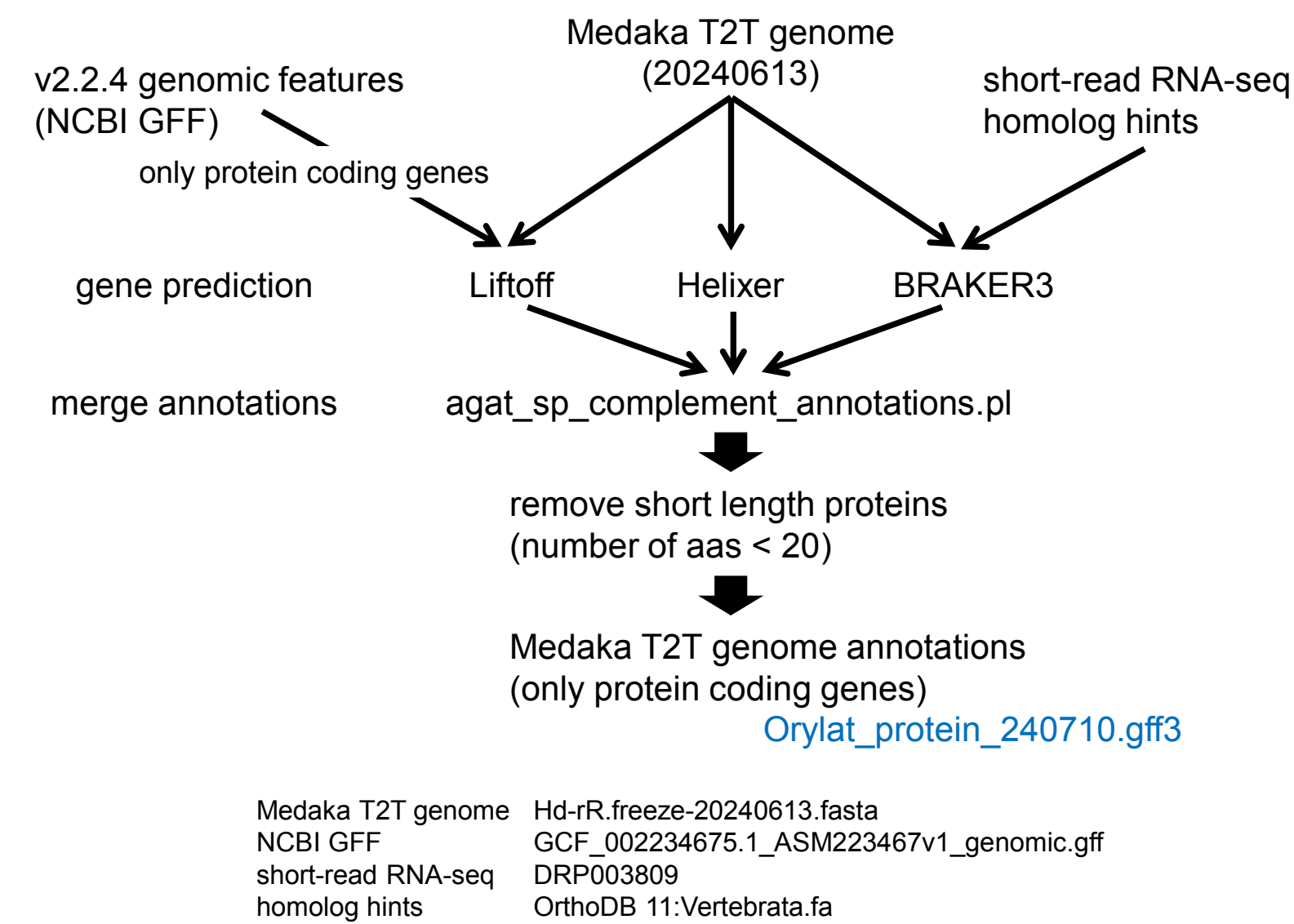


HSOK

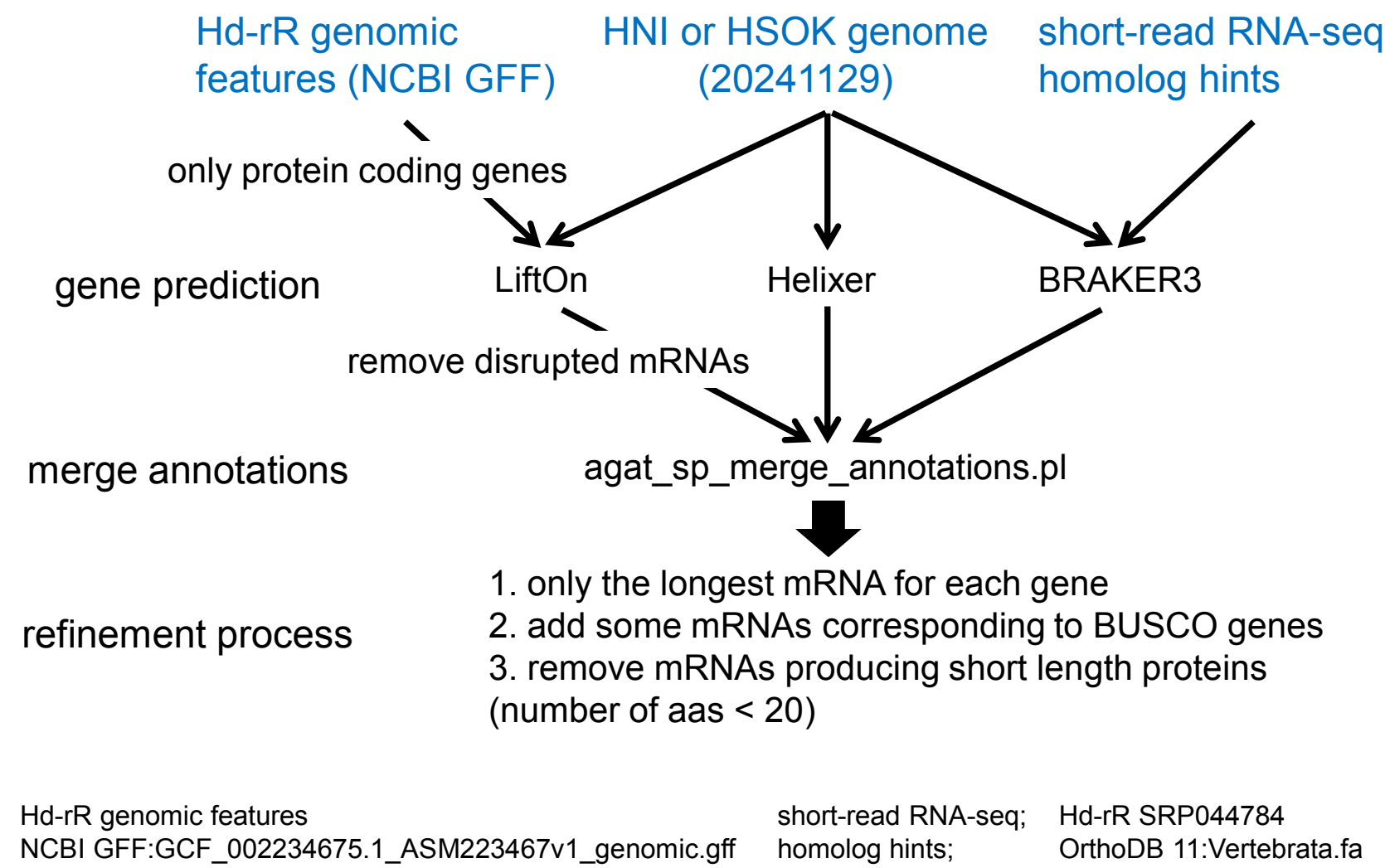


Extended Data Figure 5

a



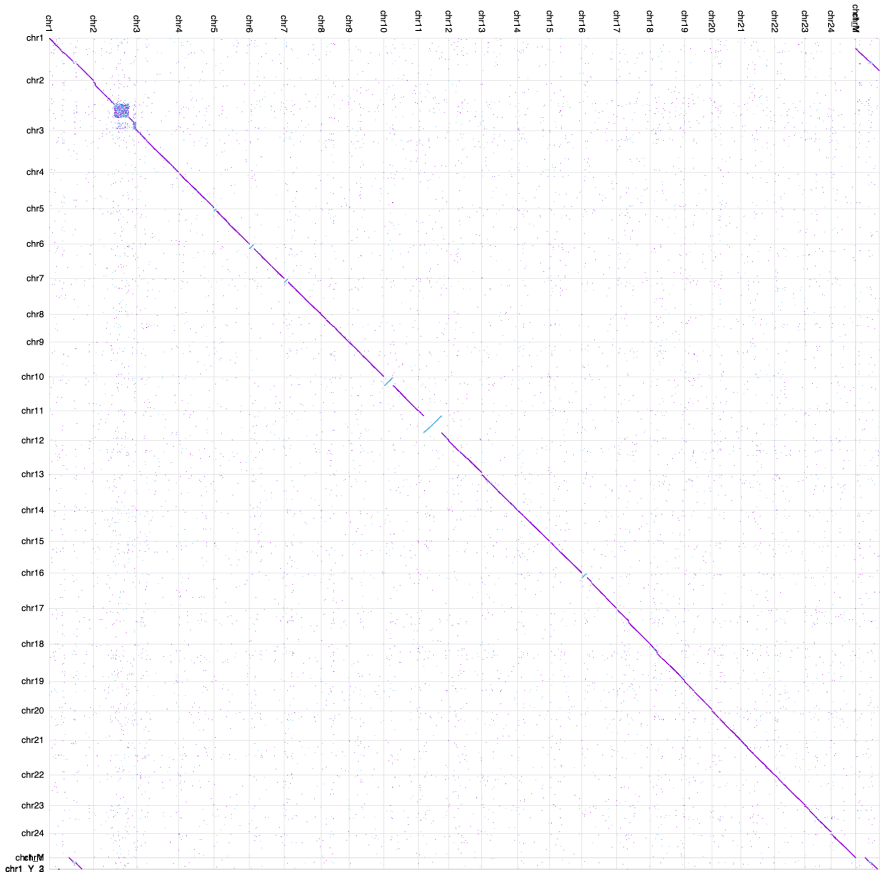
b



Extended Data Figure 6

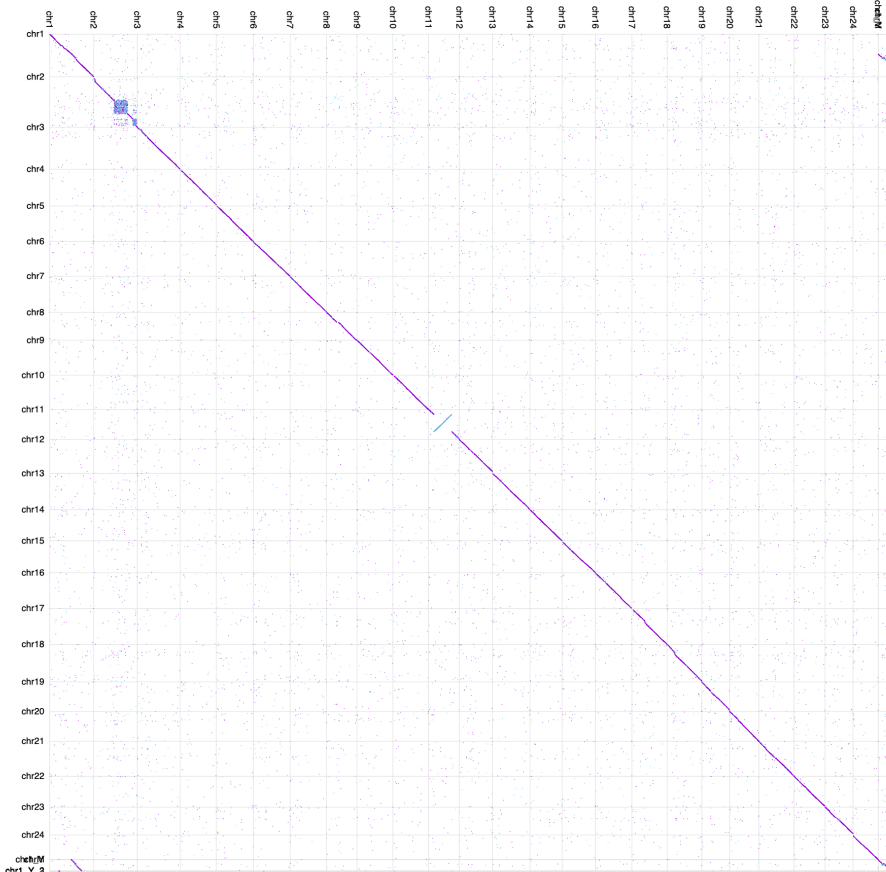
HNI

Hd-rR



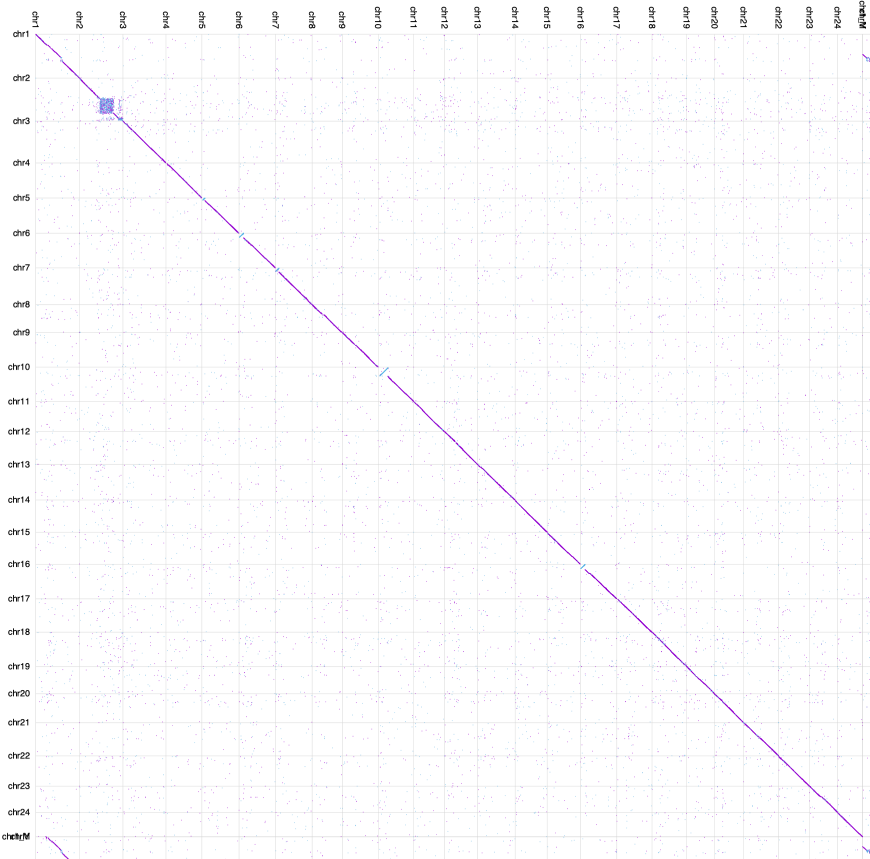
HSOK

Hd-rR



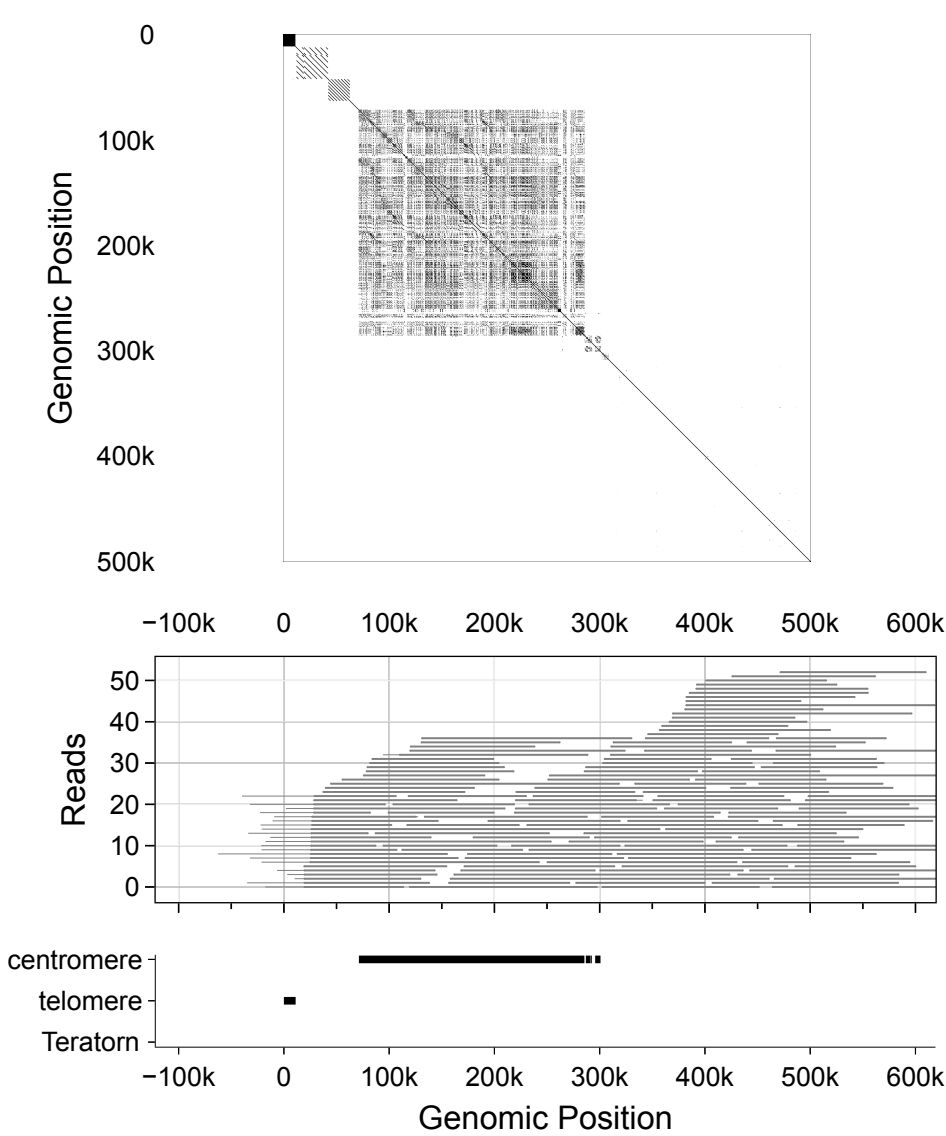
HSOK

HNI

