(a)

optrA$_{EKD}$ (n=1)

optrA$_{EDP}$ (n=1)

optrA$_{KD}$ (n=4)

optrA$_{RDK}$ (n=11)

optrA$_{KD}$ (n=1)

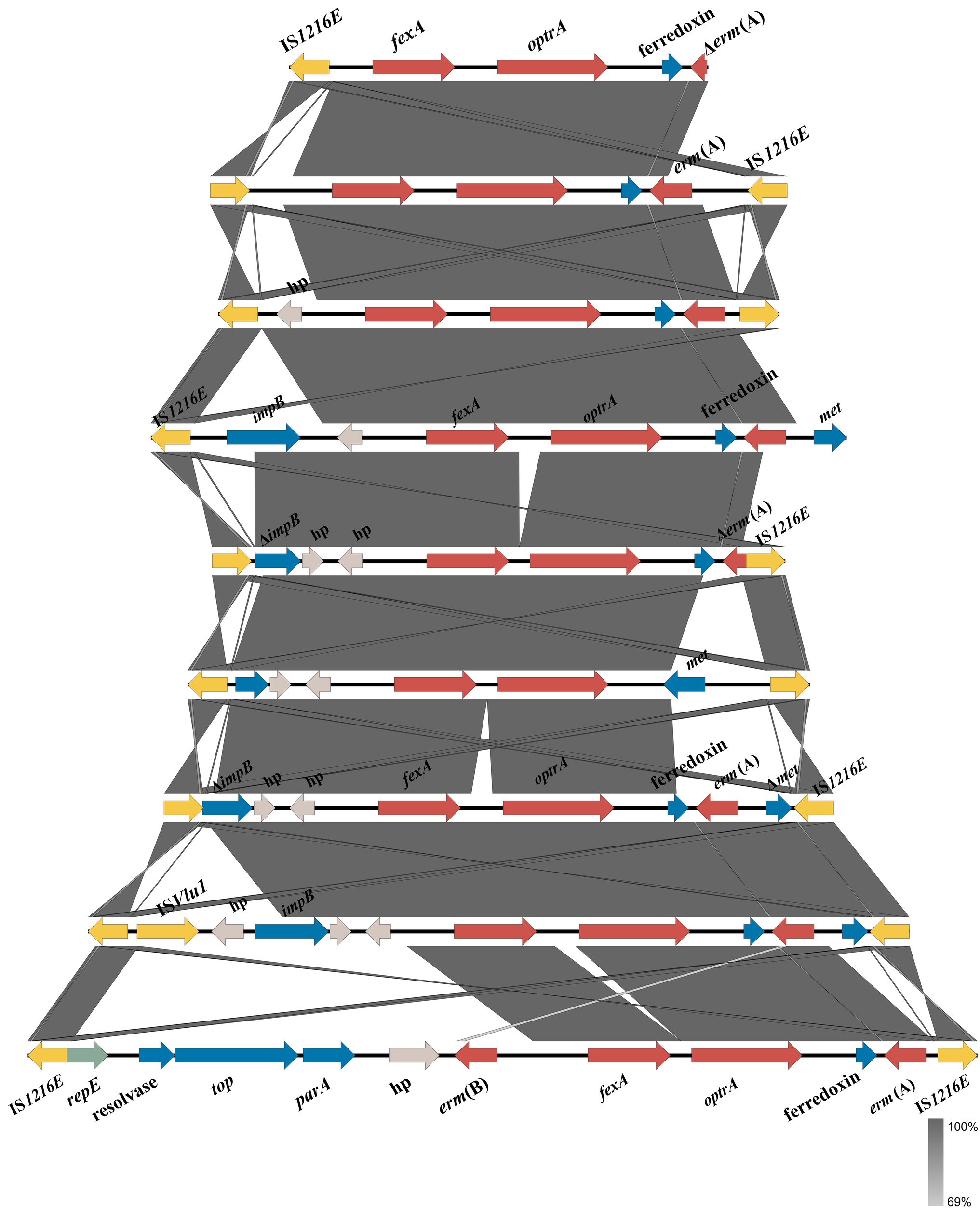
optrA$_{KLDK}$ (n=1)

optrA$_{KLDK}$ (n=3)

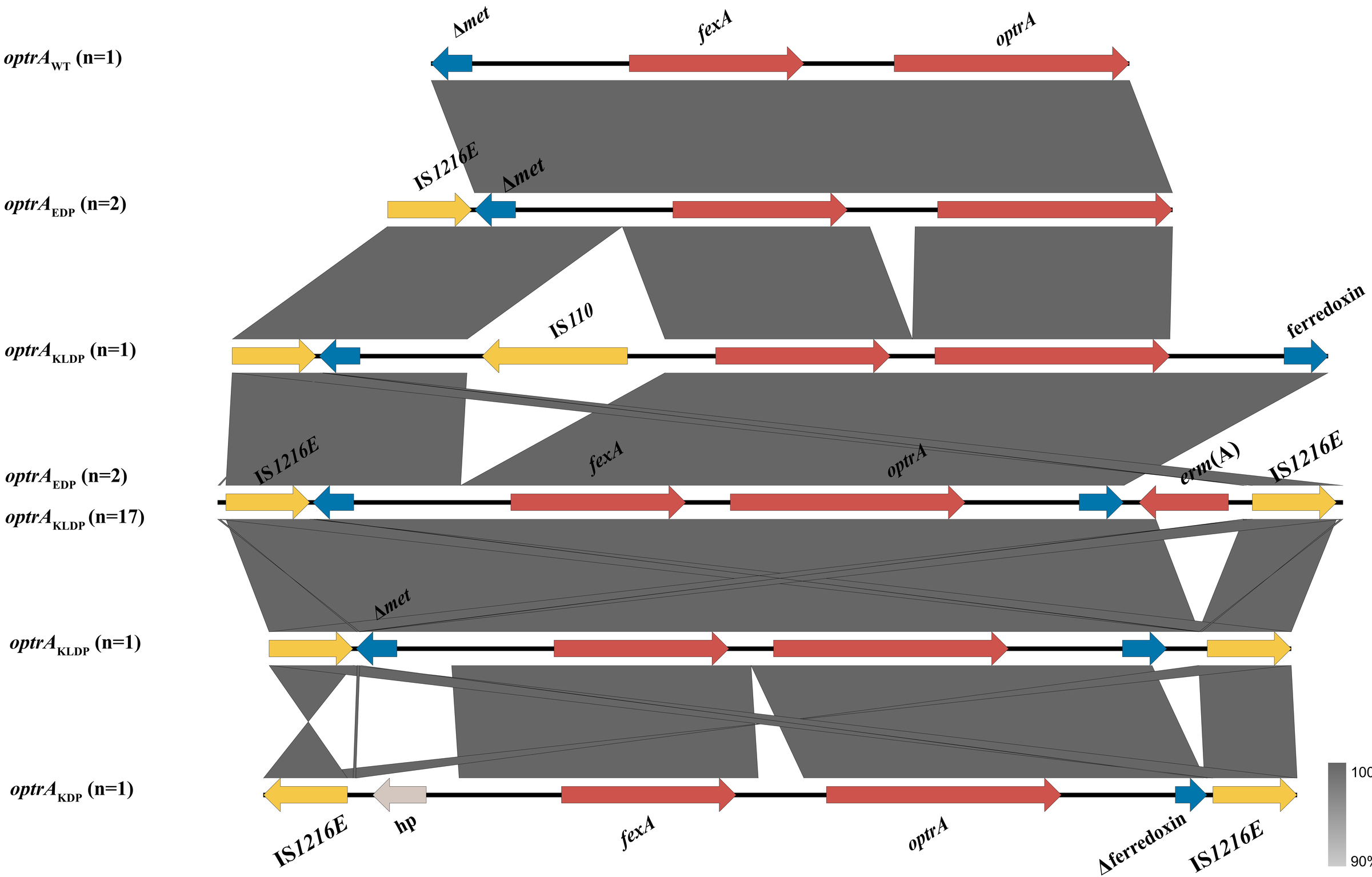
optrA$_{KD}$ (n=1)

