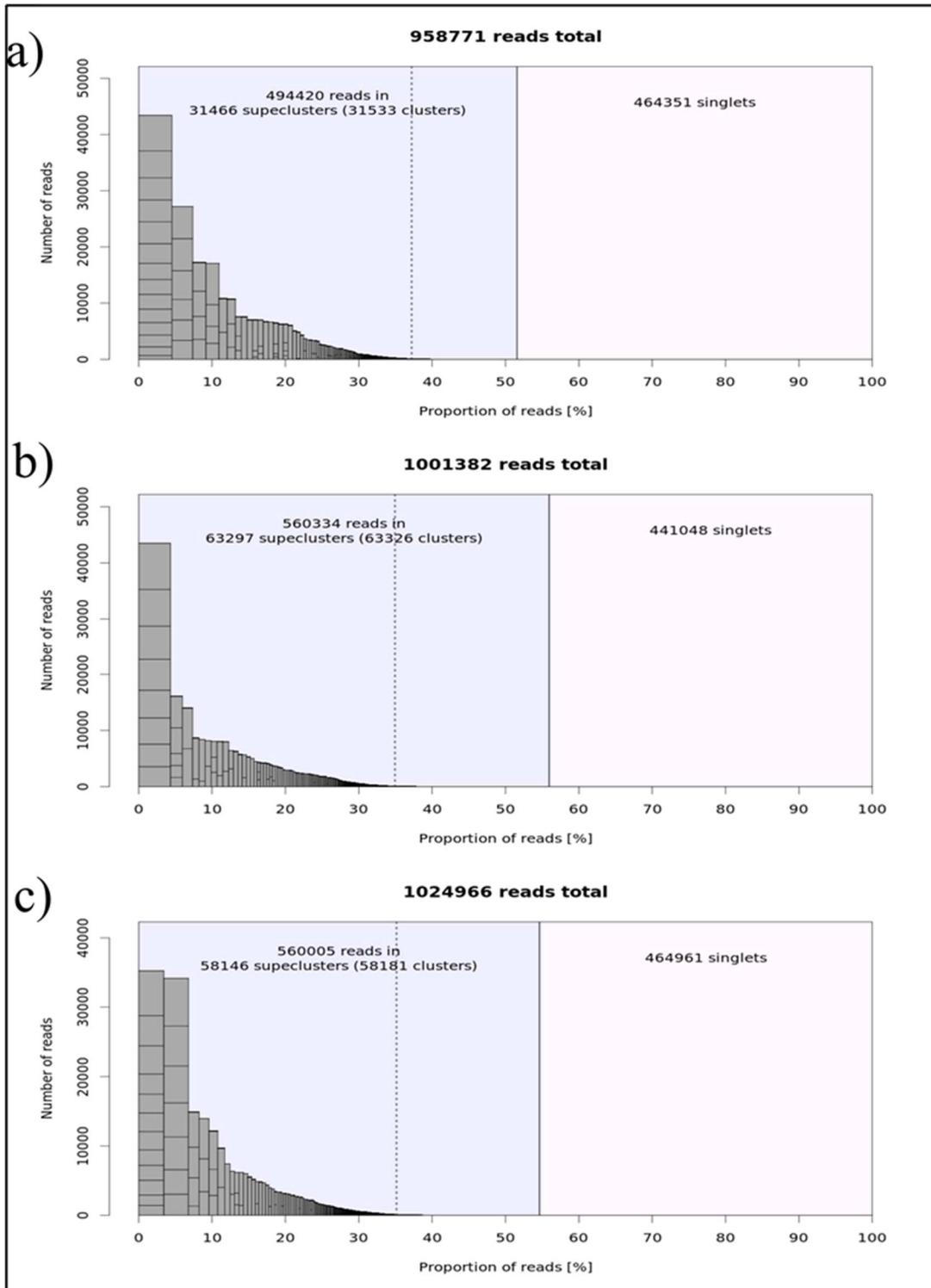


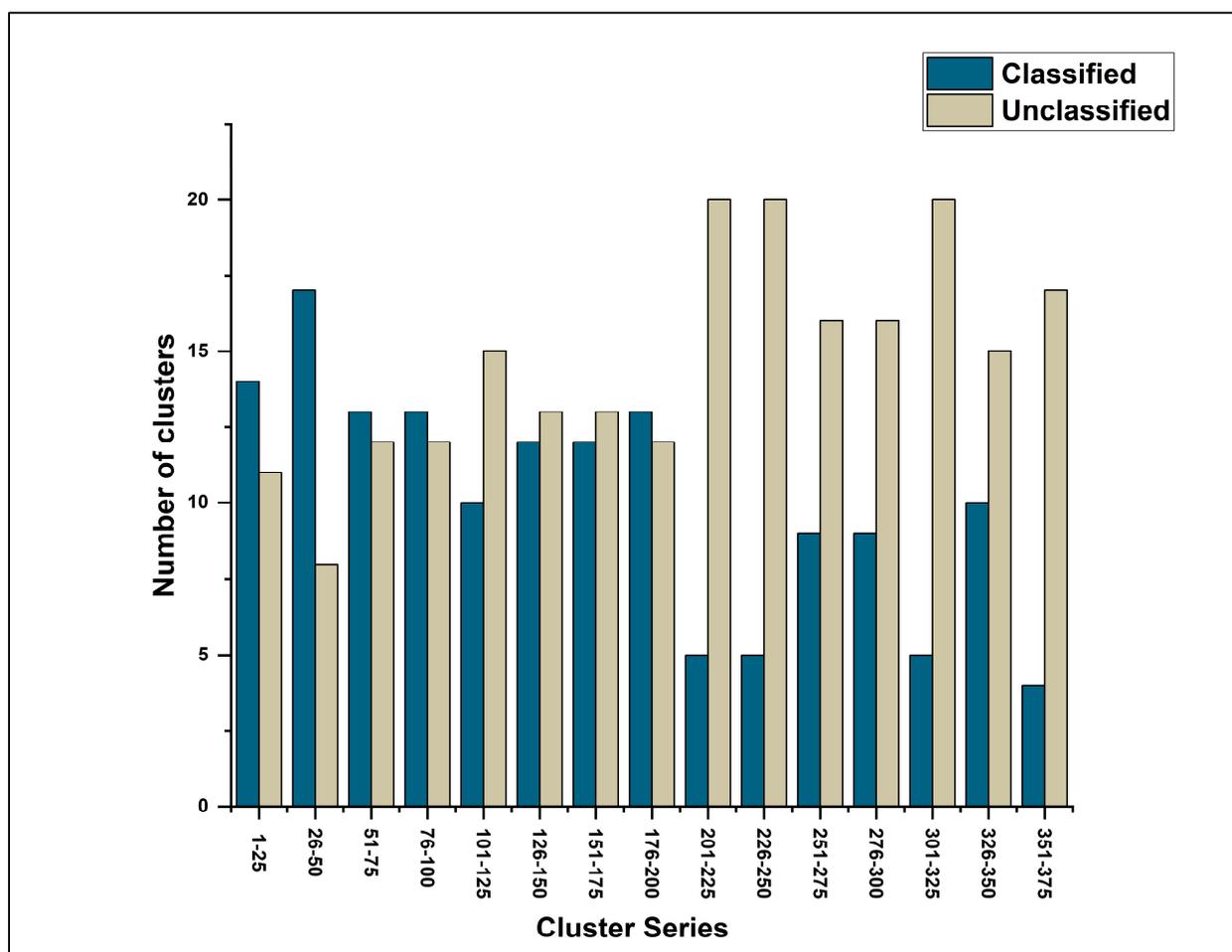
**Table S1. Genome data information used for TEs analysis.**

Species Name	Collection site	BioProject Number	SRR Number	Genome Sizes (pg)	NGS Data used in Repeatexplorer2 (reads)	Individual Clustering (coverage)	Comparative Clustering (coverage)	No. of clusters*	No. of Super Clusters*
<i>C. abbreviatus</i>	Changchun, Jilin, China	PRJNA638780	SRR14826315	9.99	16,283,700	0.5x	0.03x	345	292
<i>C. barbarus</i>	Alxa Zuoqi, Alxa League, Inner Mongolia, China	PRJNA638780	SRR14826314	10.37	16,903,100	0.5x	0.03x	355	320
<i>C. italicus</i>	Zhangye City, Gansu Province, China	PRJNA638780	SRR14826313	10.1	16,463,000	0.5x	0.03x	479	453