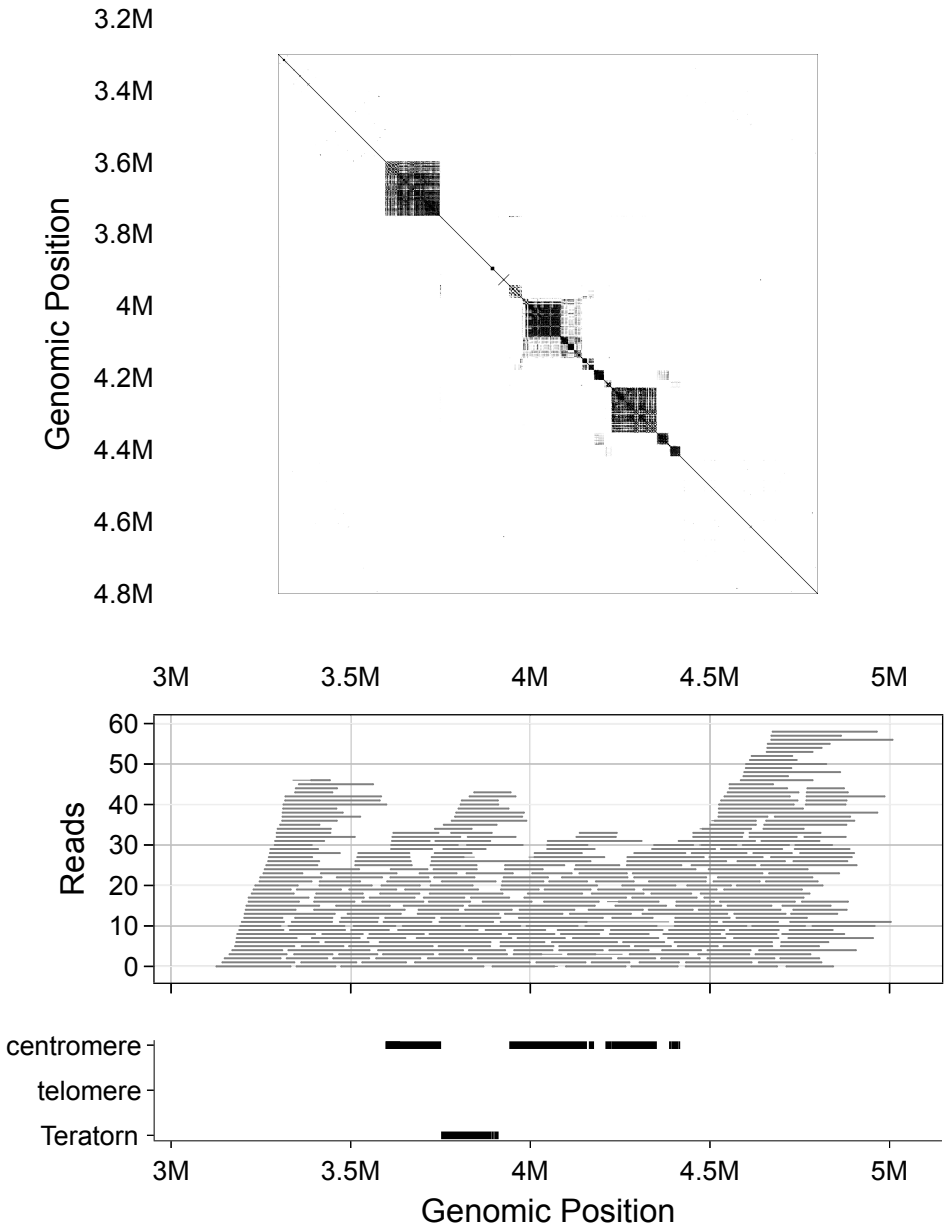


Extended Data Figure 7

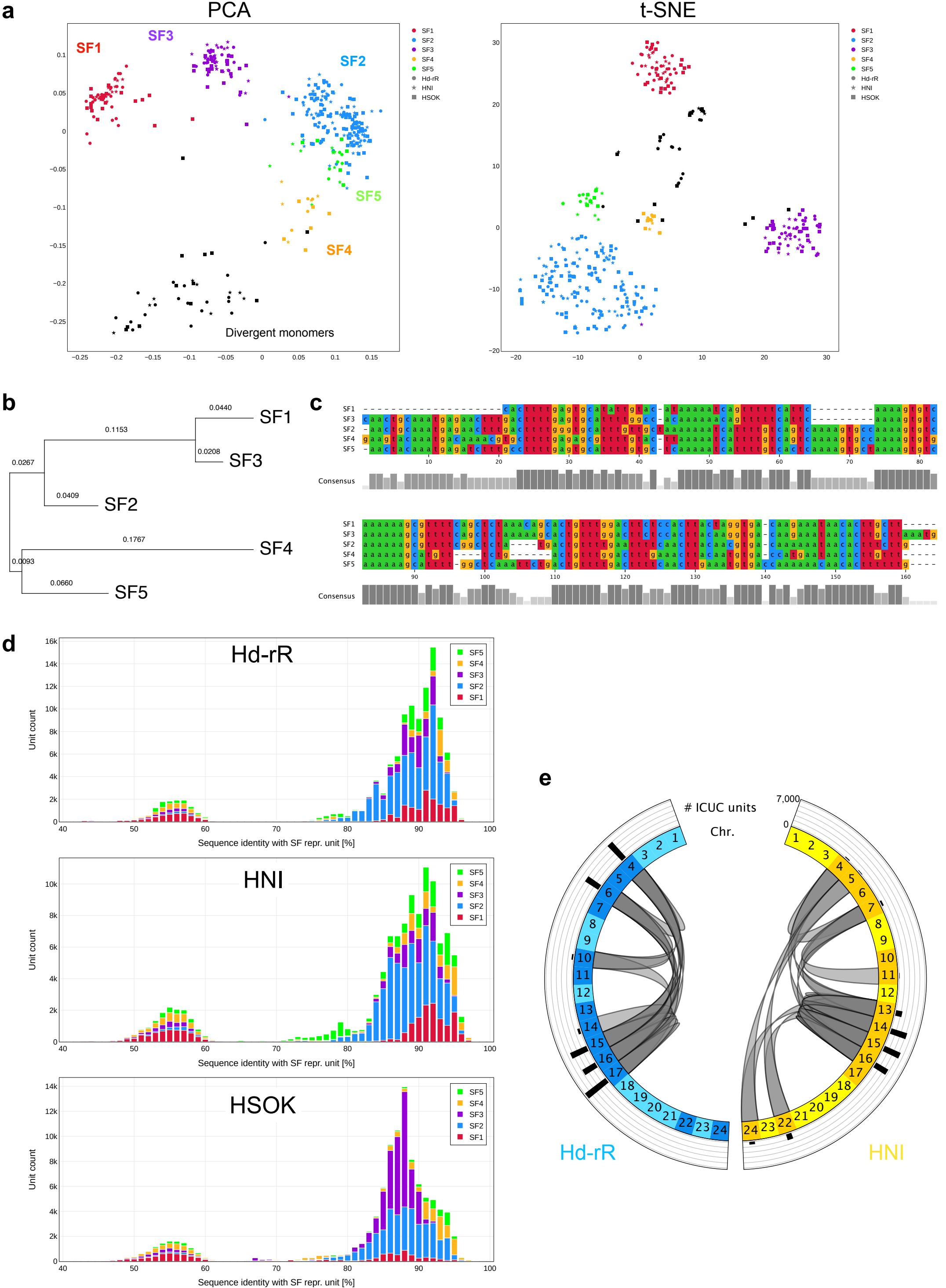
a chr7:1-500000



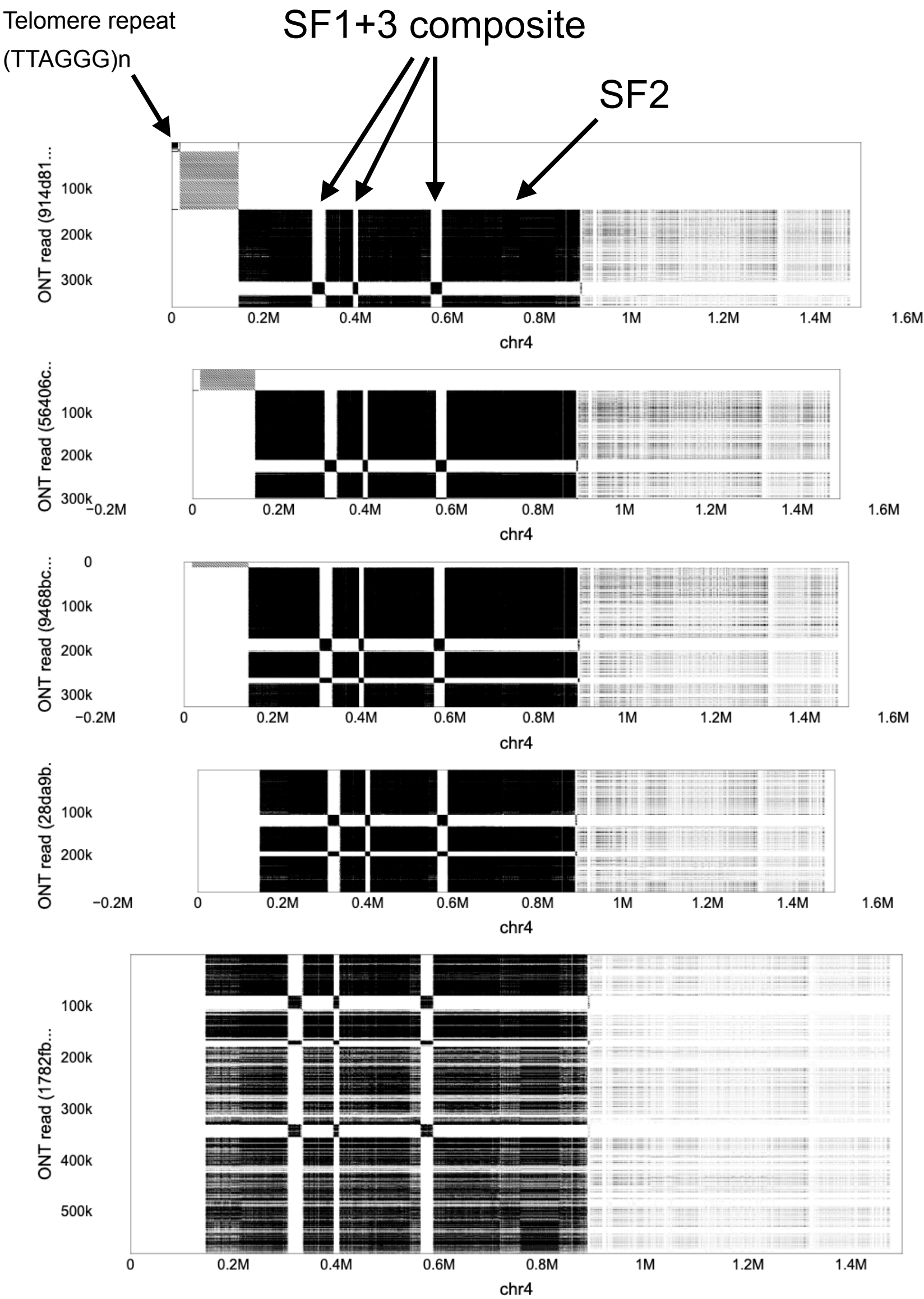
b chr7:3300001-4800000



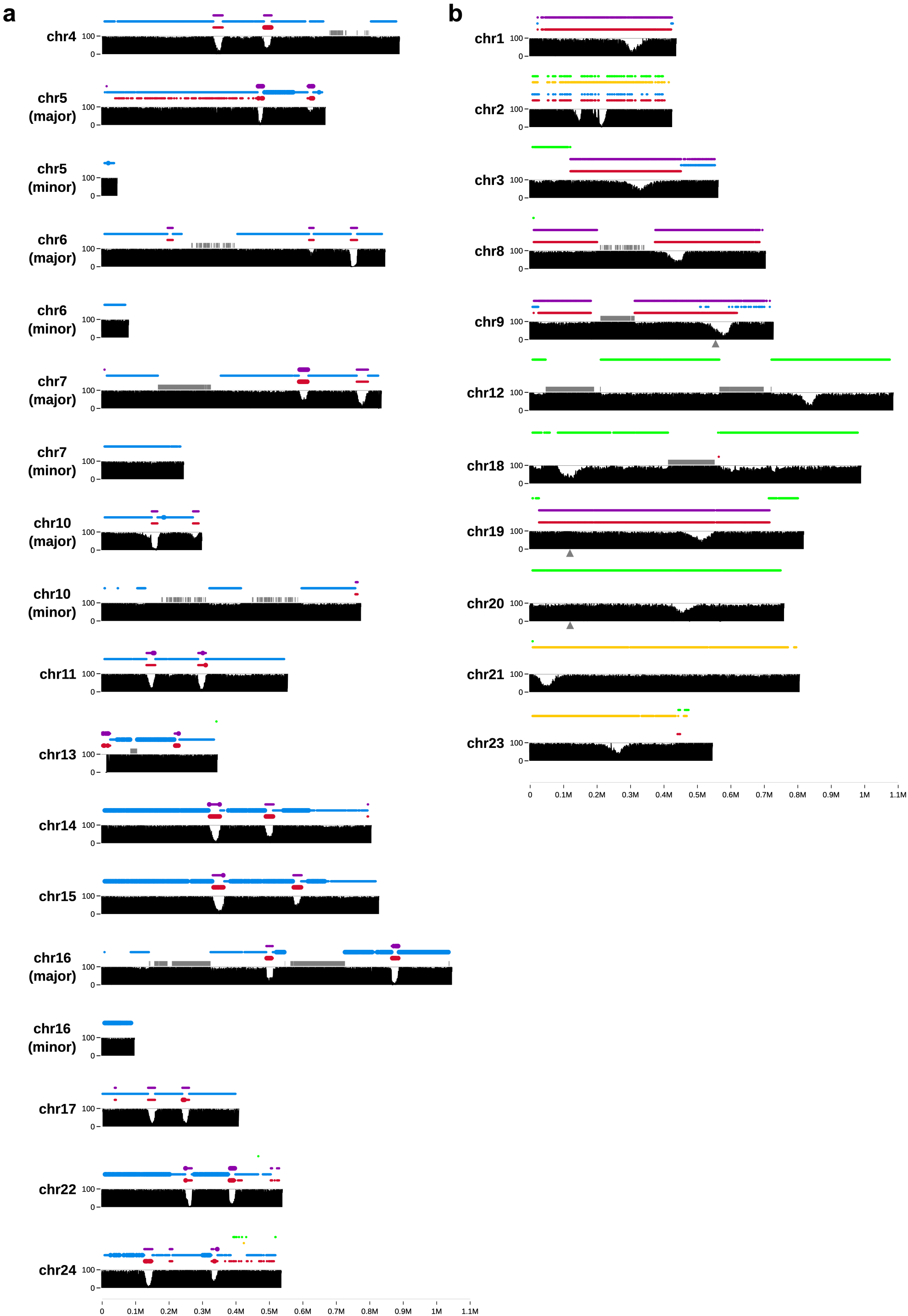
Extended Data Figure 8



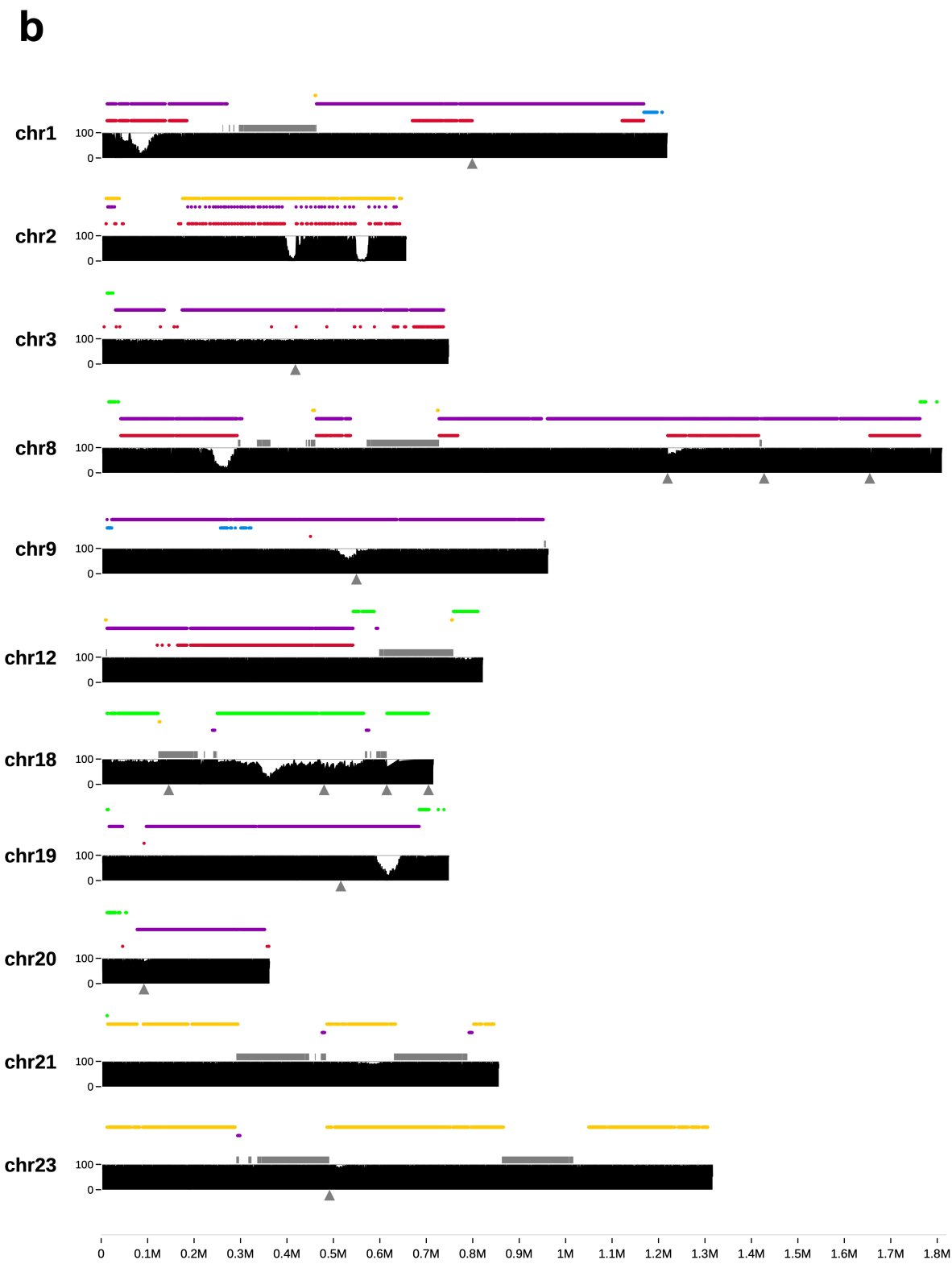
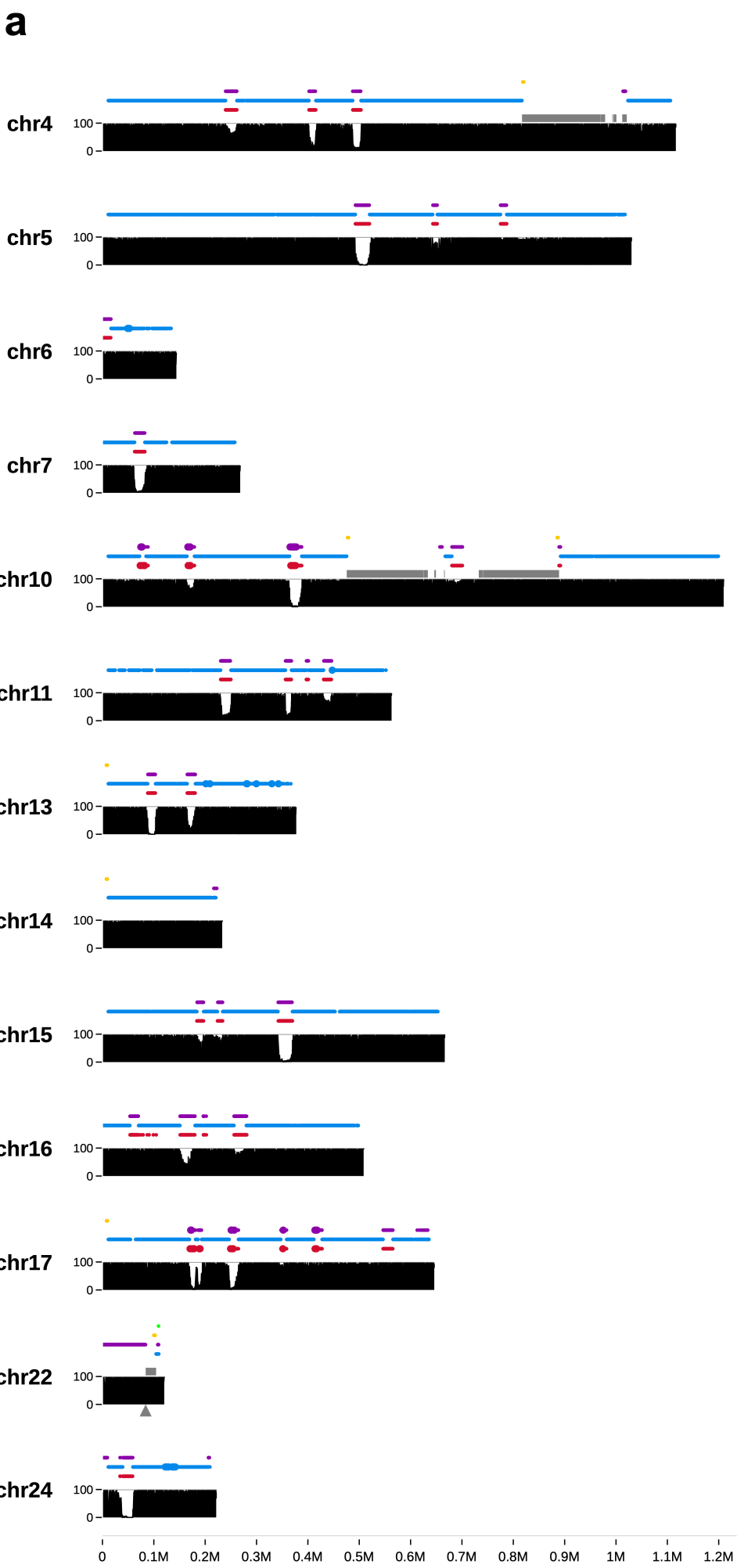
Extended Data Figure 9



