

**Part 1:** **TITLE, AUTHORS, APPROVALS, etc**

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| **Code assigned:** | **2020.005F** |  |
| **Short title:** Create one new genus, rename 73 species and create 164 new species (*Geplafuvirales*: *Genomoviridae*) | | |
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**List the ICTV Study Group(s) that have seen this proposal**

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**ICTV study group comments and response of proposer**

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**Authority to use the name of a living person**

|  |  |  |
| --- | --- | --- |
| **Taxon name** | **Person from whom the name is derived** | **Permission attached (Y/N)** |
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**Submission dates**

|  |  |
| --- | --- |
| Date first submitted to SC Chair |  |
| Date of this revision (if different to above) |  |

**ICTV-EC comments and response of the proposer**

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**Part 3:** **TAXONOMIC PROPOSAL**

**Name of accompanying Excel module**

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| 2020.005F.R.Genomoviridae.xlsx |

**Abstract**

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| The family *Genomoviridae* has nine genera and 73 species assigned to these genera. We propose to create one new genus, *Gemytripvirus*, and convert the names of the established species to “Genus + freeform epithet” binomial system. We also classify 423 new genomes into 164 new species. |

**Text of proposal**

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| |  | | --- | | The family *Genomoviridae* includes viruses with small circular ssDNA genomes (~1.8–2.4 kb) encoding rolling-circle replication initiation proteins (Rep) and unique capsid proteins in an ambience orientation. There are nine established genera within this family  *Gemycircularvirus* (43 species and 73 genomes)  *Gemyduguivirus* (1 species and 1 genome)  *Gemygorvirus* (5 species and 9 genomes)  *Gemykibivirus* (16 species and 29 genomes)  *Gemykolovirus* (2 species and 3 genomes)  *Gemykrogvirus* (3 species and 3 genomes)  *Gemykroznavirus* (1 species and 1 genome)  *Gemytondvirus* (1 species and 1 genome)  *Gemyvongvirus* (1 species and 1 genome)  Here we first propose to change the names of the currently established species to a more manageable and easy to navigate system using a “Genus + freeform epithet” binomial system. We have summarized the changes we propose to the names in Table 1.  In the period since the establishment of the family *Genomoviridae* [3] and the first report on the classification of then known genomoviruses (n=122) [7], 423 new full genome sequences of genomoviruses have been deposited in GenBank.  We used the criteria of Rep amino acid based phylogeny (Figure 1) to assign genemoviruses to genera as outlined in Varsani and Krupovic [7].  All but one viruses could be assigned to the existing genera. By contrast, the recently isolated Fusarium graminearum gemytripvirus 1 (FgGMTV1), infecting *Fusarium graminearum*, a devastating fungal plant pathogen with worldwide distribution that causes Fusarium head blight (FHB) disease in wheat and barley [4], formed a separate branch in the Rep phylogeny (Figure 1). Notably, unlike other members of the *Genomoviridae,* which are monopartite, FgGMTV1 contains three genomic segments, each encoding a single protein [4]: DNA-A encodes for a Rep protein; DNA-B encodes for a capsid protein, and DNA-C encodes for a protein of unknown function. DNA-A and DNA-B are mutually interdependent for their replication, whereas DNA-C relies on DNA-A and DNA-B for replication and appears to enhance virus pathogenesis and transmission via conidia as well as accumulation of viral DNA in infected fungi [4]. Phylogenetic analysis suggests that the multipartite genome of FgGMTV1 has evolved from a monopartite genome of an ancestral genomovirus. Thus, based on the Rep phylogeny and the multipartite genome organization, we suggest classifying FgGMTV1 into a new species, *Gemytripvirus fugra1*, within a new genus, *Gemytripvirus* (**ge**mini-like **my**co-infecting **trip**artite virus) [4]. Finally, one unclassified virus (MK032746) branches at the base of the *Genomoviridae* Rep tree (Figure 1) and encodes divergent Rep and capsid proteins homologous to those of genomoviruses. However, at this point, we refrain from officially classifying this virus, until more members of this emerging clade become available.  Using the previously established species demarcation criteria [7], namely, genome-wide pairwise identity of 78%, 35 viruses can be assigned to 8 known species and 389 to 164 new species (Table 2). We propose Genus + freeform epithet binomial system to name all new species.  We show that the representative sequences from each of the species (except for *Gemytripvirus fugra1* which has a tripartite genome) share less than 78% genome-wide pairwise identity (Figure 2 and 3) to support our proposal classification of new genomoviruses. | |

