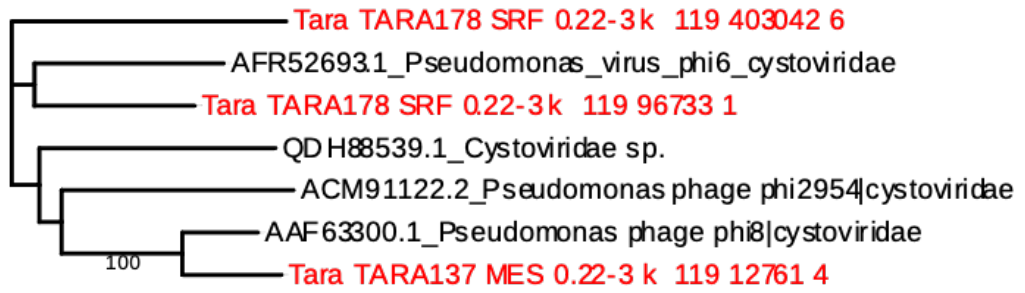


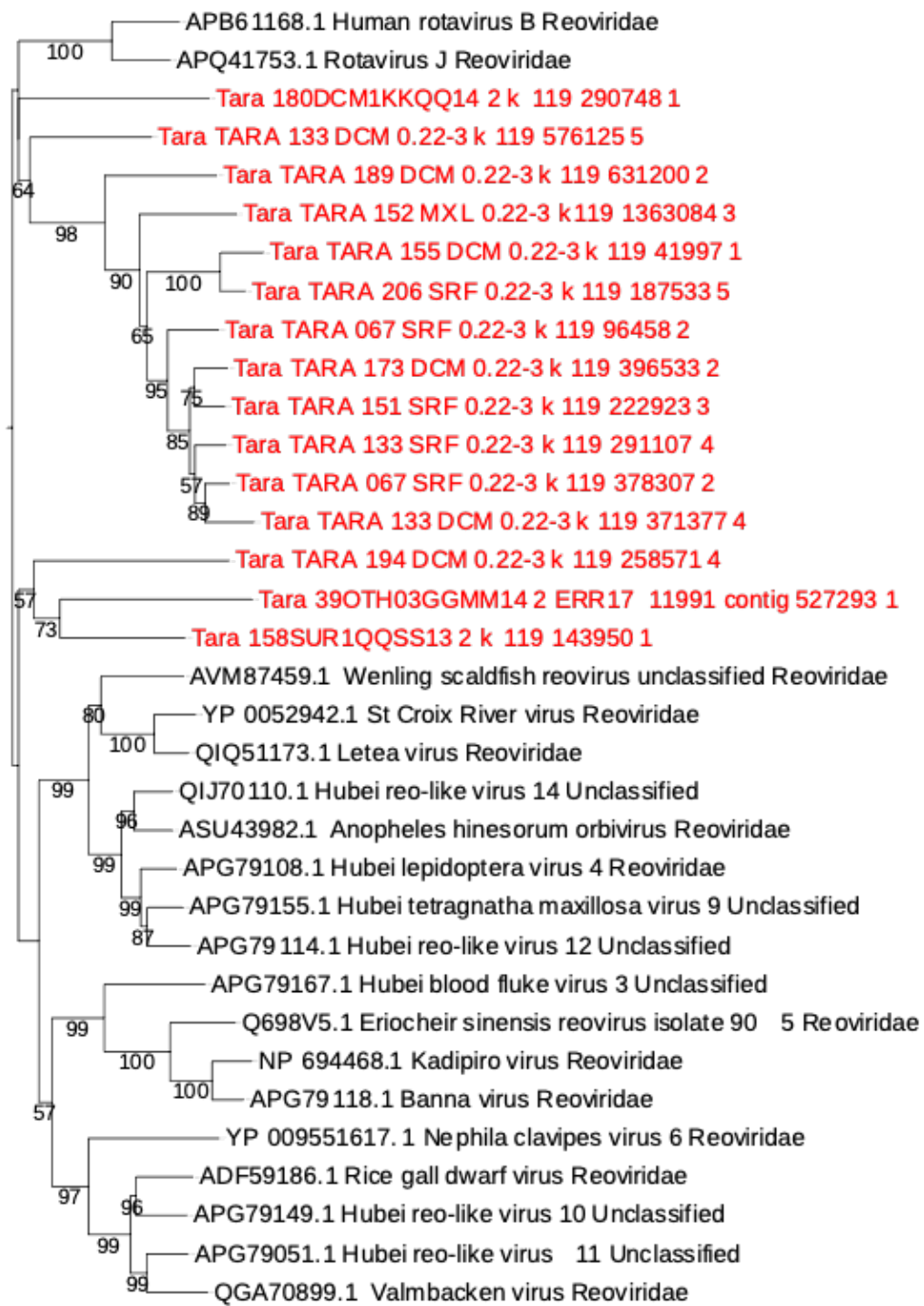
**Data S3. Cluster-specific Maximum-likelihood phylogenetic trees.** The phylogenetic trees were based on the amino-acid sequences of the RdRp domain. Tips are labelled with GenBank accession number, virus name and associated virus family if previously established/assigned. Viruses identified in this study are highlighted in red, whereas previously known sequences are highlighted in black or grey. The tree scale represents one substitution per amino acid. The multiple sequence alignments and phylogenetic trees are available online for download (see **Data and materials availability** section).

Tree scale: 1 



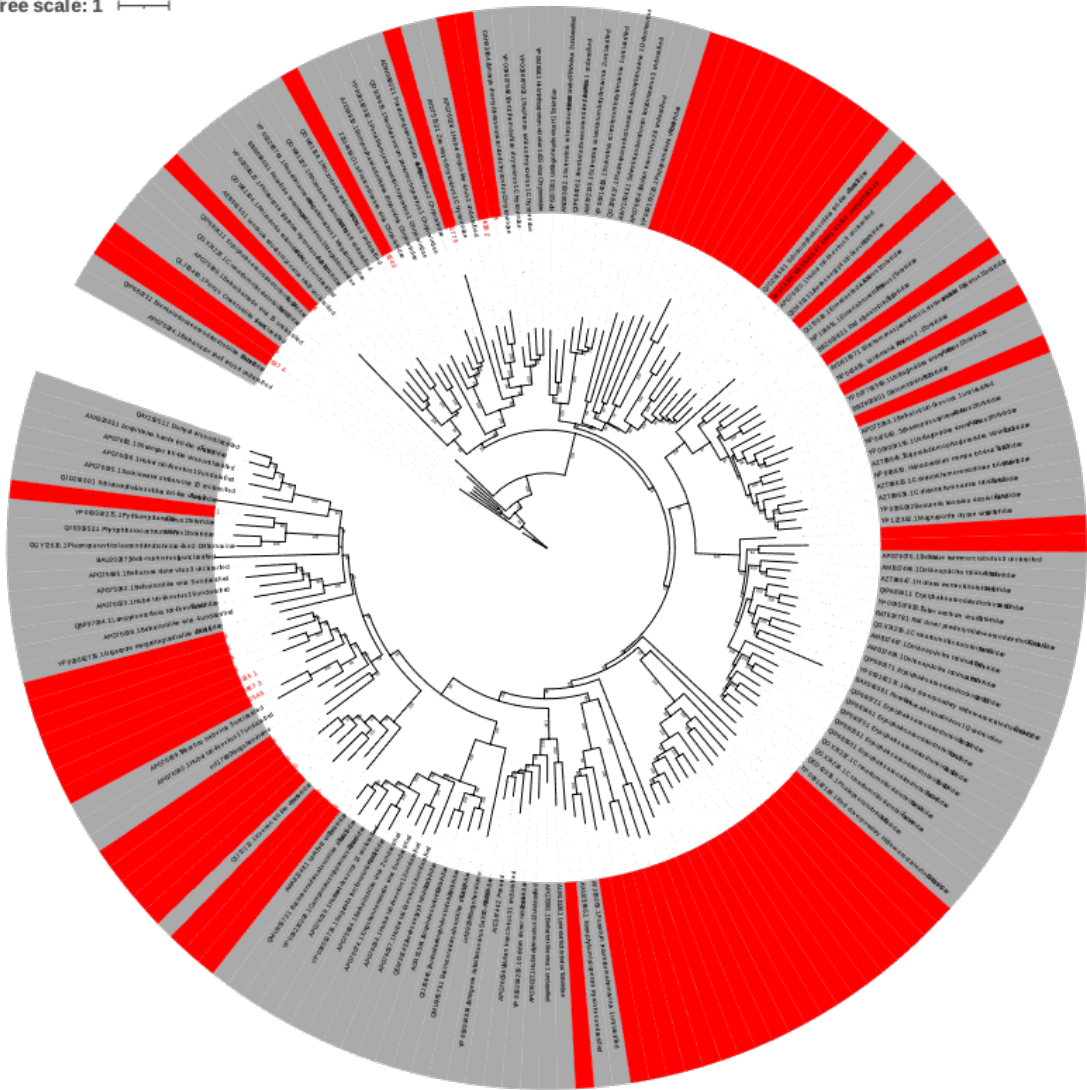
Phylogenetic tree of duplornaviricot class *Vidaverviricetes*.

Tree scale: 1



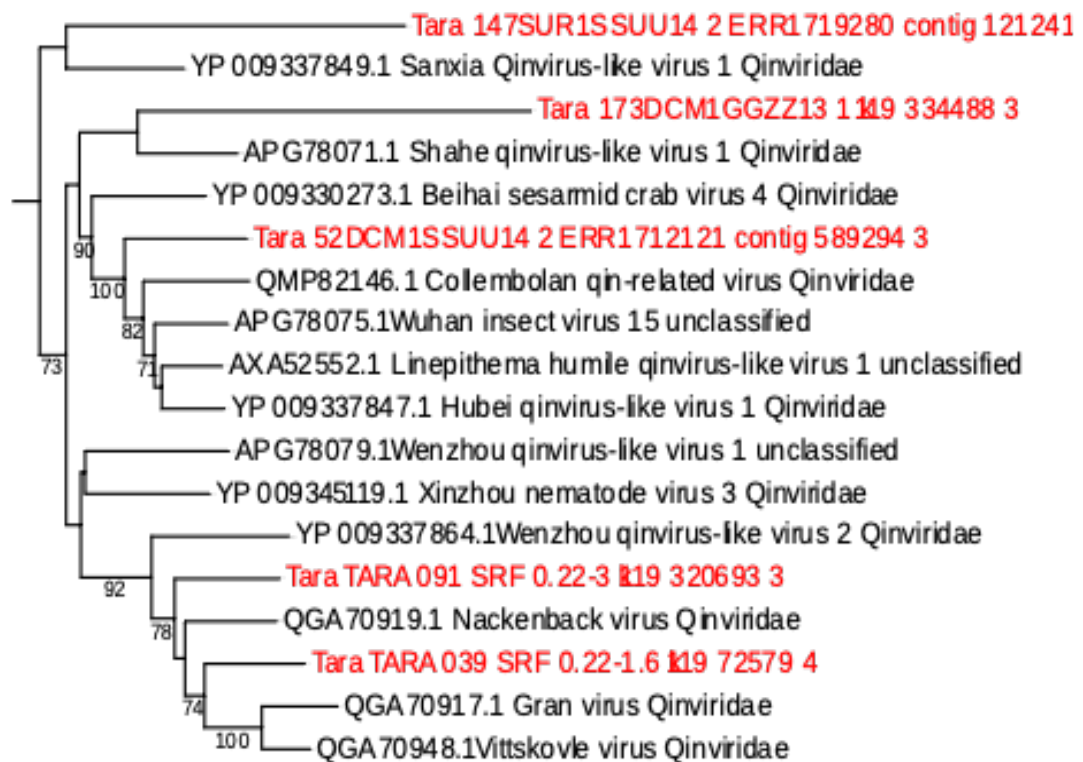
Phylogenetic tree of duplornaviricot class *Resentoviricetes*.