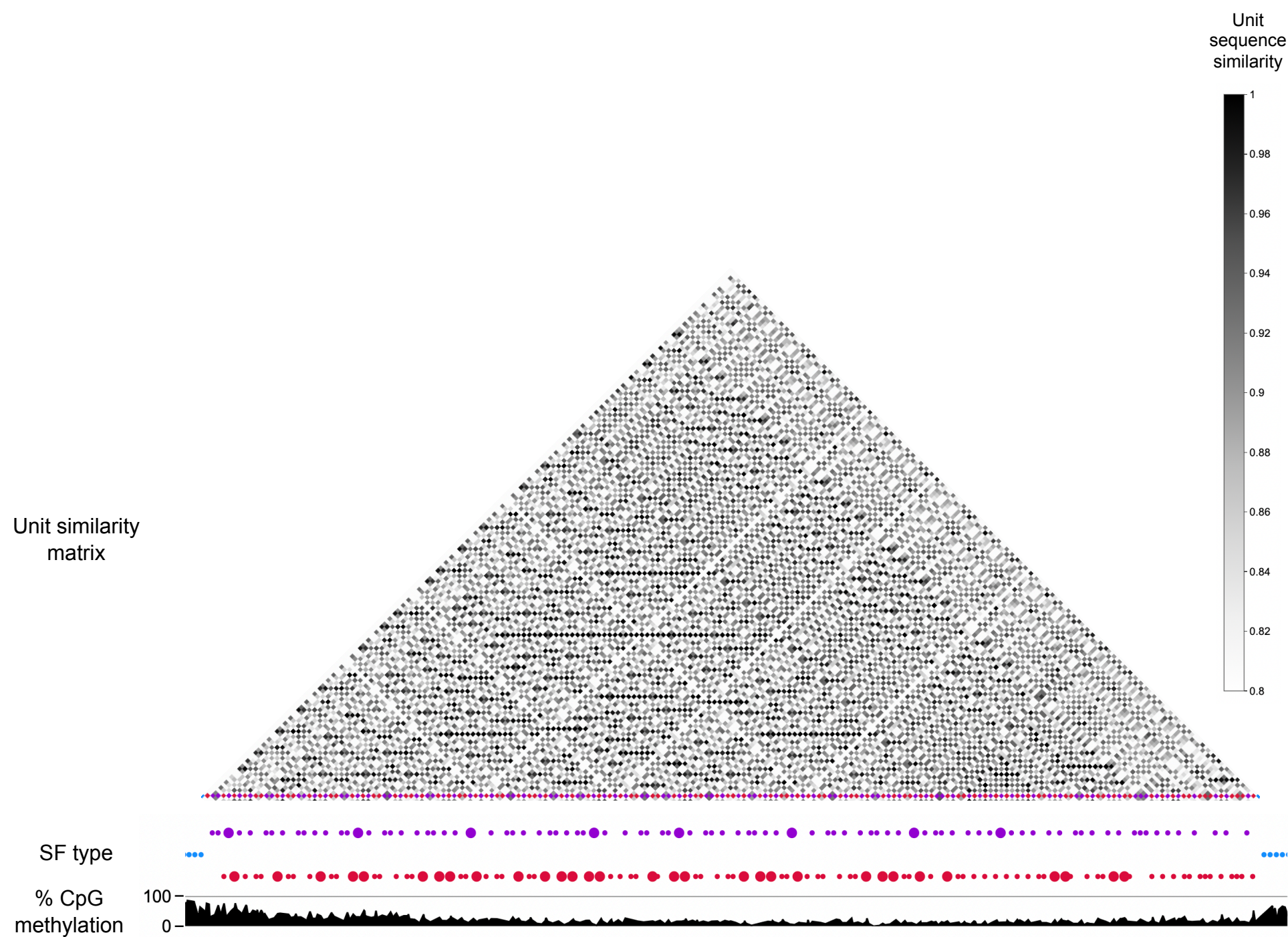
Extended Data Figure 10



Extended Data Figure 11



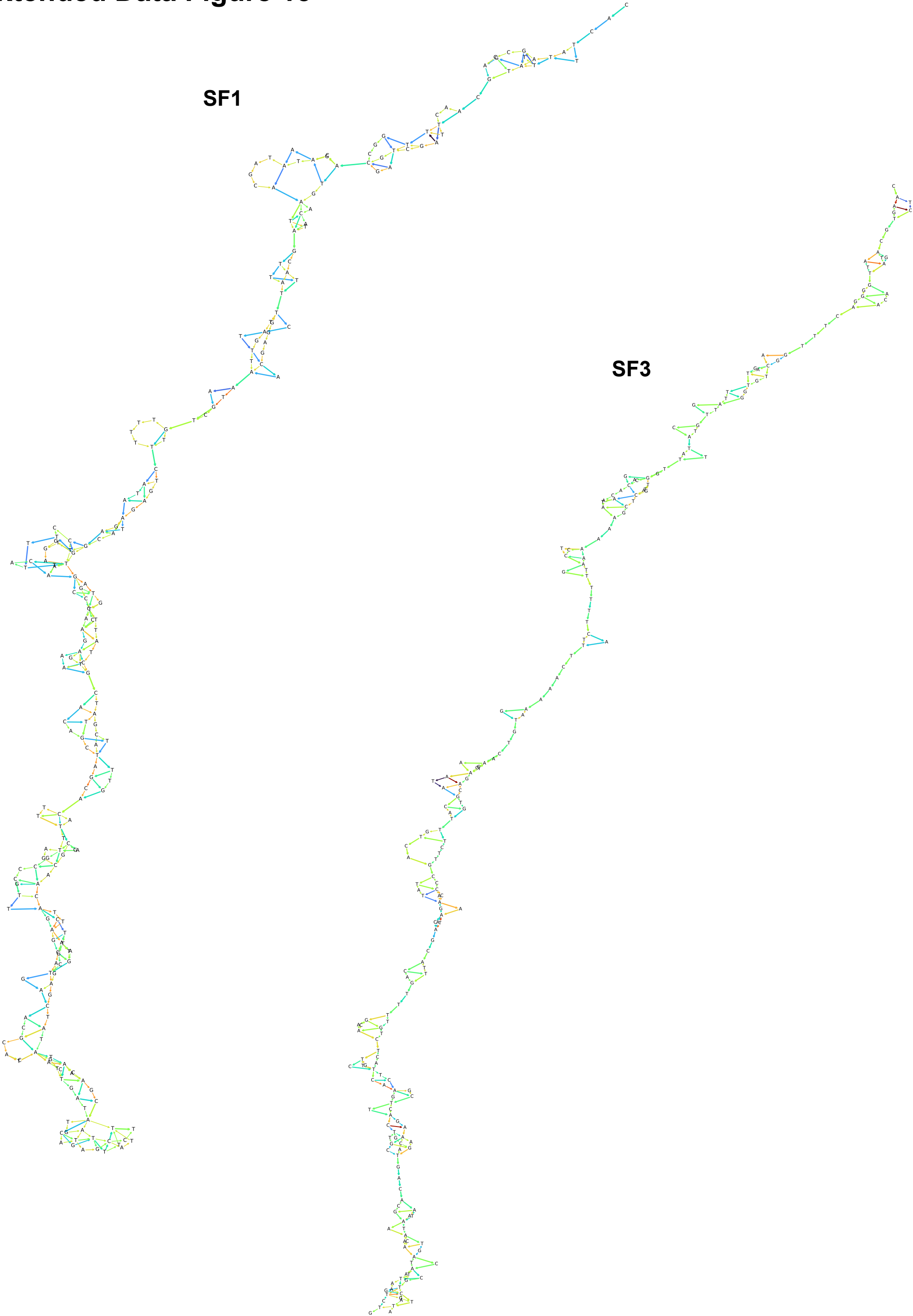
Extended Data Figure 12



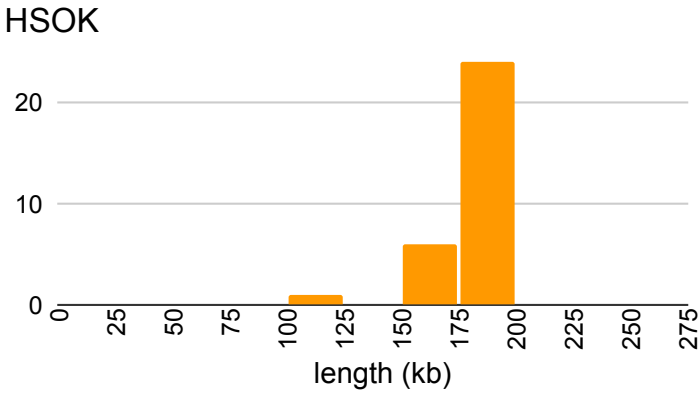
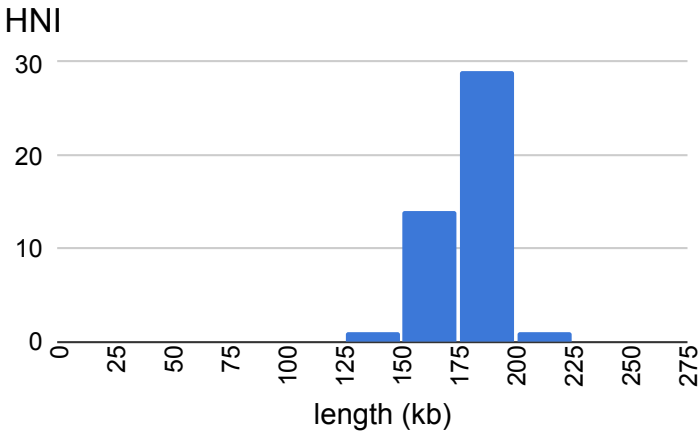
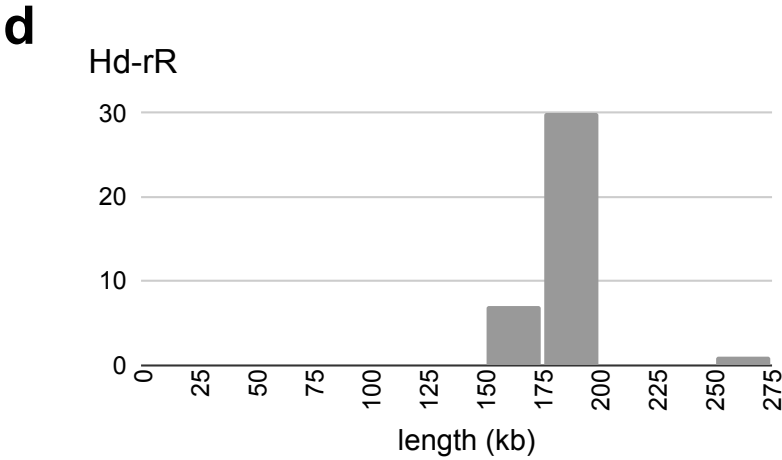
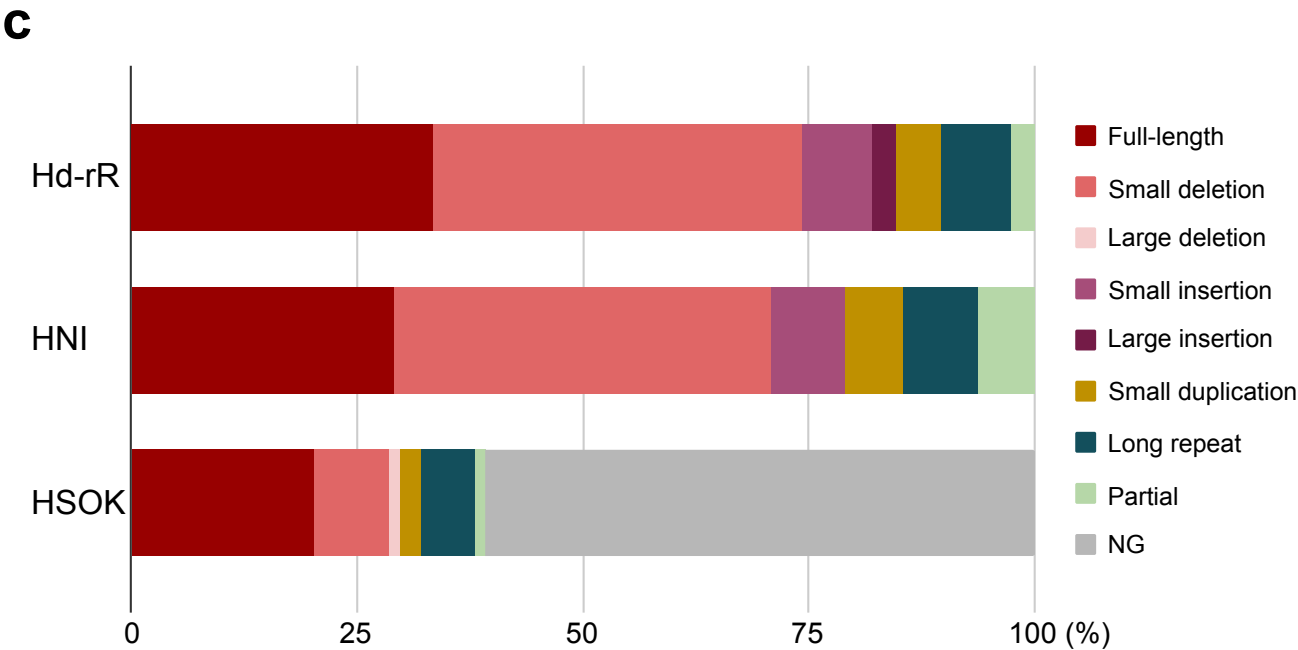
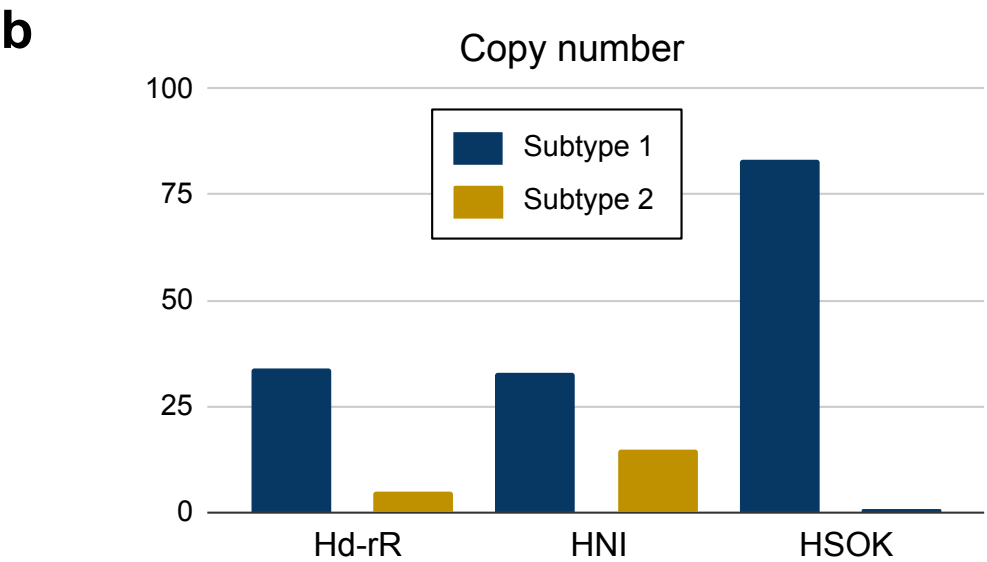
