Updated unified phylogenetic classification system and revised nomenclature for Newcastle disease virus

Kiril M. Dimitrov[a]*, Celia Abolnik[b], Claudio L. Afonso[a]*, Emmanuel Albina[c,d], Justin Bahl[e], Mikael Berg[f], Francois-Xavier Briand[g], Ian H. Brown[h], Kang-Seuk Choi[i], Ilya Chvala[j], Diego G. Diel[k], Peter A. Durr[l], Helena L. Ferreira[a,m], Alice Fusaro[n], Patricia Gil[d,o], Gabriela V. Goujgoulova[p], Christian Grund[q], Joseph T. Hicks[e], Tony M. Joannis[r], Mia Kim Torchetti[s], Sergey Kolosov[j], Bénédicte Lambrecht[t], Nicola S. Lewis[h,u], Haijin Liu[v], Sam McCullough[l], Patti J. Miller[w], Isabella Monne[n], Claude P. Muller[x], Muhammad Munir[y], Dilmara Reischak[z], Mahmoud Sabra[aa], Siba K. Samal[ab], Renata Servan de Almeida[d,o], Ismaila Shittu[r], Chantal J. Snoeck[x], David L. Suarez[a], Steven Van Borm[t], Zhiliang Wang[ac], Frank Y. K. Wong[l]

[a]Exotic and Emerging Avian Viral Disease Research Unit, Southeast Poultry Research Laboratory, US National Poultry Research Center, ARS, USDA, 934 College Station Road, Athens, GA 30605, USA
[b]Department of Production Studies, Faculty of Veterinary Science, University of Pretoria, Old Soutpan Road, Onderstepoort, Pretoria, 0110, South Africa
[c]CIRAD, UMR ASTRE, F-97170 Petit-Bourg, Guadeloupe, France
[d]ASTRE CIRAD, INRA, Univ Montpellier, Montpellier, France
[e]Center for Ecology of Infectious Disease, Department of Infectious Diseases, Department of Epidemiology and Biostatistics, Institute of Bioinformatics, University of Georgia, Athens, Georgia, 30602, USA
[f]Department of Biomedical Sciences and Veterinary Public Health, Swedish University of Agricultural Sciences, Box 7028, 750 07 Uppsala, Sweden
[g]ANSES, Avian and Rabbit Virology Immunology and Parasitology Unit, National reference laboratory for avian Influenza and Newcastle disease, BP 53 - 22440 Ploufragan, France
[h]OIE/FAO International Reference Laboratory for Newcastle Disease, Animal and Plant Health Agency (APHA –Weybridge), Addlestone, KT15 3NB, UK
[i]Animal and Plant Quarantine Agency, Ministry of Agriculture, Food and Rural Affairs (MAFRA), 177 Hyeoksin 8-ro, Gimcheon-si, Gyeongsangbuk-do, 39660, Republic of Korea
[j]Federal Governmental Budgetary Institution, Federal Centre for Animal Health, FGI ARRIAH, Vladimir 600901, Russia
[k]Department of Veterinary and Biomedical Sciences, Animal Disease, Research and Diagnostic Laboratory, South Dakota State University, Brookings, SD, USA
[l]CSIRO Australian Animal Health Laboratory, Portarlington Road, East Geelong, Victoria 3219, Australia
[m]University of Sao Paulo, ZMV- FZEA, Pirassununga, 13635900, Brazil
[n]Istituto Zooprofilattico Sperimentale delle Venezie (IZSVe), Viale dell'Università 10, Legnaro 35020, Italy
[o]CIRAD, UMR ASTRE, F-34398 Montpellier, France
[p]National Diagnostic and Research Veterinary Medical Institute, 15 Pencho Slaveikov blvd., Sofia 1606, Bulgaria
[q]Friedrich-Loeffler-Institut, 17493 Greifswald, Insel Riems, Germany
[r]Regional Laboratory for Animal Influenzas and Transboundary Animal Diseases, National Veterinary Research Institute, Vom, Nigeria

