This form should be used for all taxonomic proposals. Please complete all those modules that are applicable.

For guidance, see the notes written in blue and the separate document “Help with completing a taxonomic proposal”

Please try to keep related proposals within a single document.

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

|  |  |  |
| --- | --- | --- |
| **Code assigned:** | ***2019.014M*** | (to be completed by ICTV officers) |
| **Short title:** Create one new species in the genus *Avulavirus* (*Mononegavirales*: *Paramyxoviridae*) |
|  |
| **Author(s):** |
| Aziz-ul-Rahman, drazizangel@gmail.com Muhammad Zubair Shabbir, shabbirmz@uvas.edu.pk |
| **Corresponding author with e-mail address:** |
| Muhammad Zubair Shabbir, shabbirmz@uvas.edu.pk  |
| **List the ICTV study group(s) that have seen this proposal:** |
| A list of study groups and contacts is provided at <http://www.ictvonline.org/subcommittees.asp> . If in doubt, contact the appropriate subcommittee chair (there are six virus subcommittees: animal DNA and retroviruses, animal ssRNA-, animal ssRNA+, fungal and protist, plant, bacterial and archaeal) | **ICTV *Paramyxoviridae* Study Group** |
| **ICTV Study Group comments (if any) and response of the proposer:** |
|       |
|  |
| Date first submitted to ICTV: | January 10, 2019 |
| Date of this revision (if different to above): |  |

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

**Part 2**: **PROPOSED TAXONOMY**

|  |
| --- |
| Present the proposed new taxonomy on accompanying spreadsheet |
| **Name of accompanying spreadsheet:** 2019.014M.A.v1.Avulavirus\_1newsp |

Please display the taxonomic changes you are proposing on the accompanying spreadsheet module 2017\_TP\_Template\_Excel\_module. Submit both this and the spreadsheet to the appropriate ICTV Subcommittee Chair.

**Part 4:** **APPENDIX**: supporting material

We propose a novel species for an avian paramyxovirus discovered in wild birds in South Korea (MF594598), which was tentatively named “avian paramyxovirus 17” at the same time as another, only distantly related, “avian paramyxovirus 17” was described in Antarctic penguins [1, 2, 4, 5]. The Antarctic virus was renamed “Antarctic penguin virus A (APV-A) and was classified into the species *Avian avulavirus 17*, but the South Korean virus has not yet been classified [4].

As had been reported previously [1, 5], a total of six criteria were used for classification of this particular novel APMV. These include phylogenies based upon complete virus genomes and complete *F* and *L* genes, PASC analysis forF and L proteins, and presence of an amino acid motif (NRKSCS) in the hemagglutinin-neuraminidase (HN) protein. In the phylogenies, the South Korean isolate clustered individually in distinct clades close to already classified APMVs 1, 9, and 16 but separate from APV-A, B, and C and APMV-20 (Fig. 1A-C).

Complete genome sequence based PASC and STD analysis revealed high nucleotide divergence between the South Korean isolate and other avulaviruses. This divergence is also obvious when only the complete *F* or *L* genes were analyzed using PASC (Fig. 2, Tables 1-3). The South Korean isolate HN protein contains the avulavirus-typical motif (NRTKSCS), but at a location distinct from other avulavirus HN proteins.

We therefore rename the South Korean “avian paramyxovirus 17” to “avian paramyxovirus 21” to avoid confusion in the literature with the Antarctic “avian paramyxovirus 17” (Antarctic penguin virus A) and propose to classify avian paramyxovirus 21 into a novel species *Avian avulavirus 21*, taking into account that an “avian paramyxovirus 20” (MF033136) has recently been discovered and will likely be proposed to be classified into a novel species *Avian avulavirus 20* (personal communication, Dr. Bert Rima, 2018).



**A**

**C**

**B**

**A**

****

**B**

**C**

****

**Fig. 1** Phylogenetic analysis of complete genome (**A**), complete *F* (**B**) and *L* (**C**) coding genomes sequence of all known avulaviruses (APMVs-1-16, APV-A-C, APMV-20 and -21). The neighbour-joining method with 1,000 bootstraps was used for analysis of evolutionary relationship between isolates using MEGA 6 software.



**Fig. 2** Estimation of nucleotide divergence of complete genome of all known avulaviruses (APMVs-1-16, APV-A-C, APMV-20 and -21) using SDT analysis. The accession numbers and isolate names of all avulaviruses (APMVs and APVs) correspond to those in Fig. 1.