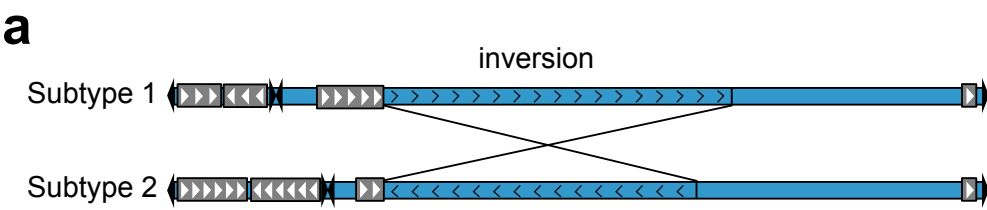
Extended Data Figure 13

SF1

SF3

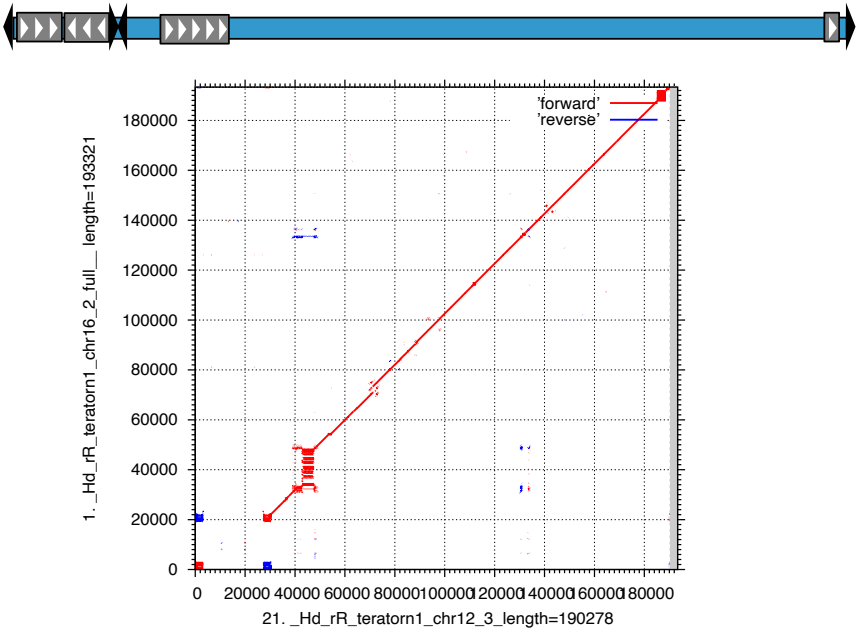


Extended Data Figure 14

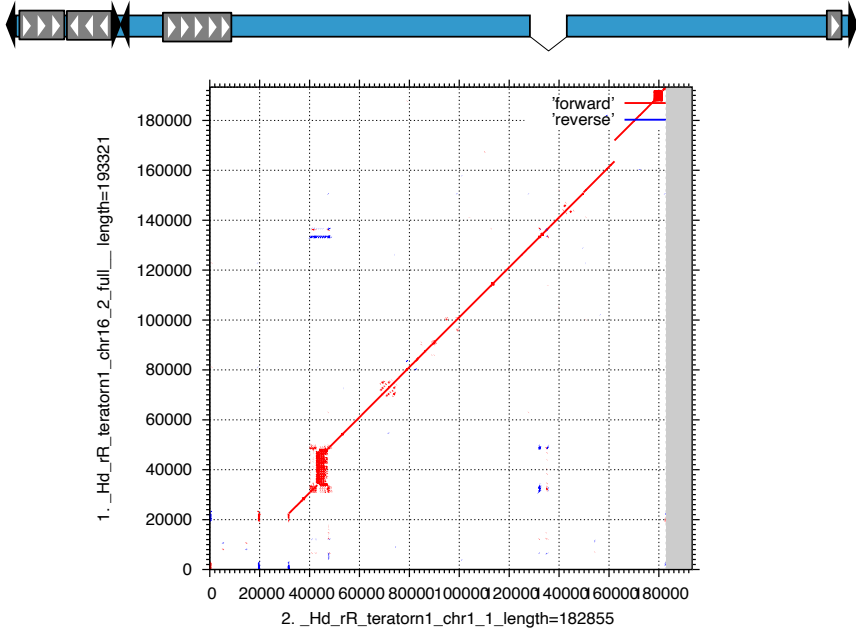


Extended Data Figure 15

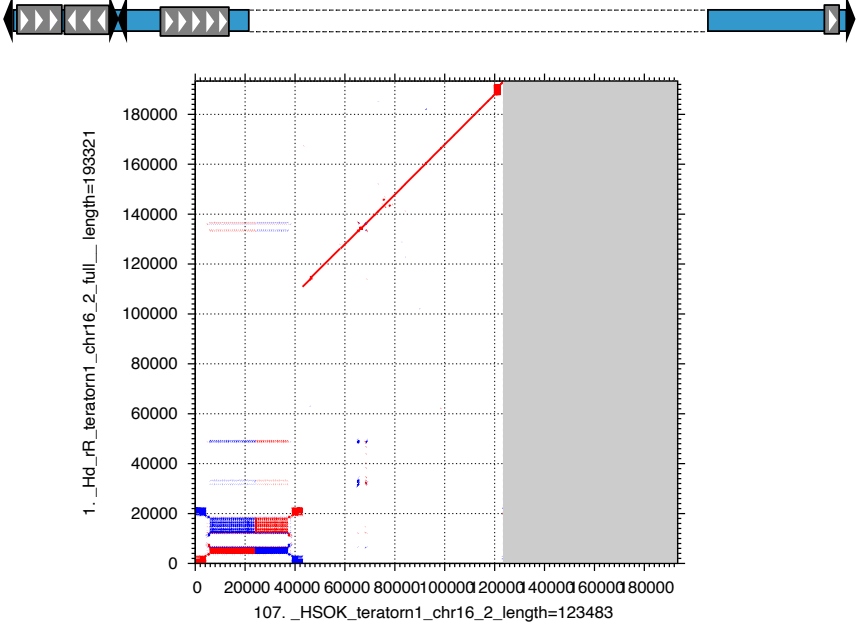
Full-length



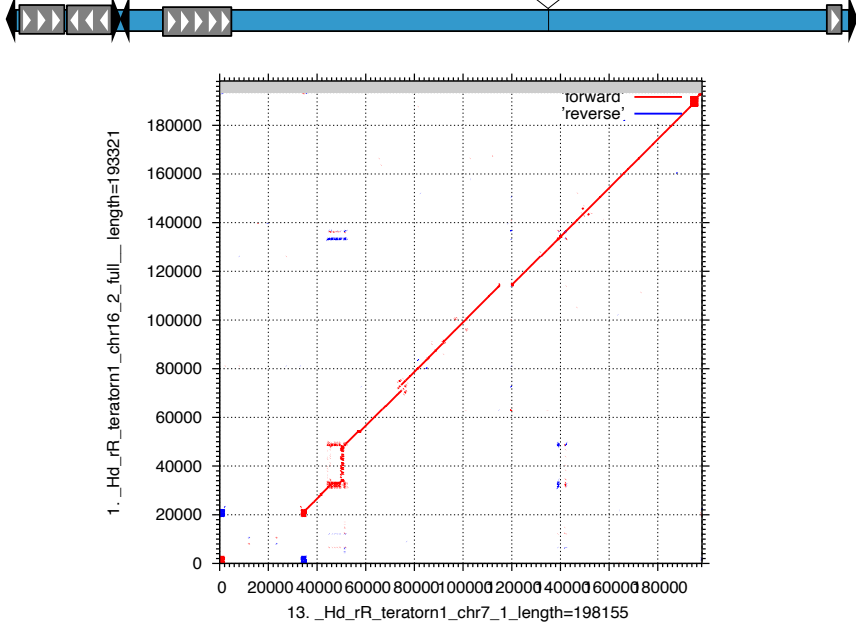
Small deletion (< 50 kb)



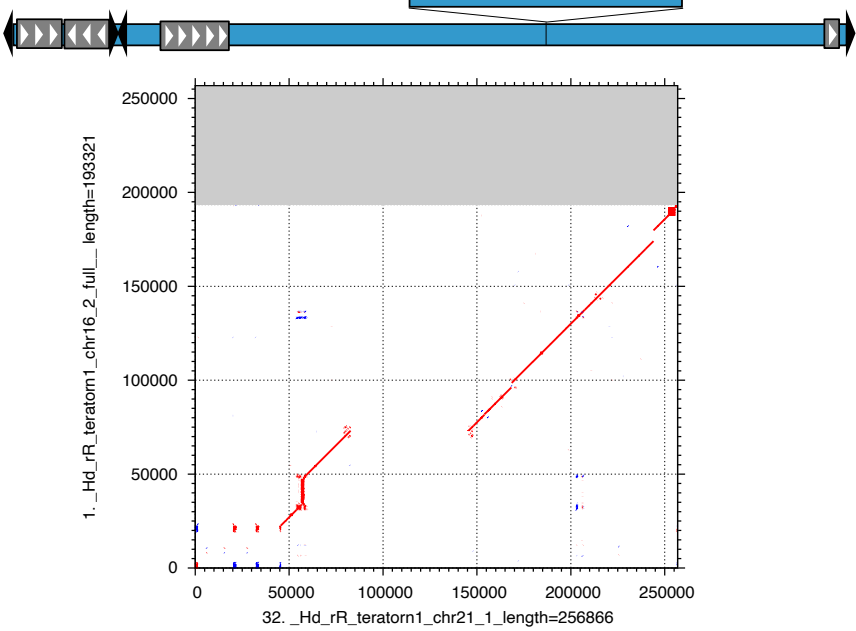
Large deletion (> 50 kb)