[s]National Veterinary Services Laboratories, Diagnostics and Biologics, Veterinary Services, Animal and Plant Health Inspection Service, U.S. Department of Agriculture, 1920 Dayton Ave, Ames, IA 50010, USA
[t]Infectious Diseases in Animals, SCIENSANO, Groeselenberg 99, 1180 Ukkel, Brussels, Belgium
[u]Royal Veterinary College, University of London, 4 Royal College Street, London NW1 0TU, UK
[v]College of Veterinary Medicine, Northwest A & F University, Yangling, Shaanxi, 712100, People's Republic of China
[w]Department of Population Health, College of Veterinary Medicine, University of Georgia, 953 College Station Road, Athens, GA 30602, USA
[x]Infectious Diseases Research Unit, Department of Infection and Immunity, Luxembourg Institute of Health, 29, rue Henri Koch, L-4354 Esch-sur-Alzette, Luxembourg
[y]Division of Biomedical and Life Sciences, Faculty of Health and Medicine, Lancaster University, Lancaster, United Kingdom.
[z]Ministério da Agricultura, Pecuária e Abastecimento, Laboratório Federal de Defesa Agropecuário, Campinas, SP, 13100-105 Brazil
[aa]Department of Poultry Diseases, Faculty of Veterinary Medicine, South Valley University, Qena 83523, Egypt
[ab]Virginia-Maryland Regional College of Veterinary Medicine, University of Maryland, College Park, MD, USA
[ac]National Reference Laboratory for Newcastle Disease, China Animal Health and Epidemiology Center (CAHEC), 369 Nanjing Road, Qingdao 266032, China

*Corresponding authors

Telephone: +1 706 546 6342

Fax: +1 706-546-3161

Email address: claudio.afonso@ars.usda.gov

dimitrov_kiril@yahoo.com

ABSTRACT

Several *Avian paramyxoviruses 1* classification systems have been proposed for strain identification and differentiation. These systems pioneered classification efforts; however, they were based on different approaches and lacked objective criteria for the differentiation of isolates (the term Newcastle disease viruses or NDV is used hereafter). These differences have created discrepancies among systems, rendering discussions and comparisons across studies difficult. Although a system that used objective classification criteria was proposed by Diel and co-workers in 2012, the ample worldwide circulation and constant evolution of NDV, and utilization of only some of the criteria led to identical naming and/or incorrect assigning of new sub/genotypes. To address these issues, an international consortium of experts was convened to undertake in-depth analyses of NDV genetic diversity. This consortium generated curated, up-to-date, complete fusion gene class I and class II datasets of all known NDV for public use, performed comprehensive phylogenetic Neighbor-Joining, maximum-likelihood, Bayesian and nucleotide distance analyses, and compared these inference methods. An updated NDV classification and nomenclature system that incorporates phylogenetic topology, genetic distances, branch support, and epidemiological independence was developed. This new consensus system maintains two NDV classes and existing genotypes, identifies three new genotypes, and reduces the number of sub-genotypes. In order to track the ancestry of viruses, a dichotomous naming system for designating sub-genotypes was introduced. In addition, a pilot dataset and sub-trees rooting guidelines for rapid preliminary genotype identification of new isolates are provided. Guidelines for sequence dataset curation and phylogenetic inference, and a detailed comparison between the updated and previous systems are included. To increase the speed of phylogenetic inference and ensure consistency between laboratories, detailed guidelines for the use of a supercomputer are also provided. The proposed unified classification system will facilitate future studies of NDV evolution and epidemiology, and comparison of results obtained across the world.

Keywords

Avian paramyxovirus 1 (APMV-1); Newcastle disease virus (NDV); classification; nomenclature; genotype; phylogenetic analysis

1. Introduction

The International Committee on Taxonomy of Viruses has recently created three genera, named *Metaavulavirus*, *Orthoavulavirus*, and *Paraavulavirus*, within a new subfamily *Avulavirinae* of the family *Paramyxoviridae* (ICTV, 2019). Isolates of *Avian orthoavulavirus 1* (AOAV-1), formerly designated as *Avian avulavirus 1* (AAvV-1) or *Avian paramyxovirus 1* (APMV-1), and commonly known as Newcastle disease viruses (NDV, used hereafter for the purposes of this paper), cause infections in a wide range of domestic and wild birds worldwide (Amarasinghe et al., 2018; ICTV, 2019; Miller and Koch, 2013). Newcastle disease (ND), caused by virulent NDV, is highly contagious and can be devastating, particularly in naïve poultry (Alexander et al., 2012). Virulent strains are defined by the World Organisation for Animal Helath (OIE) as viruses that have an intracerebral pathogenicity index of 0.7 or higher (2.0 is maximum) or a fusion cleavage site with multiple basic amino acids and phenylalanine at position 117 (OIE, 2012). Newcastle disease has a global impact and 109 of 200 countries have reported the disease to the OIE in the last five years (OIE, 2018). Between 2006 and 2009, ND was ranked the 8th most important wildlife disease and the 3rd most significant poultry disease (Anonymous, 2011). The importance of NDV infections to avian health has long been recognized, and the viruses have been the subject of considerable scientific investigations over the past several decades (Alexander et al., 2012; Miller and Koch, 2013). The need for NDV classification has resulted in a variety of methods for strain identification and differentiation (Alexander et al., 1985; Bankowski and Kinjo, 1965; Pennington, 1978). These early techniques were mainly based on biological properties of the virus, such as pathogenicity, plaque formation, thermostability, analyses of structural polypeptides, and hemagglutination inhibition patterns using monoclonal antibodies (Ballági-Pordany et al., 1996; Russell and Alexander, 1983).