Tree scale: 1




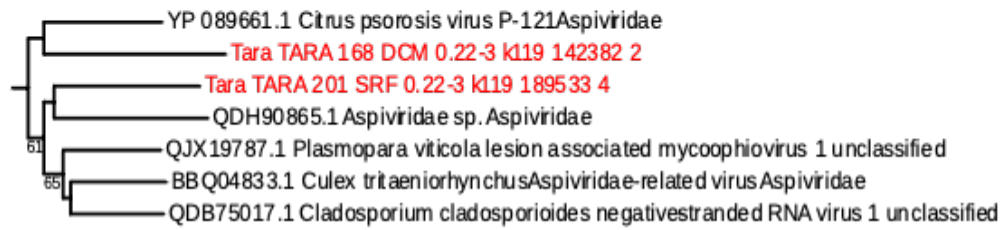
Phylogenetic tree of duplornaviricot class *Chrymotiviricetes*.

Tree scale: 1



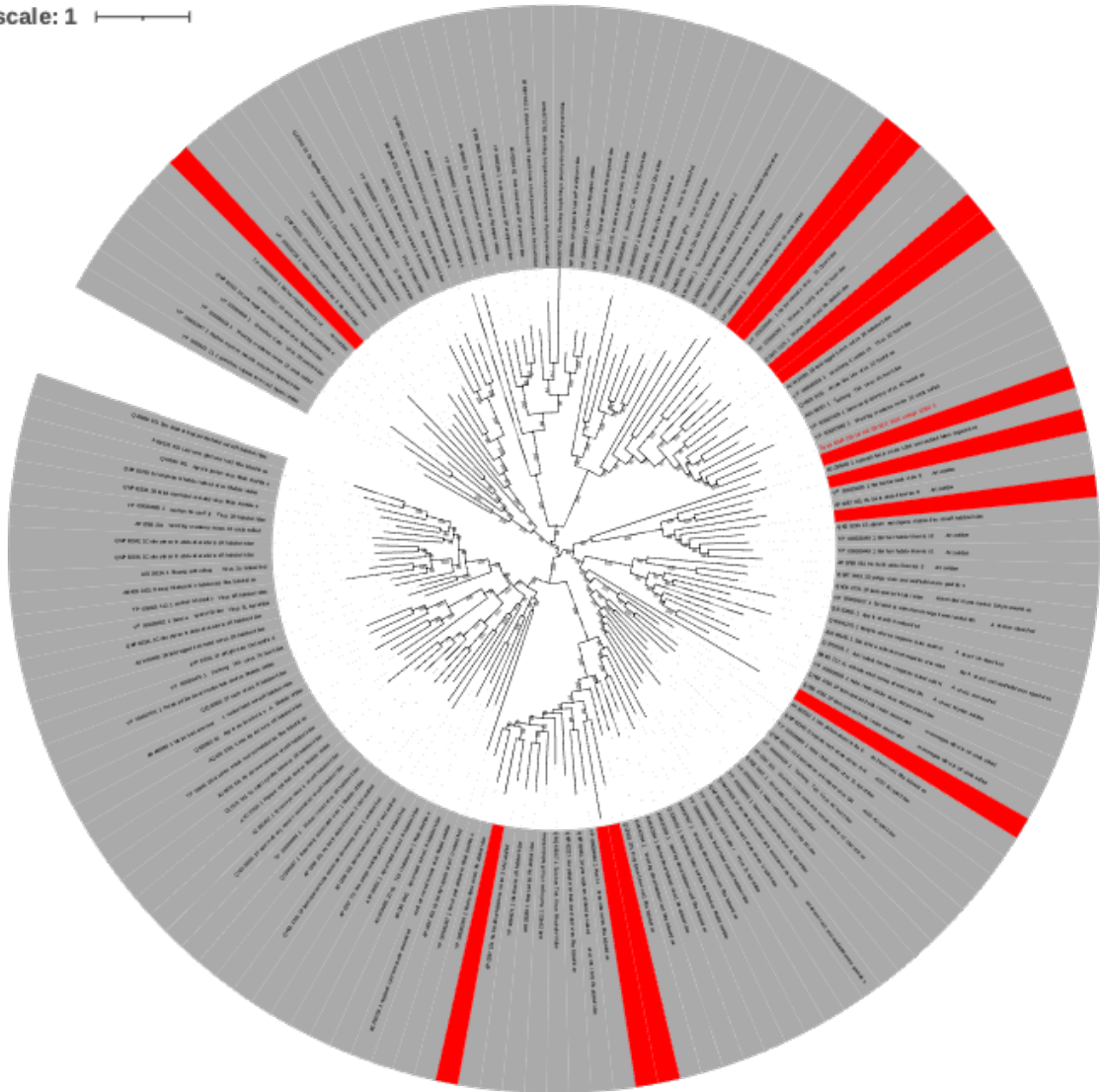
Phylogenetic tree of negarnaviricot class *Chunqiuviricetes* (subphylum *Haploviricotina*).

Tree scale: 1 



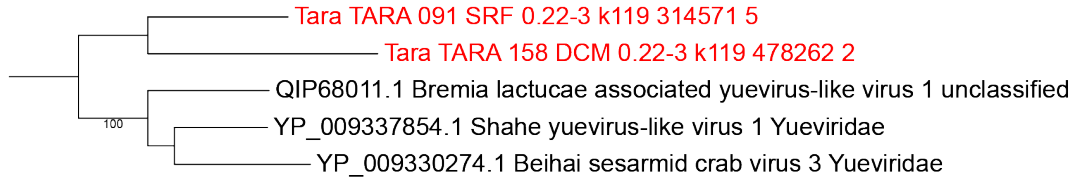
Phylogenetic tree of negarnaviricot class *Milnevircetes* (subphylum *Haploviricotina*).

Tree scale: 1



Phylogenetic tree of negarnaviricot class *Monjiviricetes* (subphylum *Haploviricotina*).

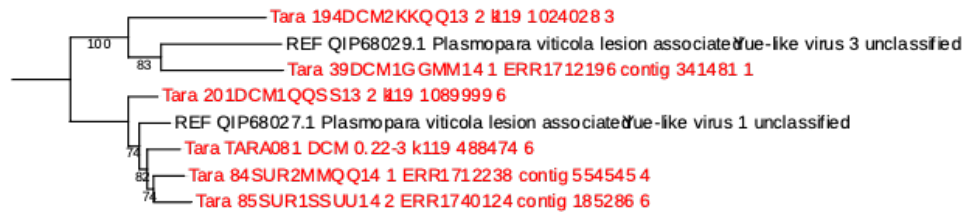
Tree scale: 1 



**Phylogenetic tree of negarnaviricot class *Yunchangviricetes* (subphylum *Haploviricotina*).**

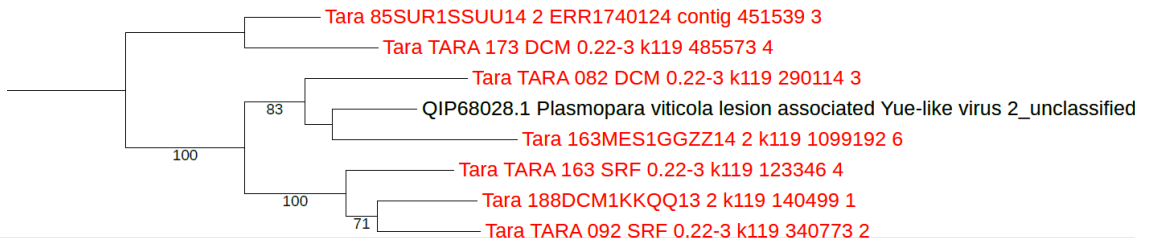


Tree scale: 1



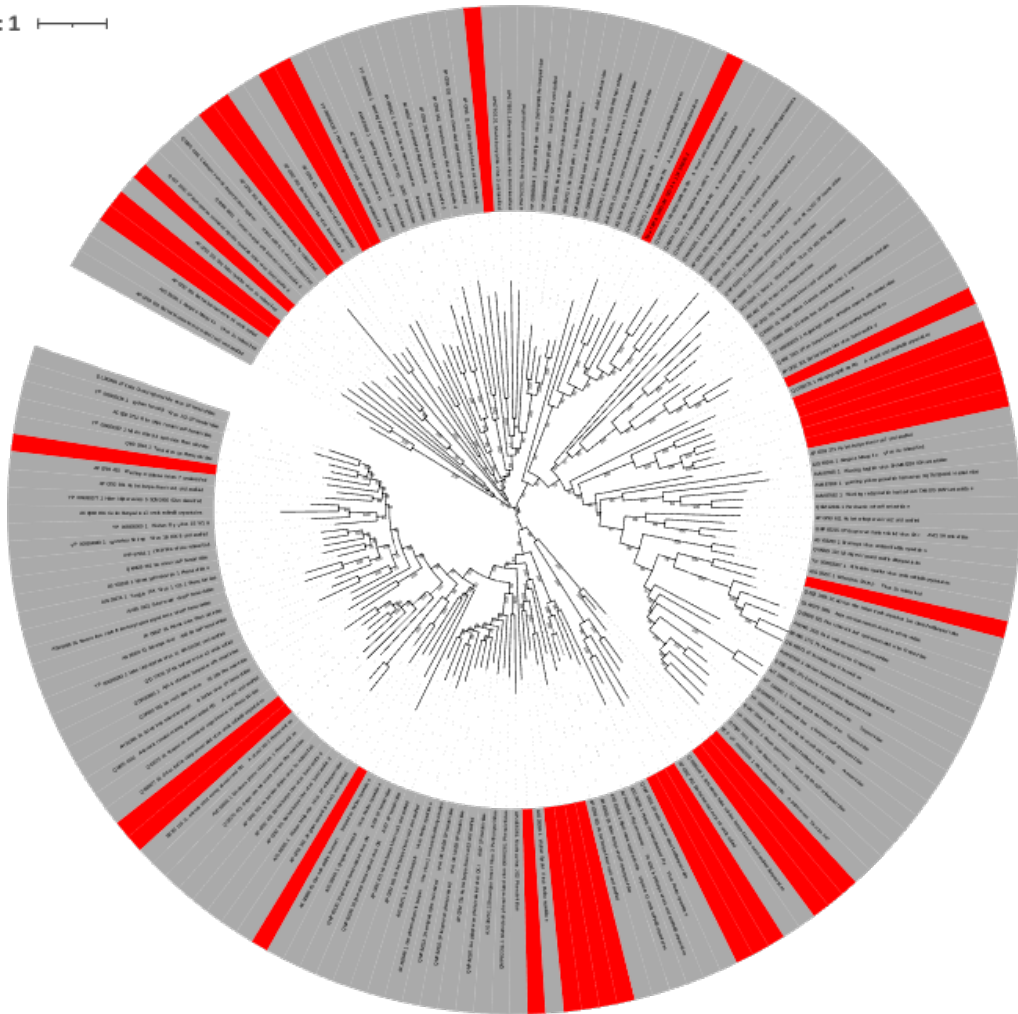
Phylogenetic tree of novel negarnaviricot class 66 (subphylum *Haploviricotina*).

