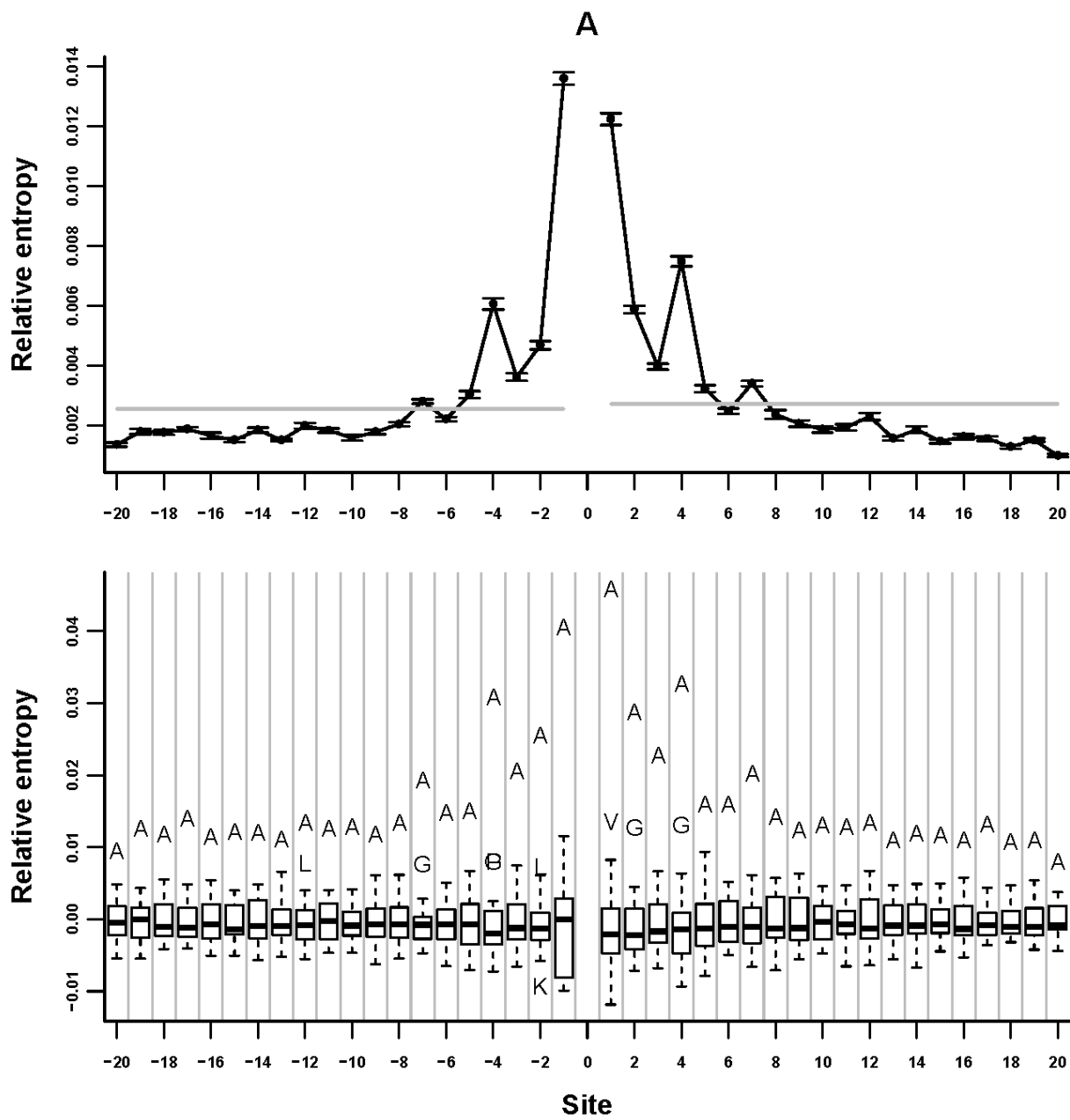
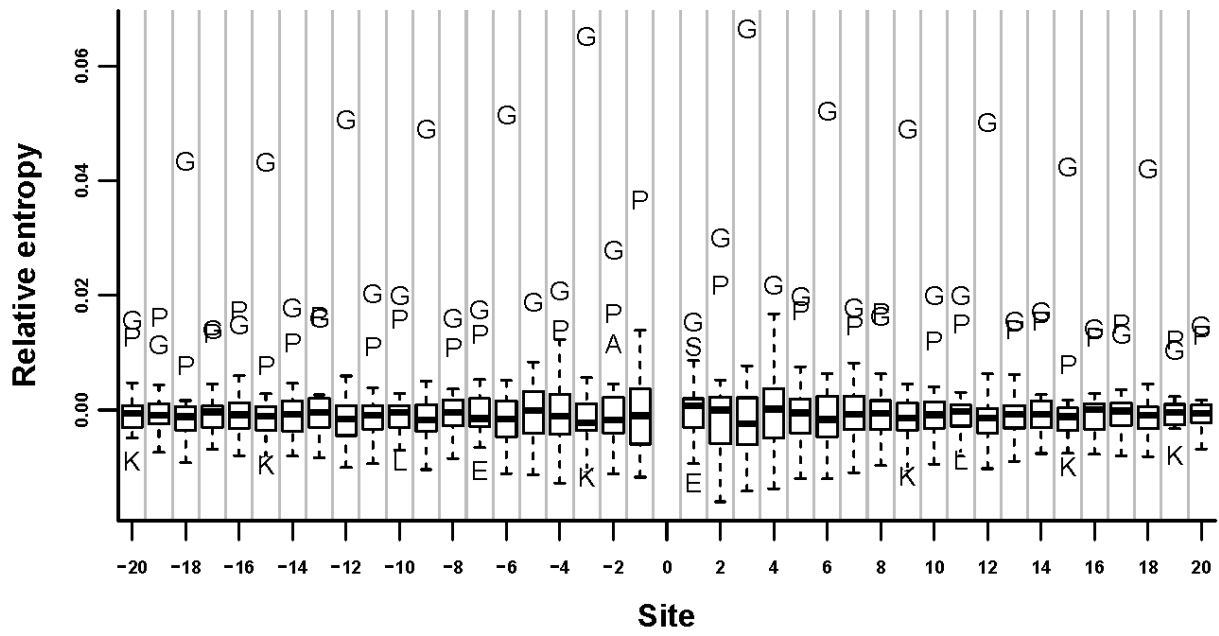
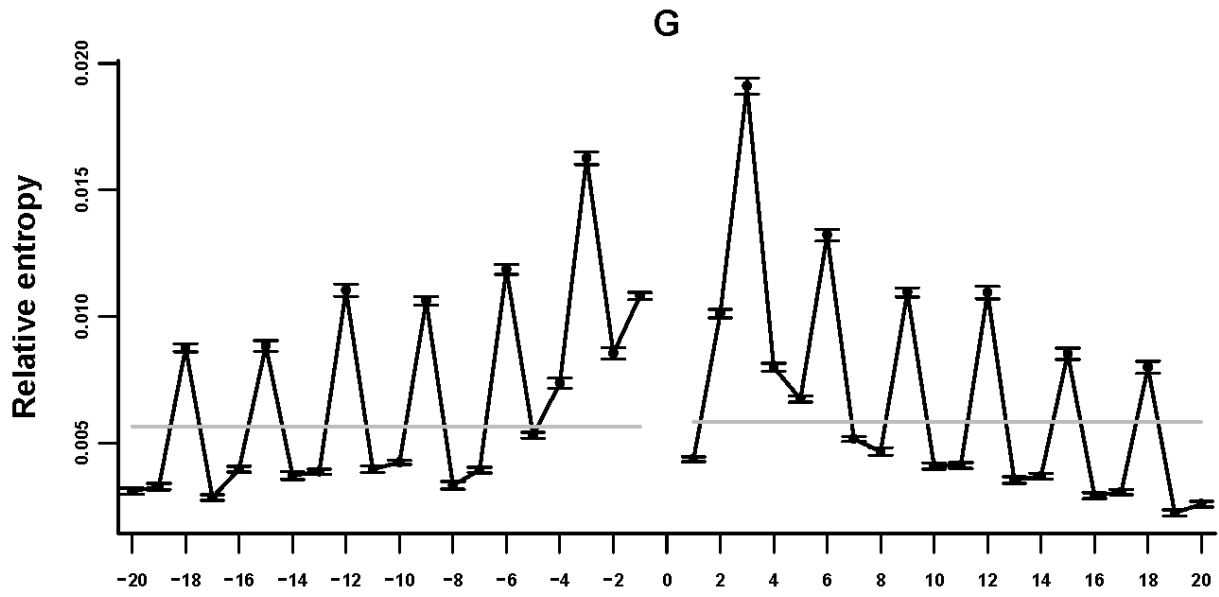
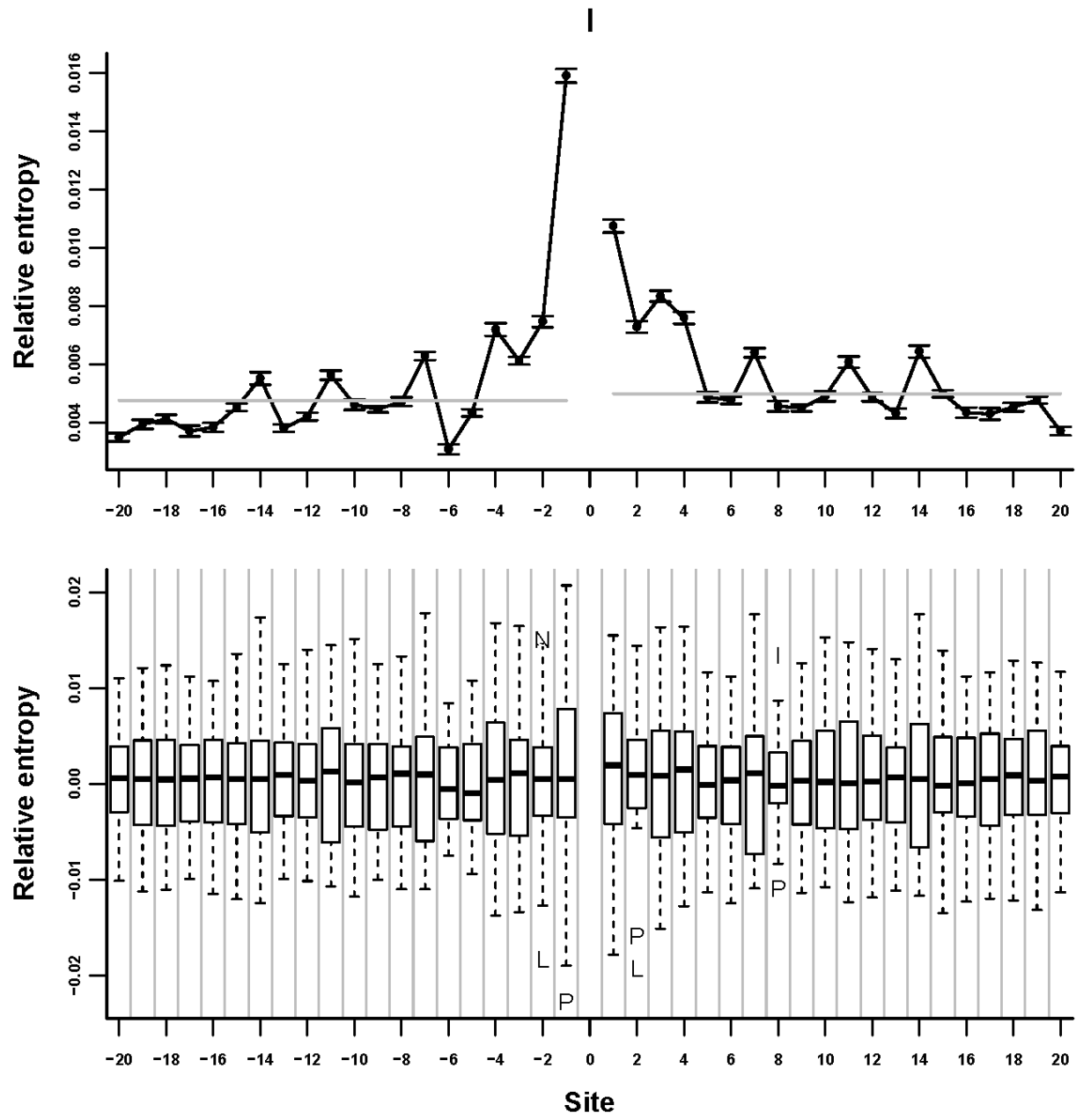


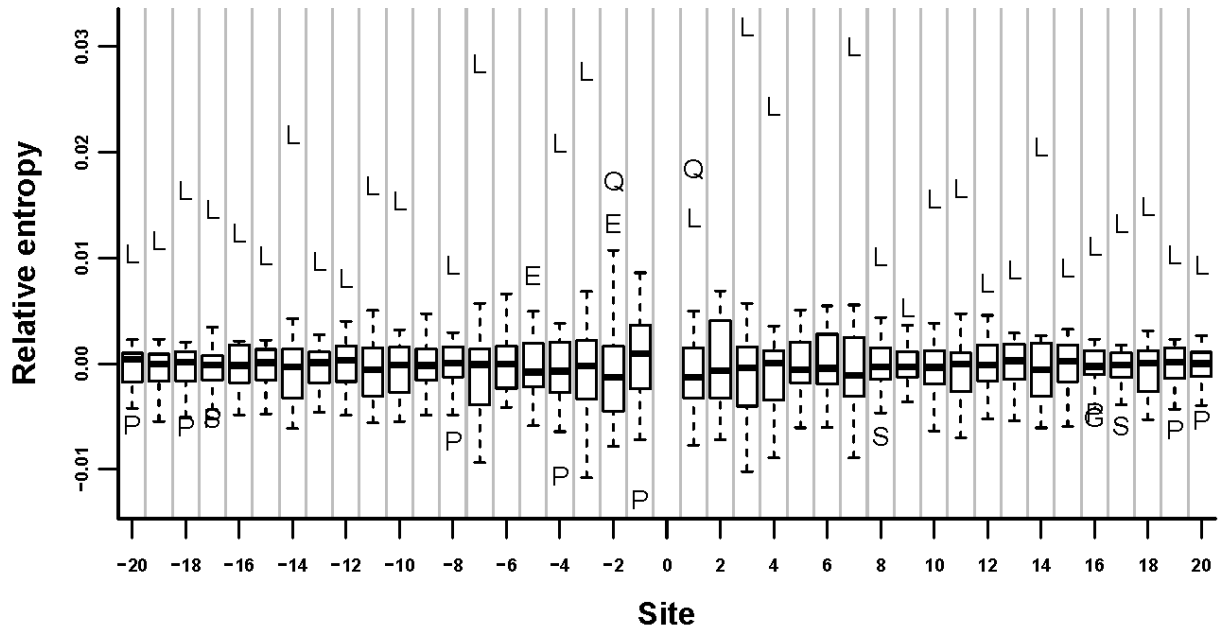
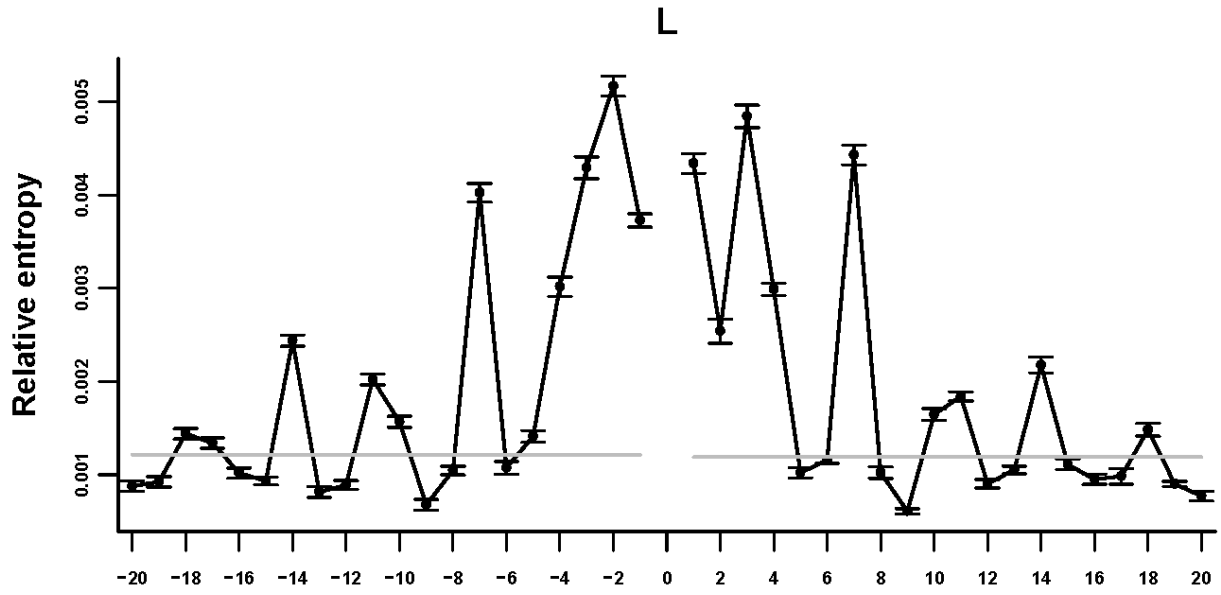
## Supplementary Information

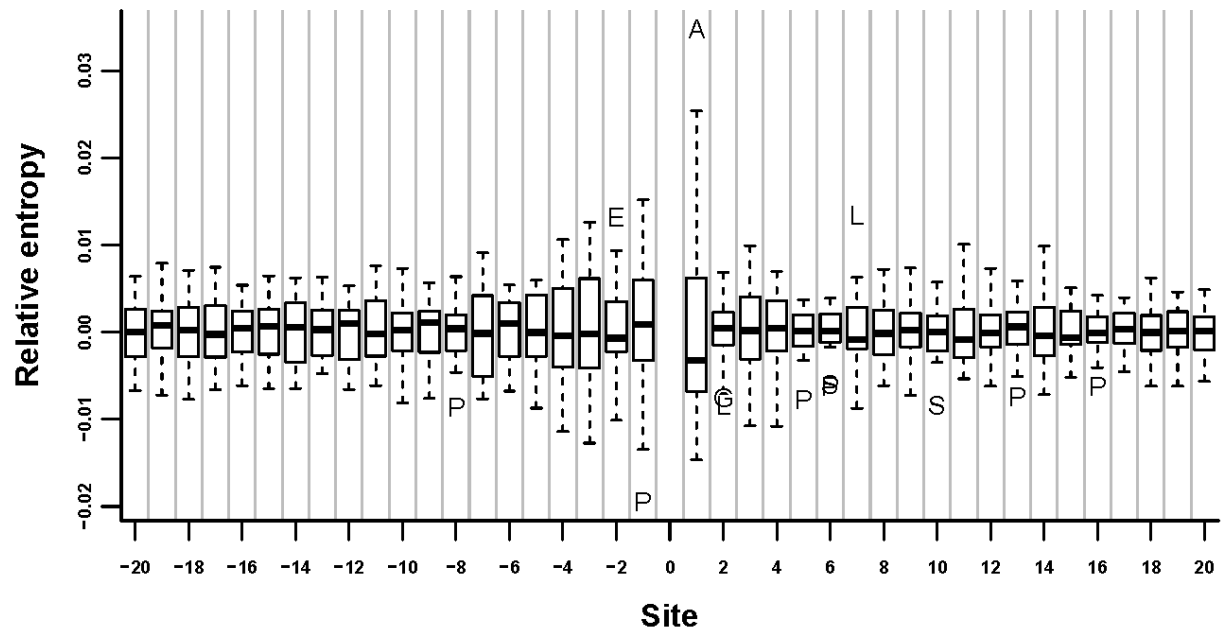
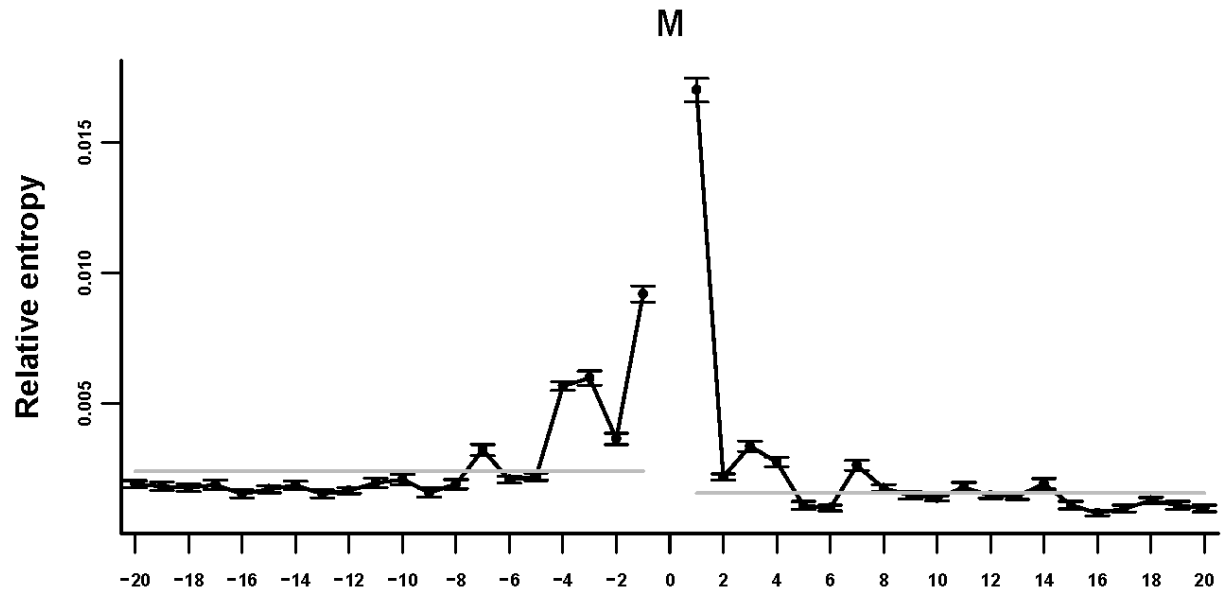
**Figure S1.** Neighbor preference patterns of the 20 amino acids.

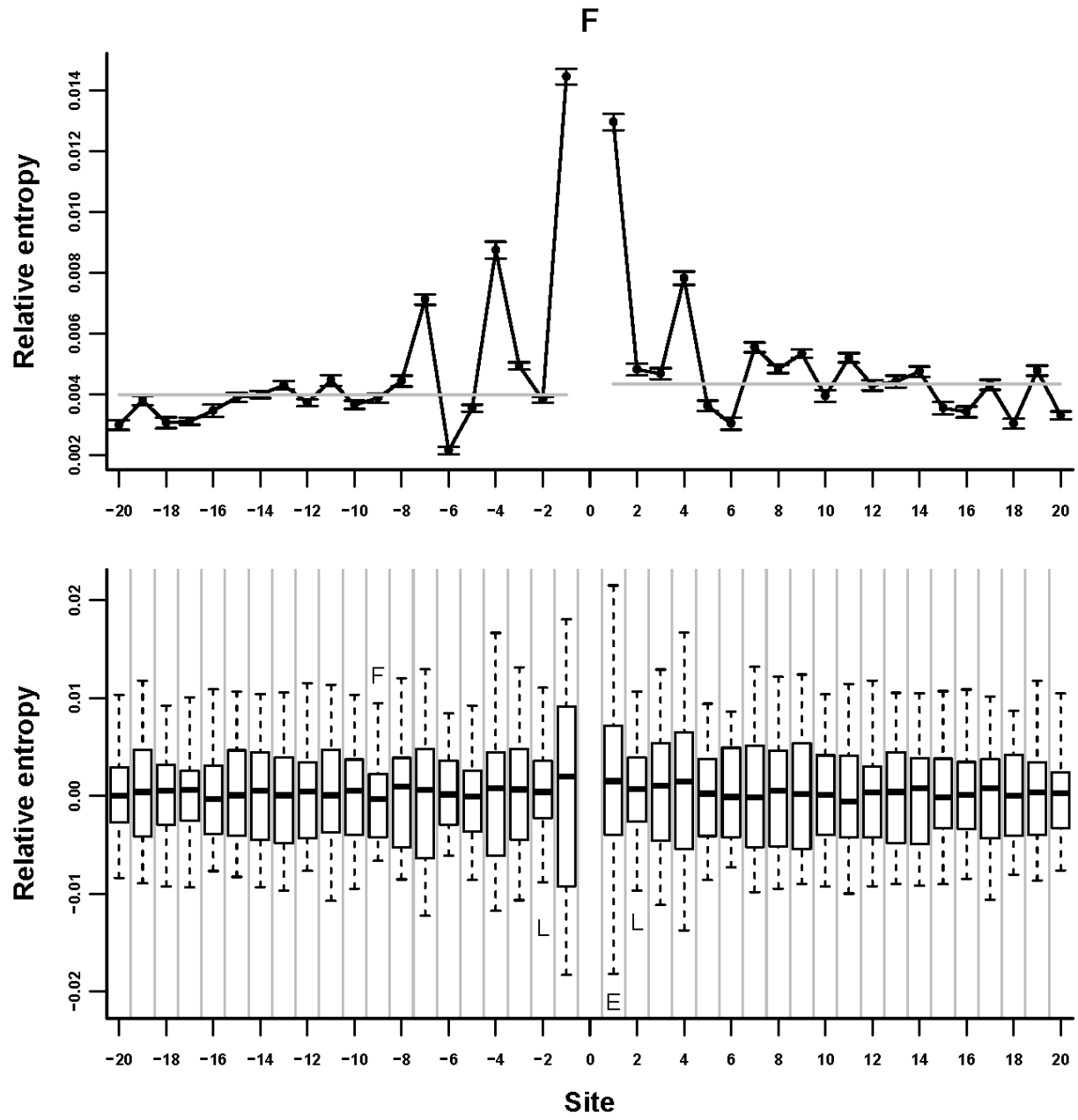


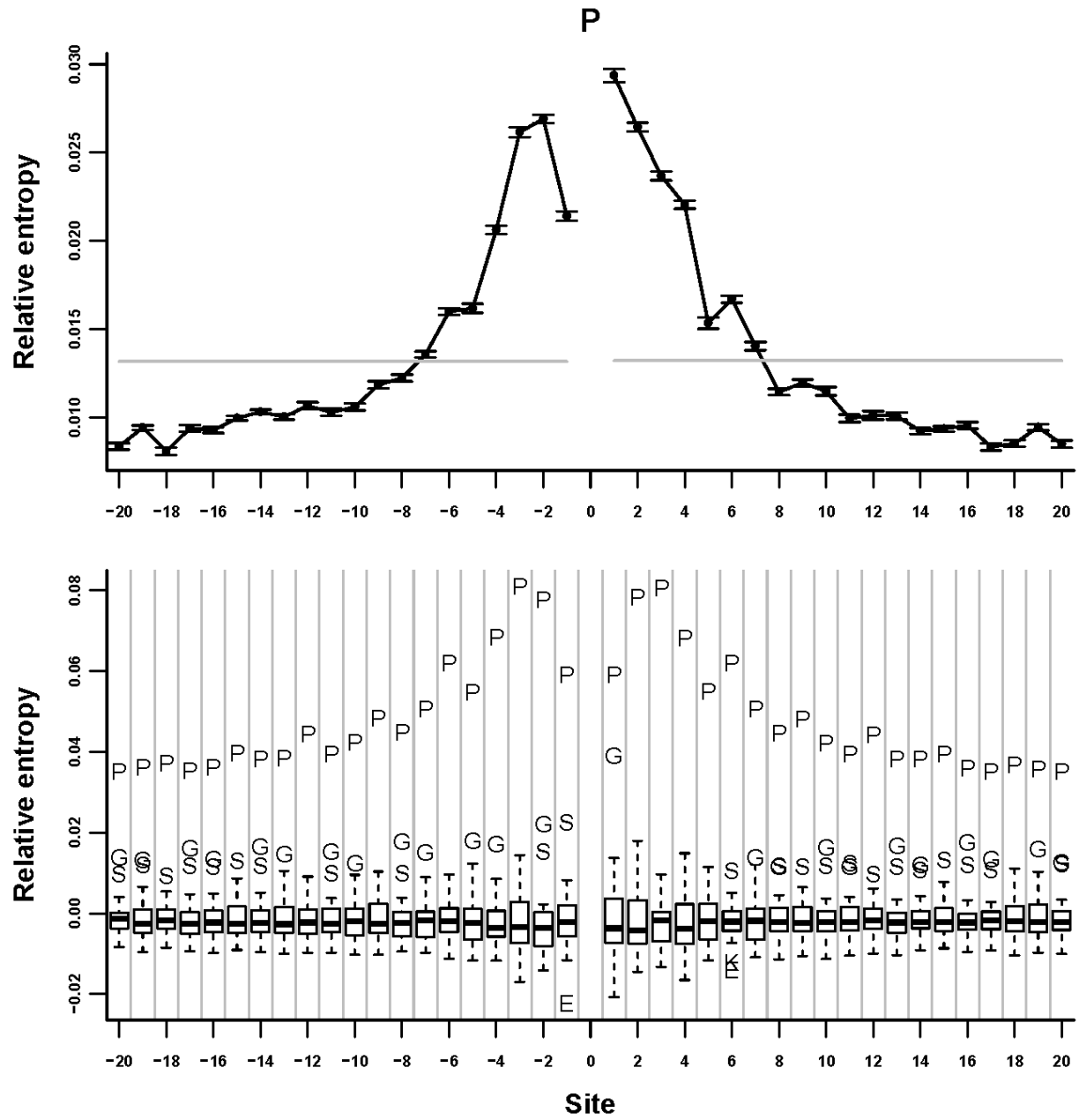


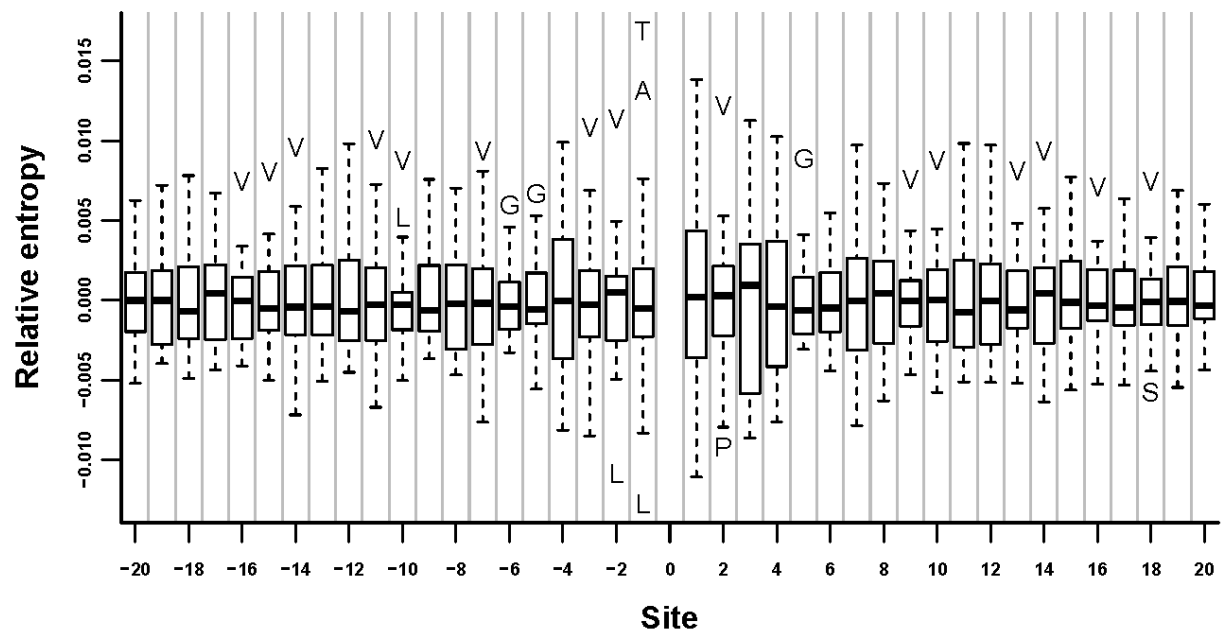
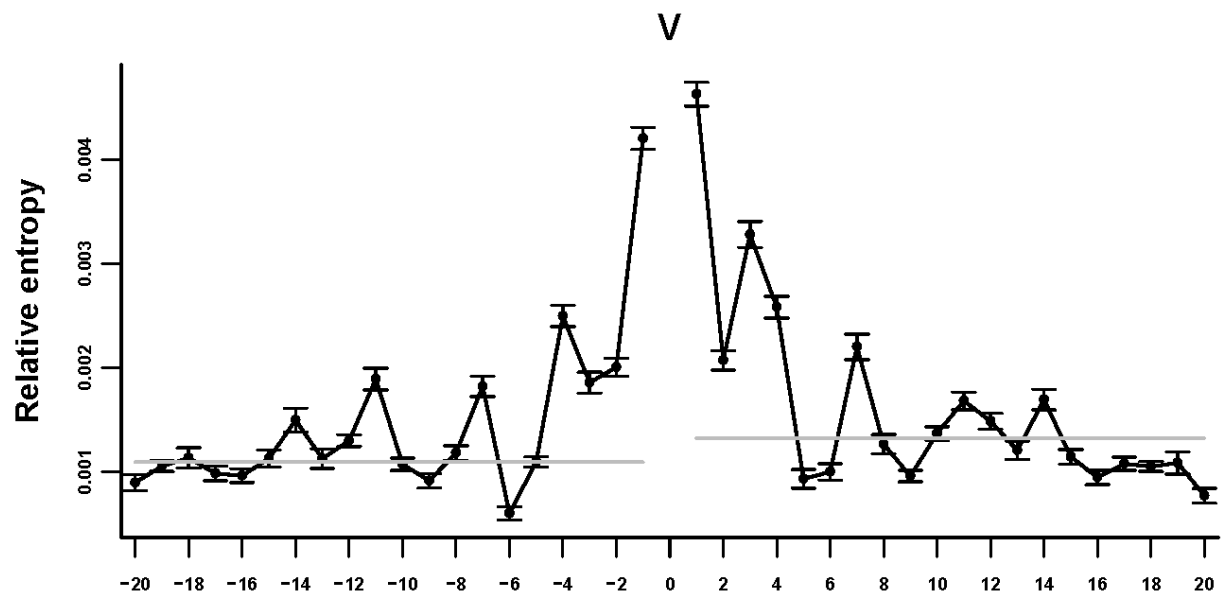


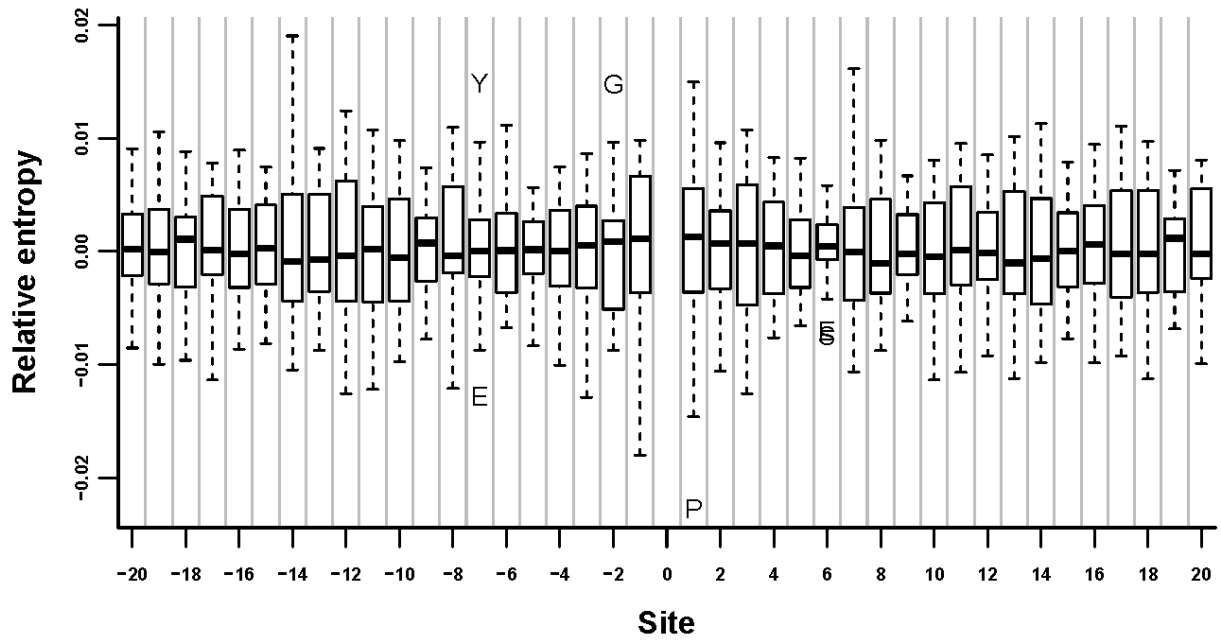
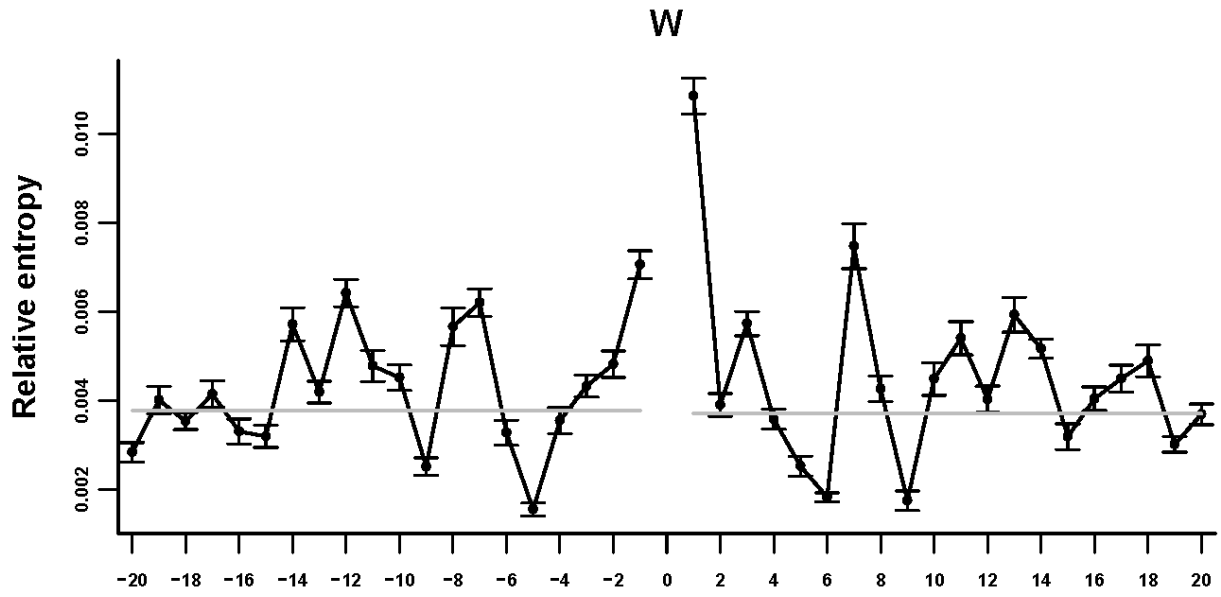


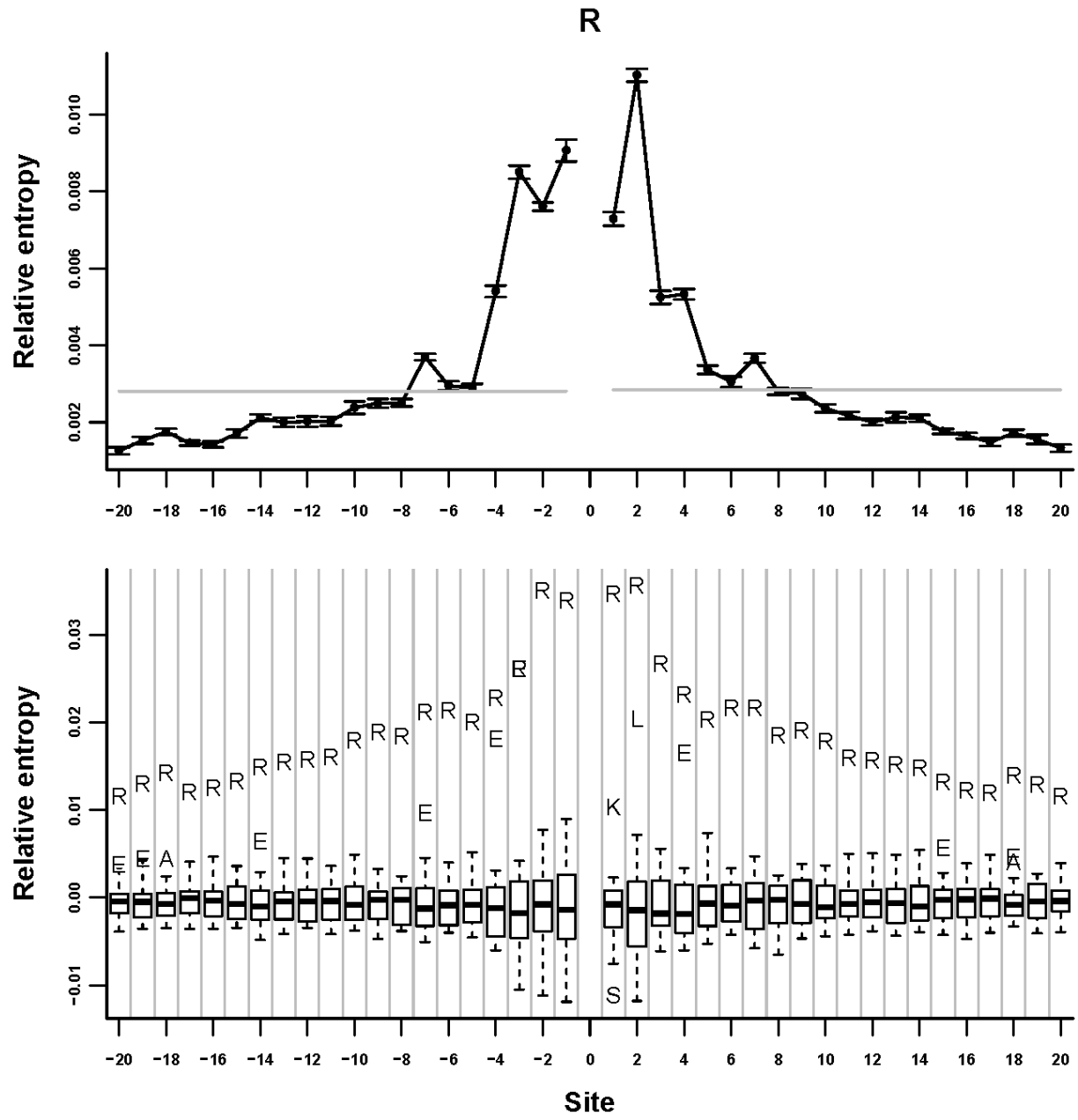


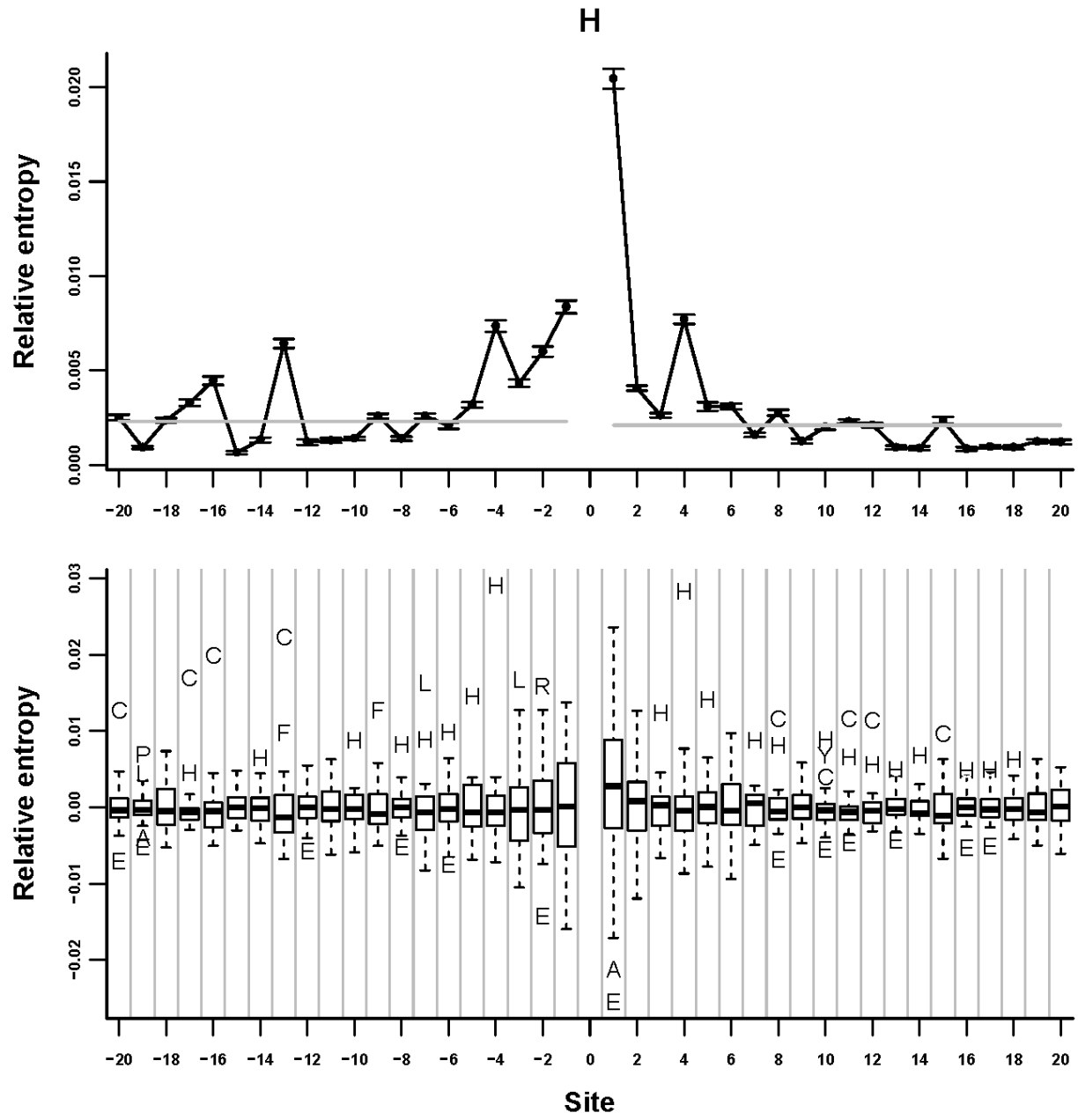


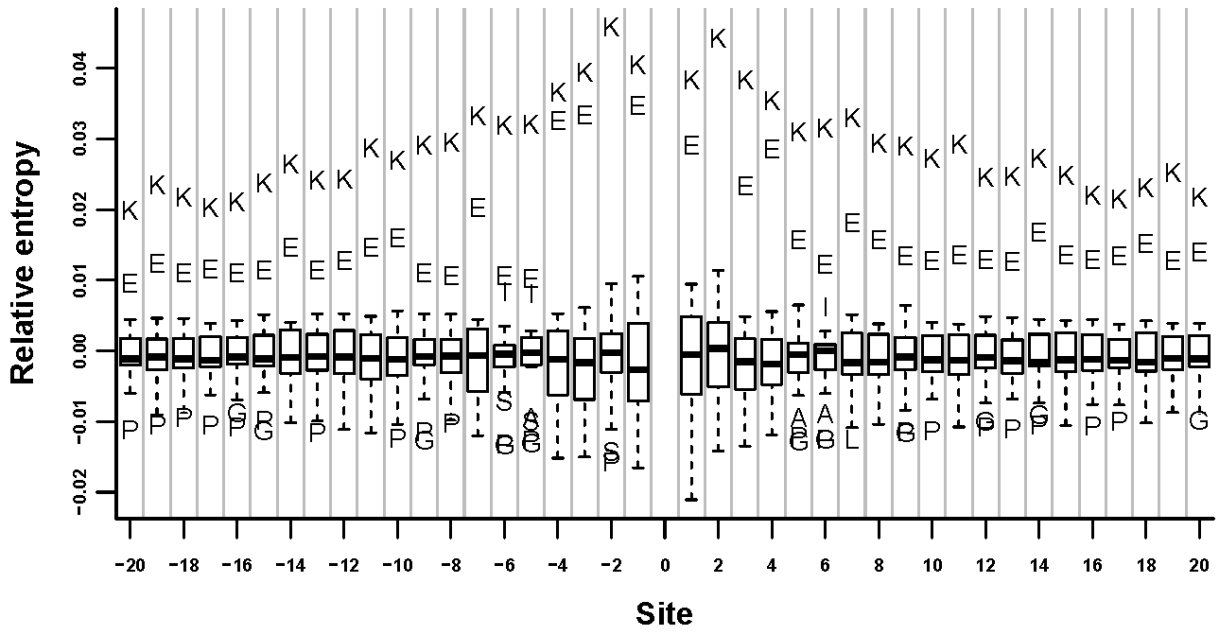
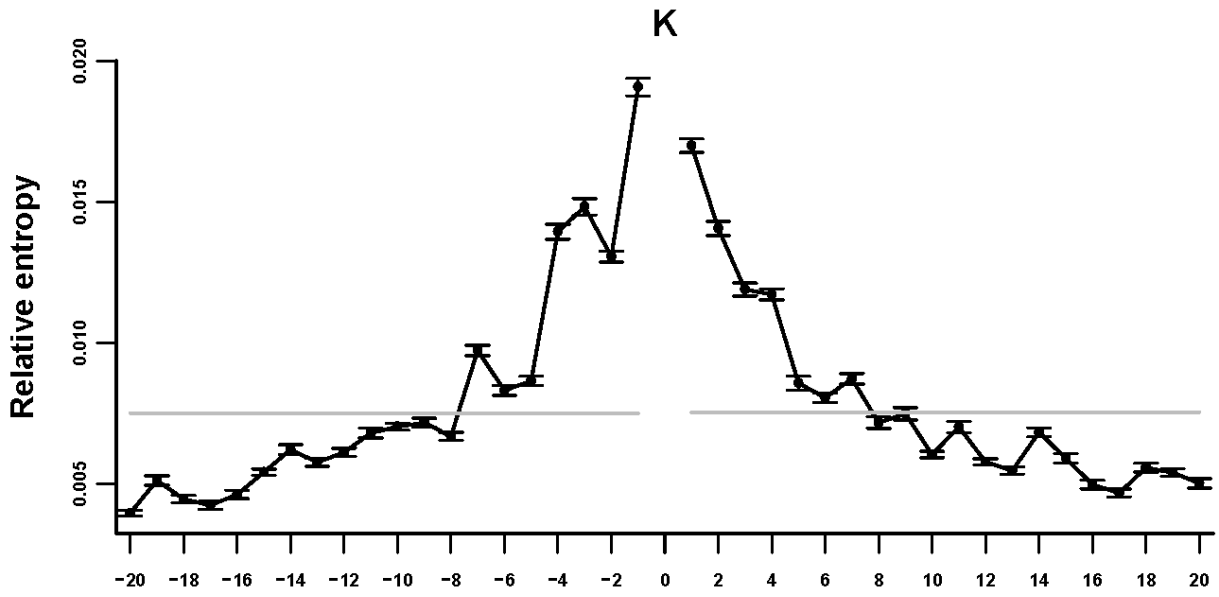


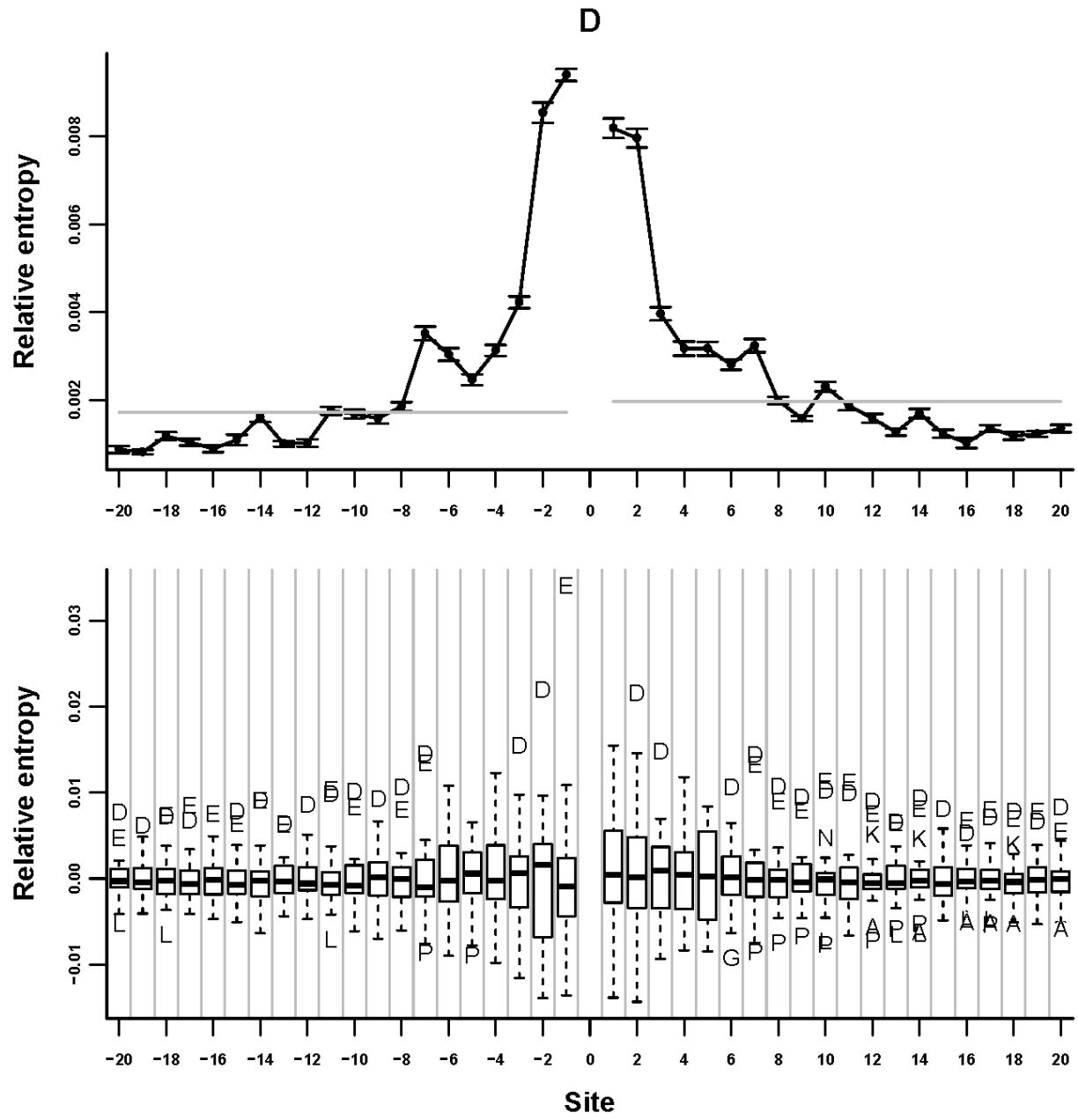


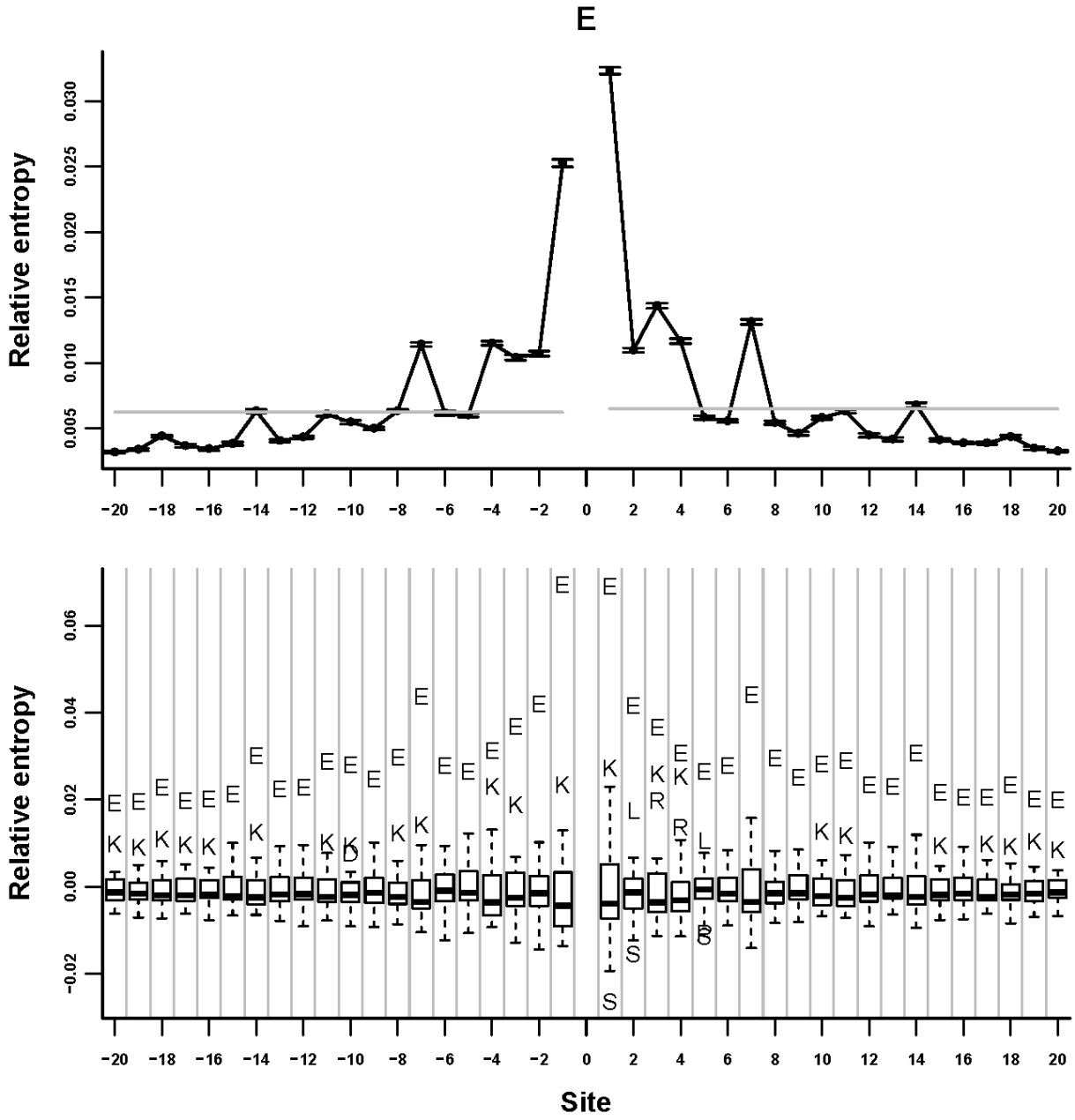


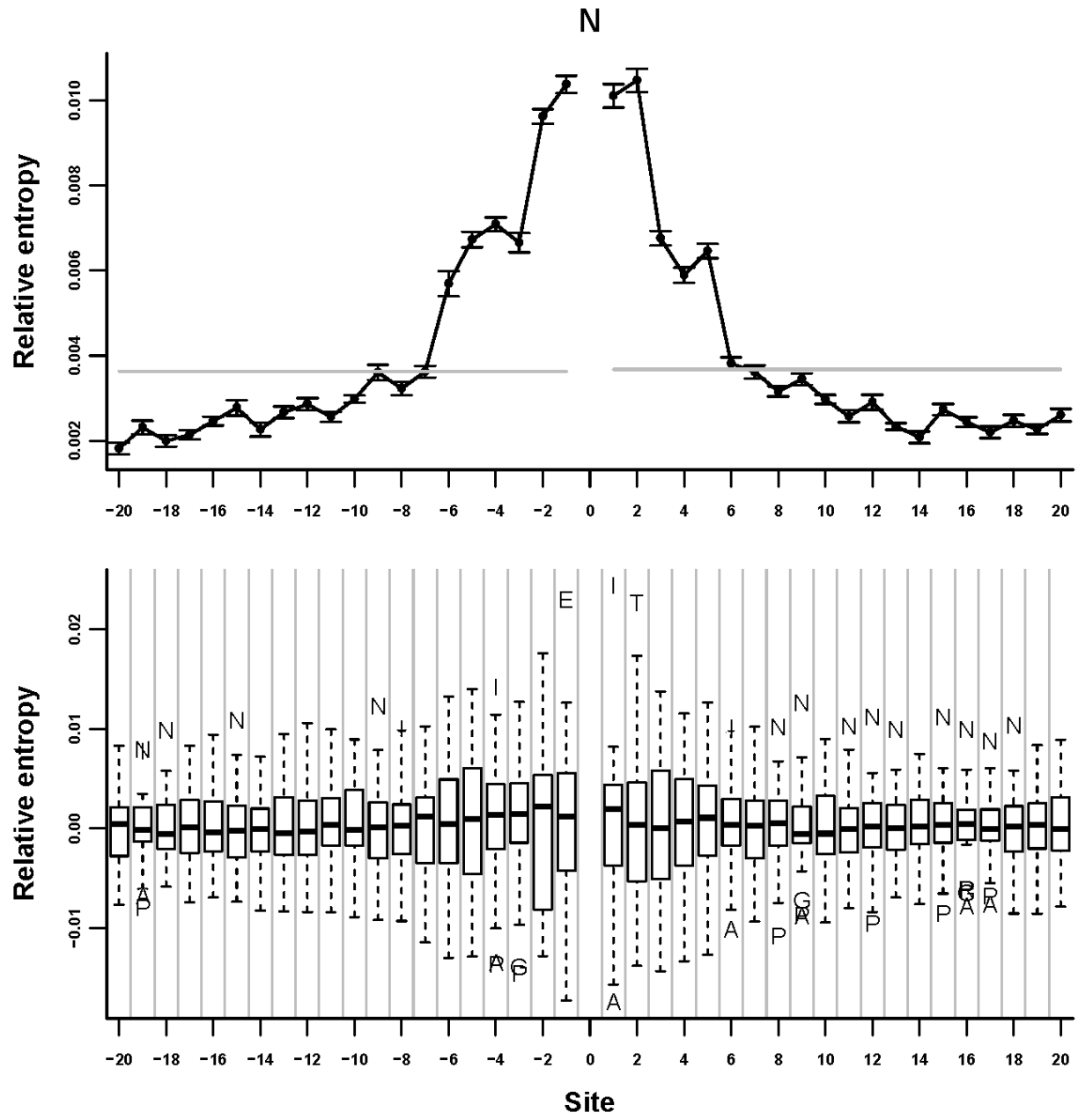


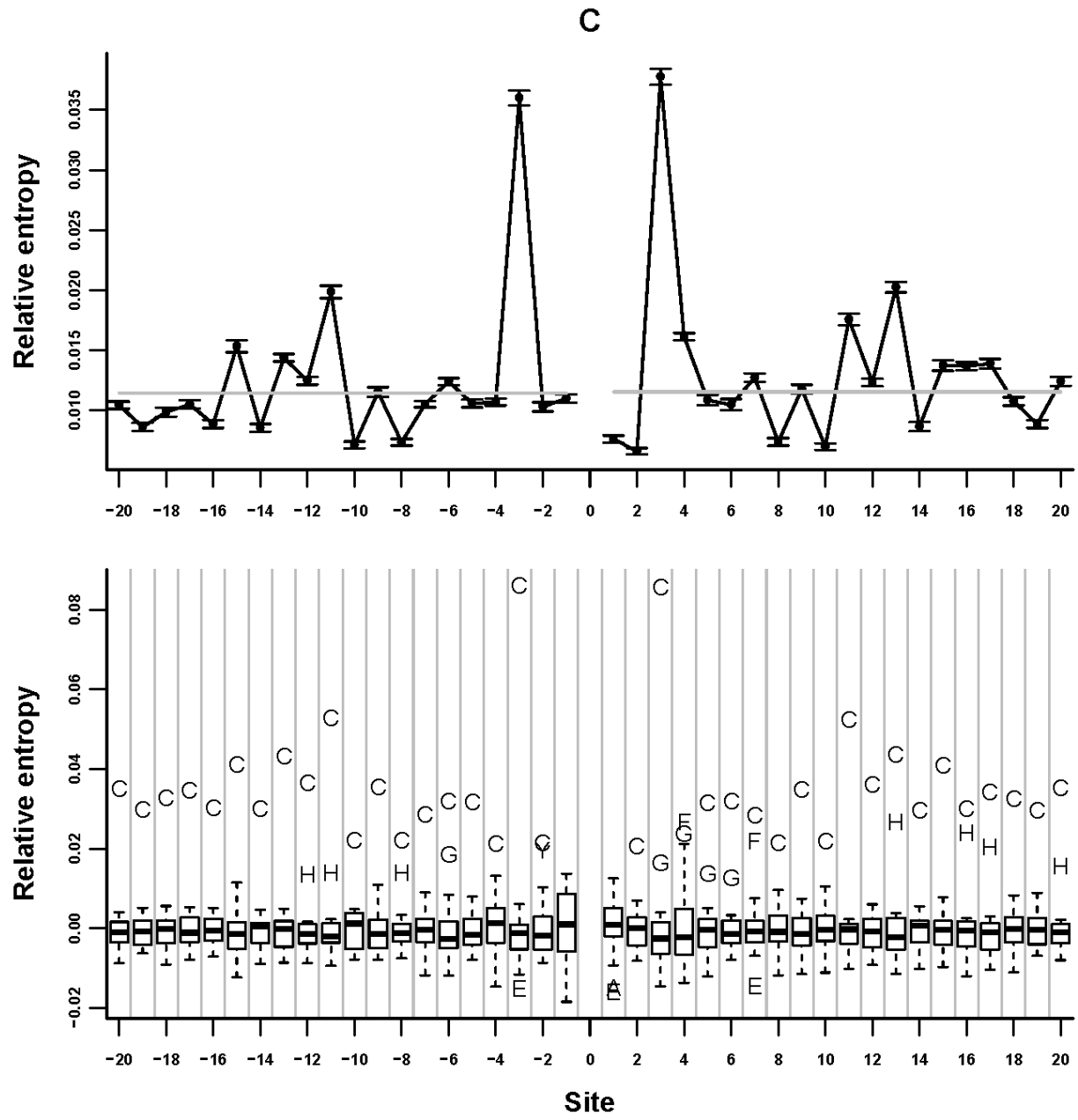


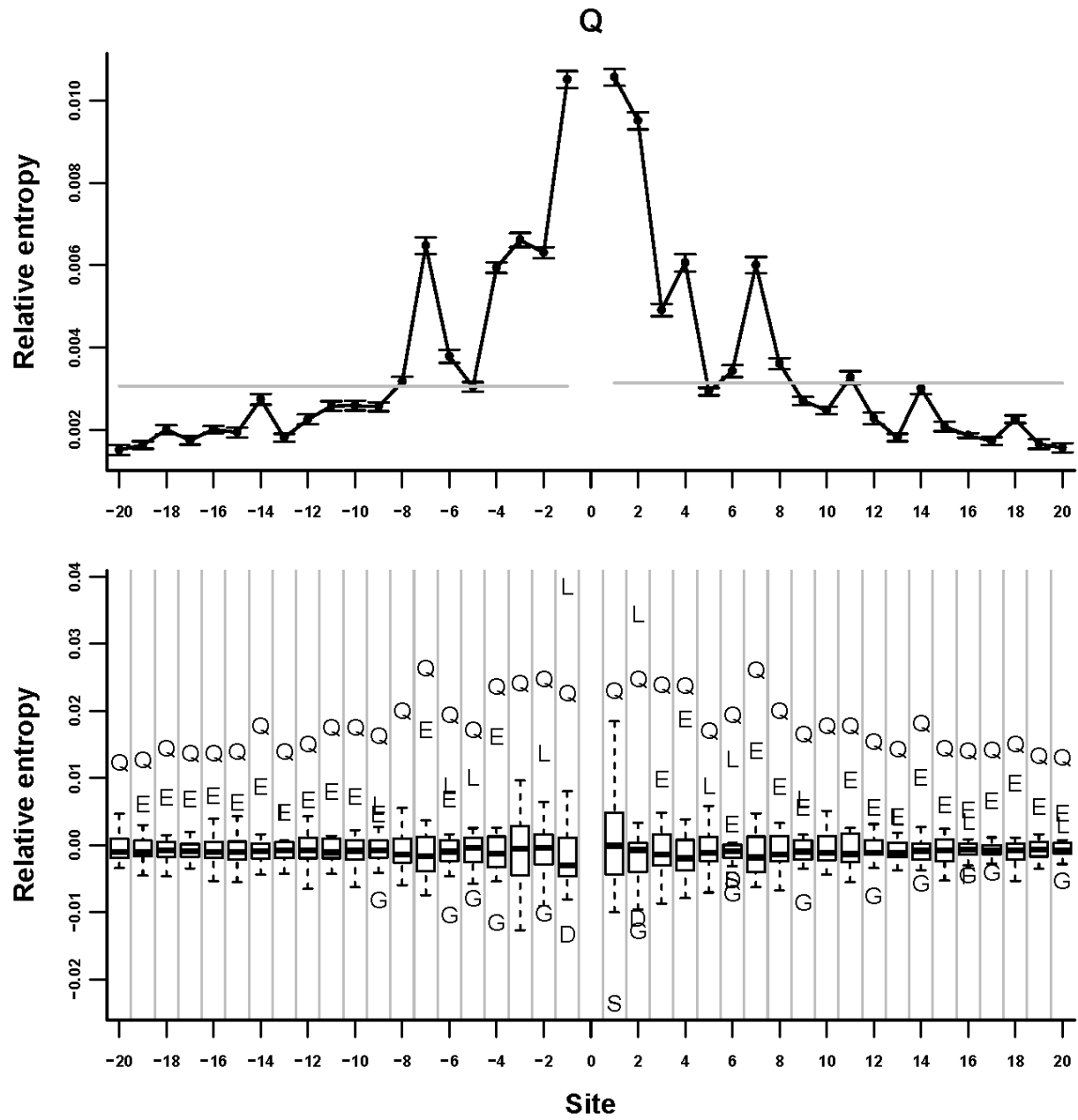


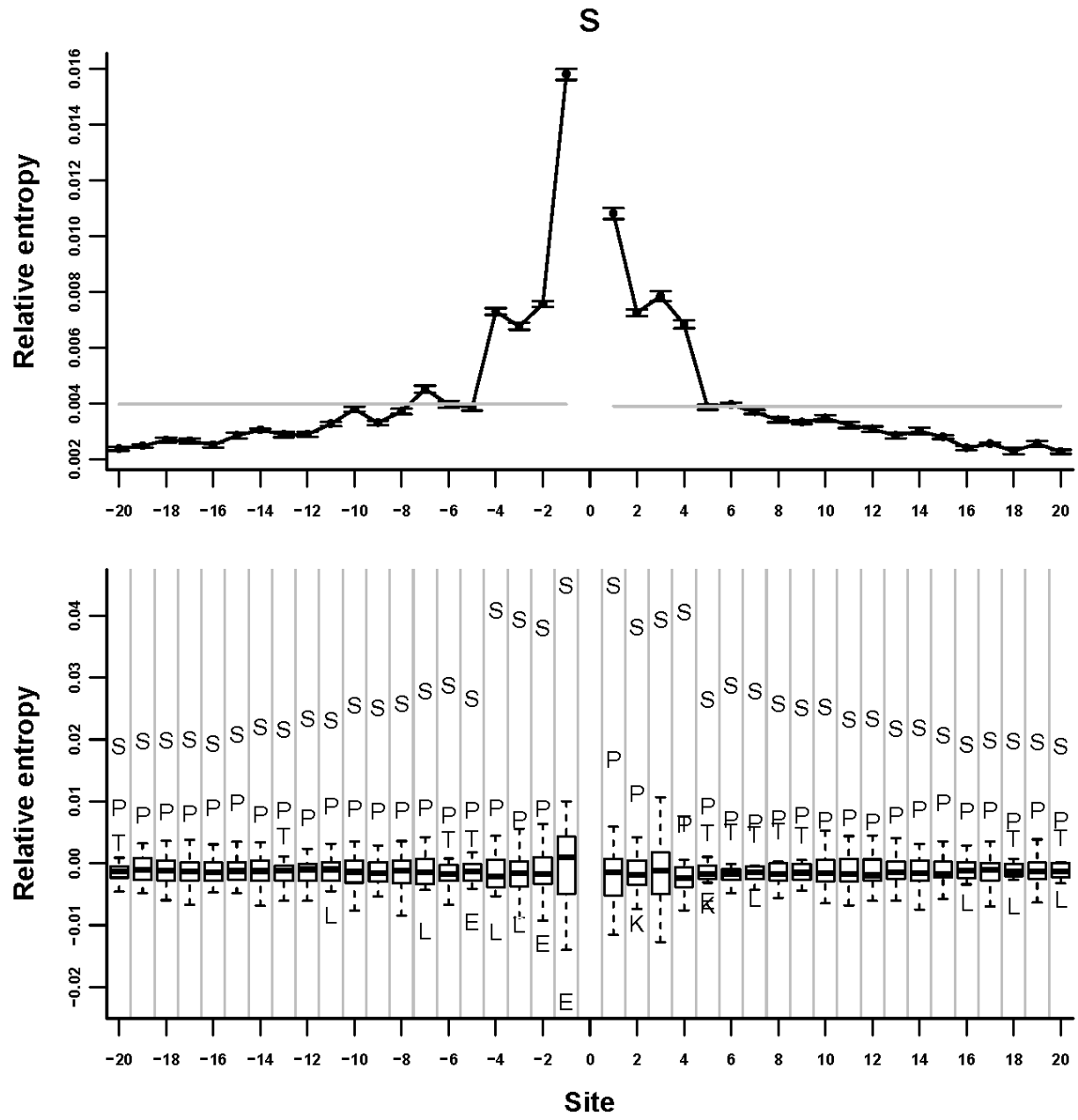


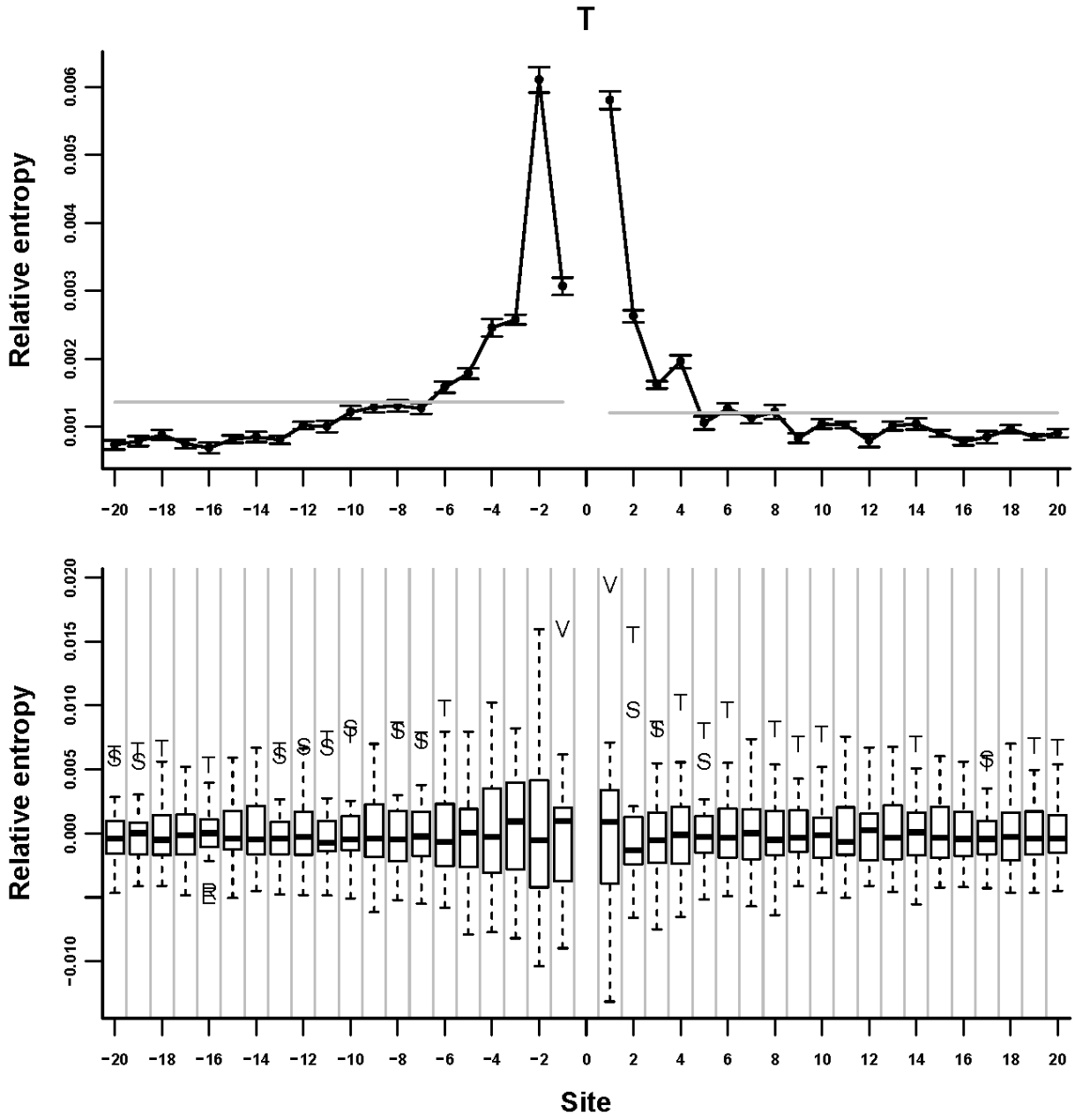


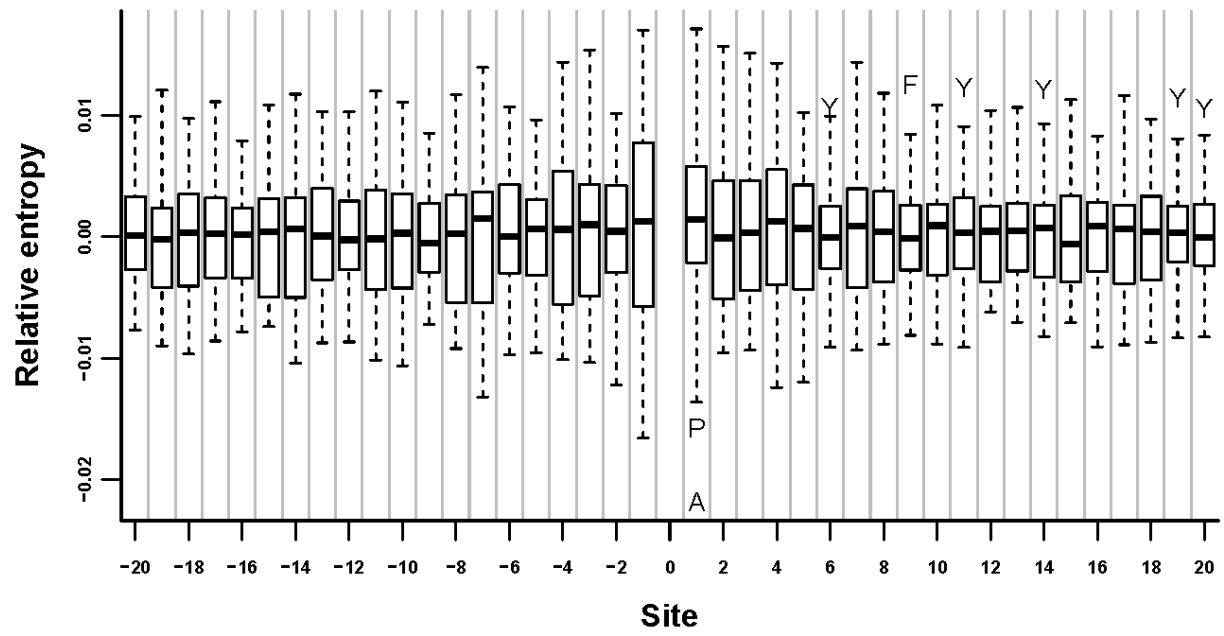
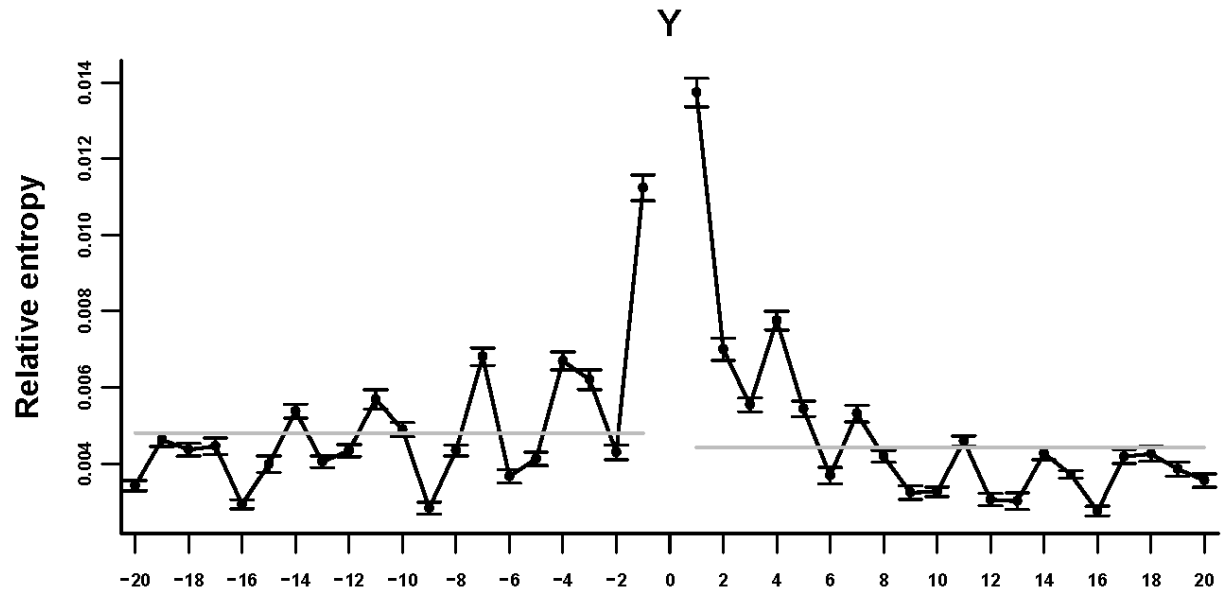




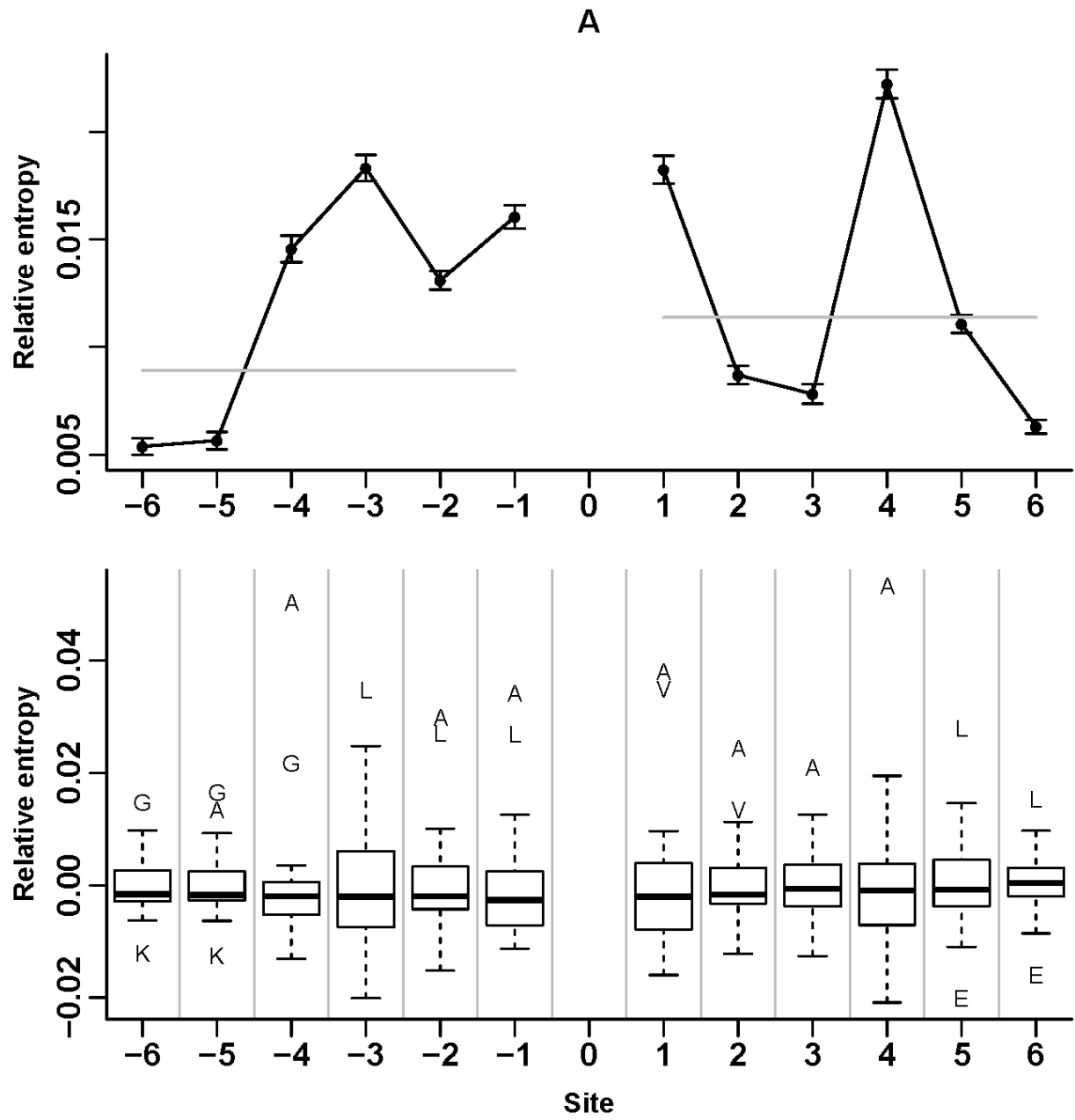


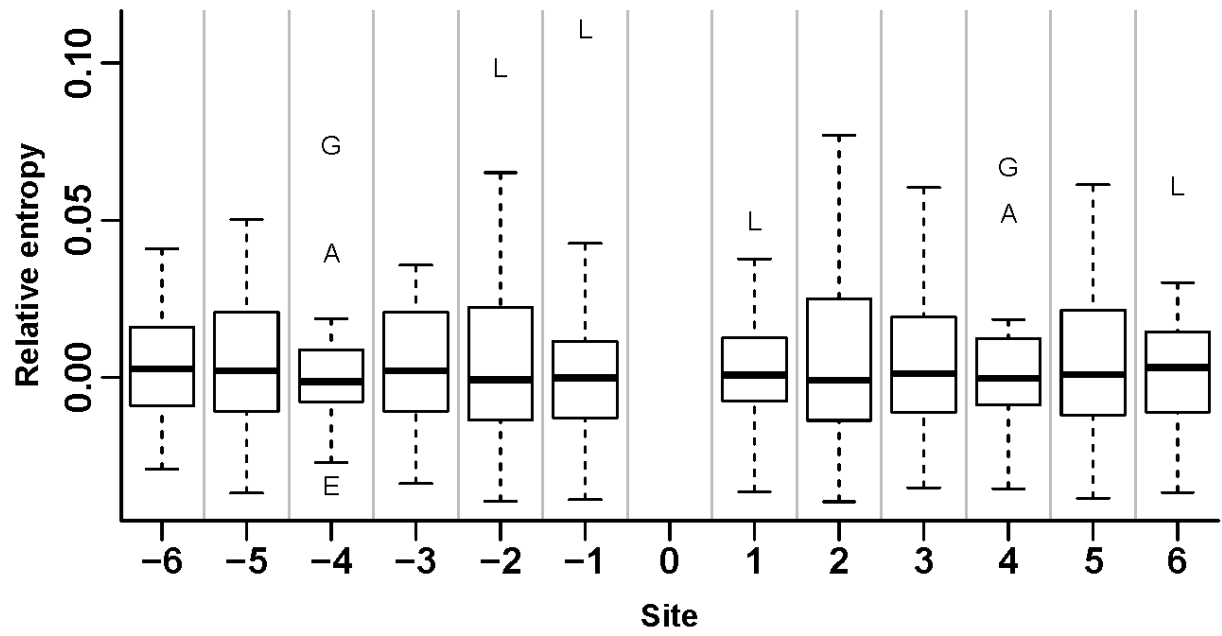
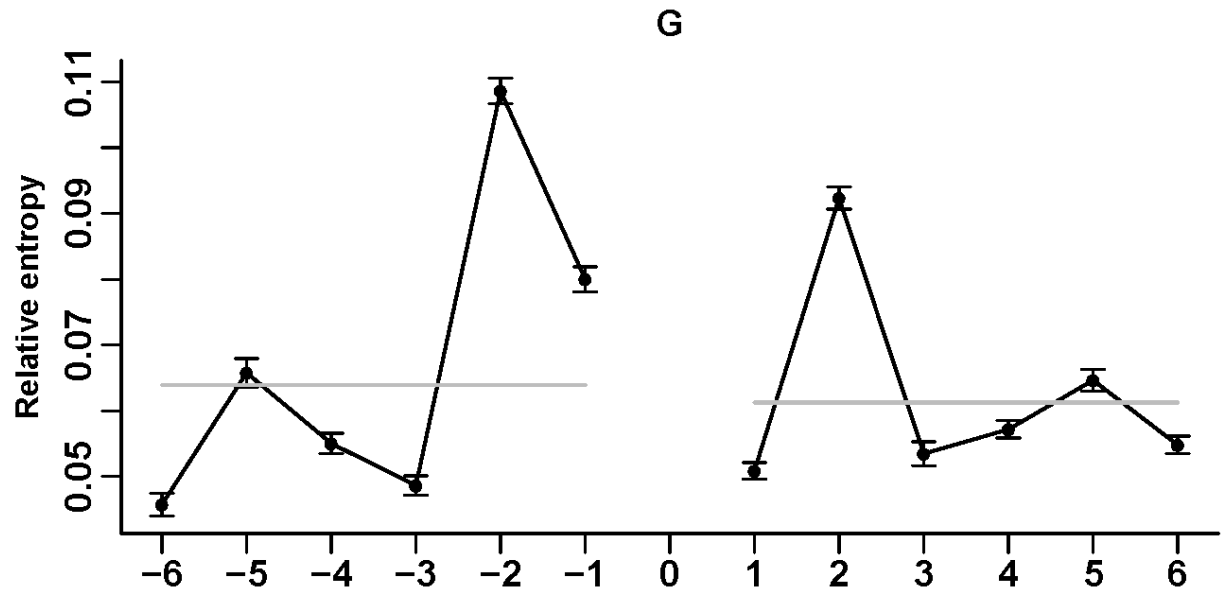


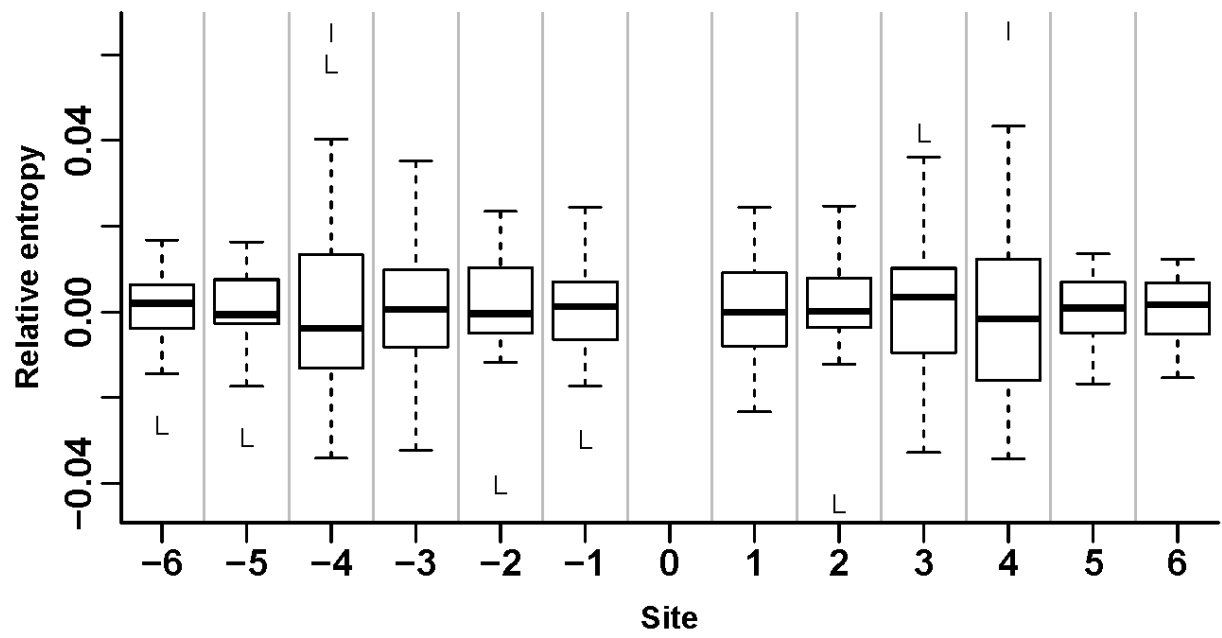
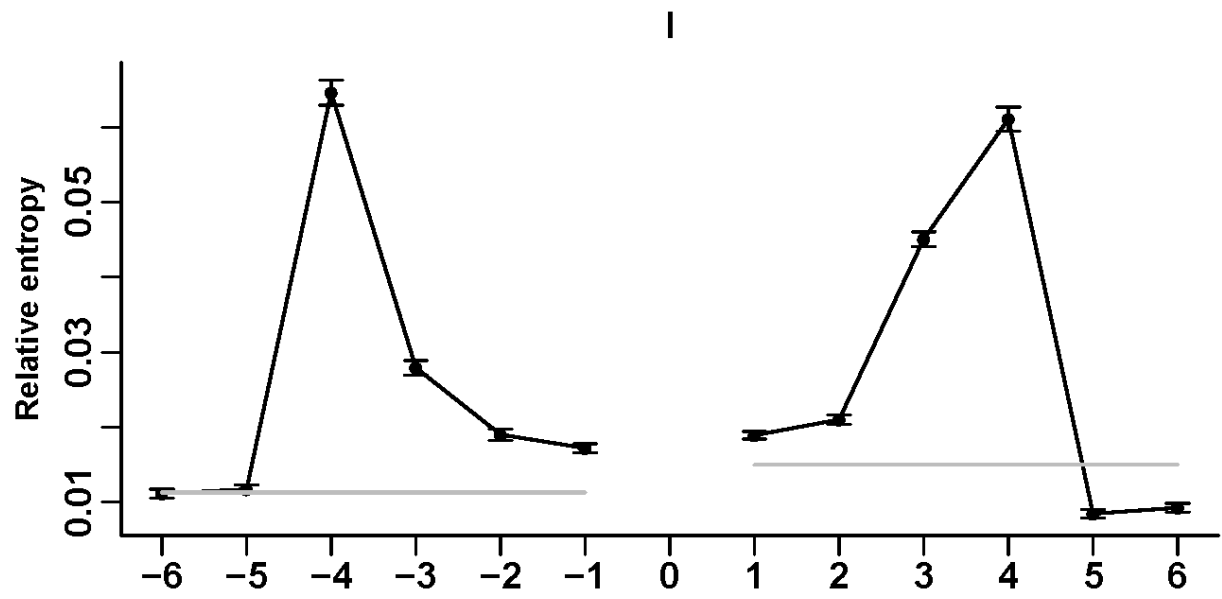


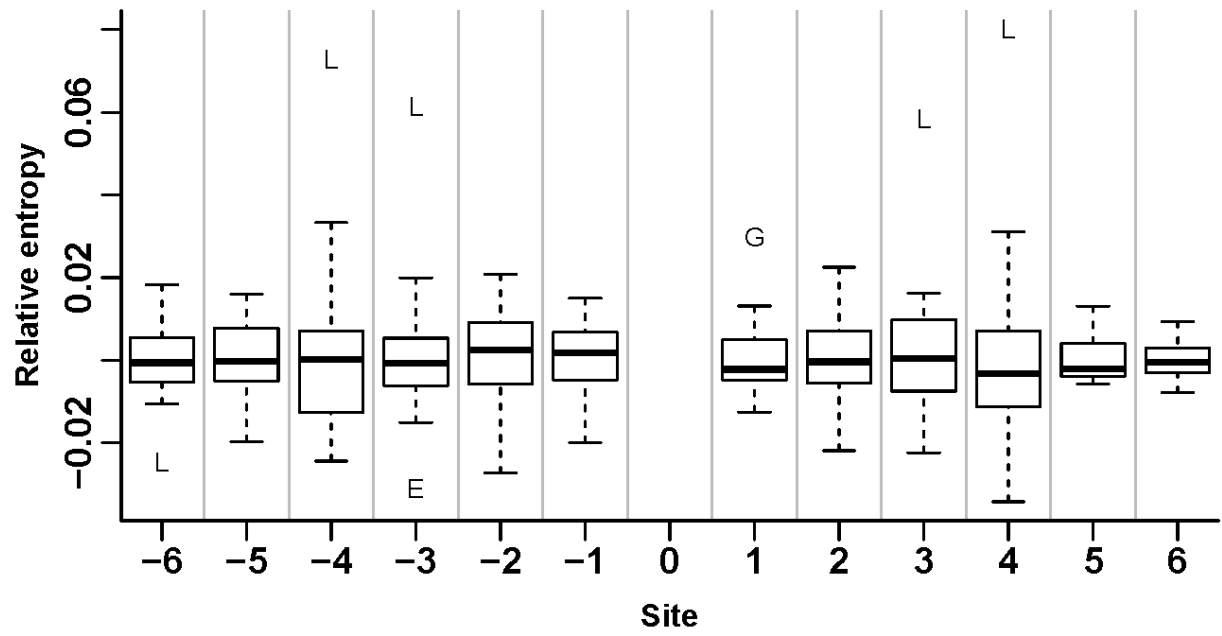
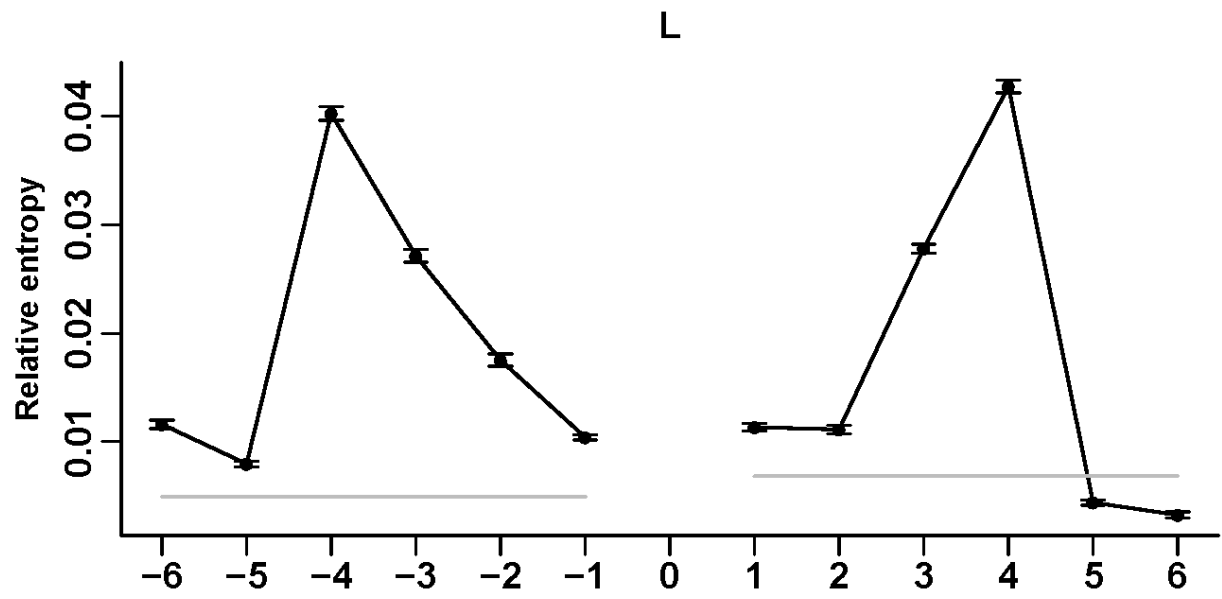


**Figure S2.** Neighbor preference patterns of the 20 amino acids in  $\alpha$ -helix.

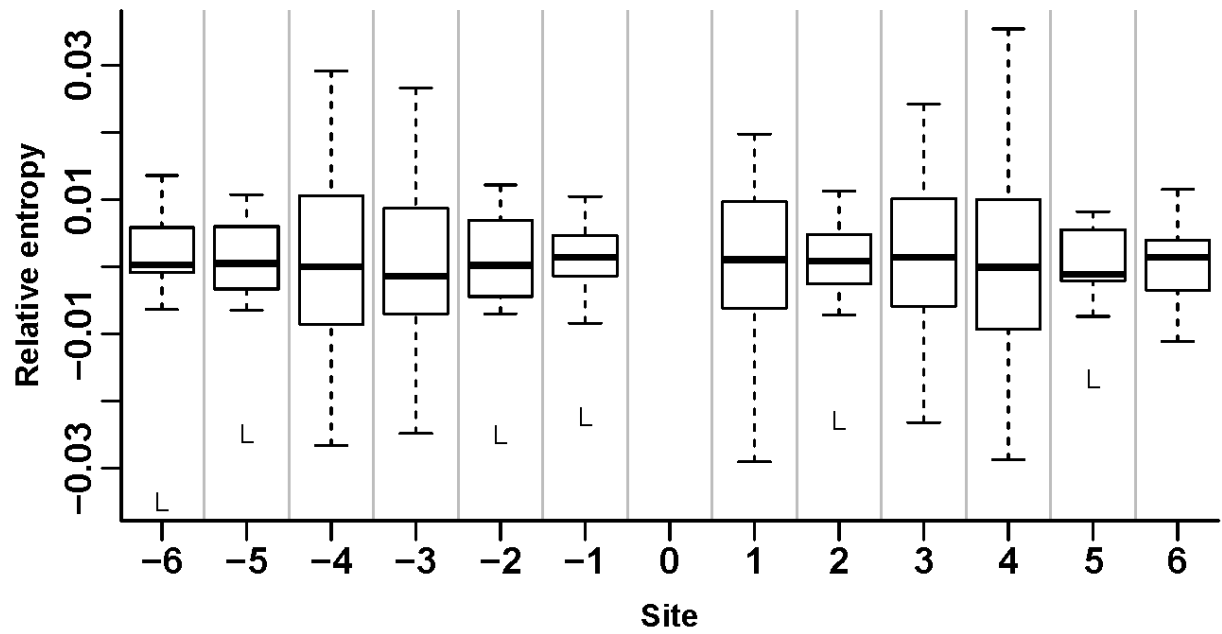
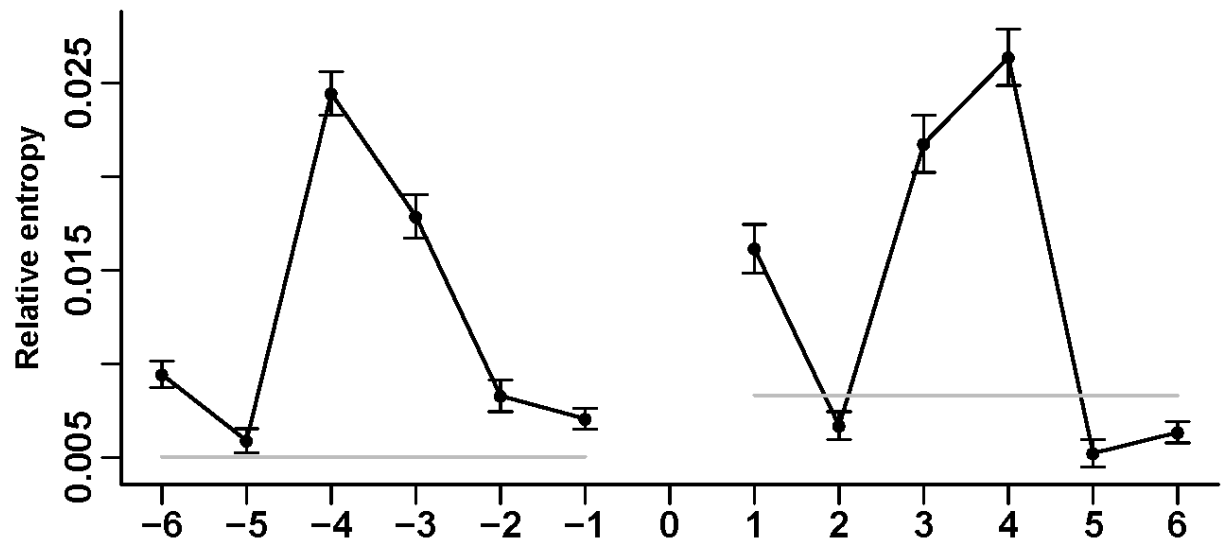


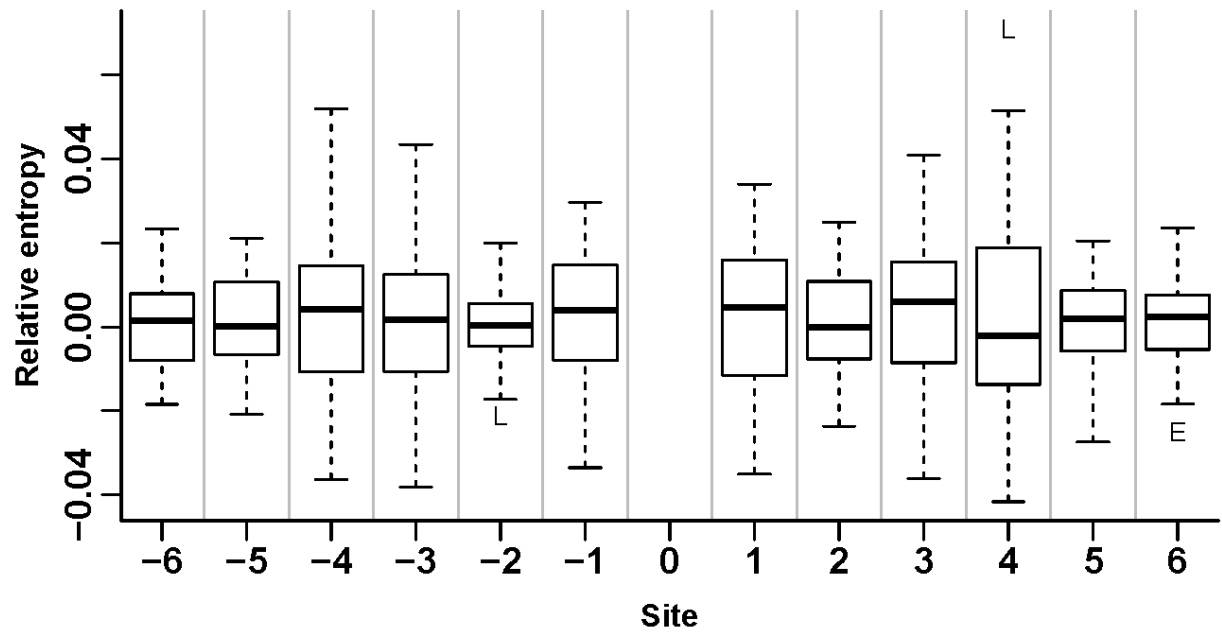
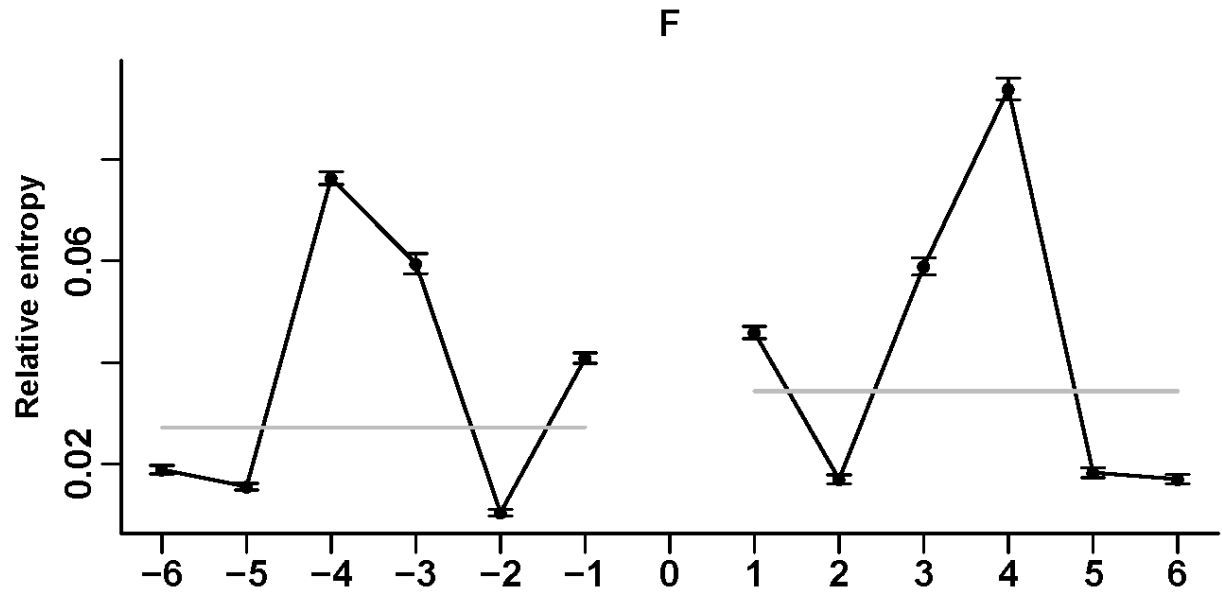


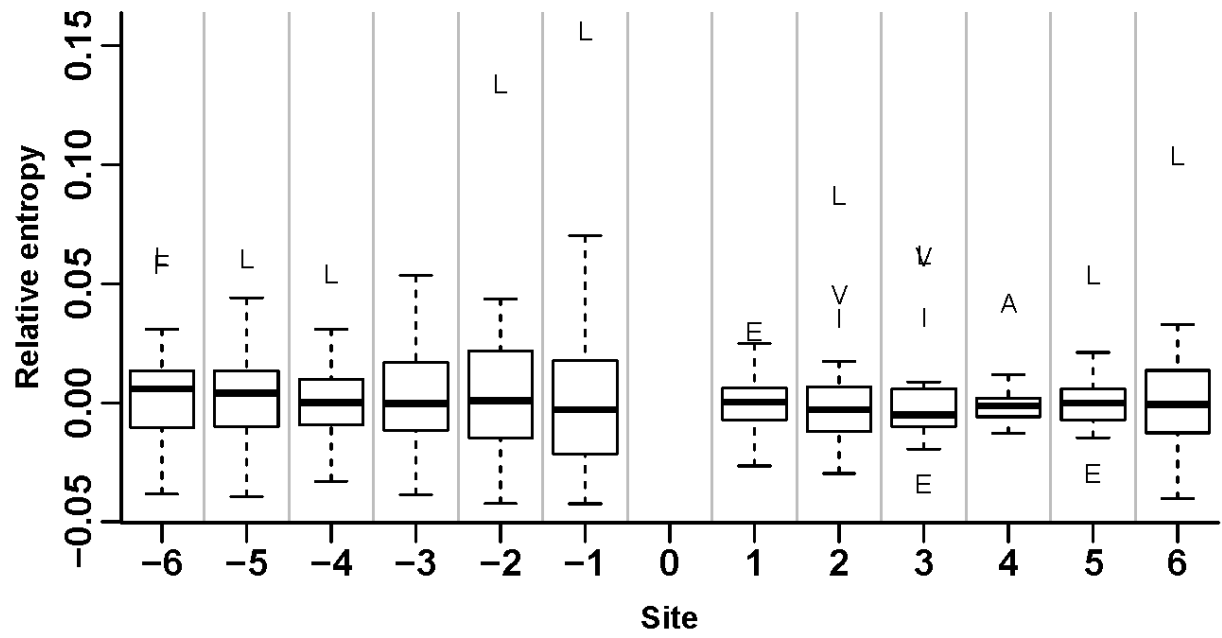
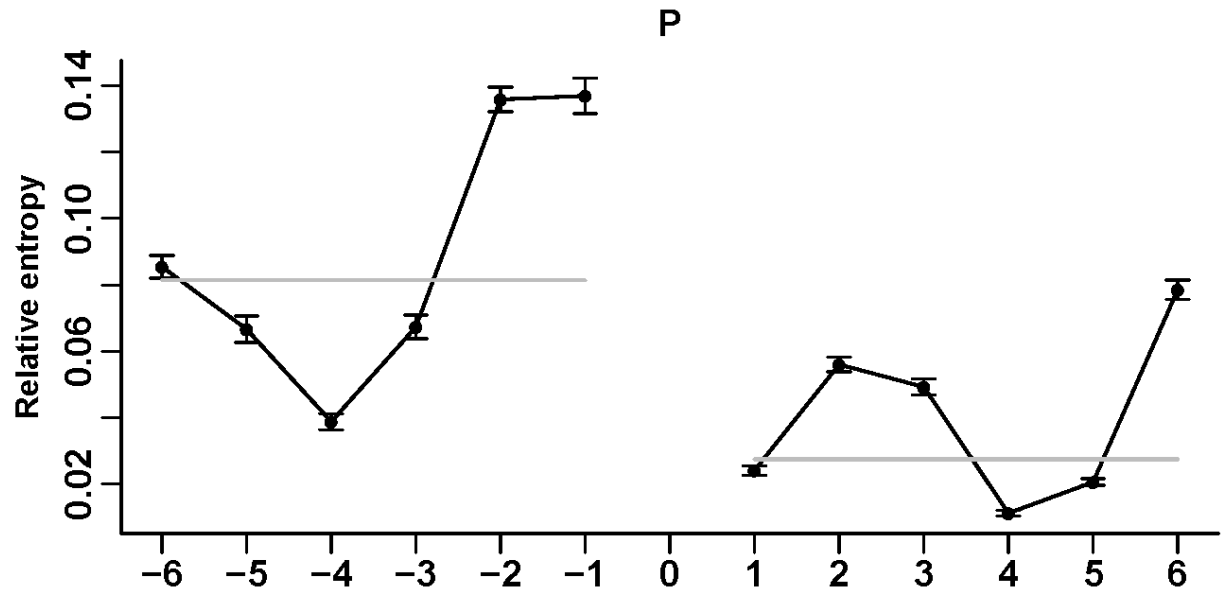


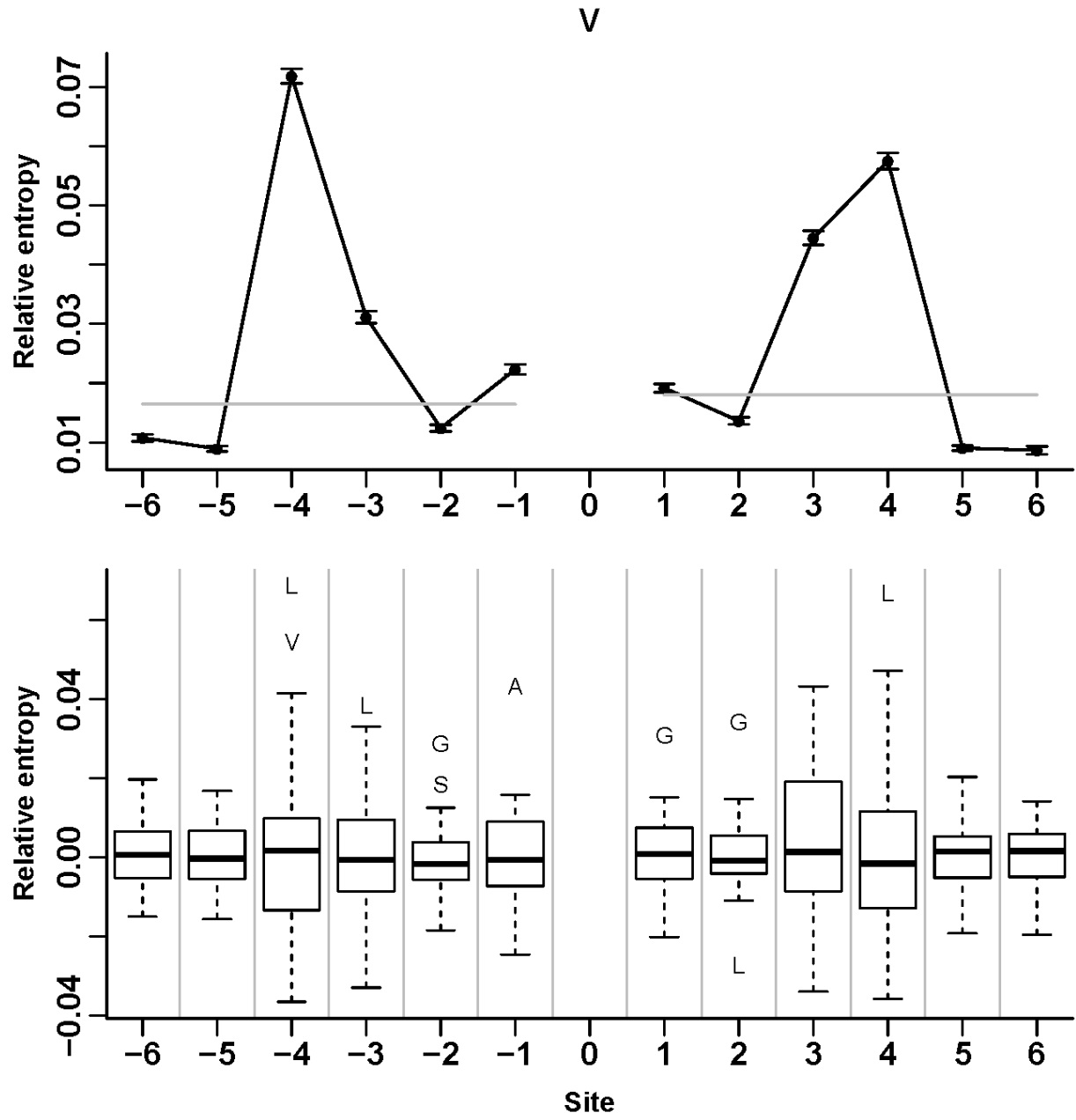


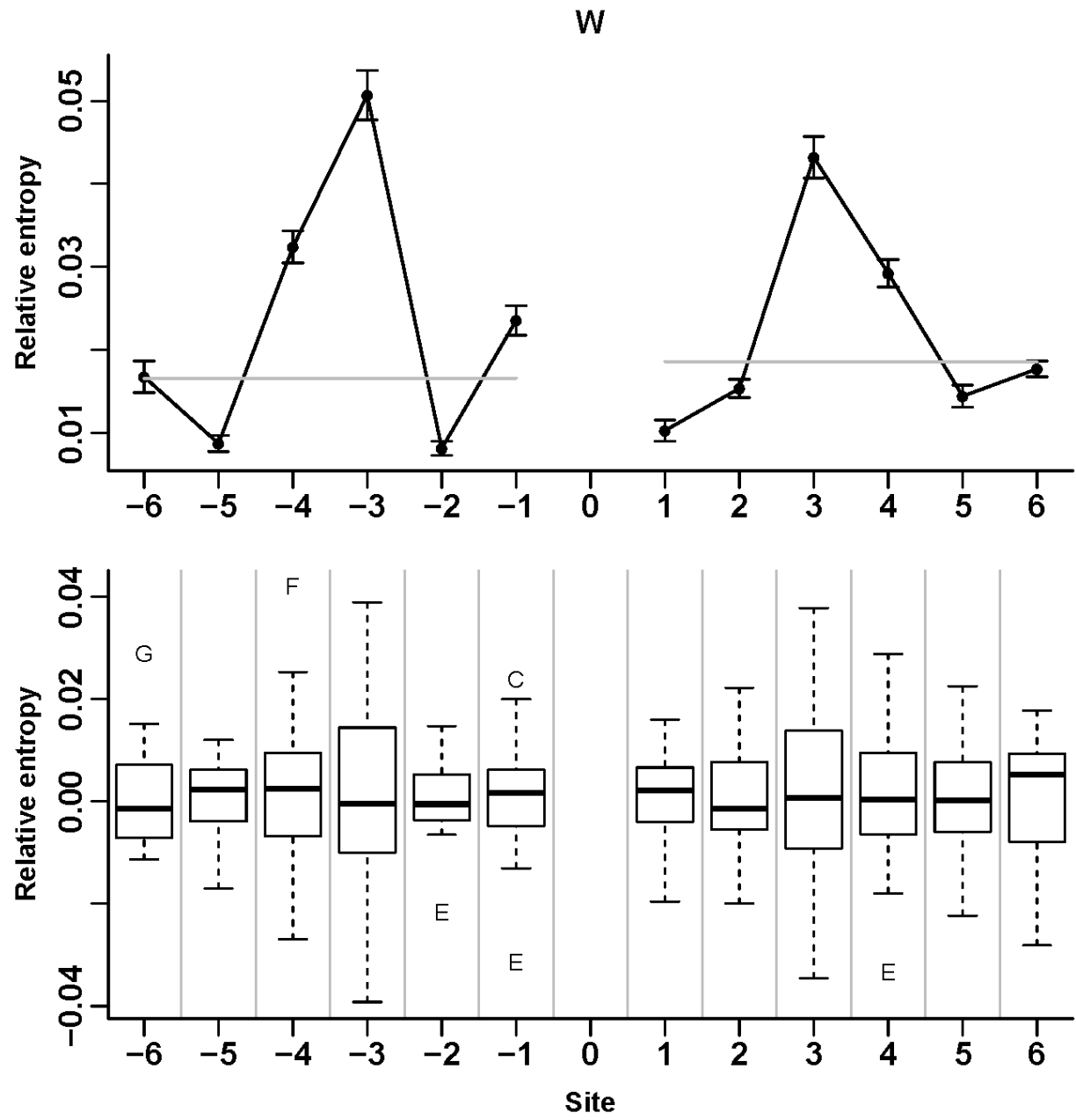
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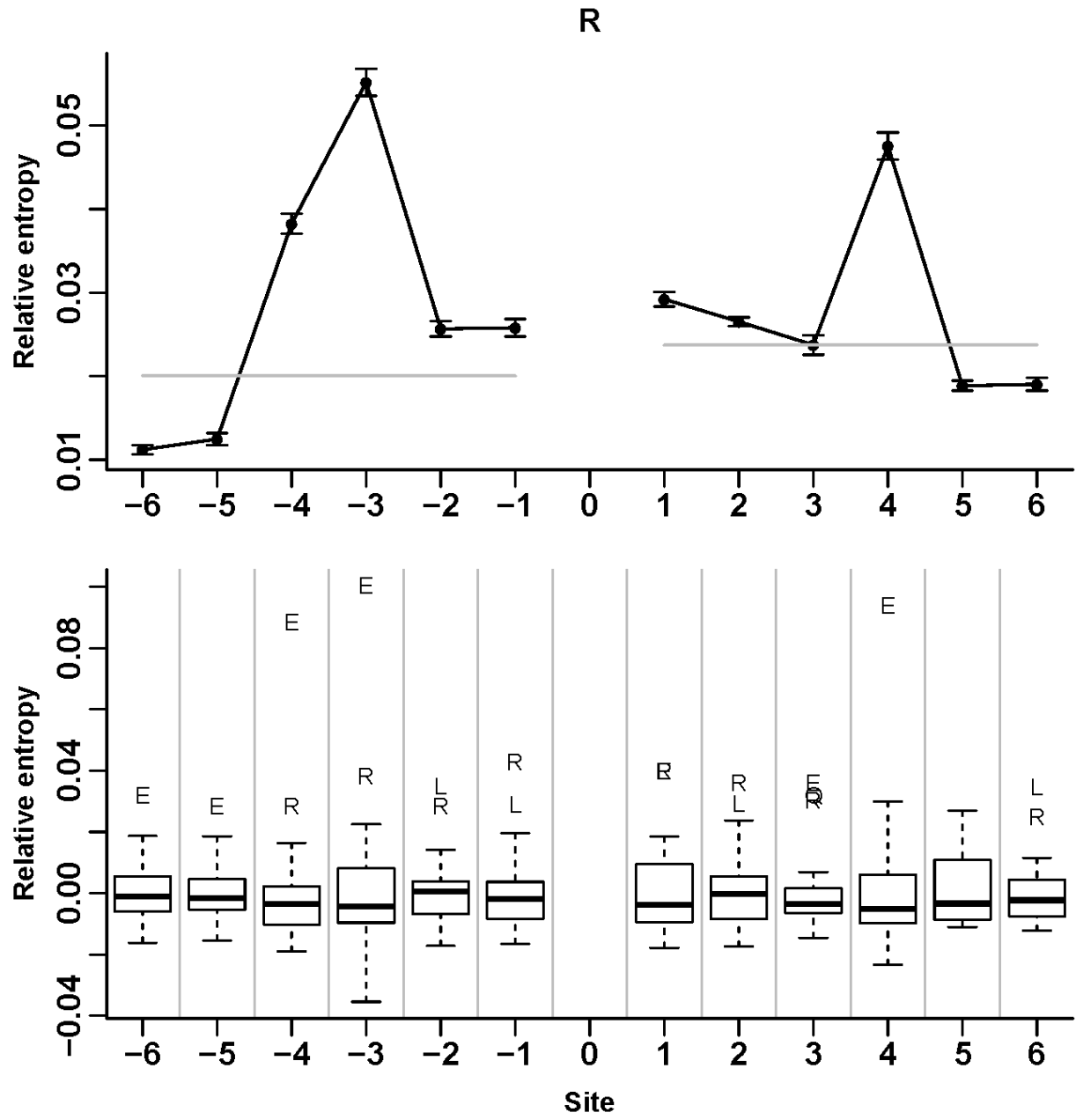


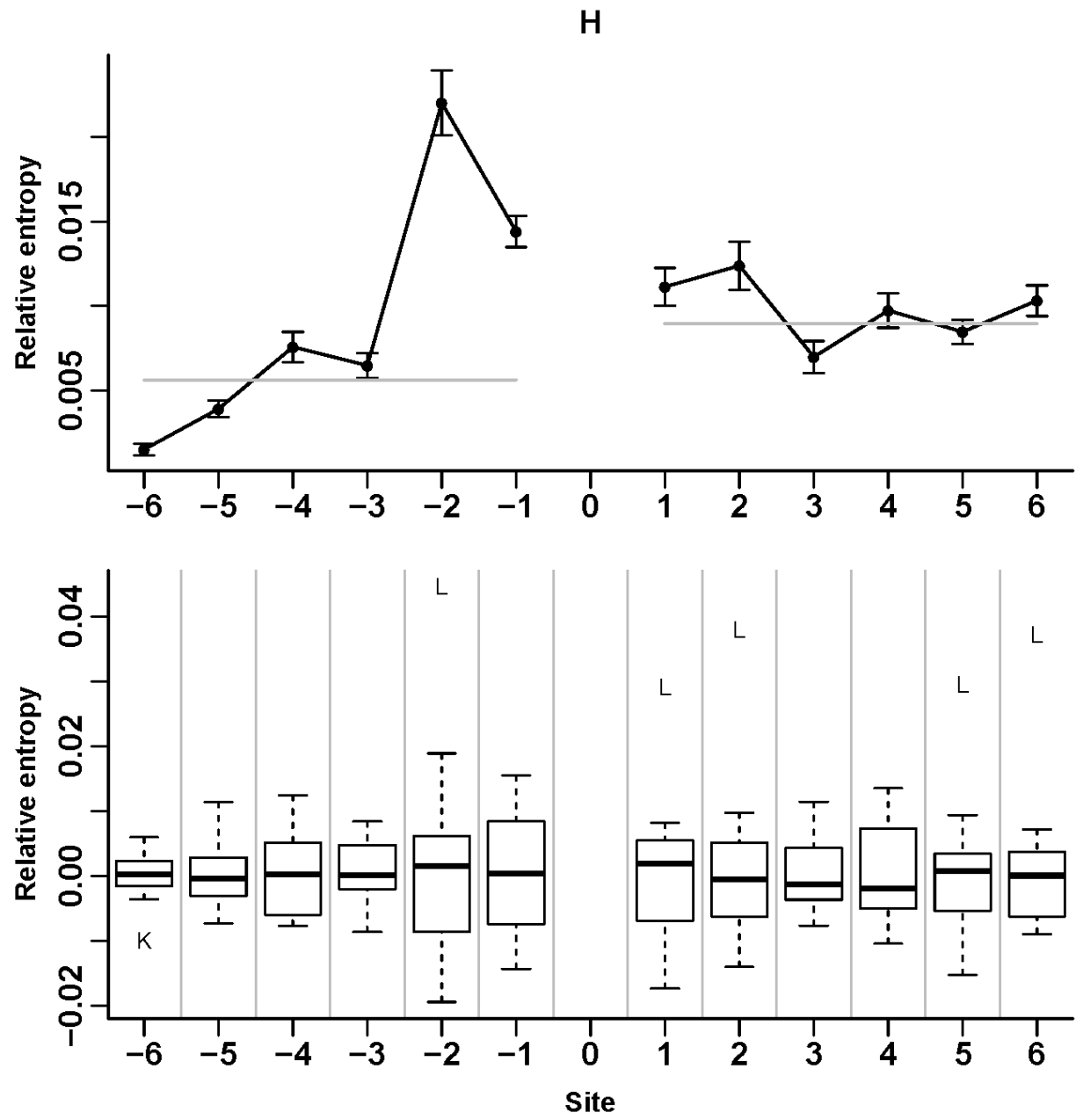


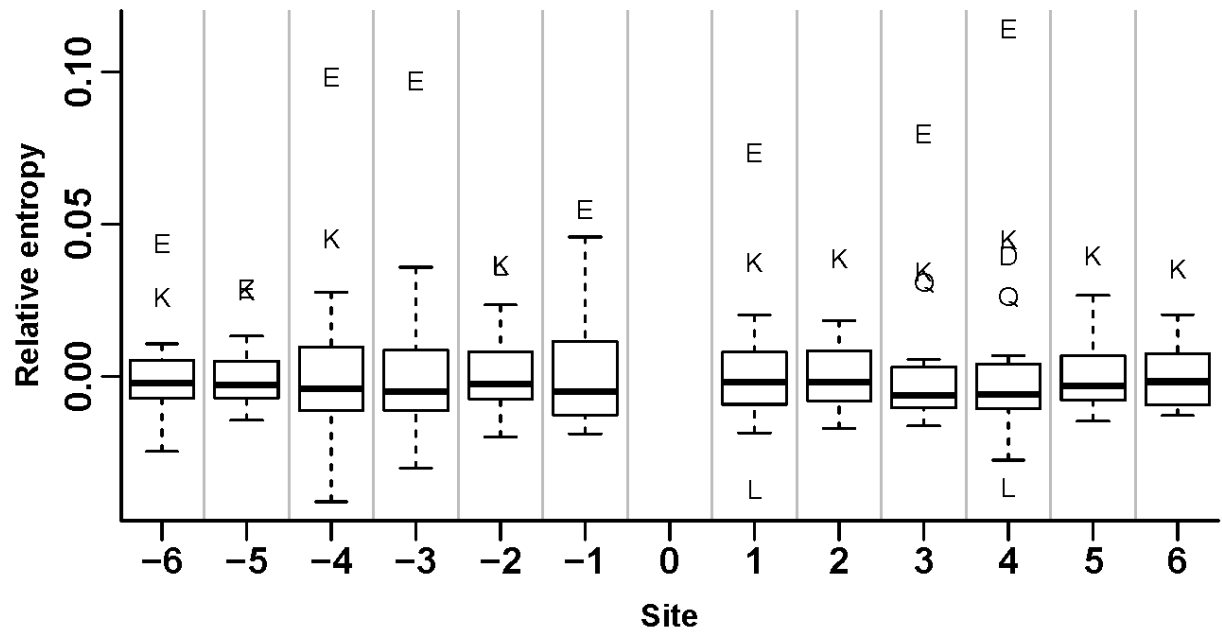
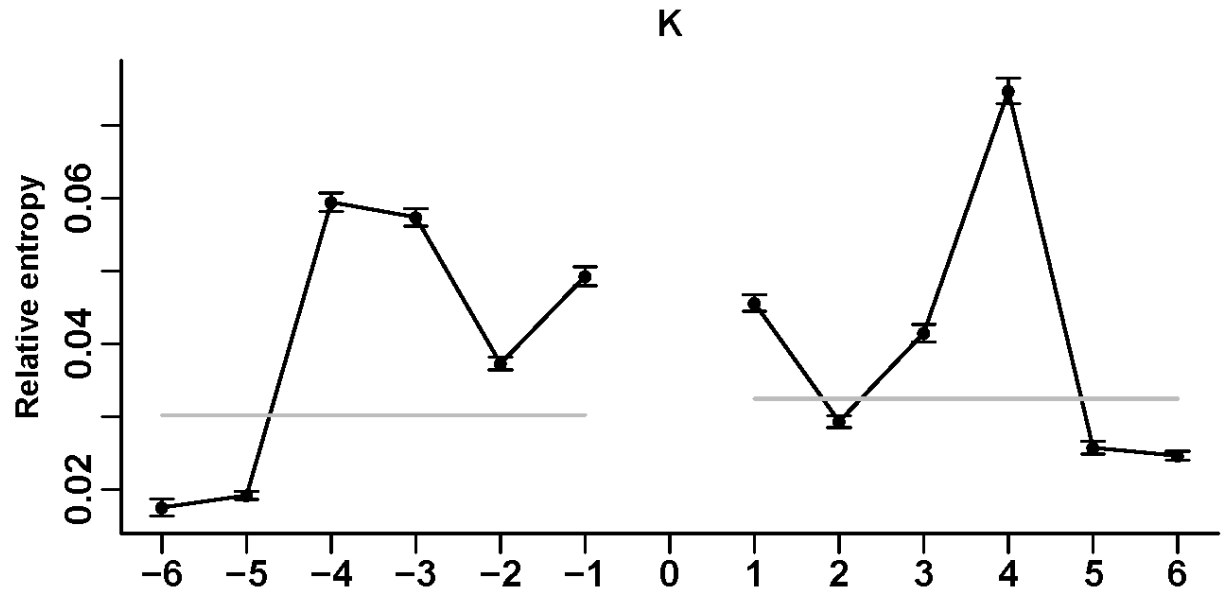




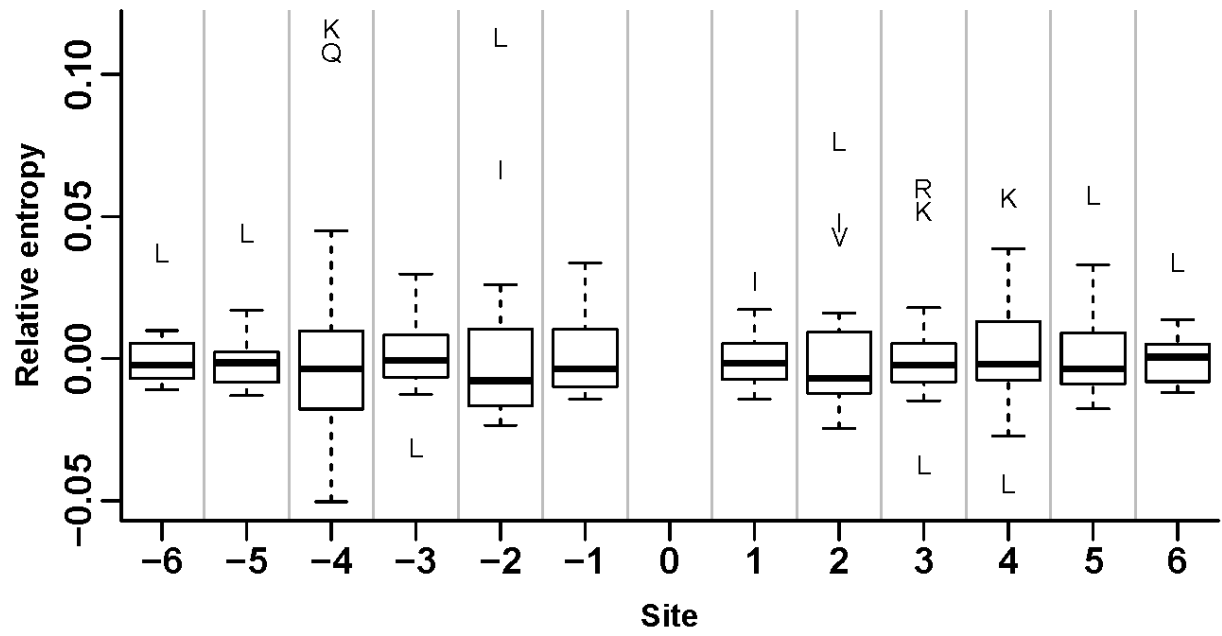
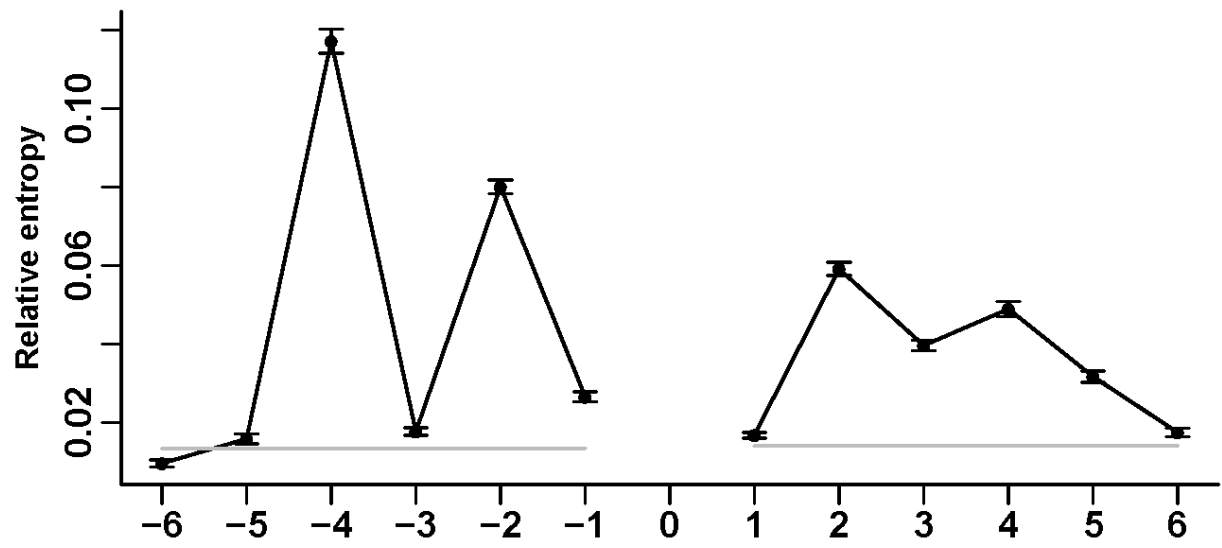


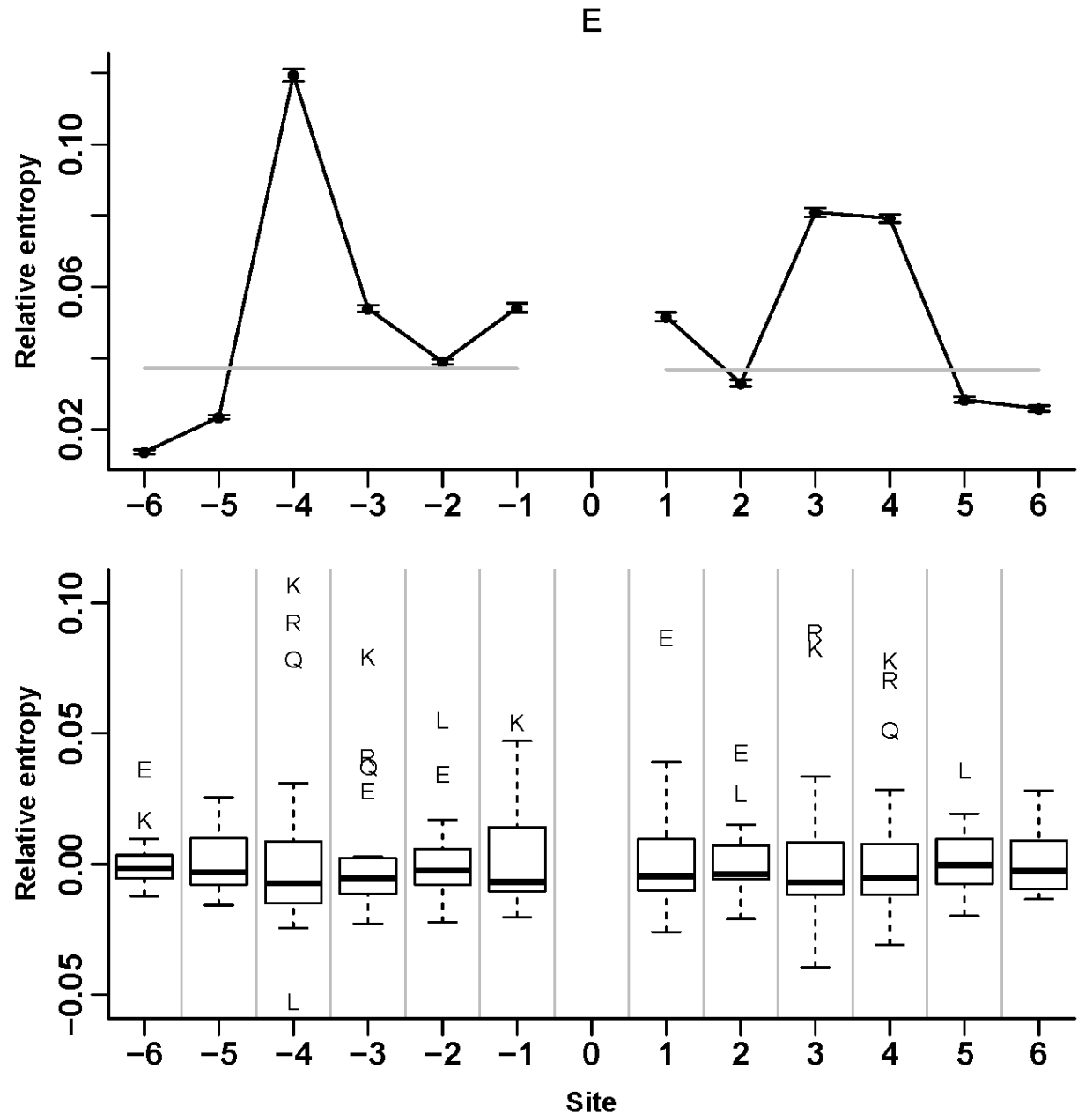


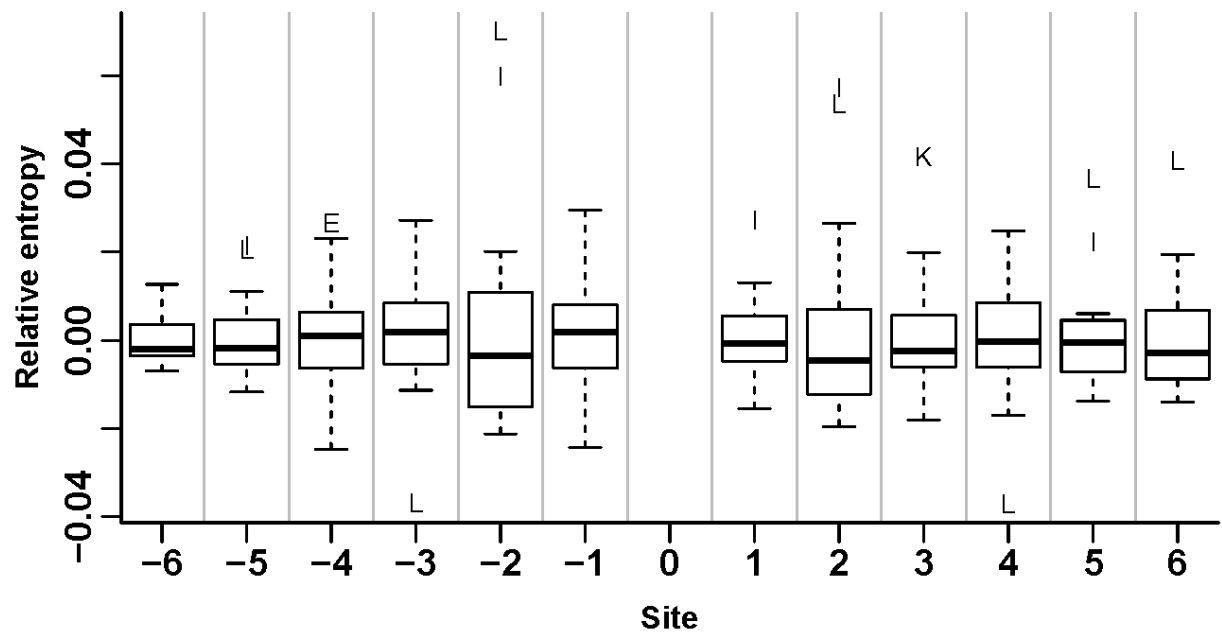
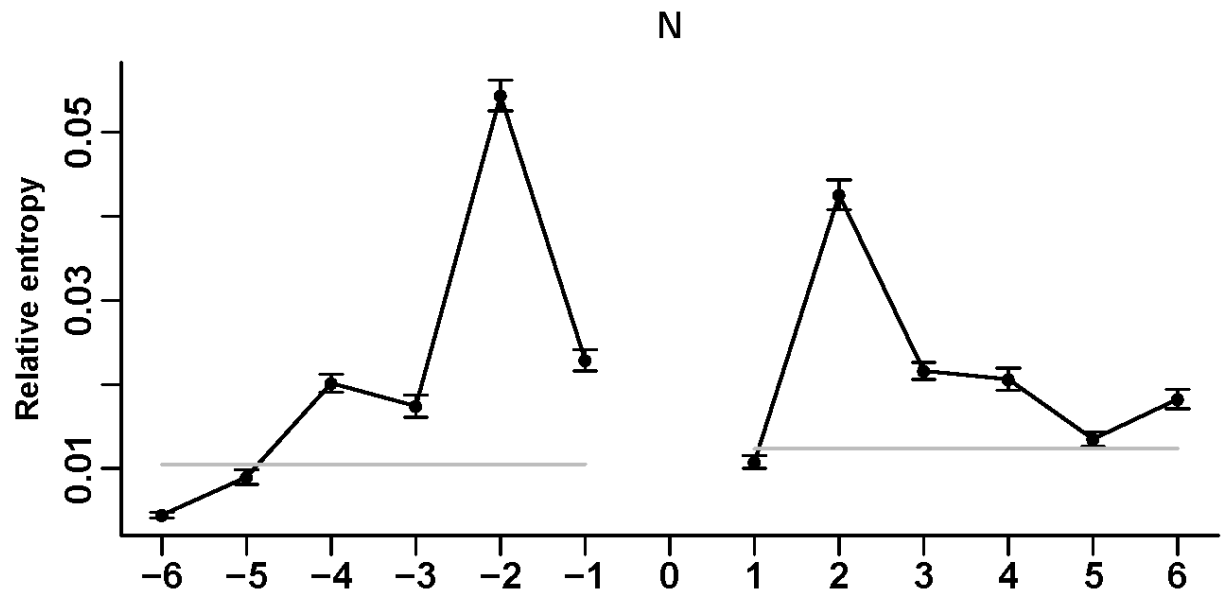




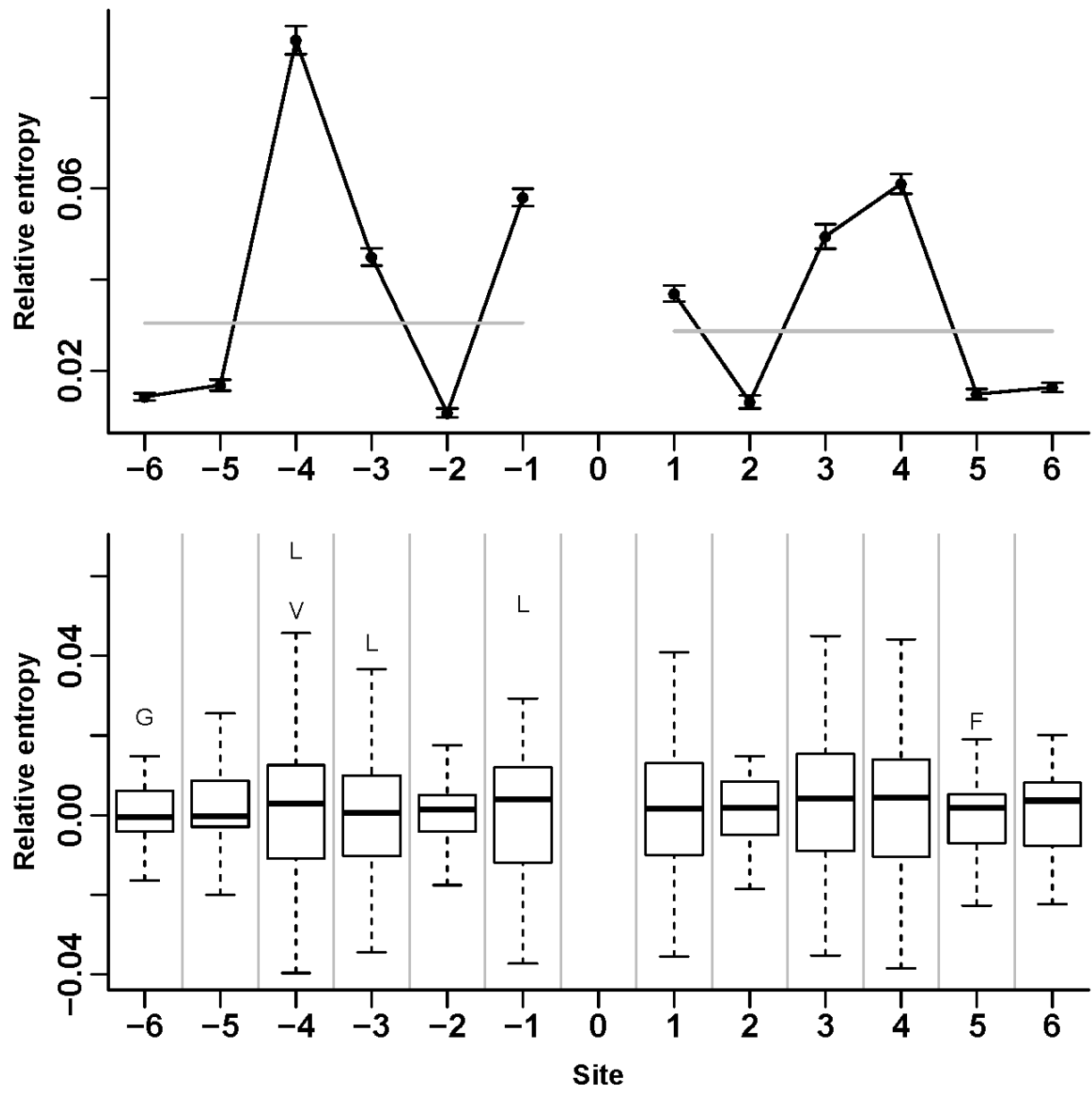
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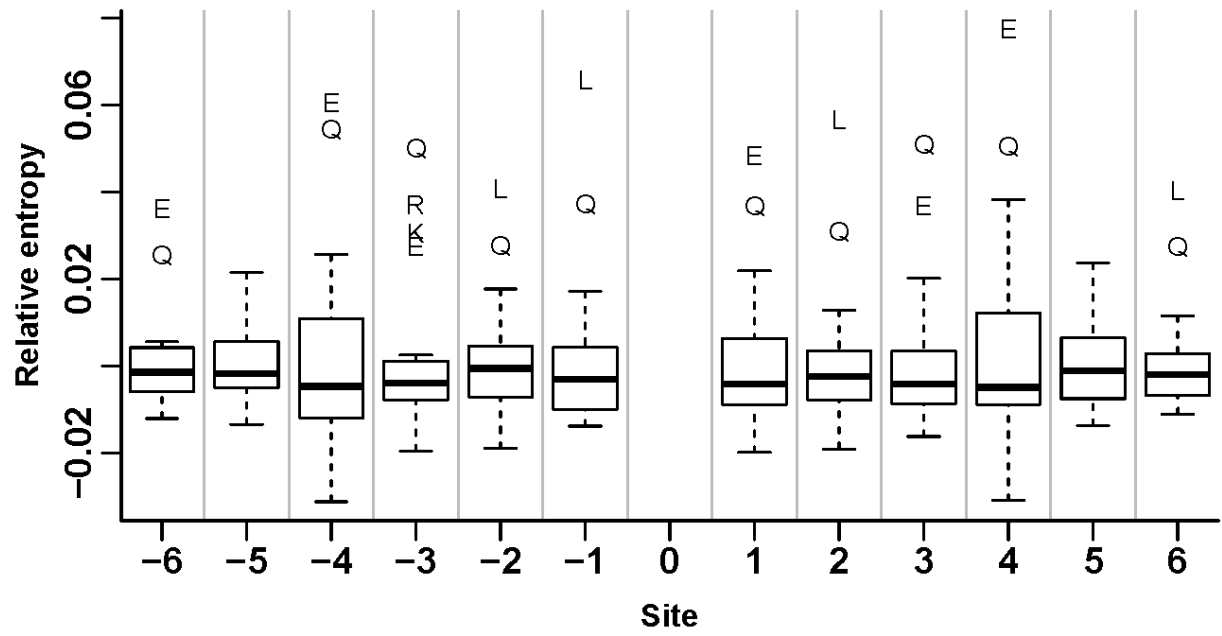
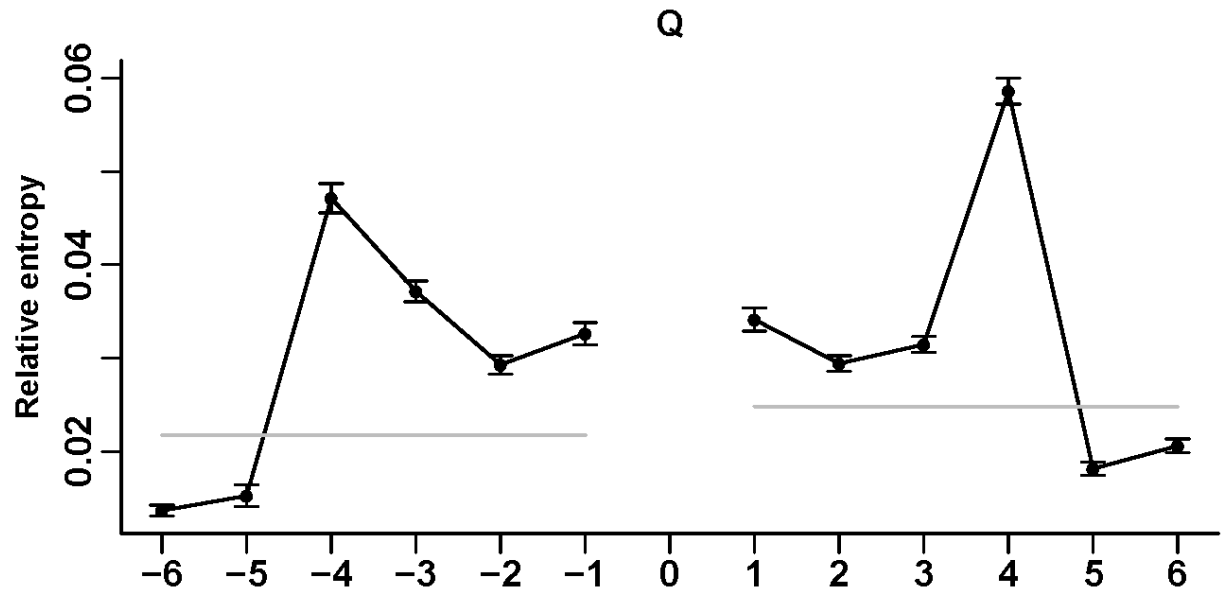


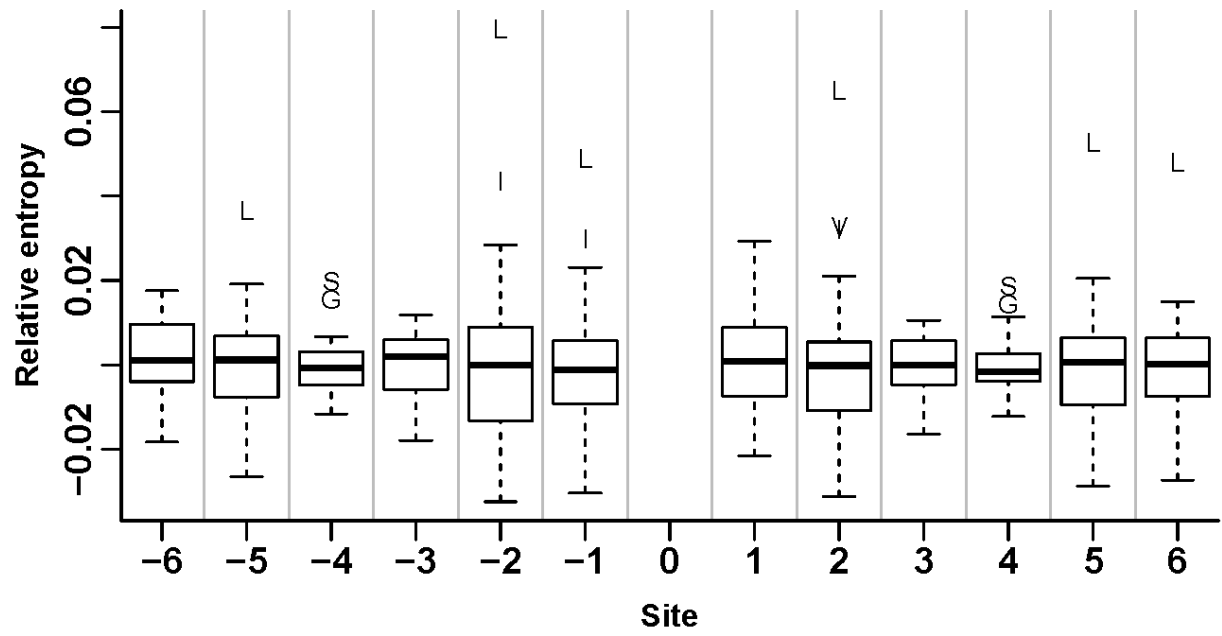
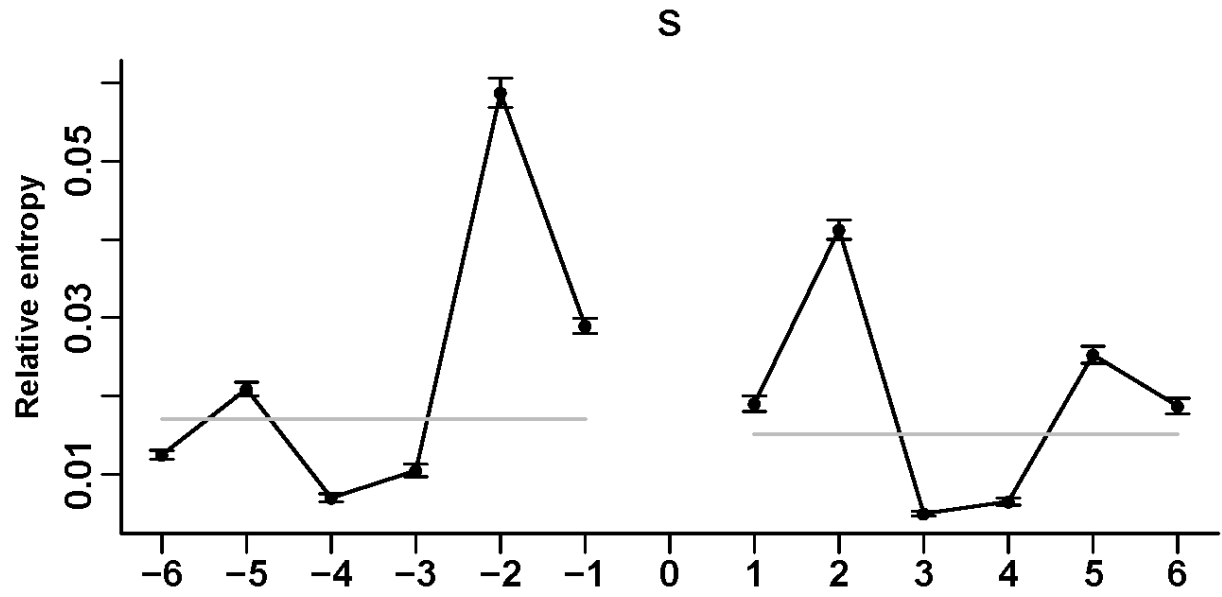


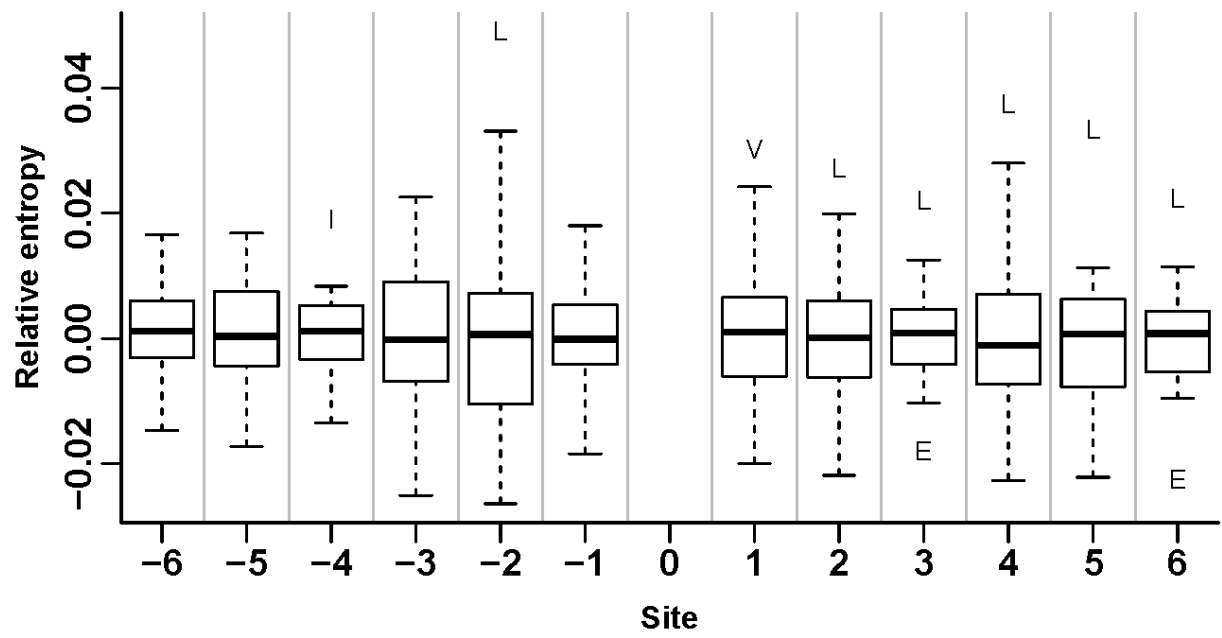
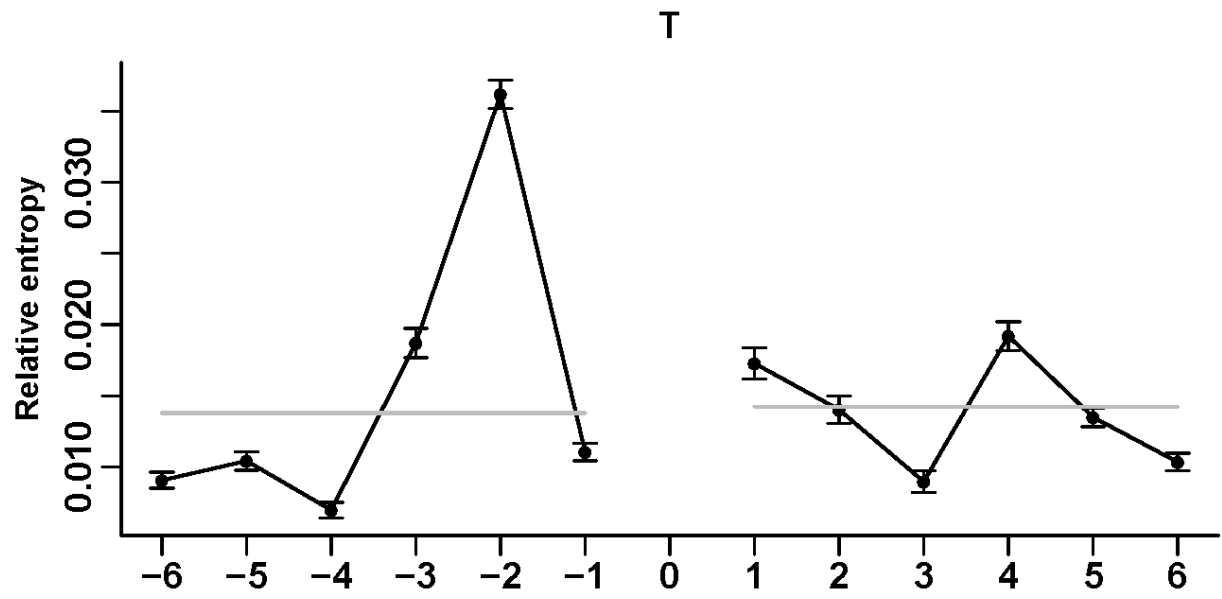


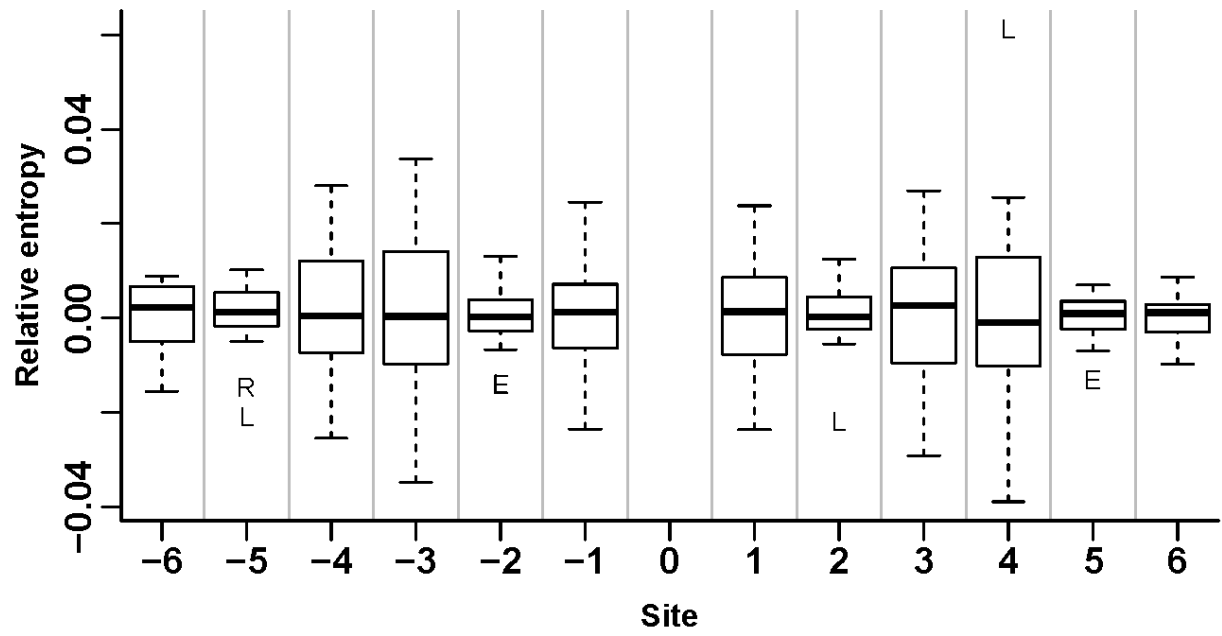
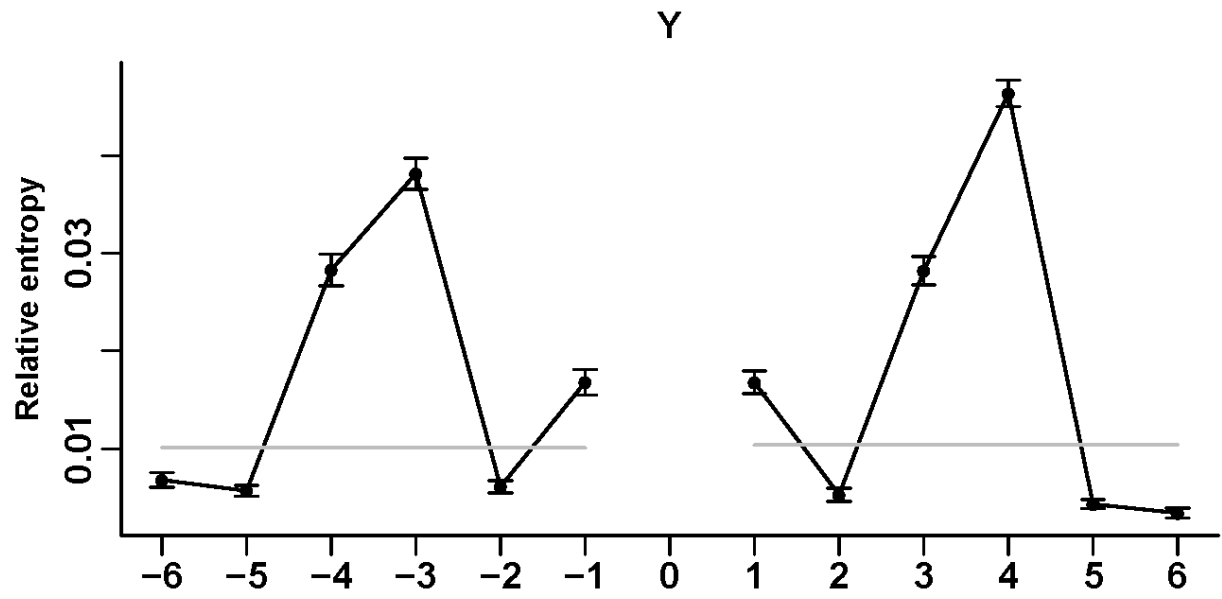
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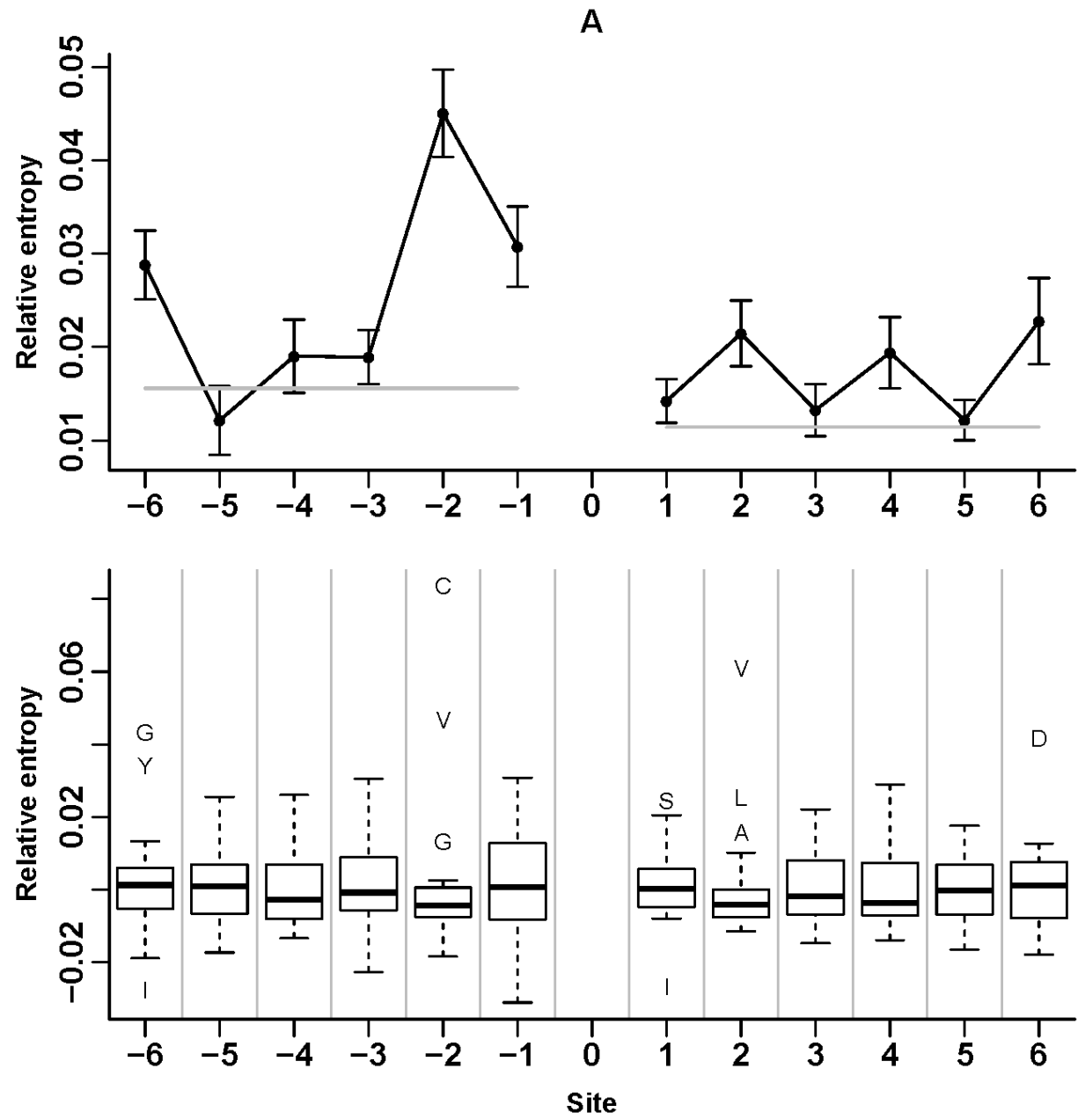


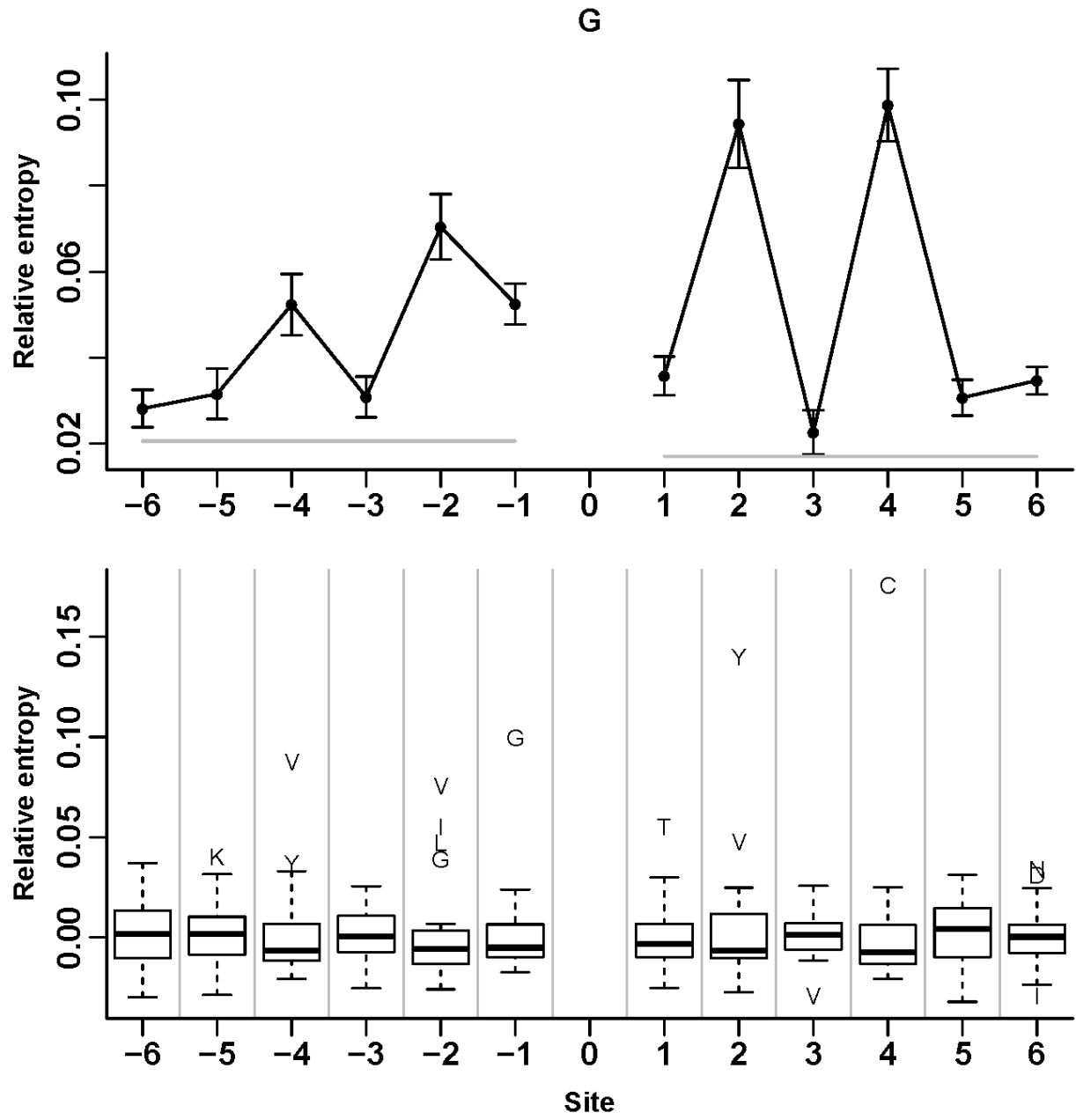


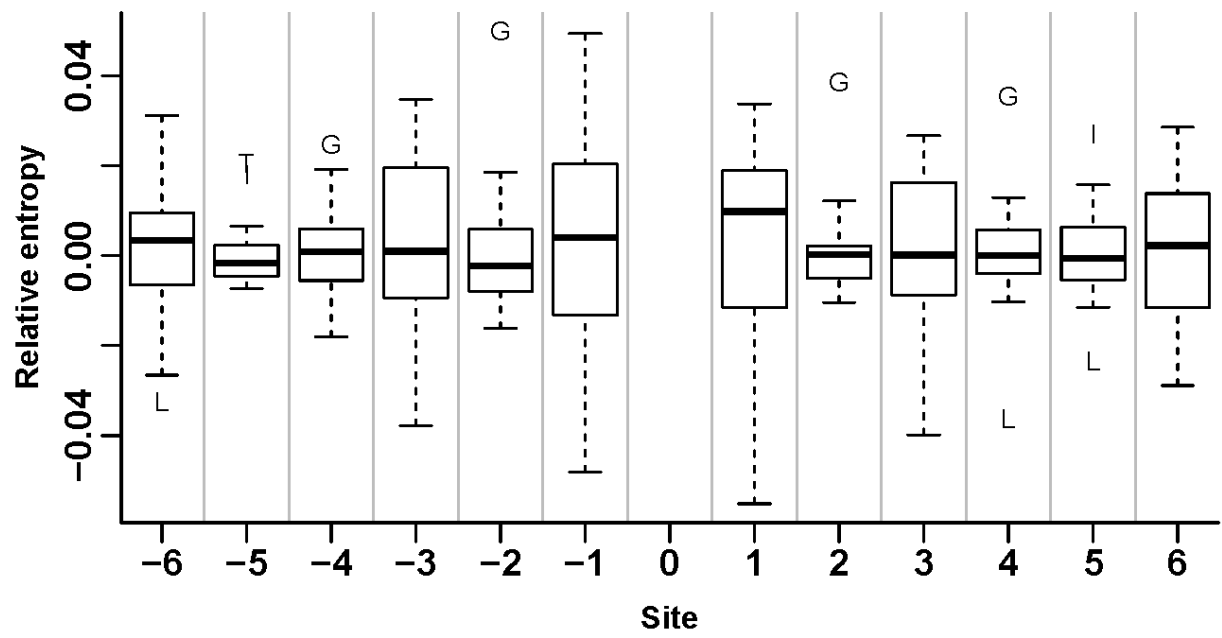
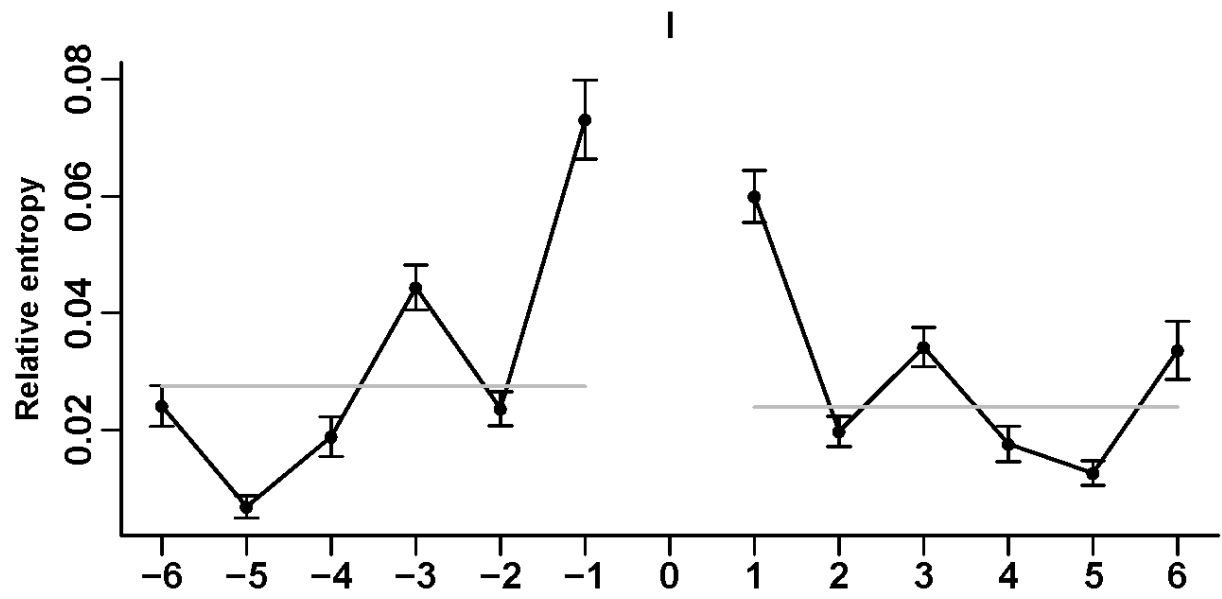


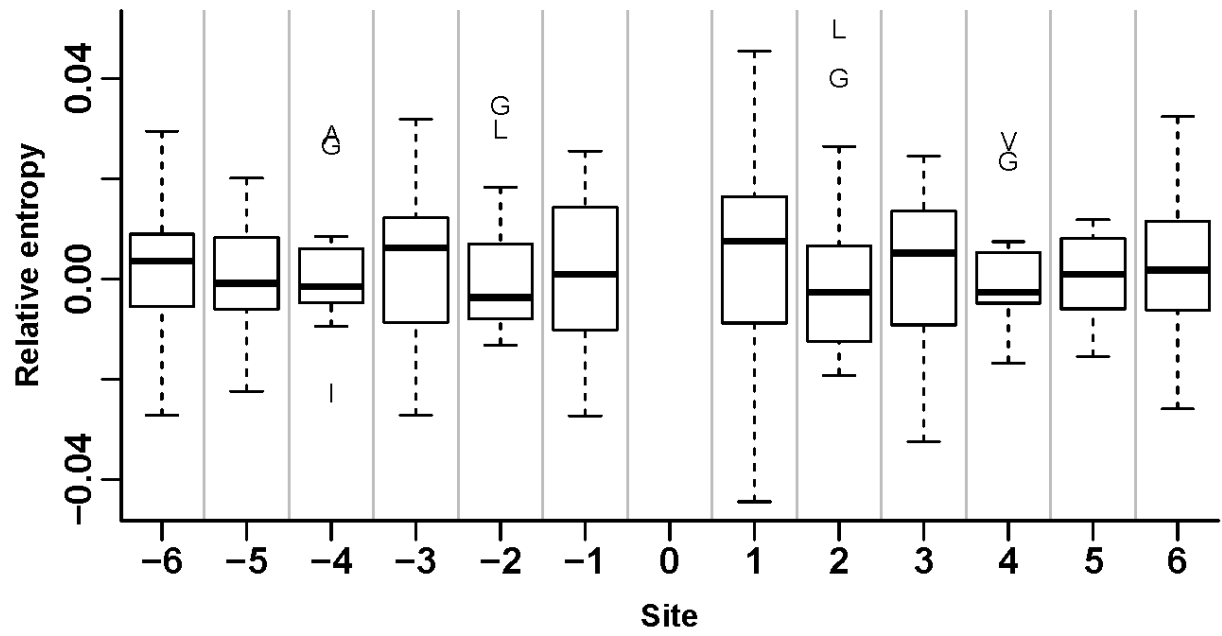
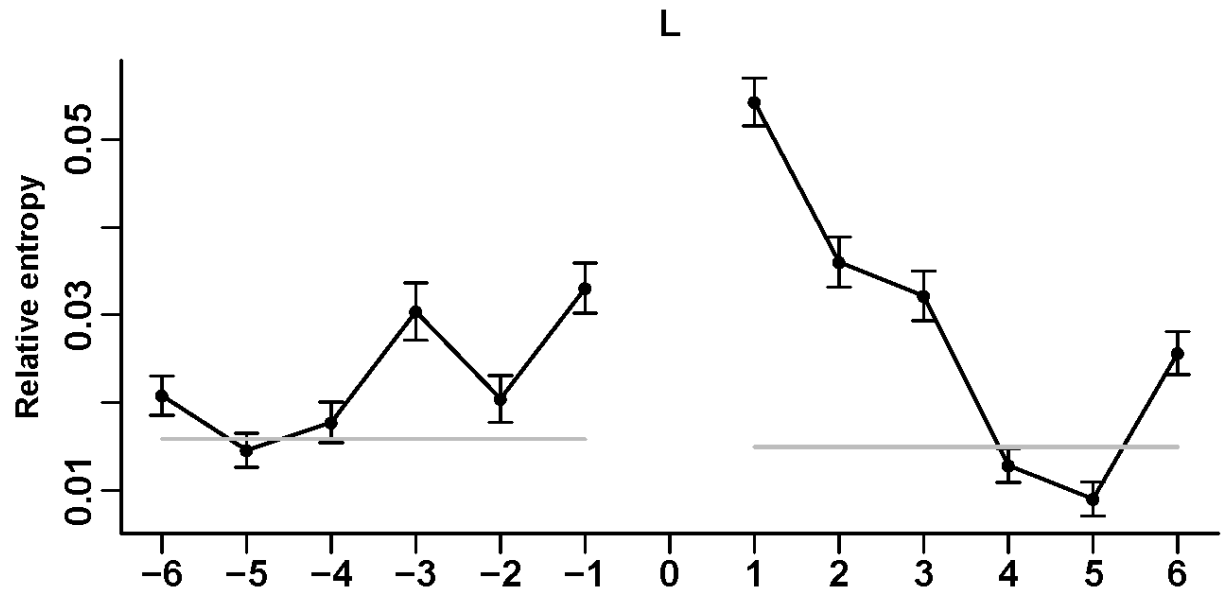


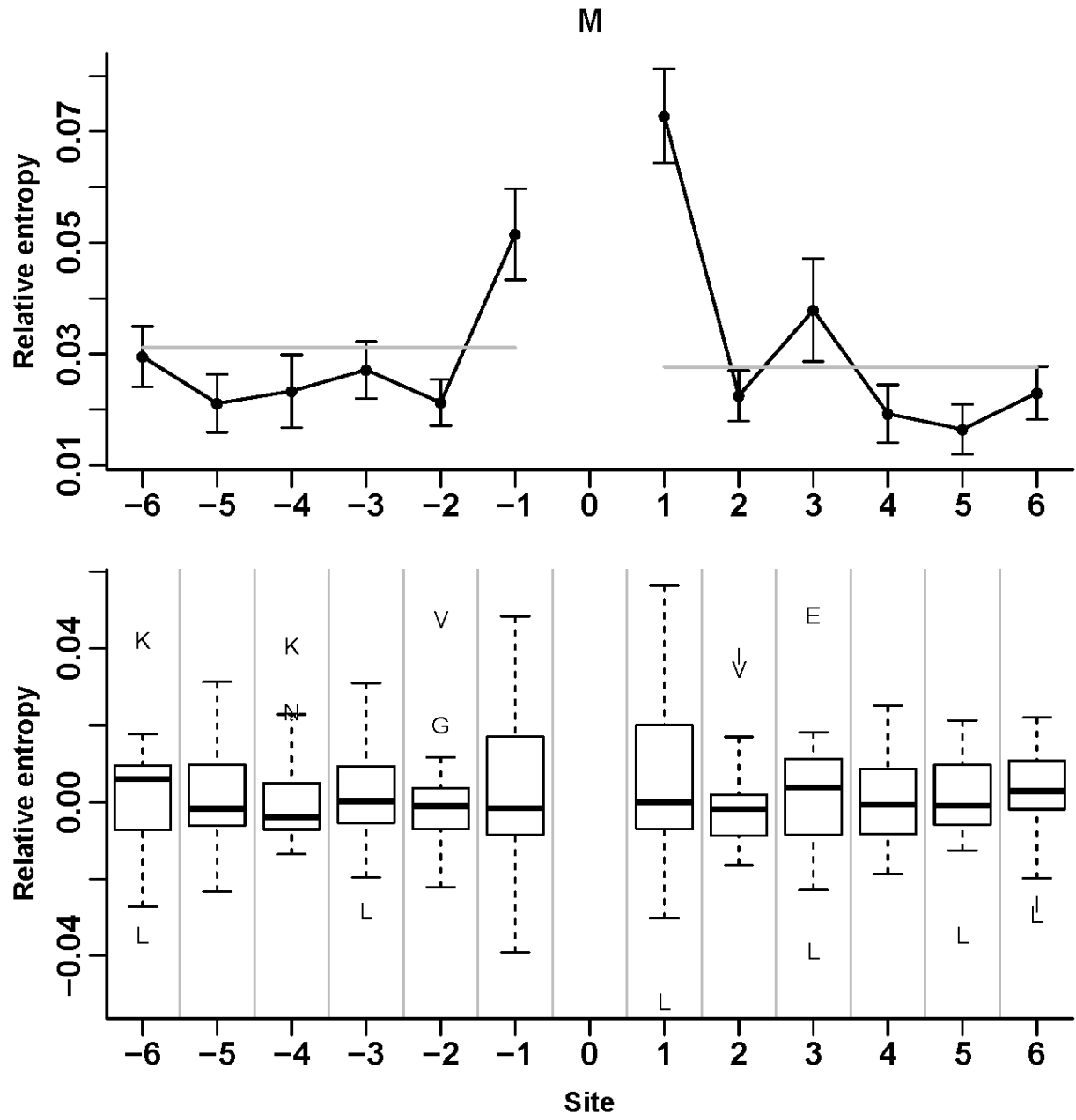
**Figure S3.** Neighbor preference patterns of the 20 amino acids in  $\beta$ -strand.