The broad circulation of NDV in poultry populations led to significant genetic diversity of the virus, with the constant emergence of NDV variants. Given the clinical and economical relevance of NDV to the poultry industry and the broad use of live ND vaccines worldwide, sequencing and phylogenetic analysis became the methods of choice for the characterization of NDV strains circulating in the field. With the incorporation of molecular methods into viral research, the collective knowledge of the NDV genetic makeup has greatly improved. To track NDV evolution and genetic diversity, several NDV molecular classification systems have been

developed. In the late 1980s, two related studies based on analyses of the fusion (F) and hemagglutinin-neuraminidase (HN) genes' sequence diversity and HN gene sizes, proposed the existence of three NDV lineages, namely A, B and C (Sakaguchi et al., 1989; Toyoda et al., 1989). In 1996, Ballági-Pordani et al. suggested the classification of NDV isolates into six distinct genotypes (I to VI) based on restriction fragment length polymorphism analyses (Ballági-Pordany et al., 1996). This system was validated and further improved by phylogenetic analysis of partial F gene sequence data, and additional NDV genotypes have since been identified (Herczeg et al., 1999; Lomniczi et al., 1998). A subsequent study based on complete genome sequences identified the existence of three different NDV genome sizes (15186, 15192, and 15198 nucleotides) and separated NDV isolates into two classes – class I and class II (Czeglédi et al., 2006). Each class was further divided into multiple genotypes (Kim et al., 2007a; Maminiaina et al., 2010; Miller et al., 2010b; Tsai et al., 2004). Another classification system, based on partial F gene analysis, was defined by Aldous and colleagues and separated NDV isolates into six distinct lineages (1 to 6) and 13 sub-lineages (Aldous et al., 2003), with an additional lineage 7 proposed later (Cattoli et al., 2010; Snoeck et al., 2009). These systems pioneered the classification efforts for NDV and provided important information on NDV evolution and genetic diversity. However, each system was based on different approaches and lacked objective criteria for the classification of NDV isolates into different genetic groups. These deficiencies created inconsistencies in NDV classification, made discussions and comparisons among studies difficult, and generated confusion in the assignment of existing and new genetic groups.

To overcome these challenges, a unified and objective NDV classification system was proposed in 2012 (Diel et al., 2012). This system utilized the complete F gene coding sequences and incorporated a number of objective criteria for classification of NDV, including: i) phylogenetic topology; ii) inter-populational evolutionary nucleotide distances; iii) branch support; and iv) epidemiological independence of at least four isolates per sub/genotype. The use of Diel et al. system (2012) and criteria led to the classification of class I NDV isolates into a single genotype (genotype 1) containing three sub-genotypes, while class II encompassed viruses delineated into 15 genotypes (I to XV) and multiple sub-genotypes. This system was widely adopted, and its use resulted in the identification of three more genotypes (XVI, XVII, and XVIII) (Courtney et al., 2013; Snoeck et al., 2013b). In addition, multiple sub-genotypes have been proposed within many of the existing genotypes (Ahmadi et al., 2016; Byarugaba et al.,

2014; Chumbe et al., 2017; Das and Kumar, 2017; Dimitrov et al., 2016b; Esmaelizad et al., 2017; Ganar et al., 2017; He et al., 2018; Miller et al., 2015; Molini et al., 2017; Nath and Kumar, 2017; Ramey et al., 2017; Ramey et al., 2013; Sabouri et al., 2017; Sabra et al., 2017; Servan de Almeida et al., 2013; Snoeck et al., 2013a; Susta et al., 2014; Xue et al., 2017a; Xue et al., 2017b).

While the Diel et al. (2012) system provided objective criteria for classification of NDV, the broad circulation and constant evolution of NDV led to the almost simultaneous identification and uncoordinated naming of new genotypes. In other instances, new genotypes were created without applying all the proposed criteria, or the classification was completed using a limited sequence dataset (often using partial F gene sequences) rather than using a curated dataset of all available complete NDV F gene sequences. For these reasons, there are inconsistencies in the naming and classification of some newly proposed genotypes and some sub-genotypes bear identical names while describing different and unrelated viruses (Ahmadi et al., 2016; Barman et al., 2017; Das and Kumar, 2017; Esmaelizad et al., 2017; Ganar et al., 2017; Gowthaman et al., 2018; Nath and Kumar, 2017; Servan de Almeida et al., 2013; Snoeck et al., 2013a; Xue et al., 2017a). Furthermore, with the increased surveillance efforts and the improvement of sequencing technologies, the amount of available sequences has vastly increased, adding to the already complex challenge of studying the molecular evolution of NDV and the relationships among its isolates.