Tree scale: 1 



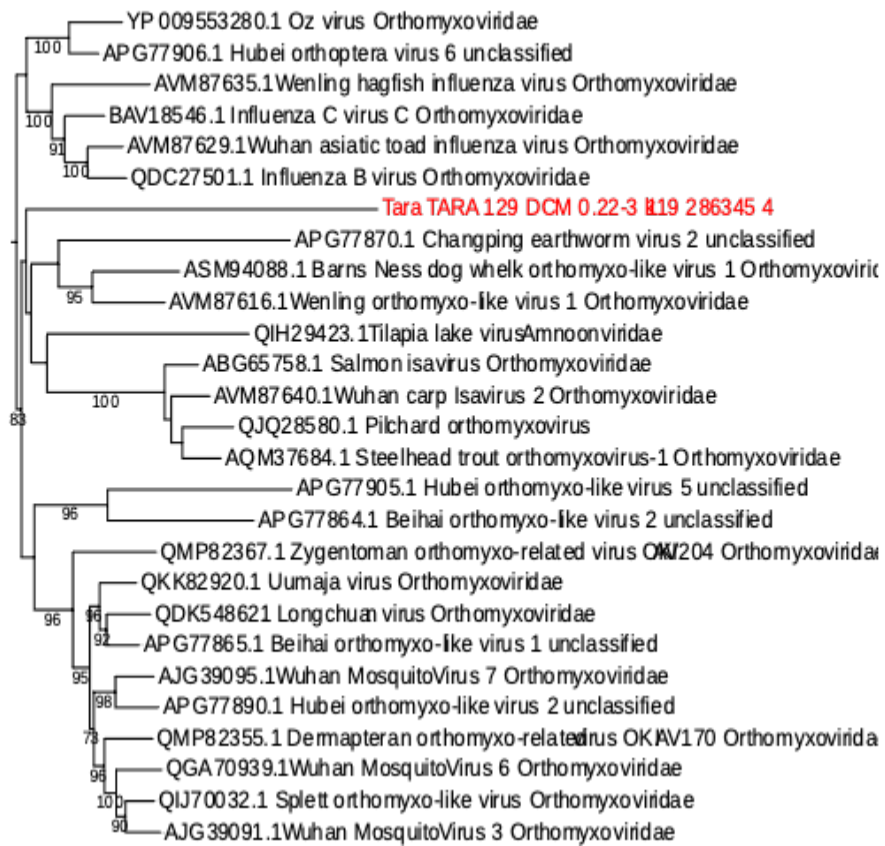
**Phylogenetic tree of novel negarnaviricot class 67 (subphylum *Haploviricotina*).**

Tree scale: 1 



Phylogenetic tree of negarnaviricot class *Ellioviricetes* (subphylum *Polyploviricotina*).

Tree scale: 1



**Phylogenetic tree of negarnaviricot class *Insthoviricetes* (subphylum *Polyploviricotina*).**

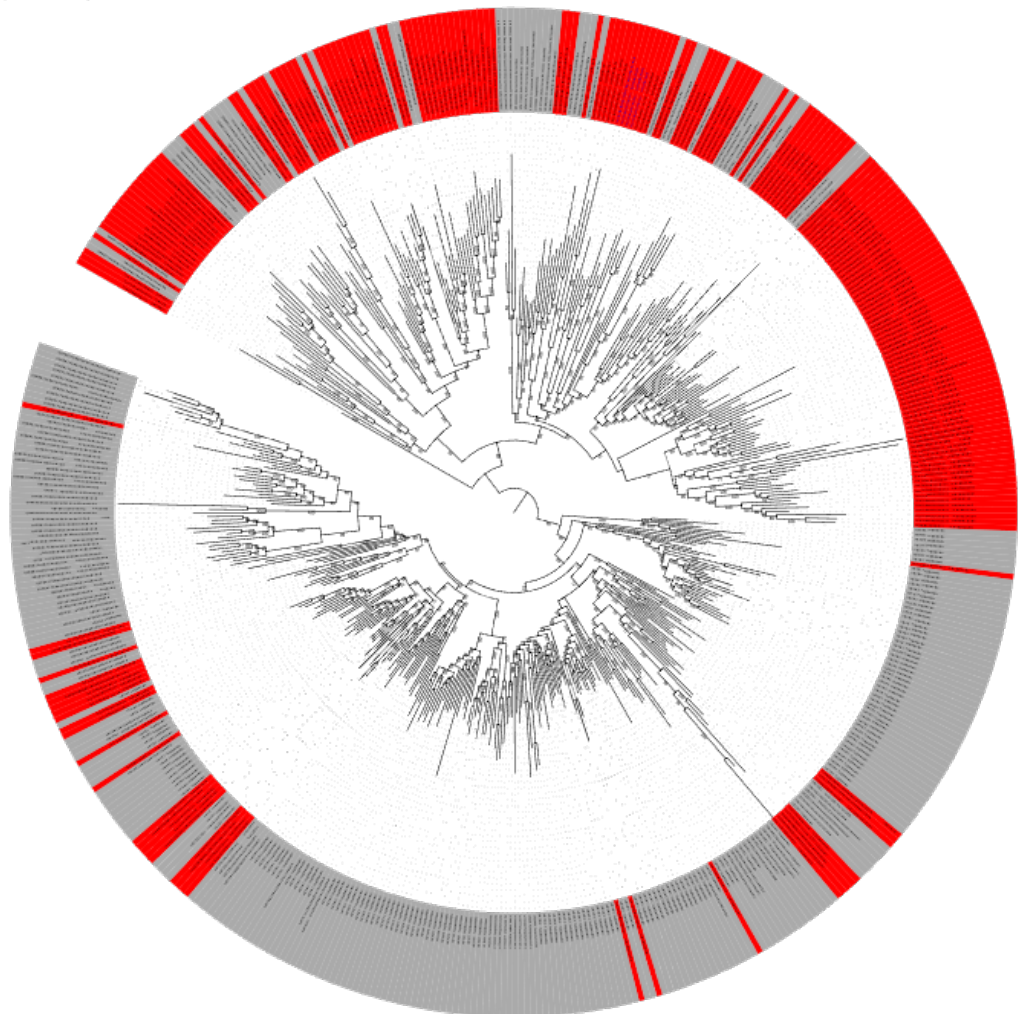
Tree scale: 1 



**Phylogenetic tree of novel negarnaviricot class 33 (subphylum *Polyploviricotina*).**

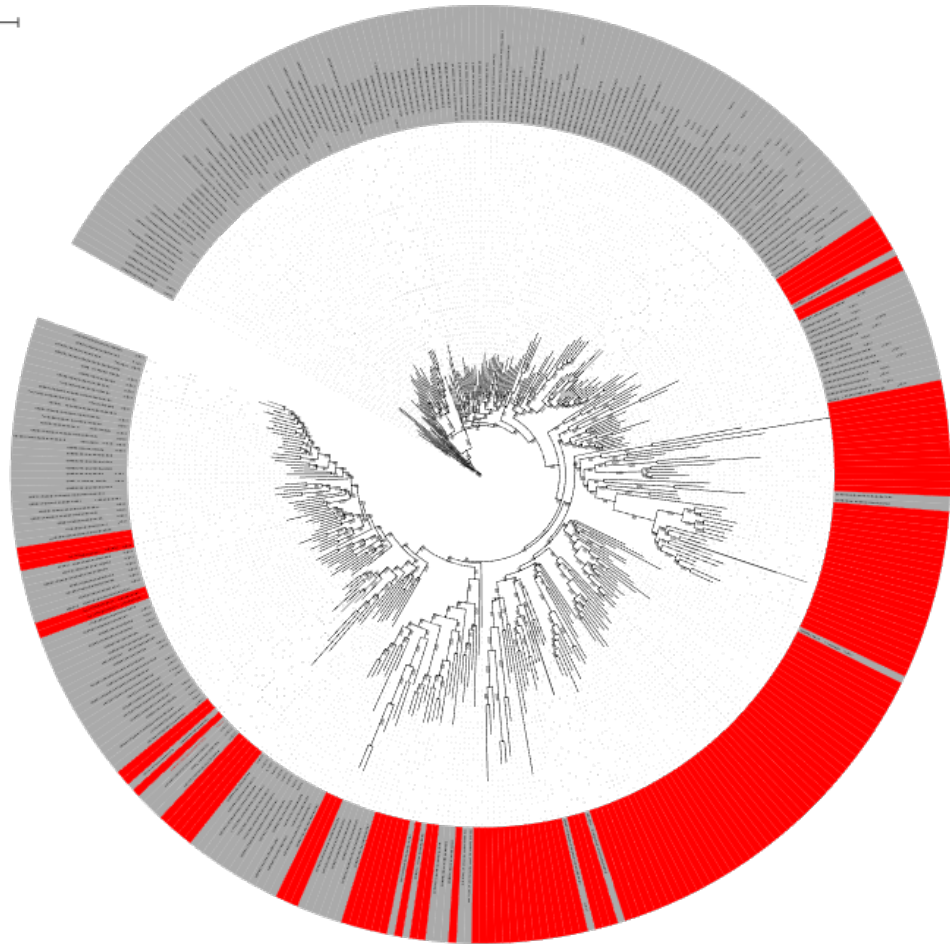


Tree scale: 1



Phylogenetic tree of lenarviricot cluster "*Miaviricetes-Amabiliviricetes*".

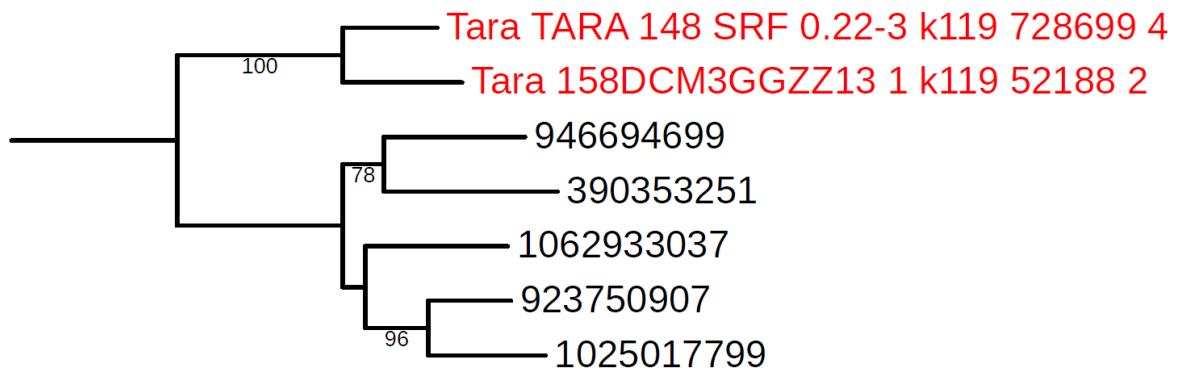
Tree scale: 1 



Phylogenetic tree of lenarviricot cluster "*Howeltoviricetes-Amabiliviricetes*".