**Table 1.** PASC analysis of complete genome sequence of all known avulaviruses APMVs-1-16, APV-A-C, APMV-20 and -21)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MF594598\_Cheonsu1510 (Proposed APMV-21) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| JQ247691\_APMV-1/chicken/Ca/2098/71 | 42.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| HM159994\_APMV-2/Gadwell/Kenya/3/80 | 55.7 | 55.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EU403085\_APMV-3/PKT/Netherland/449/75 | 57.9 | 57.9 | 57.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| KY681684\_APMV-4/Mallard/LBM/Korea/019/2012 | 57.9 | 58.0 | 57.2 | 54.8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LC168750\_APMV-5/budgerigar/Japan/TI/75 | 57.4 | 55.8 | 51.5 | 58.6 | 57.9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EF569970\_APMV-6/Goose/FarEast/4440/2003 | 57.7 | 57.0 | 53.1 | 59.1 | 58.9 | 45.3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| FJ231524\_APMV-7/dove/Tennessee/4/75 | 57.0 | 55.8 | 51.3 | 57.5 | 58.2 | 52.0 | 53.7 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| JX901129\_APMV-8/pintail/Wakuya/20/78 | 56.3 | 55.5 | 43.2 | 57.7 | 57.8 | 51.6 | 54.4 | 50.6 |  |  |  |  |  |  |  |  |  |  |  |  |
| EU910942\_duck/New\_York/22/1978 | 35.8 | 42.2 | 55.6 | 57.3 | 57.9 | 56.2 | 57.7 | 56.2 | 54.9 |  |  |  |  |  |  |  |  |  |  |  |
| HM755888\_APMV-10/Penguin/Falkland\_Islands/539/2007 | 56.7 | 55.3 | 40.1 | 57.8 | 56.9 | 51.4 | 53.0 | 50.6 | 42.7 | 55.2 |  |  |  |  |  |  |  |  |  |  |
| JQ886184\_common\_snipe/France/100212/2010 | 57.3 | 56.6 | 50.6 | 58.5 | 57.8 | 52.3 | 54.3 | 51.2 | 50.9 | 56.3 | 50.8 |  |  |  |  |  |  |  |  |  |
| KC333050\_Wigeon/Italy/3920\_1/2005 | 46.7 | 45.2 | 55.3 | 57.7 | 57.7 | 55.7 | 58.0 | 55.9 | 55.1 | 46.3 | 55.4 | 56.4 |  |  |  |  |  |  |  |  |
| KU646513\_goose/Kazakhstan/5751/2013 | 47.5 | 45.7 | 55.8 | 58.0 | 57.8 | 56.7 | 57.7 | 55.7 | 55.7 | 47.0 | 55.9 | 57.1 | 37.6 |  |  |  |  |  |  |  |
| KX258200\_APMV-14/duck/Japan/11OG0352/2011 | 56.5 | 55.7 | 51.4 | 57.5 | 57.5 | 49.1 | 50.8 | 52.4 | 50.4 | 55.9 | 50.9 | 52.0 | 55.4 | 55.4 |  |  |  |  |  |  |
| KX932454\_APMV-15/calidris\_fuscicollis/Brazil/RS1177/2012 | 57.0 | 55.5 | 42.9 | 57.6 | 57.4 | 51.6 | 53.6 | 51.2 | 43.7 | 55.5 | 41.5 | 50.5 | 55.3 | 55.6 | 50.8 |  |  |  |  |  |
| KY511044\_APMV-16/WB/Kr/UPO216/2014 | 42.5 | 34.0 | 55.1 | 58.2 | 58.0 | 56.2 | 57.4 | 55.8 | 54.8 | 42.1 | 55.0 | 56.1 | 45.2 | 45.1 | 55.1 | 55.2 |  |  |  |  |
| KY452442\_Antarctic\_penguin\_virus\_A (APV-A) | 49.1 | 48.1 | 55.0 | 57.6 | 56.9 | 56.2 | 57.4 | 55.5 | 54.9 | 48.7 | 55.8 | 55.9 | 48.3 | 48.5 | 55.3 | 54.3 | 48.2 |  |  |  |
| KY452443\_Antarctic\_penguin\_virus\_B (APV-B) | 48.9 | 48.3 | 55.6 | 57.3 | 57.2 | 56.3 | 57.9 | 57.0 | 56.0 | 49.0 | 56.0 | 56.8 | 48.6 | 49.3 | 55.7 | 55.6 | 48.1 | 34.8 |  |  |
| KY452444\_Antarctic\_penguin\_virus\_C (APV-C) | 48.5 | 48.1 | 56.0 | 57.2 | 56.9 | 56.5 | 57.7 | 56.9 | 55.8 | 49.0 | 56.1 | 56.7 | 49.1 | 48.9 | 55.6 | 55.5 | 48.2 | 40.3 | 39.5 |  |
| MF033136\_APMV-20/gull/Kazakhstan/5976/2014 | 56.8 | 56.4 | 43.3 | 56.9 | 57.6 | 52.3 | 54.6 | 51.2 | 43.7 | 55.4 | 42.5 | 51.4 | 55.8 | 56.0 | 51.5 | 44.3 | 55.7 | 55.4 | 56.2 | 56.1 |