To address these issues, a large group of international scientists and collaborators from 29 laboratories from all continents (except Antarctica) and representing all OIE reference laboratories for ND, was established in early 2014. Members of this consortium have convened during the OFFLU meeting in April 2014 in Paris, France, the 9th International Symposium on Avian Influenza in April 2015 in Athens, Georgia, USA, the 2nd International Avian Respiratory Disease Conference in May 2018 in Athens, Georgia, USA, and through multiple teleconferences. Three working groups were assigned, and the consortium was set out to revise the existing NDV classification systems and to propose updated classification and nomenclature criteria for NDV. The work described here was performed with the aims to: i) establish unified criteria for NDV sequence collection and curation; ii) generate and maintain updated sequence datasets; iii) perform comprehensive phylogenetic analyses using the generated datasets; iv) propose unified criteria for NDV classification; v) propose naming criteria for NDV genotypes; and vi) provide complete and

partial datasets for future public use. Here, in-depth analyses of the genetic diversity of NDV utilizing all available complete F gene sequences are presented. An updated NDV classification system with new nomenclature criteria is proposed. In addition, curated reference datasets for phylogenetic inference, software recommendations, and guidelines for using high-performance computer clusters are provided.

2. Materials and Methods

2.1. Working groups

Three working groups (WG1 to 3) were formed within the consortium. WG1 was tasked with defining criteria for sequence data quality (e.g. size, coverage, recombination, and identical sequences) and generating the datasets that will be used in the analyses. The focus of WG2 was to make the datasets publically available for future application. The WG3 was tasked to evaluate methods for phylogenetic analyses utilizing the generated datasets and to propose unified NDV classification and nomenclature criteria. This WG was also tasked with selecting representative sequences for a smaller class II dataset for rapid genotype identification of new isolates (named the "pilot" dataset).

2.2. Collection of sequences

Due to its variability and biological function (virulence determinant), the F gene is commonly targeted in sequencing efforts. Accordingly, the complete F gene coding nucleotide sequences of all available class I and class II NDV isolates were downloaded from GenBank of the National Center for Biotechnology Information (Benson et al., 2017). Only sequences that represented more than 99% of the full-length open reading frame of the F gene (≥1645 nucleotides, nt) were selected and aligned using Multiple Alignment with Fast Fourier Transformation (MAFFT v7.221.3) (Katoh and Standley, 2013) as implemented in the Galaxy platform (Goecks et al., 2010). A total of 2966 sequences that had submission dates up to February 21st 2019 were obtained, resulting in two separate initial datasets – class I (n = 431) and class II (n = 2535). Similarly, all available complete genome sequences of class II NDV were downloaded from GenBank and aligned using the same tools (due to the scarcity of class I complete genomes, these were not analyzed). The leader and tail sequences and intergenic regions were trimmed, and the coding sequences for all six genes were concatenated. A total of 651 class II complete genome sequences submitted on or before Feb 21st 2019, were obtained. Metadata like host, year and location of isolation, and isolate name for all sequences was collected from GenBank annotations, where available, or from the respective peer-reviewed publications when the data was not provided with the sequence submission.

2.3. Datasets curation

Sequences identified as 100% identical and originating from the same species, country, laboratory, and/or outbreak or having identical names and dates were removed from the datasets (one representative from each duplication pair/group was kept). Each sequence was evaluated and all gaps and insertions that caused alignment shifts were deleted. Sequences that were found to originate from man-made clones, mutant viruses, vaccines, and chimeric viruses were removed from the datasets. Sequences obtained from viruses identified as spillovers or escapes (recent viruses identical or almost identical to vaccine and standard strains originally isolated decades before) were also excluded from further analyses. In addition, recombination analysis was performed with all sequences using the RDP4 program (Martin et al., 2015) as described previously (Dimitrov et al., 2016a), and sequences with recombination events were removed from the datasets.