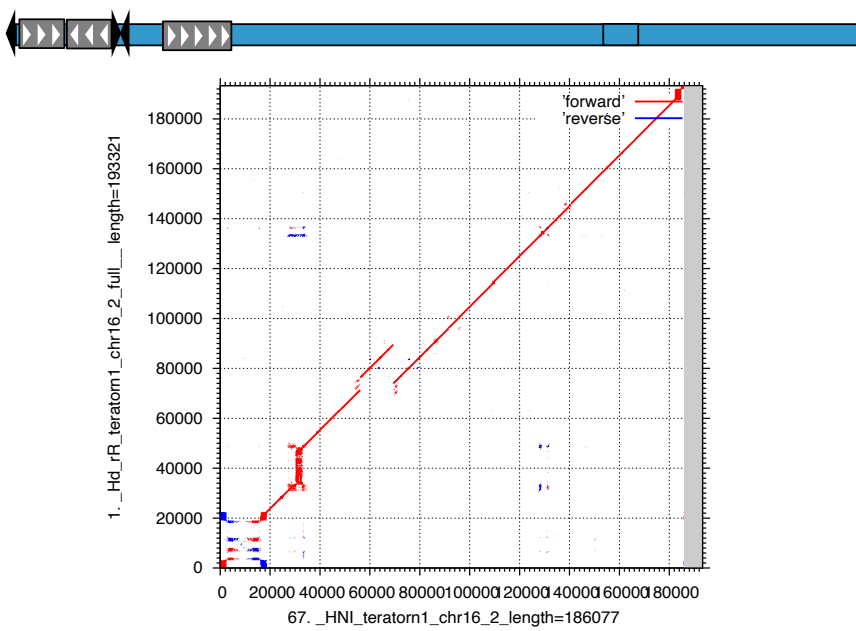
Small insertion (< 50 kb)



Large insertion (> 50 kb)



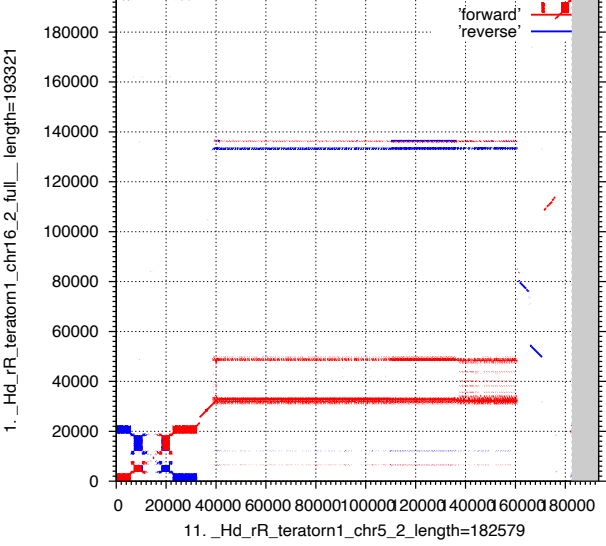
Small duplication (< 50 kb)



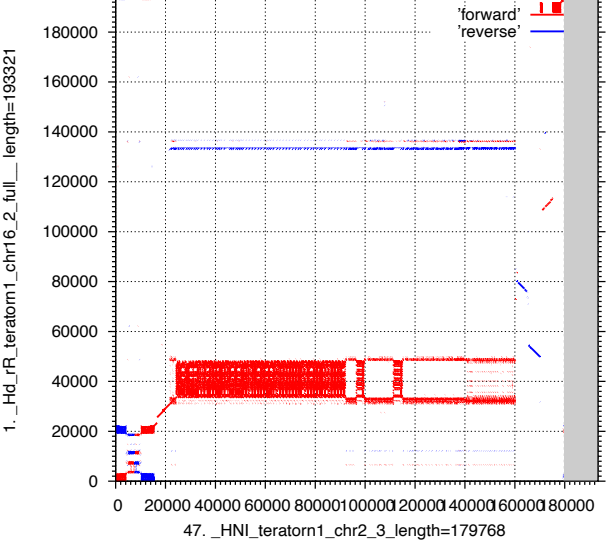
Long repeat



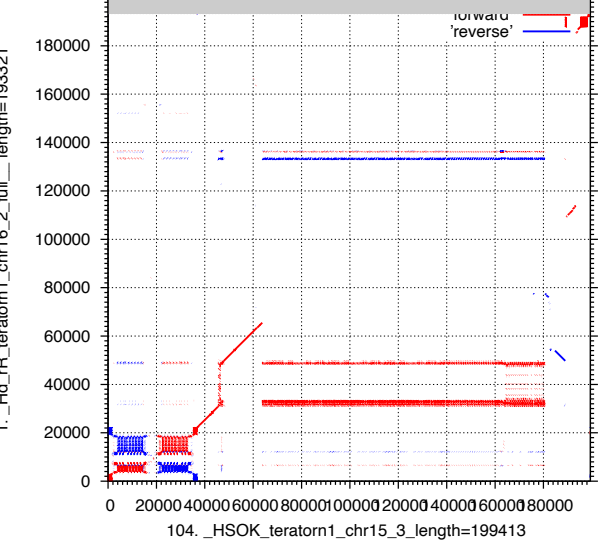
Hd-rR



HNI

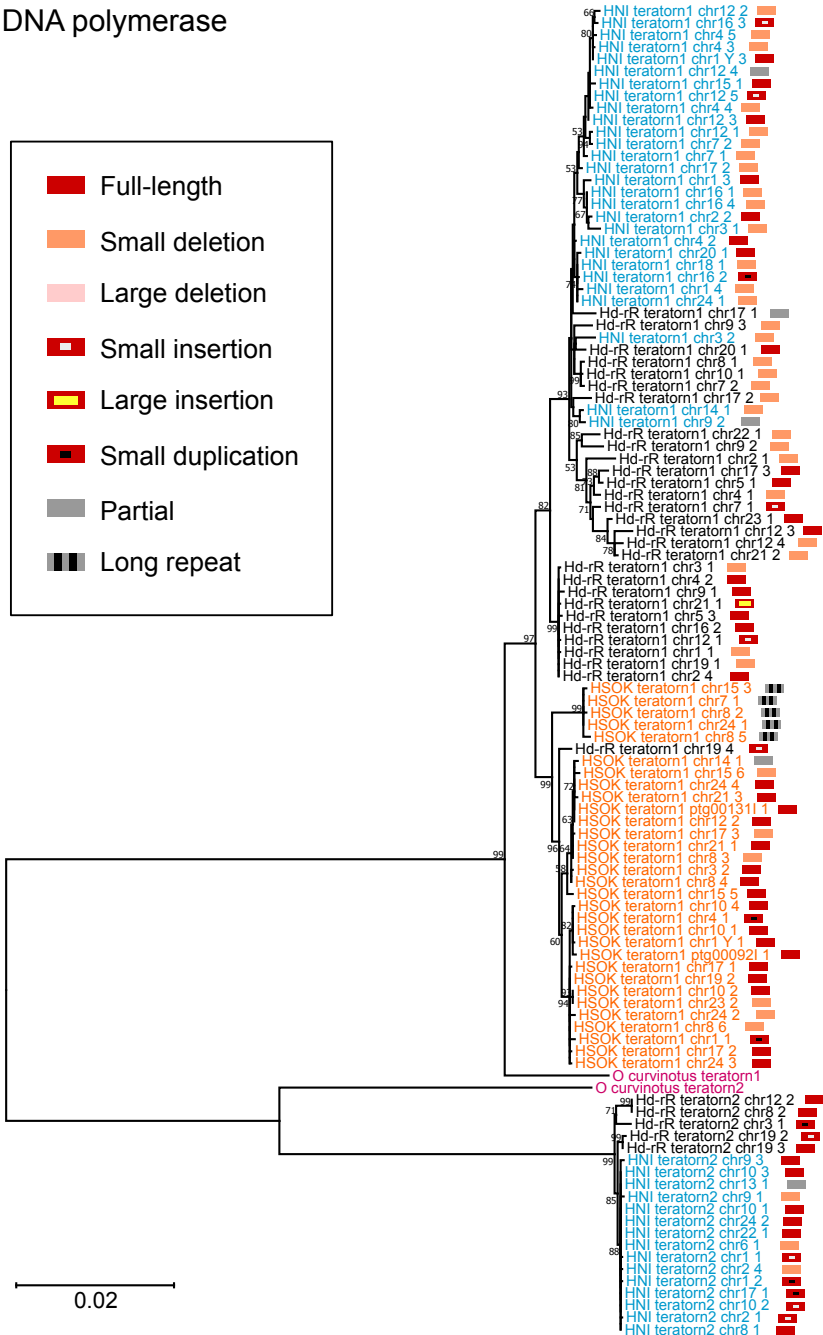
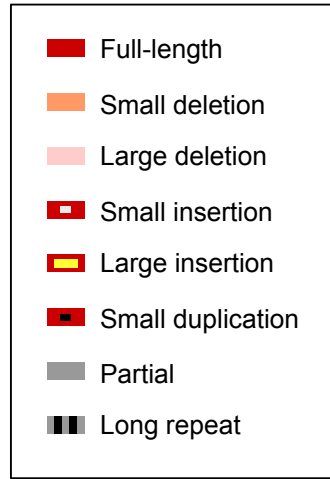