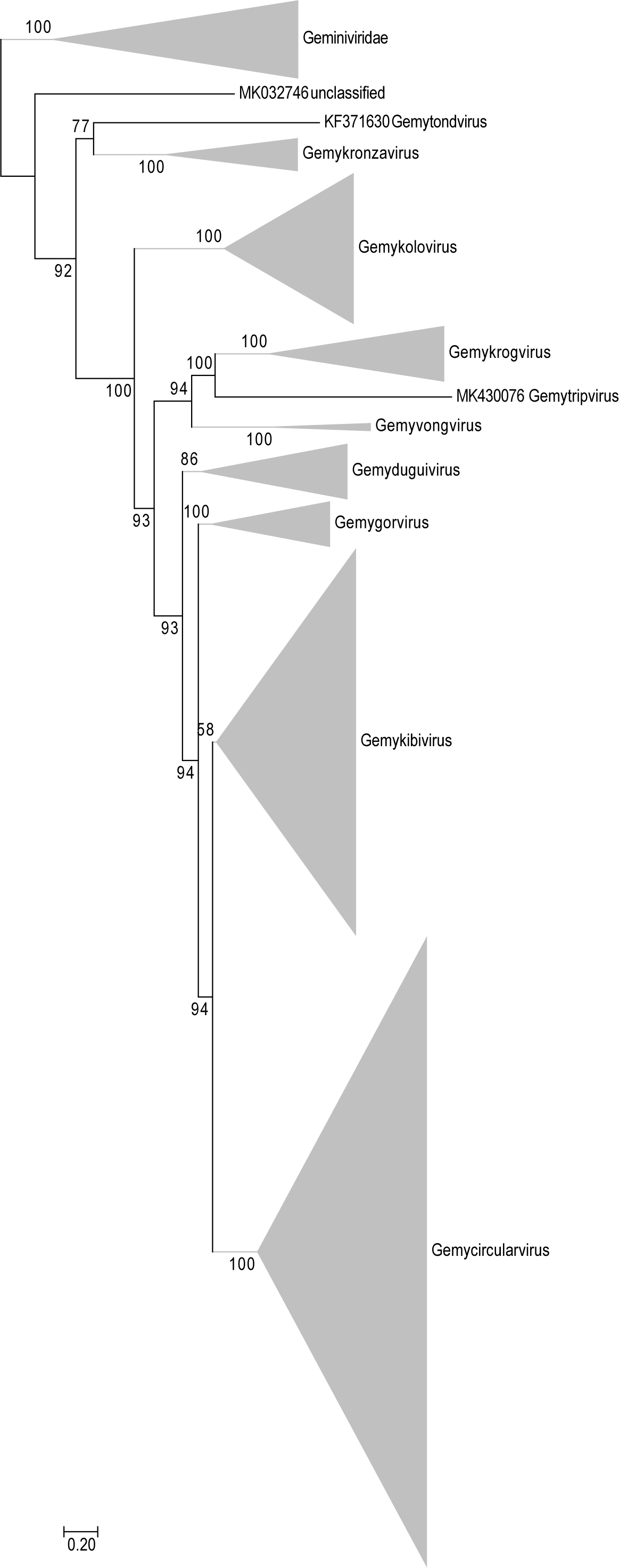
**Supporting evidence**

**Table 1:** Summary of names changes to from current species names to Genus + freeform epithet.

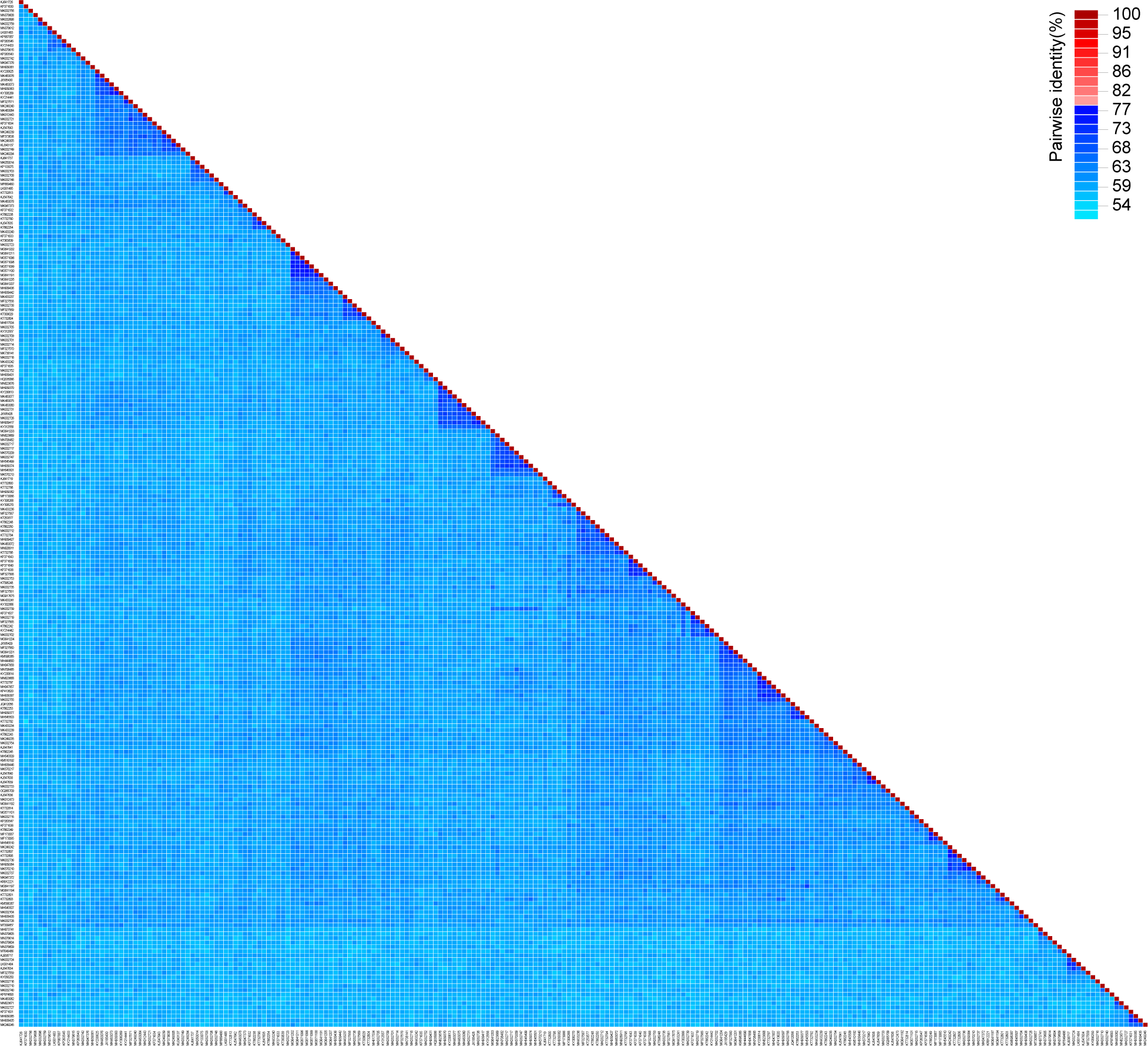
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| --- | --- | --- | --- | --- |
| **Genus** | **Proposed species name** | **Current species name** | **Virus name** | **Accession #** |
| *Gemycircularvirus* | *Gemycircularvirus blabi1* | Blackbird associated gemycircularvirus 1 | Faecal-associated gemycircularvirus 1a | KF371643 |
|  | *Gemycircularvirus bovas1* | Bovine associated gemycircularvirus 1 | Faeces associated gemycircularvirus 22 | KT862253 |
|  | *Gemycircularvirus bromas1* | Bromus associated gemycircularvirus 1 | Bromus-associated circular DNA virus 3 | KM510192 |
|  | *Gemycircularvirus cassa1* | Cassava associated gemycircularvirus 1 | Cassava associated cicular DNA virus | JQ412056 |
|  | *Gemycircularvirus chickad1* | Chickadee associated gemycircularvirus 1 | Poecile atricapillus GI tract-associated gemycircularvirus | KT309029 |
|  | *Gemycircularvirus chicas1* | Chicken associated gemycircularvirus 1 | Faeces associated gemycircularvirus 20 | KT862243 |
|  | *Gemycircularvirus chicas2* | Chicken associated gemycircularvirus 2 | Faeces associated gemycircularvirus 17 | KT862242 |
|  | *Gemycircularvirus draga1* | Dragonfly associated gemycircularvirus 1 | Dragonfly-associated circular virus 2 | JX185429 |
| *-* | *Gemycircularvirus equas1* | Equine associated gemycircularvirus 1 | Faeces associated gemycircularvirus 18 | KT862248 |
|  | *Gemycircularvirus furse1* | Fur seal associated gemycircularvirus 1 | Faecal-associated gemycircularvirus 4 | KF371638 |
|  | *Gemycircularvirus geras1* | Gerygone associated gemycircularvirus 1 | Faecal-associated gemycircularvirus 6 | KF371636 |
|  | *Gemycircularvirus geras2* | Gerygone associated gemycircularvirus 2 | Faecal-associated gemycircularvirus 5 | KF371637 |
|  | *Gemycircularvirus geras3* | Gerygone associated gemycircularvirus 3 | Faecal-associated gemycircularvirus 3 | KF371639 |
|  | *Gemycircularvirus hypas1* | Hypericum associated gemycircularvirus 1 | Hypericum japonicum associated circular DNA virus | KF413620 |
|  | *Gemycircularvirus lamas1* | Lama associated gemycircularvirus 1 | Faeces associated gemycircularvirus 21 | KT862245 |
|  | *Gemycircularvirus malas1* | Mallard associated gemycircularvirus 1 | Faecal-associated gemycircularvirus 7 | KF371635 |
|  | *Gemycircularvirus minio1* | Miniopterus associated gemycircularvirus 1 | Bat circovirus | KJ641719 |
|  | *Gemycircularvirus monas1* | Mongoose associated gemycircularvirus 1 | Mongoose feces-associated gemycircularvirus d | KP263547 |
|  | *Gemycircularvirus mosqi1* | Mosquito associated gemycircularvirus 1 | Mosquito VEM virus SDBVL G | HQ335086 |
|  | *Gemycircularvirus odona1* | Odonata associated gemycircularvirus 1 | Odonata associated gemycircularvirus-1 | KM598385 |
|  | *Gemycircularvirus odona2* | Odonata associated gemycircularvirus 2 | Odonata associated gemycircularvirus-2 | KM598387 |
|  | *Gemycircularvirus poass1* | Poaceae associated gemycircularvirus 1 | Poaceae-associated gemycircularvirus 1 | KT253577 |