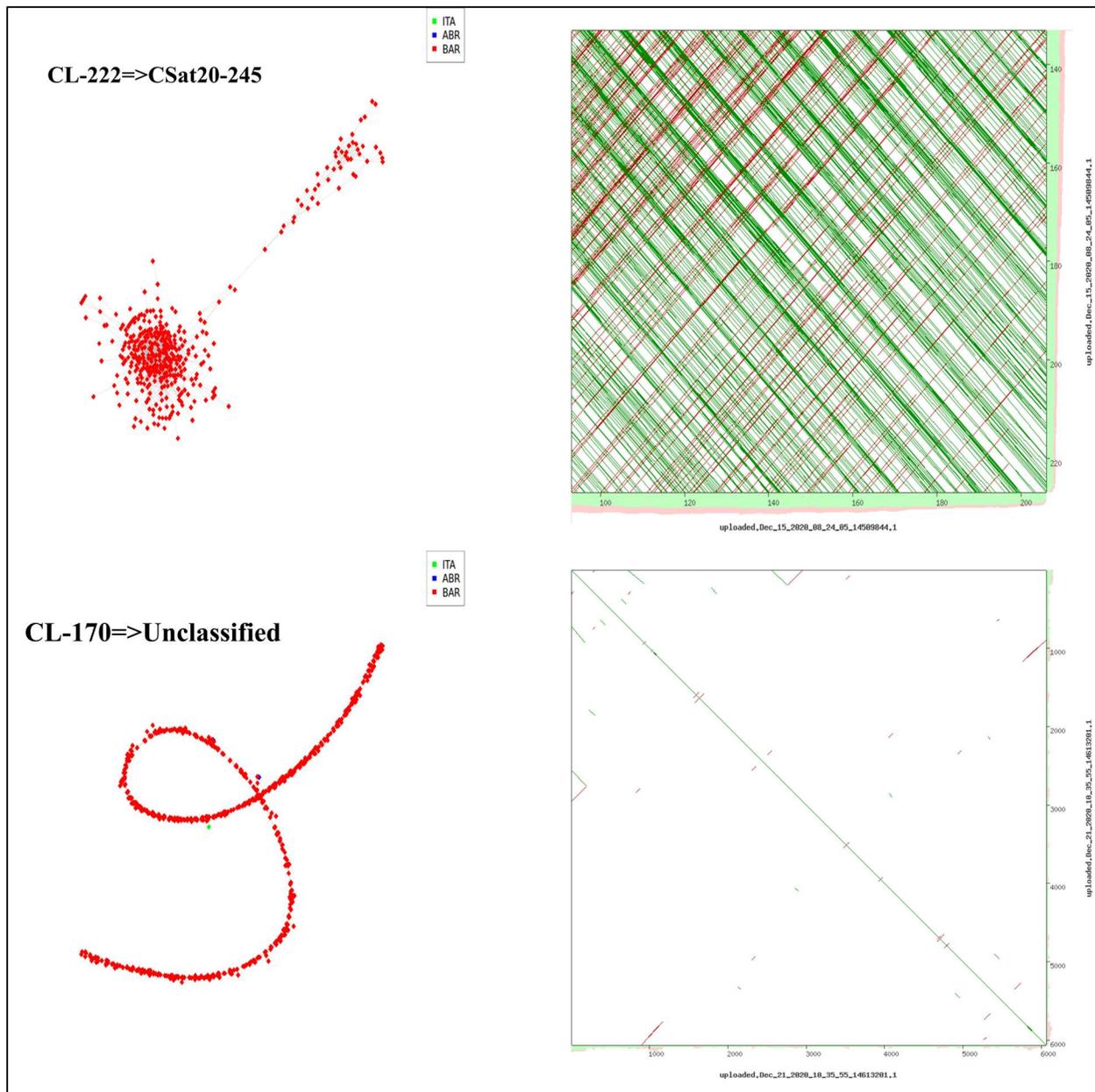
\*Clusters and Super Cluster above the threshold of 0.01%.