**Table 2.** PASC analysis of complete *F* gene sequence of all known avulaviruses (APMVs-1-16, APV-A-C, APMV-20 and -21)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MF594598\_Cheonsu1510 (Proposed APMV-21) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| JQ247691\_APMV-1/chicken/Ca/2098/71 | 42.2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| HM159994\_APMV-2/Gadwell/Kenya/3/80 | 52.5 | 52.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EU403085\_APMV-3/PKT/Netherland/449/75 | 58.3 | 57.0 | 59.7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| KY681684\_APMV-4/Mallard/LBM/Korea/019/2012 | 56.7 | 57.9 | 57.5 | 55.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LC168750\_APMV-5/budgerigar/Japan/TI/75 | 52.6 | 52.9 | 47.2 | 55.9 | 55.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EF569970\_APMV-6/Goose/FarEast/4440/2003 | 54.5 | 54.5 | 49.0 | 57.5 | 56.3 | 41.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| FJ231524\_APMV-7/dove/Tennessee/4/75 | 56.3 | 55.5 | 52.8 | 59.1 | 58.7 | 50.1 | 53.6 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| JX901129\_APMV-8/pintail/Wakuya/20/78 | 52.8 | 53.5 | 40.9 | 57.0 | 56.7 | 47.8 | 49.7 | 50.1 |  |  |  |  |  |  |  |  |  |  |  |  |
| EU910942\_duck/New\_York/22/1978 | 35.5 | 40.3 | 53.5 | 57.9 | 58.3 | 52.9 | 53.6 | 57.2 | 51.8 |  |  |  |  |  |  |  |  |  |  |  |
| HM755888\_APMV-10/Penguin/Falkland\_Islands/539/2007 | 53.8 | 53.3 | 40.8 | 59.5 | 55.8 | 46.2 | 47.9 | 51.2 | 41.7 | 53.0 |  |  |  |  |  |  |  |  |  |  |
| JQ886184\_common\_snipe/France/100212/2010 | 58.4 | 56.7 | 51.3 | 57.5 | 57.4 | 54.2 | 51.2 | 47.1 | 48.4 | 56.4 | 50.0 |  |  |  |  |  |  |  |  |  |
| KC333050\_Wigeon/Italy/3920\_1/2005 | 44.2 | 43.2 | 52.8 | 56.6 | 57.0 | 54.0 | 53.9 | 55.8 | 53.3 | 44.8 | 52.3 | 56.0 |  |  |  |  |  |  |  |  |
| KU646513\_goose/Kazakhstan/5751/2013 | 45.8 | 43.8 | 54.0 | 56.3 | 55.5 | 51.2 | 55.2 | 56.7 | 53.7 | 46.8 | 52.7 | 56.2 | 37.9 |  |  |  |  |  |  |  |
| KX258200\_APMV-14/duck/Japan/11OG0352/2011 | 54.7 | 53.4 | 49.4 | 58.1 | 55.9 | 44.3 | 43.4 | 52.2 | 48.9 | 55.5 | 48.2 | 52.6 | 52.3 | 53.2 |  |  |  |  |  |  |
| KX932454\_APMV-15/calidris\_fuscicollis/Brazil/RS1177/2012 | 53.6 | 52.7 | 42.8 | 57.1 | 55.1 | 45.2 | 46.6 | 52.8 | 41.9 | 52.2 | 40.9 | 49.1 | 53.1 | 52.2 | 46.3 |  |  |  |  |  |
| KY511044\_APMV-16/WB/Kr/UPO216/2014 | 43.5 | 33.0 | 53.5 | 58.5 | 56.9 | 53.4 | 55.5 | 54.9 | 53.2 | 42.2 | 52.2 | 54.6 | 43.9 | 44.1 | 52.3 | 53.1 |  |  |  |  |
| KY452442\_Antarctic\_penguin\_virus\_A (APV-A) | 51.3 | 49.2 | 53.2 | 57.4 | 56.0 | 53.9 | 52.8 | 55.3 | 55.1 | 51.7 | 55.3 | 54.9 | 50.2 | 51.3 | 53.9 | 51.3 | 50.2 |  |  |  |
| KY452443\_Antarctic\_penguin\_virus\_B (APV-B) | 50.7 | 49.6 | 52.6 | 56.0 | 53.9 | 52.5 | 52.1 | 57.4 | 54.0 | 50.0 | 52.8 | 55.7 | 48.7 | 52.1 | 51.7 | 52.1 | 48.7 | 37.6 |  |  |
| KY452444\_Antarctic\_penguin\_virus\_C (APV-C) | 49.7 | 47.3 | 55.5 | 58.3 | 55.8 | 53.7 | 54.6 | 56.1 | 53.8 | 49.1 | 53.6 | 56.0 | 49.3 | 50.6 | 52.9 | 53.1 | 47.4 | 43.2 | 40.2 |  |
| MF033136\_APMV-20/gull/Kazakhstan/5976/2014 | 53.1 | 52.9 | 37.9 | 58.3 | 55.9 | 46.0 | 47.4 | 51.6 | 41.4 | 53.1 | 39.7 | 50.0 | 54.3 | 54.2 | 48.9 | 41.2 | 54.7 | 55.0 | 54.0 | 55.3 |