|  | *Gemycircularvirus porci1* | Porcine associated gemycircularvirus 1 | Faeces associated gemycircularvirus 19 | KT862250 |
|  | *Gemycircularvirus porci2* | Porcine associated gemycircularvirus 2 | Faecal-associated gemycircularvirus 2 | KF371640 |
|  | *Gemycircularvirus ptero1* | Pteropus associated gemycircularvirus 1 | Pacific flying fox faeces associated gemycircularvirus-10 | KT732804 |
|  | *Gemycircularvirus ptero2* | Pteropus associated gemycircularvirus 2 | Pacific flying fox faeces associated gemycircularvirus-2 | KT732792 |
|  | *Gemycircularvirus ptero3* | Pteropus associated gemycircularvirus 3 | Pacific flying fox faeces associated gemycircularvirus-5 | KT732797 |
|  | *Gemycircularvirus ptero4* | Pteropus associated gemycircularvirus 4 | Pacific flying fox faeces associated gemycircularvirus-13 | KT732814 |
|  | *Gemycircularvirus ptero5* | Pteropus associated gemycircularvirus 5 | Pacific flying fox faeces associated gemycircularvirus-8 | KT732801 |
|  | *Gemycircularvirus ptero6* | Pteropus associated gemycircularvirus 6 | Pacific flying fox faeces associated gemycircularvirus-9 | KT732803 |
|  | *Gemycircularvirus ptero7* | Pteropus associated gemycircularvirus 7 | Pacific flying fox faeces associated gemycircularvirus-11 | KT732807 |
|  | *Gemycircularvirus ptero8* | Pteropus associated gemycircularvirus 8 | Pacific flying fox faeces associated gemycircularvirus-14 | KT732806 |
|  | *Gemycircularvirus ptero9* | Pteropus associated gemycircularvirus 9 | Pacific flying fox faeces associated gemycircularvirus-4 | KT732795 |
|  | *Gemycircularvirus ptero10* | Pteropus associated gemycircularvirus 10 | Pacific flying fox faeces associated gemycircularvirus-3 | KT732794 |
|  | *Gemycircularvirus ratas1* | Rat associated gemycircularvirus 1 | Gemycircularvirus gemy-ch-rat1 | KR912221 |
|  | *Gemycircularvirus sclero1* | Sclerotinia gemycircularvirus 1 | Sclerotinia sclerotiorum hypovirulence associated DNA virus 1 | GQ365709 |
|  | *Gemycircularvirus sewopo1* | Sewage derived gemycircularvirus 1 | Sewage-associated gemycircularvirus-8 | KJ547638 |
|  | *Gemycircularvirus sewopo2* | Sewage derived gemycircularvirus 2 | Sewage-associated gemycircularvirus-11 | KJ547641 |
|  | *Gemycircularvirus sewopo3* | Sewage derived gemycircularvirus 3 | Sewage-associated gemycircularvirus-6 | KJ547636 |
|  | *Gemycircularvirus sewopo4* | Sewage derived gemycircularvirus 4 | Sewage-associated gemycircularvirus-7b | KJ547640 |
|  | *Gemycircularvirus sewopo5* | Sewage derived gemycircularvirus 5 | Sewage-associated gemycircularvirus-9 | KJ547639 |
|  | *Gemycircularvirus sheas1* | Sheep associated gemycircularvirus 1 | Faeces associated gemycircularvirus 16 | KT862249 |
|  | *Gemycircularvirus soybe1* | Soybean associated gemycircularvirus 1 | Soybean leaf-associated gemycircularvirus 1 | KT598248 |
| *Gemyduguivirus* | *Gemyduguivirus draga1* | Dragonfly associated gemyduguivirus 1 | Dragonfly-associated circular virus 3 | JX185428 |
| *Gemygorvirus* | *Gemygorvirus cania1* | Canine associated gemygorvirus 1 | Faeces associated gemycircularvirus 15 | KT862254 |
|  | *Gemygorvirus malas1* | Mallard associated gemygorvirus 1 | Faeces associated gemycircularvirus 14 | KT862238 |
