Complex adaptive polymorphisms are common in nature, yet their underlying genetic basis is rarely known. Intraspecific variation in social organization has evolved multiple times in ants. The convergent evolution of similar social polymorphism in two independent ant species provides a great opportunity to investigate how genomes evolved under parallel selection. Here, we demonstrate that a large, non-recombining 'social chromosome' is associated with social organization in the alpine ant *Formica selysi*. This social chromosome shares architectural characteristics with that of the fire ant *Solenopsis invicta*, but the two show no detectable similarity in gene content. In line with recent theoretical studies, these findings demonstrate that suppression of recombination and chromosomal rearrangement play a key role in shaping phenotypes involving multiple co-adapted traits, such as social organization.