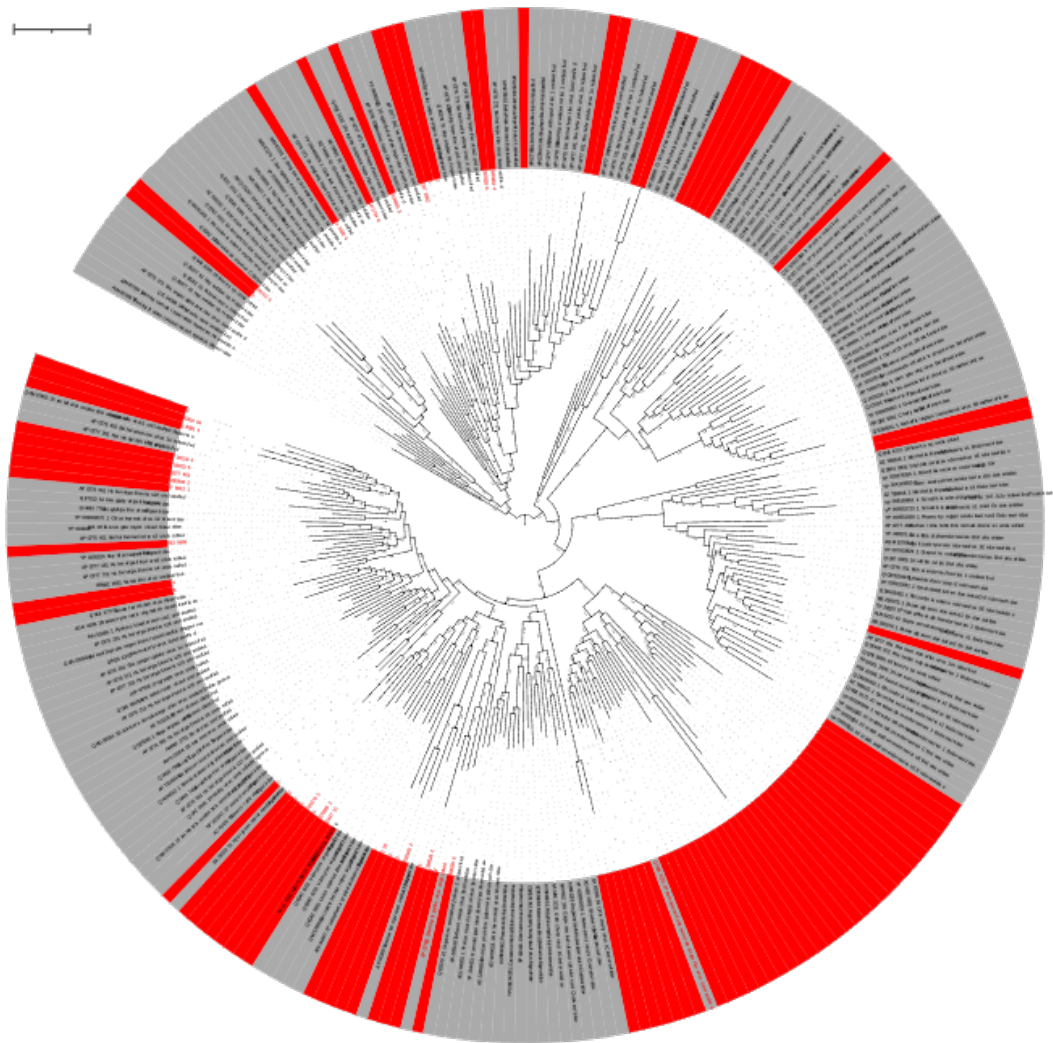


Tree scale: 1 |-----|



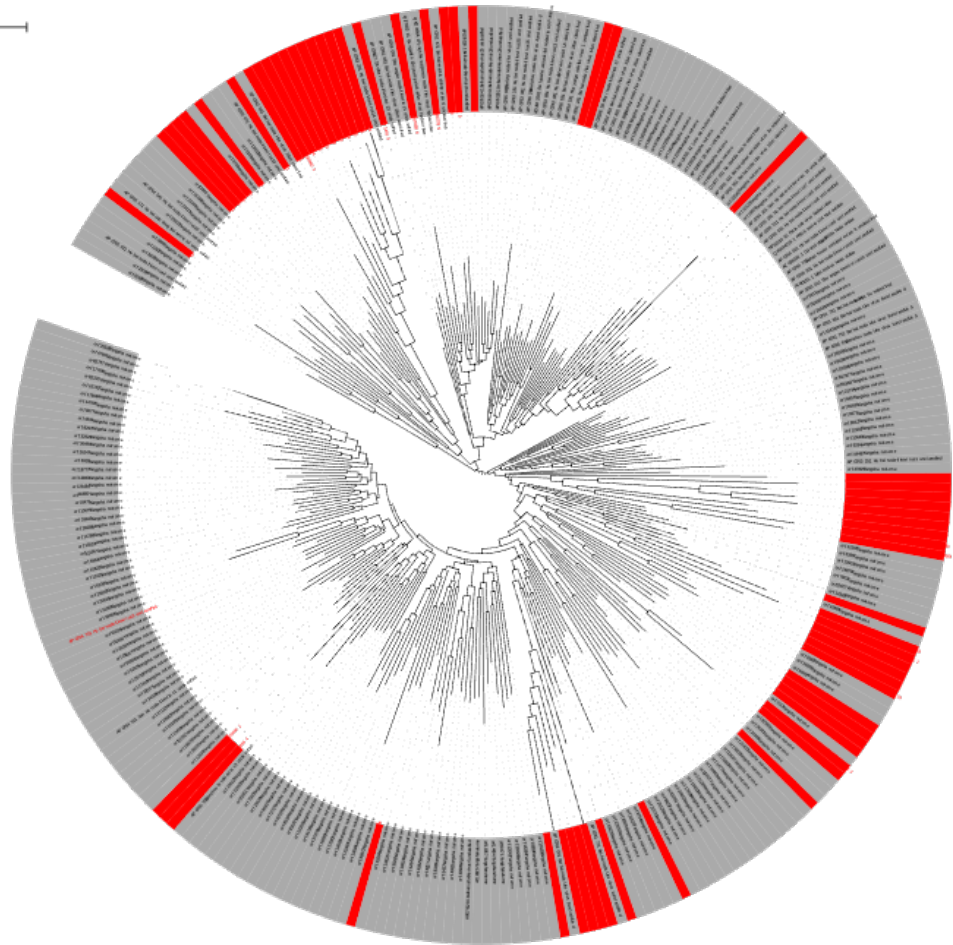
**Phylogenetic tree of novel lenarviricot class 48, with reverse transcriptase (RT) used to root the tree.**

Tree scale: 1



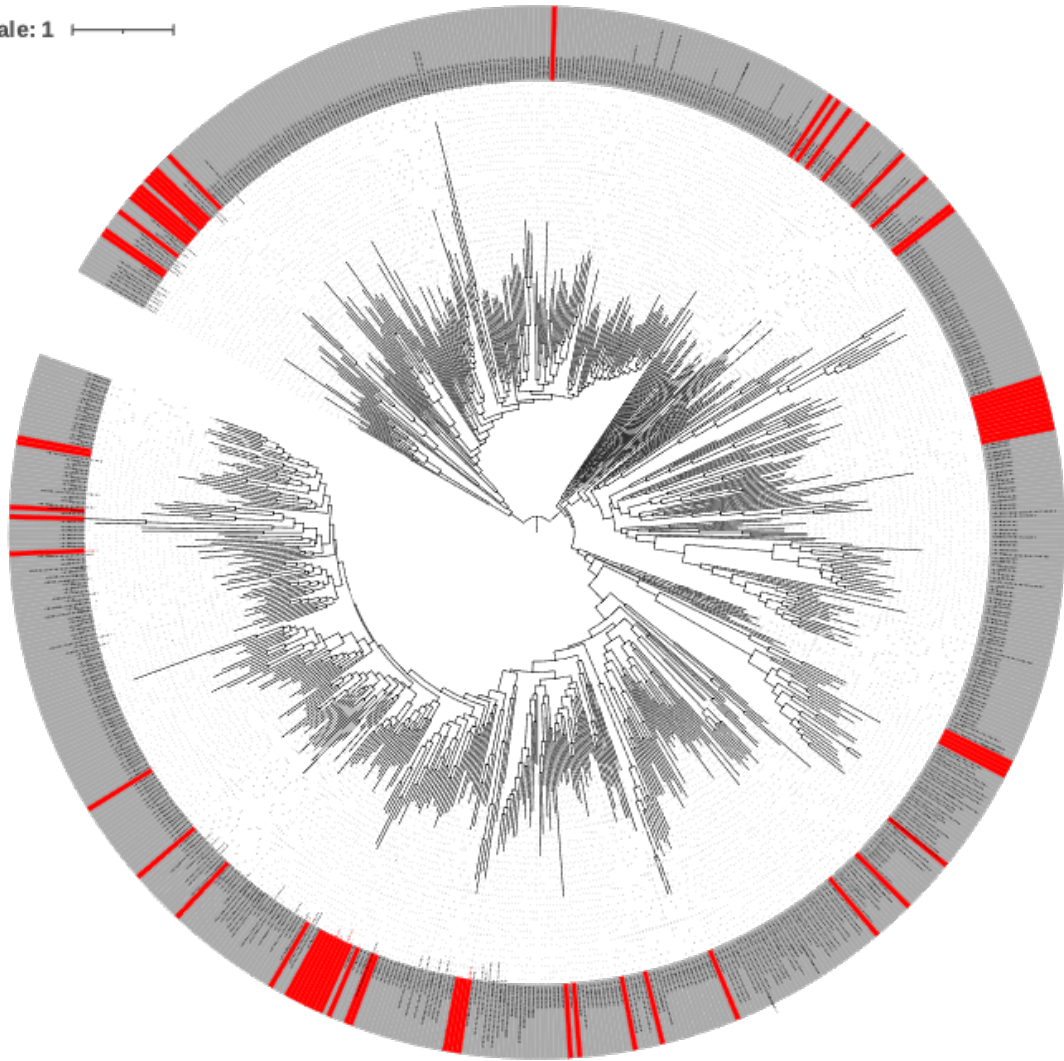
Phylogenetic tree of kitrinoviricot class *Alsuviricetes*.