2.4. RNA extraction and nucleotide sequencing

Three Nigerian and five Bulgarian historical viruses from underrepresented genotypes were obtained from the repository of the Southeast Poultry Research Laboratory of the USDA and were sequenced in this study: (chicken/Nigeria/Kano/N52/899/1973, chicken/Nigeria/Plateau/N53/900/1973, chicken/Nigeria/FLD/N54/901/1973, pullet/Bulgaria/Plovdiv/1153/1959, chicken/Bulgaria/ElovDol/1156/1981, pigeon/Bulgaria/Septemvriitsi/1157/1982, chicken/Bulgaria/Furen/1159/1988, pigeon/Bulgaria/NovoSelo/1161/1995). RNA extraction, next-generation sequencing, and genome assembly were performed as described previously (Dimitrov et al., 2017).

2.5. Final datasets and phylogenetic analyses

A total of 1956 complete F gene sequences remained after the curation of the datasets and were used for the phylogenetic analyses – class I (n = 284, Supplemental Table S1) and class II (n = 1672, Supplemental Table S2, “larger” class II dataset). Neighbor-joining (NJ), maximum-likelihood (ML), and Bayesian methods were used to infer phylogenetic relationships and

construct phylogenetic trees of both classes. Neighbor-joining trees (Maximum Composite Likelihood model) were constructed using MEGA6 (Tamura et al., 2013) with 1,000 bootstrap replicates. Codon positions included were 1st, 2nd, 3rd, and noncoding, and all positions containing gaps and missing data were eliminated. Maximum-likelihood trees based on general time-reversible (GTR) model (Tavaré, 1986) (goodness-of-fit measured by the corrected Akaike information criterion) were constructed by using RaxML version 8.2.11 (Stamatakis, 2014) with 1,000 bootstrap replicates and the following command: `-s input_filename.phy -n output_tree_name -m GTRGAMMAI -f a -x 123 -N 1000 -p 456`. A discrete Gamma distribution (Γ) was used to model evolutionary rate differences among sites and the rate variation model allowed for some sites to be evolutionarily invariable (I). Utilizing the same datasets and parameters, RaxML trees were also constructed through the CIPRES Science Gateway (Miller et al., 2010a). A class II complete genome tree was constructed using the same ML method, utilizing the curated dataset of concatenated coding sequences (n = 491). Class I and class II complete F gene maximum-likelihood trees based on the GTR model were also constructed using MEGA6. Bayesian analyses were performed for comparison using the BEAGLE-enhanced parallel version of MrBayes v3.2 (Altekar et al., 2004; Ayres et al., 2012; Ronquist et al., 2012). For both class I and II datasets, the GTR substitution model with a gamma-distributed variation of rates and a proportion of invariable sites (Yang, 1993) were used. All other parameters were set to the MrBayes default settings. Independent runs of a 10 million generation length Markov Chain Monte Carlo (MCMC) simulation (Geyer, 1991) were performed sampling every 1,000 states. Run convergence was assessed using Tracer v1.6 (http://tree.bio.ed.ac.uk/software/tracer) to ensure an effective sampling size larger than 200 for all parameters. After discarding non-convergent runs and removal of at least 10% burn-in, the runs were combined with MrBayes to produce a maximum clade credibility tree and Bayesian posterior probabilities (BPP) were estimated. Trees were visualized using FigTree v1.4.2 (http://tree.bio.ed.ac.uk/software/figtree). Topological congruence between trees was compared through visual inspection for each sub/genotype.

The final class I and class II datasets used for phylogenetic reconstruction were also used to estimate the mean inter-populational distances (nucleotide distances between sub/genotypes). The estimates of average evolutionary distances were inferred using MEGA6 (Tamura et al., 2004). Analyses were conducted using the Maximum Composite Likelihood model. The rate variation among sites was modeled with a gamma distribution (shape parameter=1).

2.6. Pilot tree and individual genotype trees for rapid preliminary identification

After performing the analyses described above and identifying the main NDV genotypes, a smaller (pilot) dataset of class II sequences (*n* = 125, Supplemental Table S3, "smaller" class II dataset) was parsed from the complete dataset used in the phylogenetic analyses. This pilot dataset included representative sequences from all identified sub/genotypes and was phylogenetically analyzed with the ML method as described above to ensure that the topology inferred using the larger class II dataset would be maintained if fewer isolates were used. To explore the option to use sub-trees for genotype identification of new isolates, sub-trees were built separately, utilizing the ML method and using all sequences in each class II genotype. To ensure congruent topology with the biggest class II tree, these sub-trees were rooted to historical isolates ancestral to the respective genotypes.