optrA$_{DP}$ (n=4)

optrA$_{KLDP}$ (n=1)



(b)


optrA_WT (n=1)
Δmet
fexA
optrA
optrA_EDP (n=2)
IS1216E
Δmet
optrA_KLDP (n=1)
IS110
ferredoxin
optrA_EDP (n=2)
optrA_KLDP (n=17)
IS1216E
fexA
optrA
ermA
IS1216E
optrA_KLDP (n=1)
Δmet
optrA_KDP (n=1)
IS1216E
hp
fexA
optrA
Δferredoxin
IS1216E
100%
90%

(c)

optrA$_{RDK}$ (n=5)

optrA$_{RDK}$ (n=1)

optrA$_{RDK}$ (n=1)

optrA$_{KLDP}$ (n=1)

optrA$_{EKD}$ (n=1)

optrA$_{KD}$ (n=1)

optrA$_{KD}$ (n=3)

optrA$_{KD}$ (n=1)

optrA$_{KLDP}$ (n=1)

optrA$_{KLDKK}$ (n=1)

optrA$_{KLDKP}$ (n=1)

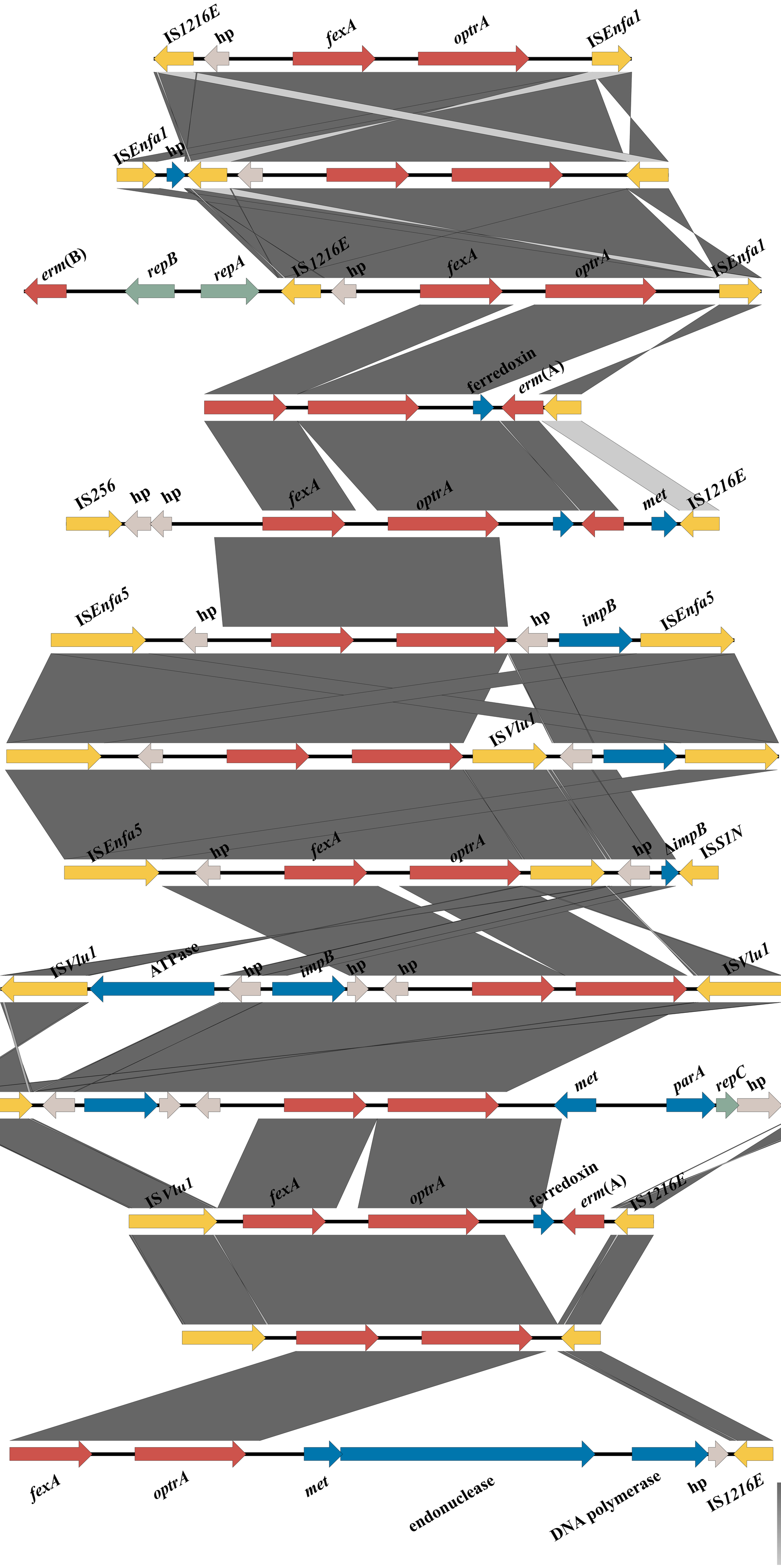
optrA$_{WT}$ (n=1)

optrA$_{KLDKP}$ (n=1)

optrA$_{IDKTKGP}$ (n=1)

optrA$_{IDKKGP}$ (n=1)

optrA$_{WT}$ (n=1)