HSOK

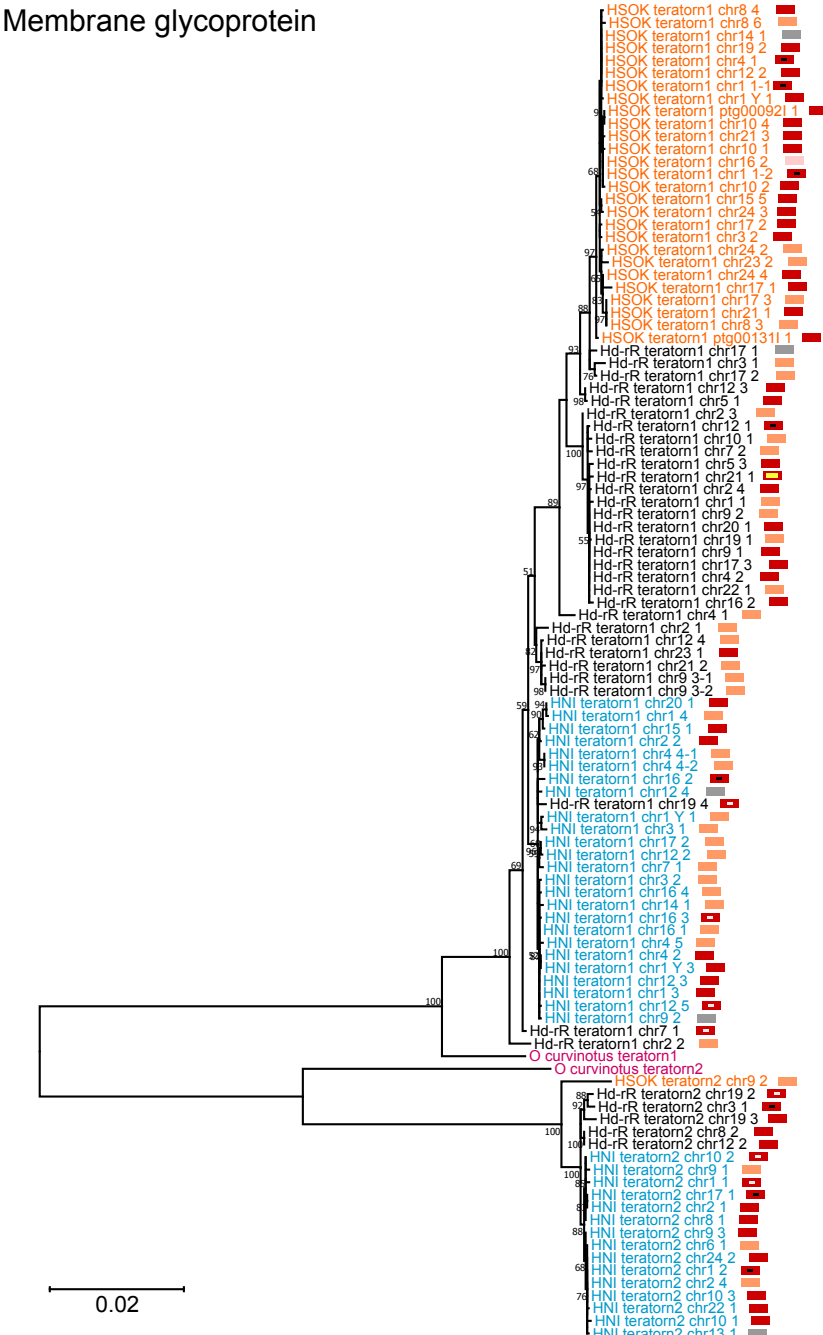


Extended Data Figure 16

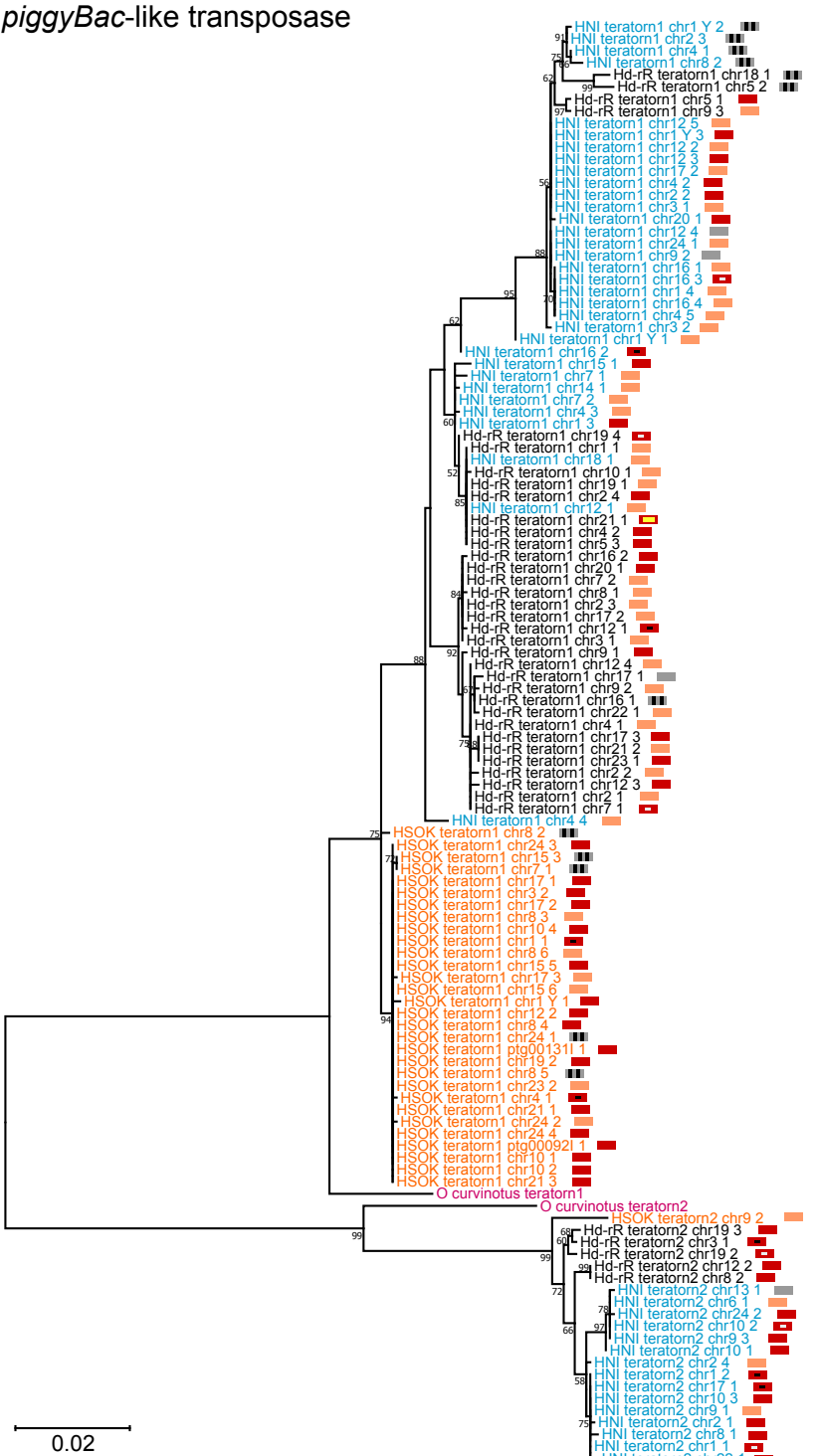
DNA polymerase



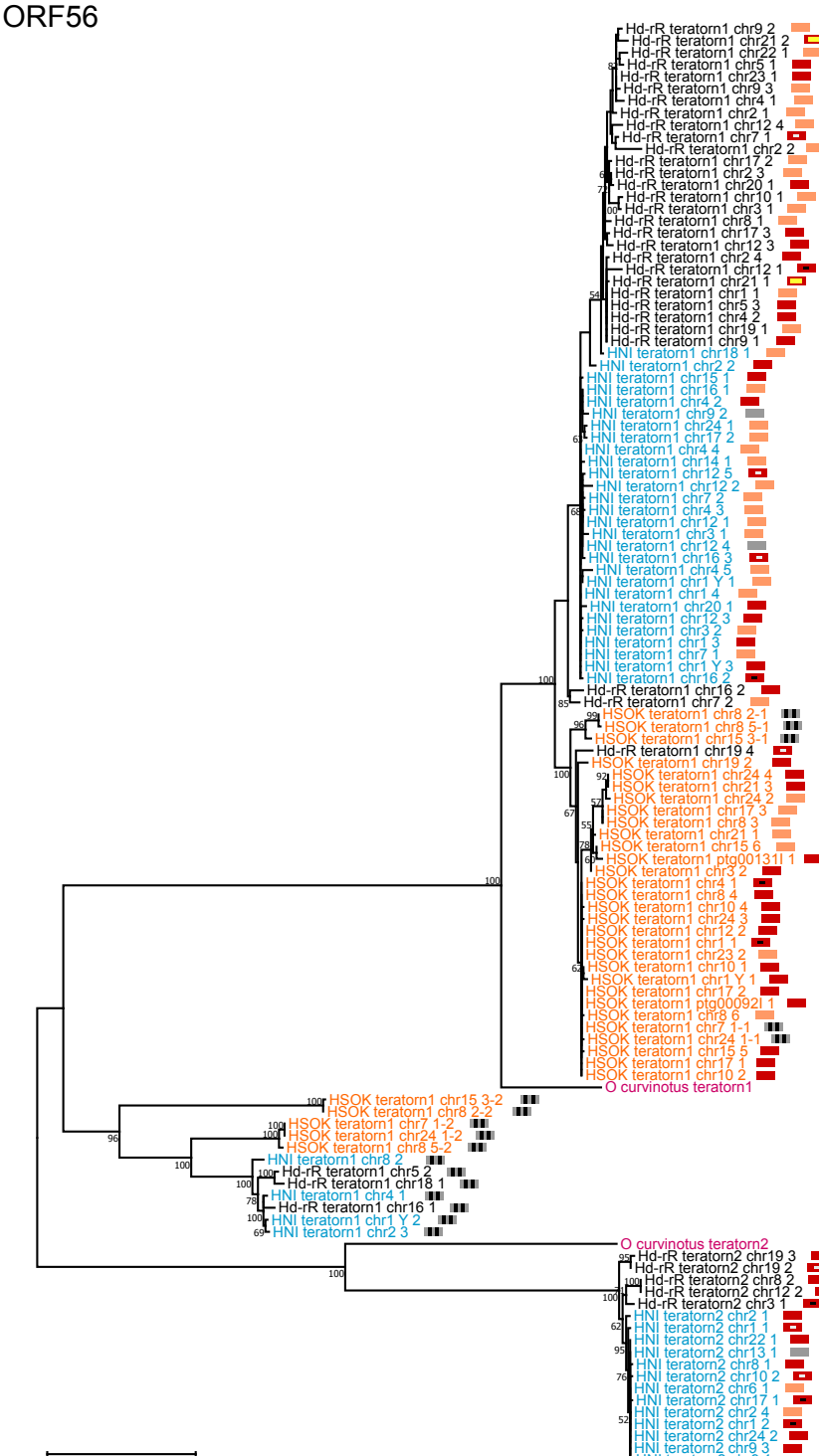
Membrane glycoprotein



piggyBac-like transposase

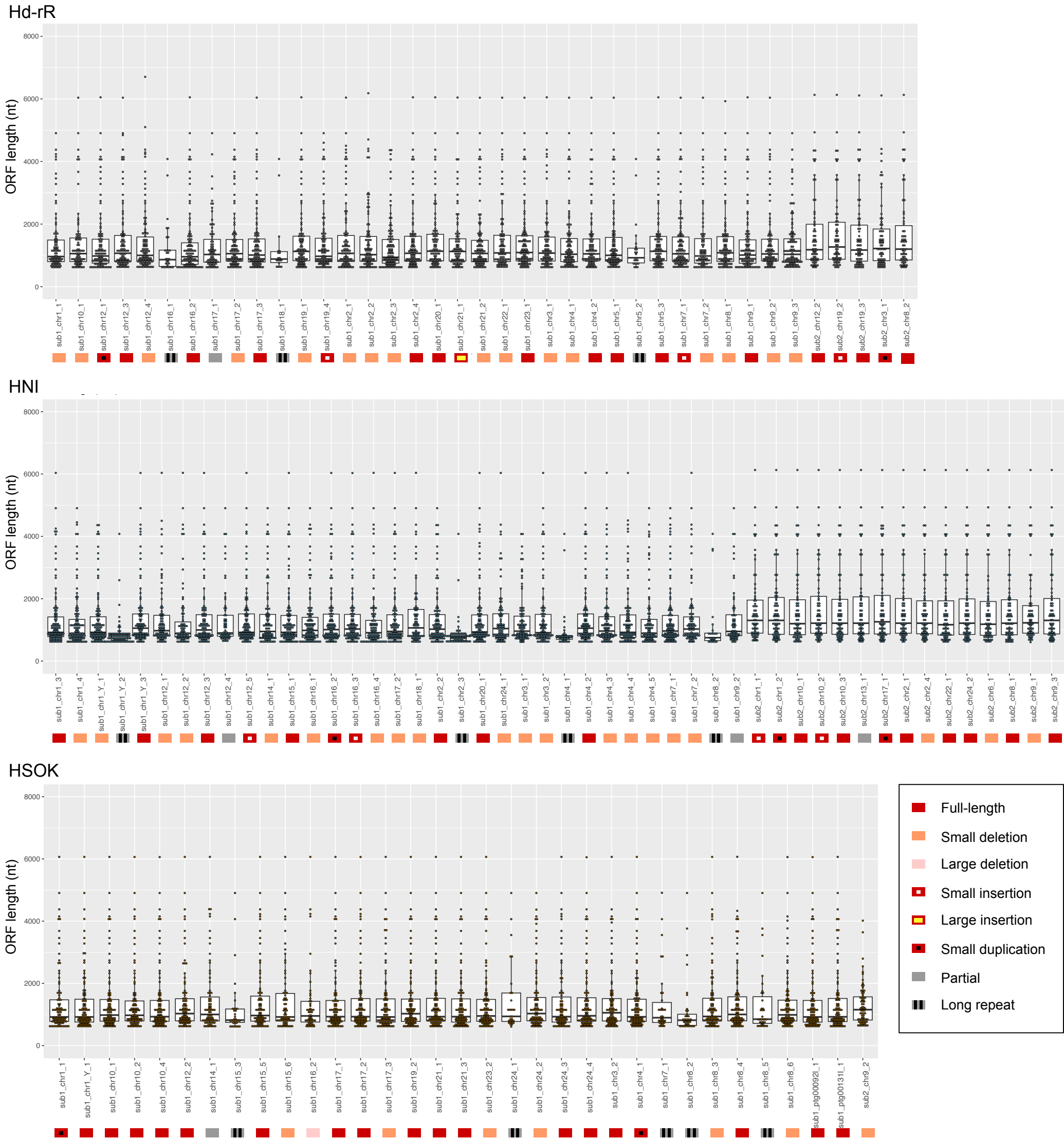


ORF56

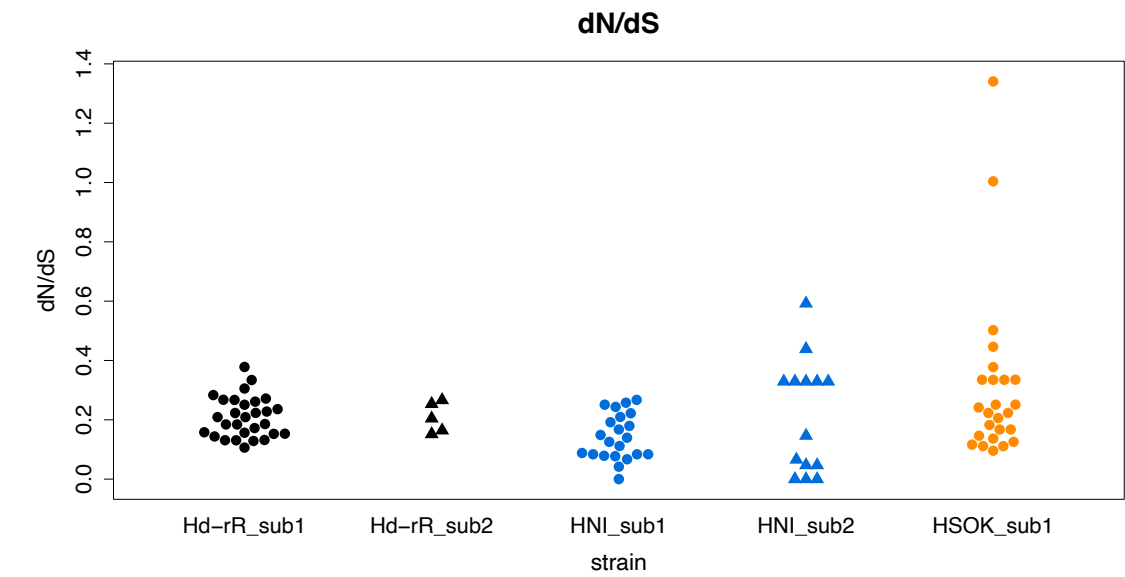