|  | *Gemygorvirus ptero1* | Pteropus associated gemygorvirus 1 | Pacific flying fox faeces associated gemycircularvirus-1 | KT732790 |
|  | *Gemygorvirus sewopo1* | Sewage derived gemygorvirus 1 | Sewage-associated gemycircularvirus-5 | KJ547635 |
|  | *Gemygorvirus stara1* | Starling associated gemygorvirus 1 | Faecal-associated gemycircularvirus 10 | KF371632 |
| *Gemykibivirus* | *Gemykibivirus badas1* | Badger associated gemykibivirus 1 | Badger feces-associated gemycircularvirus | KP263543 |
|  | *Gemykibivirus blaro1* | Black robin associated gemykibivirus 1 | Faecal-associated gemycircularvirus 8 | KF371634 |
|  | *Gemykibivirus blabi1* | Blackbird associated gemykibivirus 1 | Faecal-associated gemycircularvirus 9 | KF371633 |
|  | *Gemykibivirus bovas1* | Bovine associated gemykibivirus 1 | HCBI8.215 virus | LK931483 |
|  | *Gemykibivirus draga1* | Dragonfly associated gemykibivirus 1 | Dragonfly-associated circular virus 1 | JX185430 |
|  | *Gemykibivirus humas1* | Human associated gemykibivirus 1 | MSSI2.225 virus | LK931485 |
|  | *Gemykibivirus humas2* | Human associated gemykibivirus 2 | Gemycircularvirus SL1 | KP133075 |
|  | *Gemykibivirus humas3* | Human associated gemykibivirus 3 | Gemycircularvirus C1c | KP987887 |
|  | *Gemykibivirus humas4* | Human associated gemykibivirus 4 | Human gemycircularvirus GeTz1 | KT363839 |
|  | *Gemykibivirus humas5* | Human associated gemykibivirus 5 | Gemycircularvirus HV-GcV2 | KU343137 |
|  | *Gemykibivirus monas1* | Mongoose associated gemykibivirus 1 | Mongoose feces-associated gemycircularvirus b | KP263545 |
|  | *Gemykibivirus ptero1* | Pteropus associated gemykibivirus 1 | Pacific flying fox faeces associated gemycircularvirus-12 | KT732813 |
|  | *Gemykibivirus rhina1* | Rhinolophus associated gemykibivirus 1 | Bat circovirus | KJ641737 |
|  | *Gemykibivirus rhina2* | Rhinolophus associated gemykibivirus 2 | Bat circovirus | KJ641726 |
|  | *Gemykibivirus sewopo1* | Sewage derived gemykibivirus 1 | Sewage-associated gemycircularvirus-3 | KJ547643 |
|  | *Gemykibivirus sewopo2* | Sewage derived gemykibivirus 2 | Sewage-associated gemycircularvirus-2 | KJ547642 |
| *Gemykolovirus* | *Gemykolovirus ptero1* | Pteropus associated gemykolovirus 1 | Pacific flying fox faeces associated gemycircularvirus-6 | KT732798 |
|  | *Gemykolovirus ptero2* | Pteropus associated gemykolovirus 2 | Pacific flying fox faeces associated gemycircularvirus-7 | KT732800 |
| *Gemykrogvirus* | *Gemykrogvirus bovas1* | Bovine associated gemykrogvirus 1 | HCBI9.212 virus | LK931484 |
|  | *Gemykrogvirus carib1* | Caribou associated gemykrogvirus 1 | Caribou feces-associated gemycircularvirus | KJ938717 |
|  | *Gemykrogvirus sewopo1* | Sewage derived gemykrogvirus 1 | Sewage-associated gemycircularvirus-4 | KJ547634 |
| *Gemykroznavirus* | *Gemykroznavirus rabas1* | Rabbit associated gemykroznavirus 1 | Faecal-associated gemycircularvirus 11 | KF371631 |
| *Gemytondvirus* | *Gemytondvirus ostri1* | Ostrich associated gemytondvirus 1 | Faecal-associated gemycircularvirus 12 | KF371630 |
| *Gemyvongvirus* | *Gemyvongvirus humas1* | Human associated gemyvongvirus 1 | Human plasma-associated gemycircularvirus | KP974693 |