**Table 3.** PASC analysis of complete L amino acid sequence of all known avulaviruses (APMVs-1-16, APV-A-C, APMV-20 and -21)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MF594598\_Cheonsu1510 (Proposed APMV-21) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| JQ247691\_APMV-1/chicken/Ca/2098/71 | 40.9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| HM159994\_APMV-2/Gadwell/Kenya/3/80 | 54.1 | 53.2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EU403085\_APMV-3/PKT/Netherland/449/75 | 57.6 | 56.1 | 55.9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| KY681684\_APMV-4/Mallard/LBM/Korea/019/2012 | 57.3 | 56.4 | 56.1 | 48.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LC168750\_APMV-5/budgerigar/Japan/TI/75 | 54.6 | 53.7 | 51.1 | 56.7 | 57.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EF569970\_APMV-6/Goose/FarEast/4440/2003 | 53.9 | 52.6 | 50.6 | 56.1 | 56.7 | 45.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| FJ231524\_APMV-7/dove/Tennessee/4/75 | 53.4 | 53.0 | 50.6 | 55.3 | 55.7 | 48.6 | 49.3 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| JX901129\_APMV-8/pintail/Wakuya/20/78 | 53.9 | 52.6 | 42.2 | 55.7 | 56.4 | 50.5 | 51.4 | 49.2 |  |  |  |  |  |  |  |  |  |  |  |  |
| EU910942\_duck/New\_York/22/1978 | 34.4 | 39.7 | 53.4 | 56.1 | 56.5 | 53.3 | 53.5 | 53.5 | 52.8 |  |  |  |  |  |  |  |  |  |  |  |
| HM755888\_APMV-10/Penguin/Falkland\_Islands/539/2007 | 54.5 | 53.6 | 40.6 | 55.5 | 55.3 | 50.7 | 50.9 | 49.3 | 40.3 | 52.6 |  |  |  |  |  |  |  |  |  |  |
| JQ886184\_common\_snipe/France/100212/2010 | 53.4 | 53.2 | 48.1 | 54.8 | 55.4 | 47.6 | 49.2 | 44.1 | 48.8 | 53.1 | 48.0 |  |  |  |  |  |  |  |  |  |
| KC333050\_Wigeon/Italy/3920\_1/2005 | 45.9 | 43.4 | 53.0 | 56.7 | 56.9 | 52.5 | 53.5 | 52.8 | 53.1 | 44.5 | 54.3 | 52.2 |  |  |  |  |  |  |  |  |
| KU646513\_goose/Kazakhstan/5751/2013 | 46.1 | 43.0 | 54.2 | 55.6 | 56.5 | 53.6 | 52.6 | 51.9 | 52.5 | 44.2 | 53.2 | 52.5 | 36.3 |  |  |  |  |  |  |  |
| KX258200\_APMV-14/duck/Japan/11OG0352/2011 | 55.3 | 53.7 | 51.5 | 56.0 | 57.0 | 45.3 | 44.4 | 50.5 | 50.3 | 53.8 | 51.1 | 49.1 | 53.9 | 53.5 |  |  |  |  |  |  |
| KX932454\_APMV-15/calidris\_fuscicollis/Brazil/RS1177/2012 | 54.1 | 53.4 | 40.0 | 56.3 | 55.9 | 50.2 | 50.9 | 49.9 | 41.9 | 52.9 | 40.3 | 47.6 | 52.7 | 52.8 | 51.4 |  |  |  |  |  |
| KY511044\_APMV-16/WB/Kr/UPO216/2014 | 40.7 | 32.3 | 53.3 | 56.8 | 56.8 | 53.6 | 53.0 | 53.1 | 52.6 | 39.9 | 53.2 | 52.6 | 43.1 | 43.3 | 53.0 | 52.2 |  |  |  |  |
| KY452442\_Antarctic\_penguin\_virus\_A (APV-A) | 45.7 | 45.2 | 52.1 | 56.4 | 56.9 | 53.7 | 53.4 | 53.6 | 52.9 | 45.6 | 53.3 | 52.7 | 45.5 | 45.2 | 53.7 | 52.6 | 44.7 |  |  |  |
| KY452443\_Antarctic\_penguin\_virus\_B (APV-B) | 45.9 | 44.8 | 53.1 | 56.2 | 57.2 | 53.9 | 54.2 | 54.7 | 54.0 | 46.0 | 53.9 | 53.1 | 45.9 | 46.3 | 54.2 | 53.7 | 45.1 | 32.2 |  |  |
| KY452444\_Antarctic\_penguin\_virus\_C (APV-C) | 46.3 | 45.7 | 53.2 | 56.4 | 57.0 | 53.4 | 53.5 | 54.2 | 53.5 | 46.6 | 54.8 | 53.2 | 46.7 | 46.5 | 54.1 | 53.6 | 45.8 | 36.5 | 36.2 |  |
| MF033136\_APMV-20/gull/Kazakhstan/5976/2014 | 53.8 | 53.2 | 42.0 | 55.0 | 55.9 | 50.4 | 50.6 | 49.9 | 40.8 | 52.1 | 38.5 | 48.8 | 52.5 | 52.3 | 50.7 | 41.8 | 52.5 | 52.9 | 53.5 | 53.6 |