2.7. Classification criteria

In all analyses, the criteria put forth by Diel et al. (2012) were used to initially assess the diversity of NDV and served as the foundation to update and propose a consensus classification system. The criteria accepted here, include the previously proposed criteria of clustering of sequences from one sub/genotype into a monophyletic branch, average nucleotide distance per site among genotypes (above 10%), and the presence in each group of at least four independent viruses from distinct outbreaks and without a direct epidemiologic link. To avoid excessive delineation of sub-genotypes, the cut-off value for nucleotide distance between these was increased to 5% (instead of 3%). In order to increase the reliability and stringency of the phylogenetic clustering, the bootstrap support value cut-off at the nodes that define sub/genotypes was raised to be 70% or above. The updated consensus classification criteria are summarized in Table 1. Similar classification criteria have also been used by the World Health Organization/World Organisation for Animal Health/Food and Agriculture Organization H5N1 Evolution Working Group (WHO/OIE/FAO, 2014).

2.8. Nomenclature criteria

When possible, names for all genotypes were maintained with Arabic numerals used in class I and Roman numerals used in class II. The lowercase Latin letter system used to name sub-genotypes was replaced with a numerical-decimal system using Arabic numerals. Dichotomous splitting was used at every defining node (at which separation into sub-genotypes was done) using the numerals 1 and 2. It is assumed that each node has two immediate descendants (two higher order sub-genotypes). For example, within genotype VII (names of sub/genotypes used in this paragraph do not correspond to the classification proposed in this study and are used solely for demonstration purpose), the first two sub-genotypes will become VII.1 and VII.2 (see Supplemental Fig. S1 for examples). At the next node (closer to the tips or higher order) within sub-genotype VII.1, the sub-genotypes that are one order higher will become VII.1.1 and VII.1.2, and respectively at the next node within sub-genotype VII.2, the two further sub-genotypes will be named VII.2.1 and VII.2.2. The updated nomenclature criteria are presented in Table 2 and examples are provided in Supplemental Fig. S1, S2, and S3.

2.6. Accession numbers

The complete F-gene sequences (n = 8) of NDV obtained in this study were submitted to GenBank and are available under the accession numbers MH996897 to MH996904.

3. Results and Discussion

3.1. Dataset curation

A total of 1956 complete F gene sequences remained after the curation of the datasets, including 284 class I sequences and 1672 class II sequences. After utilizing the dataset curation criteria described above, 1010 sequences were removed from the initial datasets (class I: n = 147; class II: n = 863). In the class I dataset, 128 duplicate sequences, 17 recombinant sequences and 2 sequences that resulted from cloning were identified and removed. In the class II dataset, 419 duplicates, 170 recombinant forms, 56 man-made vaccine clones and 218 spillovers or escapes of vaccine/standard viruses were identified and removed. These numbers highlight the importance of

carefully assessing the NDV datasets prior to phylogenetic inference. It has been reported, for example, that spillovers of vaccine and of older standard NDV strains can significantly impact analyses, resulting in skewed inferences (Ayala et al., 2016; Dimitrov et al., 2016a; Taylor et al., 2017). In addition, the increasing number of chimeric sequences as identified by the recombination analysis has implications in virus classification and impacts topology of phylogenetic trees. Although recombination has been suggested to play a role in NDV evolution (Han et al., 2008; Qin et al., 2008; Satharasinghe et al., 2016) and increasing numbers of chimeric sequences have been deposited in GenBank, the natural occurrence of recombination events remains disputable (Afonso, 2008; Song et al., 2011). Selection and the inherent error rate of the viral RNA polymerase are believed to be the main forces driving the evolution and diversity of NDV (Diel et al., 2012). The actual role and contribution of recombination to this process remains to be established. However, to provide a reliable phylogenetic inference based on clearly identified genotypes, we suggest that recombinant sequences always be identified through analysis with RDP (or alternative appropriate tool) and removed from the dataset before performing an analysis and a classification tree construction. A similar approach has already been adopted for porcine circovirus type 2 (Franzo et al., 2015) and infectious bronchitis virus (Valastro et al., 2016).

3.2. Phylogenetic analyses and congruence between inference methods

3.2.1. Class I

The phylogenetic analyses utilizing the NJ, ML, and Bayesian methods revealed high topology congruence within class I NDV (Supplemental Fig. S4, A-C). All class I trees were rooted to the oldest class I NDV isolate - EF564833/Canada Goose/USA(OH)/78/1987. The existence of a single genotype (i.e. genotype 1) was confirmed as previously determined by Diel et al. (2012). Minor topological differences among a few unclassified sequences and lack of branch support (<70 bootstrap values) were observed when using the NJ method; however, the existence of a single class I genotype 1 was consistent between the used methods. Based on the ML method (selected due to easier and faster tree construction and because it outperformed NJ), there are three (n = 3) sub-genotypes within genotype 1 of class I (Supplemental Fig S4B). Utilizing the new naming criteria, these are sub-genotypes 1.1.1 (former 1a), 1.1.2 (former 1b), and 1.2 (former 1c and 1d) (Supplemental Table S1, Table 3). For visualization purposes and to provide an overview of the