(d)

optrA$_{EDD}$ (n=2)
optrA$_{EYDKD}$ (n=1)
optrA$_{V}$ (n=1)
optrA$_{WT}$ (n=13)

optrA$_{EDD}$ (n=6)

optrA$_{DD}$ (n=7)

optrA$_{EDM}$ (n=7)

optrA$_{EDM}$ (n=1)

optrA$_{ED}$ (n=3)

optrA$_{ED}$ (n=1)

optrA$_{EDM}$ (n=1)

optrA$_{EDM}$ (n=1)

optrA$_{EYDNDM}$ (n=1)

optrA$_{EYDNDM}$ (n=11)
optrA$_{EYDNDNM}$ (n=1)

optrA$_{EDM}$ (n=1)

optrA$_{EDM}$ (n=1)

optrA$_{EYDNDM}$ (n=2)

optrA$_{EYDNDM}$ + *cfr* (n=1)

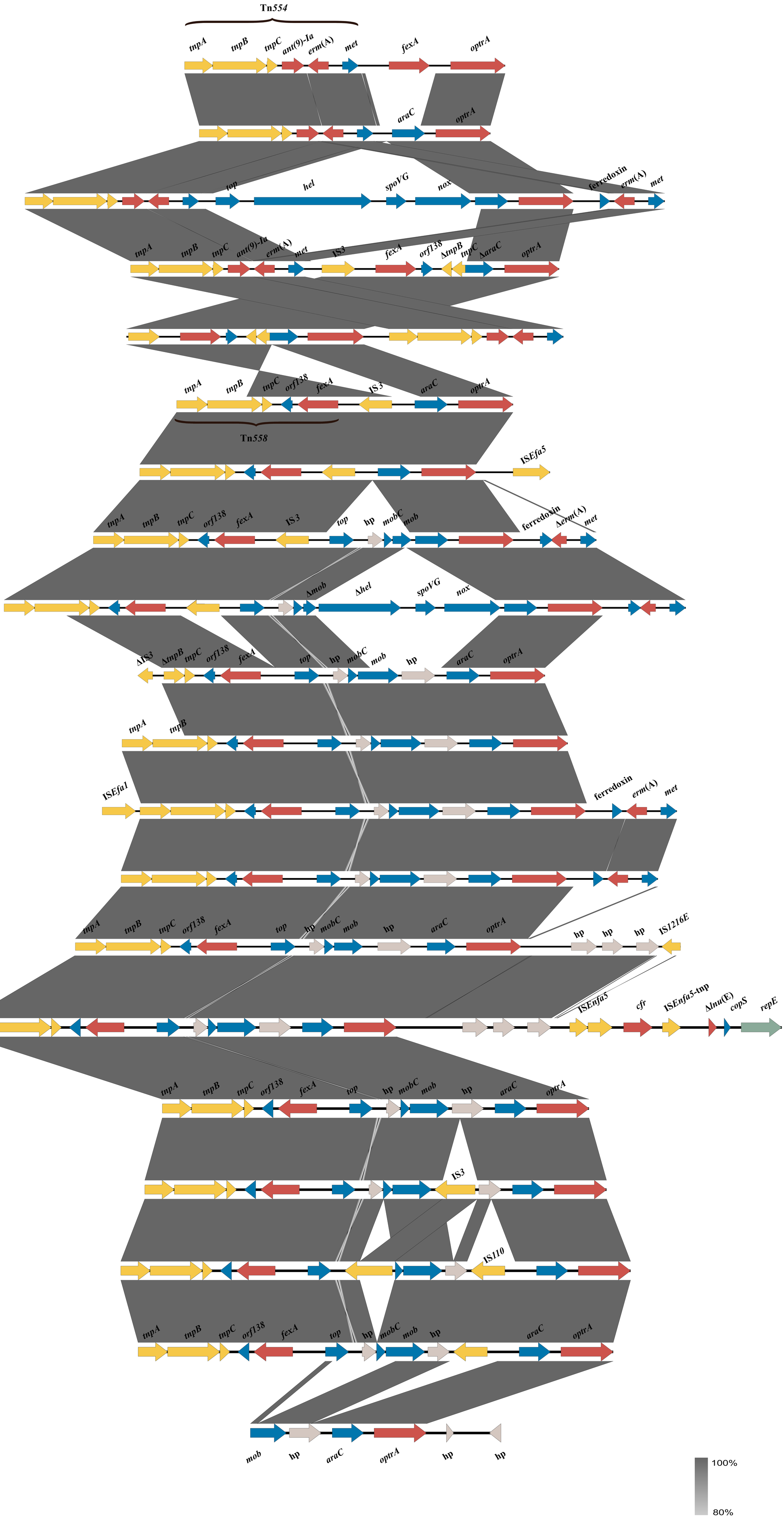
optrA$_{EYDNDM}$ (n=5)
optrA$_{EYDNDNM}$ (n=1)

optrA$_{EYDNDM}$ (n=1)

optrA$_{EYDNDM}$ (n=1)

optrA$_{EYDNDM}$ (n=1)