Tree scale: 1



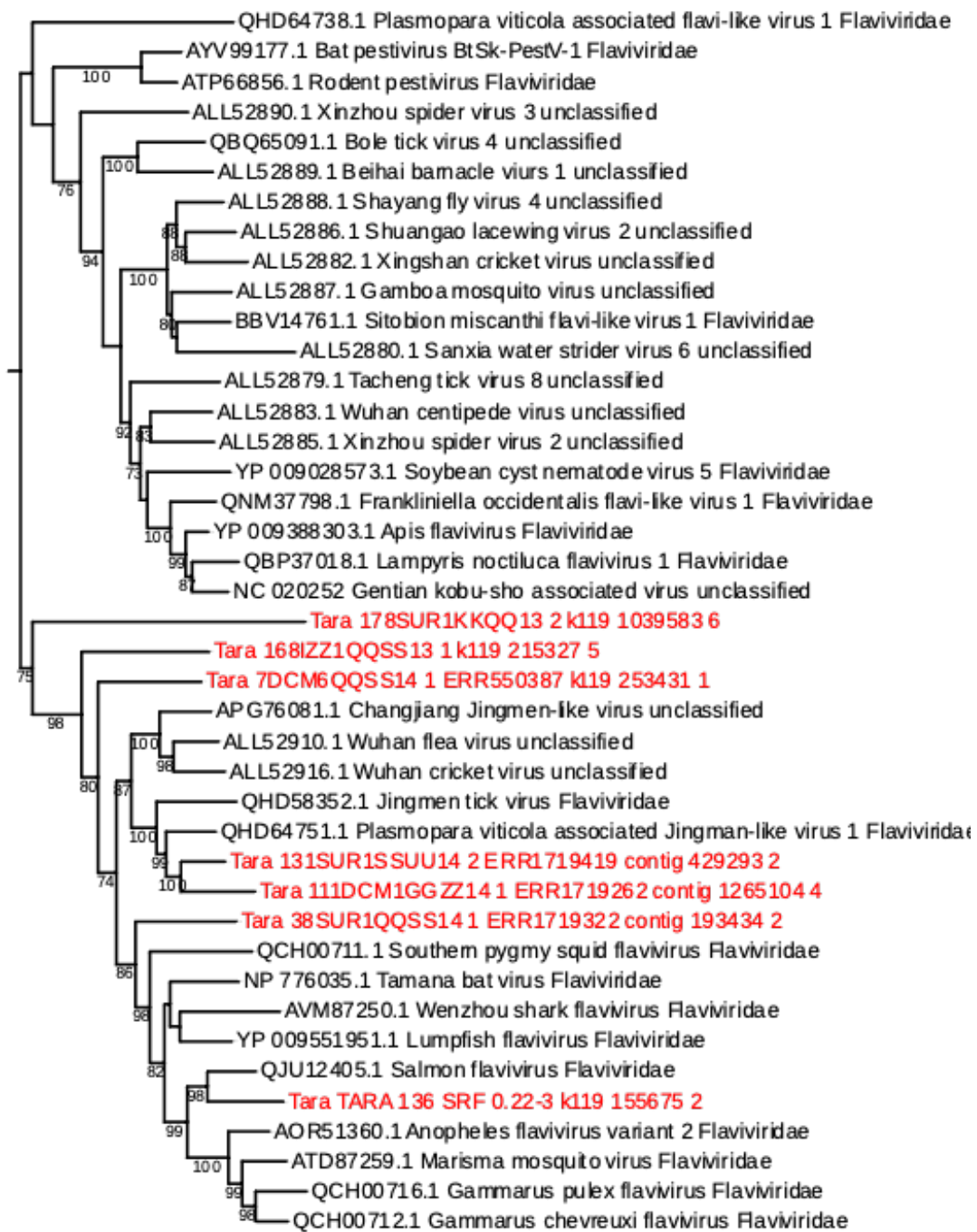
Phylogenetic tree of kitrinoviricot class *Magsaviricetes*.

Tree scale: 1

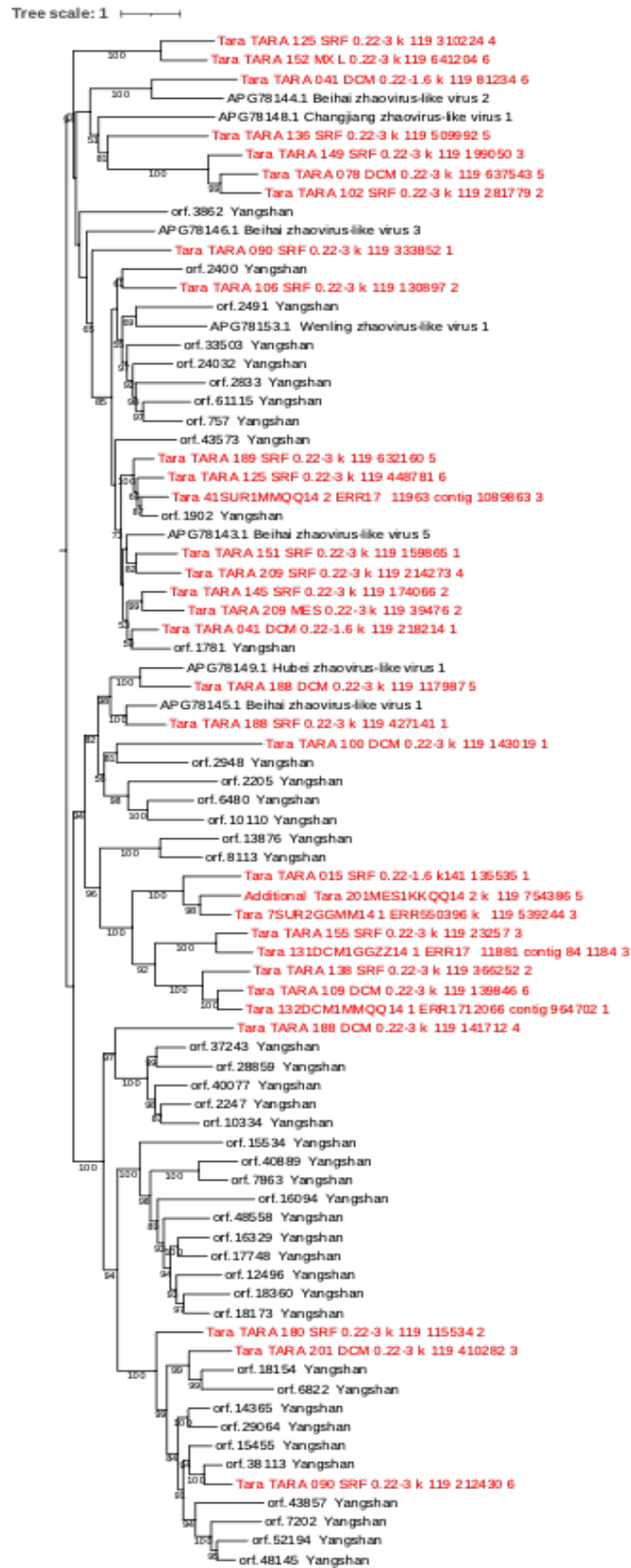


Phylogenetic tree of kitrinoviricot cluster "*Tolucaviricetes-Flasuviricetes*".

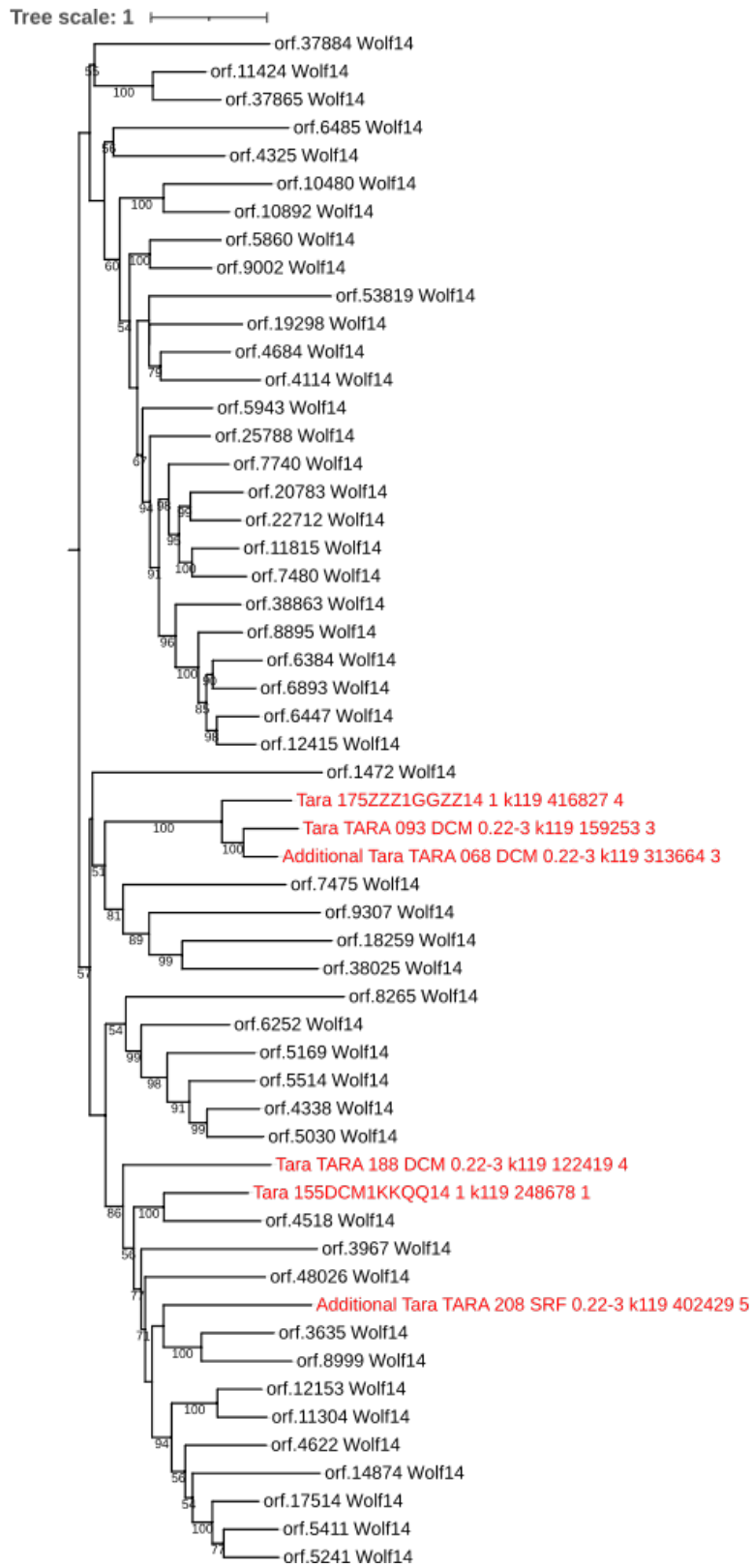
Tree scale: 1



Phylogenetic tree of kitrinoviricot class *Flaviviricetes*.



Phylogenetic tree of kitrinoviricot cluster "Zhao-like" viruses.