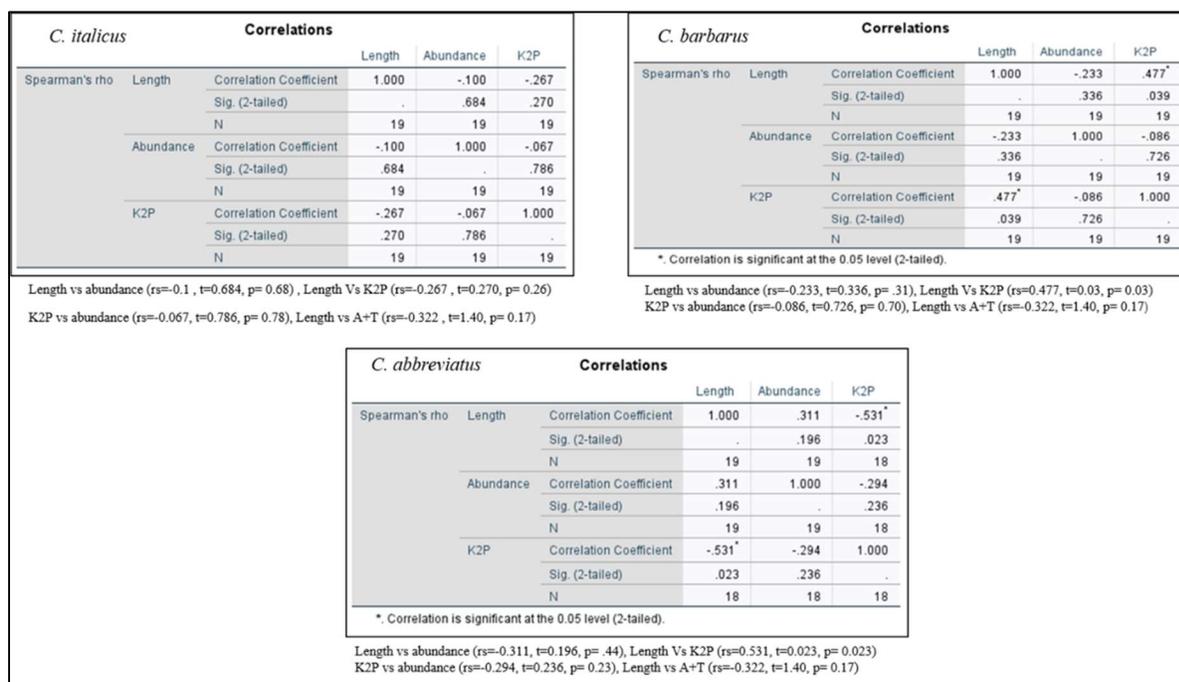
**Figure S1.** The graphical summary of individual clustering analysis of the genus *Calliptamus* species. The heights and widths of the bars denote superclusters, corresponding to the number of reads in the superclusters on y-axis and their proportions in all examined reads on x-axis. Individual clusters are represented by rectangles inside the supercluster bars. The proportions of clustered and single reads are shown in the blue and pink background panels, respectively. On the left of the dotted line are the top clusters. **a)** *C. abbreviatus*, **b)** *C. italicus*, **c)** *C. barbarus*.



**Figure S2.** The proportion of annotation of classified and unclassified clusters by RepeatExplorer2. Clusters are arranged in ascending order.



**Figure S3.** The classification of *C. barbarus* species-specific unclassified cluster CL-222 and CL-170 using the YASS tool. The CL-222 graph depicts a typical layout of tandem repeats, and the contigs in this cluster were compared to one another (Self-comparison). The diagonal lines (green lines) in the graph represent the tandem repeat, which allows us to characterize it as satellite DNA repeat CSat20-245. The other cluster CL-170 has not shown any evidence of tandem repeat and left it as unclassified.



**Figure S4.** The Spearman rank-order correlation test. There was no significant correlation observed between K2P divergence against monomer length ( $r_s = -0.267$ ,  $t = 0.270$ ,  $p = 0.26$ ) and A+T content ( $r_s = 0.02$ ,  $t = 0.09$ ,  $p = 0.92$ ) in *Calliptamus italicus* species. the K2P divergence has shown a positive correlation with monomer length ( $r_s = 0.477$ ,  $t = 0.03$ ,  $p = 0.03$ ) in *Calliptamus barbarus* and in *Calliptamus abbreviatus* ( $r_s = 0.531$ ,  $t = 0.023$ ,  $p = 0.023$ ).