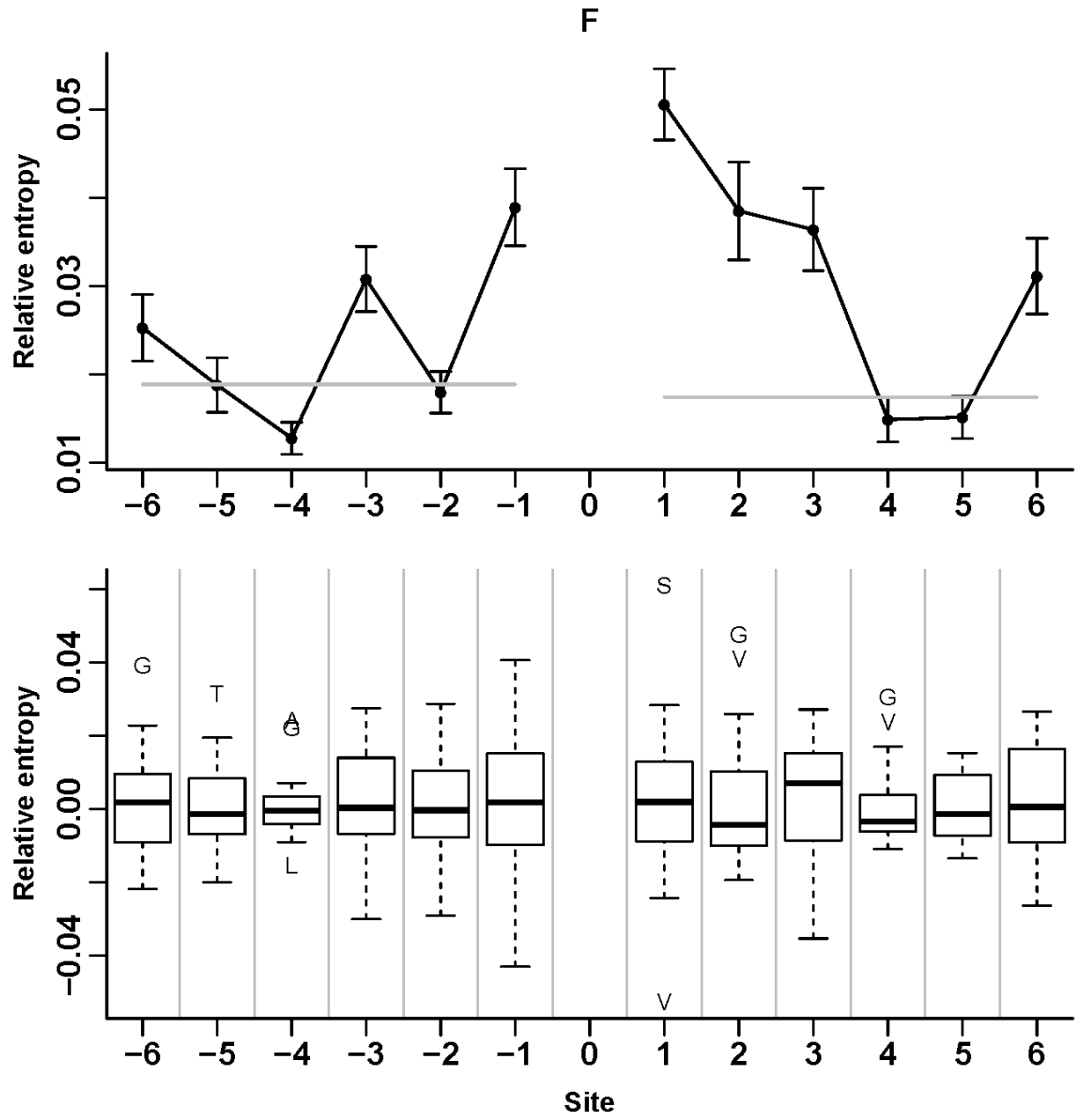


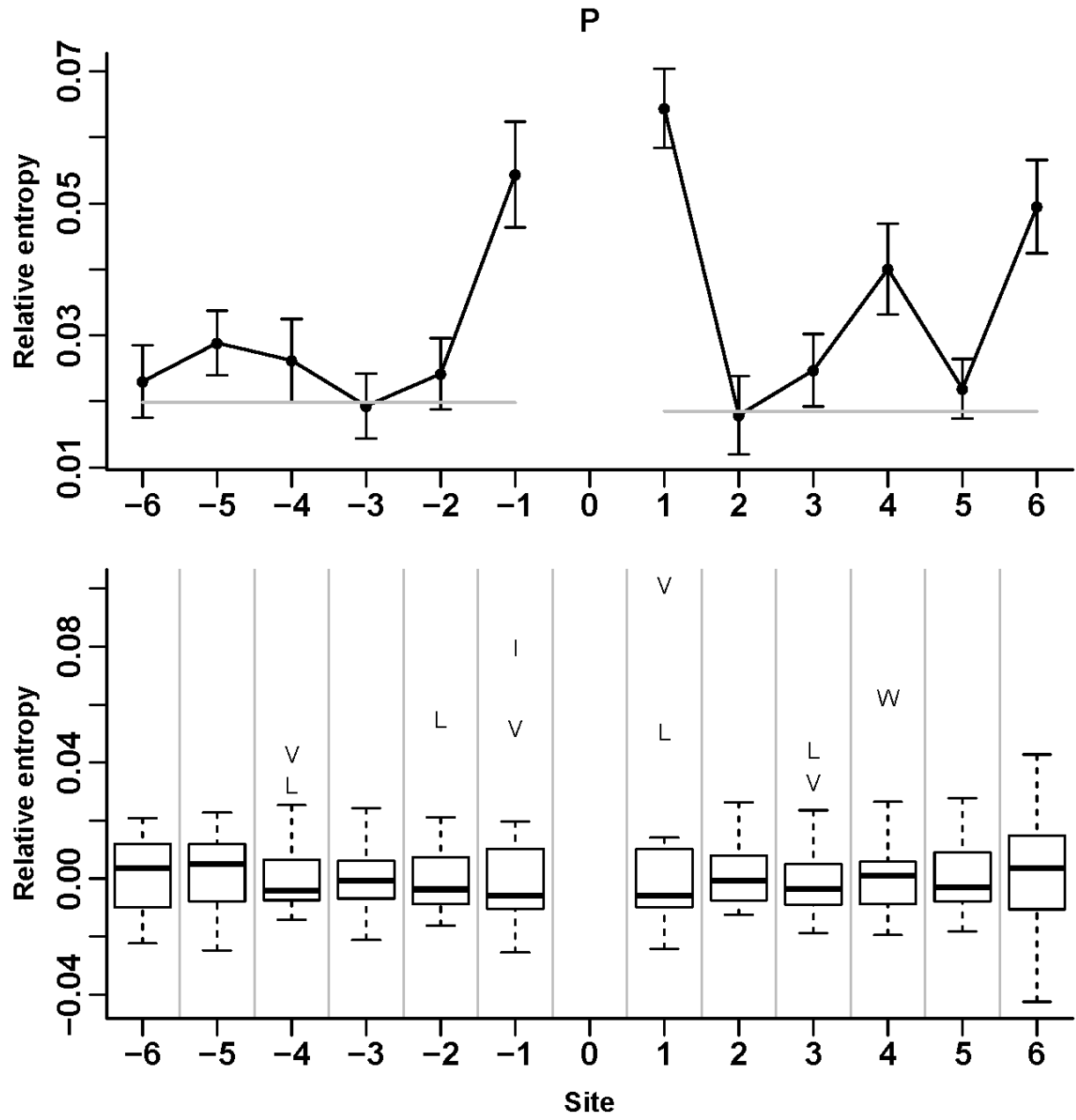


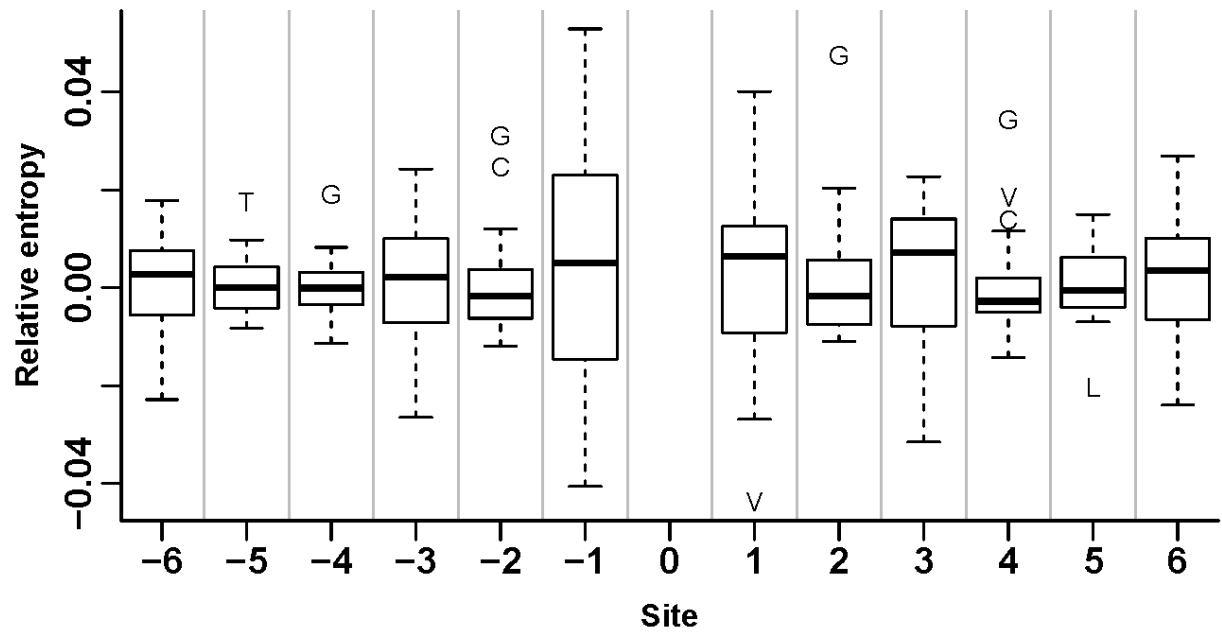
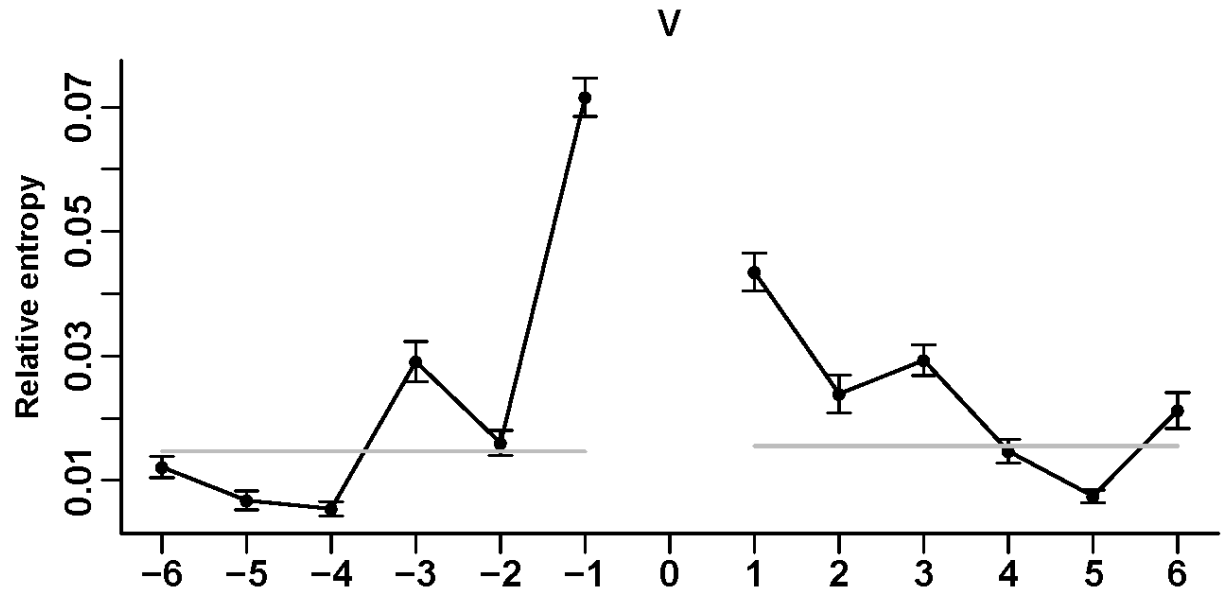


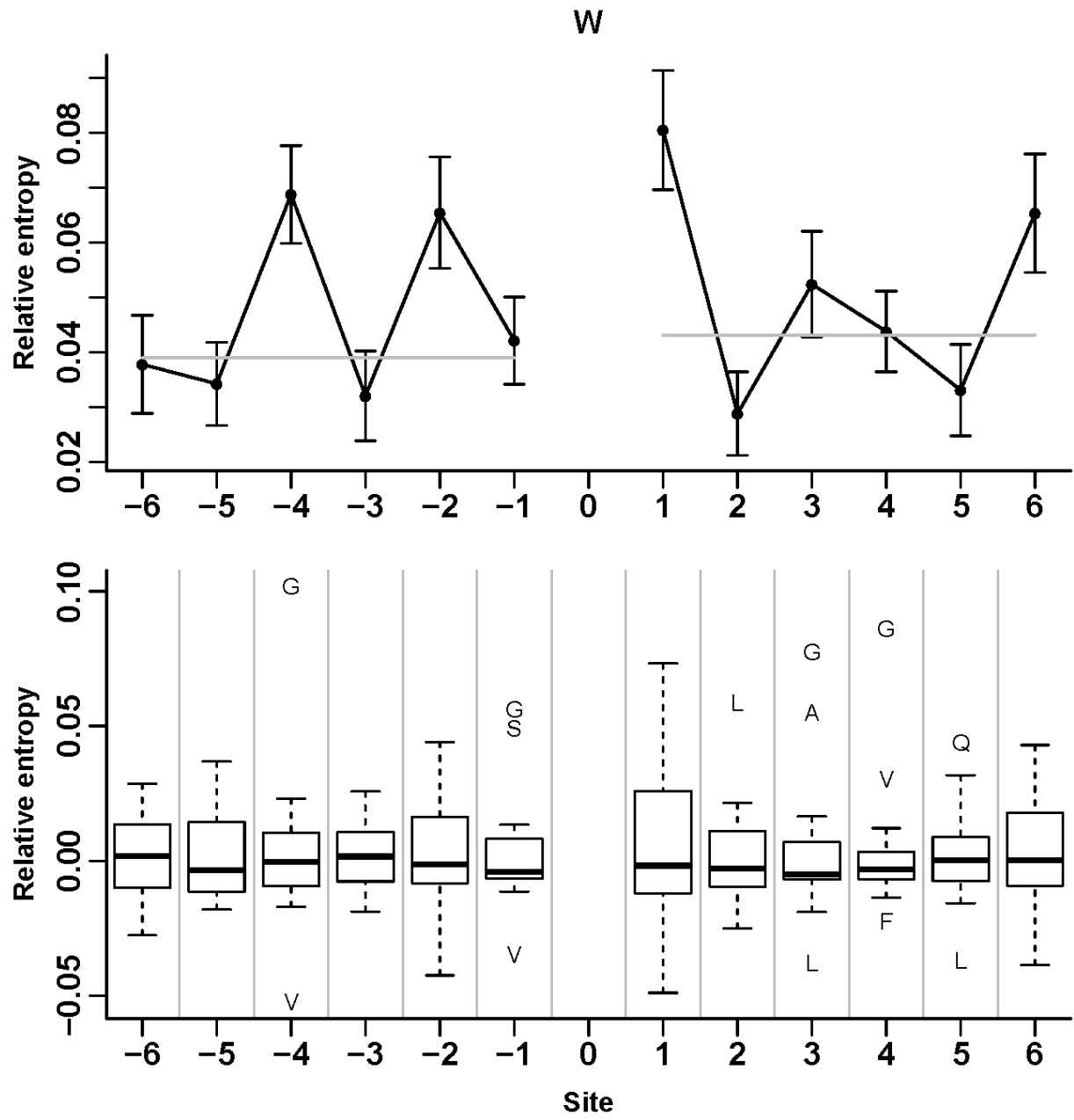


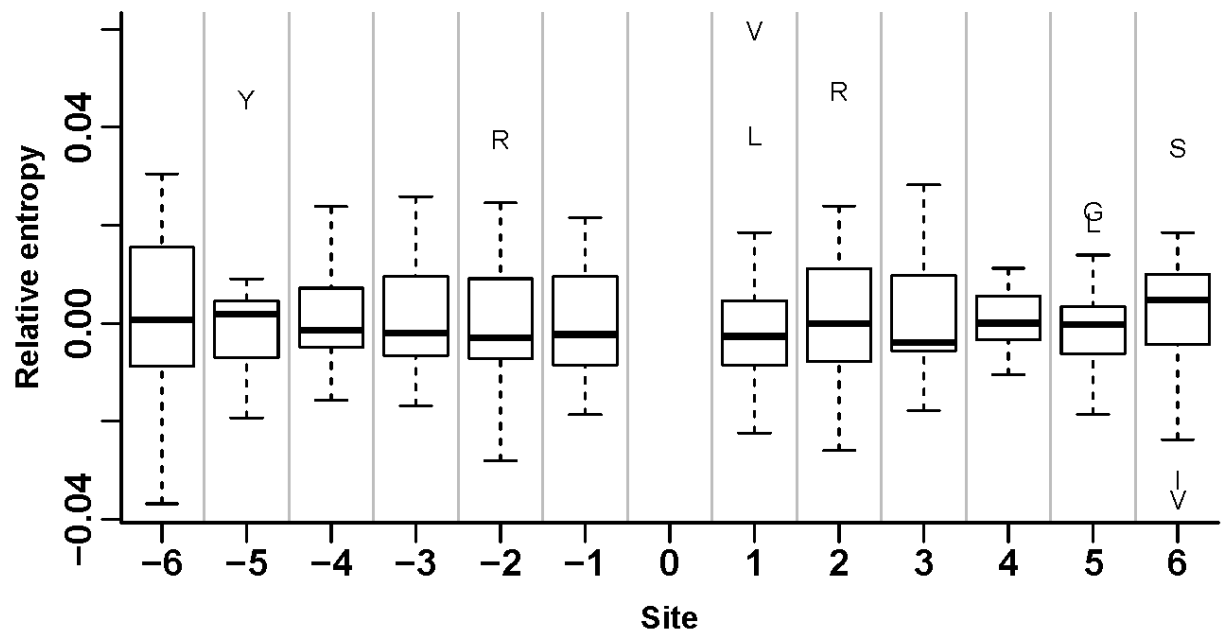
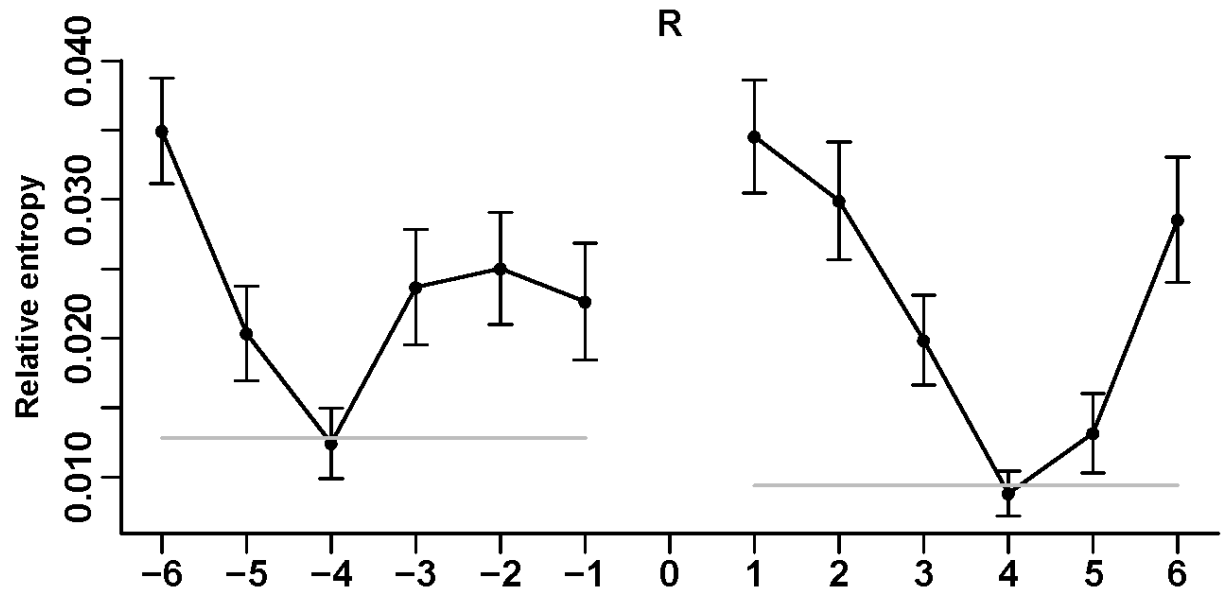


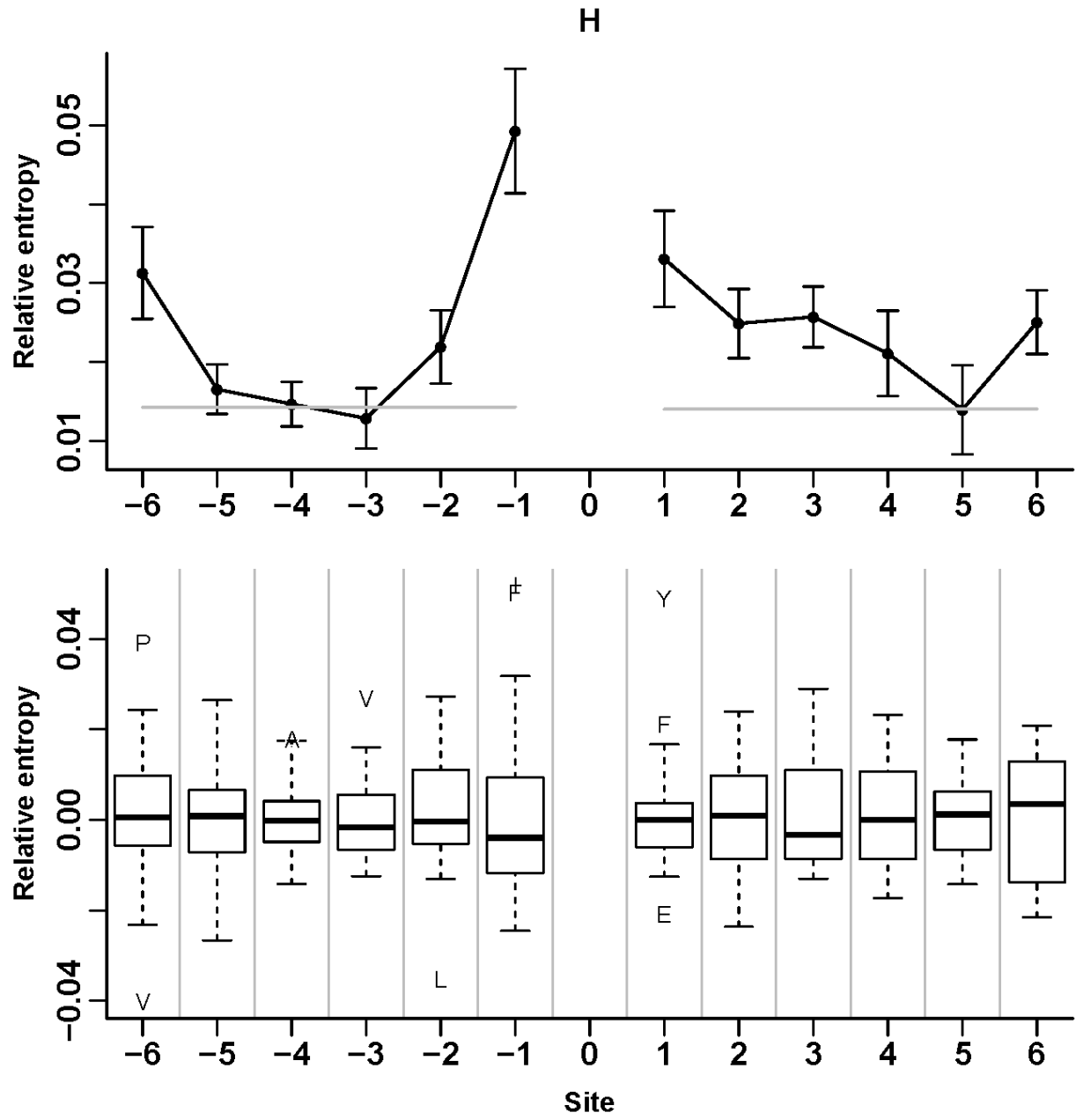


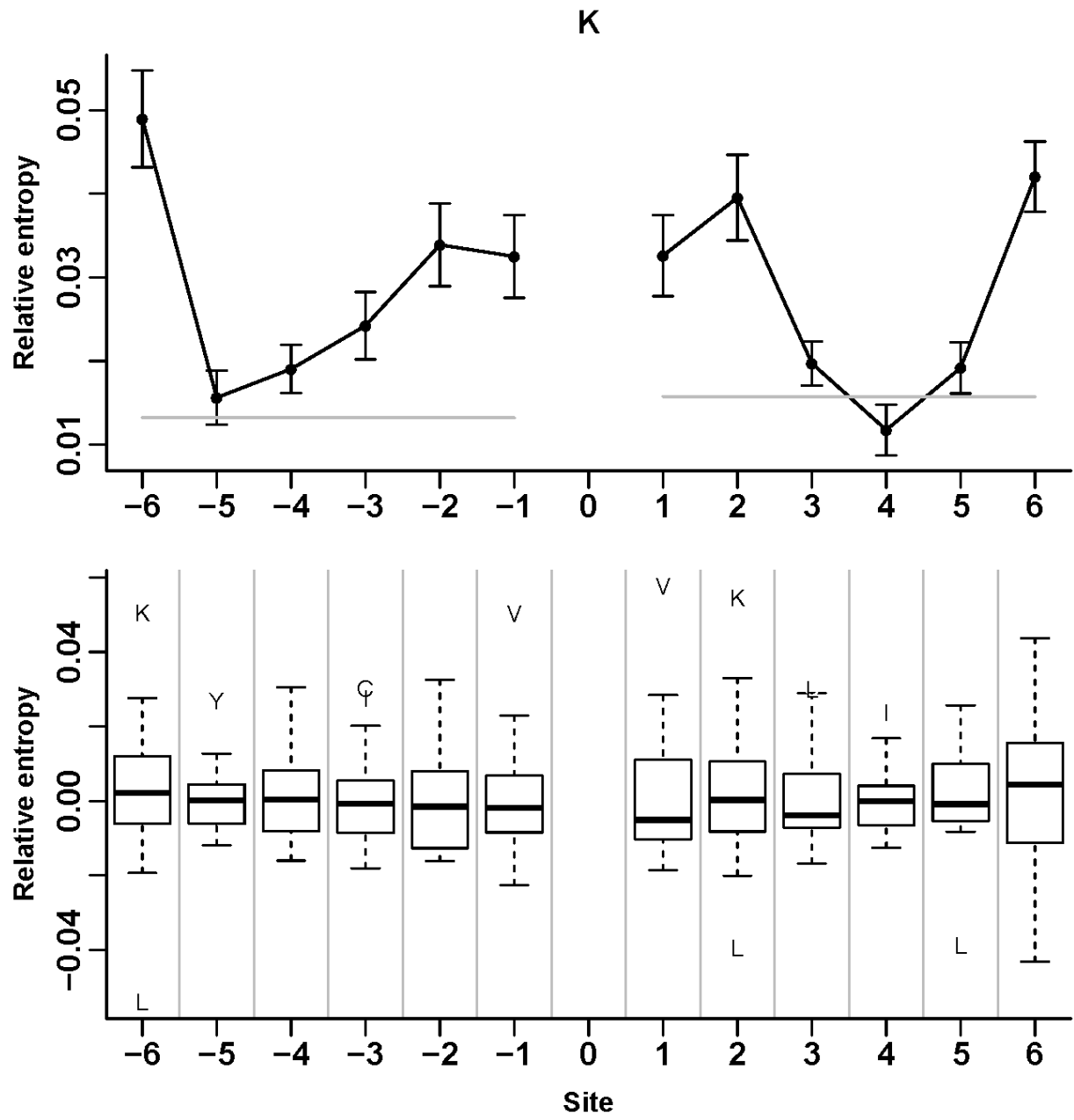


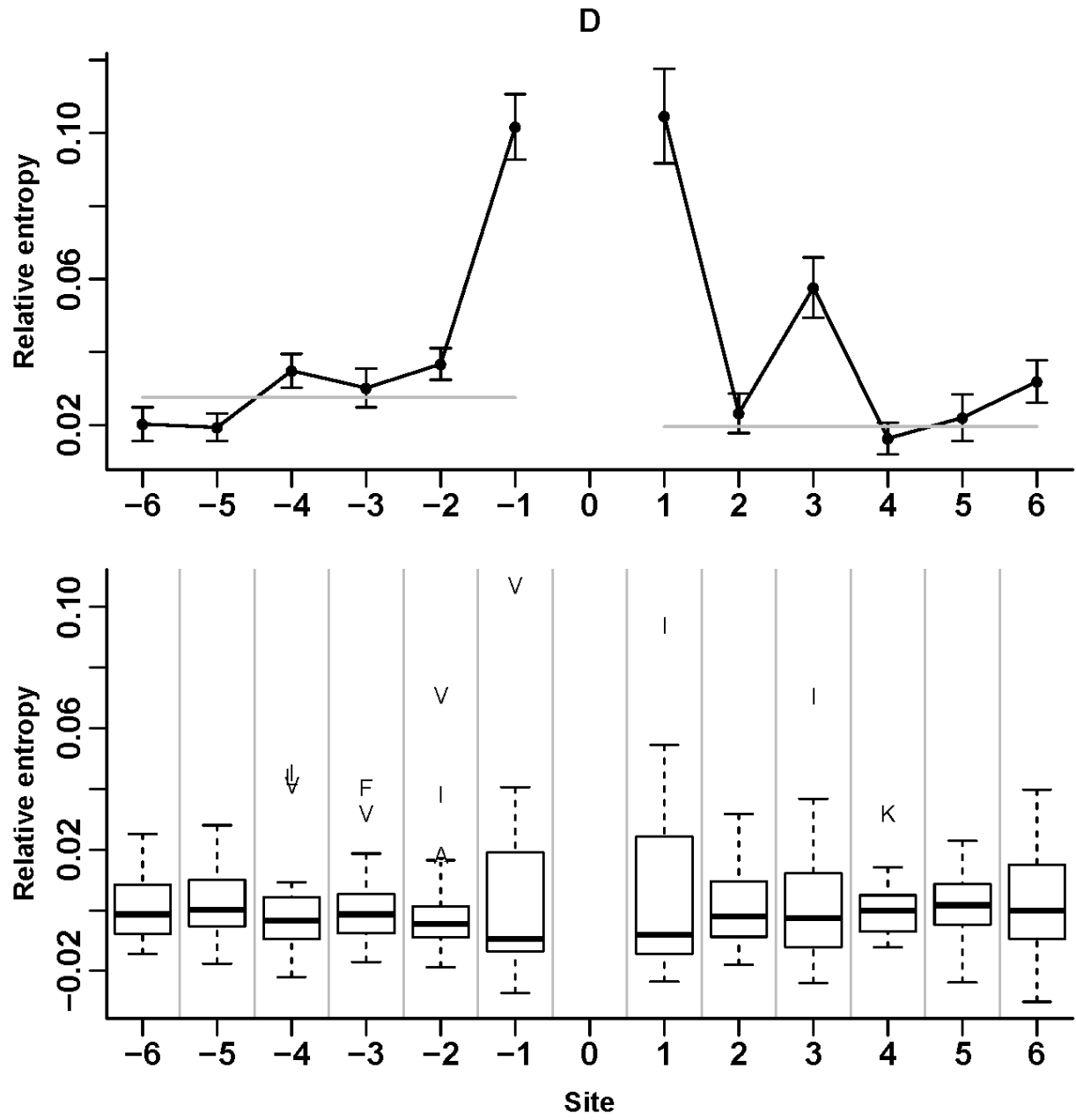


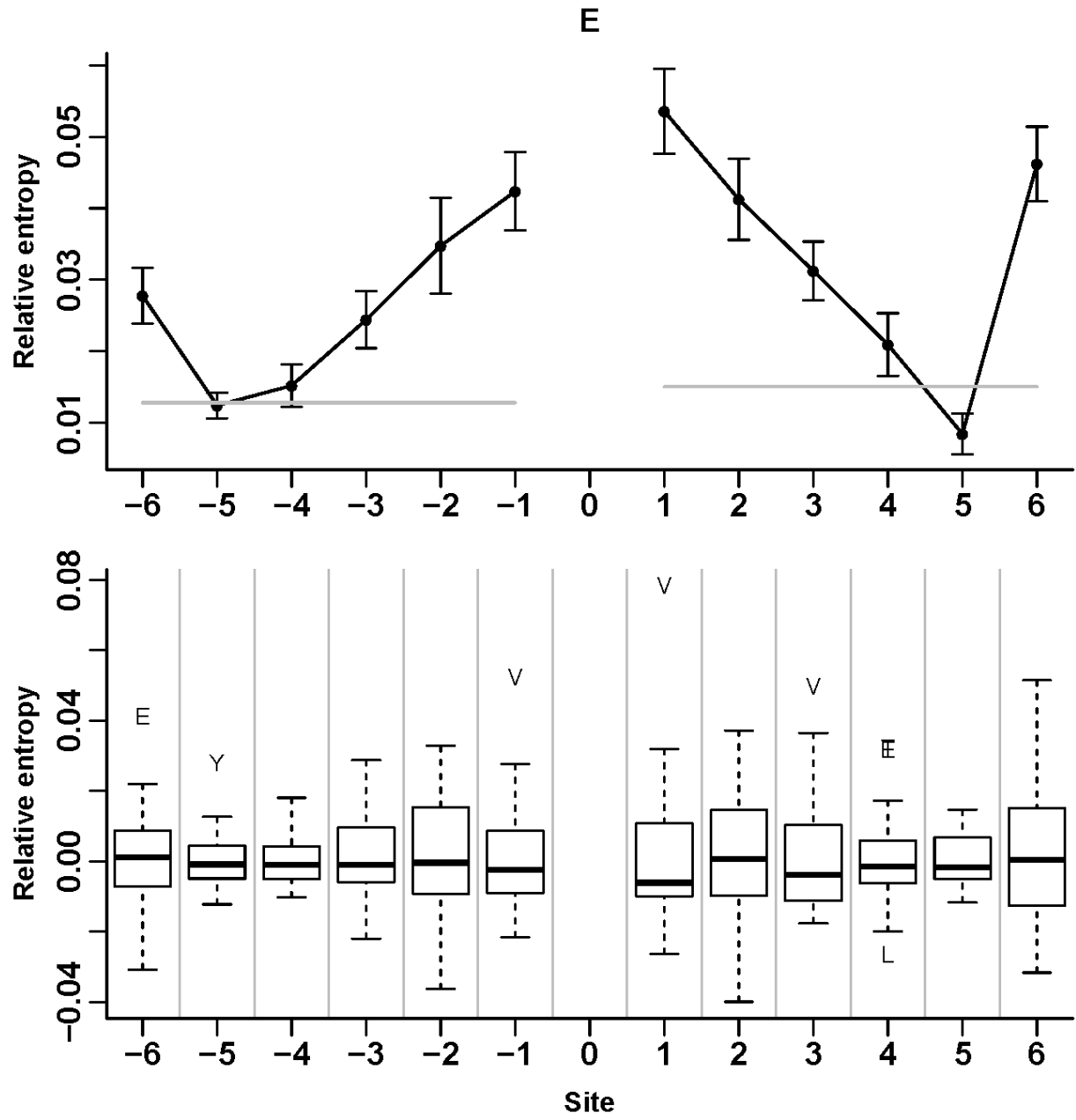


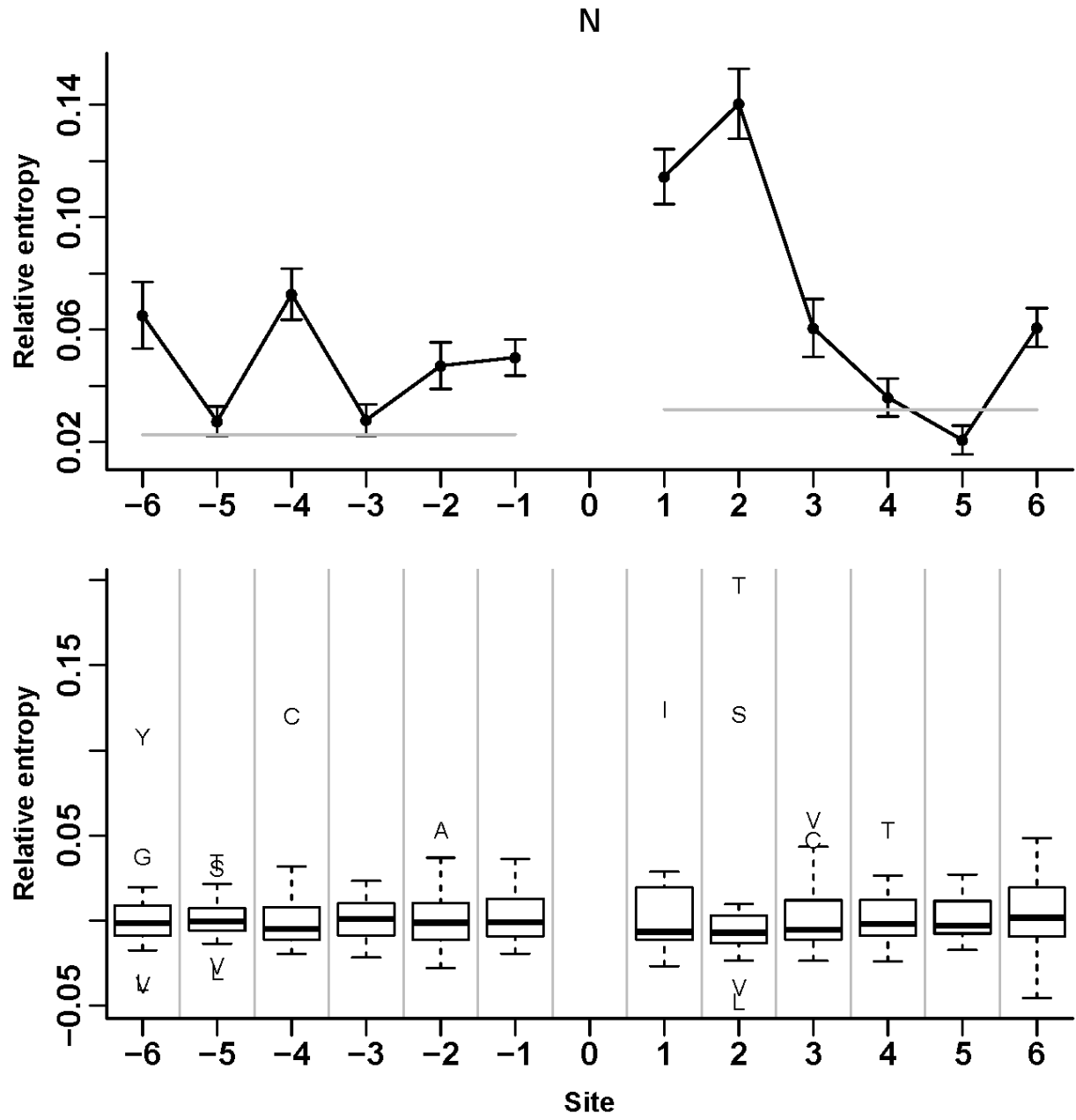


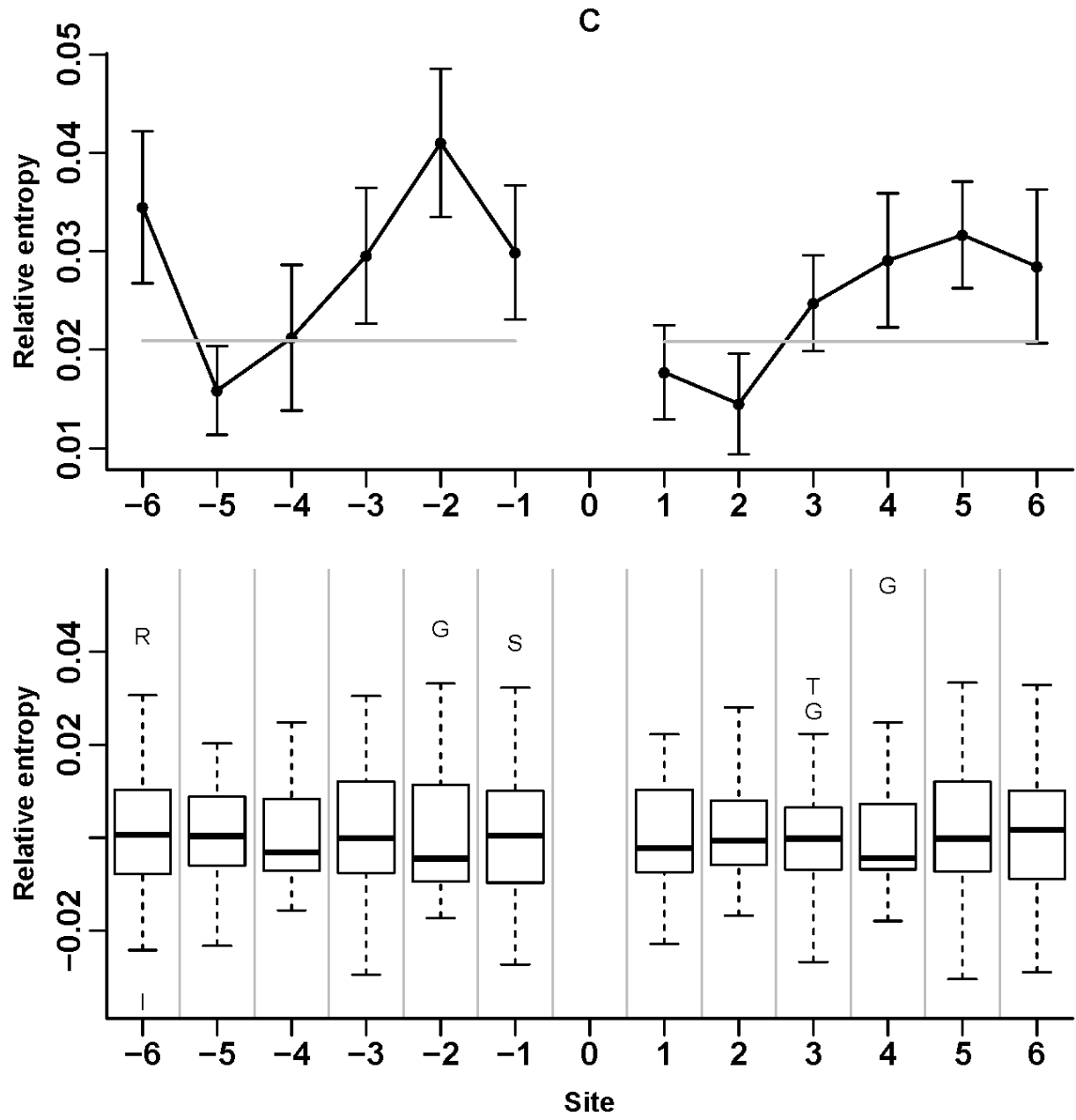


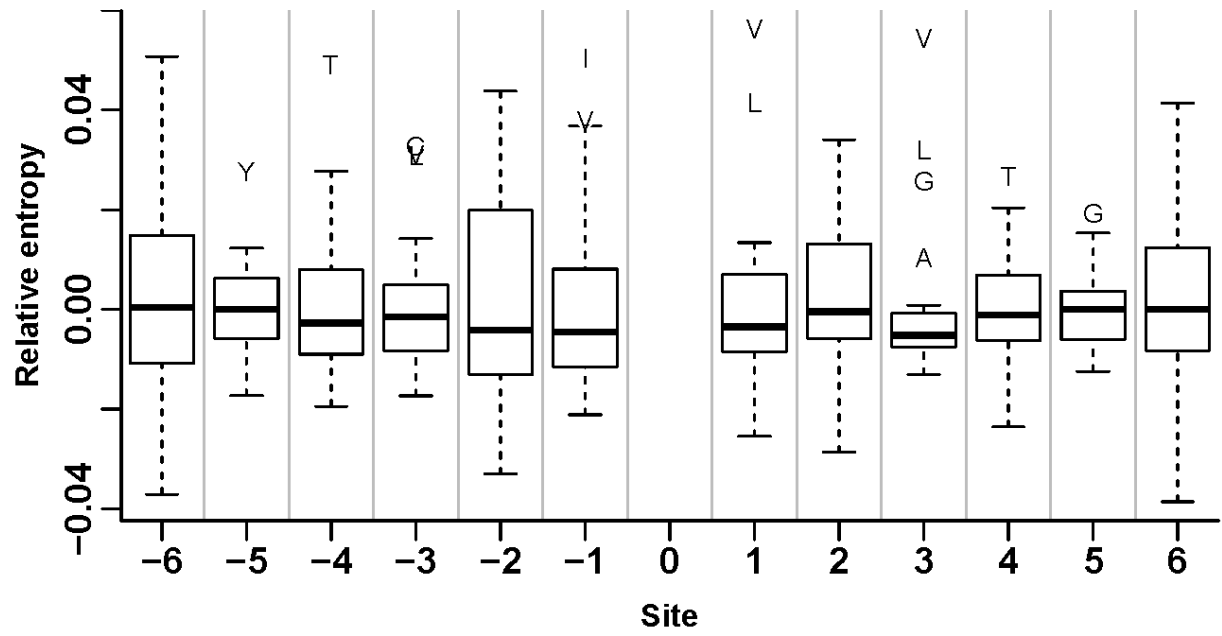
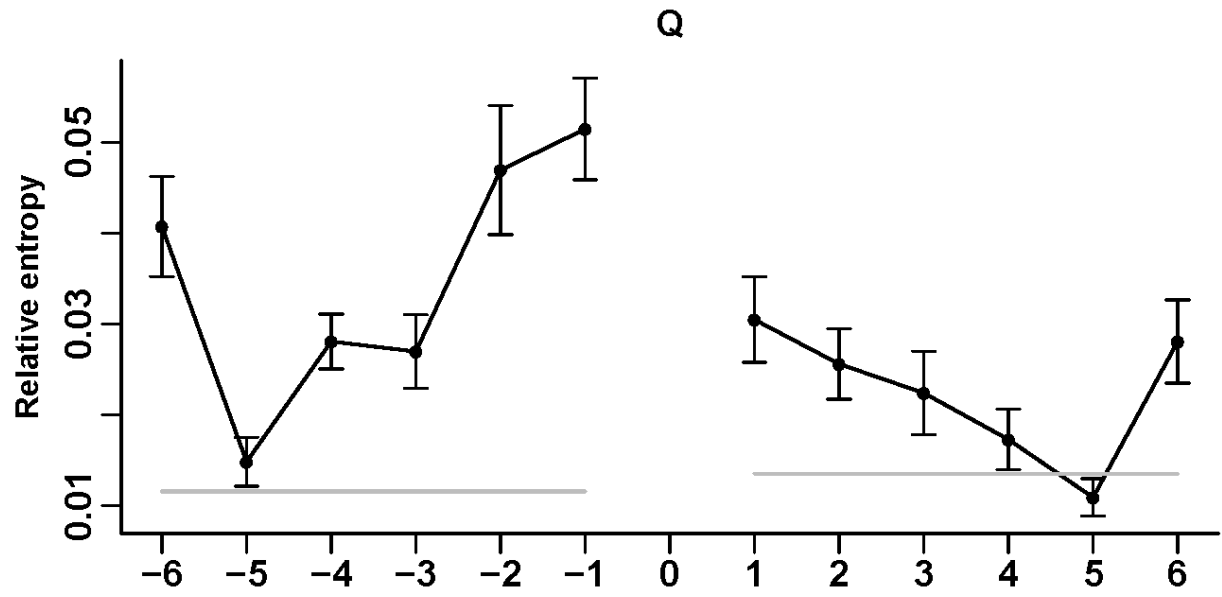


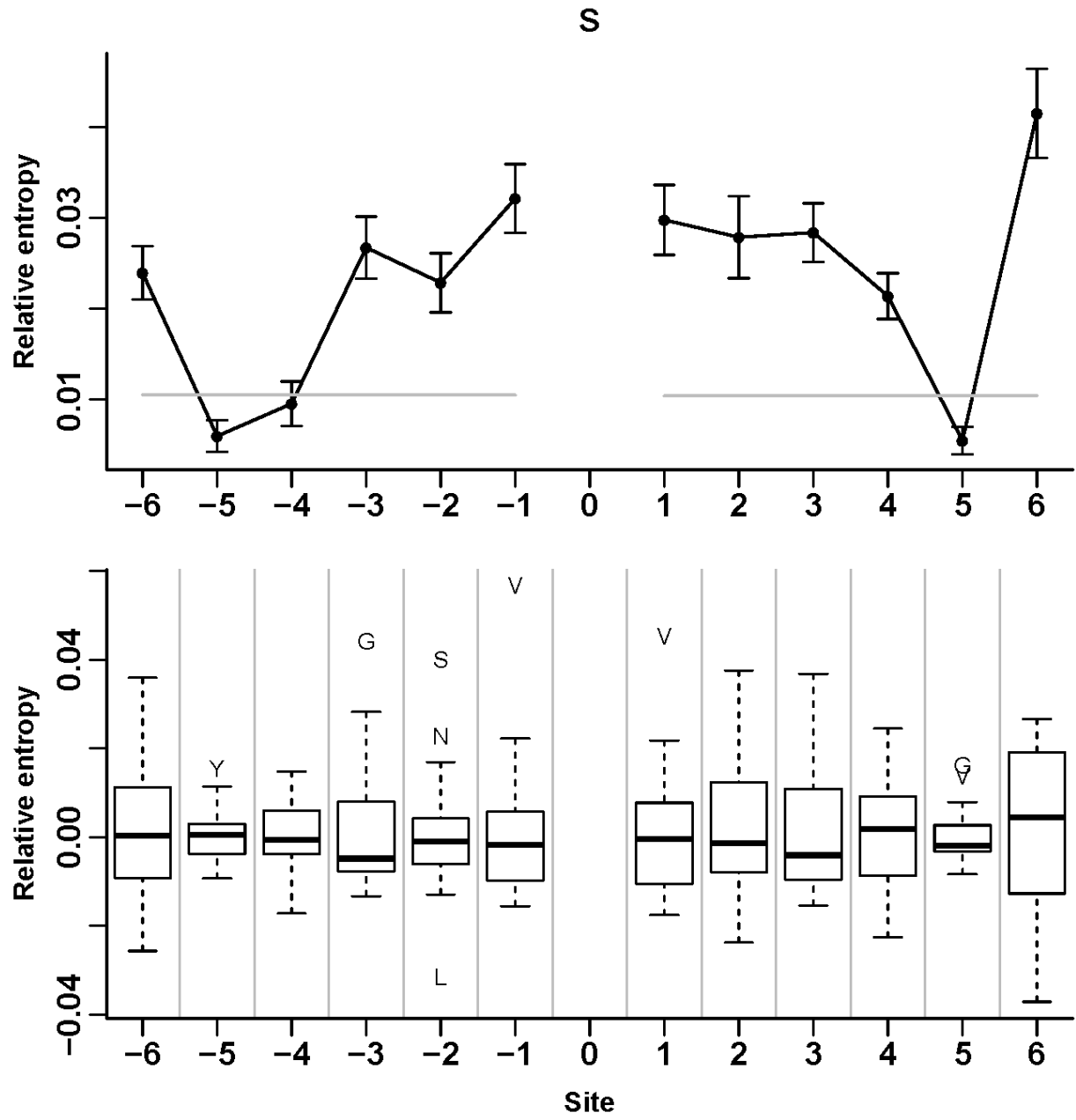


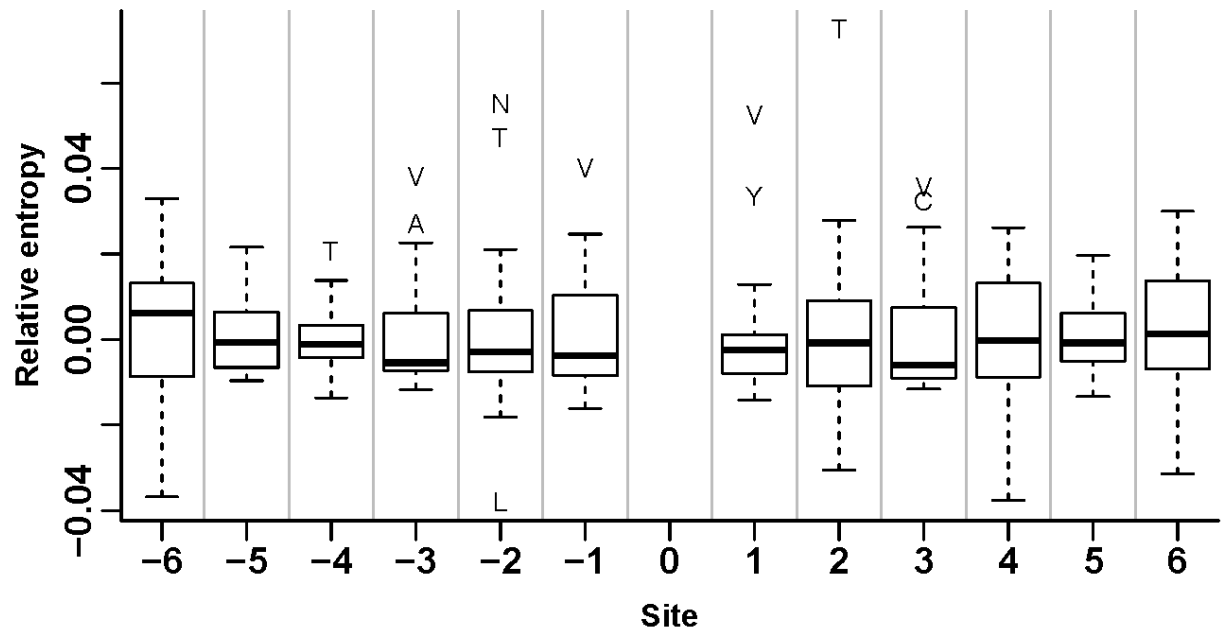
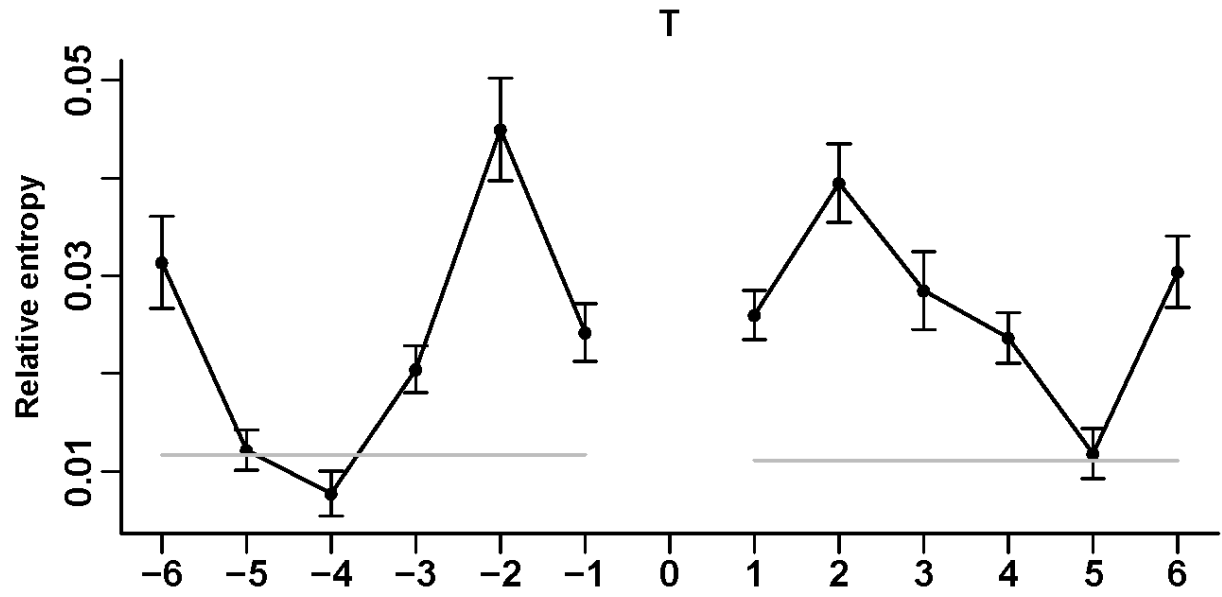












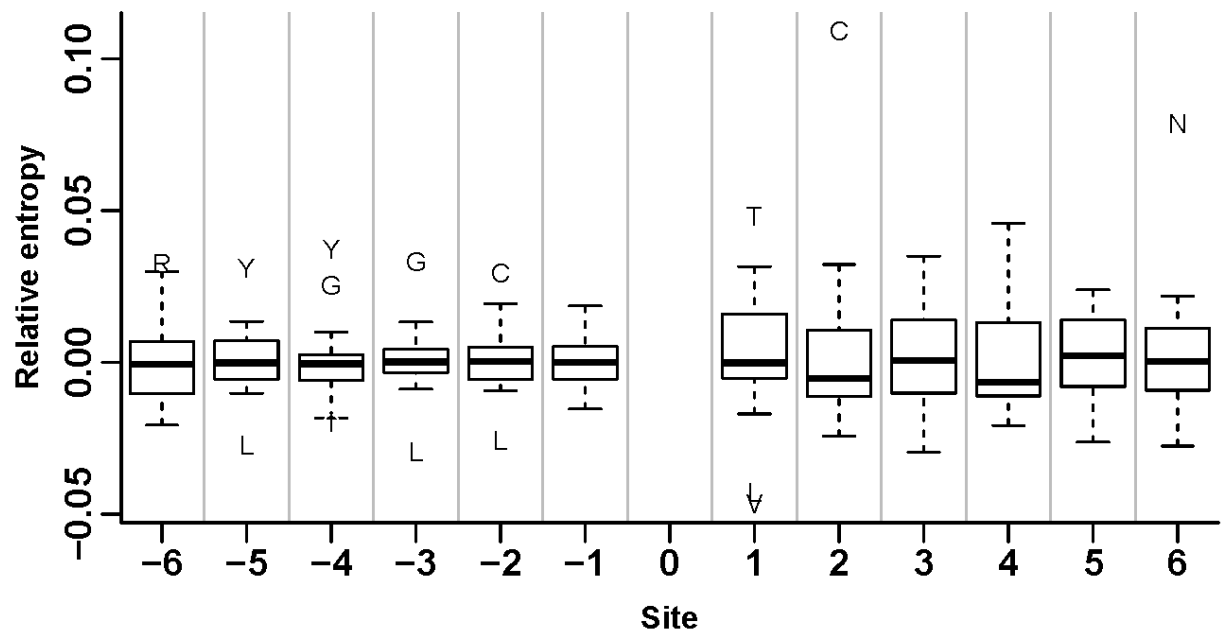
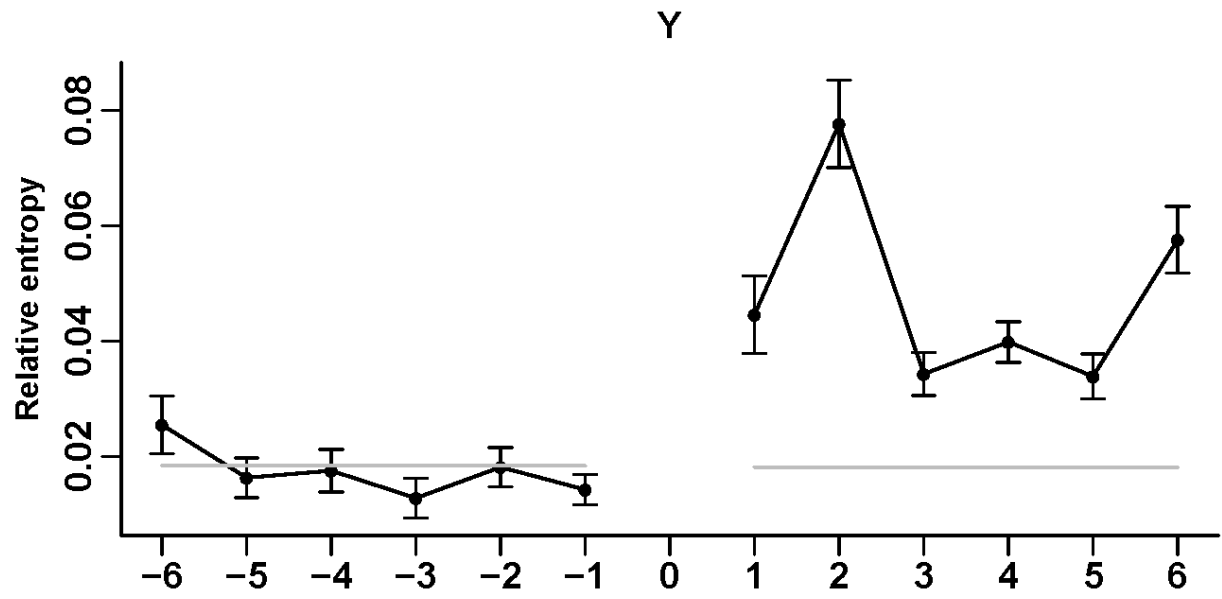
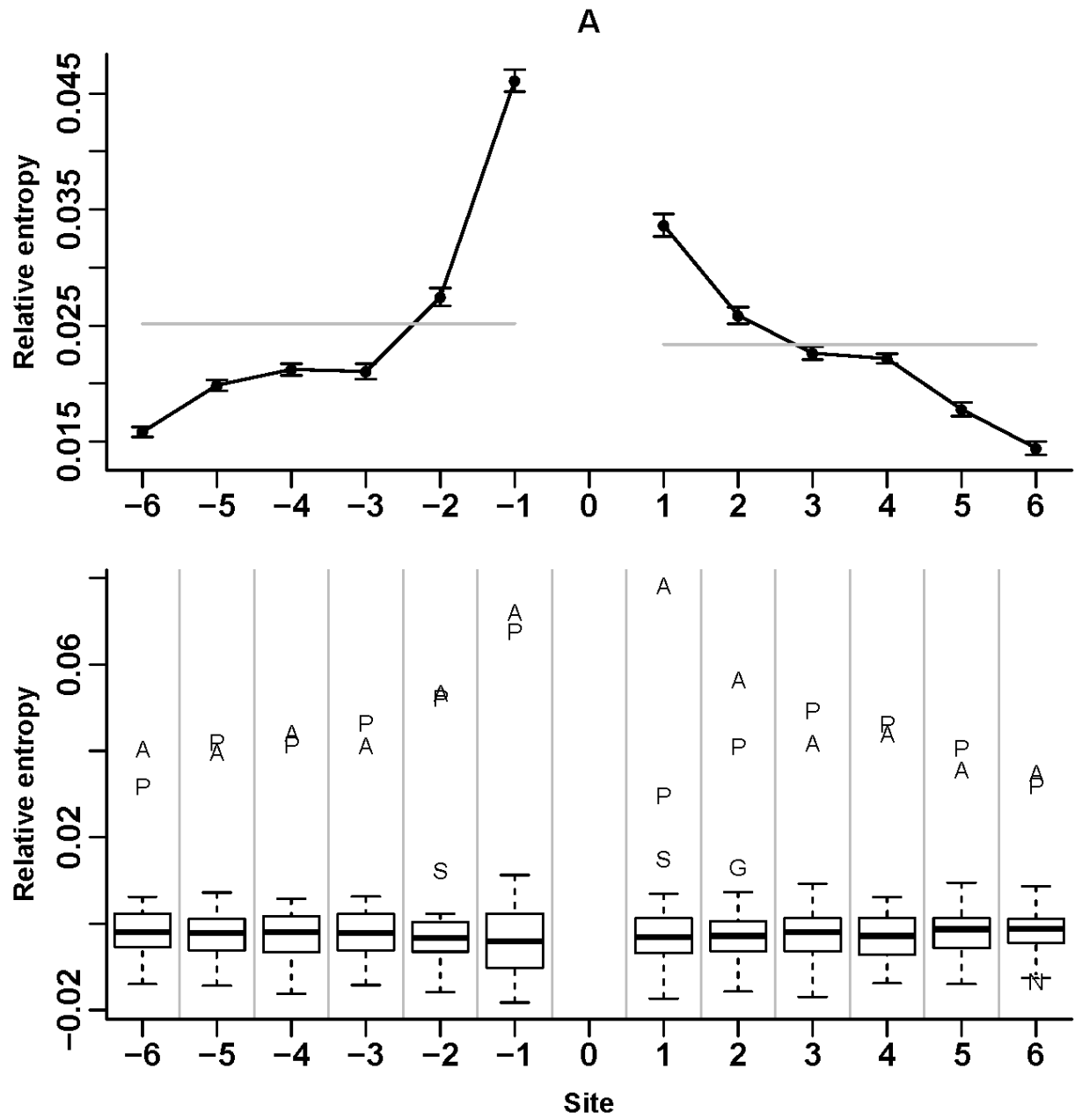
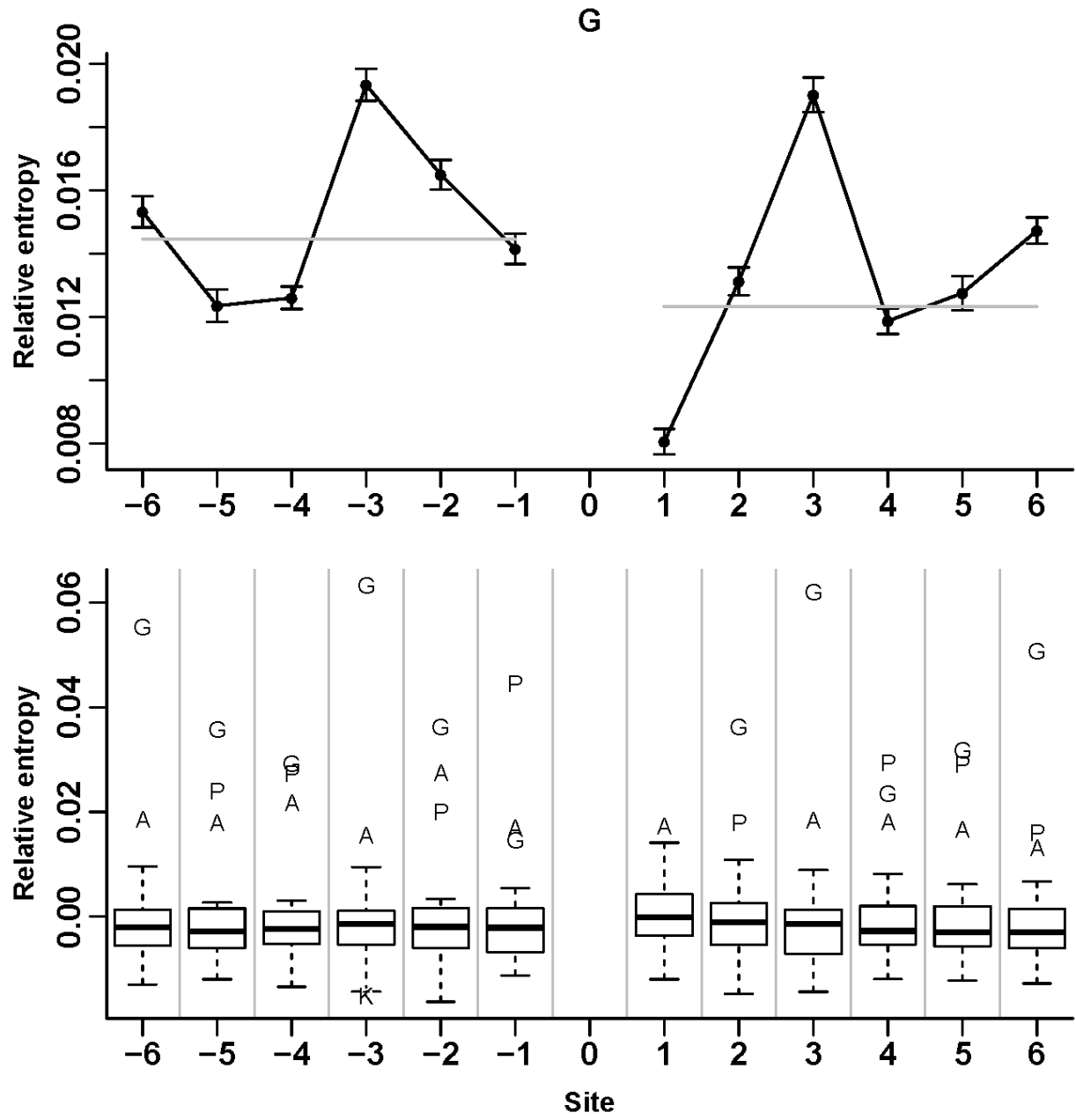
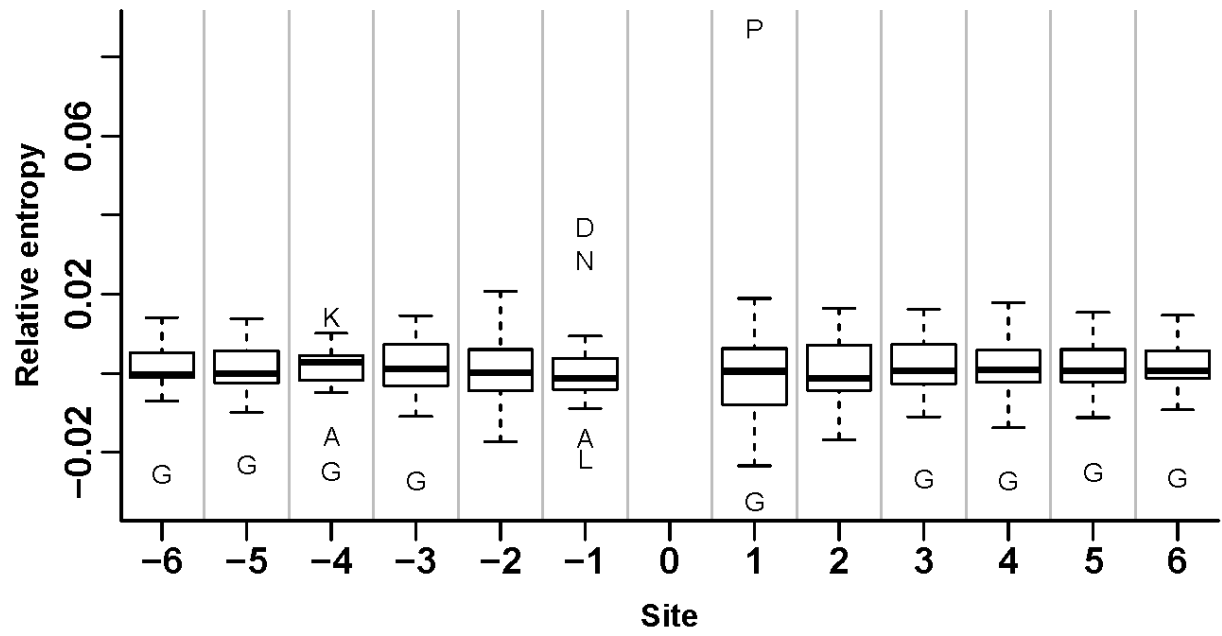
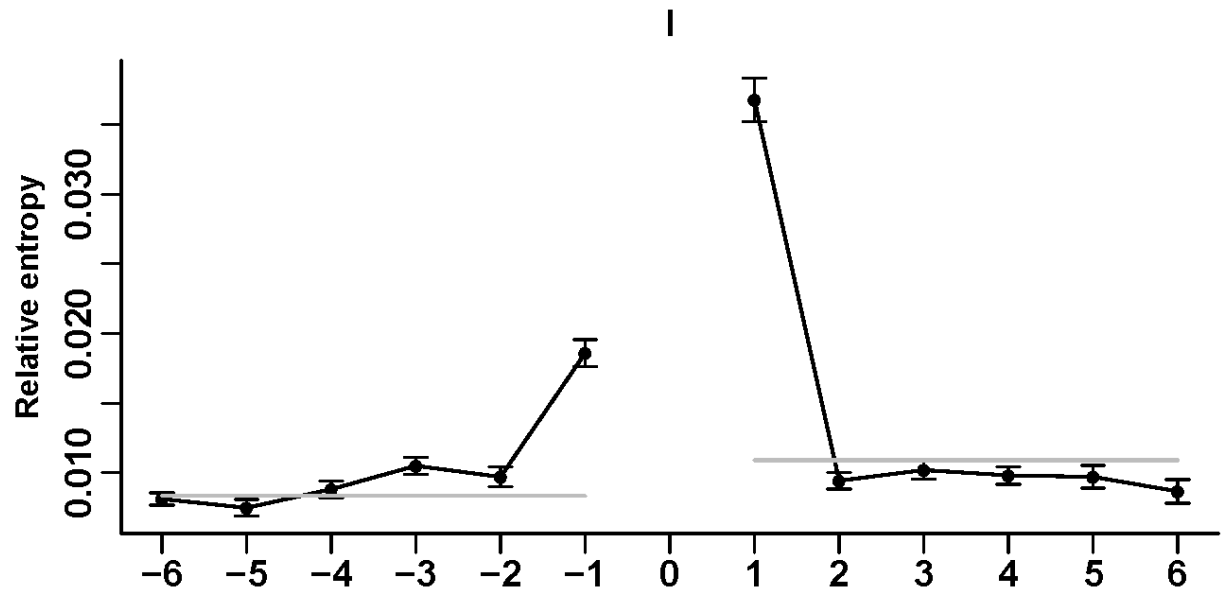
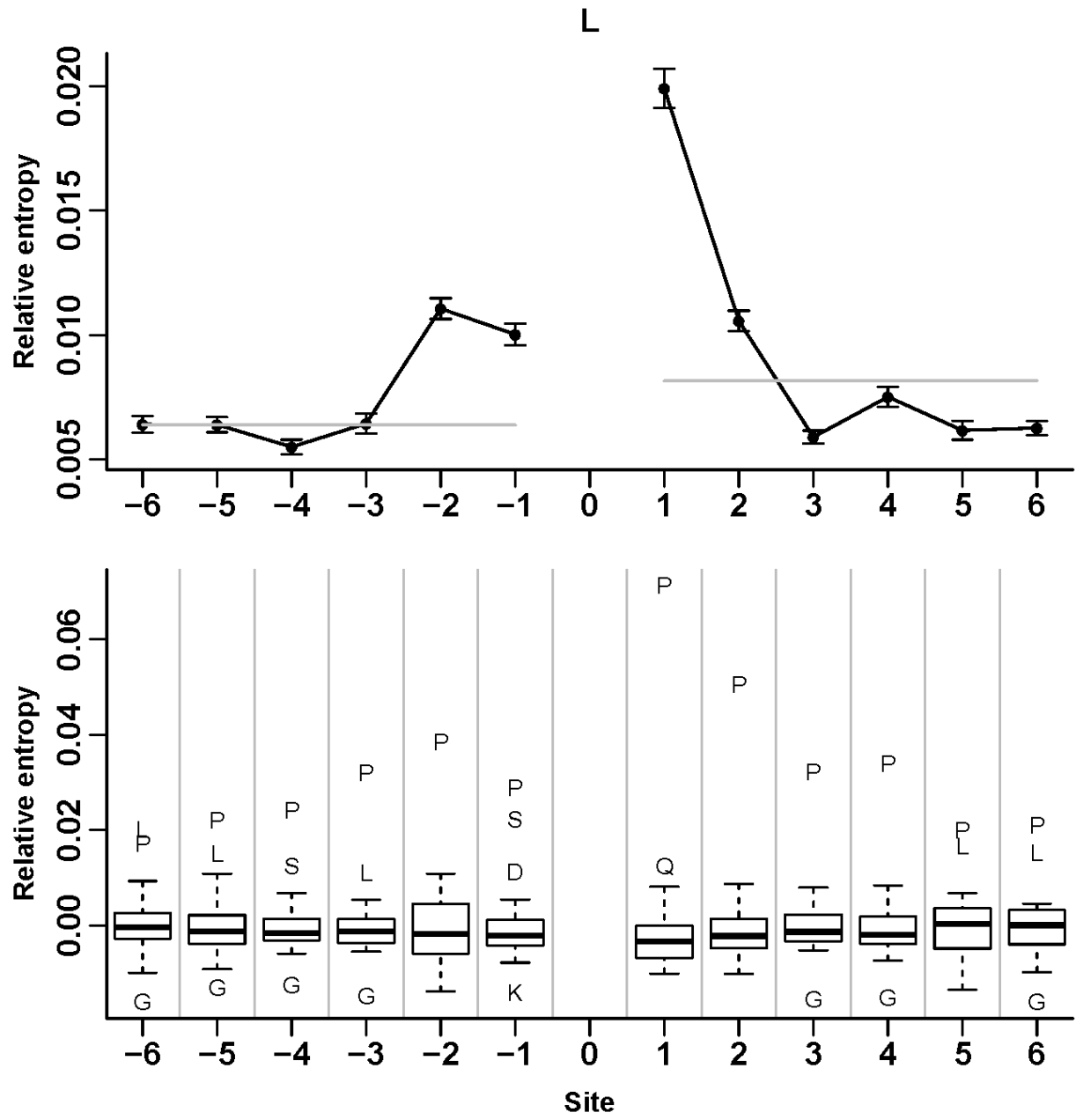


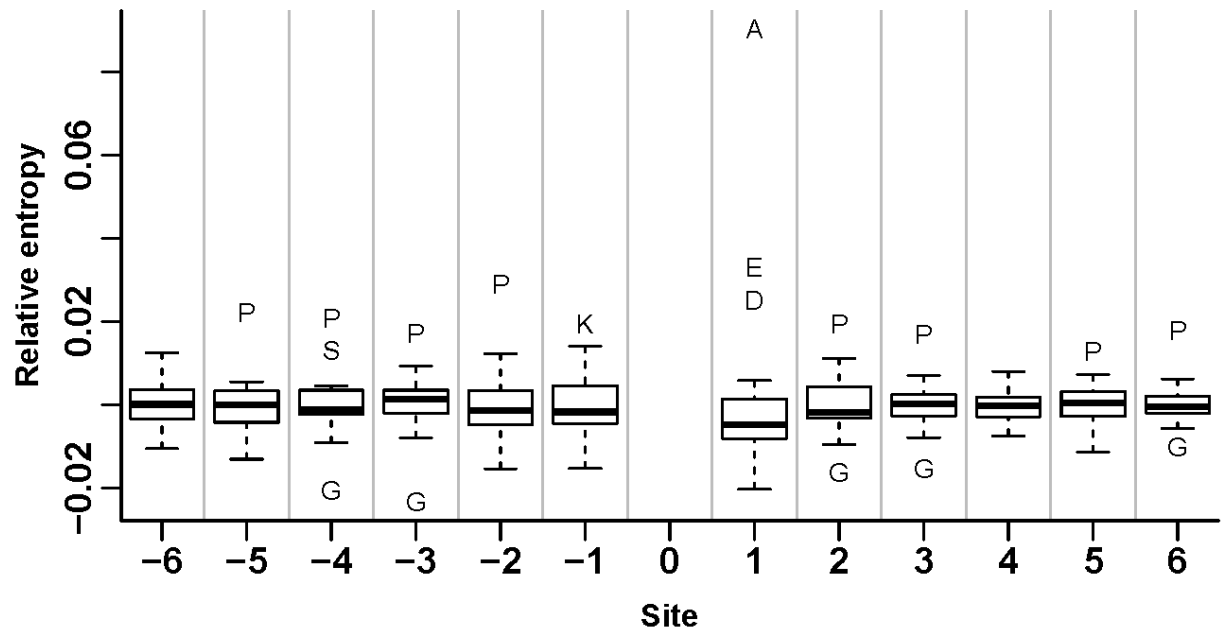
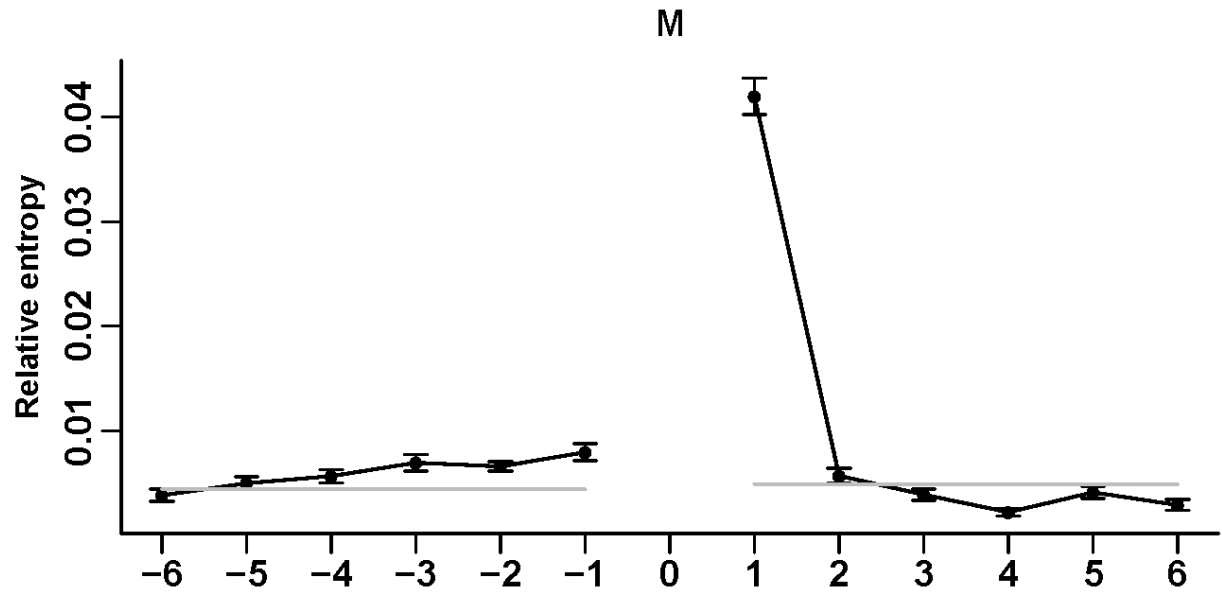
Figure S4. Neighbor preference patterns of the 20 amino acids in coil.

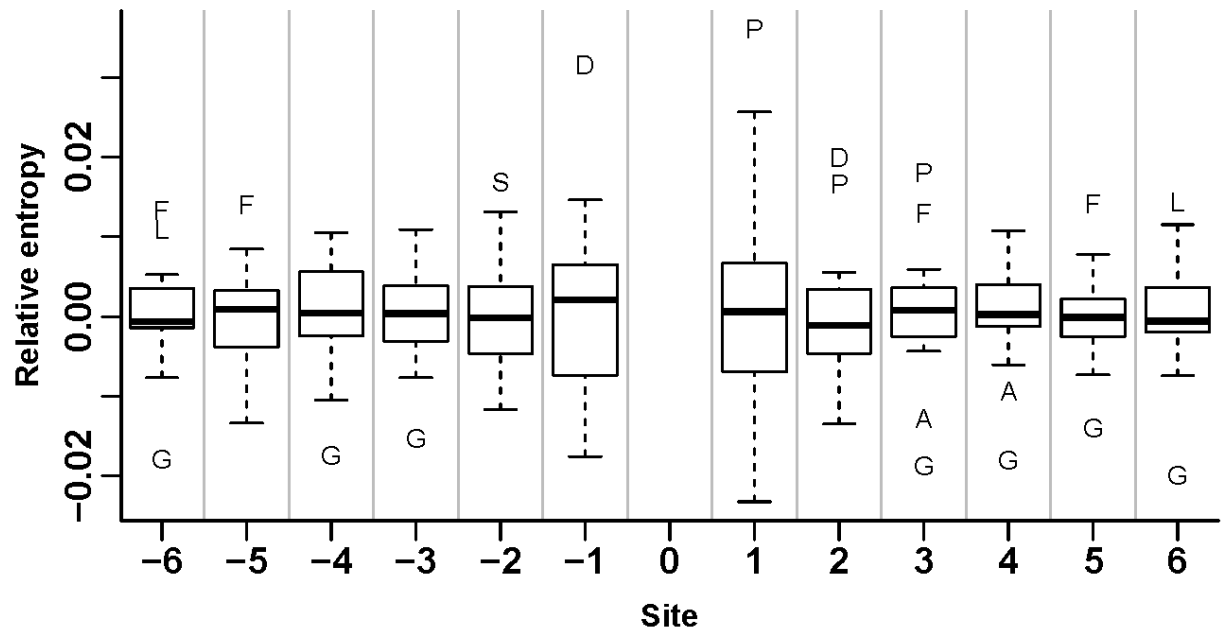
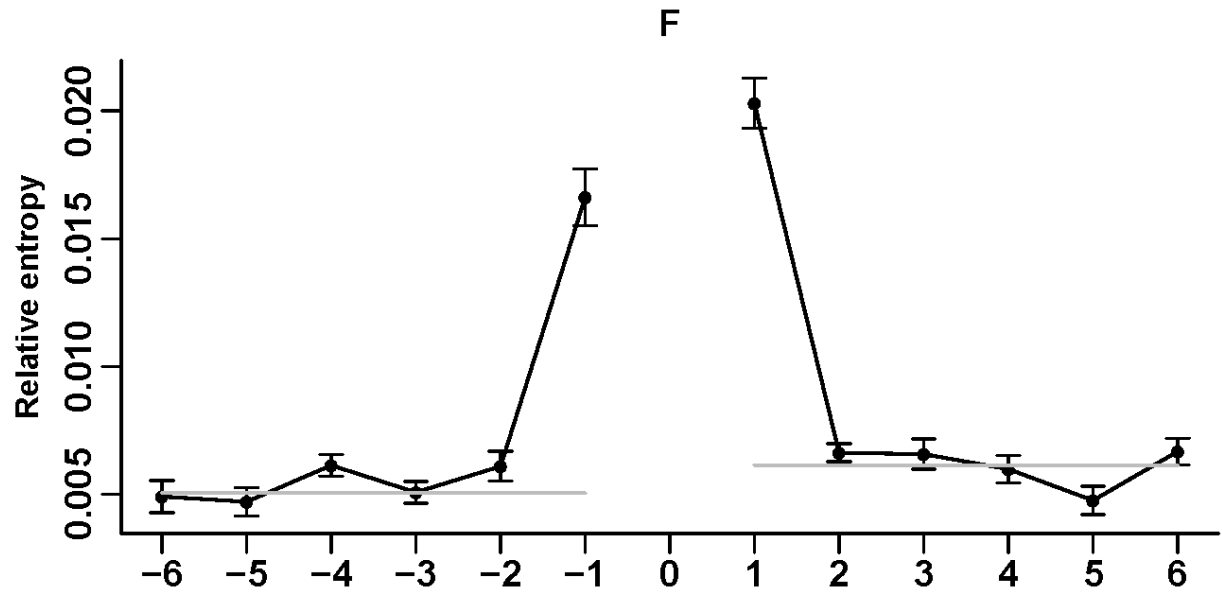


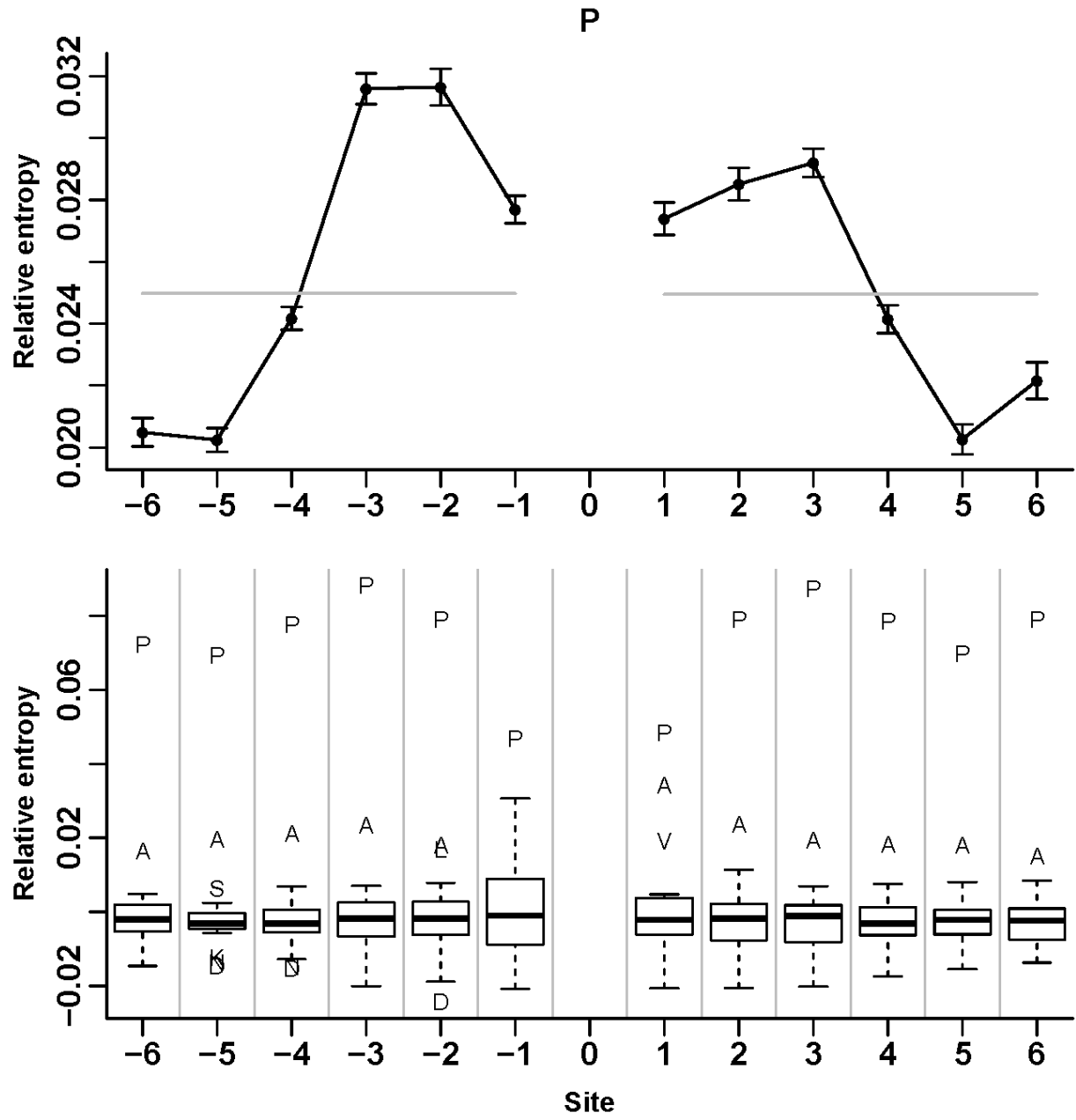


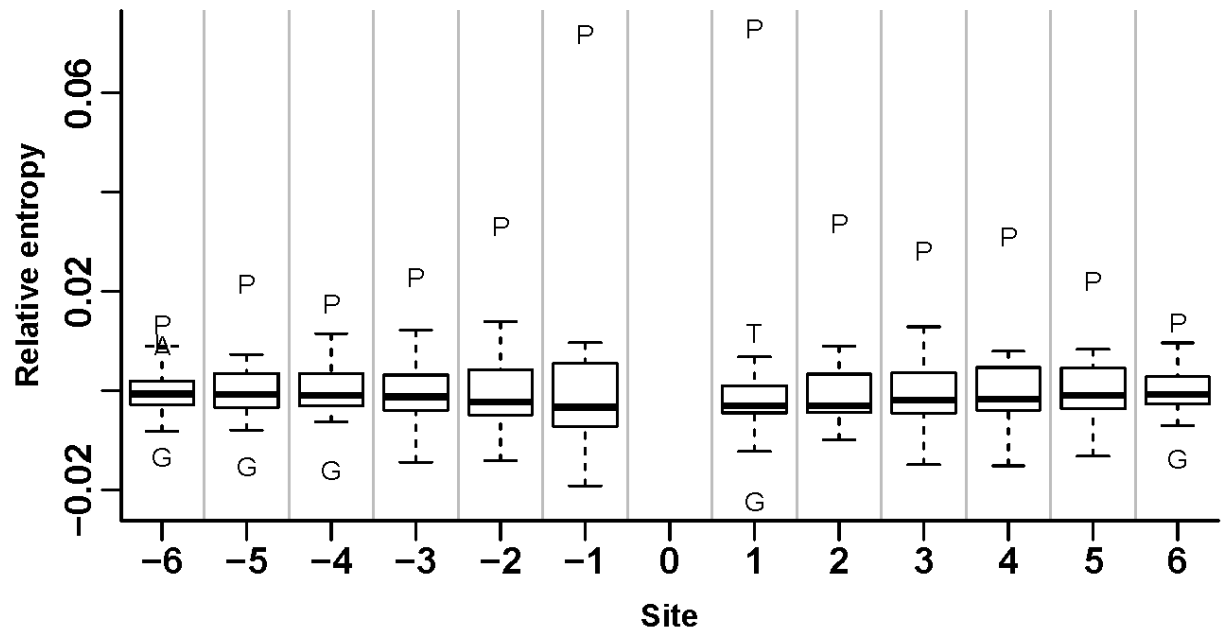
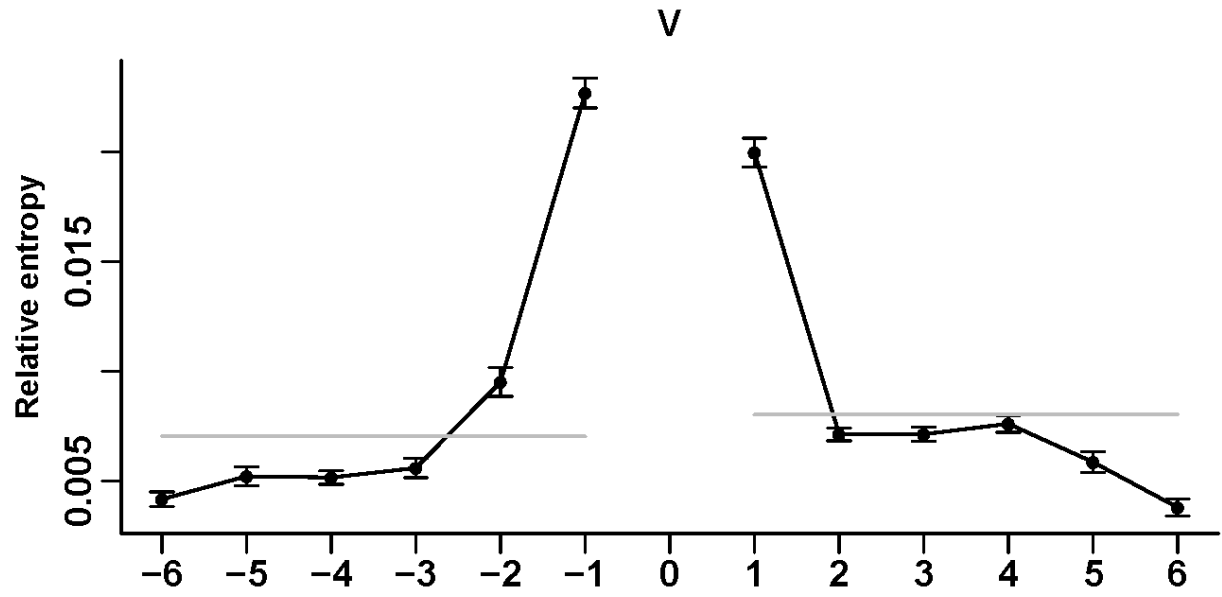


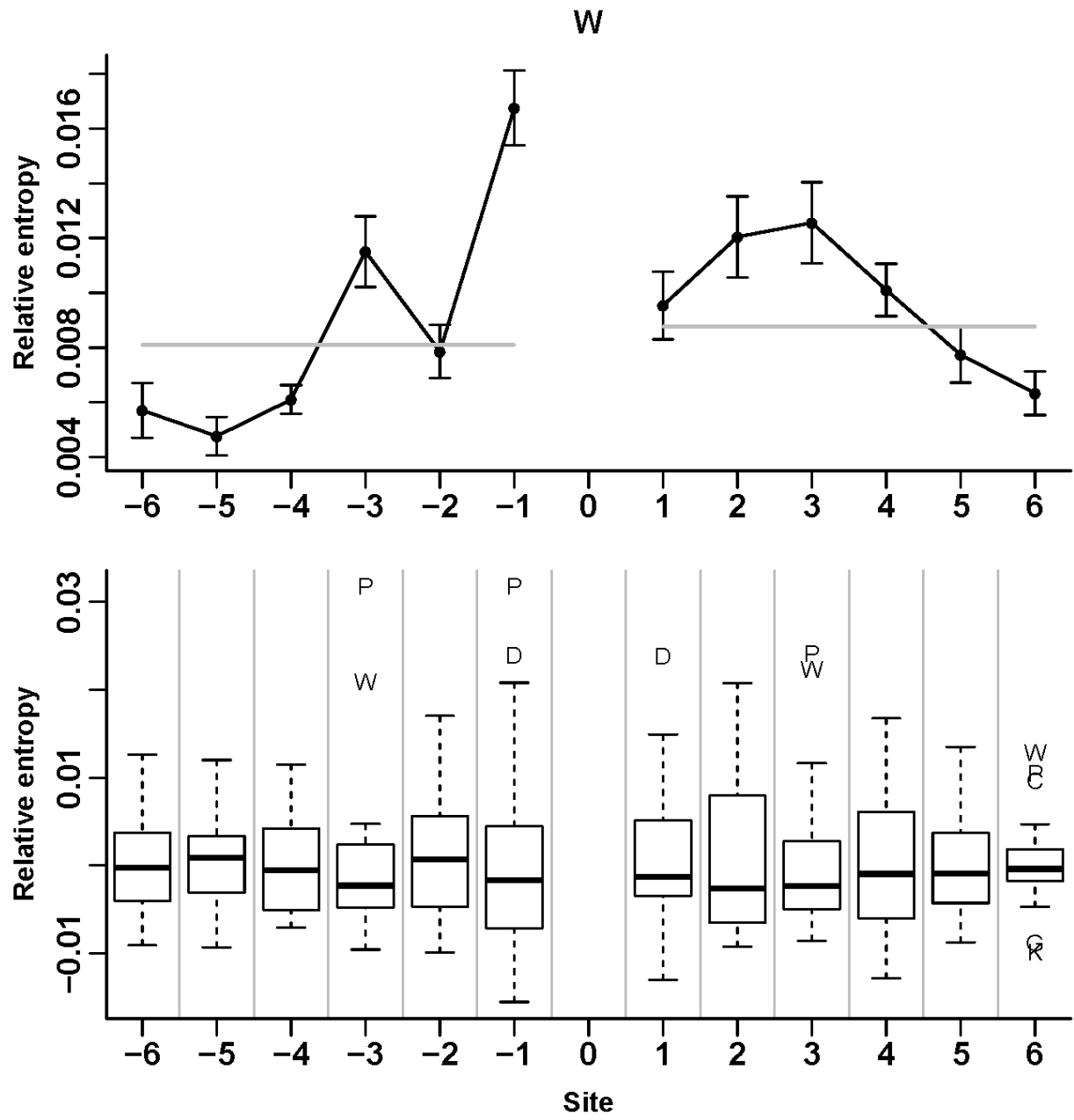


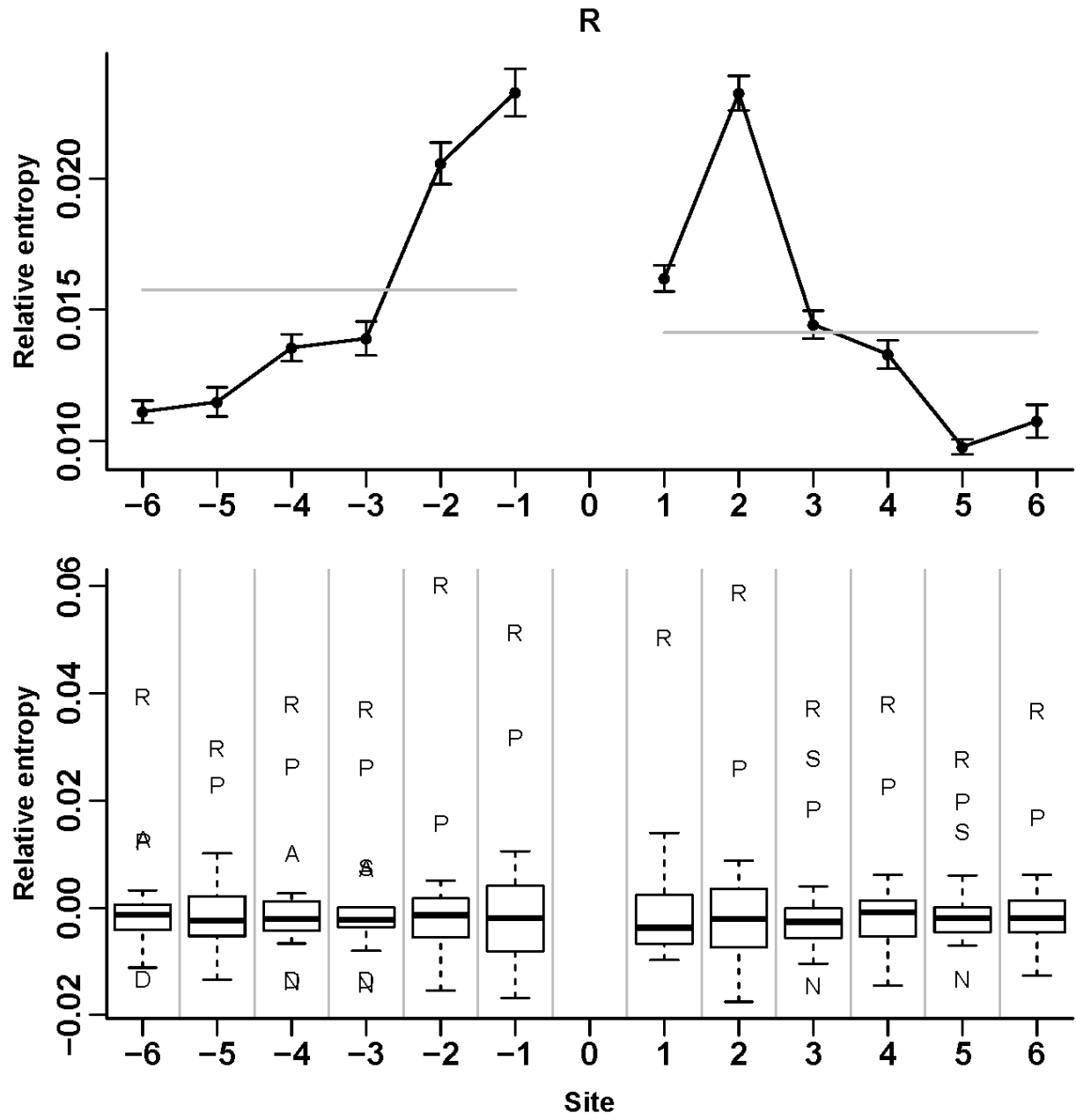


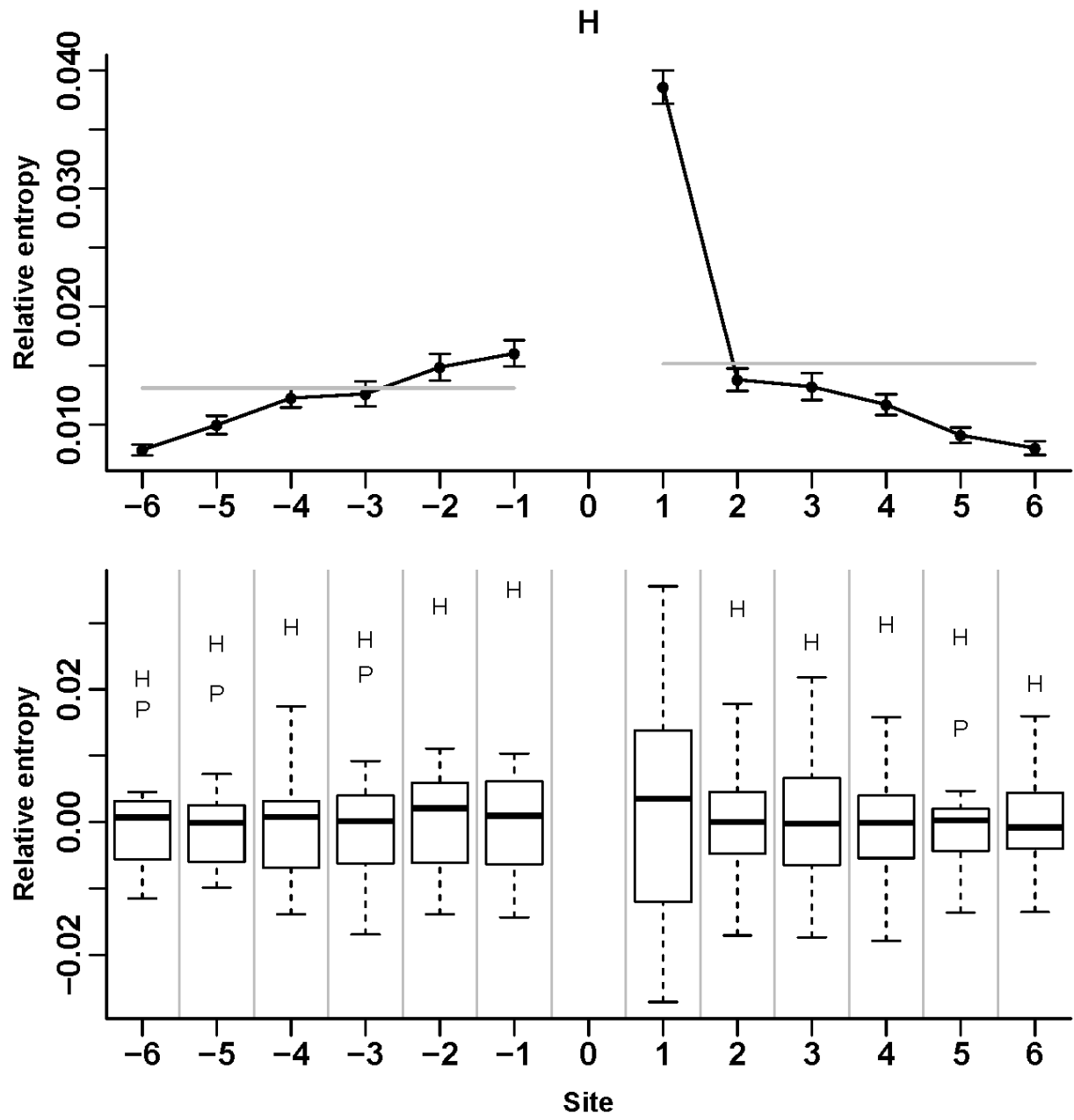


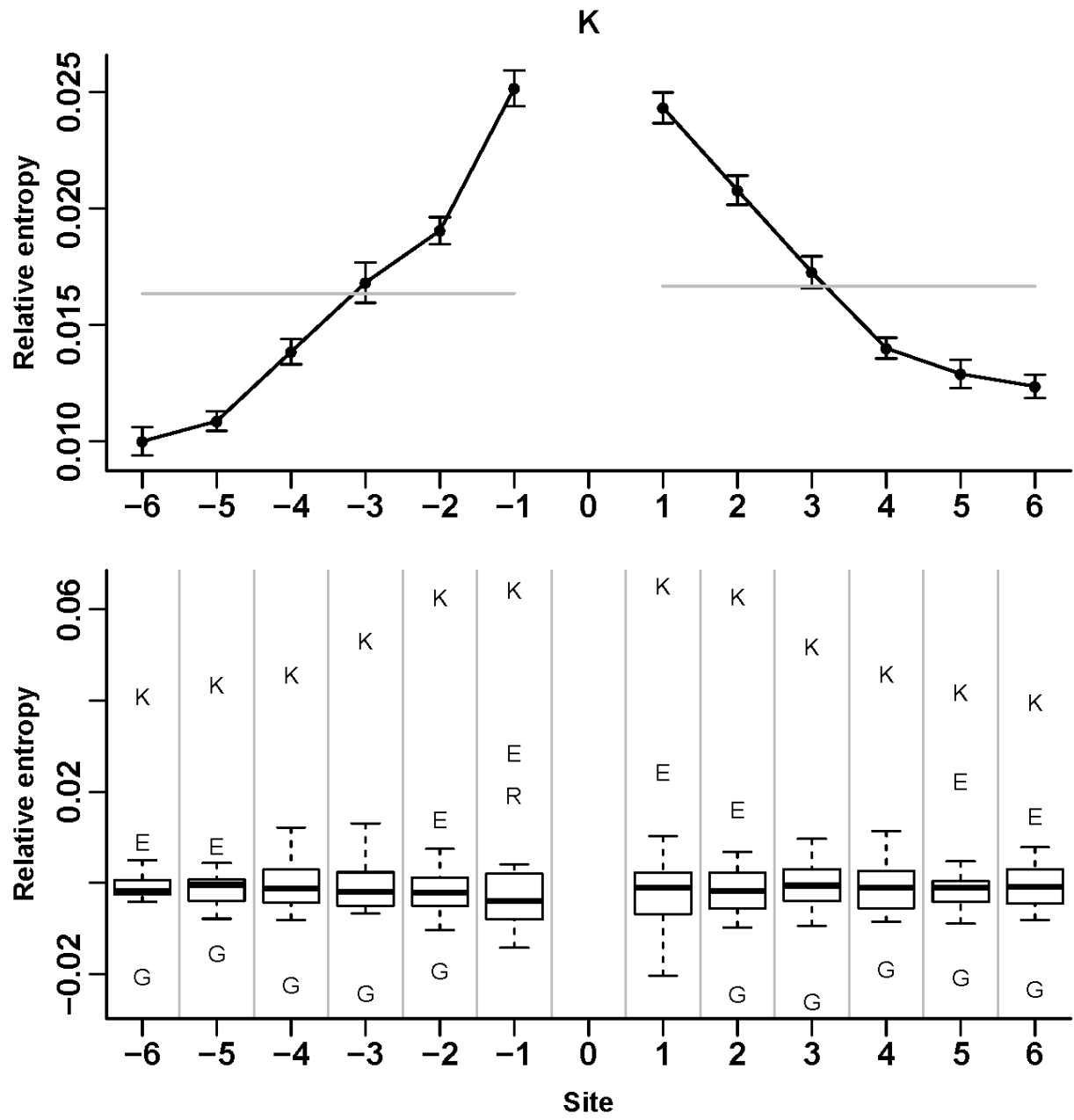


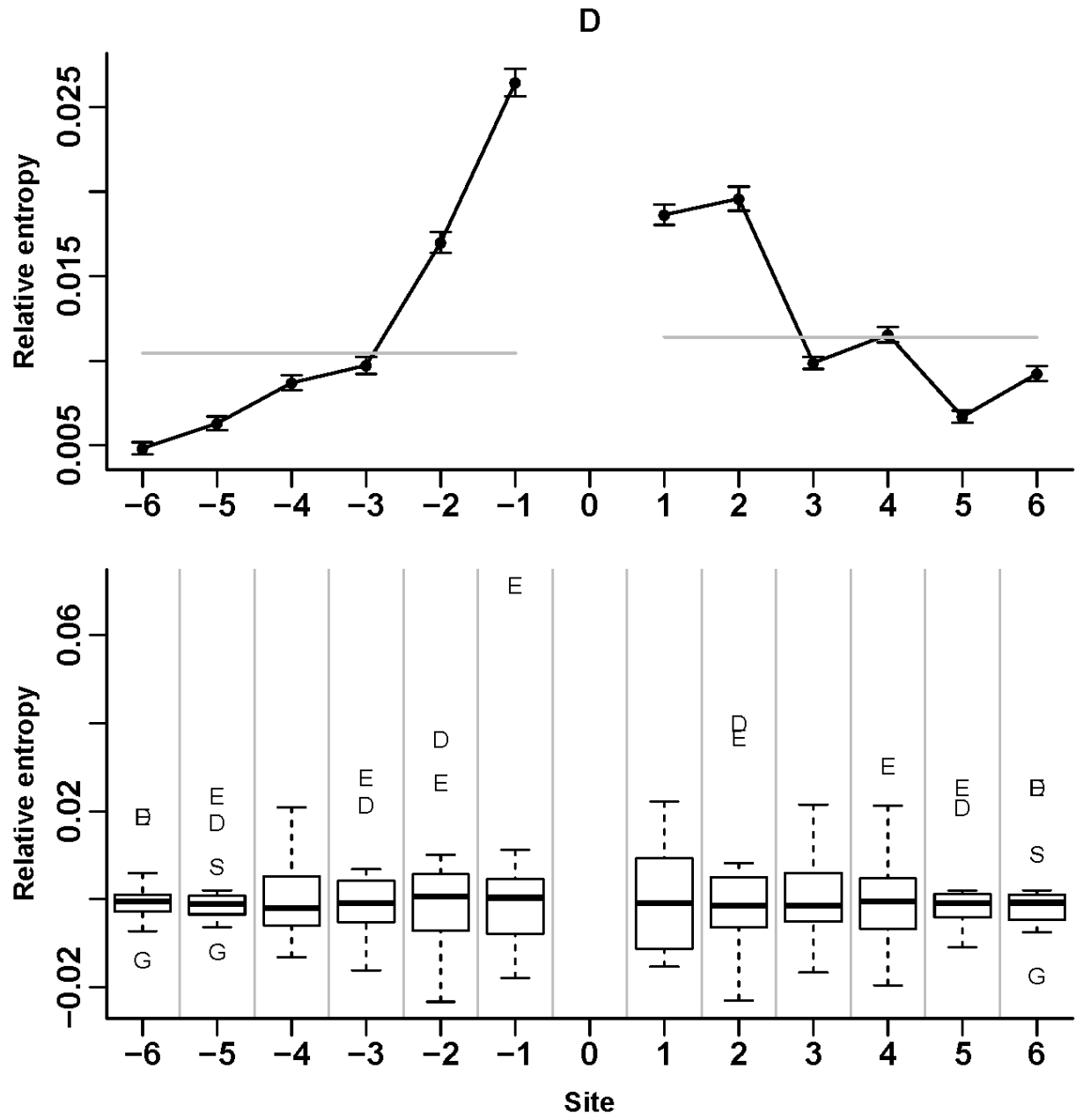


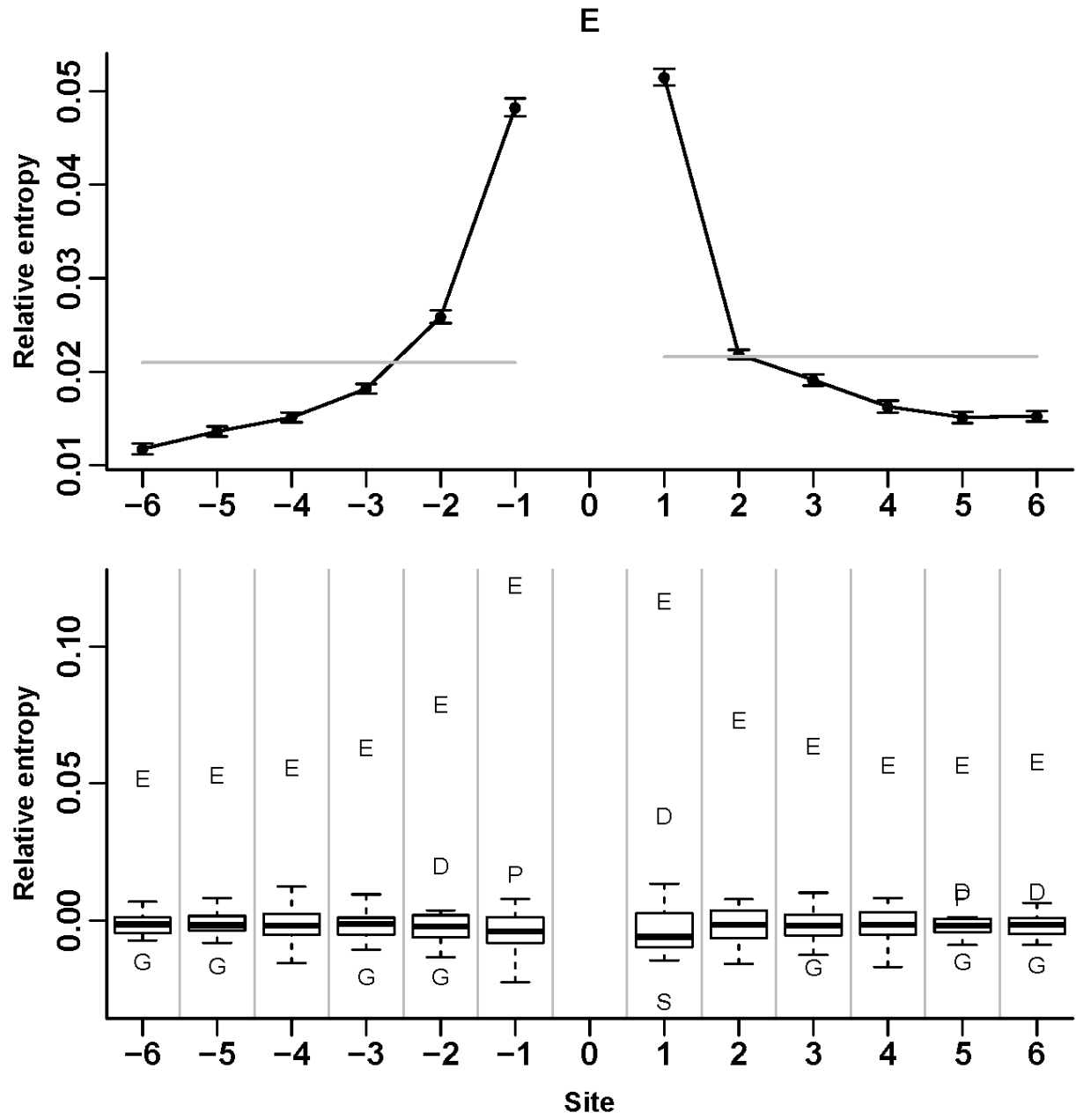


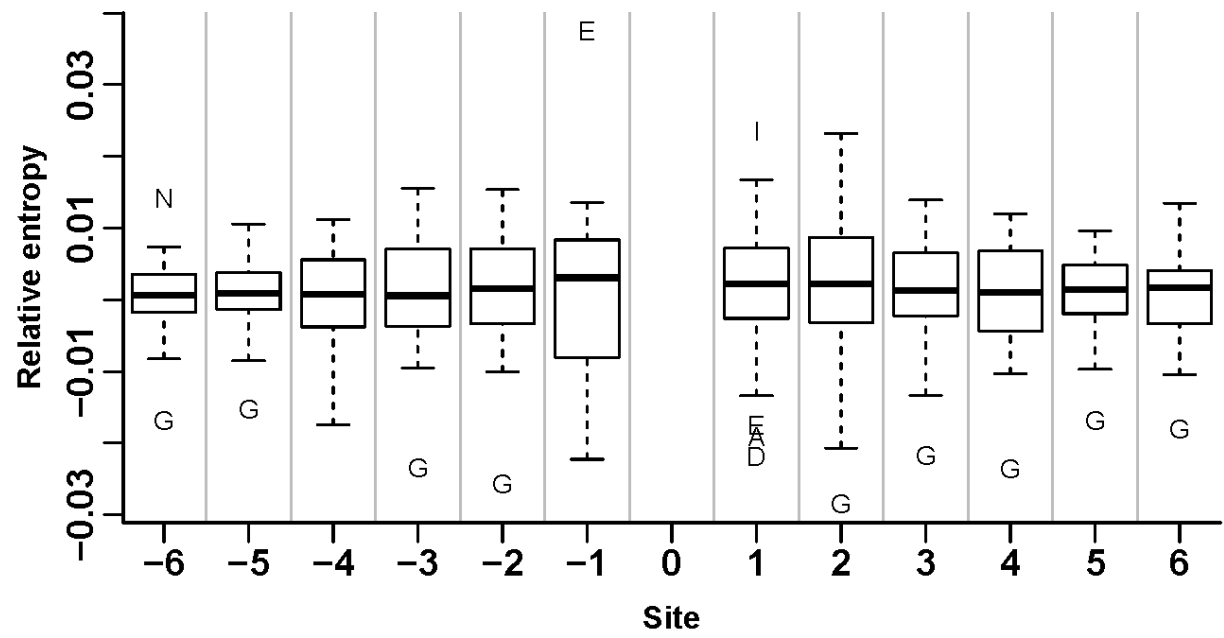
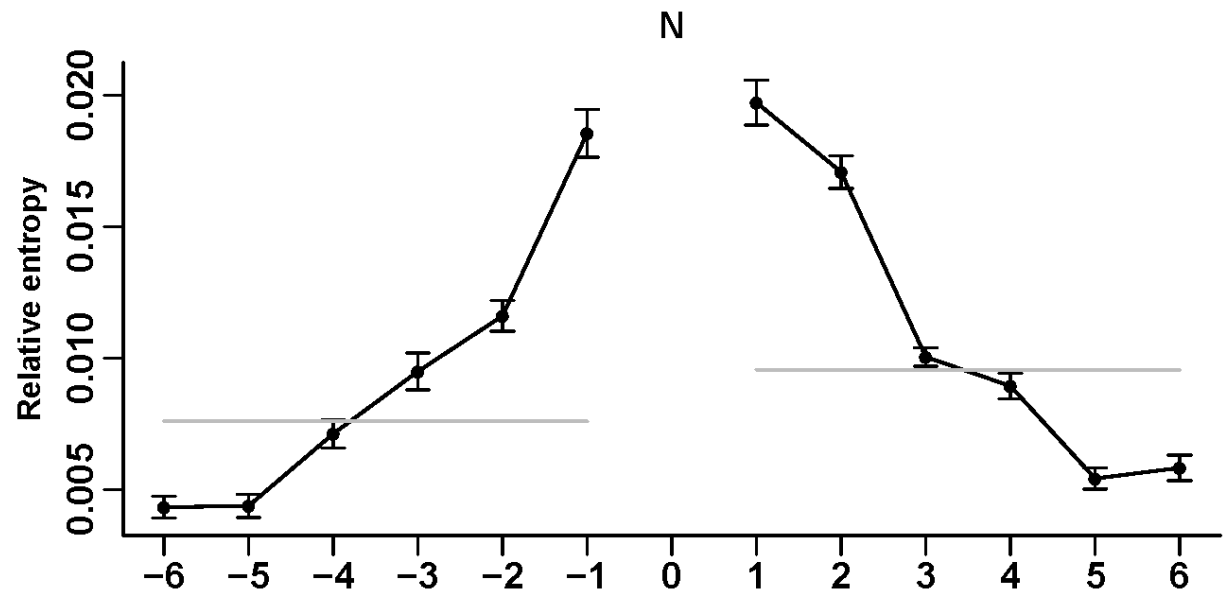


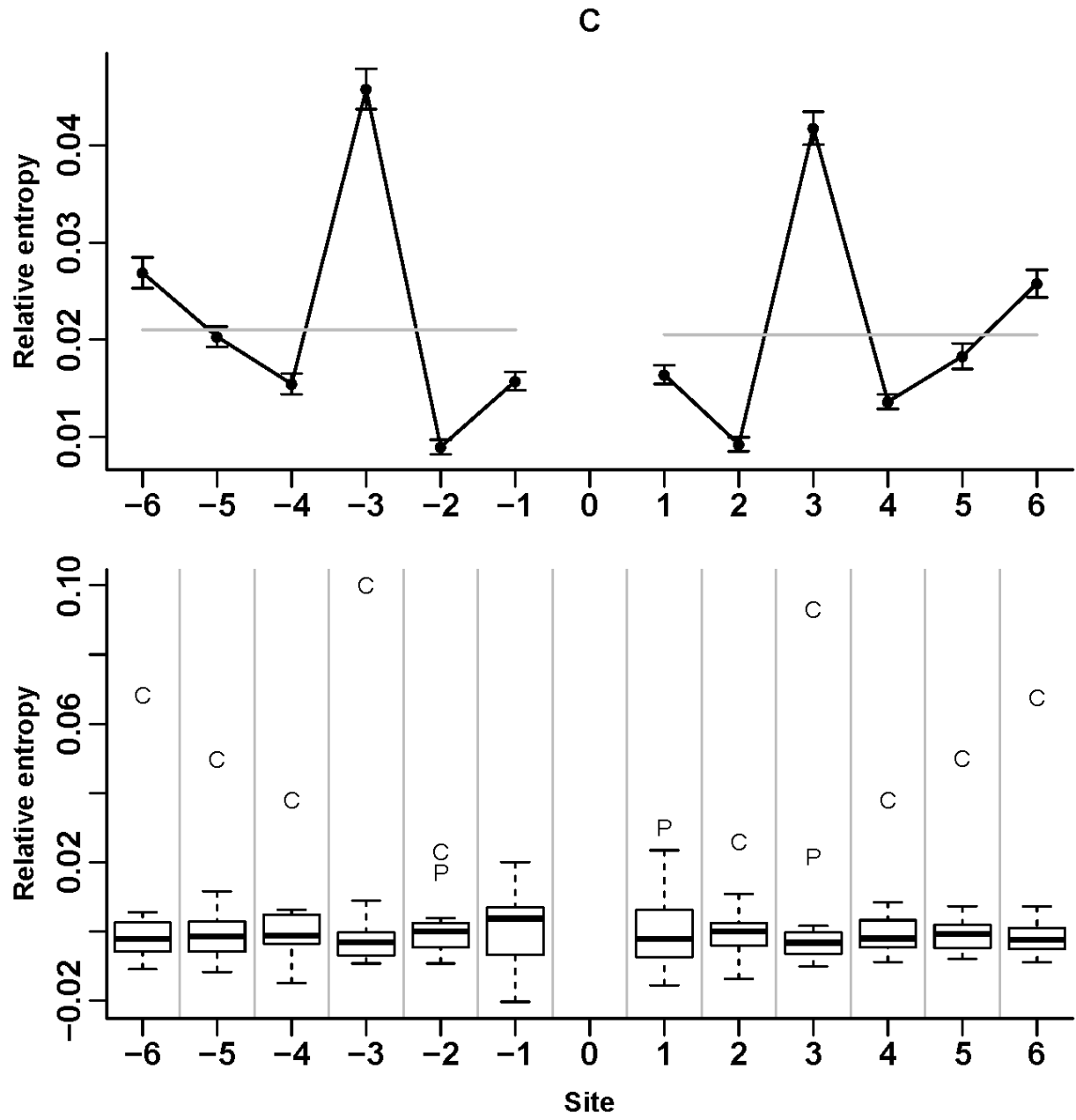


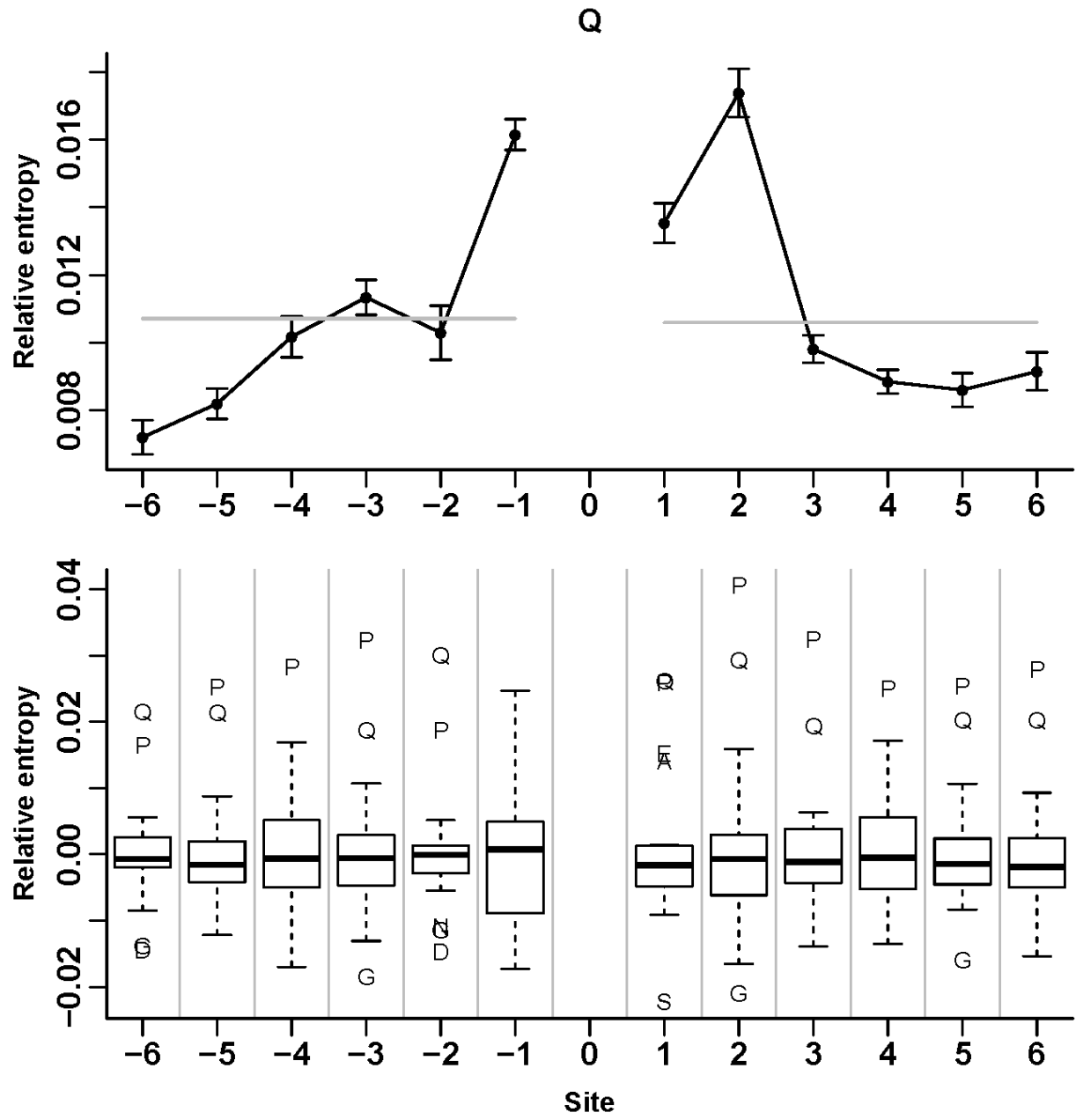


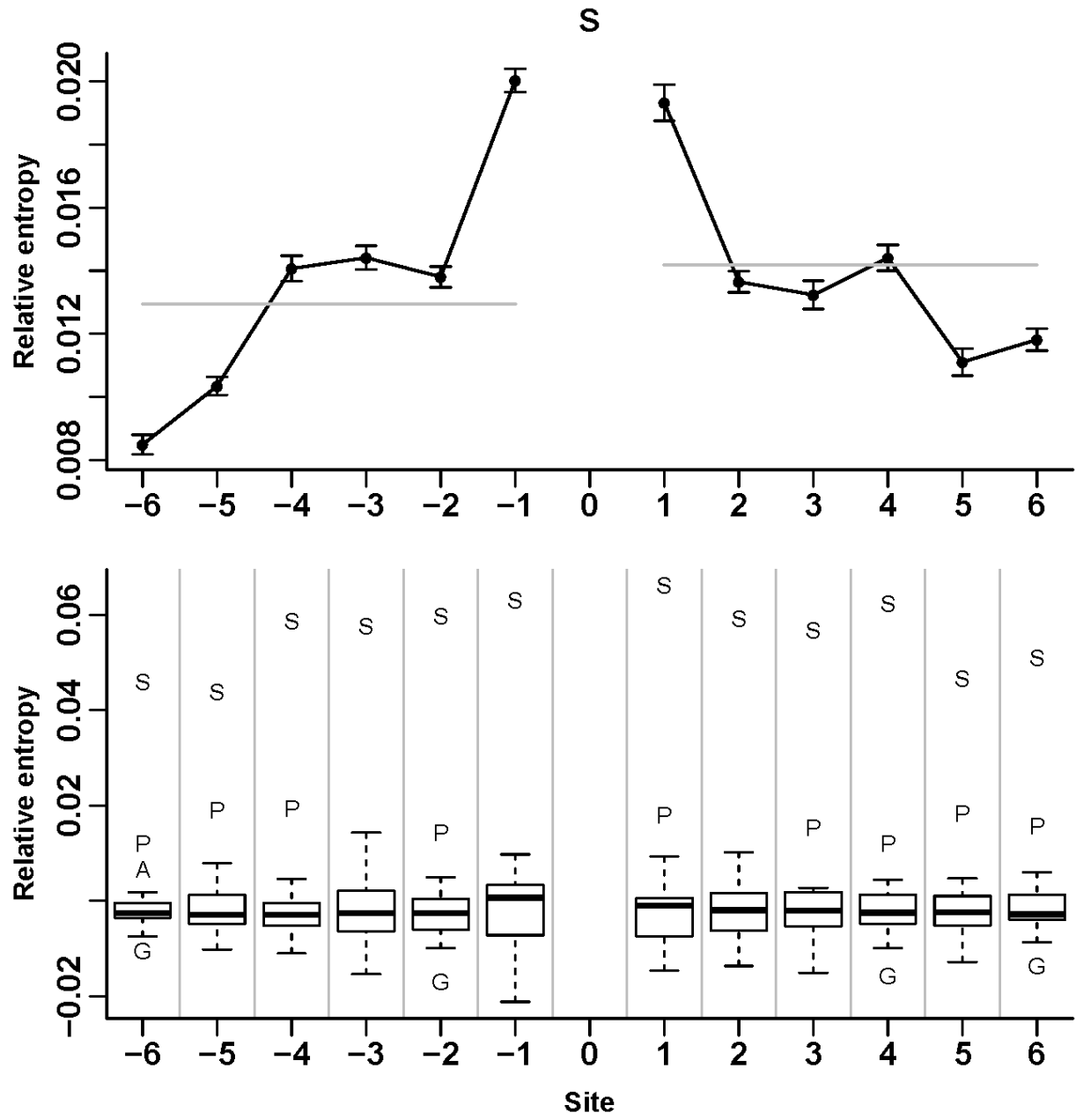




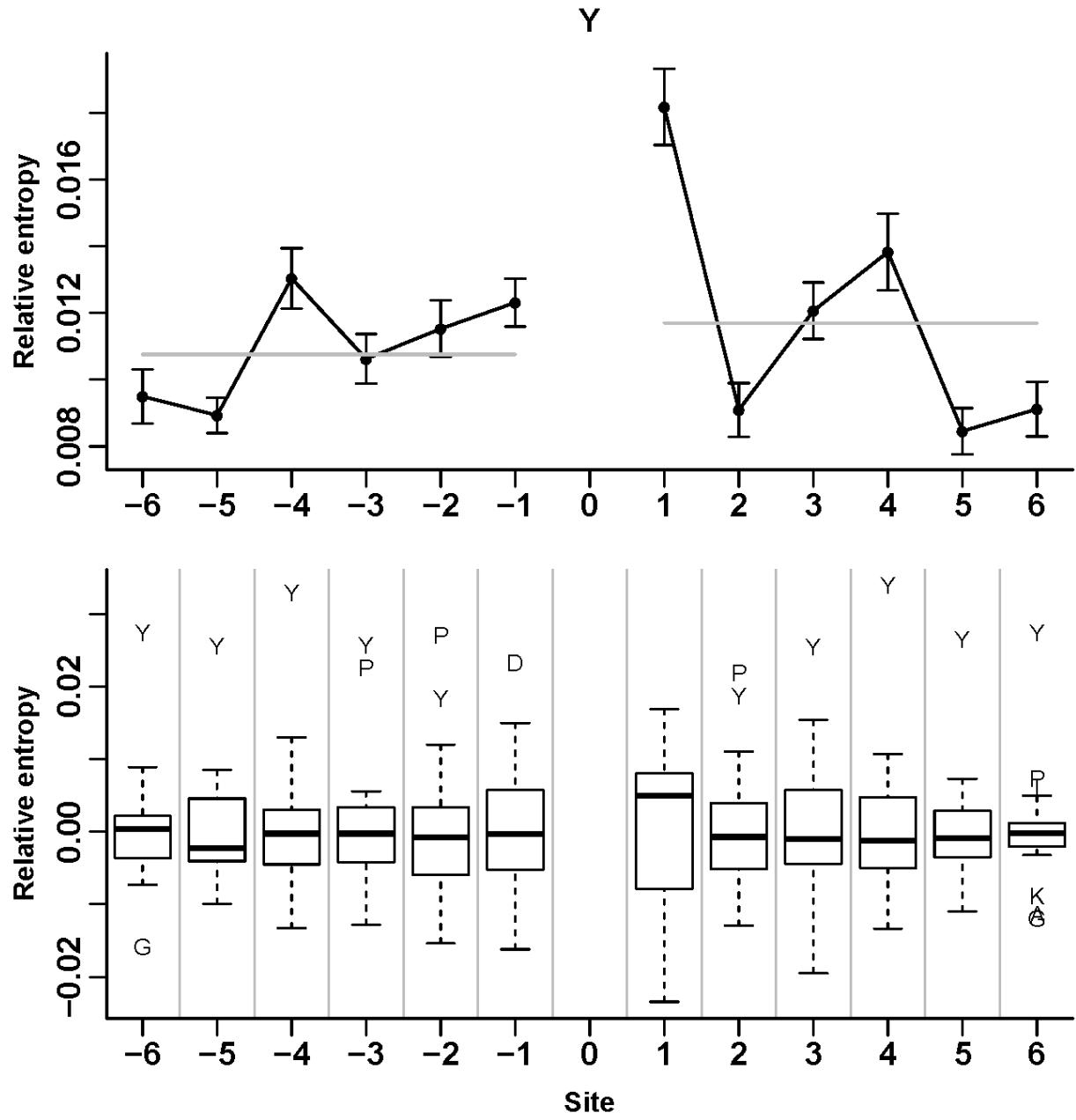




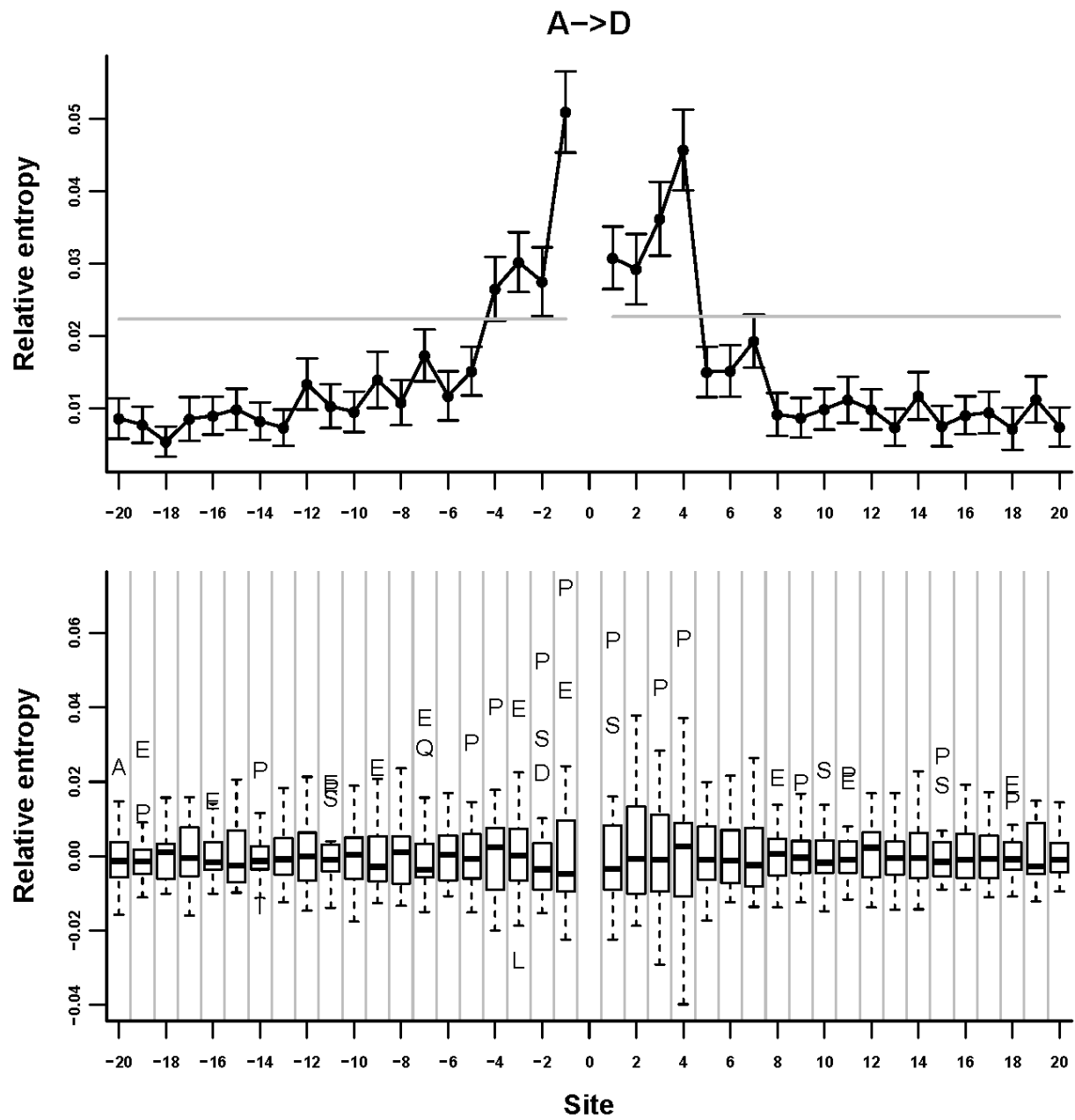


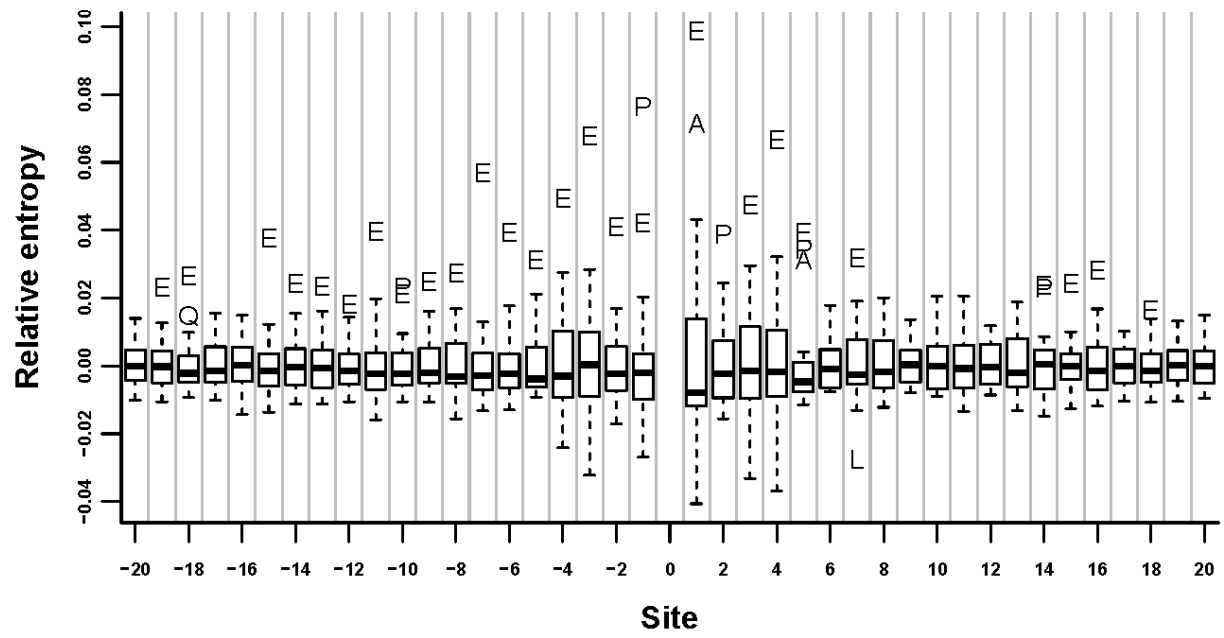
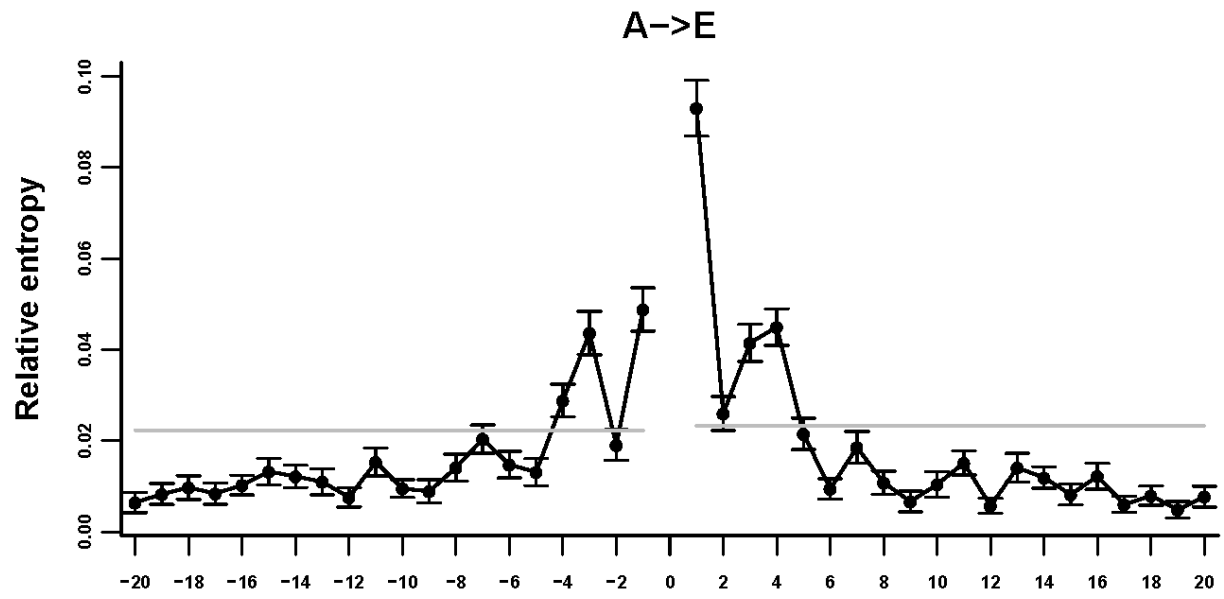


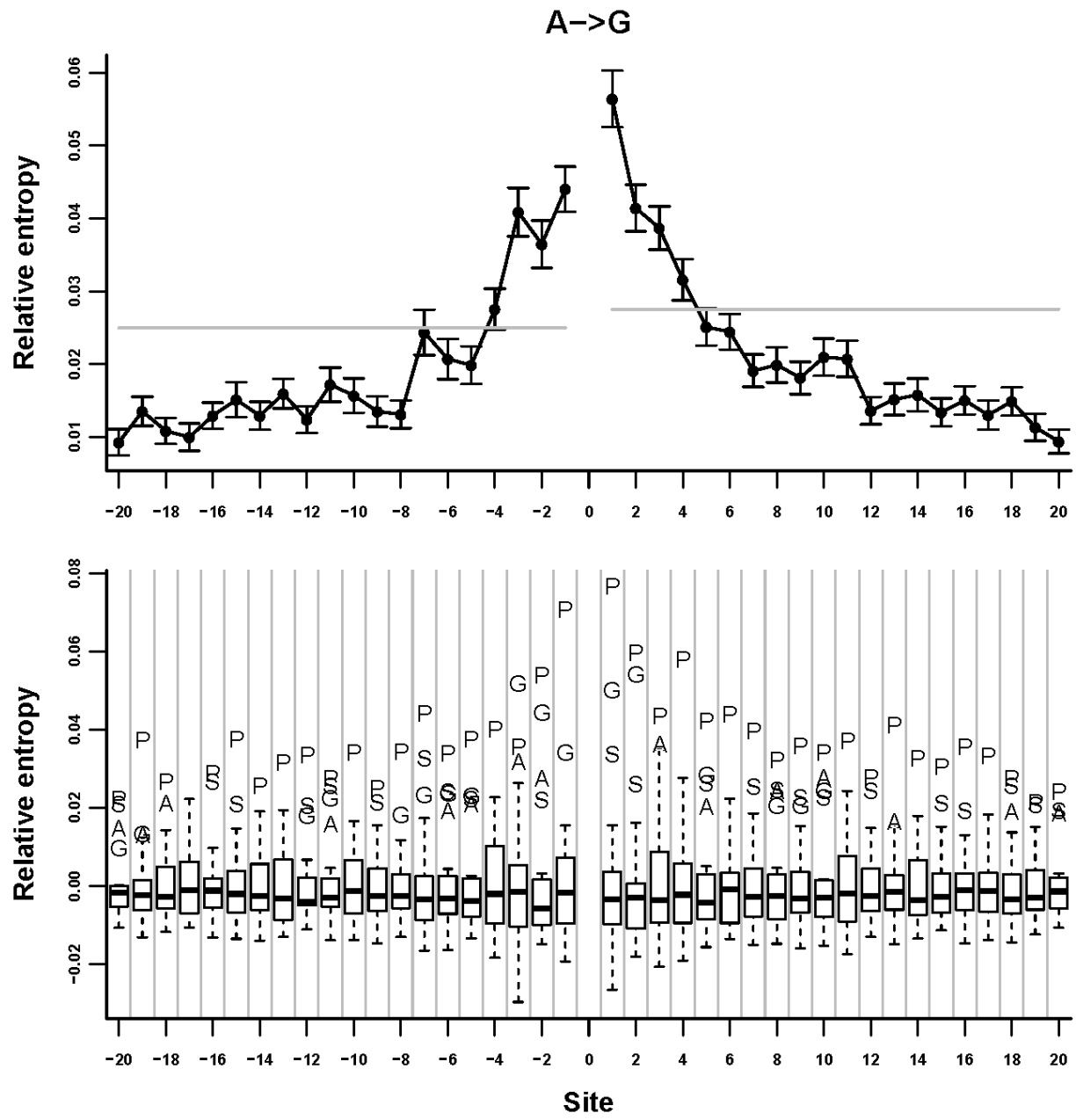


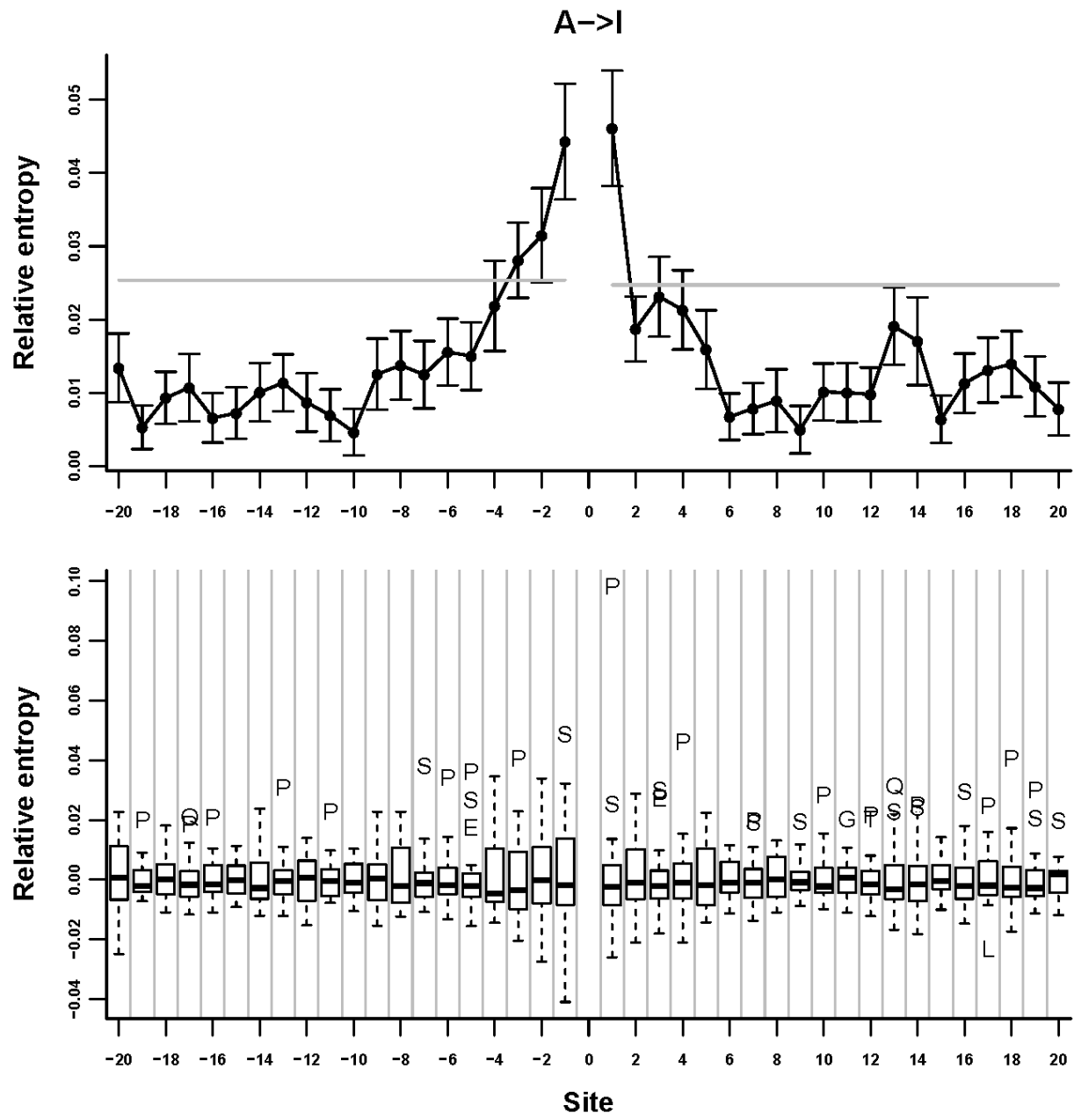


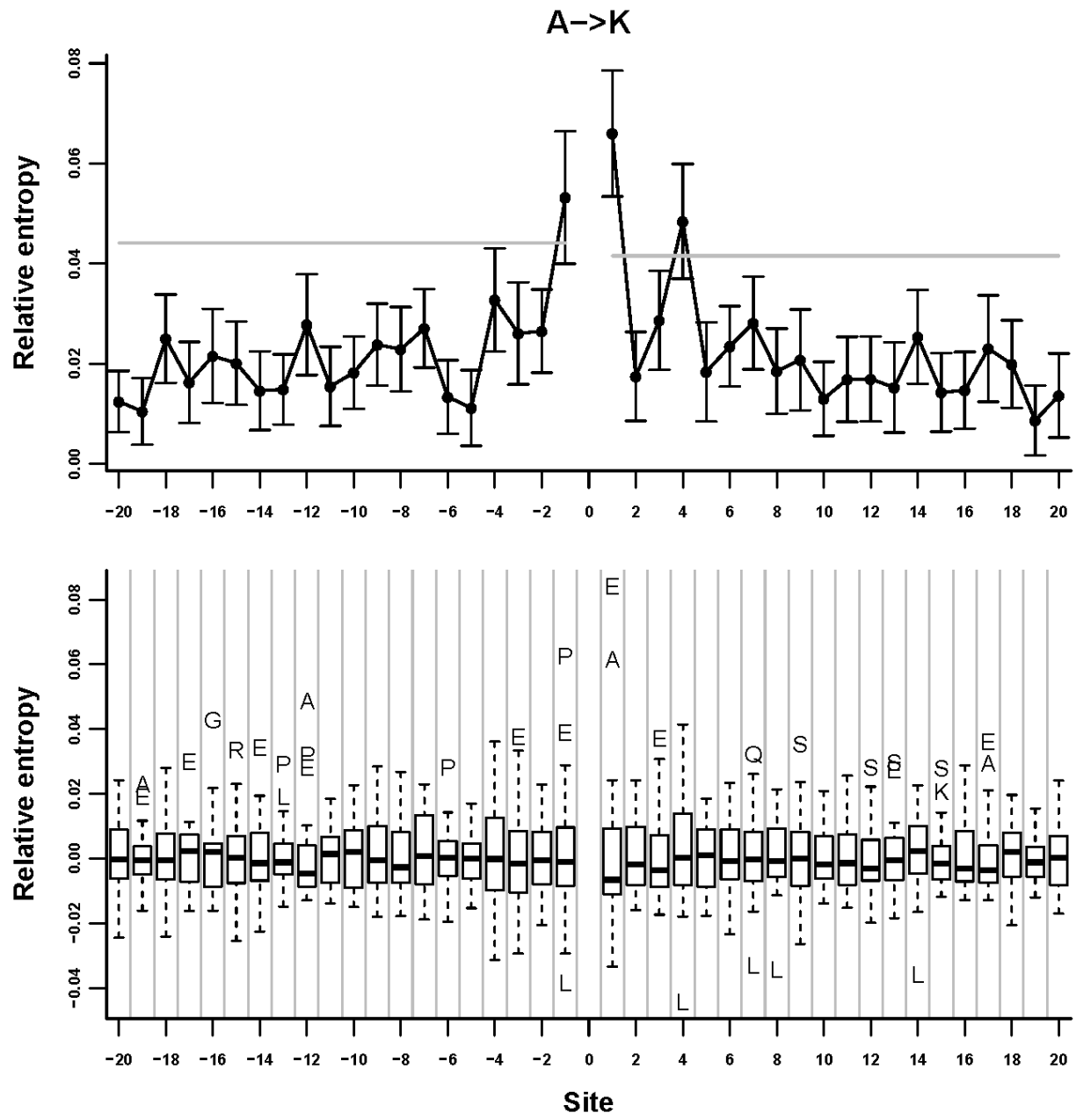
**Figure S5.** Context-dependence patterns of the amino acid substitutions.