**Table 2:** Summary of new species in established genera. Species names are prosed with Genus + freeform epithet.

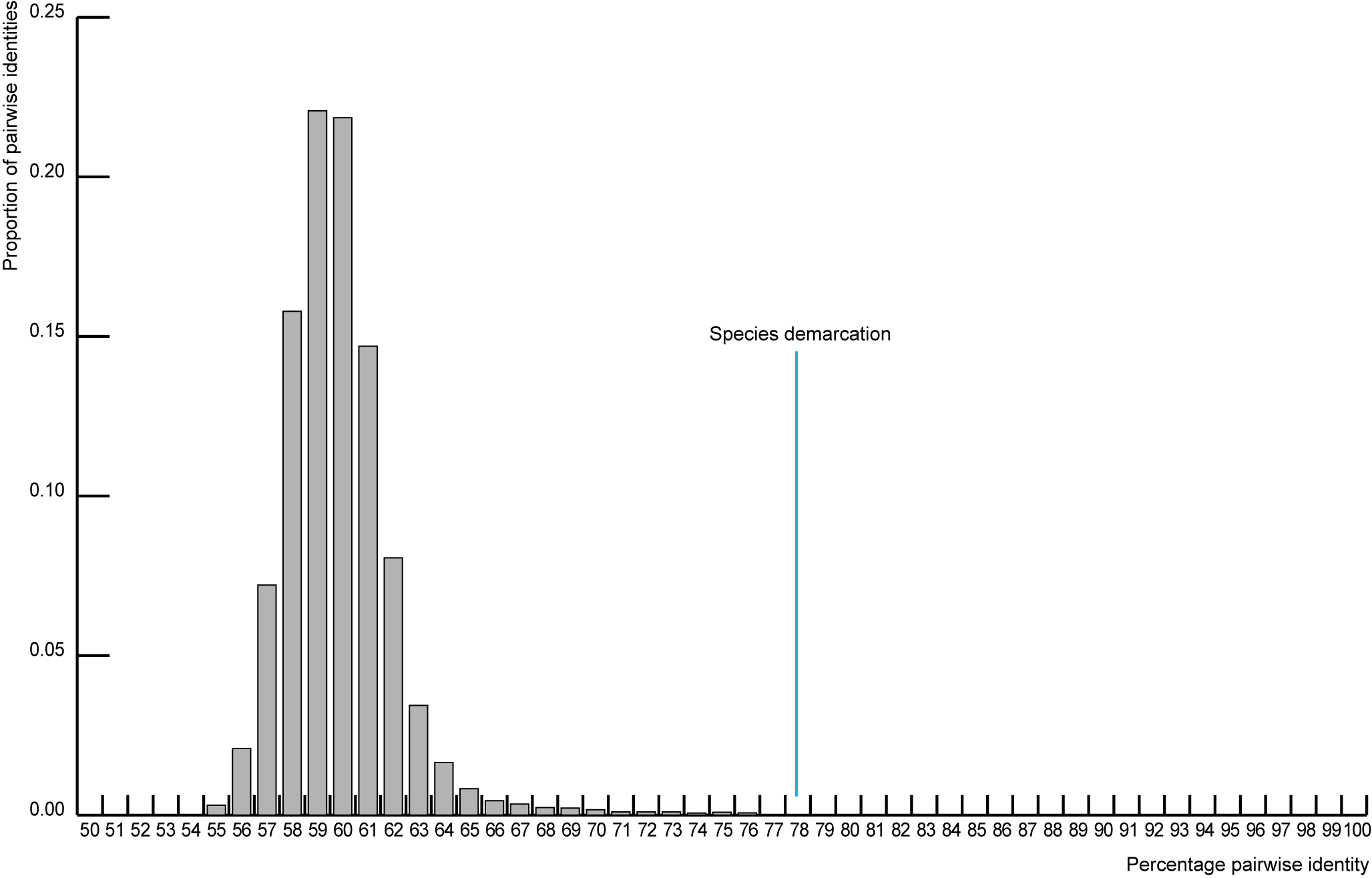
|  |  |  |  |
| --- | --- | --- | --- |
| **Genus** | **Proposed Species** | **Virus name** | **Accession #** |
| *Gemycircularvirus* | *Gemycircularvirus lepam1* | Alces alces faeces associated genomovirus MP111 | MG641205 |
|  | *Gemycircularvirus alces2* | Alces alces faeces associated genomovirus MP157 | MG641207 |
|  | *Gemycircularvirus aspar1* | Plant associated genomovirus 21 | MH939436 |
|  | *Gemycircularvirus trilo1* | Plant associated genomovirus 22 | MH939442 |
|  | *Gemycircularvirus lebec1* | Plant associated genomovirus 20 | MH939431 |
|  | *Gemycircularvirus mouti8* | Genomoviridae sp. | MK032752 |
|  | *Gemycircularvirus austro6* | Blackfly genomovirus 10 | MK433242 |
|  | *Gemycircularvirus abati1* | Genomoviridae sp. | MK032723 |
|  | *Gemycircularvirus recro1* | Gemycircularvirus sp. | KY312557 |
|  | *Gemycircularvirus miniti4* | Genomoviridae sp. | MK032709 |
|  | *Gemycircularvirus giapa8* | Giant panda associated gemycircularvirus | MF327570 |
|  | *Gemycircularvirus miniti2* | Genomoviridae sp. | MK032701 |
|  | *Gemycircularvirus mouti9* | Genomoviridae sp. | MK032714 |
|  | *Gemycircularvirus rebac1* | Northern red-backed vole stool-associated gemycircularvirus 110 | MK738141 |
|  | *Gemycircularvirus minti6* | Genomoviridae sp. | MH617534 |
|  | *Gemycircularvirus mouti10* | Genomoviridae sp. | MK032705 |
|  | *Gemycircularvirus mouti11* | Genomoviridae sp. | MK032718 |
|  | *Gemycircularvirus mouti1* | Genomoviridae sp. | MK032728 |
|  | *Gemycircularvirus hadtis1* | Genomoviridae sp. | MK032733 |
|  | *Gemycircularvirus dichism1* | Plant associated genomovirus 19 | MH939446 |
|  | *Gemycircularvirus gopha1* | Tortoise genomovirus 17 | MK570217 |
|  | *Gemycircularvirus raski1* | Genomoviridae sp. | MK032754 |
|  | *Gemycircularvirus haeme1* | Finch associated genomovirus 5 | MK249235 |
|  | *Gemycircularvirus erati1* | Giant house spider associated circular virus 1 | MH545509 |
|  | *Gemycircularvirus austro1* | Blackfly genomovirus 2 | MK433234 |
|  | *Gemycircularvirus austro2* | Blackfly genomovirus 7 | MK433239 |
|  | *Gemycircularvirus lynca1* | Lynx canadensis faeces associated genomovirus CL1 48 | MG641192 |
|  | *Gemycircularvirus turti1* | Genomoviridae sp. | MK012473 |
|  | *Gemycircularvirus cybusi1* | Spider associated circular virus 1 | MH545503 |
|  | *Gemycircularvirus legle1* | Plant associated genomovirus 15 | MH939377 |
|  | *Gemycircularvirus giapa1* | Giant panda associated gemycircularvirus | MF327560 |
|  | *Gemycircularvirus lynca3* | Lynx canadensis faeces associated genomovirus CL5 48 | MG641201 |
|  | *Gemycircularvirus alces1* | Alces alces faeces associated genomovirus MP84 | MG641204 |
|  | *Gemycircularvirus oltre1* | Olive associated gemycircularvirus 1 | MH444690 |
|  | *Gemycircularvirus euhet1* | Euphorbia heterophylla associated gemycircularvirus | MH047858 |
|  | *Gemycircularvirus citas1* | Citrus Tunisia genomovirus 2 | MN708485 |
|  | *Gemycircularvirus sarpe1* | Plant associated genomovirus 17 | MH939397 |
|  | *Gemycircularvirus bemta1* | Bemisia-associated genomovirus AdO | KY230614 |
|  | *Gemycircularvirus oxcor1* | Oxalis corniculata genomoviridae | MN823668 |
|  | *Gemycircularvirus mocha1* | Momordica charantia associated gemycircularvirus | MH047857 |
|  | *Gemycircularvirus mouti2* | Genomoviridae sp. | MK032755 |
|  | *Gemycircularvirus denpo1* | Bark beetle-associated genomovirus 5 | MG571101 |
|  | *Gemycircularvirus mouti3* | Genomoviridae sp. | MK032715 |
|  | *Gemycircularvirus ixode1* | Tick-associated genomovirus 3 | MF173067 |
|  | *Gemycircularvirus derva1* | Tick-associated genomovirus 1 | MF173065 |
|  | *Gemycircularvirus siedo1* | Sierra dome spider associated circular virus 1 | MH545510 |
|  | *Gemycircularvirus mouti4* | Genomoviridae sp. | MK032719 |
|  | *Gemycircularvirus giapa2* | Giant panda associated gemycircularvirus | MF327565 |
|  | *Gemycircularvirus canlup1* | Lupine feces-associated gemycircularvirus 2 | KY214442 |
|  | *Gemycircularvirus mouti12* | Genomoviridae sp. | MK032702 |