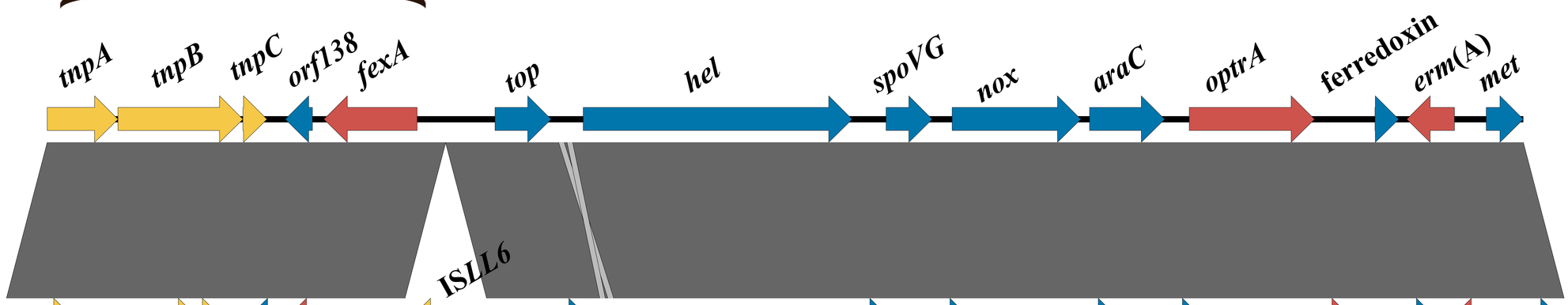
optrA$_{EYDNDM}$ (n=1)



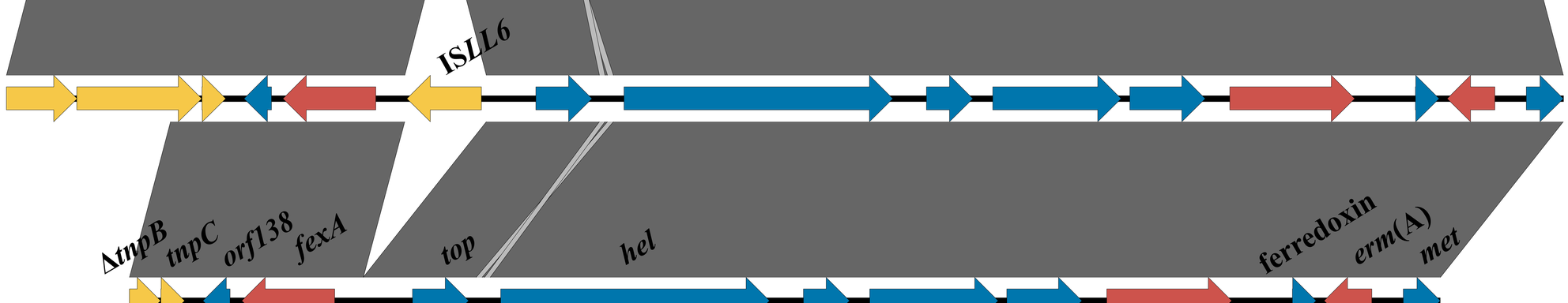
(e)

Tn*558*

optrA$_{DD}$ (n=1)
optrA$_{DDD}$ (n=3)
optrA$_{EDM}$ (n=14)
optrA$_{EDDM}$ (n=5)

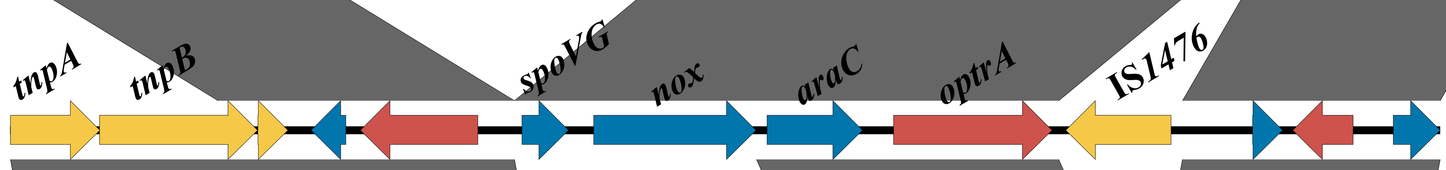


optrA$_{EDM}$ (n=1)

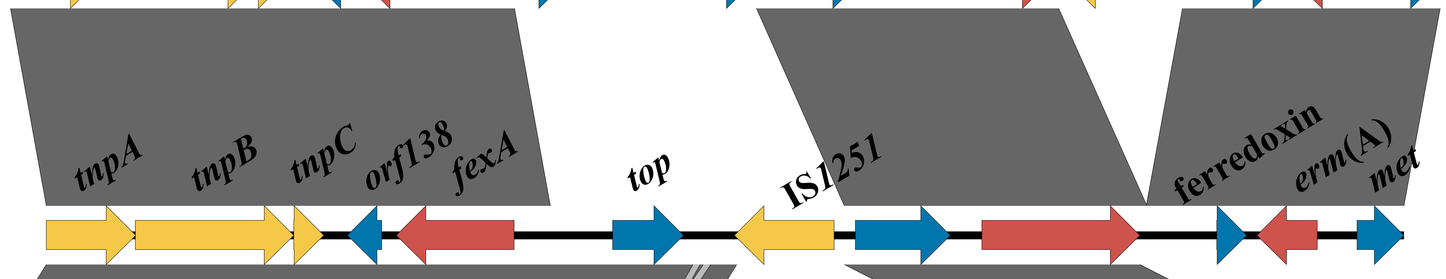


optrA$_{DDD}$ (n=1)