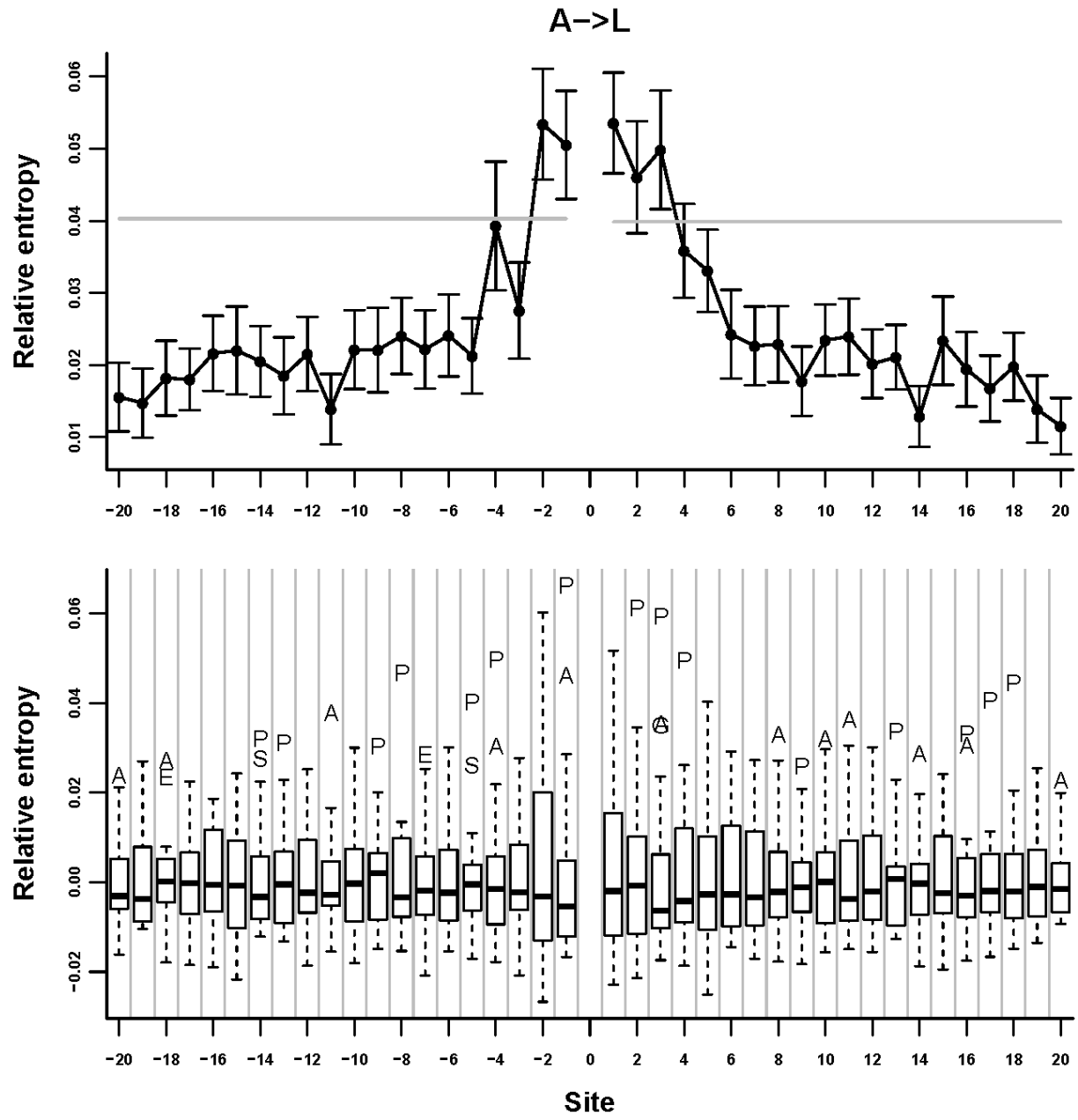


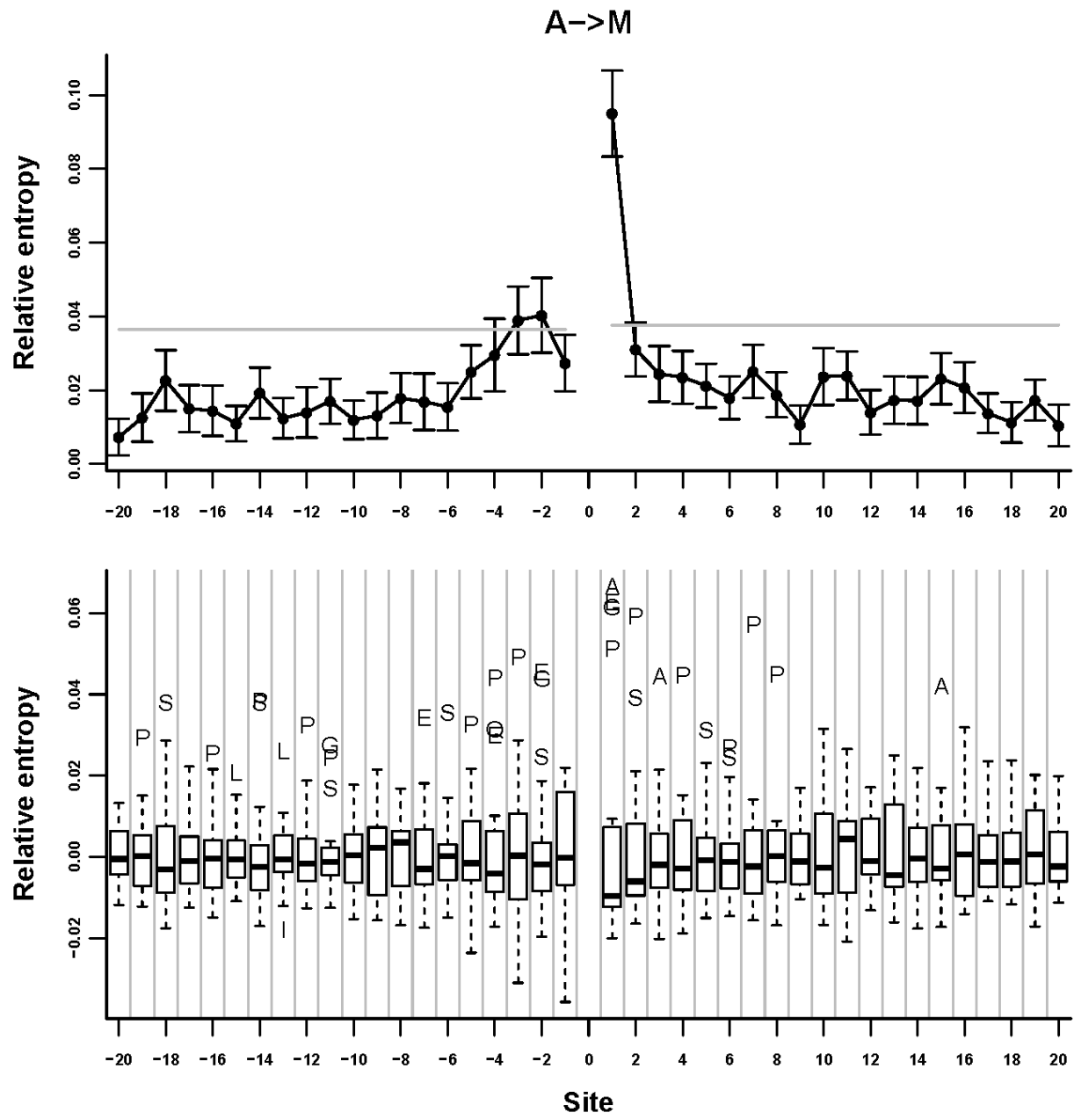


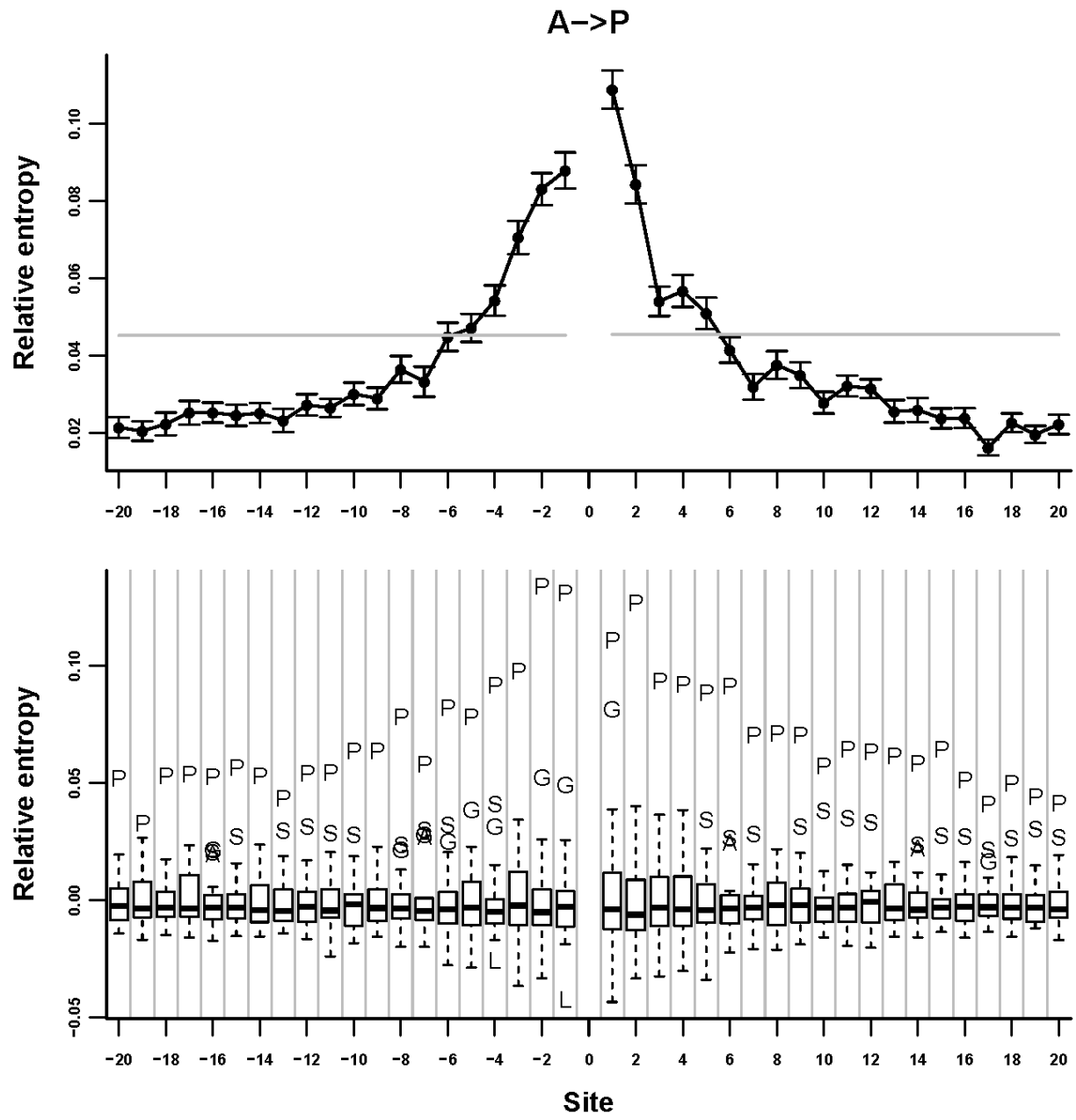


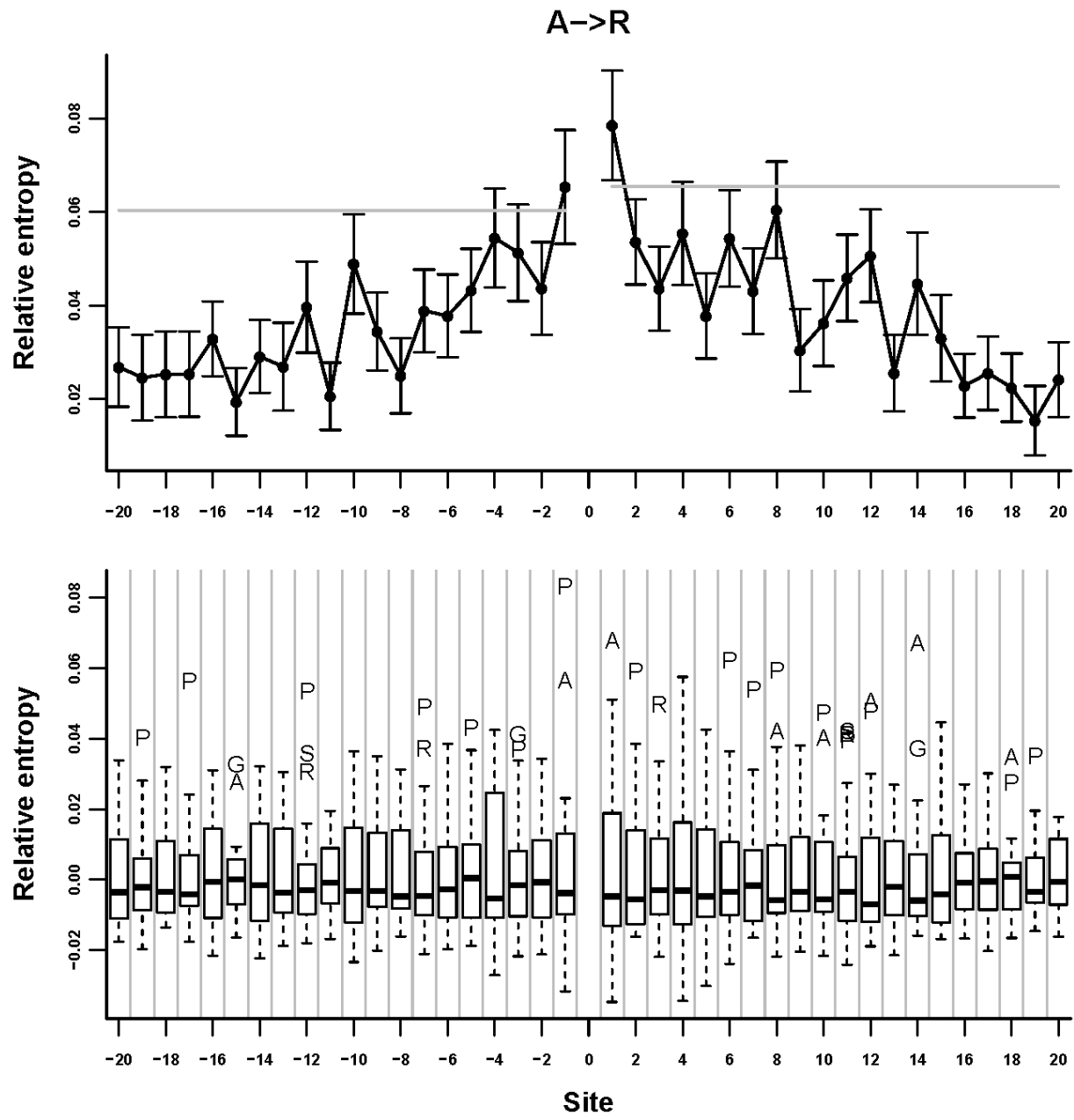


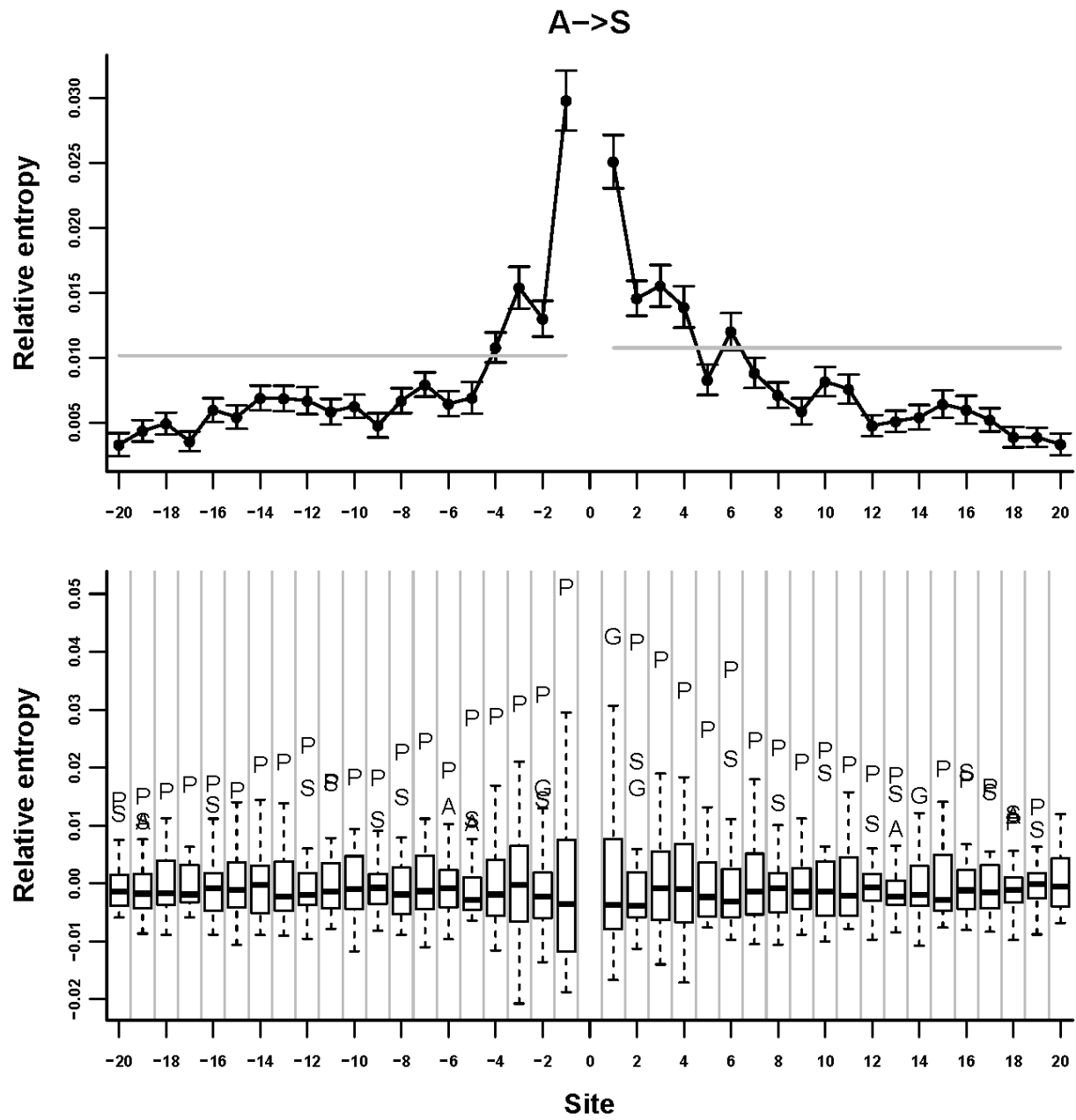


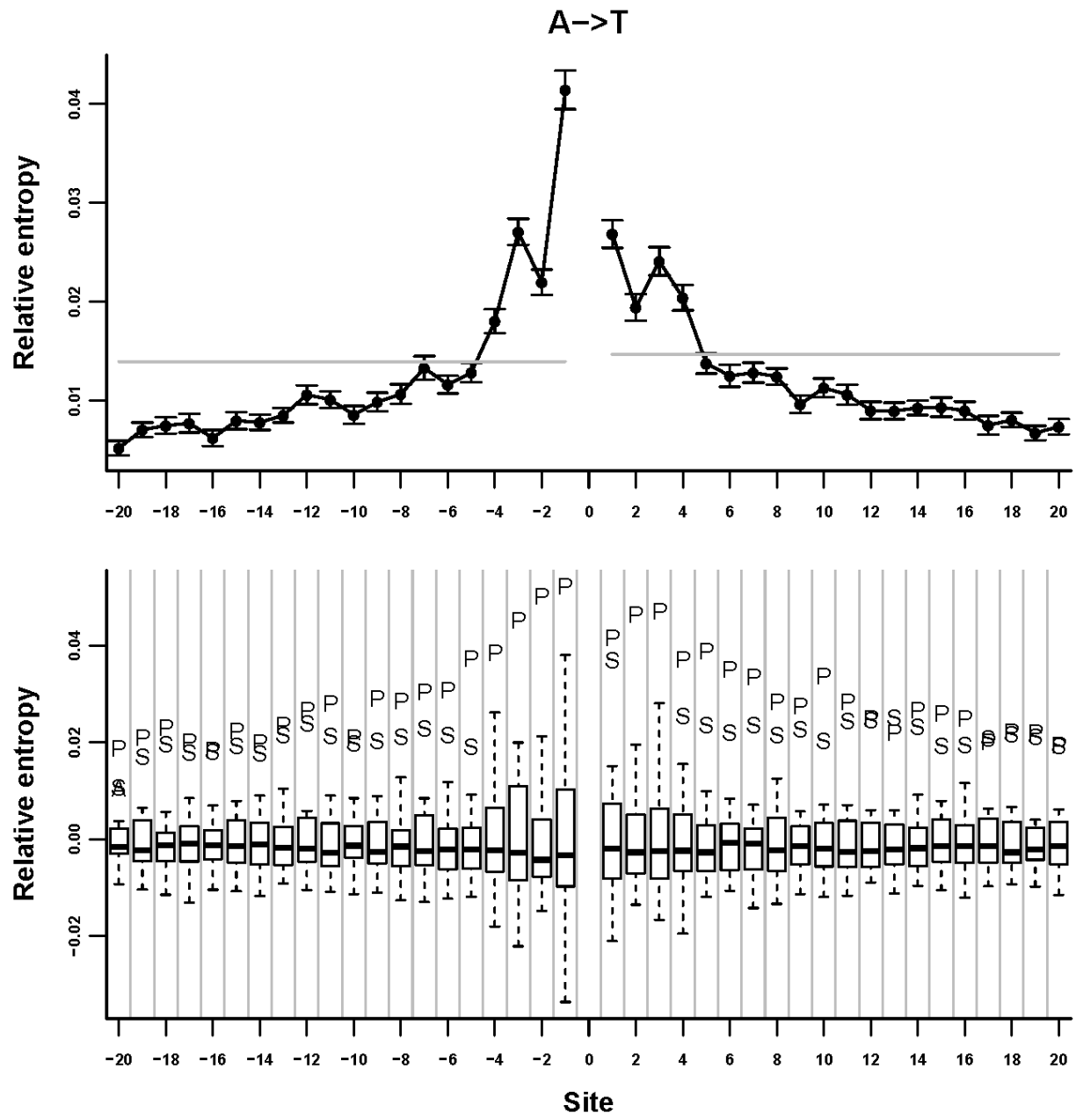


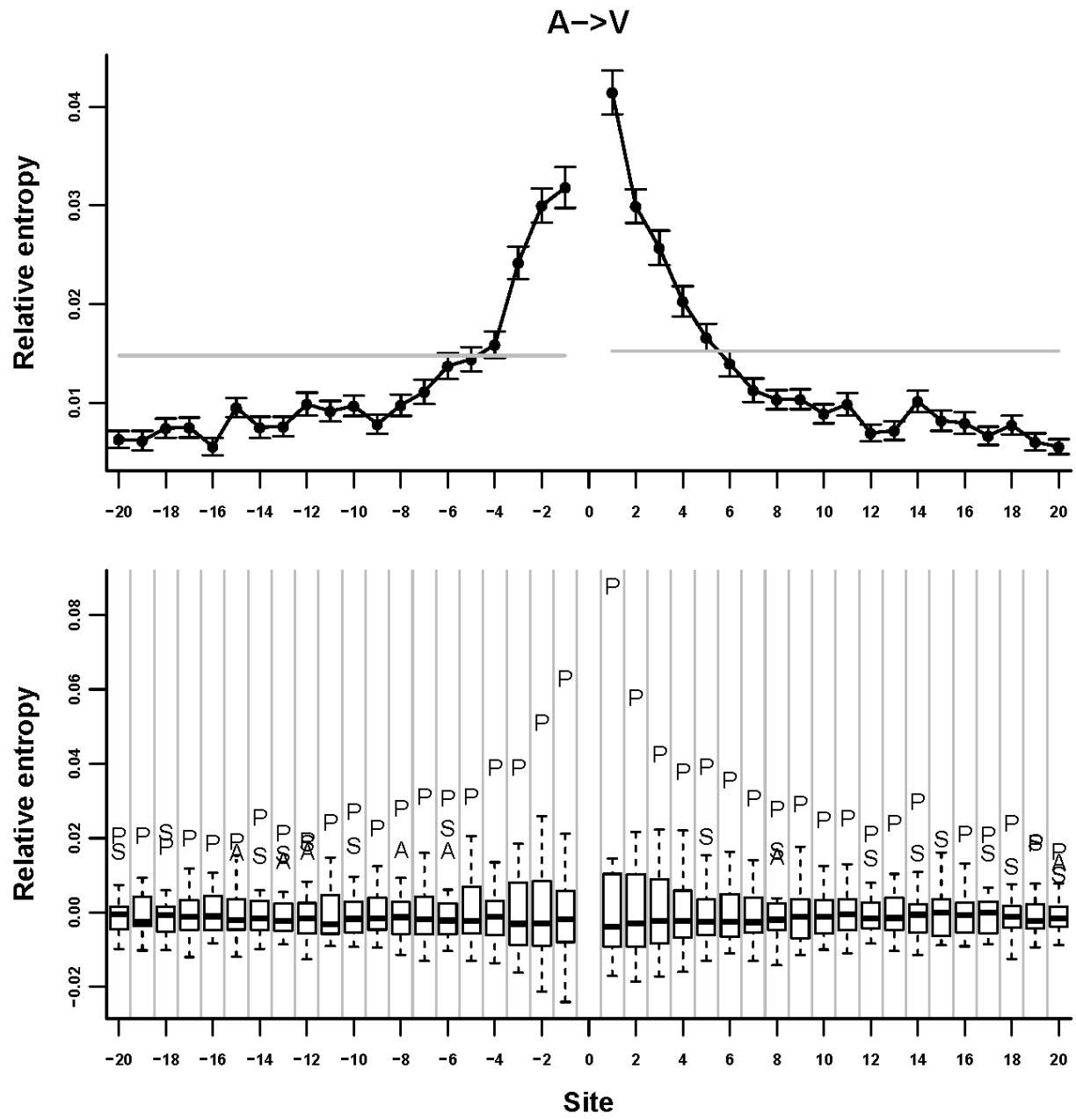


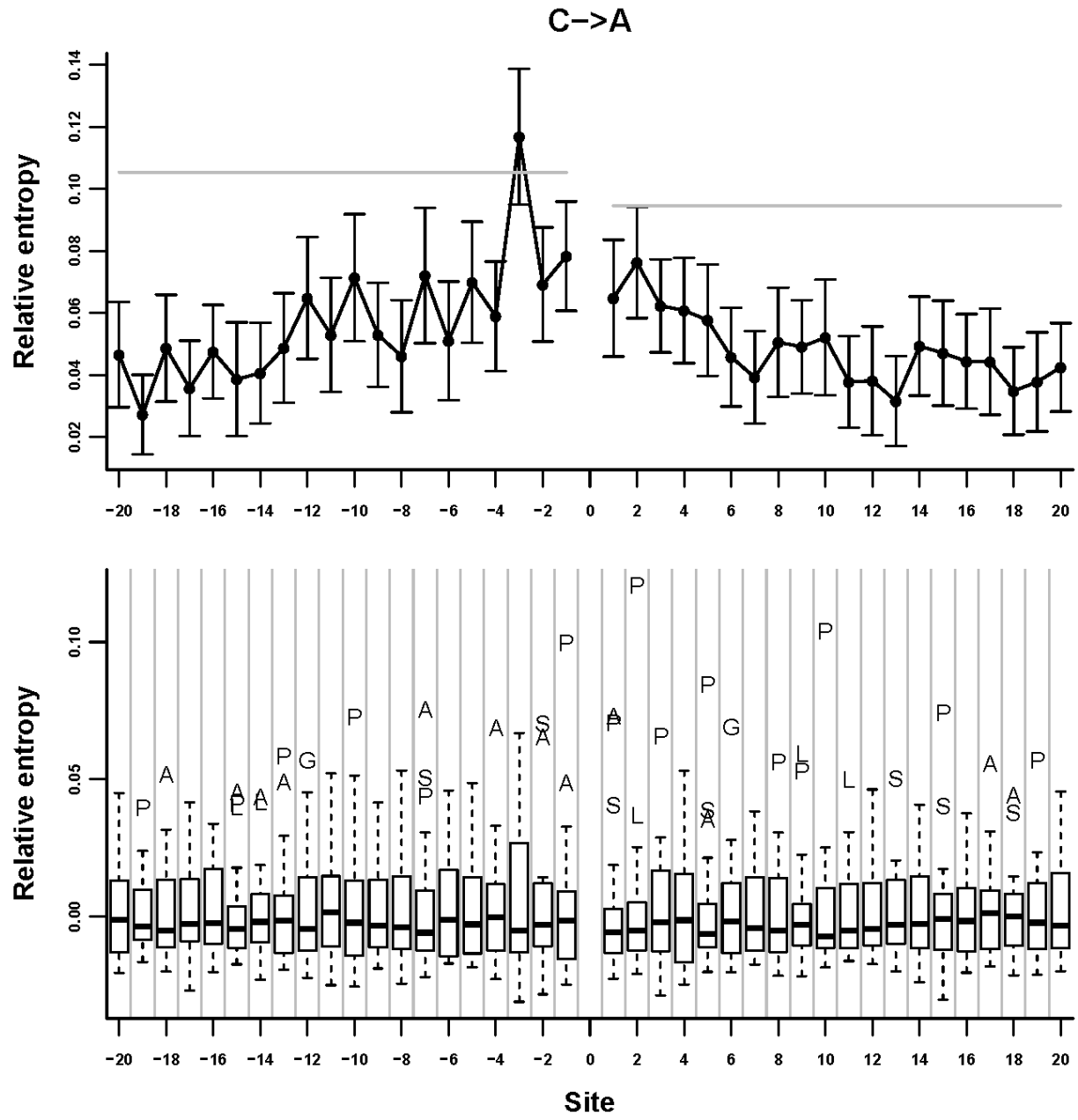


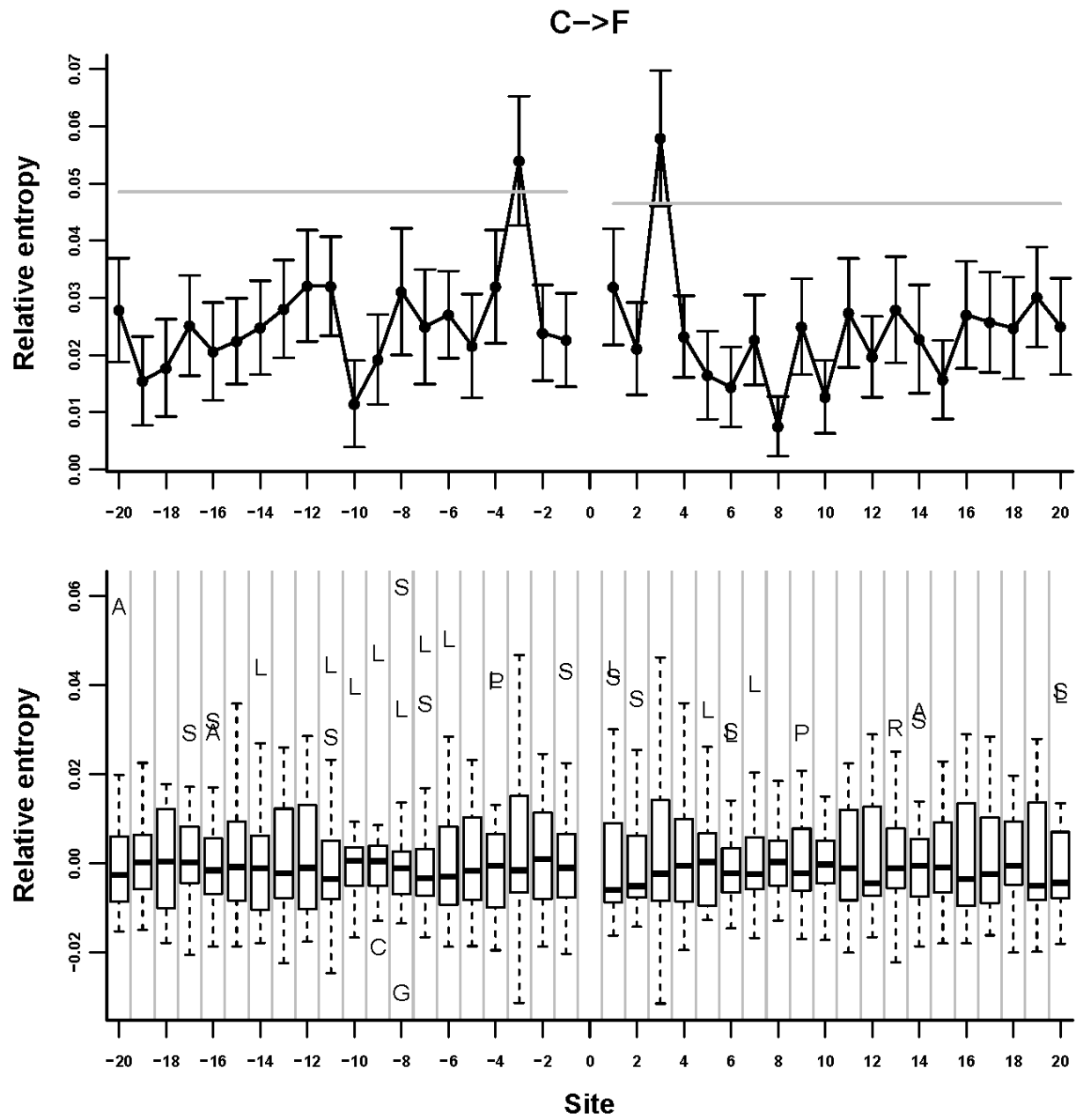


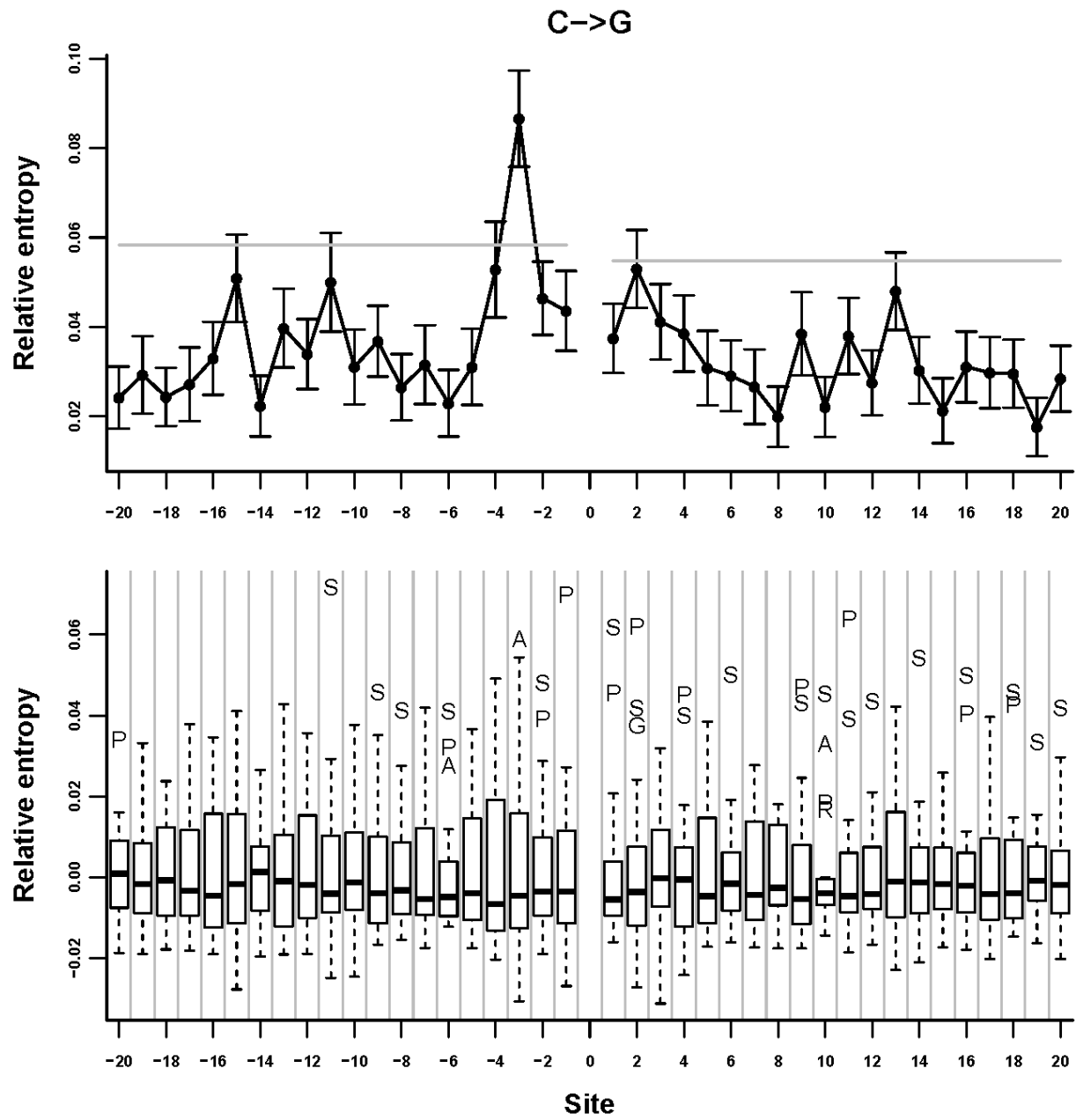


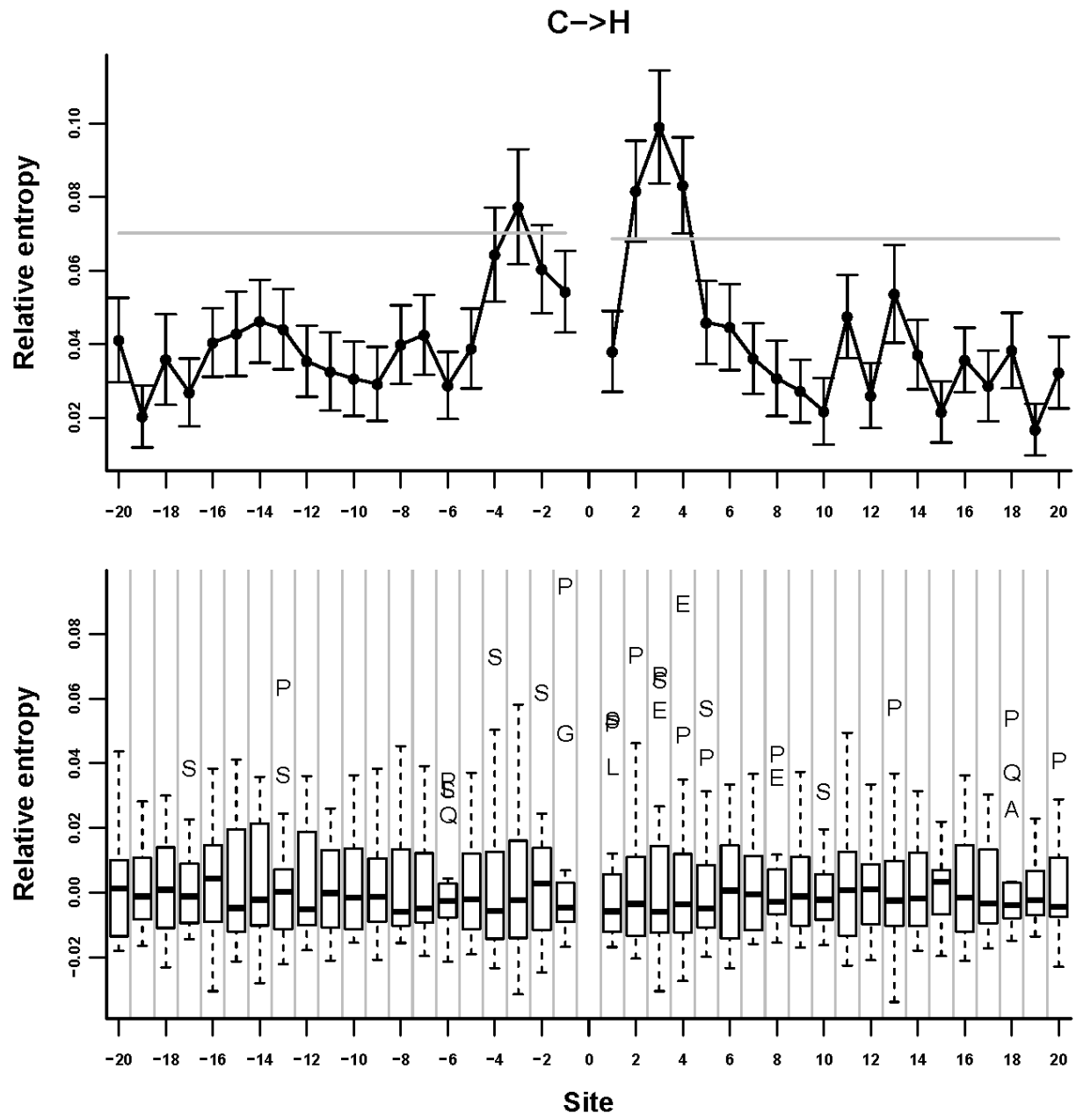


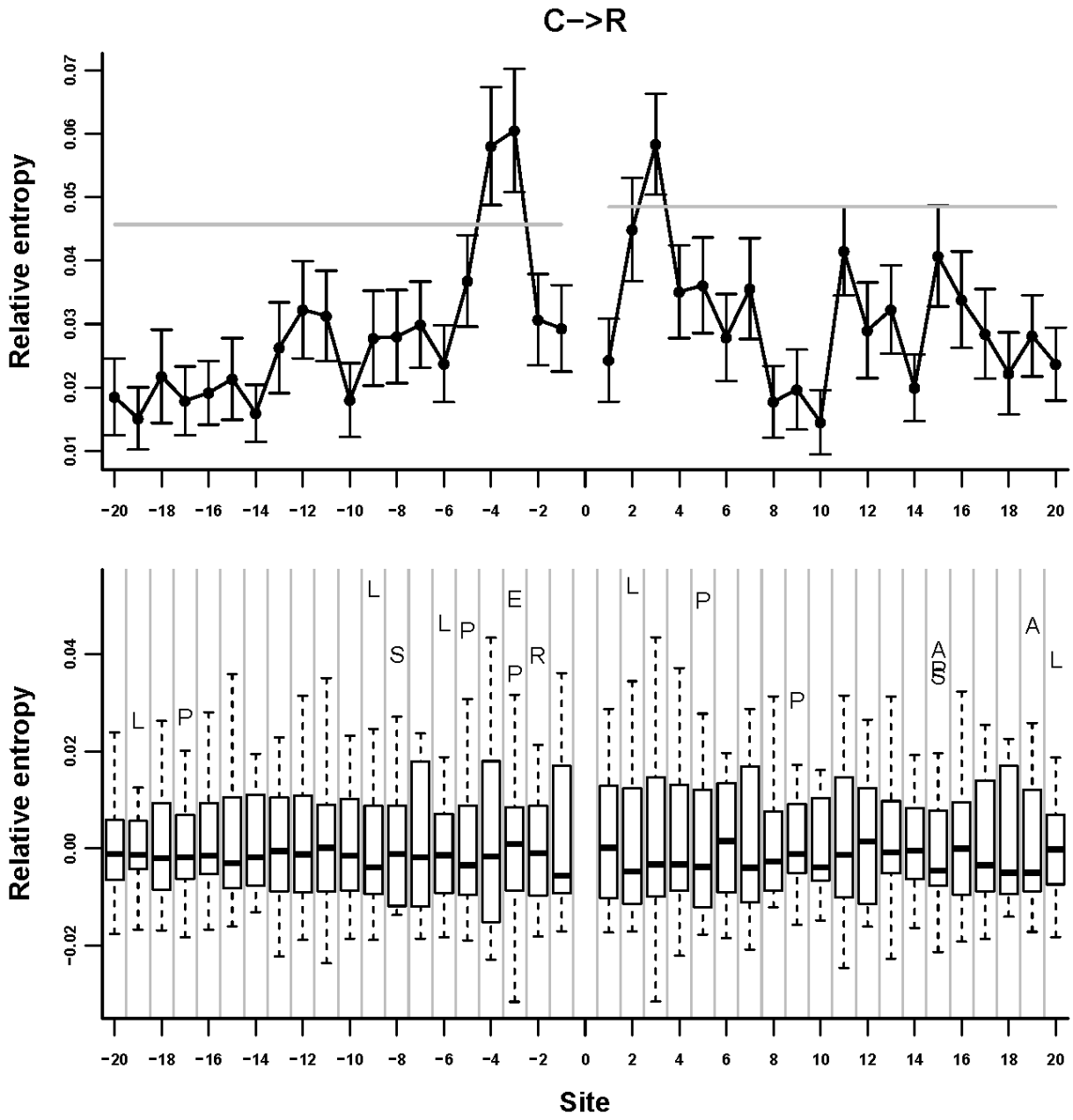


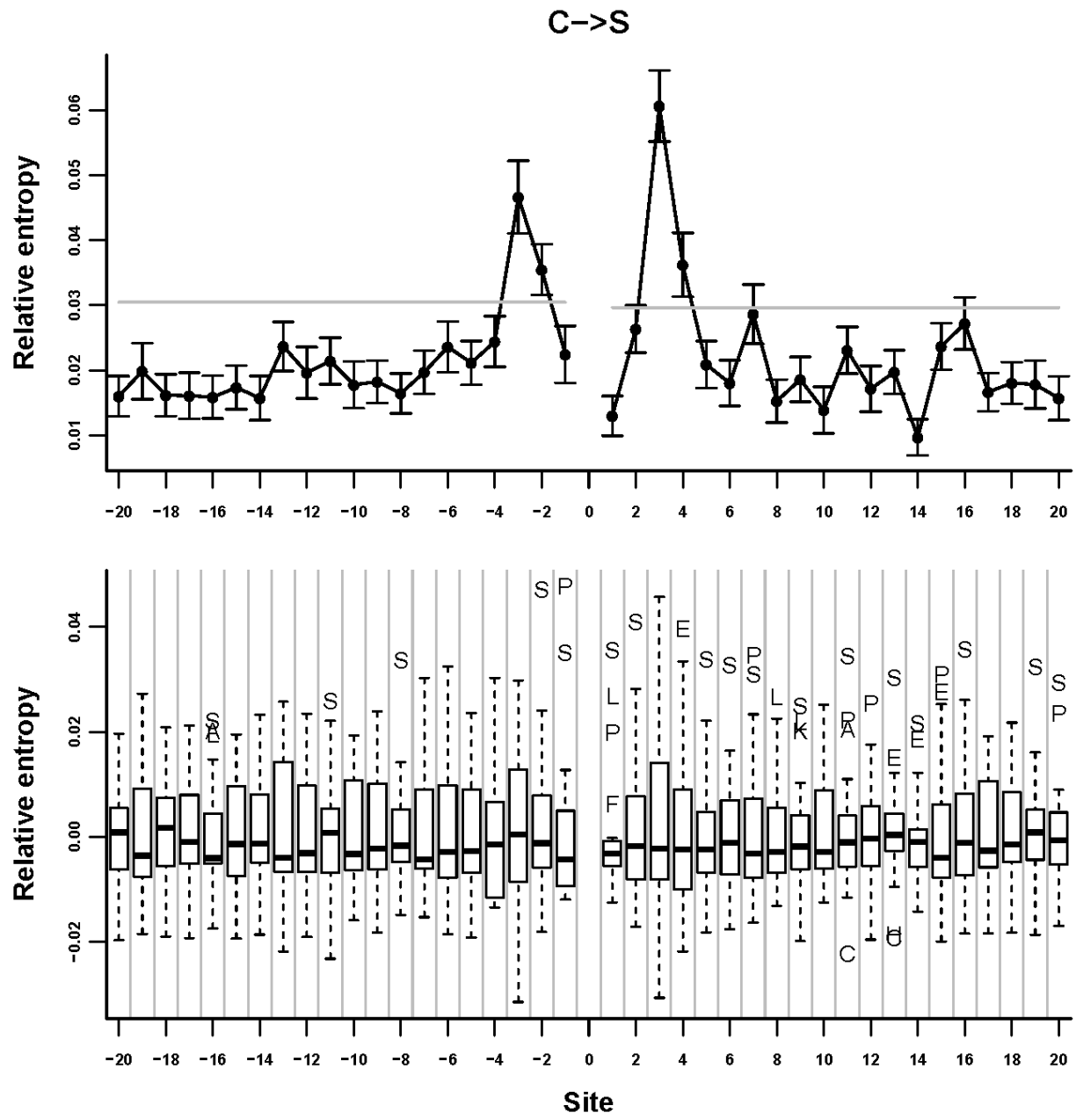


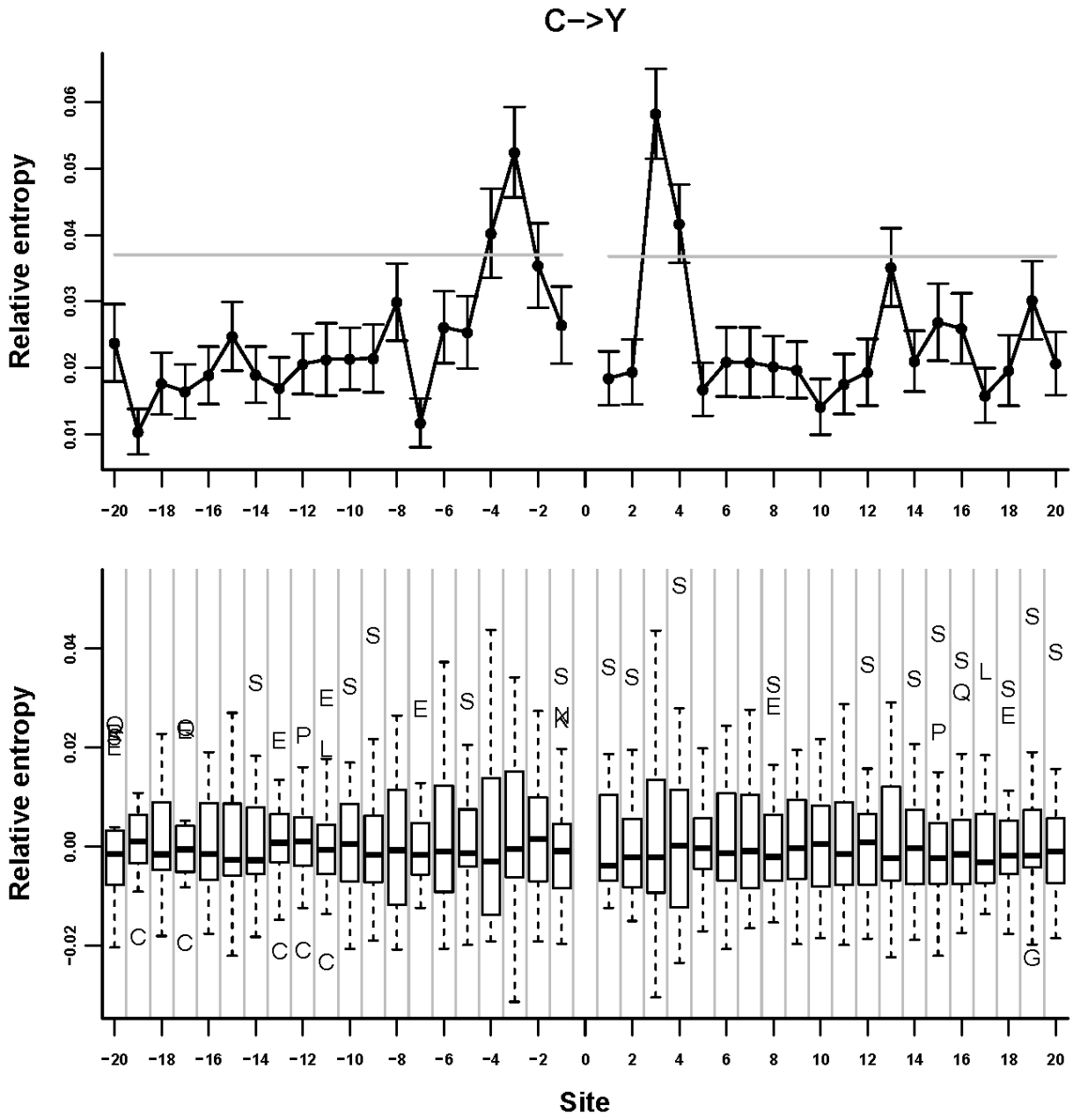


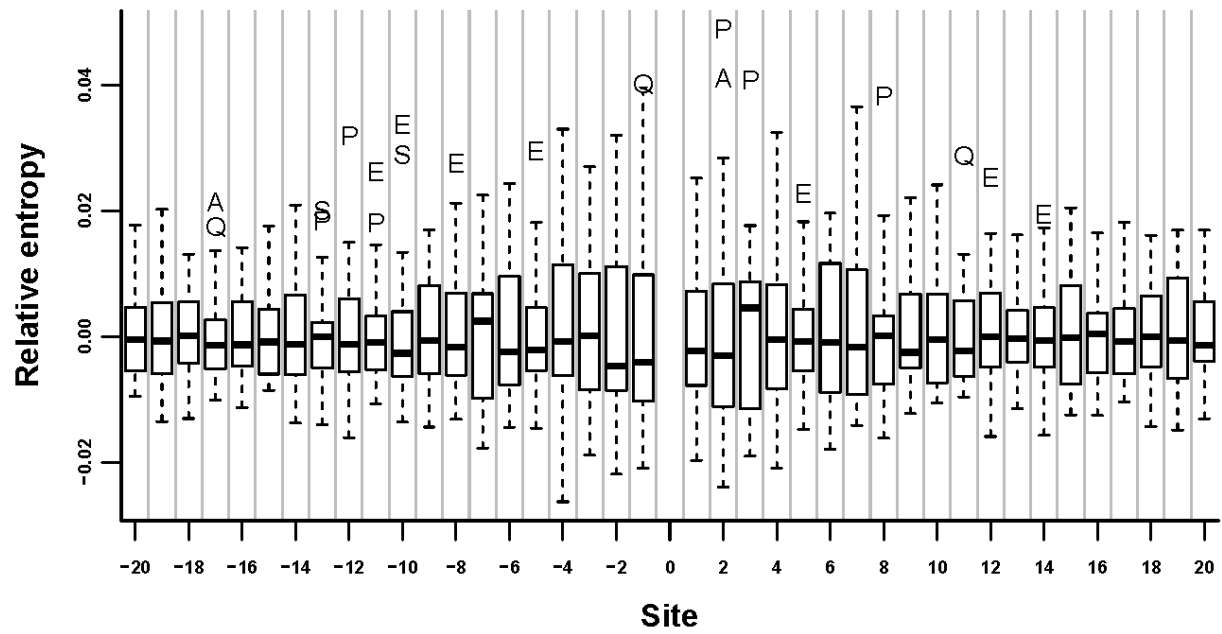
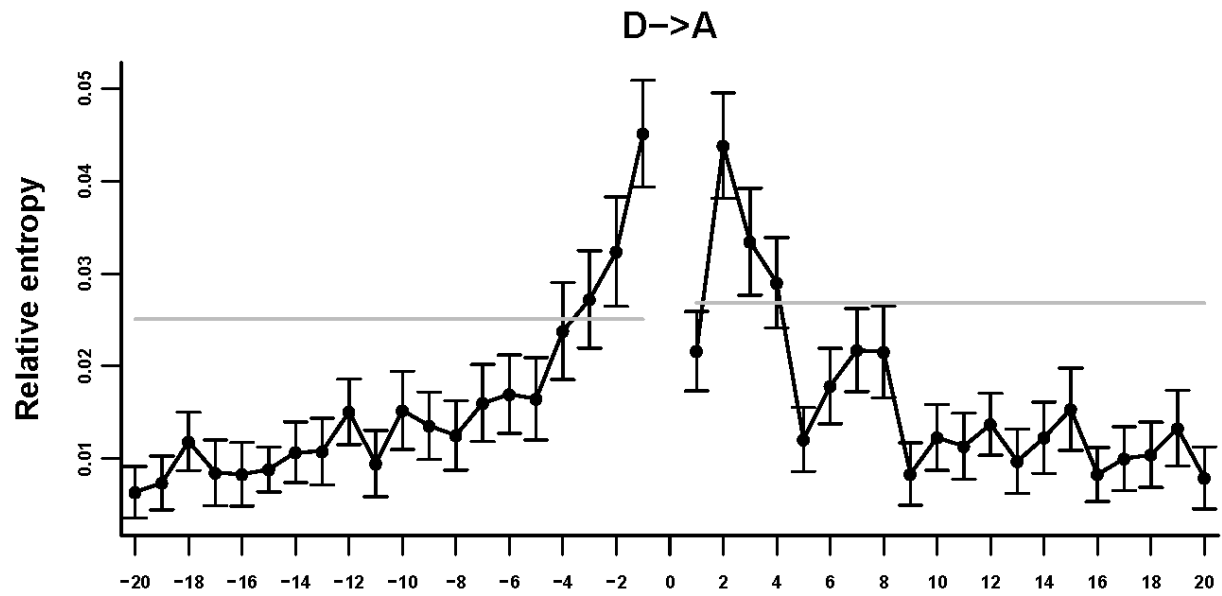


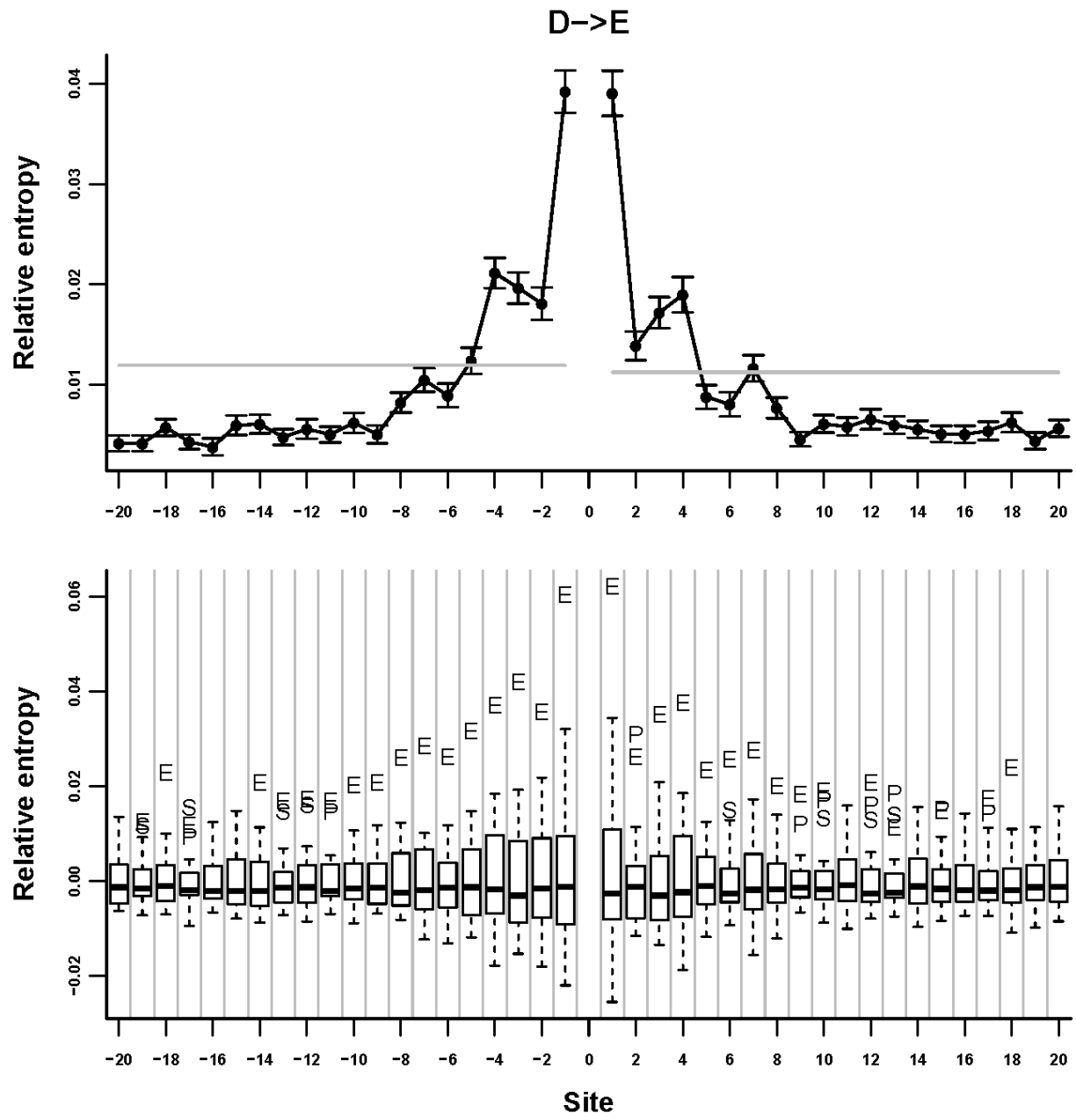


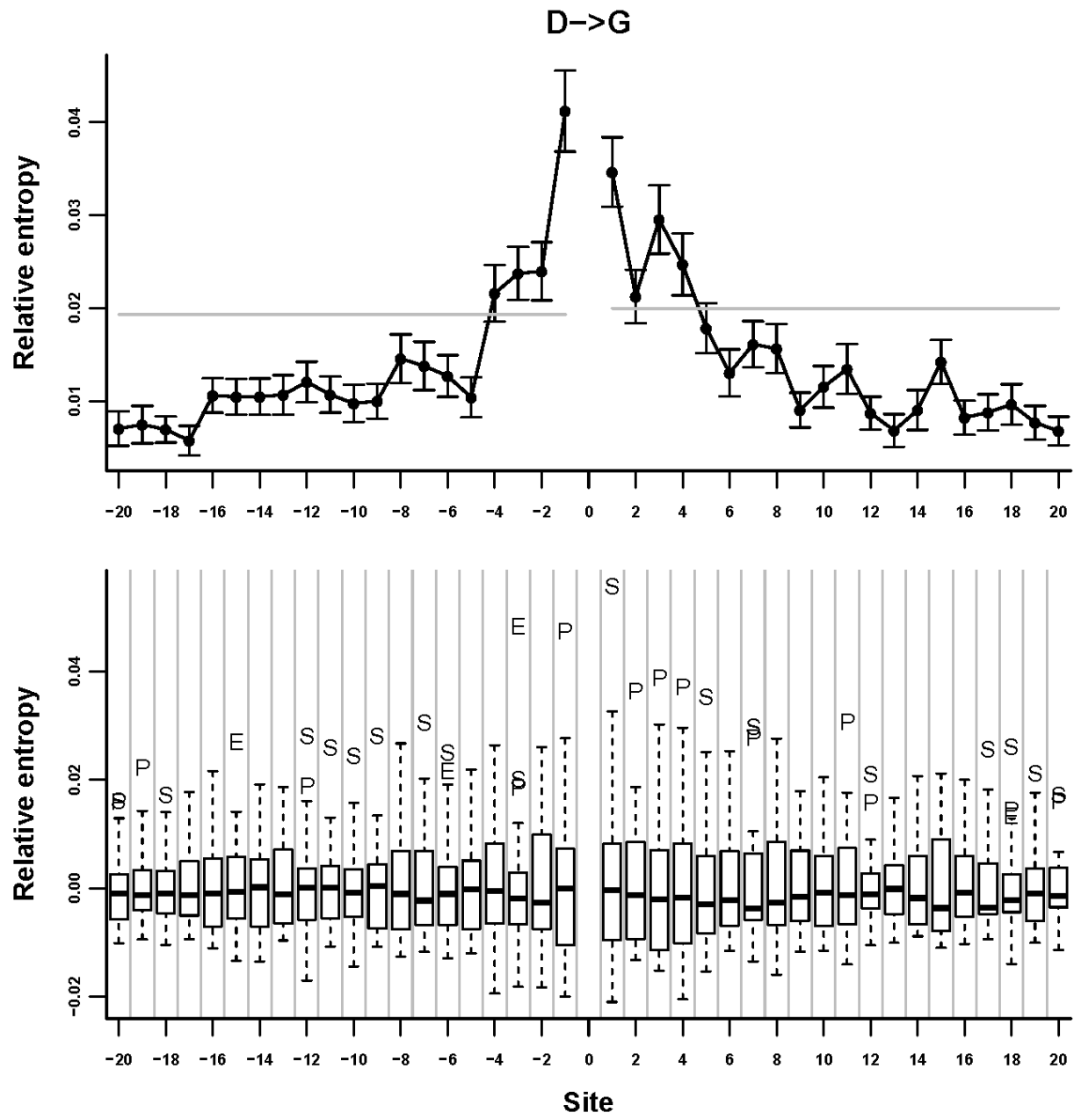




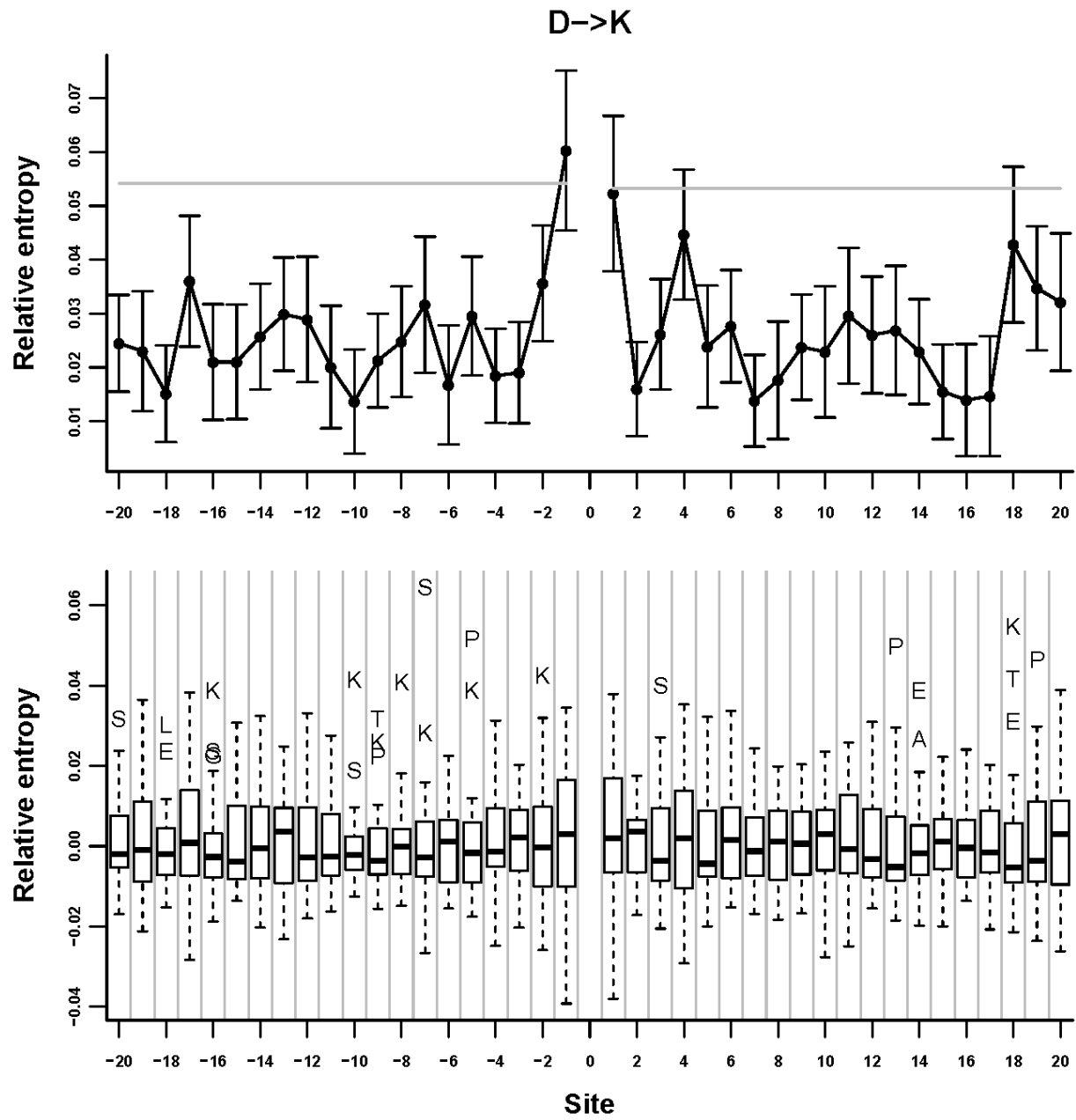


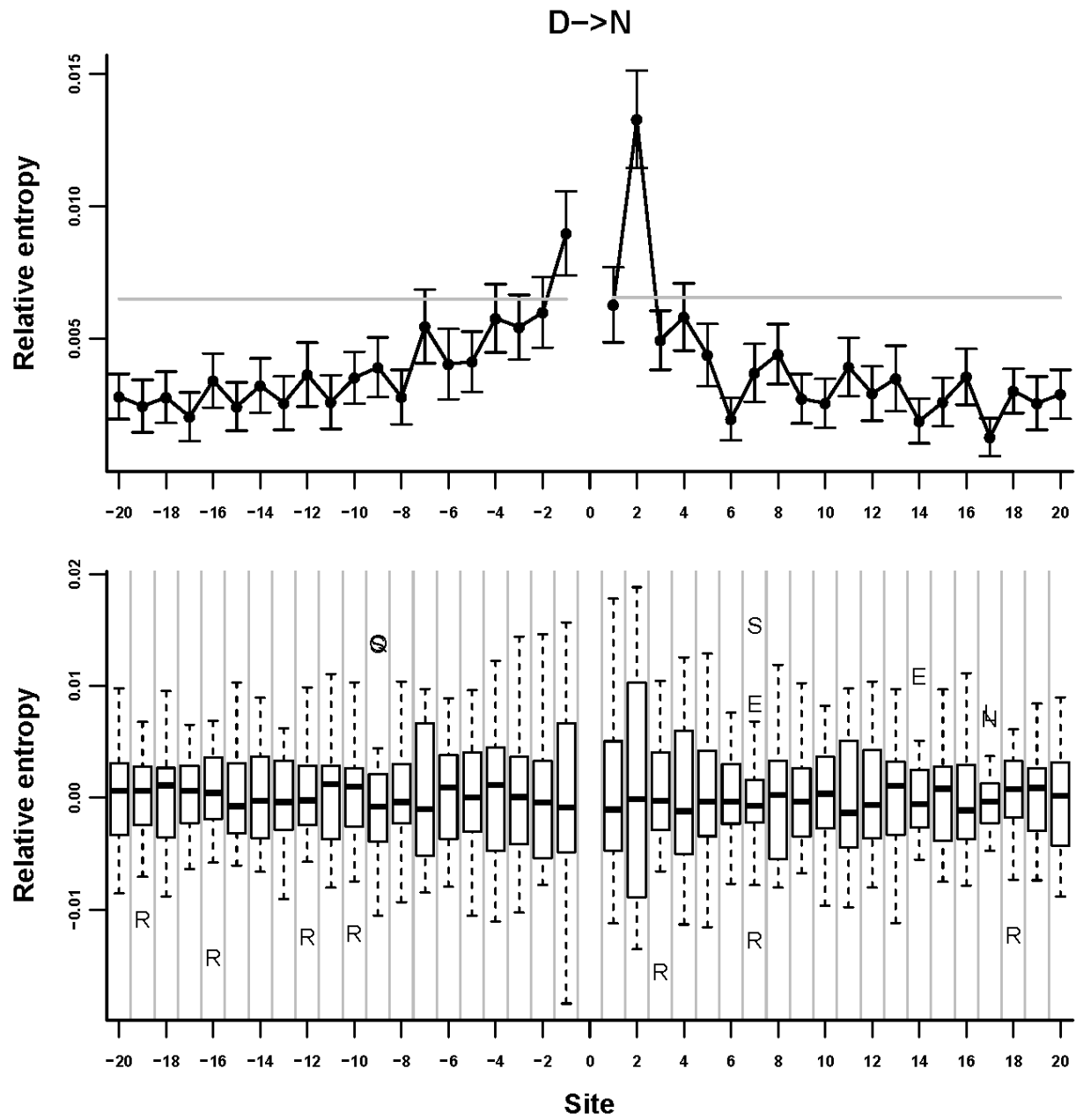


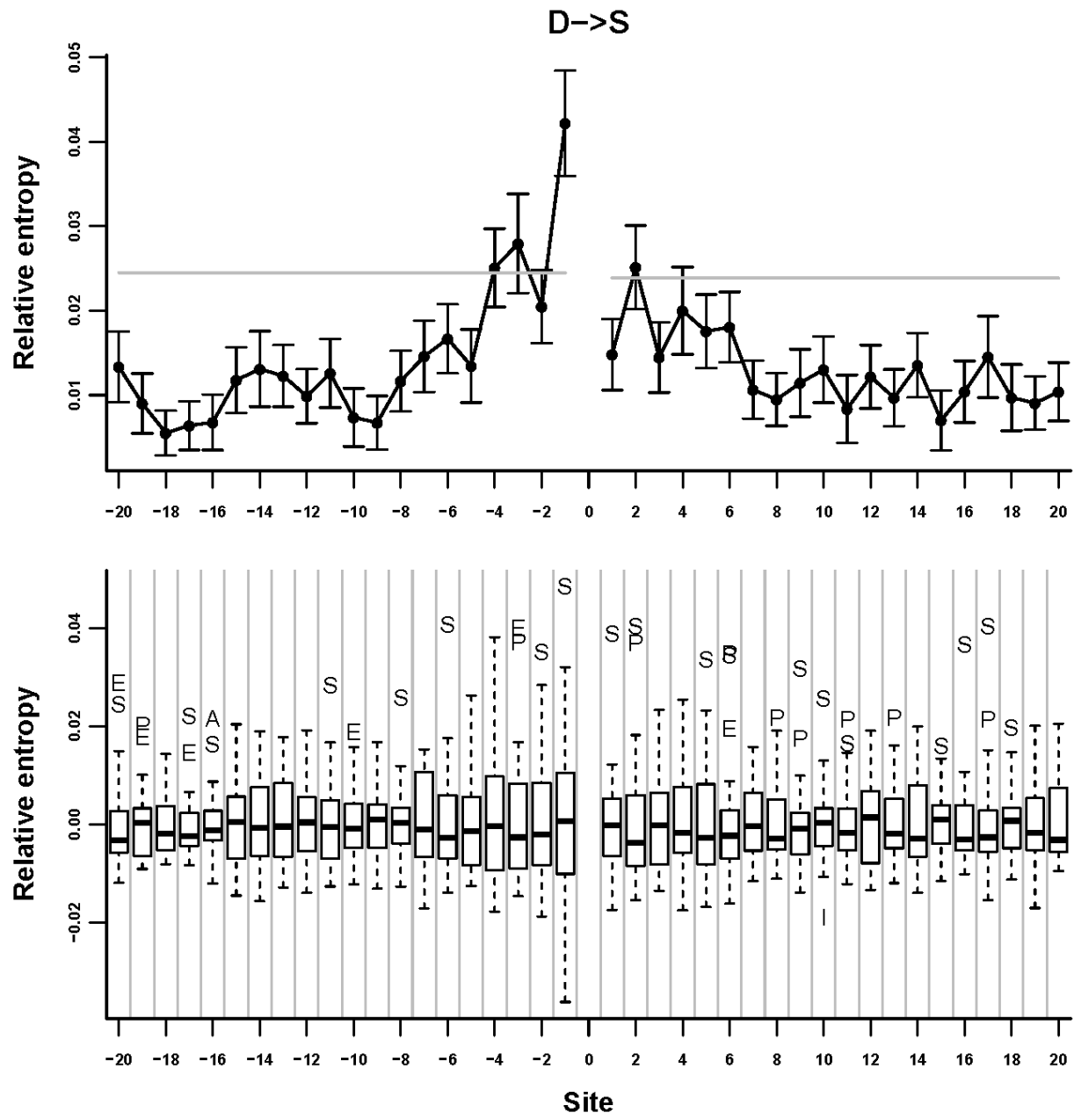


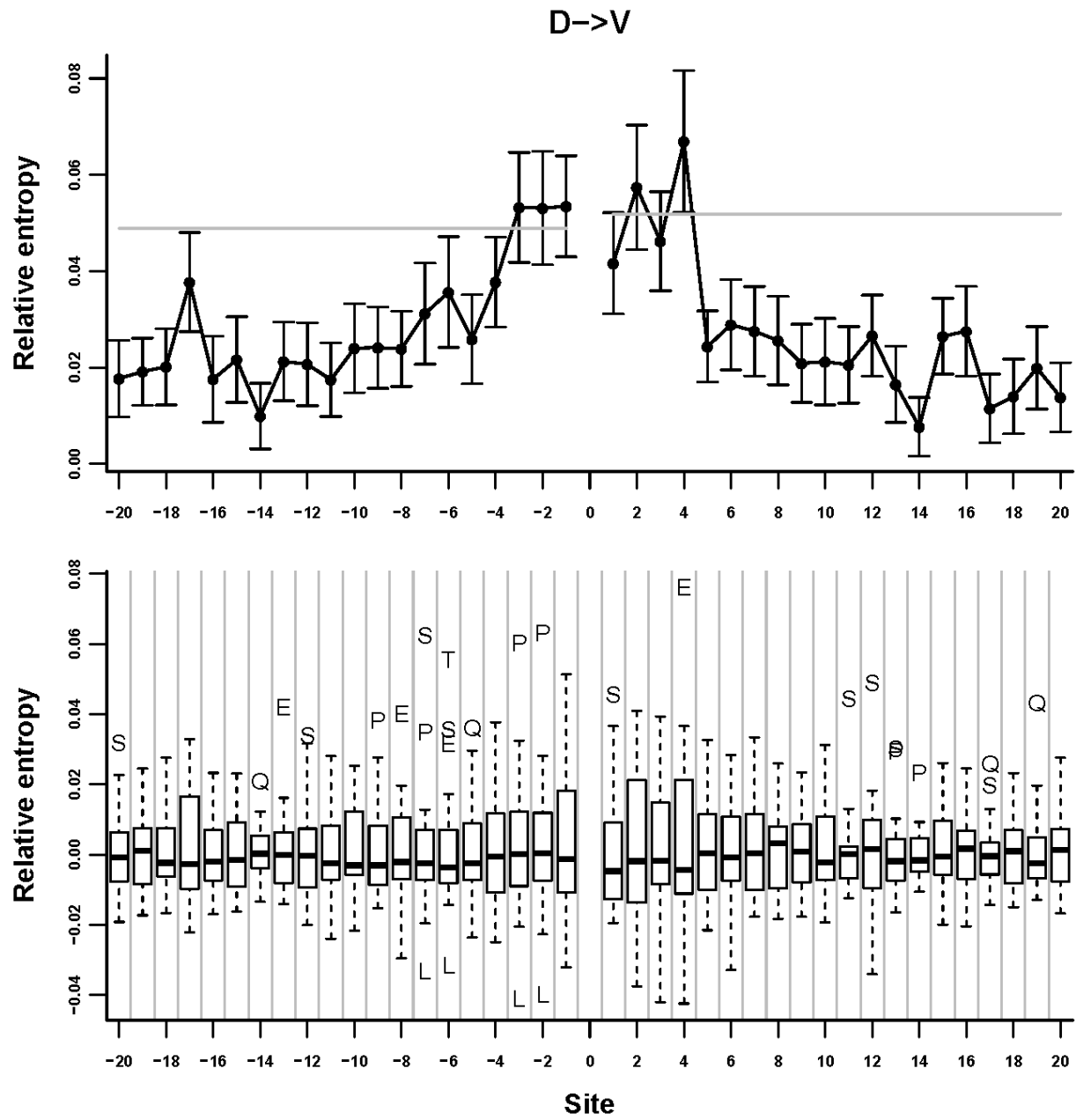


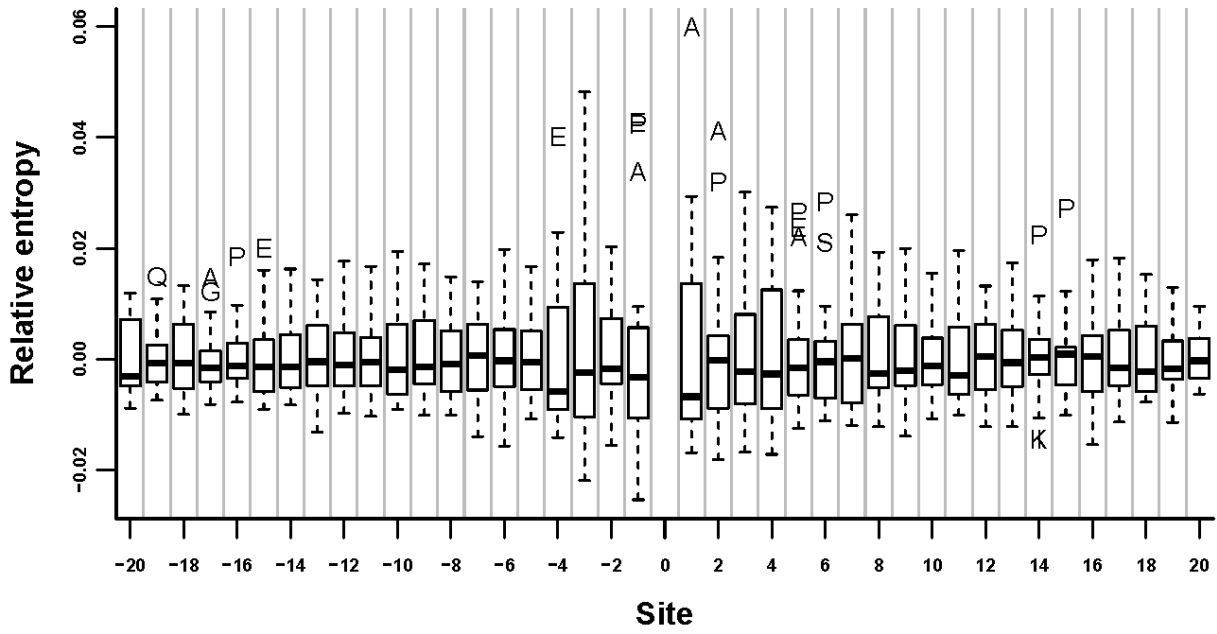
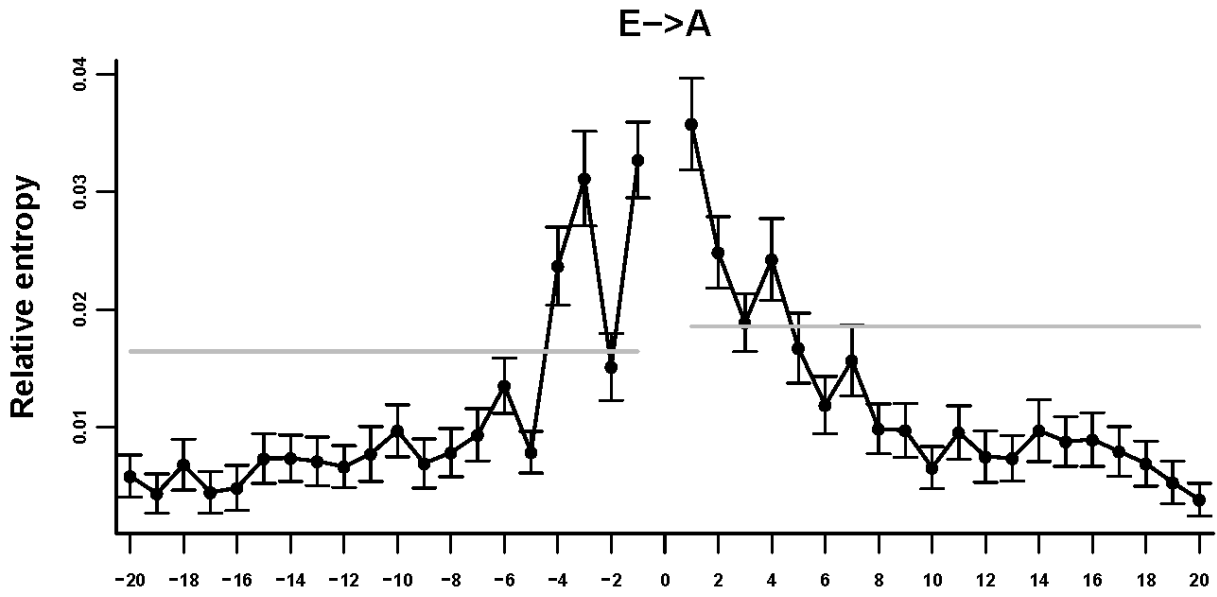


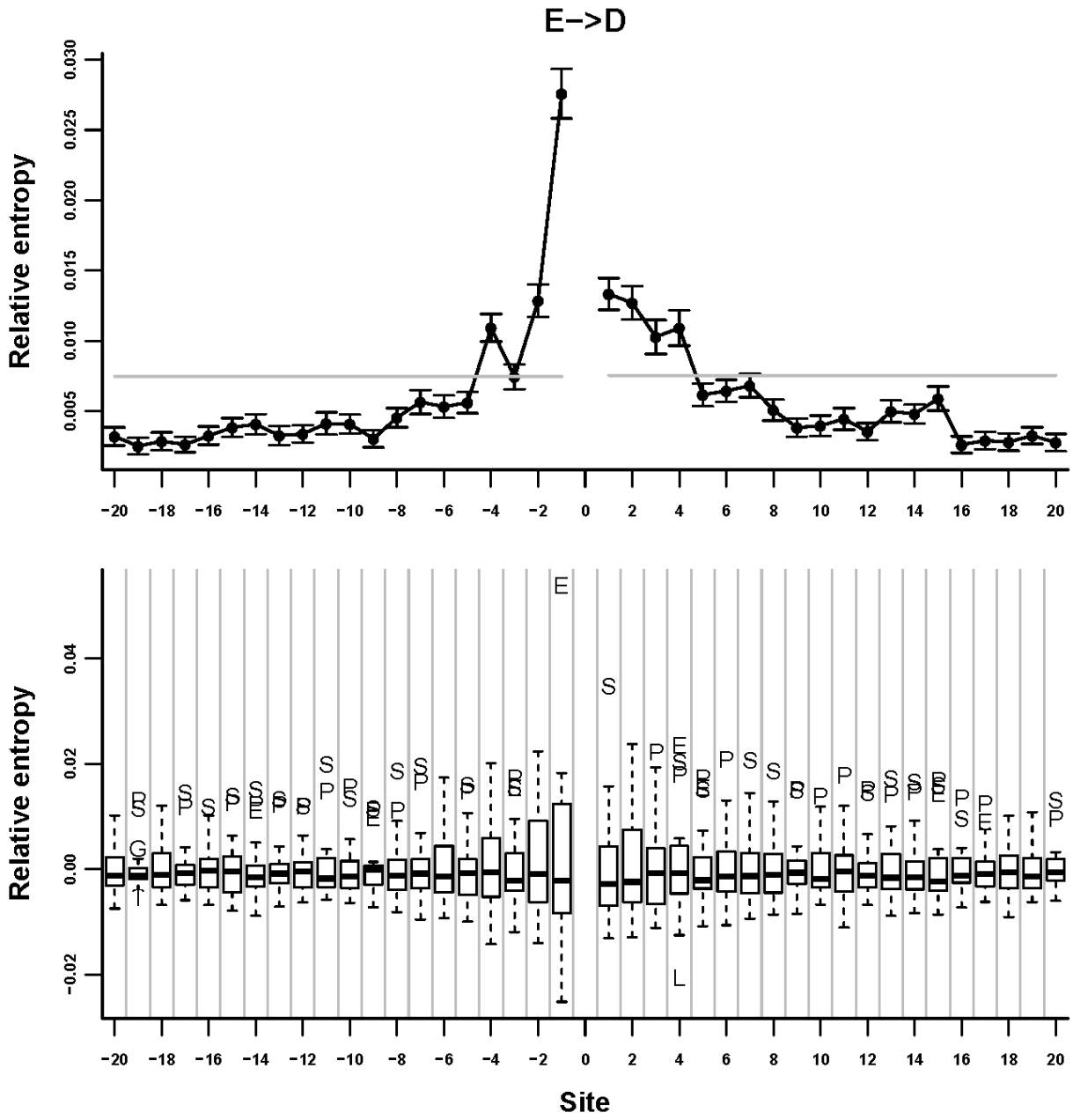


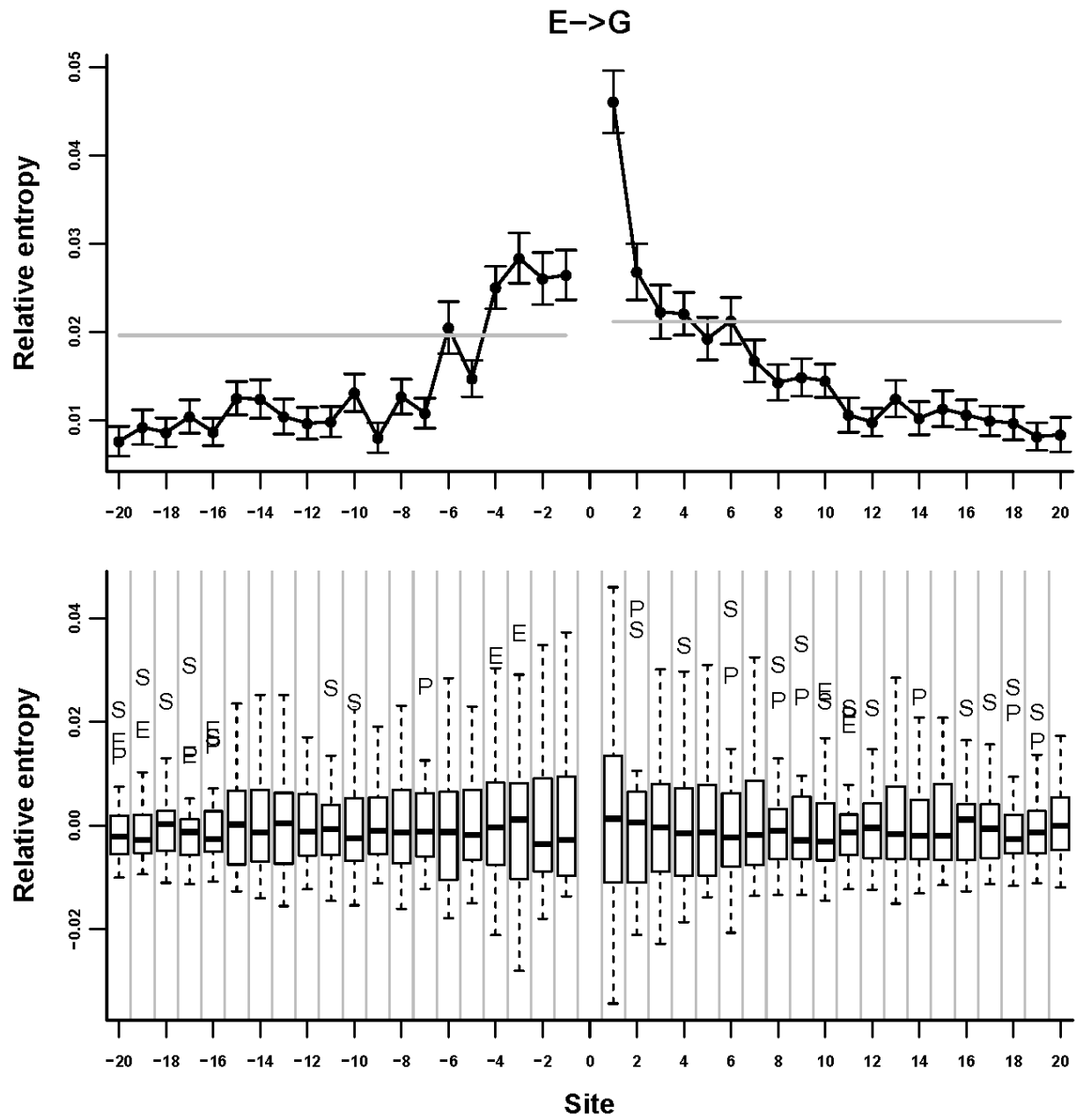


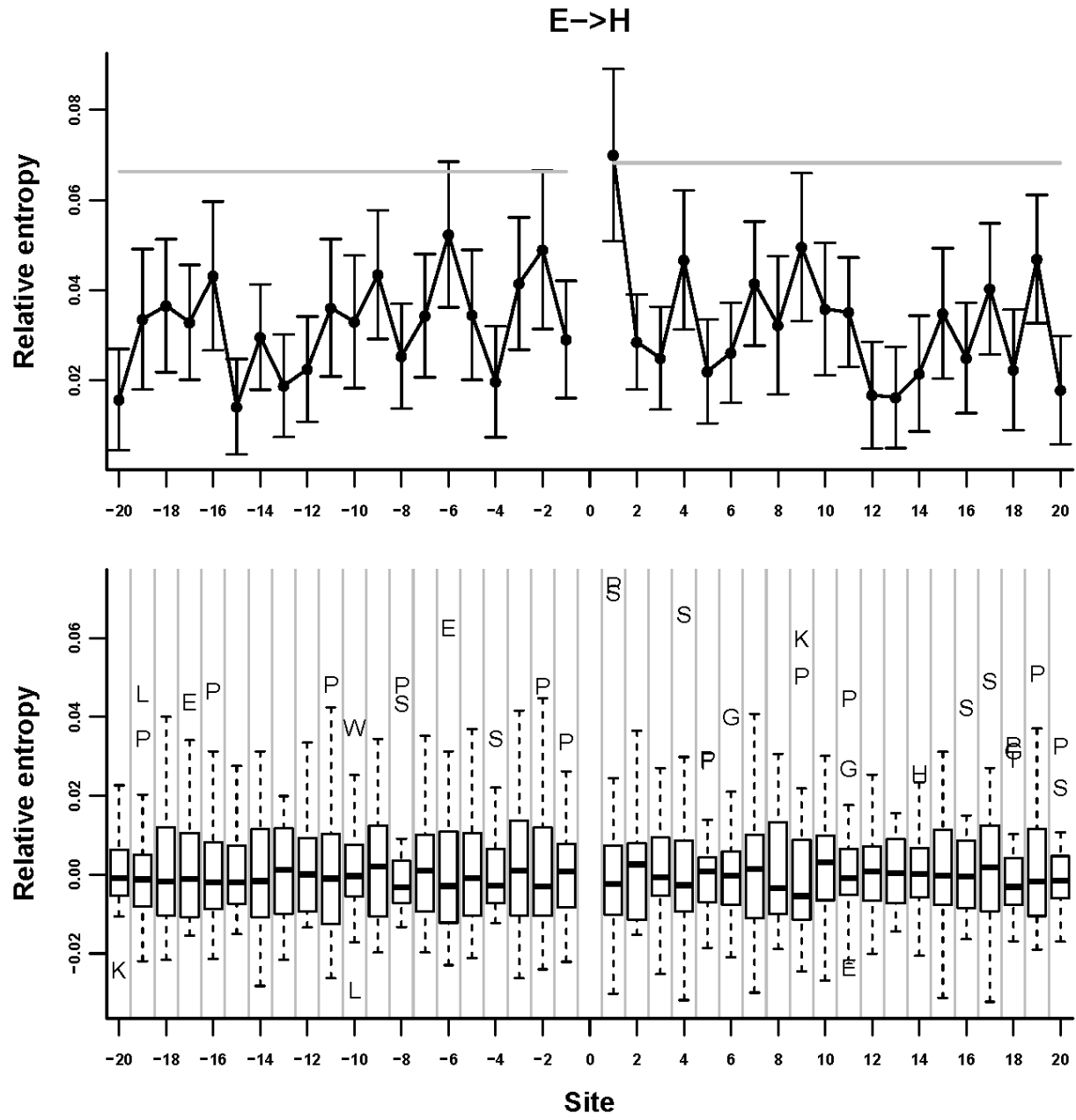


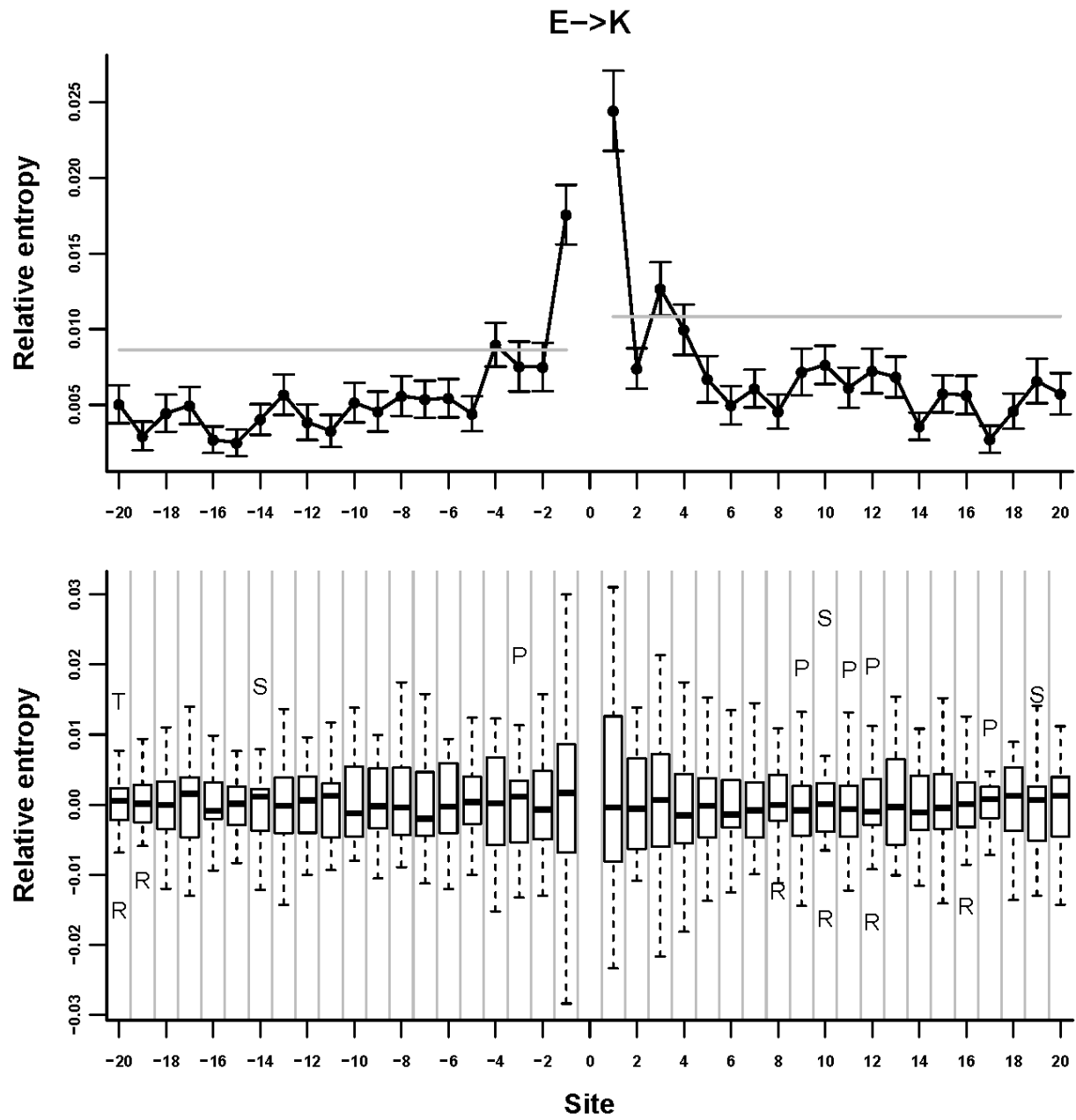


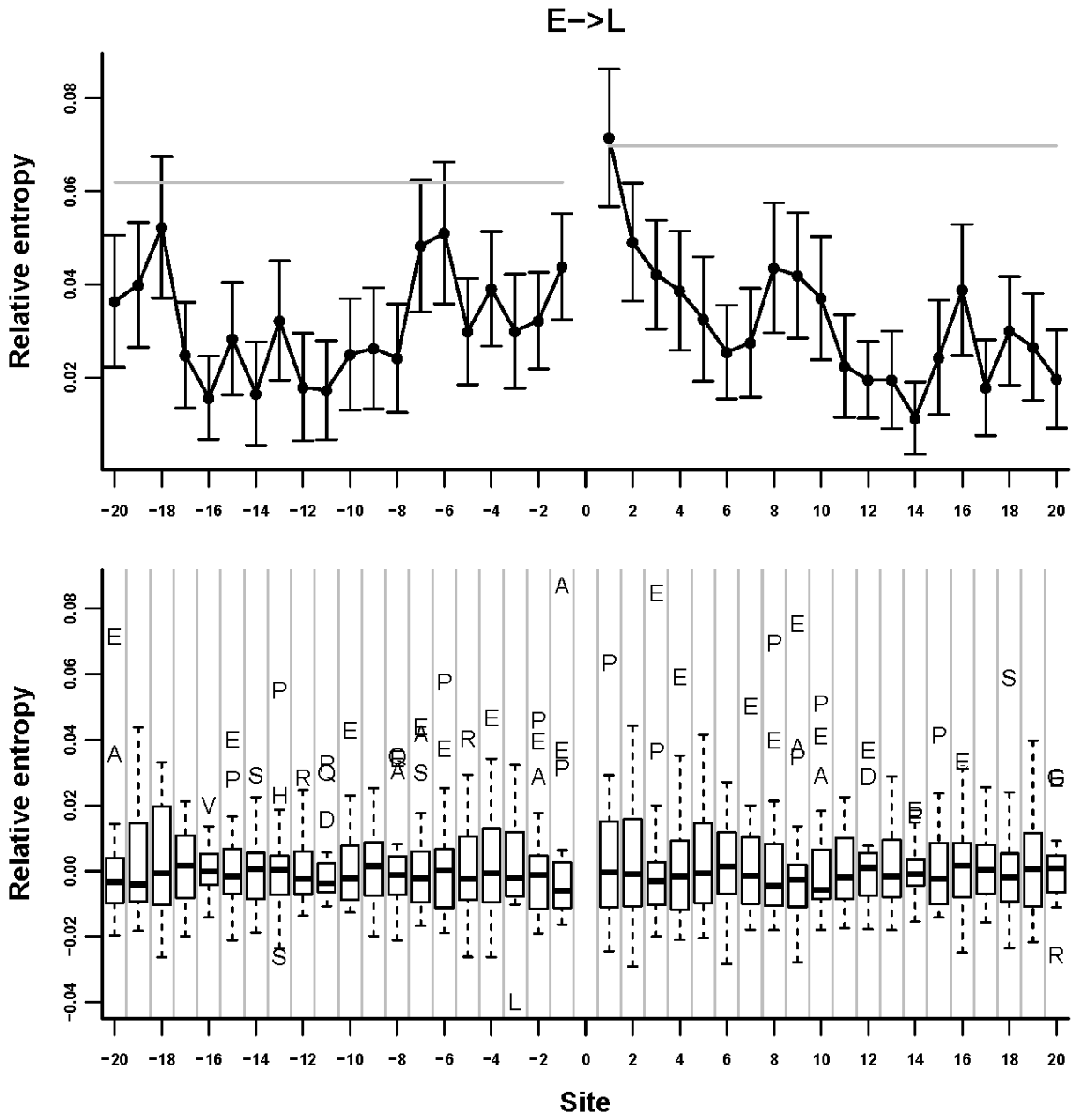




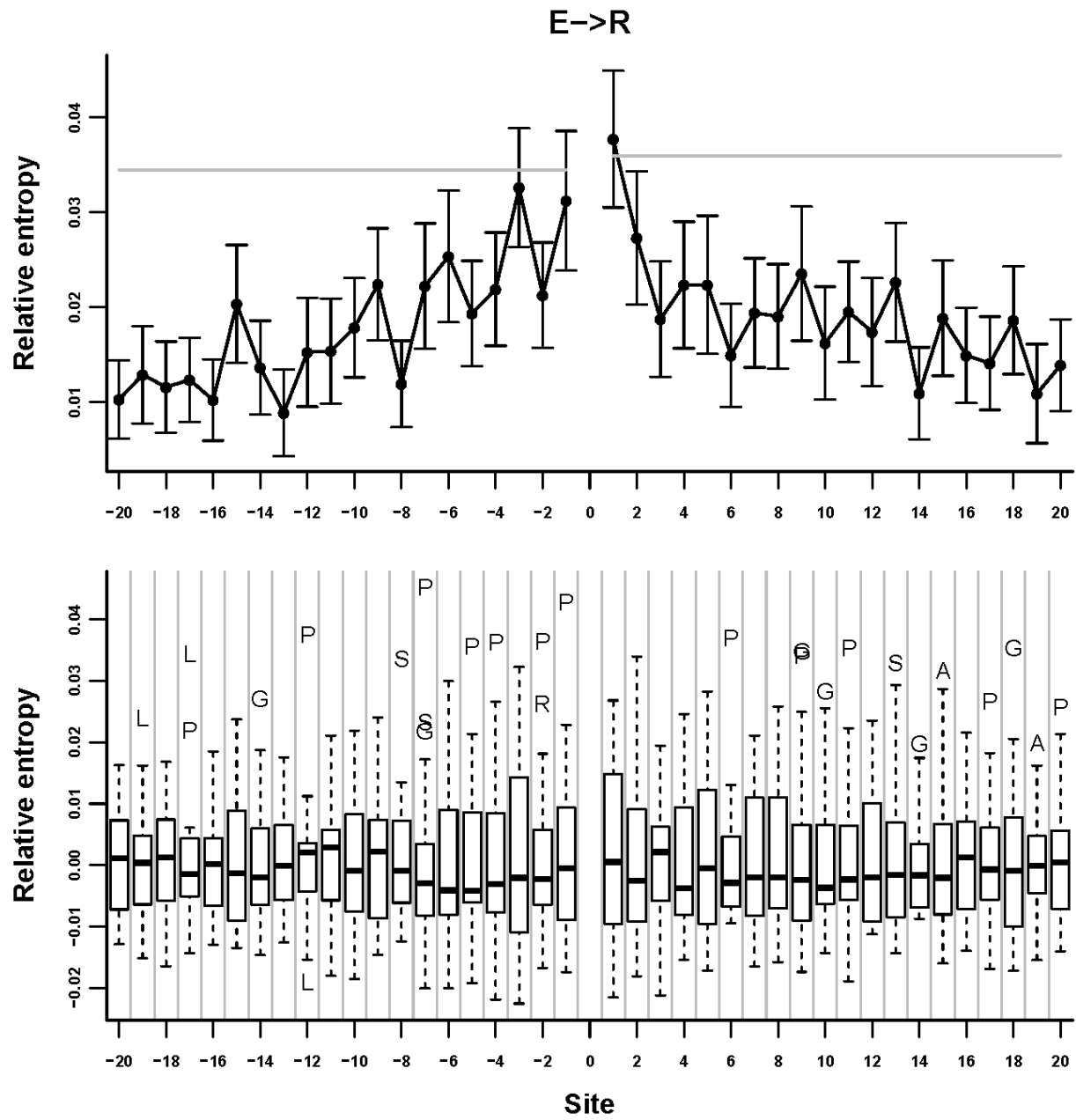


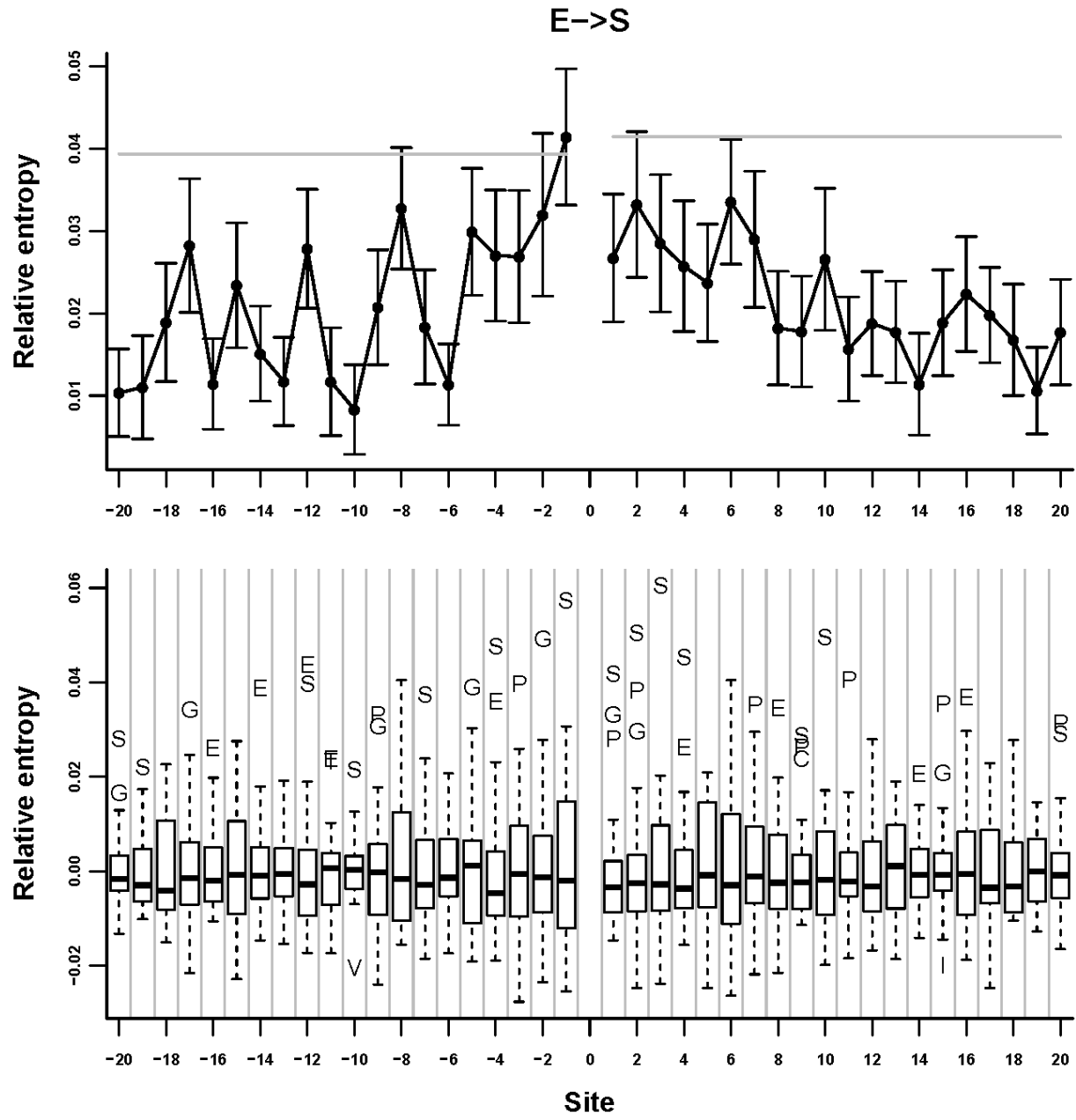


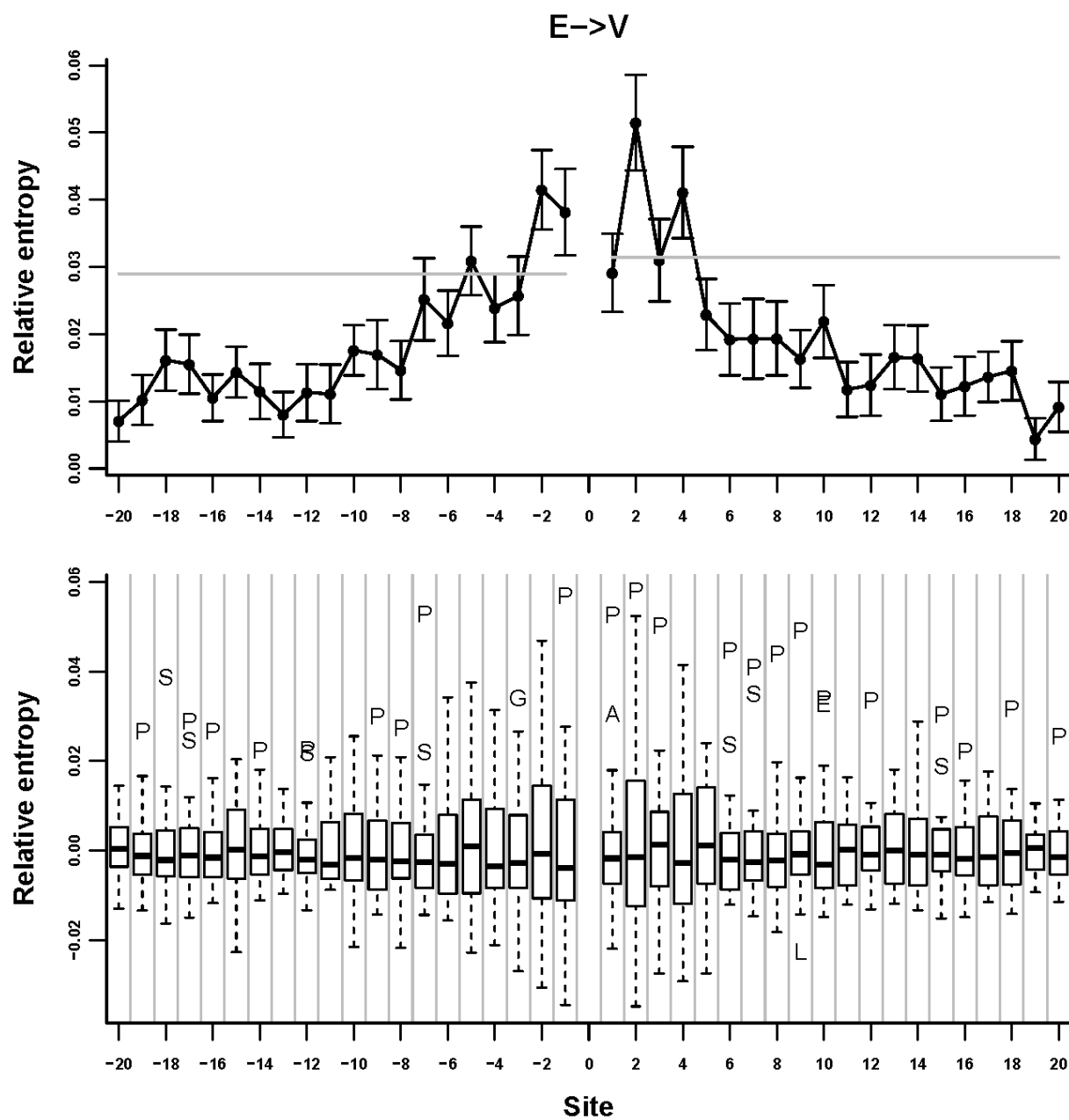


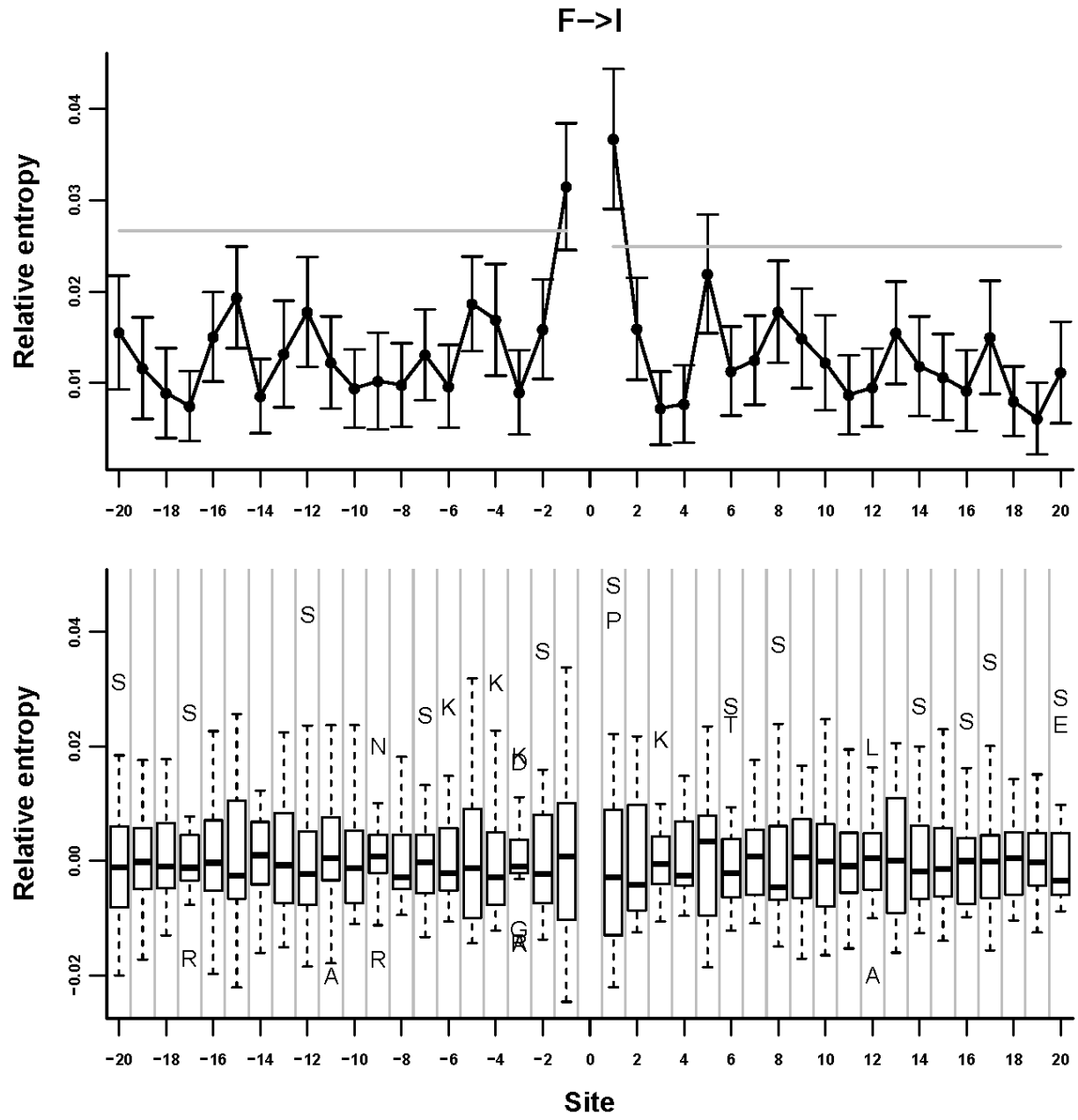


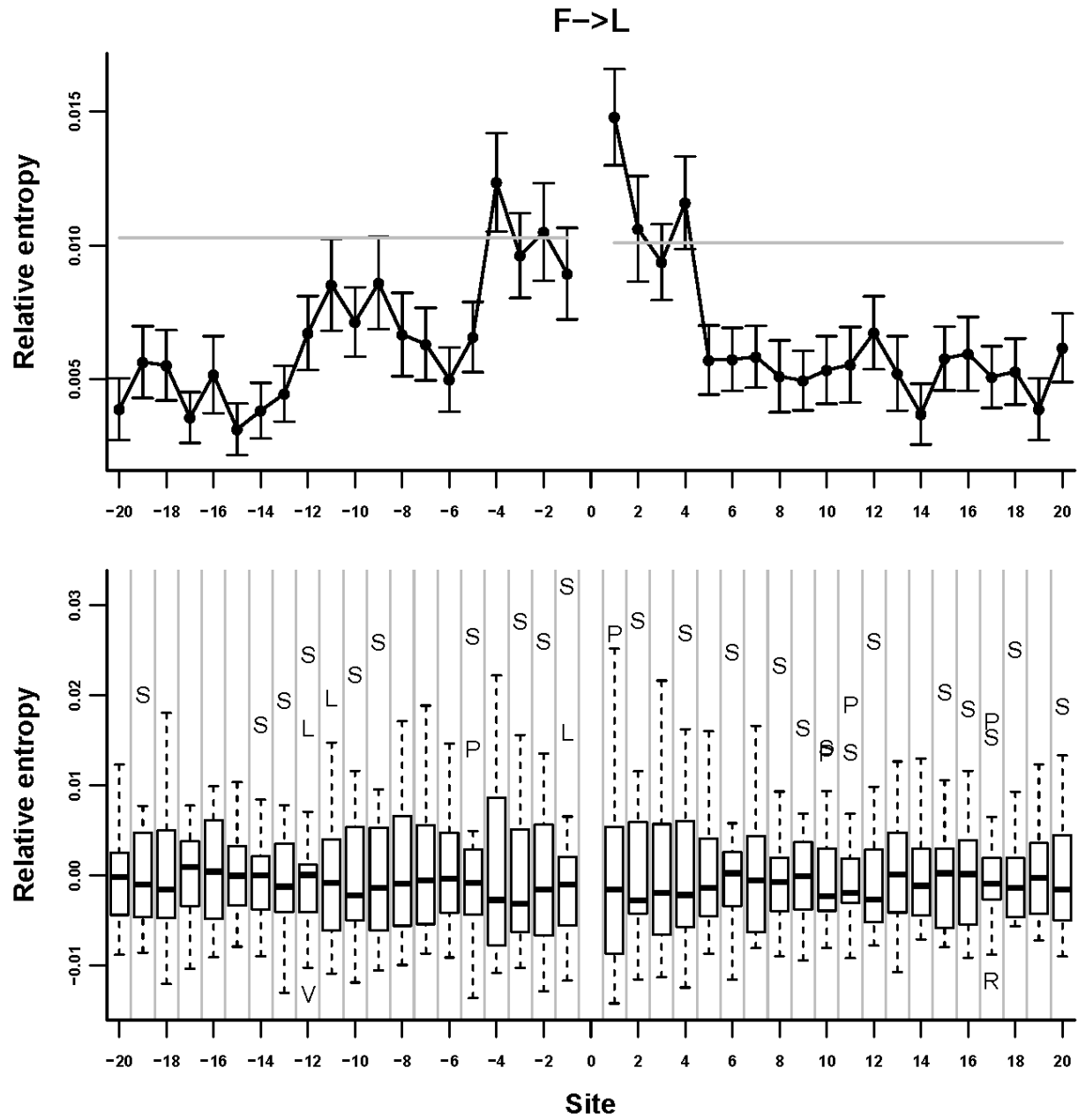


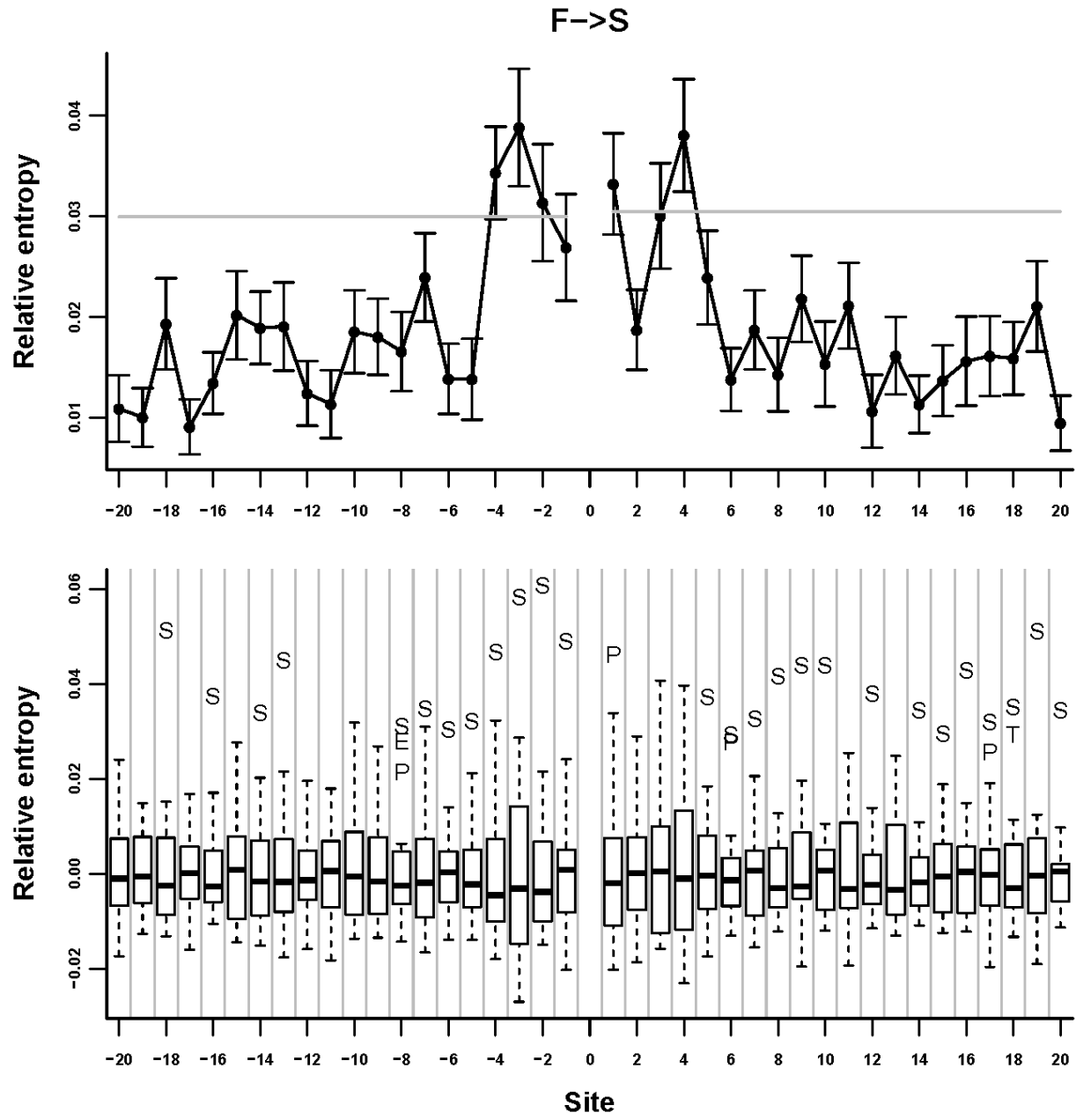


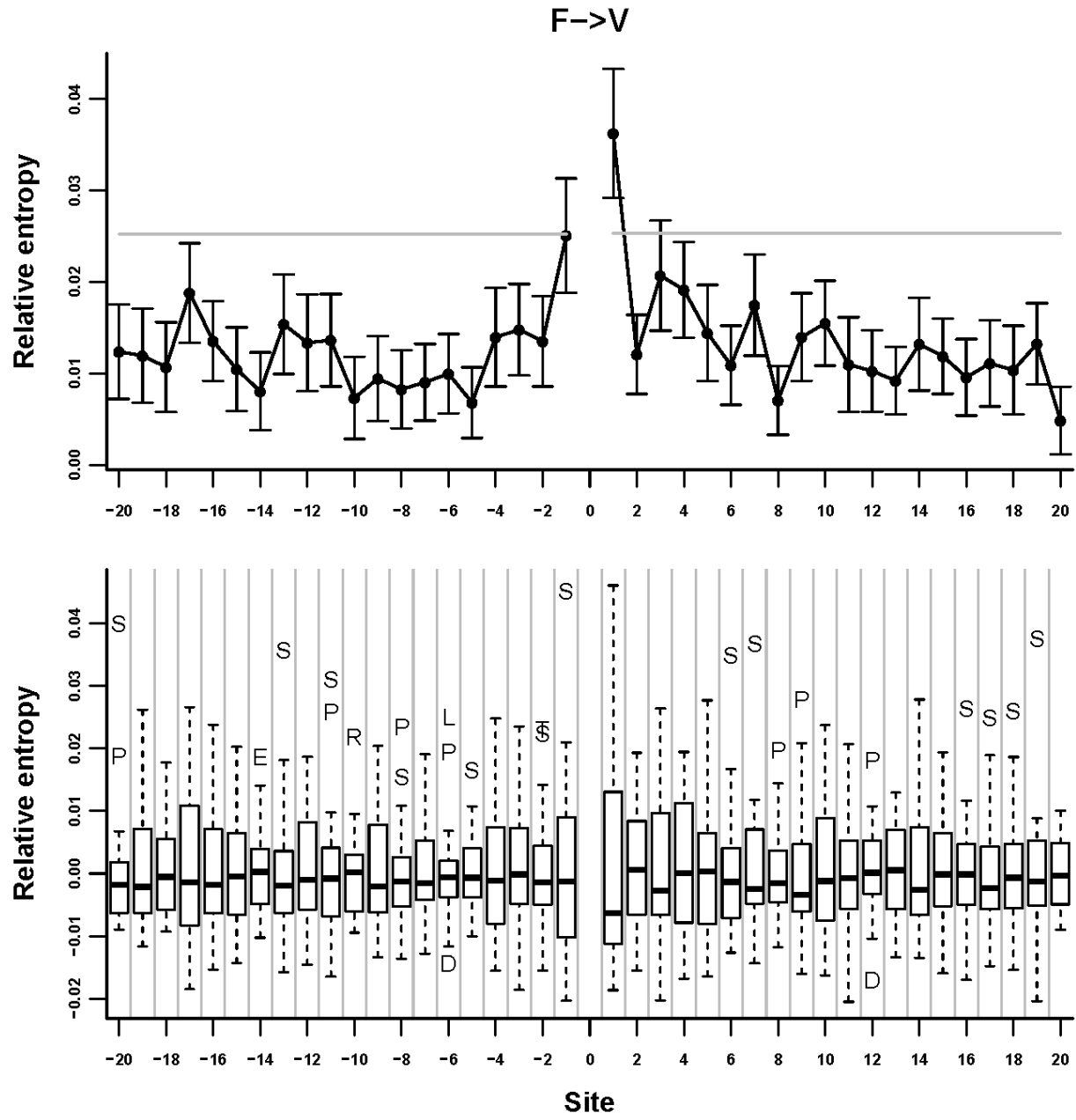


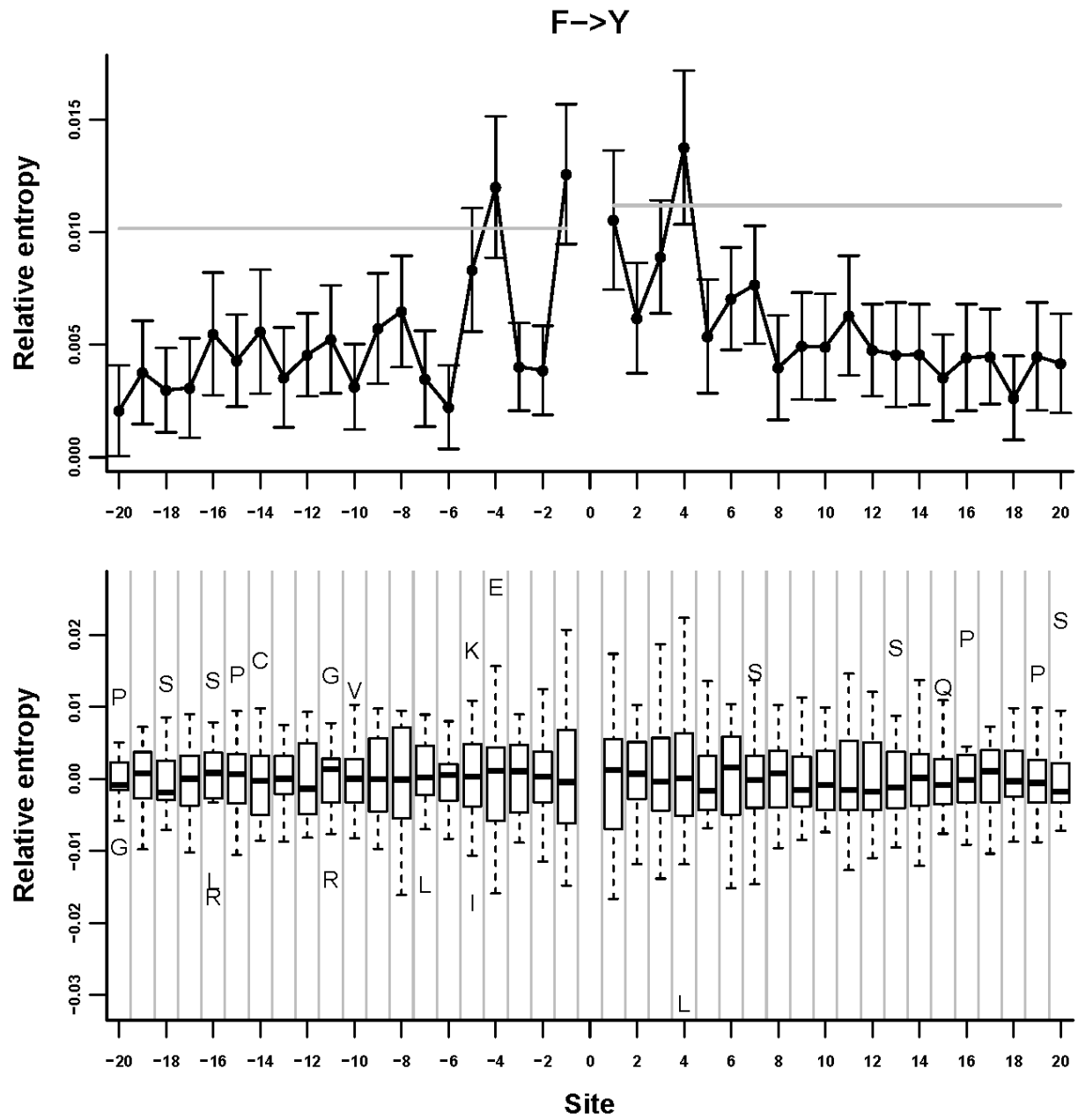


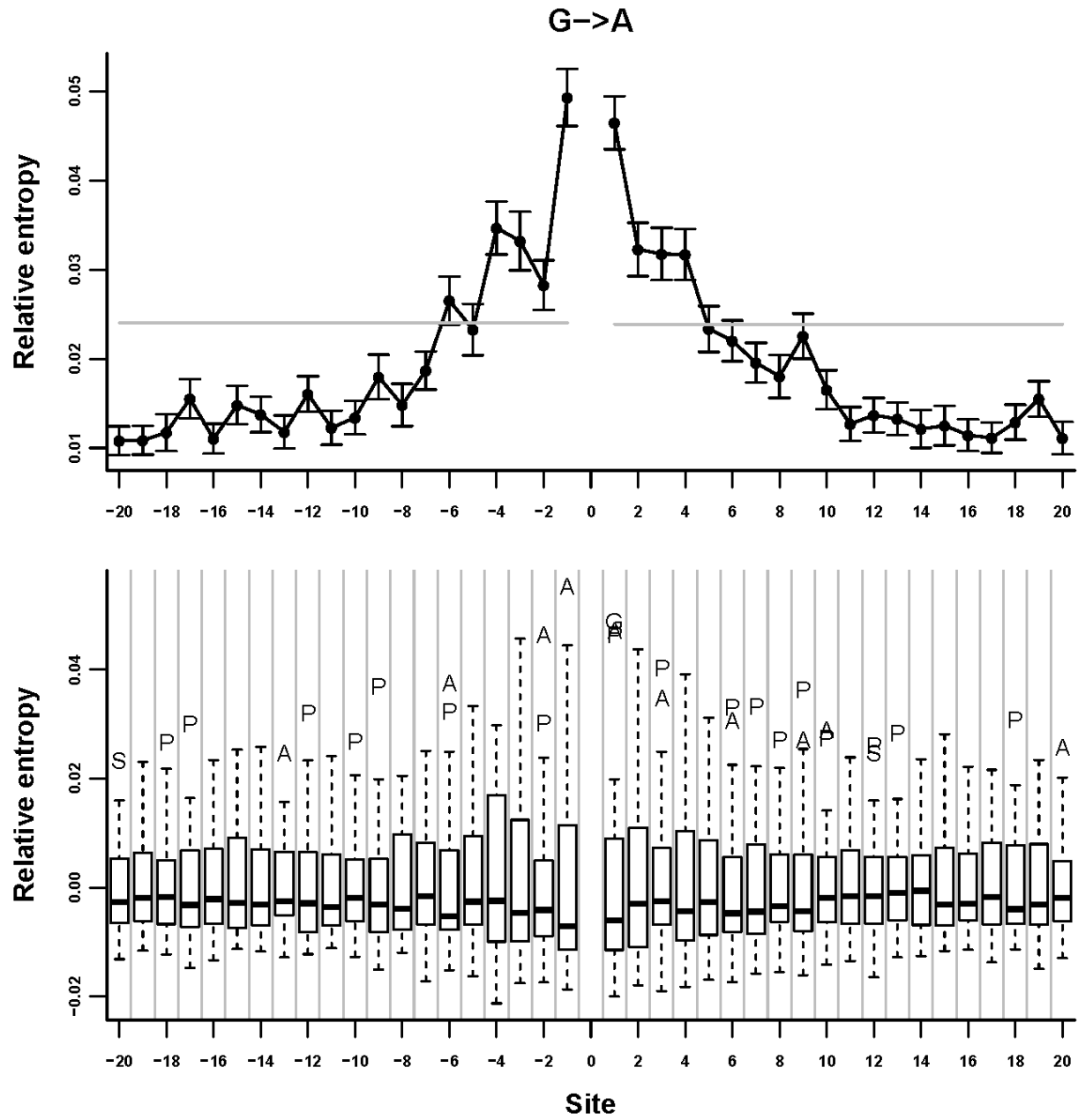


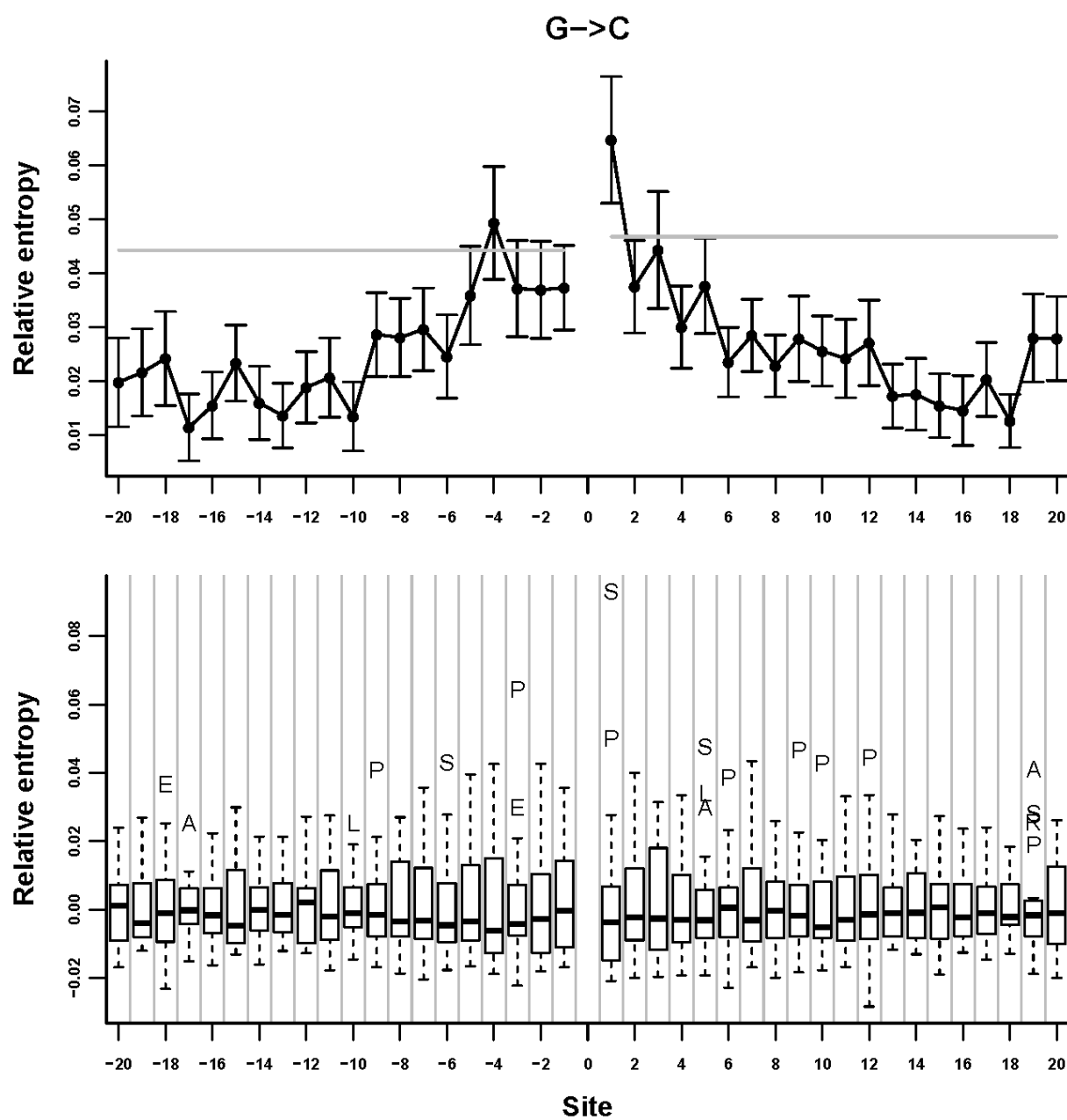


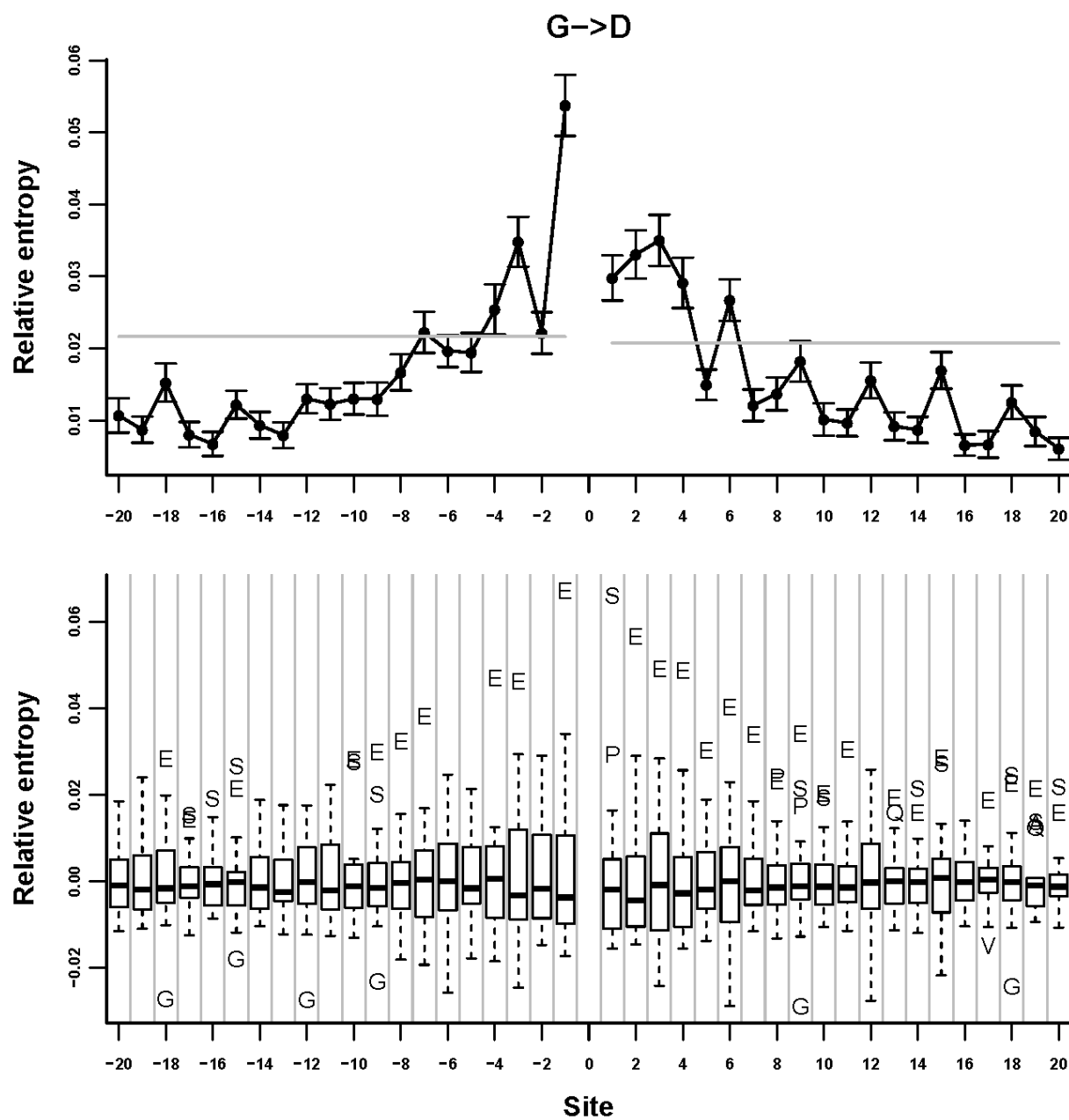


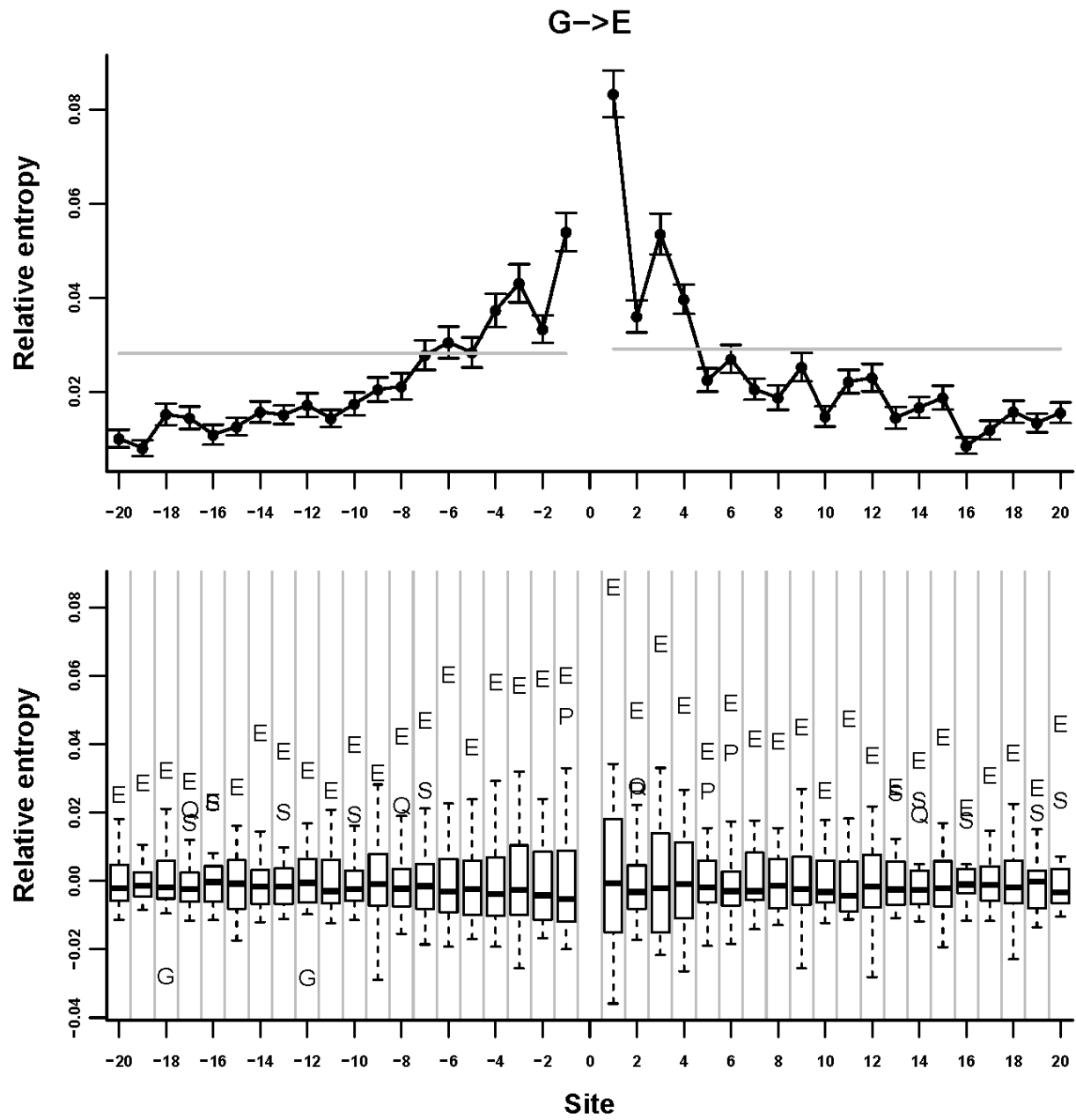


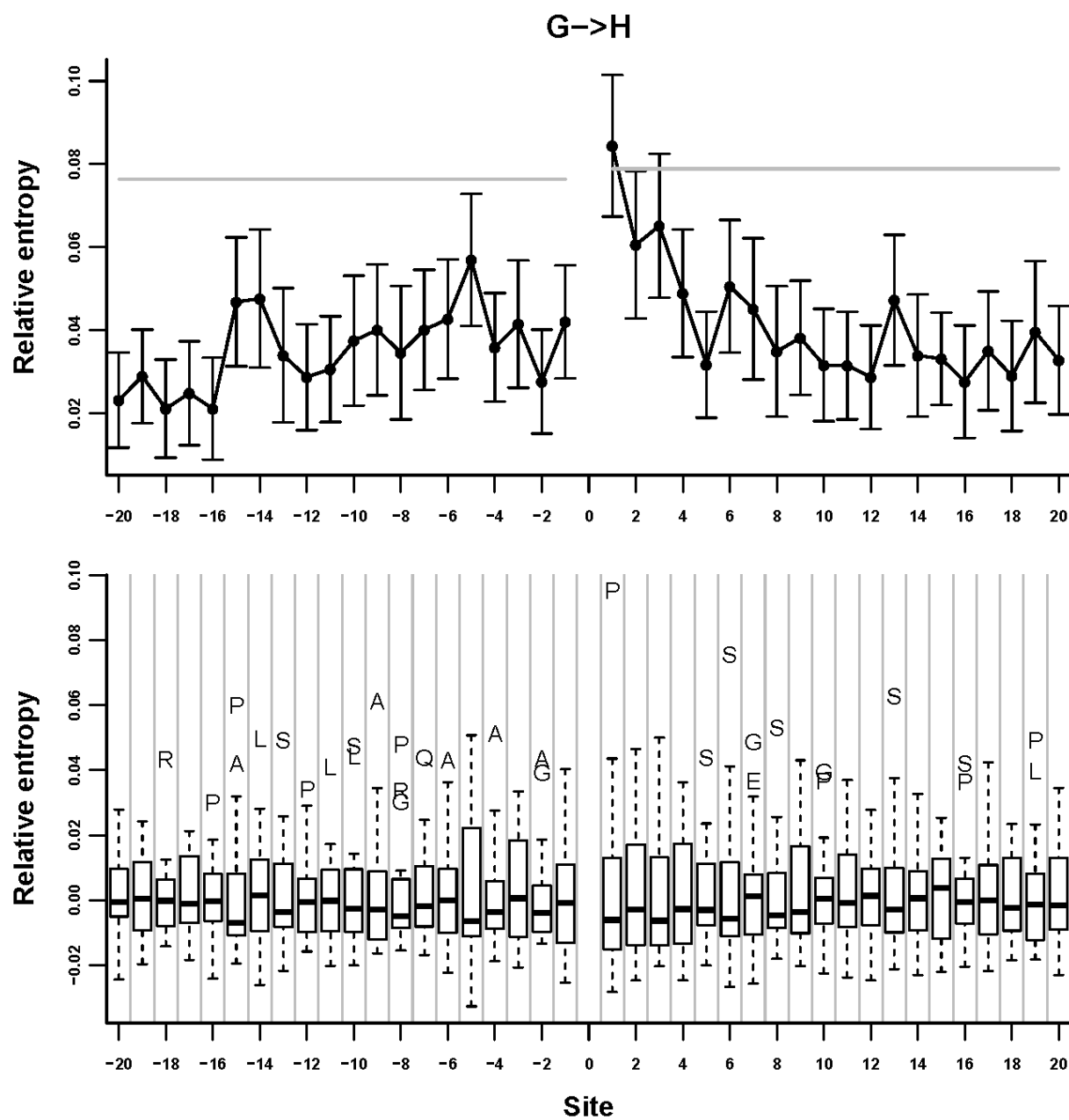


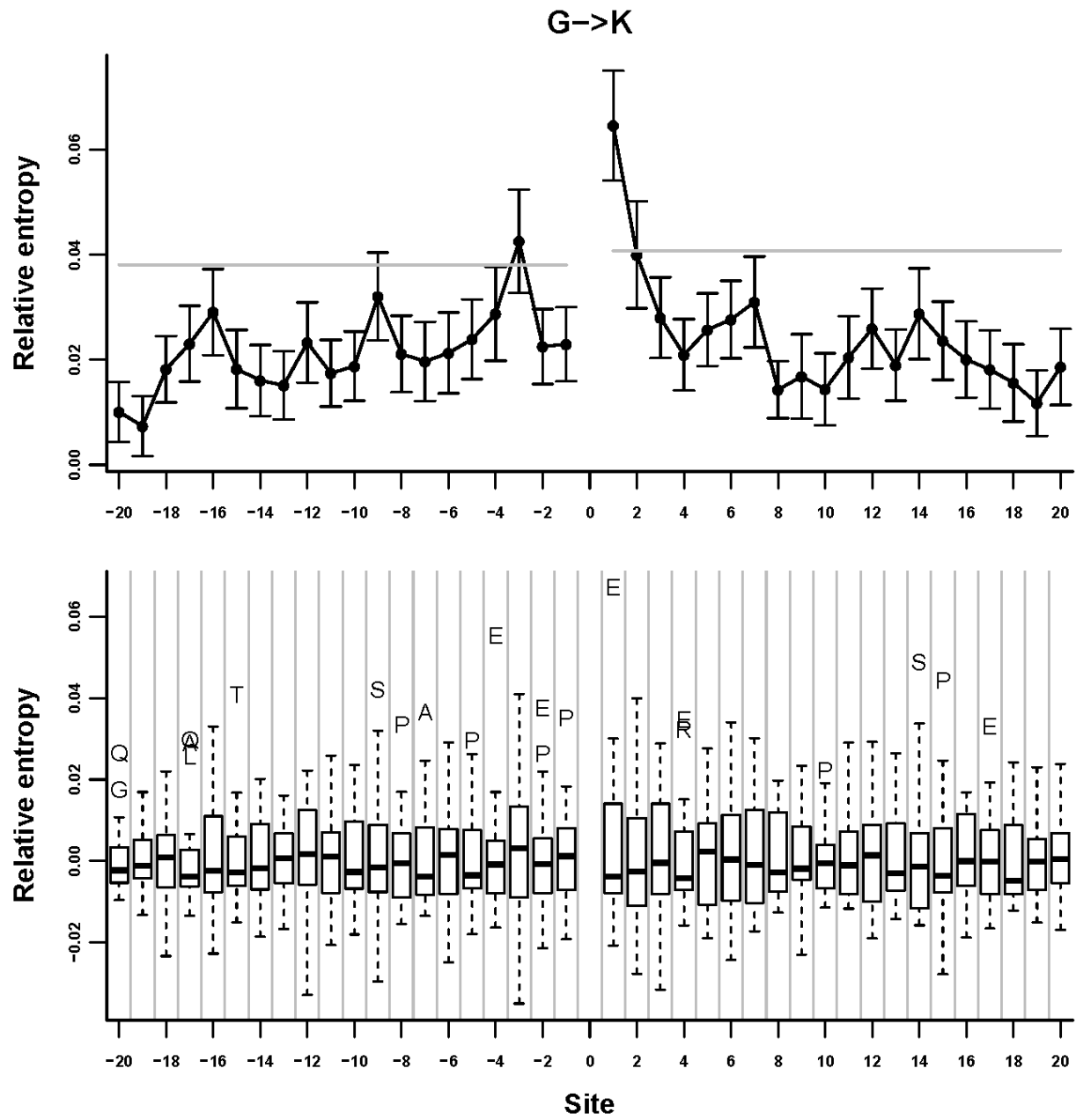


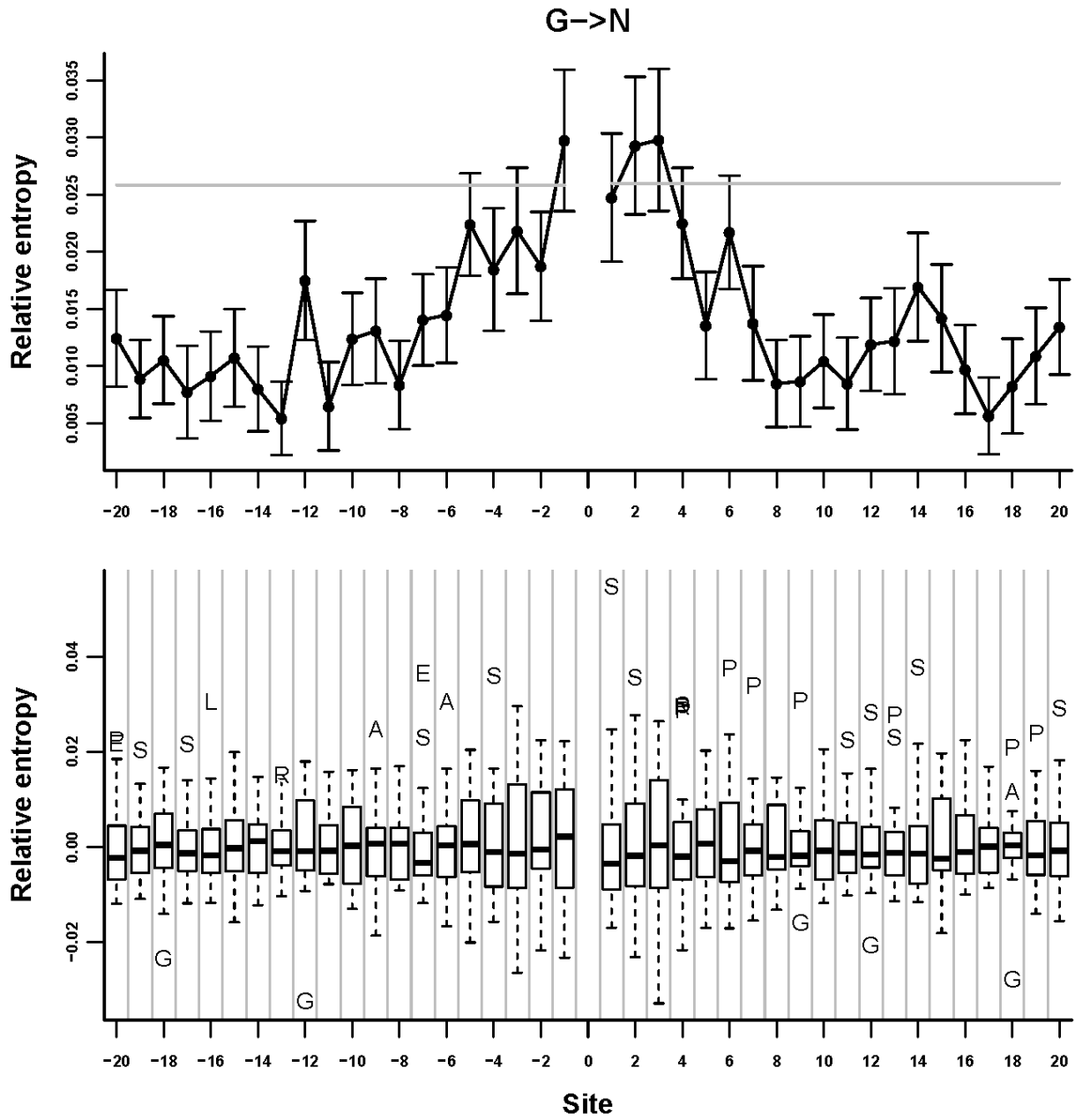


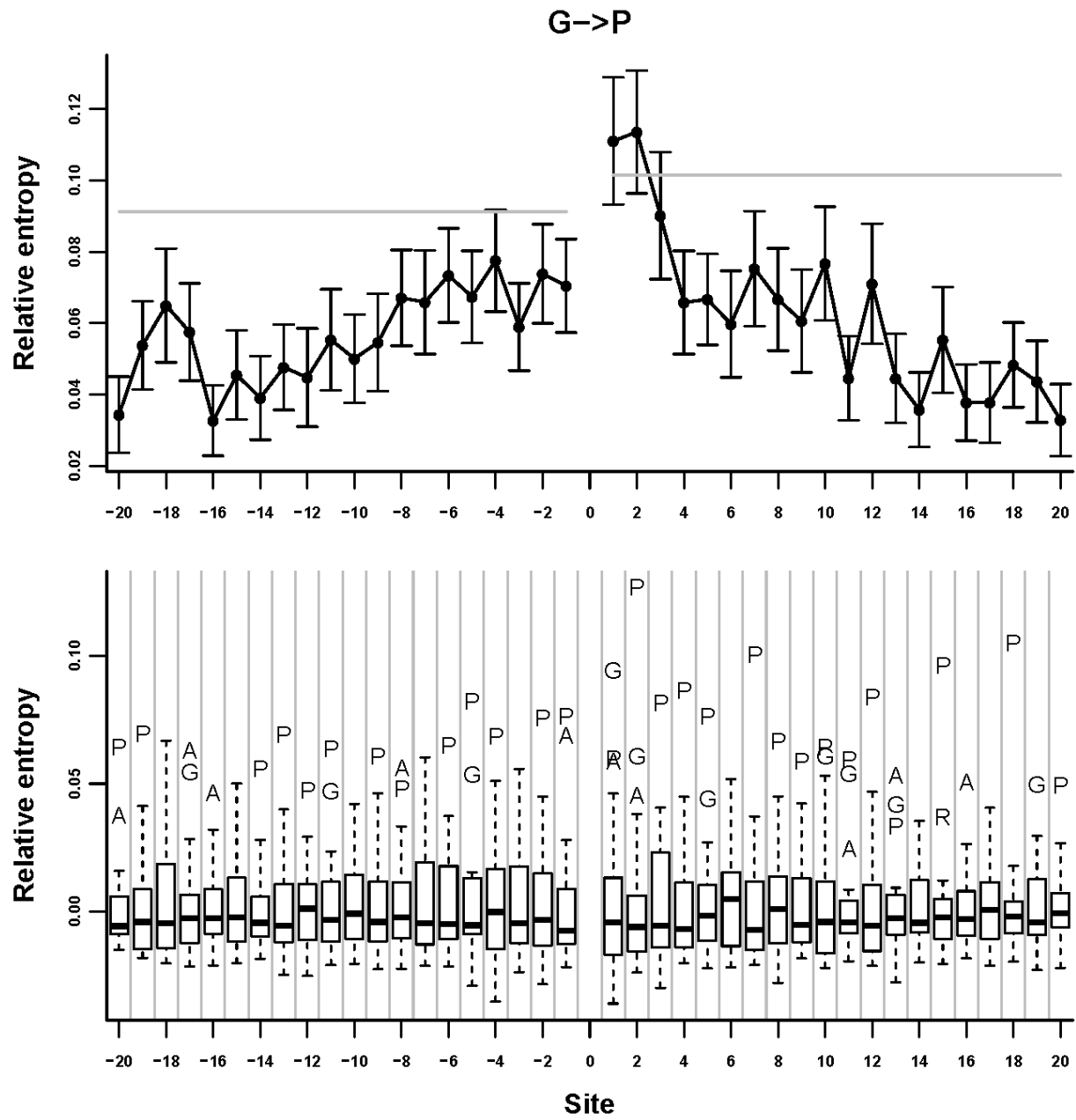


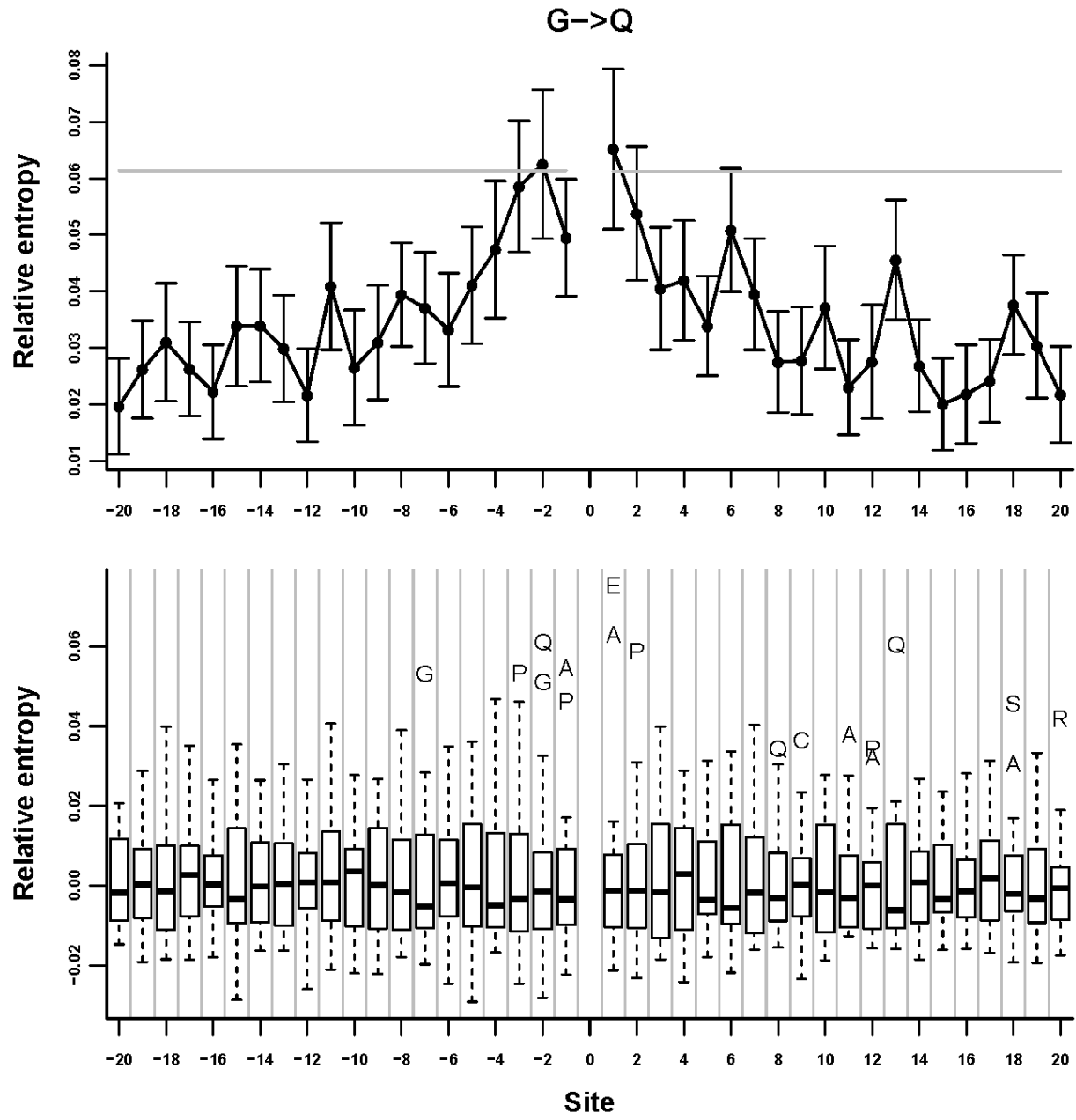


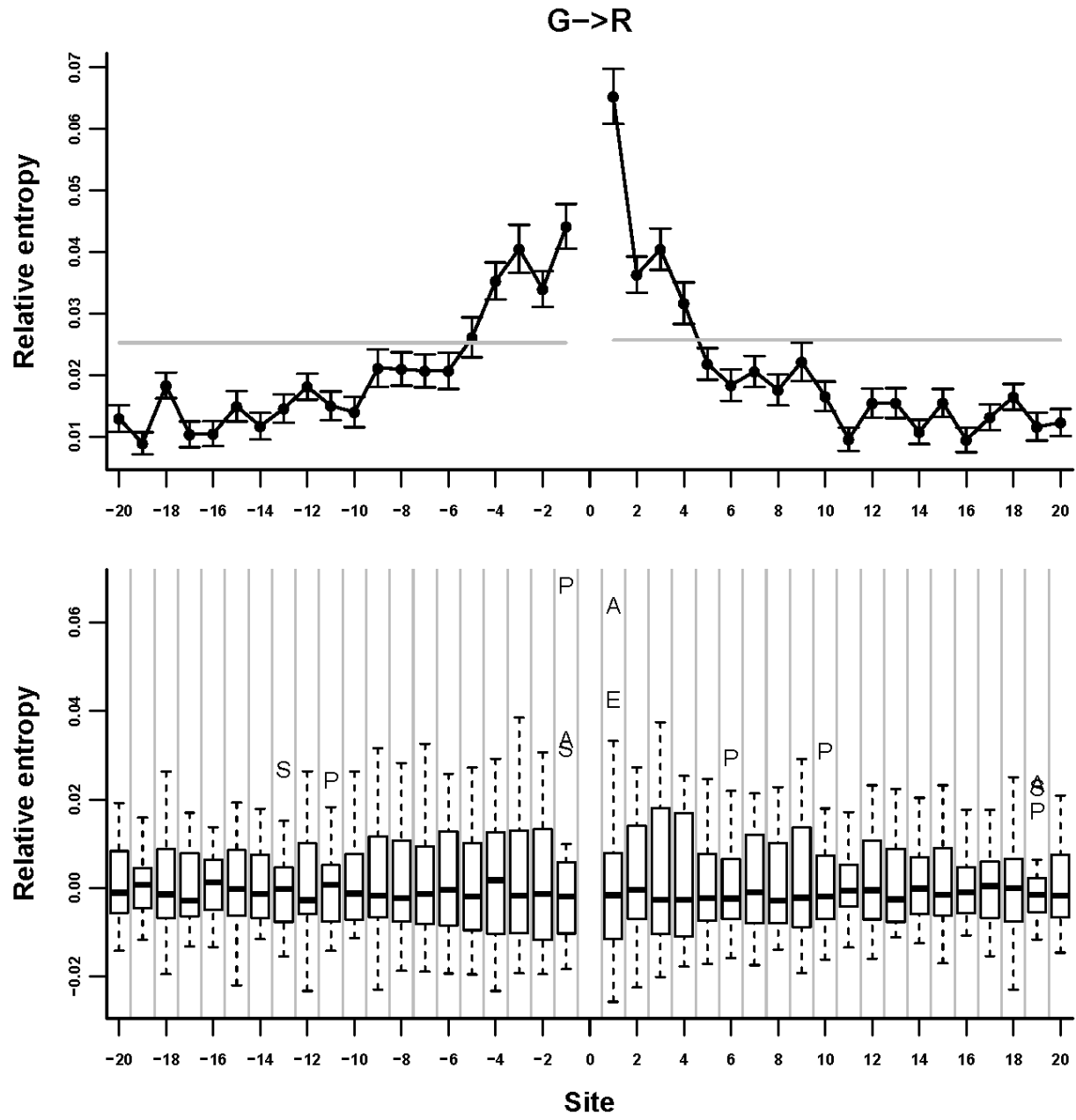


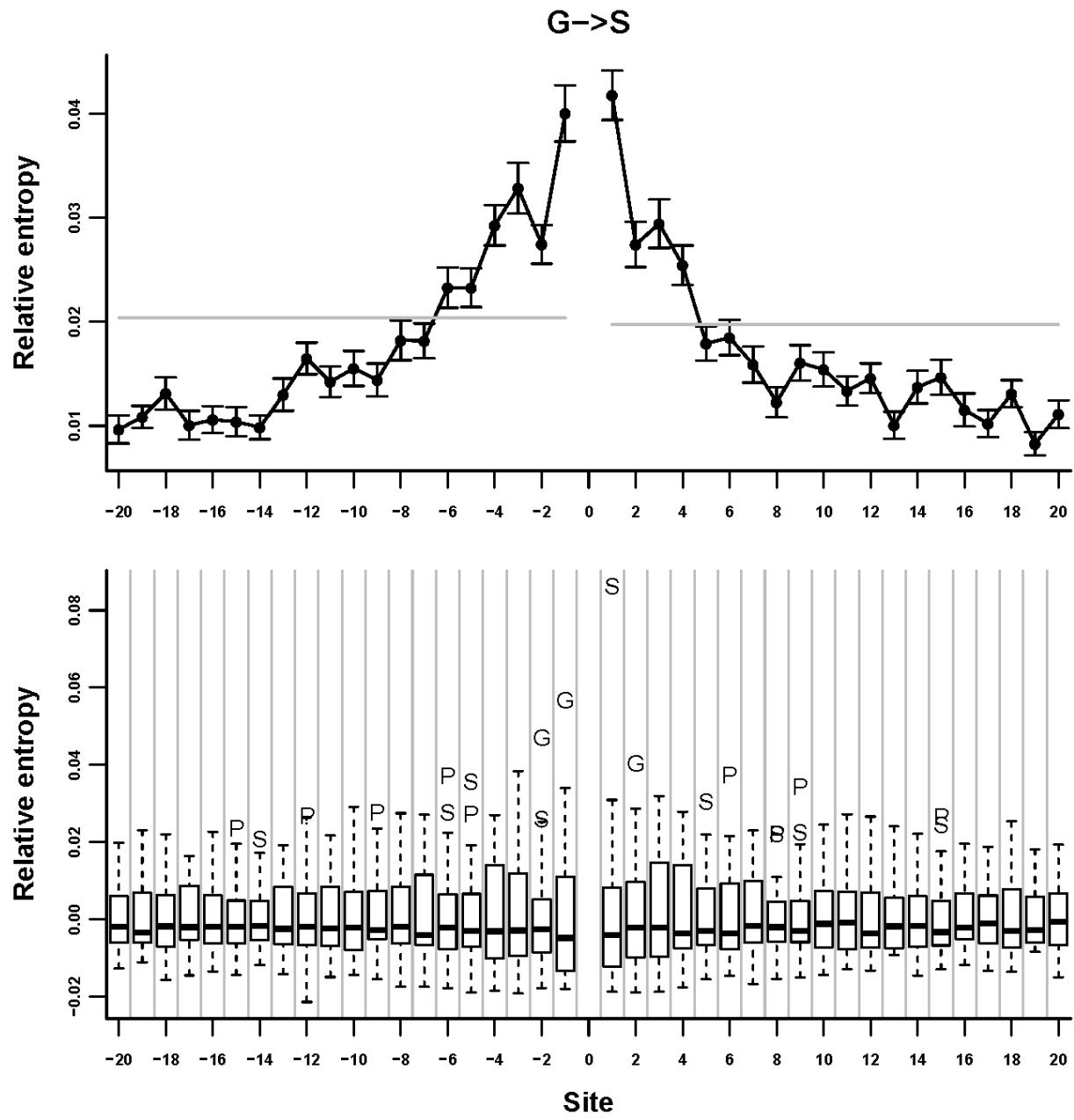




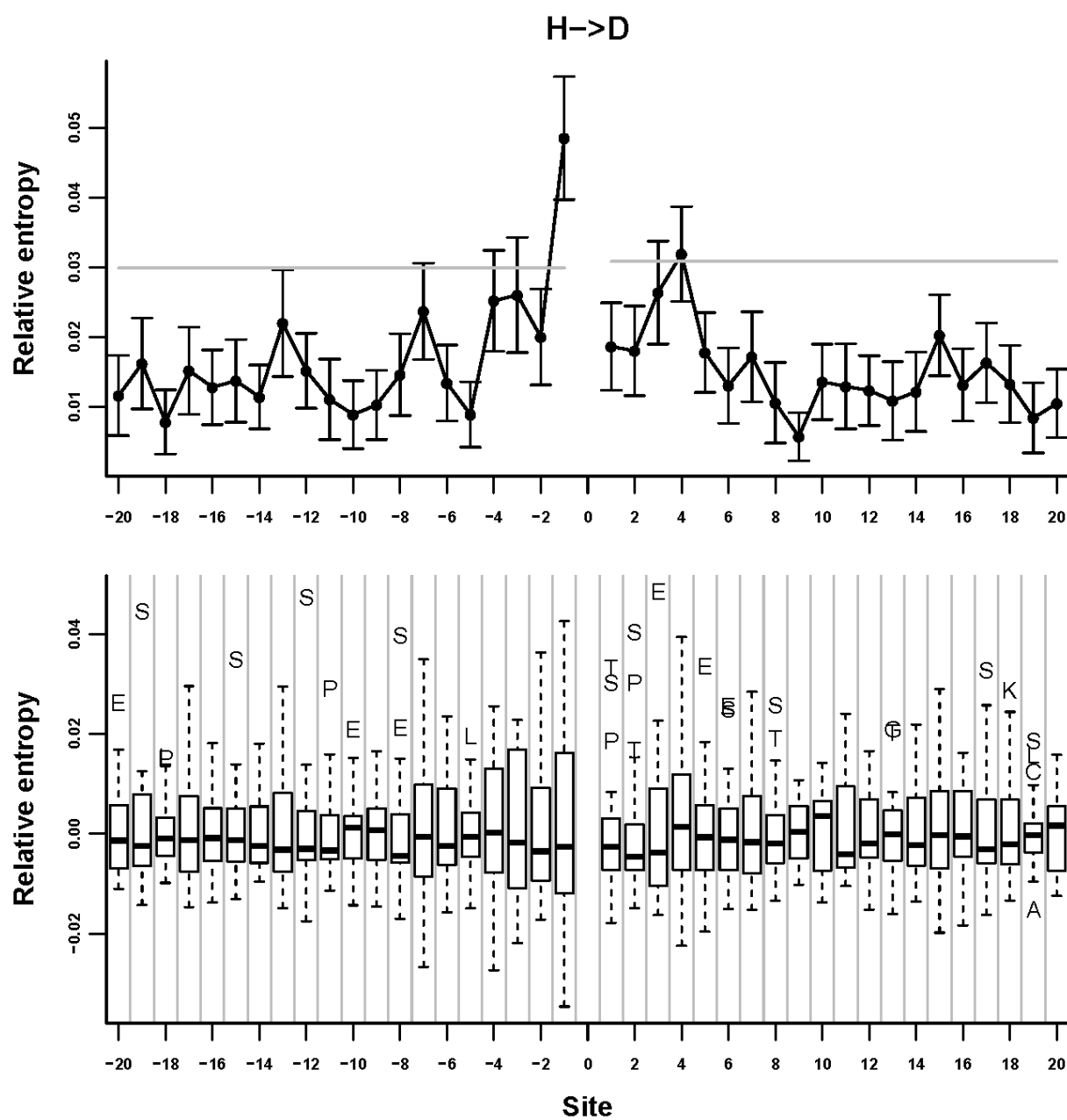


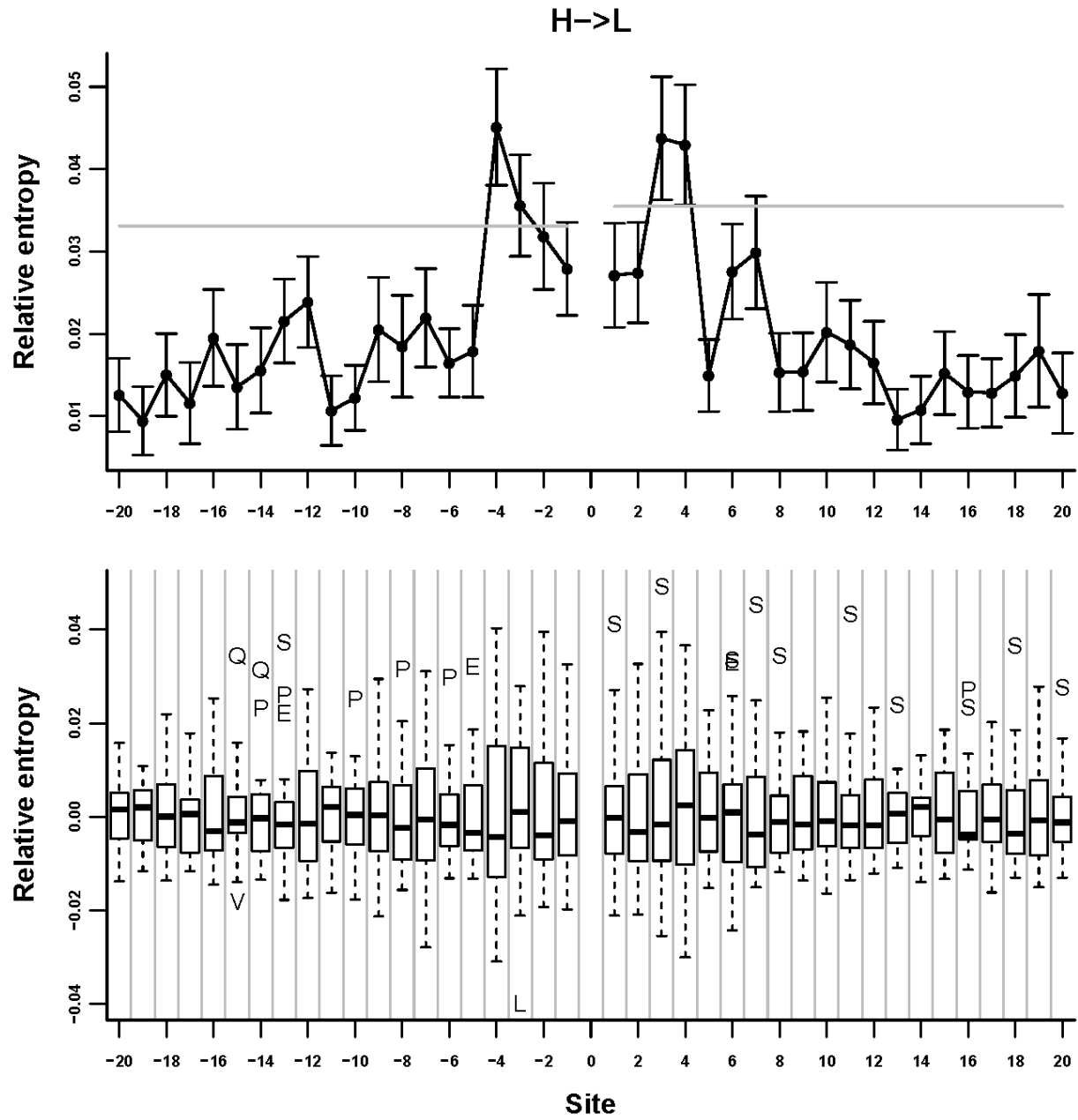


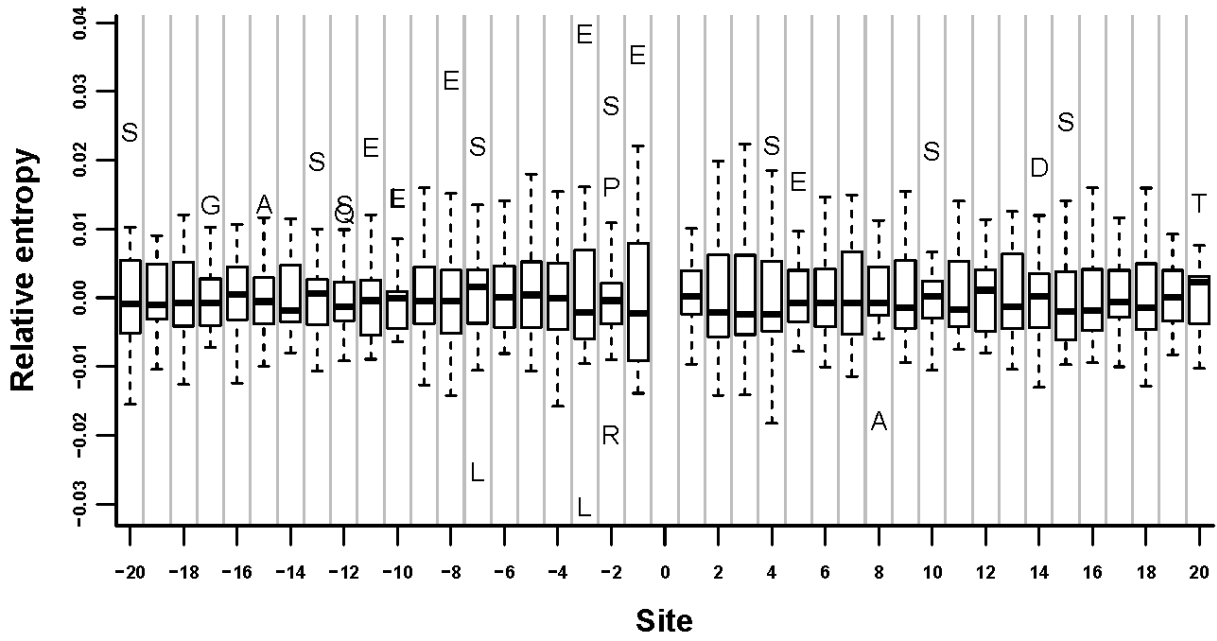
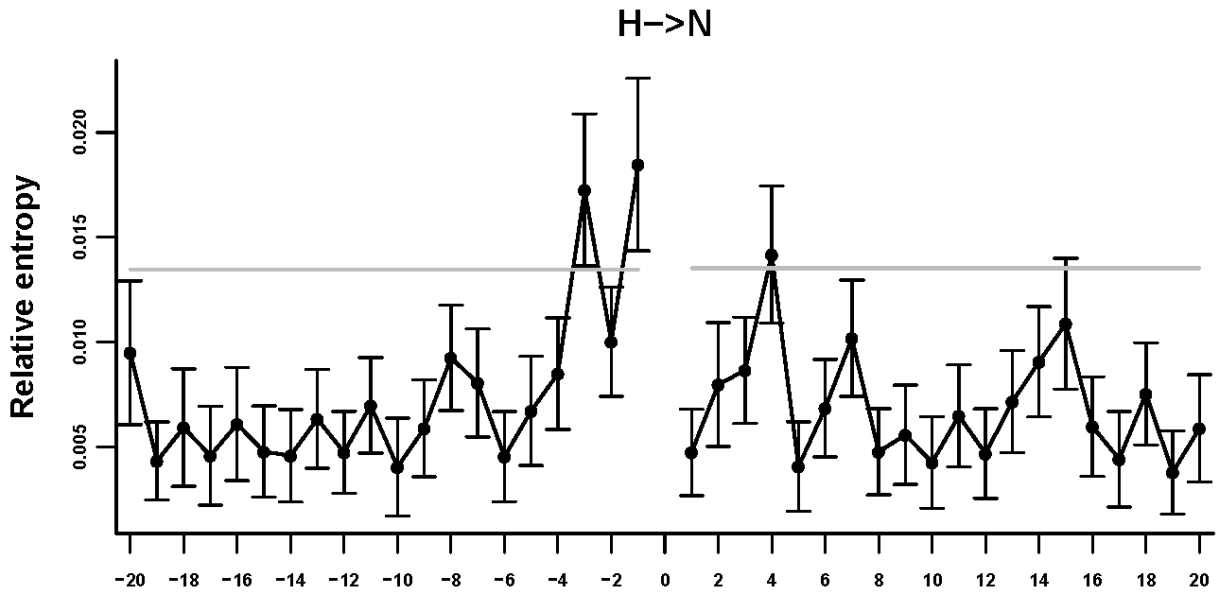