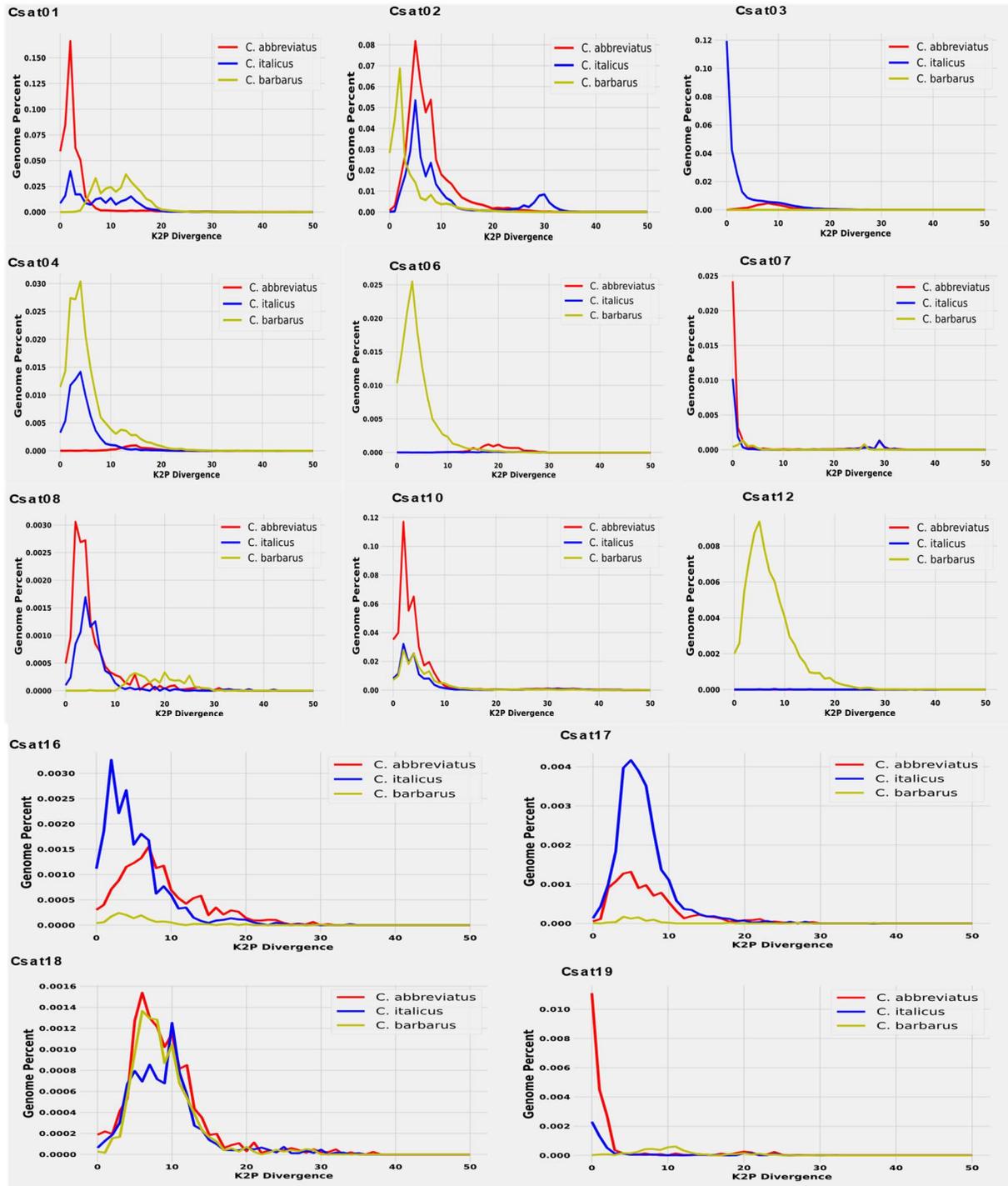
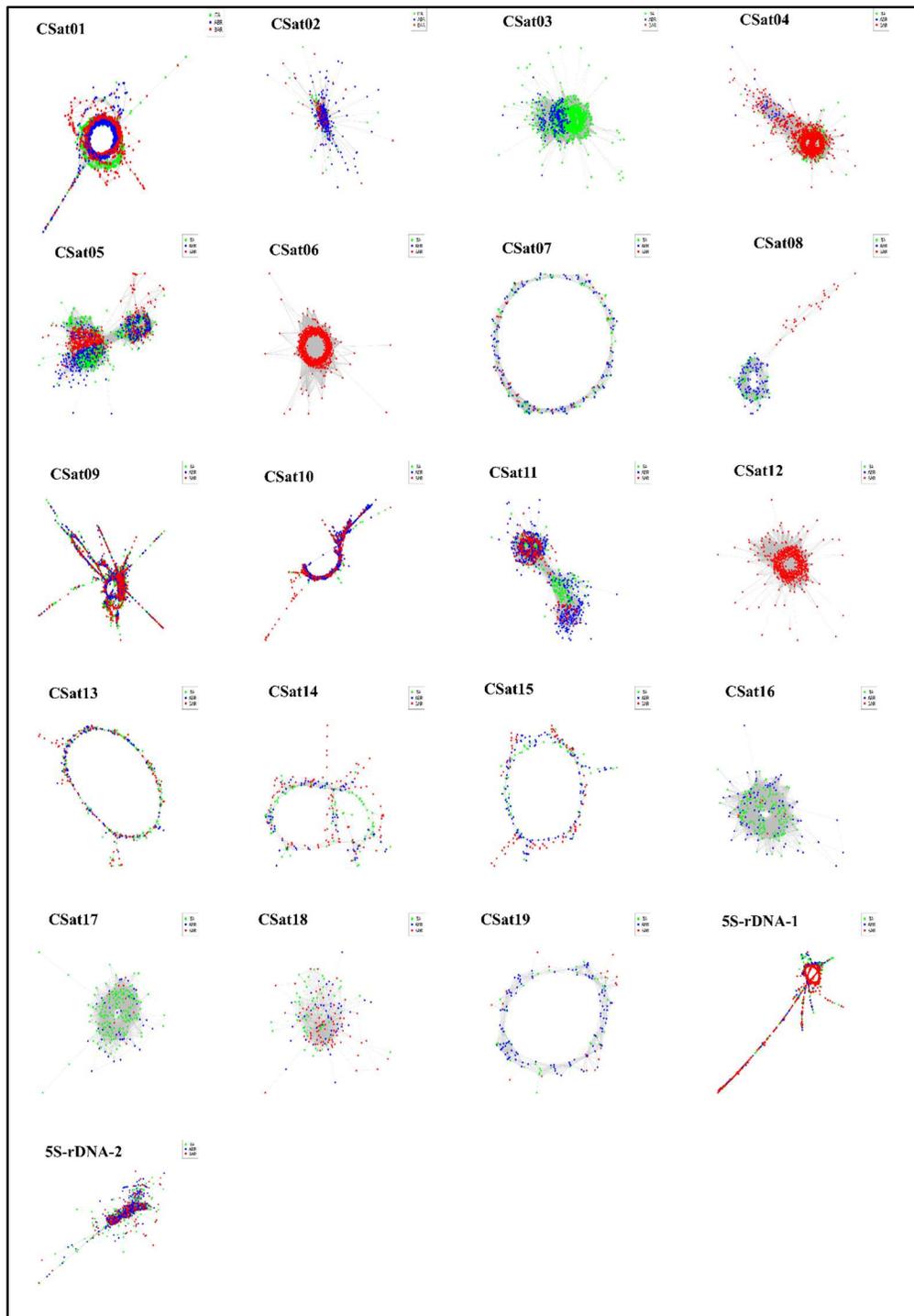