topology of class I NDV, a condensed ML tree without taxa names is featured in Fig. 1A. The increase of the cut-off for differentiation of sub-genotypes to 5% resulted in the merging of former sub-genotypes 1c and 1d into one single sub-genotype 1.2 (distance between 1c and 1d - 3.68%) (Supplemental Table S4). Of note, there are five unclassified viruses within class I (Supplemental Fig. S4B, UNCL 9 to 13) that cluster together but are genetically distant from each other (9 to 11%) and have the potential to become multiple separate genotypes if sequences from additional epidemiologically independent viruses related to them become available. It is also possible that these sequences represent extinct viral lineages, which does not warrant their further classification into genotypes. These observations highlight the importance of having at least four epidemiologically independent sequences in order to classify NDV isolates into a new sub/genotype. Although there is evidence of ongoing evolution among the viruses of class I NDV (Ramey et al., 2017), the evolutionary diversity within this class remains low. The majority of sequenced class I viruses are isolated from wild birds, however, poultry detections are not uncommon (Dimitrov et al., 2016b; Kim et al., 2007a). The circulation of class I viruses mainly in wild birds, which are not vaccinated for ND, thus keeping the immune pressure on these viruses low, may explain the relatively lower genetic diversity of these viruses when compared to class II. While there has been one report of a virulent class I NDV (Collins et al., 1998), all remaining sequences in the class are from viruses of low virulence. It is likely that the low virulence nature of class I viruses in wild birds and poultry and their low incidence in poultry, has negatively influenced efforts to sequence and characterize them. This may explain the restricted spatial distribution of the majority of the available sequences (the U.S. and China, and a few sequences from Japan and Europe). In addition, not all RT-PCR assays are able to detect class I isolates and their circulation may have been missed as they do not commonly cause clinical disease (Fuller et al., 2010; Kim et al., 2007b). Additional sequencing of historical and prospective class I NDV isolates will provide a more detailed characterization of the genetic diversity of this group of viruses.

3.2.2. Class II

The class II phylogenetic trees, constructed using the NJ, ML, and Bayesian methods, had presented some significant differences, particularly between NJ (Supplemental Fig. S5A) and the

other two methods (ML and Bayesian) (Supplemental Fig. S5B and S5C, respectively). Notably, lack of branch support was observed at many defining nodes, and the identified monophyletic branches differed in the NJ tree compared to the remaining two methods (e.g. in genotypes I, VI, and XIII) (Supplemental Fig. S5, A-C). With the exception of one small branch (former sub-genotype Vd) and low support between two genotype I sub-genotypes, the topologies between the trees obtained using the ML and the Bayesian approach were generally consistent with well-defined monophyletic branches and strong branch support (≥70 bootstrap and ≥0.9 posterior probability values, respectively) at most defining nodes (Supplemental Fig. S5B and S5C, Supplemental Table S2). Since it statistically outperformed NJ, and due to its ease of use, greater speed and wide utilization and accessibility, the ML method was selected as a method of choice for class II NDV phylogenetic inference. Compared to class I, class II is more diverse, contains a range of non-virulent to virulent viruses, and the complete analyses identified at least 20 distinct genotypes (I to XXI, genotype XV that contains only recombinant sequences was excluded from the analyses). Viruses previously classified as members of sub-genotype Va were separated in a new genotype XIX. Viruses previously classified as three of the sub-genotypes of genotype VI also formed two new genotypes, namely XX and XXI. All class II trees were rooted to the clade of genotype IV, consistent with molecular clock trees. The evolutionary distances between genotypes are presented in Table 4.

Consistent with previous classifications, genotypes I, V, VI, VII, XII, XIII, XIV, and XVIII were confirmed to be further divided into sub-genotypes (Supplemental Fig. S5B, Table 3) (Diel et al., 2012; Dimitrov et al., 2016b; Snoeck et al., 2013b). The number of existing sub-genotypes in genotypes I, XIV, and XVIII, remained the same (four, two, and two, respectively) (Ramey et al., 2013; Snoeck et al., 2013b), and their new names were assigned based on the updated nomenclature criteria (see Table 5, Supplemental Table S2, Supplemental Fig. S5B). No sub-genotypes were identified in genotypes II, III, IV, VIII, IX, XI, XVI, XIX, and XX. Sequences from eight viruses were not assigned to any of the identified genotypes ("UNCL" 1 to 8, see Supplemental Table S2). For an overview purposes and to provide an overall picture of the topology of class II NDV, a condensed phylogenetic tree without taxa names is presented in Fig. 1B. Utilizing the higher nucleotide distance cut-off of 5%, however, resulted in no sub-genotypes in genotypes X and XVII (distances of 4.83 and 4.59, respectively, Supplemental Table S4).