Extended Data Figure 17

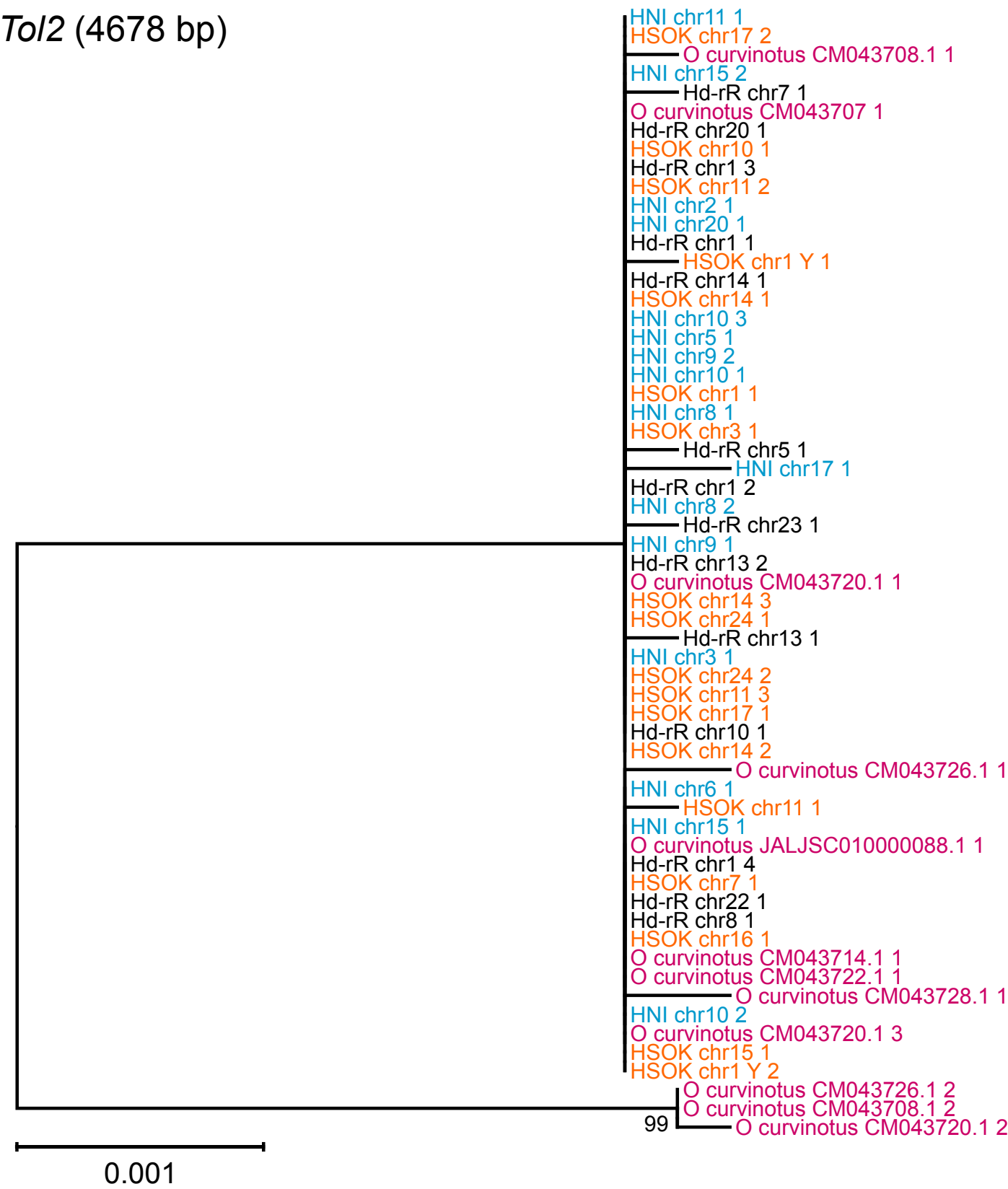
a



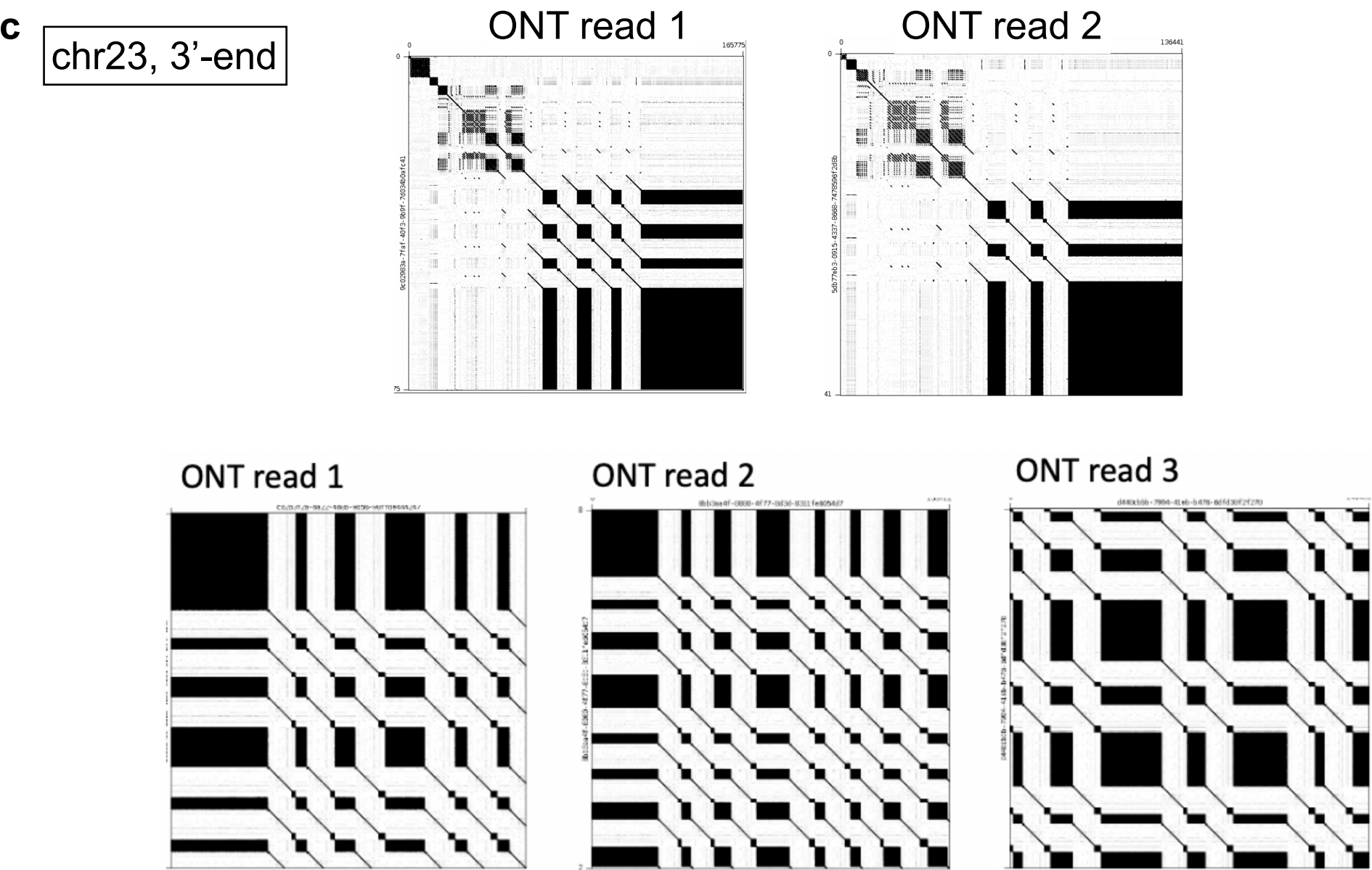
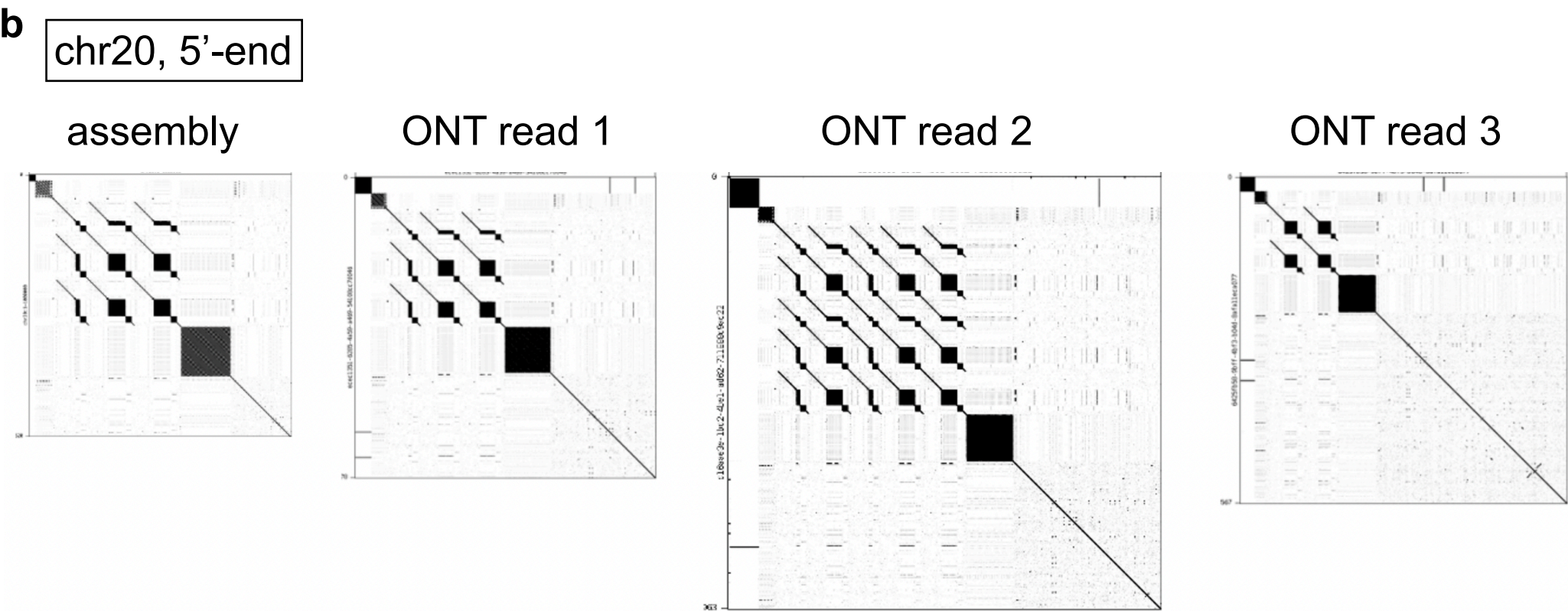
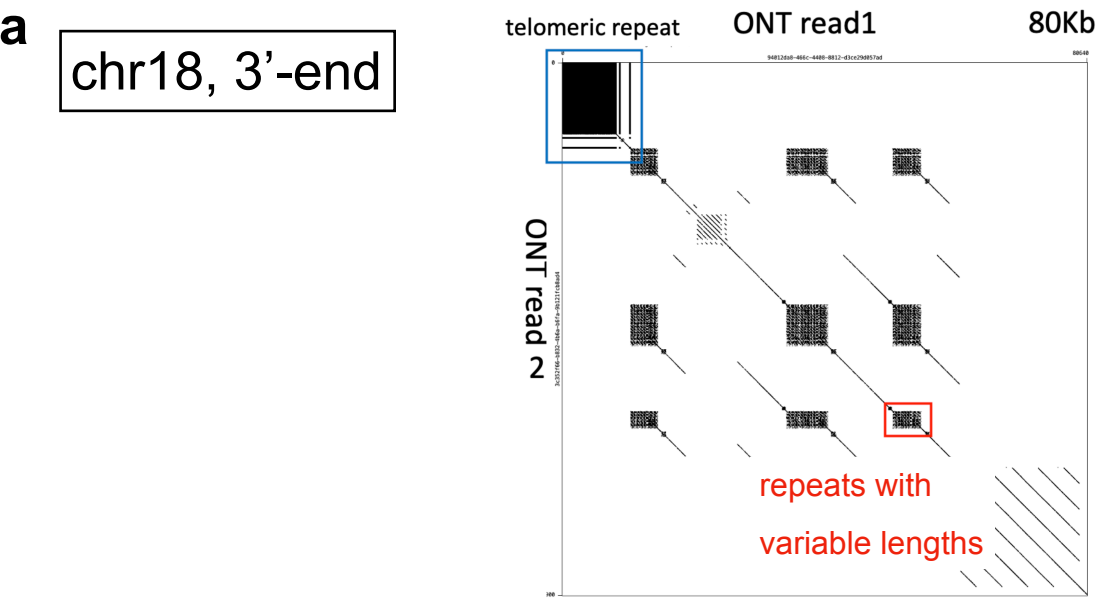
b



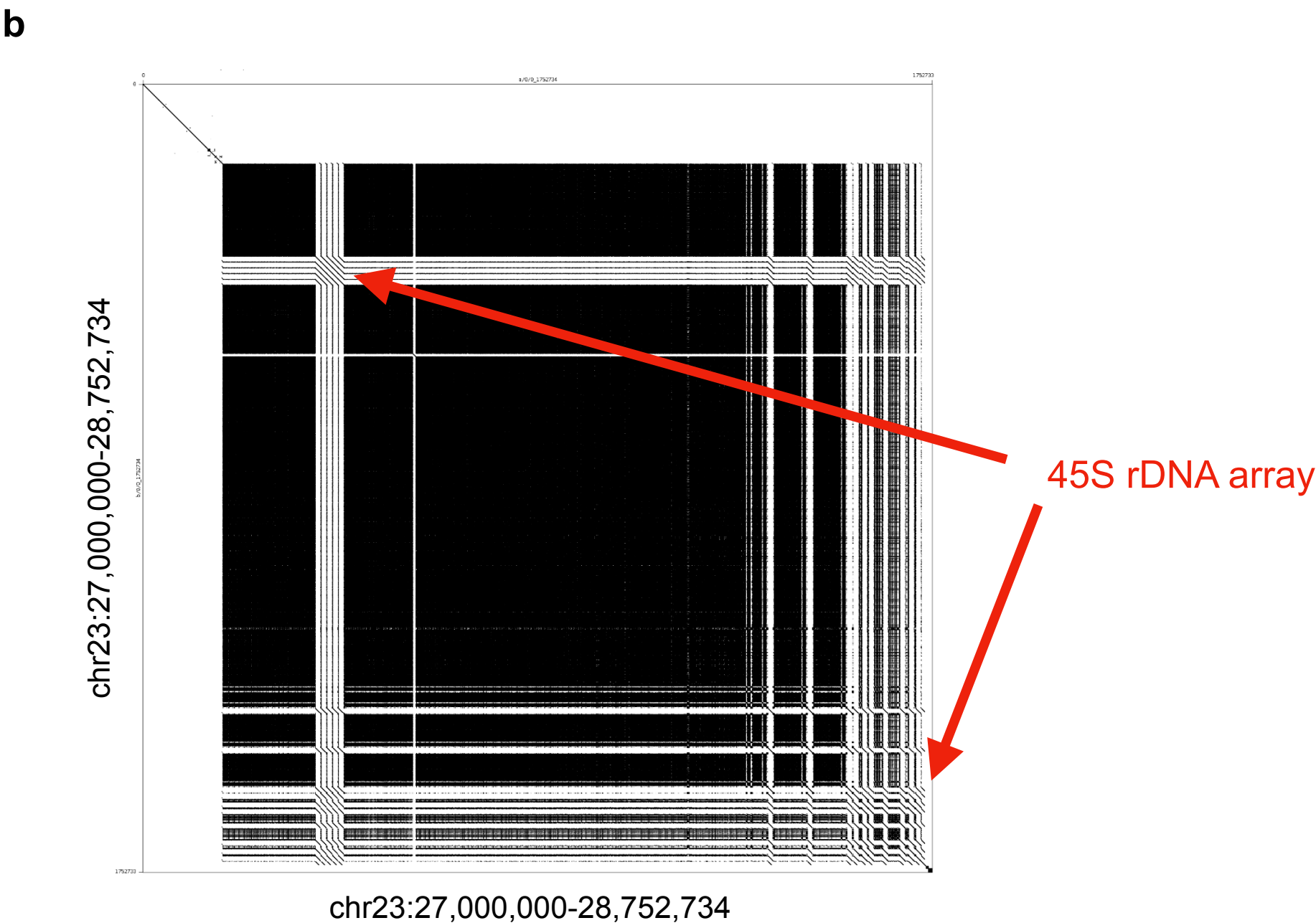
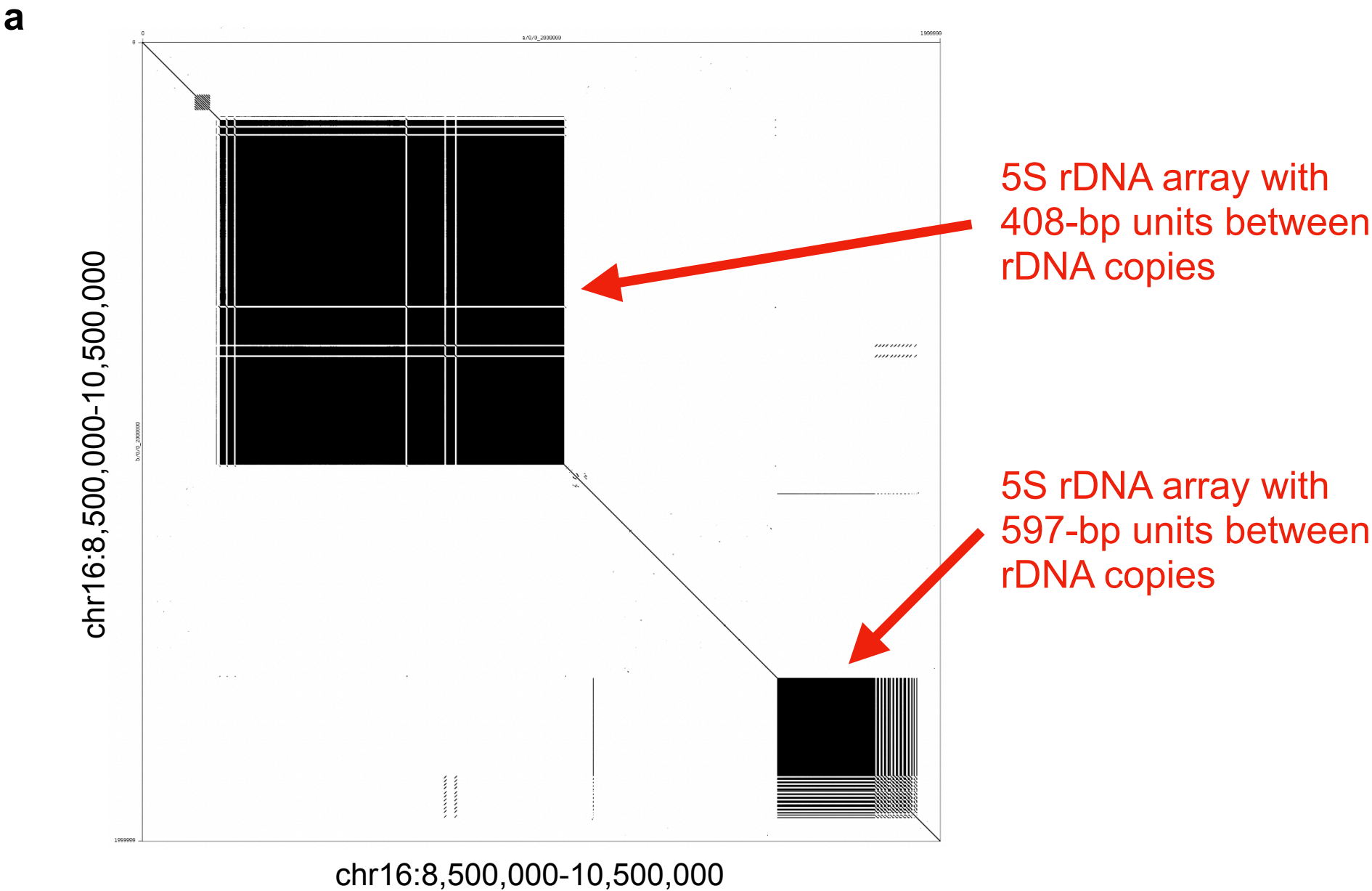
Extended Data Figure 18