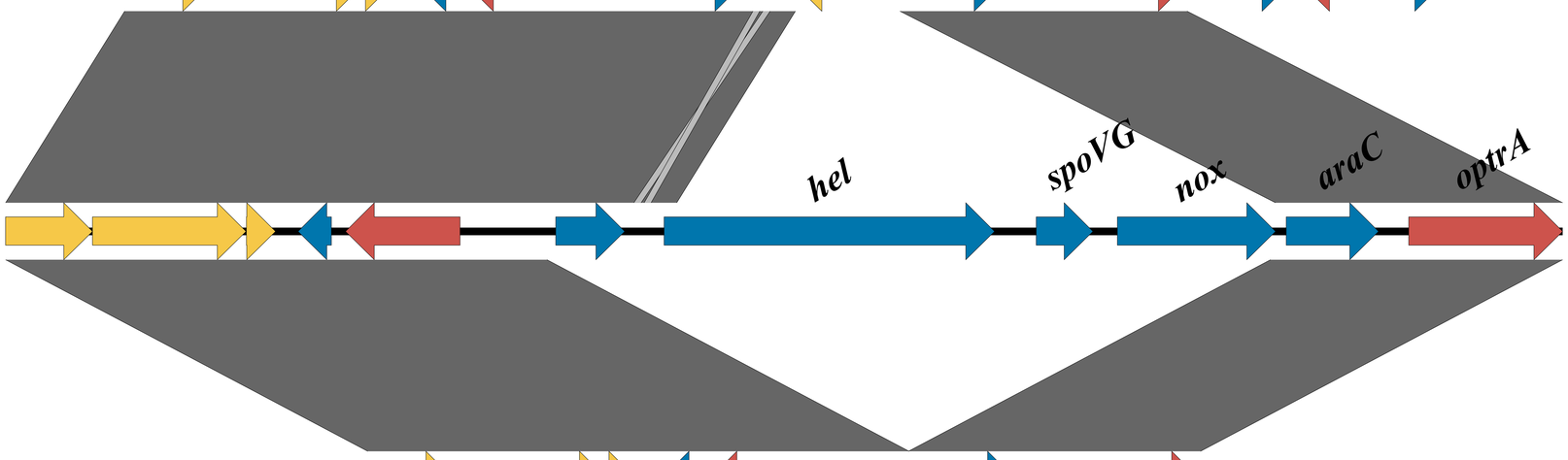
optrA$_{EDM}$ (n=1)



optrA$_{EDM}$ (n=1)



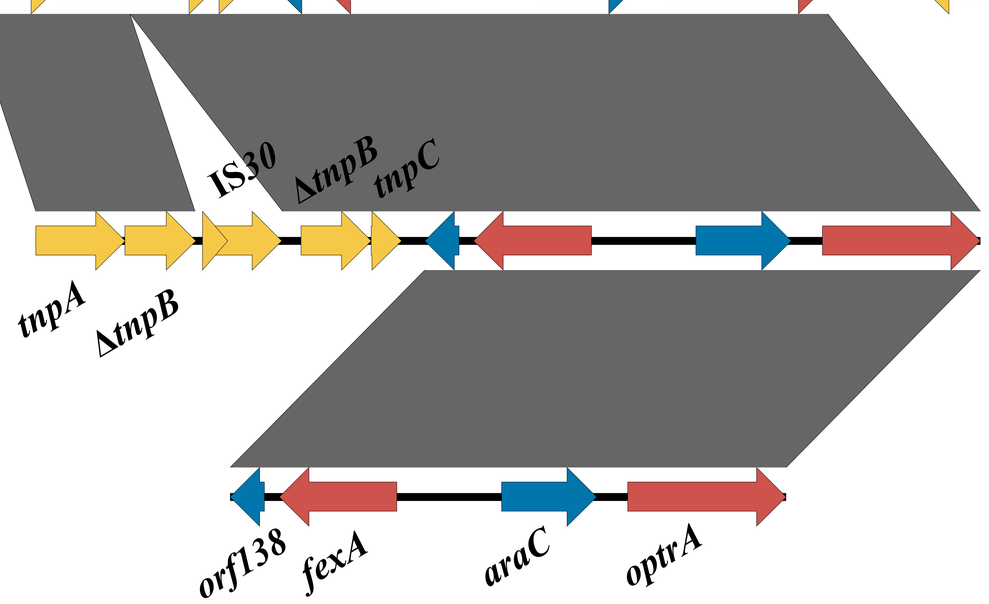
optrA$_{EYD}$ (n=1)



optrA$_{EDD}$ (n=7)
optrA$_{EYDNDM}$ (n=1)

optrA$_{EDD}$ (n=1)

optrA$_{EDD}$ (n=1)



optrA$_{EDD}$ (n=1)

optrA$_{EDD}$ (n=1)

100%
85%

(f)

optrA$_{EYDDI}$ (n=6)

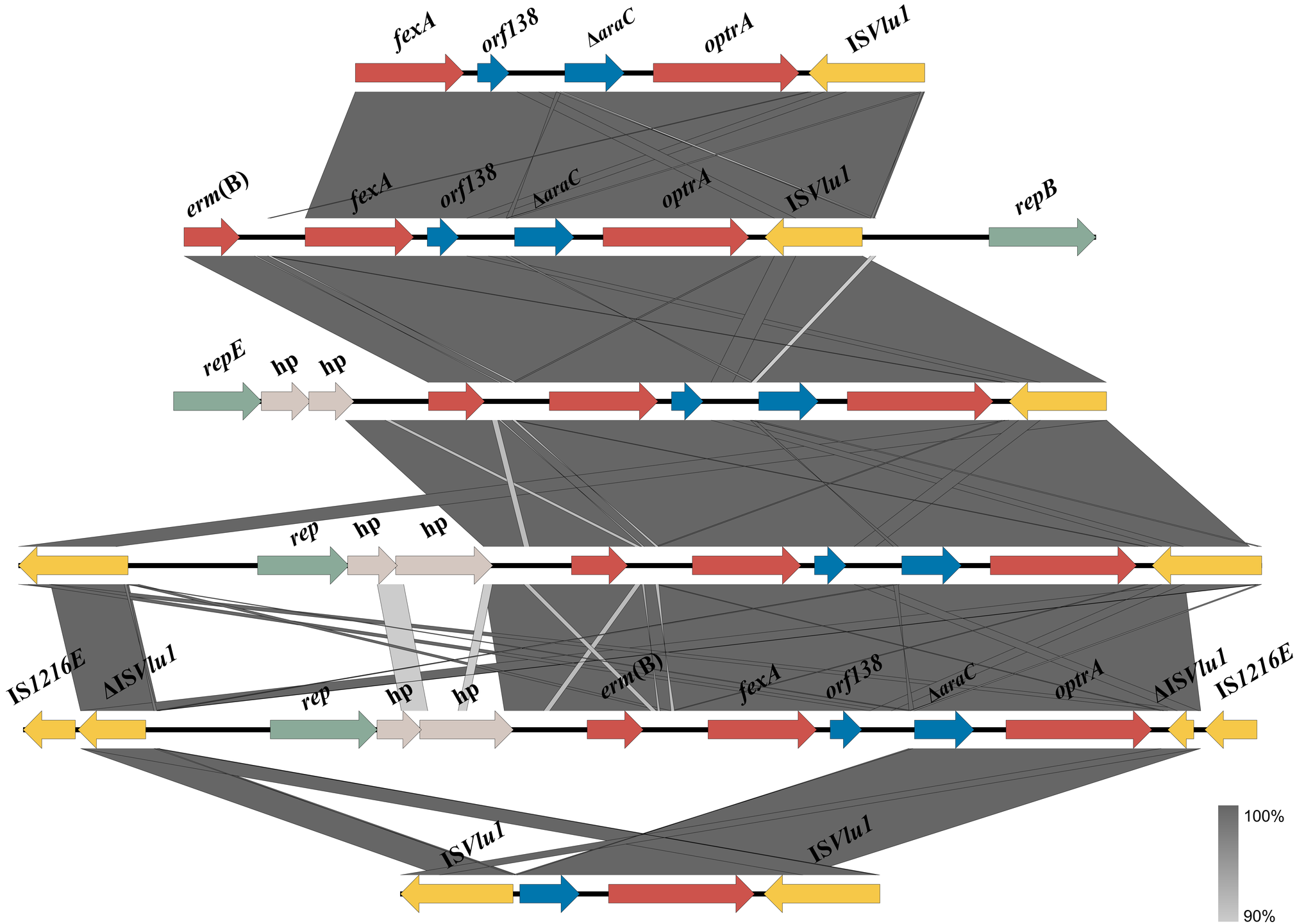
optrA$_{EYDDI}$ (n=2)