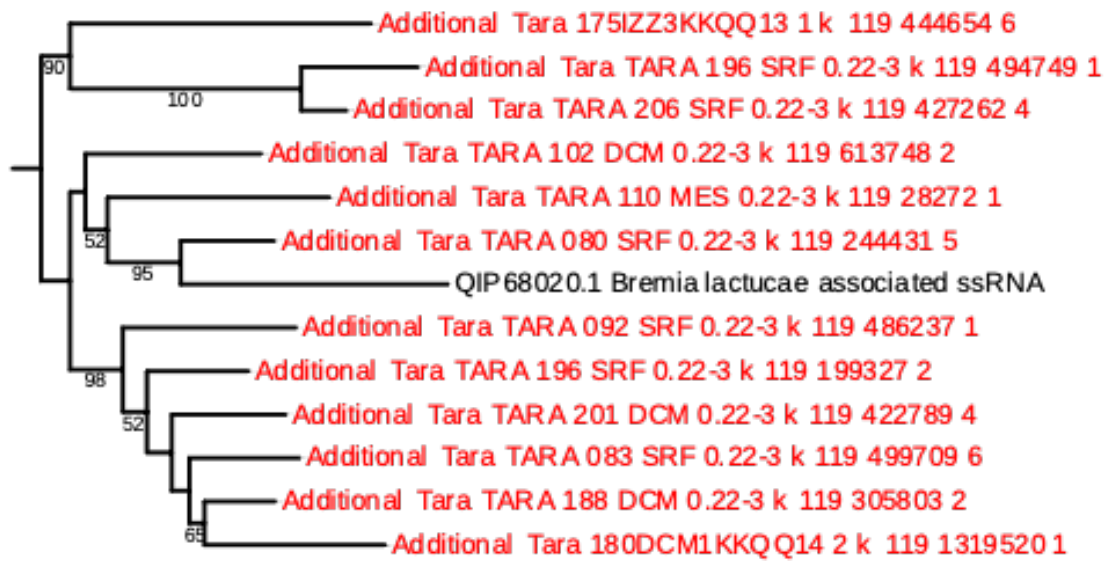


**Phylogenetic tree of kitrinoviricot cluster “Shanghai-like” viruses.**



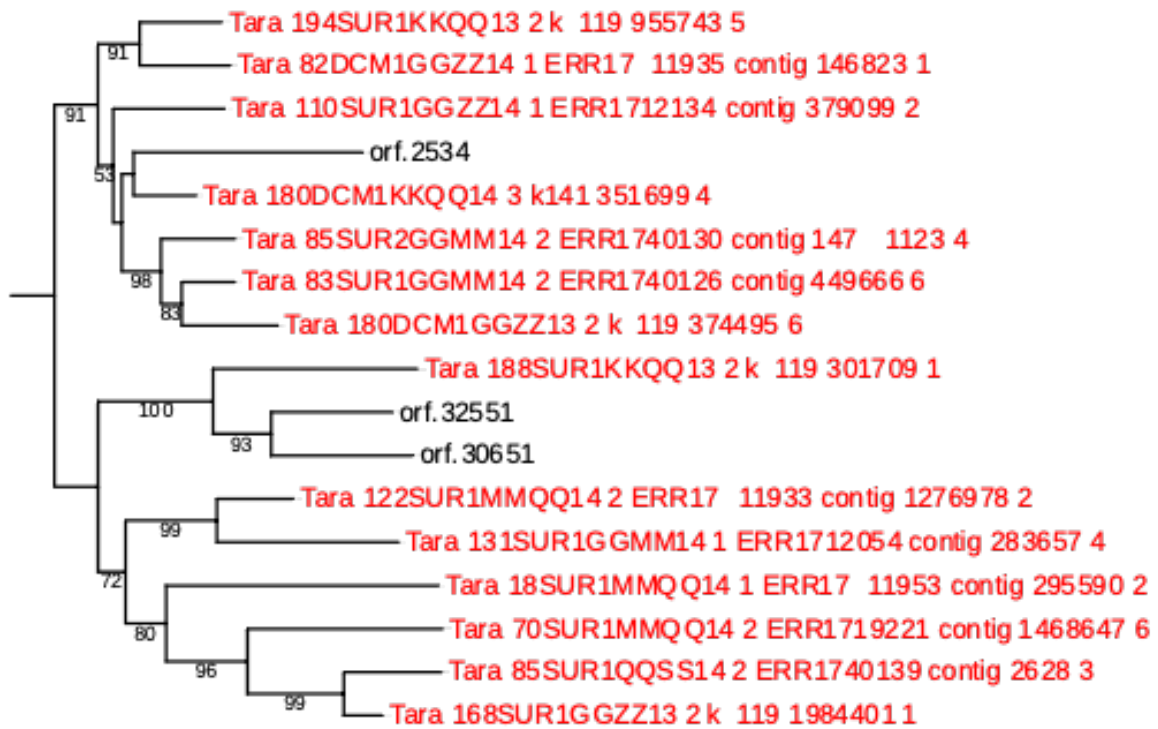


Tree scale: 1




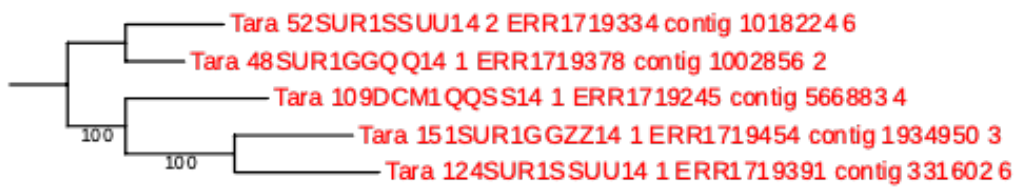
Phylogenetic tree of kitrinoviricot class 13.

Tree scale: 1 



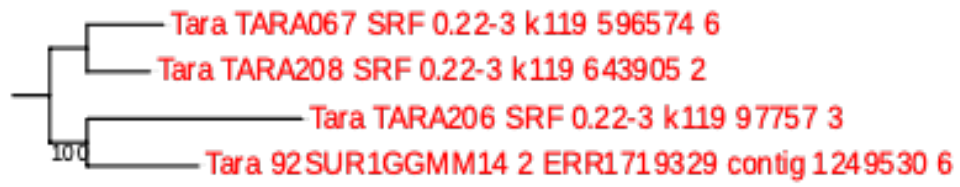
Phylogenetic tree of kitrinoviricot class 25.

Tree scale: 1 



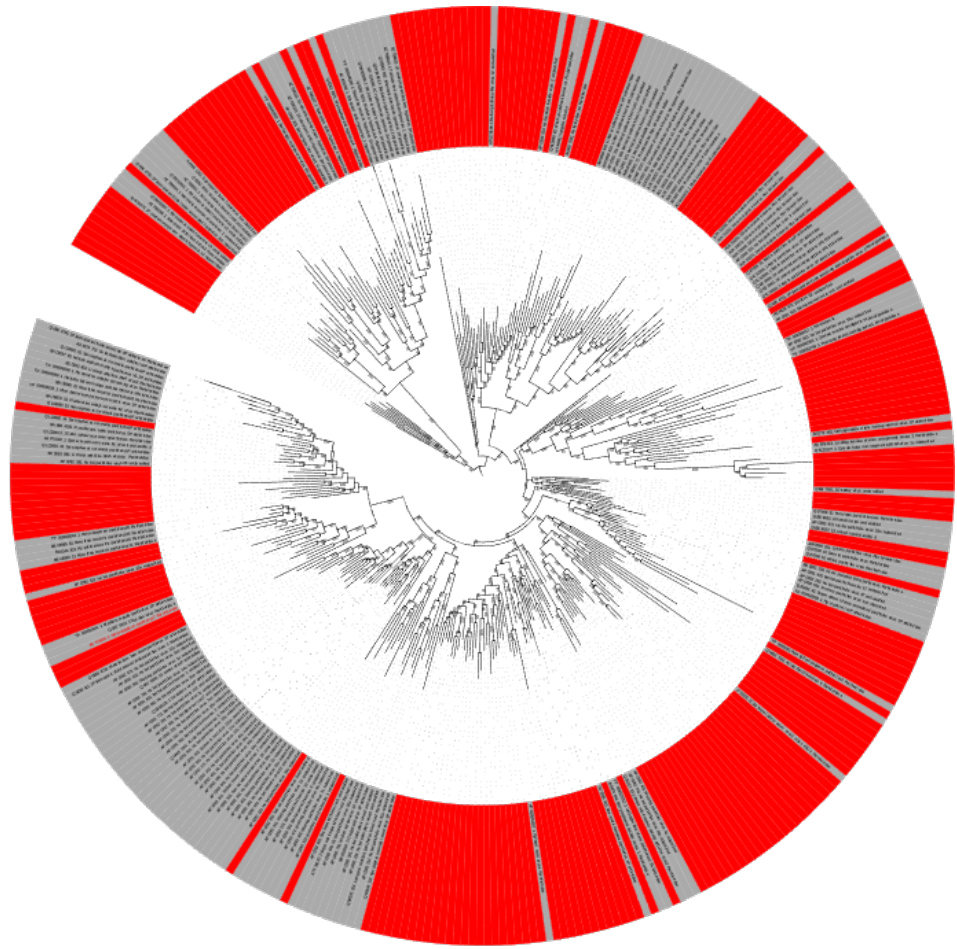
**Phylogenetic tree of novel kitrinoviricot class 36.**

Tree scale: 1 



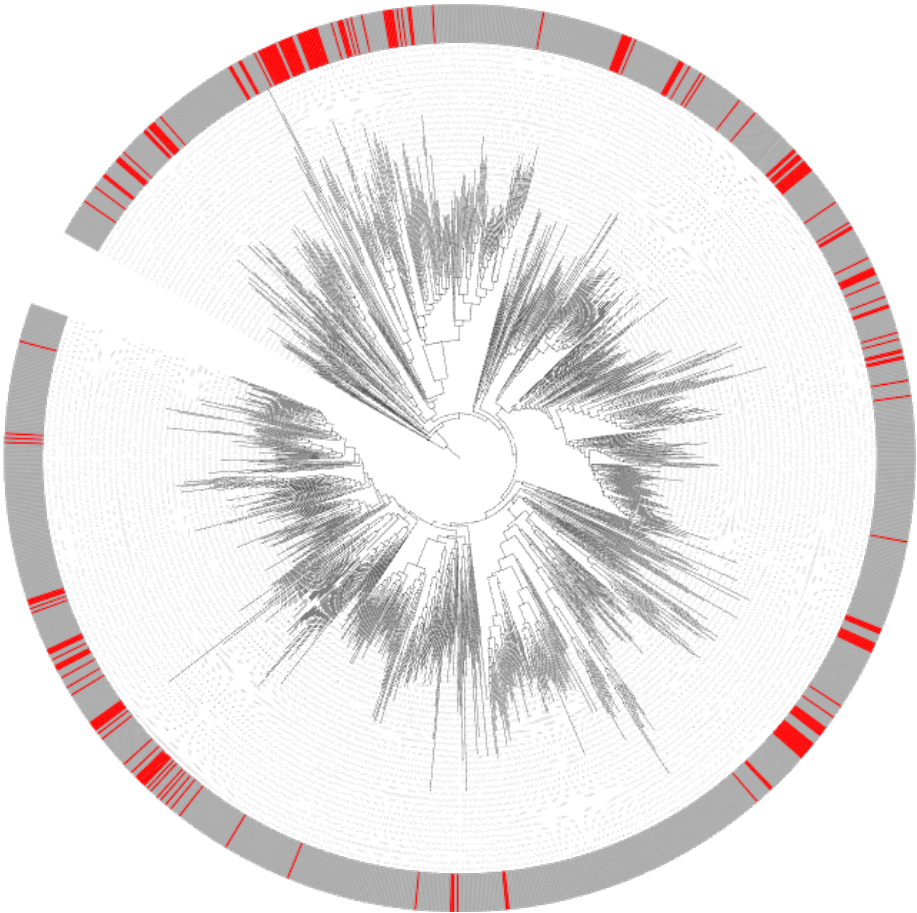
Phylogenetic tree novel kitrinoviricot class 39.