**References:**

|  |
| --- |
| 1. Diel DG, da Silva LH, Liu H, Wang Z, Miller PJ, Afonso CL (2012). Genetic diversity of avian paramyxovirus type 1: proposal for a unified nomenclature and classification system of Newcastle disease virus genotypes. Infec Genet Evol 12(8):1770-9
2. Jeong J, Kim Y, An I, Wang SJ, Kim Y, Lee HJ, Choi KS, Im SP, Min W, Oem JK, Jheong W (2018). Complete genome sequence of a novel avian paramyxovirus isolated from wild birds in South Korea. Arch of Virol 163(1):223-7
3. Lee HJ, Kim JY, Lee YJ, Lee EK, Song BM, Lee HS, Choi KS (2017). A Novel Avian Paramyxovirus (Putative Serotype 15) Isolated from Wild Birds. Front Microbiol 8:786
4. Neira V, Tapia R, Verdugo C, Barriga G, Mor S, Ng TFF, García V, Del Río J, Rodrigues P, Briceño C, Medina RA (2017). Novel avulaviruses in penguins. Antarctica. Emerg Infec Dis 23(7): 1212
5. Rima B, Collins P, Easton A, Fouchier R, Kurath G, Lamb RA, Lee B, Maisner A, Rota P, Wang LF (2018). Problems of classification in the family *Paramyxoviridae*. Archi of Virol 1-0.
6. Thomazelli LM, de Araújo J, Fabrizio T, Walker D, Reischak D, Ometto T, Barbosa CM, Petry MV, Webby RJ, Durigon EL (2017). Novel avian paramyxovirus (APMV-15) isolated from a migratory bird in South America. PloS One 12 (5): e0177214
 |