|  | *Gemycircularvirus pleca1* | Gemycircularvirus sp. | KY302866 |
|  | *Gemycircularvirus austro4* | Blackfly genomovirus 9 | MK433241 |
|  | *Gemycircularvirus giapa3* | Giant panda associated gemycircularvirus | MF327568 |
|  | *Gemycircularvirus mouti5* | Genomoviridae sp. | MK032753 |
|  | *Gemycircularvirus echiam1* | Thrips-associated genomovirus 1 | KY308268 |
|  | *Gemycircularvirus giapa4* | Giant panda associated gemycircularvirus | MF327561 |
|  | *Gemycircularvirus termi1* | Termite associated circular virus 2 | MG917675 |
|  | *Gemycircularvirus mouti6* | Genomoviridae sp. | MK032735 |
|  | *Gemycircularvirus ansal1* | Genomoviridae sp. | MN928911 |
|  | *Gemycircularvirus hydro1* | Capybara genomovirus 1 | MK483072 |
|  | *Gemycircularvirus willde1* | Plant associated genomovirus 13 | MH939427 |
|  | *Gemycircularvirus miniti3* | Genomoviridae sp. | MK032712 |
|  | *Gemycircularvirus giapa5* | Giant panda associated gemycircularvirus | MF327567 |
|  | *Gemycircularvirus austro3* | Blackfly genomovirus 4 | MK433236 |
|  | *Gemycircularvirus lynca2* | Lynx canadensis faeces associated genomovirus CL1 71 | MG641194 |
|  | *Gemycircularvirus lynca4* | Lynx canadensis faeces associated genomovirus CL1 148 | MG641197 |
|  | *Gemycircularvirus haeme2* | Finch associated genomovirus 6 | MK249242 |
|  | *Gemycircularvirus solas1* | Plant associated genomovirus 11 | MH939384 |
|  | *Gemycircularvirus miniti1* | Genomoviridae sp. | MK032736 |
|  | *Gemycircularvirus gopha2* | Tortoise genomovirus 10 | MK570210 |
|  | *Gemycircularvirus gopha3* | Genomoviridae sp. | MK032737 |
|  | *Gemycircularvirus opunt1* | Plant associated genomovirus 25 | MK947372 |
|  | *Gemycircularvirus giapa6* | Giant panda associated gemycircularvirus | MF327569 |
|  | *Gemycircularvirus mouti7* | Genomoviridae sp. | MK032738 |
|  | *Gemycircularvirus giapa7* | Giant panda associated gemycircularvirus | MF327558 |
|  | *Gemycircularvirus austro5* | Blackfly genomovirus 5 | MK433237 |
|  | *Gemycircularvirus denbre1* | Bark beetle-associated genomovirus 1 | MG571096 |
|  | *Gemycircularvirus denbre2* | Bark beetle-associated genomovirus 2 | MG571098 |
|  | *Gemycircularvirus denbre3* | Bark beetle-associated genomovirus 3 | MG571099 |
|  | *Gemycircularvirus lepam2* | Alces alces faeces associated genomovirus MP43 | MG641202 |
|  | *Gemycircularvirus lepam3* | Lepus americanus faeces associated genomovirus SHP9 | MG641211 |
|  | *Gemycircularvirus denbre4* | Bark beetle-associated genomovirus 4 | MG571100 |
|  | *Gemycircularvirus lepa2* | Lynx canadensis faeces associated genomovirus CL1 46 | MG641191 |
| *Gemyduguivirus* | *Gemyduguivirus merre1* | Plant associated genomovirus 5 | MH939417 |
|  | *Gemyduguivirus minti2* | Genomoviridae sp. | MK032726 |
|  | *Gemyduguivirus macra1* | Plant associated genomovirus 4 | MH939370 |
|  | *Gemyduguivirus arteca1* | Artemisia carvifolia genomoviridae | MN823676 |
|  | *Gemyduguivirus minti1* | Genomoviridae sp. | MK032731 |
|  | *Gemyduguivirus hydro1* | Capybara genomovirus 3 | MK483075 |
|  | *Gemyduguivirus hydro2* | Capybara genomovirus 8 | MK483080 |
|  | *Gemyduguivirus bemta1* | Bemisia-associated genomovirus AdDF | KY230613 |
|  | *Gemyduguivirus hydro3* | Capybara genomovirus 5 | MK483077 |
|  | *Gemyduguivirus recro1* | Gemycircularvirus sp. | KY312558 |
|  | *Gemyduguivirus austo1* | Blackfly genomovirus 8 | MK433240 |
| *Gemygorvirus* | *Gemygorvirus poaspe1* | Plant associated genomovirus 1 | MH939361 |
|  | *Gemygorvirus hydro1* | Capybara genomovirus 6 | MK483078 |
|  | *Gemygorvirus opunt1* | Plant associated genomovirus 26 | MK947373 |
| *Gemykibivirus* | *Gemykibivirus hipla1* | Bat gemycircularvirus | MK050014 |
|  | *Gemykibivirus hydro1* | Capybara genomovirus 4 | MK483076 |
|  | *Gemykibivirus echi1* | Thrips-associated genomovirus 3 | KY308269 |
|  | *Gemykibivirus hydro2* | Capybara genomovirus 2 | MK483073 |
|  | *Gemykibivirus planta1* | Plant associated genomovirus 2 | MH939363 |
|  | *Gemykibivirus canfam1* | Canine feces-associated gemycircularvirus | KY214441 |
|  | *Gemykibivirus cybusi1* | Cybaeus spider associated circular virus 2 | MH545507 |
|  | *Gemykibivirus cynas1* | Plant associated genomovirus 3 | MH939438 |