Tree scale: 1



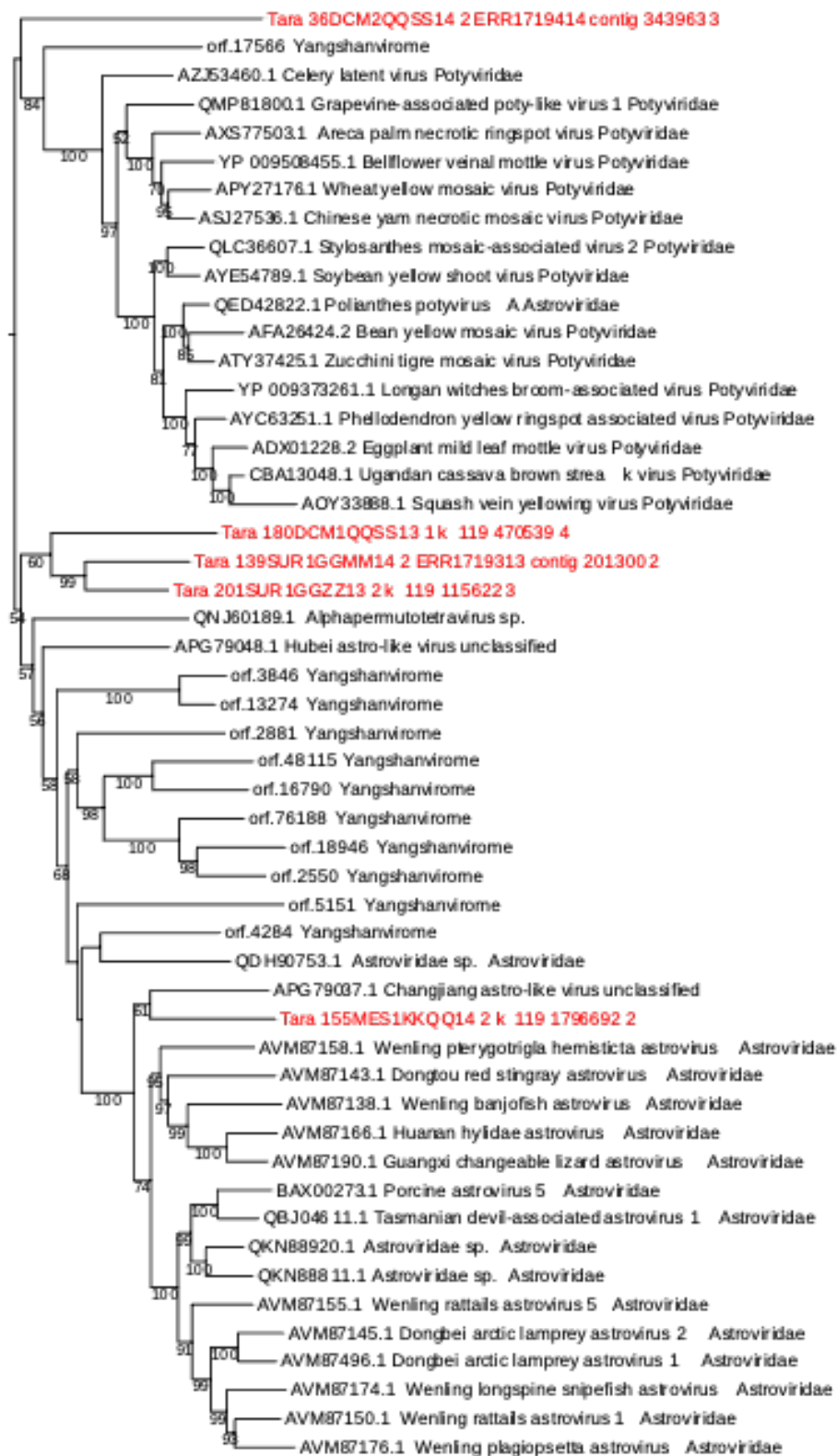
Phylogenetic tree of pisuviricot class *Duplopiviricetes*.

Tree scale: 1




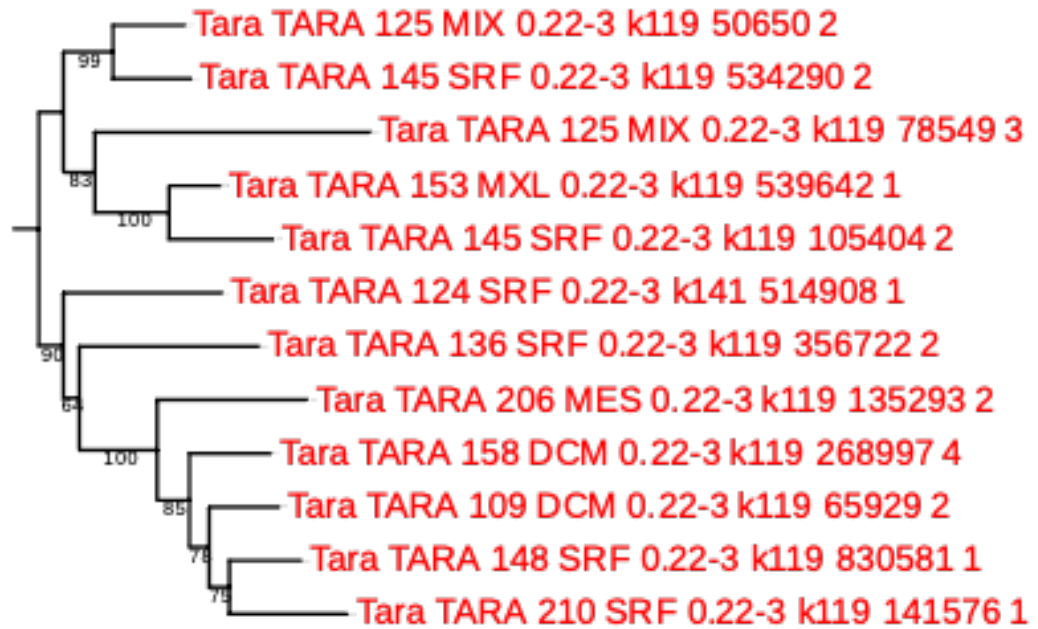
Phylogenetic tree of pisuviricot class *Pisoniviricetes*.

Tree scale: 1



Phylogenetic tree of pisuviricot class *Stelpaviricetes*.

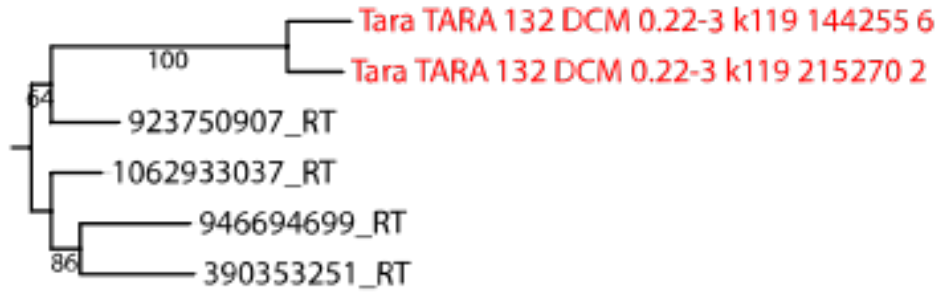
Tree scale: 1 



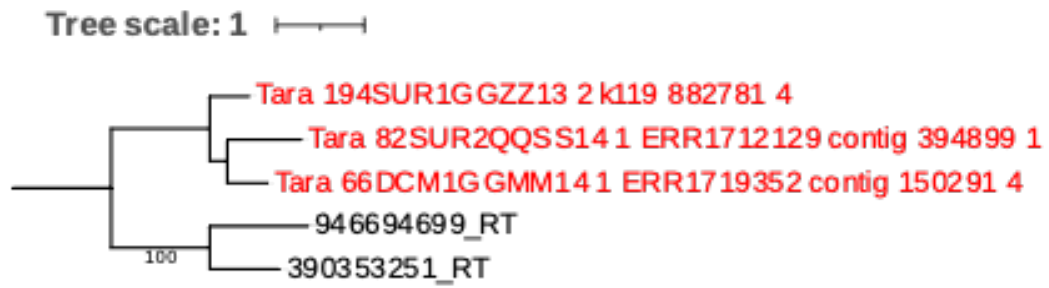
Phylogenetic tree of novel pisuviricot class 27.



Tree scale: 1

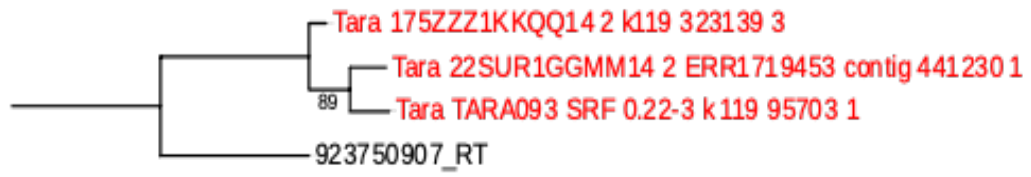


**Phylogenetic tree of novel pisuviricot class 37, with reverse transcriptase RT used to root the tree.**



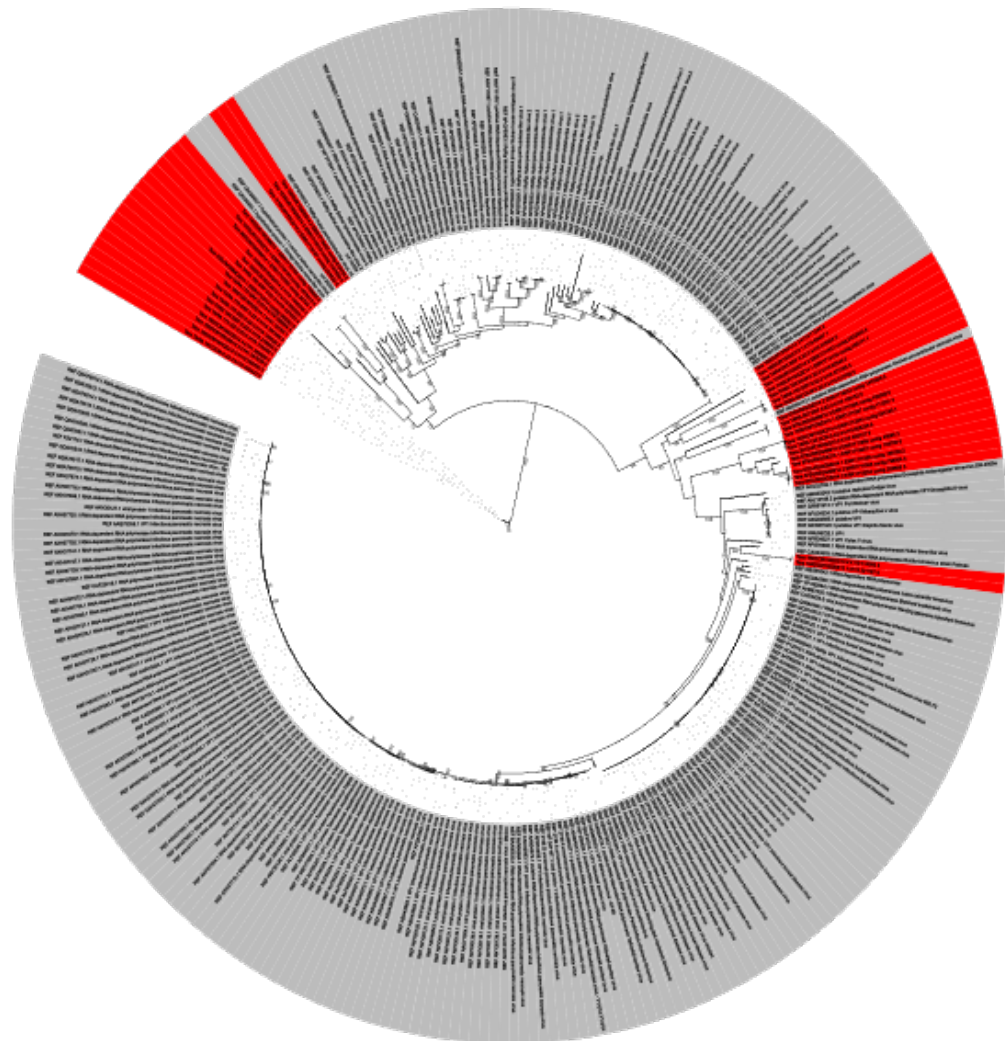
Phylogenetic tree of novel pisuviricot class 38, with reverse transcriptase RT used to root the tree.