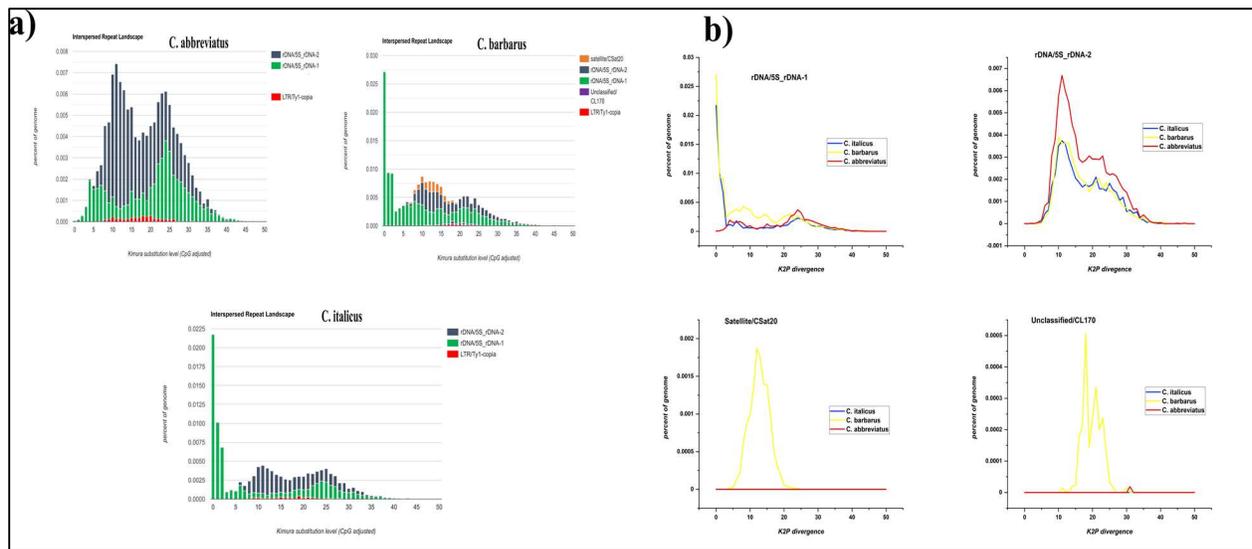