optrA$_{EYDDI}$ (n=1)

optrA$_{EYDDI}$ (n=1)

optrA$_{EYDDI}$ (n=1)

optrA$_{EYDDI}$ (n=3)



(g)

optrA$_{EDM}$ (n=1)

optrA$_{EDM}$ (n=1)

optrA$_{EDM}$ (n=1)

optrA$_{EDM}$ (n=1)

optrA$_{EDM}$ (n=5)

optrA$_{D'D}$ (n=1)

optrA$_{EDM}$ (n=1)

optrA$_{ED'DM}$ (n=1)

optrA$_{DD}$ (n=5)

optrA$_{LDSK}$ (n=1)

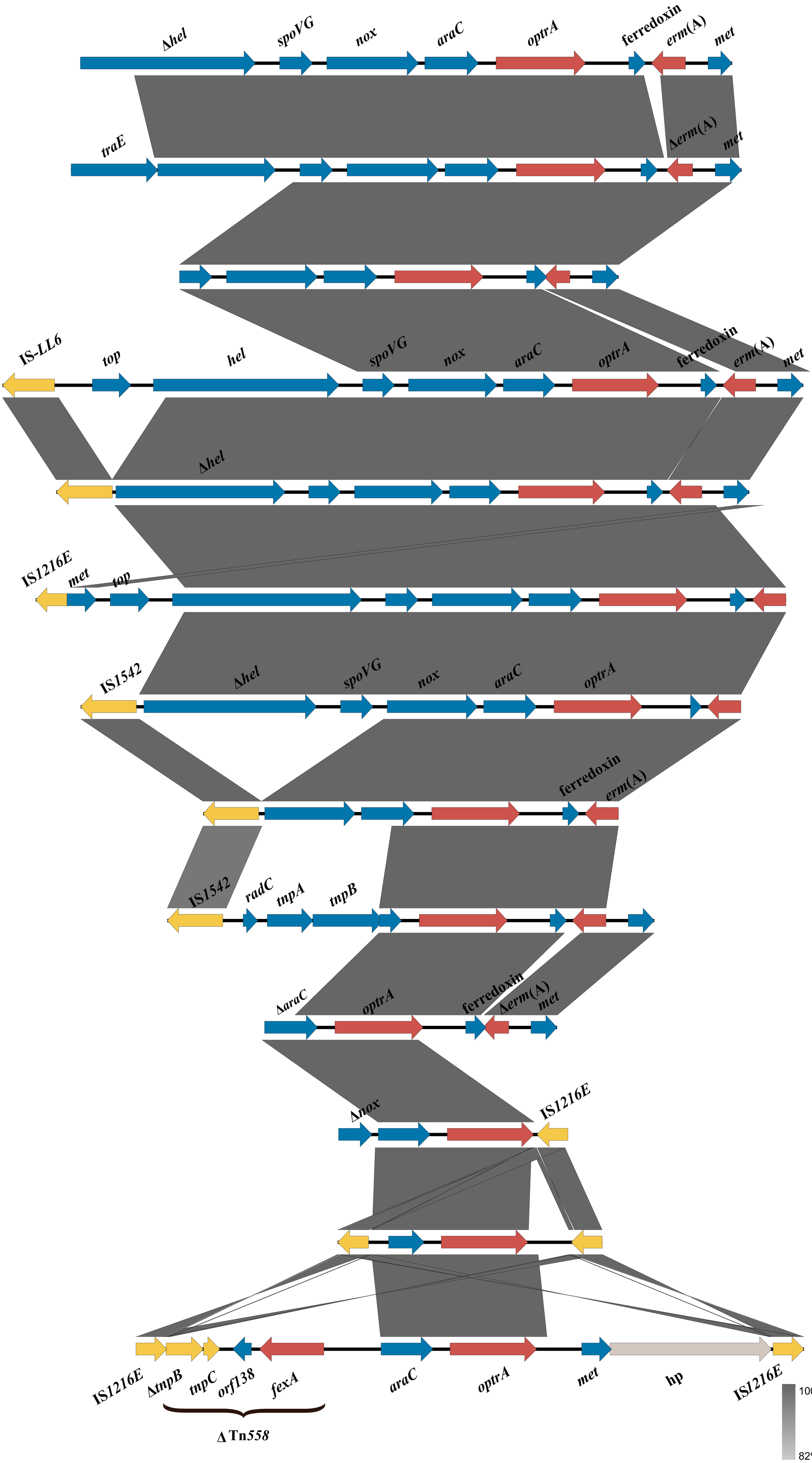
optrA$_{EDM}$ (n=2)

optrA$_{EYDD}$ (n=3)

optrA$_{D}$ (n=1)

optrA$_{EDD}$ (n=1)

optrA$_{EDD}$ (n=1)