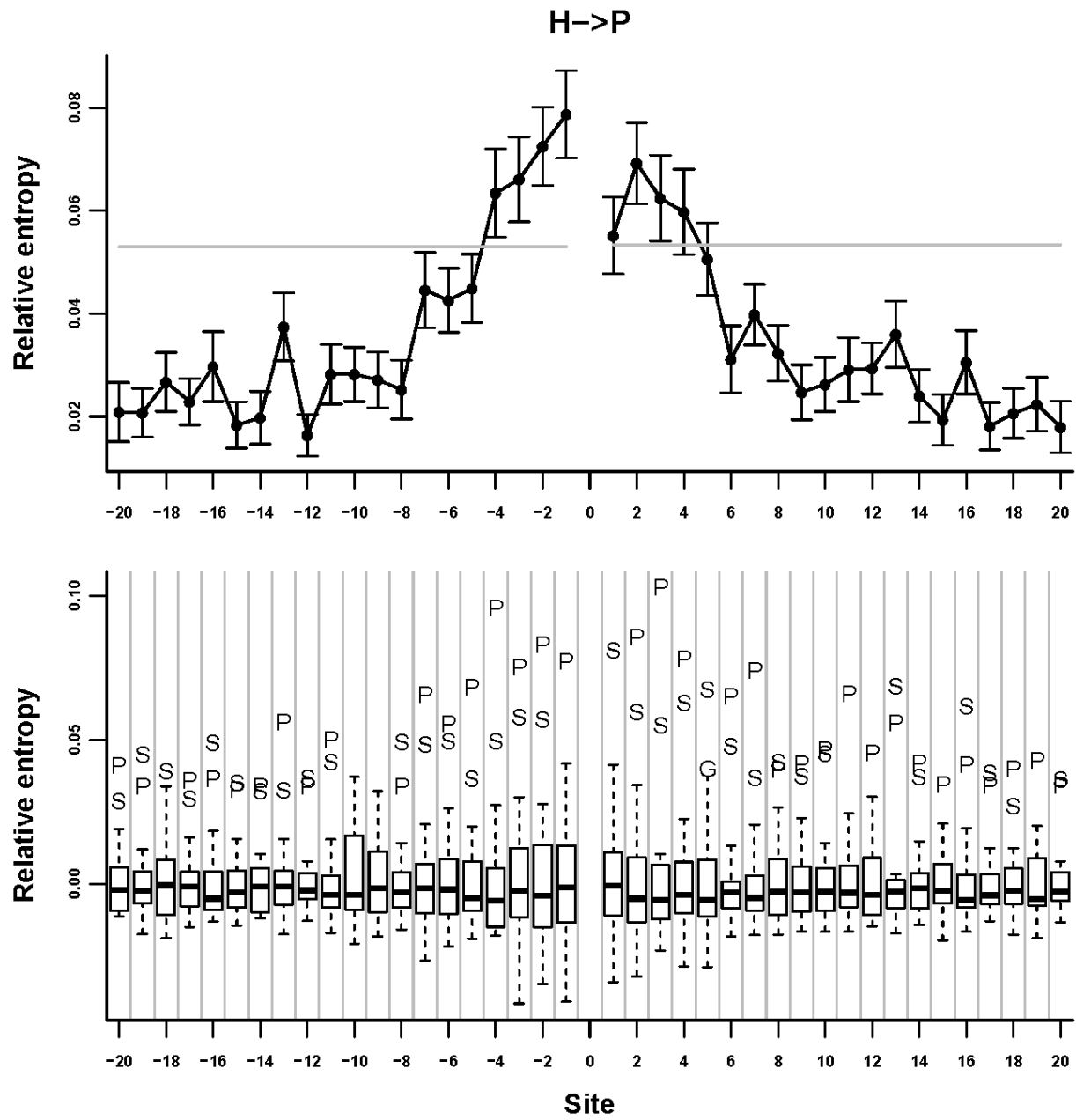


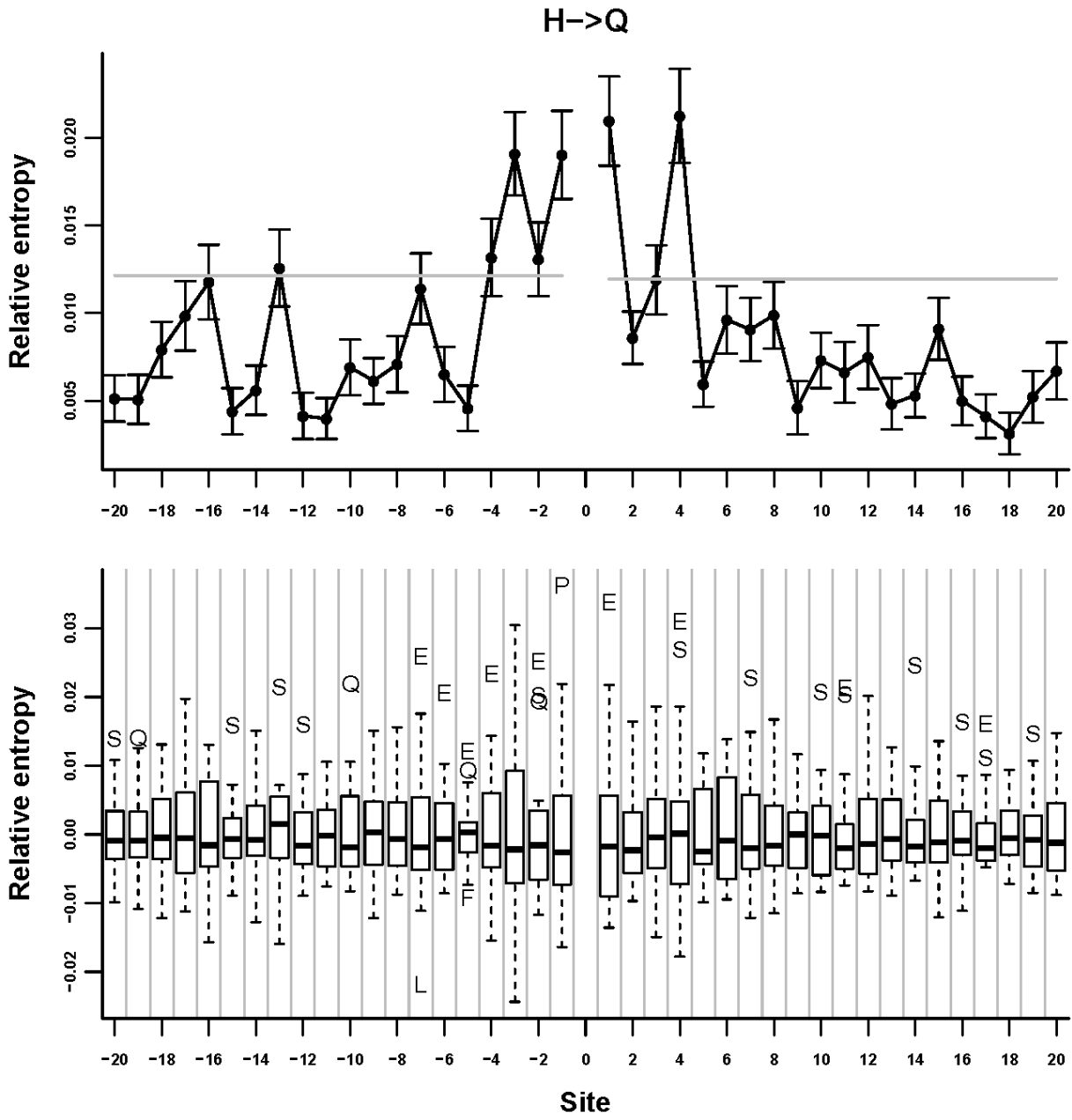


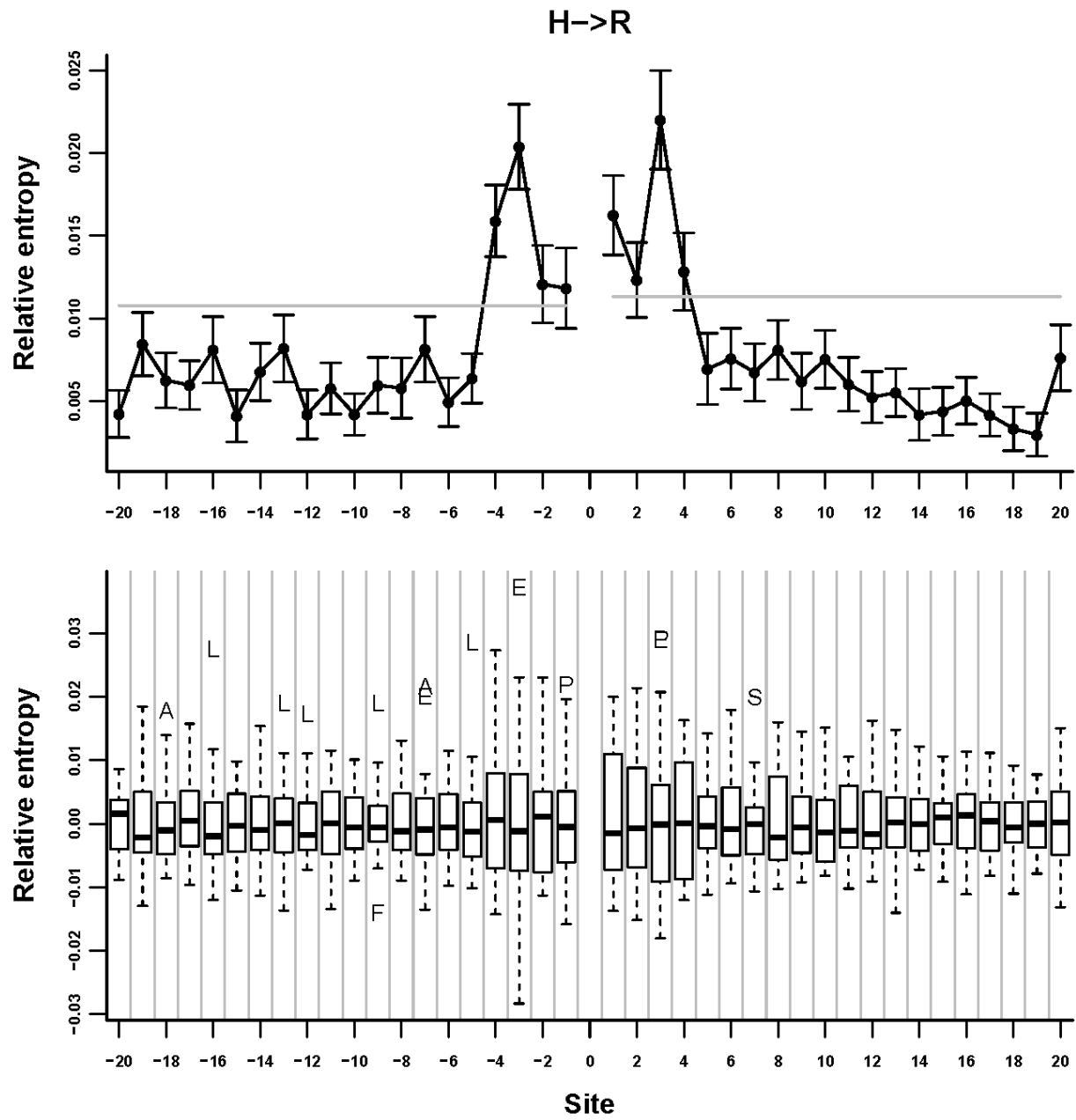


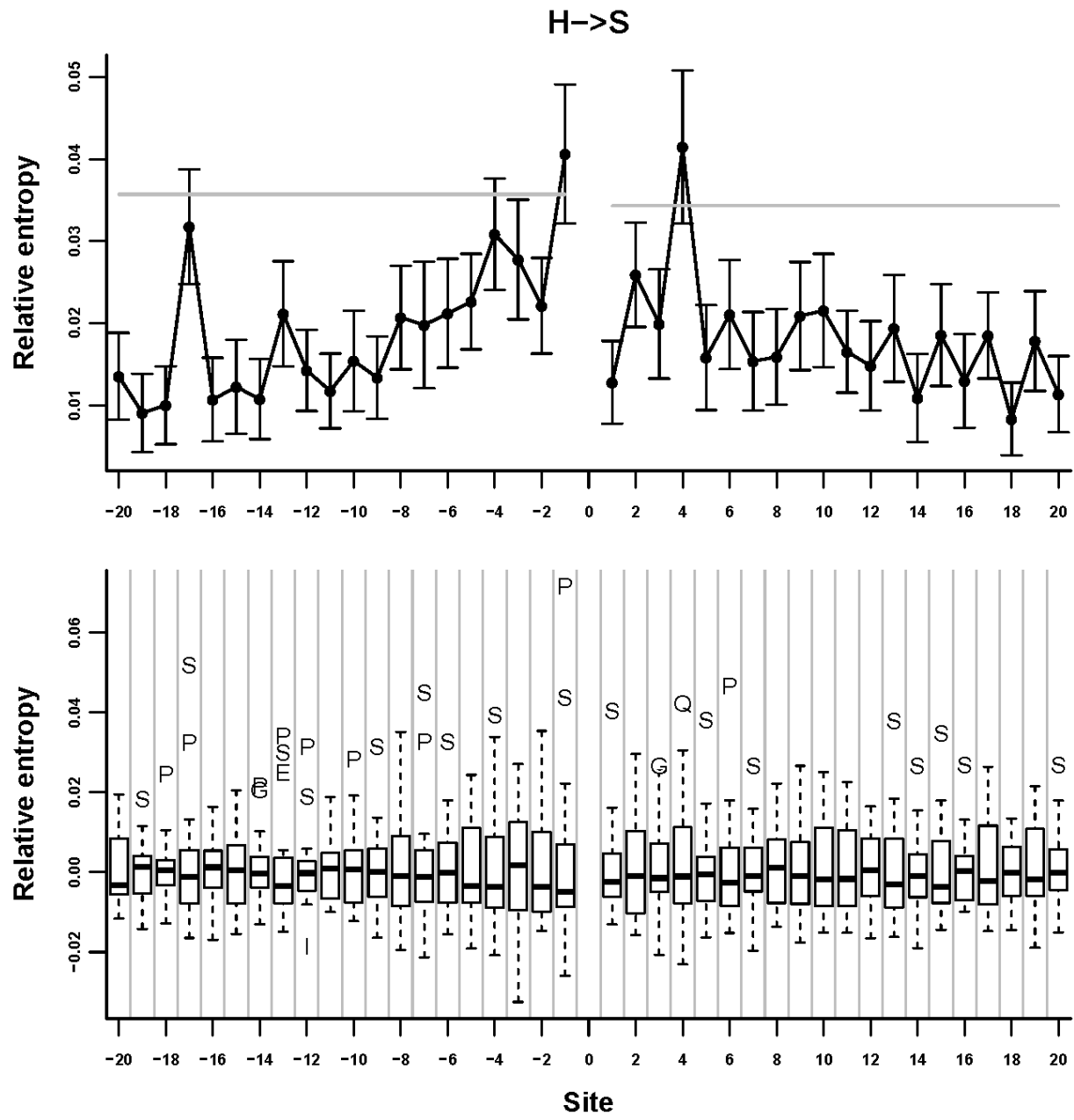


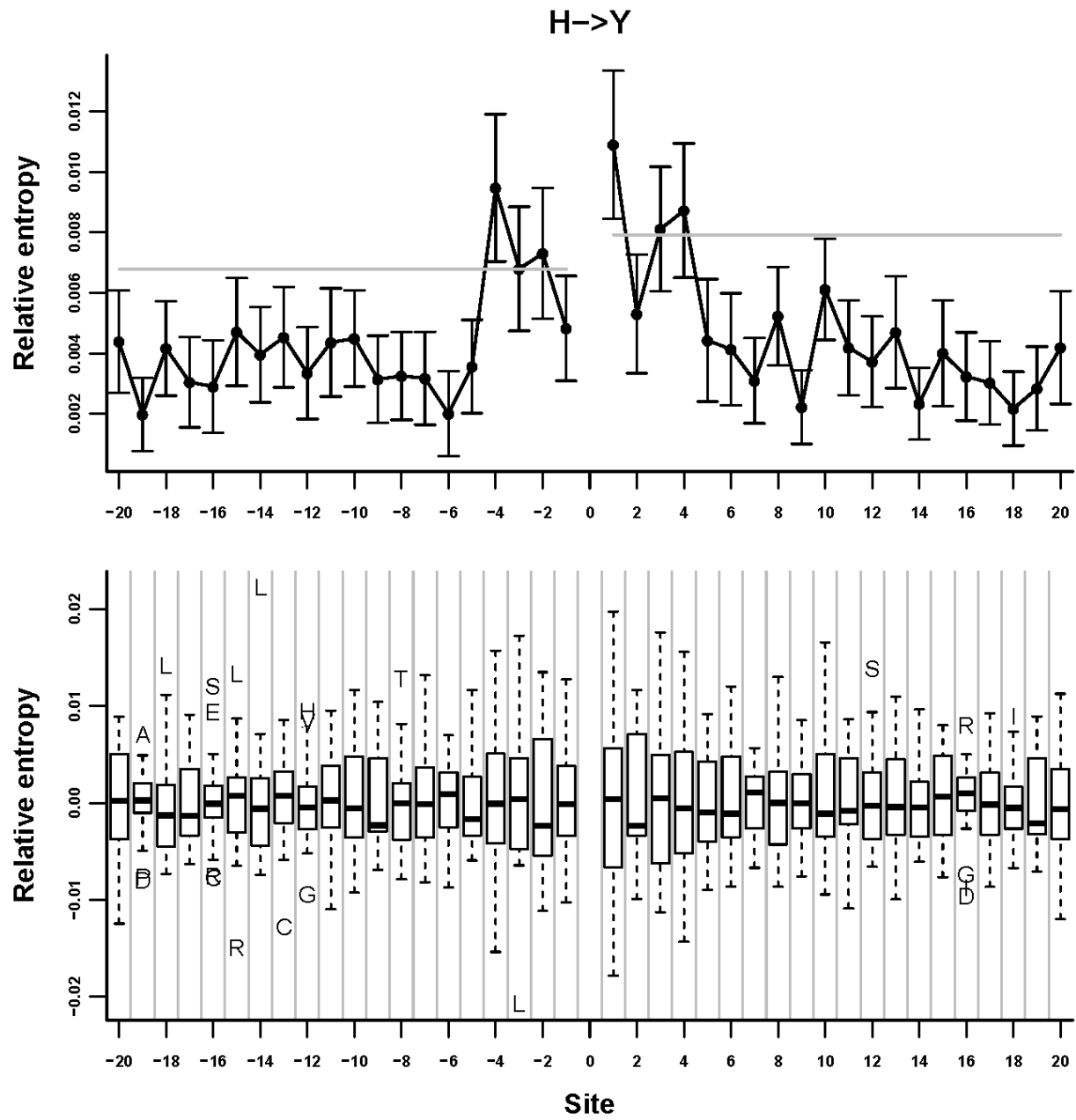


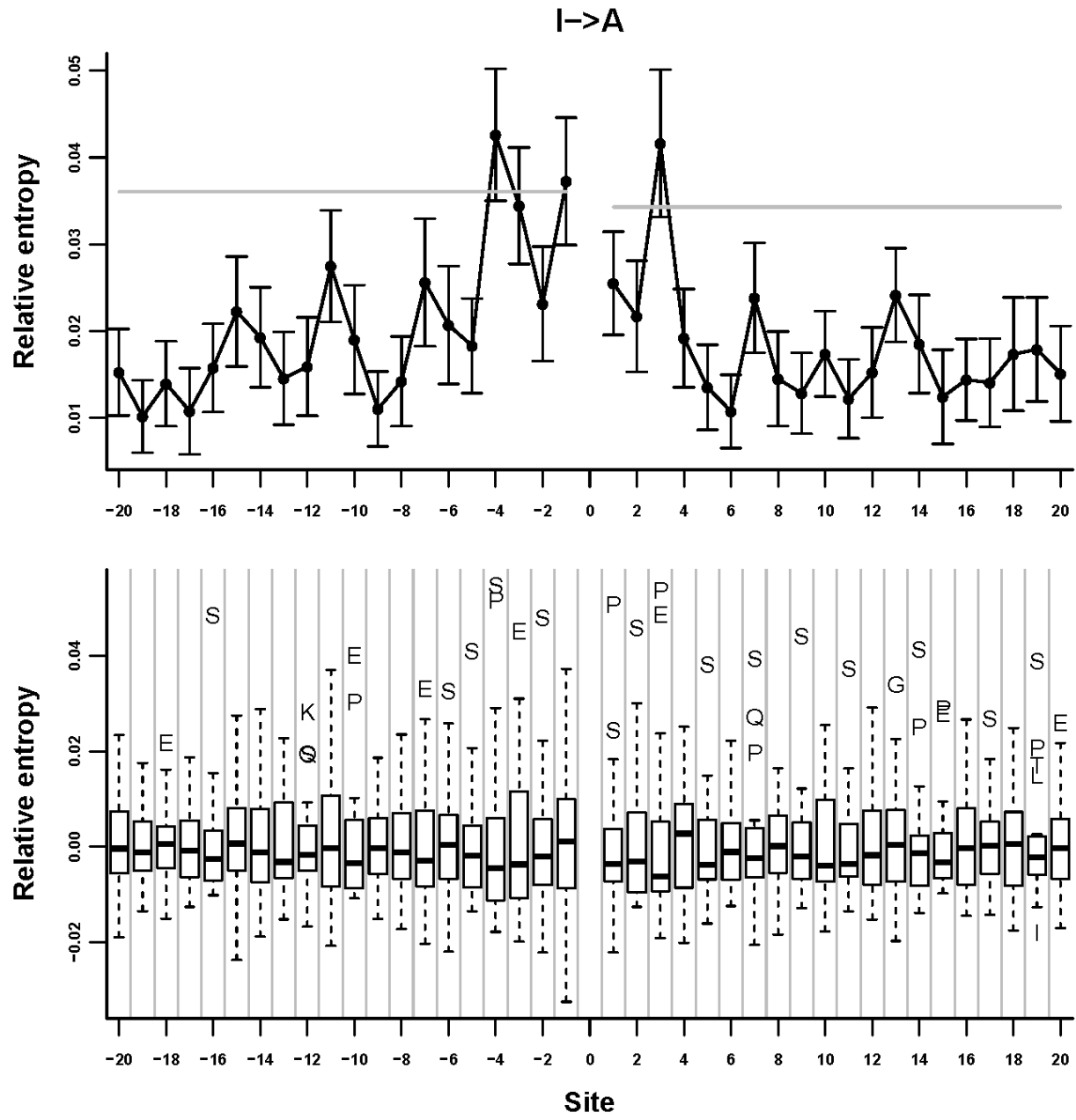


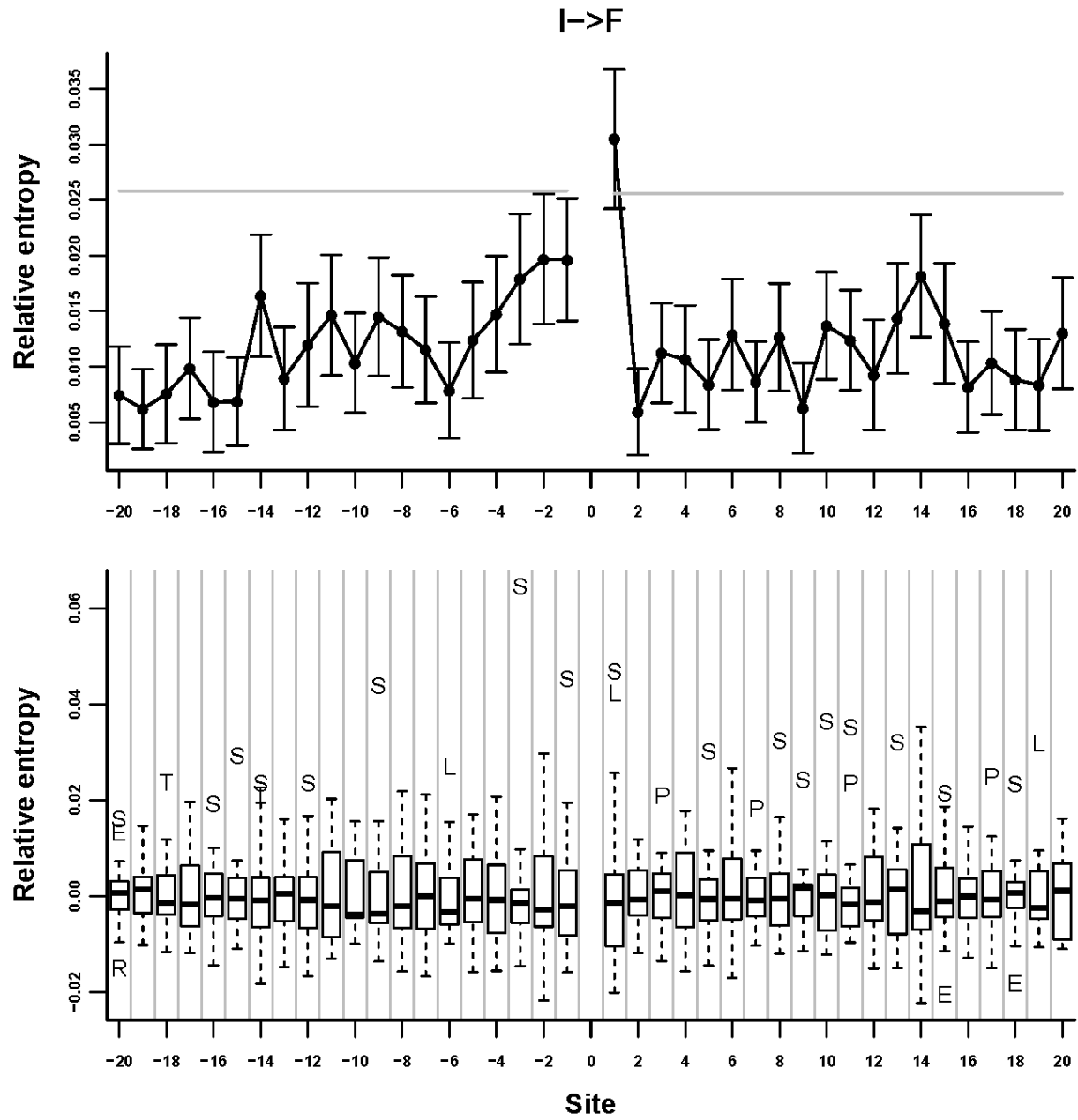


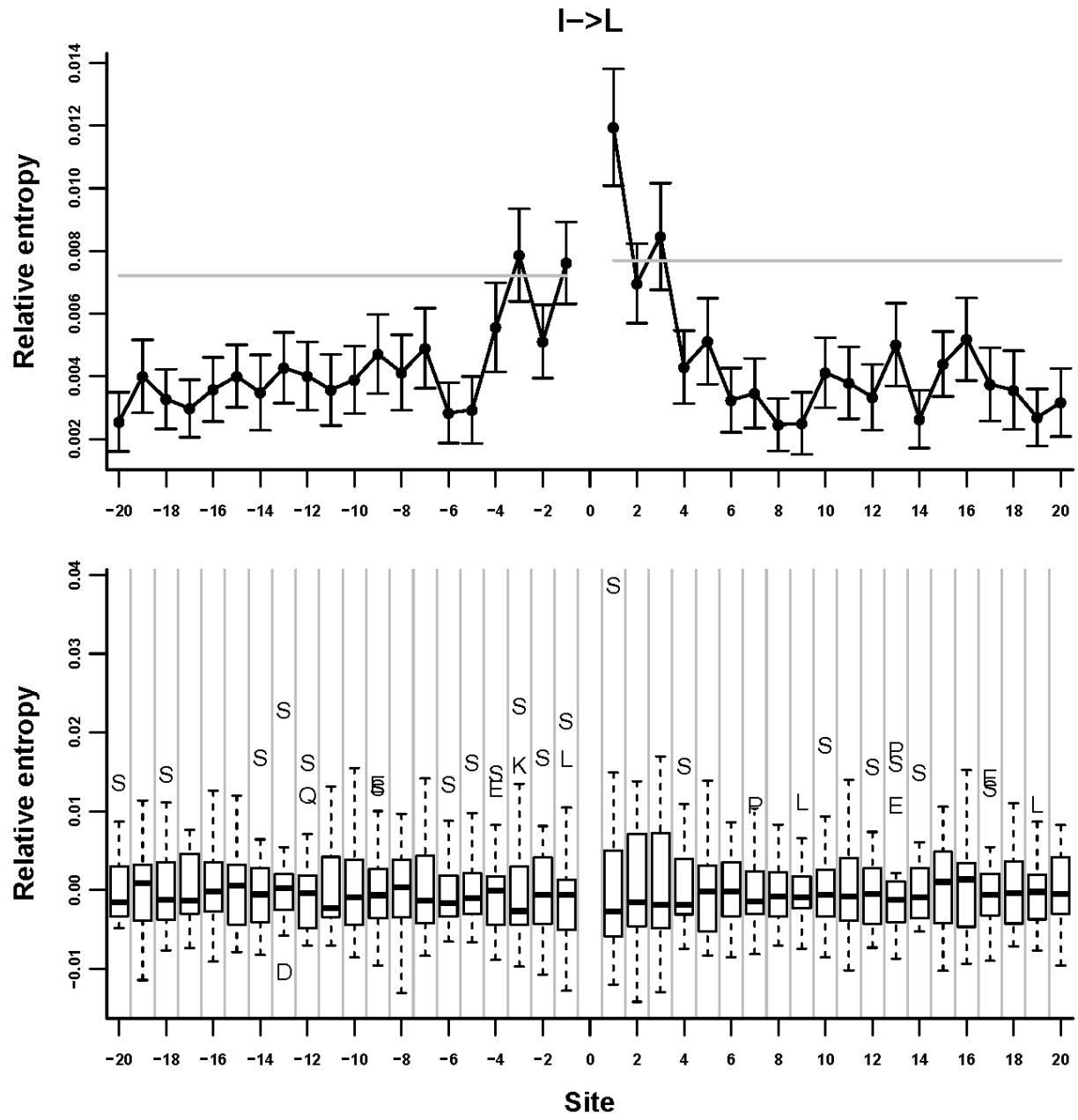


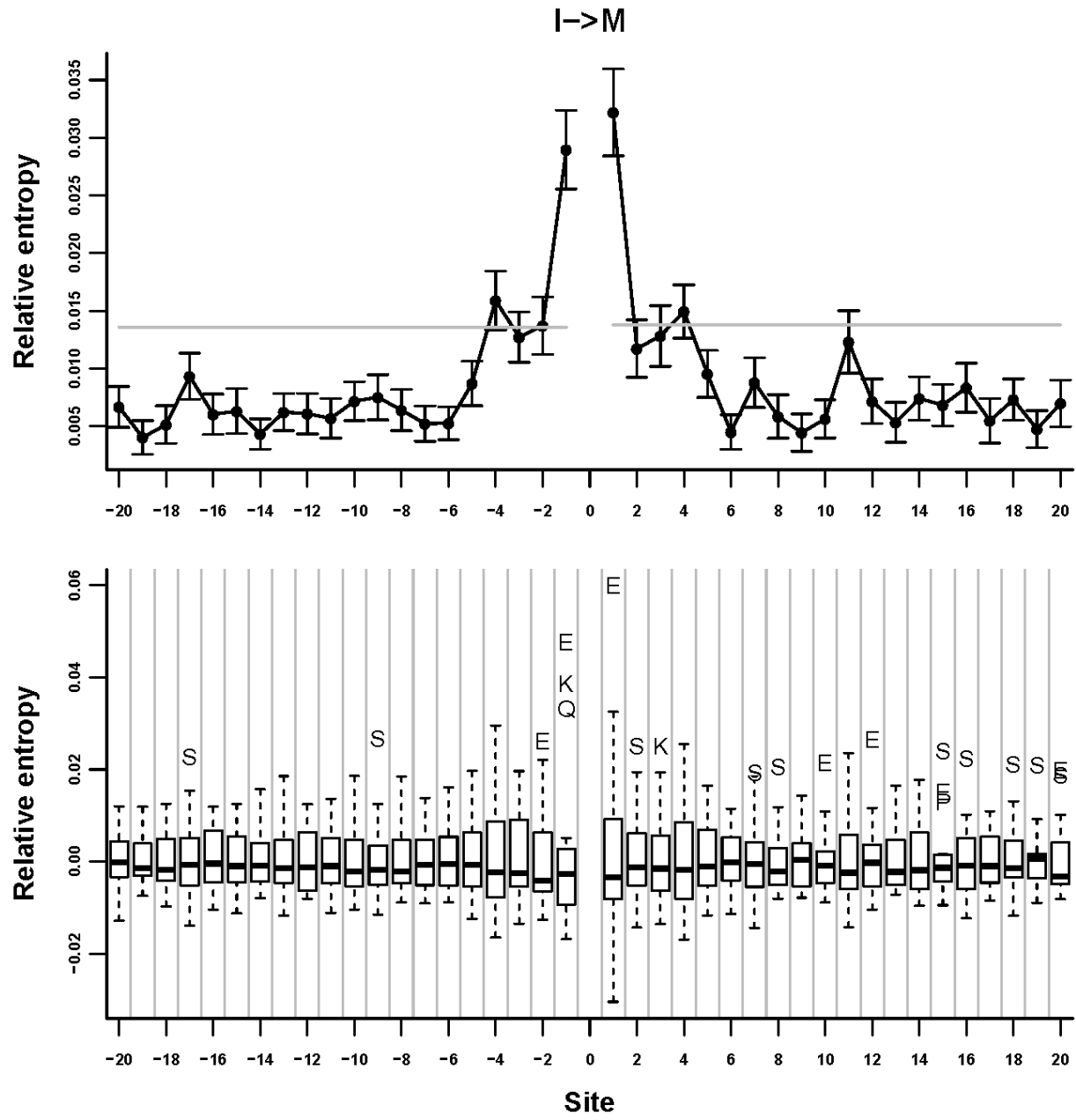


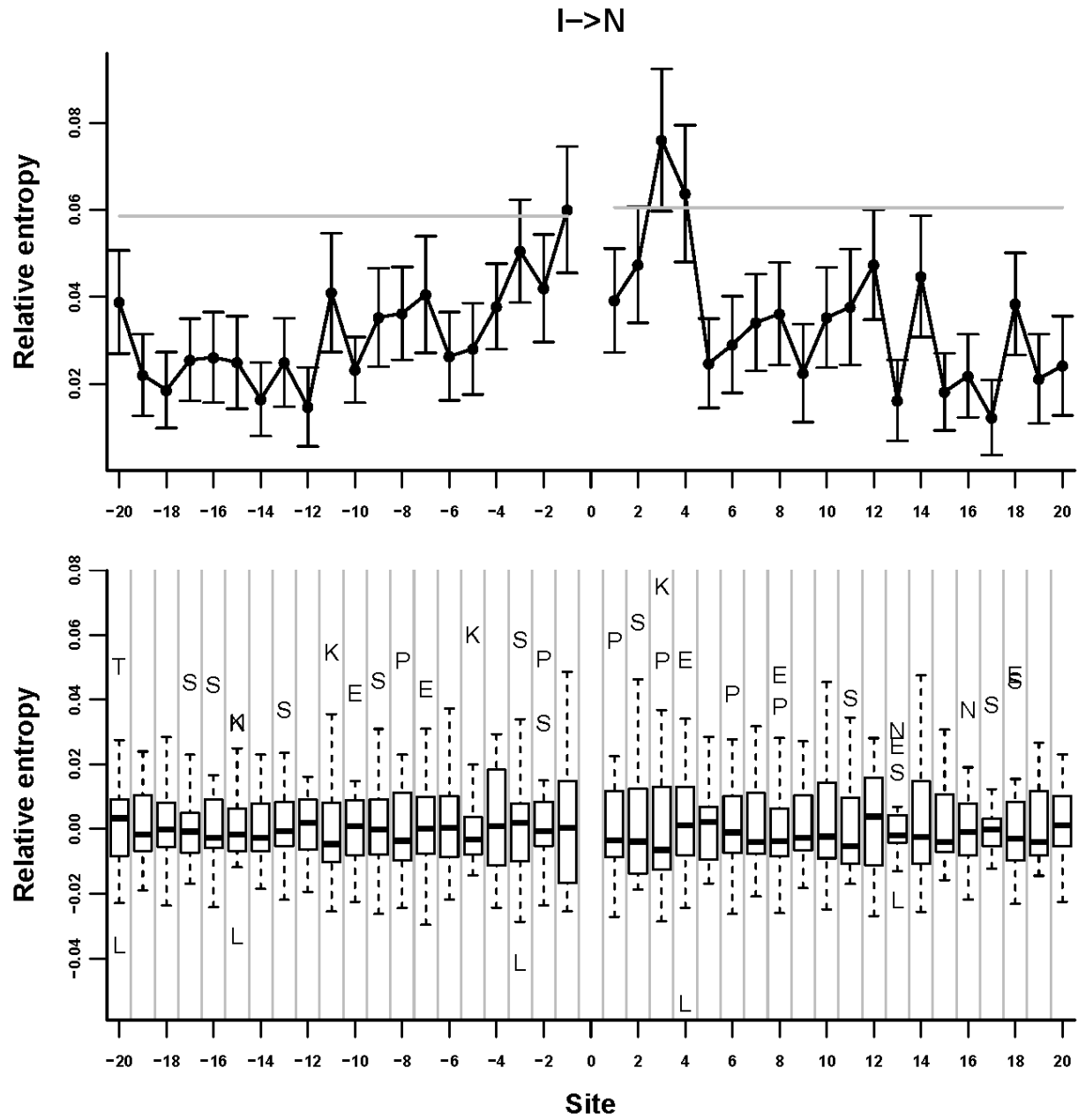


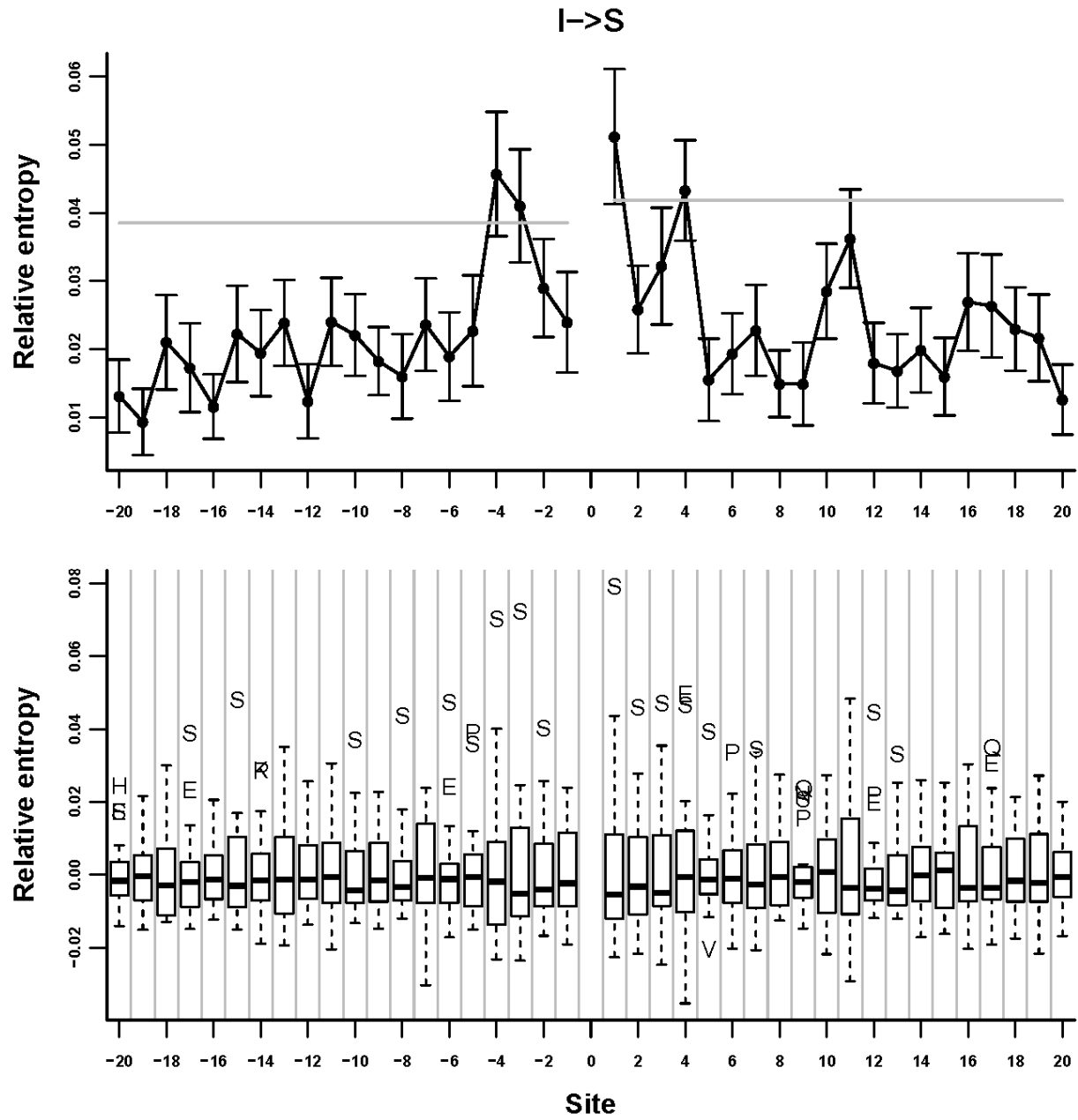


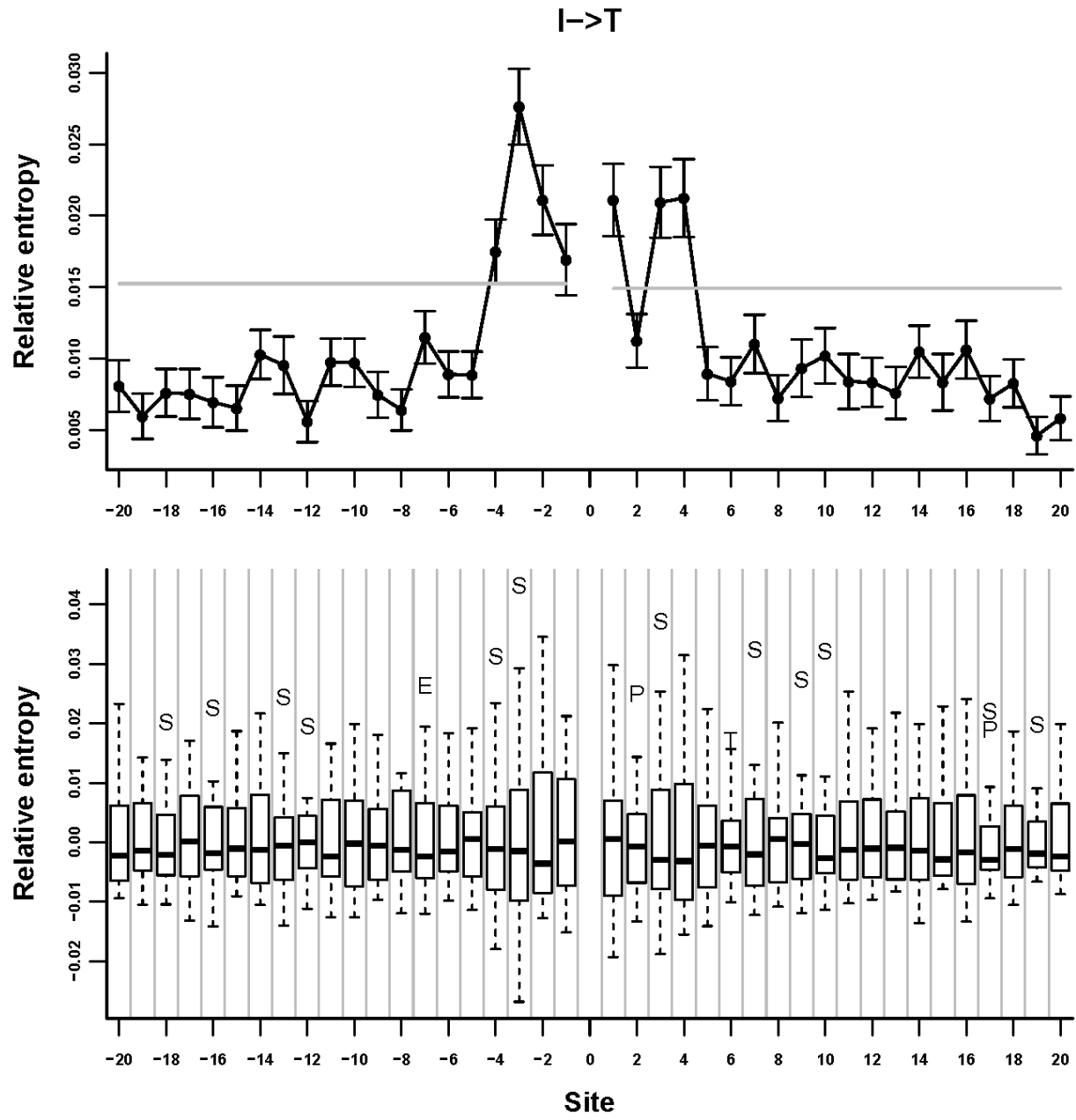


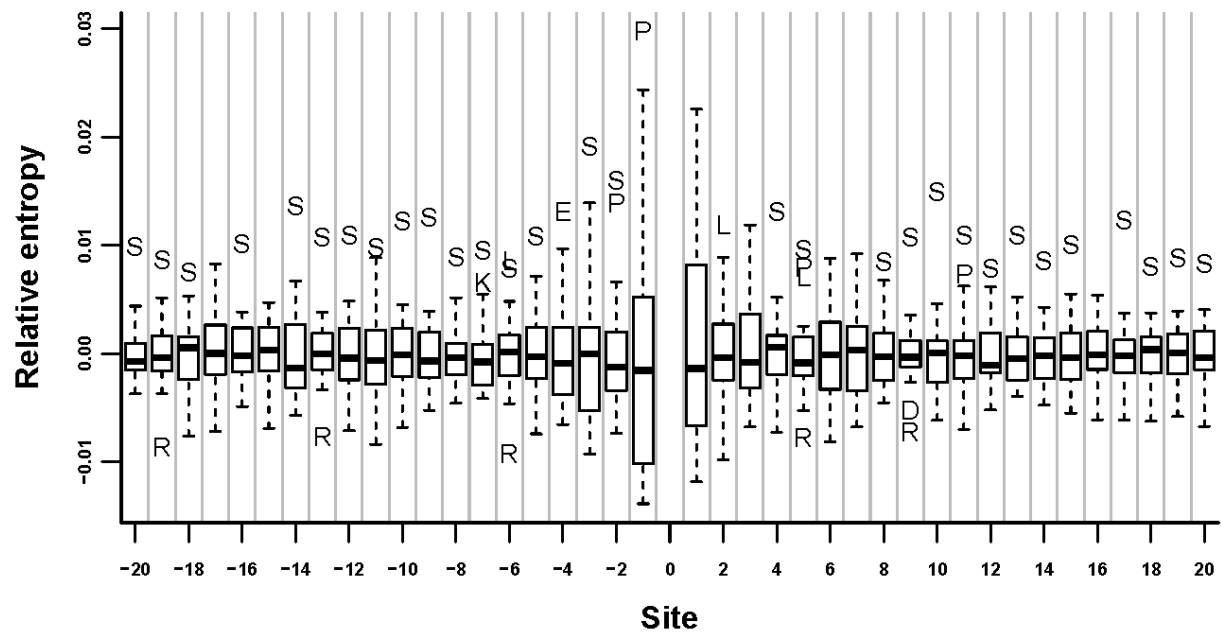
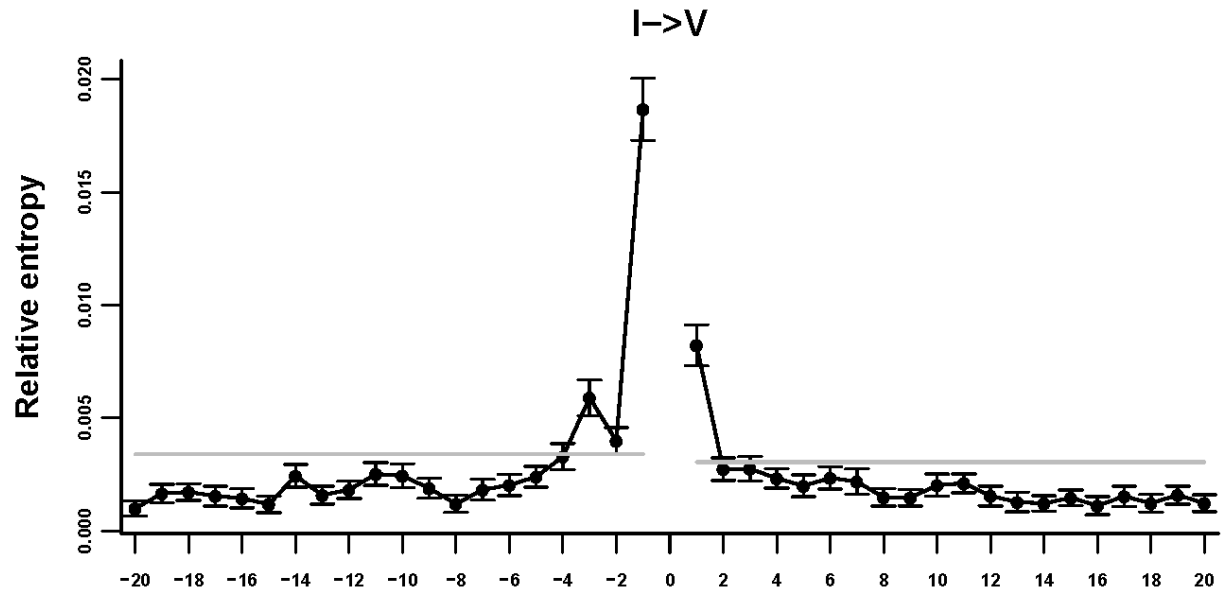


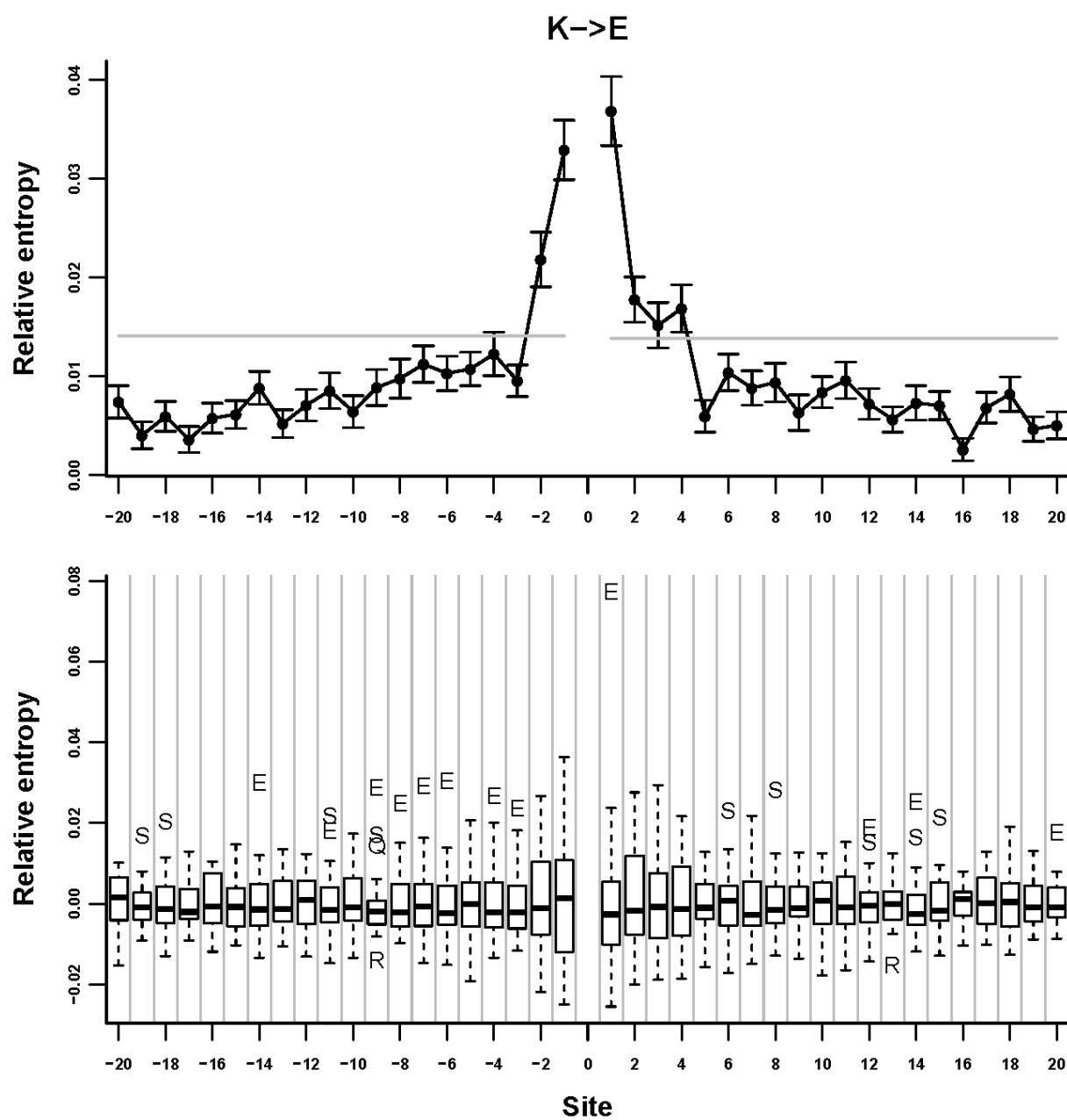


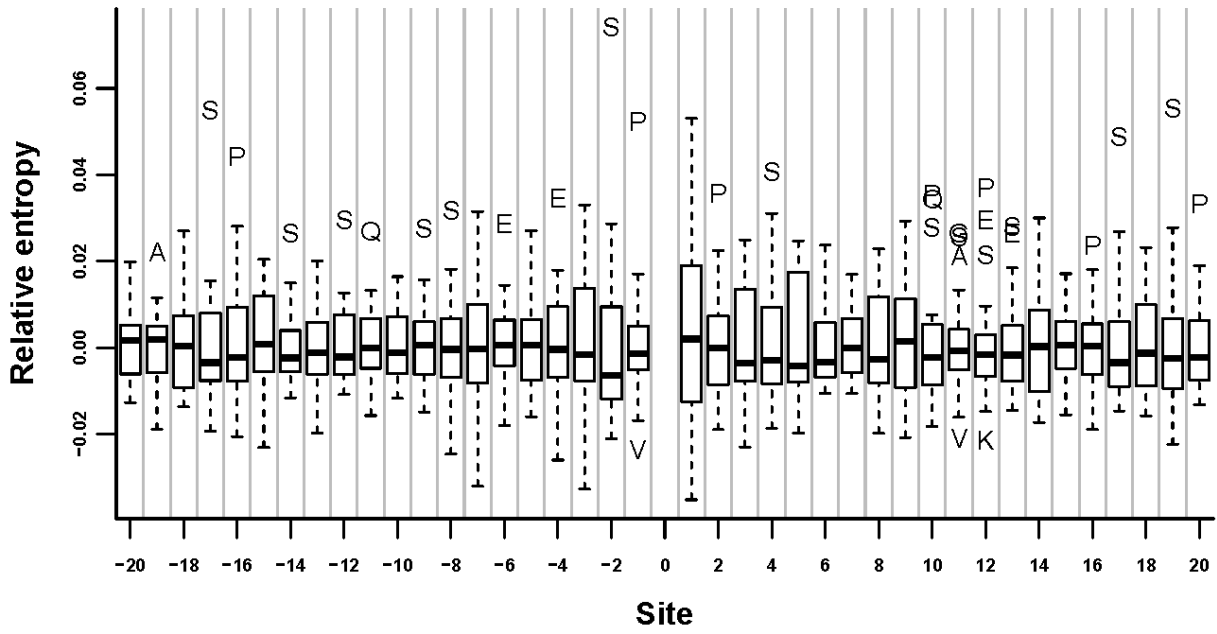
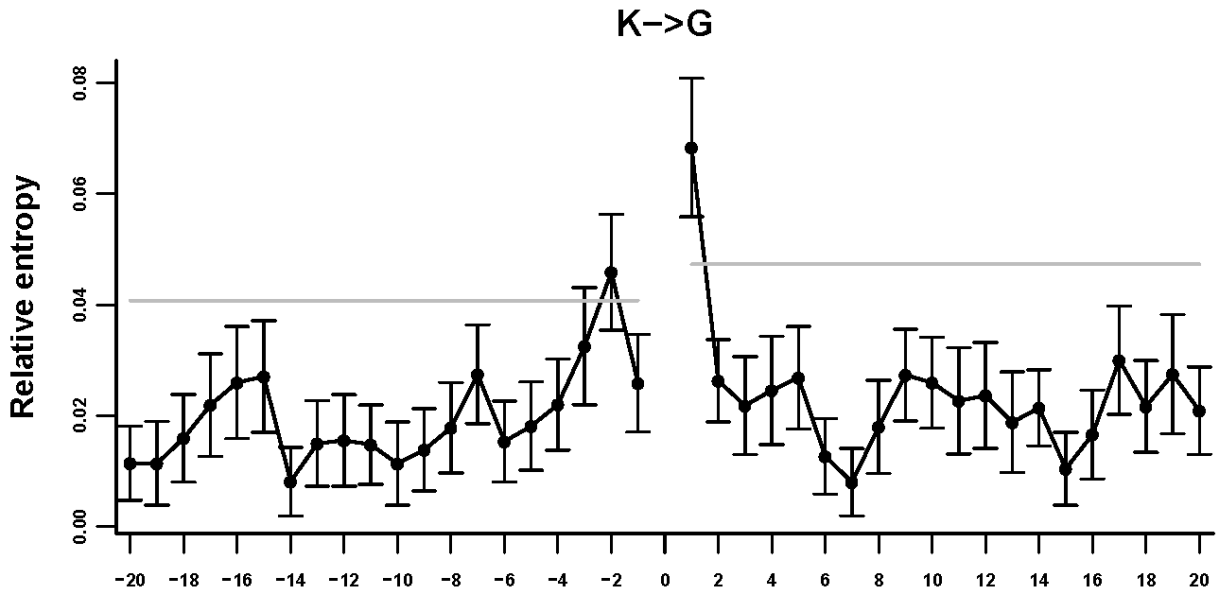


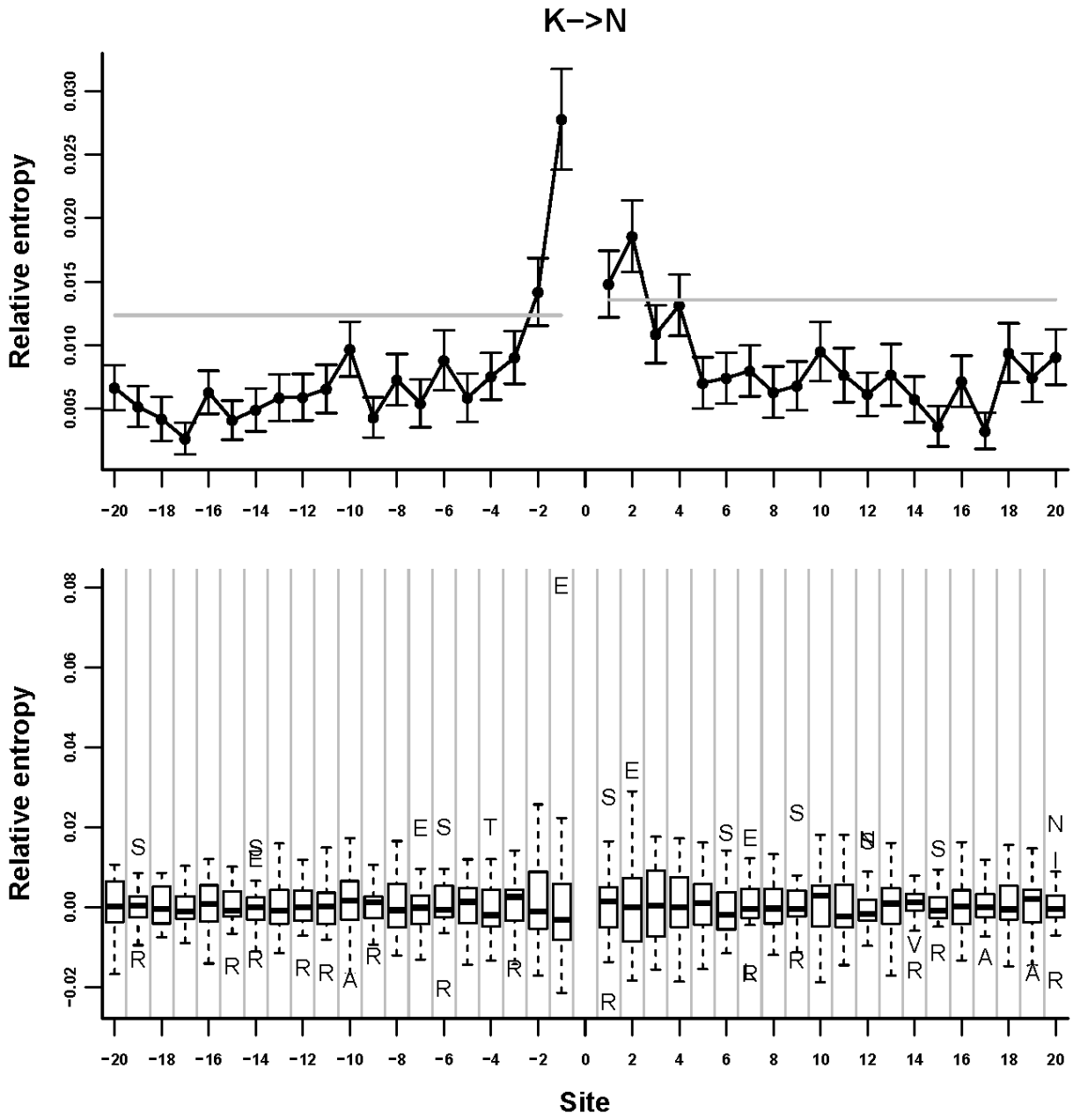


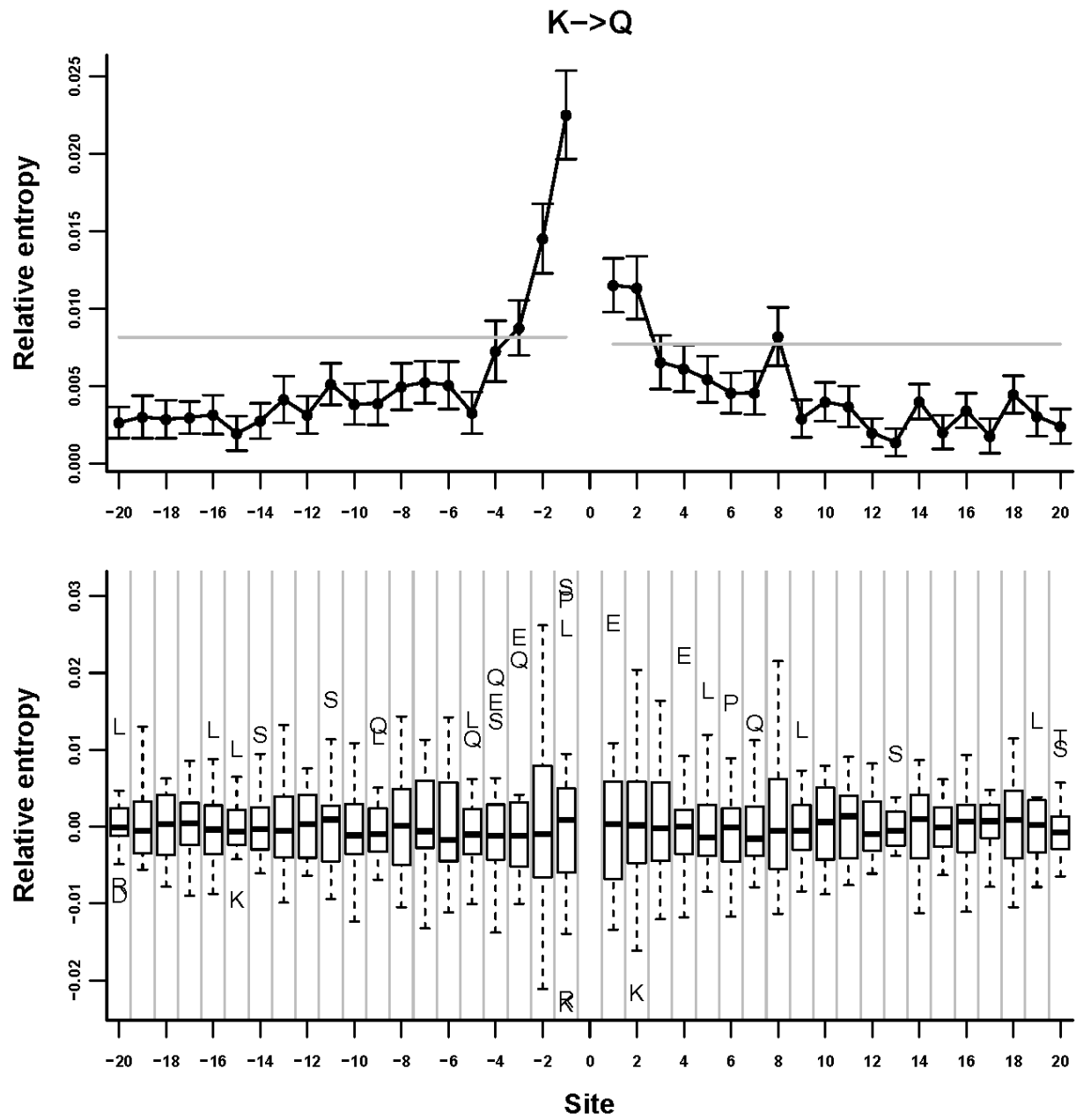


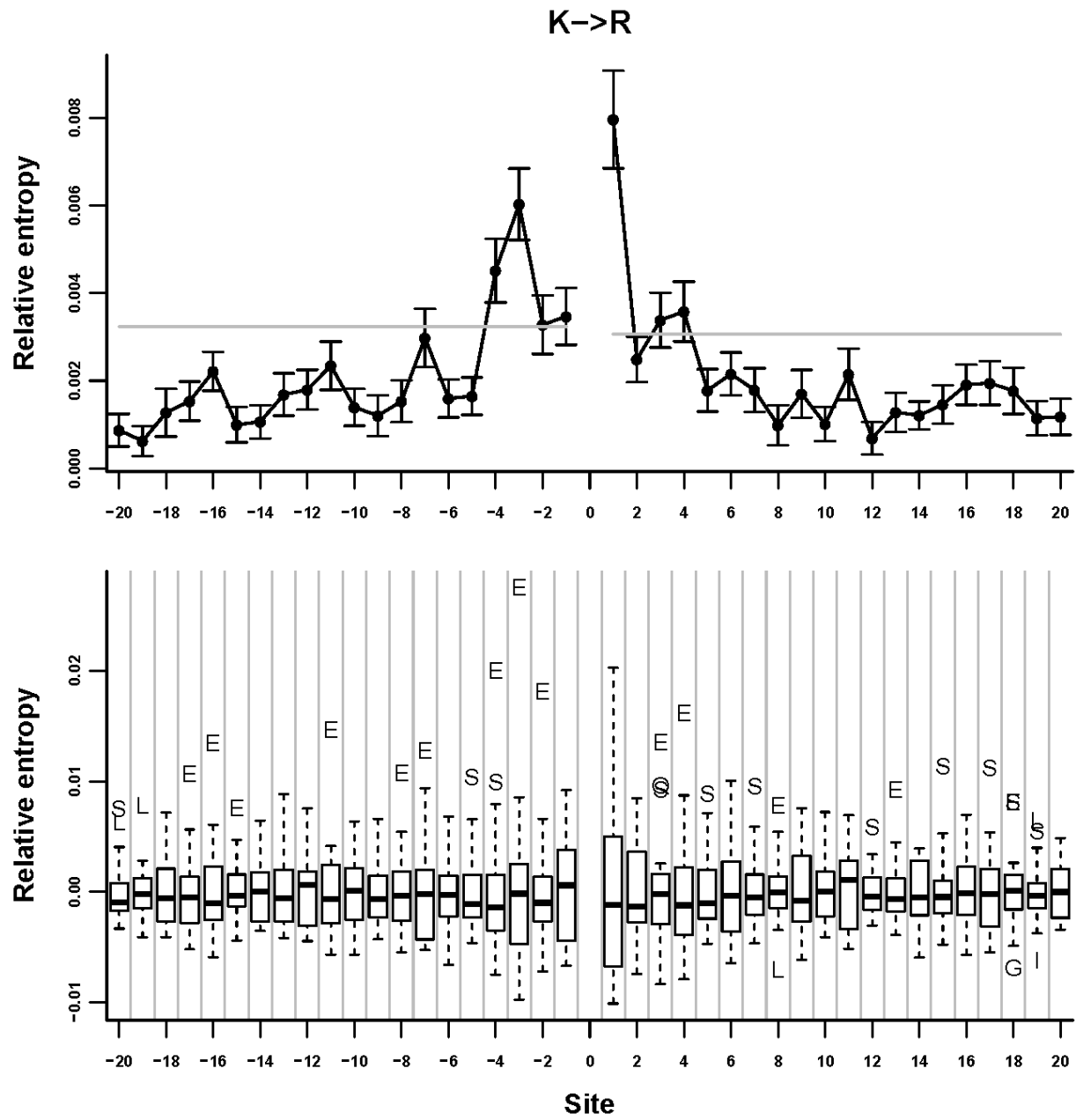


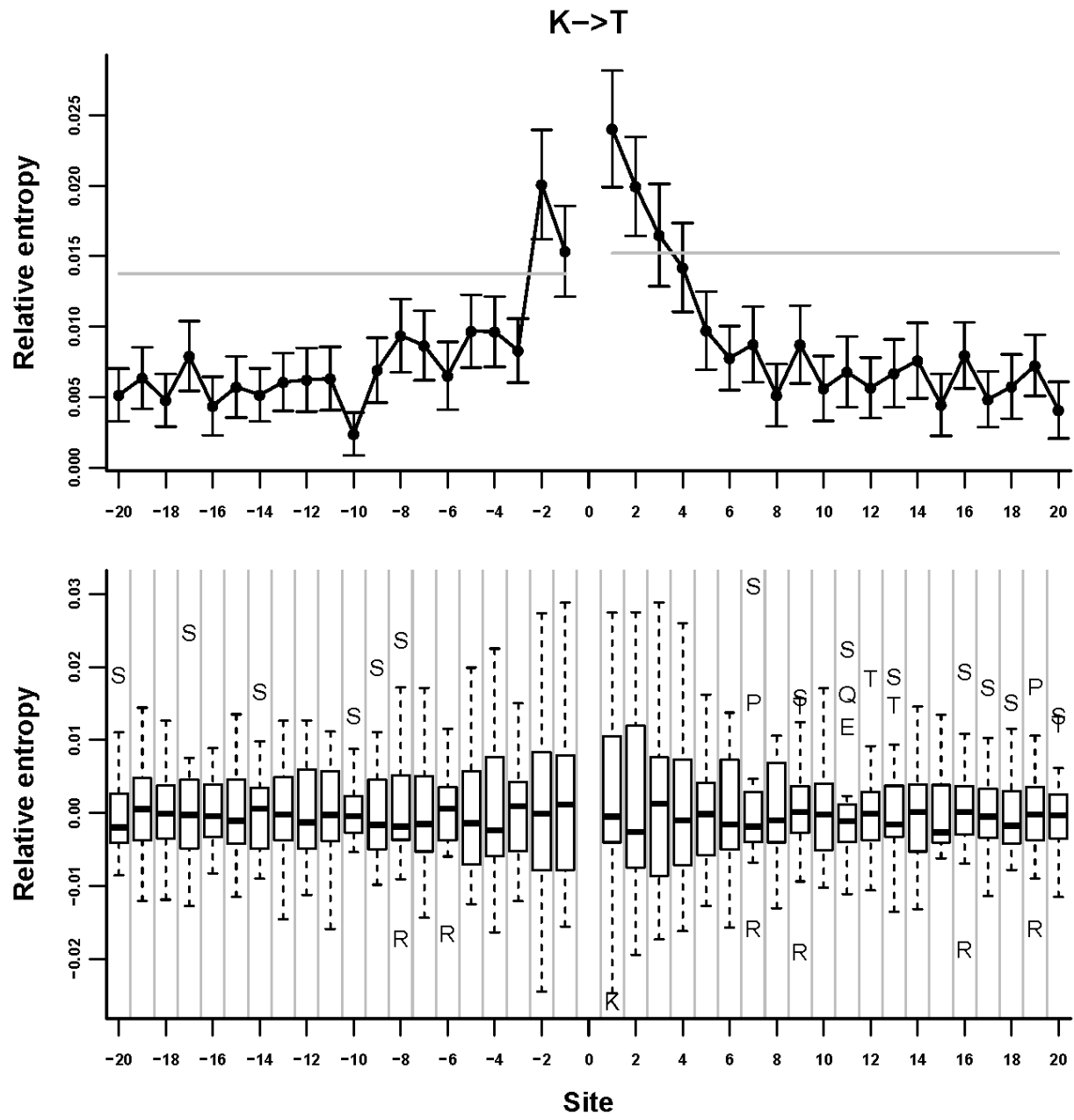


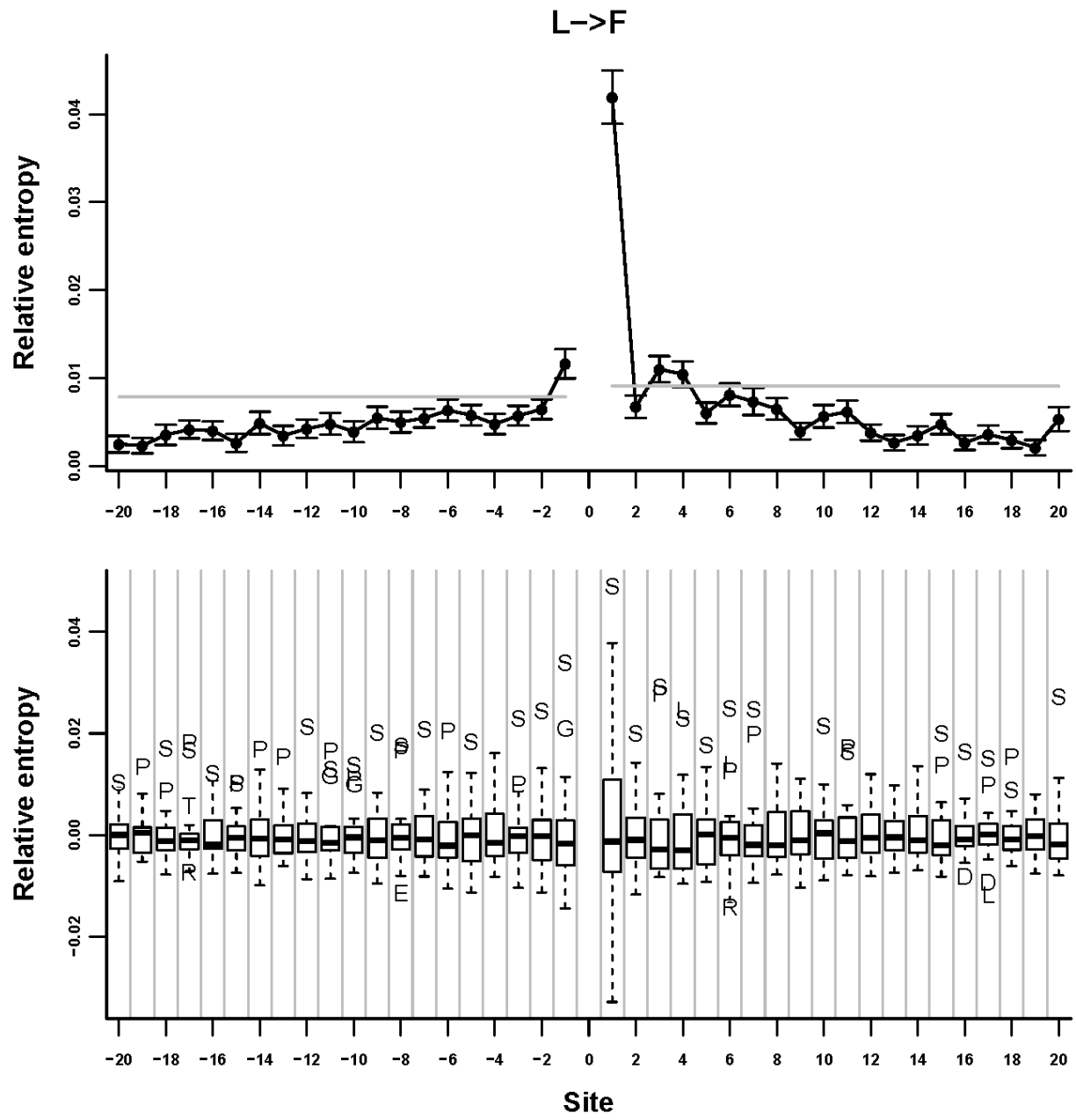


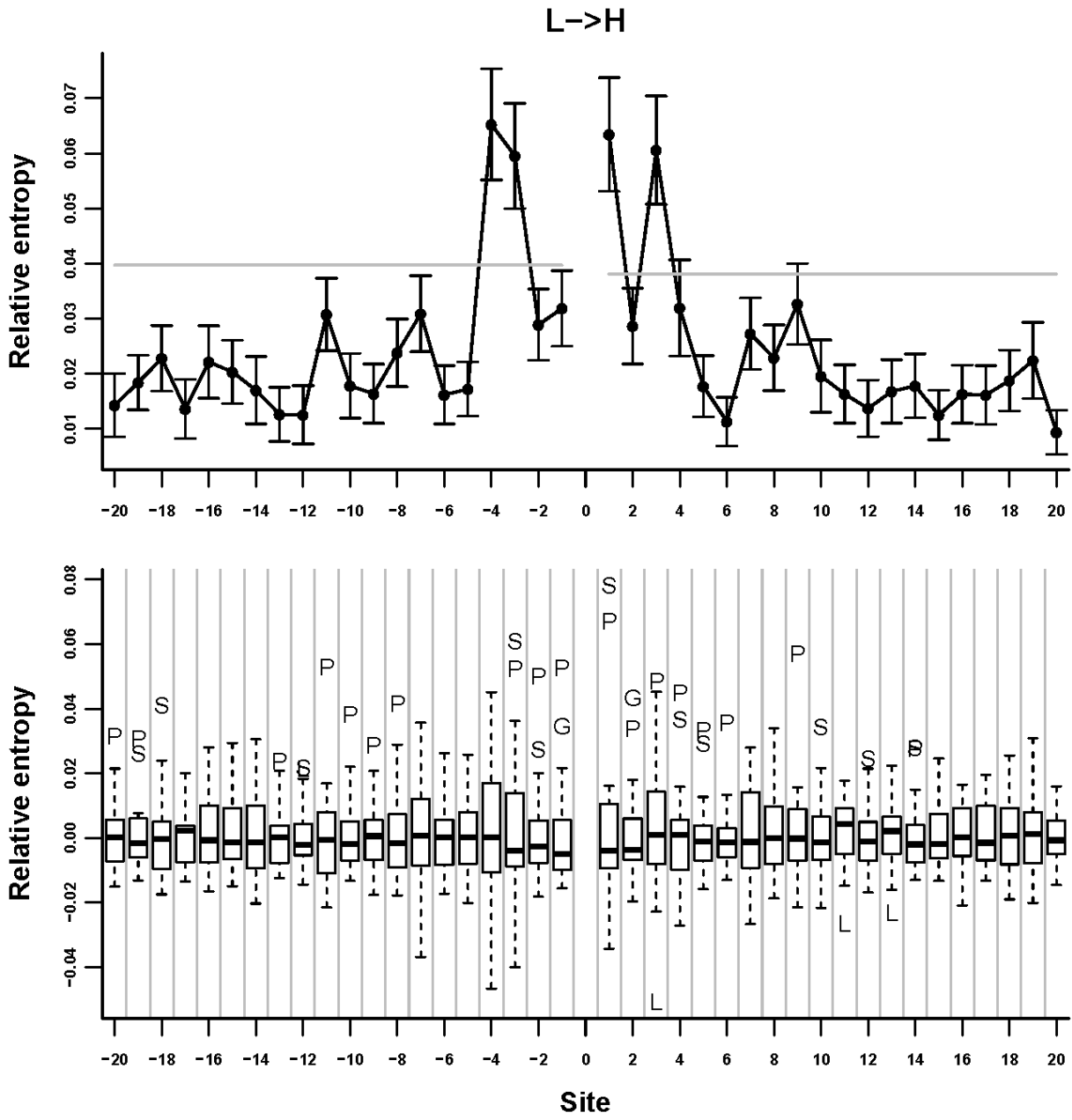


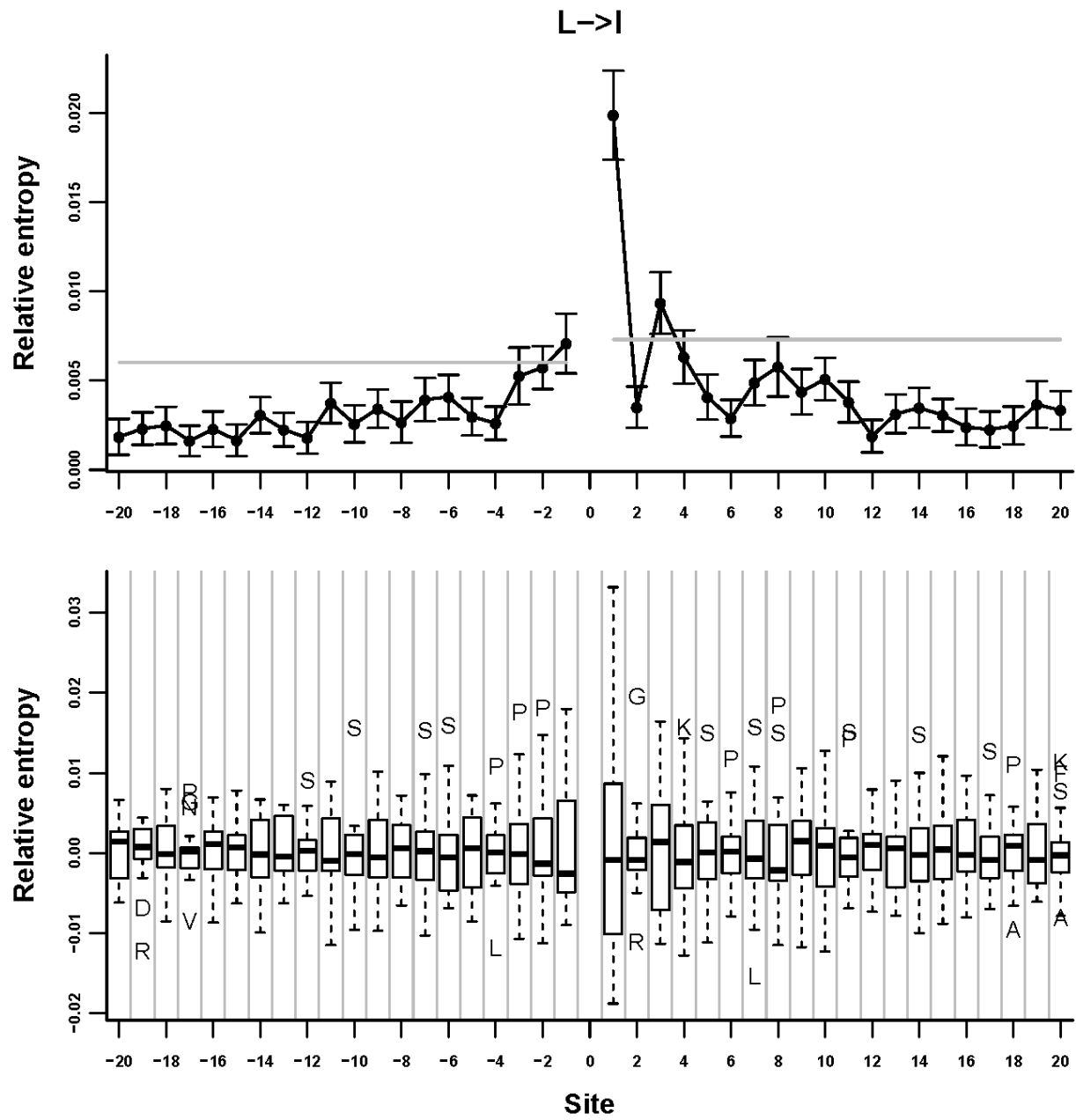


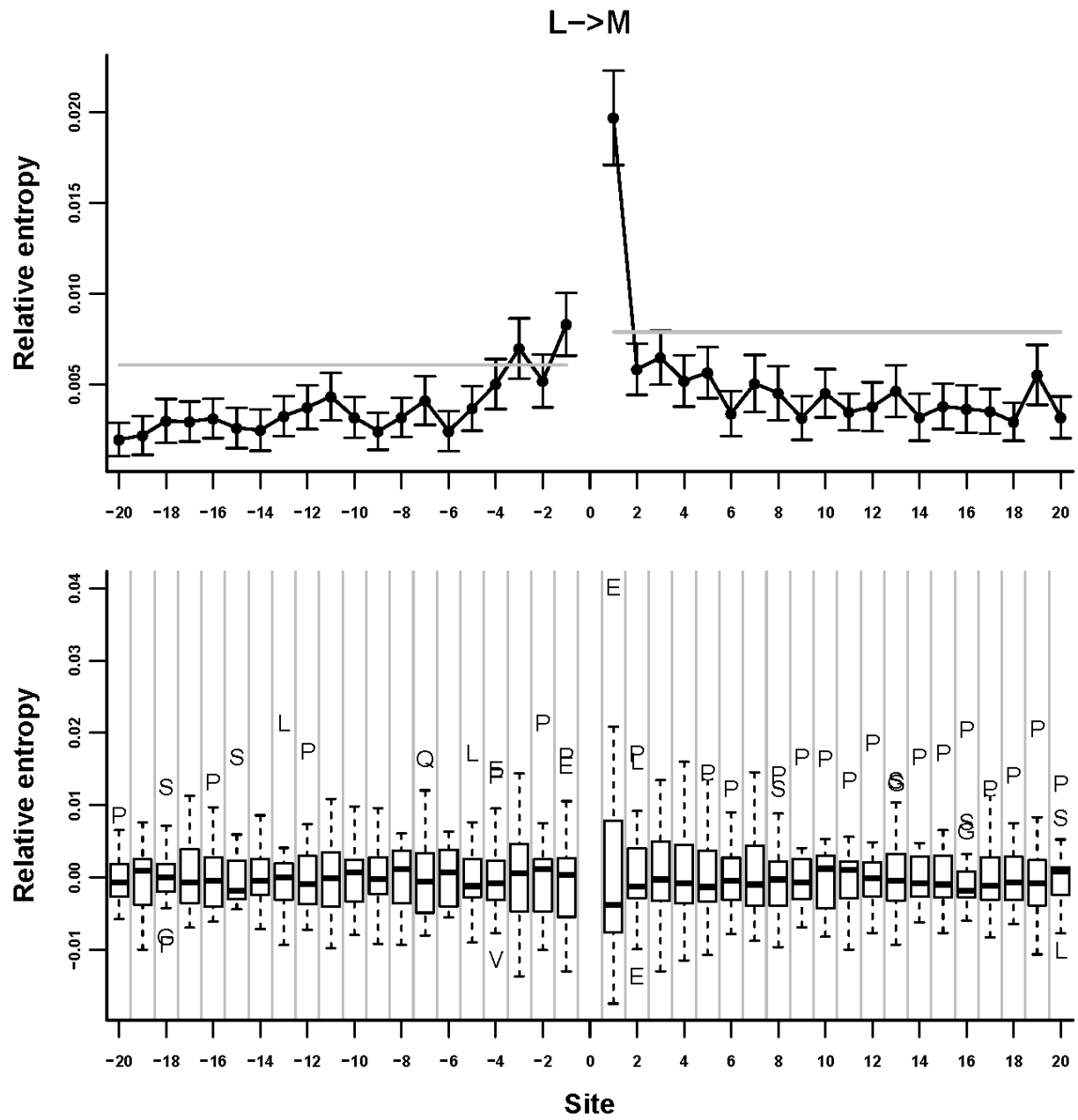


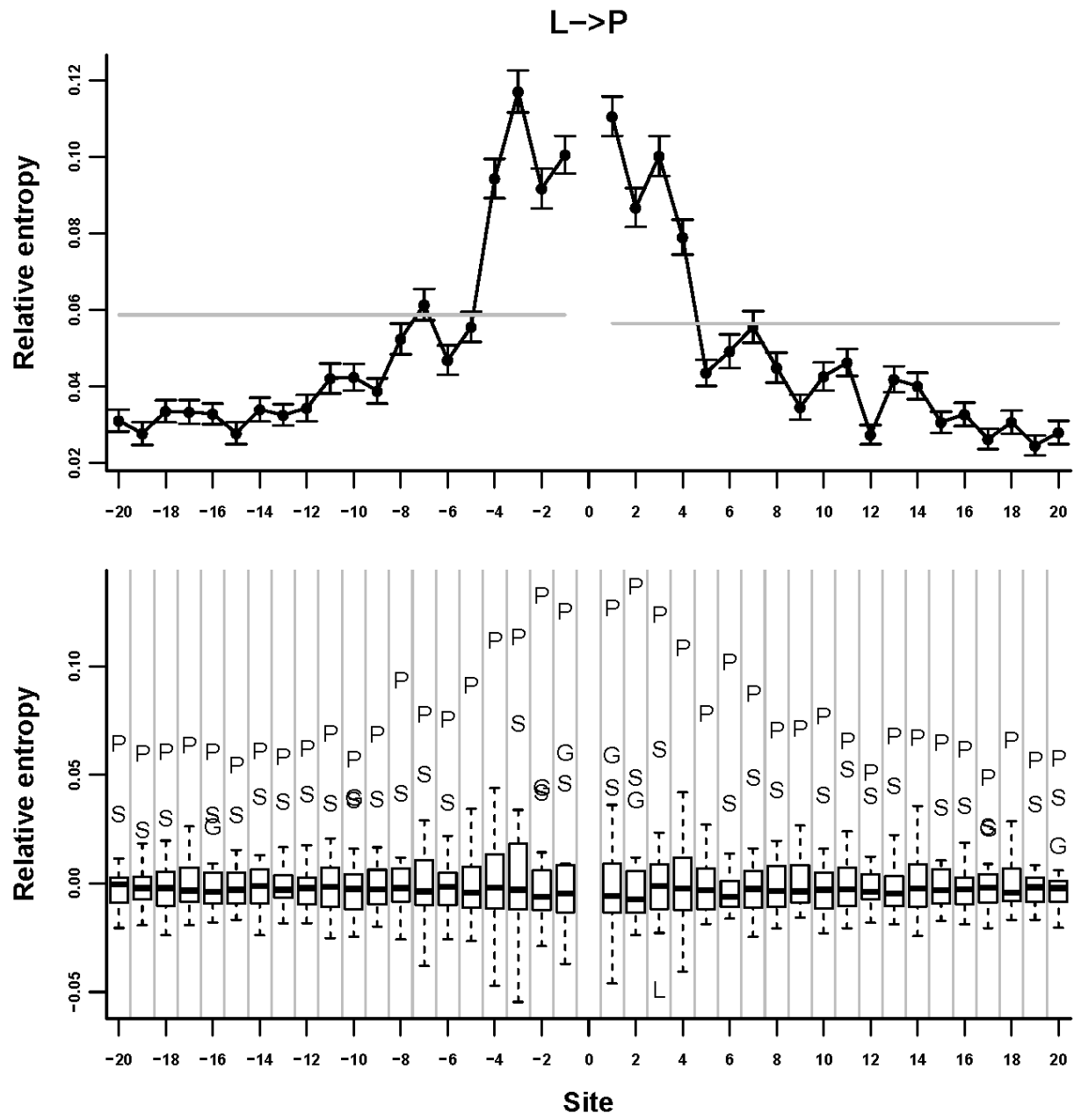


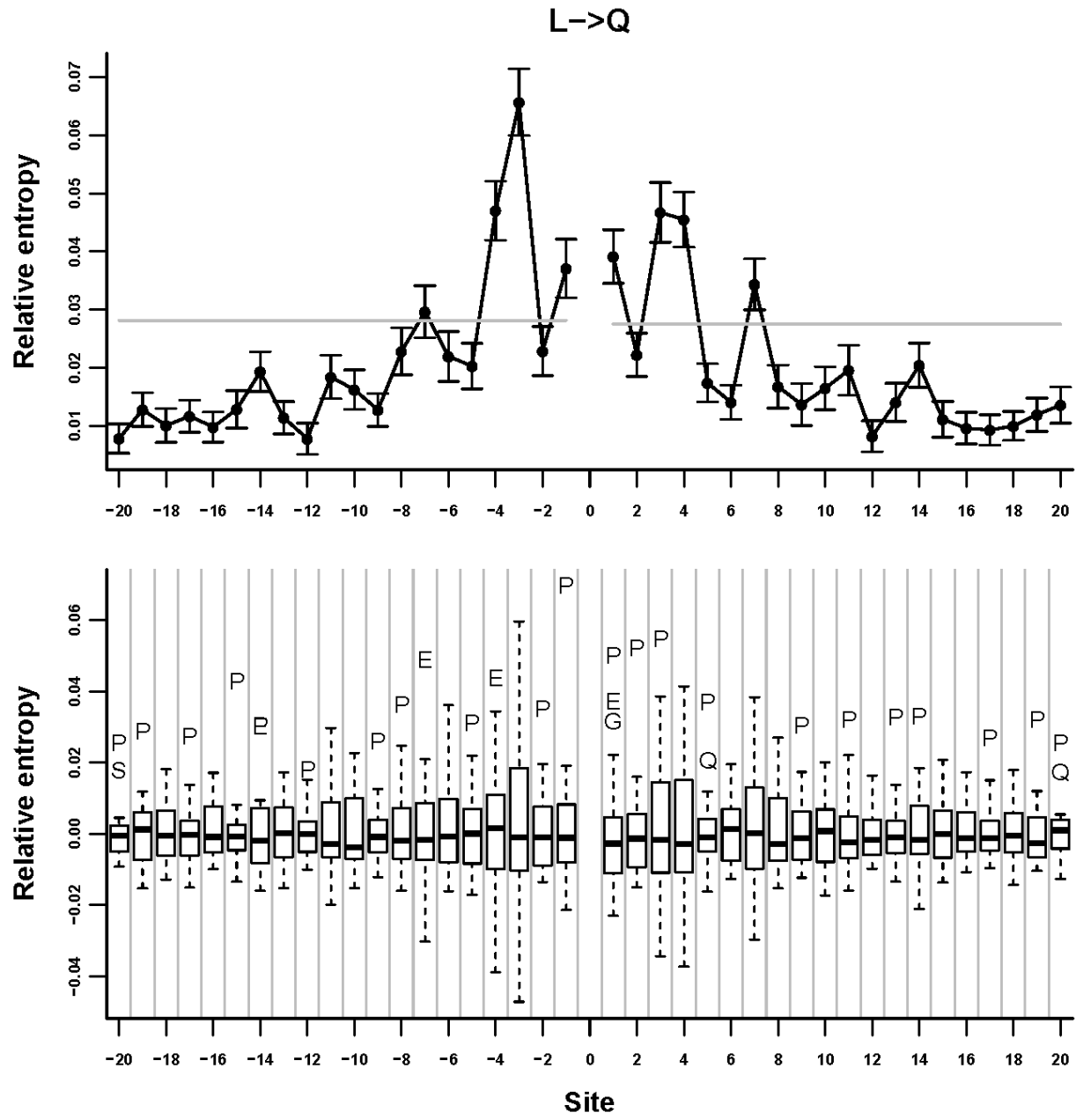


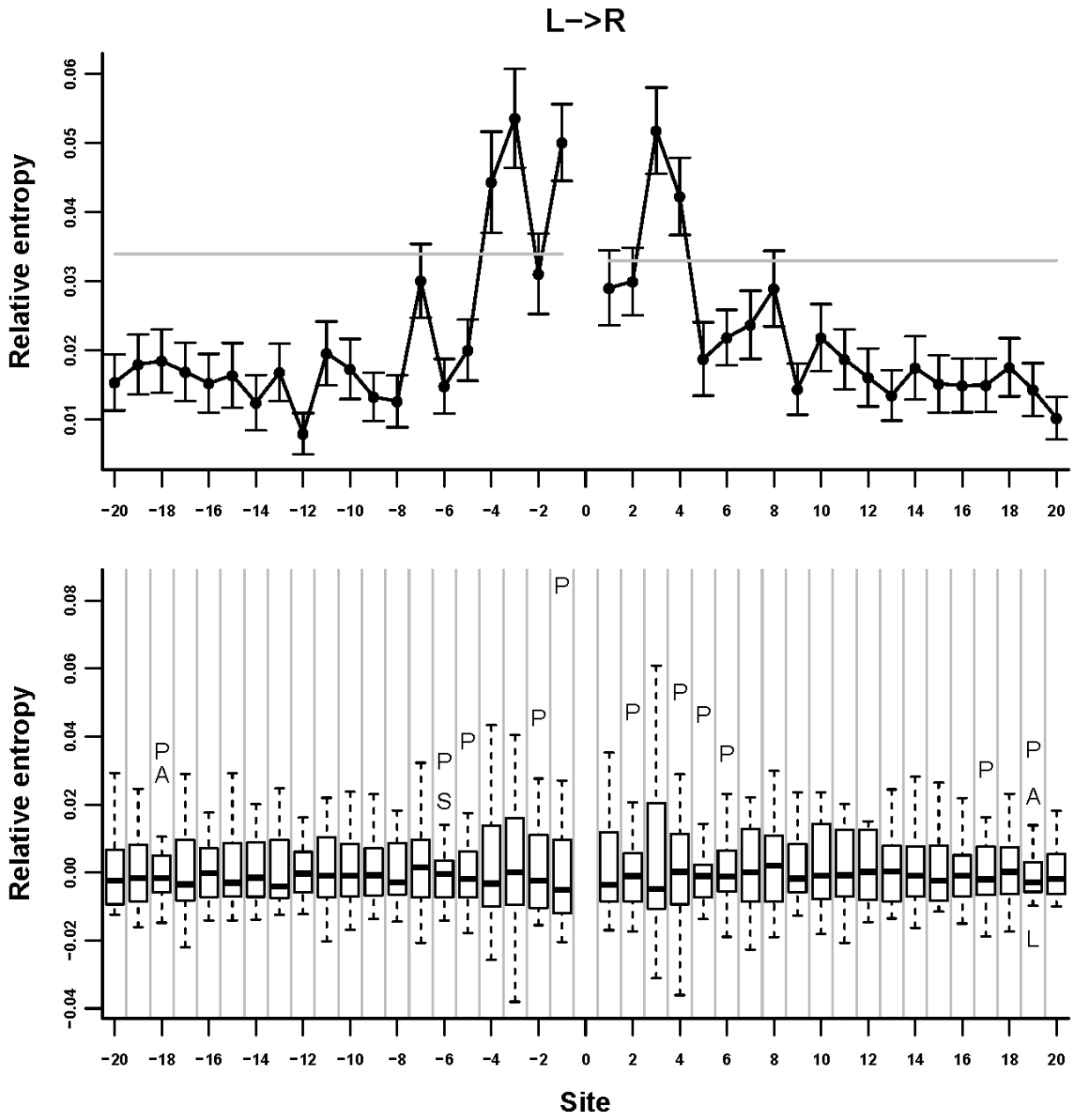


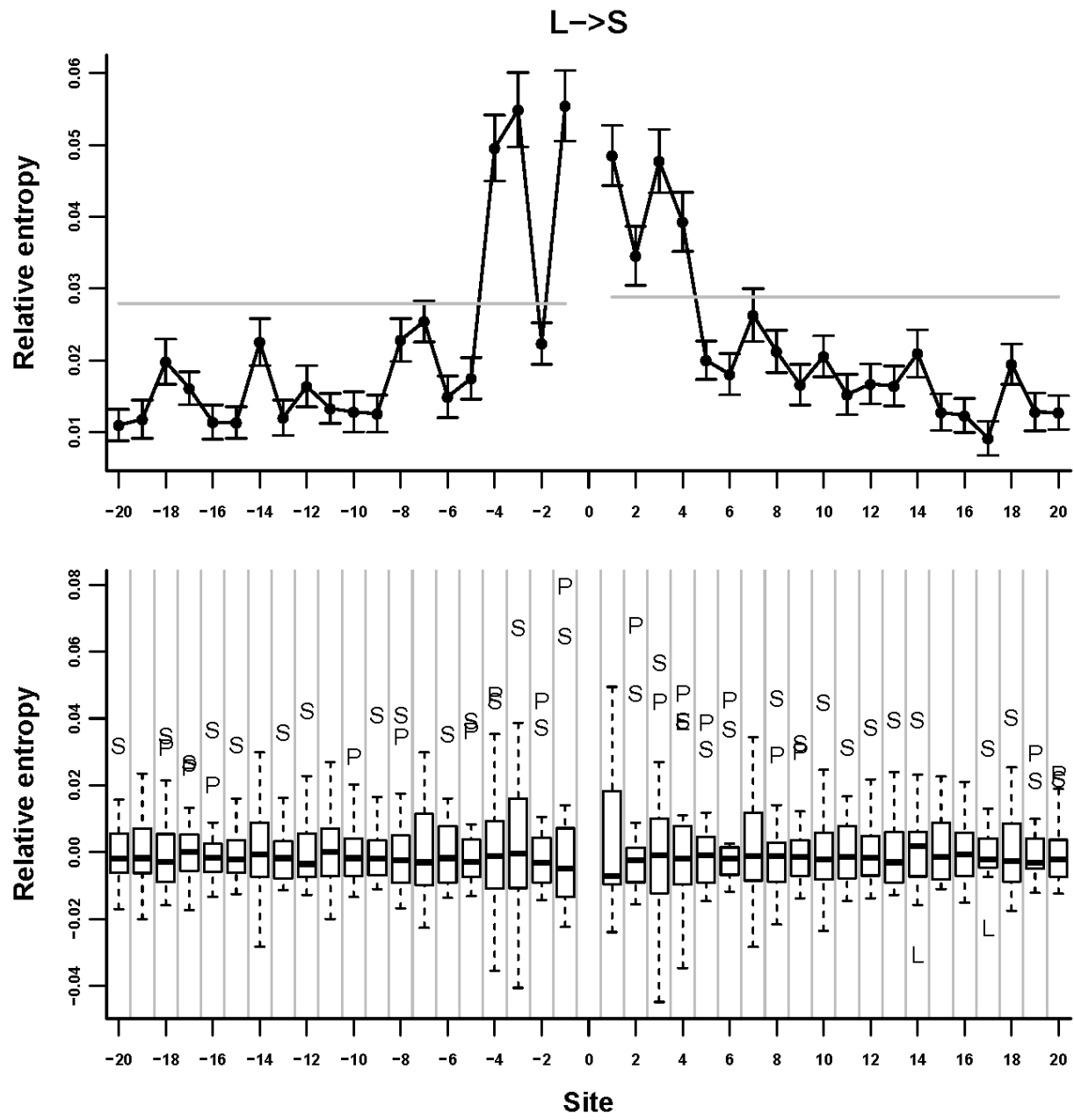


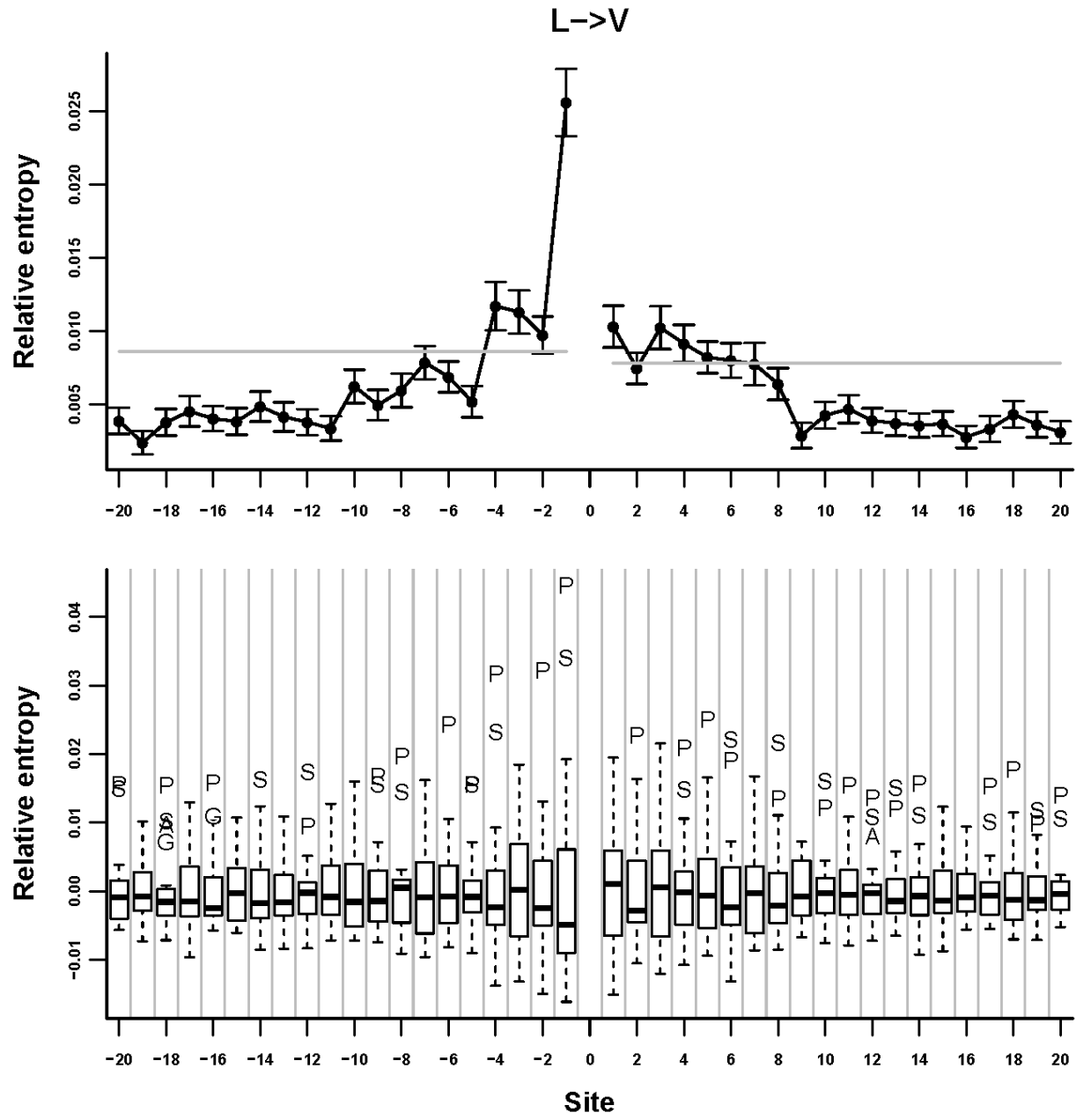


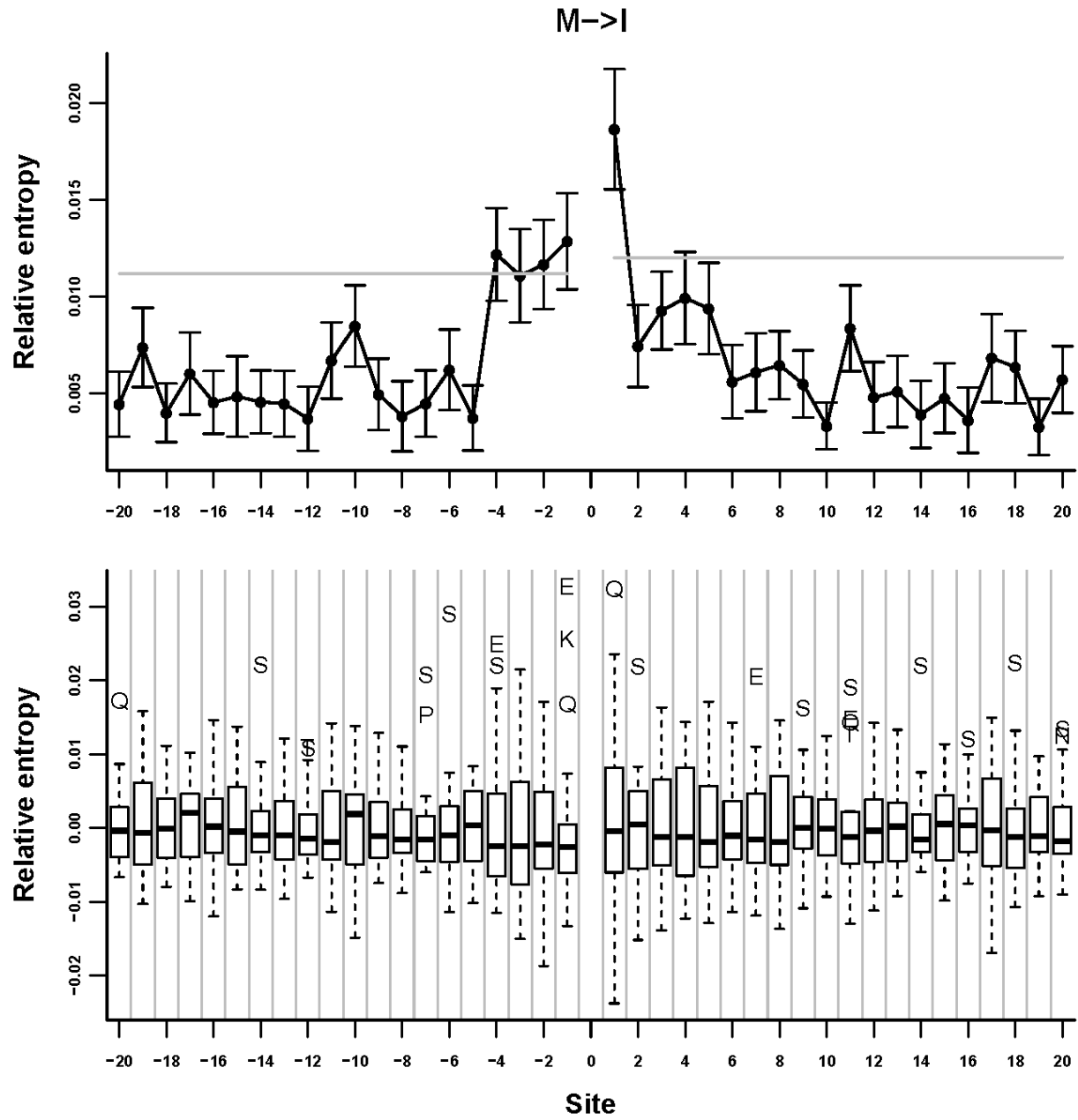


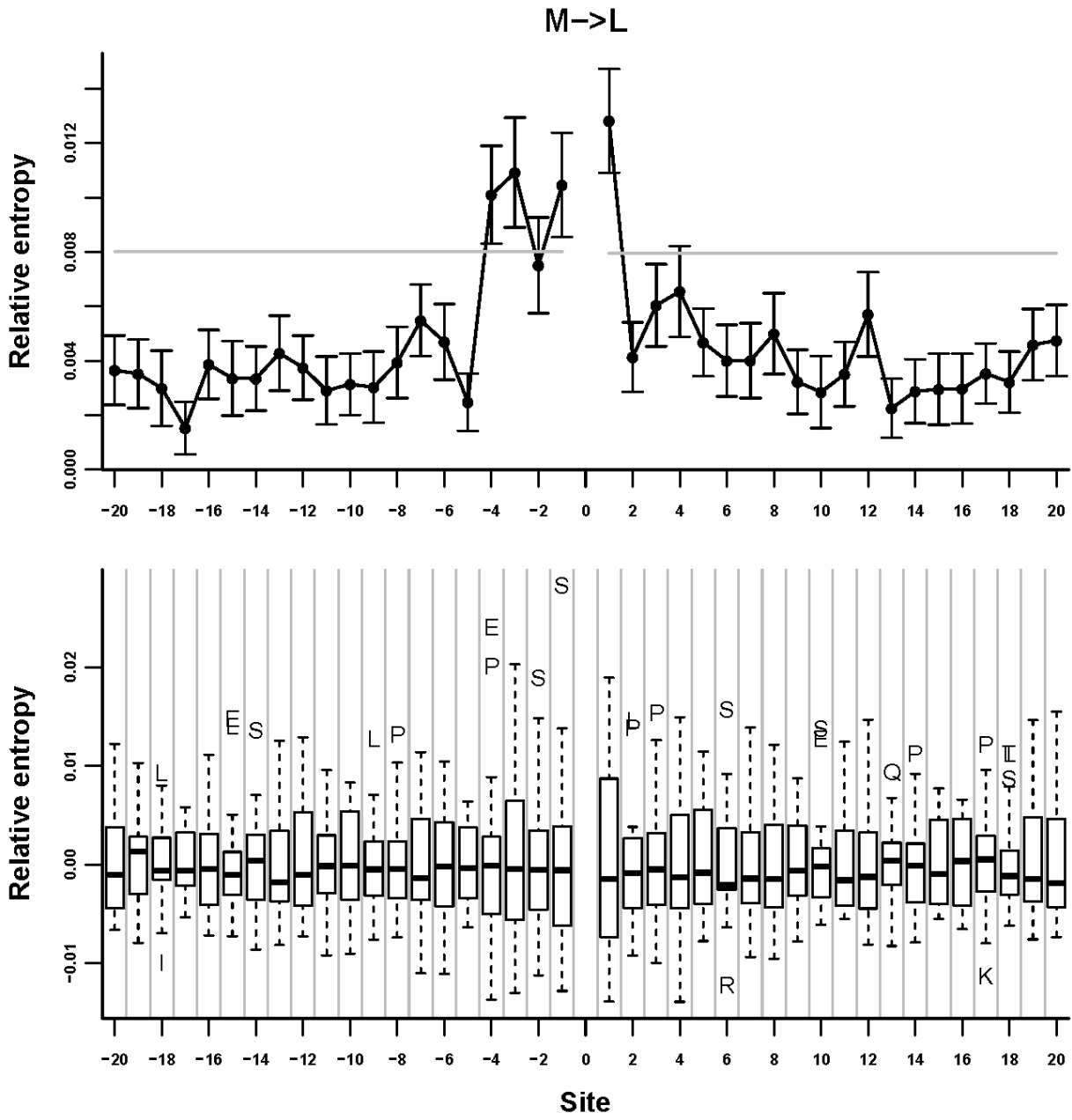


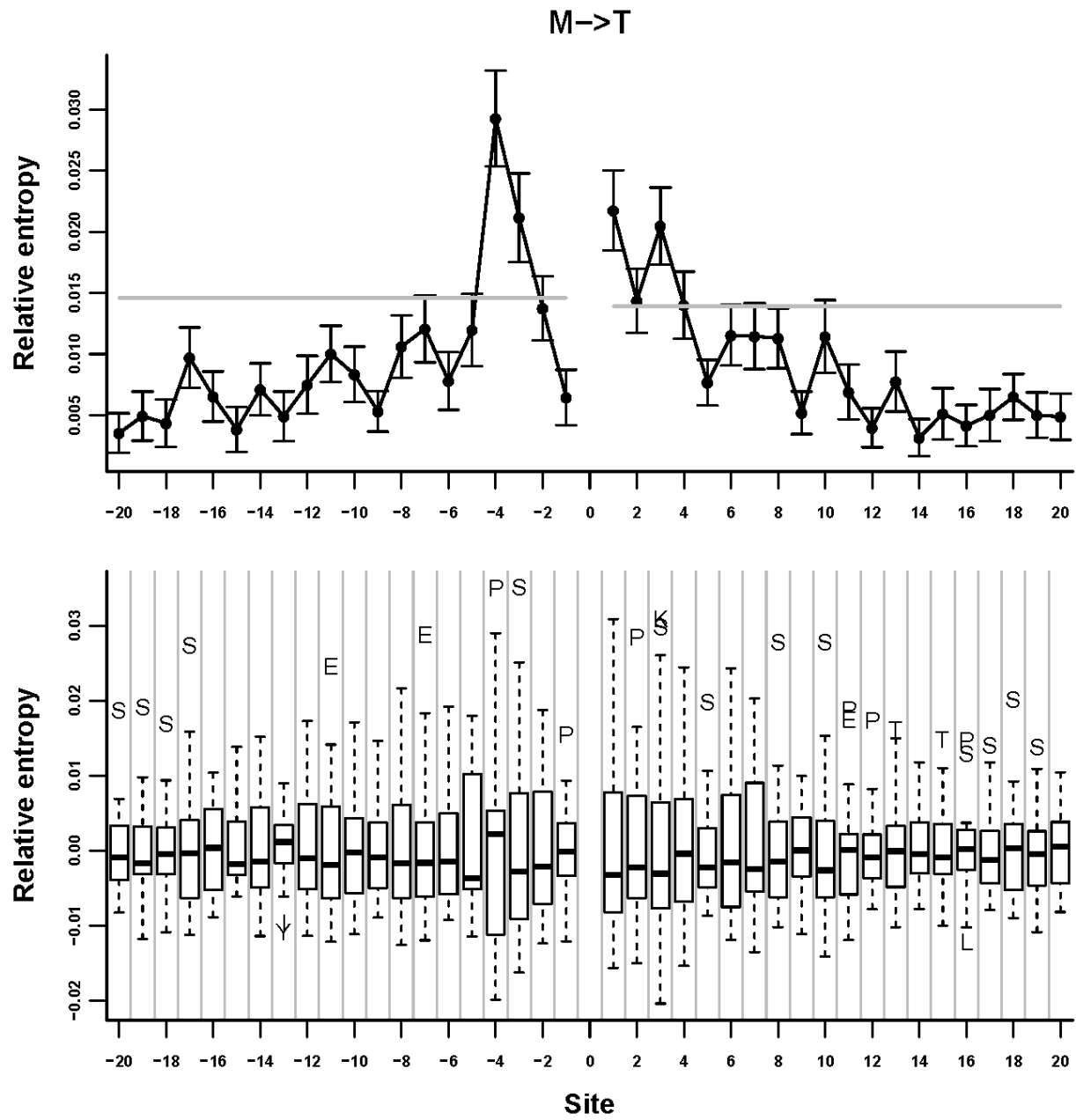


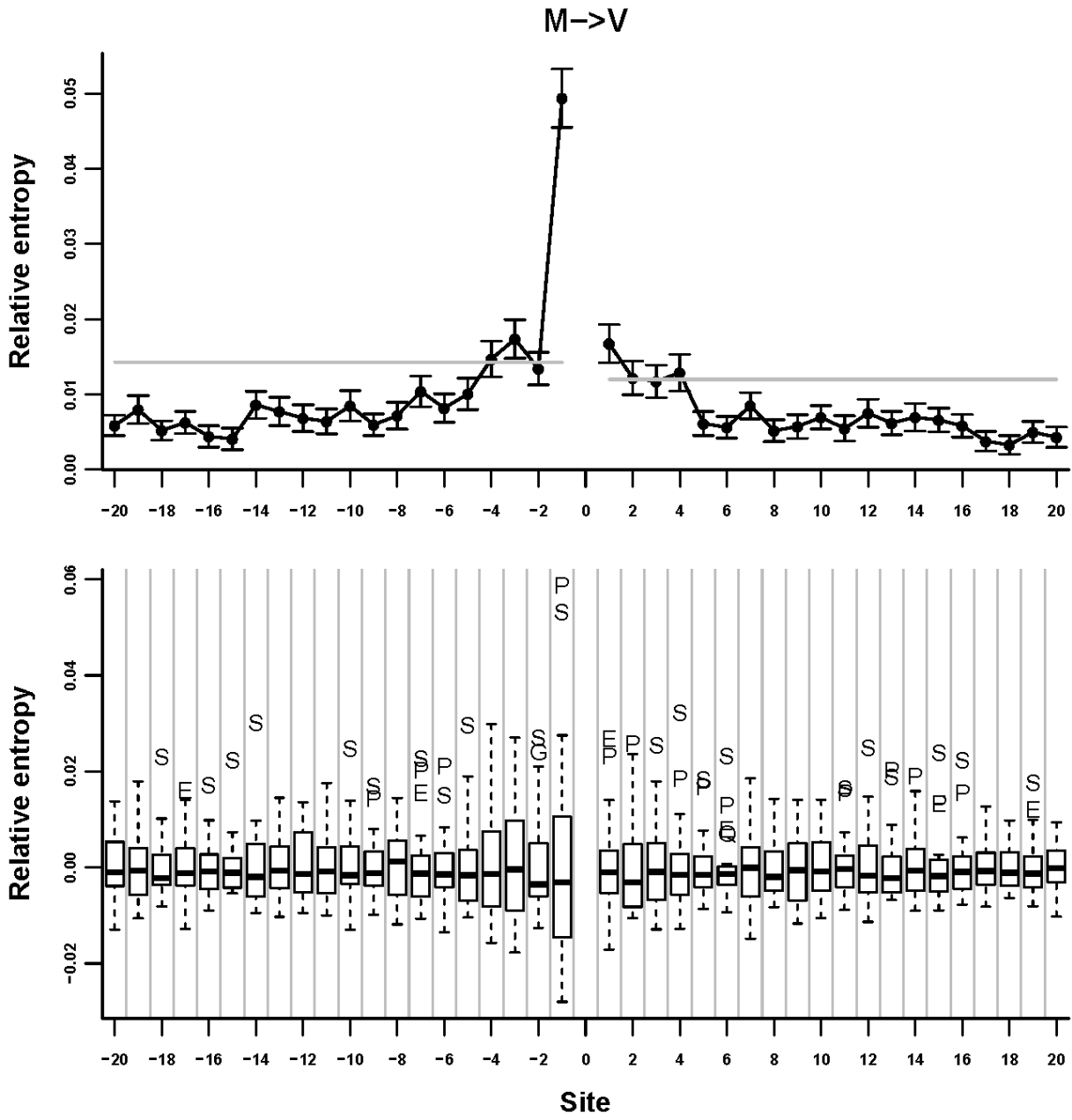


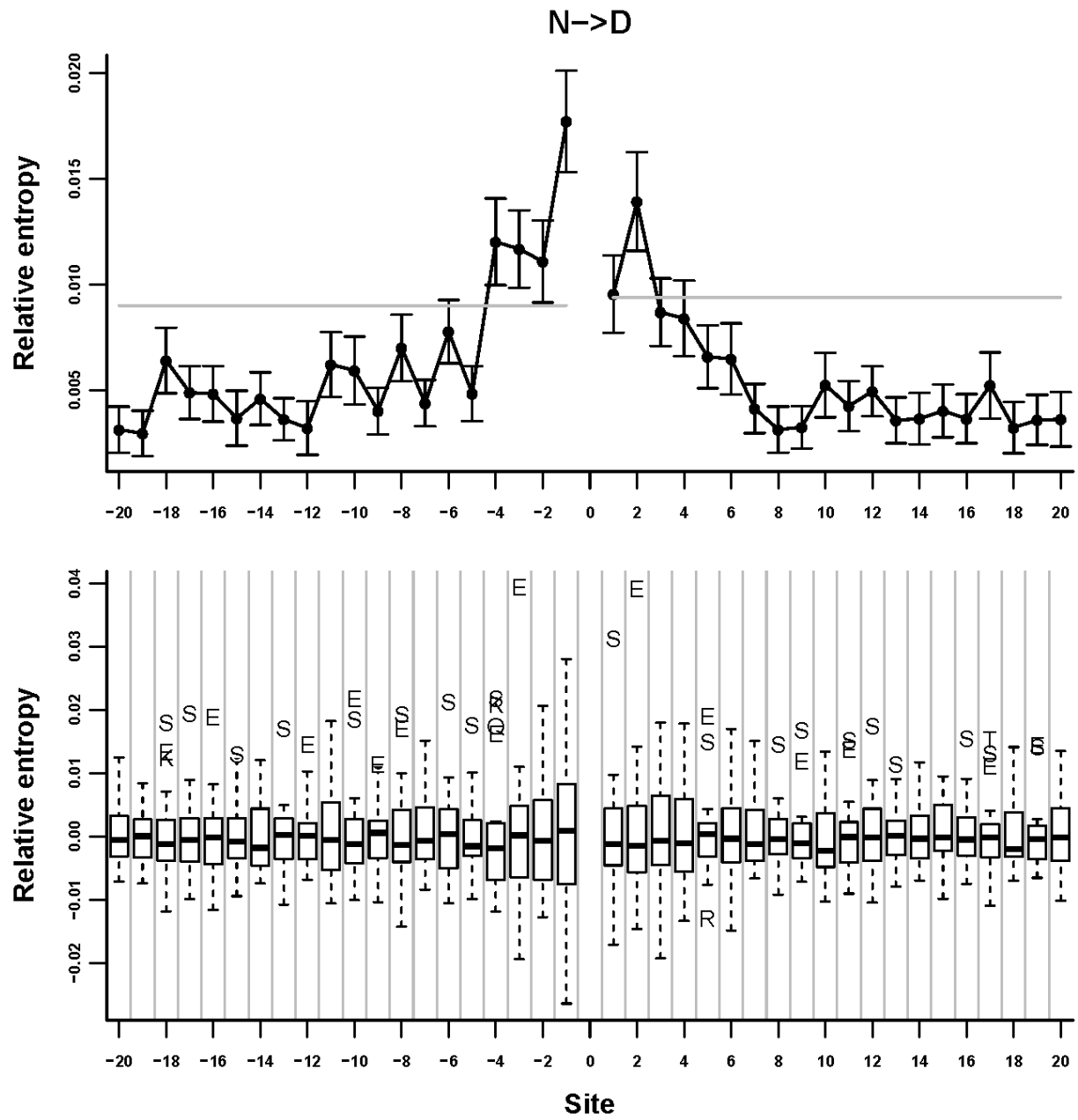


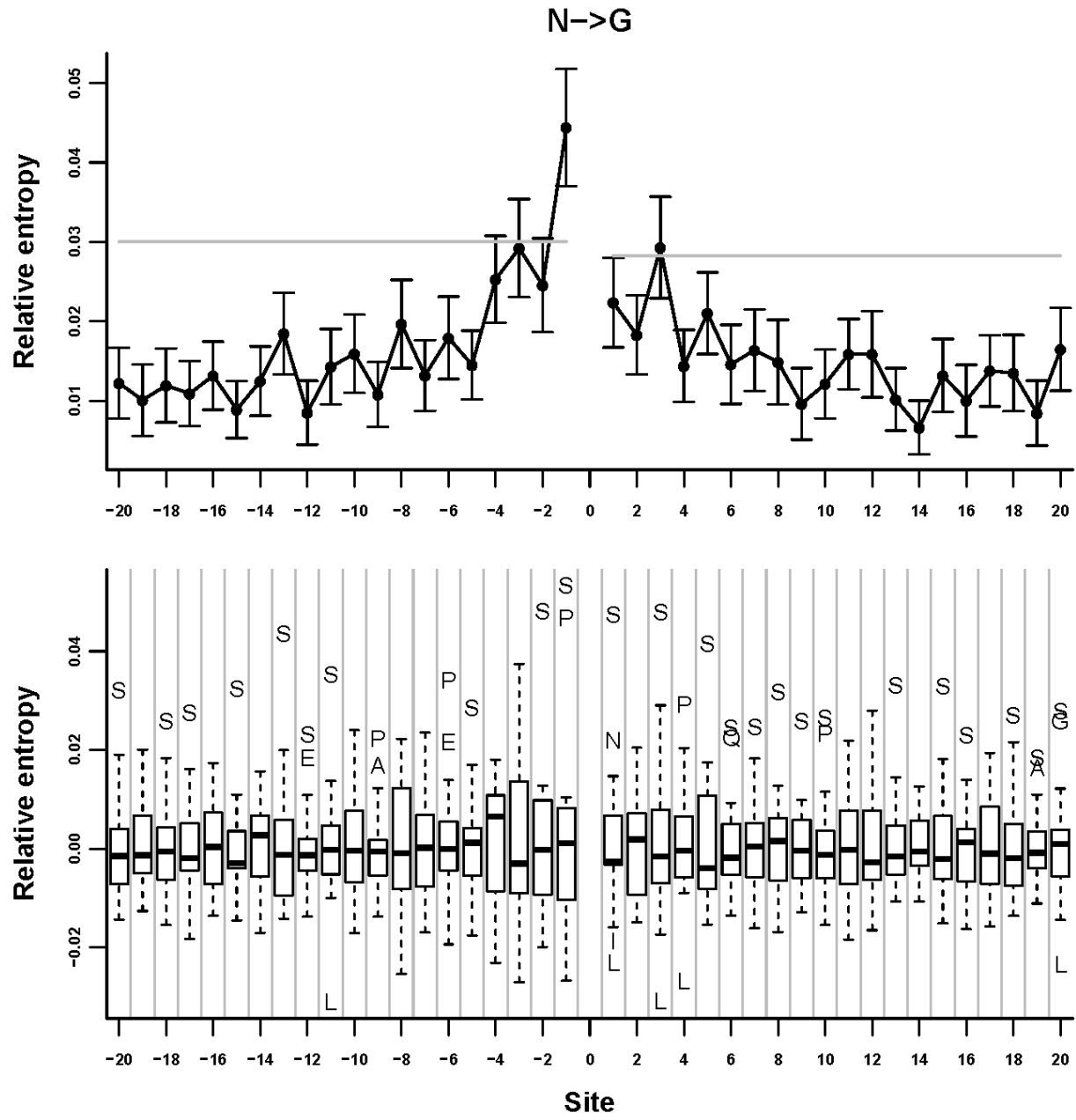


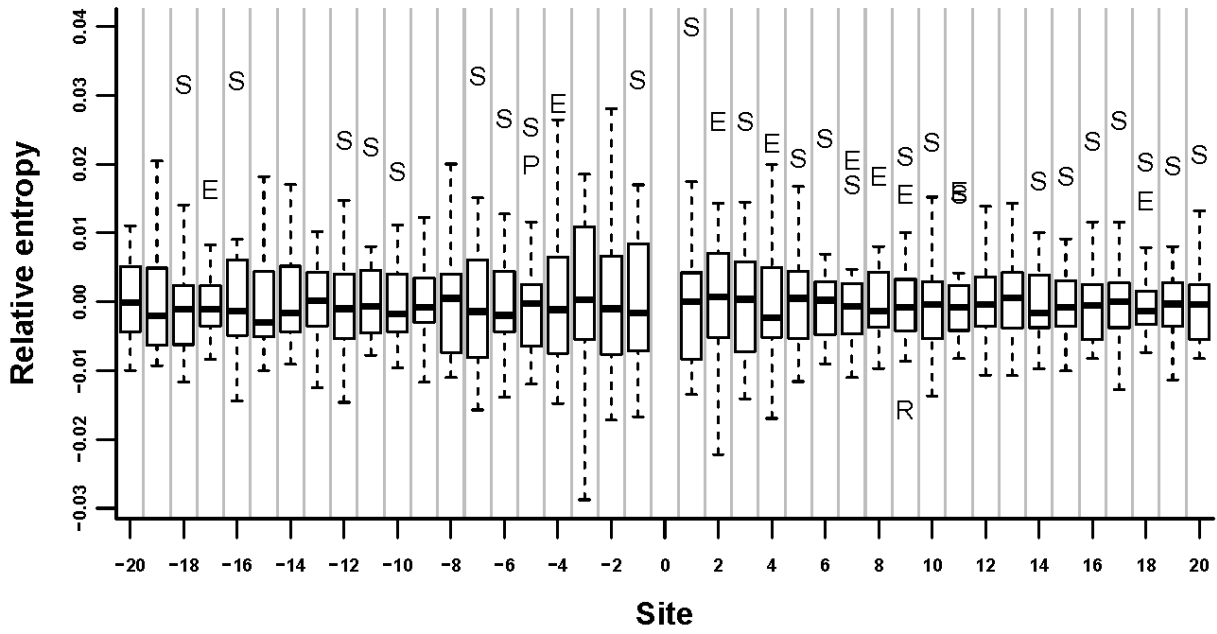
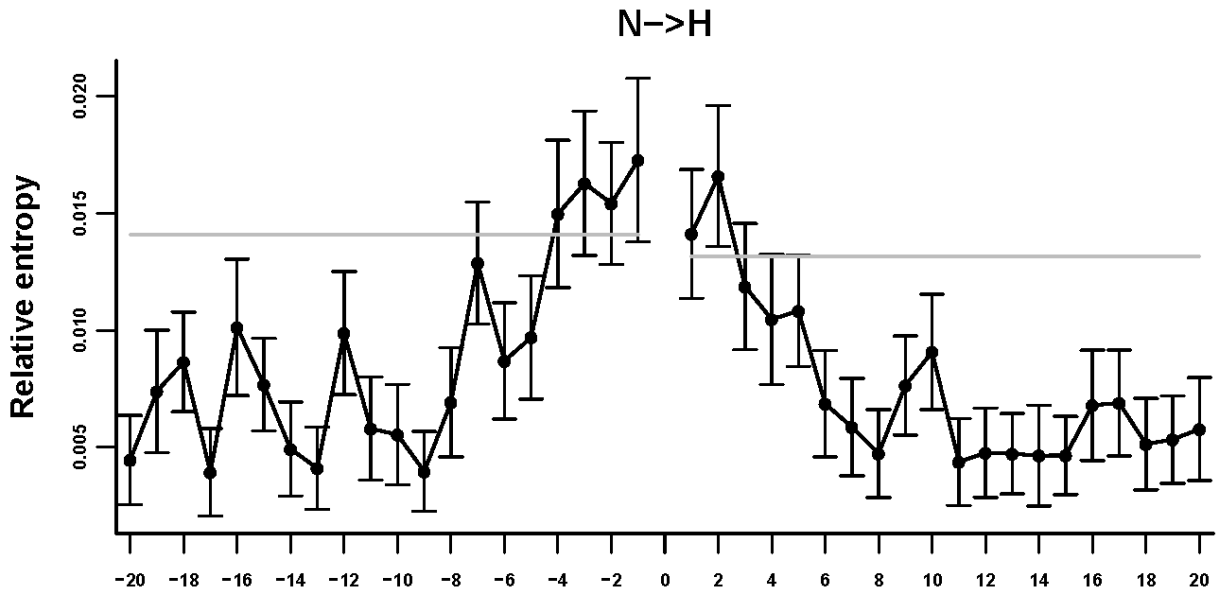


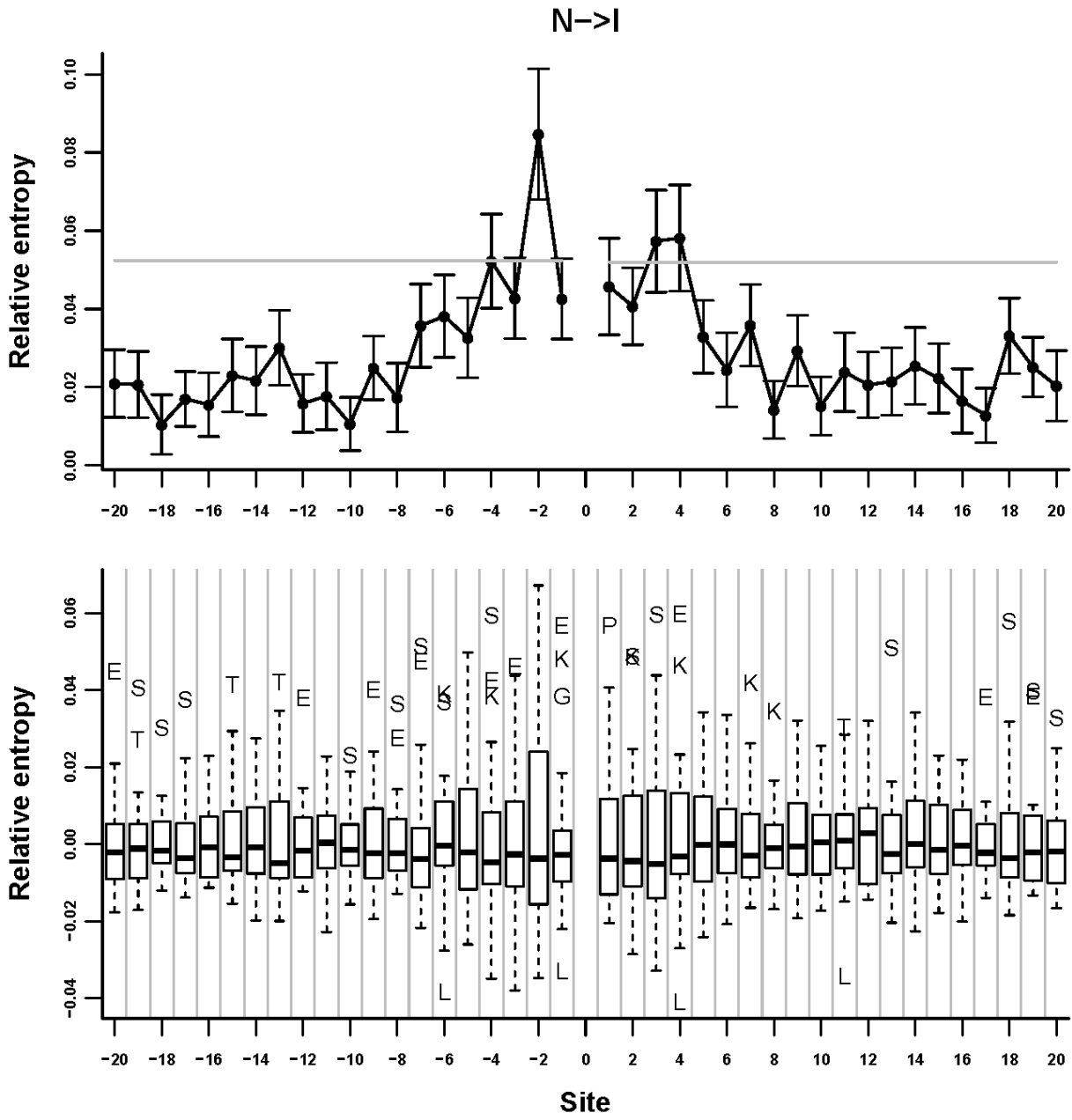


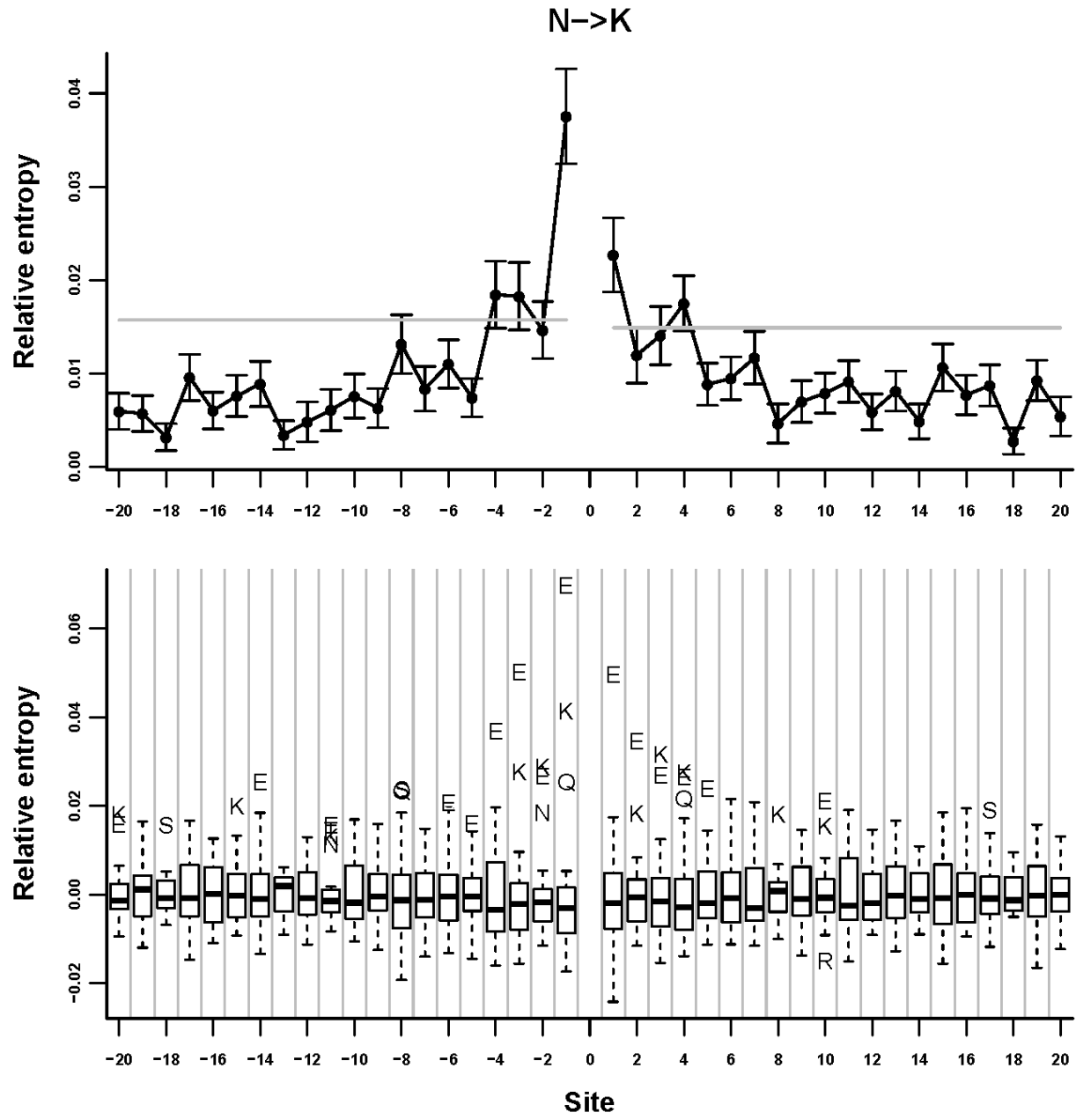


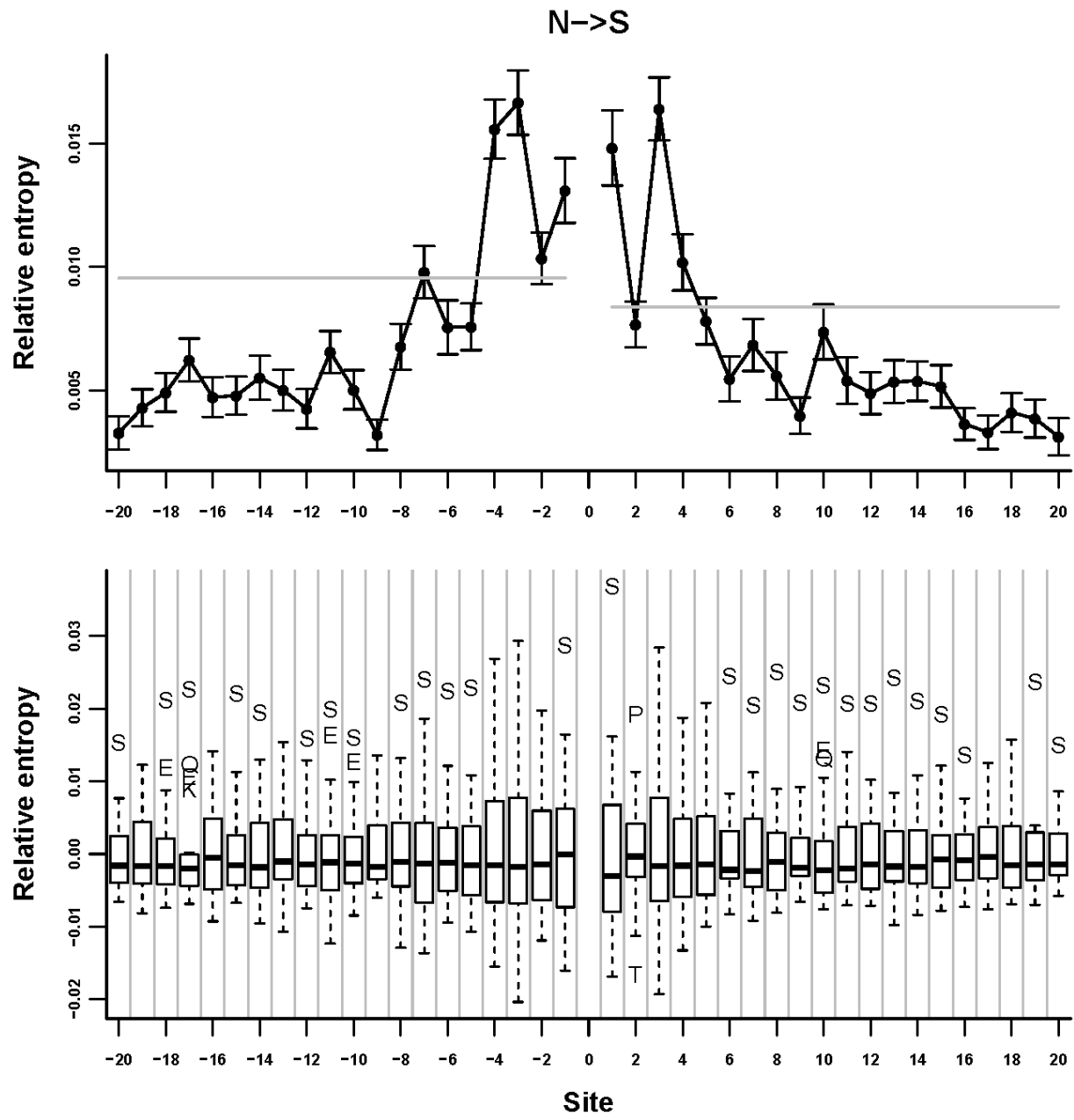


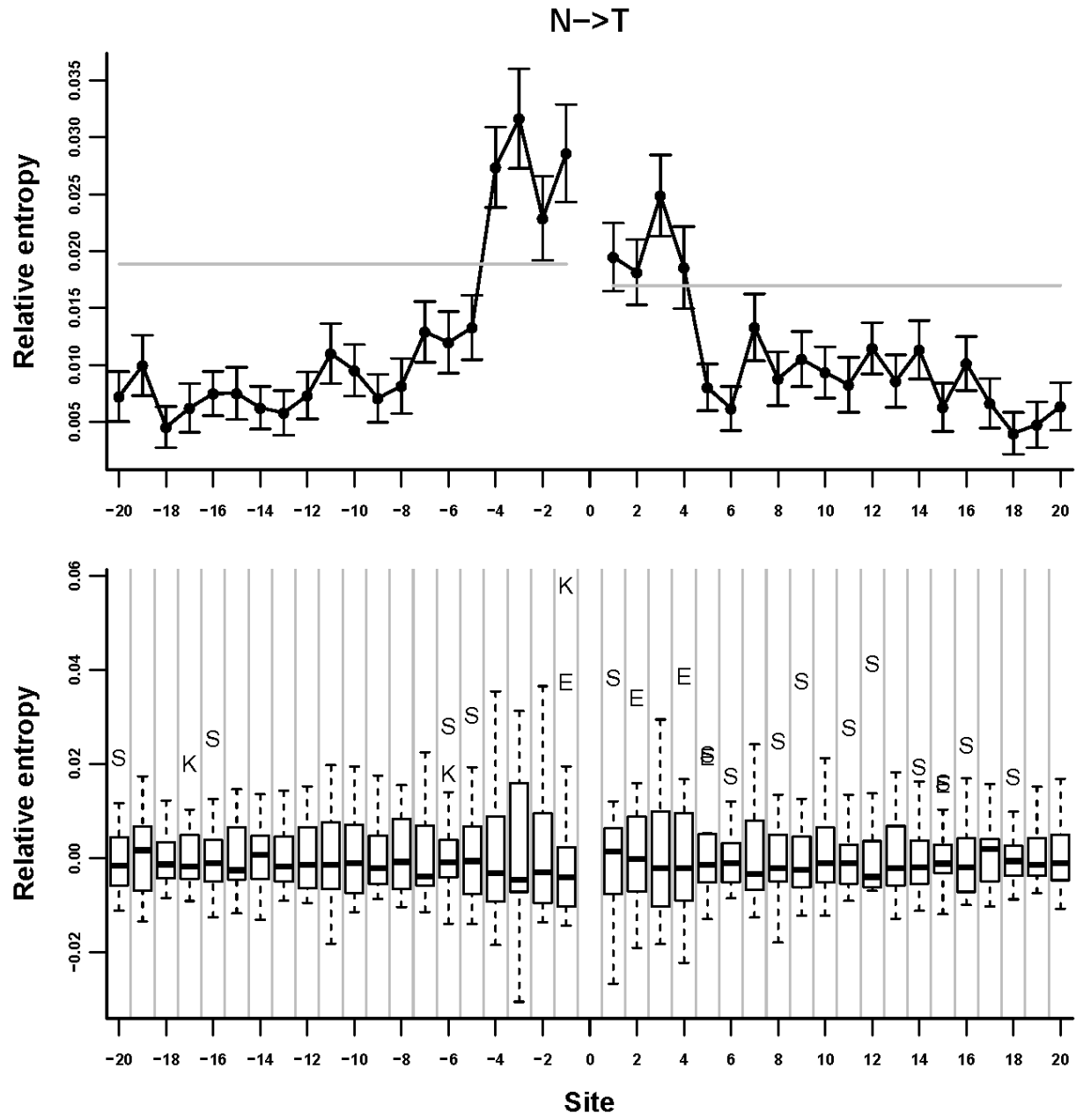


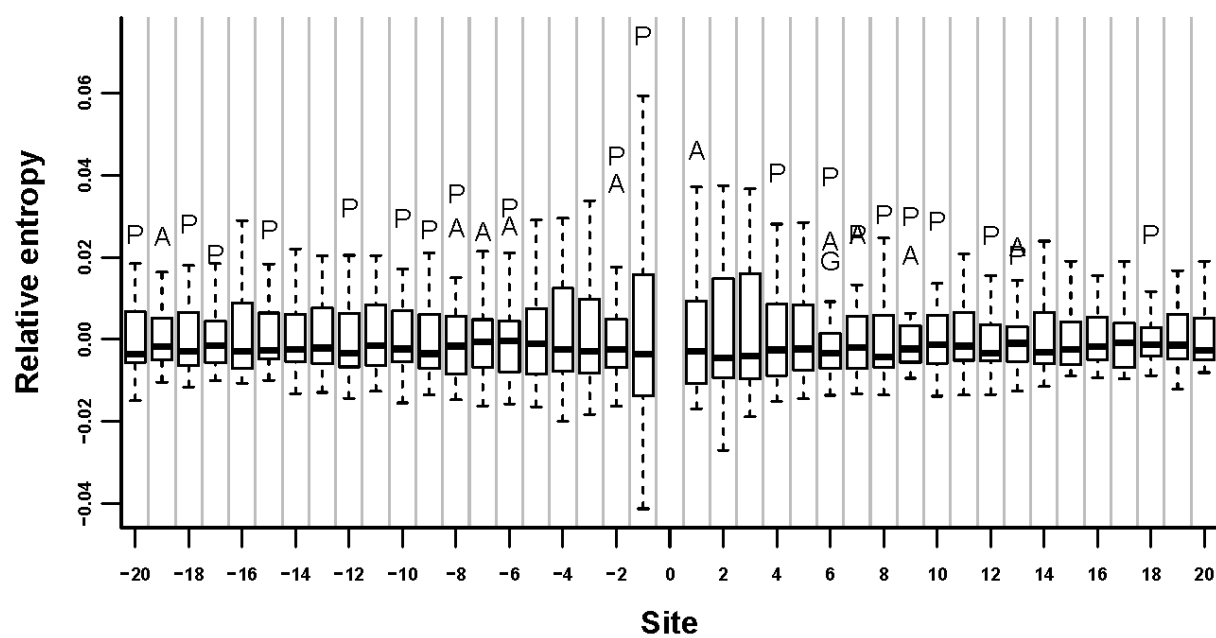
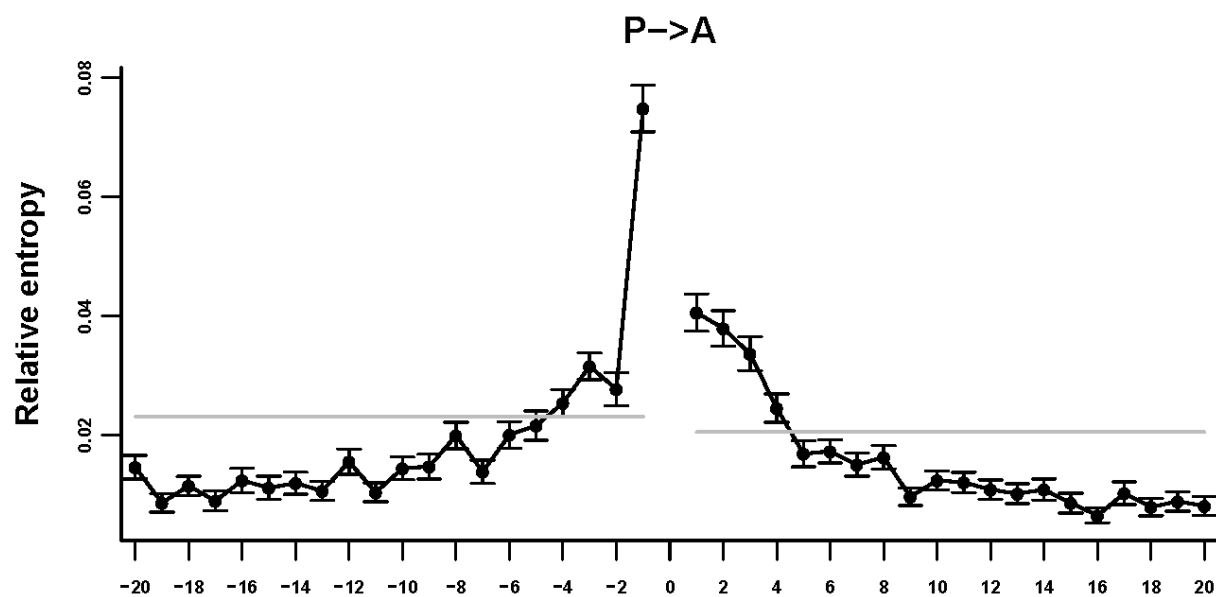