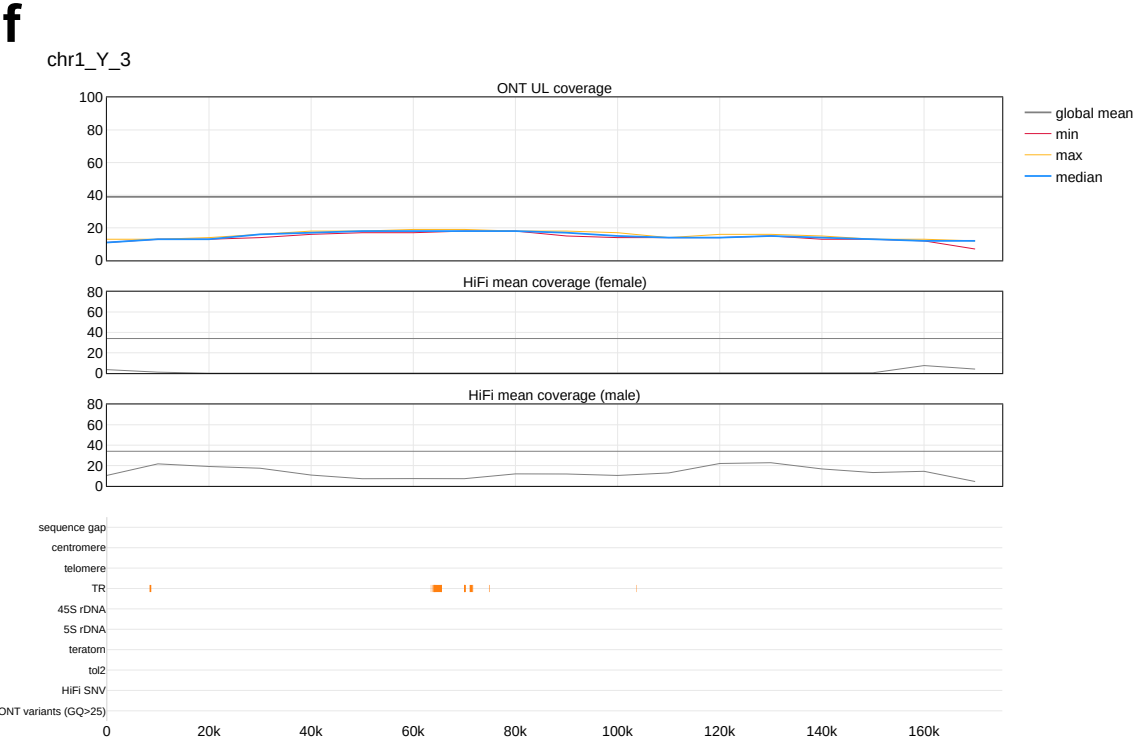
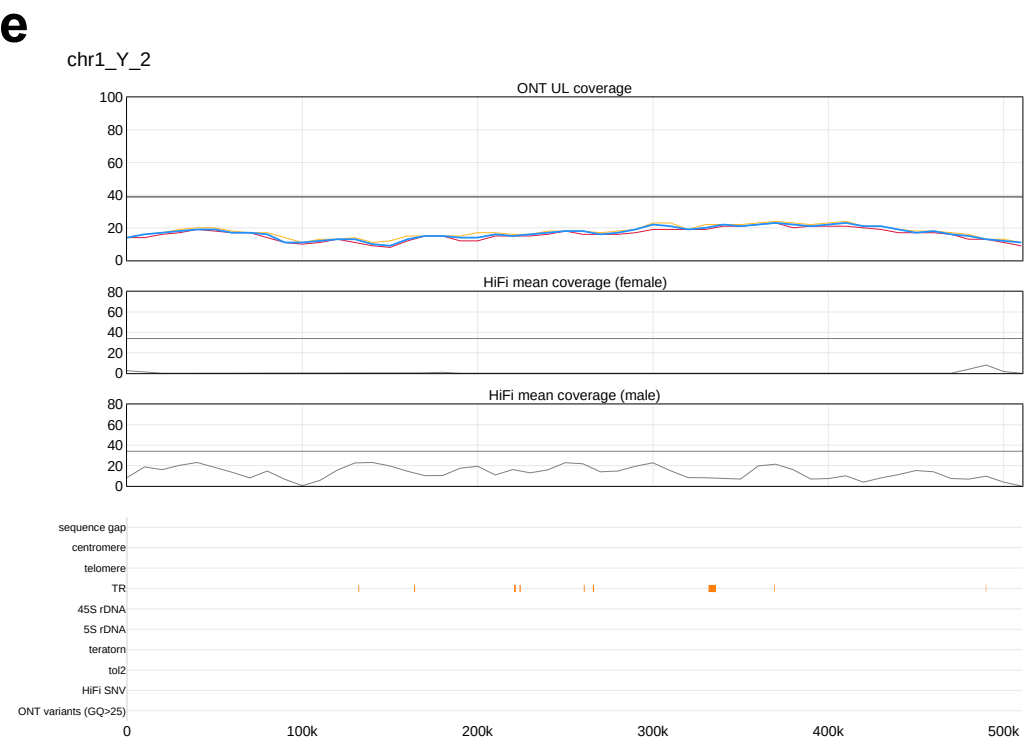
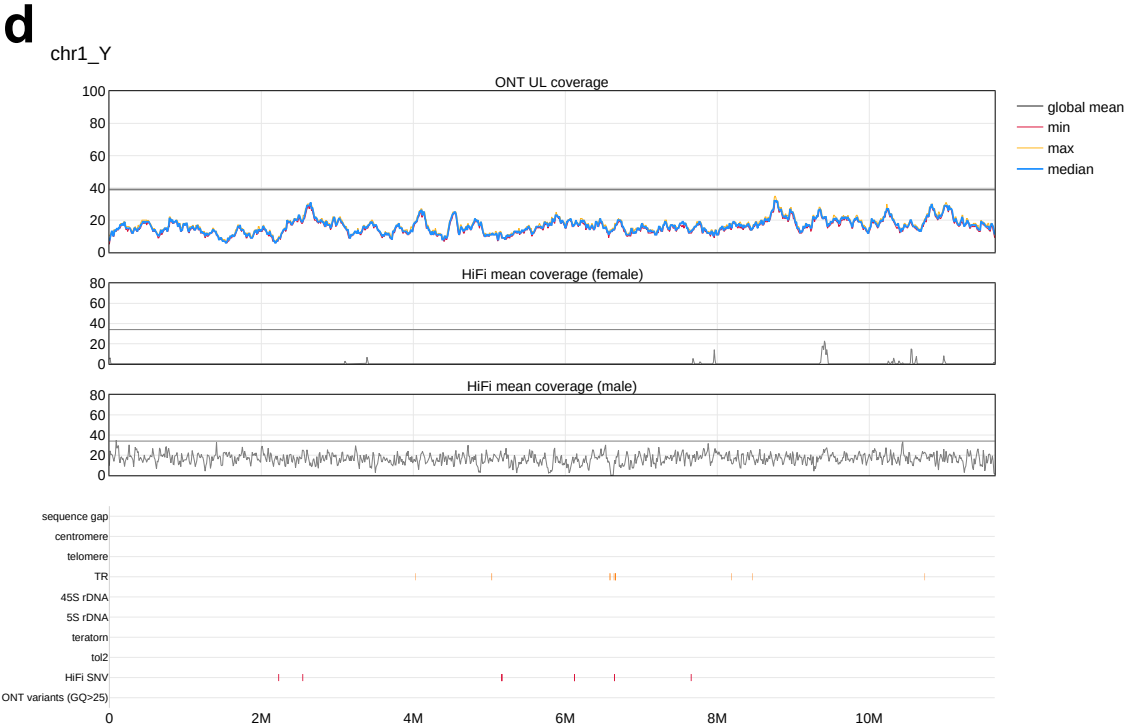
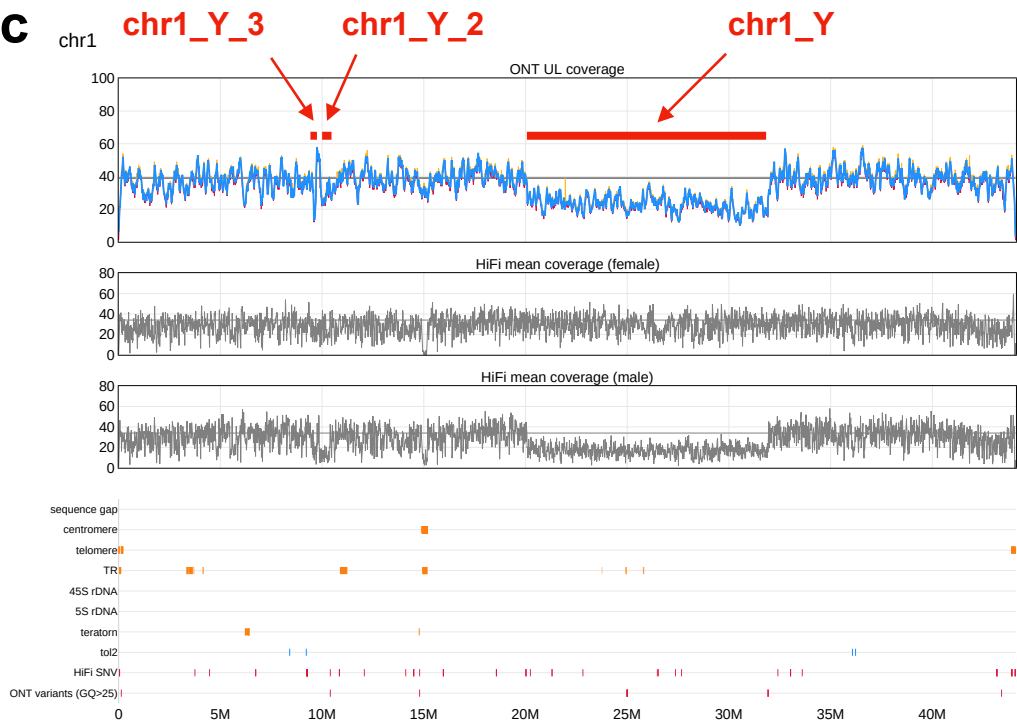
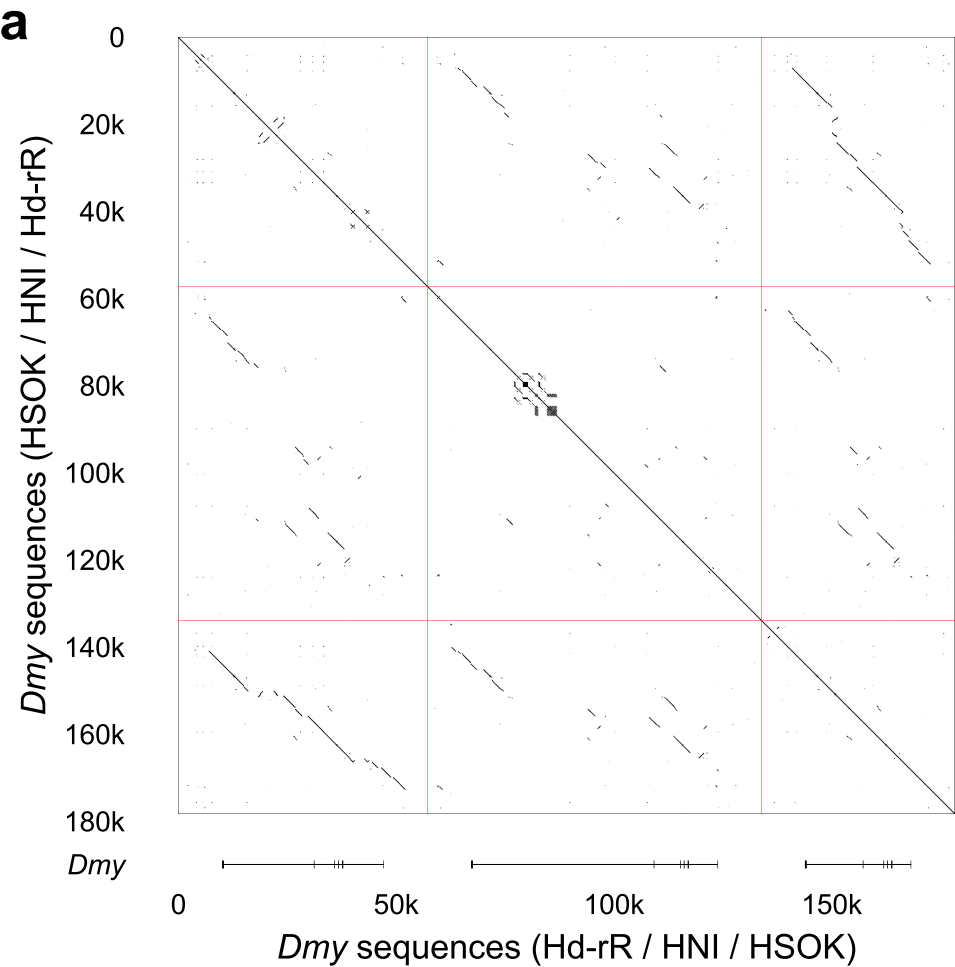
Extended Data Figure 19



Extended Data Figure 20

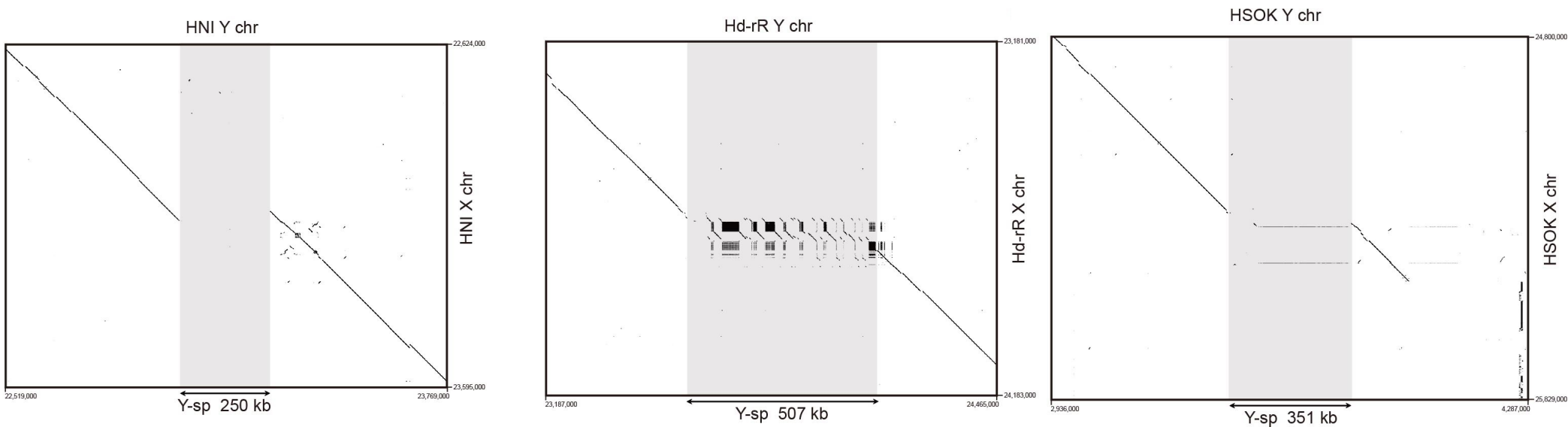


Extended Data Figure 21

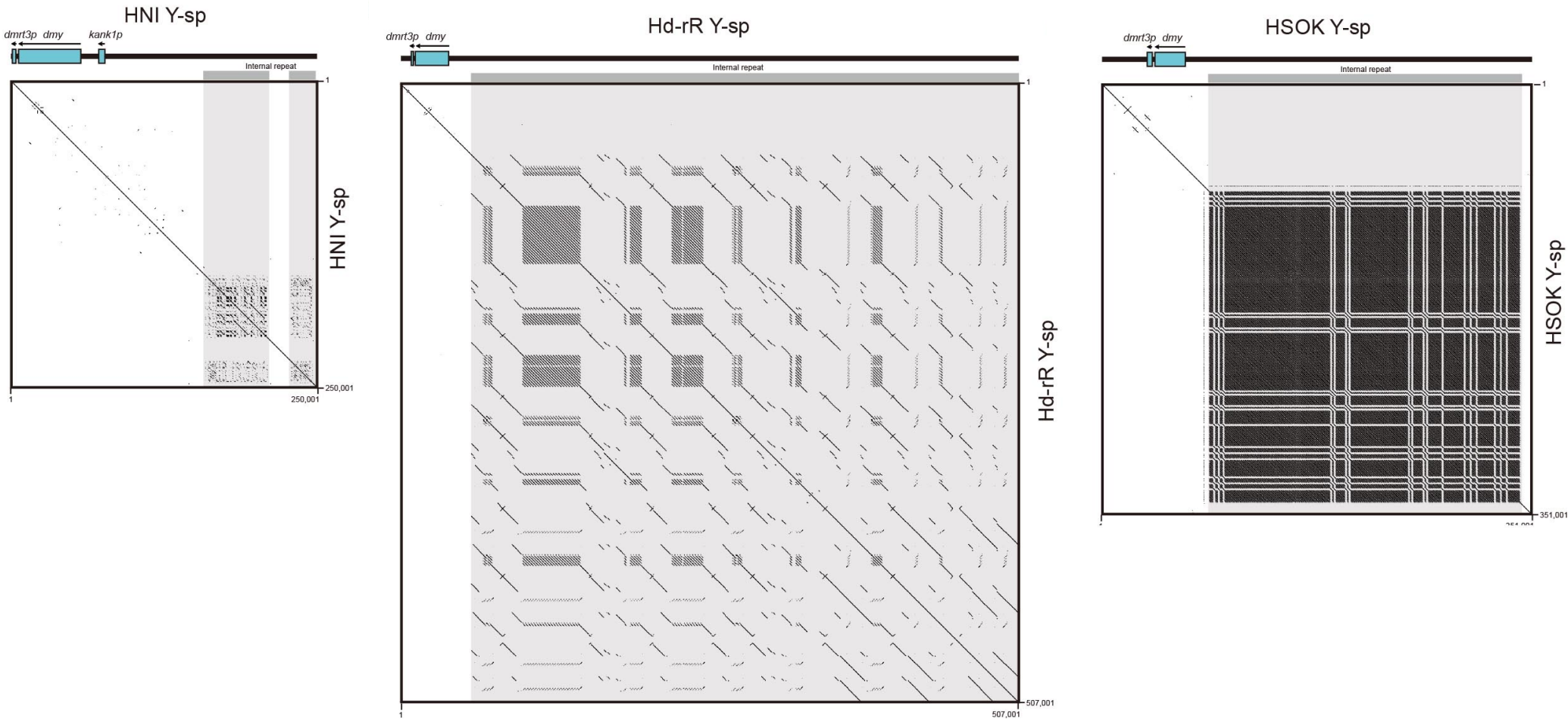


Extended Data Figure 22

a



b



Extended Data Figure 23