Tree scale: 1 



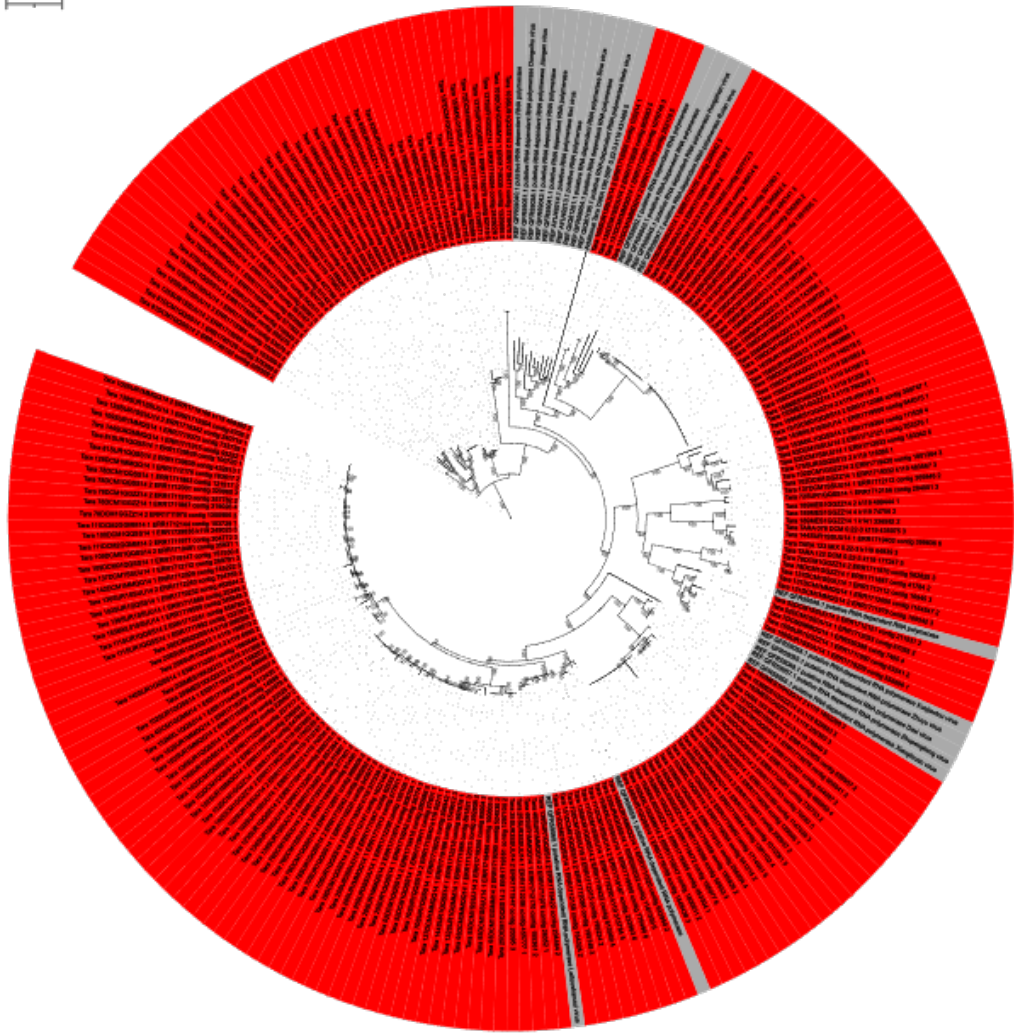
**Phylogenetic tree of novel pisuviricot class 43, with reverse transcriptase (RT) used to root the tree.**

Tree scale: 10



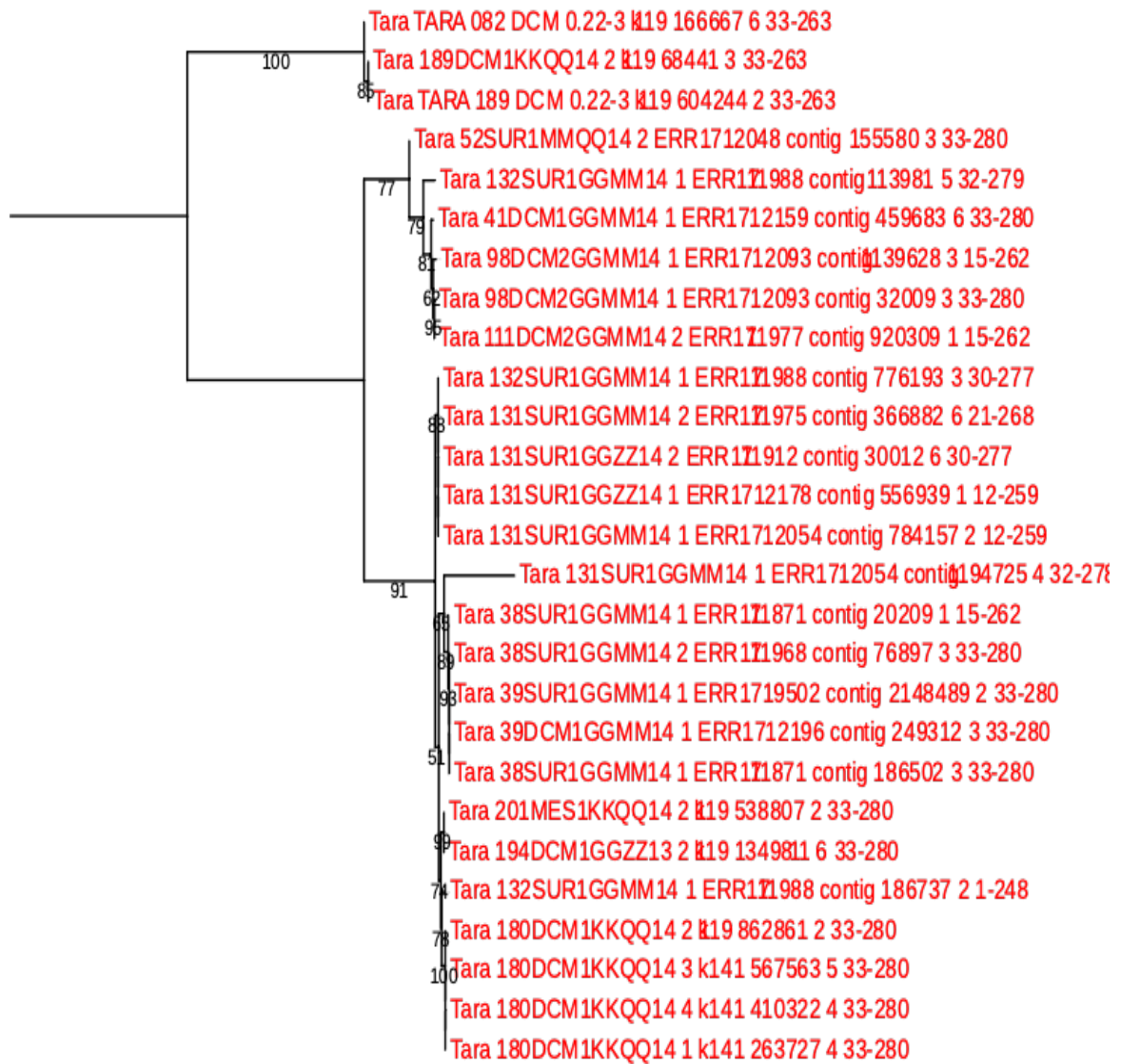
Phylogenetic tree of cluster "*Permutotetraviridae-Birnaviridae*".

Tree scale: 1 




Phylogenetic tree of novel phylum "*Taraviricota*".

Tree scale: 1



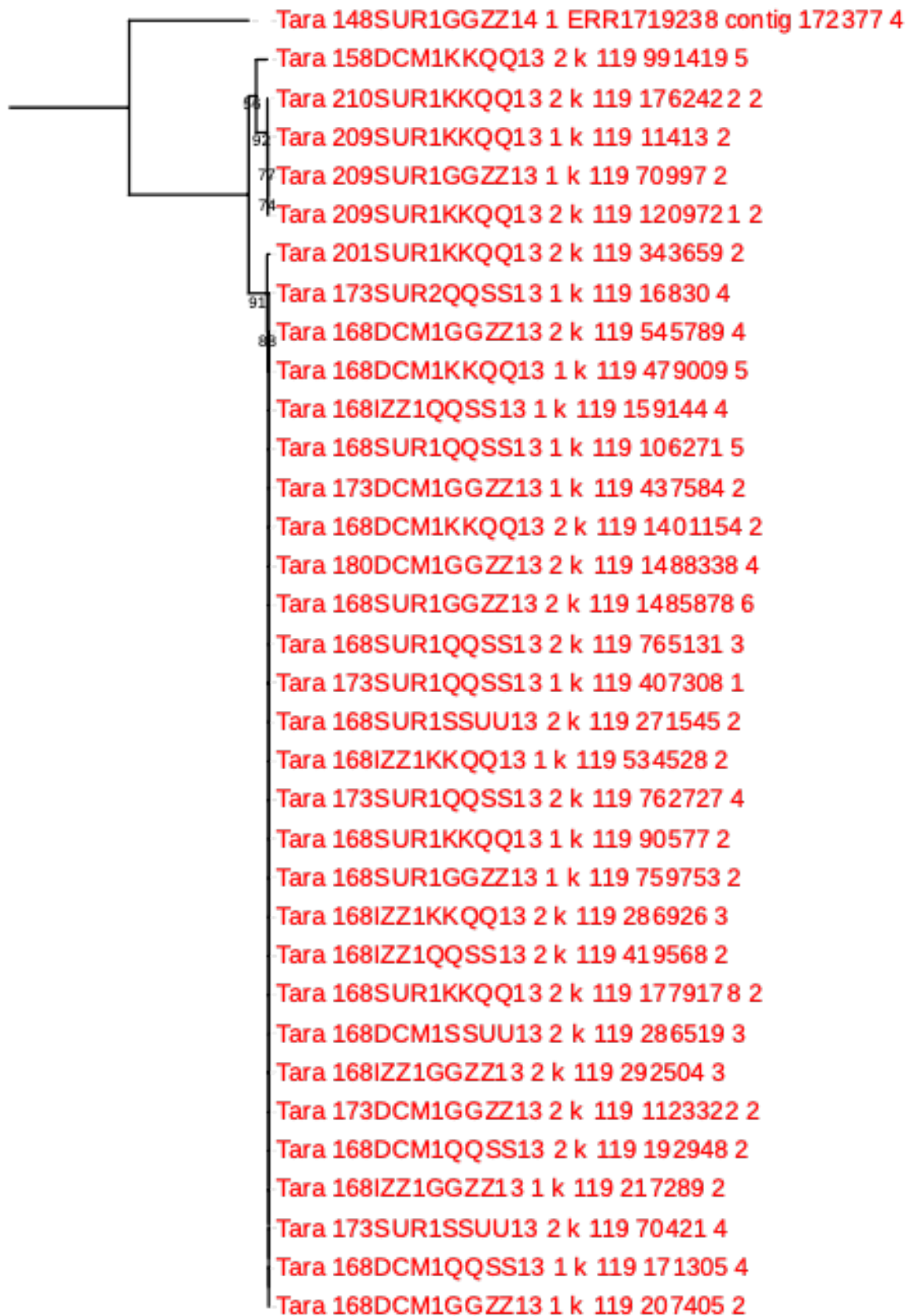
Phylogenetic tree of novel phylum "*Pomiviricota*".

Tree scale: 1 



Phylogenetic tree of novel phylum "*Paraxenoviricota*".

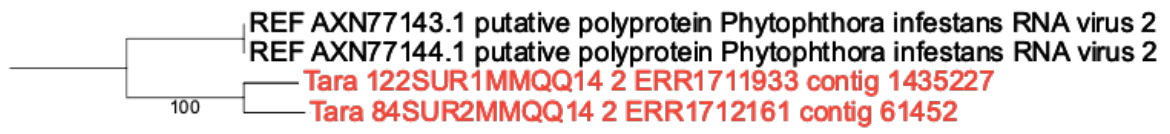
Tree scale: 1



Phylogenetic tree of novel phylum "*Arctiviricota*".



Tree scale: 1 



Phylogenetic tree of novel phylum "*Wamoviricota*".