|  | *Gemykibivirus raski1* | Genomoviridae sp. | MK032704 |
|  | *Gemykibivirus womot1* | Genomoviridae sp. | MK032756 |
|  | *Gemykibivirus giapa1* | Giant panda associated gemycircularvirus | MF327571 |
|  | *Gemykibivirus haeme1* | Finch associated genomovirus 3 | MK249305 |
|  | *Gemykibivirus haeme2* | Gopherus associated genomovirus 1 | MF373638 |
|  | *Gemykibivirus haeme3* | Finch associated genomovirus 2 | MK249239 |
|  | *Gemykibivirus mouti1* | Genomoviridae sp. | MK032703 |
|  | *Gemykibivirus pitis1* | Genomoviridae sp. | MK032749 |
|  | *Gemykibivirus haeme4* | Finch associated genomovirus 4 | MK249240 |
|  | *Gemykibivirus turti1* | Genomoviridae sp. | MK012443 |
|  | *Gemykibivirus pitis2* | Genomoviridae sp. | MK032721 |
|  | *Gemykibivirus hydro3* | Capybara genomovirus 12 | MK483084 |
|  | *Gemykibivirus haeme5* | Finch associated genomovirus 1 | MK249294 |
|  | *Gemykibivirus abati1* | Genomoviridae sp. | MK032696 |
|  | *Gemykibivirus abati2* | Genomoviridae sp. | MK032759 |
|  | *Gemykibivirus minti1* | Genomoviridae sp. | MK032742 |
|  | *Gemykibivirus planta2* | Plant associated genomovirus 29 | MK947376 |
|  | *Gemykibivirus hadtis1* | Genomoviridae sp. | MK032708 |
|  | *Gemykibivirus waste1* | Genomoviridae sp. | MT309857 |
|  | *Gemykibivirus mouti2* | Genomoviridae sp. | MK032748 |
|  | *Gemykibivirus cowchi1* | Cattle blood-associated gemycircularvirus | MF669480 |
|  | *Gemykibivirus anima1* | Porcine feces-associated gemycircularvirus | KY214433 |
|  | *Gemykibivirus galga1* | Chicken genomovirus mg7\_73 | MN379612 |
|  | *Gemykibivirus galga2* | Chicken genomovirus mg8\_401 | MN379615 |
|  | *Gemykibivirus bemta1* | Bemisia-associated genomovirus NfO | KY230625 |
|  | *Gemykibivirus galga3* | Chicken genomovirus mg4\_1218 | MN379608 |
| *Gemykolovirus* | *Gemykolovirus echia1* | Thrips-associated genomovirus 4 | KY308270 |
|  | *Gemykolovirus derva1* | Tick-associated genomovirus 2 | MF173066 |
|  | *Gemykolovirus poaspe1* | Plant associated genomovirus 9 | MH939382 |
|  | *Gemykolovirus lepam1* | Alces alces faeces associated genomovirus MP68 | MG641203 |
|  | *Gemykolovirus easlu1* | Grasshopper associated circular virus 1 | MH545499 |
|  | *Gemykolovirus heris1* | Plant associated genomovirus 7 | MH939374 |
|  | *Gemykolovirus hadtis1* | Genomoviridae sp. | MK032747 |
|  | *Gemykolovirus abati1* | Genomoviridae sp. | MK032717 |
|  | *Gemykolovirus gopha1* | Tortoise genomovirus 9 | MK570209 |
|  | *Gemykolovirus citas1* | Citrus Tunisia genomovirus 1b | MN708482 |
|  | *Gemykolovirus prupe1* | Amygdalus persica genomoviridae | MN823669 |
|  | *Gemykolovirus segpa1* | Tubeweb spider associated circular virus 1 | MH545501 |
|  | *Gemykolovirus gopha2* | Tortoise genomovirus 13 | MK570213 |
|  | *Gemykolovirus troti1* | Genomoviridae sp. | MK032739 |
| *Gemykrogvirus* | *Gemykrogvirus galga5* | Chicken genomovirus mg4\_1165 | MN379604 |
|  | *Gemykrogvirus hadtis1* | Genomoviridae sp. | MK032724 |
|  | *Gemykrogvirus giapa1* | Giant panda associated gemycircularvirus | MF327559 |
|  | *Gemykrogvirus abati1* | Genomoviridae sp. | MK032716 |
|  | *Gemykrogvirus galga1* | Chicken genomovirus mg4\_1247 | MN379609 |
|  | *Gemykrogvirus humas1* | Gemycircularvirus sp. | MT649486 |
|  | *Gemykrogvirus galga2* | Chicken stool-associated gemycircularvirus | KY056250 |
|  | *Gemykrogvirus apime1* | Apis mellifera genomovirus 2 | MH973741 |
|  | *Gemykrogvirus galga3* | Chicken genomovirus mg4\_1173 | MN379605 |
|  | *Gemykrogvirus galga4* | Chicken genomovirus mg7\_78 | MN379614 |
| *Gemykroznavirus* | *Gemykroznavirus poaspe1* | Plant associated genomovirus 24 | MH939435 |
|  | *Gemykroznavirus solas1* | Plant associated genomovirus 23 | MH939385 |
|  | *Gemykroznavirus haeme1* | Finch associated genomovirus 8 | MK249245 |
|  | *Gemykroznavirus anima1* | Genomoviridae sp. | MK032727 |
|  | *Gemykroznavirus hydro1* | Capybara genomovirus 10 | MK483082 |
|  | *Gemykroznavirus zizan1* | Zizania latifolia genomoviridae | MN823671 |
| *Gemyvongvirus* | *Gemyvongvirus minit1* | Genomoviridae sp. | MK032710 |
|  | *Gemyvongvirus minit2* | Genomoviridae sp. | MK032740 |
| *Gemytripvirus* | *Gemytripvirus fugra1* | Fusarium graminearum gemytripvirus 1 | MK430076, MK430077, MK430078 |