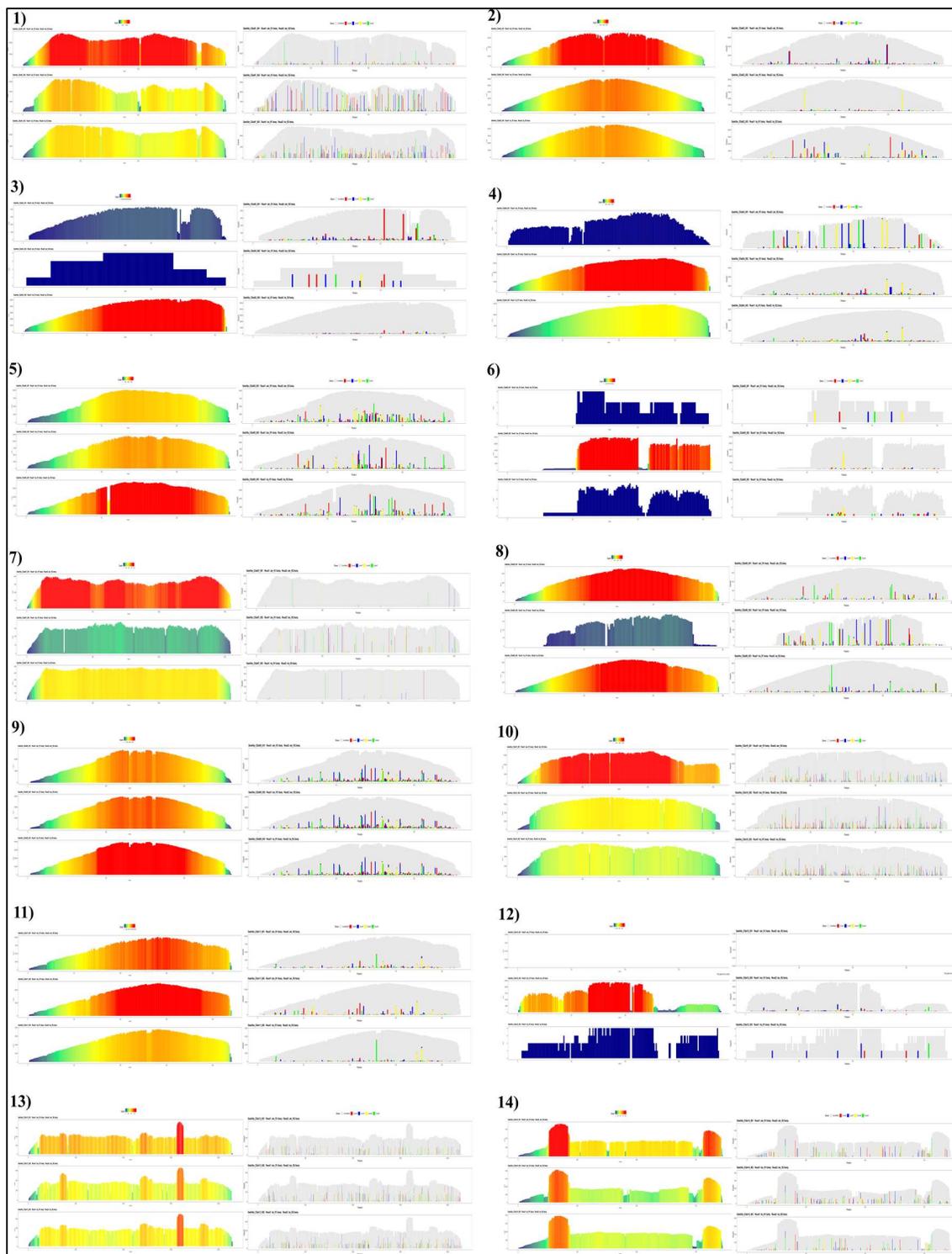
Figure S5. Satellitome comparative line graphs with single-peak and flattened distribution of abundance against the divergence.