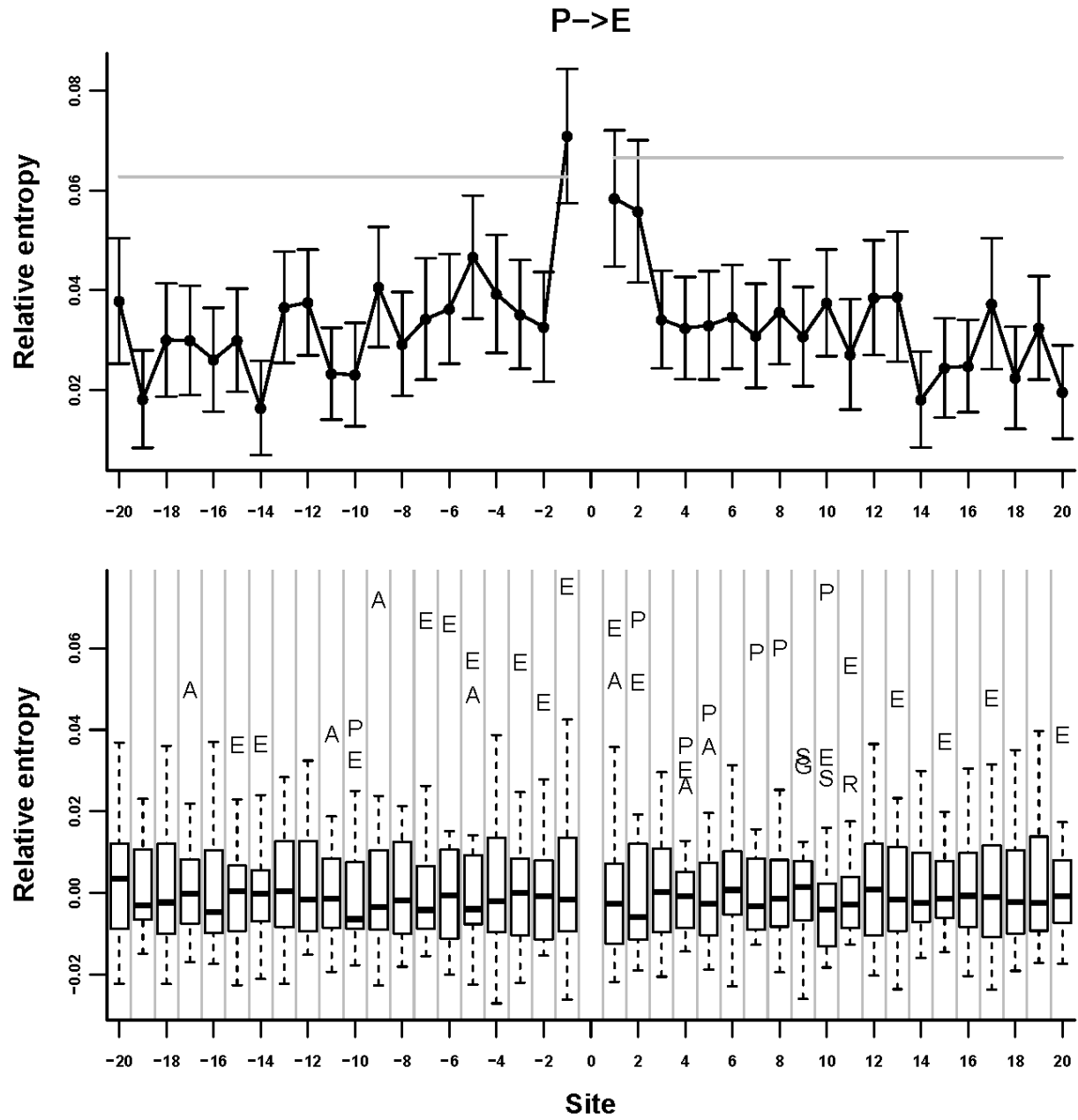


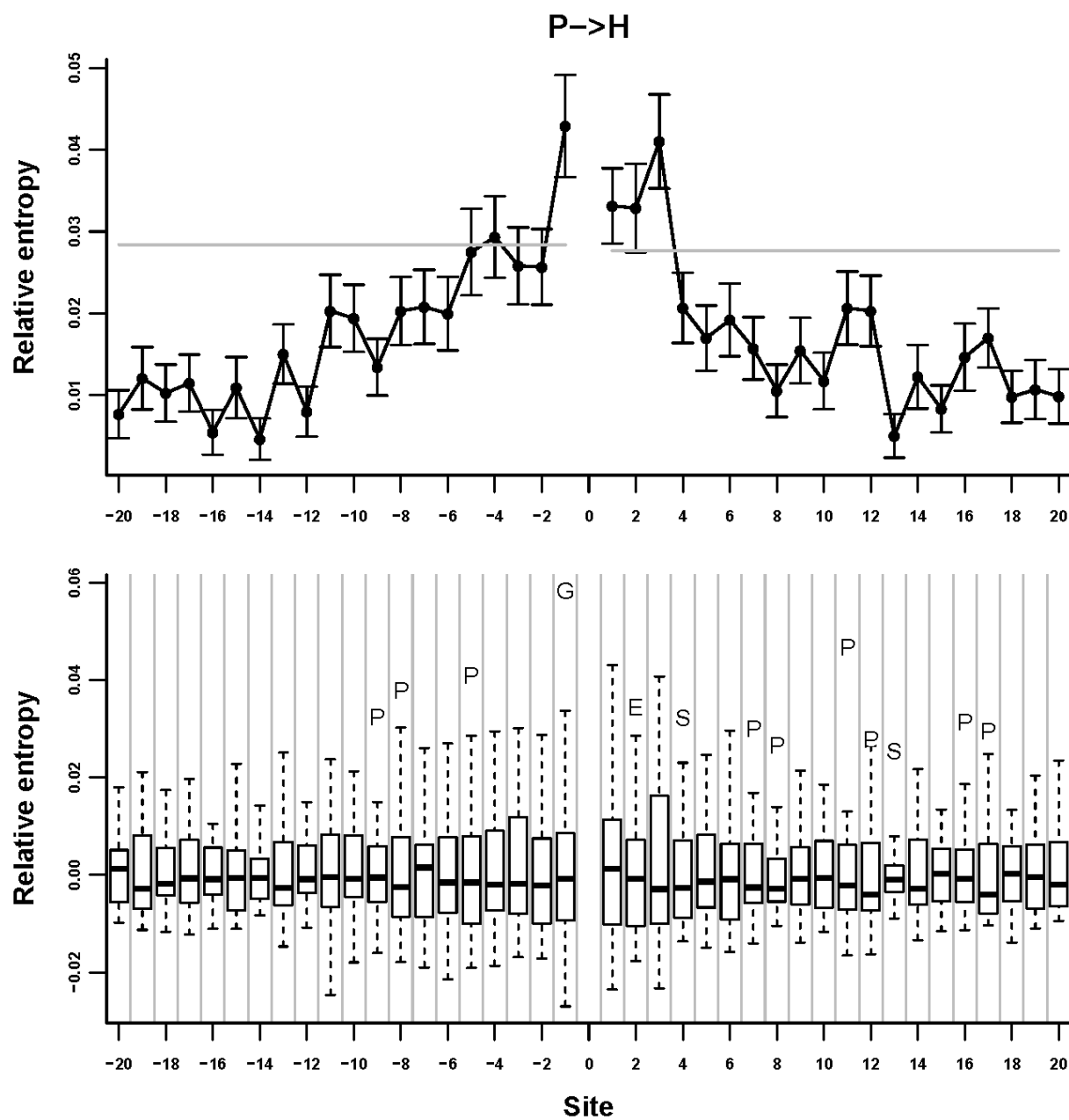


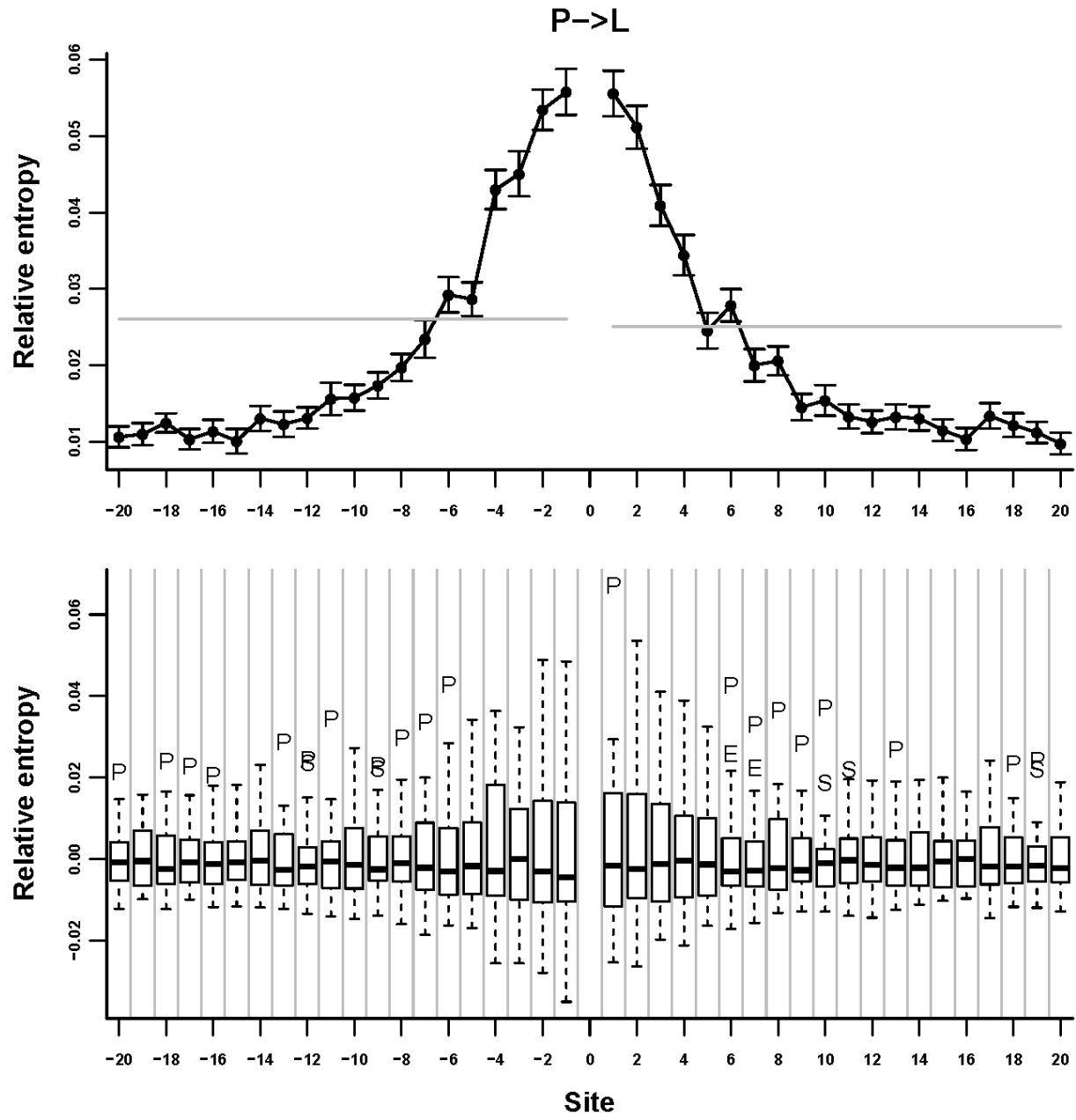


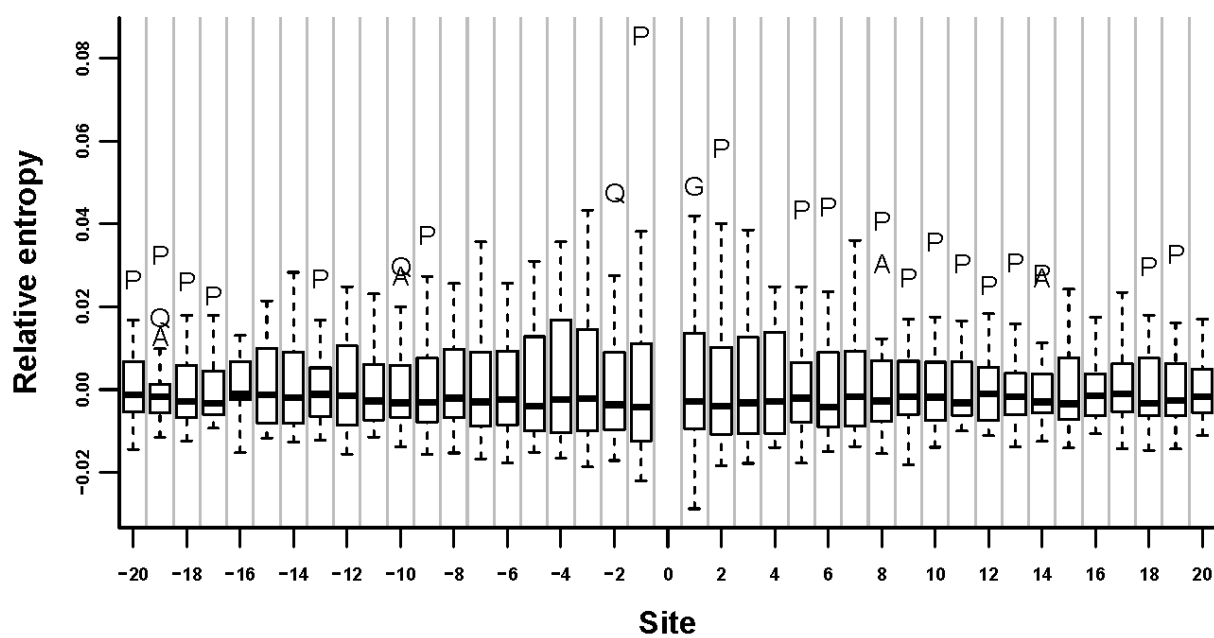
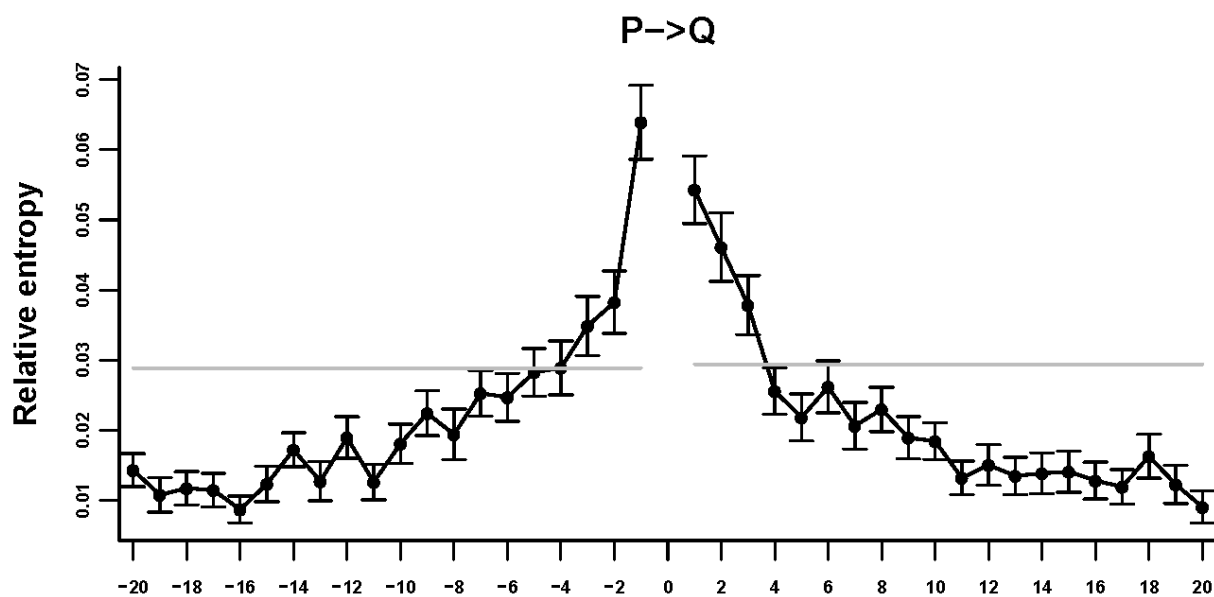


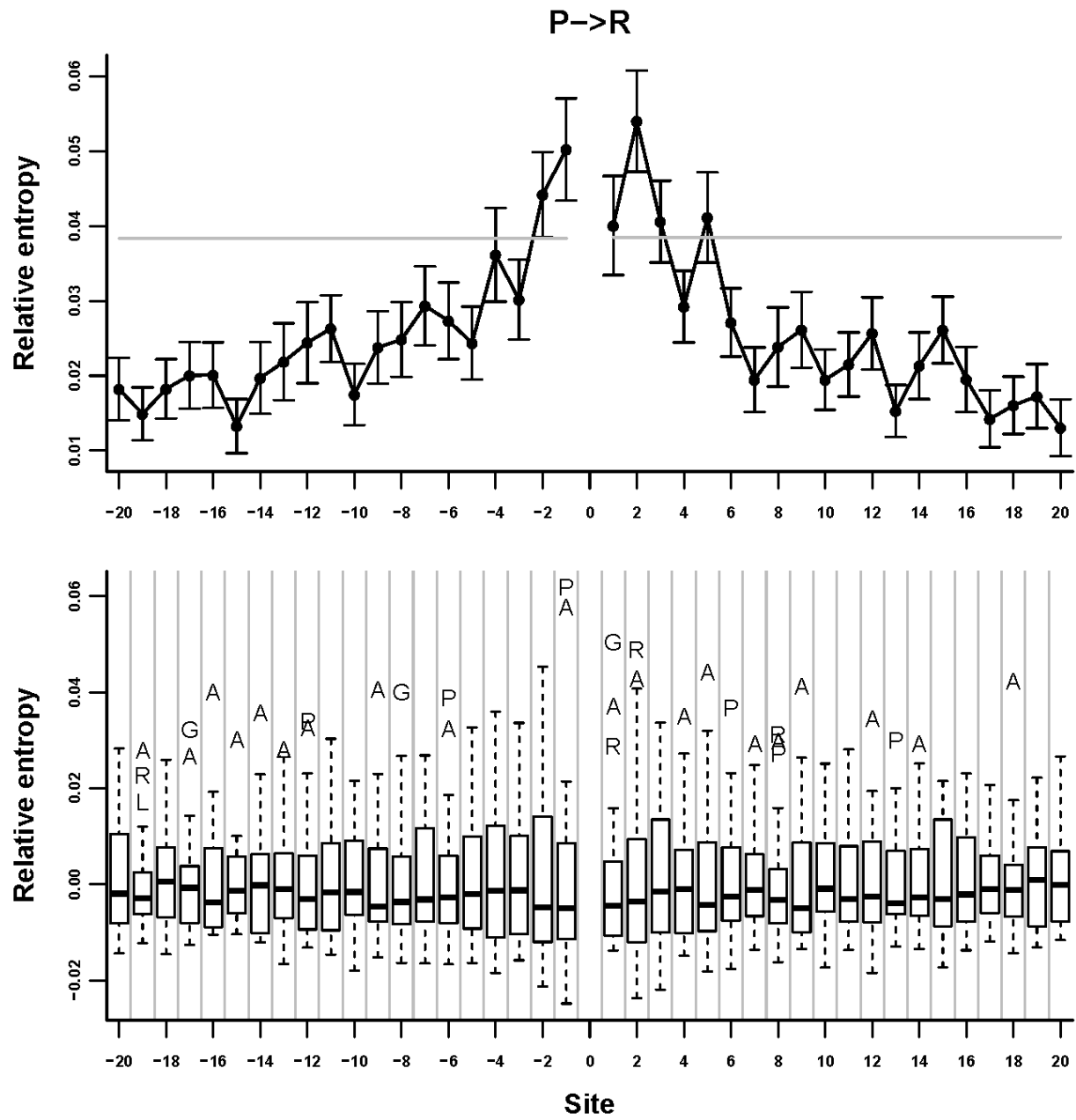


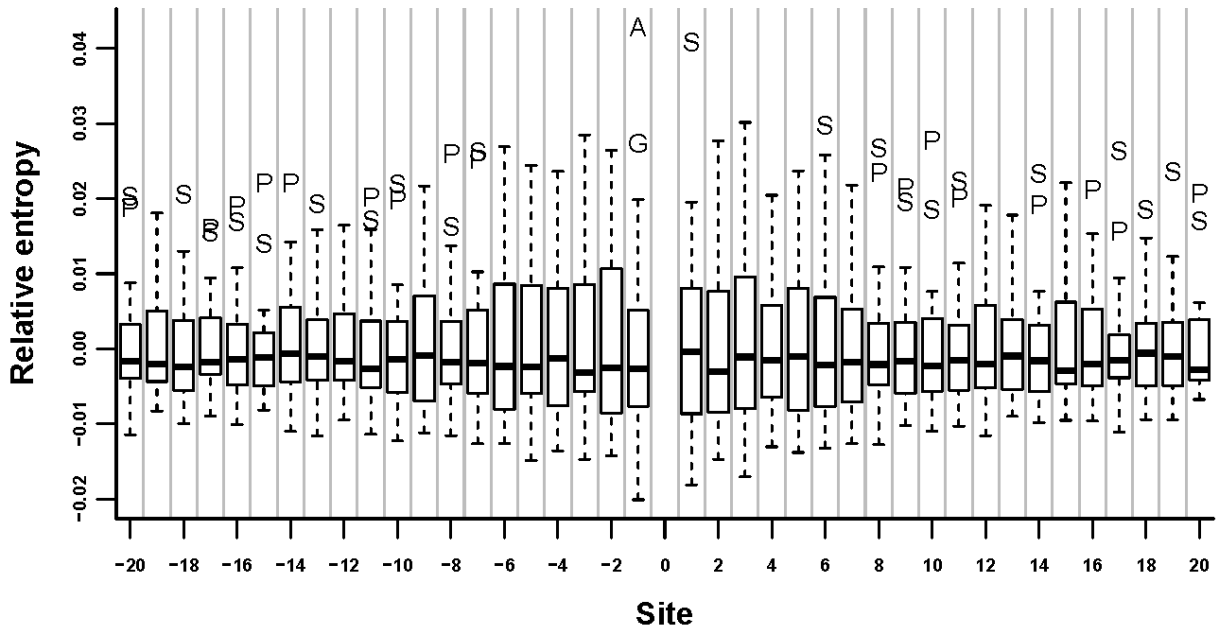
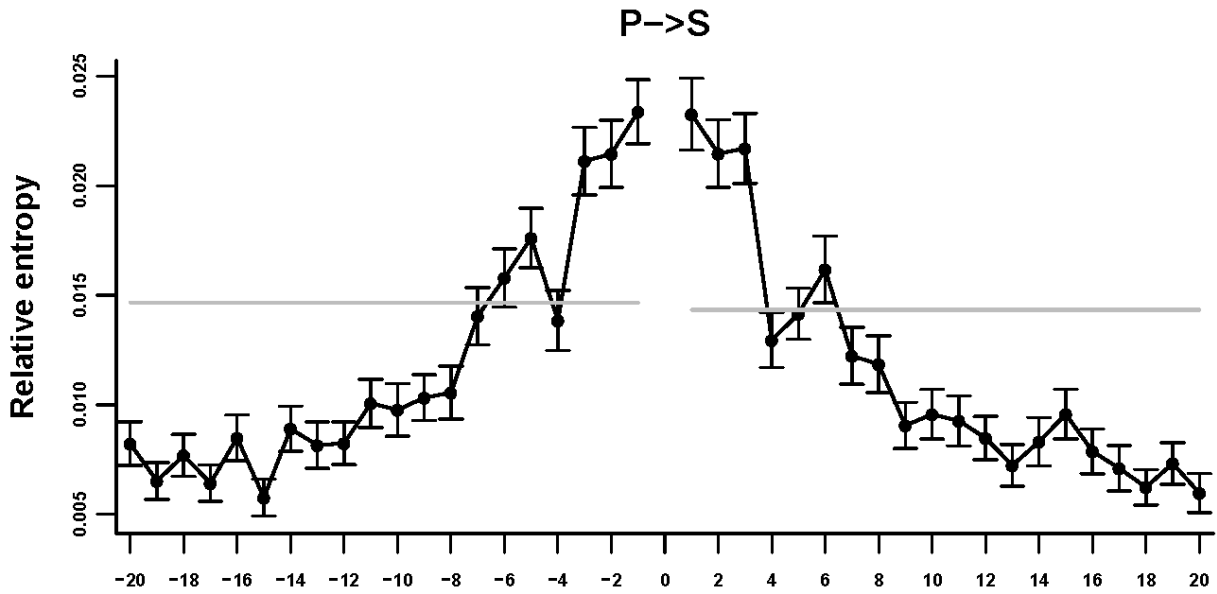


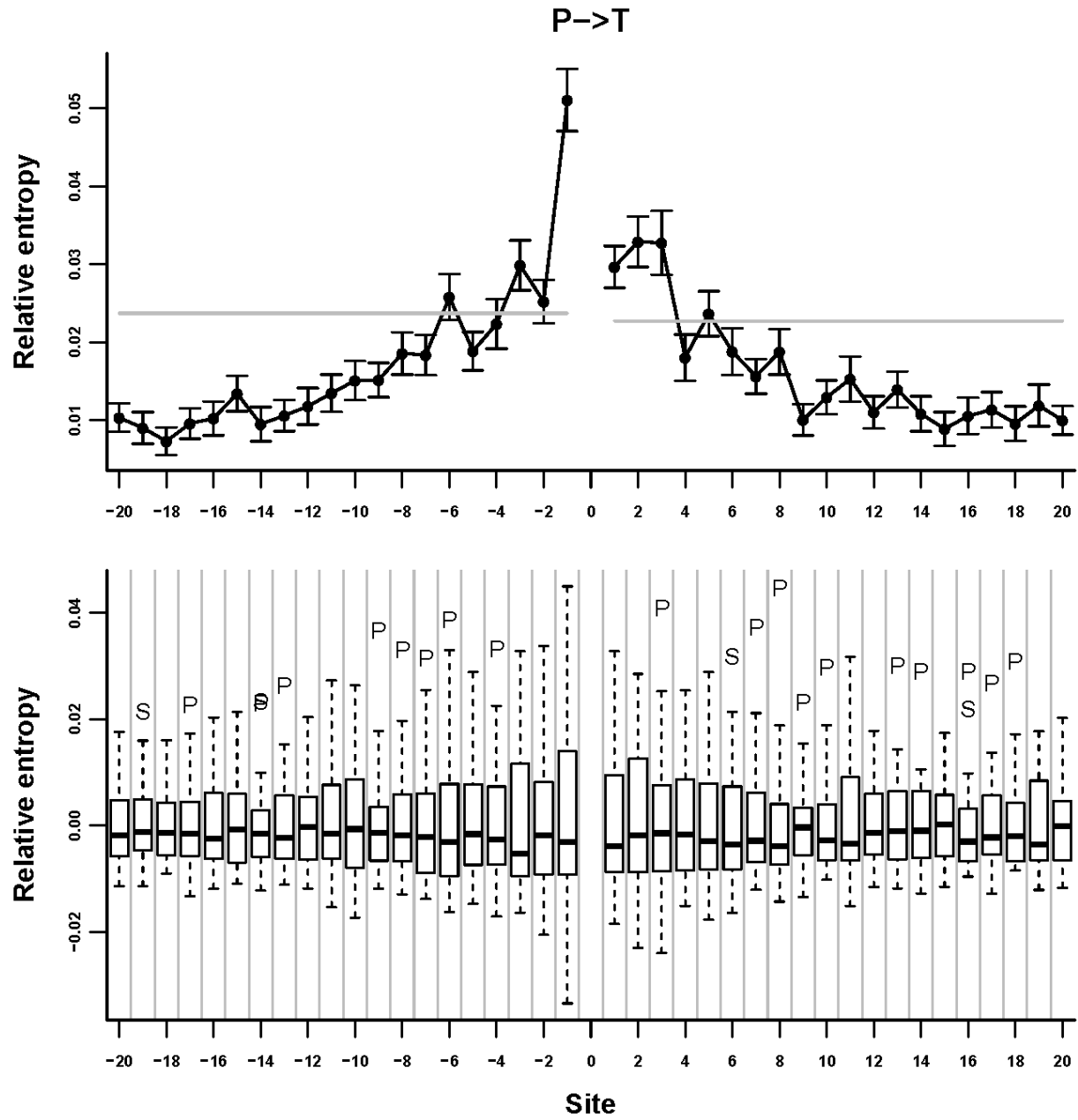


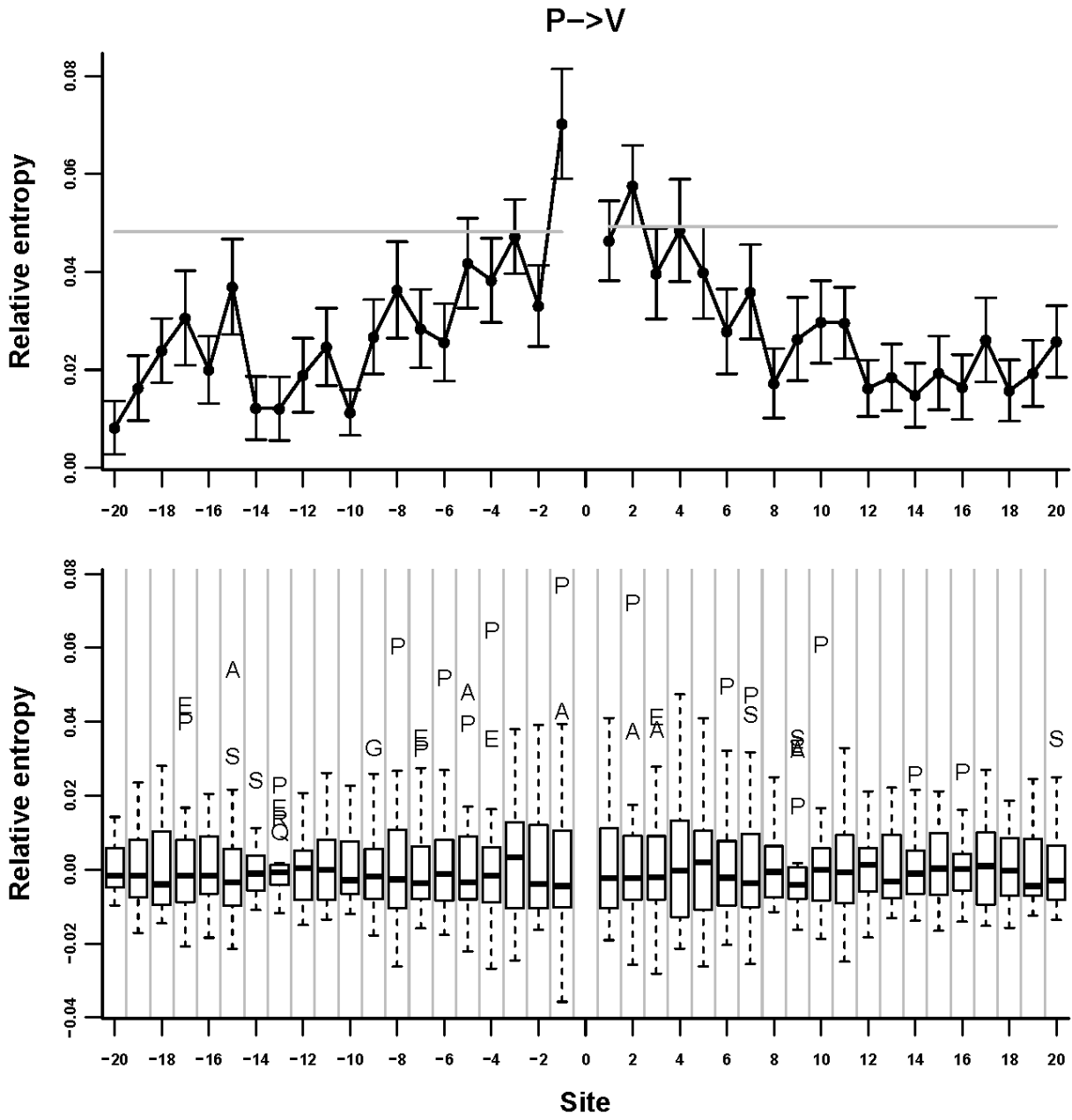


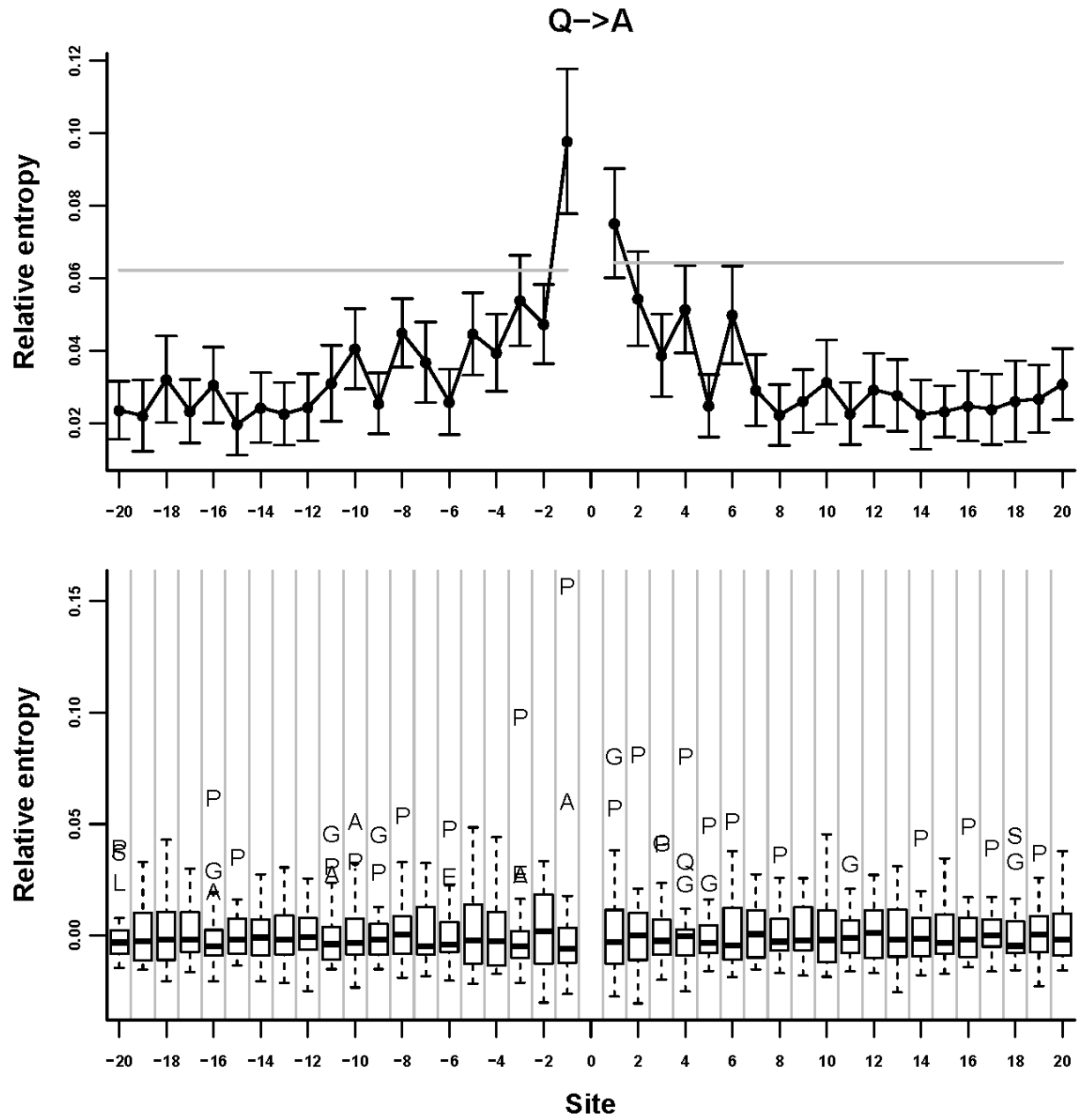


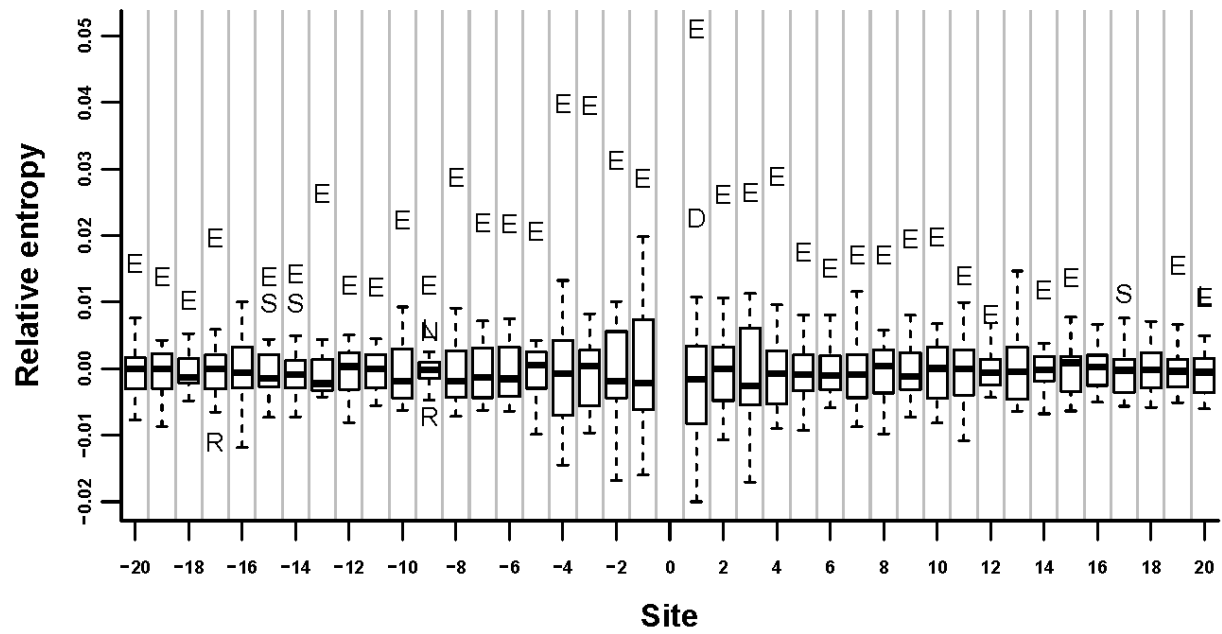
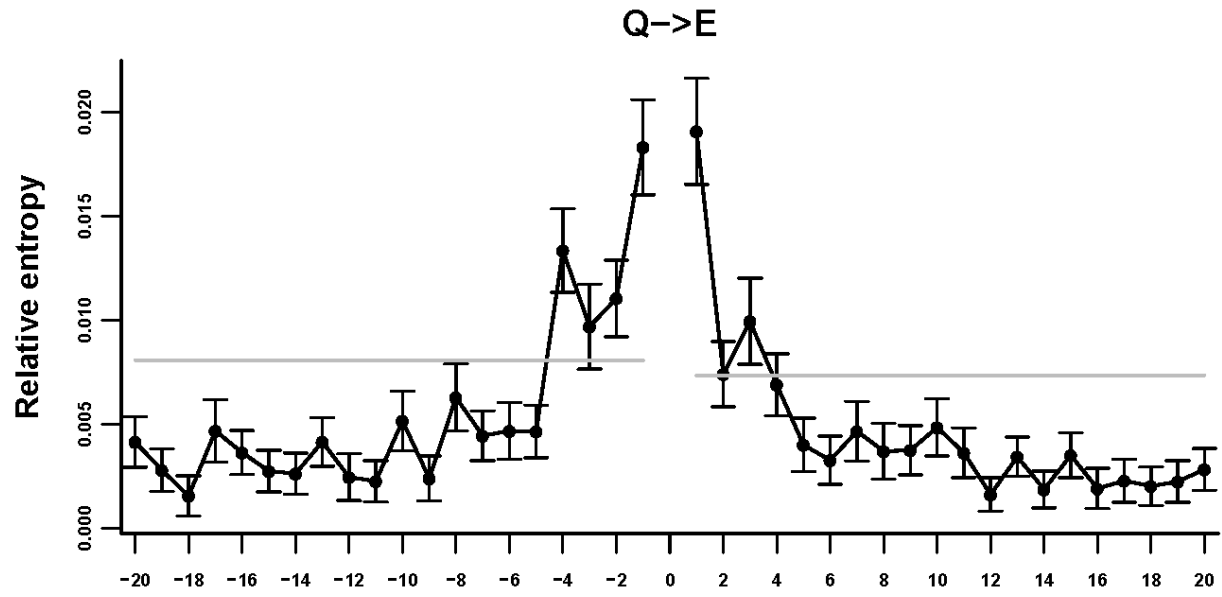


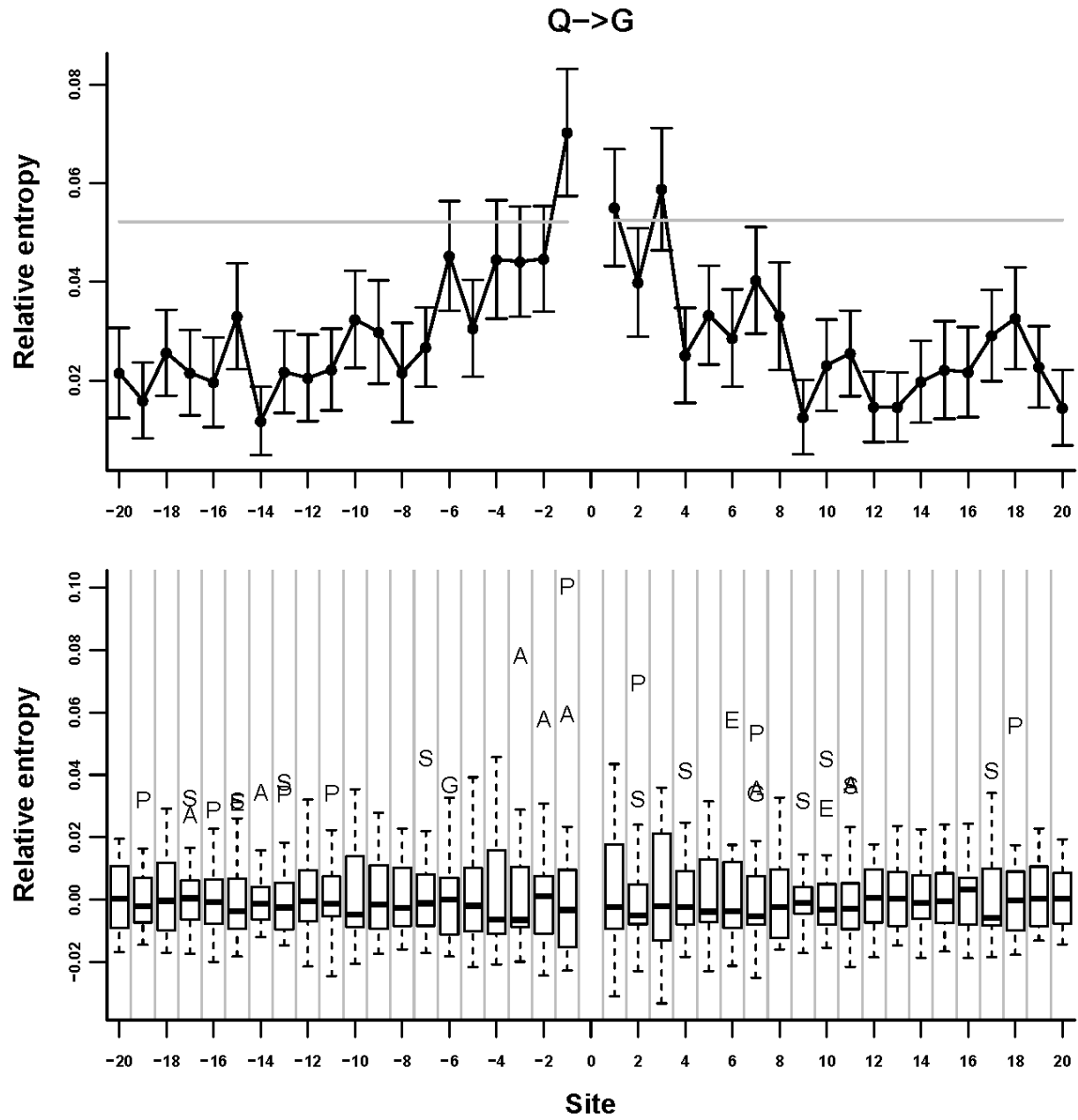


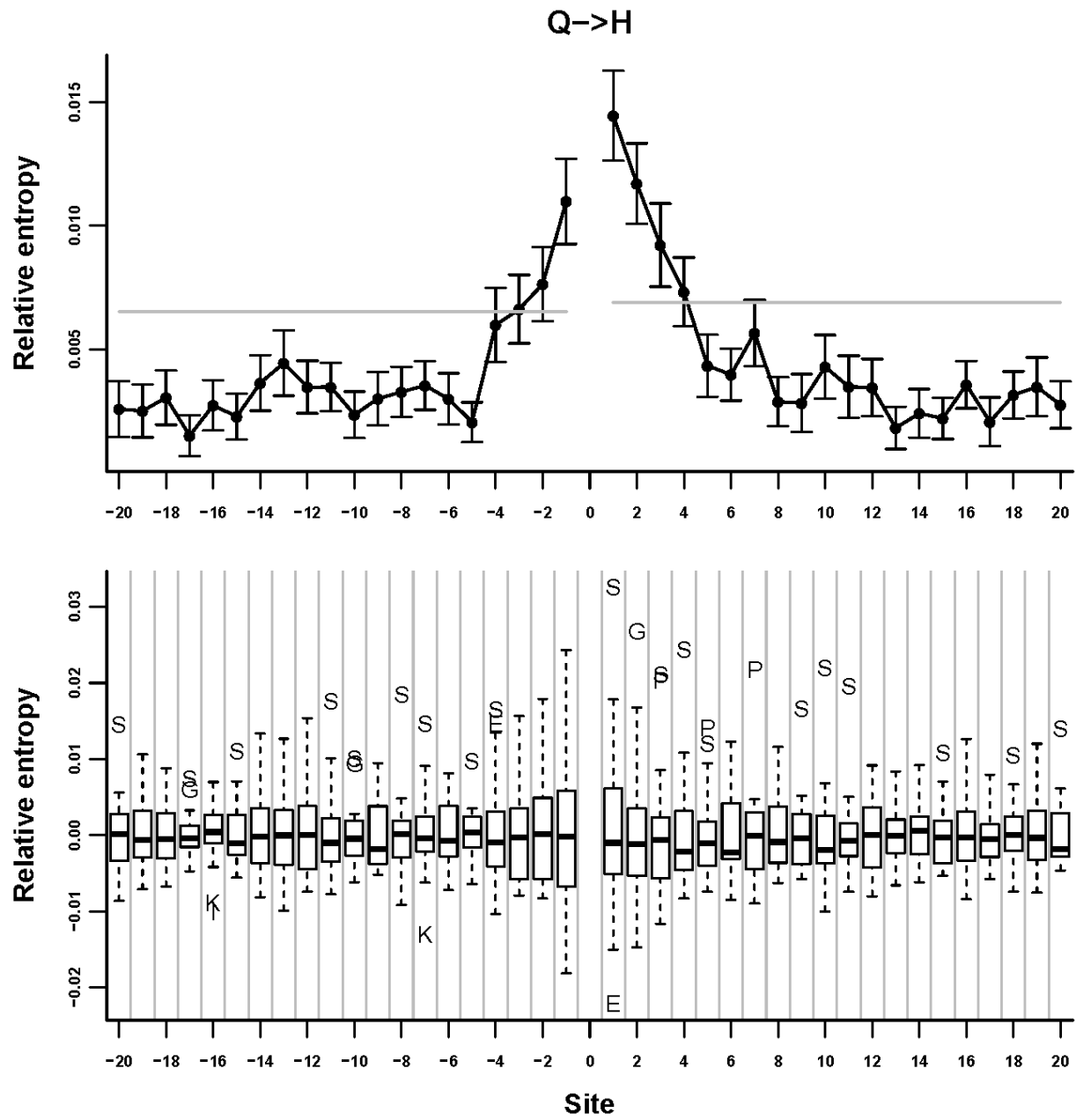


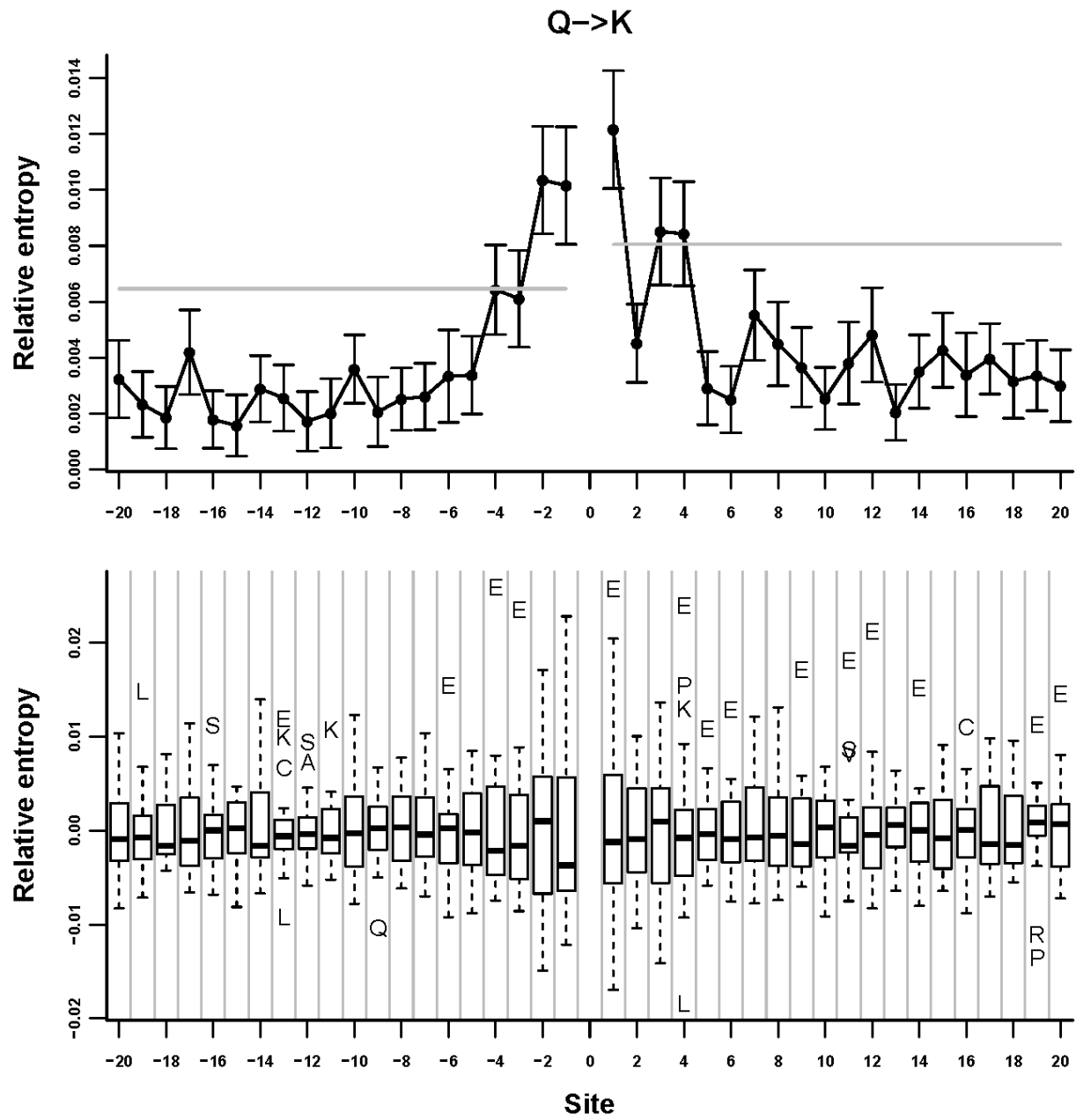


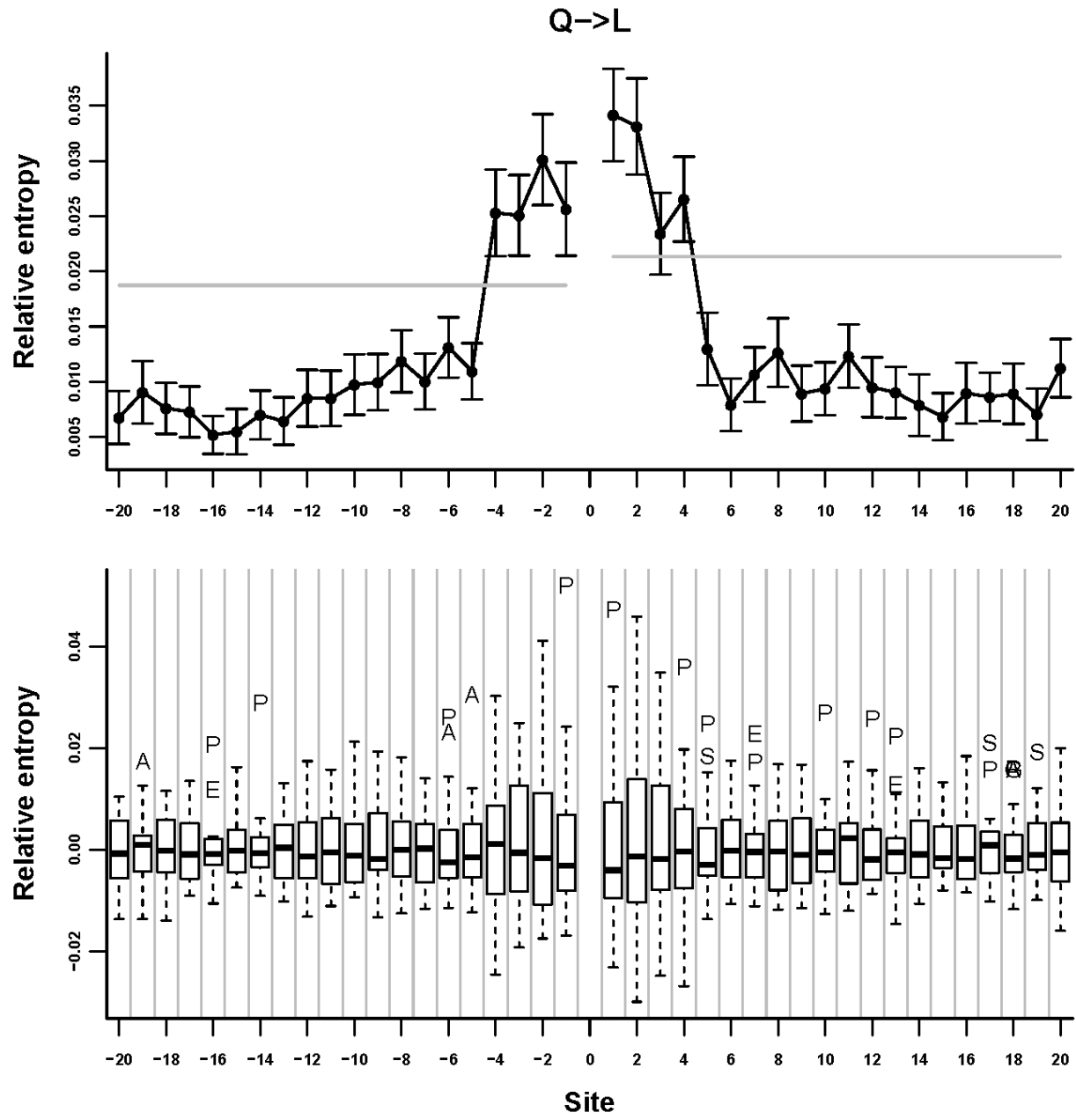


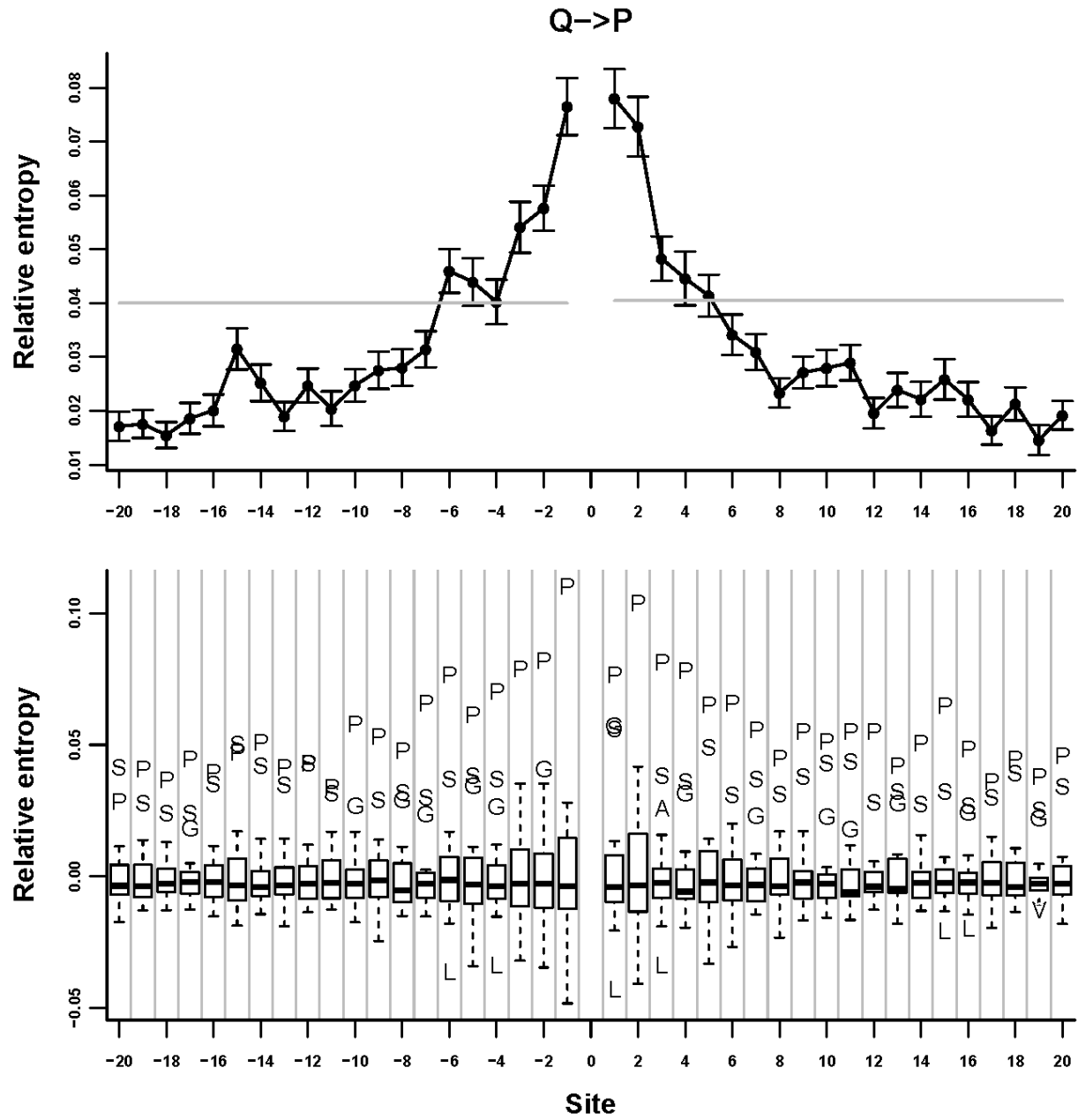


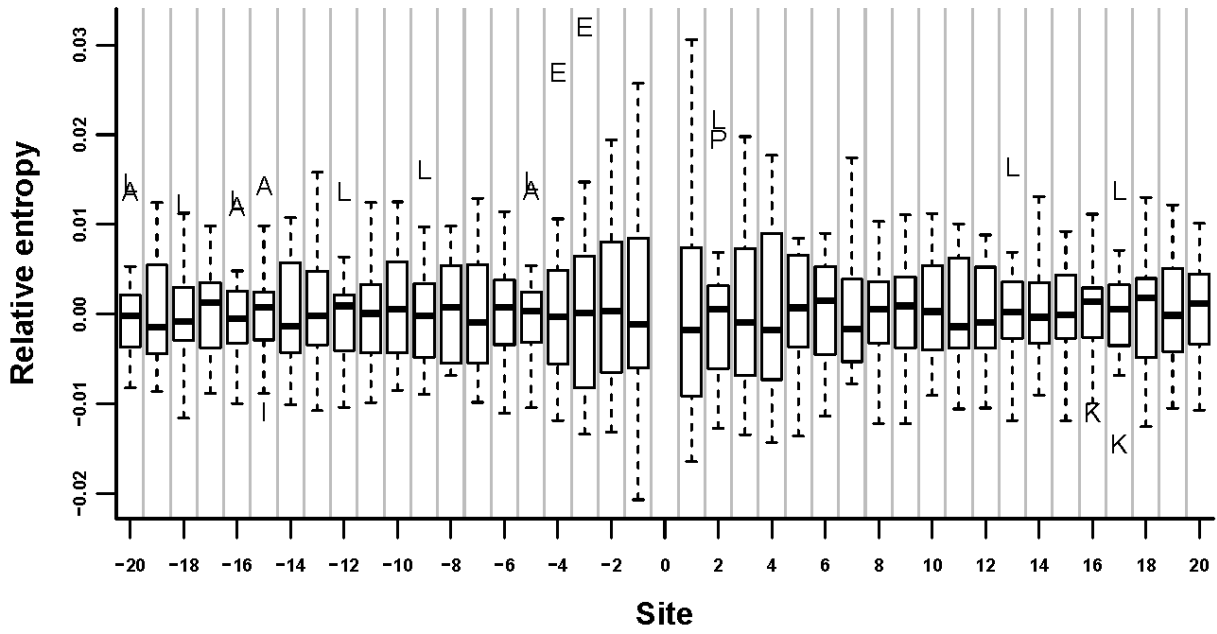
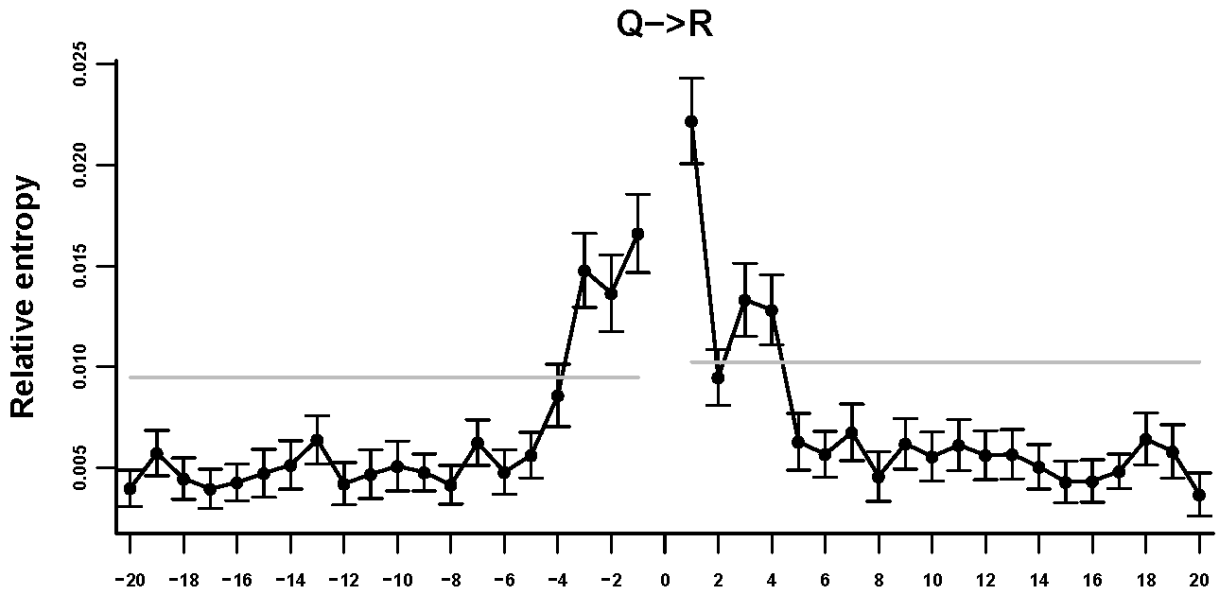


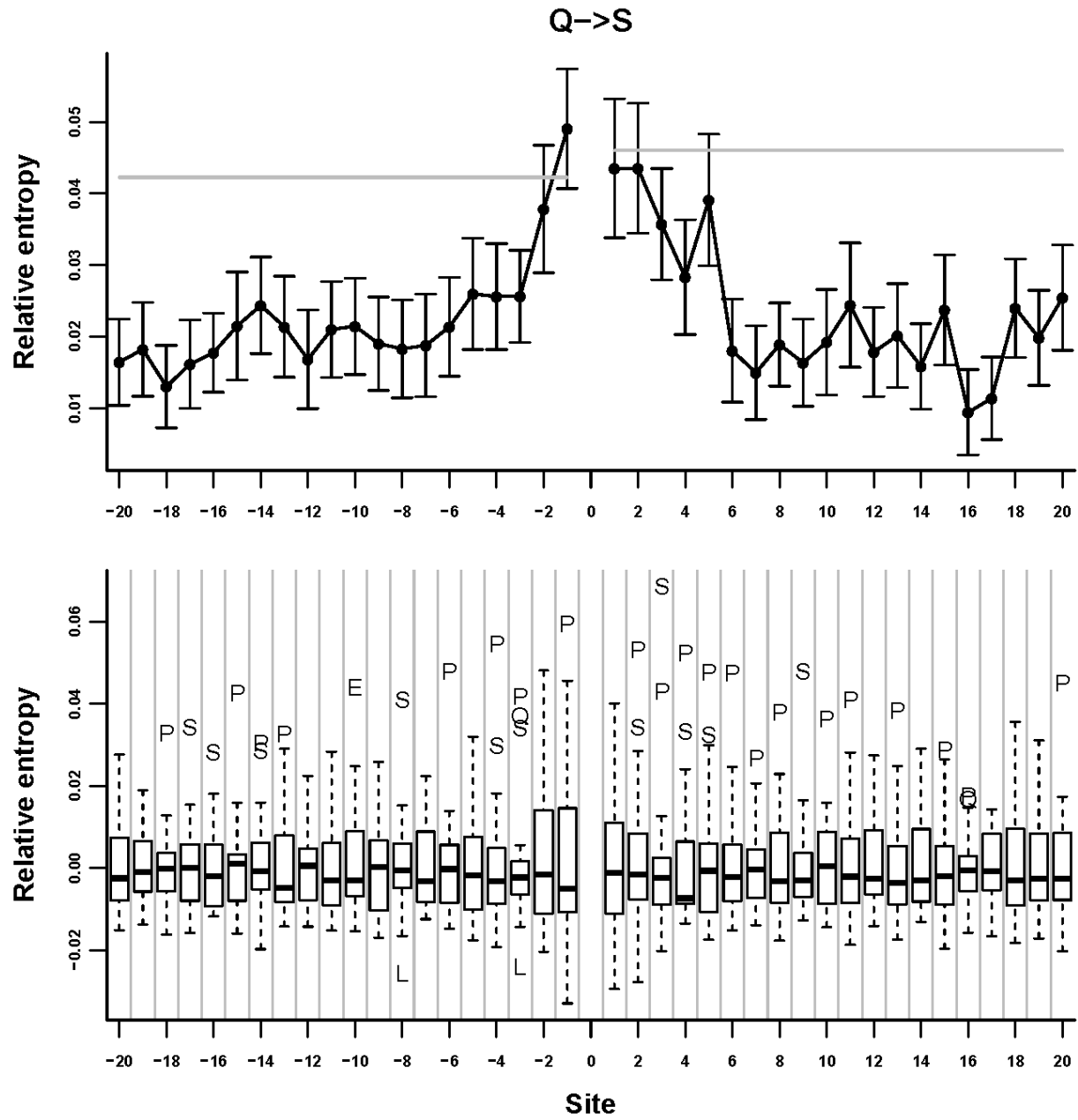


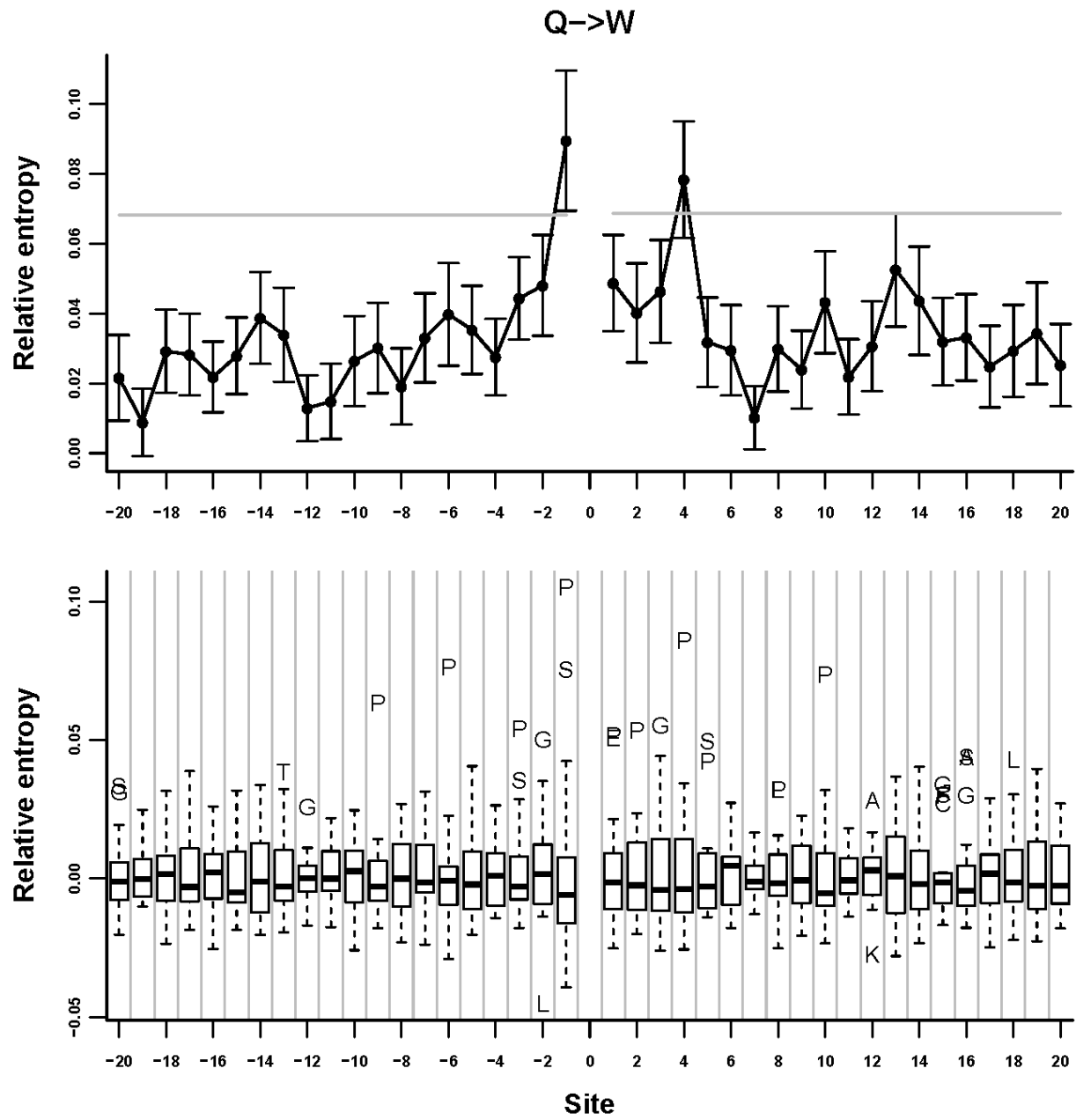


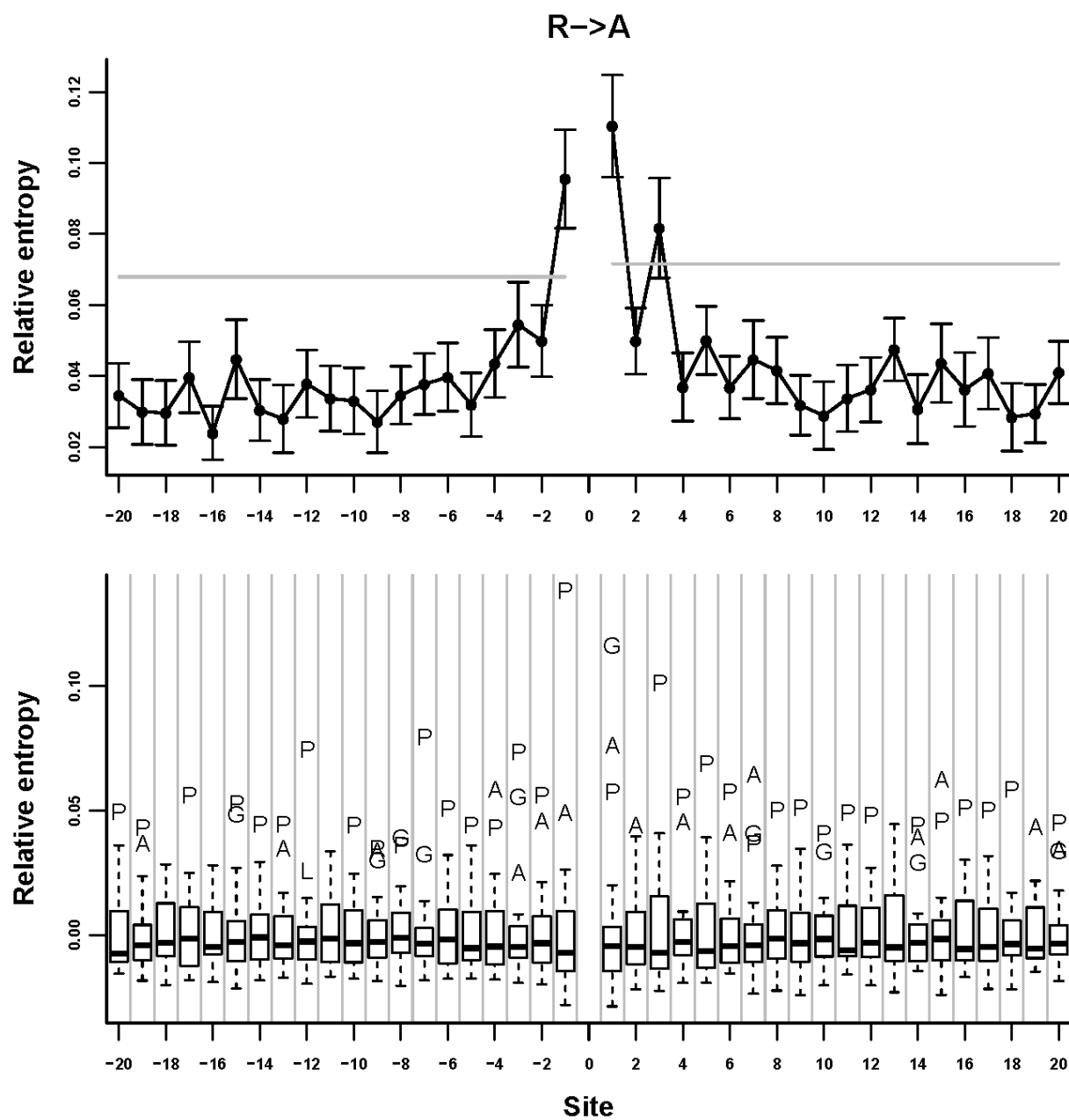


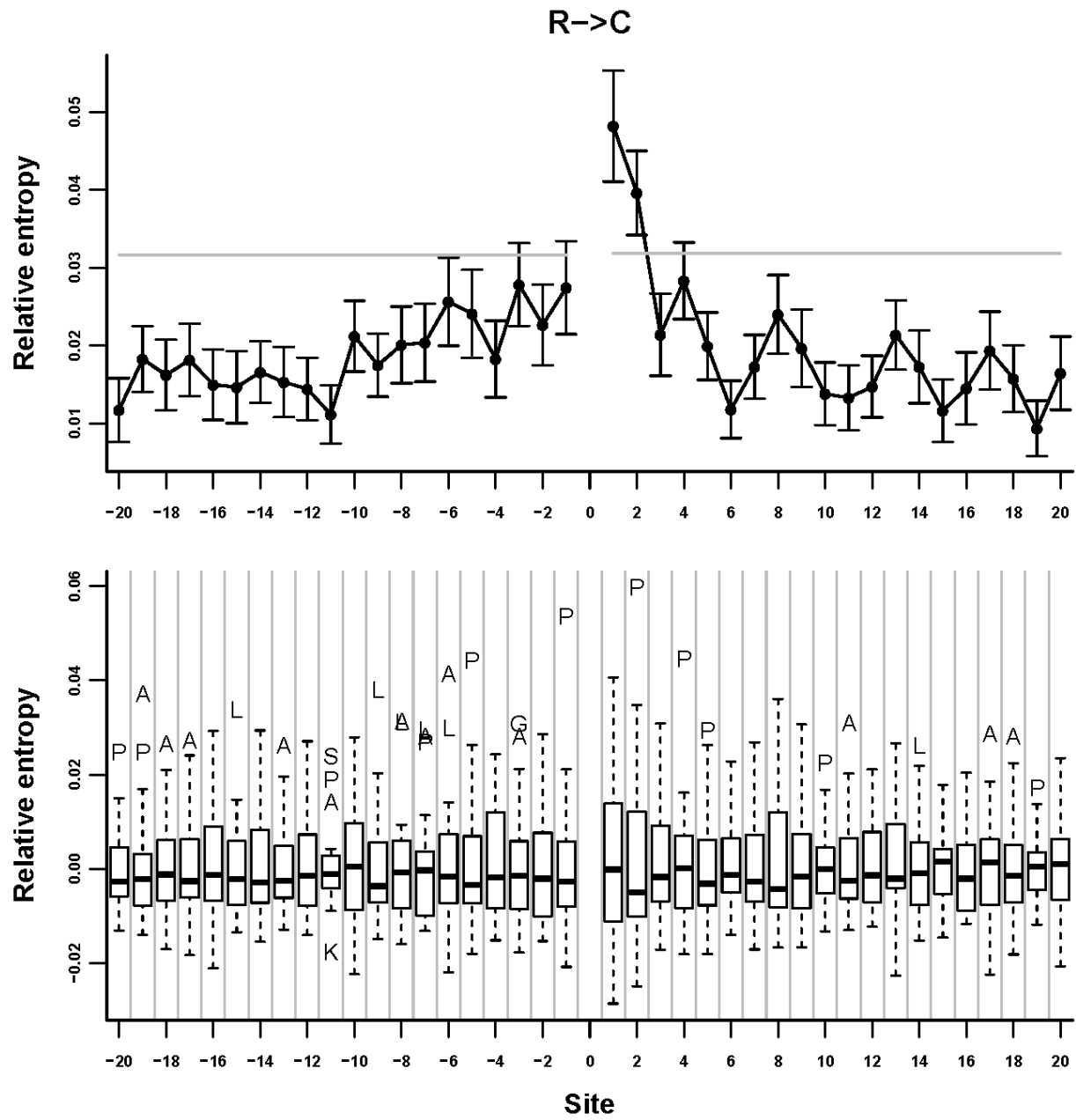


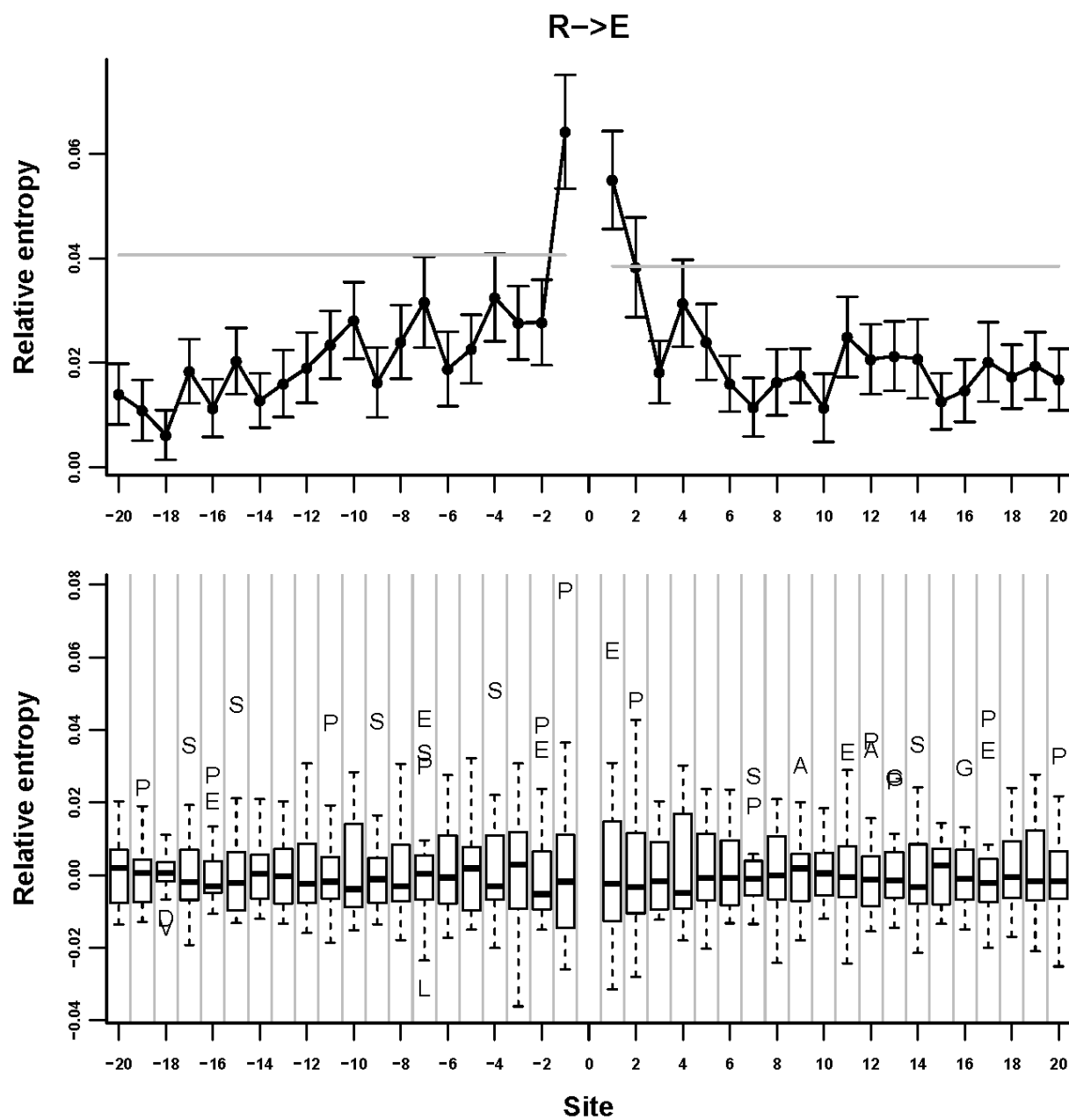


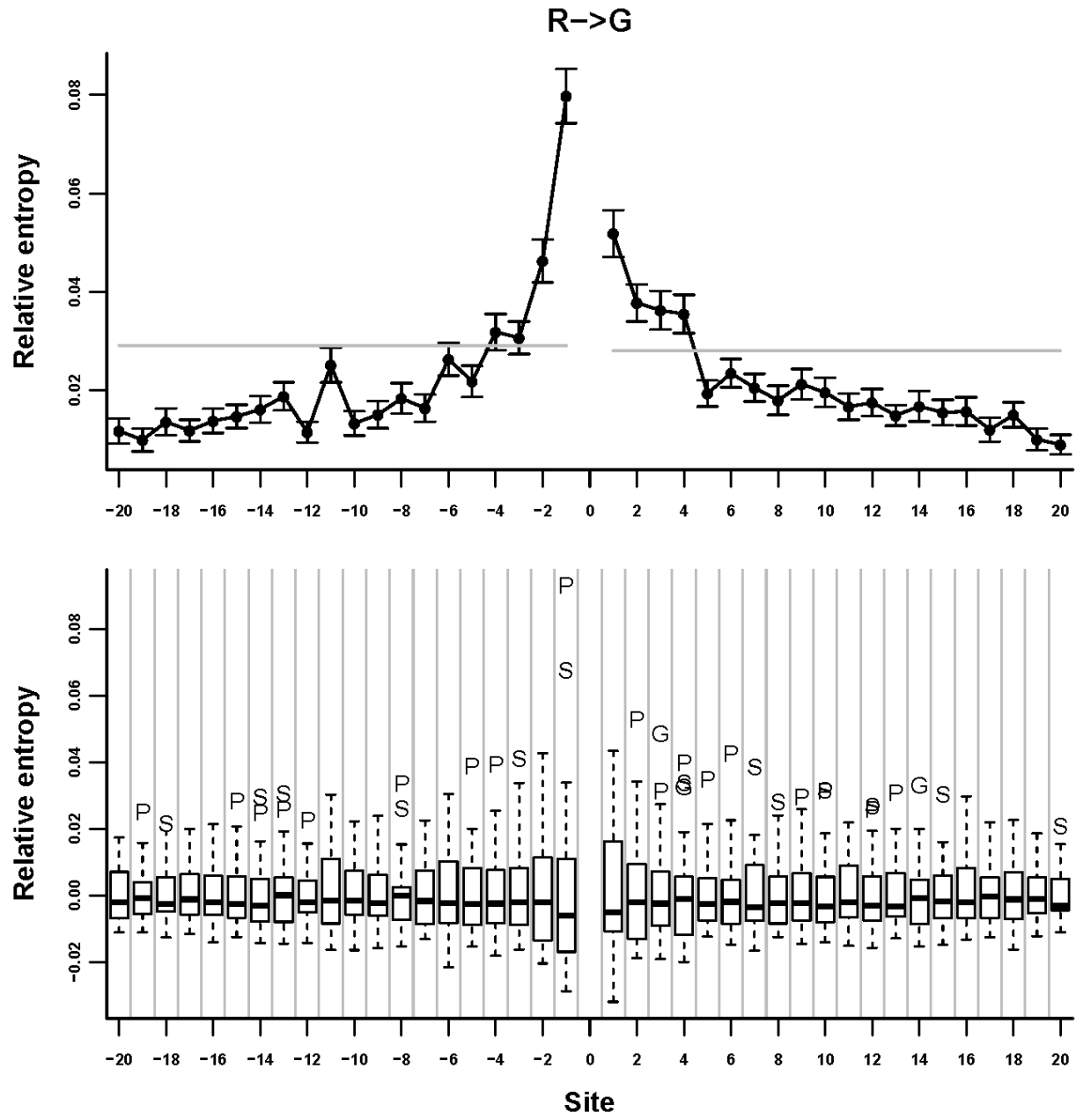


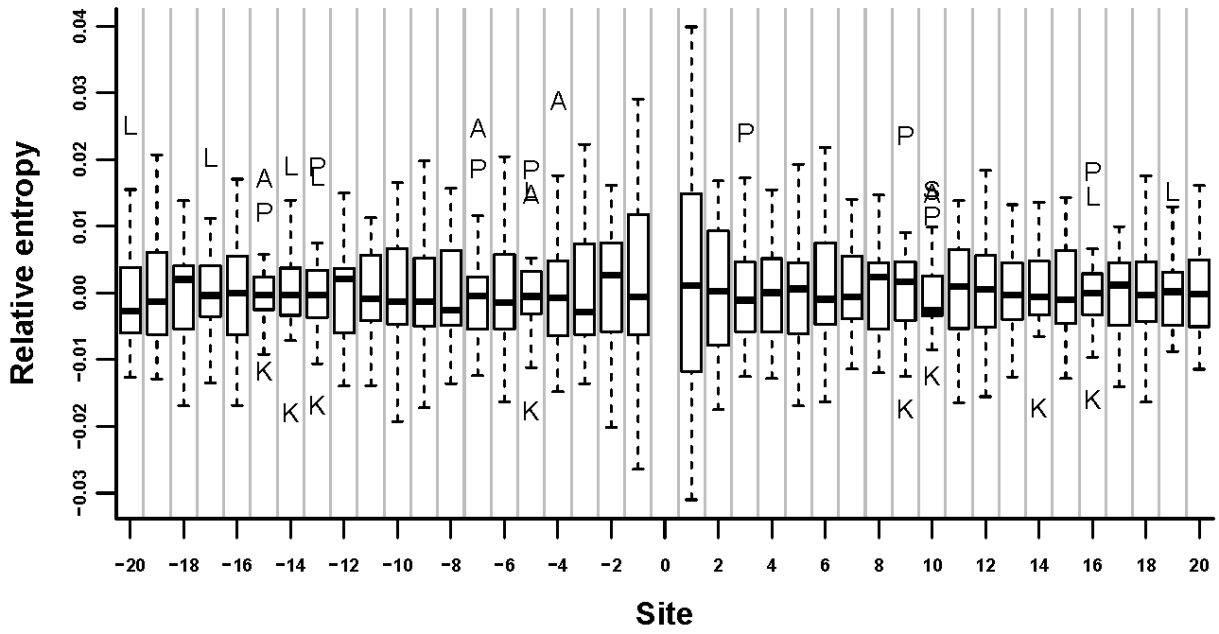
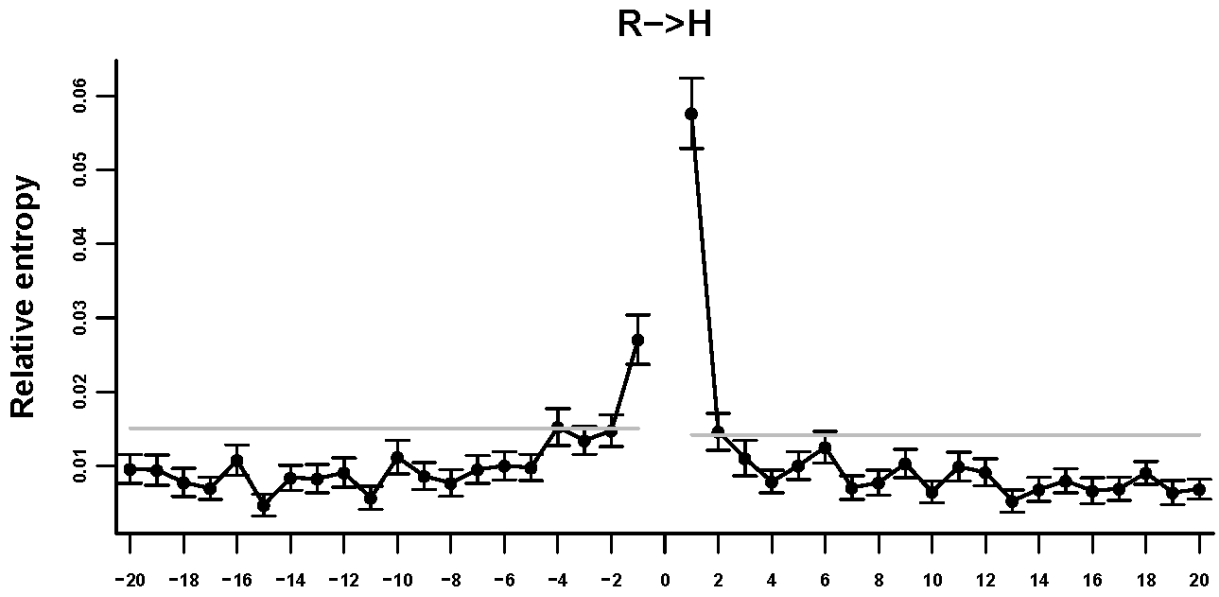


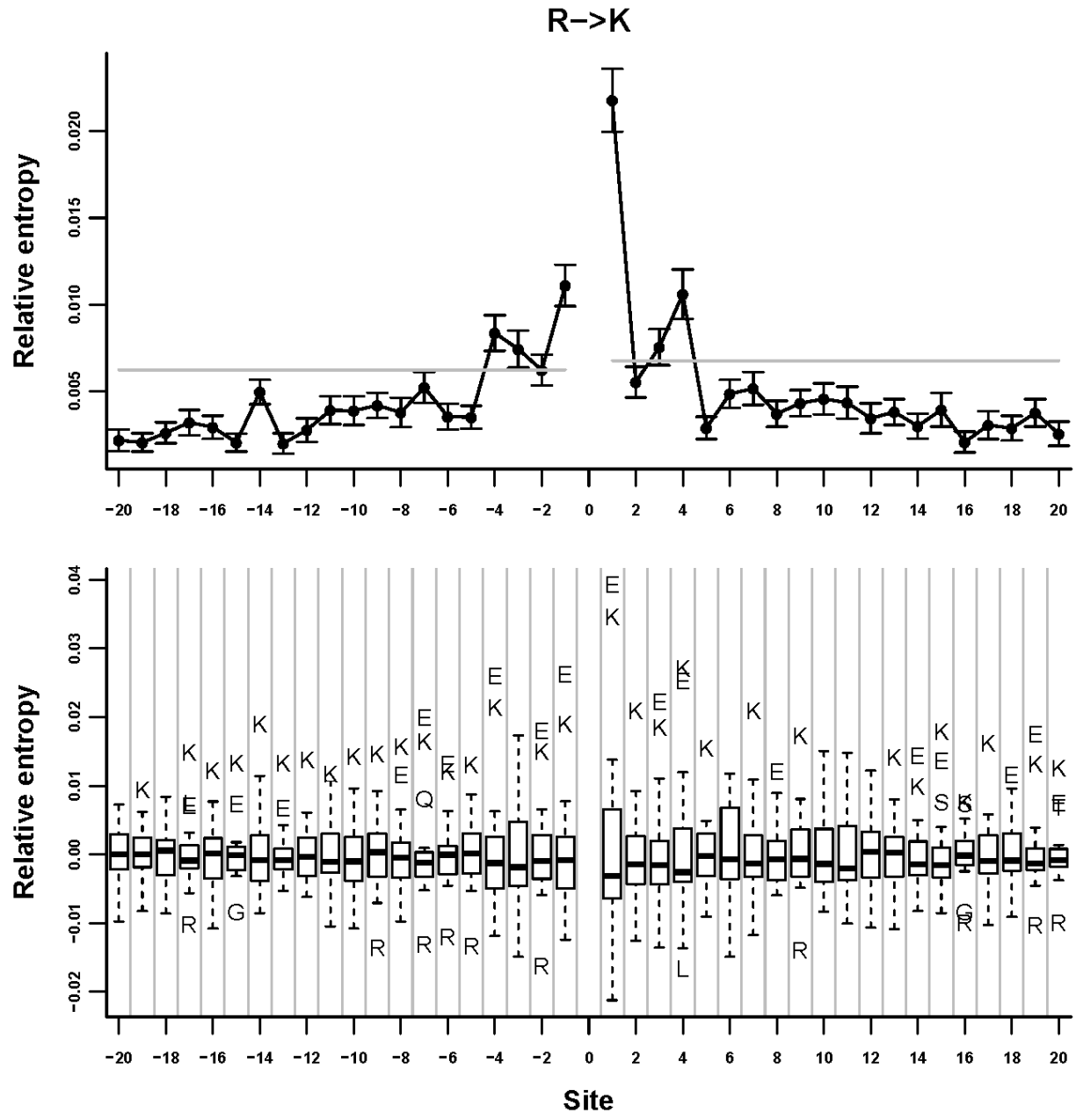


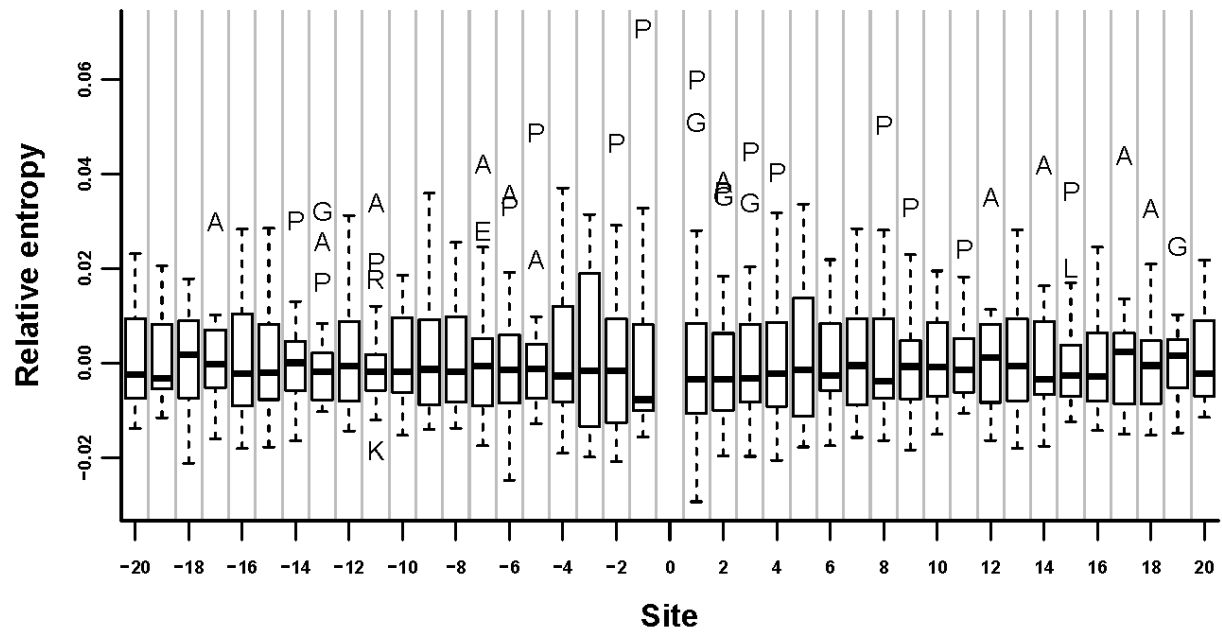
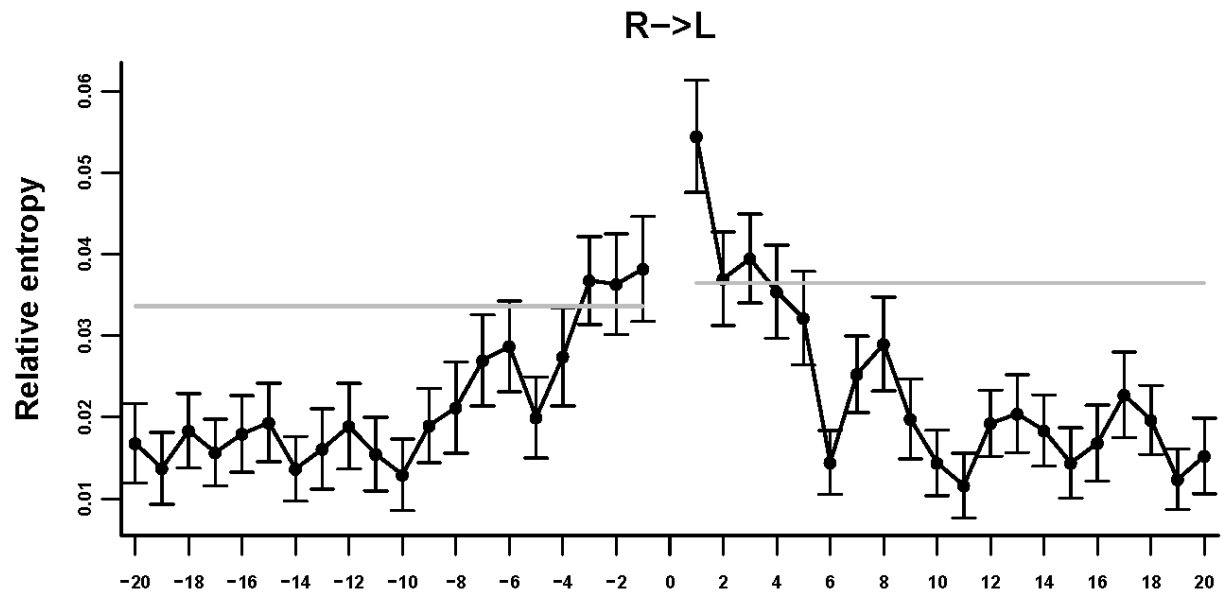




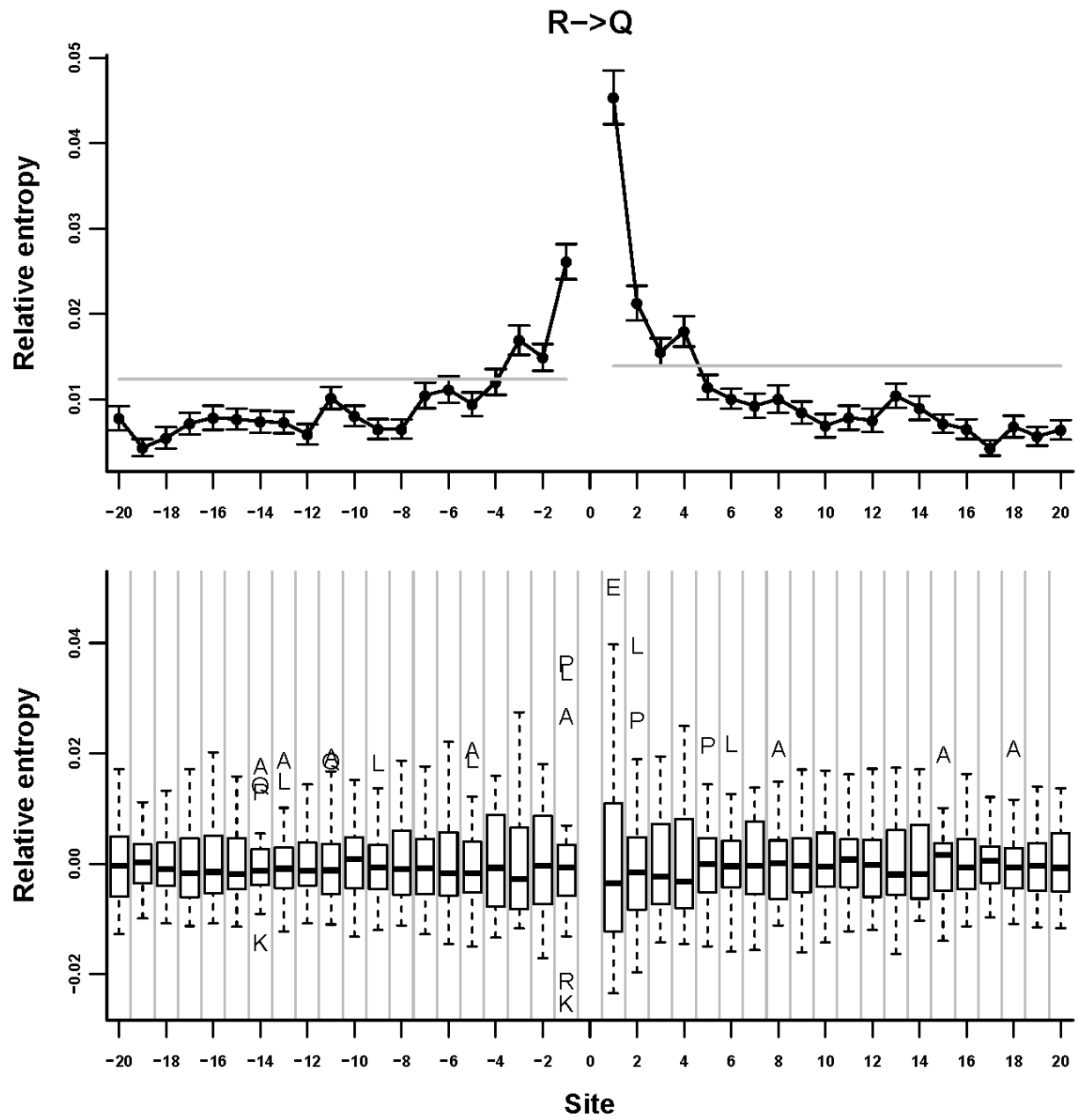


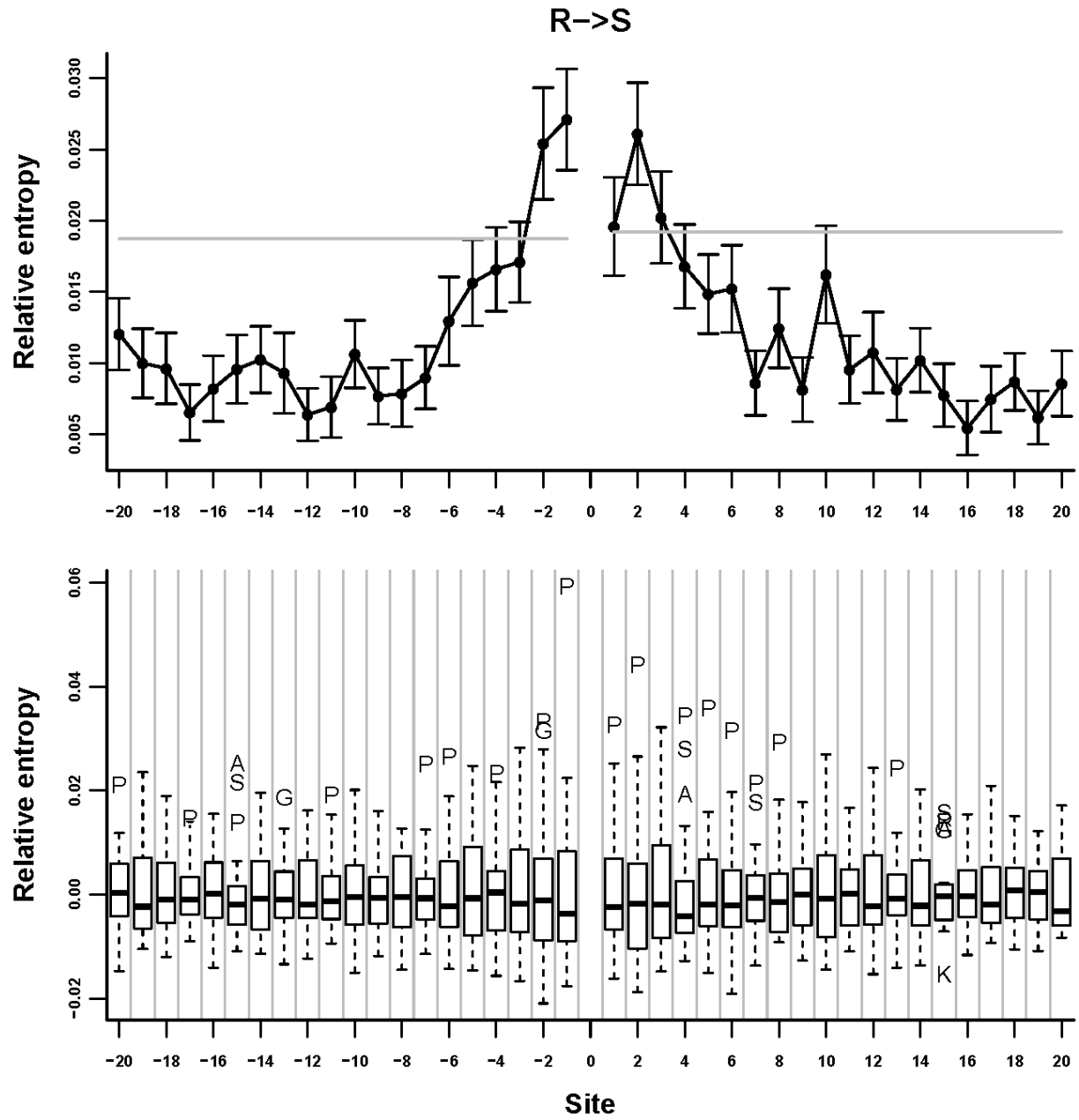


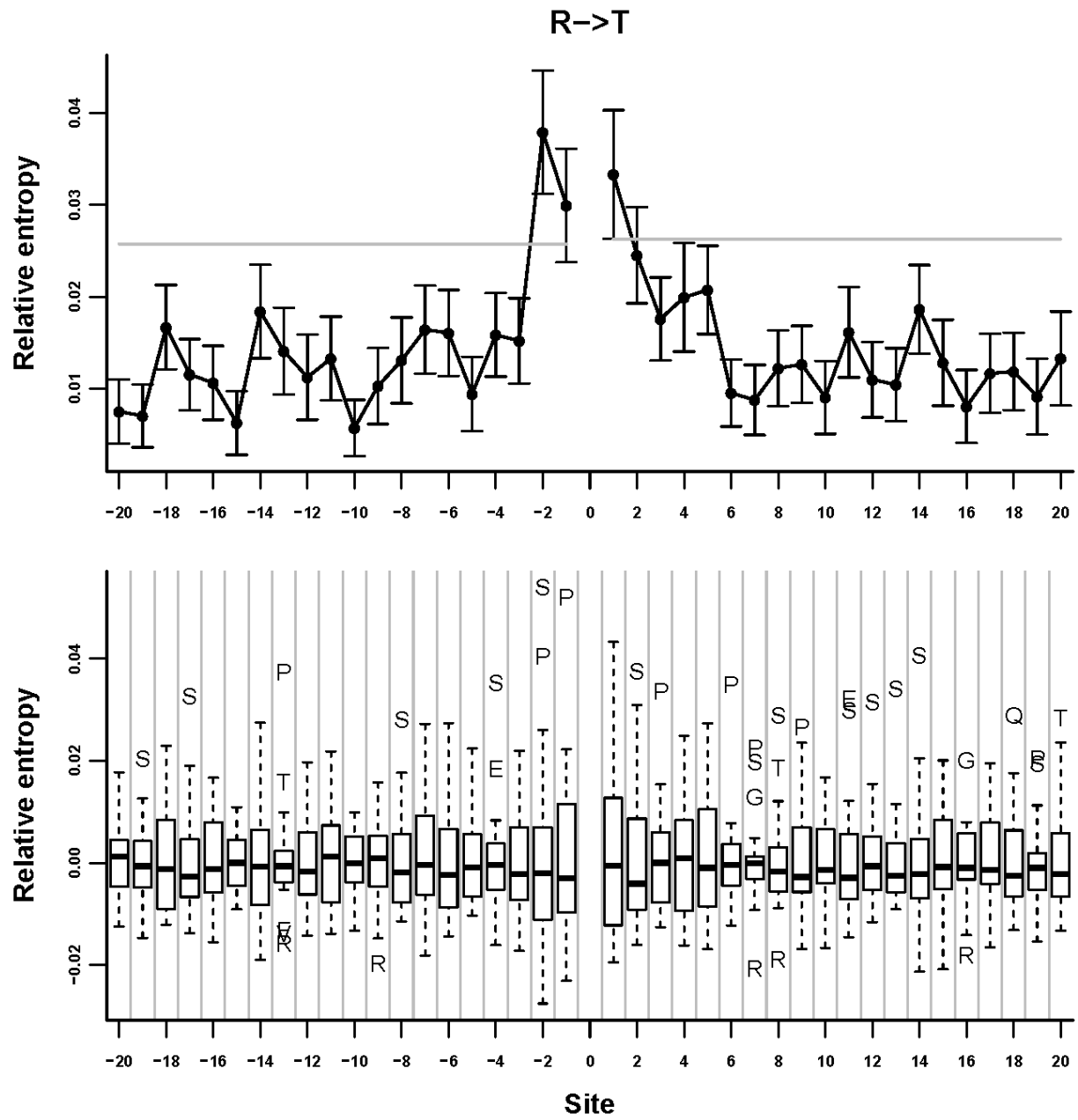


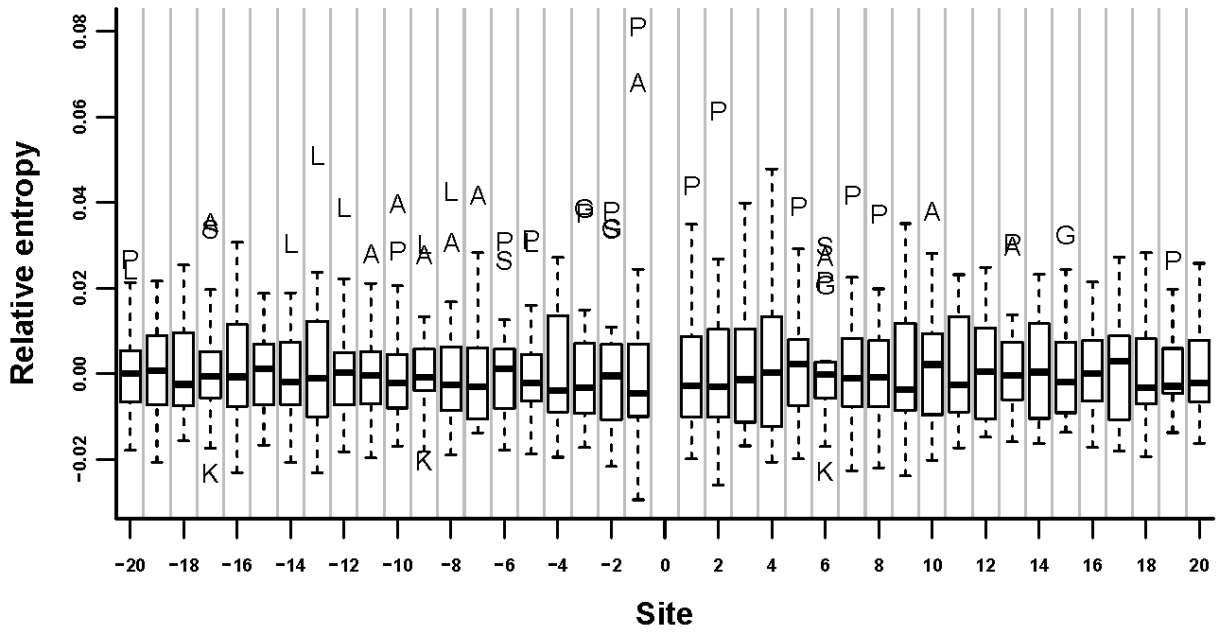
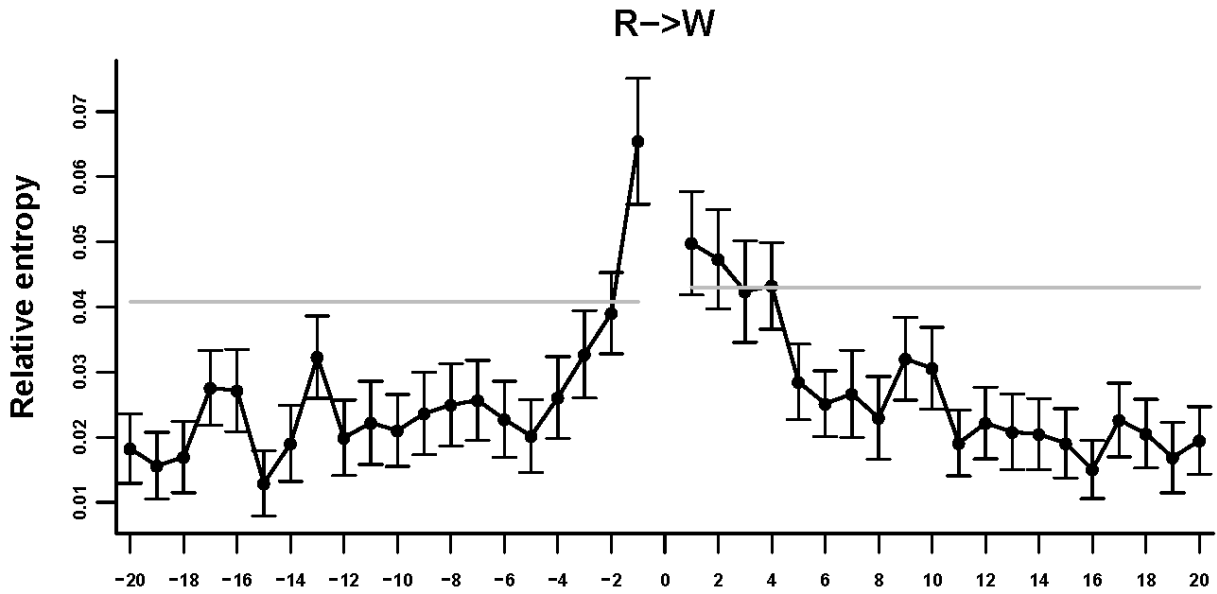


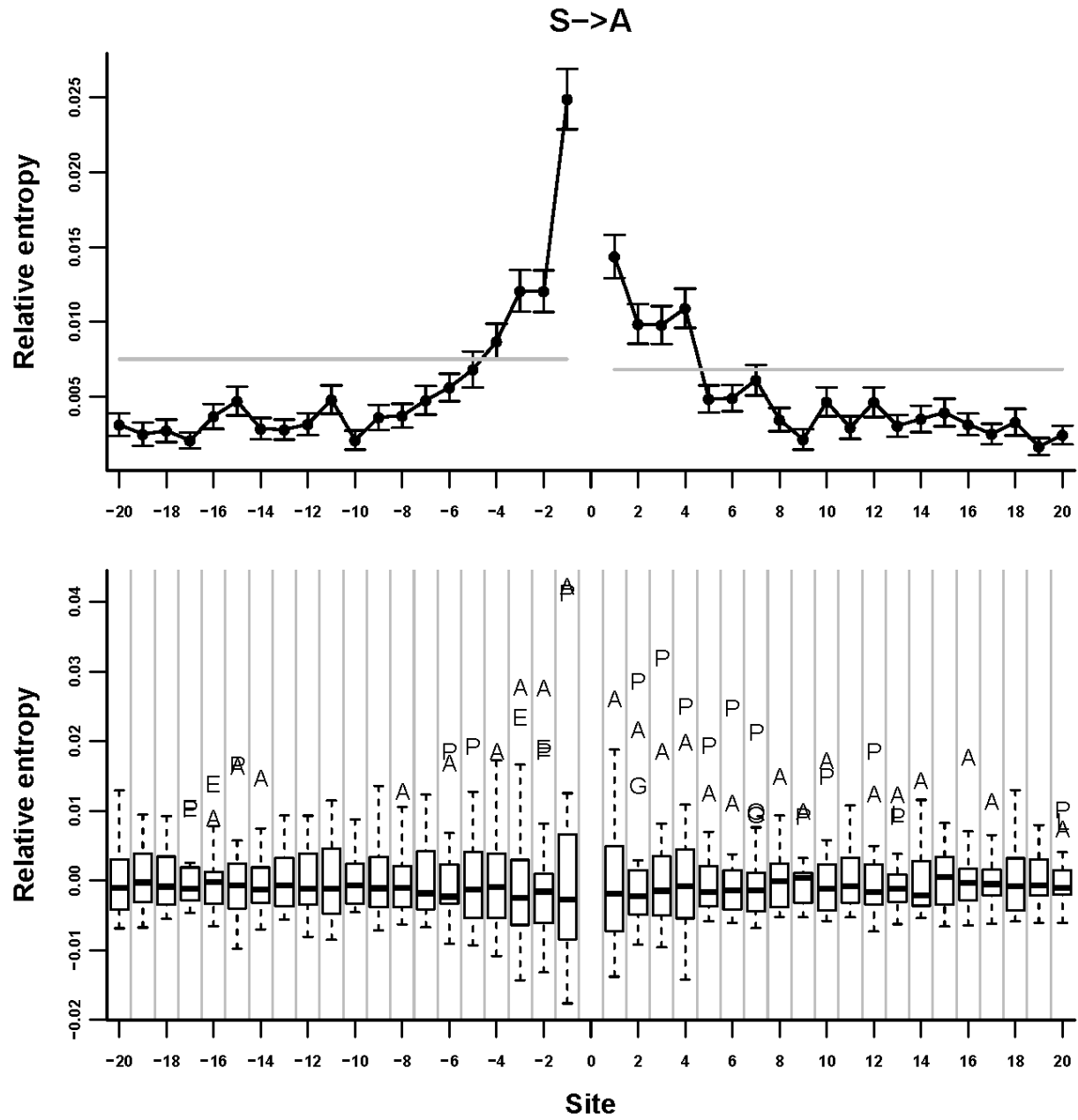


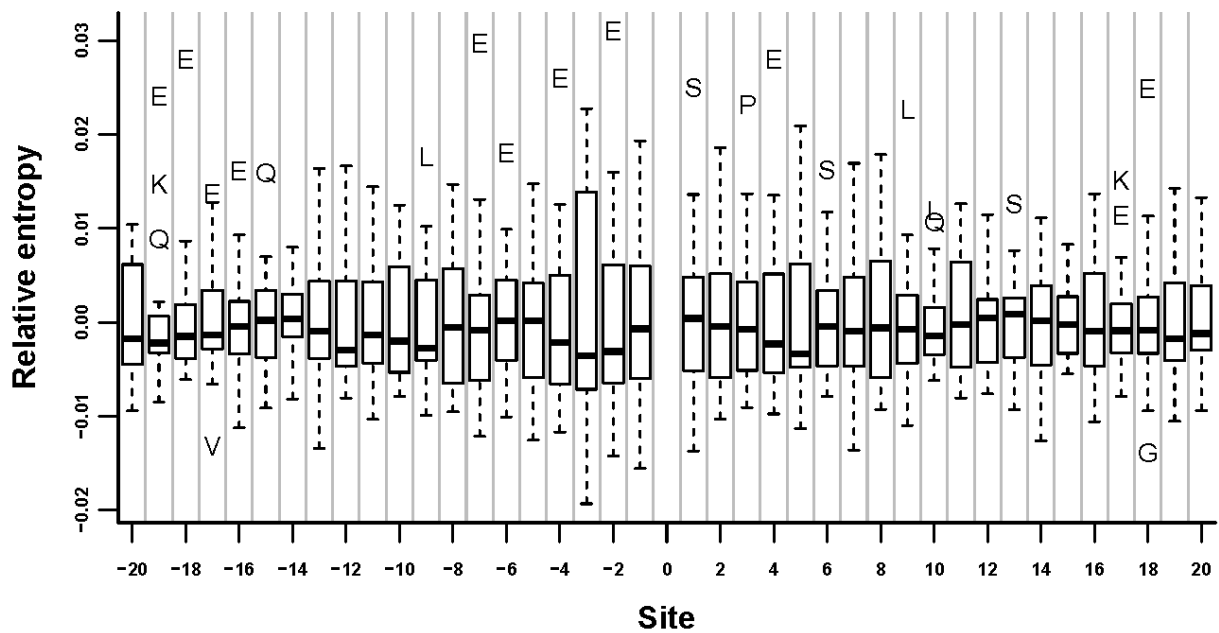
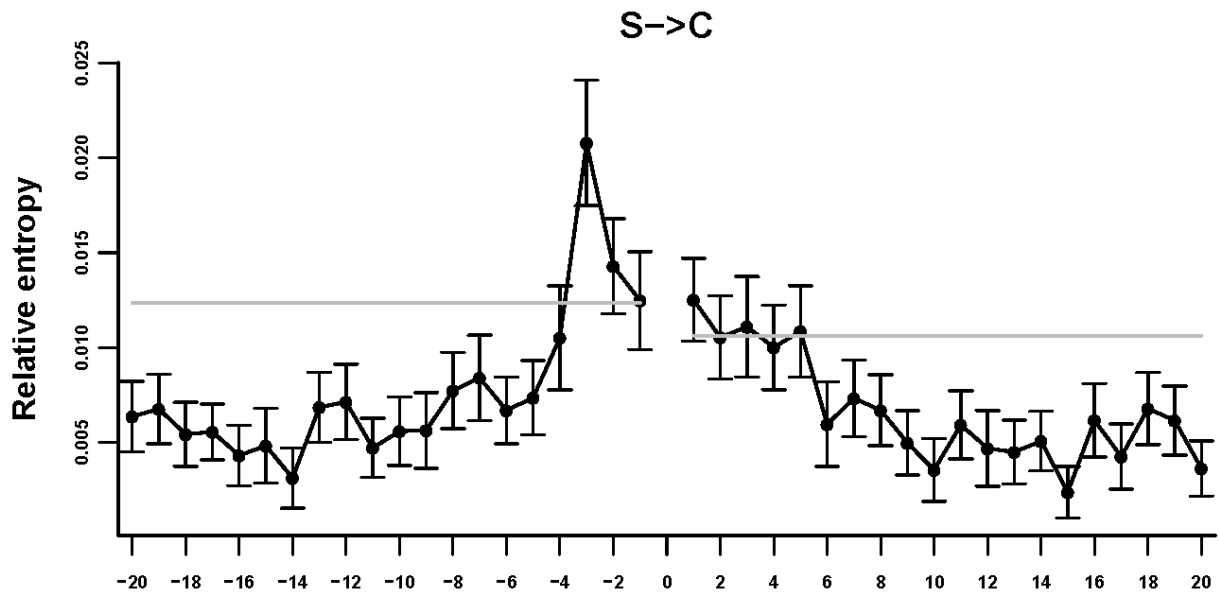


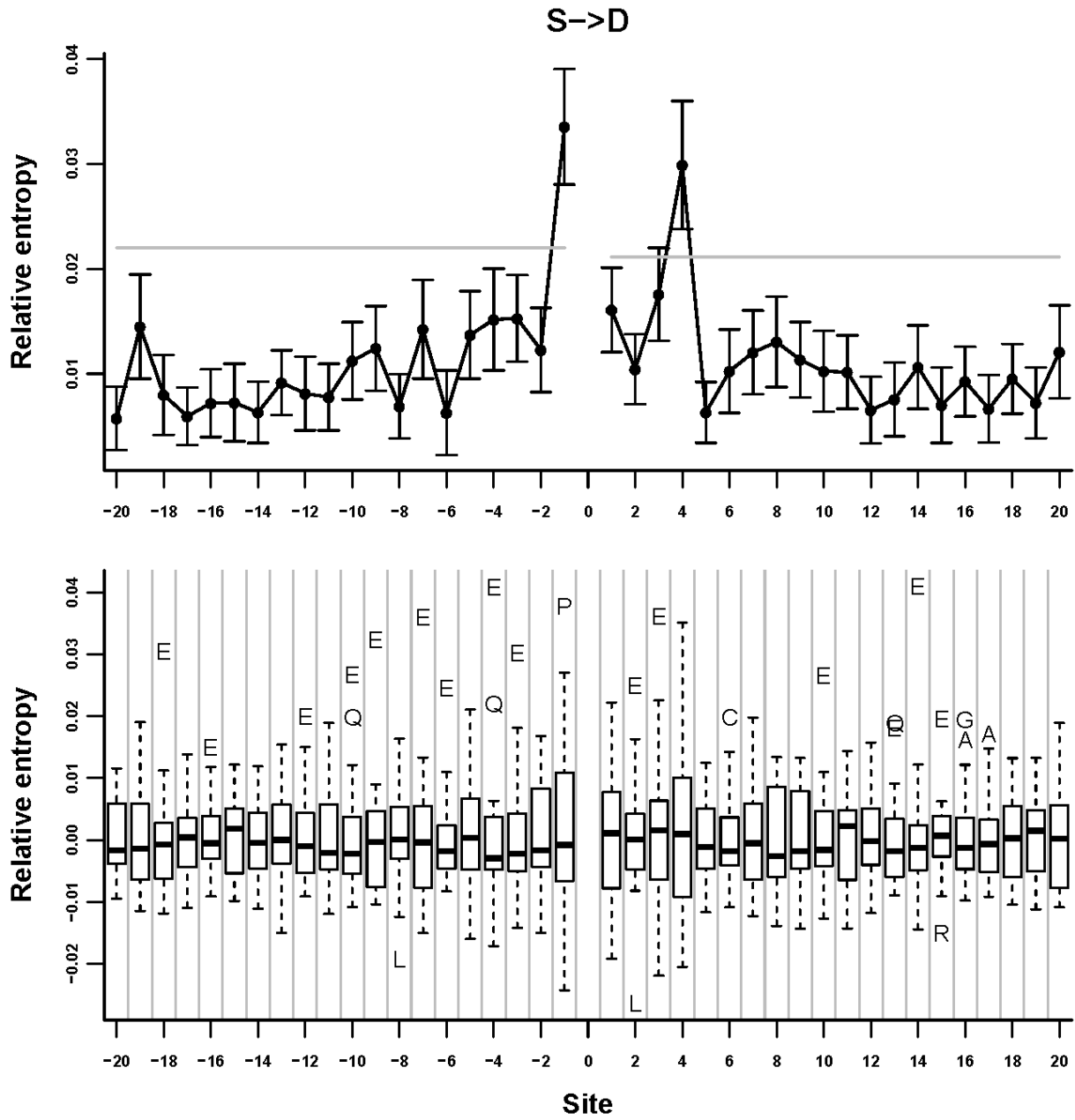


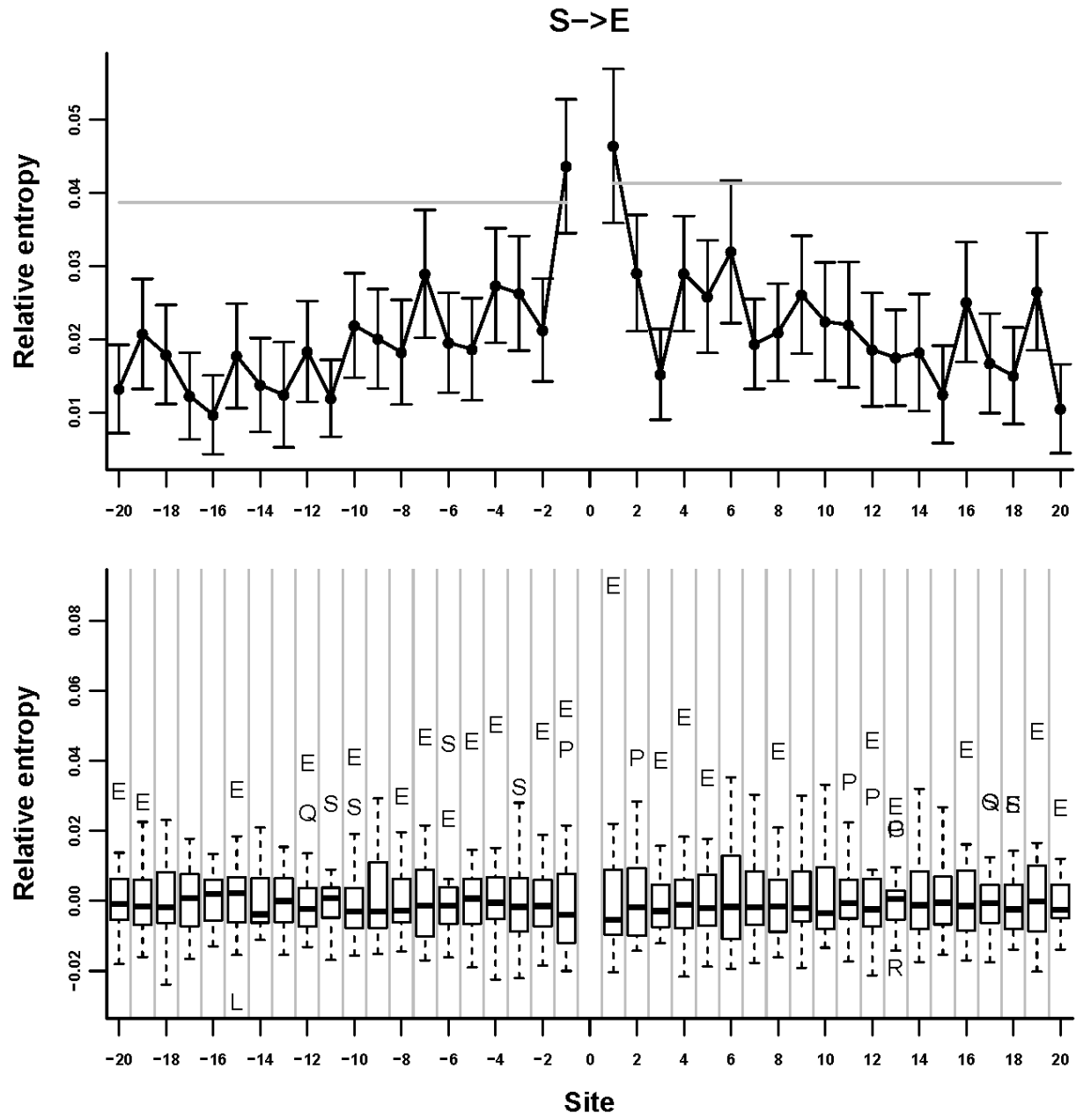


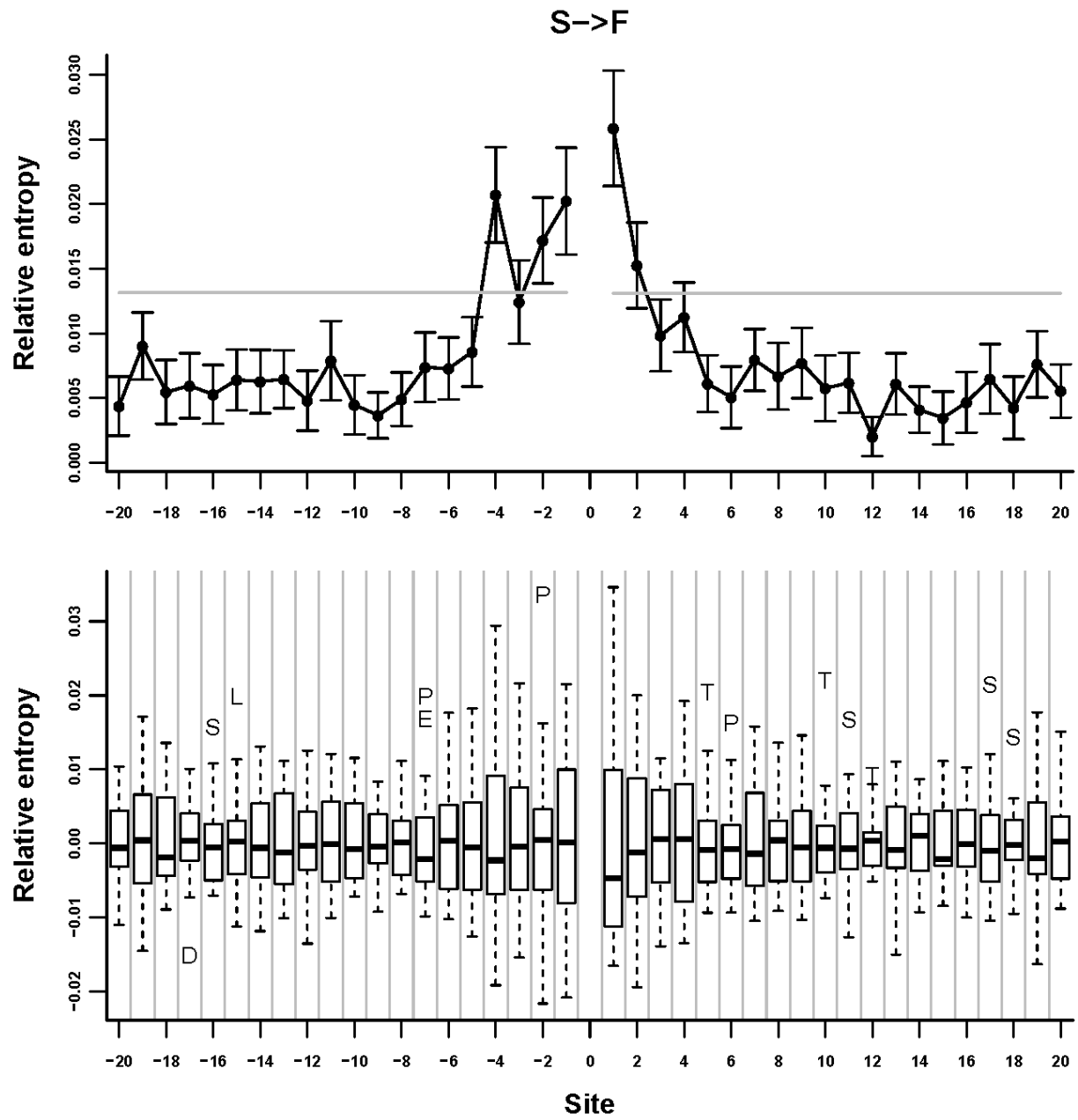


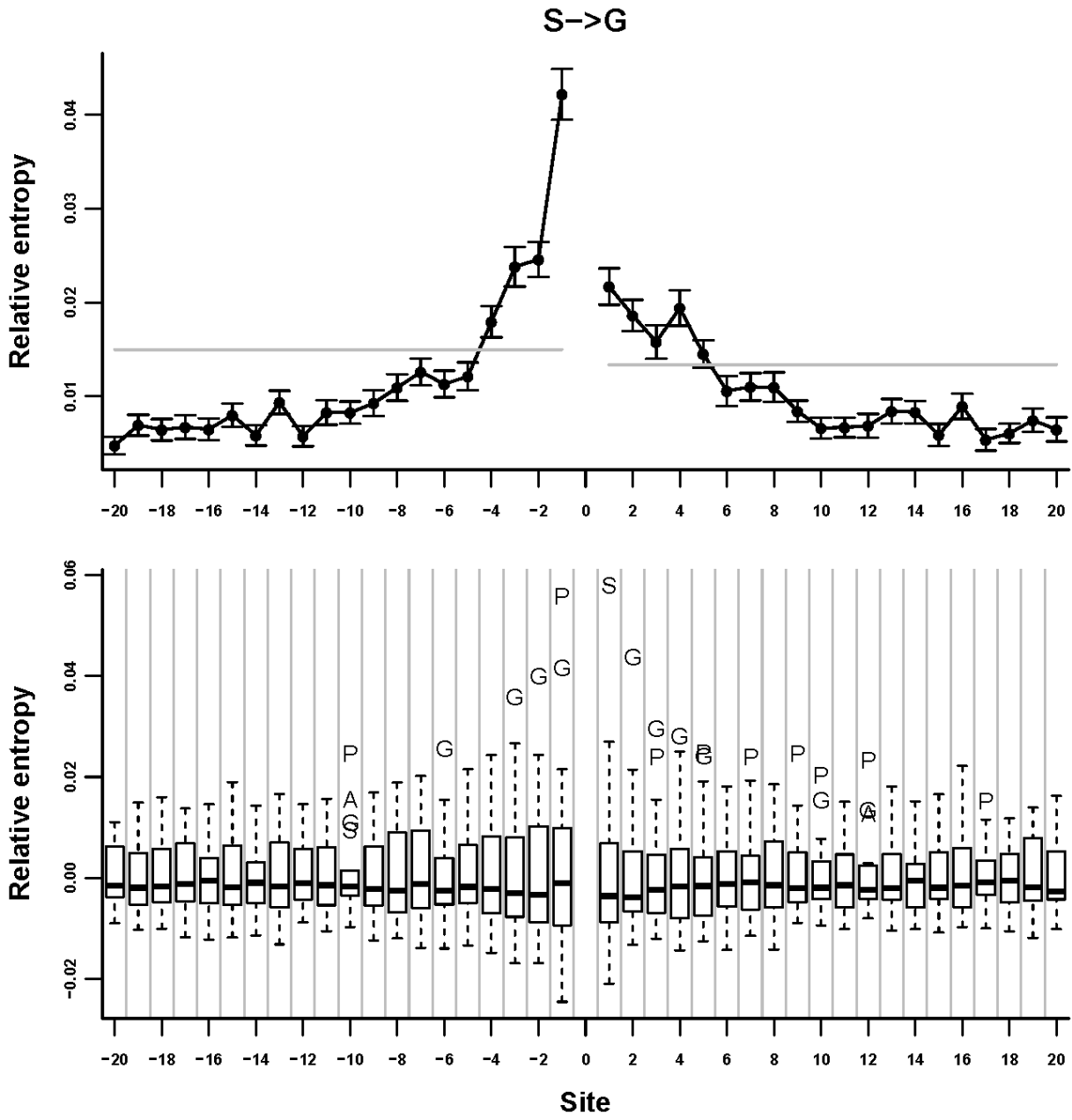


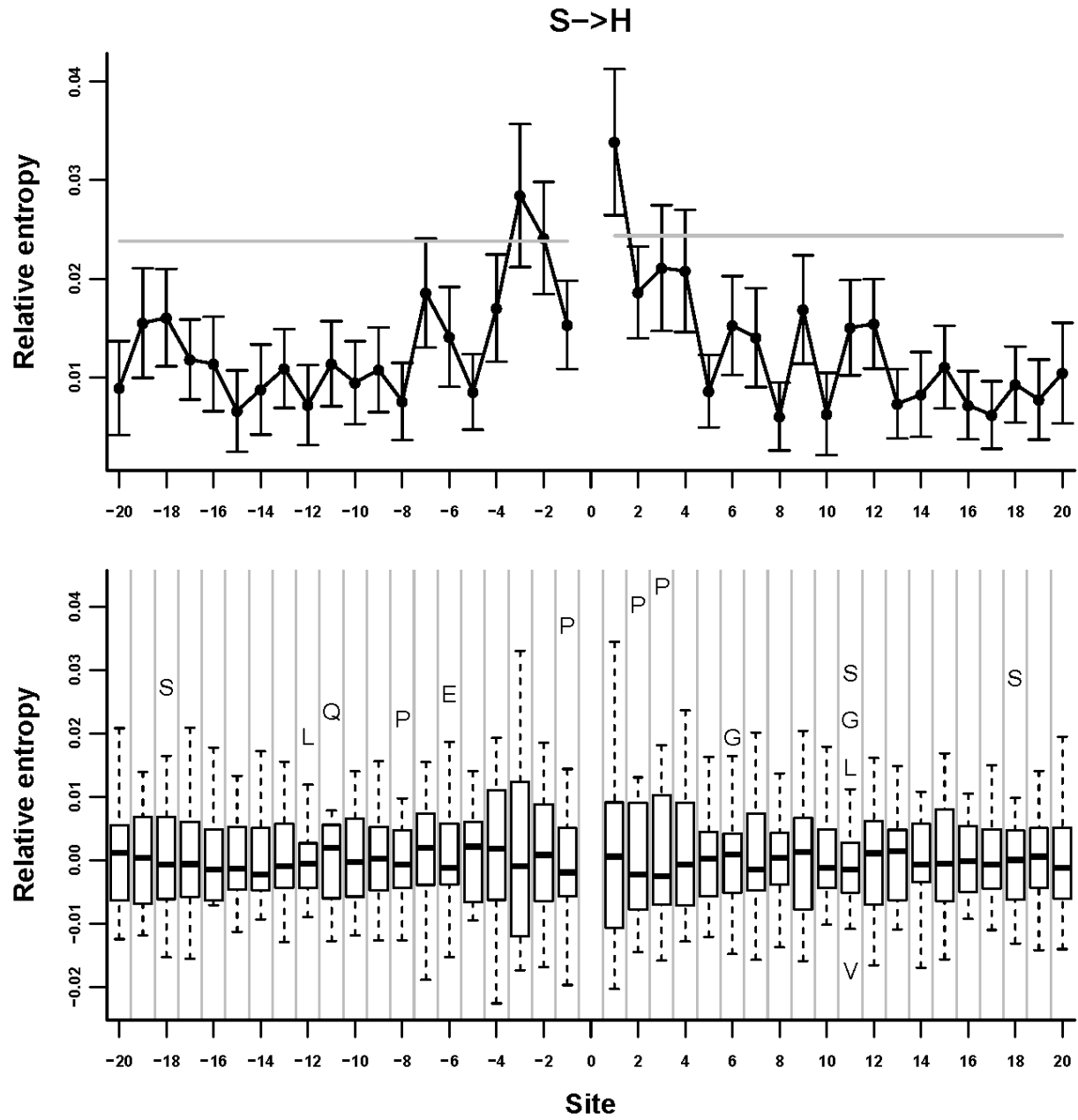


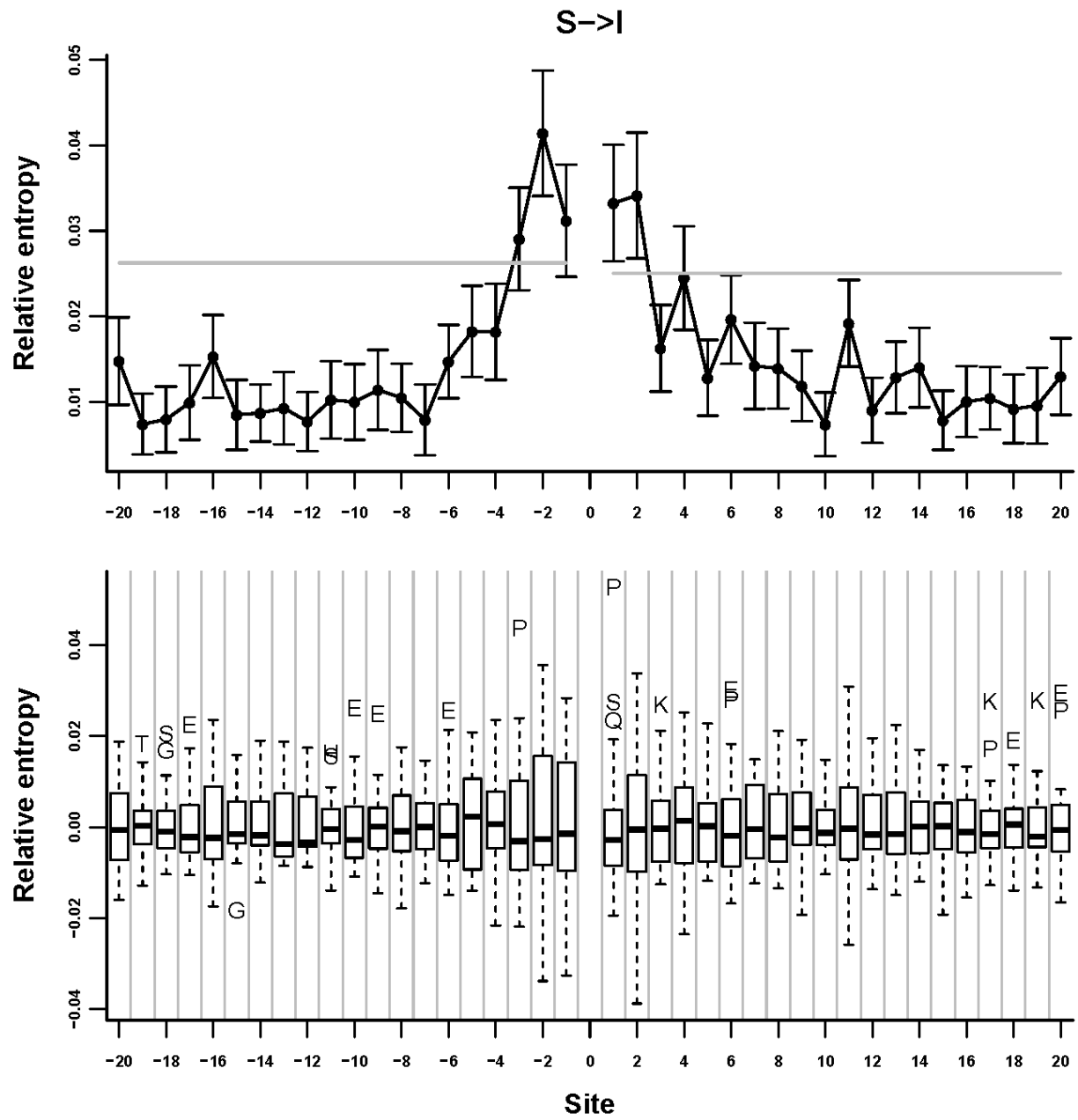


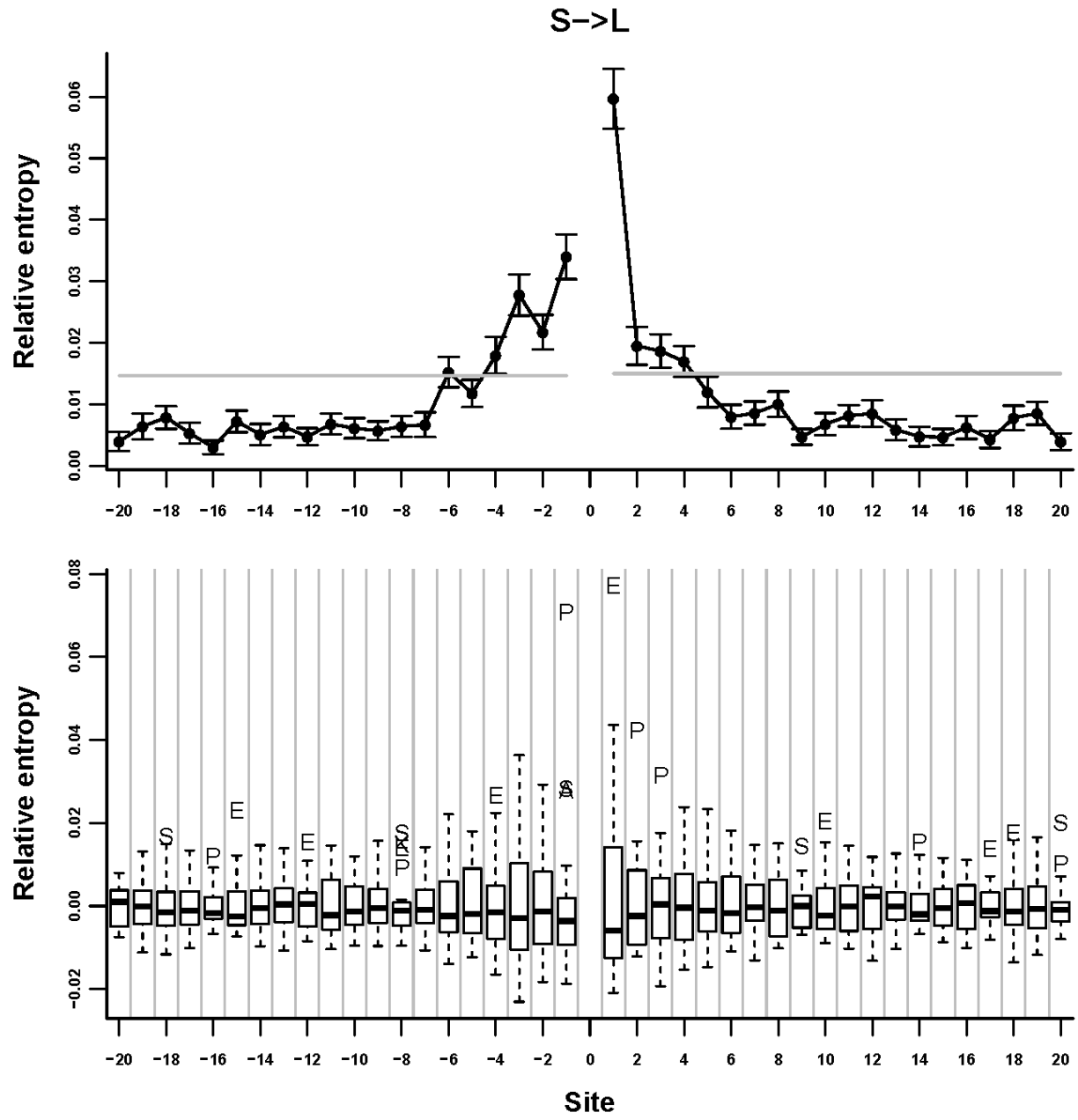


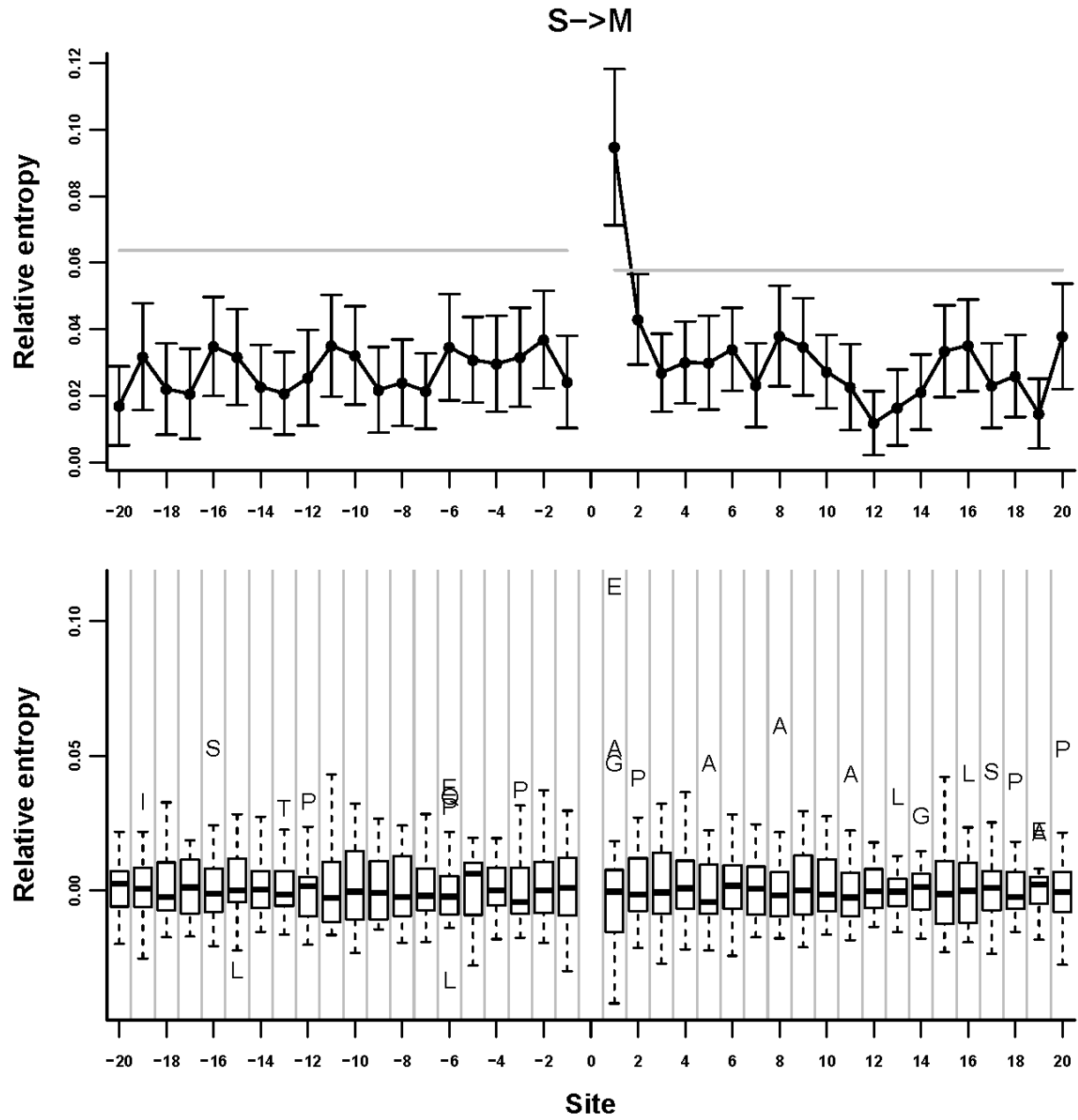


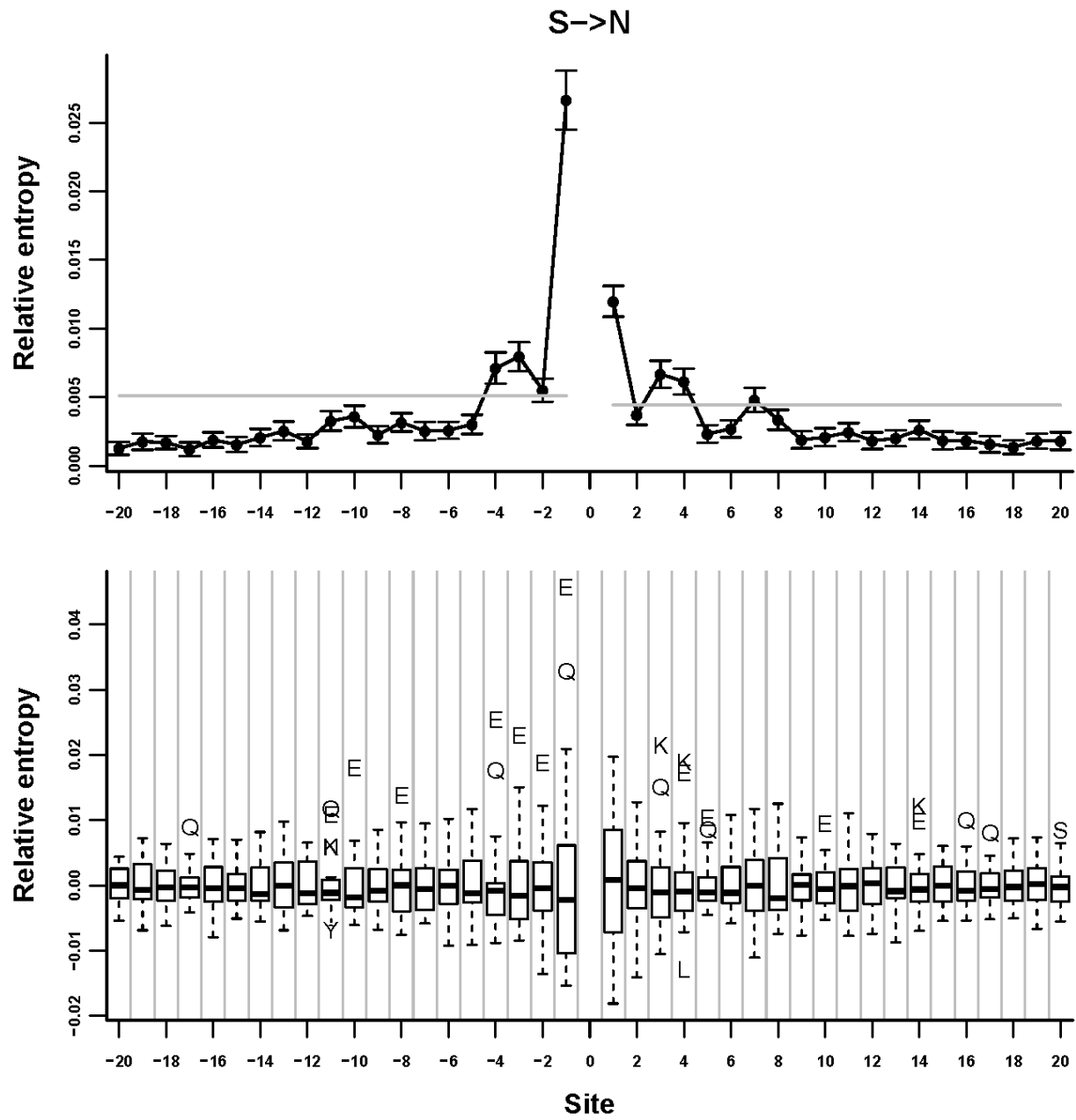


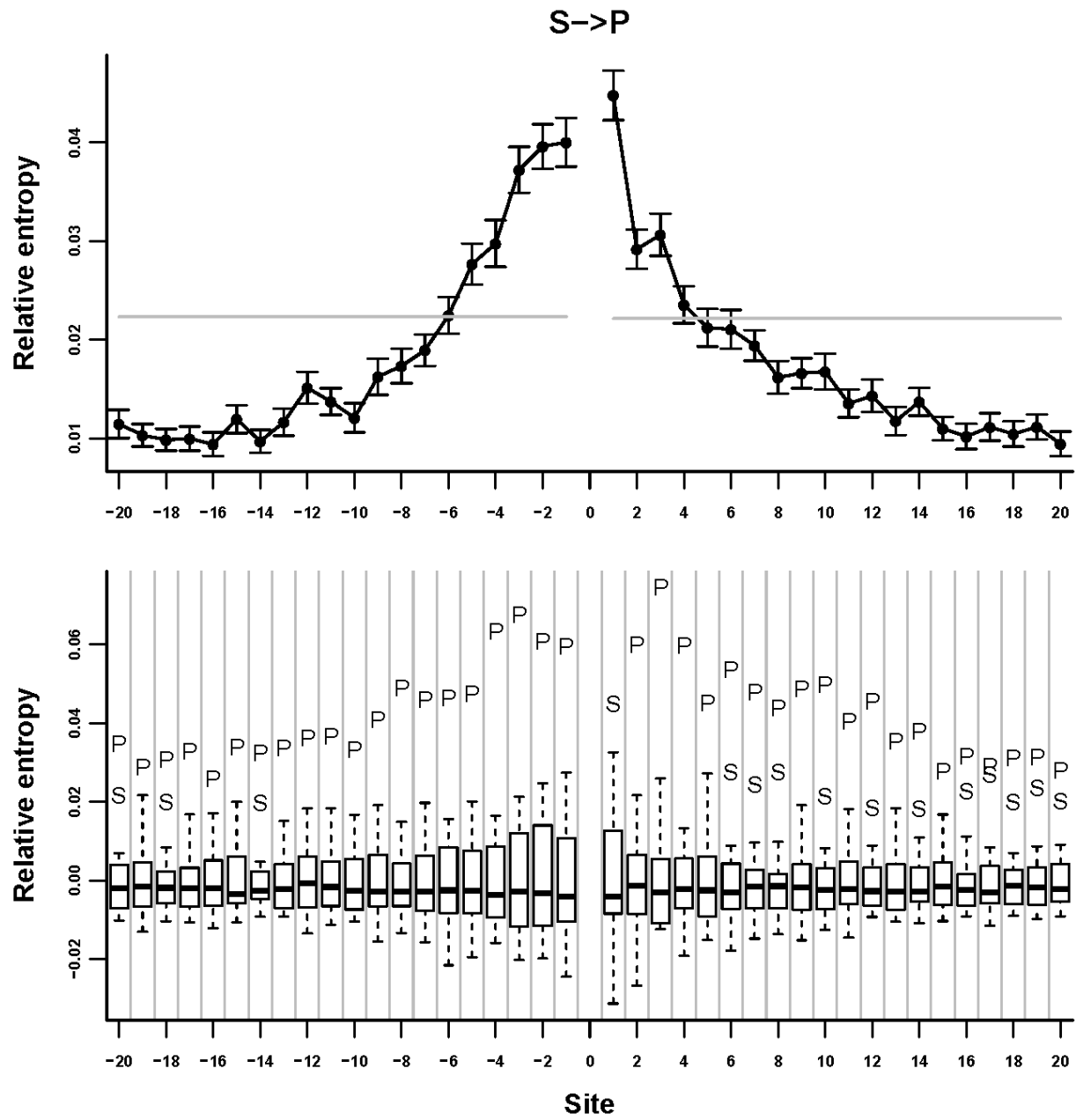


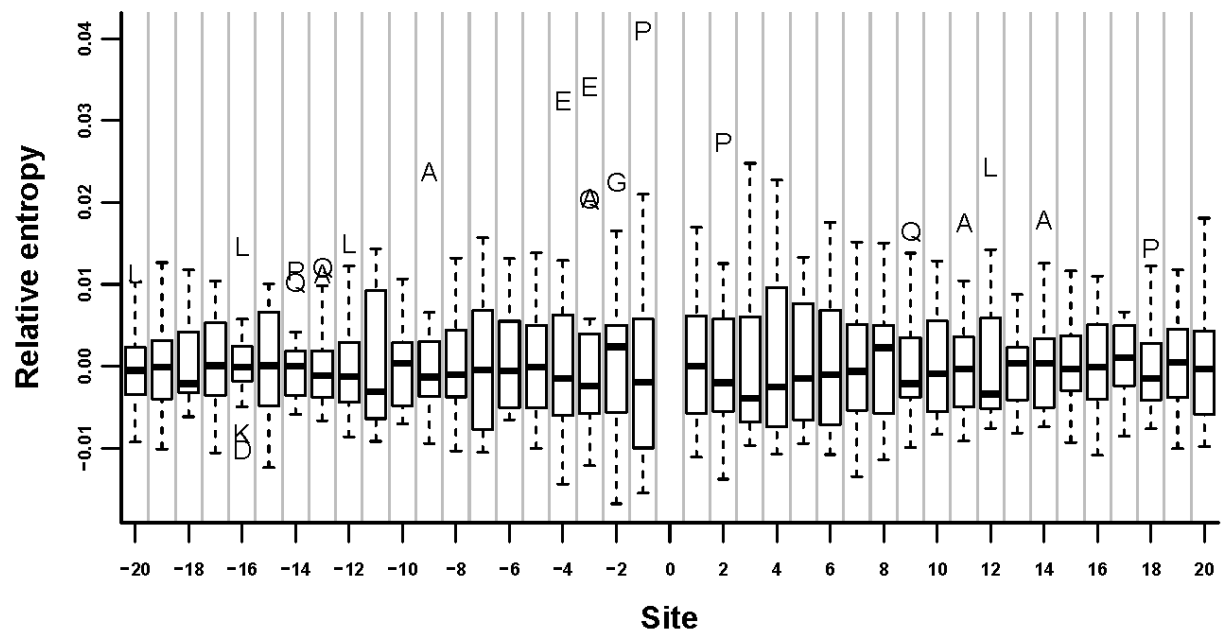
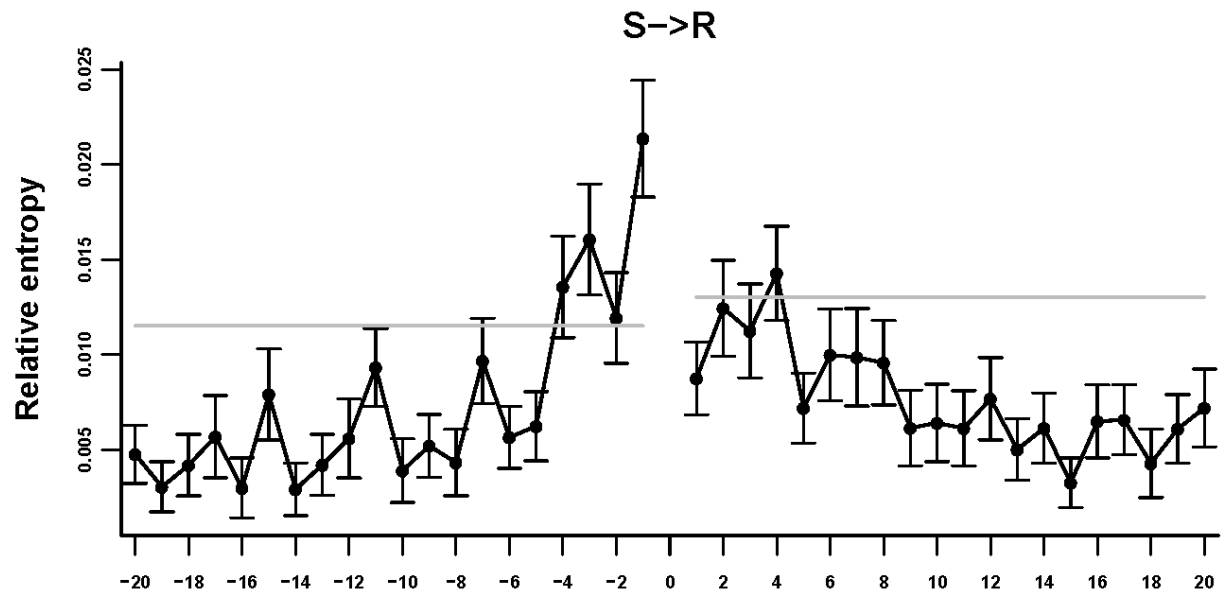


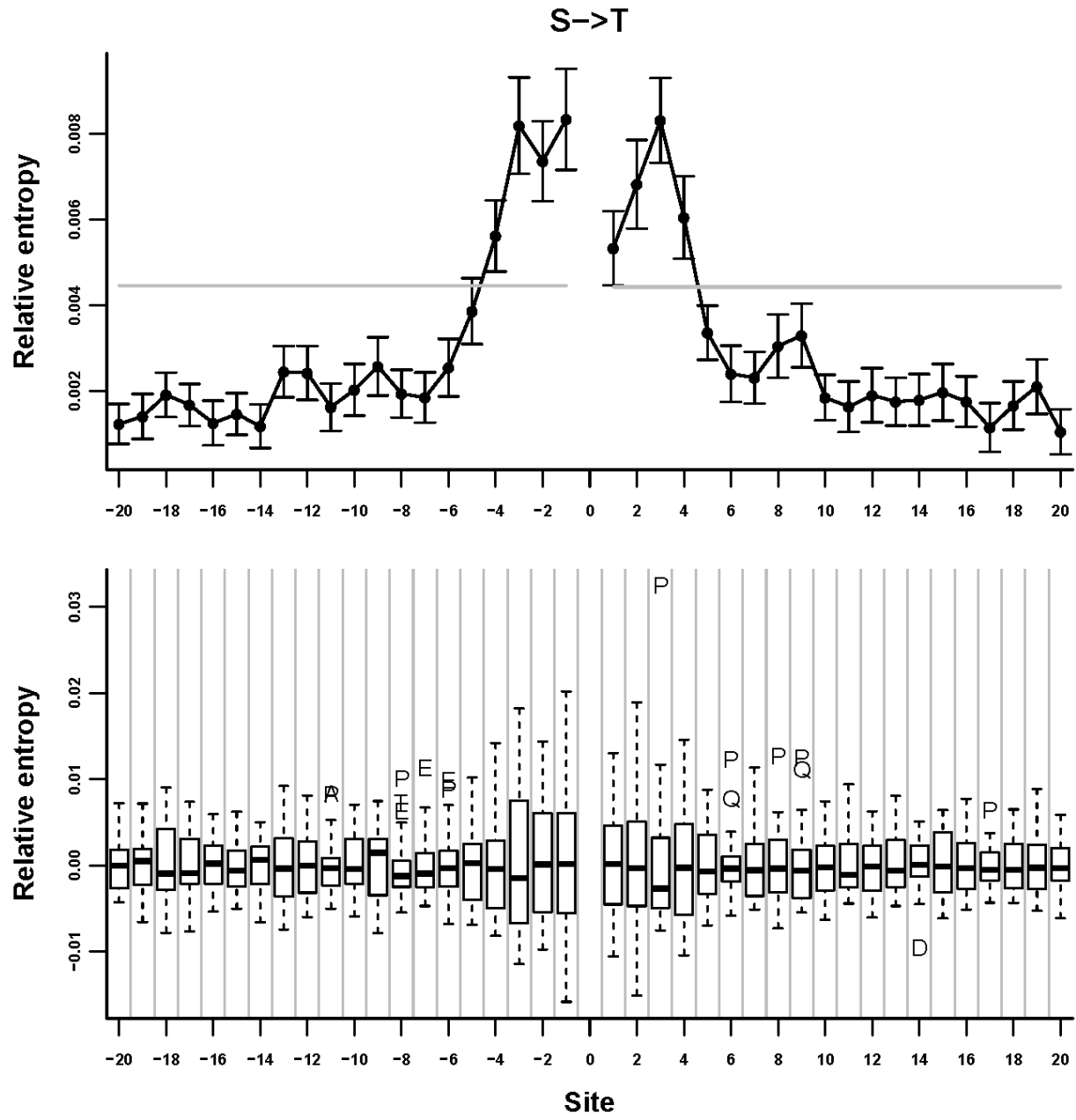


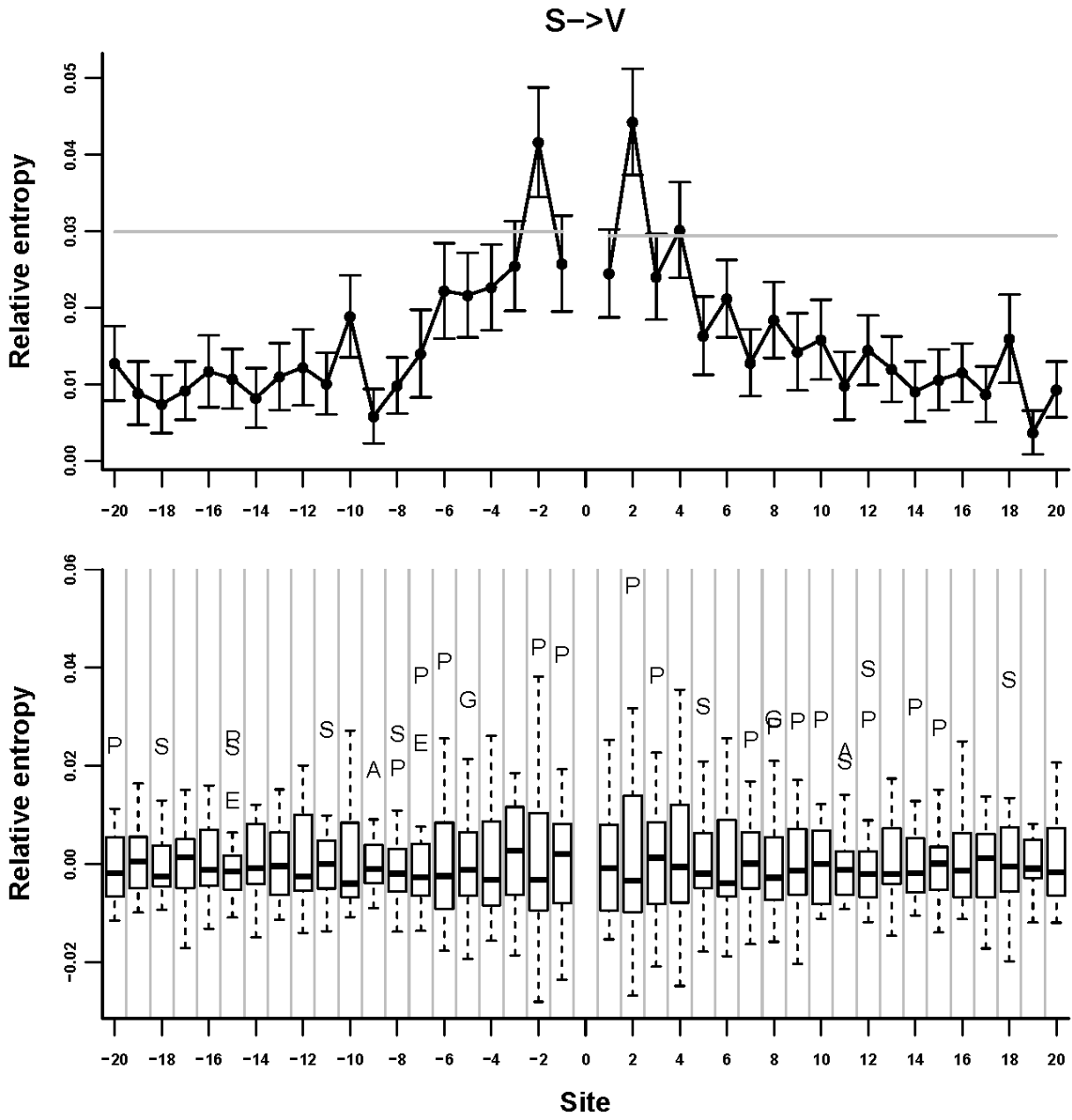


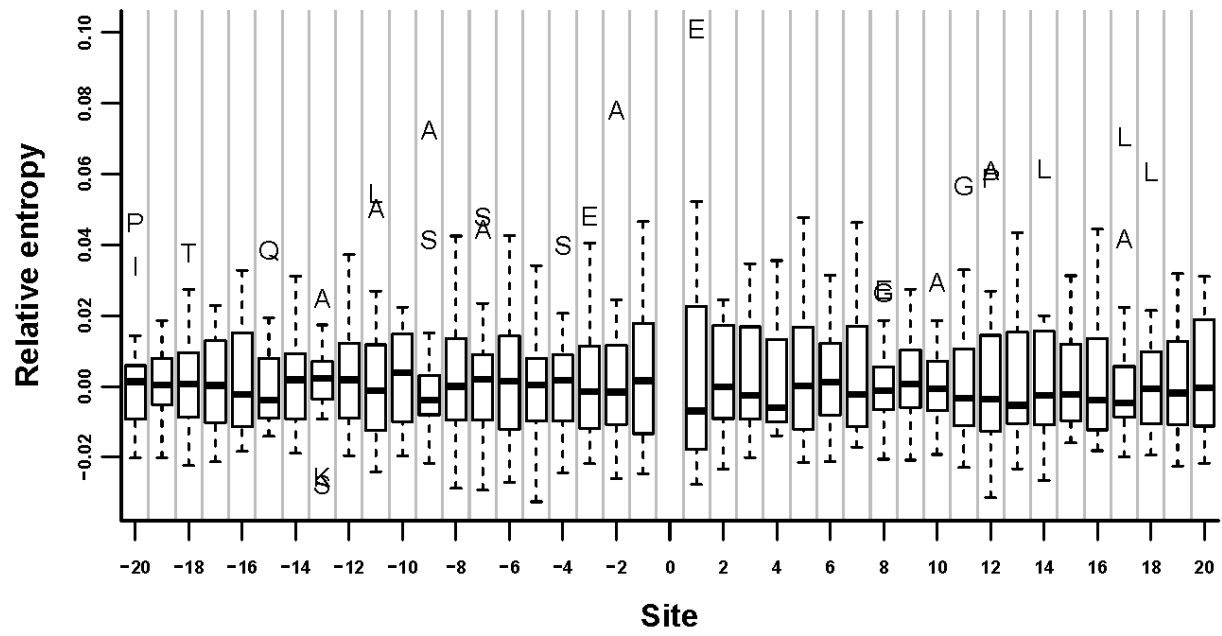
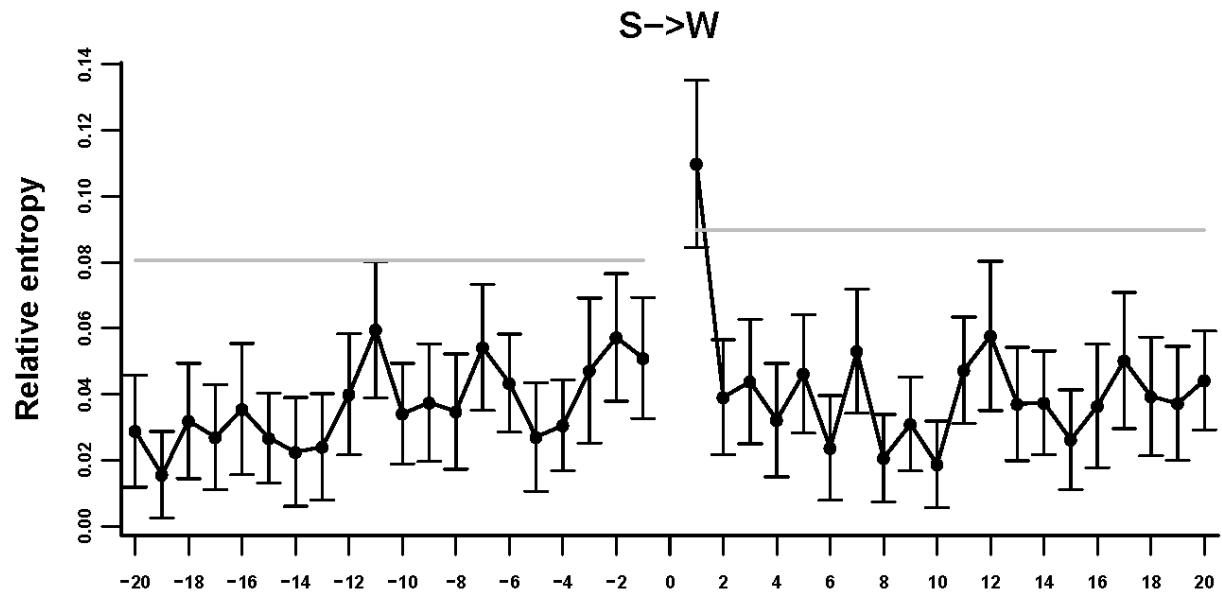