(h)

optrA$_{DP}$ (n=12)

optrA$_{DP}$ (n=1)

optrA$_{WT}$ (n=2)

optrA$_{WT}$ (n=12)

optrA$_{DD}$ (n=9)

optrA$_{EYDDI}$ (n=1)

optrA$_{WT}$ + *cfr*(D) (n=1)

optrA$_{WT}$ (n=1)

optrA$_{DD}$ (n=1)

optrA$_{EDM}$ (n=1)

optrA$_{FK}$ (n=1)

optrA$_{DD}$ (n=1)

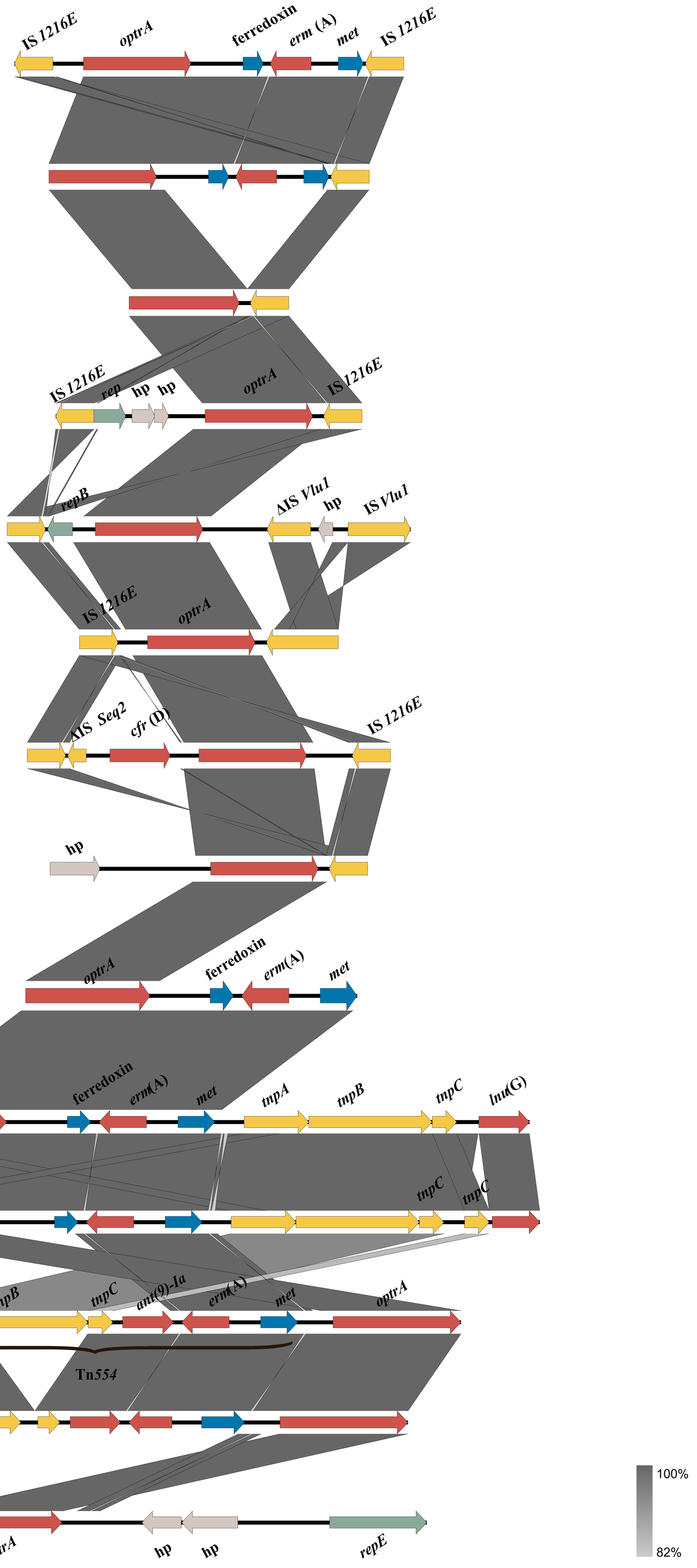
optrA$_{DD}$ (n=1)

optrA$_{EYDD}$ (n=1)

optrA$_{EYRCDVKVDAMINI}$ (n=1)

optrA$_{EYDDNI}$ (n=1)

optrA$_{EYDND}$ (n=1)



(i)

optrA$_{EDM}$ + *cfr* (n=1)

optrA$_{EYD}$ + *cfr* (n=1)

optrA$_{EYDD}$ + *cfr* (n=1)

cfr (n=1)

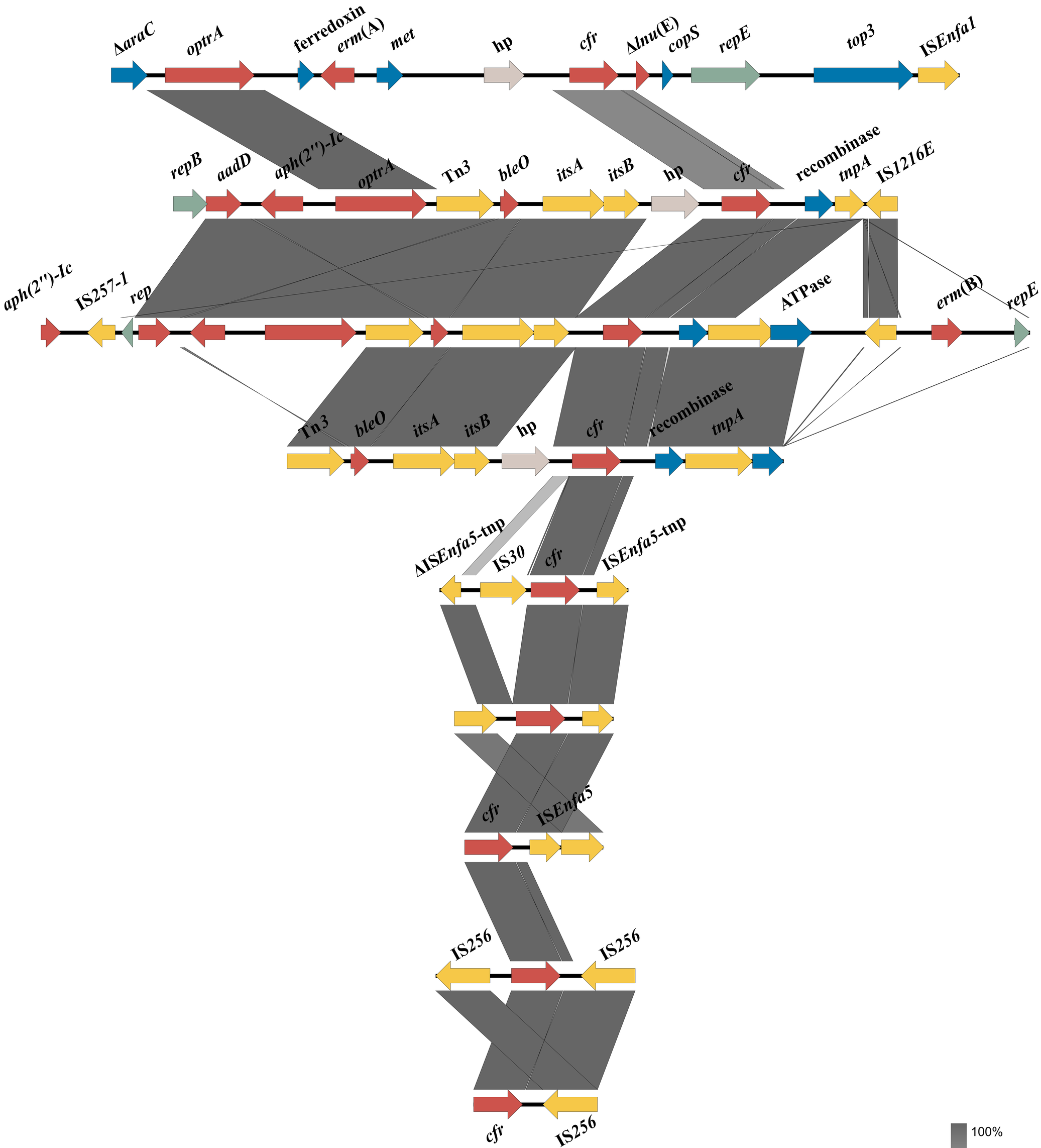
cfr (n=2)