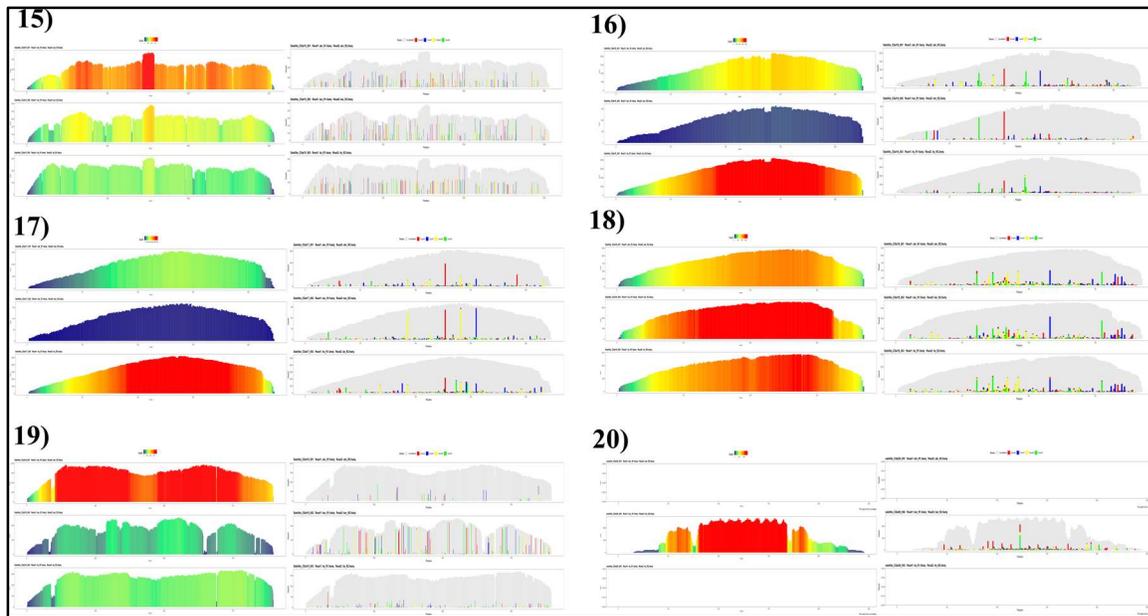


**Figure S6.** Satellitome graphical-structures for each family of satDNAs. The comparative graphical structures of satellite DNAs and rDNA-repeats reported in the Repeatexplorer2 output. Colors in the graph represent the species-specific reads (green-for-italicus, blue-for-abbreviatus, and red-for-barbarus) where the node denotes a specific read and the edges as a bridge (connecting lines) between the similar reads.



**Figure S7.** Interspersed repeat landscapes and line graphs of rDNAs and CSat20-45 family. The interspersed repeat landscape of rDNA-repeat, CSat20, and unclassified cluster has been shown here (a). In *C. barbarus*, a distinct individual repeat landscape demonstrates the existence of a single abundant peak of CSat20-245 satellite DNA. Similarly, the recent abundant copy of 5S-rDNA-01 in *C. italicus* and *C. barbarus* revealed one peak and multi-variant flat distribution in *C. abbreviatus*. There are two peaks of 5S-rDNA-02, the recent one and another ancient/degenerated highly divergent copy (b).





**Figure S8.** The individual satellite DNAs repeat and variant profiles demonstrate the strong species-specific signatures. Species profiles arranged in a sequence of *C. abbreviatus* => *C. barbarus* => *C. italicus*. Most of the satDNAs profiles have shown reasonable read depth coverage with the decrease of variation in the variant profiles, which are represented in dark red color. The CSat12 profile uneven coverage of repeats with sharp boundaries shows the differential amplification of fragmented copies of this repeat, implying the novel spread of satellite DNA sequence. Additionally, some profiles suggest the residual existence of some of the satDNAs degenerated copies such as CSat12 profile in *C. italicus*.

## The detail of consensus sequences of the satDNAs and 5S-rDNAs identified in the current experiment.

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