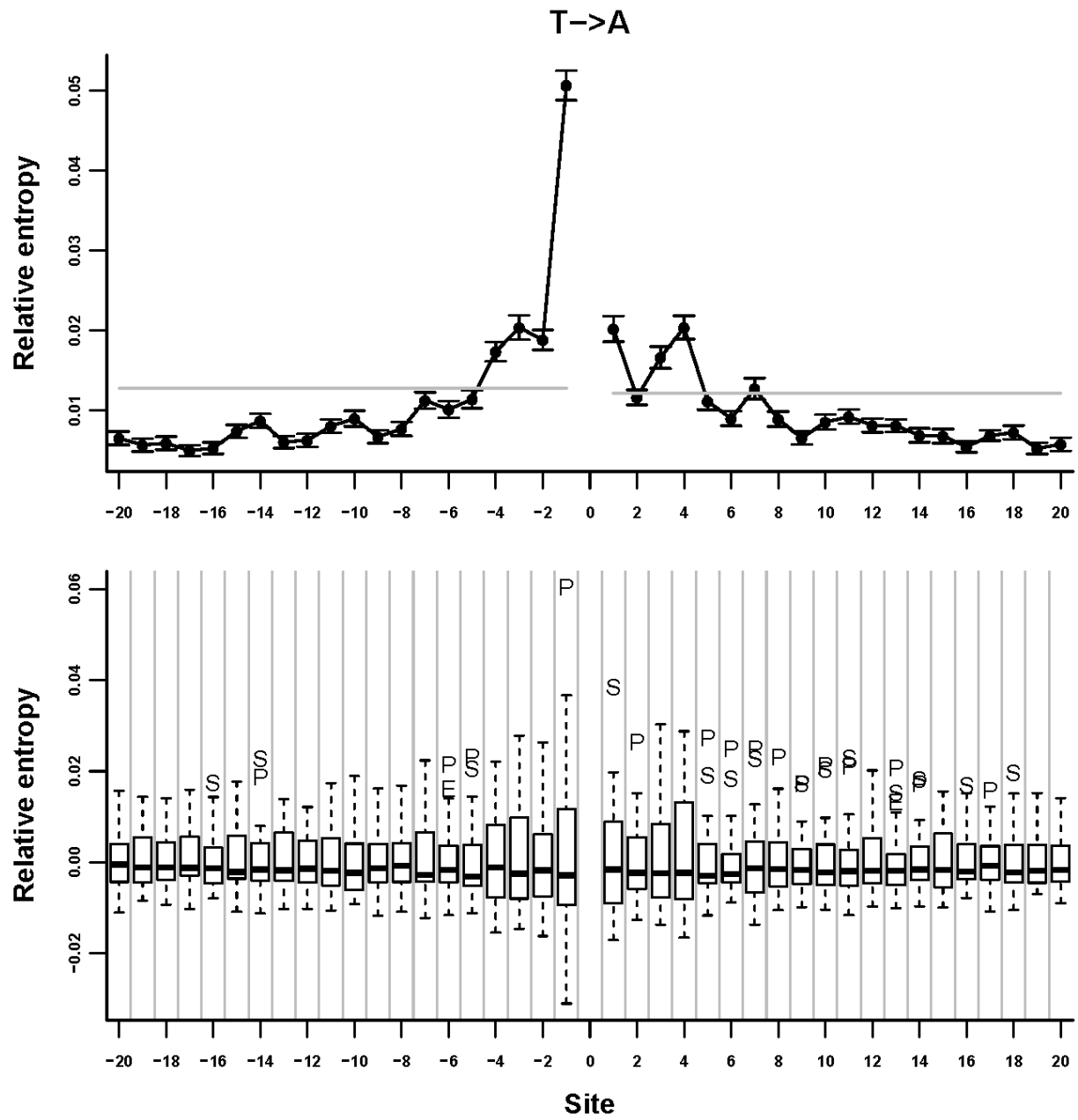


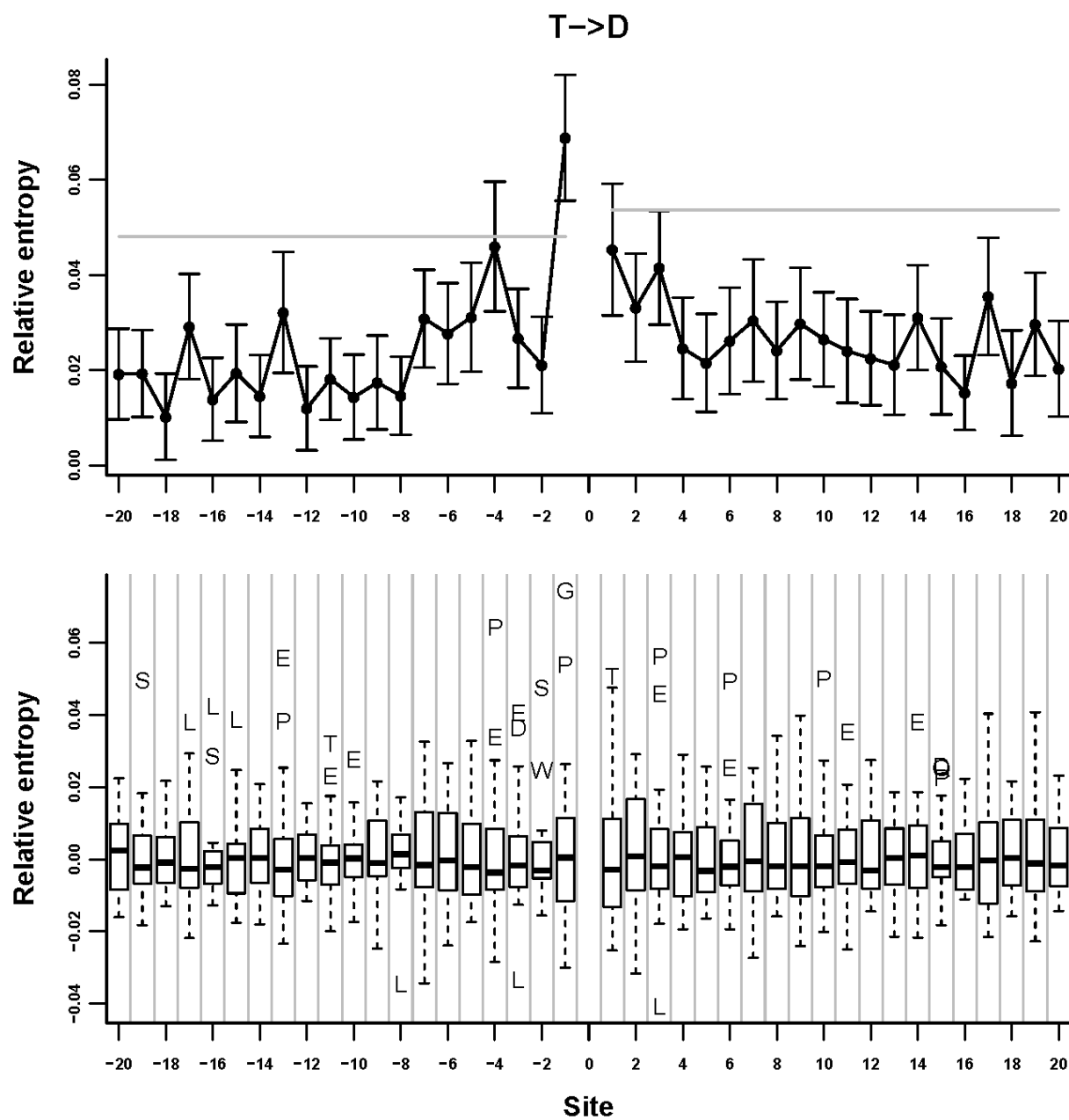


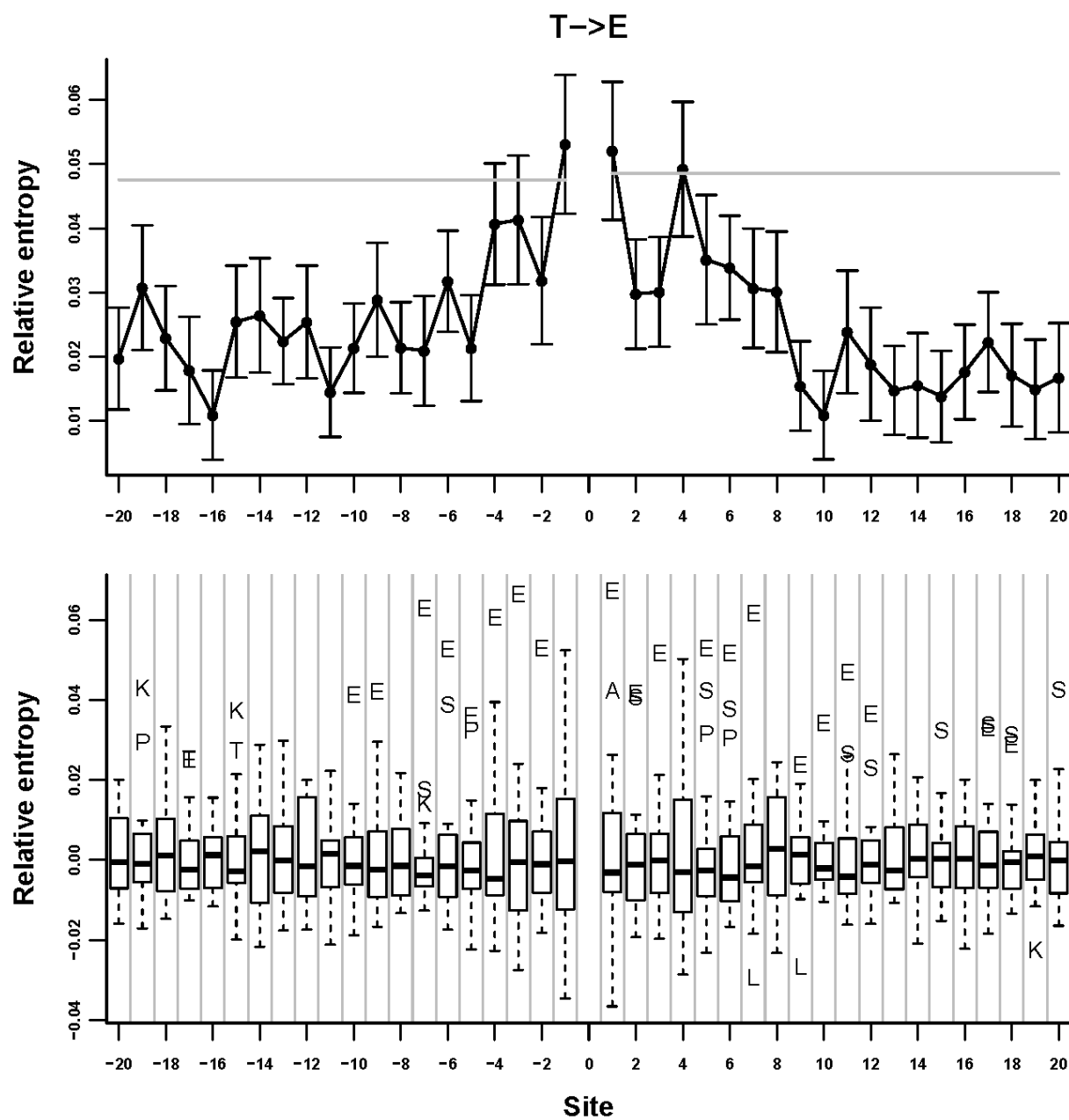


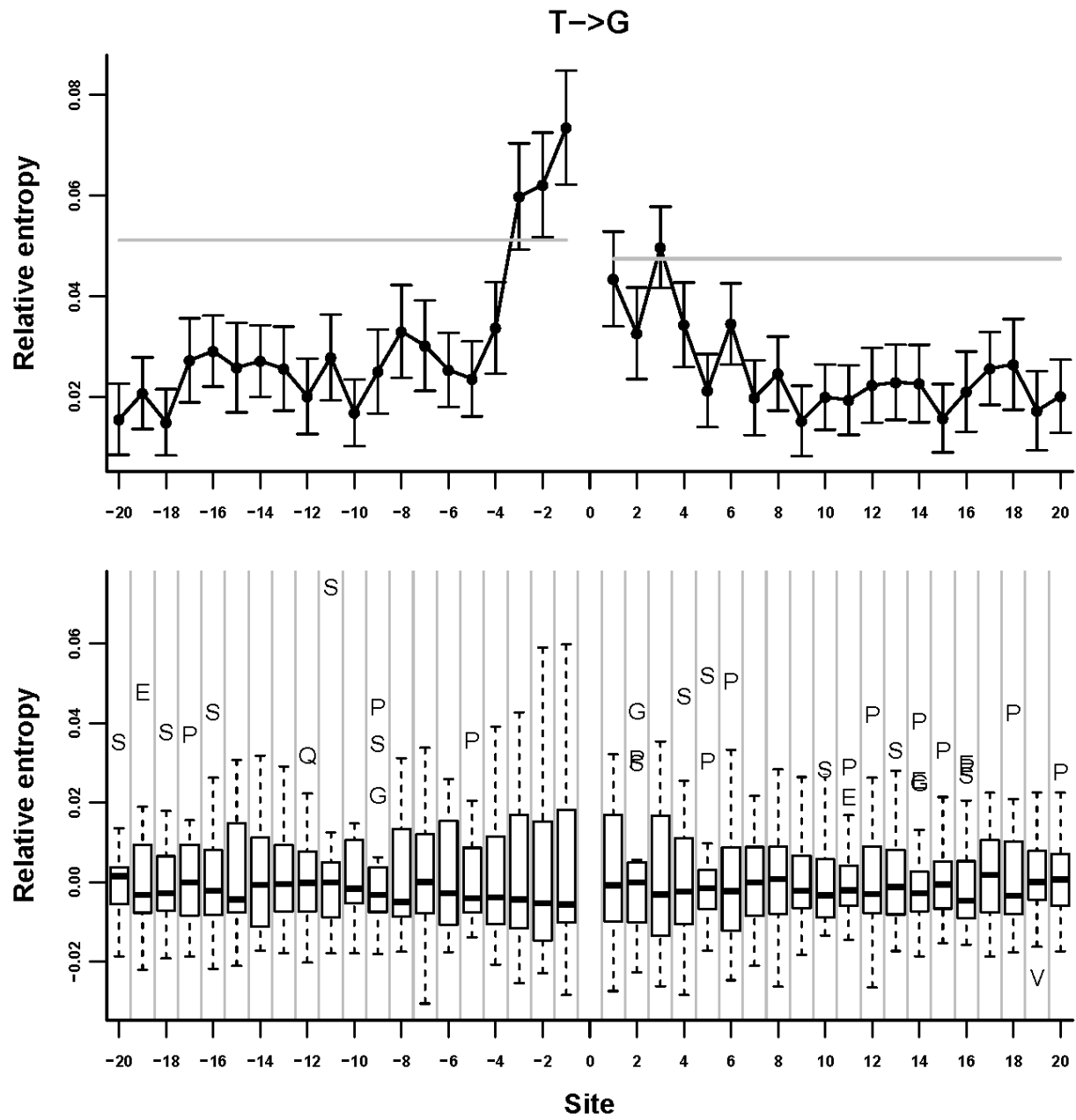


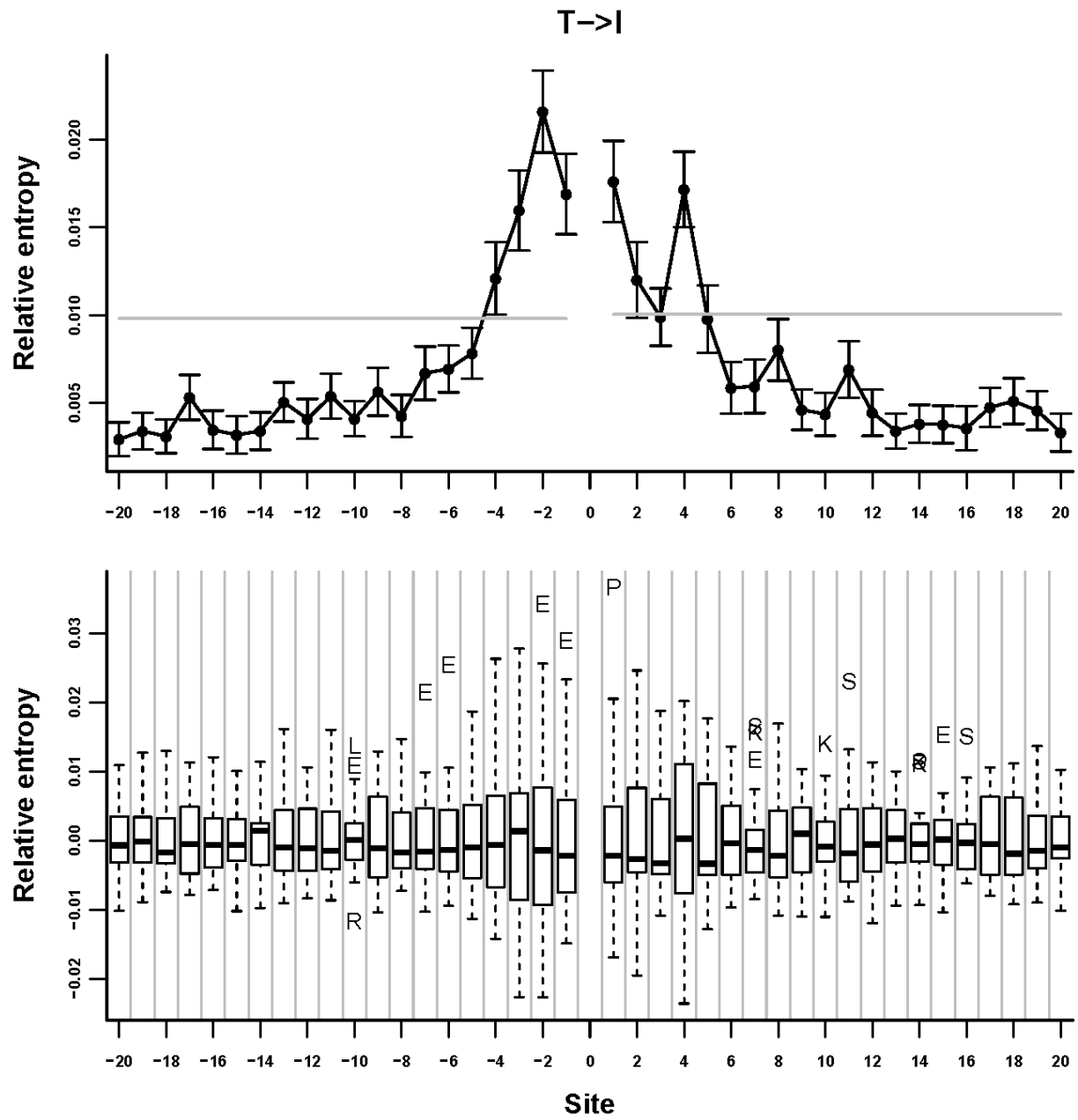


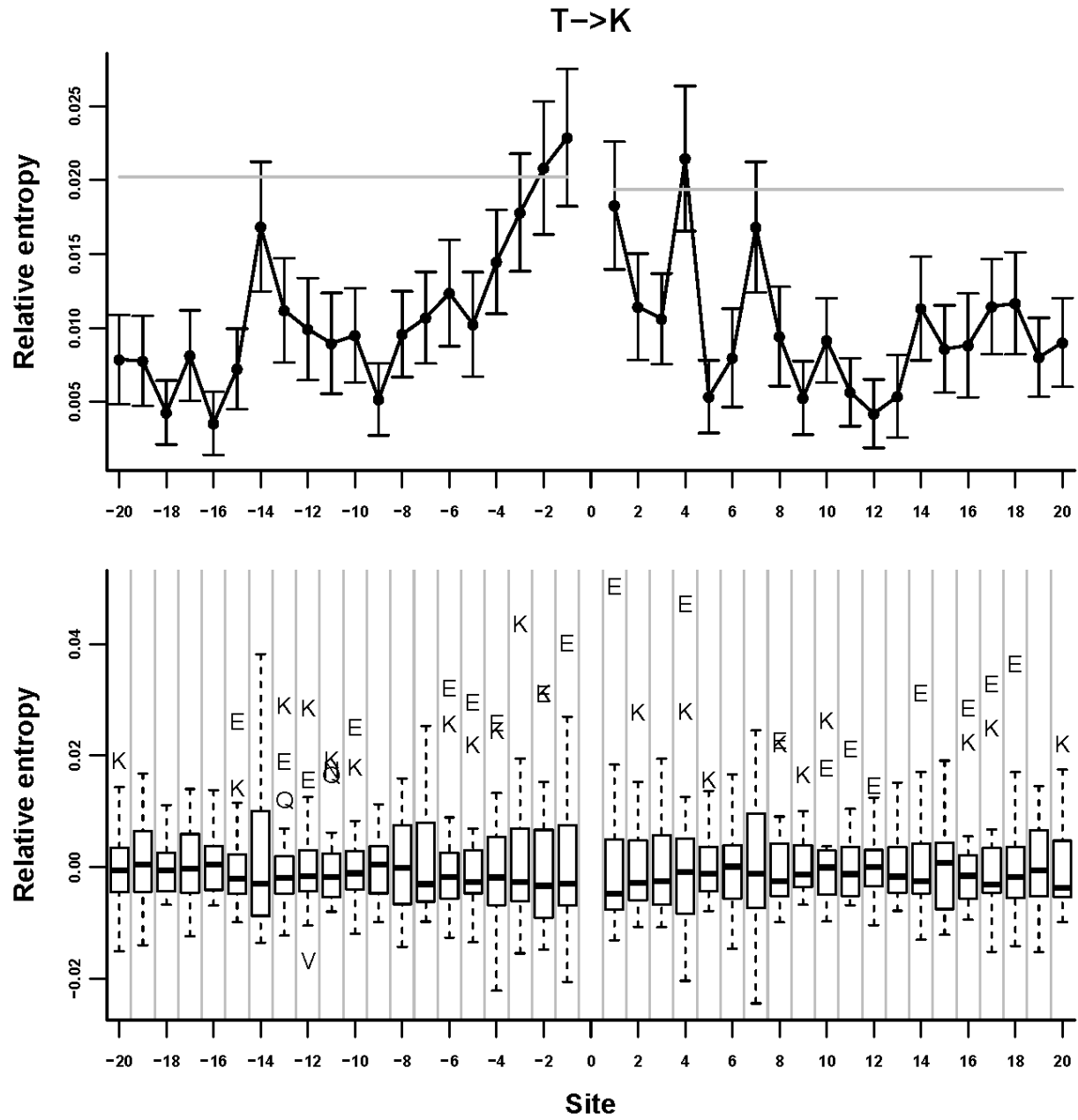


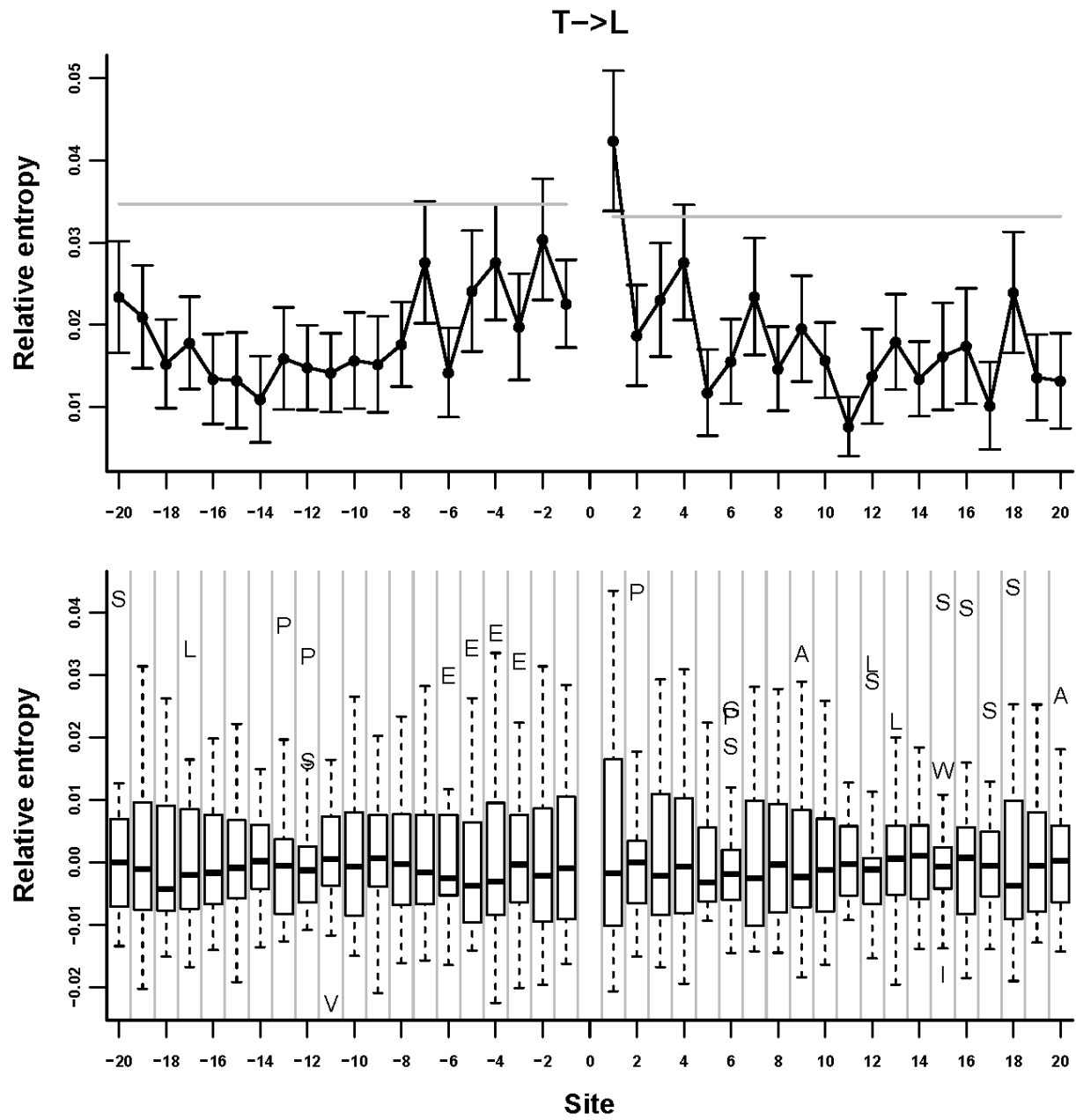




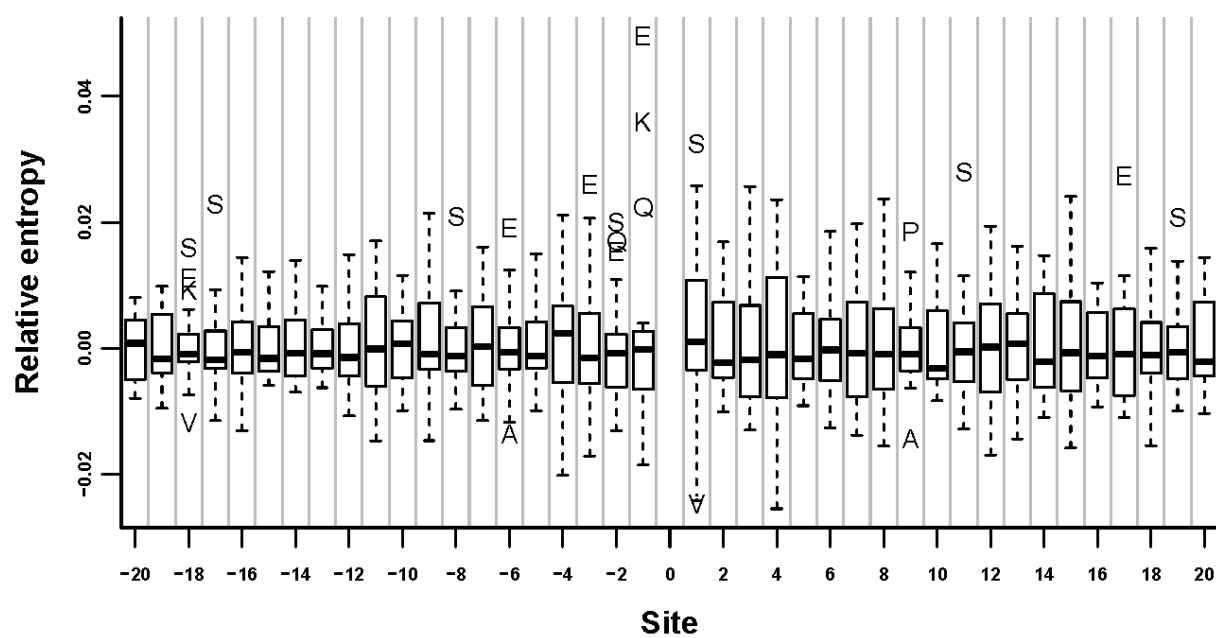
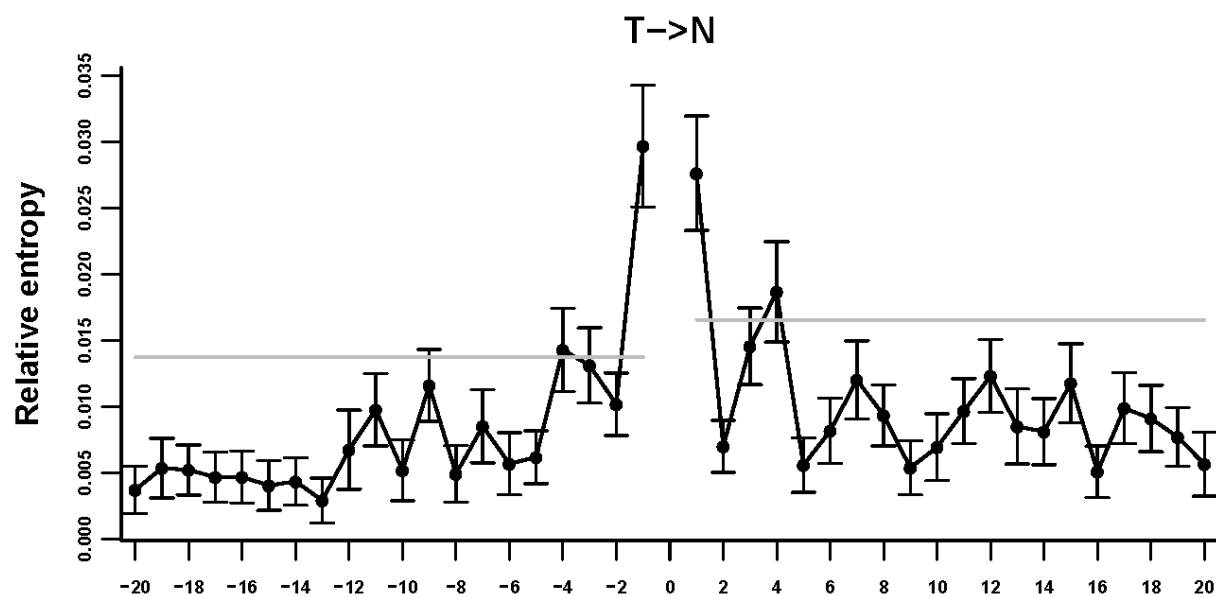


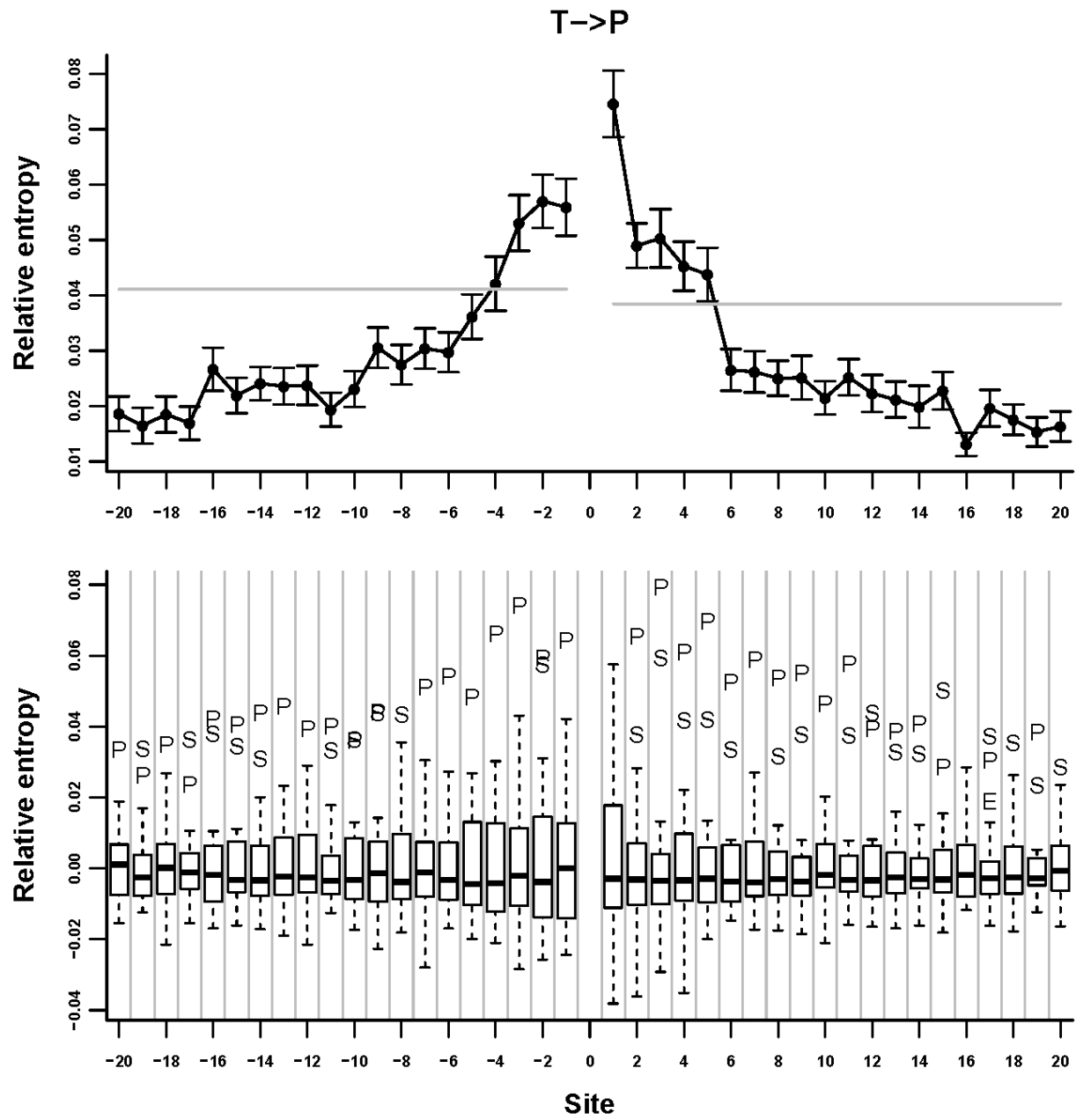




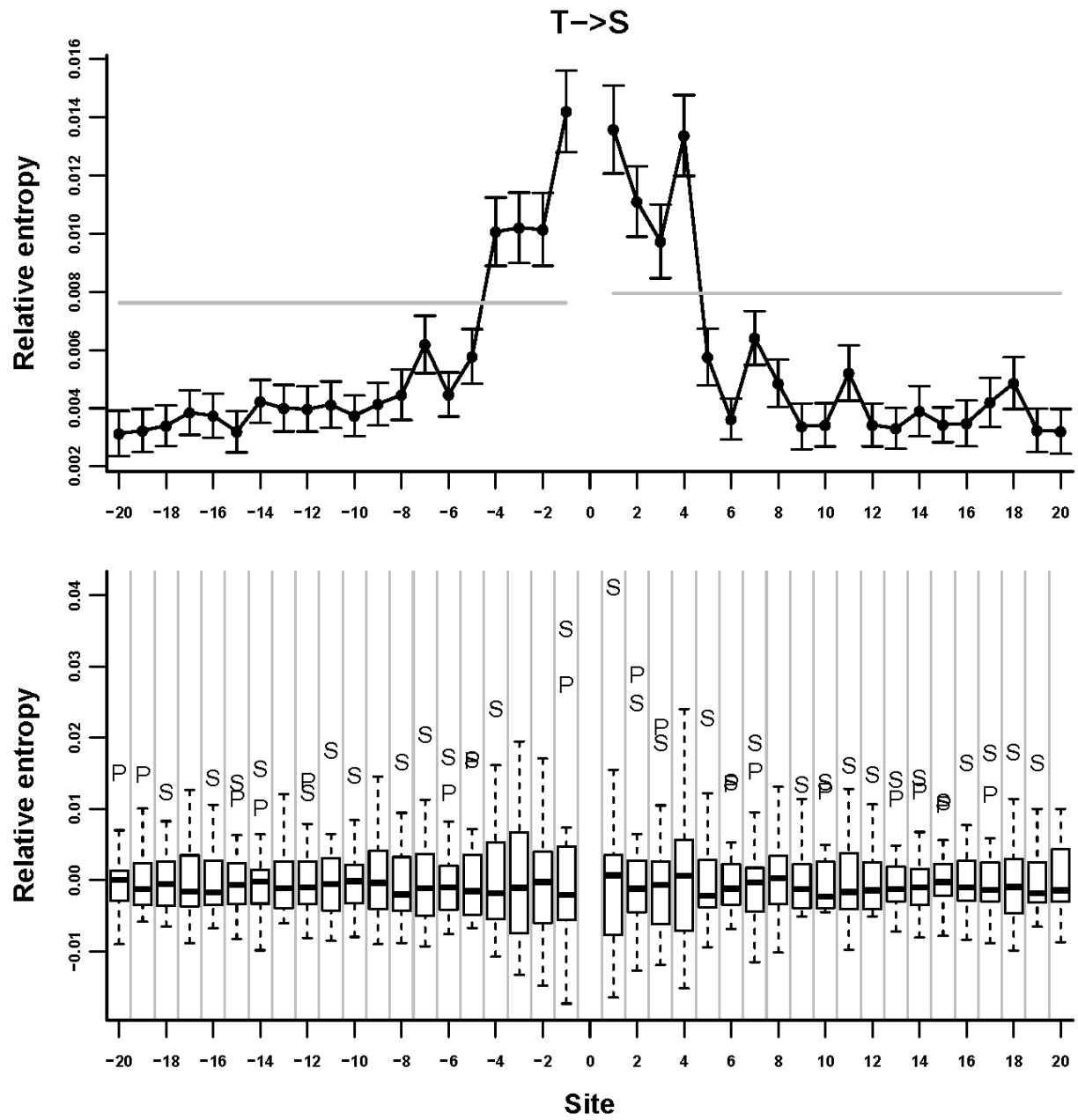


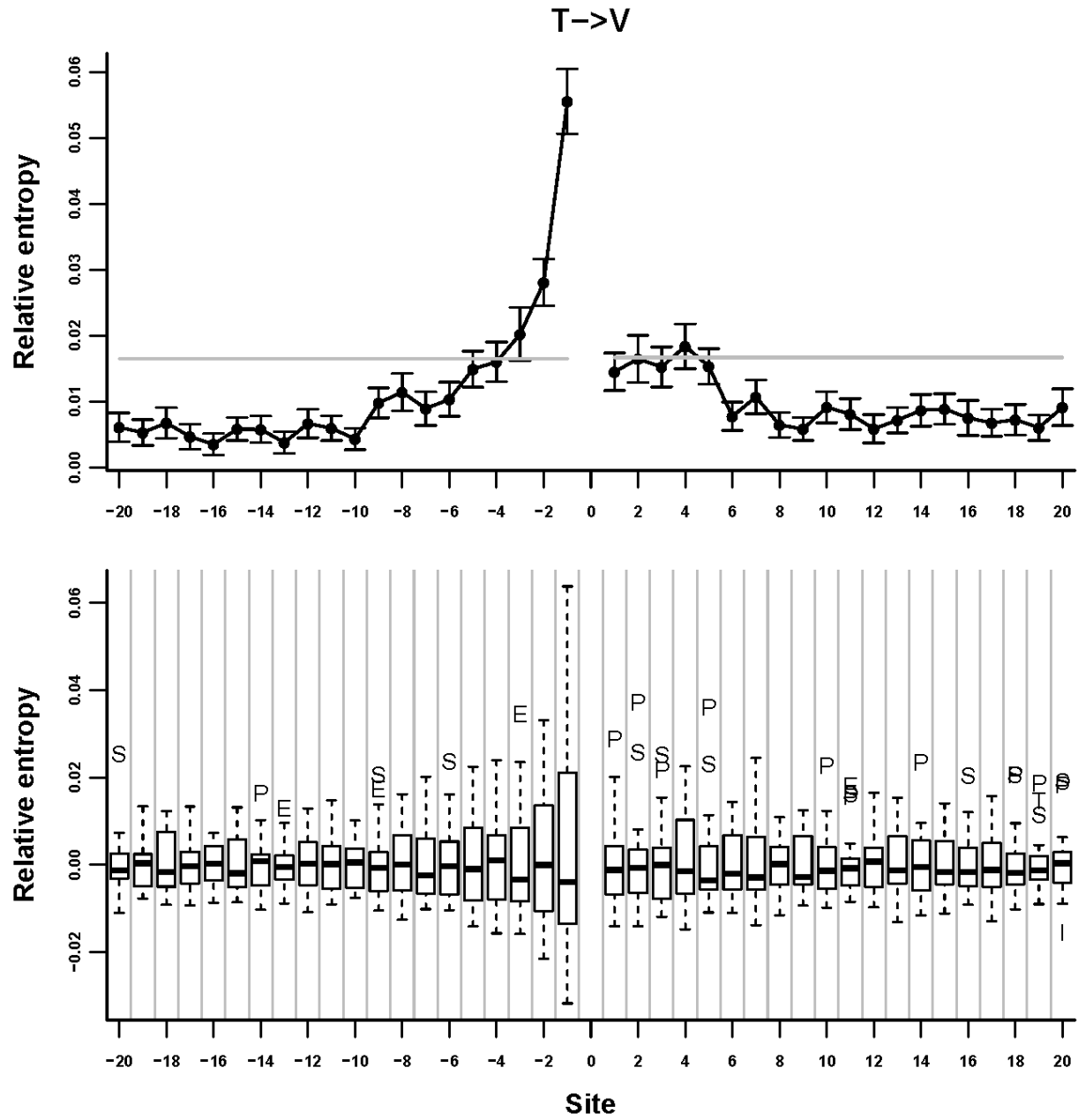


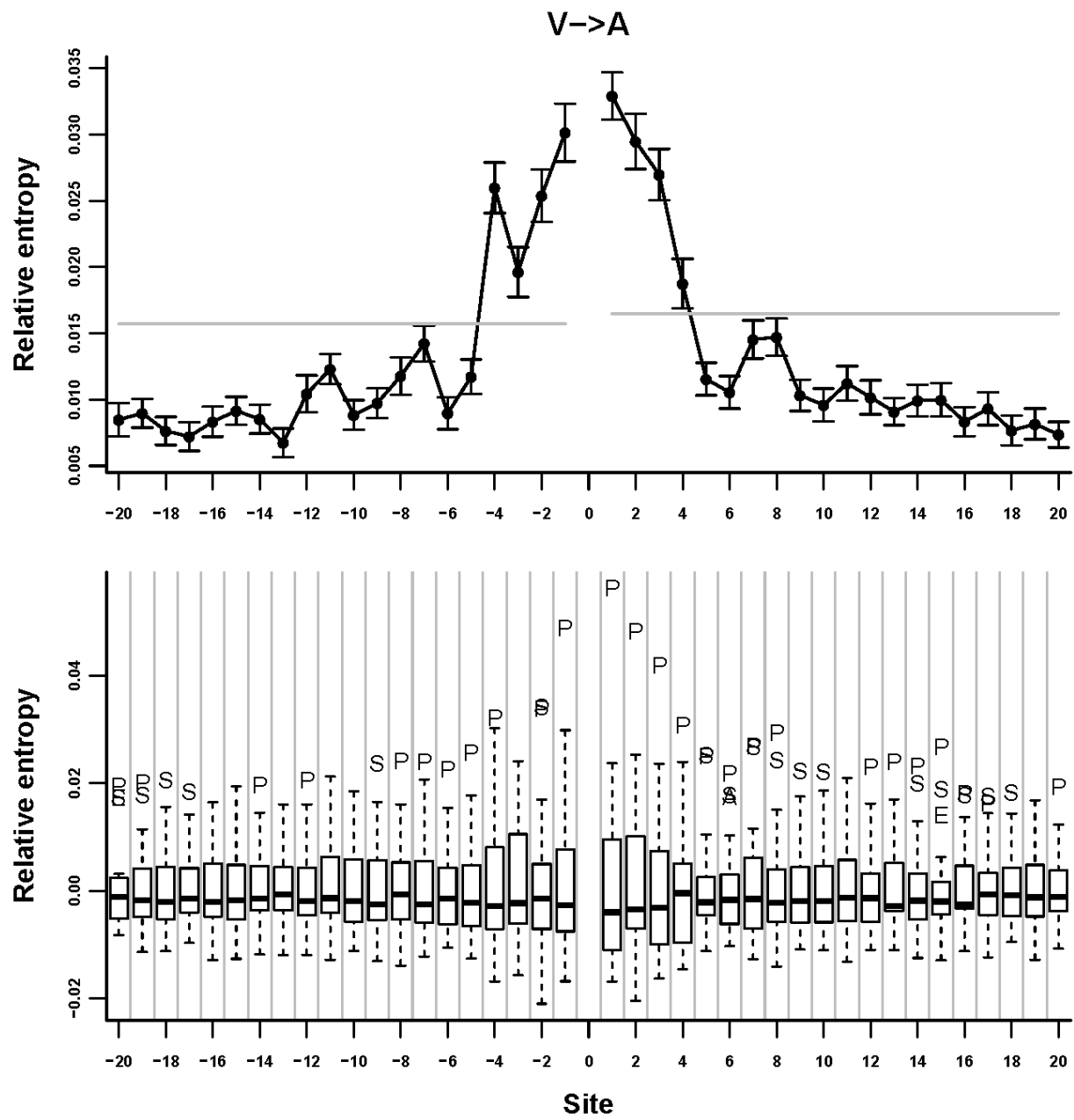


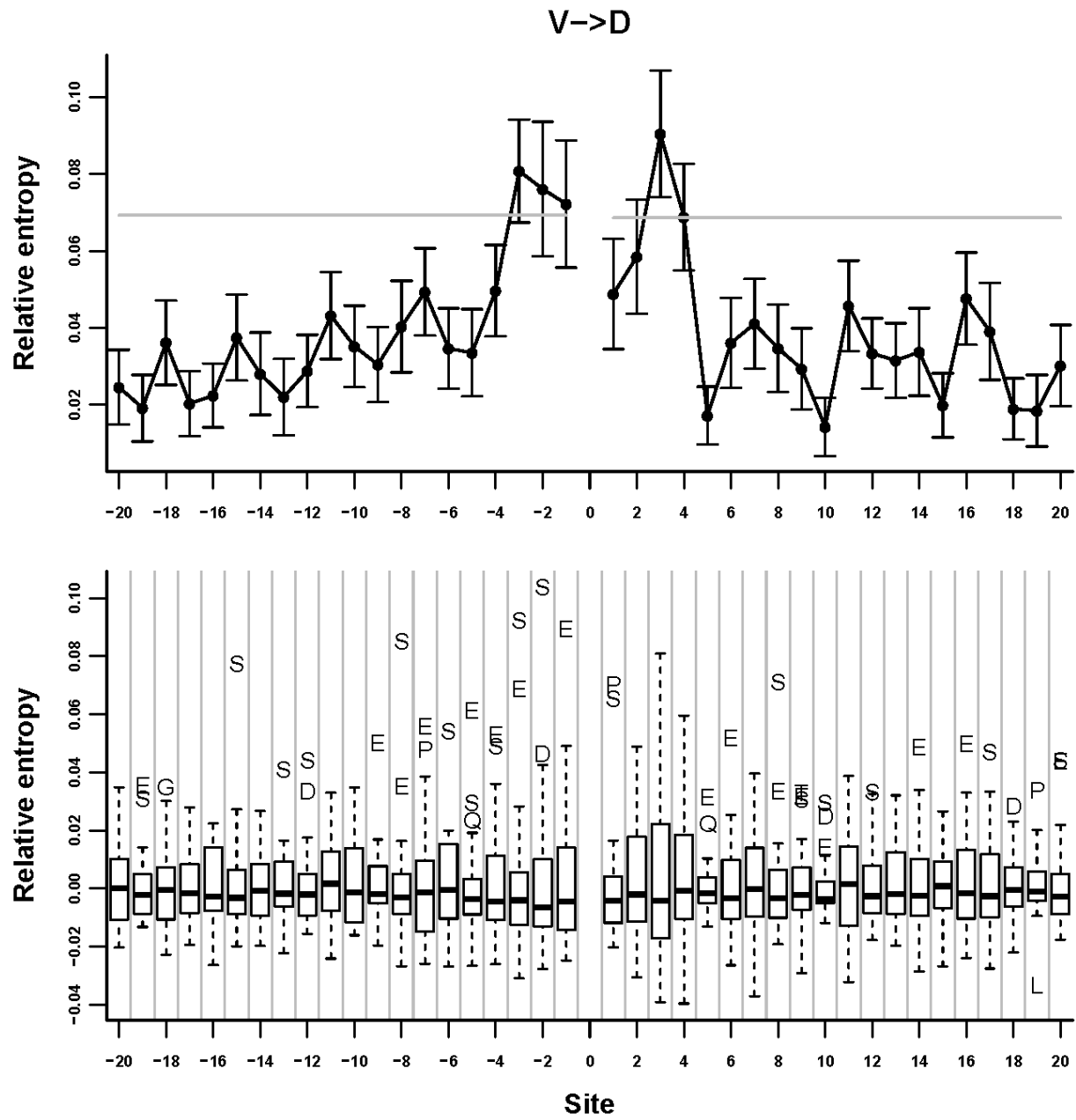


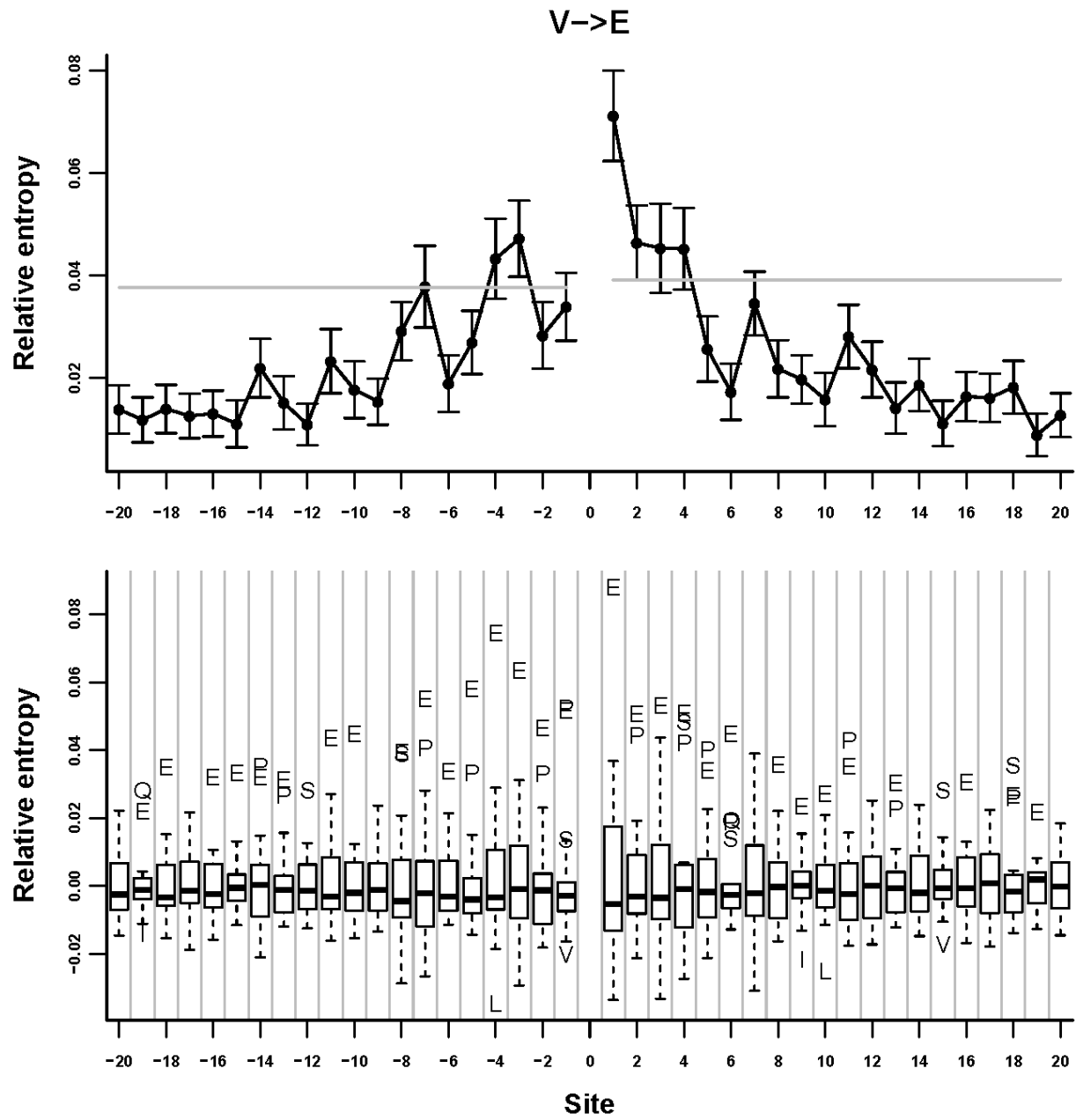


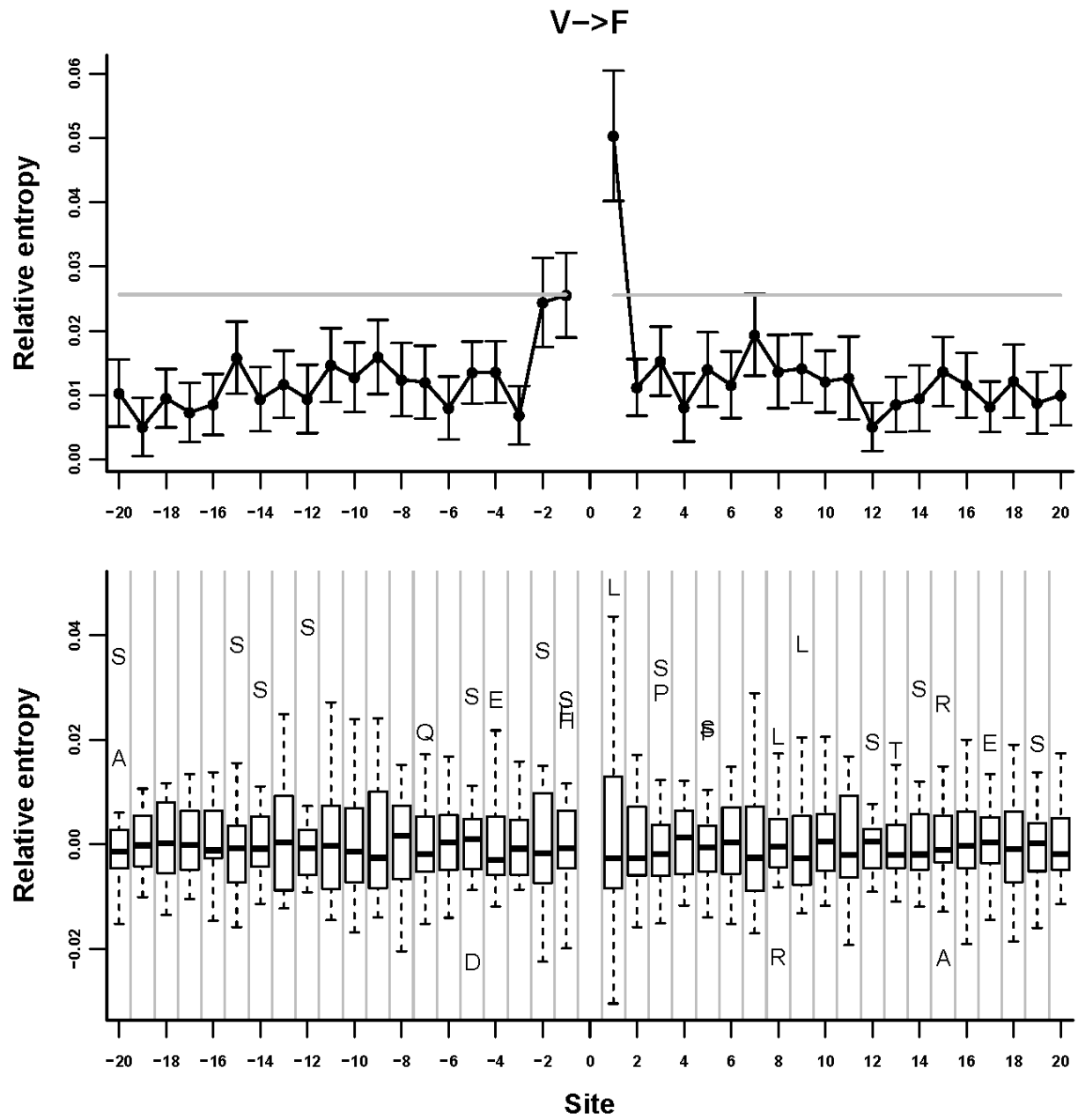


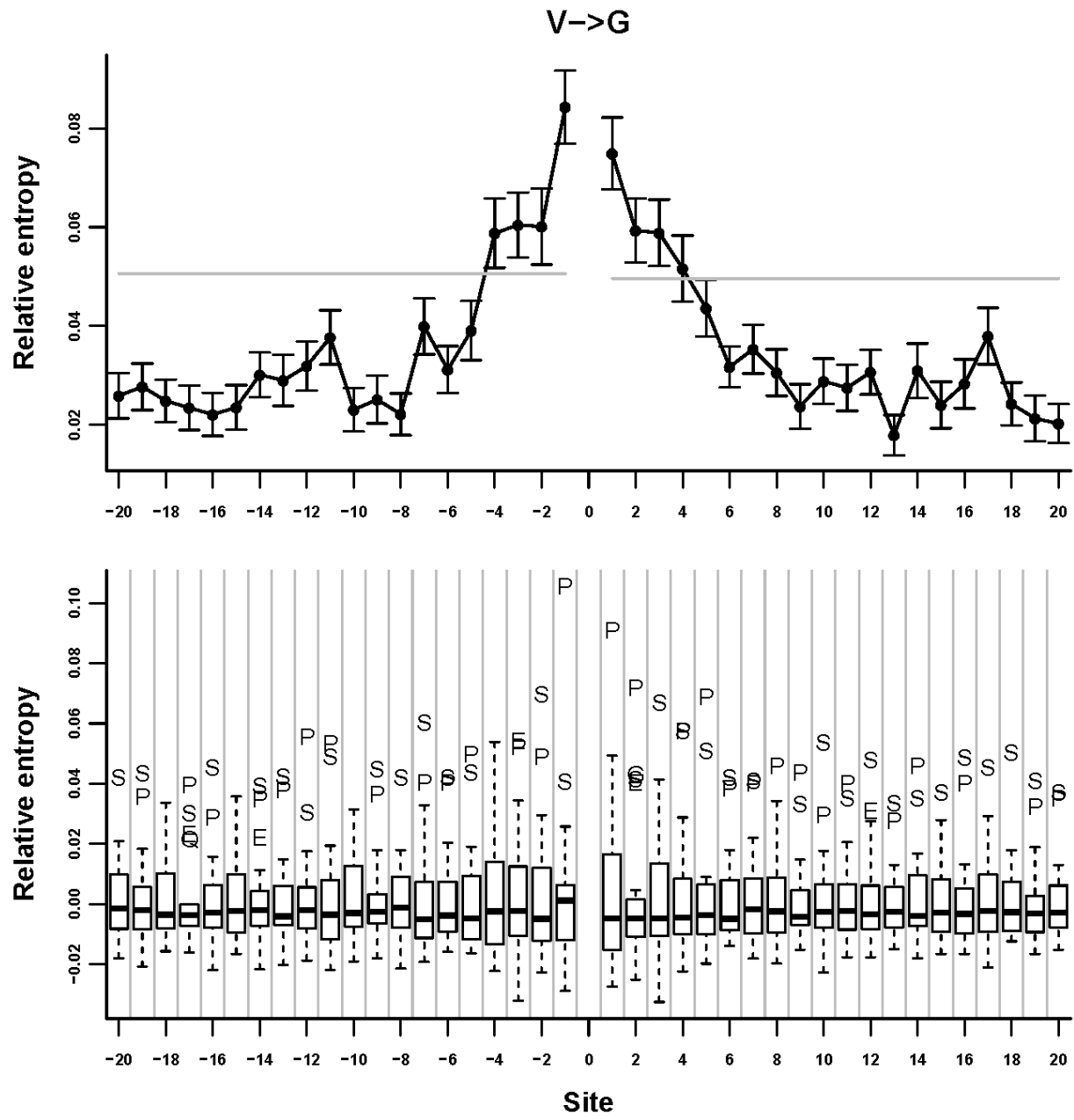


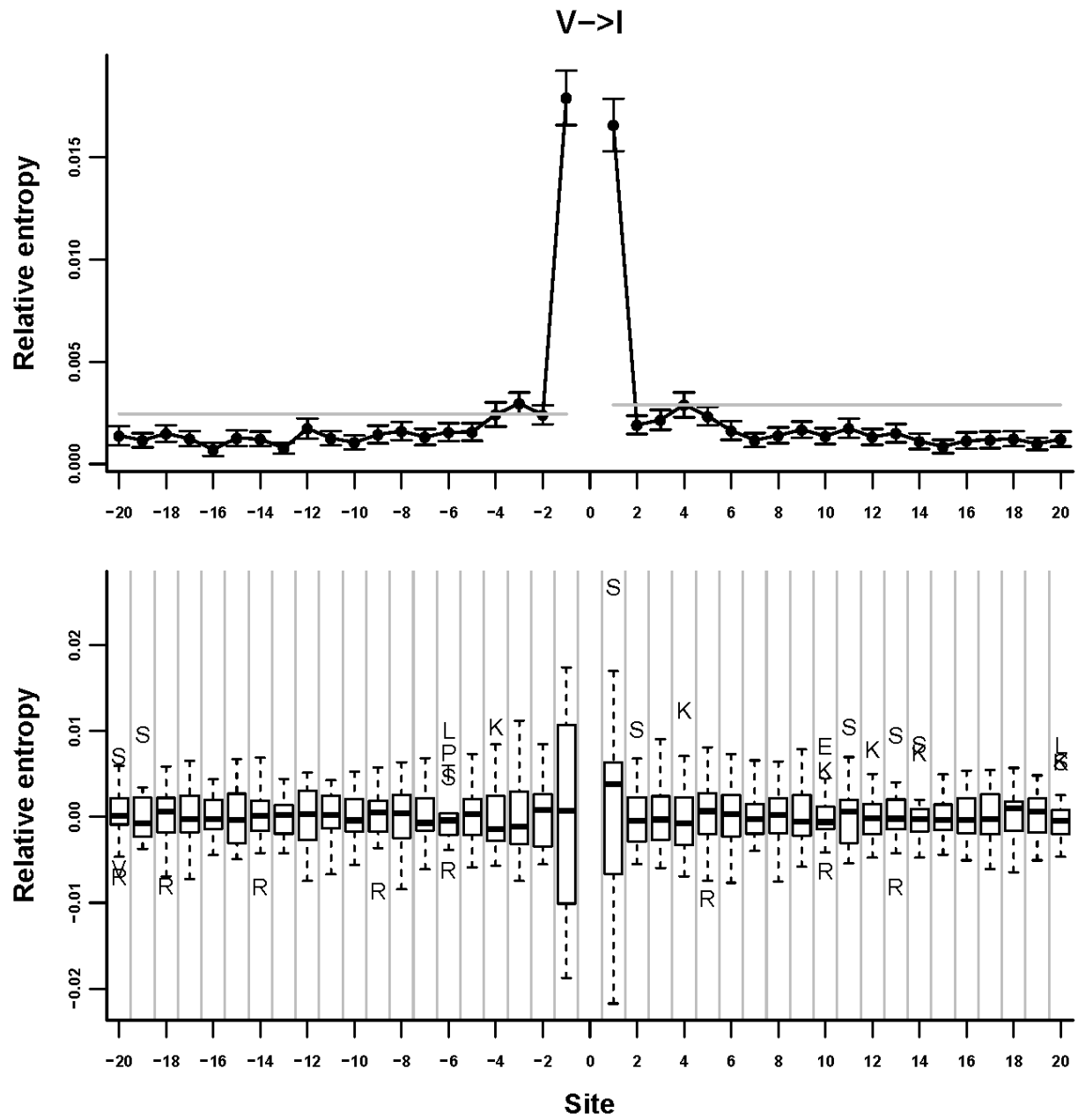


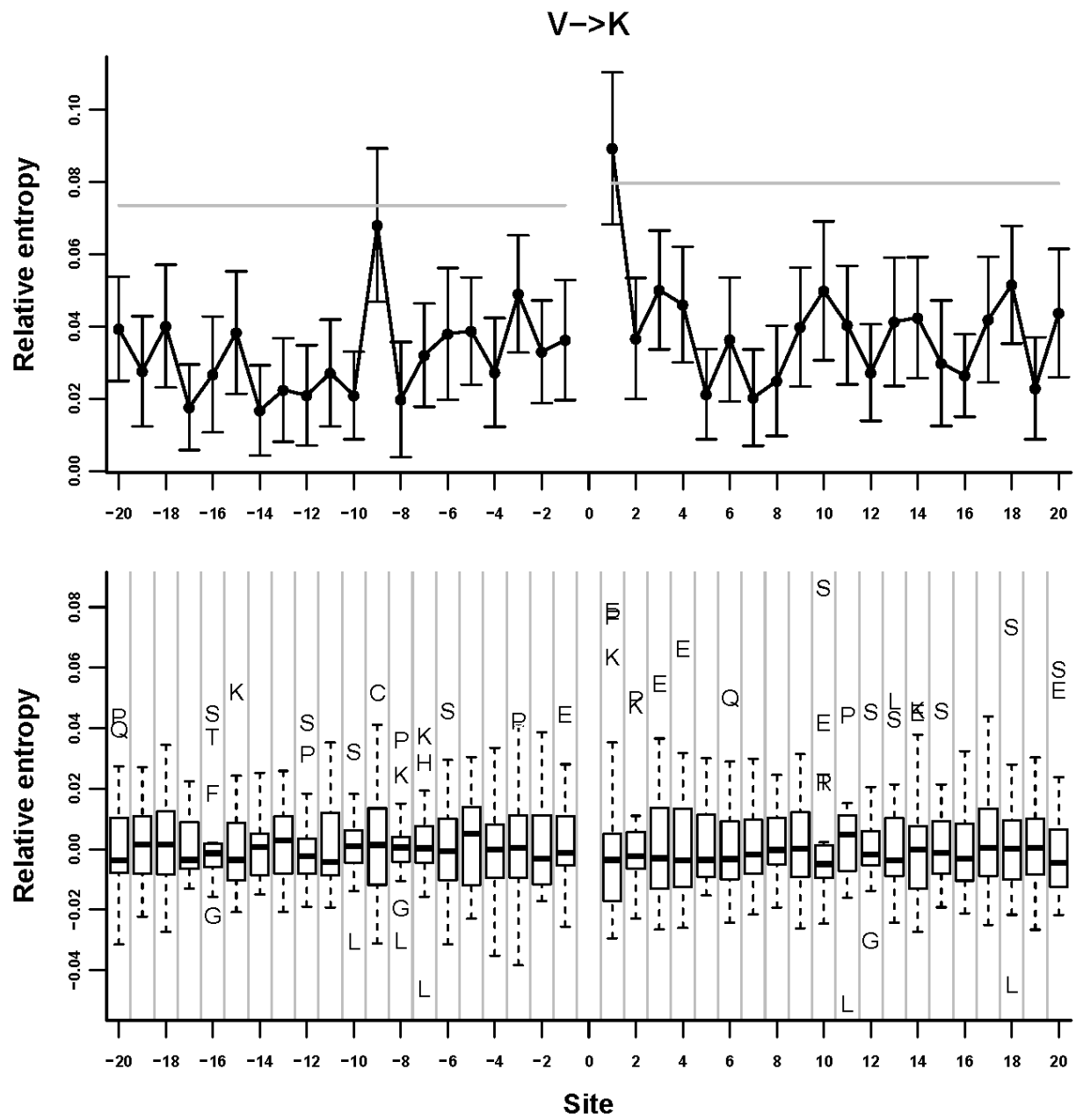


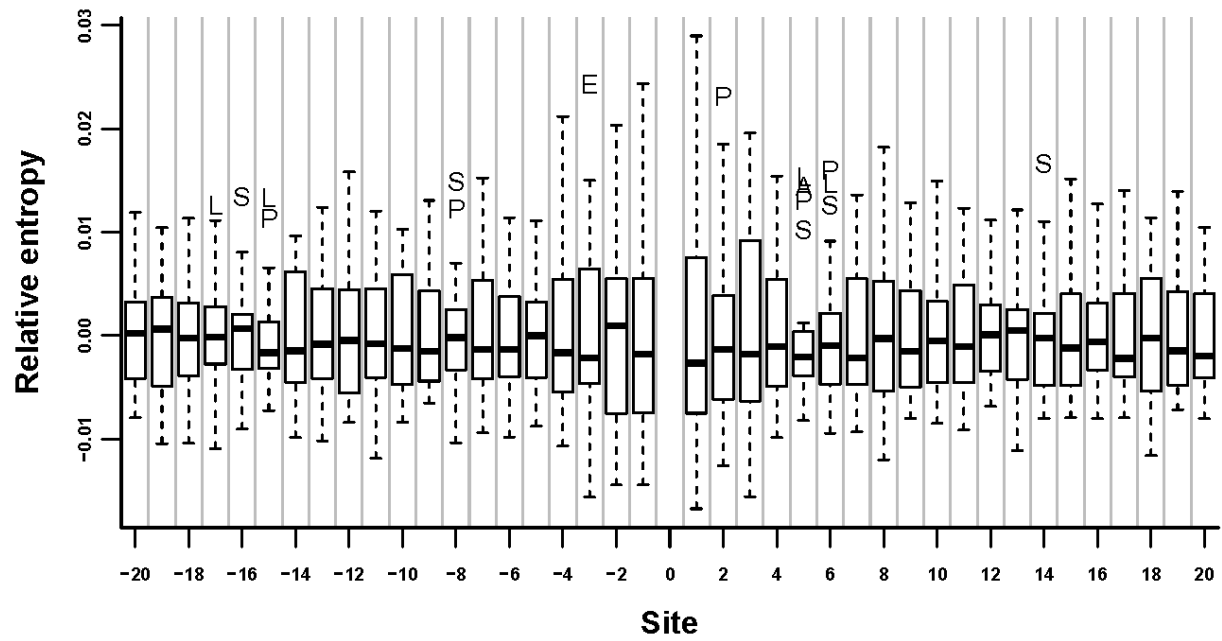
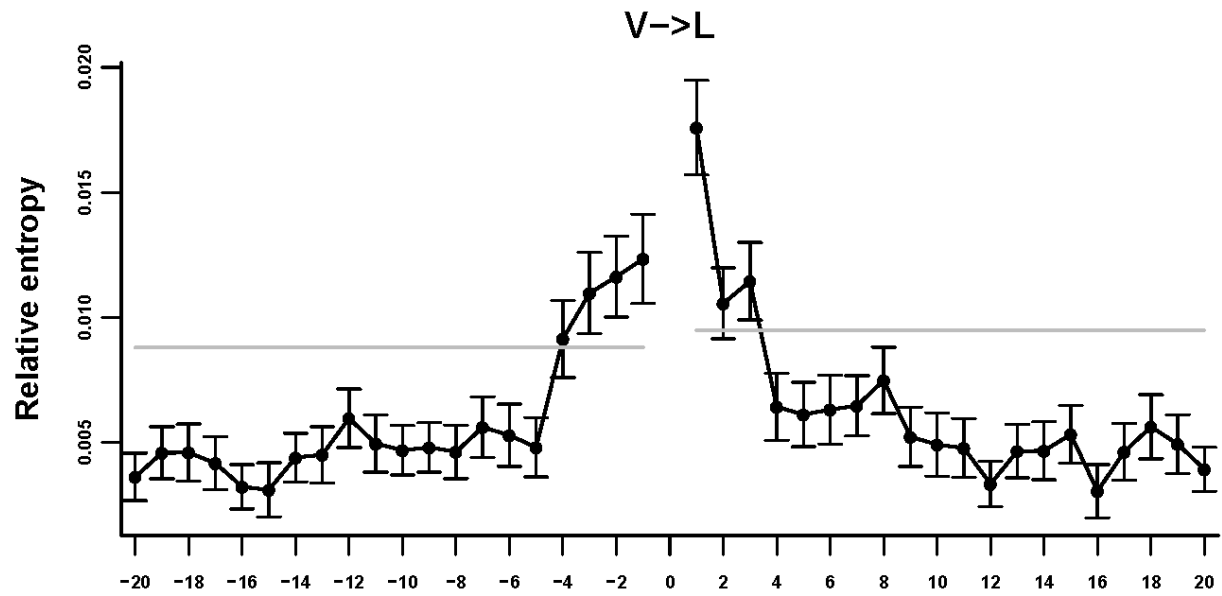


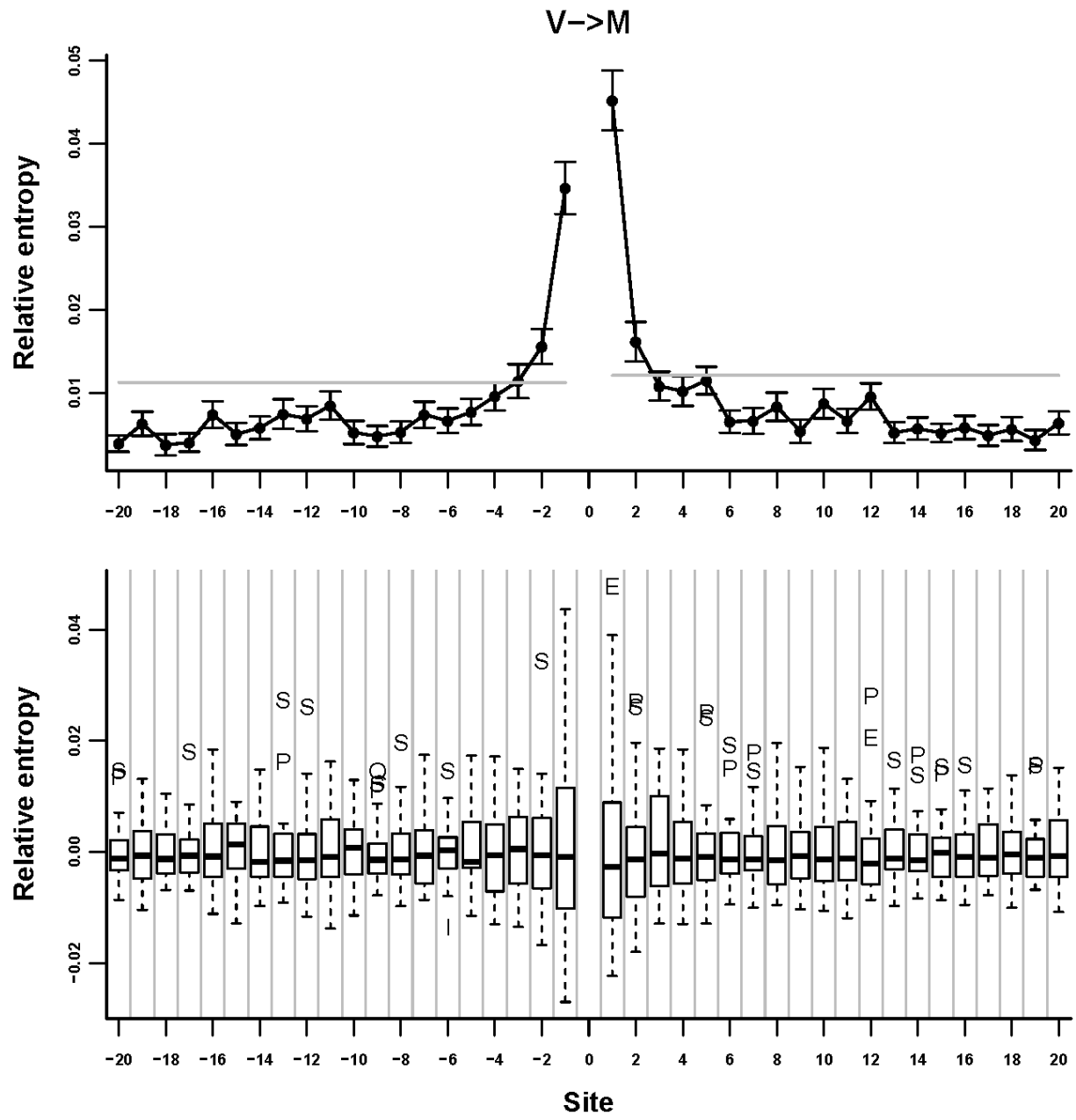


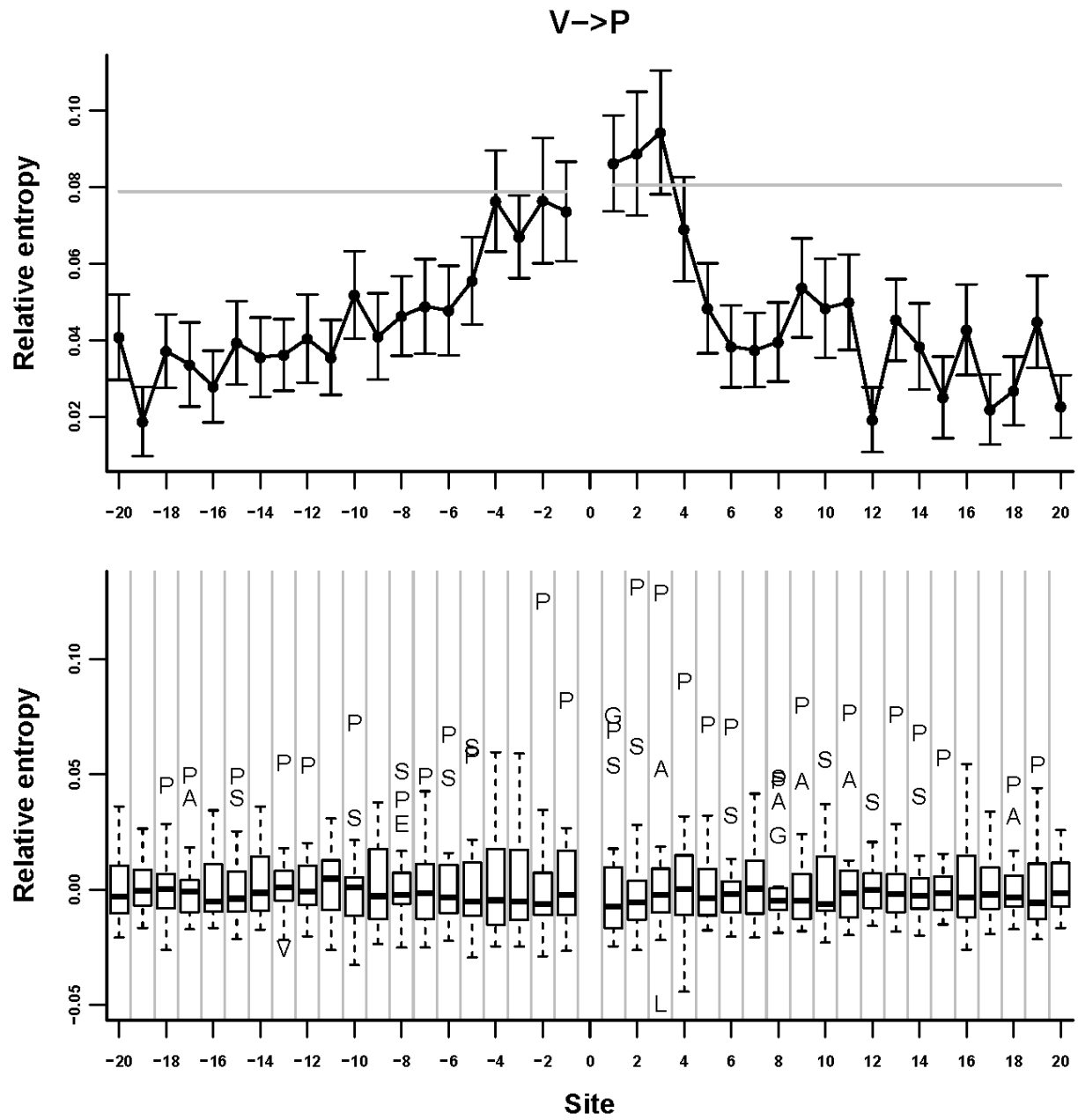


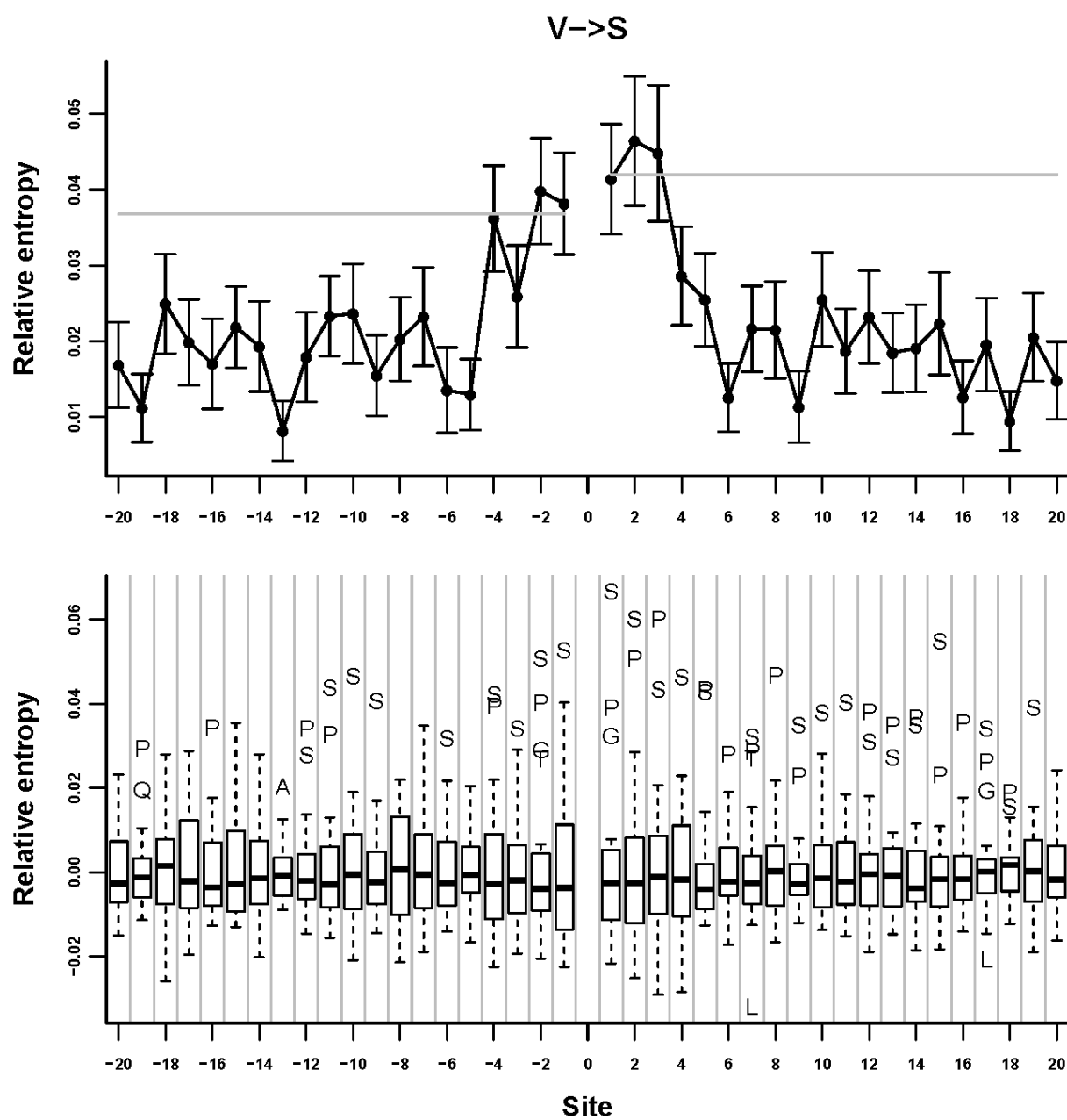


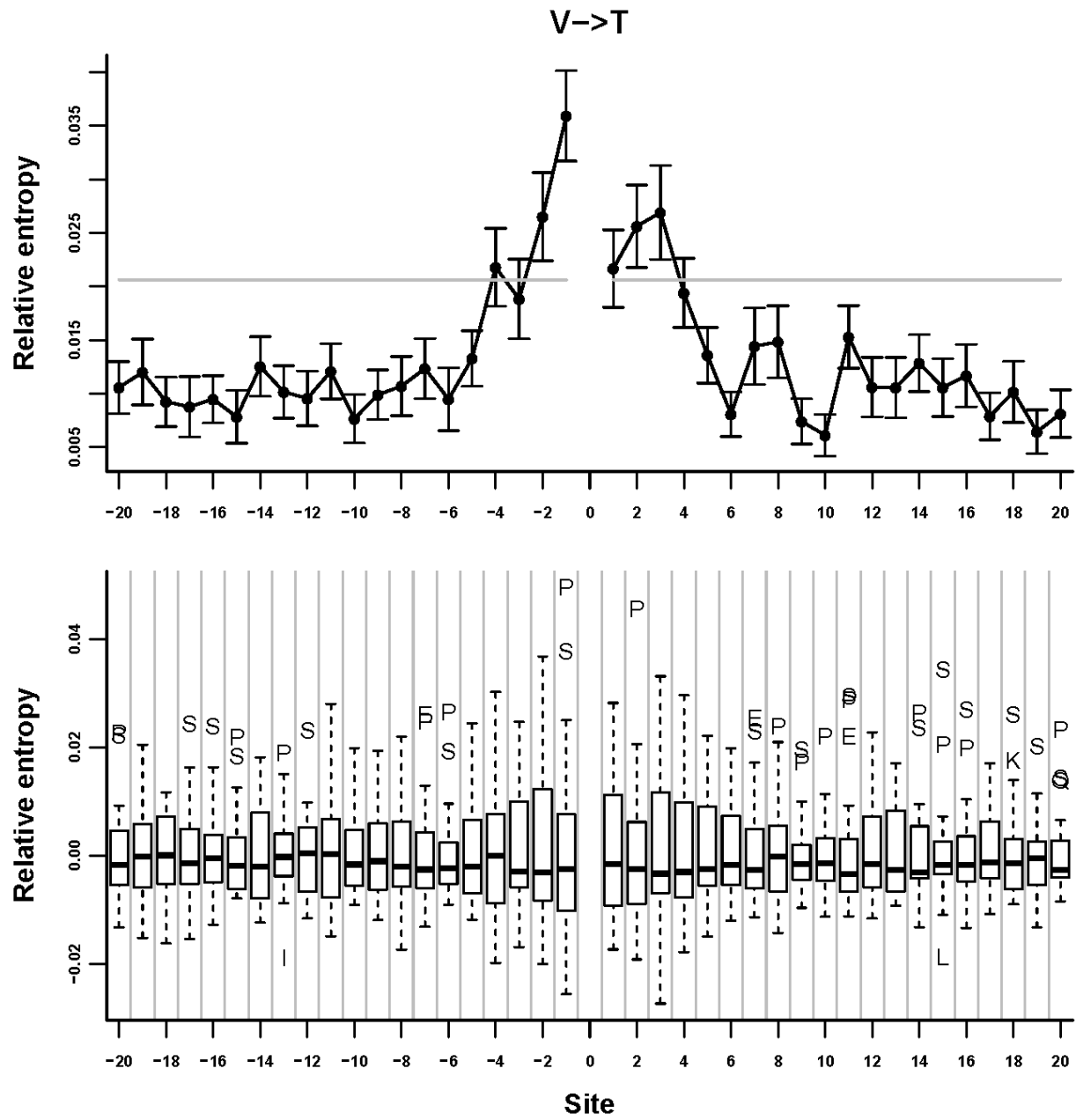


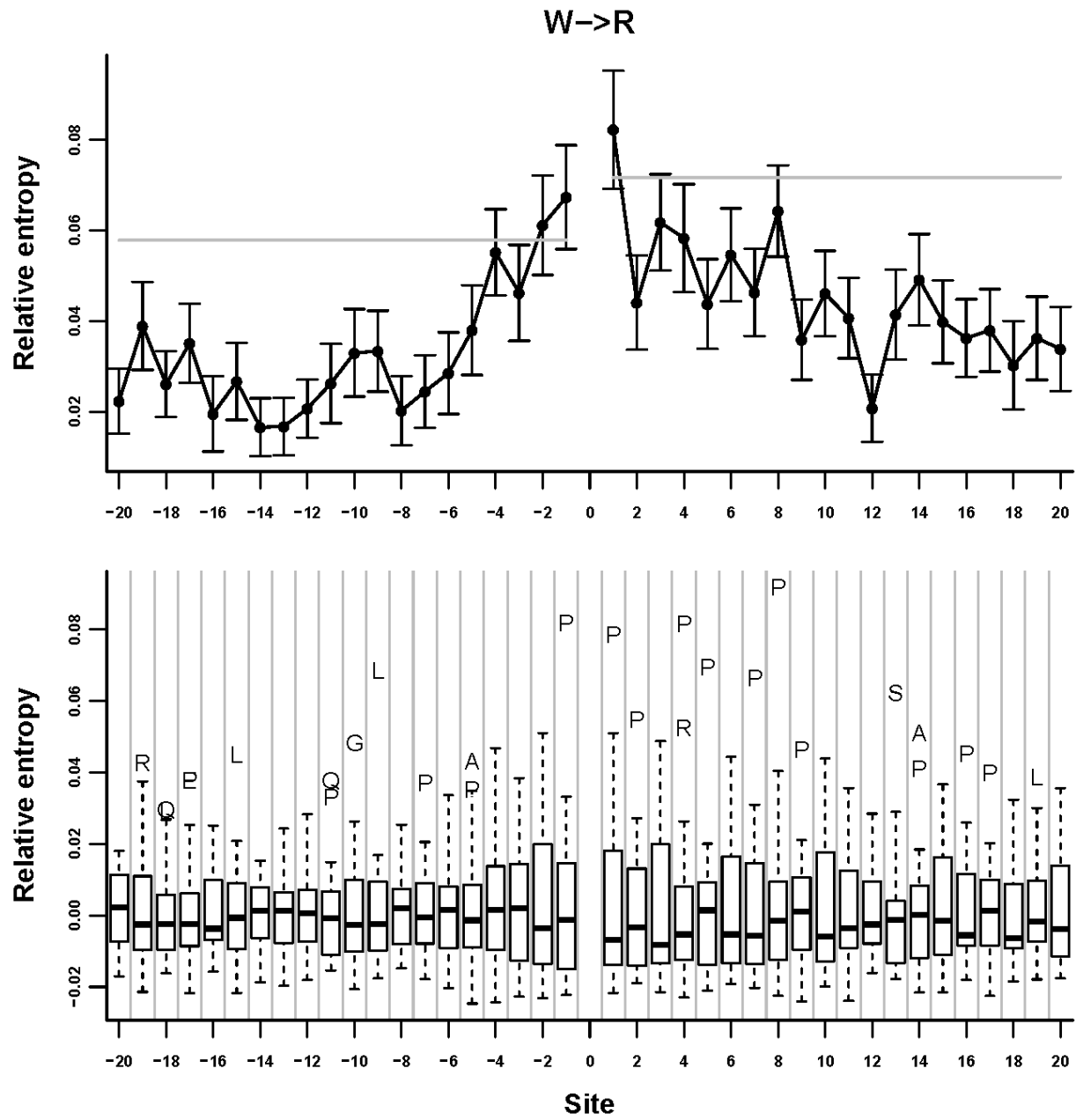


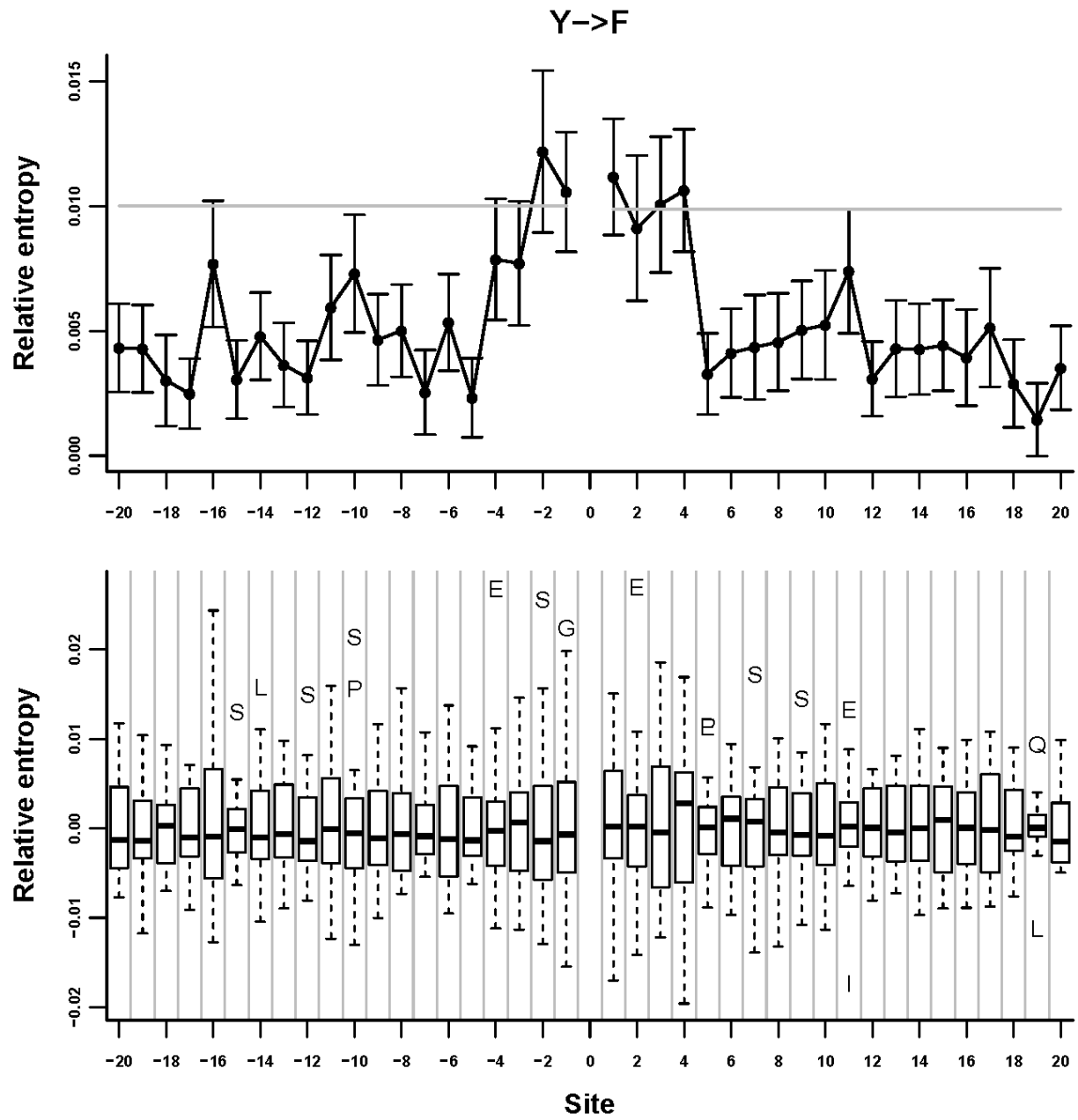


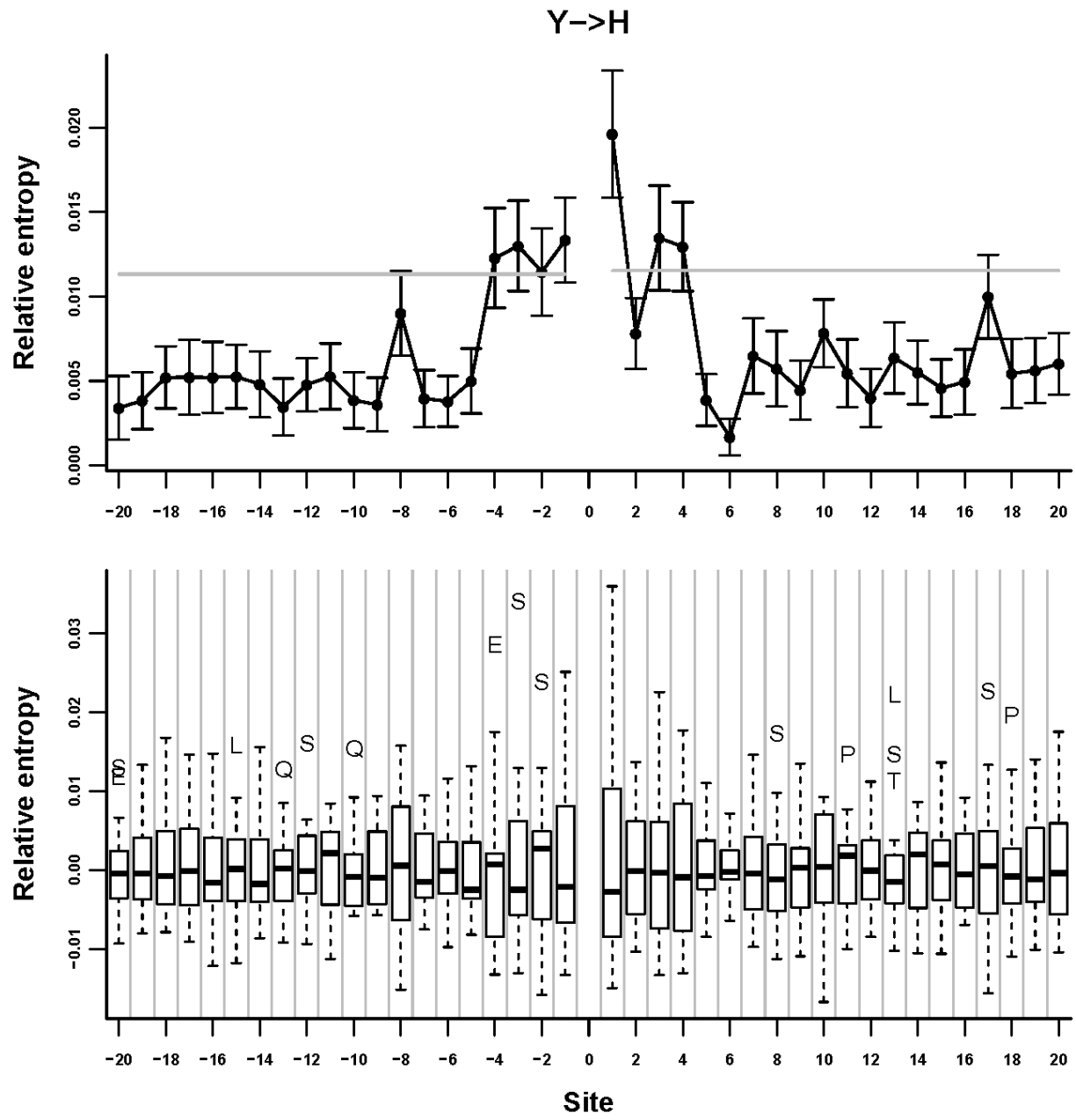




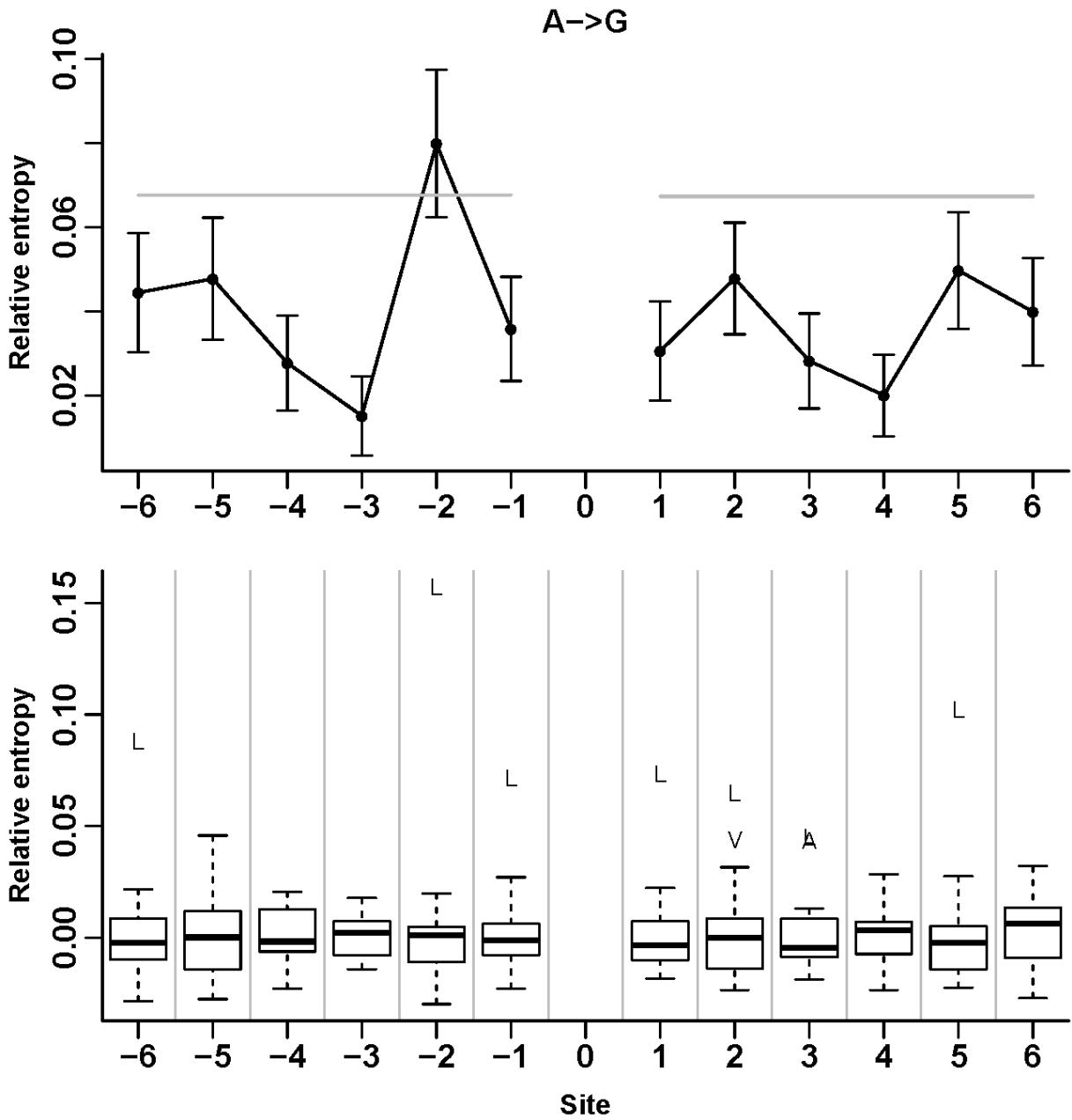


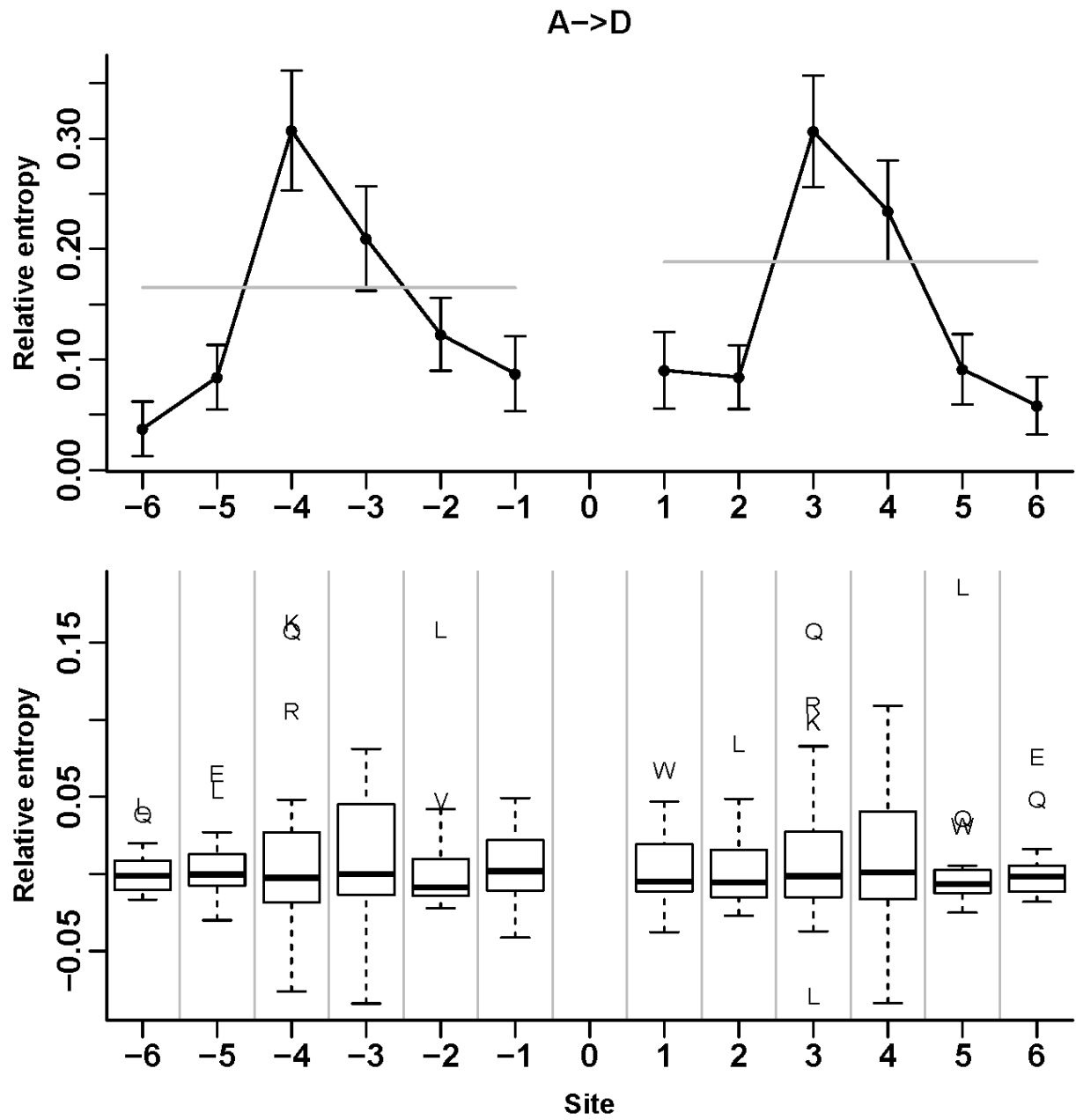


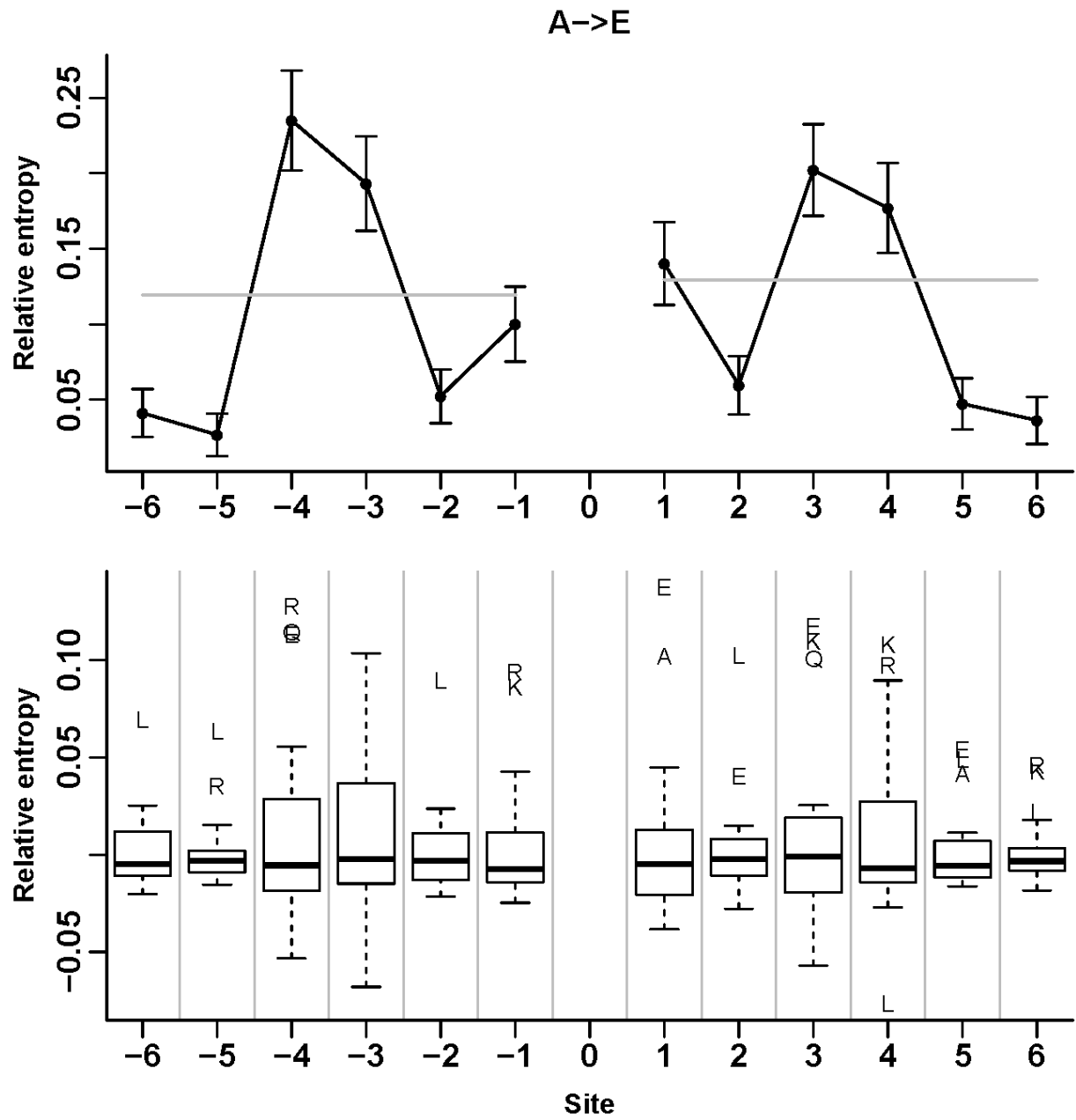


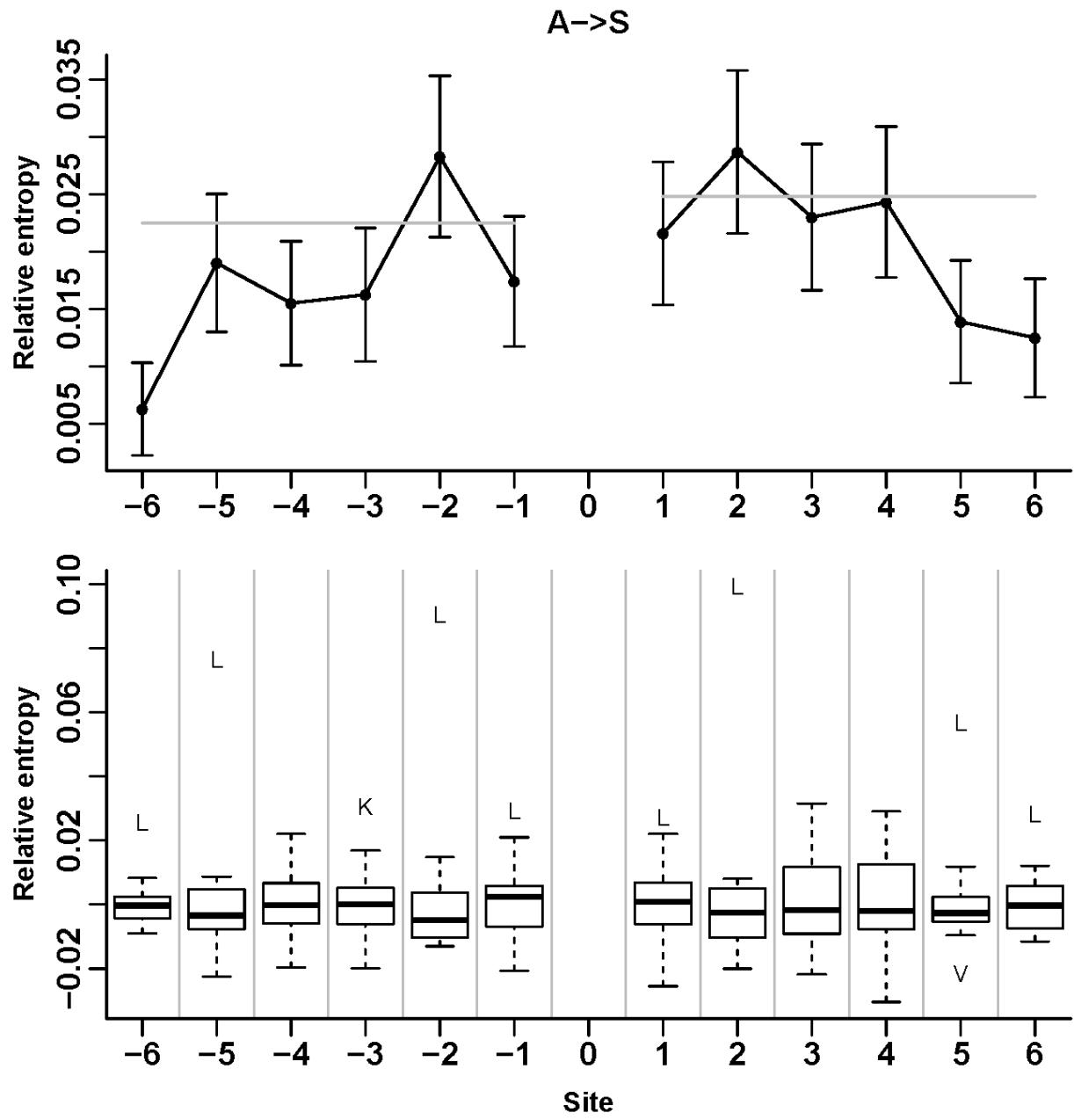


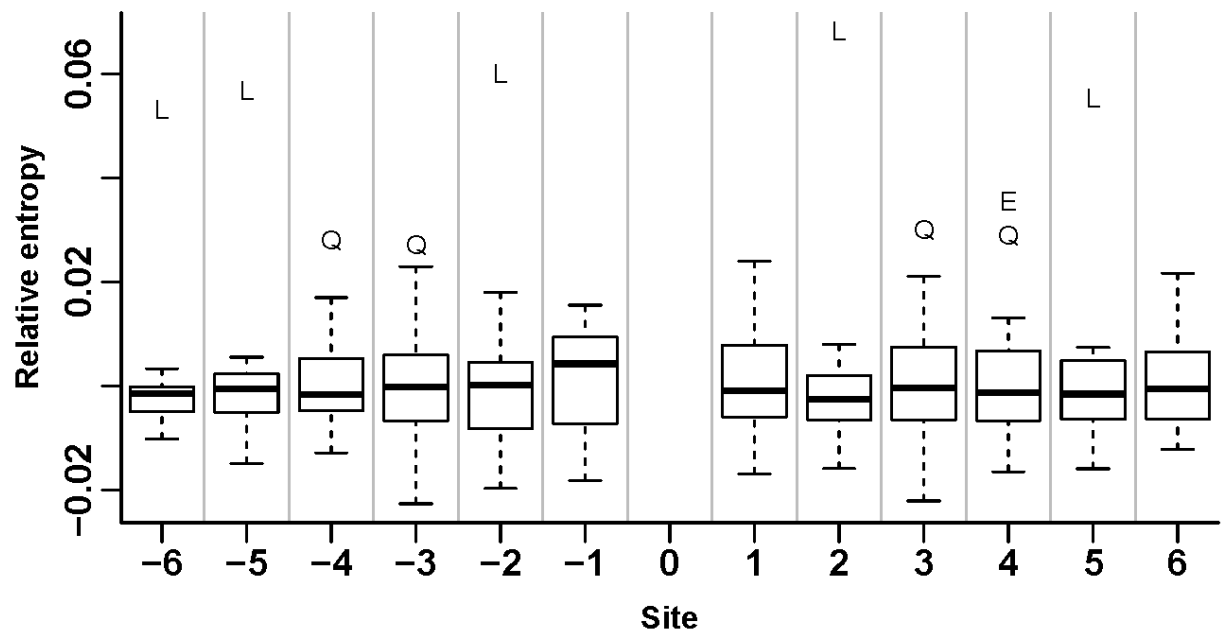
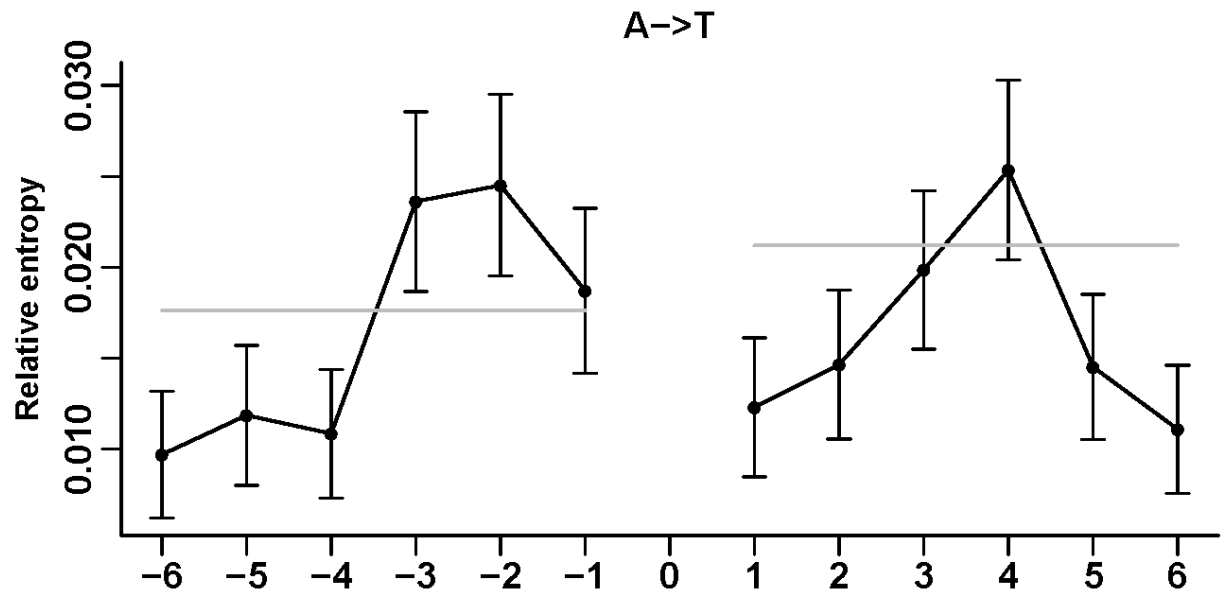
**Figure S6.** Context-dependence patterns of the amino acid substitutions in  $\alpha$ -helix.

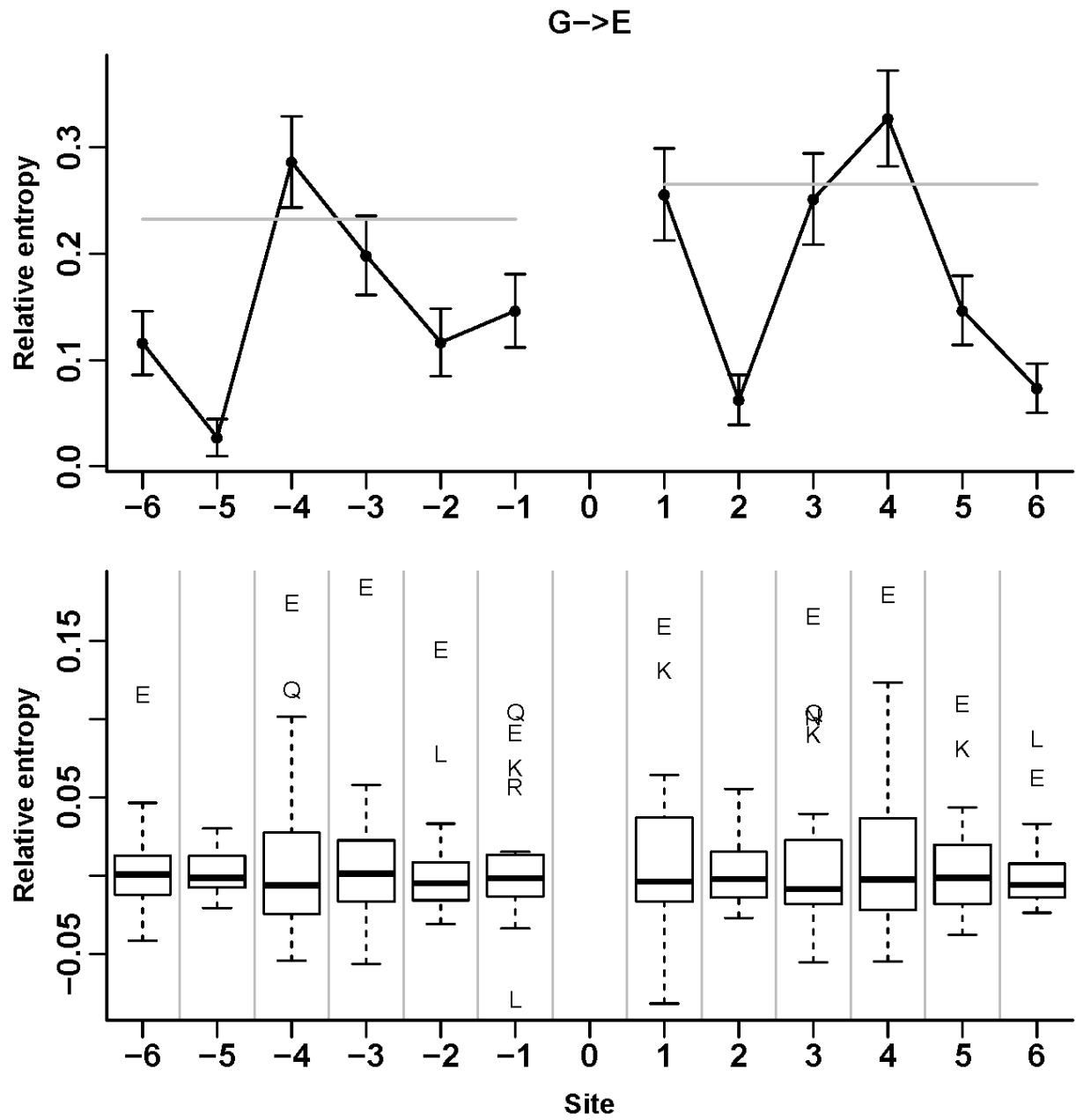


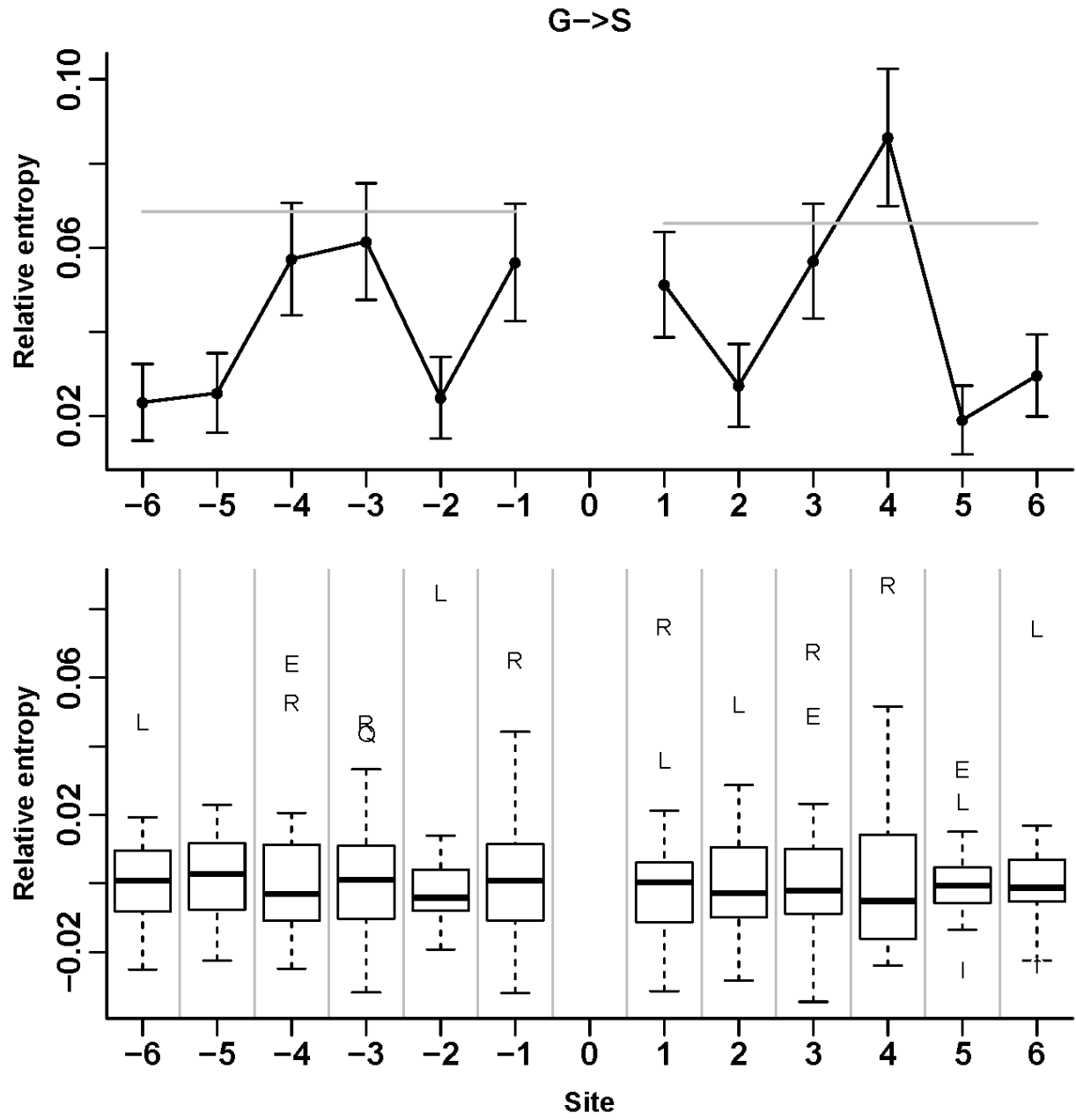


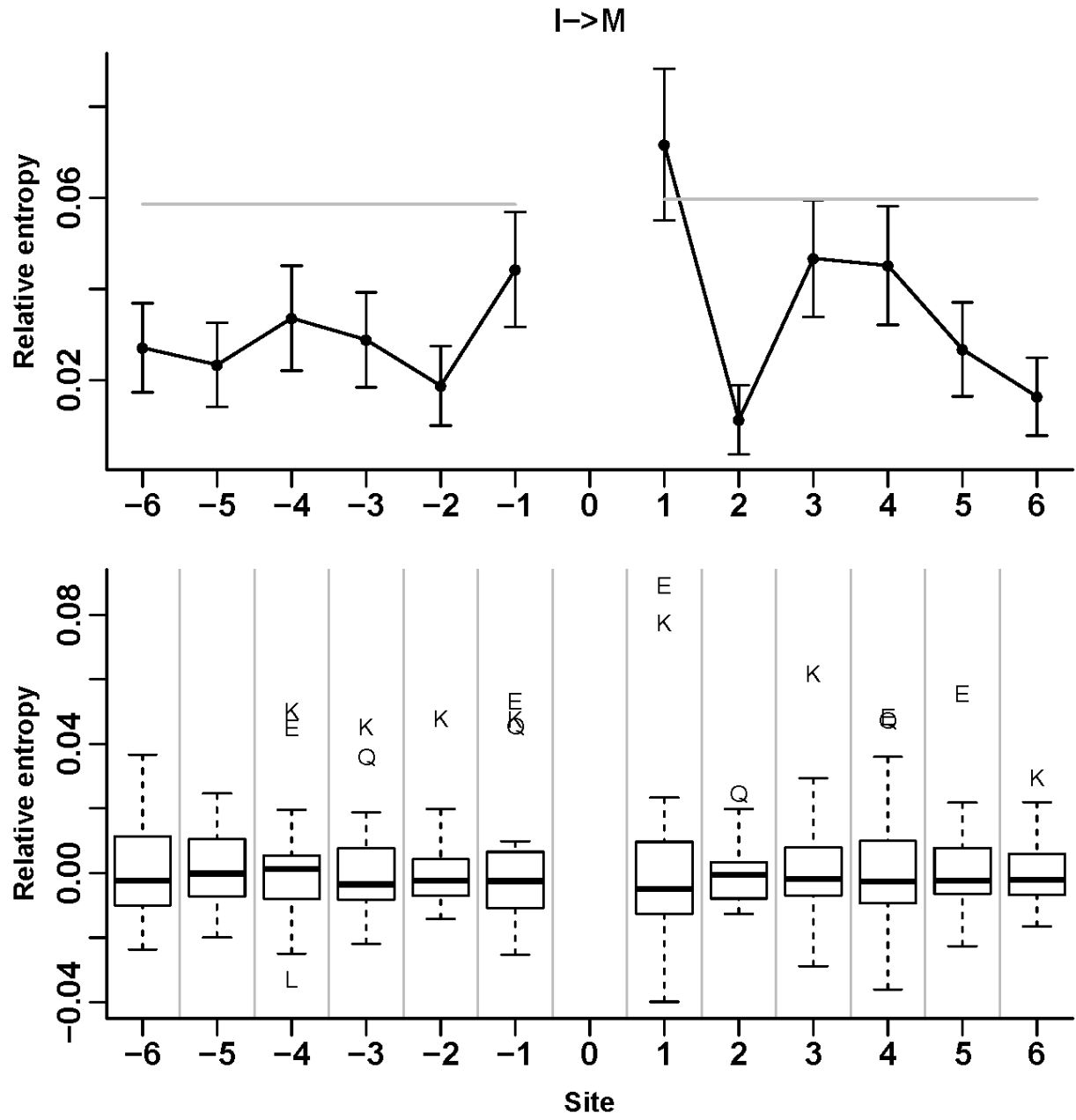


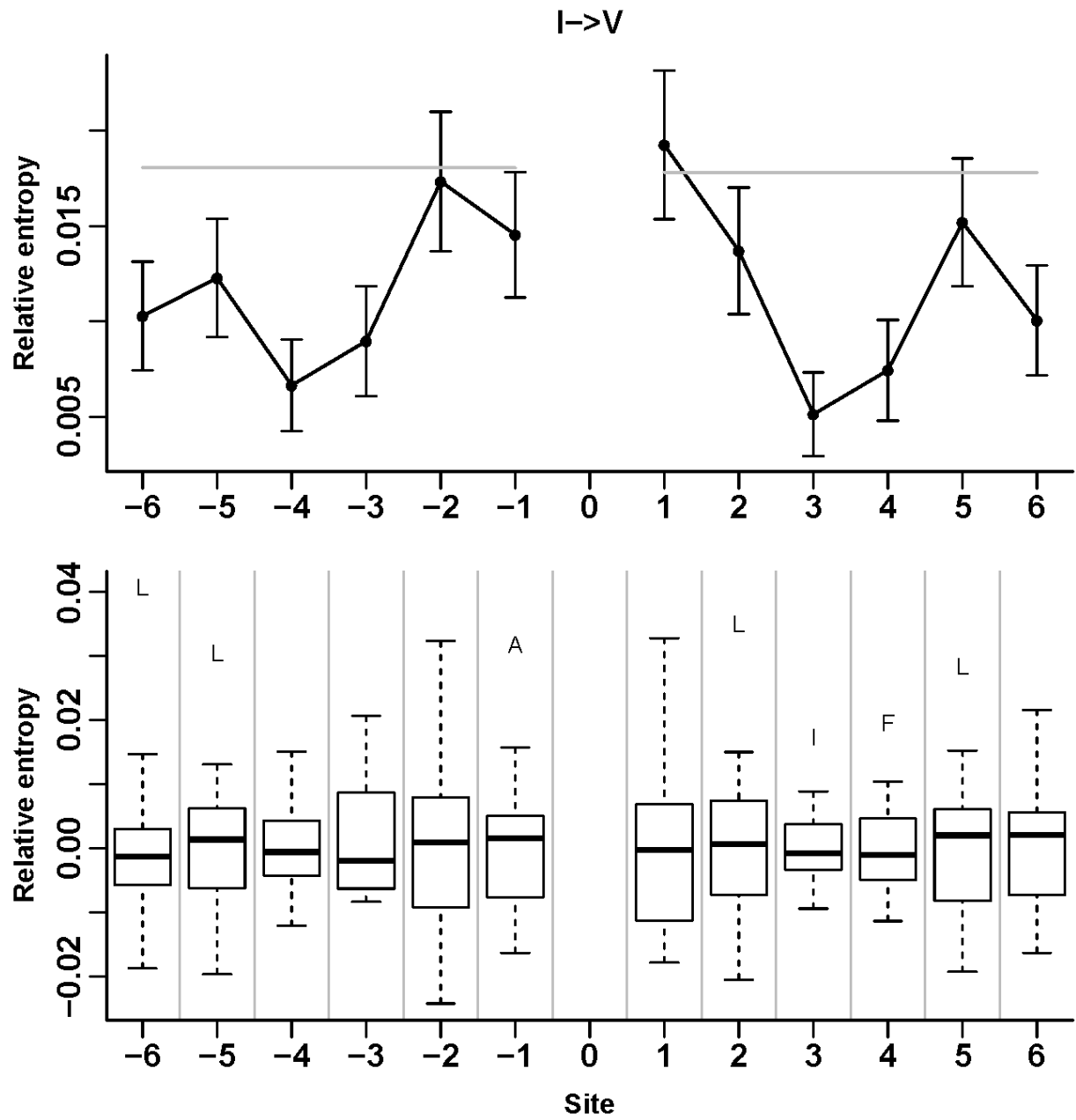


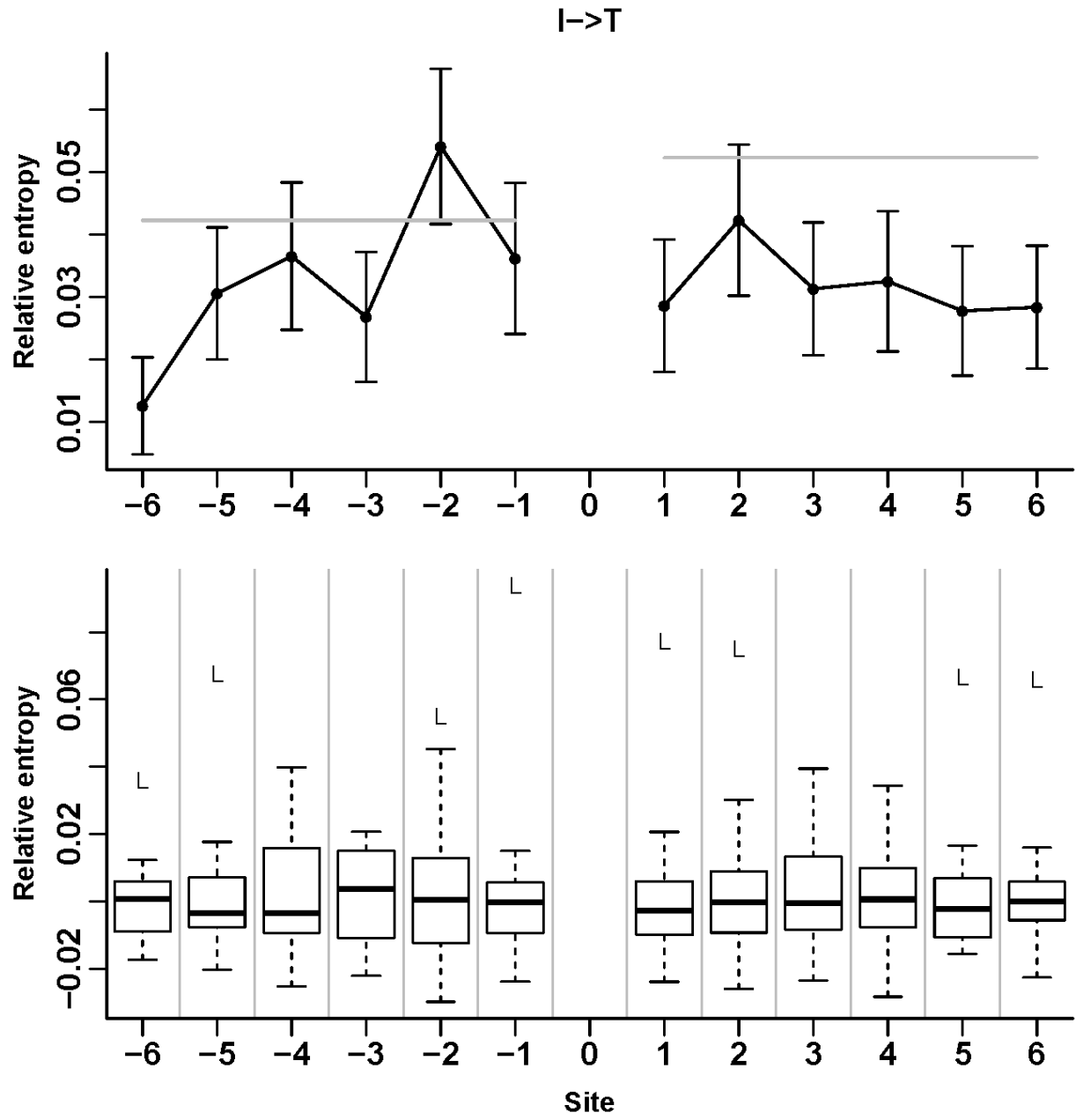


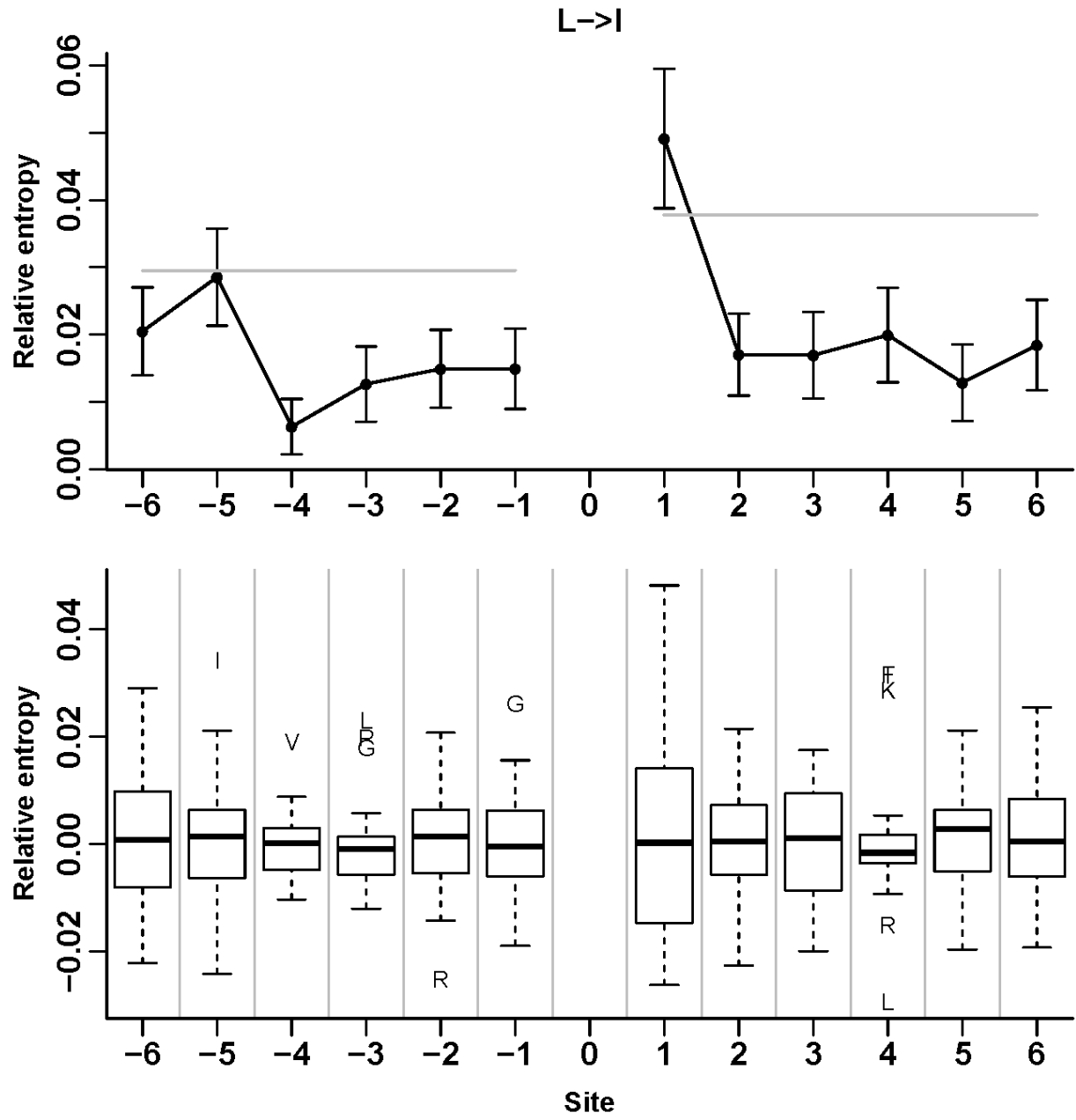


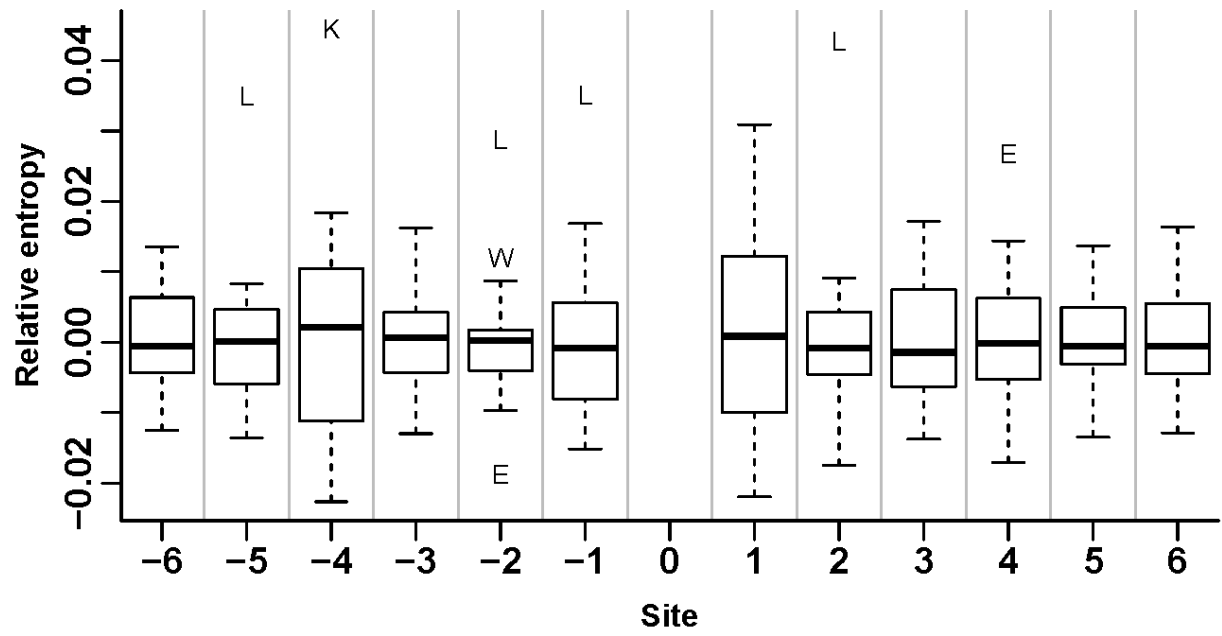
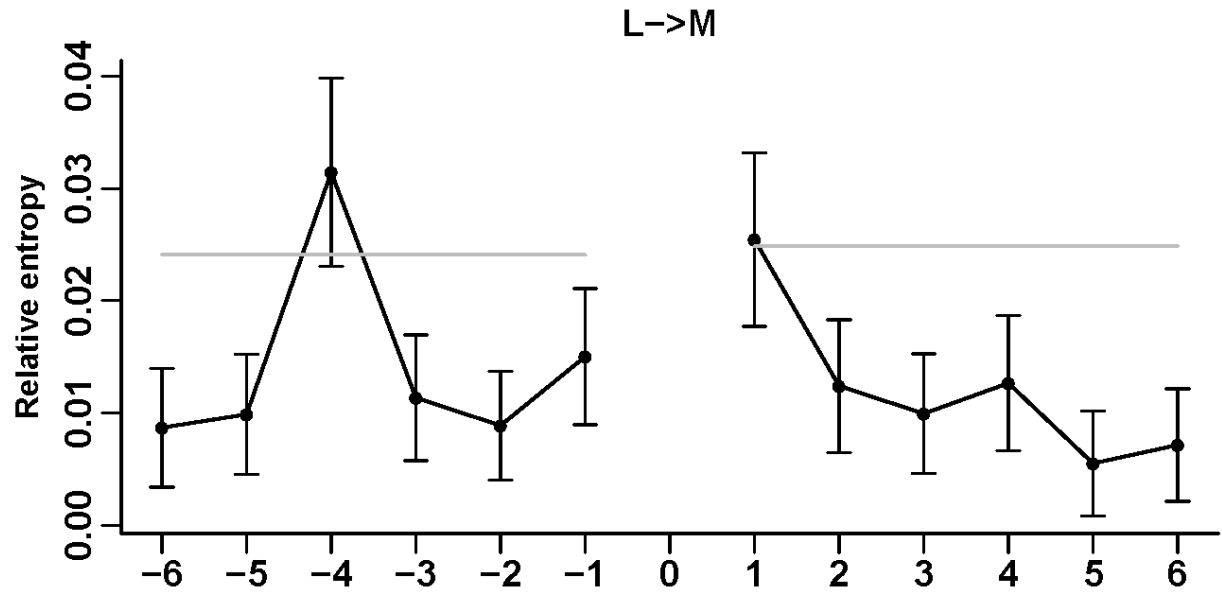


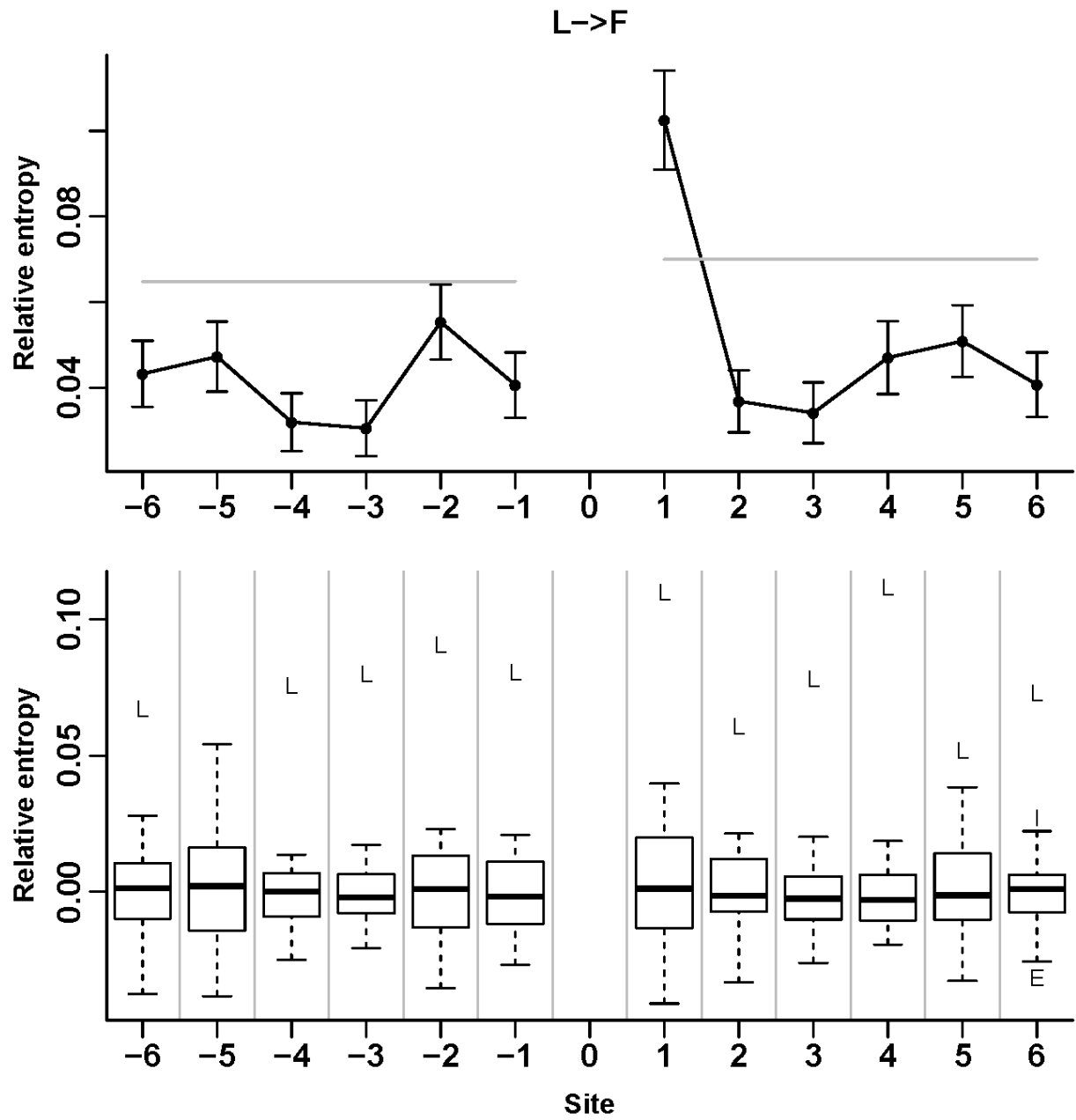


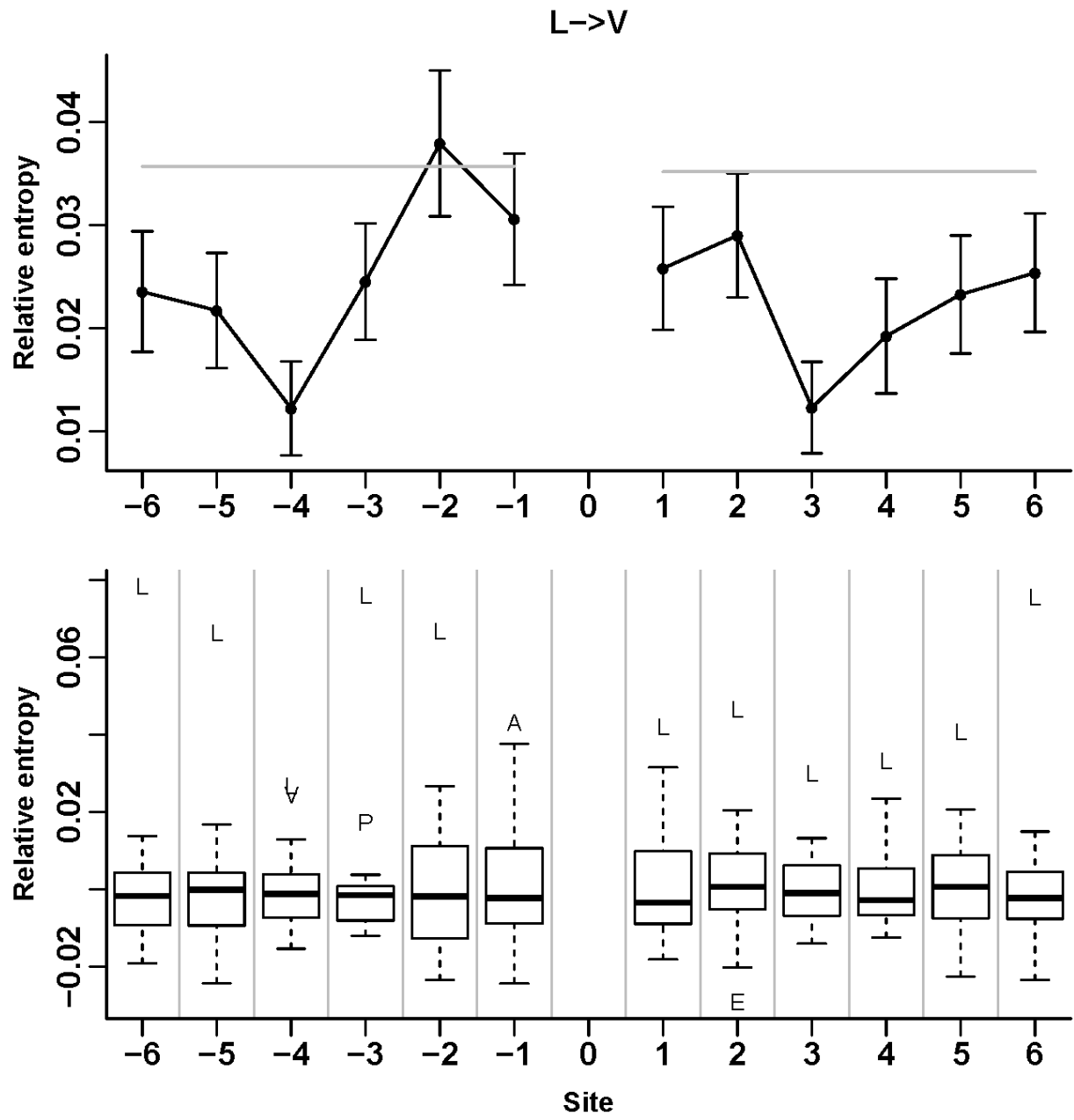


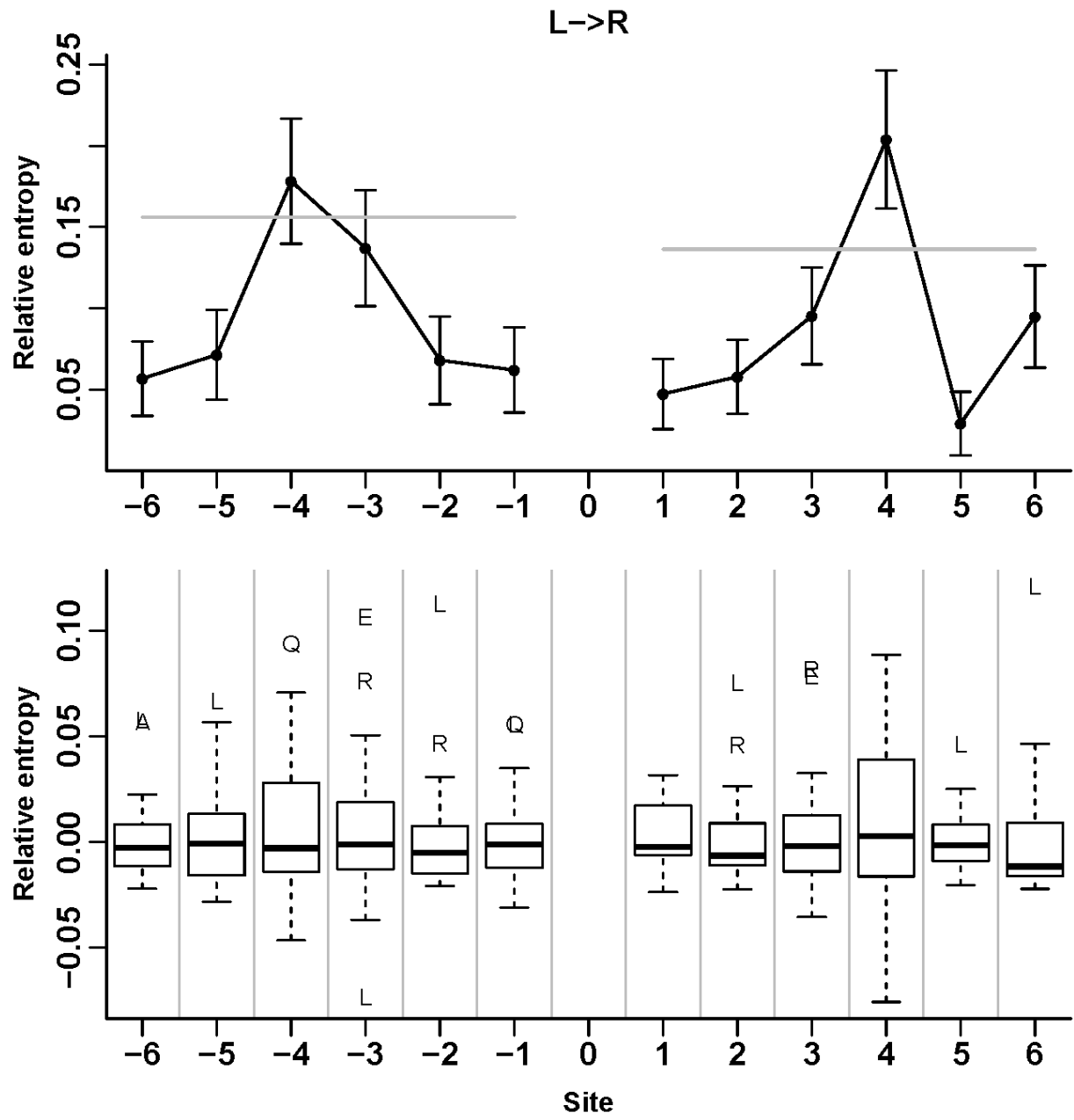




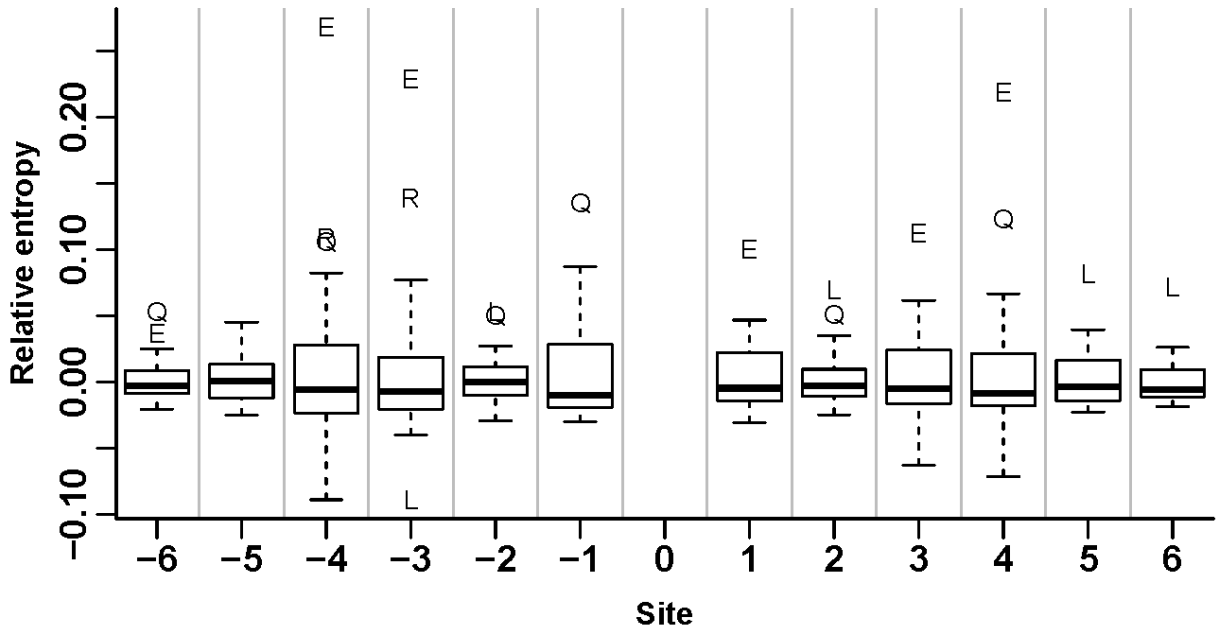
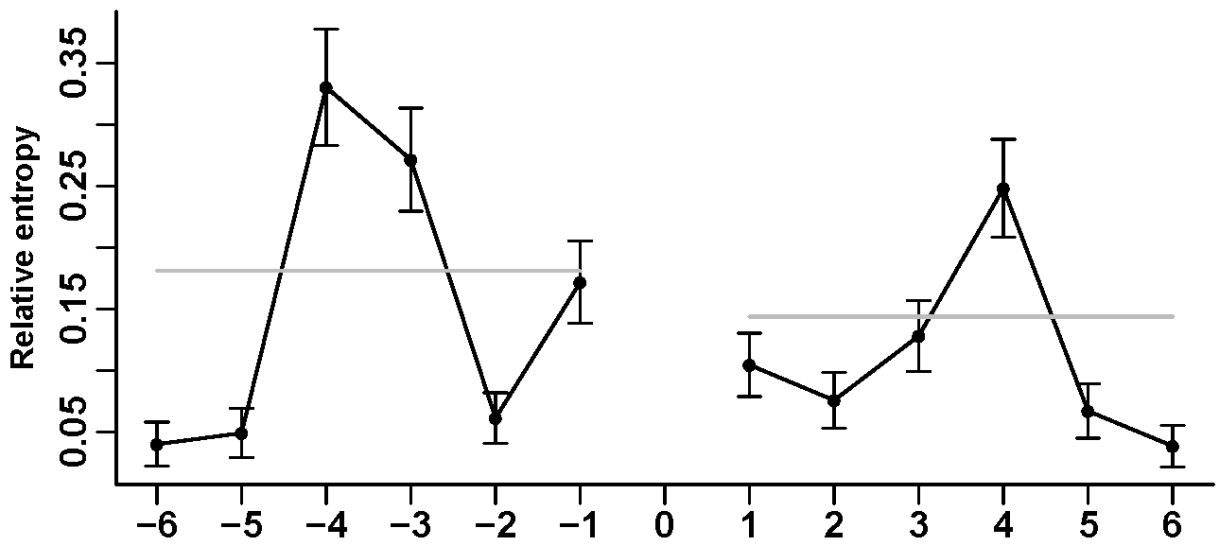