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**Figure 1:** Maximum likelihood phylogenetic tree of translated Rep amino acid sequences of 545 genomovirus sequences together with a subset of geminivirus and that of MK032746 that are distantly related. The Rep sequence alignment was constructed with MAFFT [2] and trimmed with TrimAL [1] using the gappyout option. The final alignment contained 435 amino-acid sites and was used to infer a Maximum likelihood phylogenetic with IQTree [5]. The best-fitting model was determined by IQTree and was LG+F+R9. Numbers at the nodes represent bootstrap support values (%).



**Figure 2:** Pairwise identity matrix of the genome sequences of a representative member from each species of genomoviruses (n=236; except Fusarium graminearum gemytripvirus 1 [species *Gemytripvirus fugra1*] that has a multicomponent genome) determined using SDT v1.2 [6].

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**Figure 3:** Pairwise distribution plot of the 236 representative sequences of genomoviruses (except Fusarium graminearum gemytripvirus 1 [species *Gemytripvirus fugra1*] that has a multicomponent genome) shows that no sequences from different species share >78% identity.

**References**

1. Capella-Gutierrez S, Silla-Martinez JM, Gabaldon T (2009) trimAl: a tool for automated alignment trimming in large-scale phylogenetic analyses. Bioinformatics 25:1972-1973. doi: 10.1093/bioinformatics/btp348

2. Katoh K, Rozewicki J, Yamada KD (2019) MAFFT online service: multiple sequence alignment, interactive sequence choice and visualization. Brief Bioinform 20:1160-1166. DOI: 10.1093/bib/bbx108

3. Krupovic M, Ghabrial SA, Jiang D, Varsani A (2016) Genomoviridae: a new family of widespread single-stranded DNA viruses. Arch Virol 161:2633-2643. doi: 10.1007/s00705-016-2943-3

4. Li P, Wang S, Zhang L, Qiu D, Zhou X, Guo L (2020) A tripartite ssDNA mycovirus from a plant pathogenic fungus is infectious as cloned DNA and purified virions. Sci Adv 6:eaay9634. doi: 10.1126/sciadv.aay9634

5. Minh BQ, Schmidt HA, Chernomor O, Schrempf D, Woodhams MD, von Haeseler A, Lanfear R (2020) IQ-TREE 2: New Models and Efficient Methods for Phylogenetic Inference in the Genomic Era. Mol Biol Evol 37:1530-1534. doi: 10.1093/molbev/msaa015

6. Muhire BM, Varsani A, Martin DP (2014) SDT: A Virus Classification Tool Based on Pairwise Sequence Alignment and Identity Calculation. Plos One 9:e108277. doi: 10.1371/journal.pone.0108277

7. Varsani A, Krupovic M (2017) Sequence-based taxonomic framework for the classification of uncultured single-stranded DNA viruses of the family Genomoviridae. Virus Evol 3:vew037. doi: 10.1093/ve/vew037