cfr (n=14)

cfr (n=1)

cfr (n=6)

cfr (n=1)



(j)

poxtA (n=1)

poxtA (n=46)

poxtA (n=7)

poxtA (n=2)

poxtA2 + *cfr*(D) (n=7)

cfr(D) (n=1)

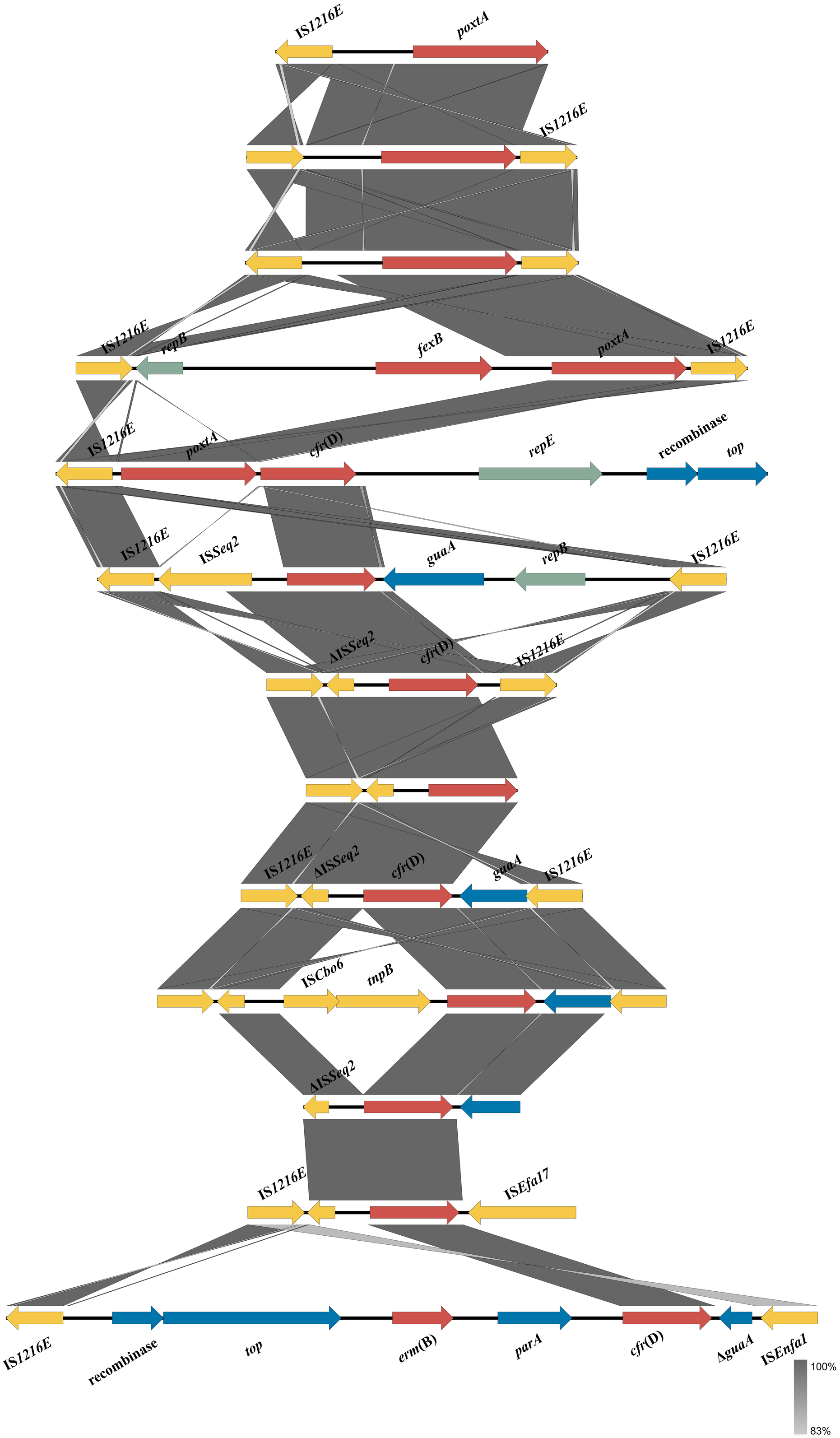
cfr(D) (n=1)

cfr(D) (n=3)

cfr(D) (n=7)

cfr(D) (n=1)

cfr(D) (n=21)

cfr(D) (n=2)

cfr(D) (n=1)