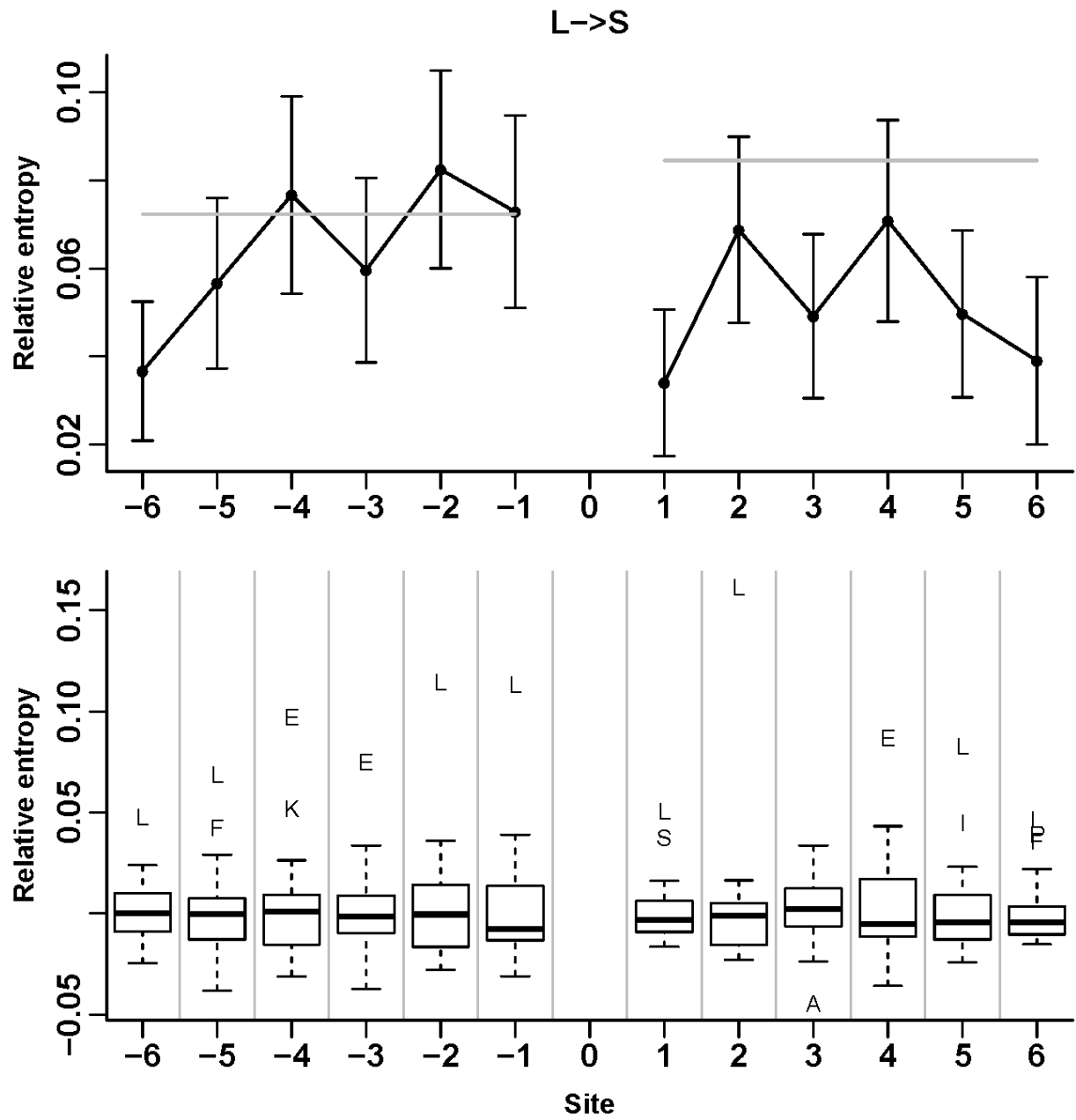


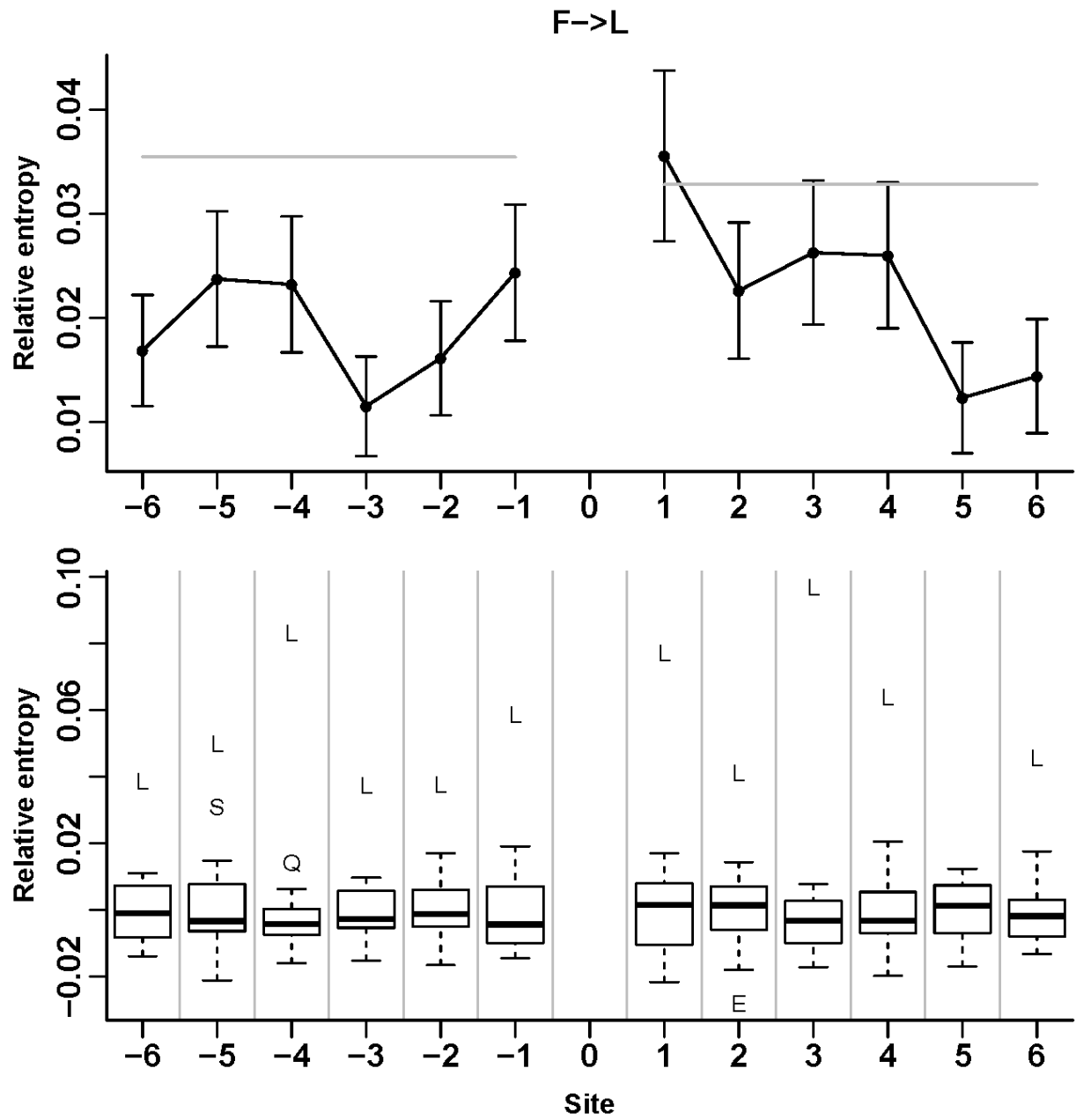


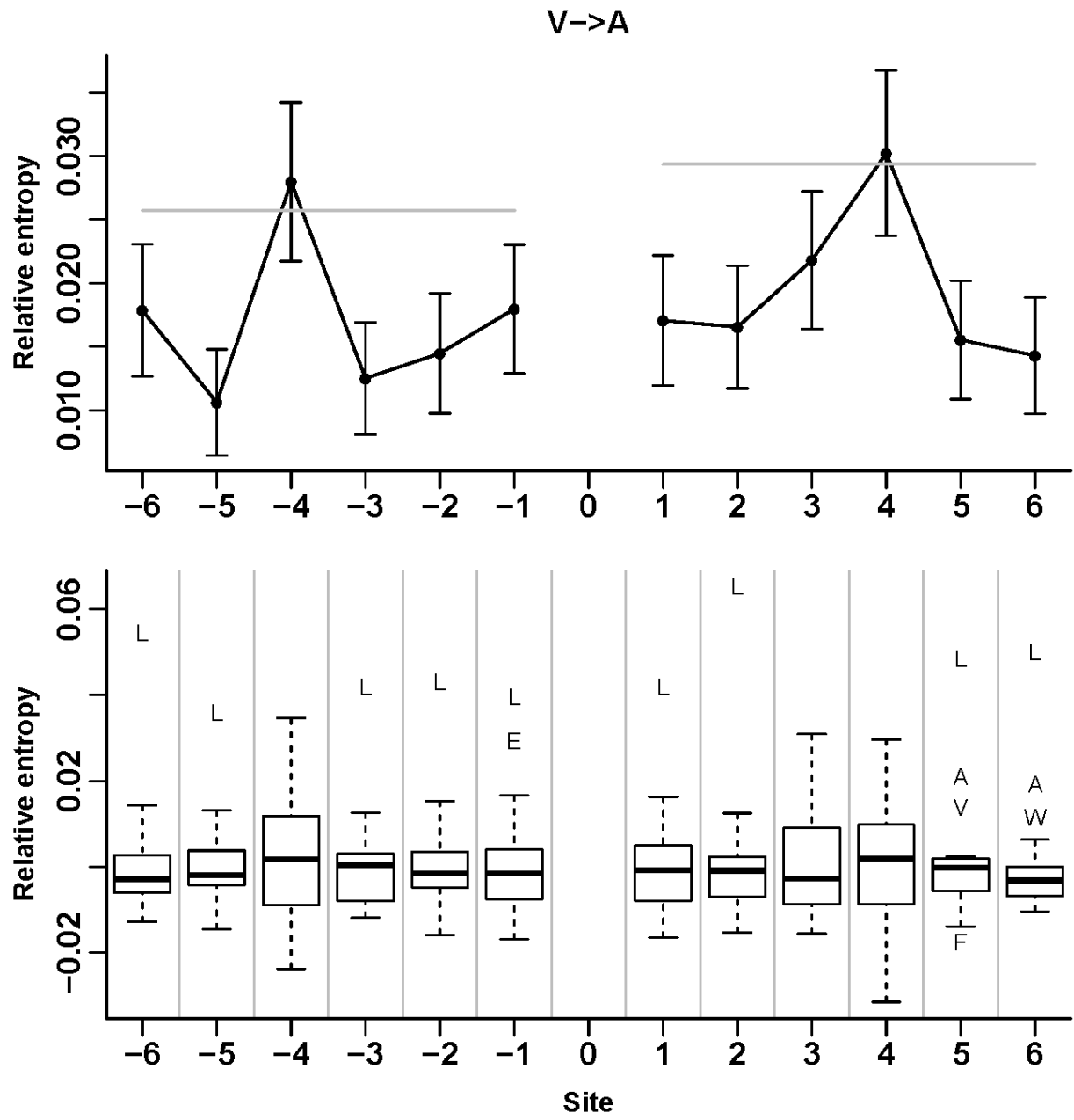


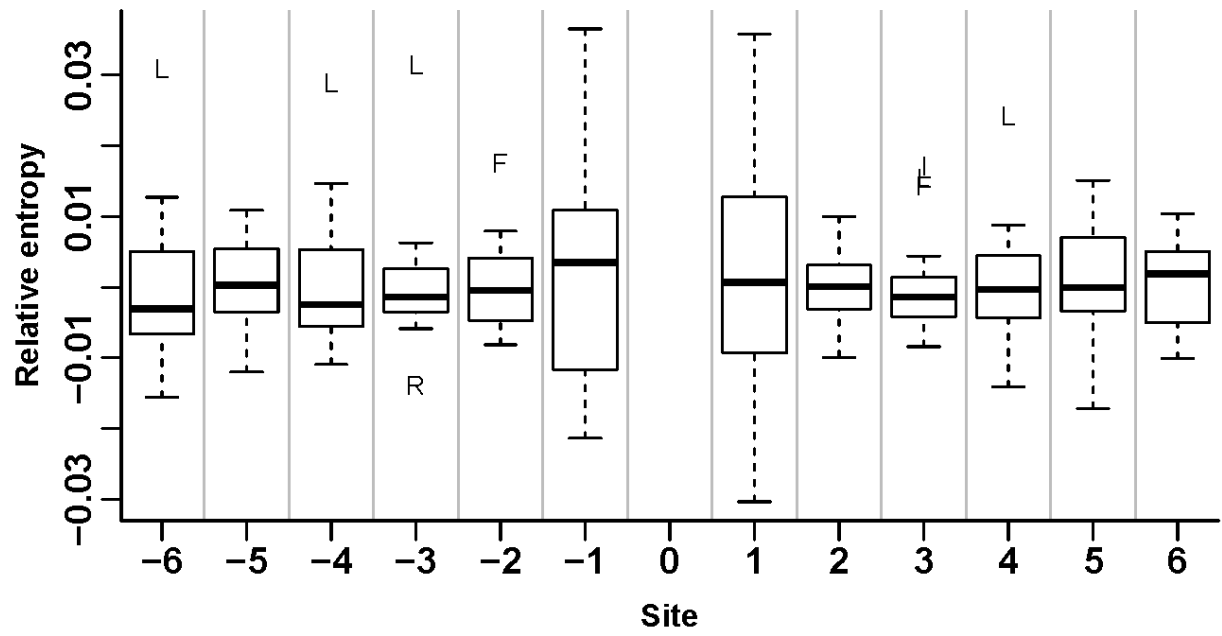
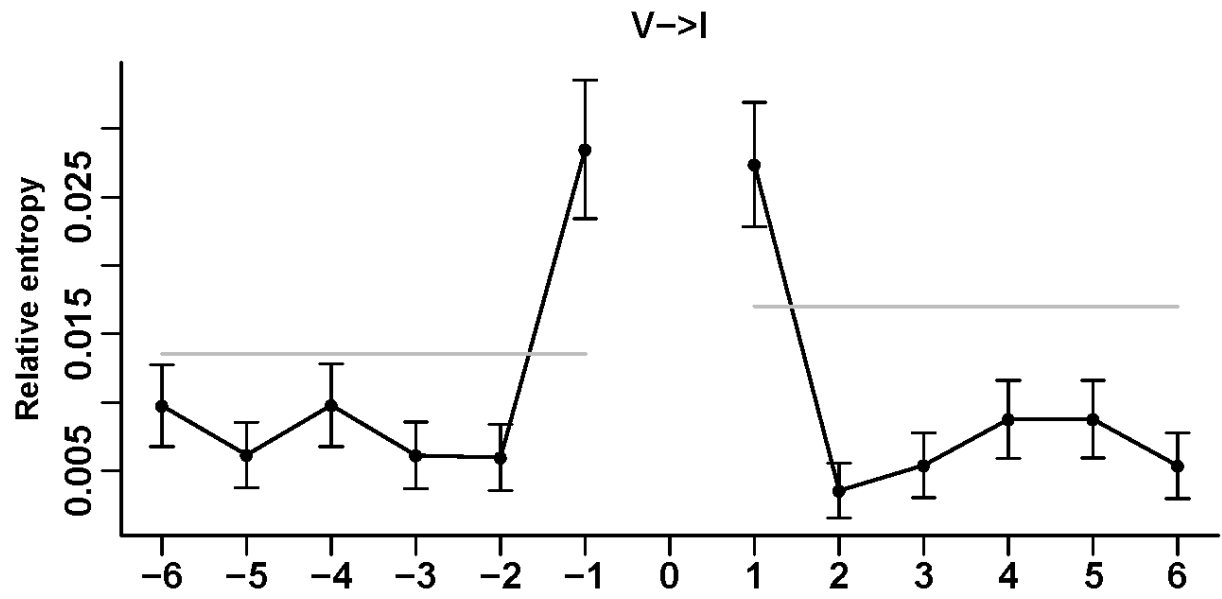
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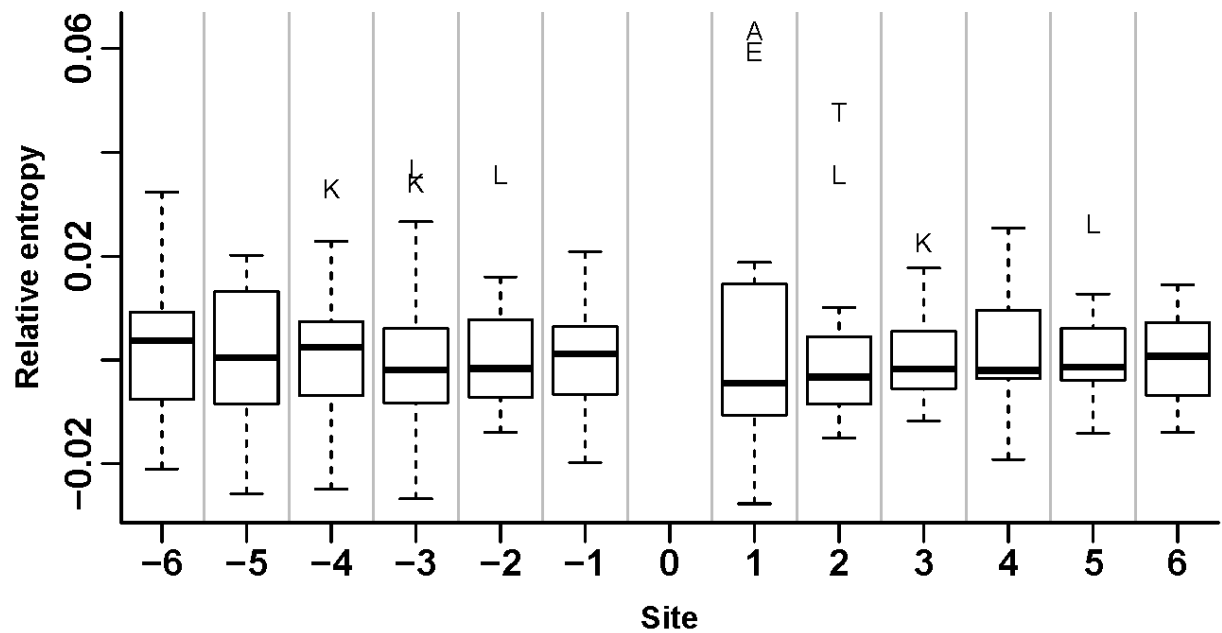
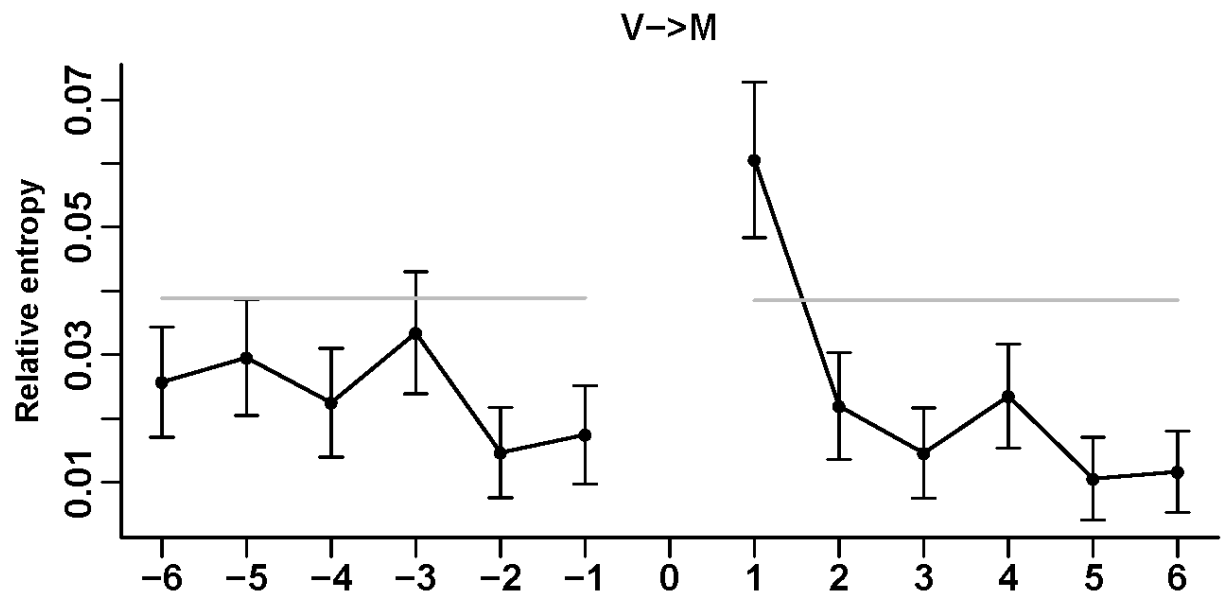


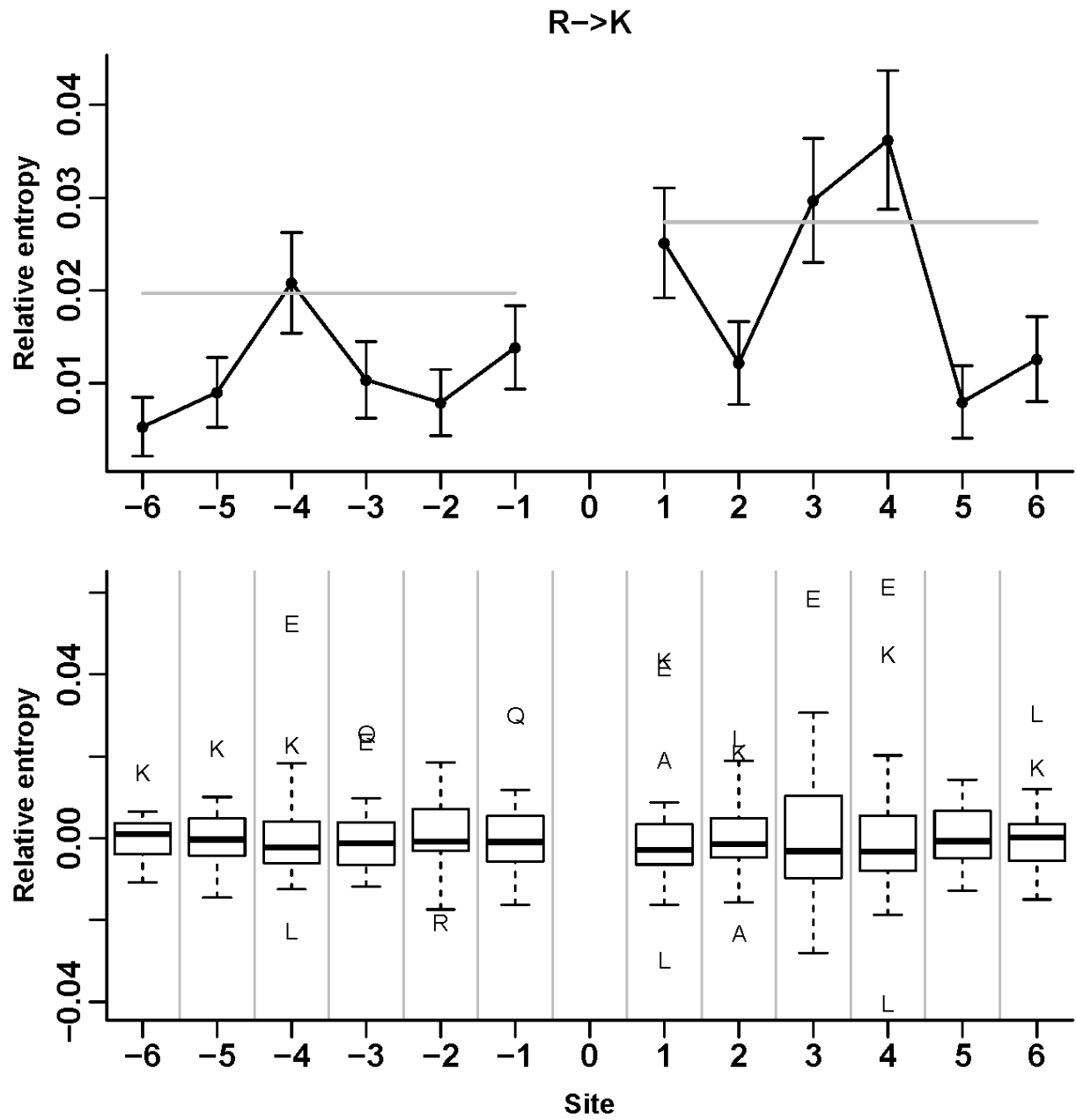


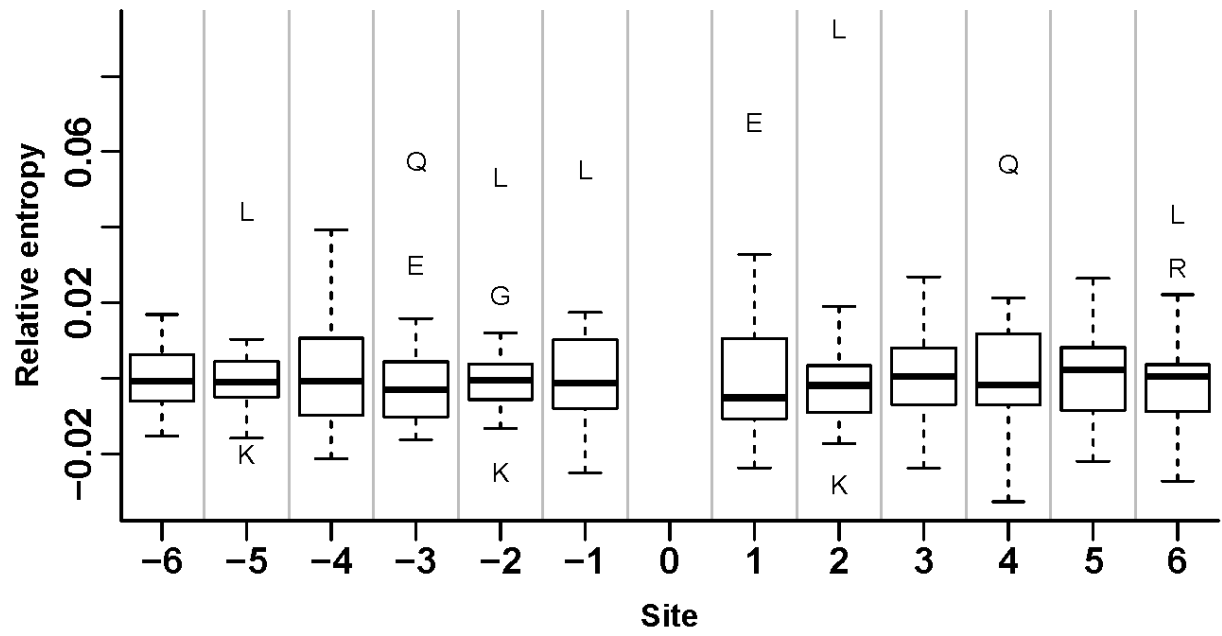
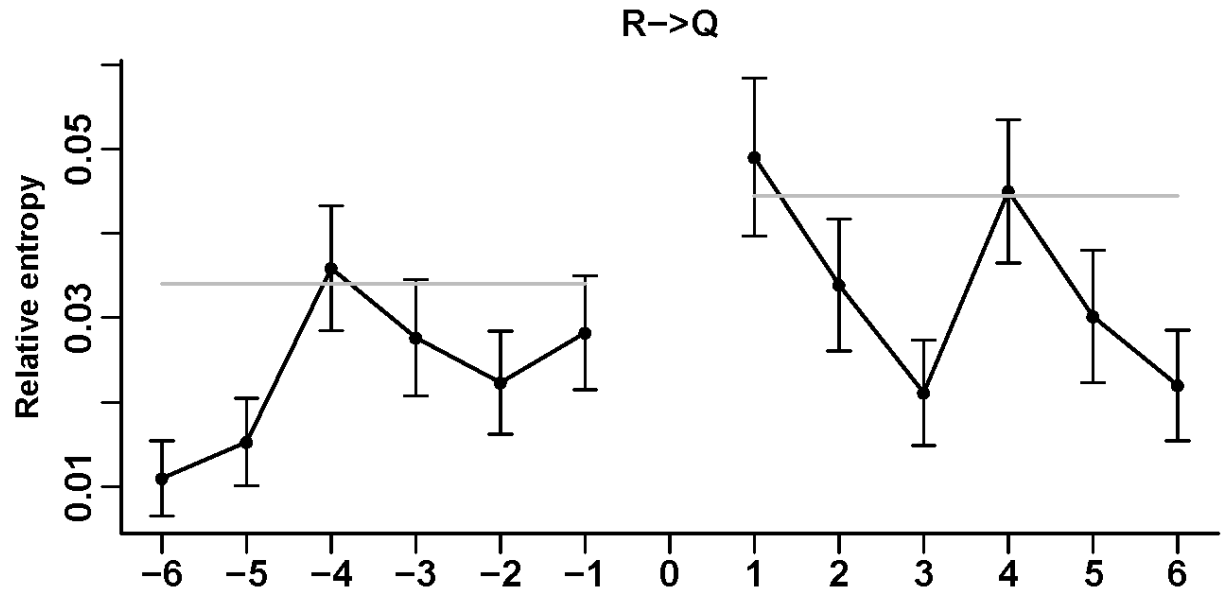


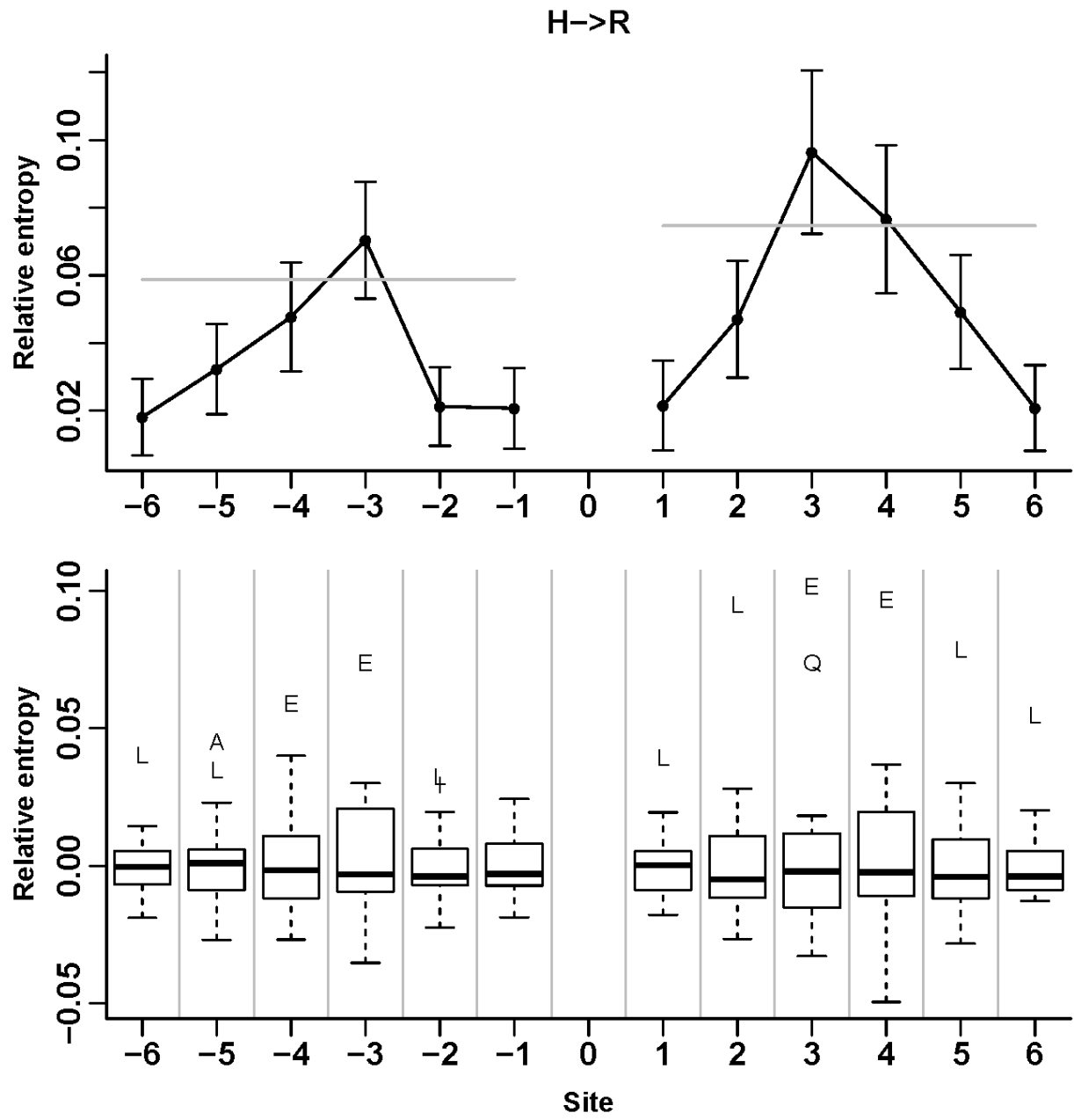


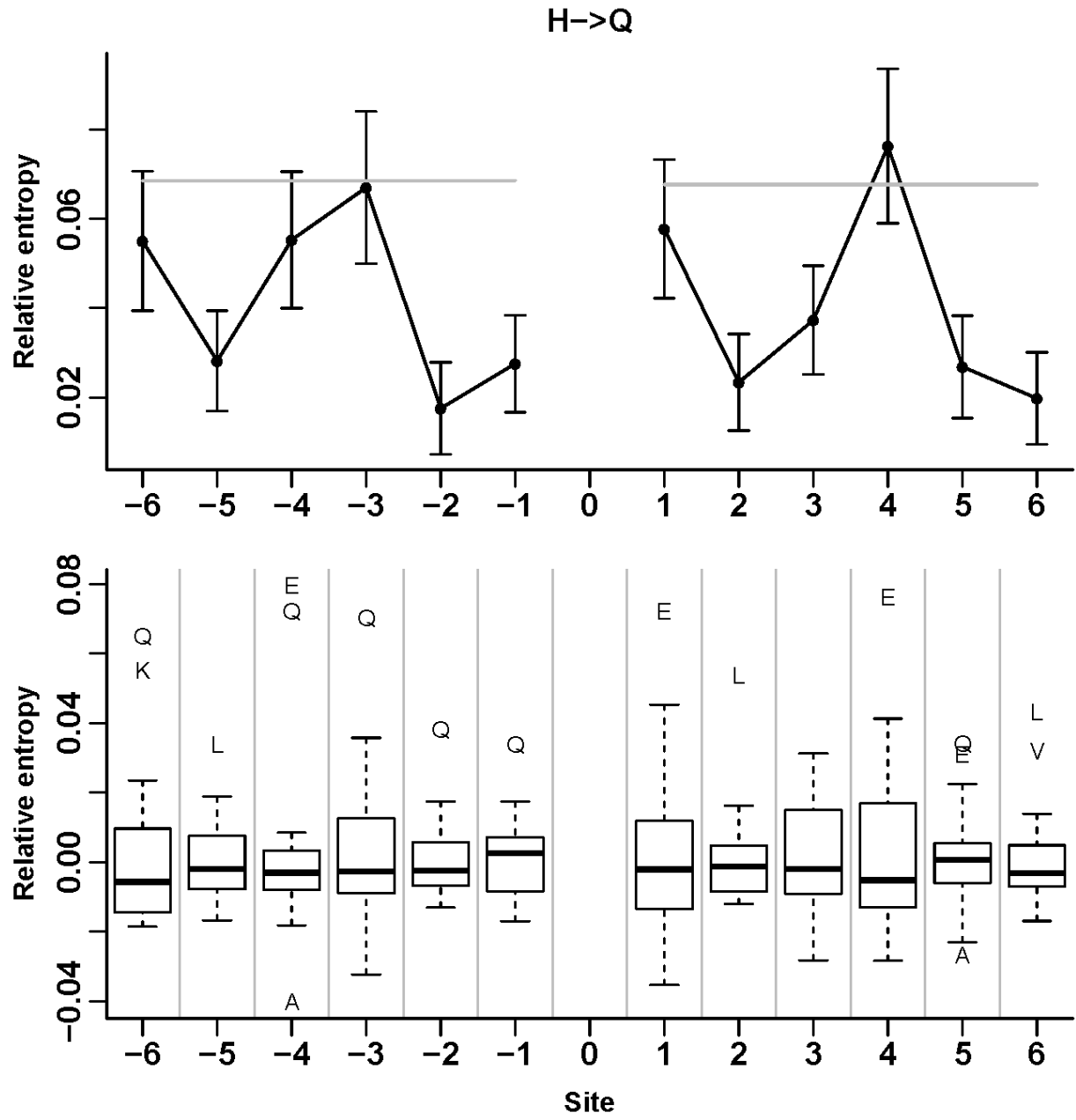


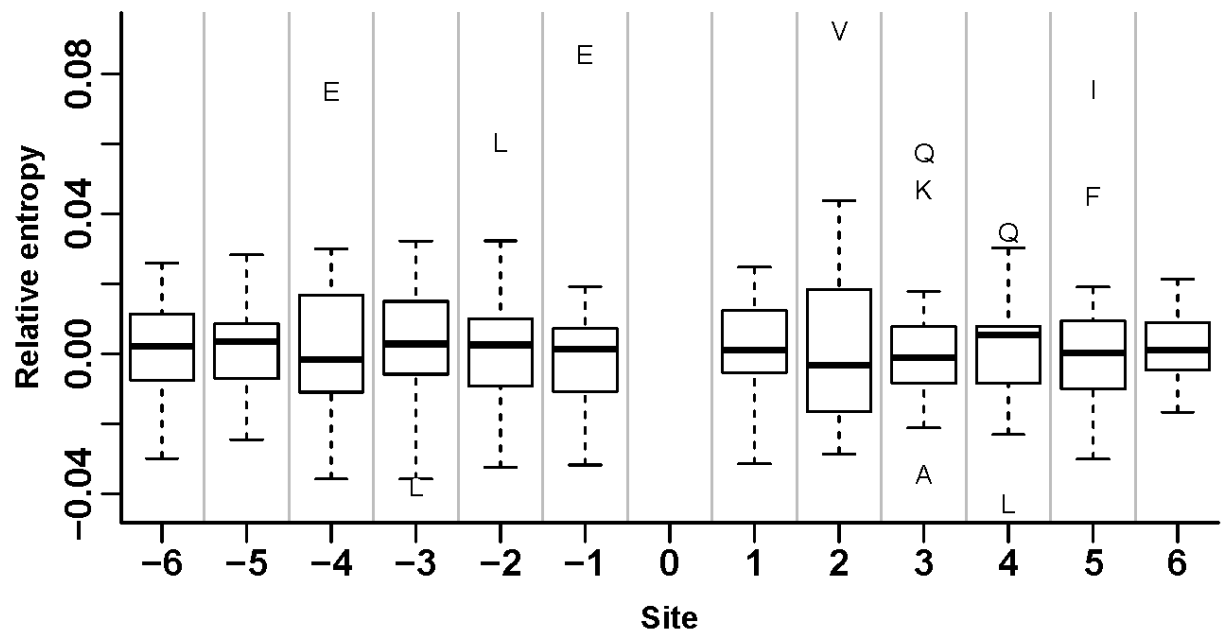
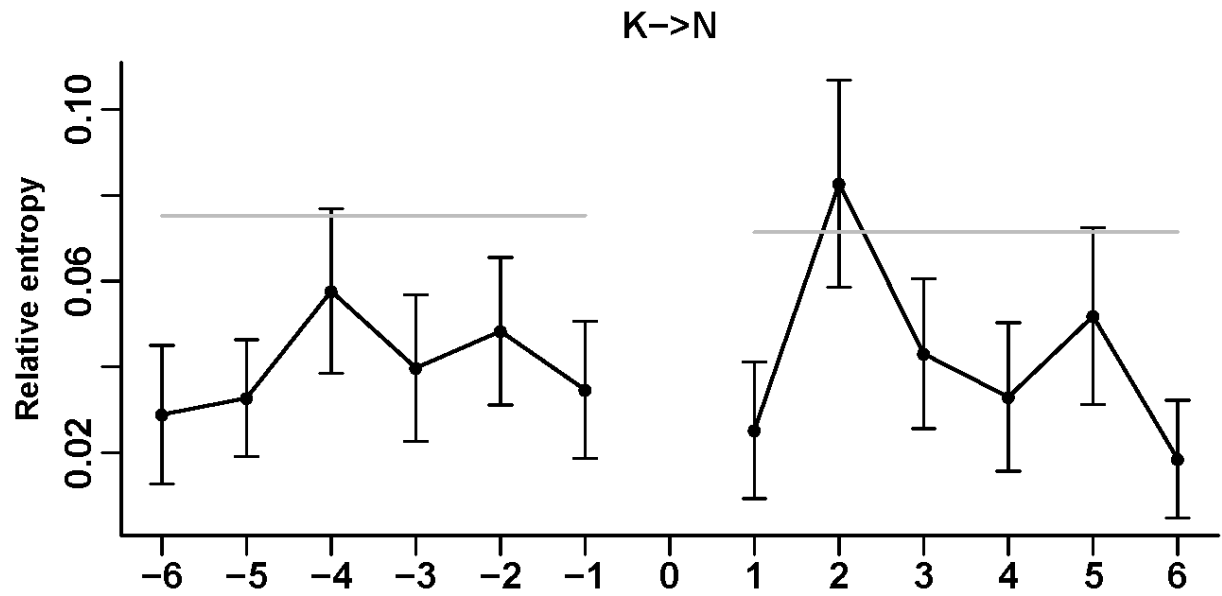


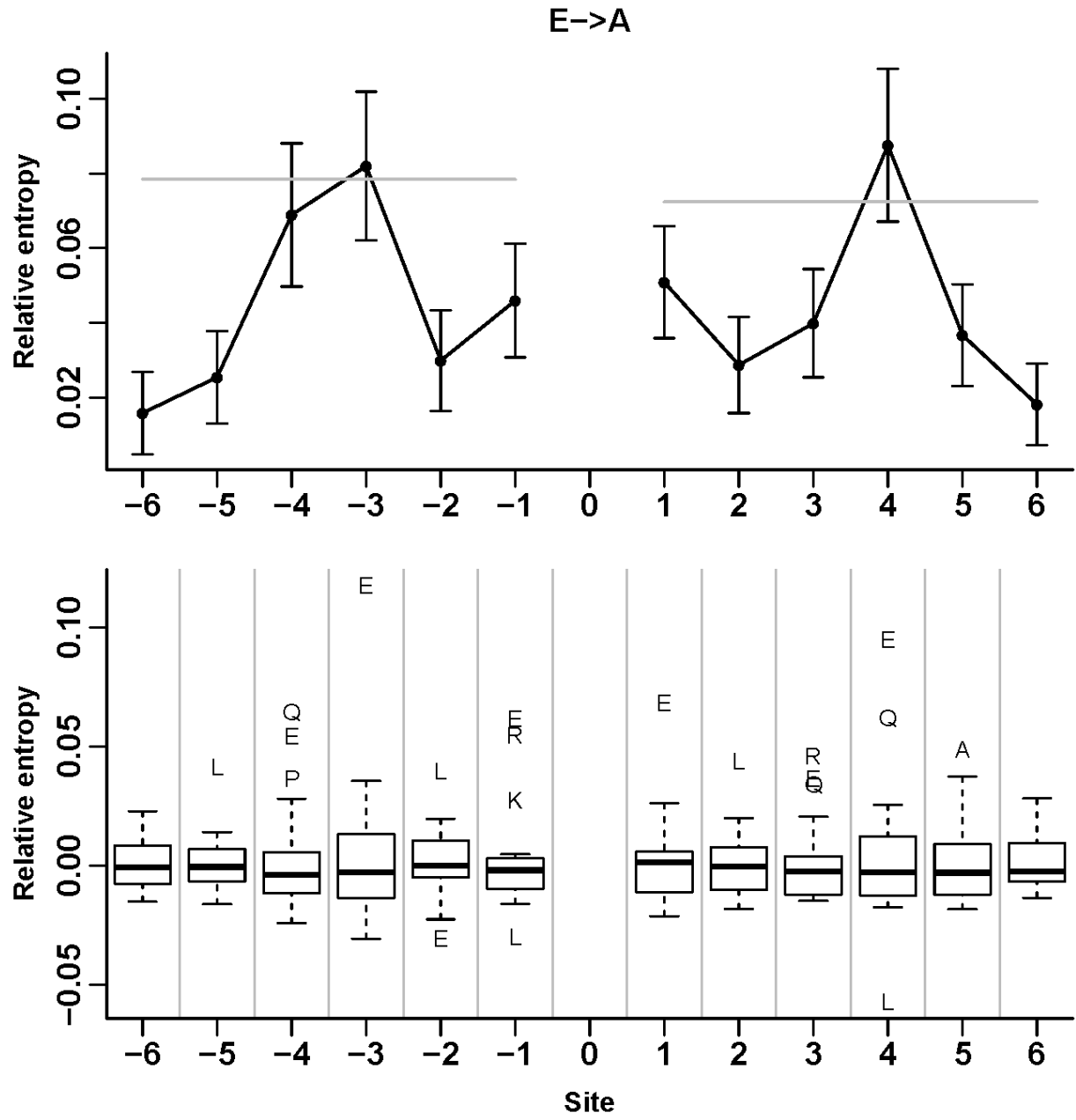


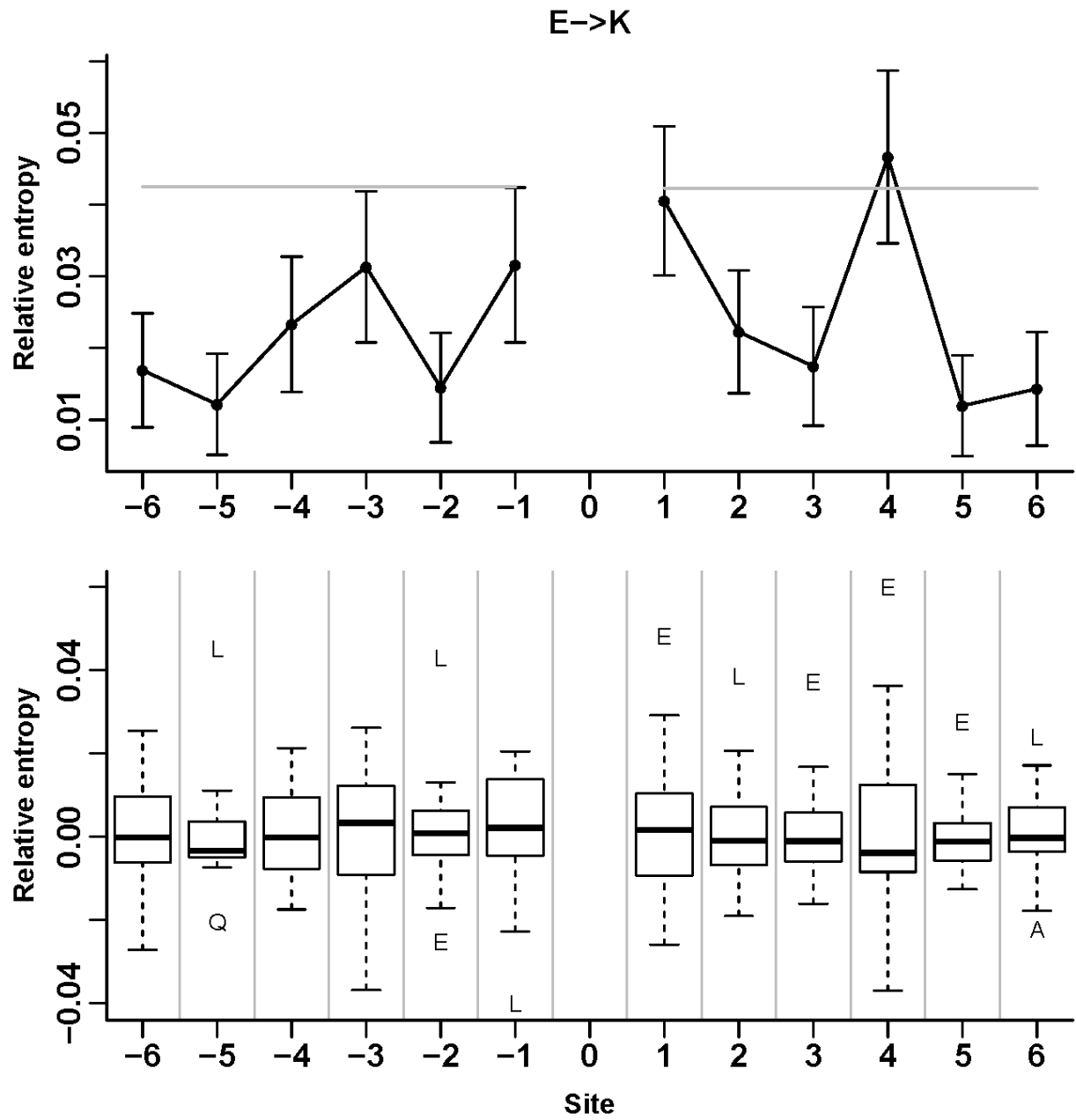


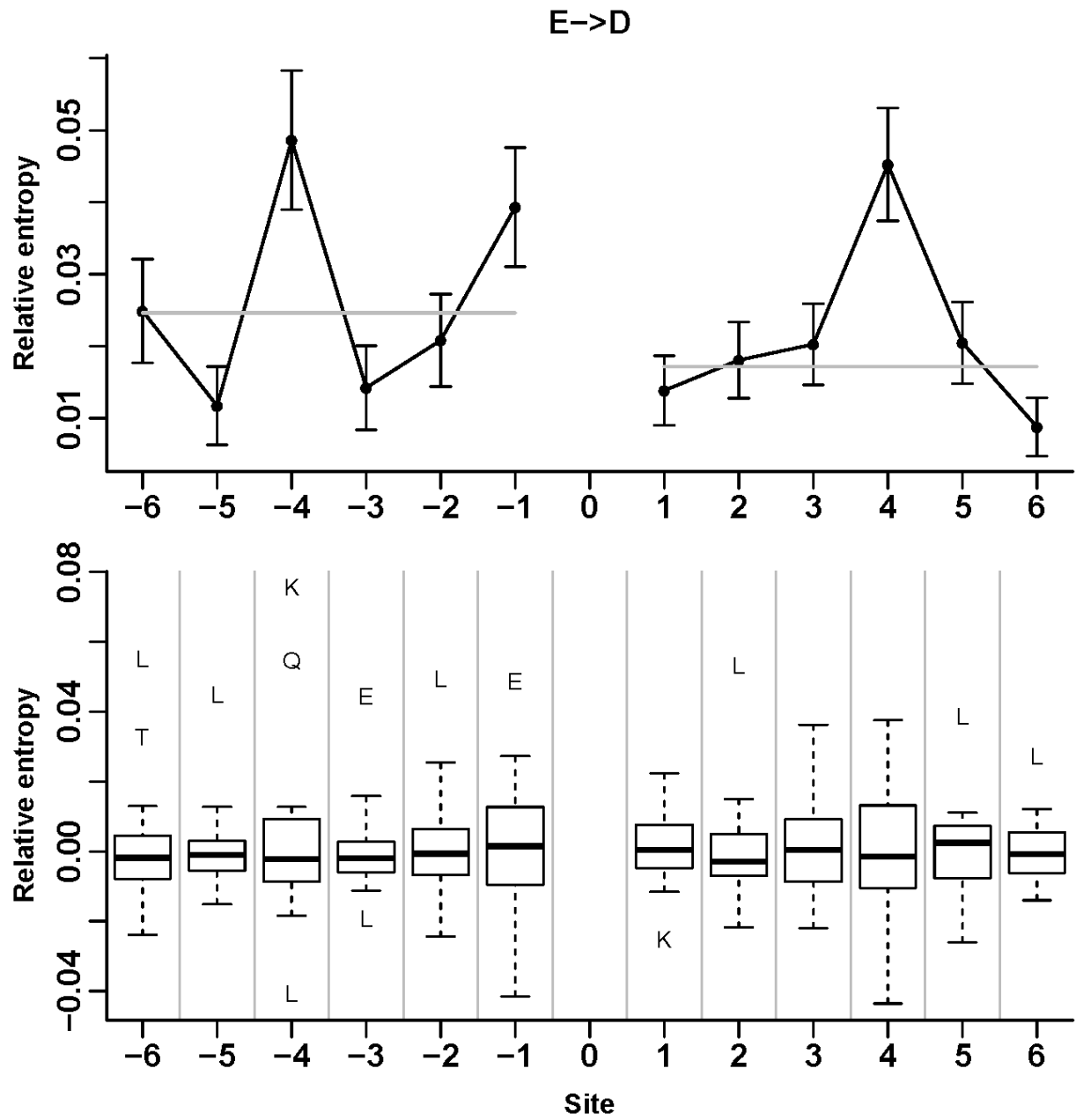


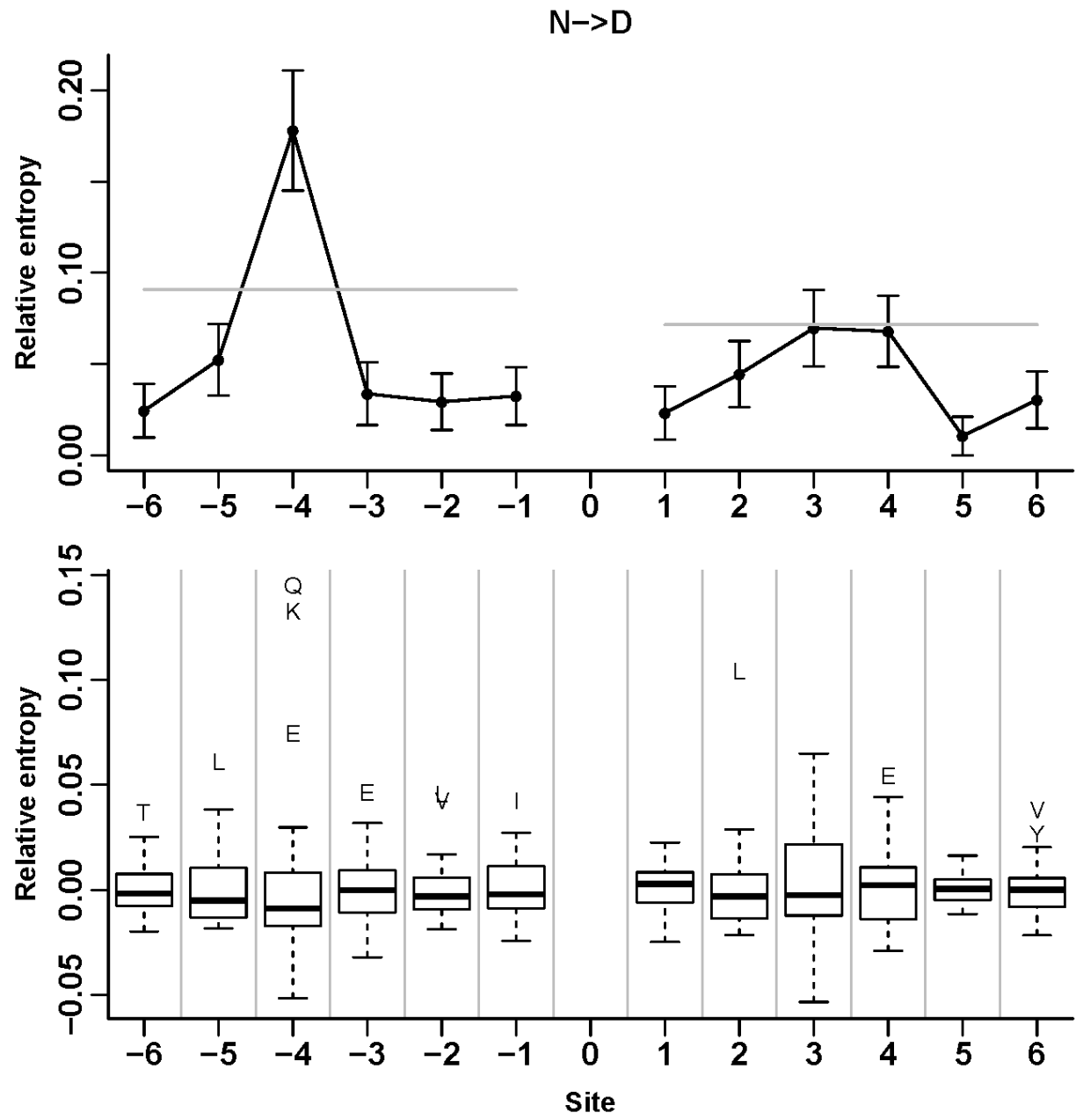


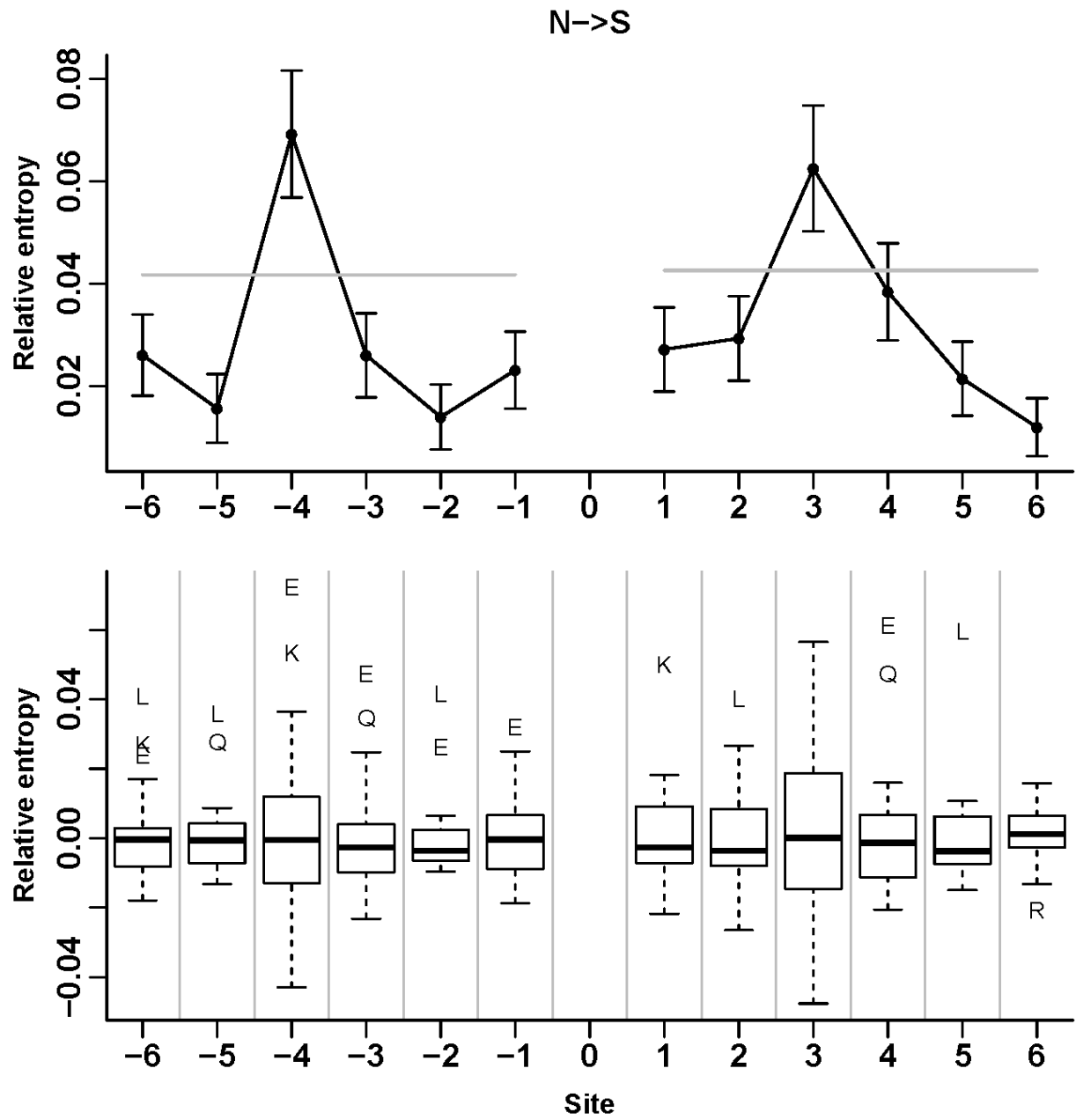


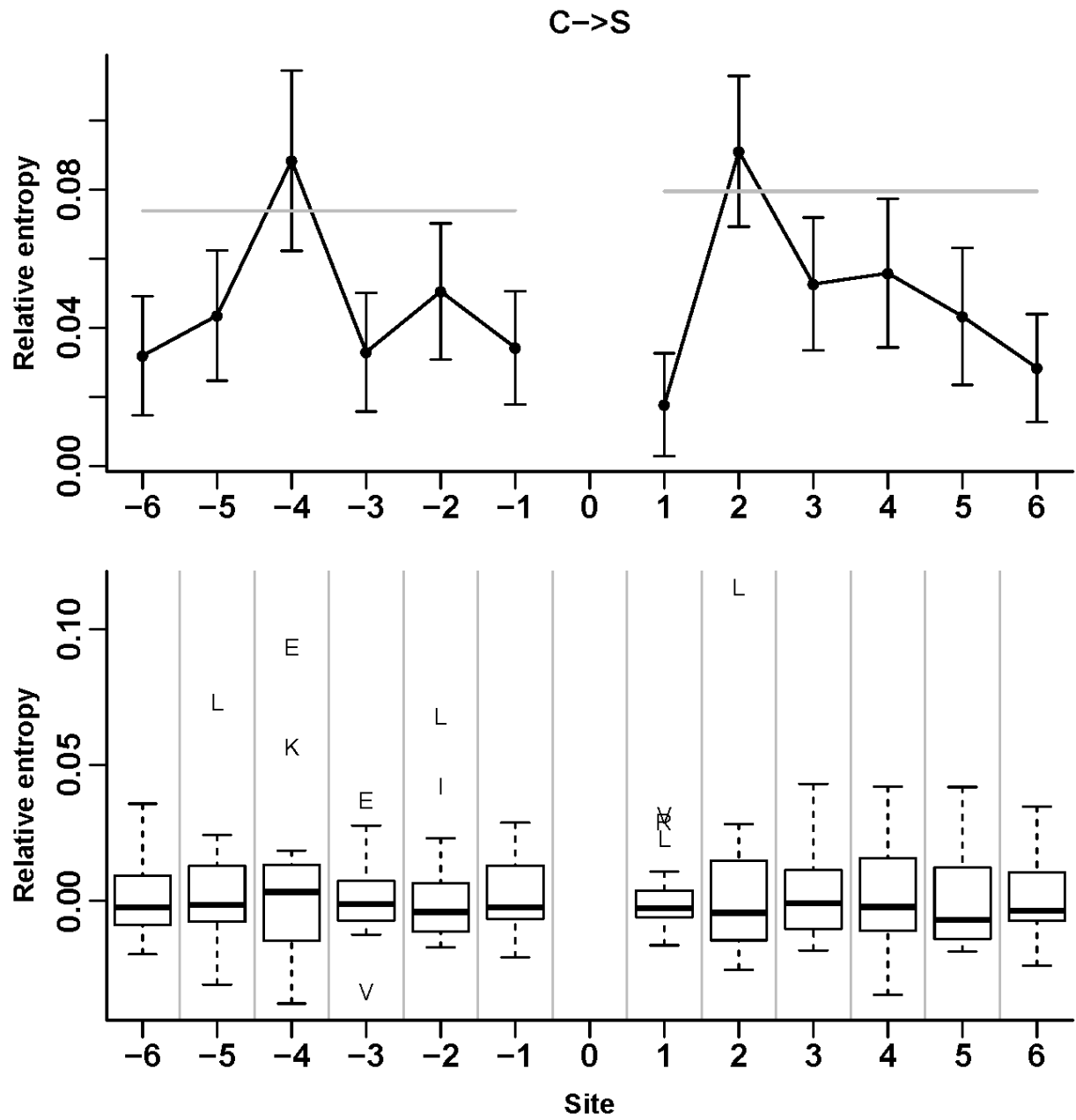


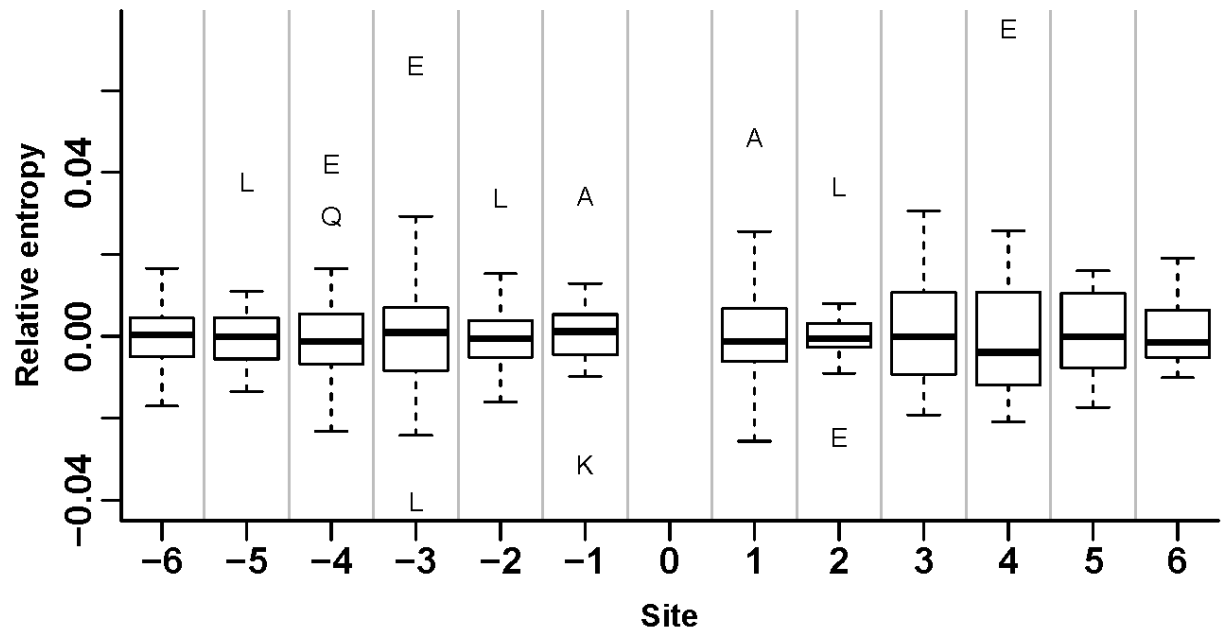
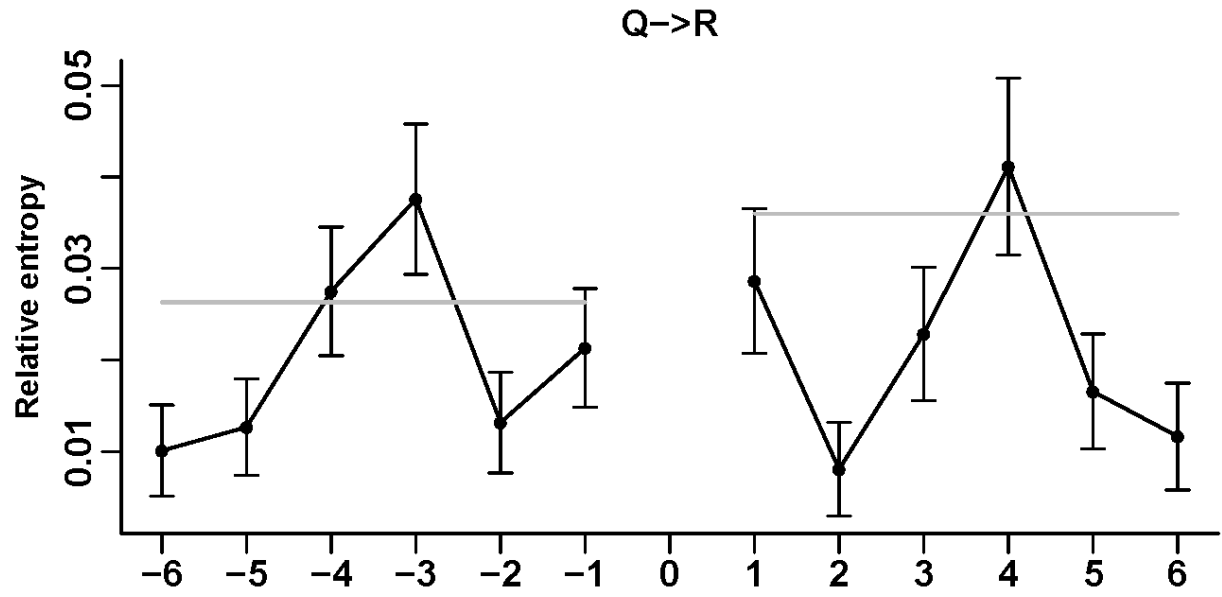


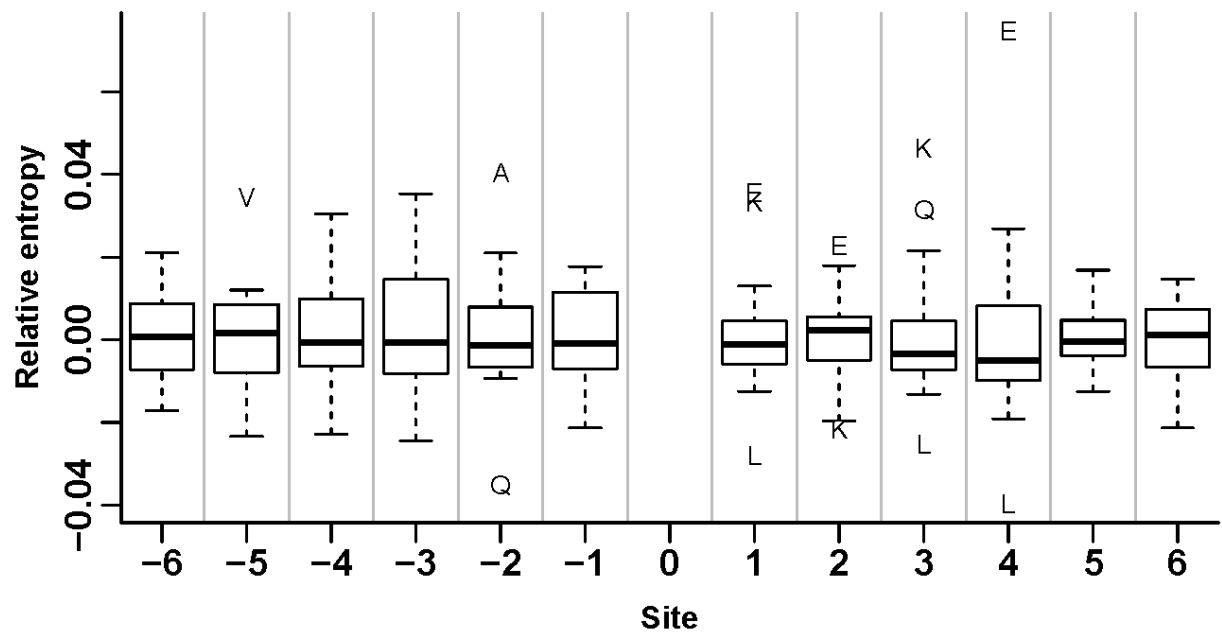
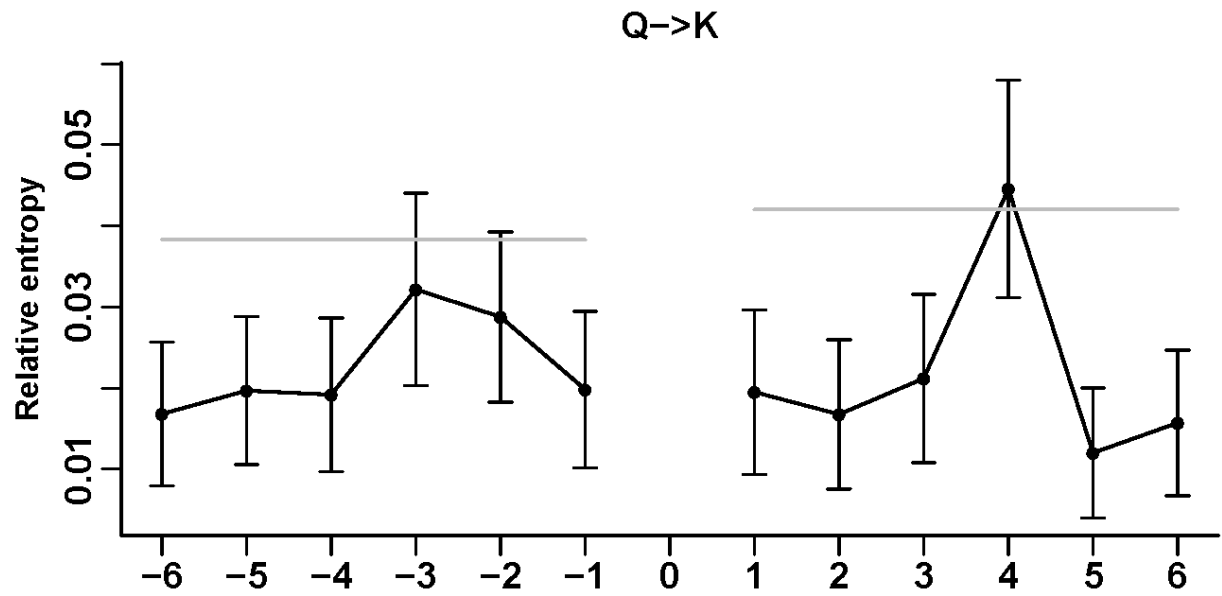


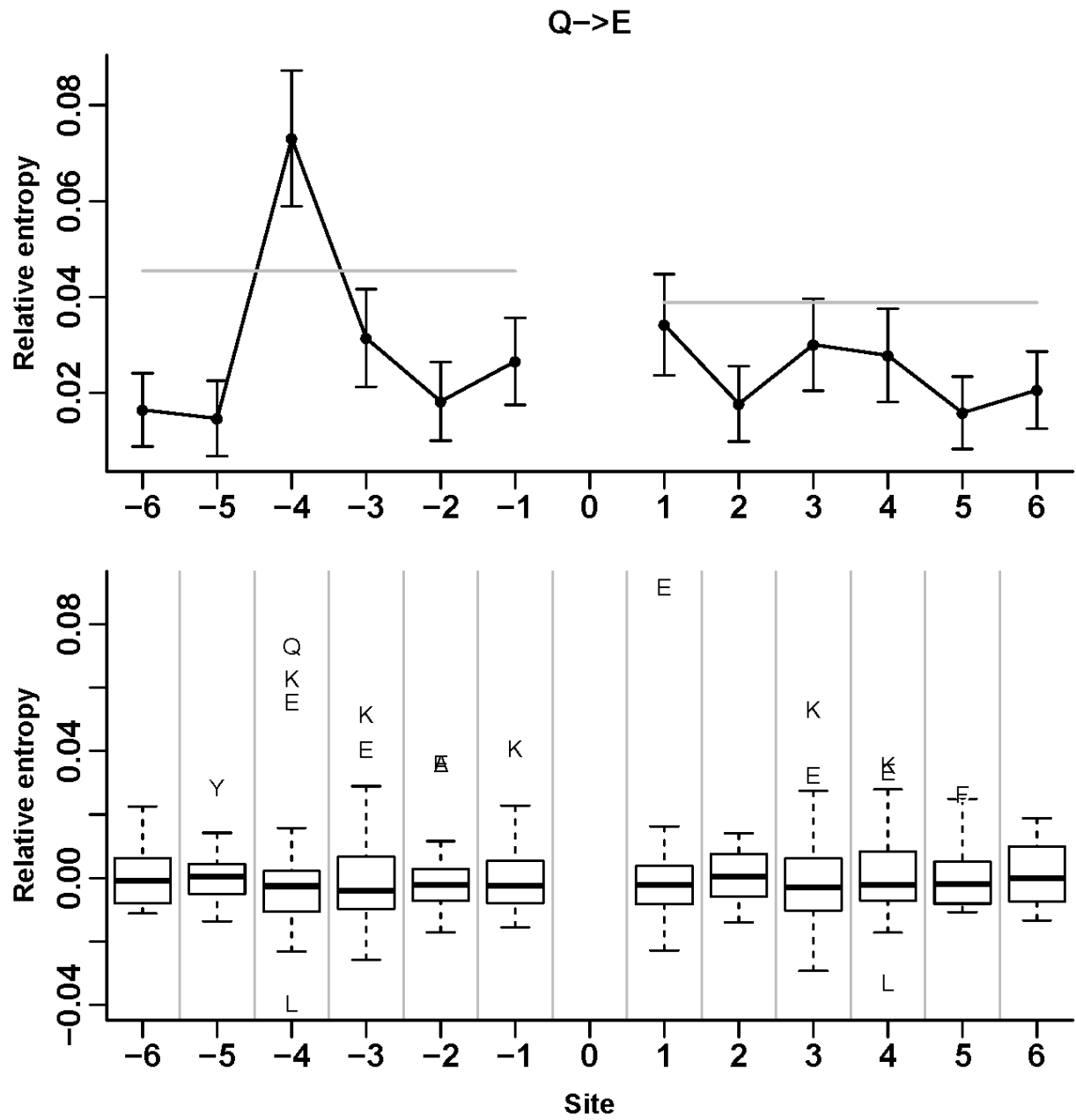


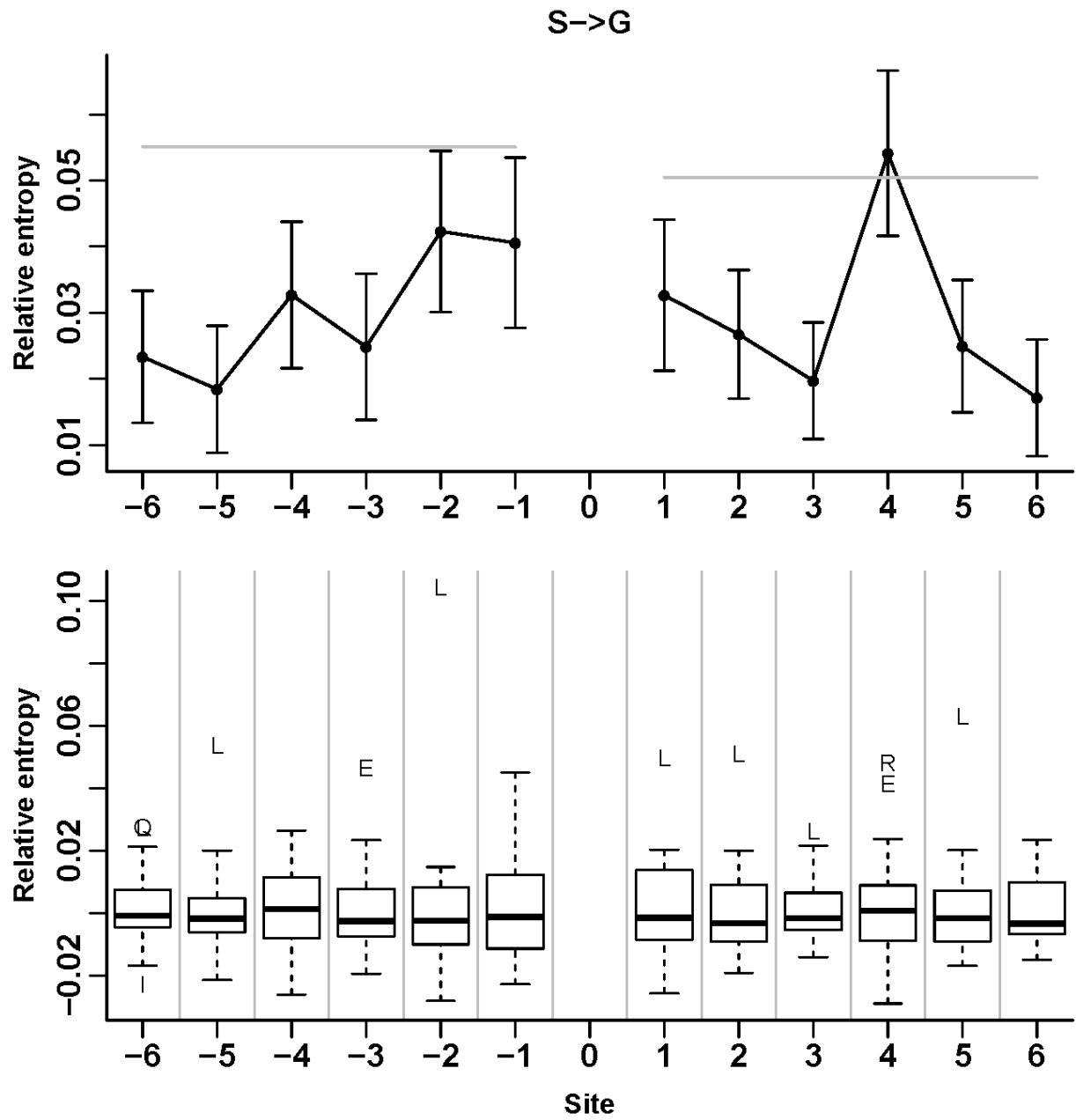


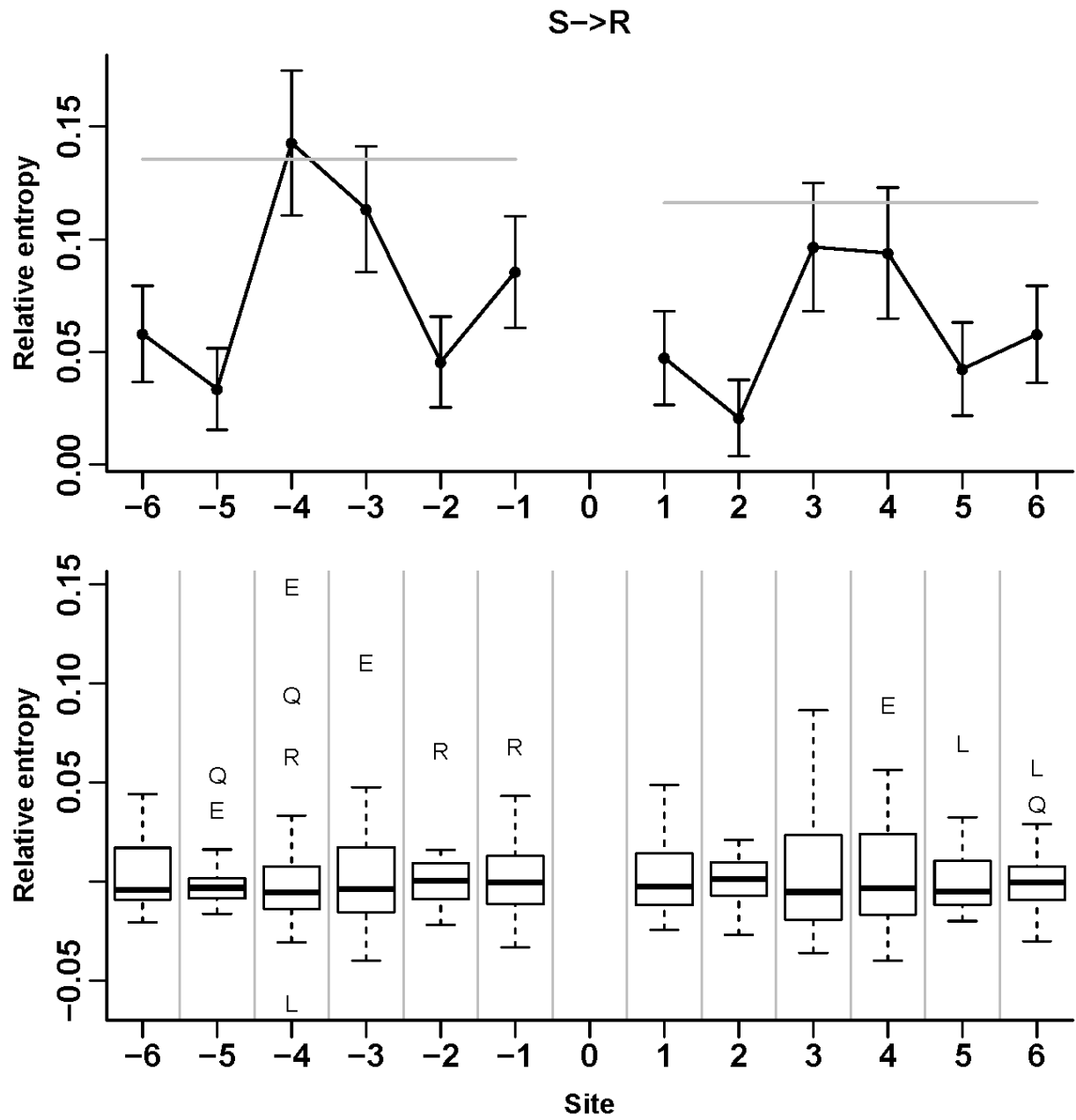


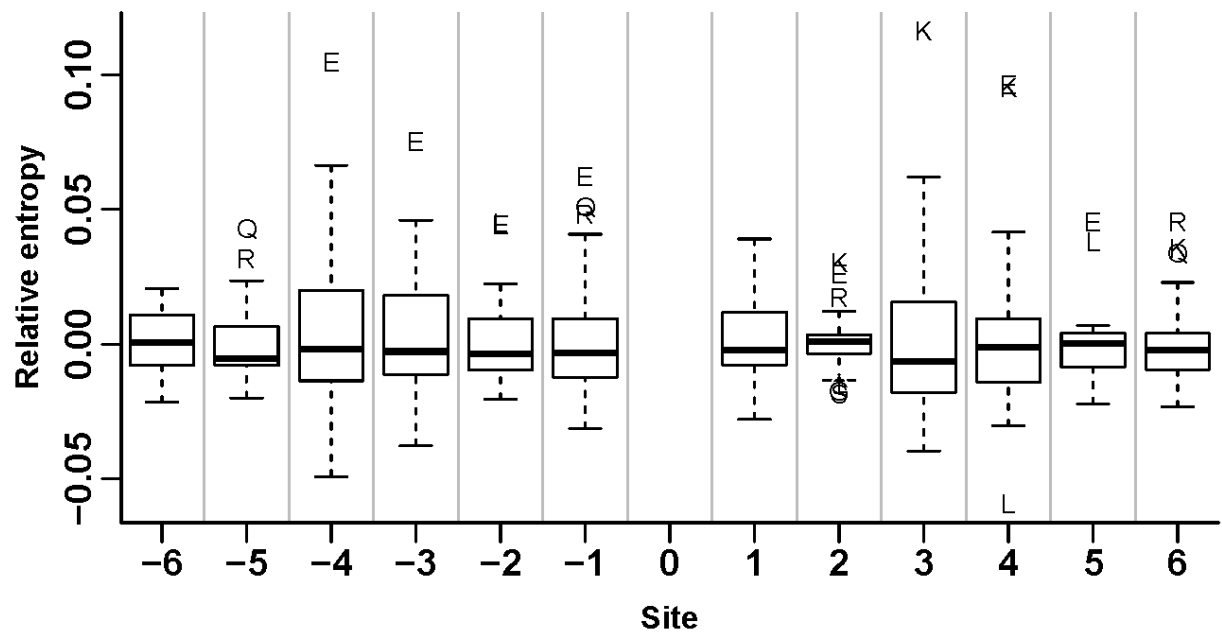
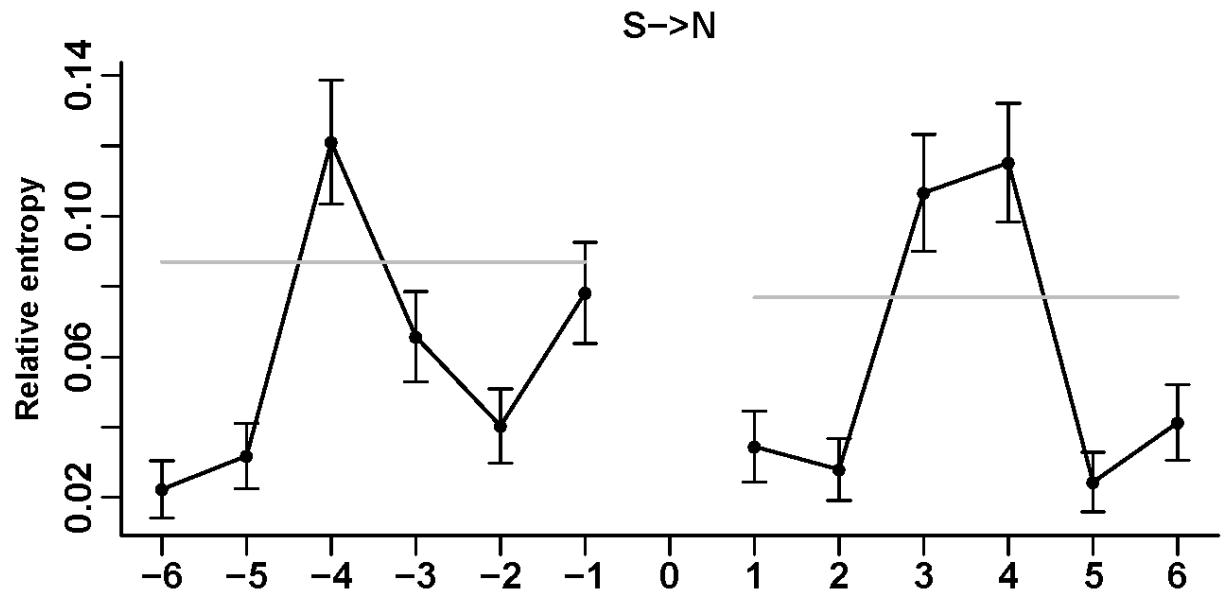


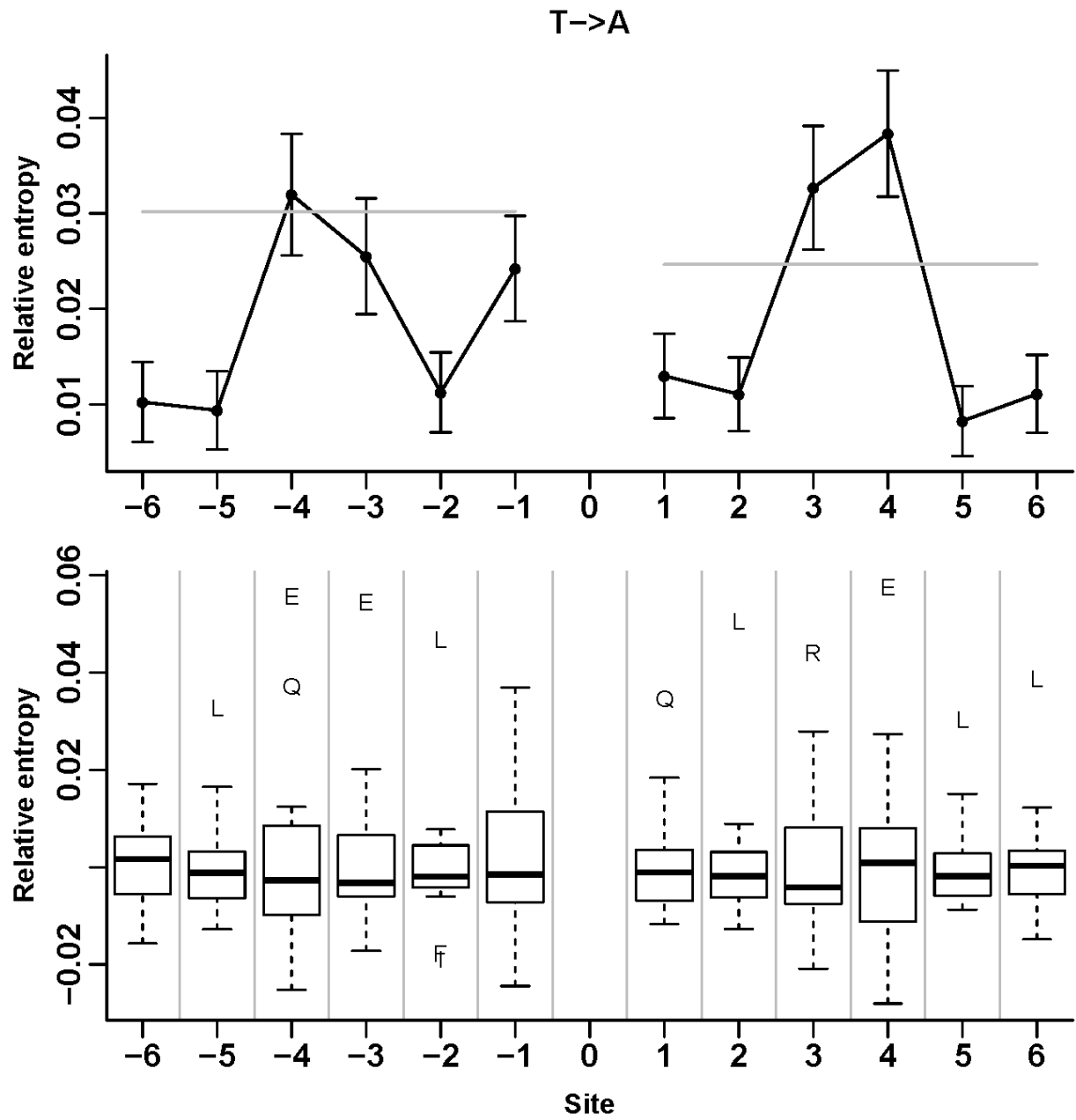


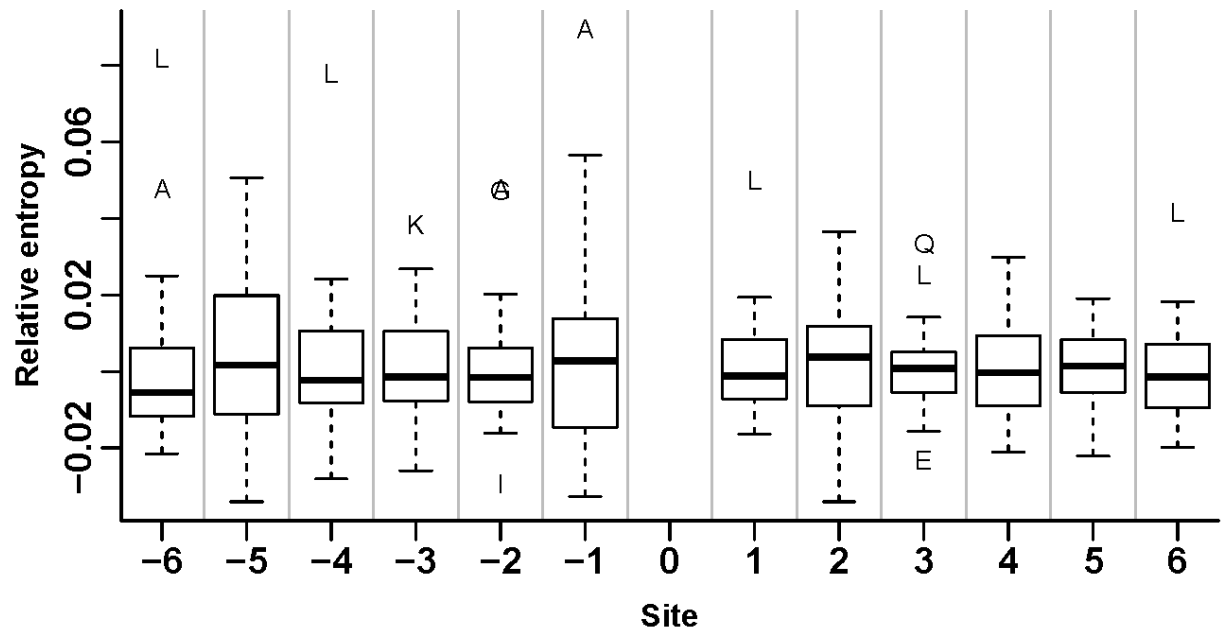
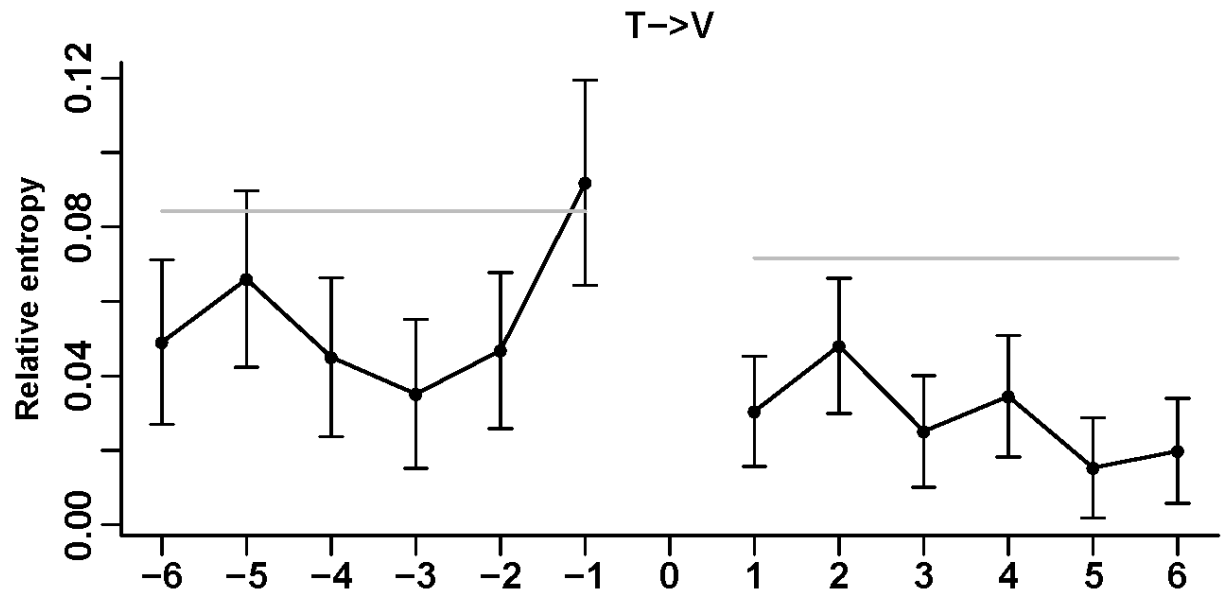


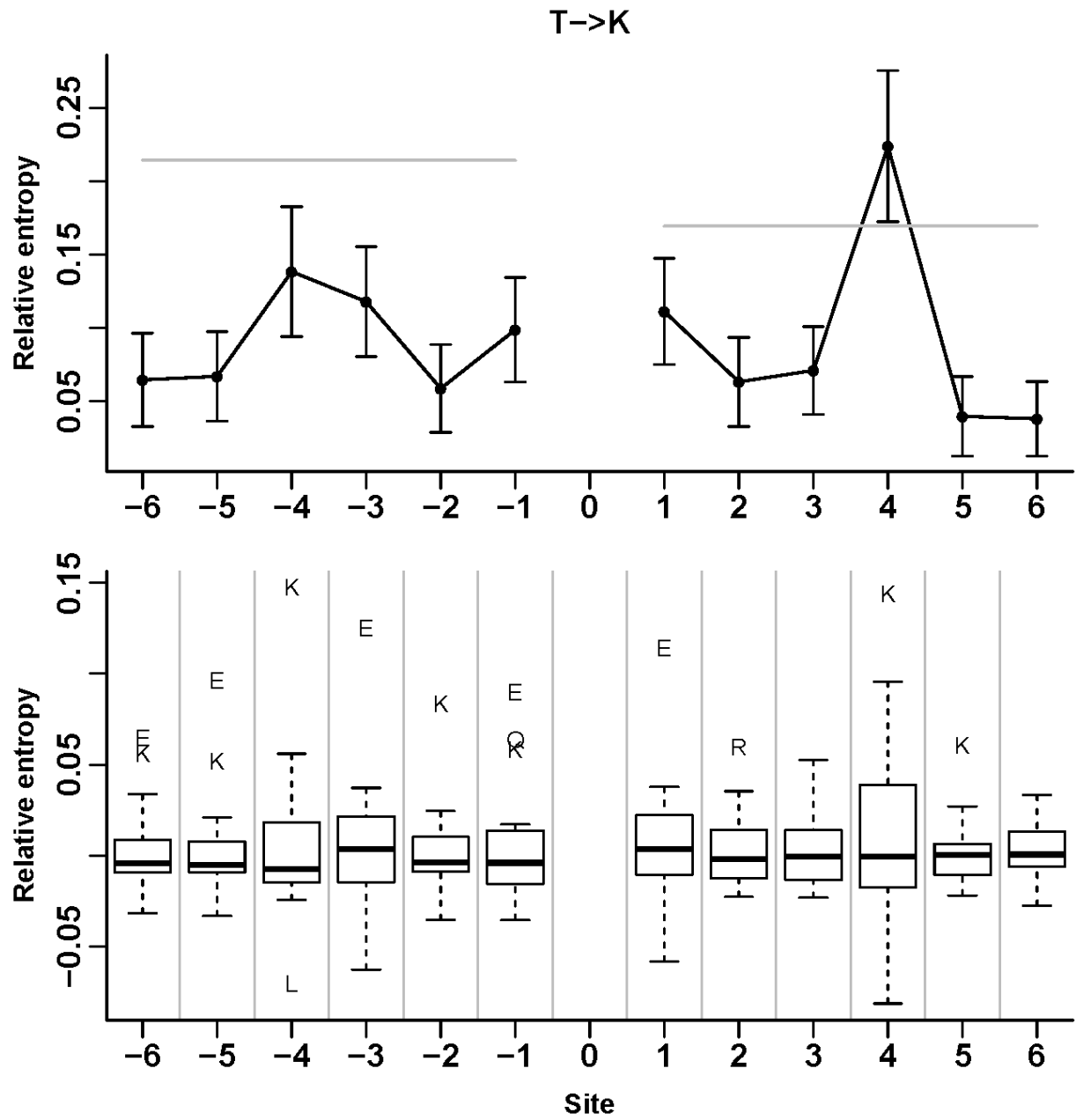


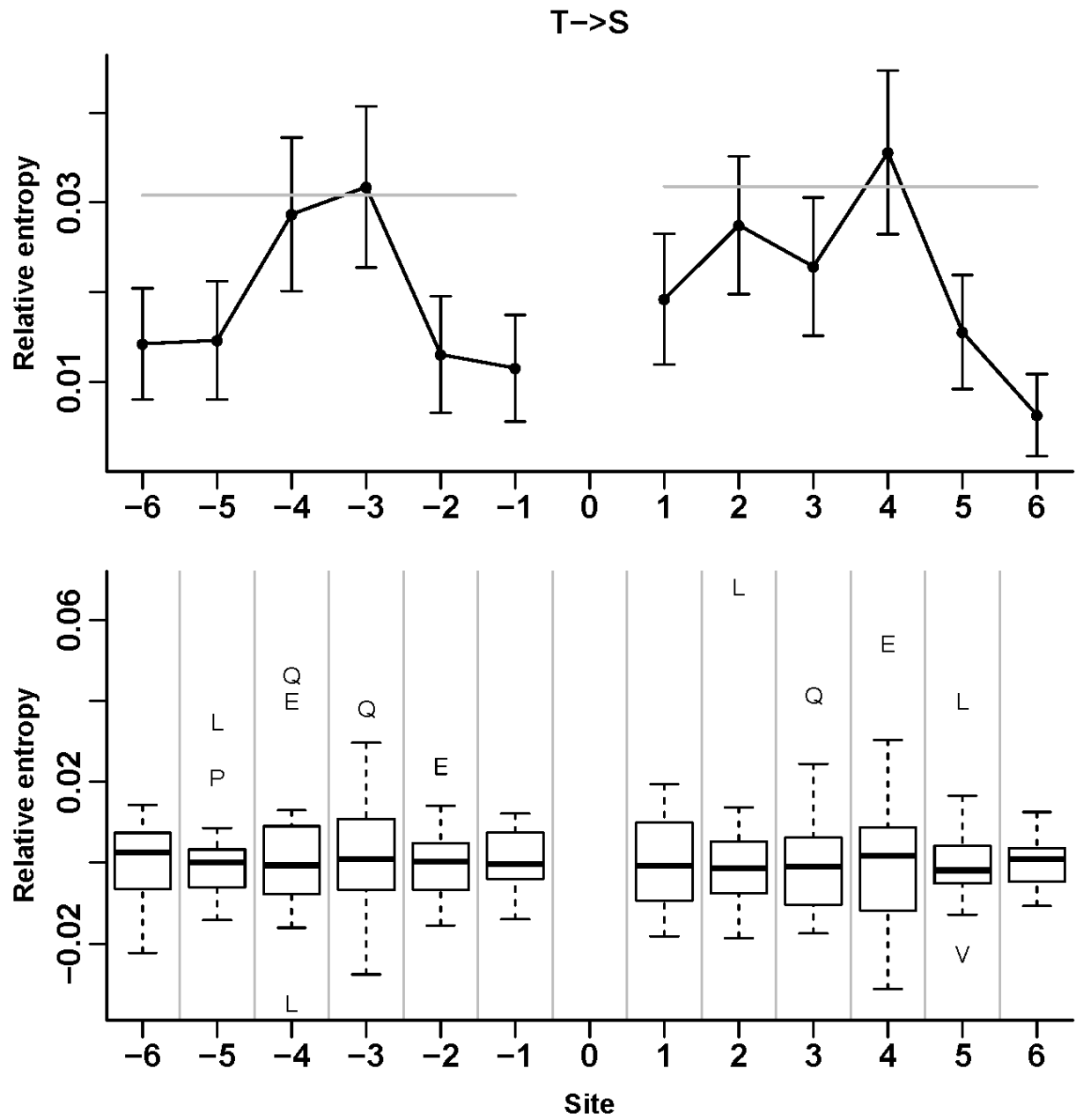


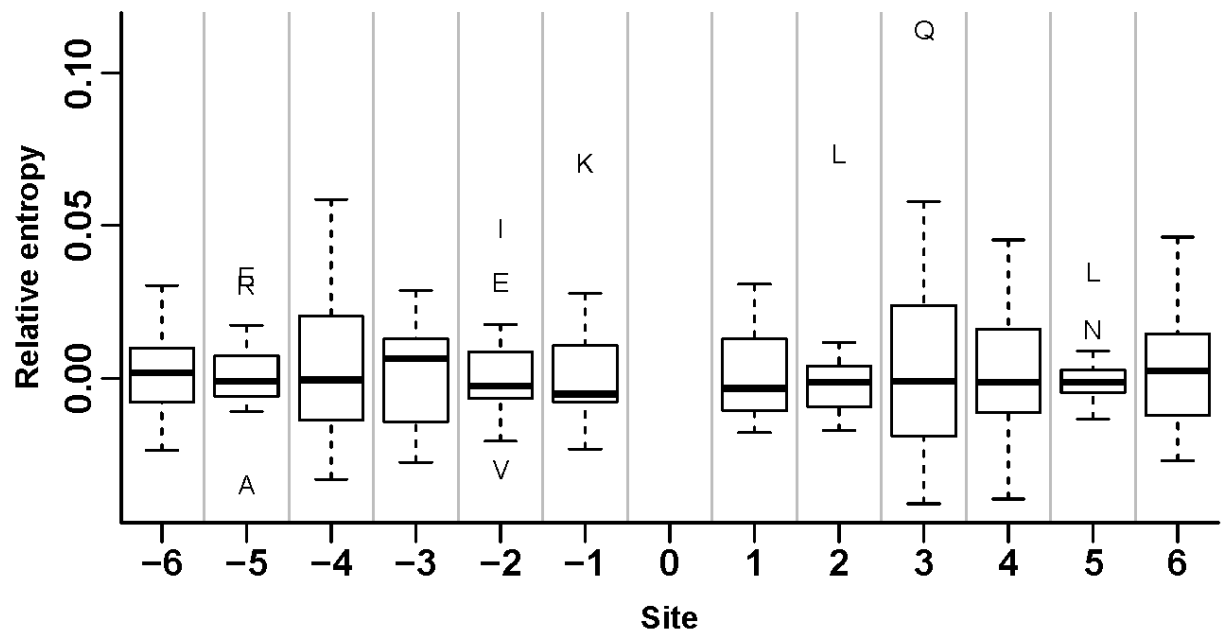
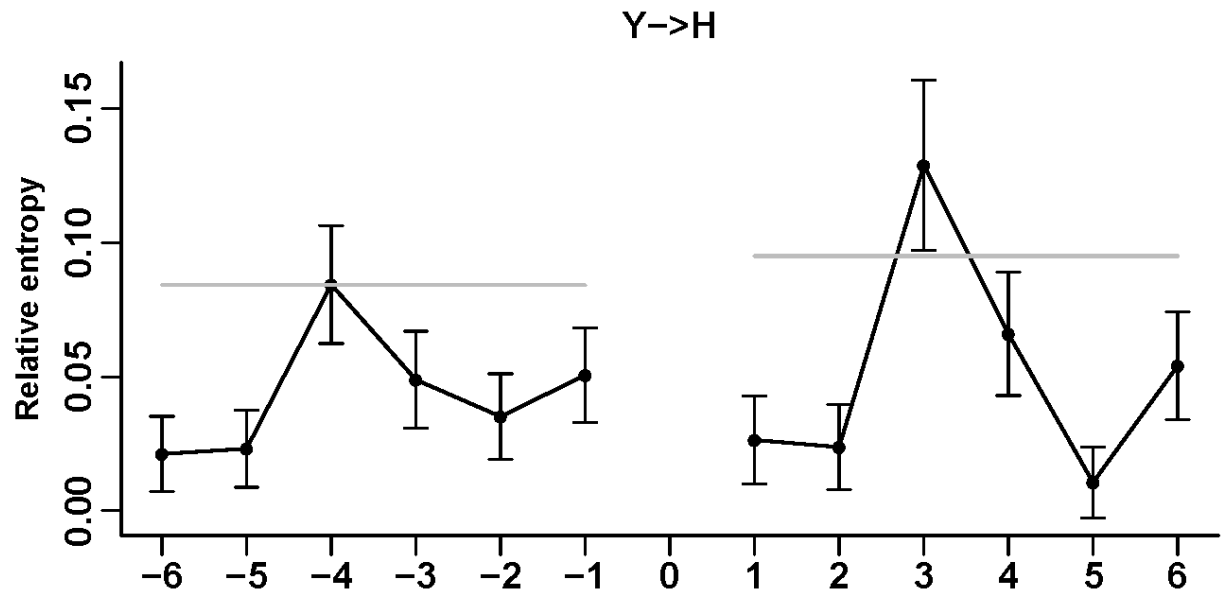




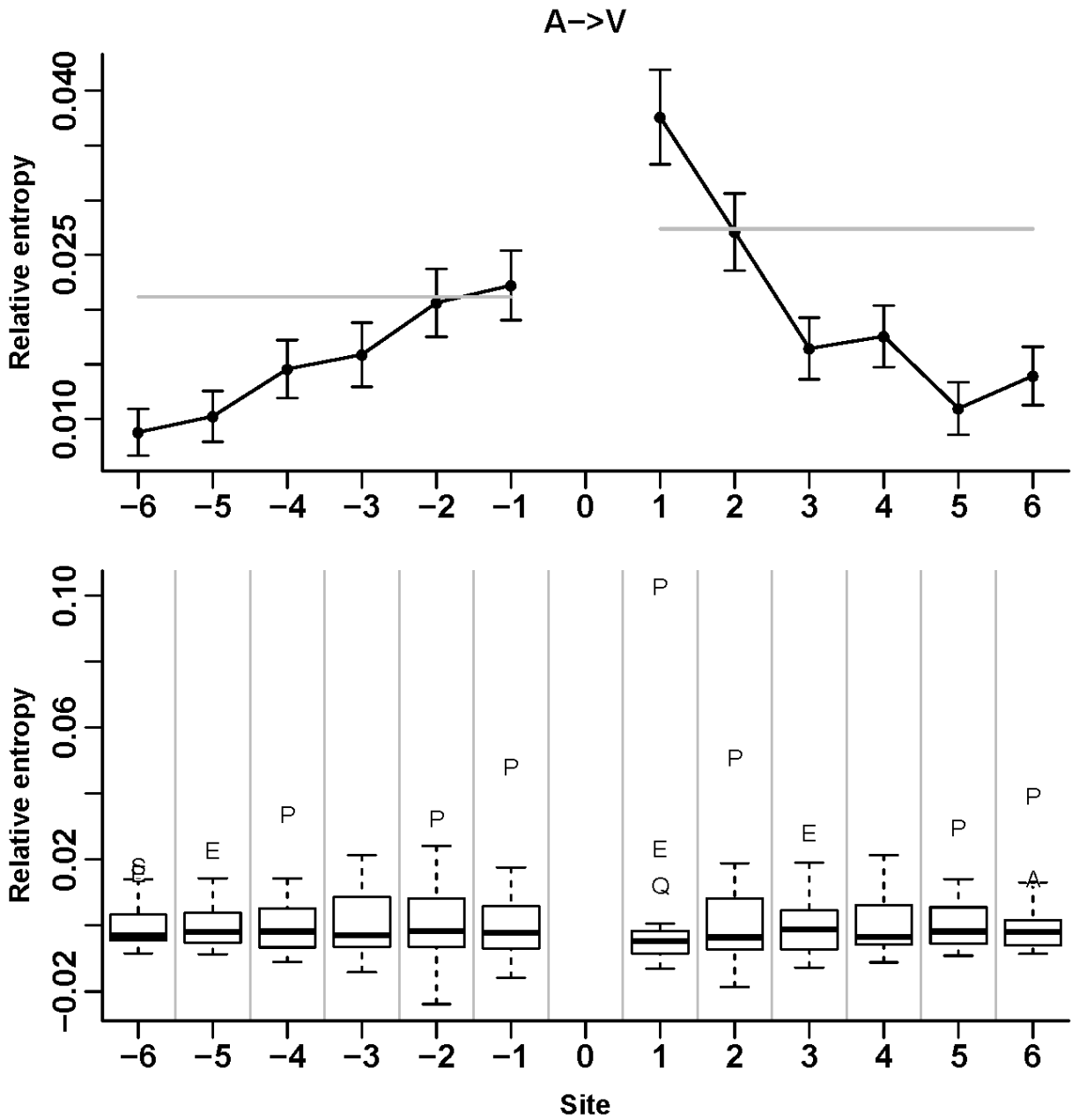


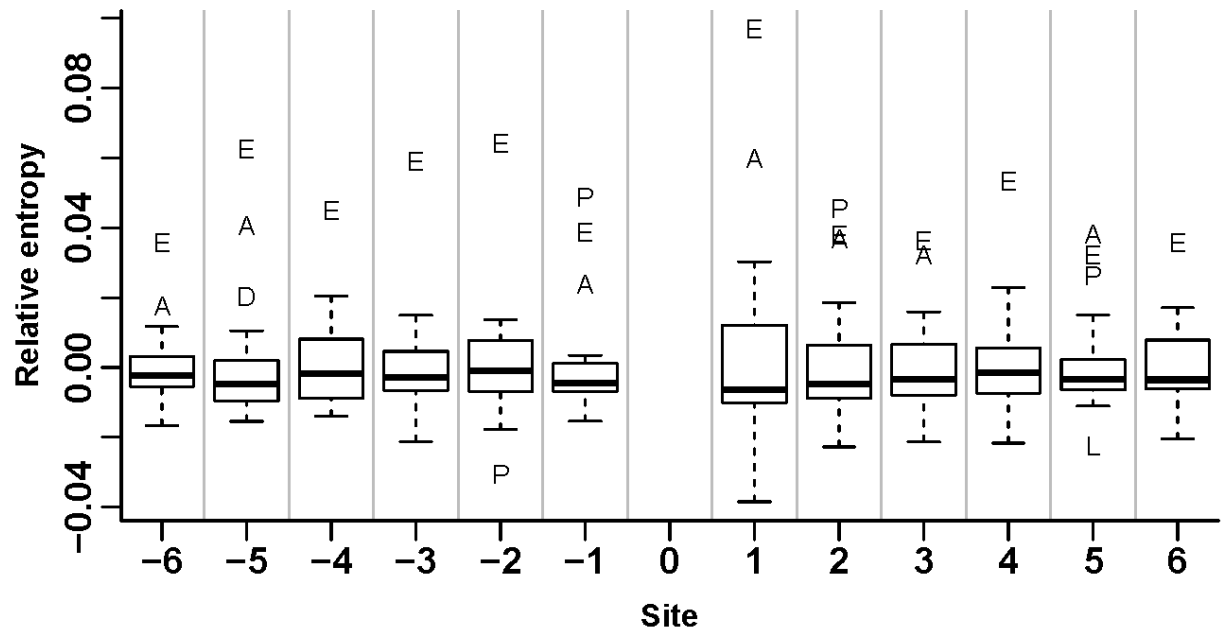
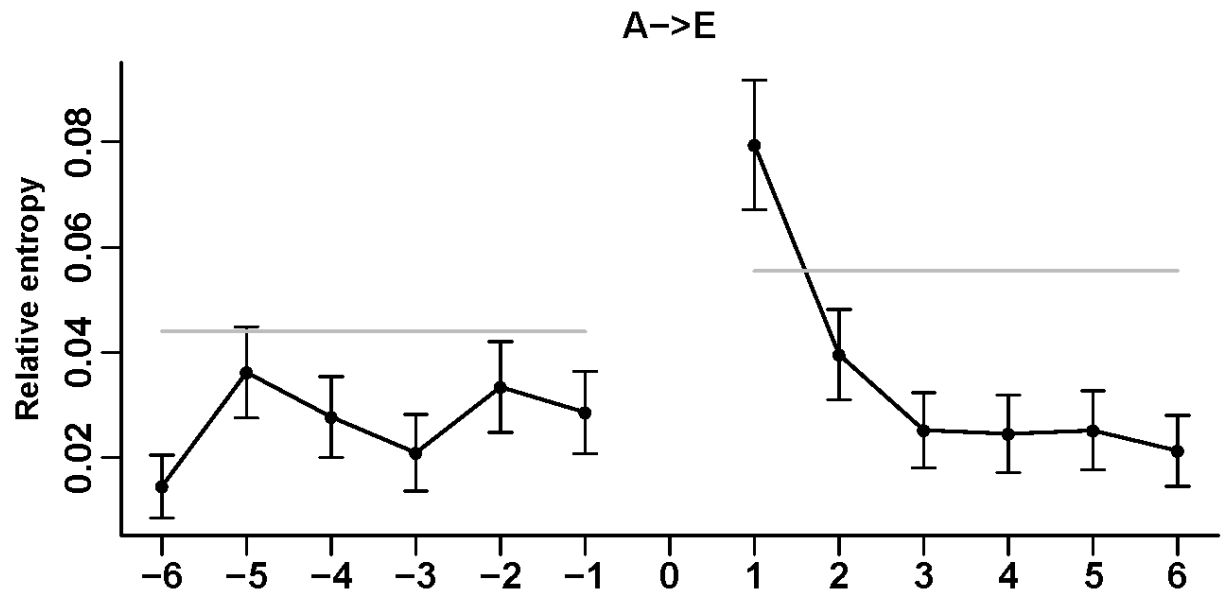


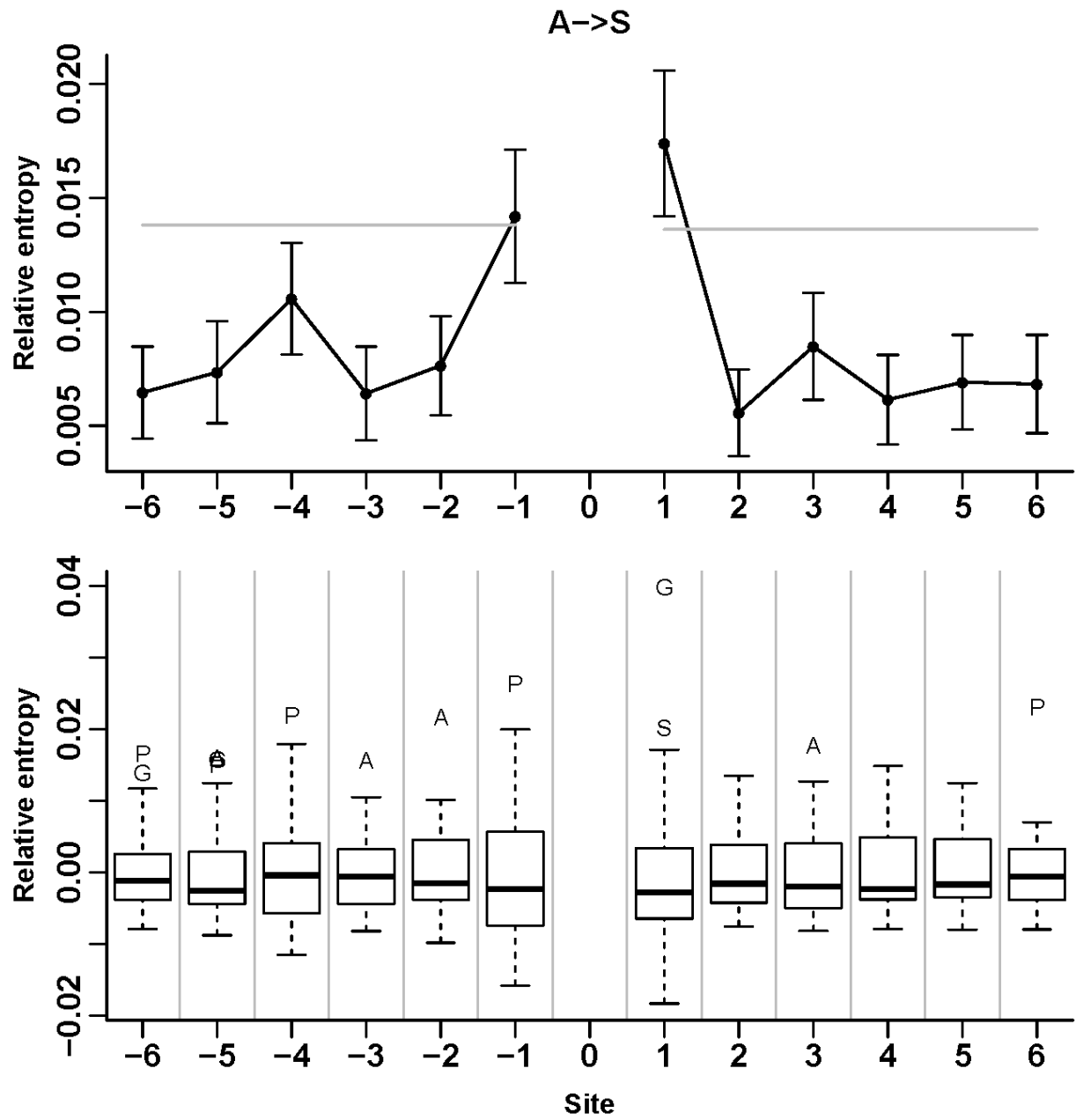


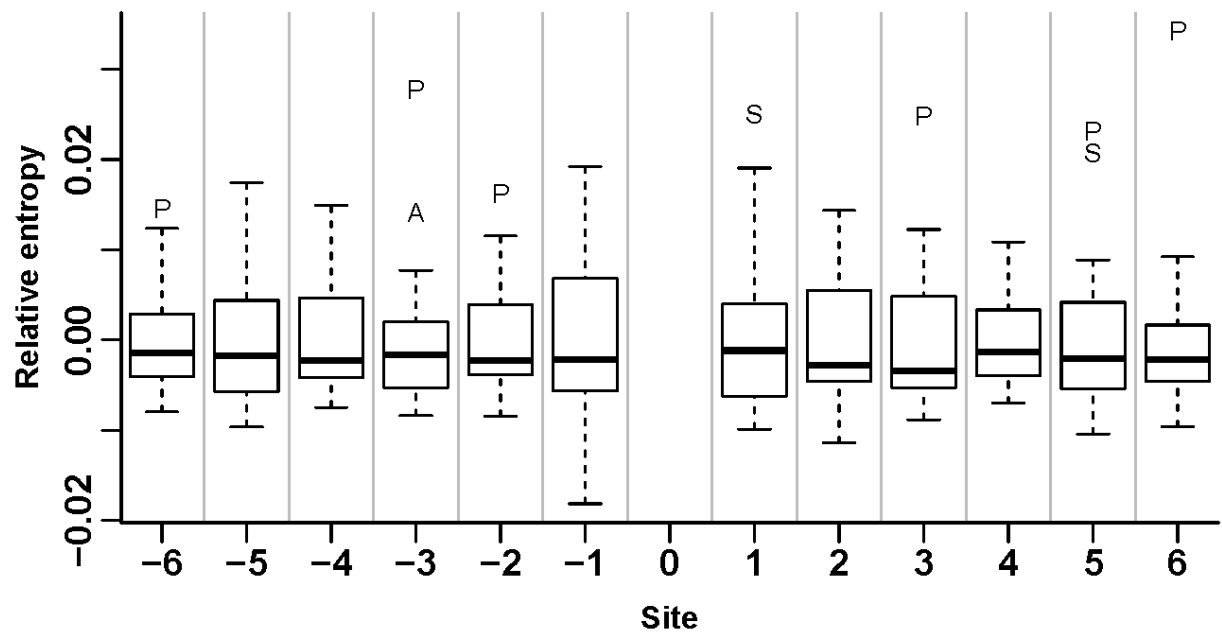
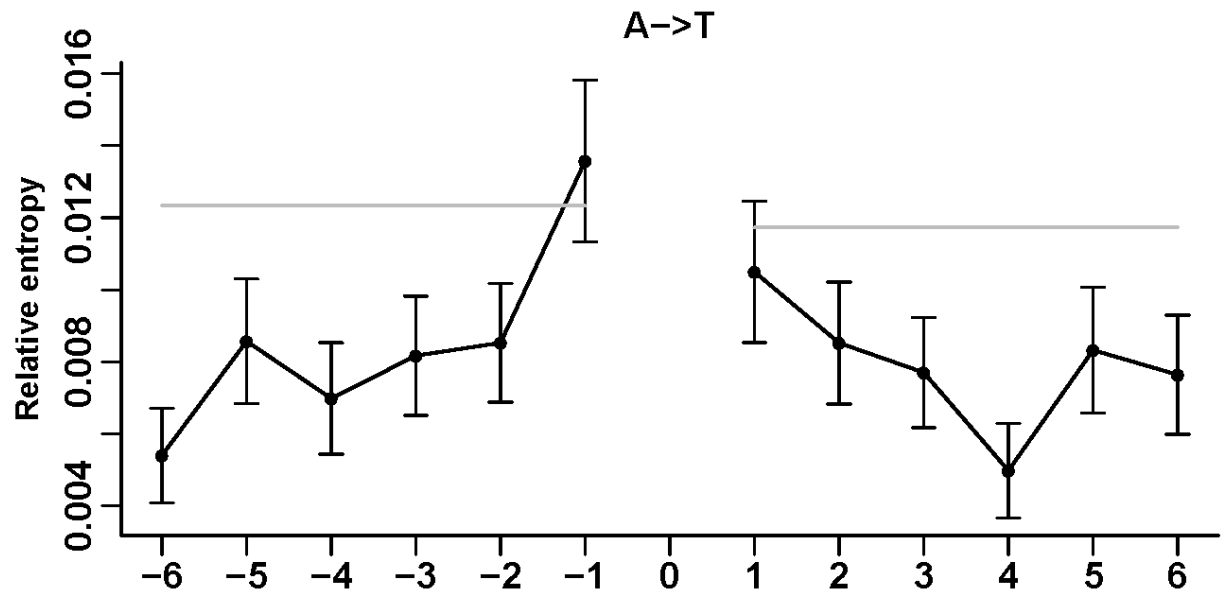


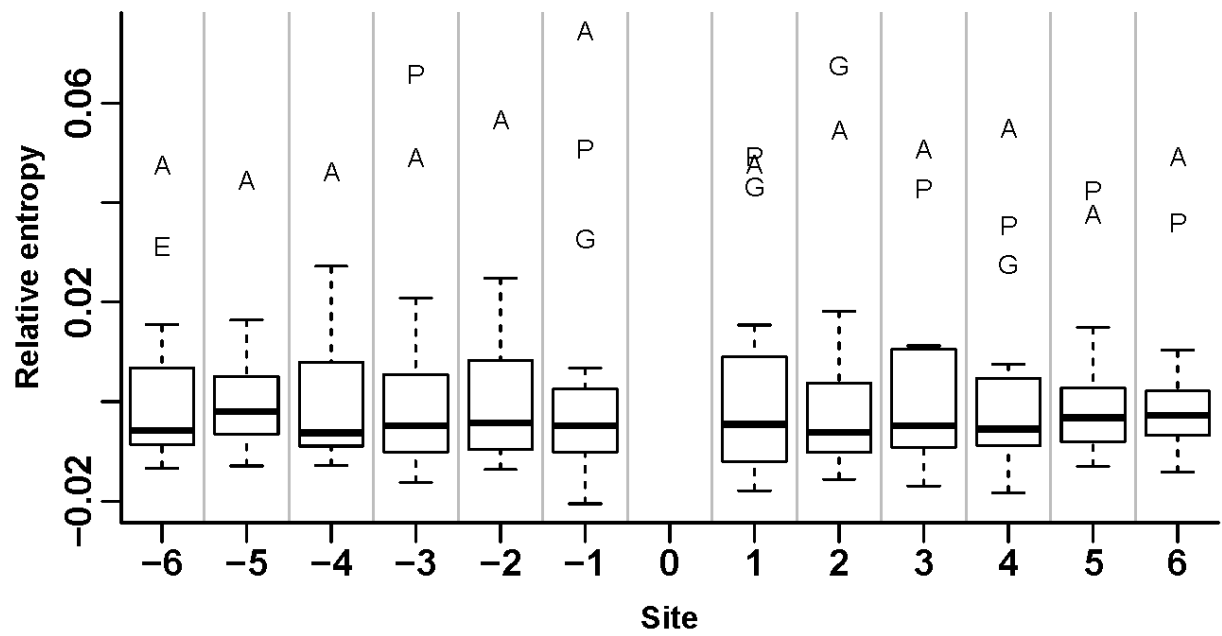
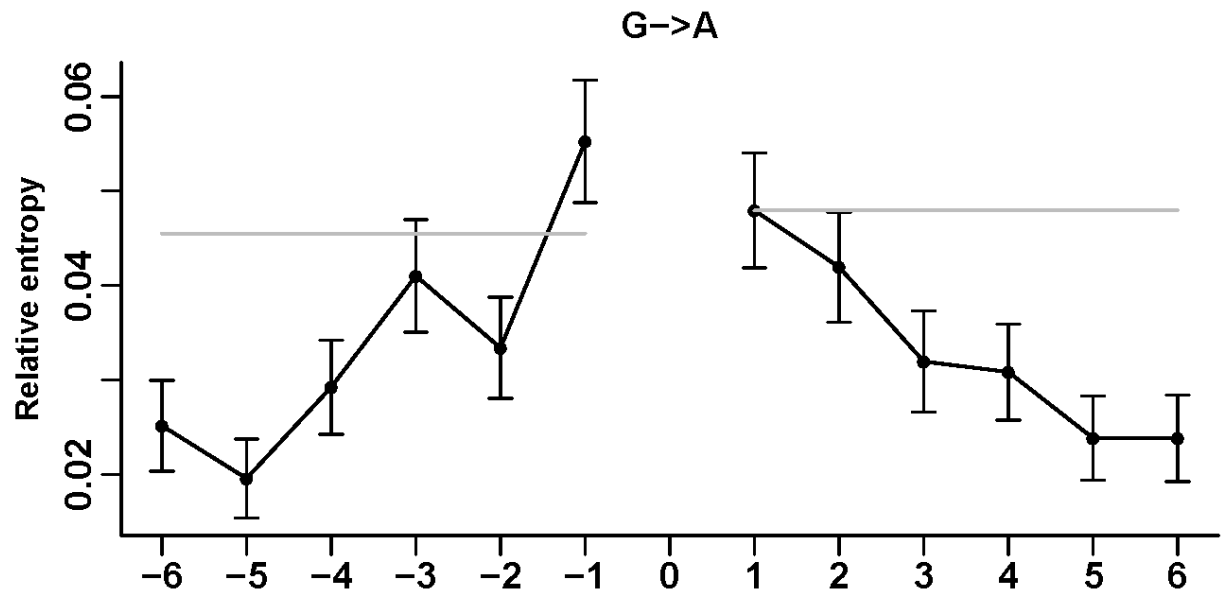
**Figure S7.** Context-dependence patterns of the amino acid substitutions in coil.

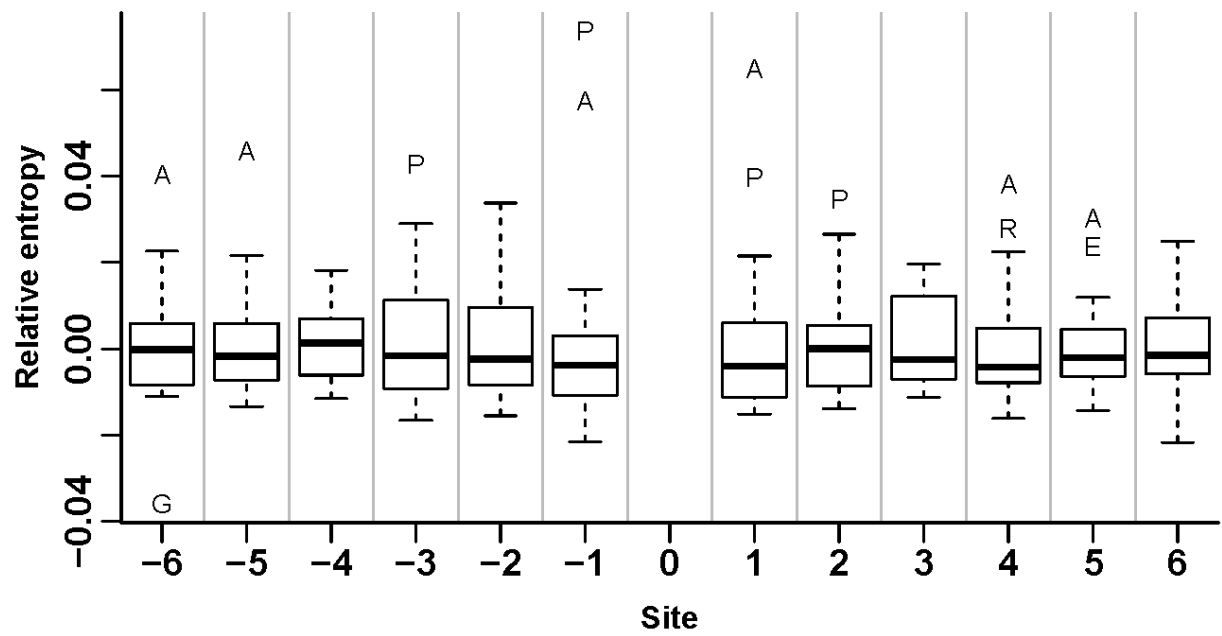
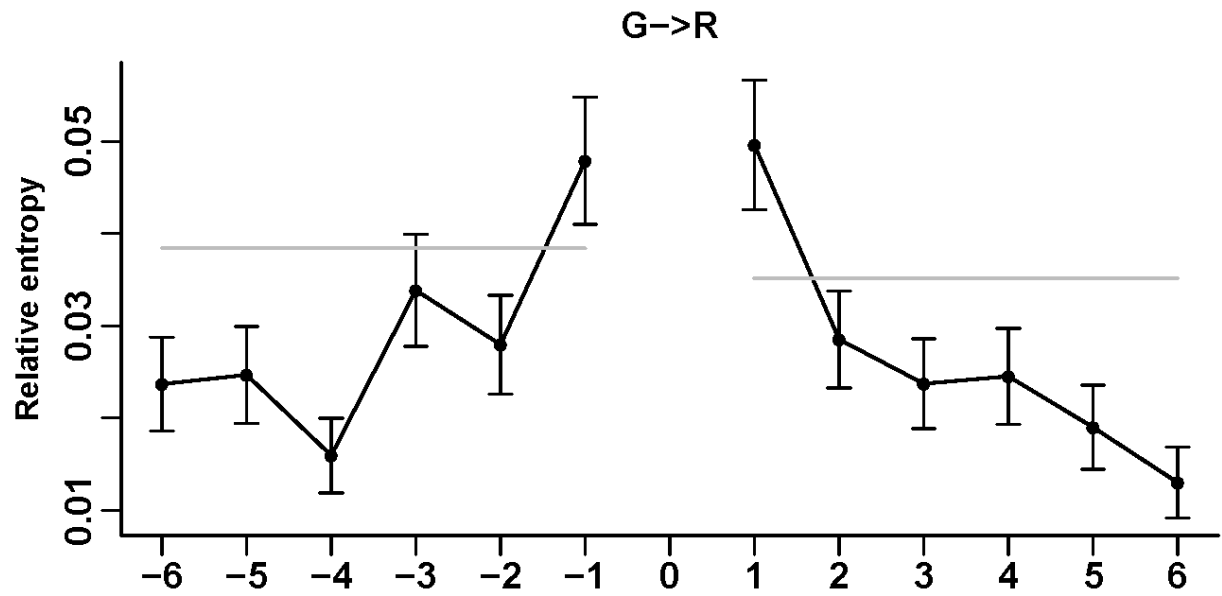


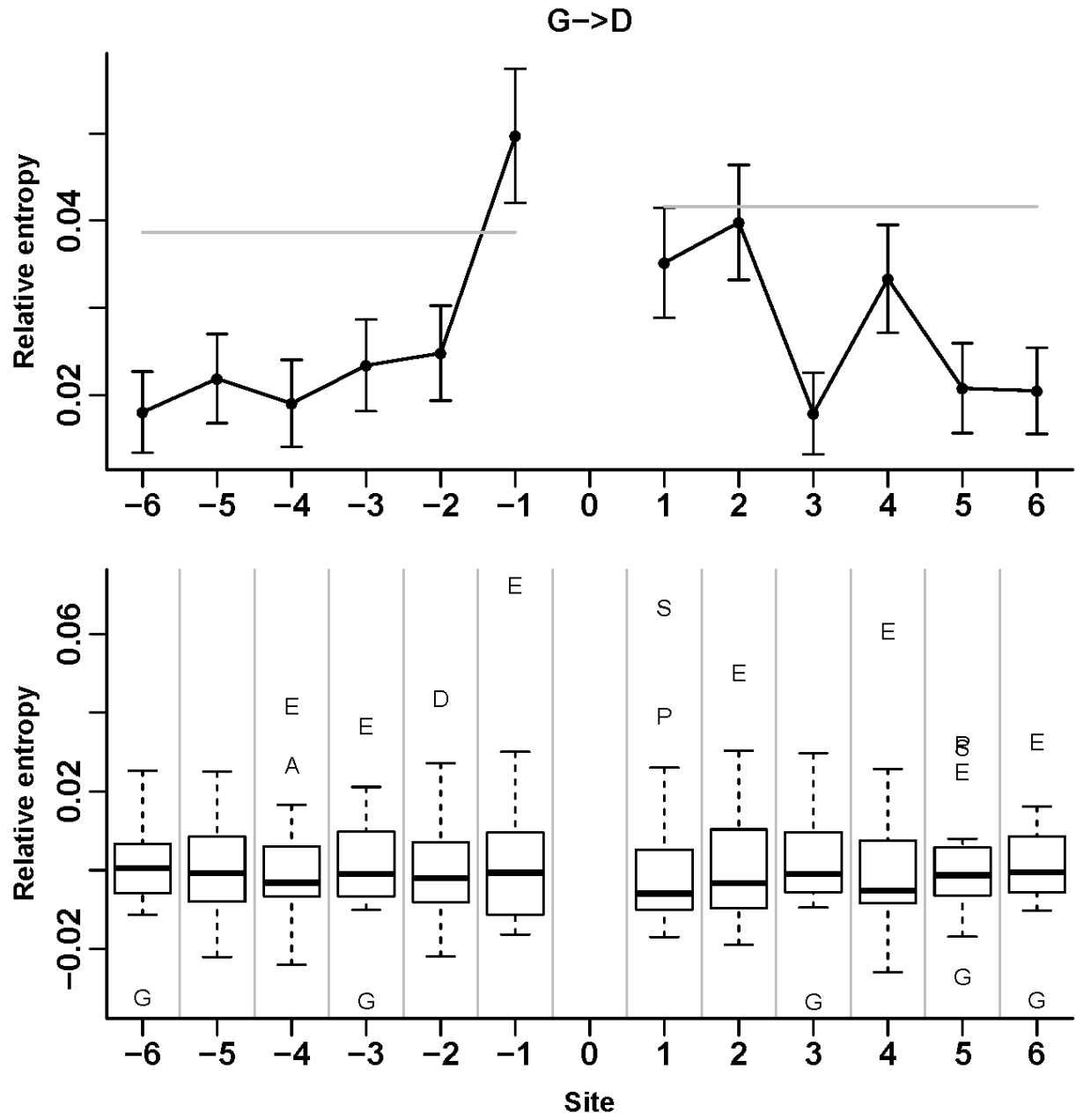


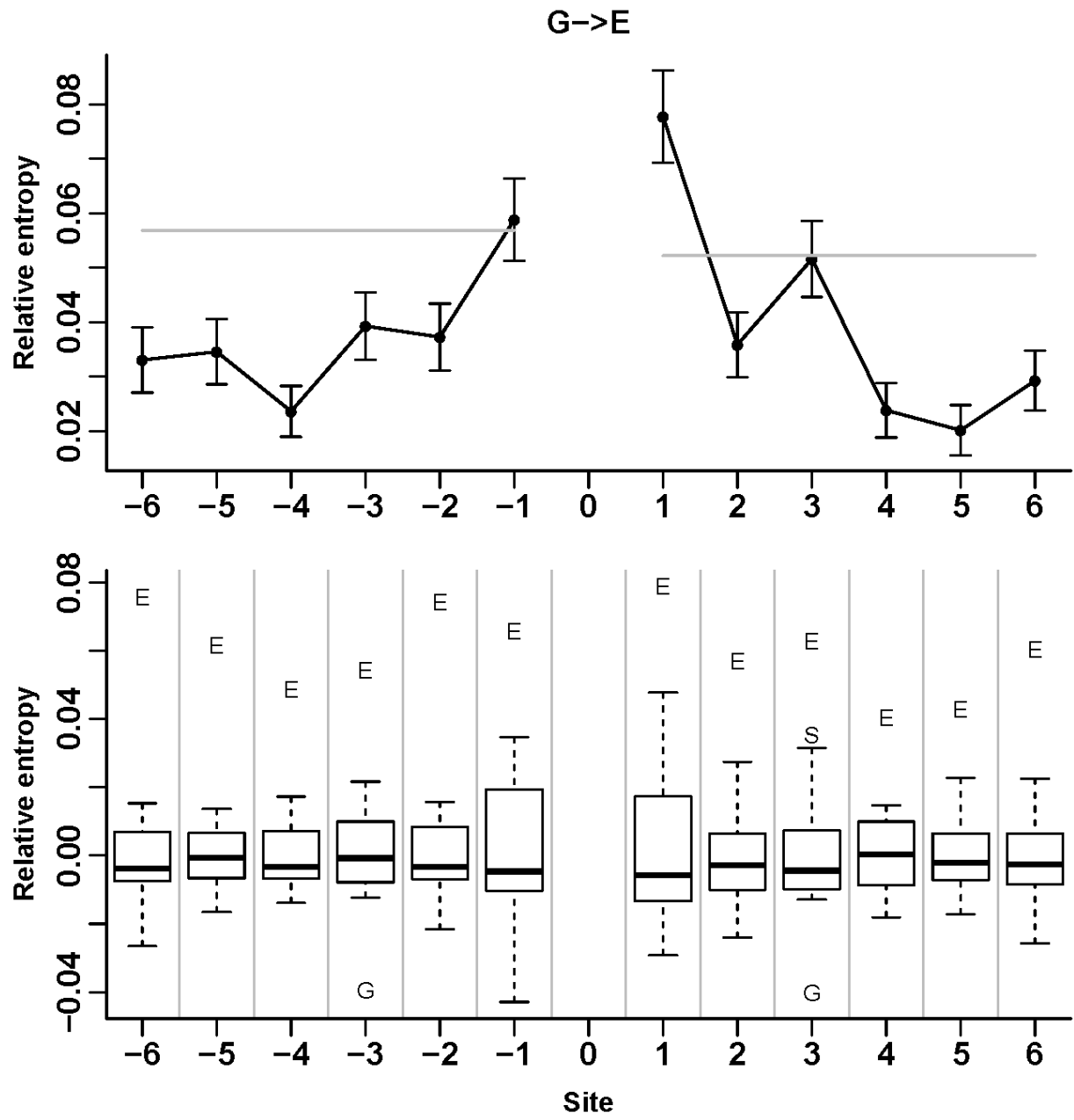


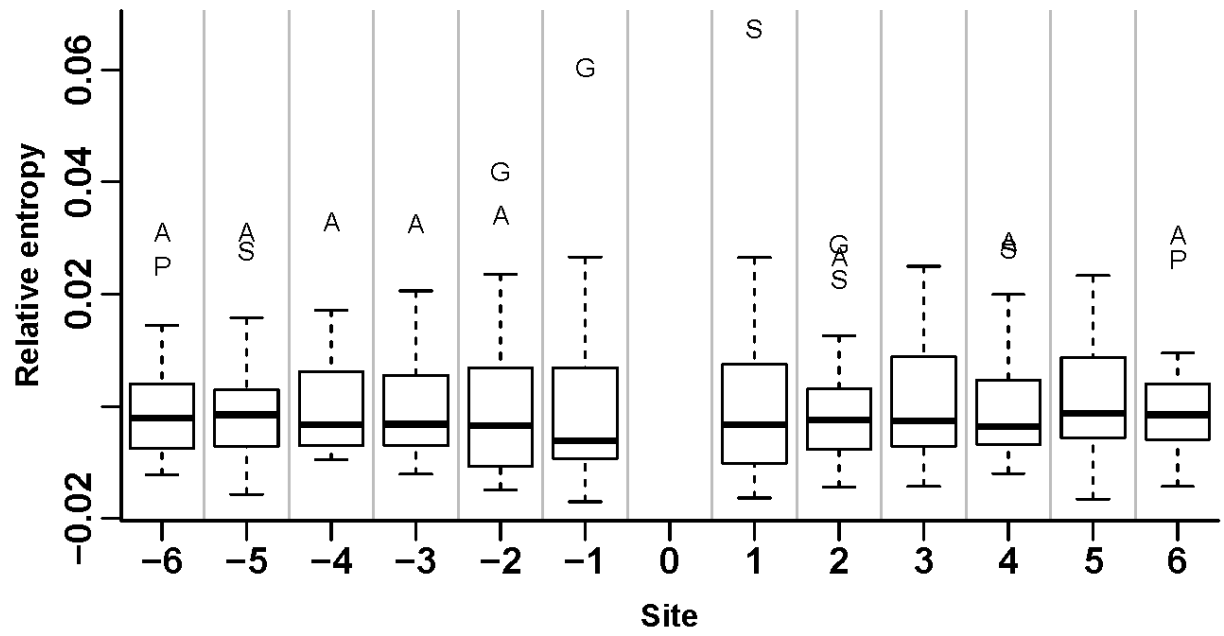
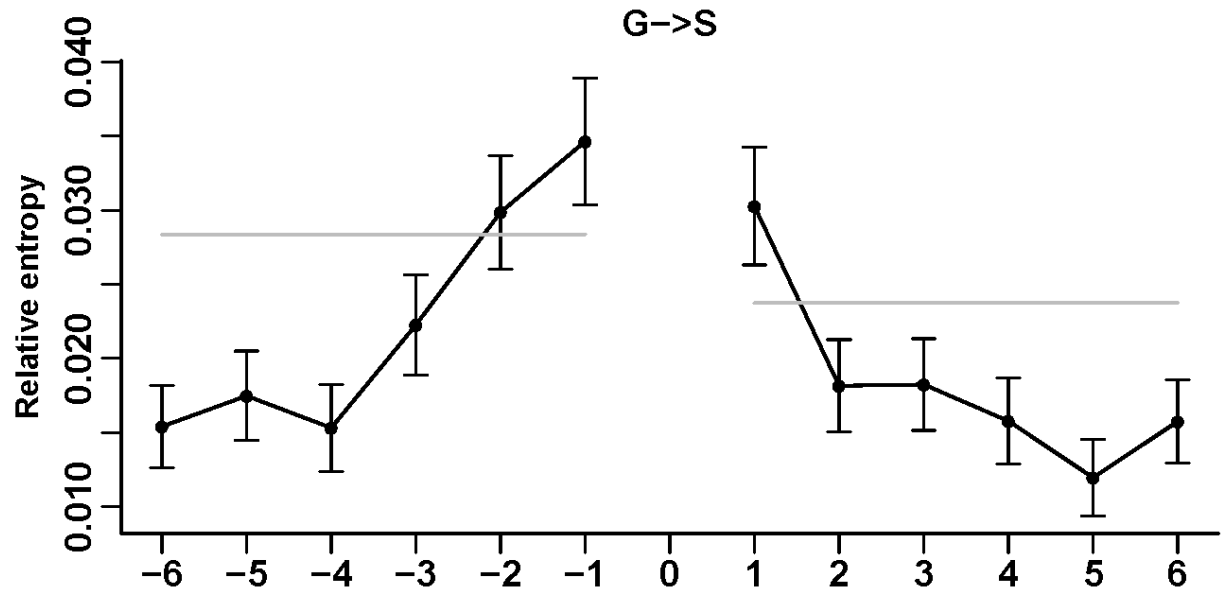


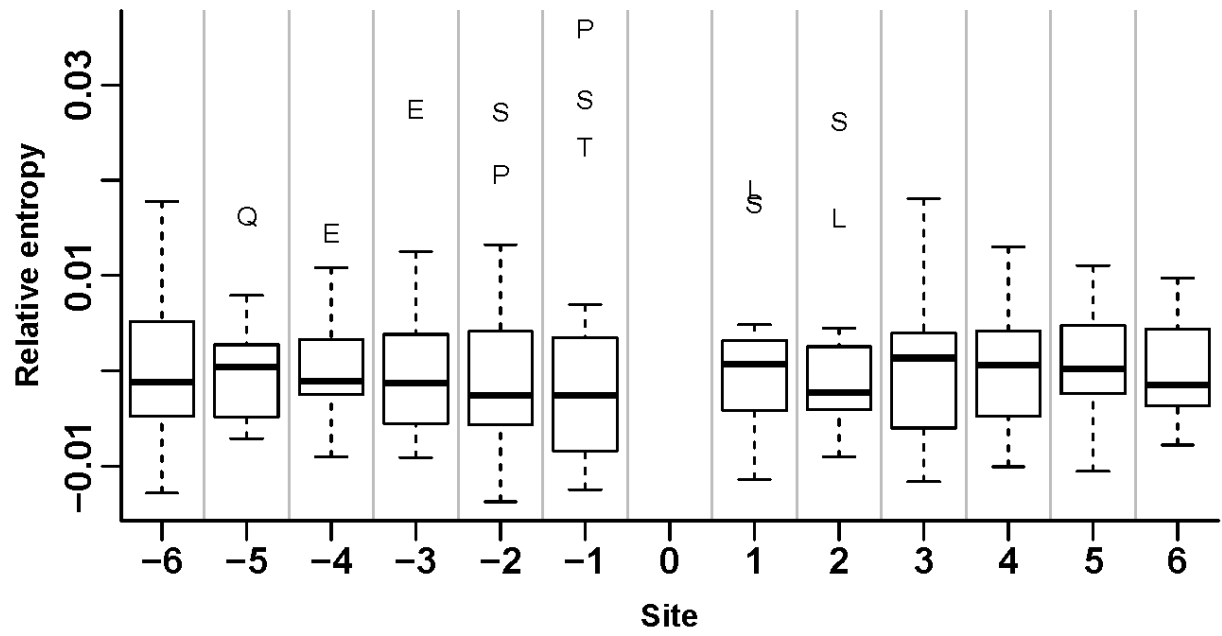
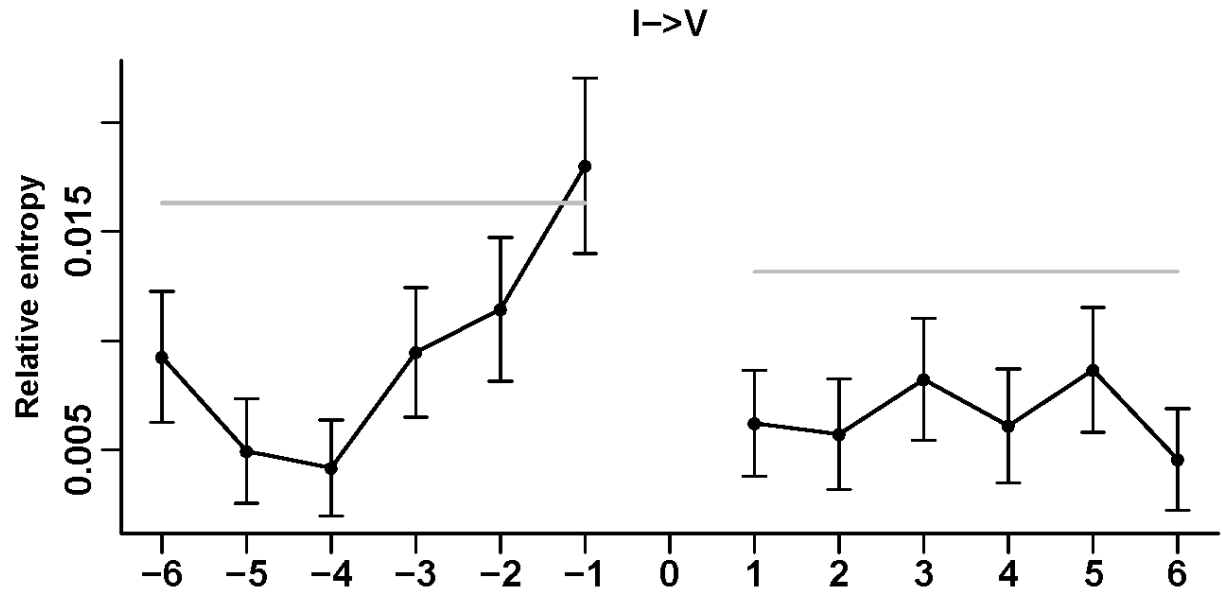


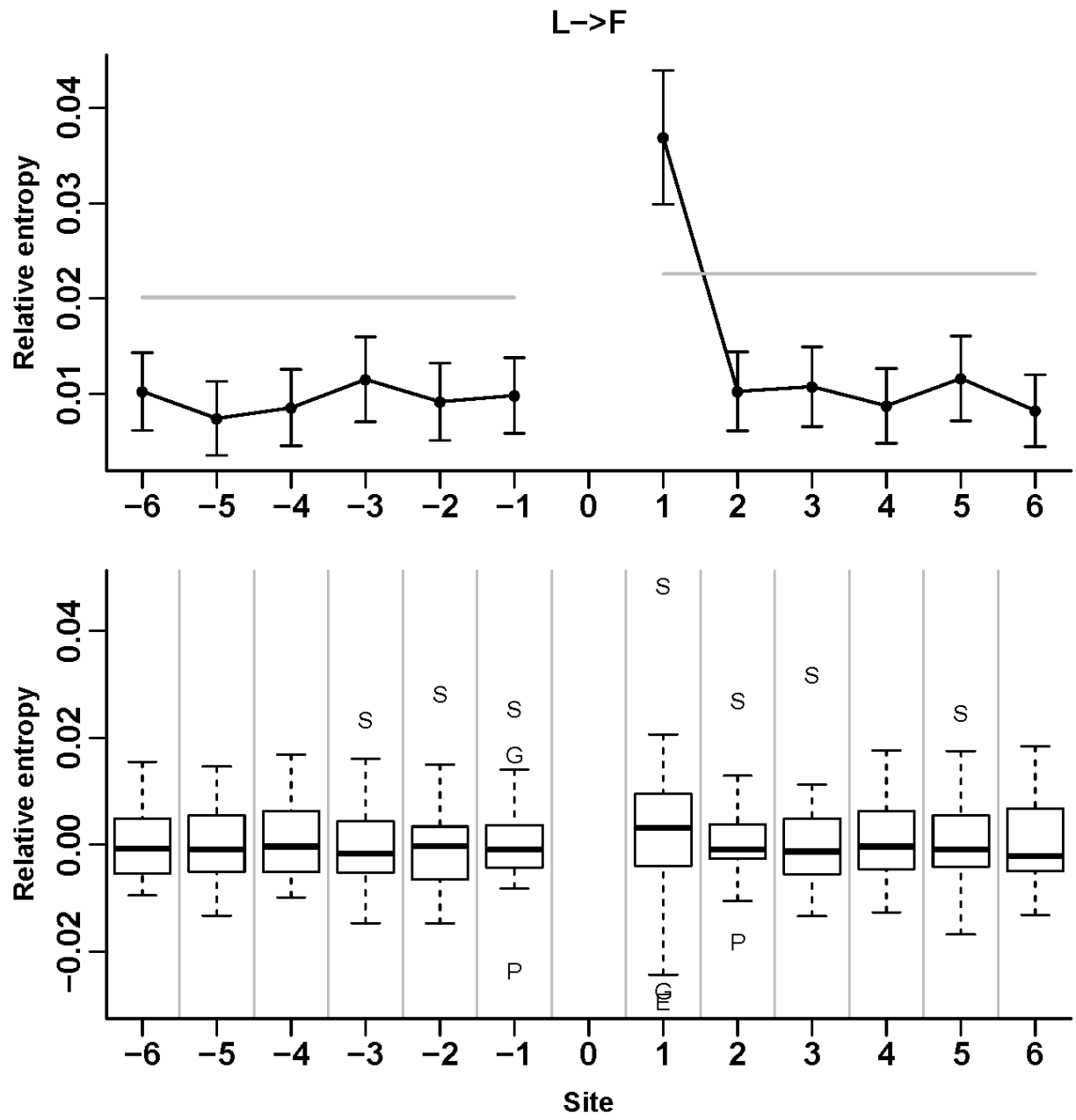


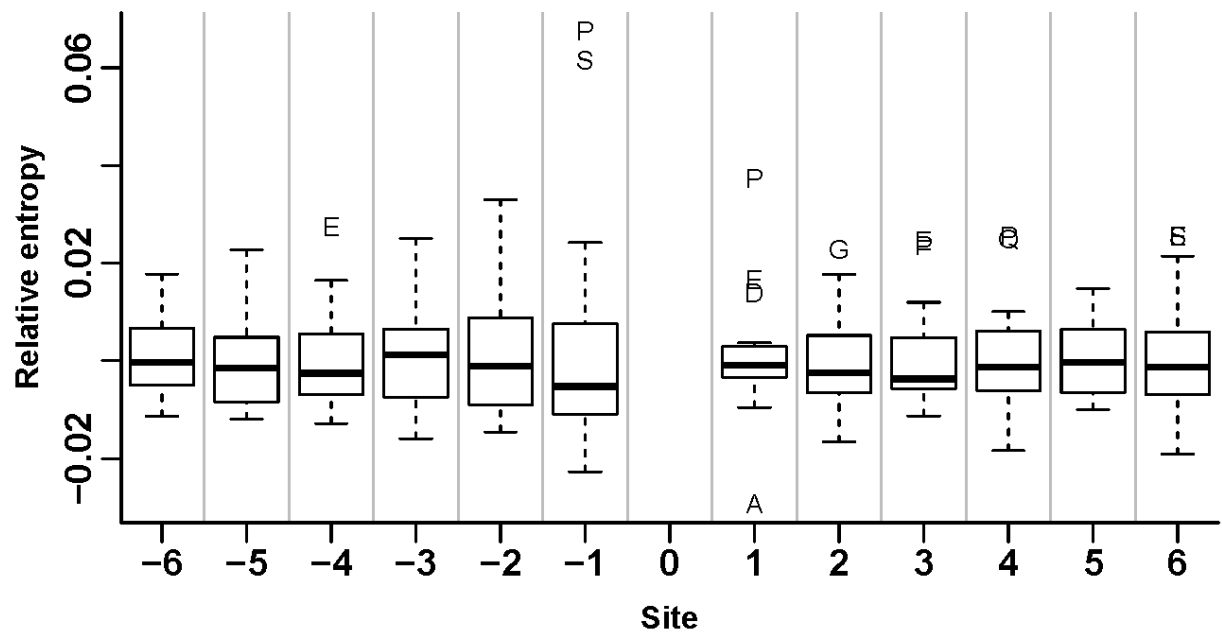
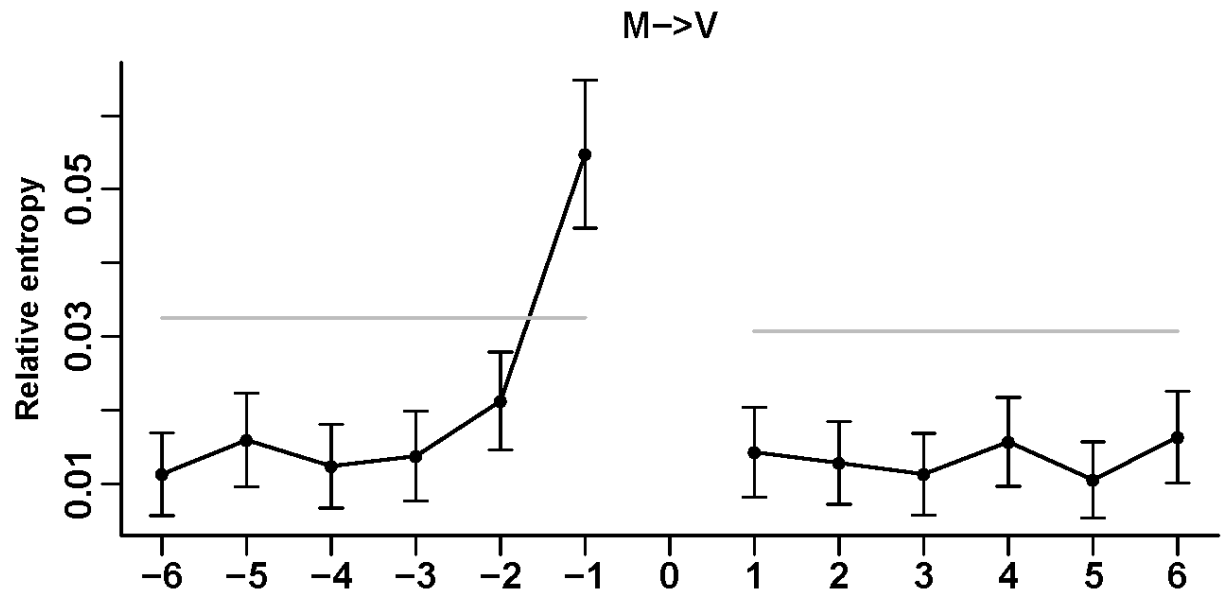


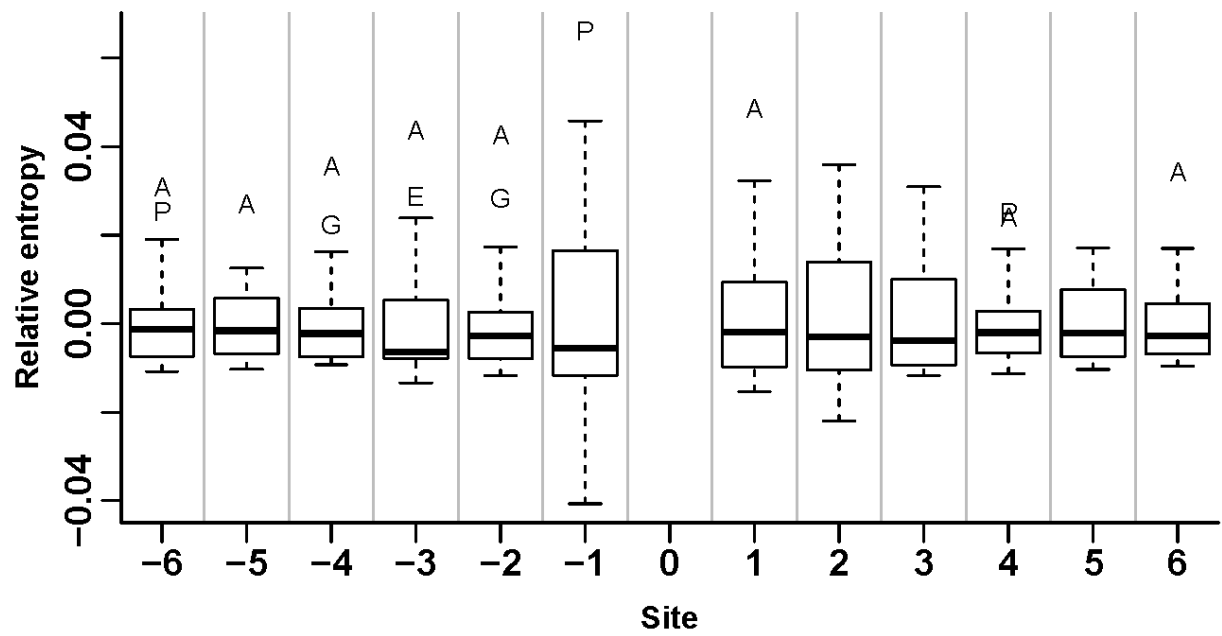
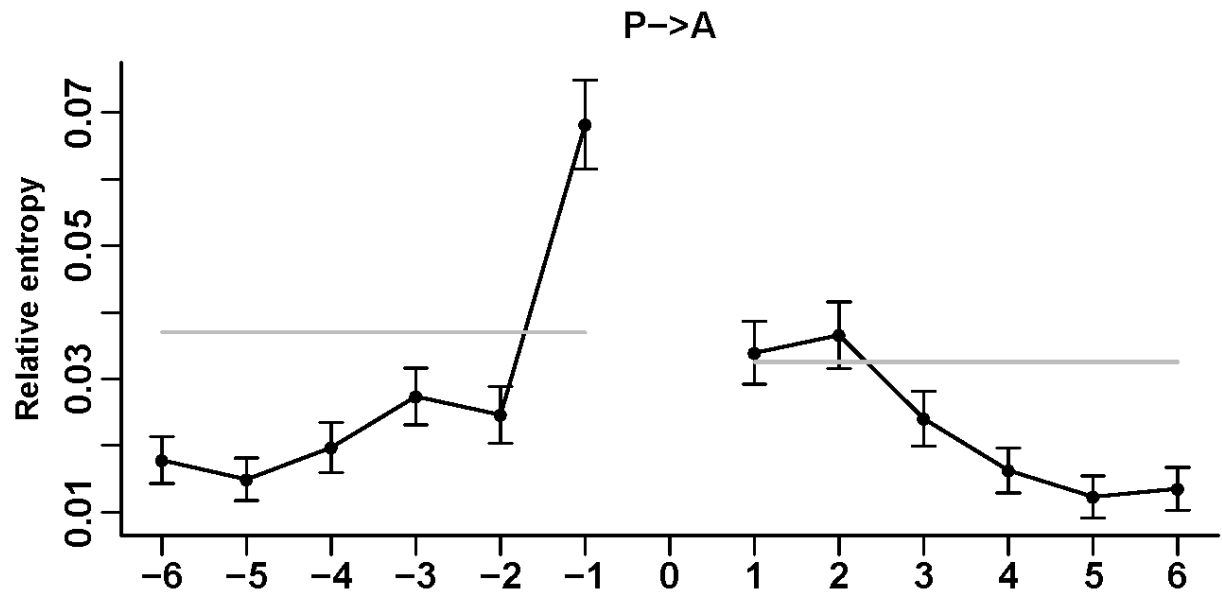


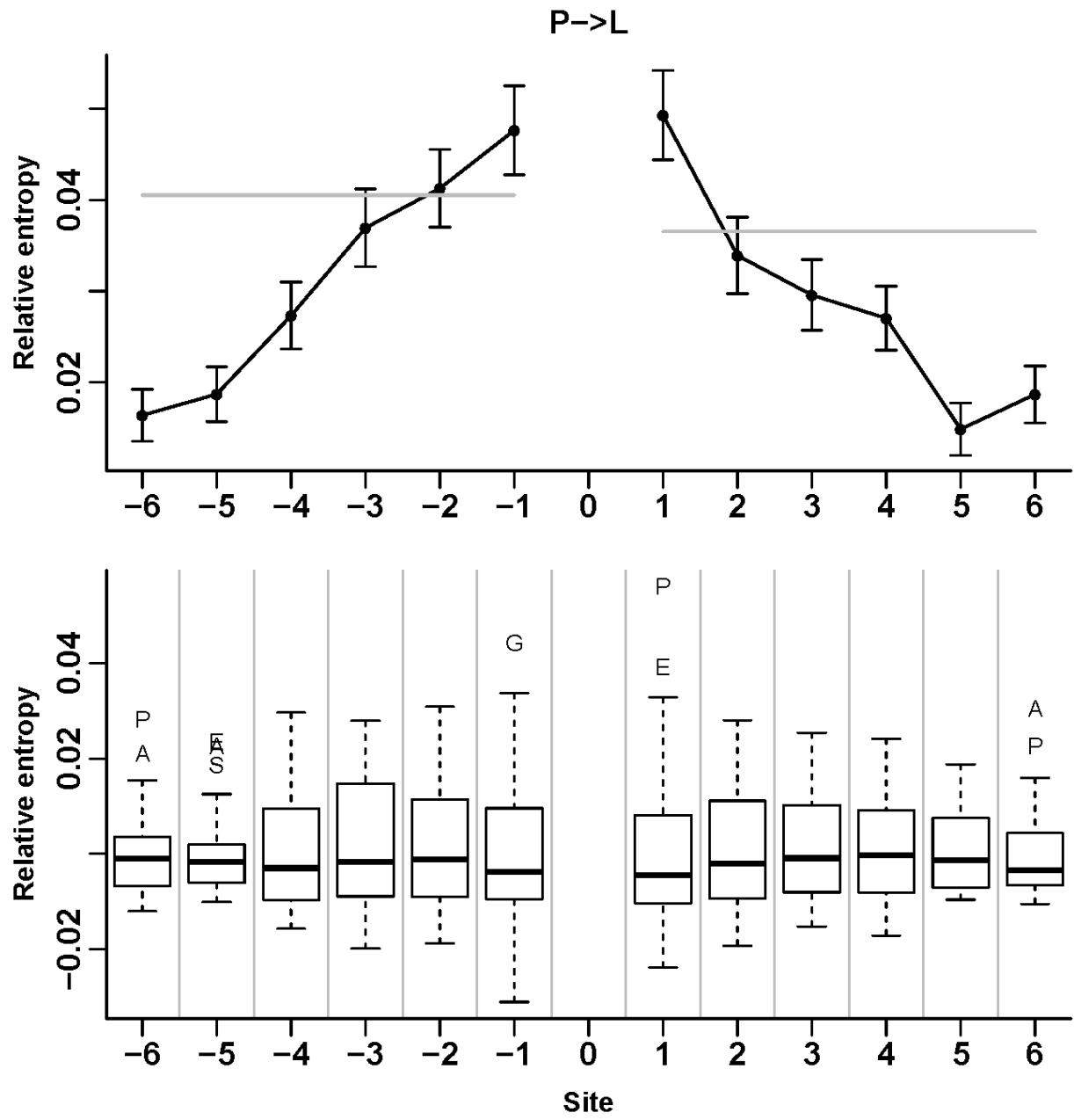


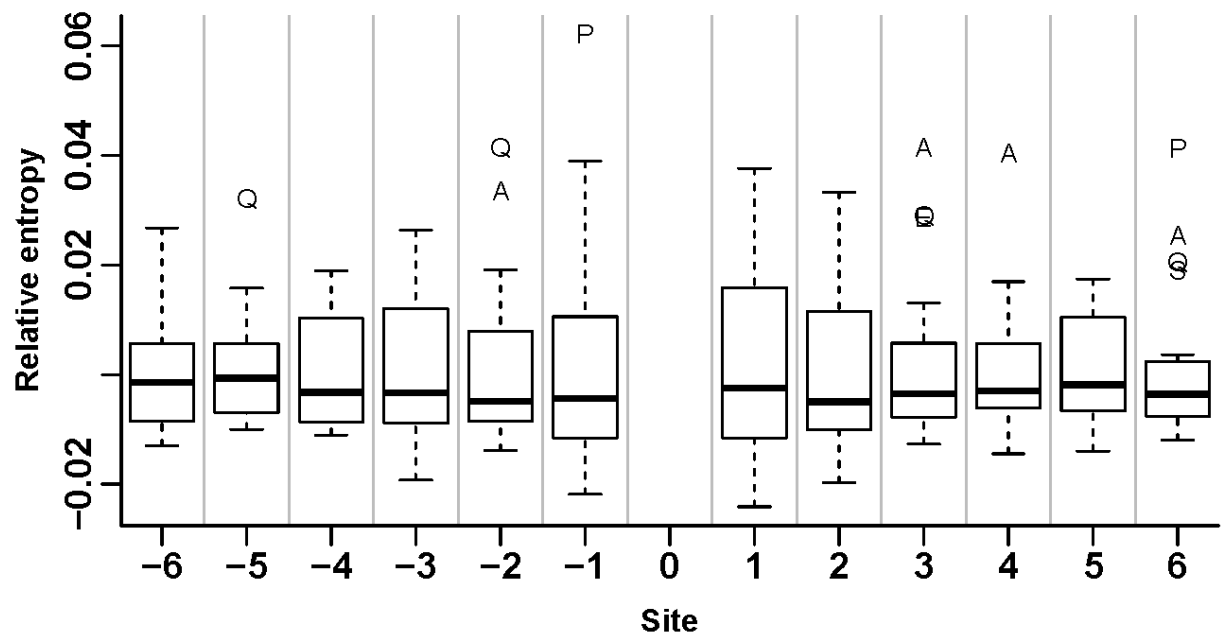
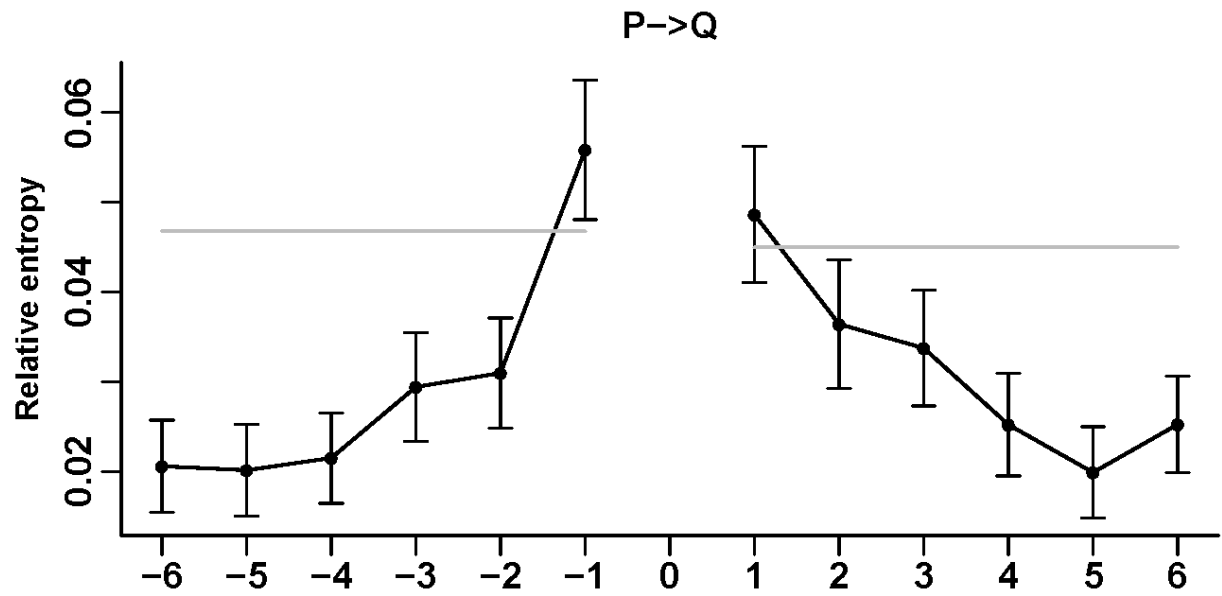


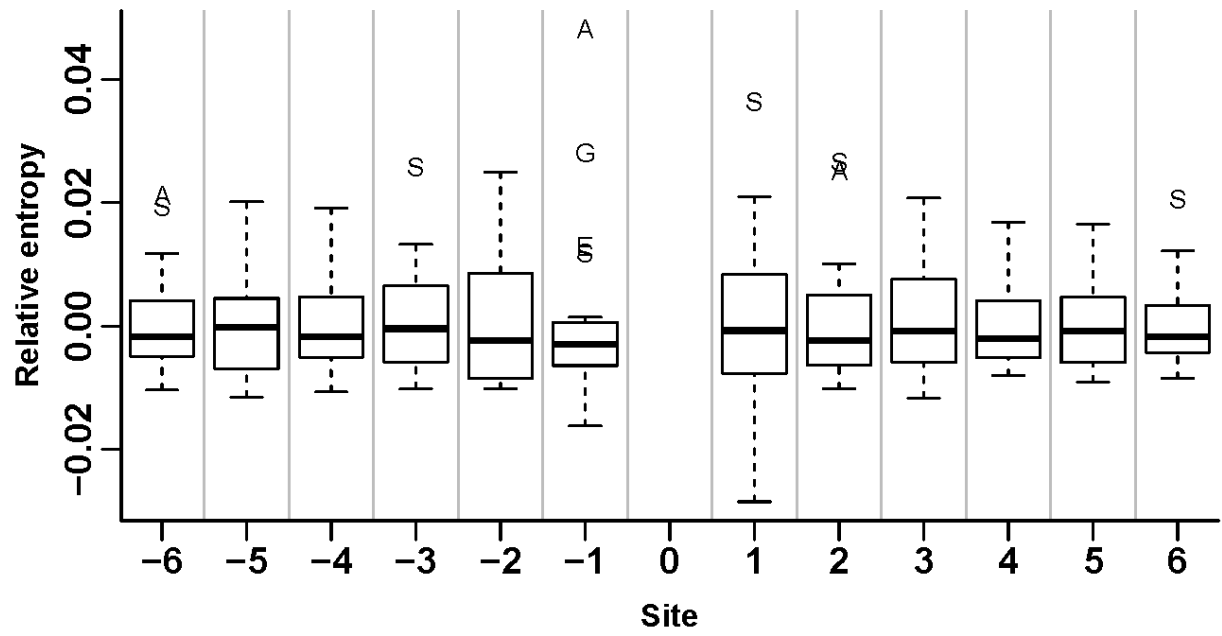
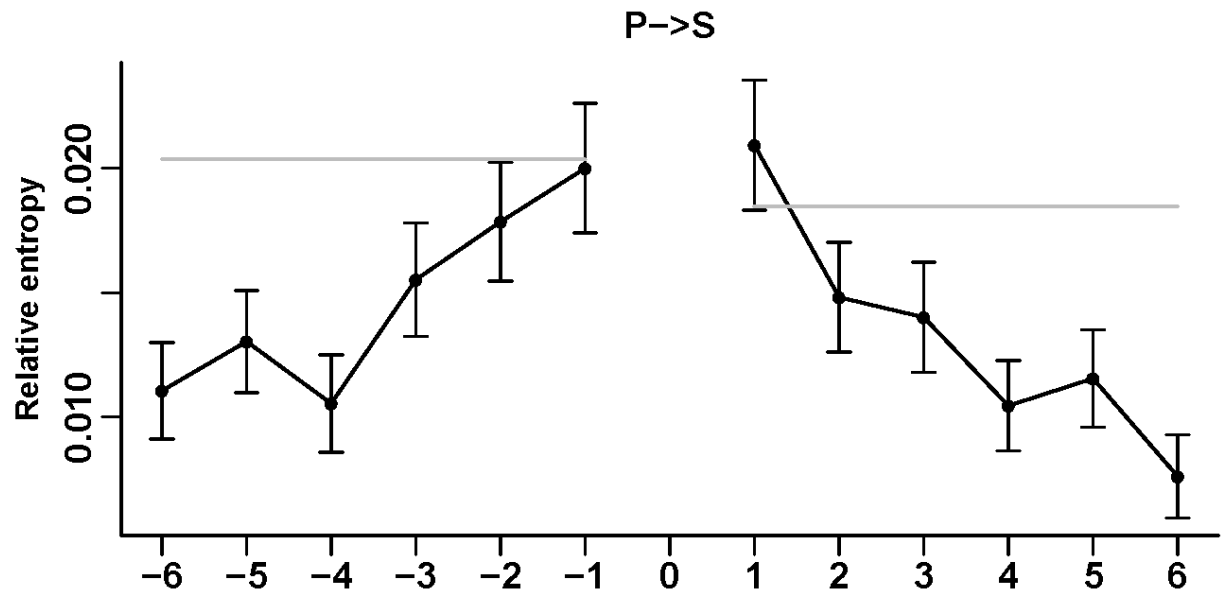


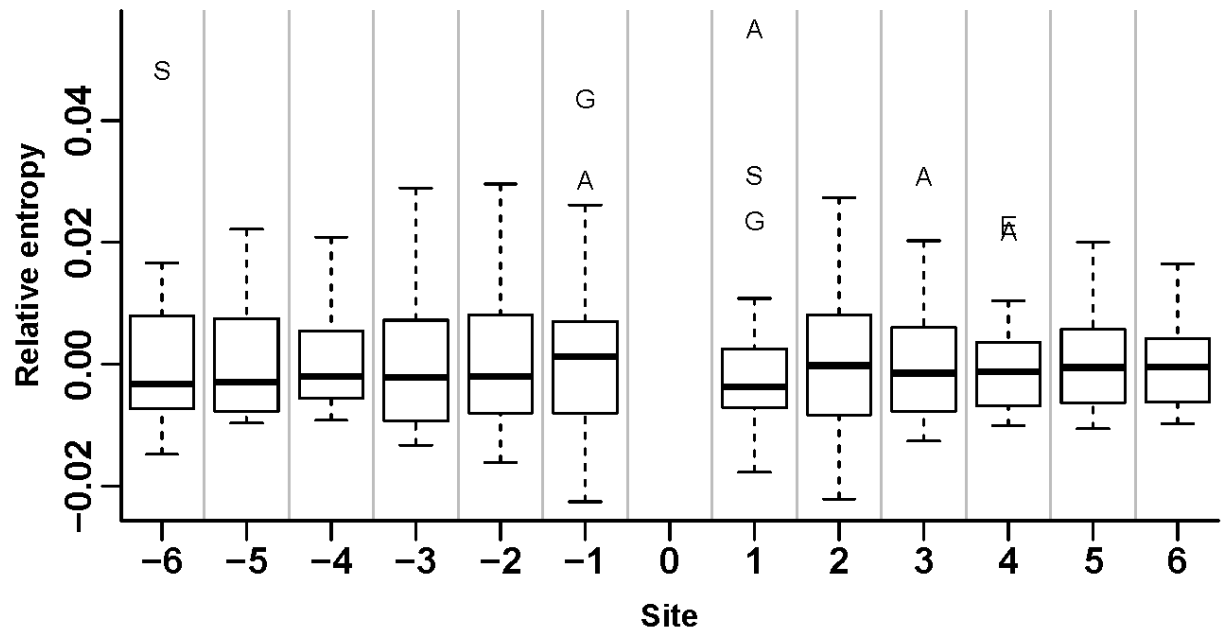
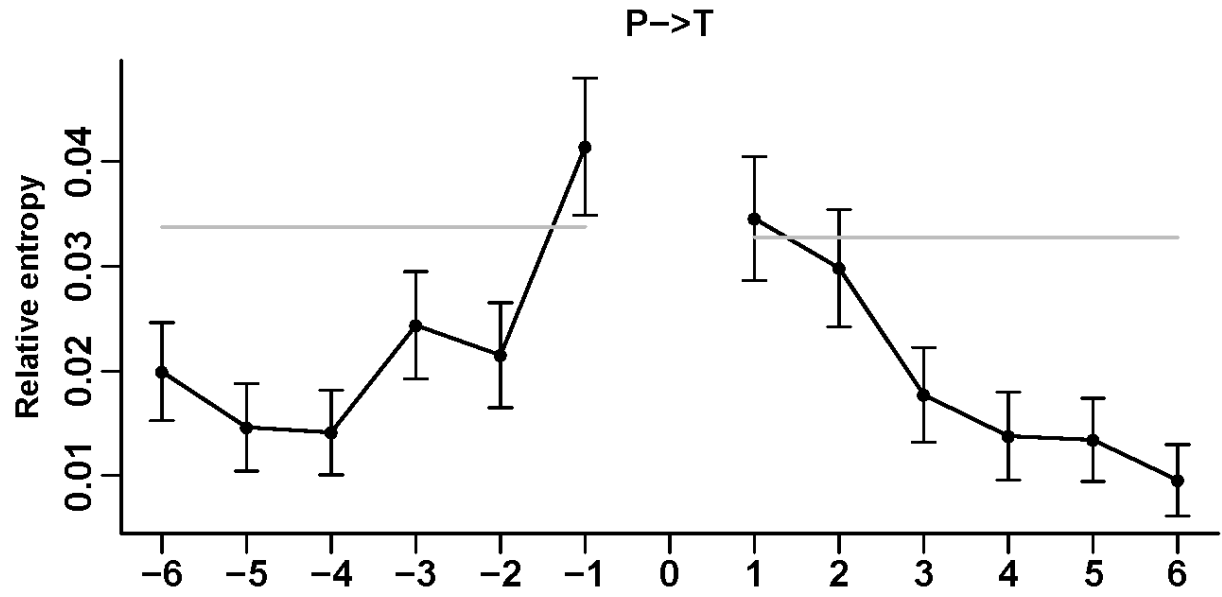


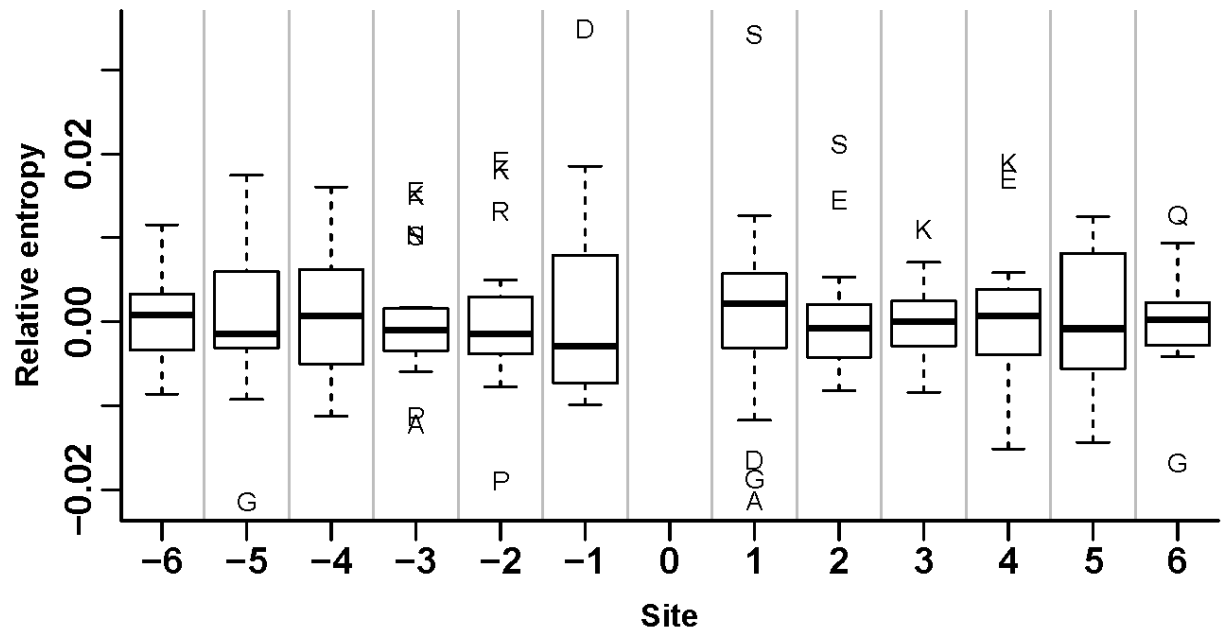
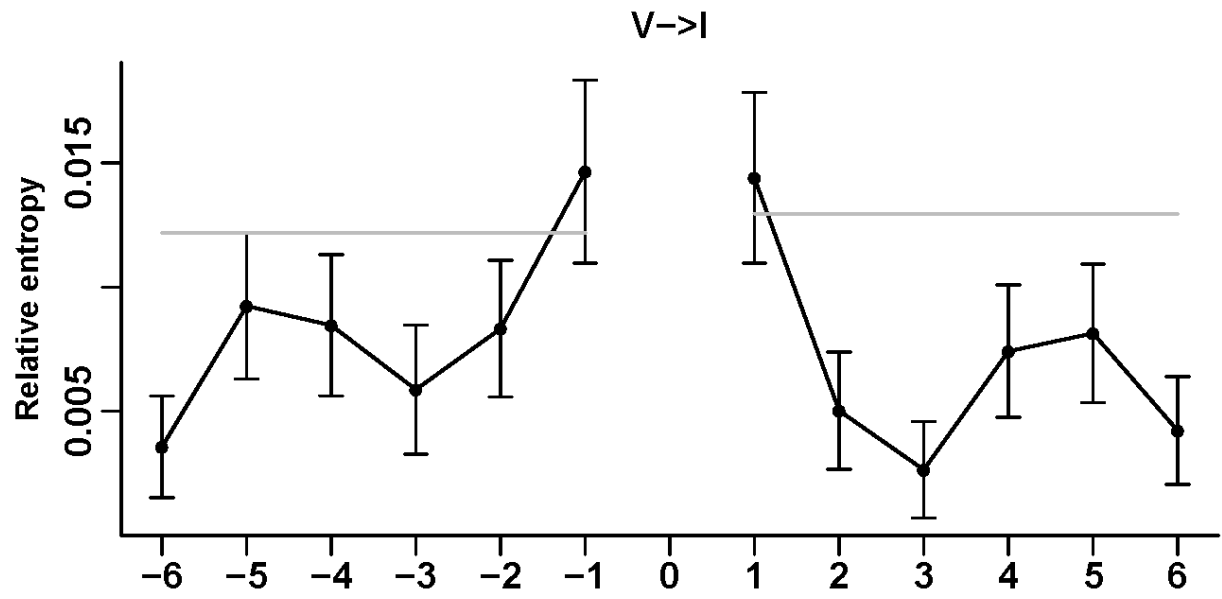


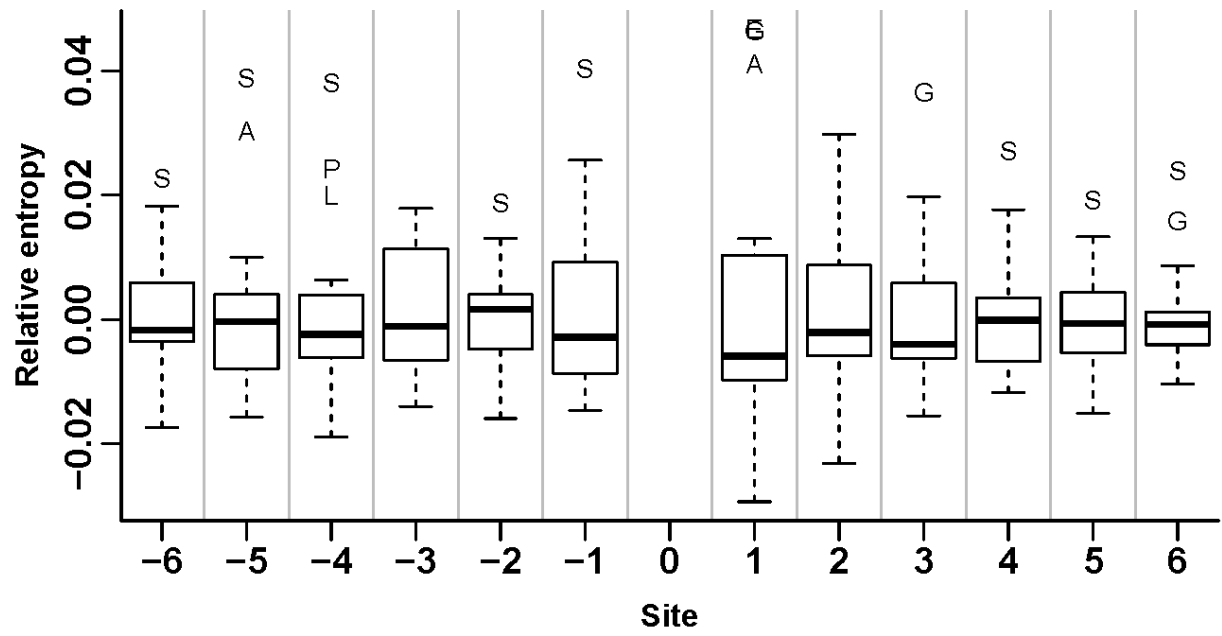
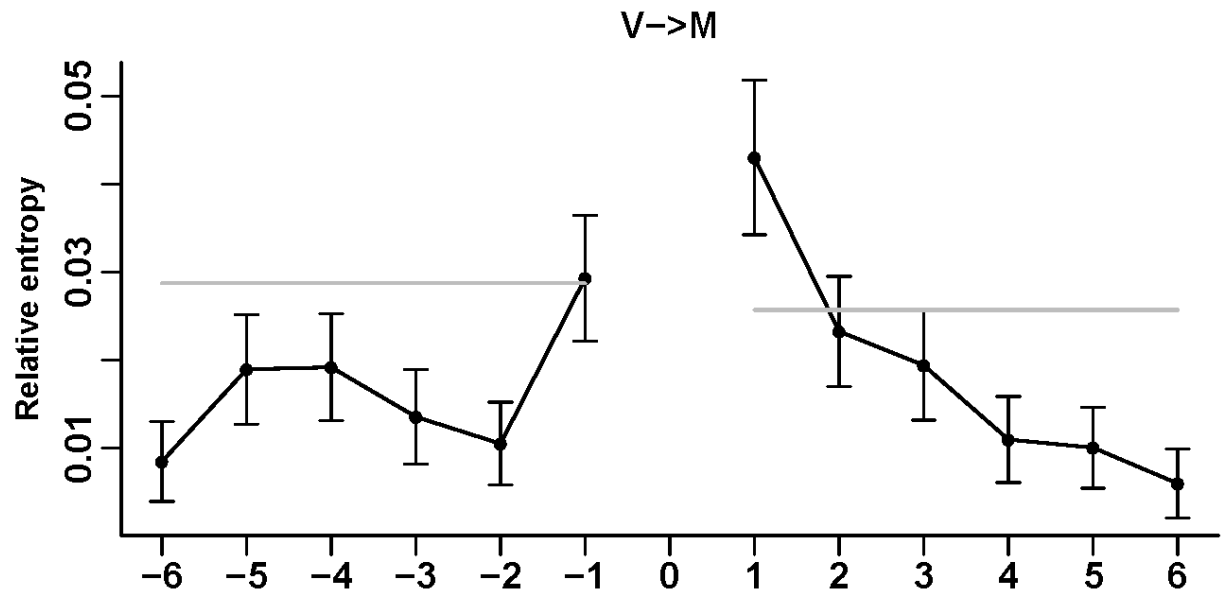


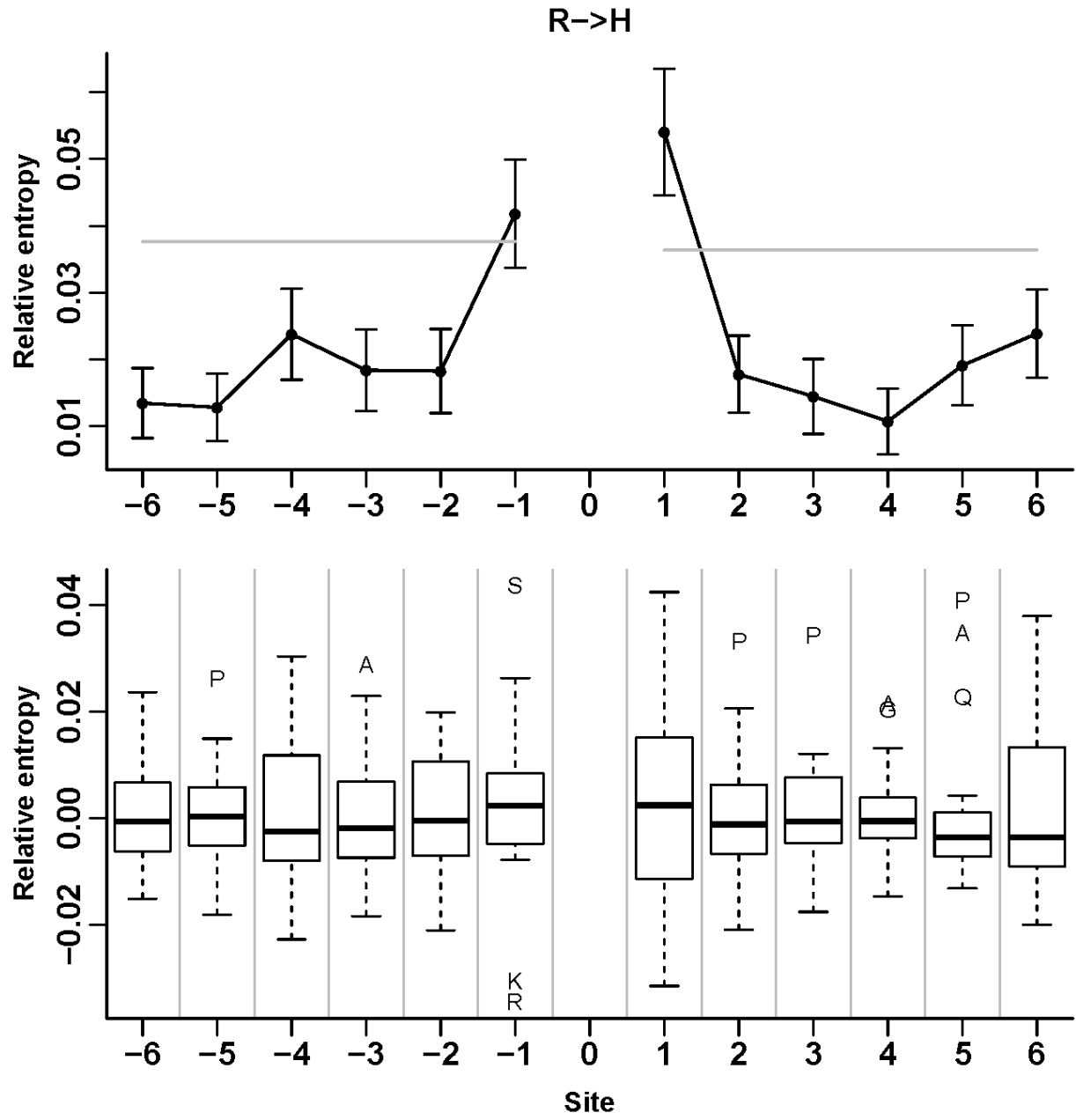


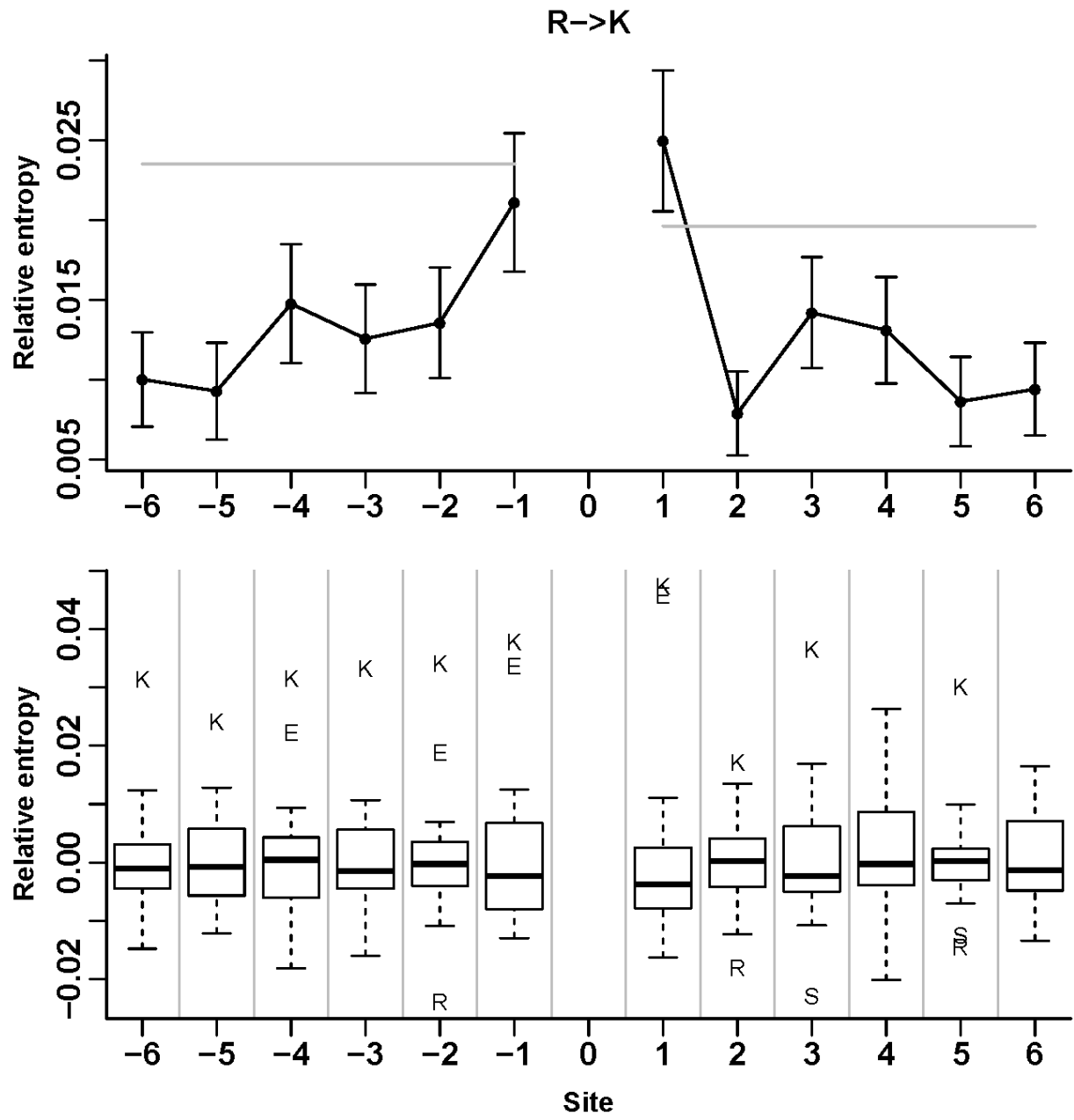


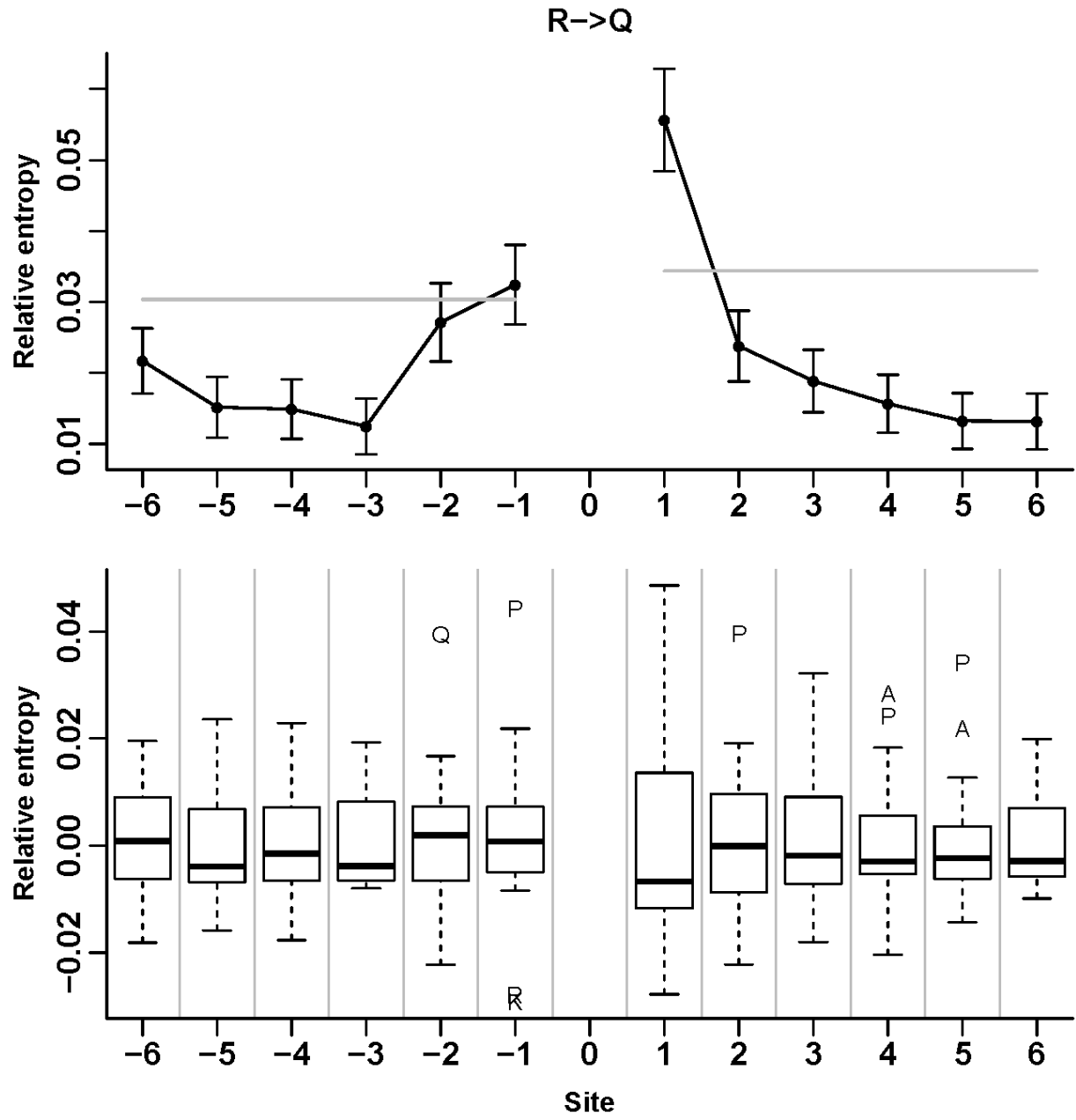


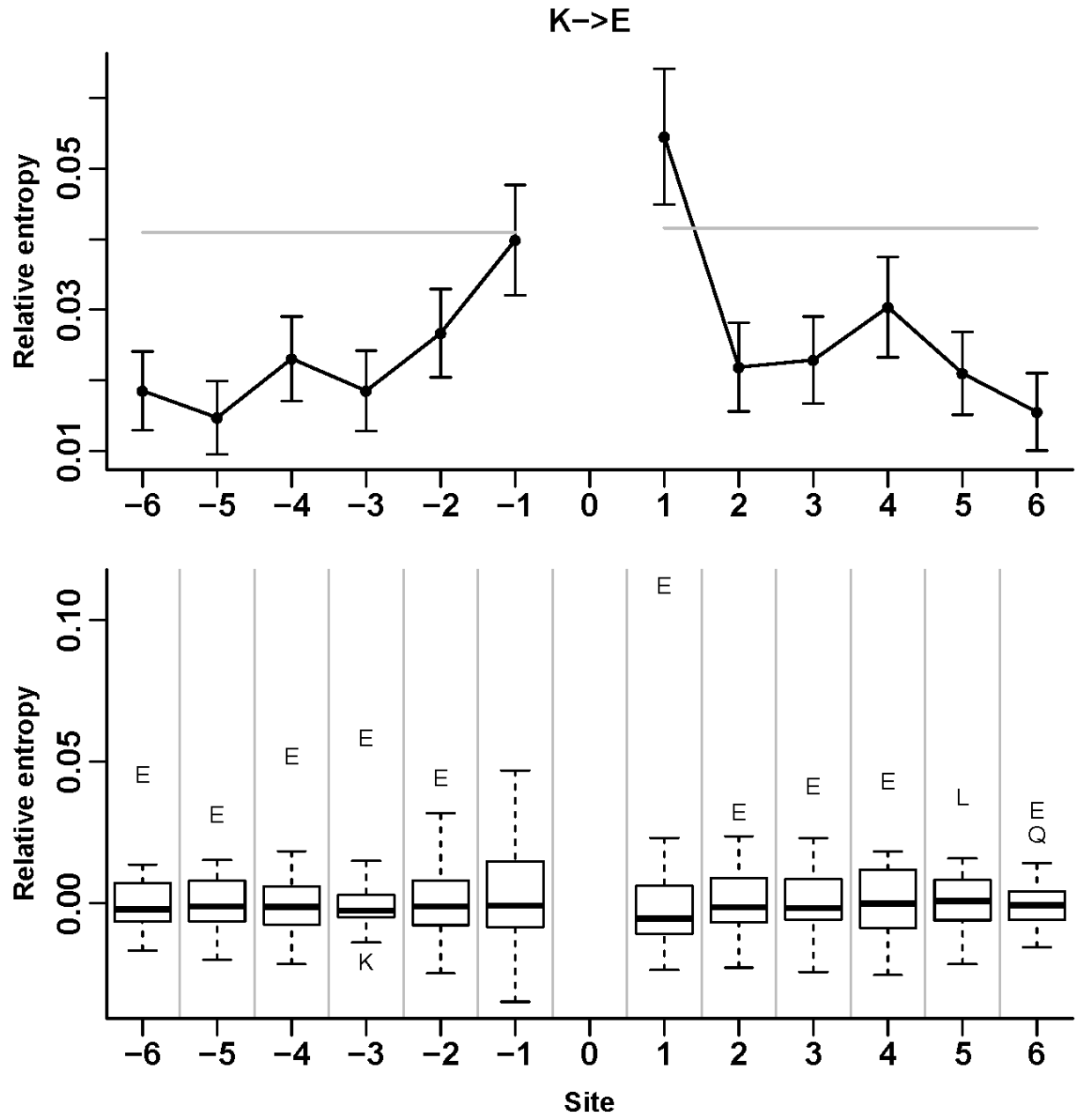


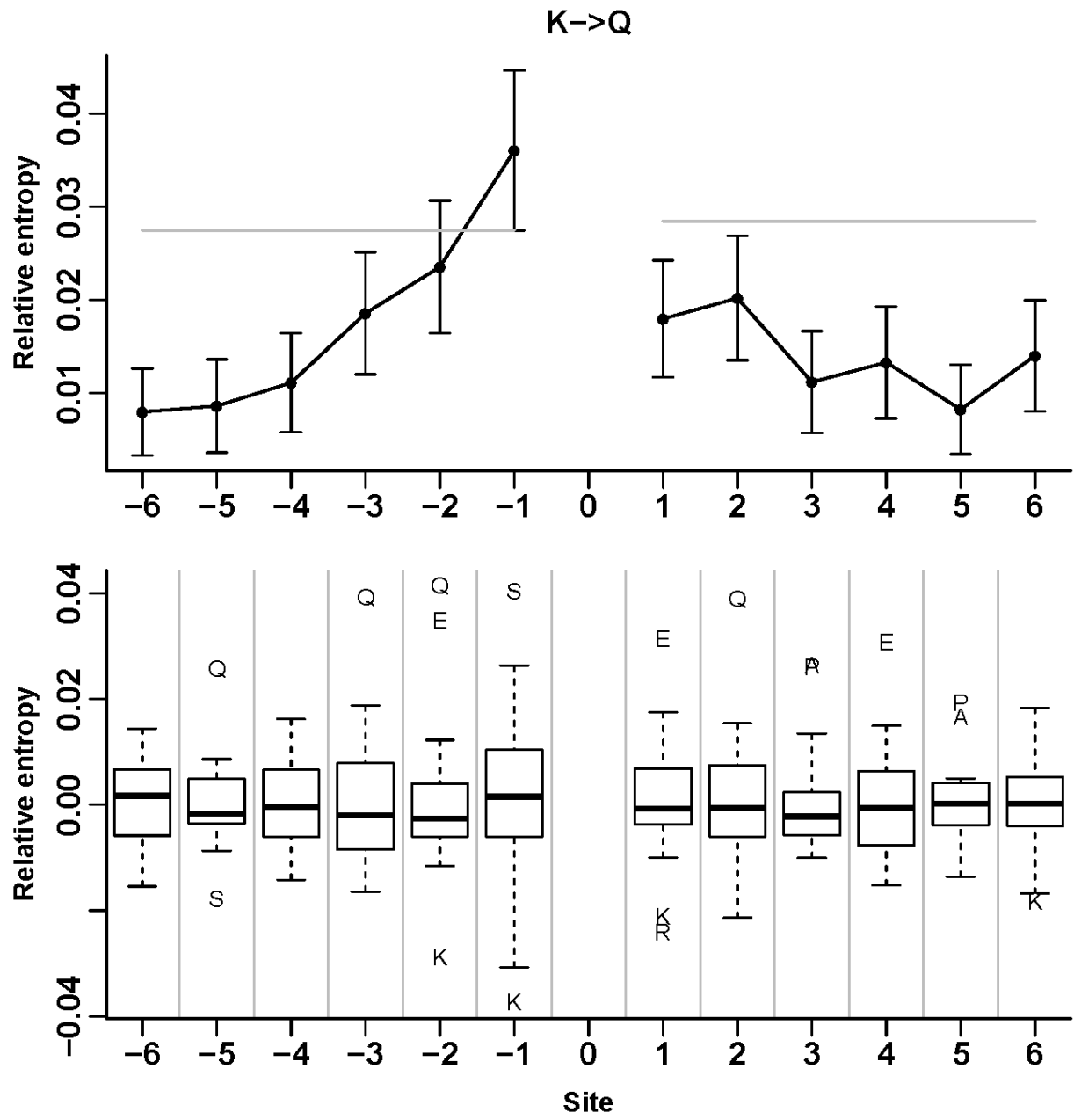


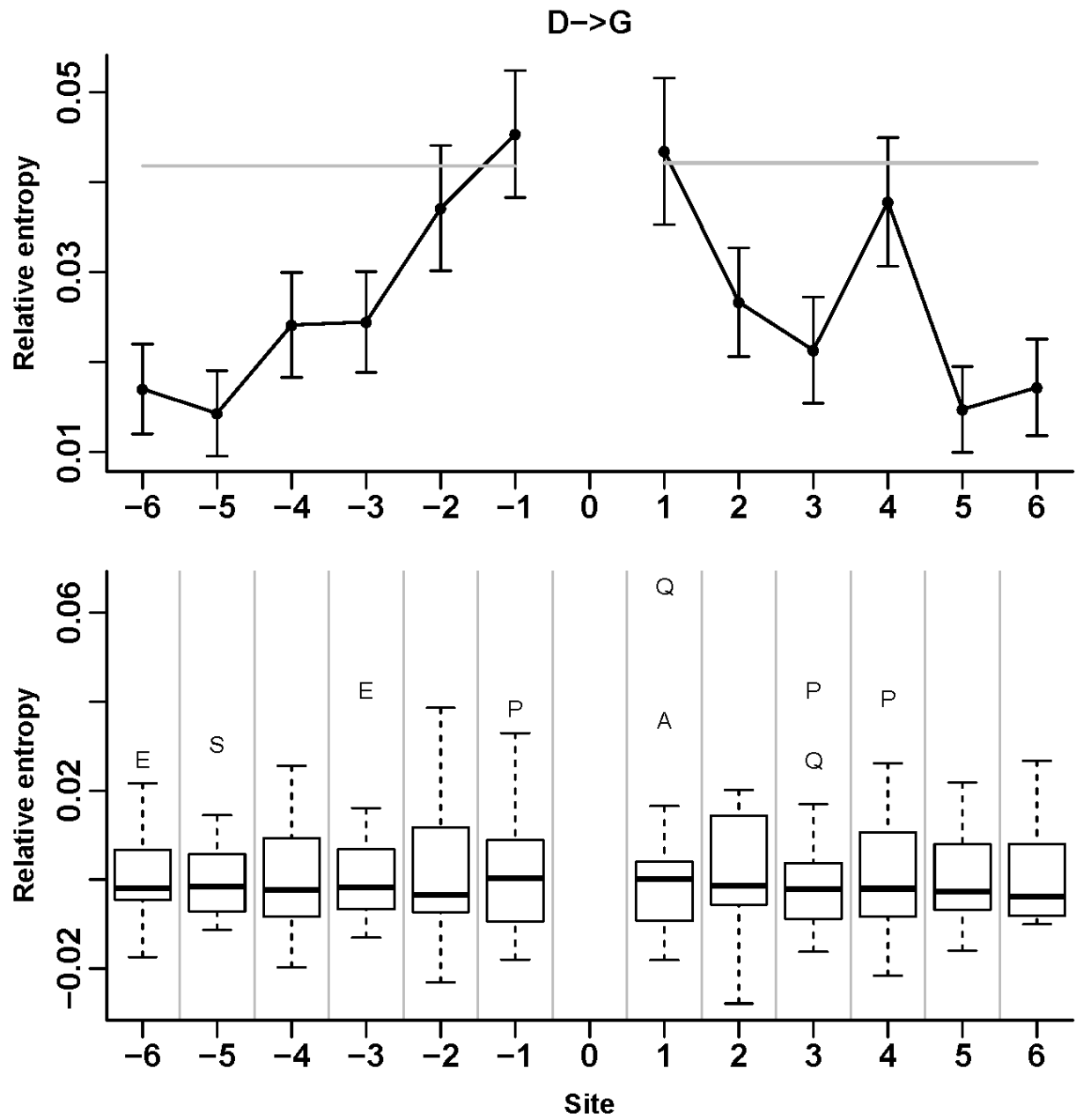


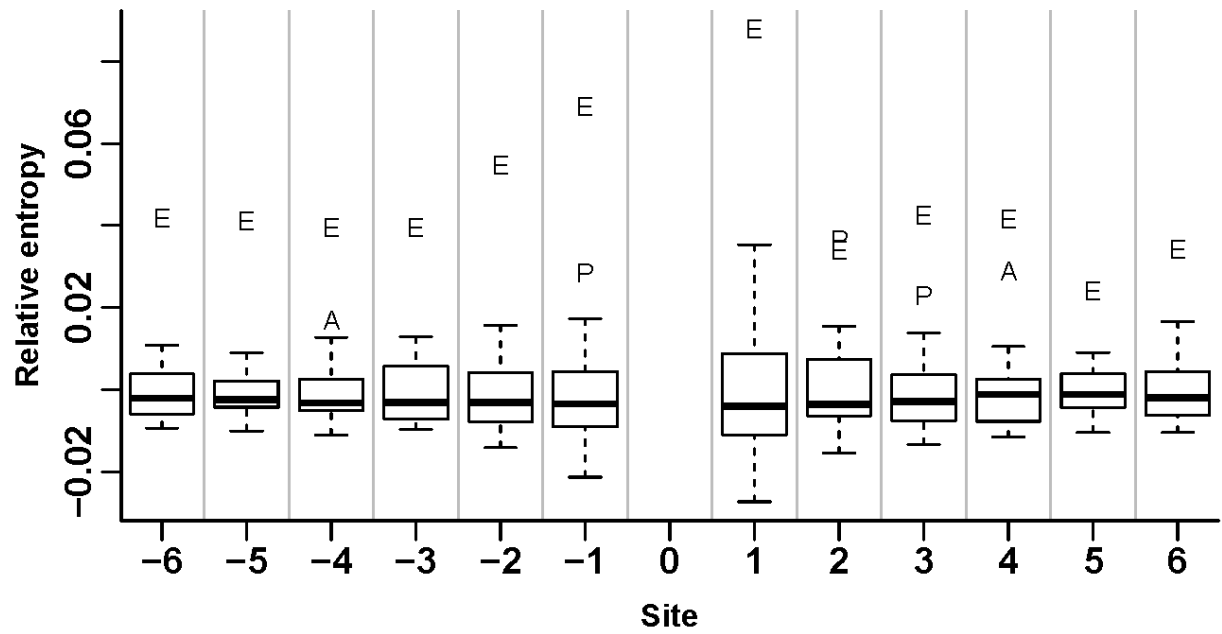
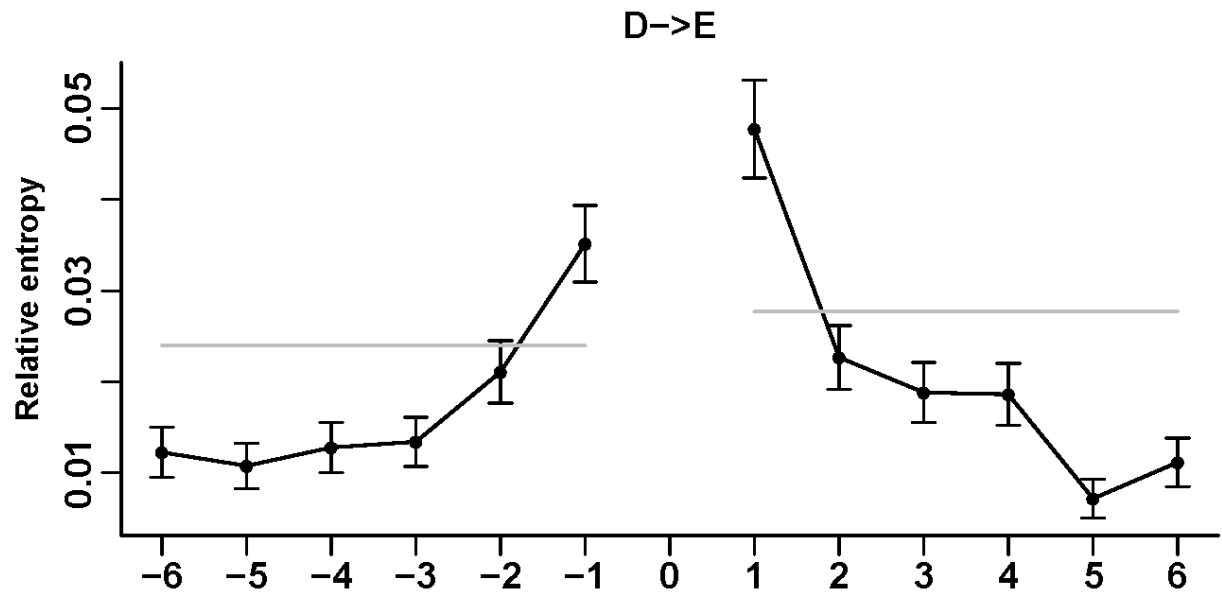


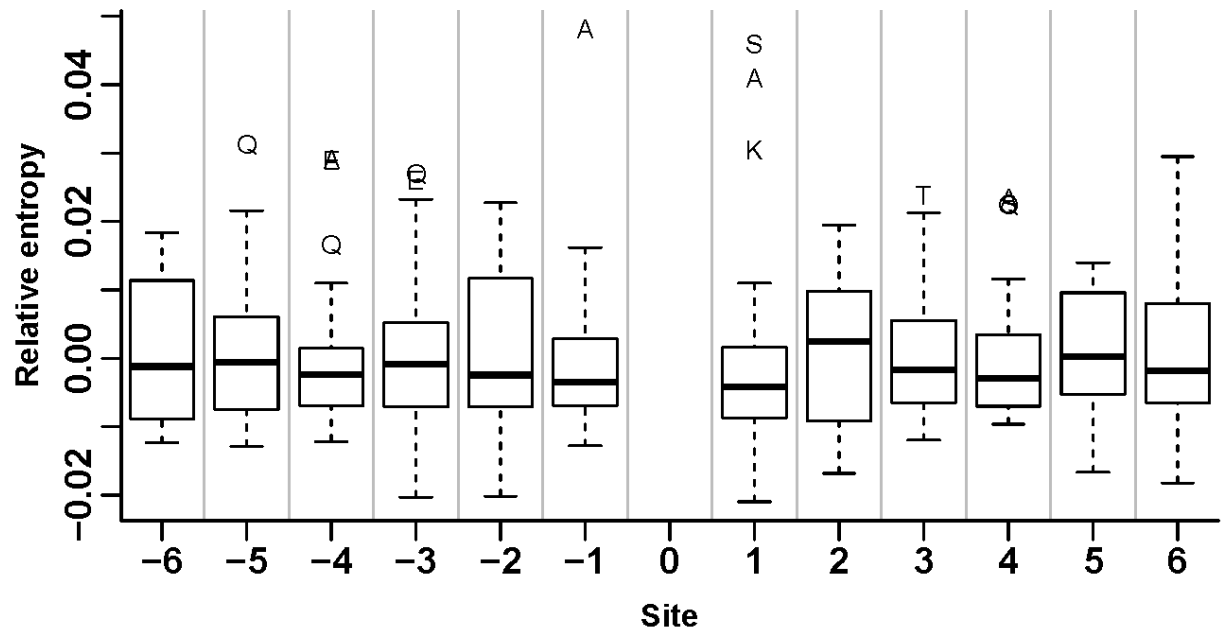
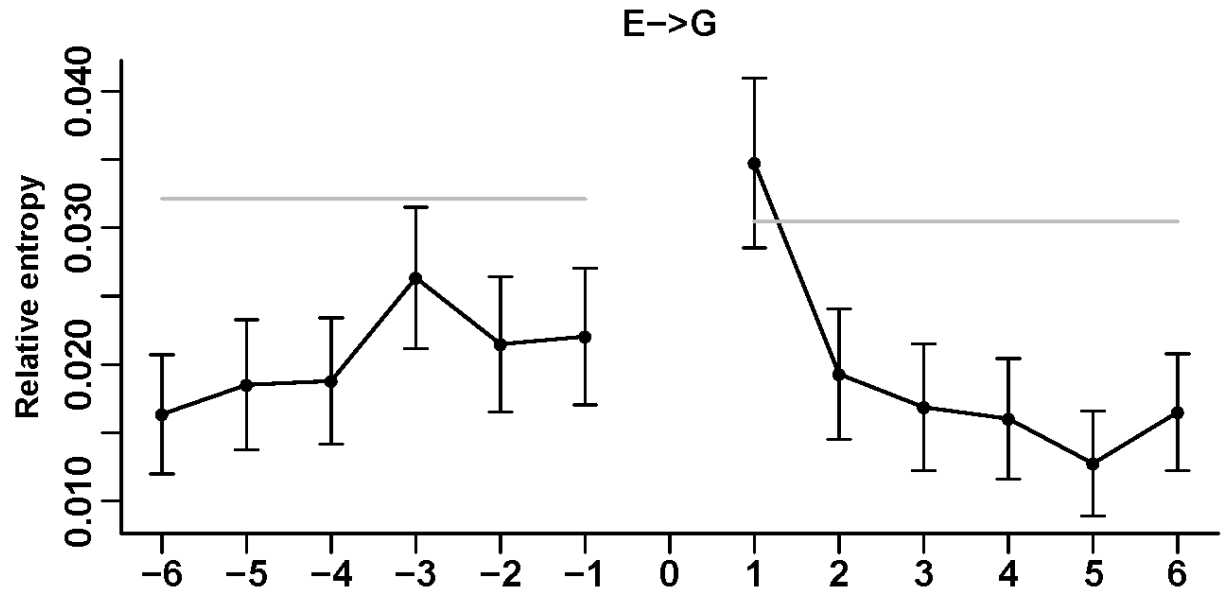


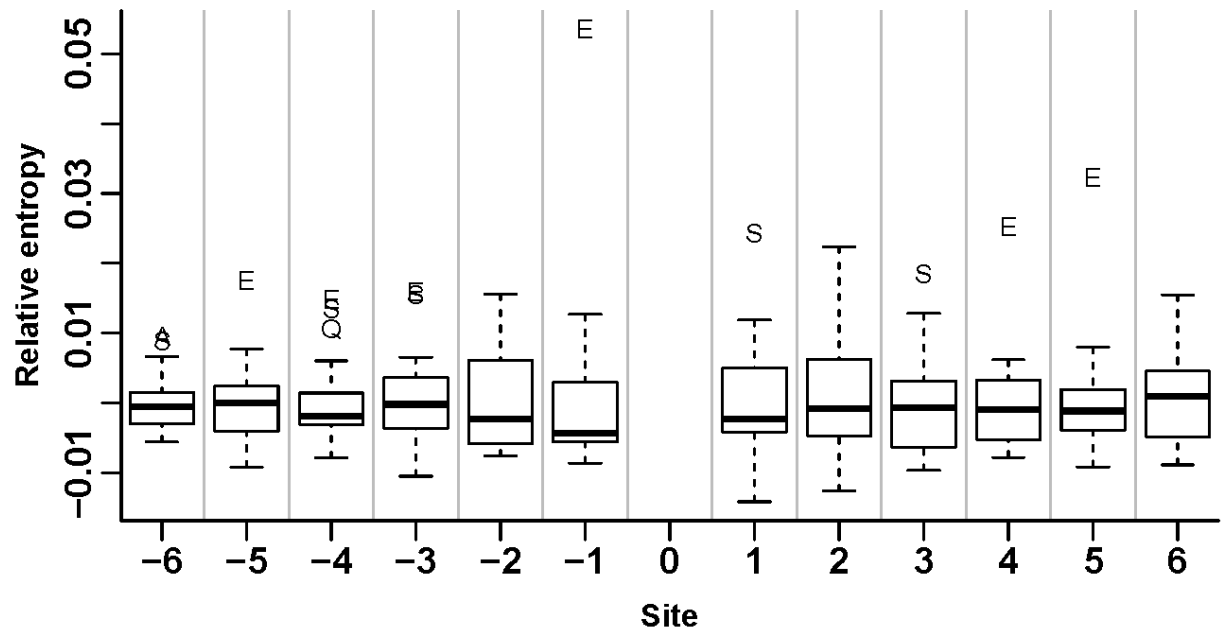
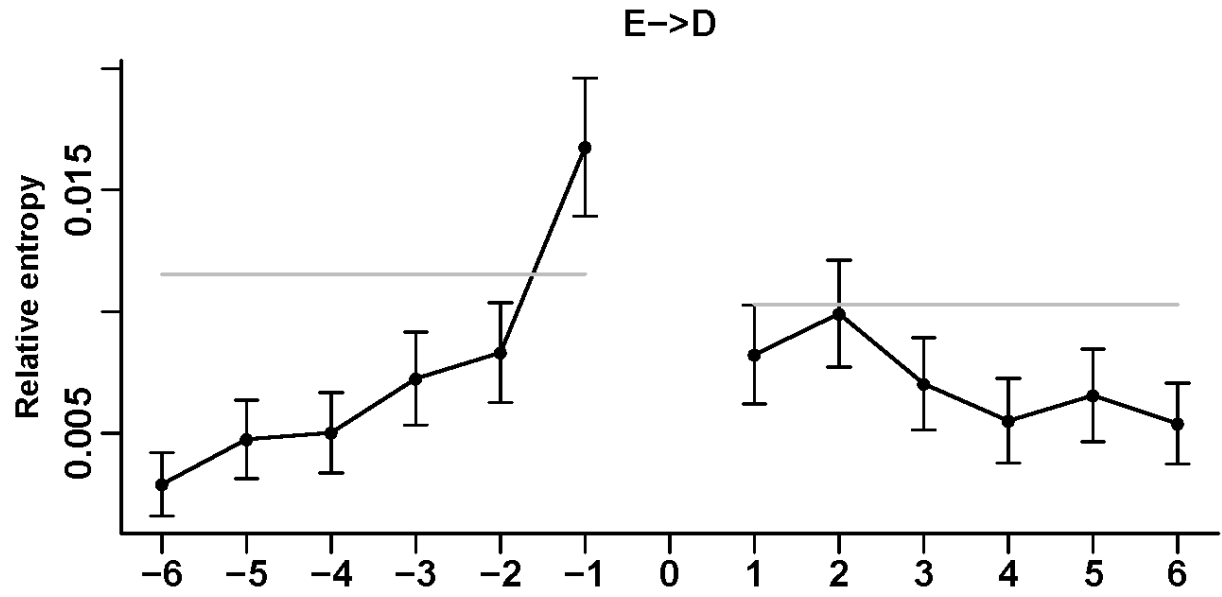


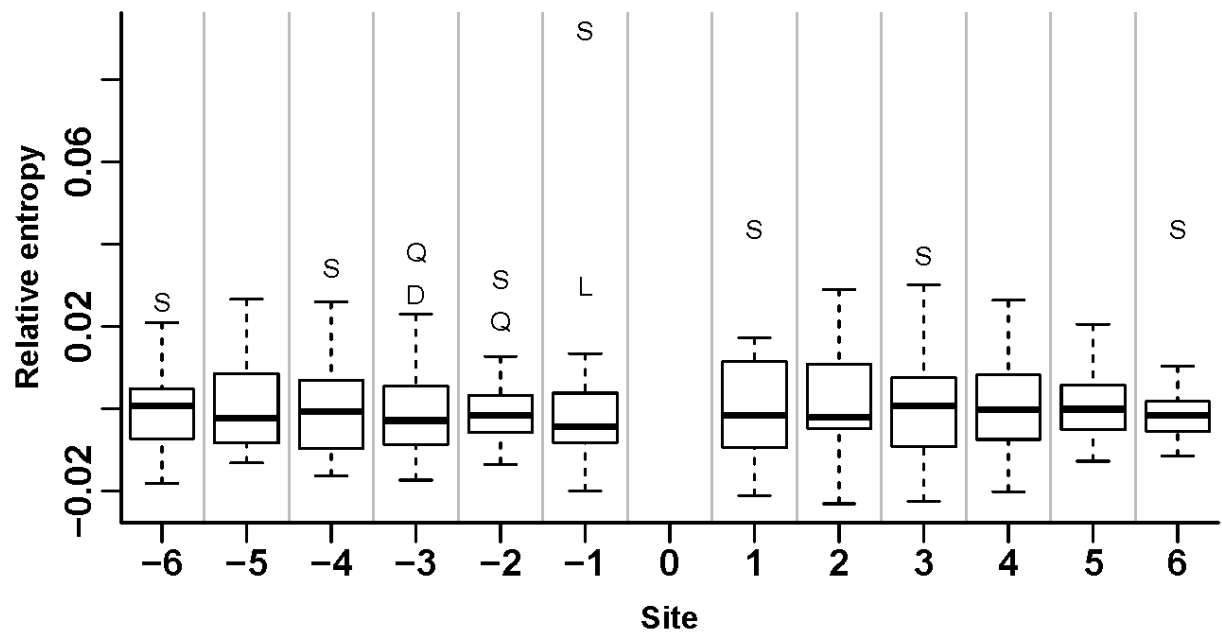
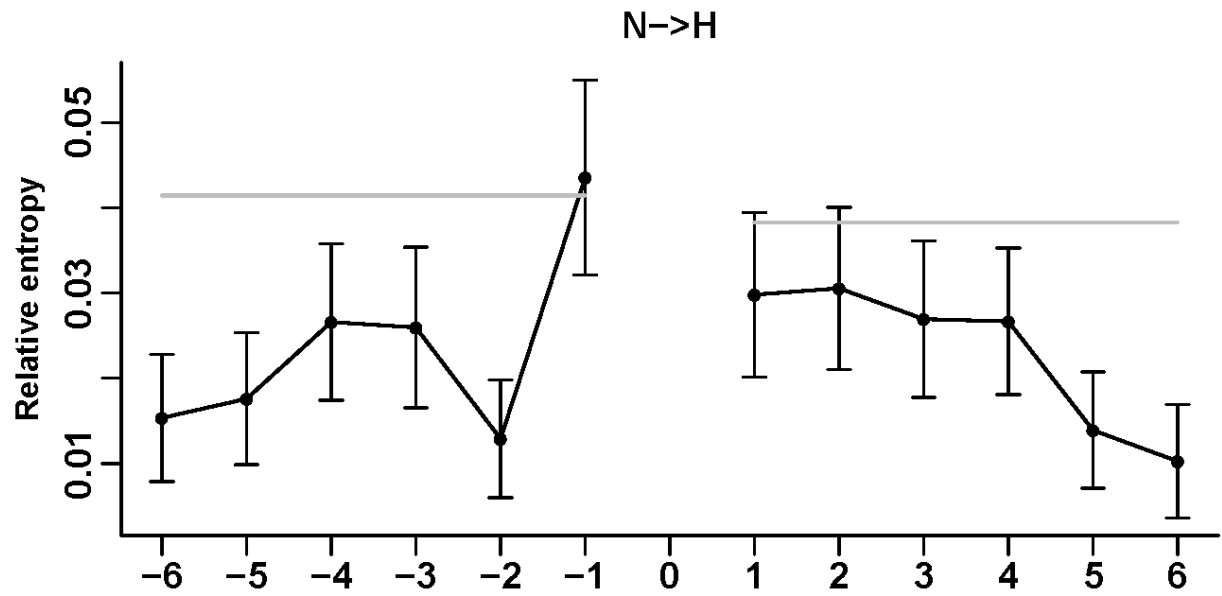


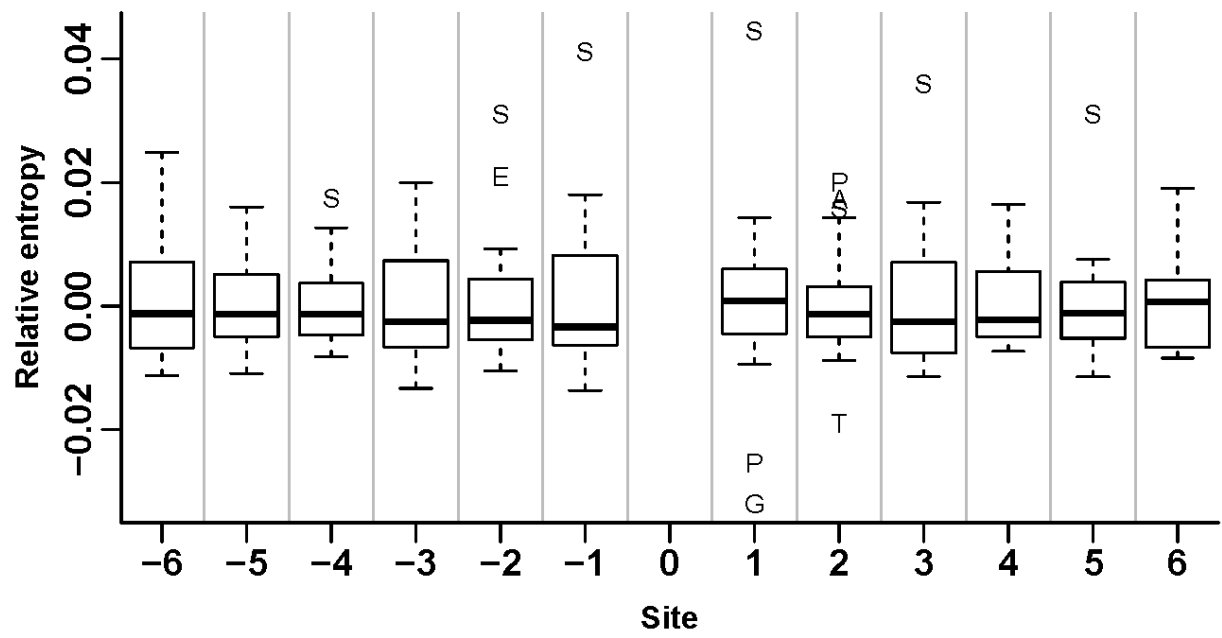
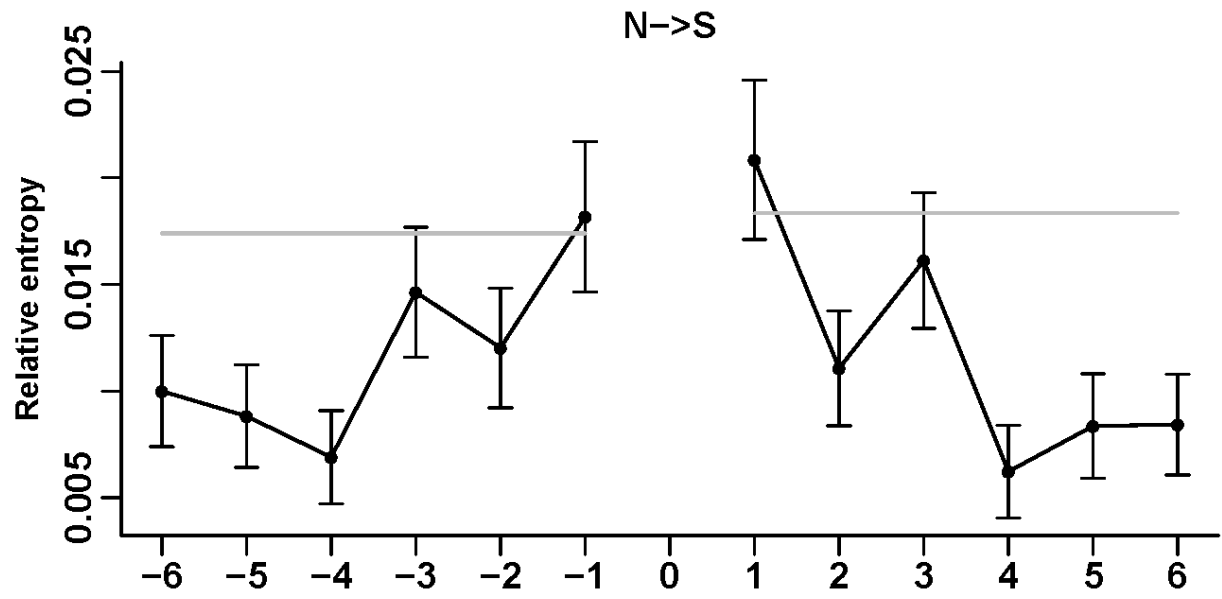


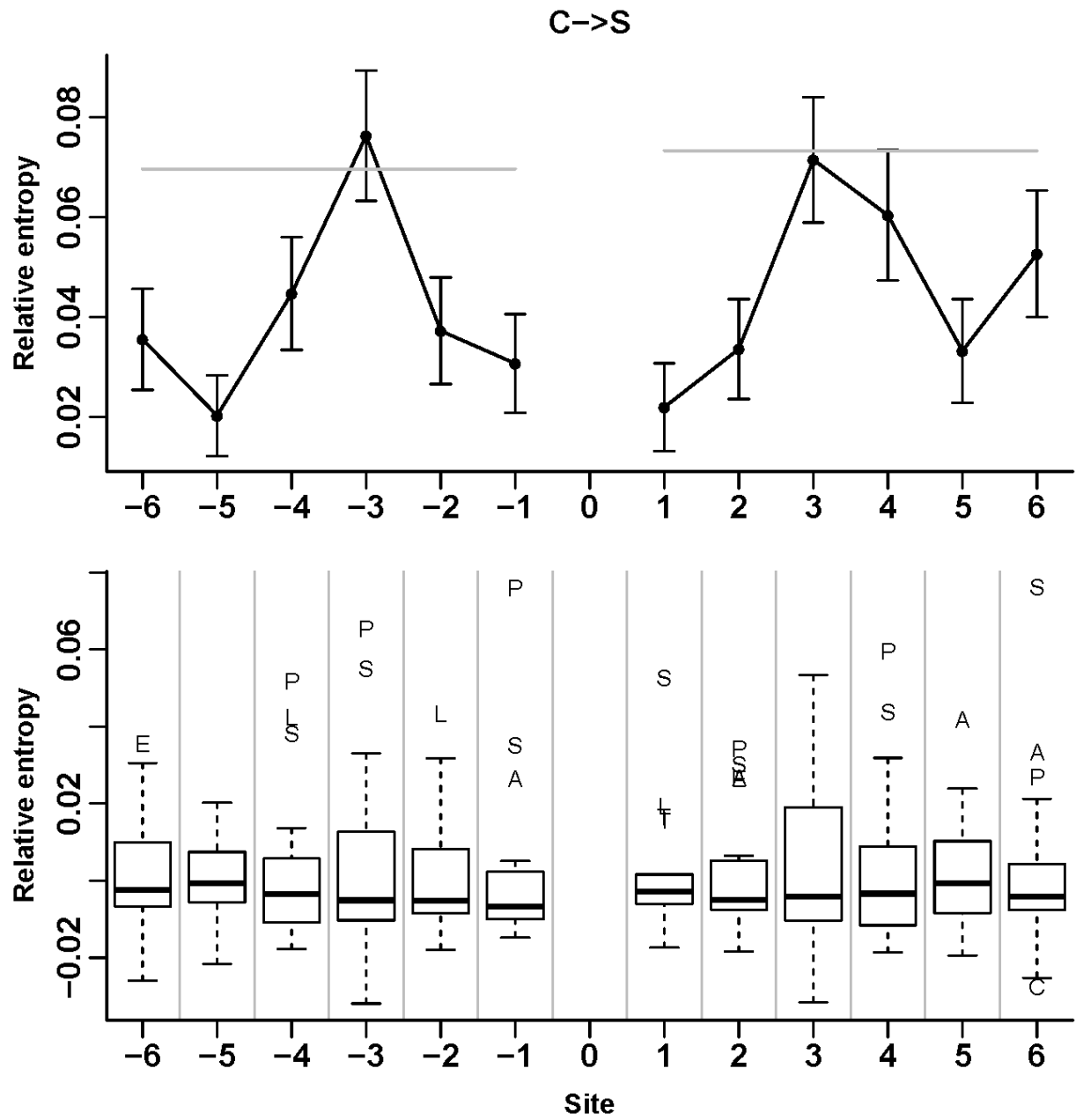


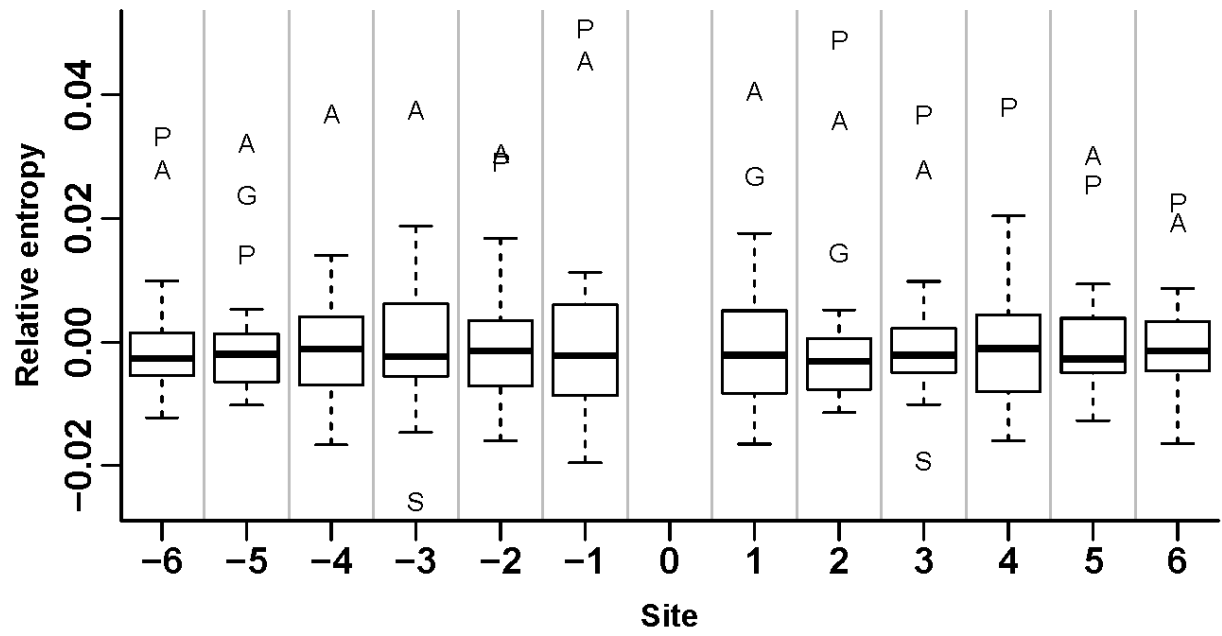
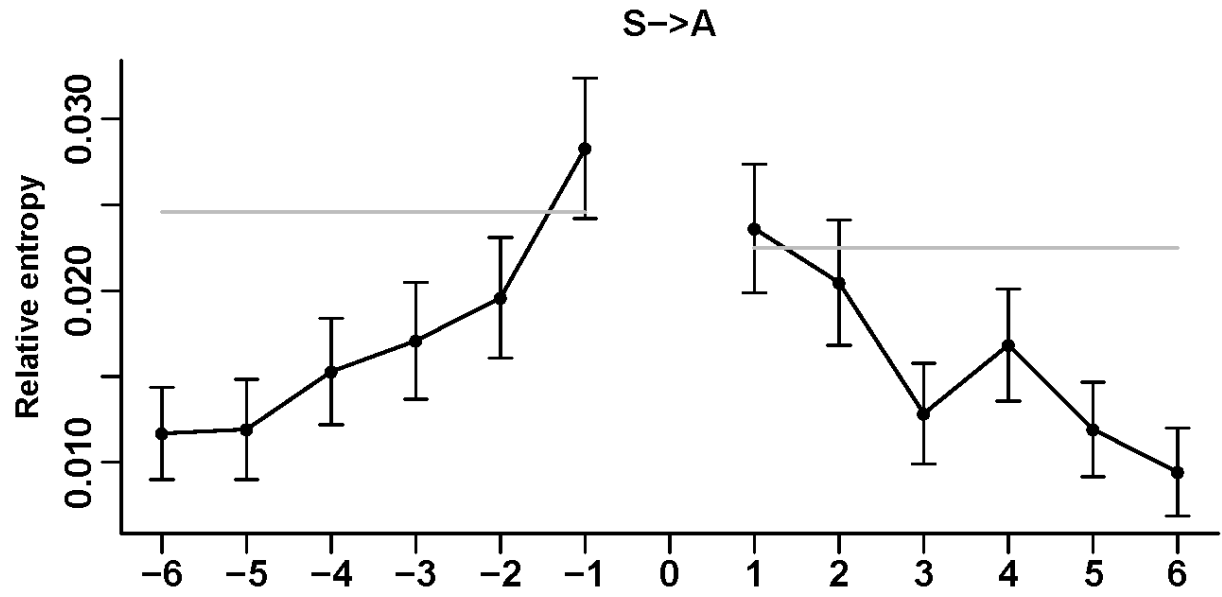




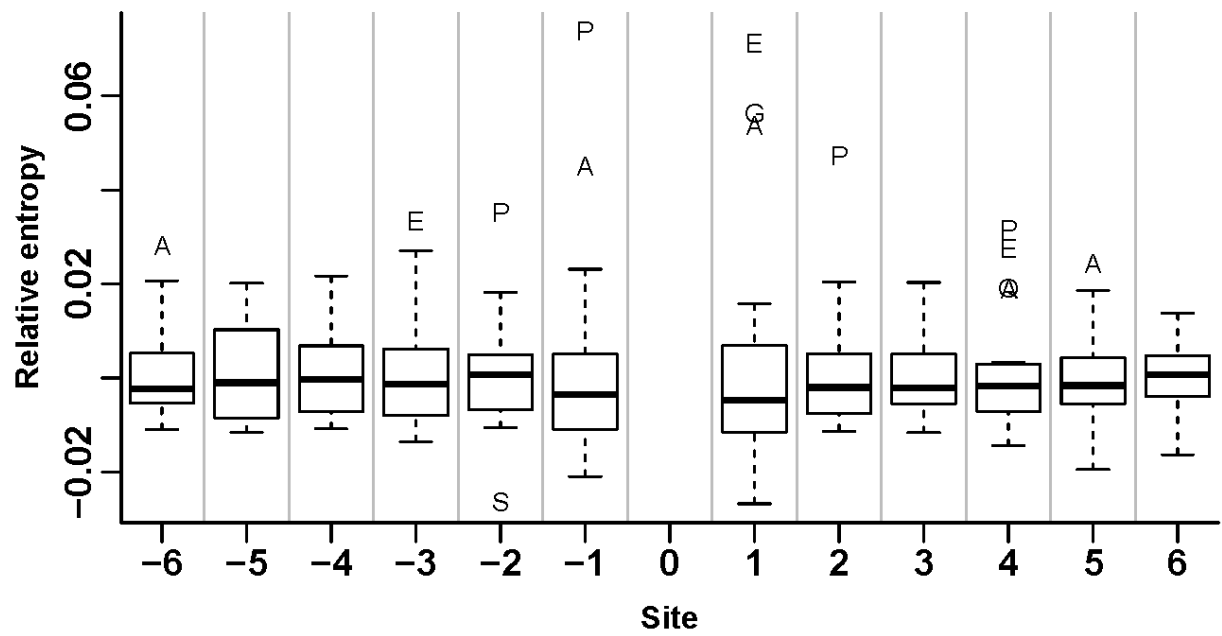
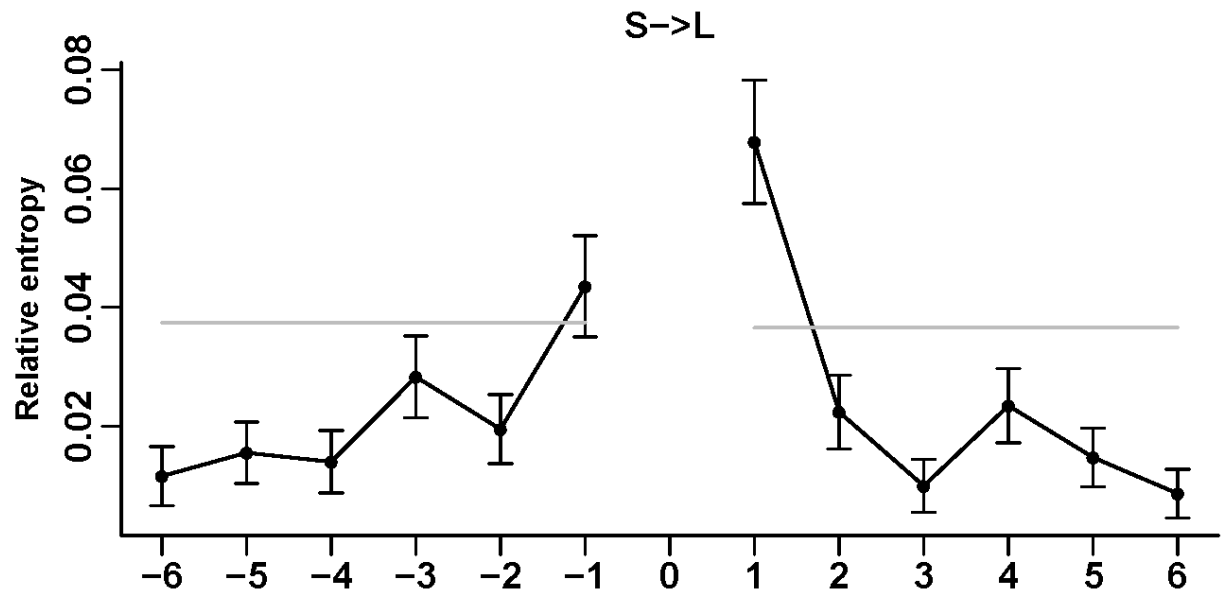




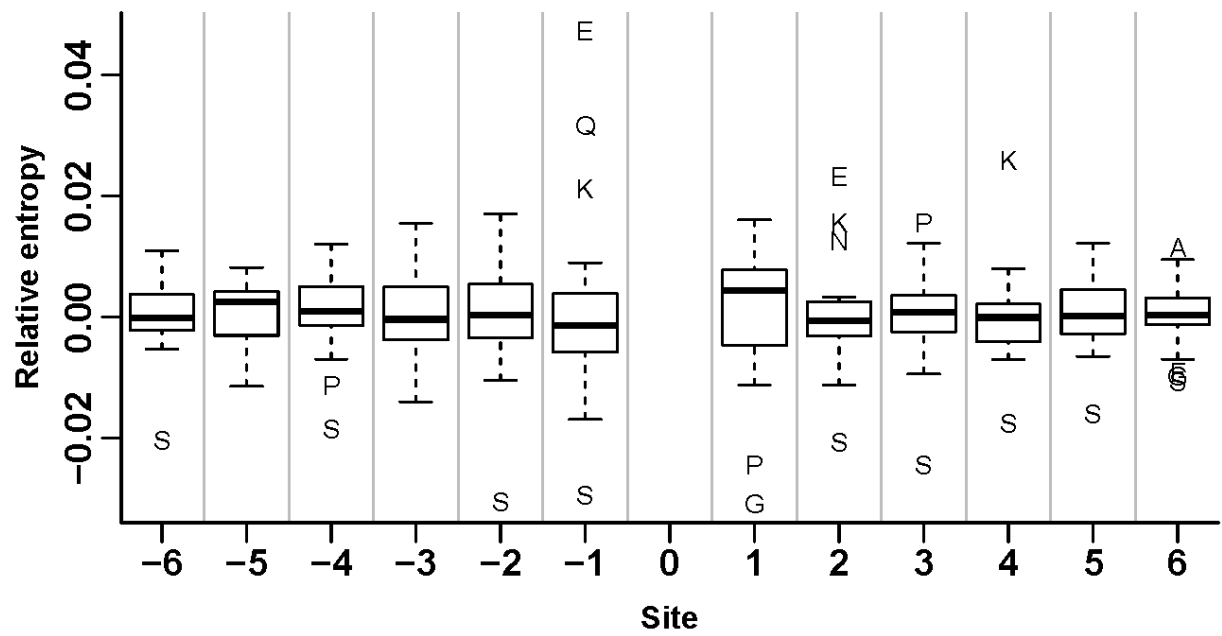
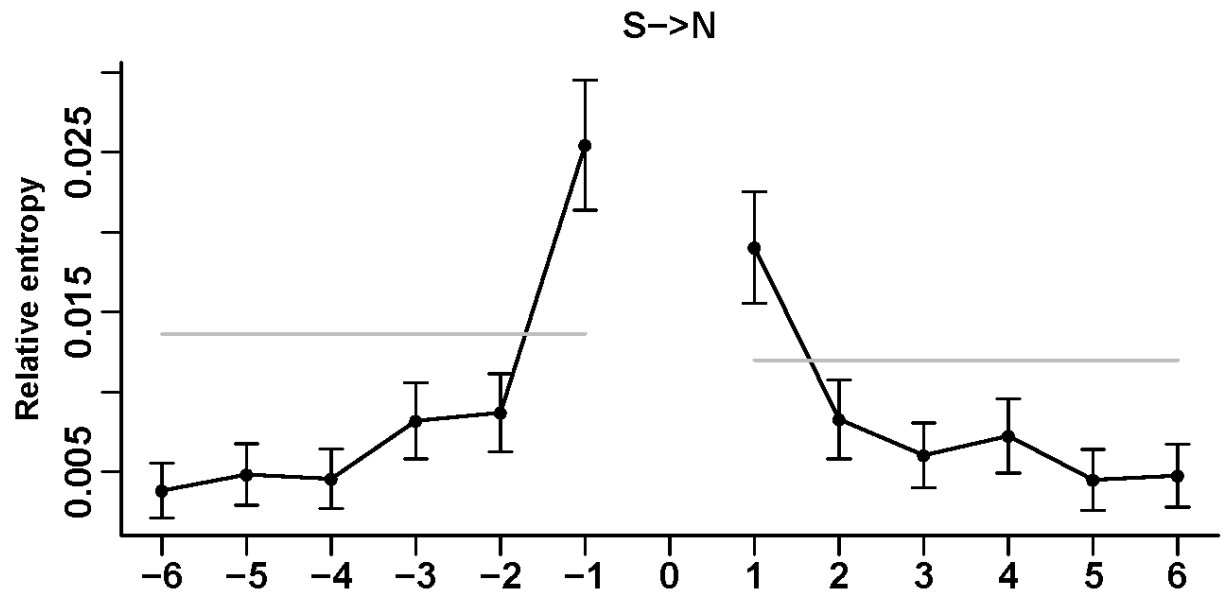


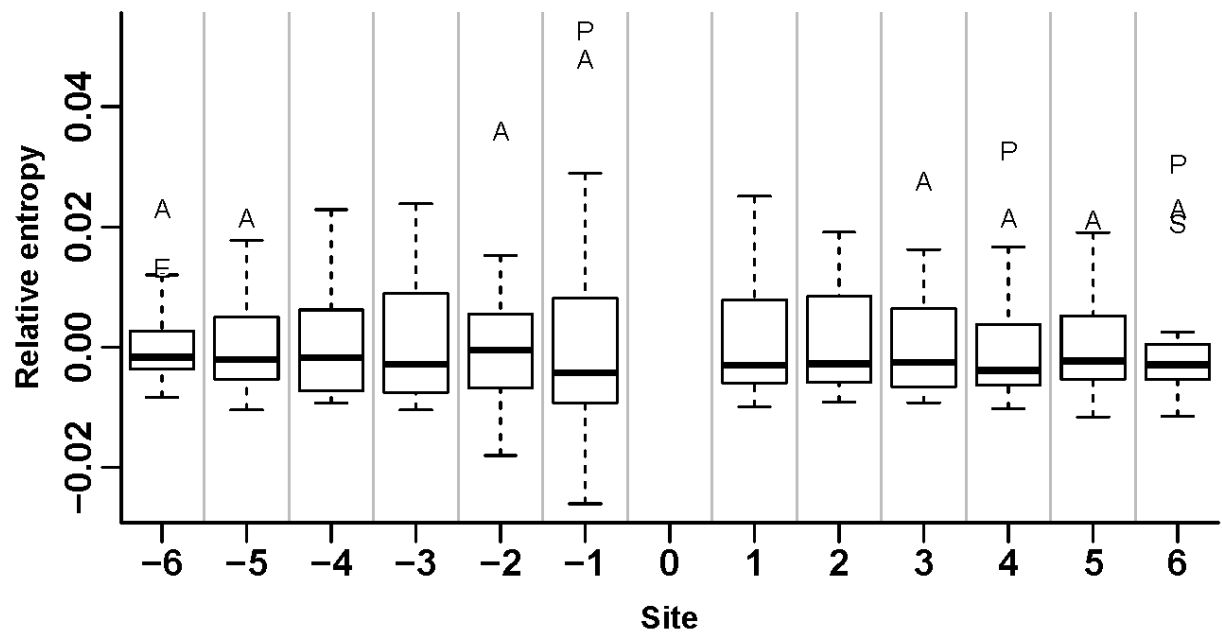
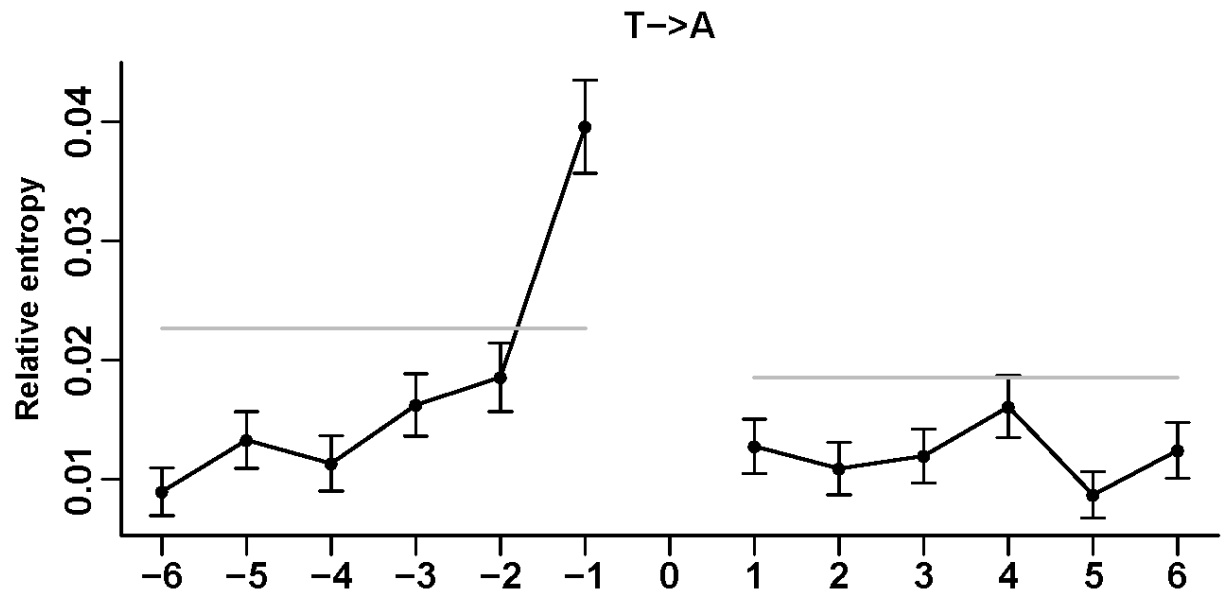


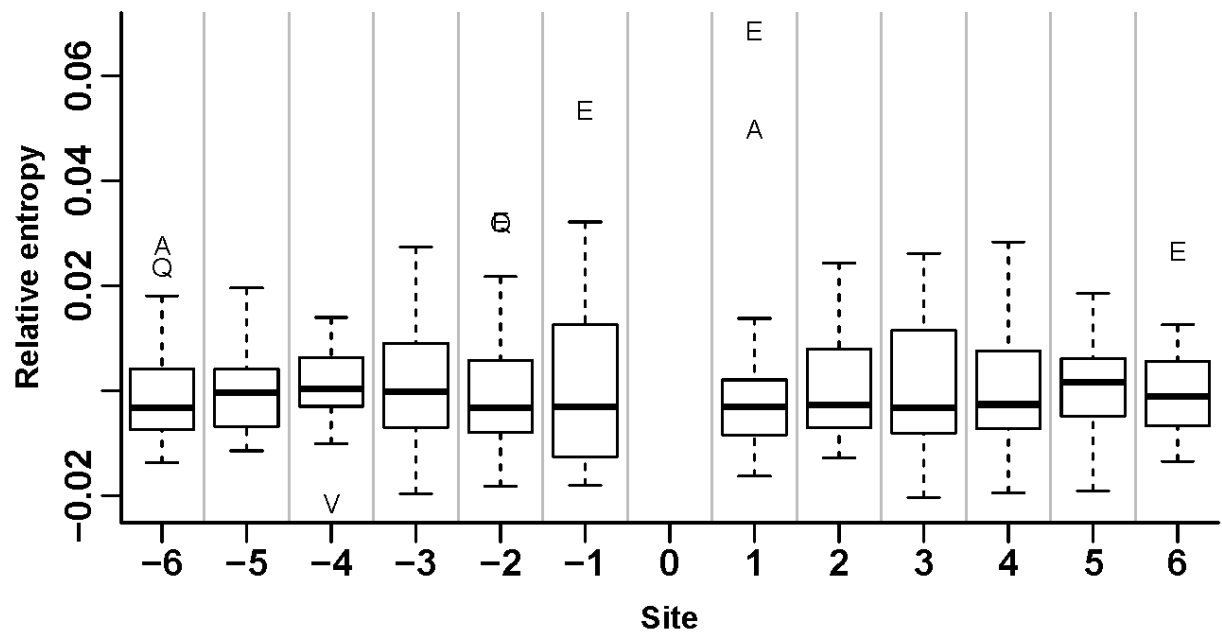
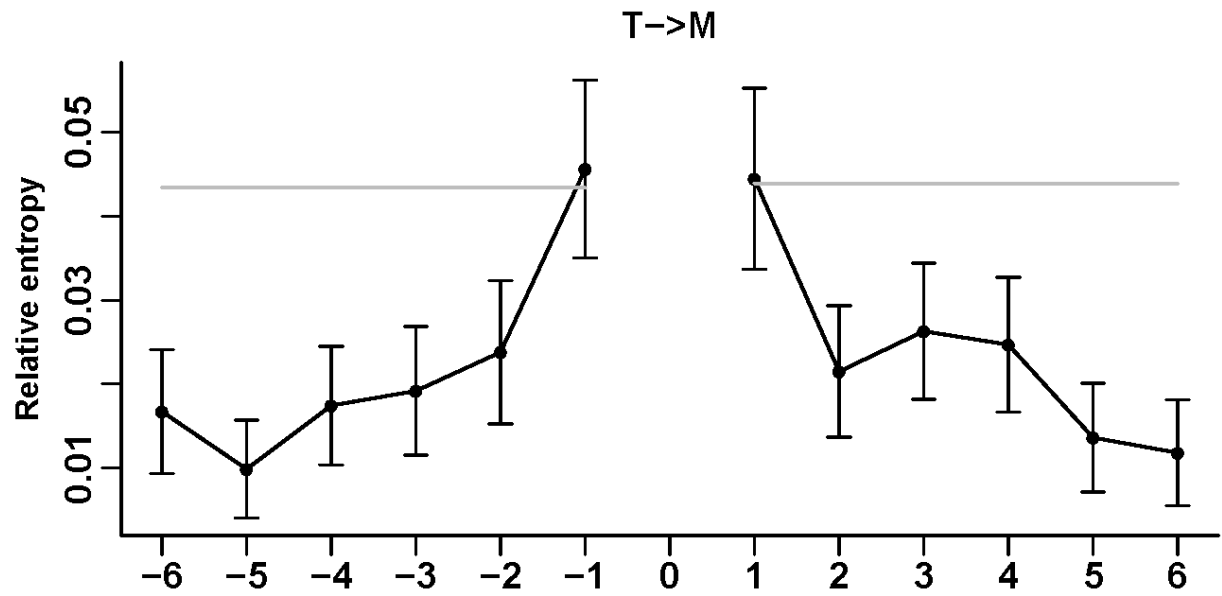


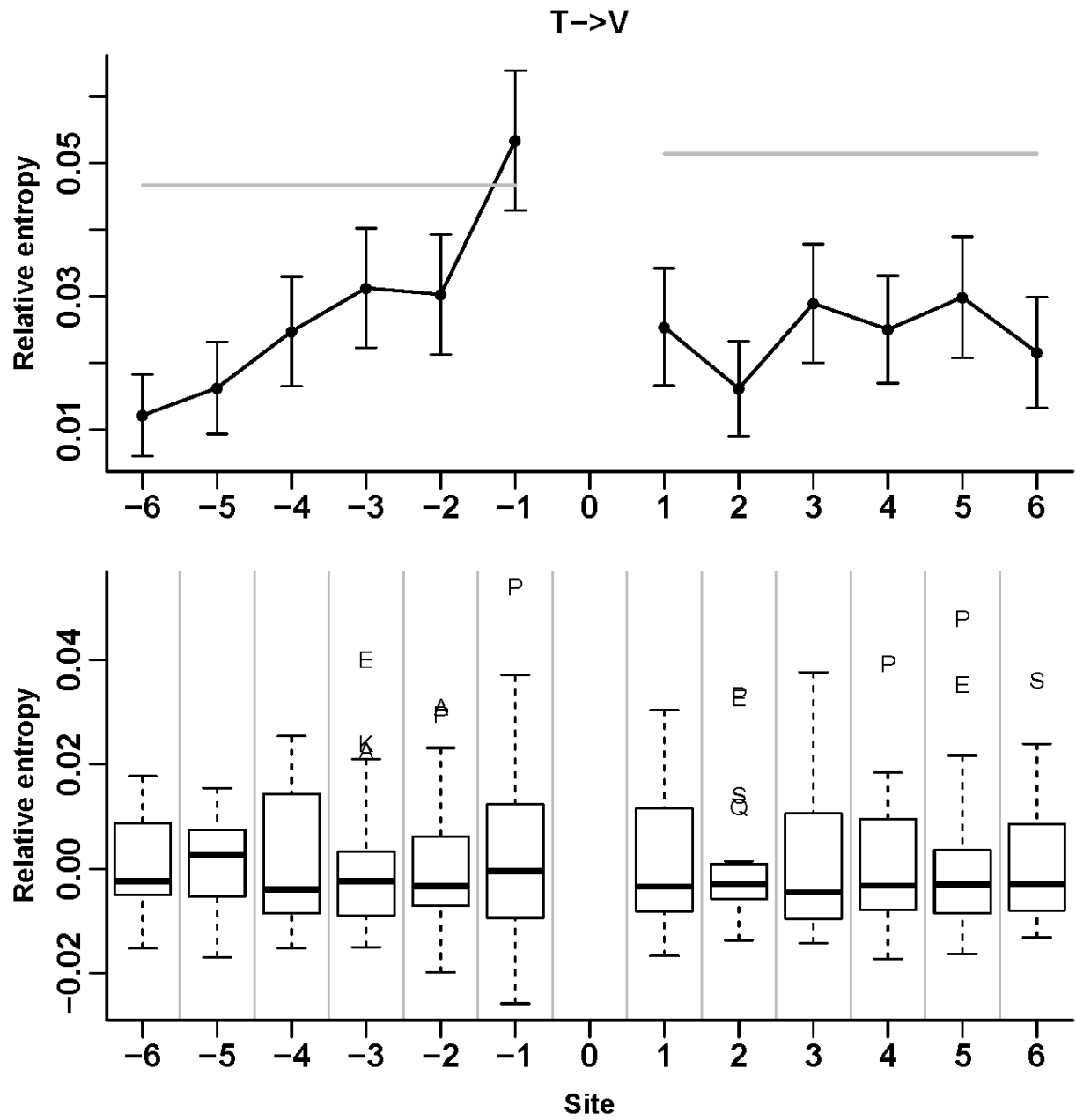


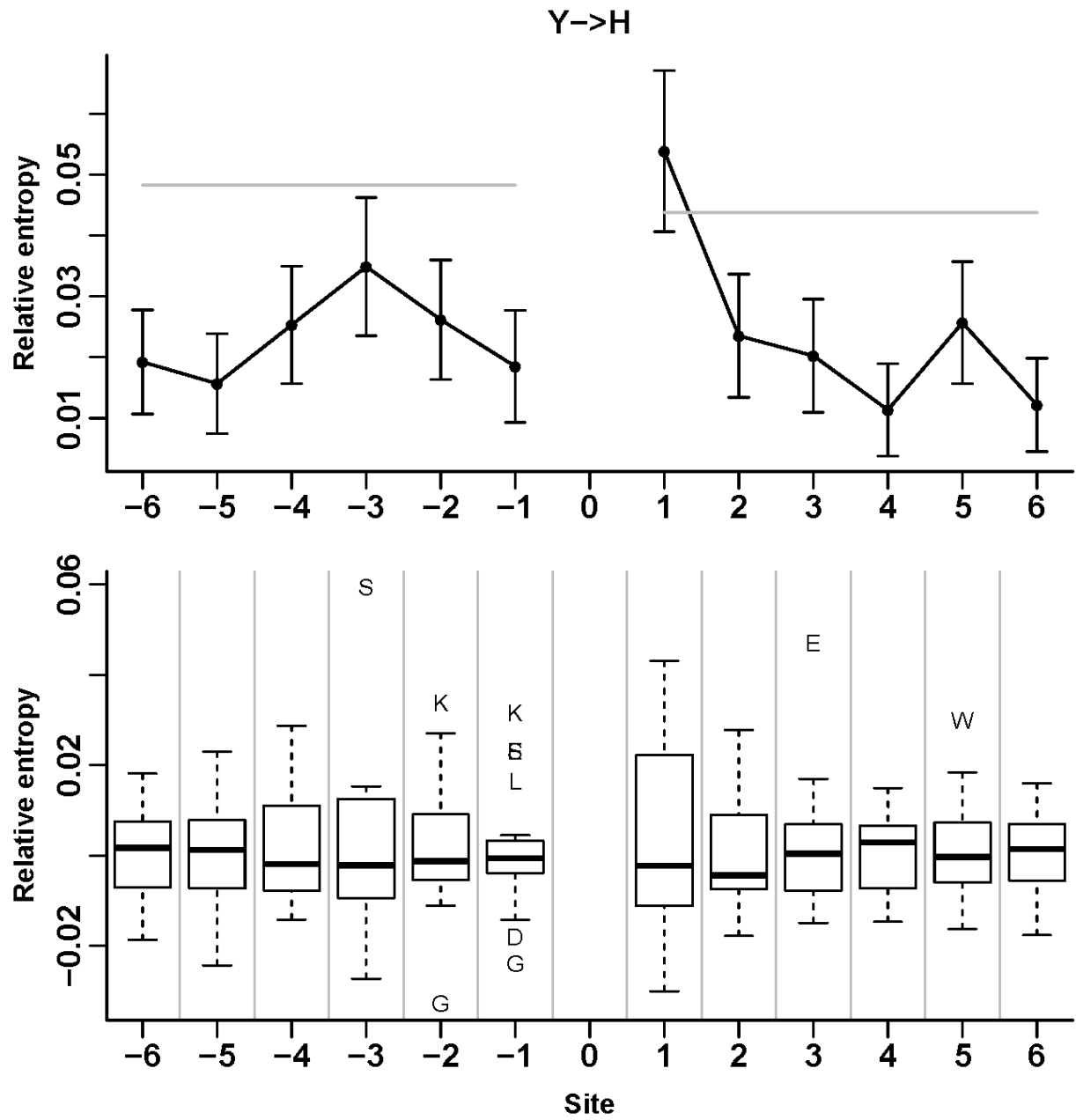




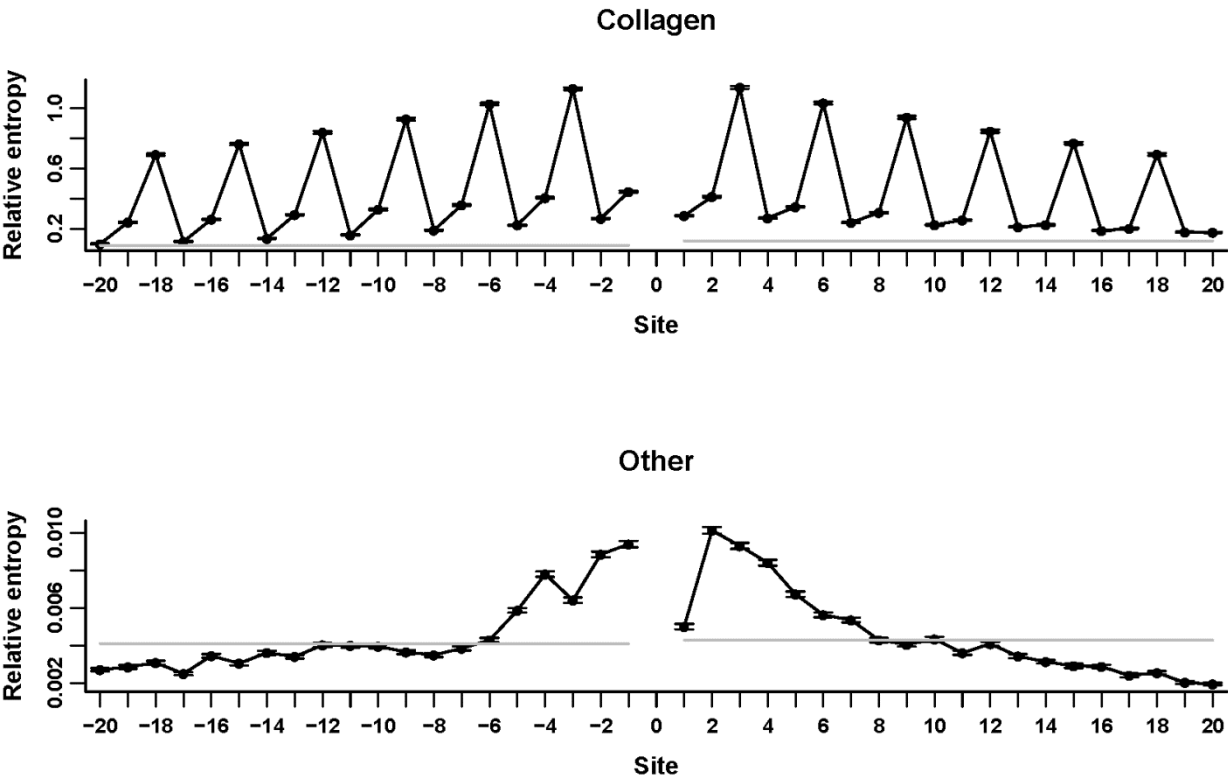




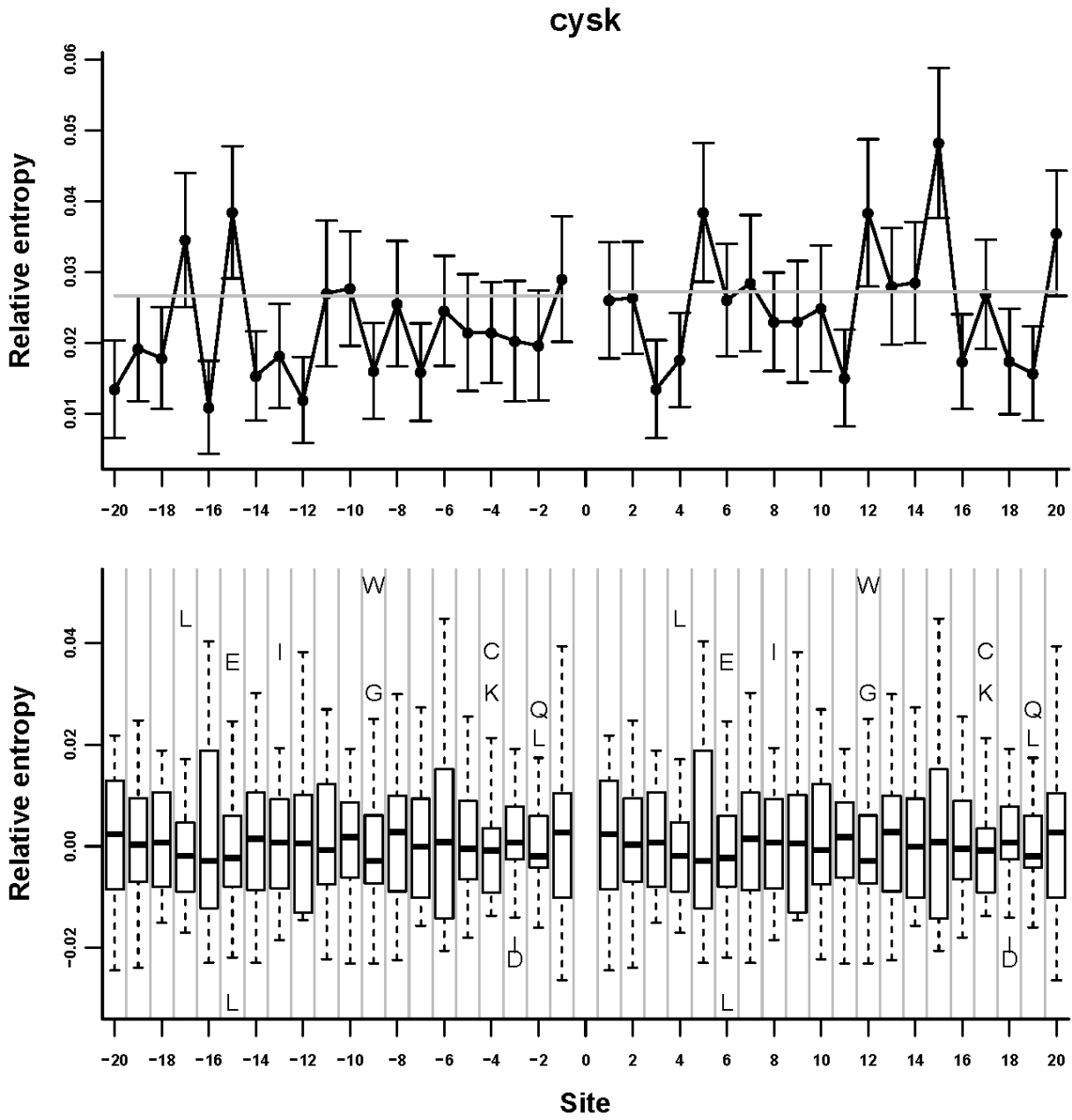


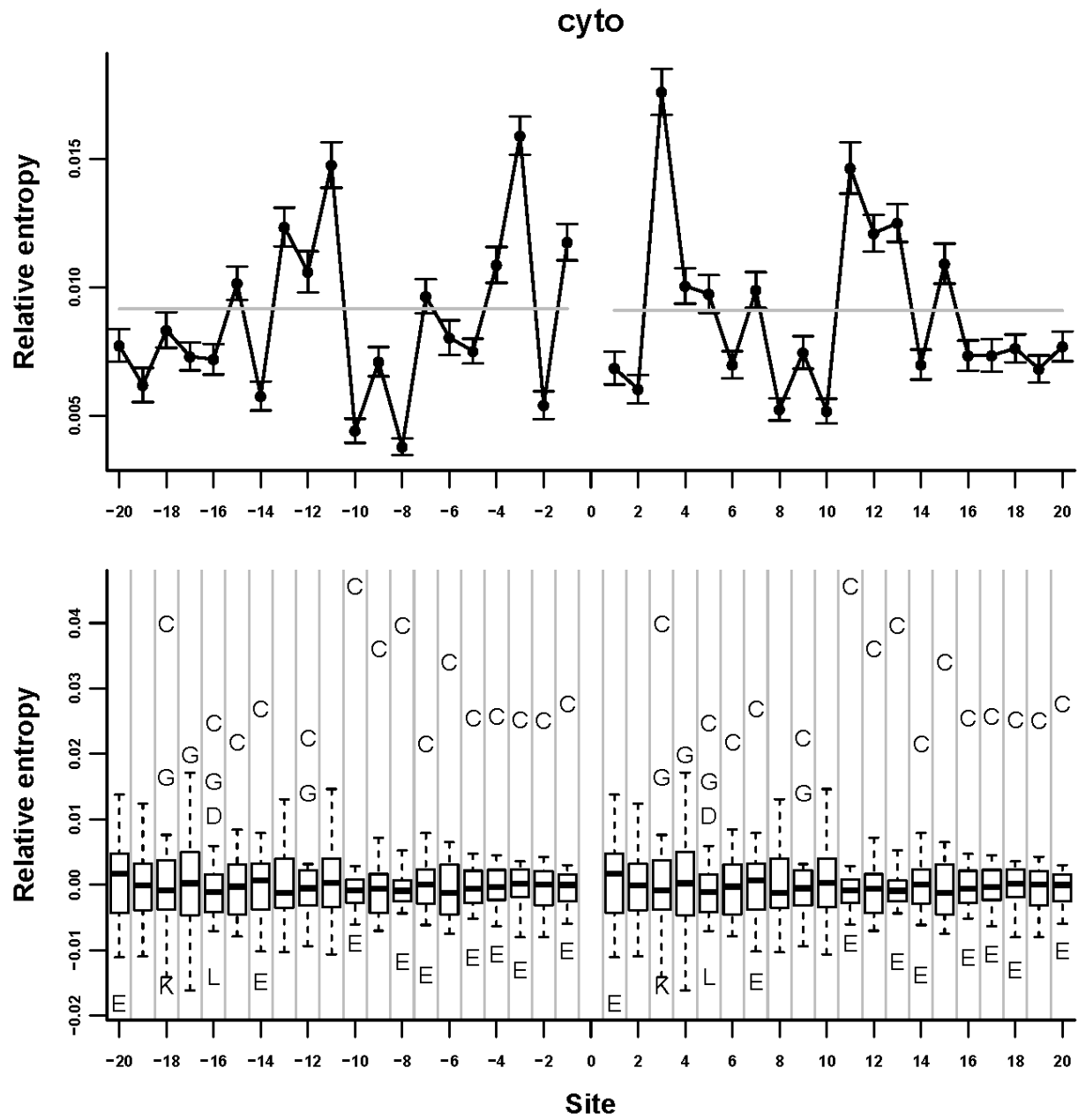


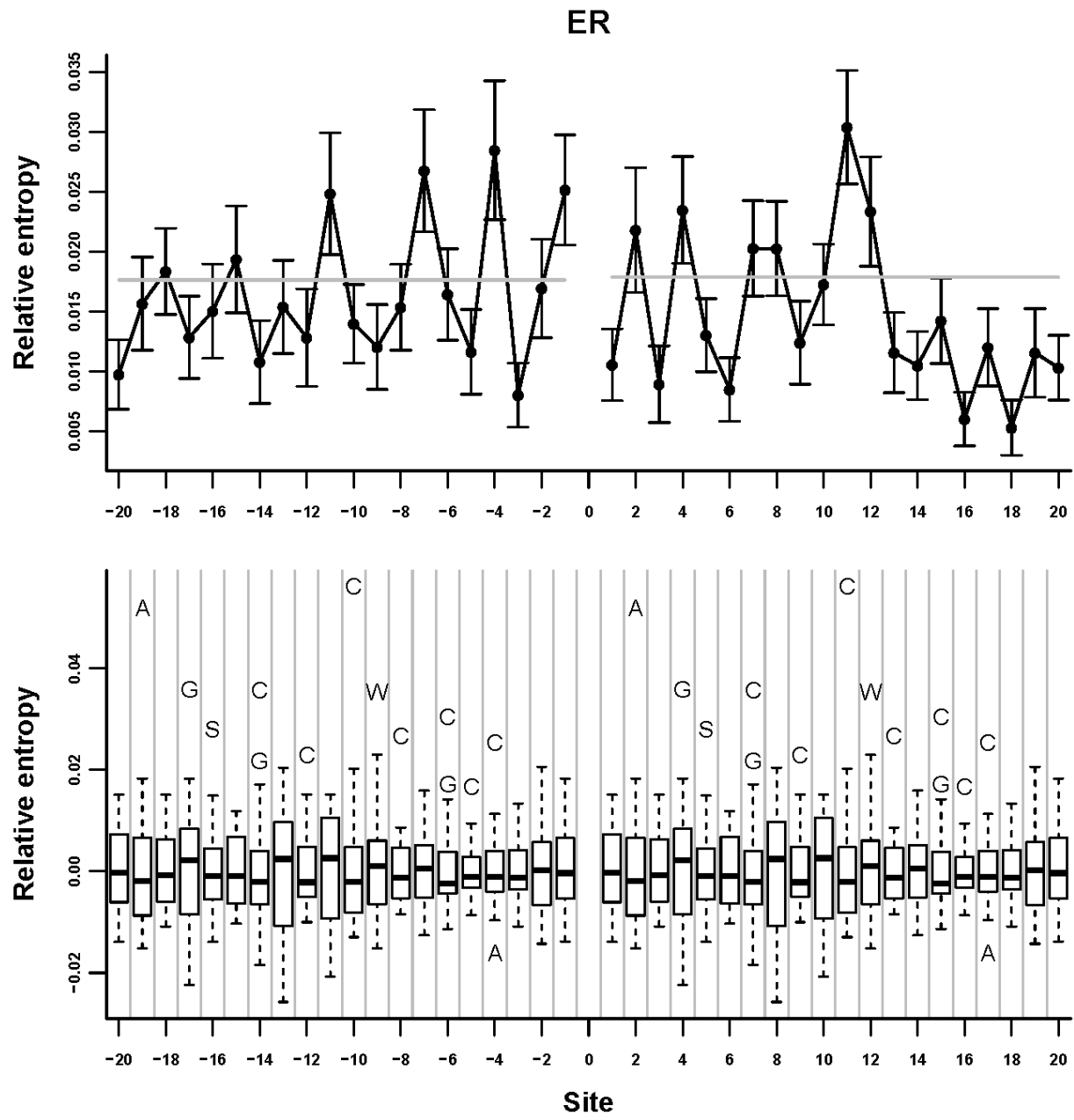
**Figure S8.** Neighbor preference patterns of G in collagen and other proteins.

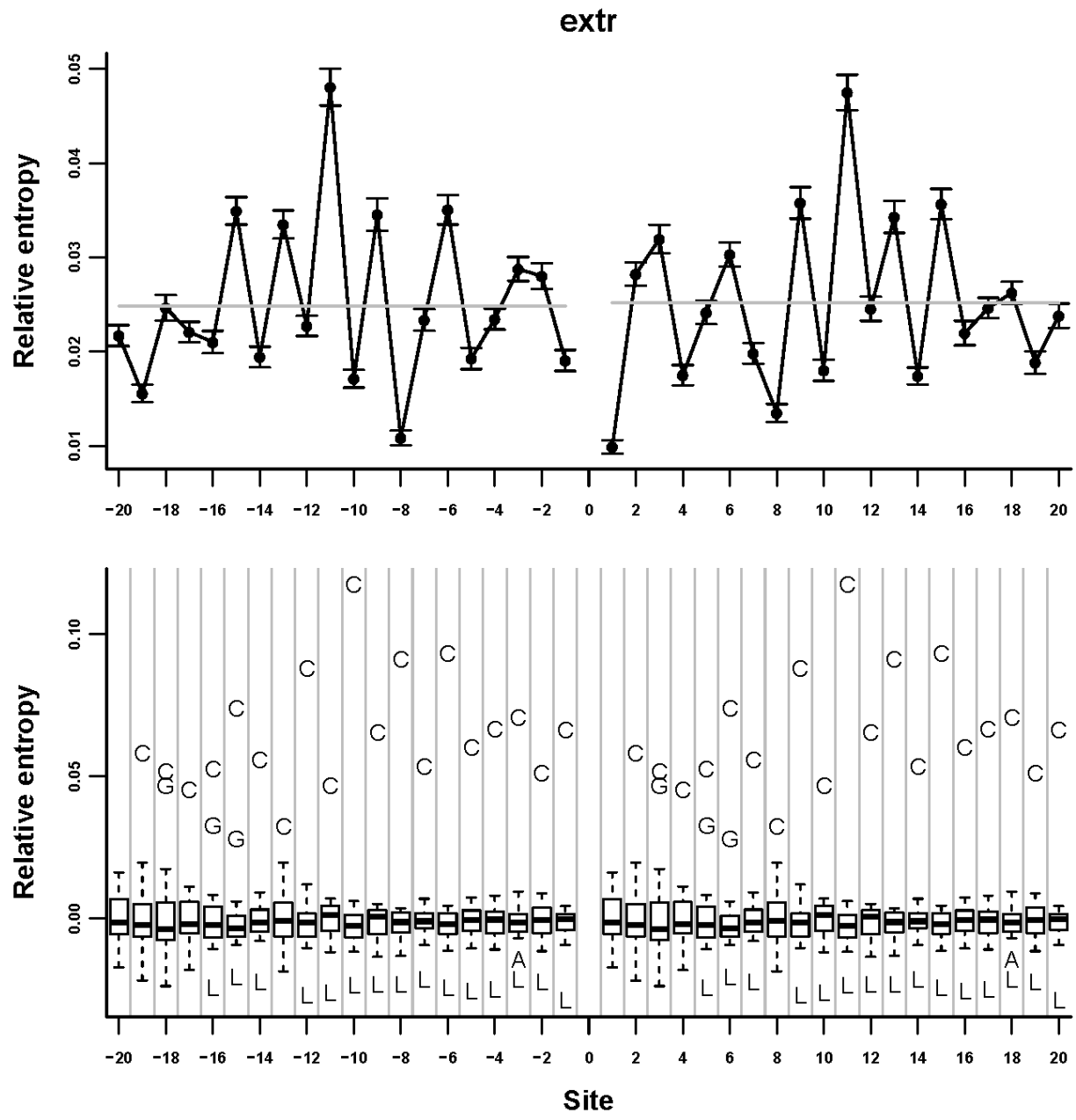


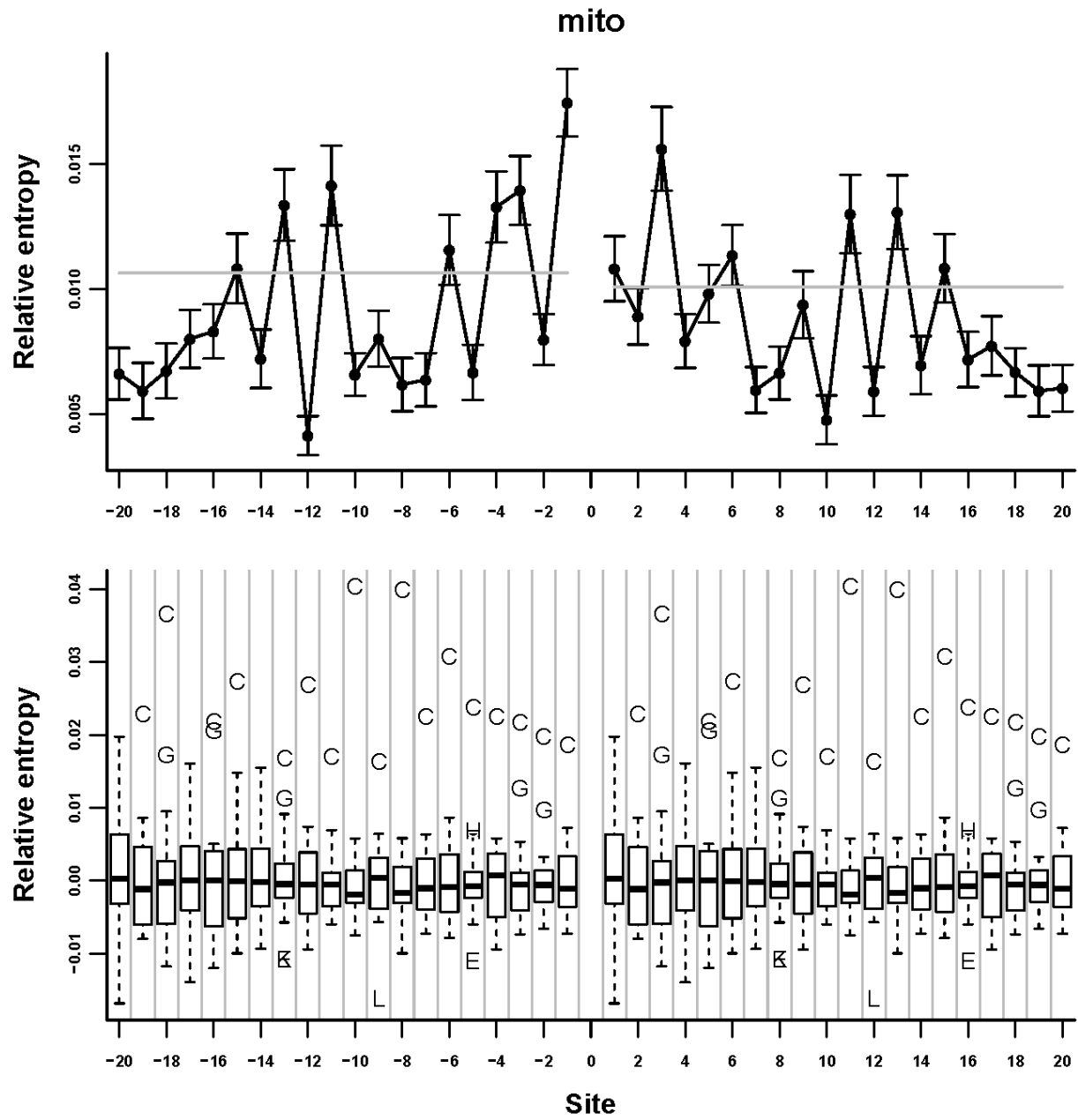
**Figure S9.** Neighbor preference patterns of C in different cellular locations.

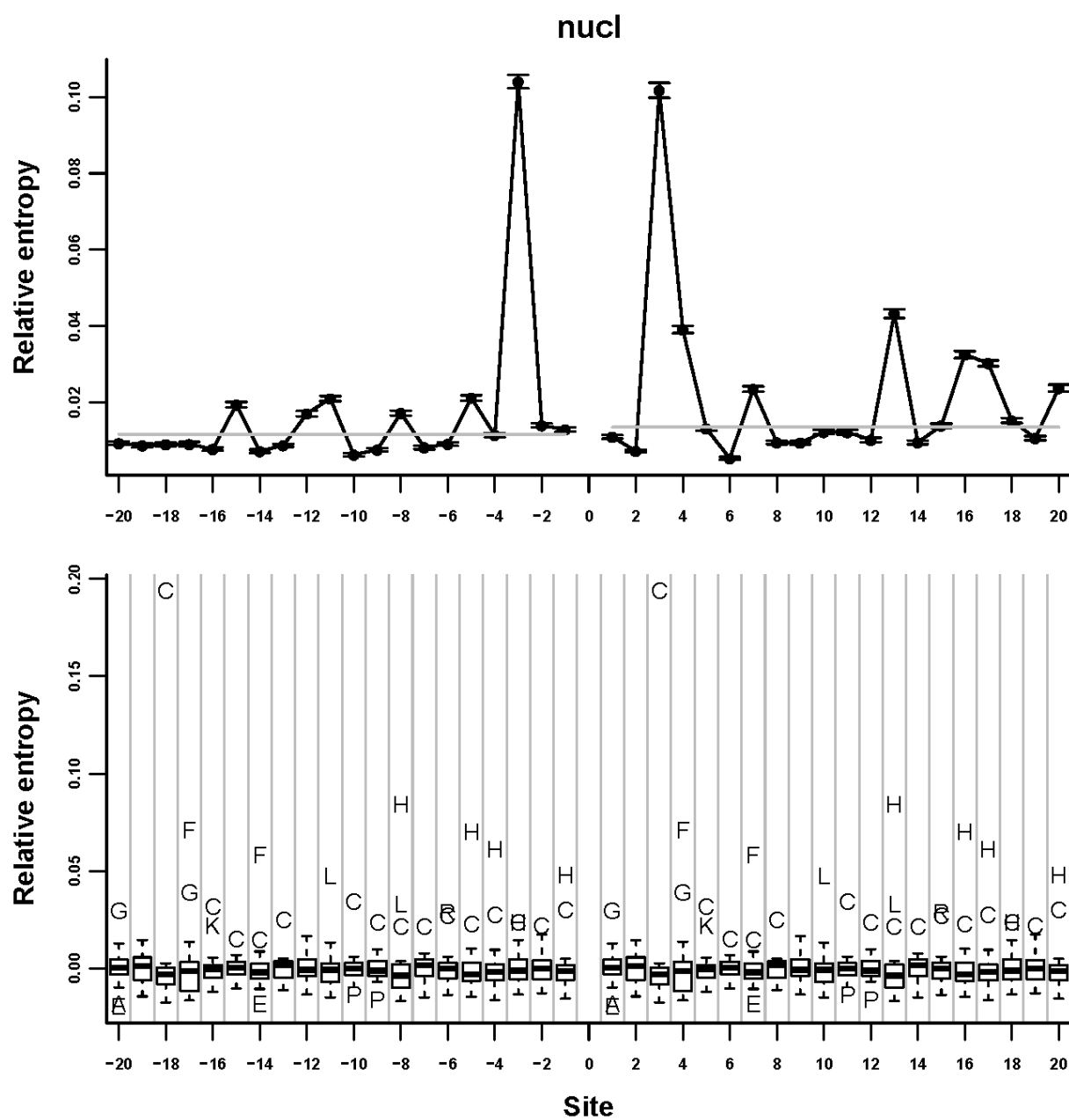


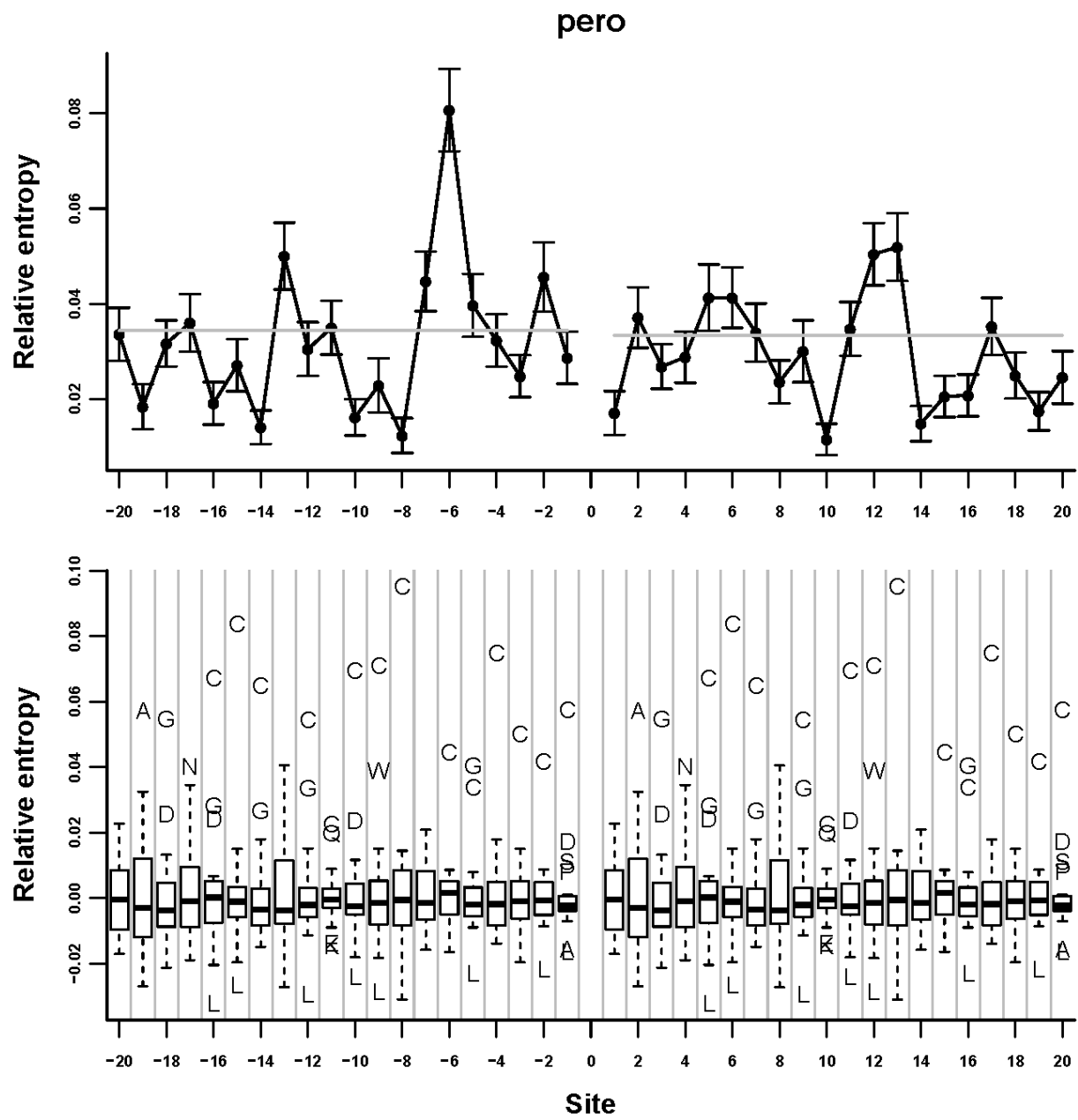


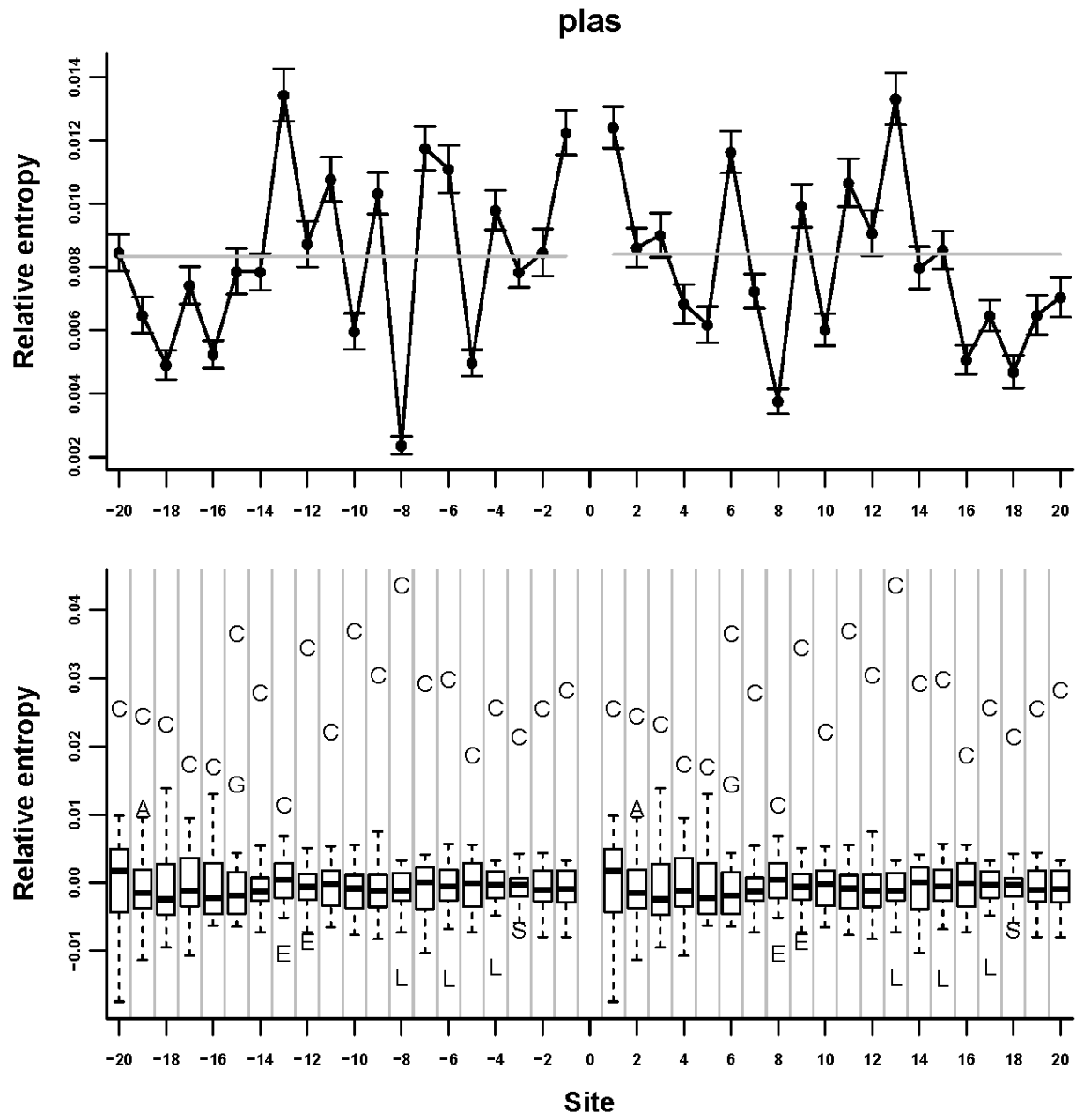




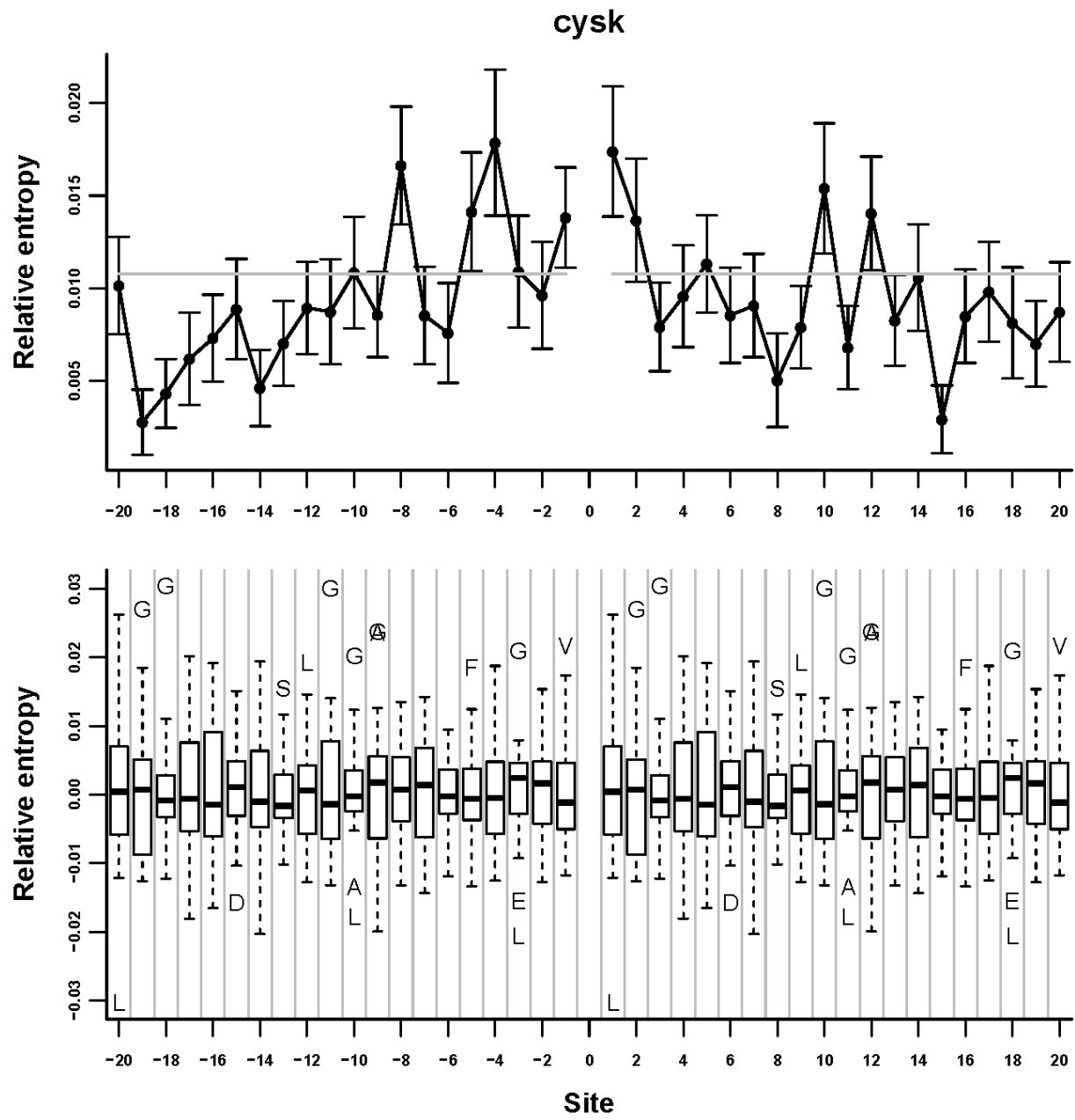


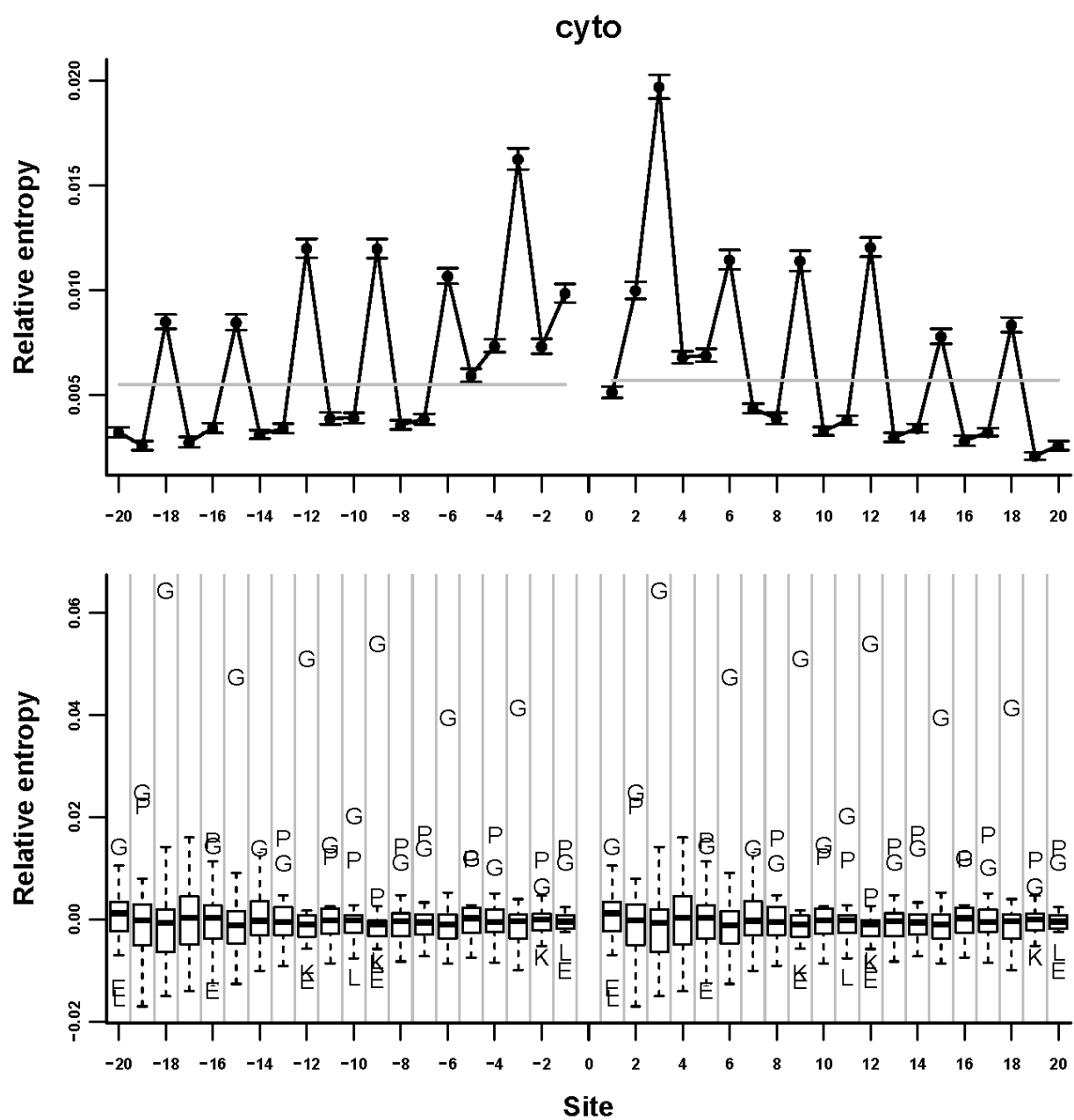


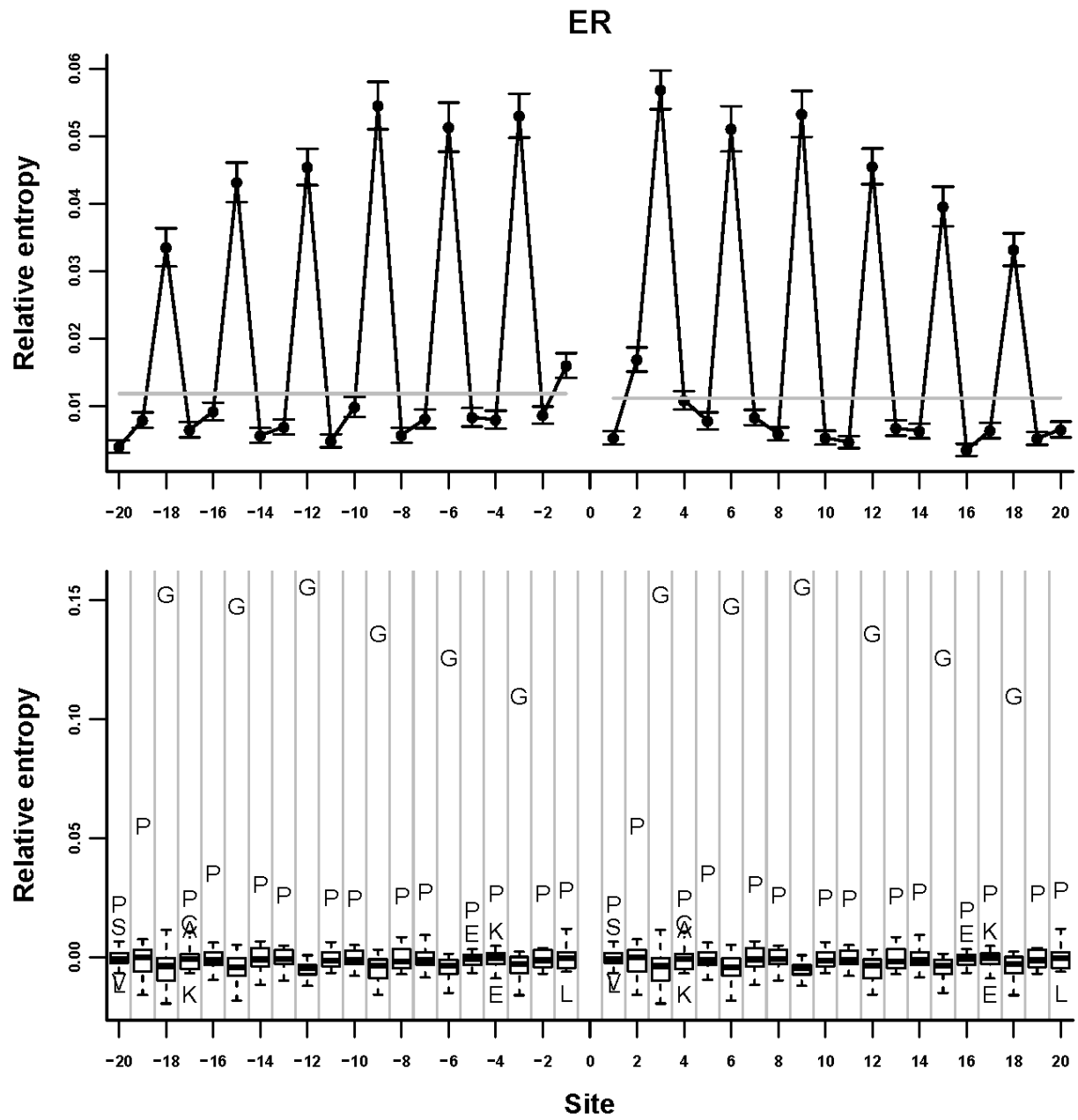


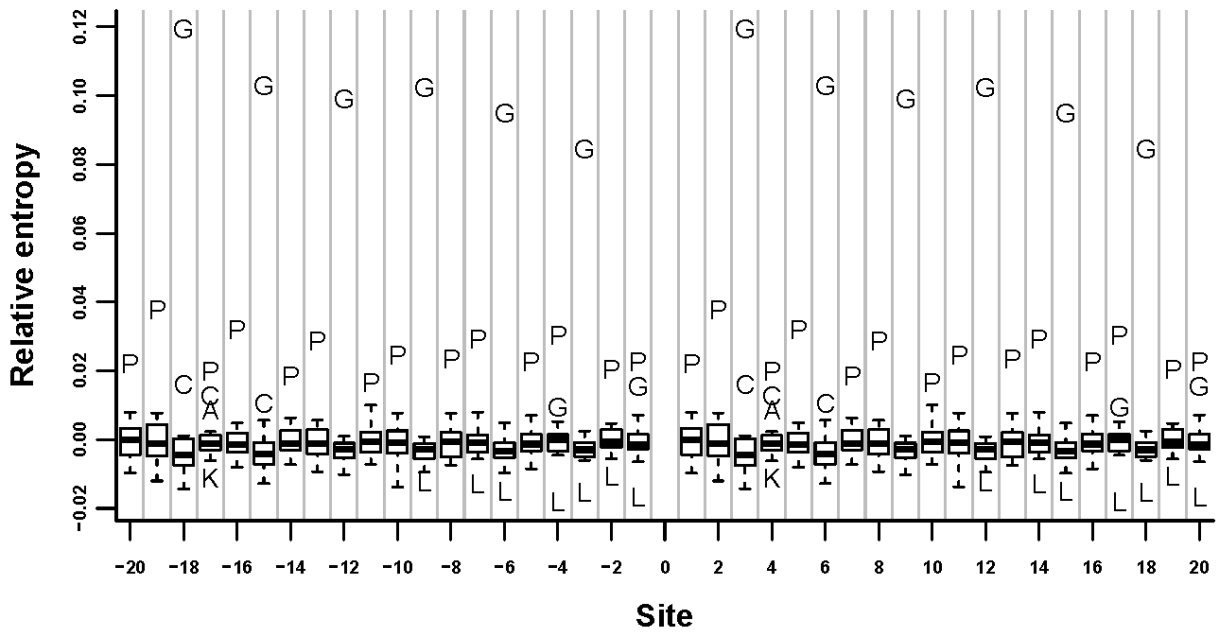
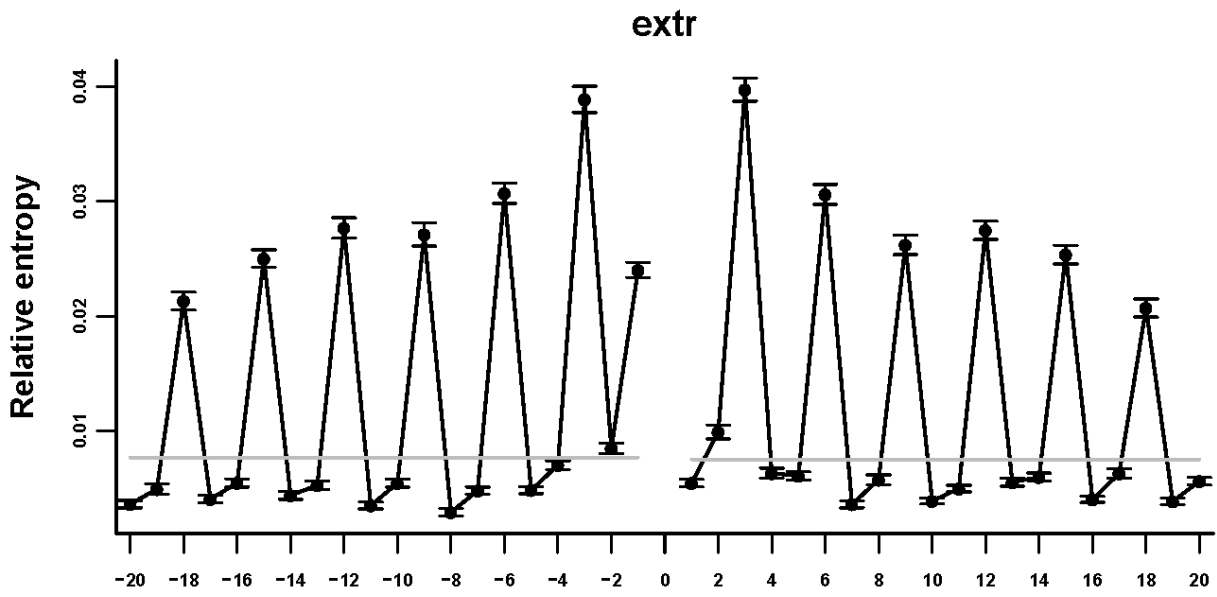


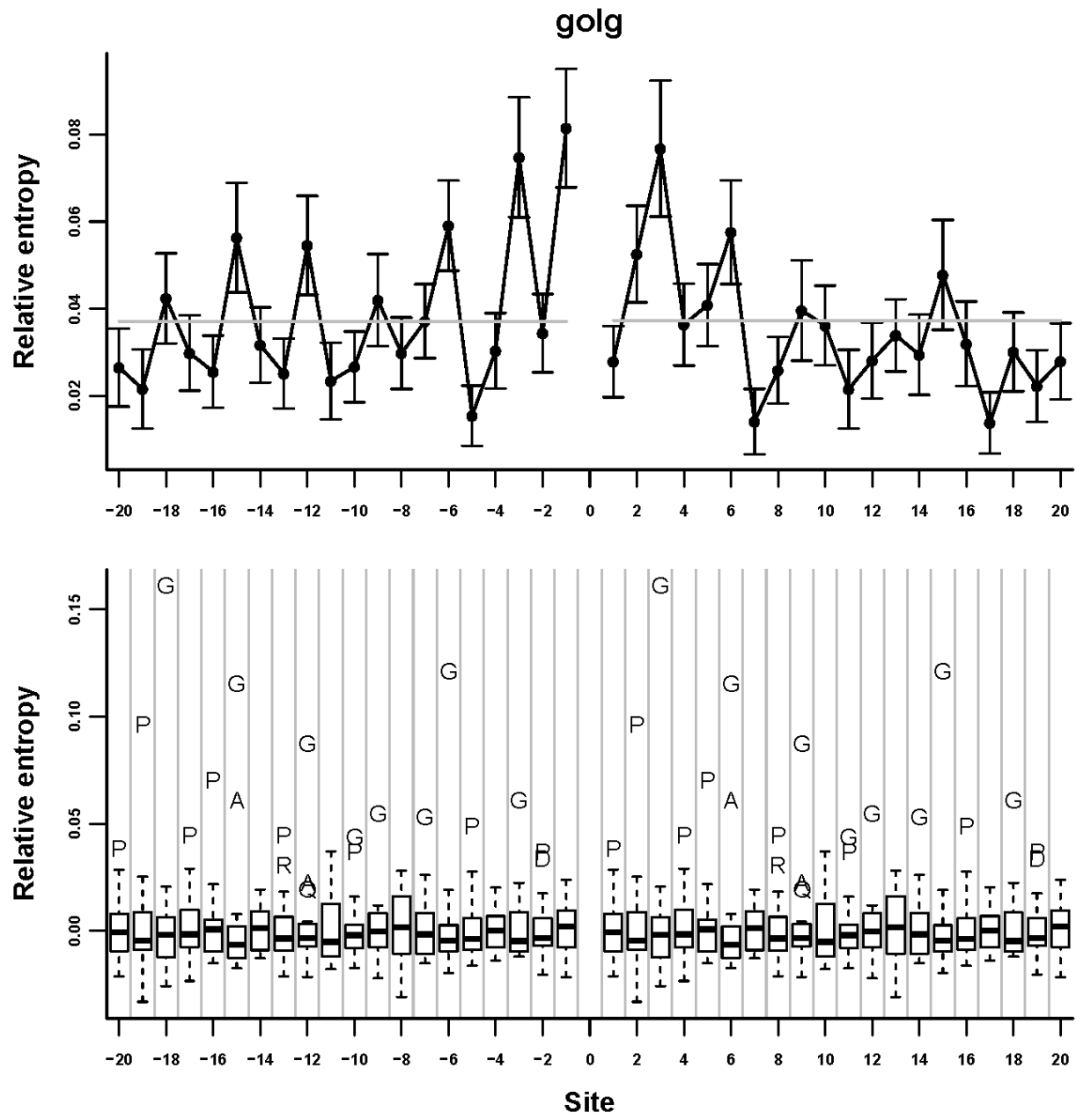
**Figure S10.** Neighbor preference patterns of G in different cellular locations.

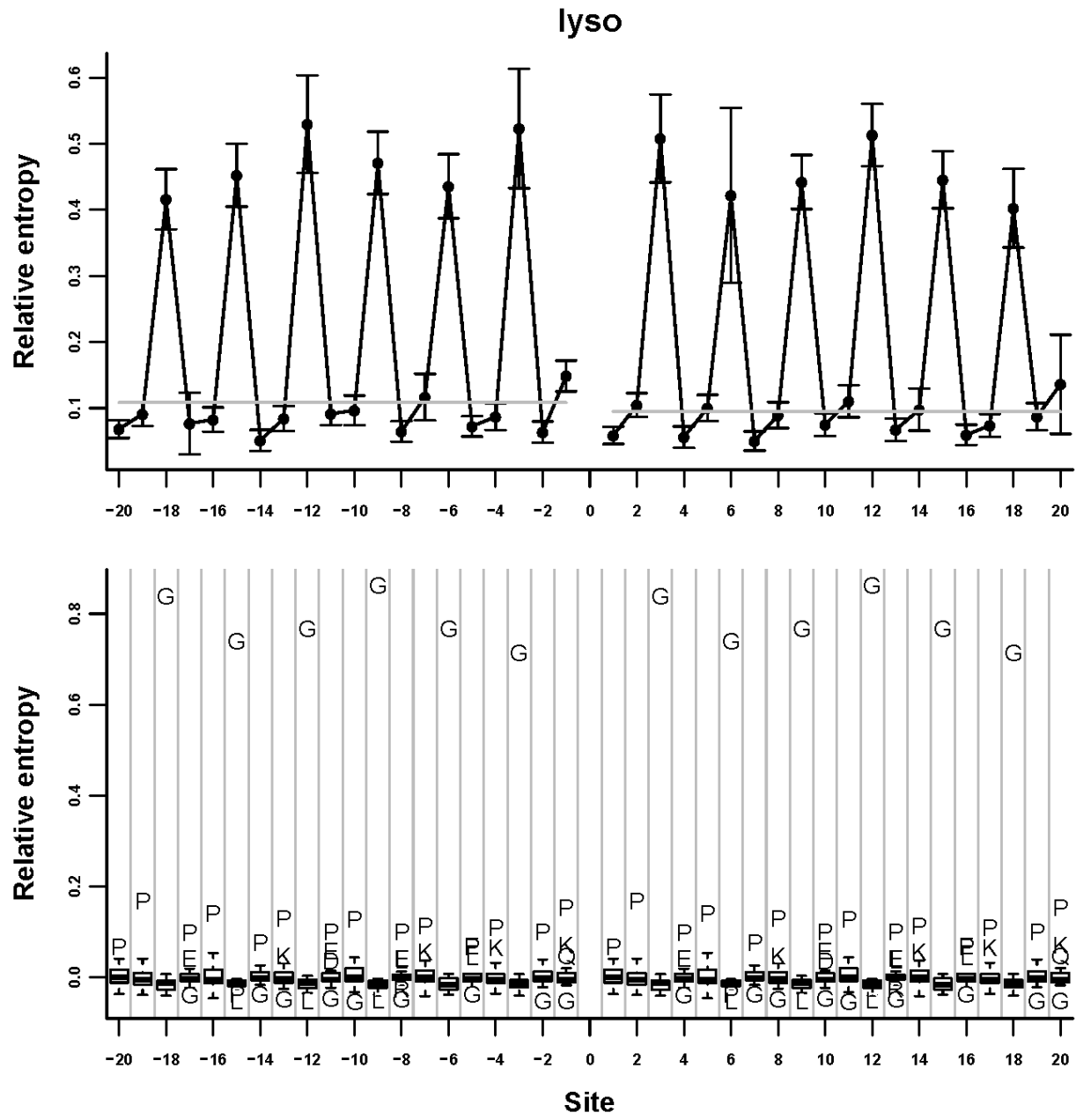


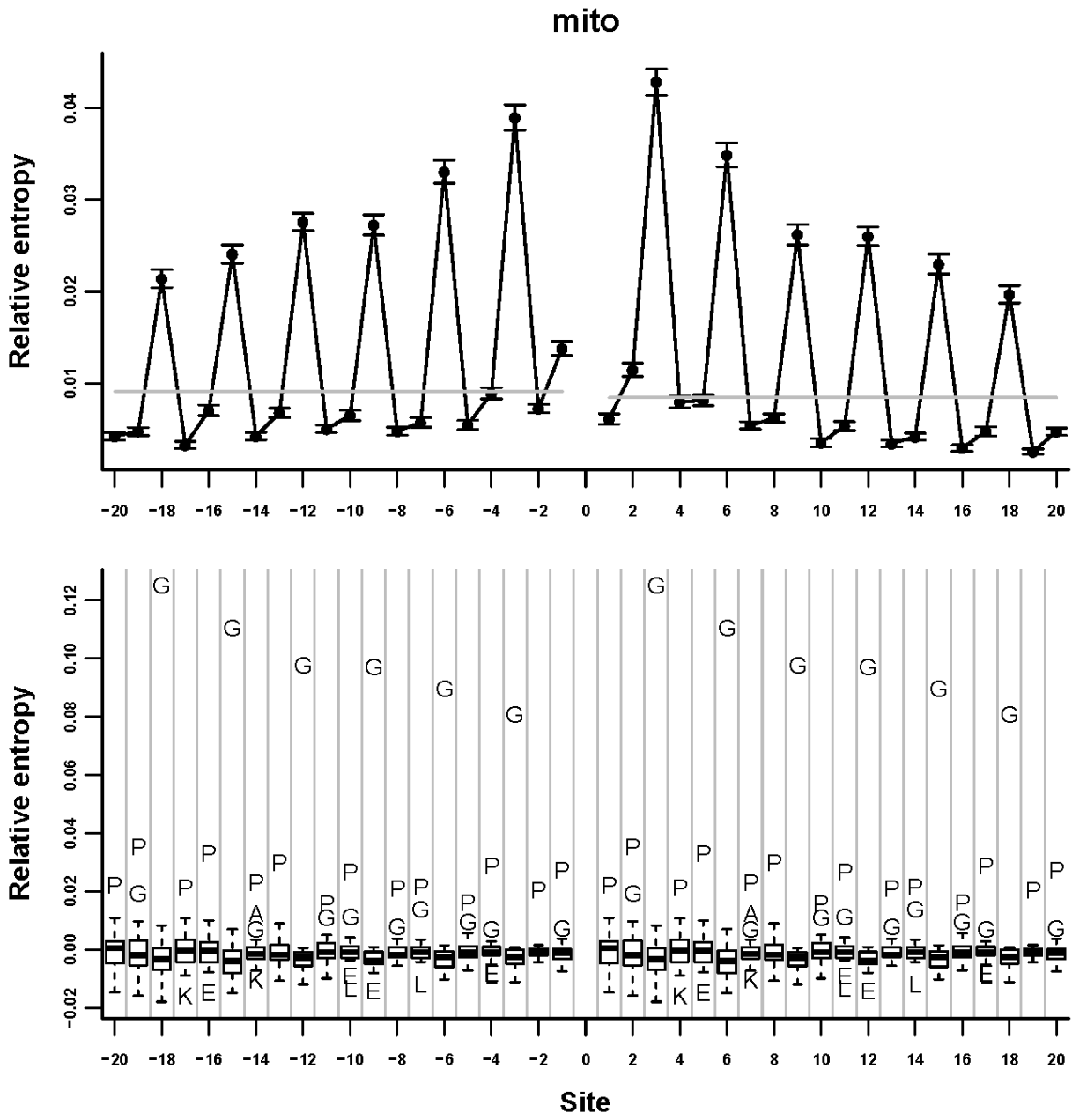




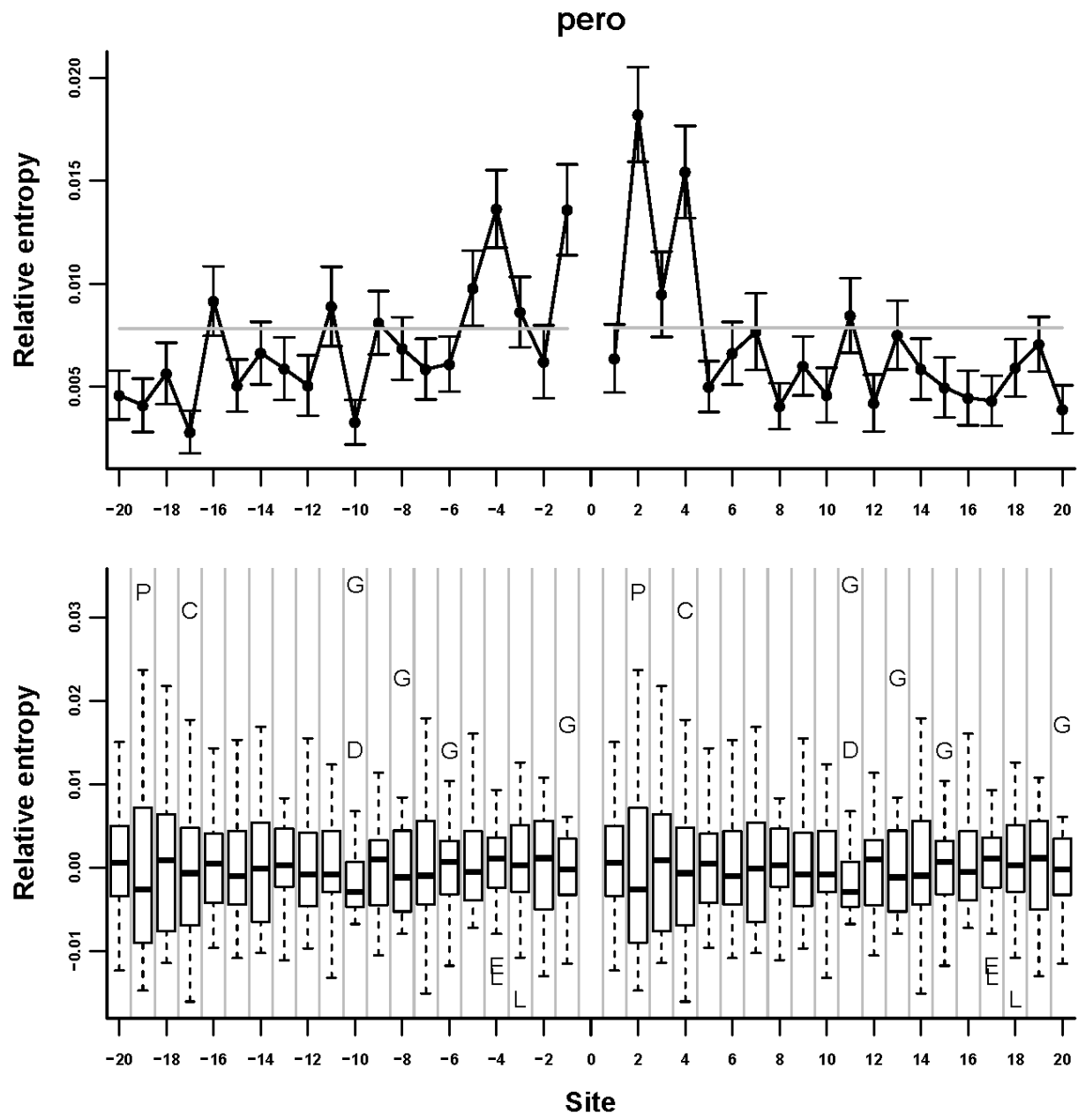


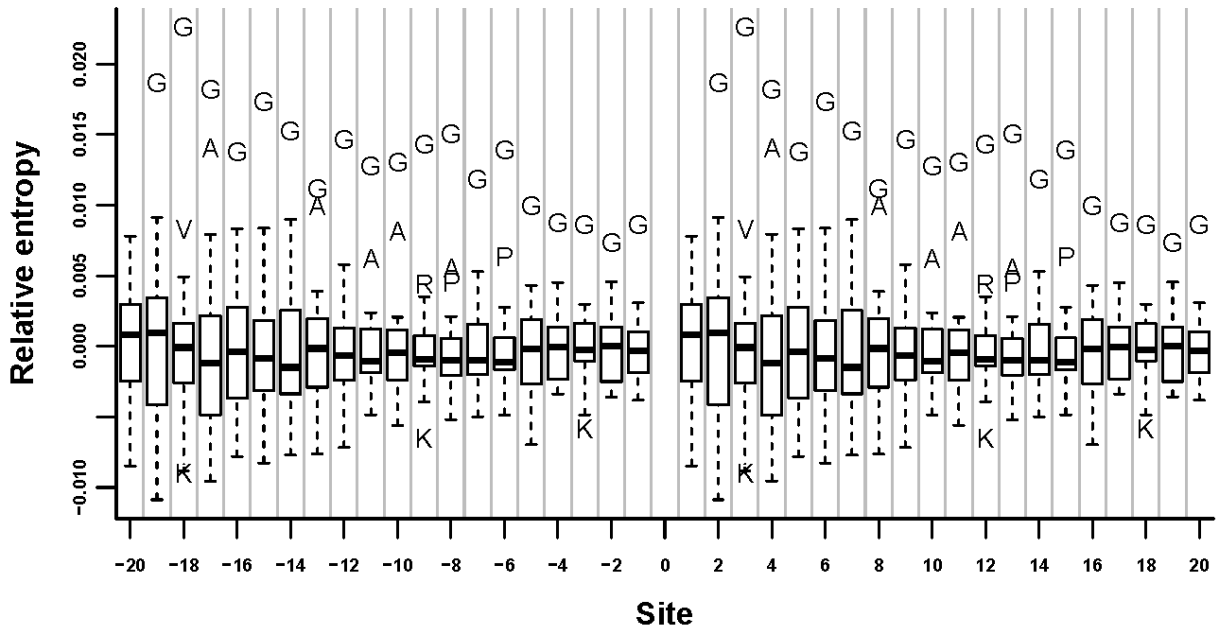
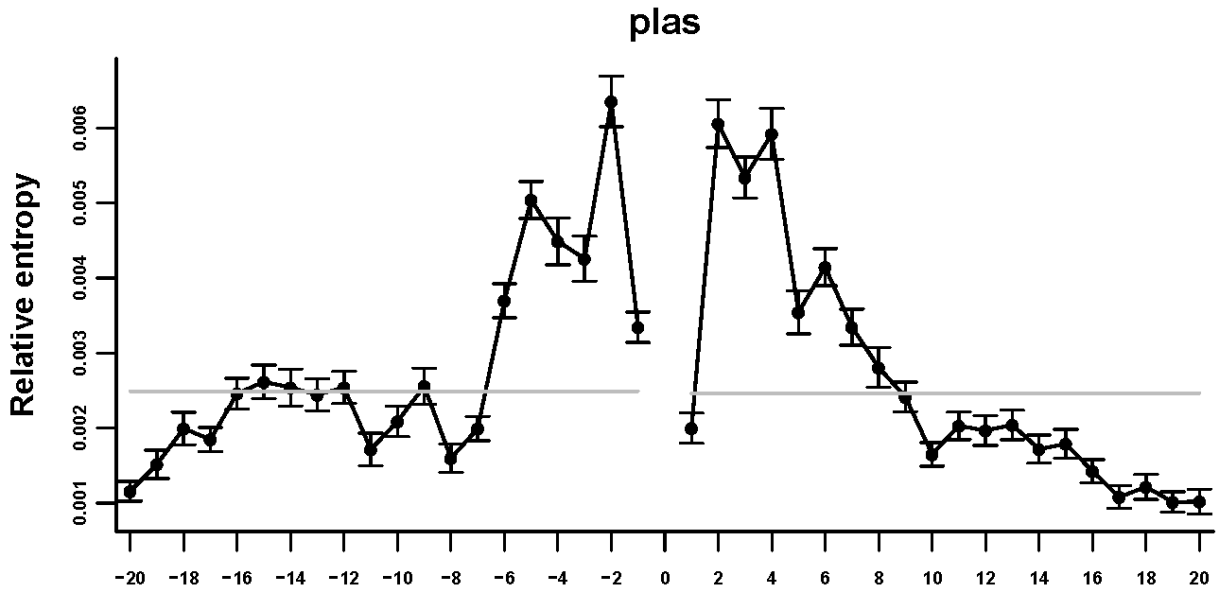




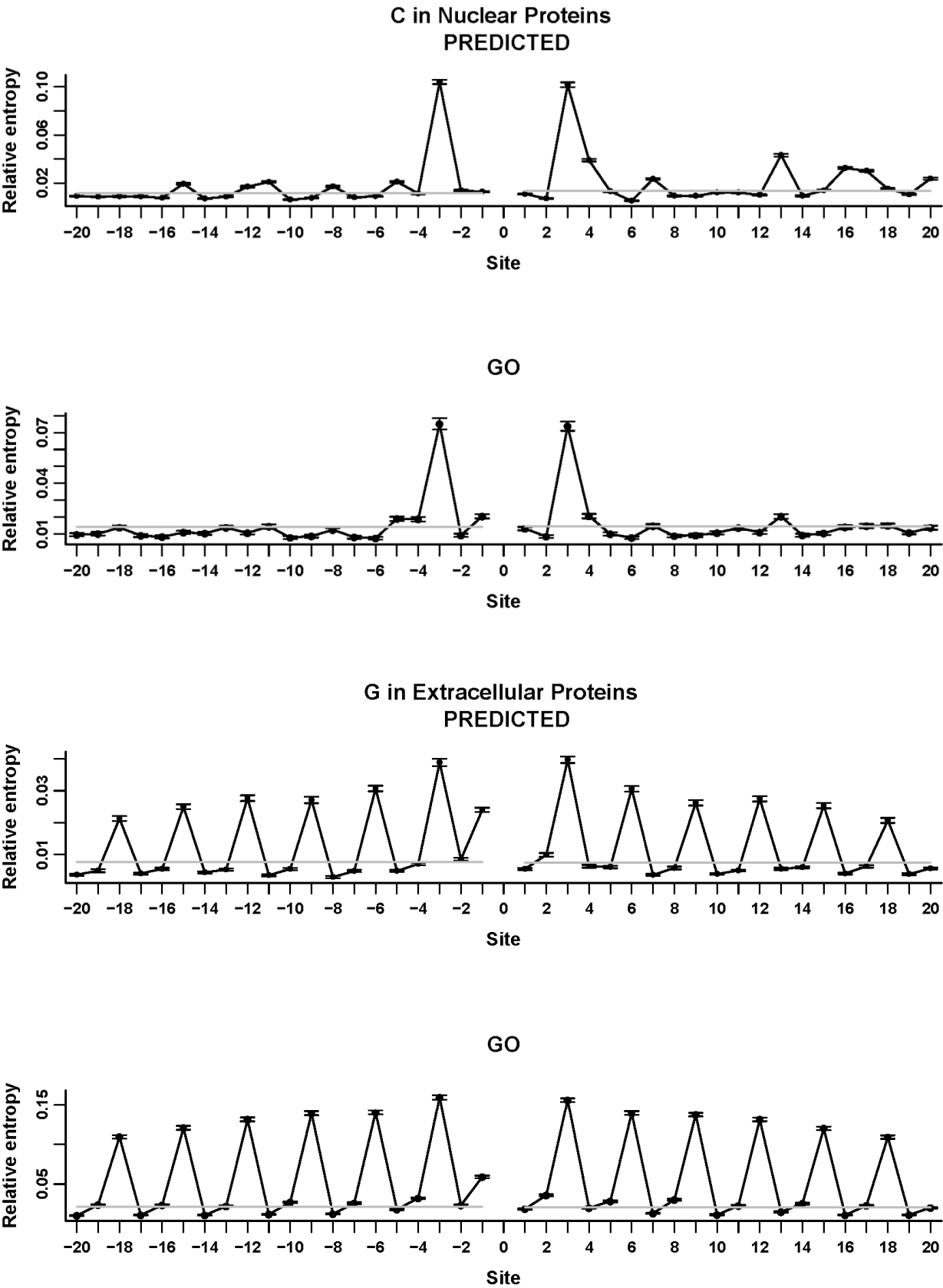








**Figure S11.** Comparison of the neighbor preference patterns of C and G in predicted and GO datasets.



**Figure S12.** The phylogenetic tree of human, mouse and dog.