The use of the updated classification and nomenclature criteria led to the identification of two sub-genotypes in genotype V, designated V.1 (former Vb) and V.2 (former Vc). Previously identified sub-genotype Vd (Byarugaba et al., 2014) lacked branch support and the sufficient number of independent isolates and was assigned to the lower order (genotype V). Eight more isolates from Europe and South and North America from the 1970s and 1980s could not be assigned to any of the genotypes (lack of branch support and branches not monophyletic) and were also designated as members of the lower order genotype V (Supplemental Fig. S5B).

Undoubtedly, genotype VI is the most diverse among all NDV genotypes. While the lineage system separated this group into four sub-lineages with multiple further groups (Aldous et al., 2004; Aldous et al., 2003), 14 sub-genotypes were identified based on Diel's system (Diel et al., 2012). Although viruses classified into two new genotypes (XX and XXI) were taken out of genotype VI, after utilizing the updated criteria suggested here, this genotype was still found to contain five sub-genotypes (Supplemental Fig. S5B). Former sub-genotypes VIa and VIn (He et al., 2018) were merged into sub-genotype VI.2.1.1.1, as they did not pass the 5% criterion for nucleotide distance between sub-genotypes (3.46 %, Supplemental Table S4). Previously identified sub-genotypes VIj and VIk (Xue et al., 2017b) were just above the 5% cut-off (Table 3) and were named VI.2.1.1.2.1 and VI.2.1.1.2.2, respectively. Former sub-genotypes VIb, VIe, VIf, VIh were confirmed and renamed accordingly (Table 5, Supplemental Table S2). Considering that many genotype VI NDV have been part of the panzootic in Columbiform birds that emerged in the Middle East more than four decades ago (Aldous et al., 2004; Alexander, 1988), and is still ongoing (Sabra et al., 2017), it is not surprising that this is the most diverse group of NDV. Unlike any other NDV genotype, genotype VI viruses have been isolated in all continents, except Antarctica (Dimitrov et al., 2016b). Their potential to infect chickens has been demonstrated, but only rarely and they appear to be highly adapted to some Columbiform birds (Aldous et al., 2014; Ujvari et al., 2003). Viruses that belong to genotype VI are often referred to as pigeon paramyxoviruses 1 (PPMV-1). These viruses can be distinguished as unique antigenic variants of NDV by the patterns produced in a hemagglutination inhibition (HI) assay when tested with a panel of monoclonal antibodies (Collins et al., 1989). This panel, although described in the OIE manual (OIE, 2012), is not widely available and used by NDV reference laboratories. Not all genotype VI viruses have been confirmed to be PPMV-1.

The use of the updated classification criteria significantly impacted genotype VII landscape. As many former sub-genotypes did not fulfill the distance (VIIb, VIId, VIIe, VIIj, VIIℓ), branch support (VIIh, VIIi, VIIk), and/or number of independent isolates (VIIk) criteria, these were merged into single sub-genotypes, resulting in a total of three genotype VII sub-genotypes (Table 3, Table 5, Supplemental Fig. S5B, Supplemental Table S4). The viruses responsible for the fourth NDV panzootic grouped together, and based on nucleotide distance, were classified into a single genotype (VII.1.1), combining former sub-genotypes VIIb, VIId, VIIe, VIIj, and VIIℓ. An exception is former sub-genotype VIIf that was classified as a separate sub-genotype, namely VII.1.2. The groups of viruses involved in the fifth NDV panzootic (VIIh and VIIi), that affected Indonesia, Asia, the Middle East, Europe, and Africa (Abolnik et al., 2018; Fuller et al., 2017; Kammon et al., 2018; Mapaco et al., 2016; Miller et al., 2015), lacked branch support, and were merged into a single s-b-genotype VII.2. A group of five other sequences from viruses isolated in Namibia in 2016, previously identified as sub-genotype VIIk (Molini et al., 2017), were also assigned to VII.2 due to lack of branch support and insufficient number of independent isolates (Supplemental Fig. S5B). Interestingly, all these groups fulfilled the nucleotide distance criterion with high genetic distances of 9.40% and 11.17% (Supplemental Table S4); however, all classification criteria need to be met before a clade is named as a separate sub-genotype. Of note, this branch (VII.2) including these three groups of viruses (former VIIh, VIIi, and VIIk) is almost 10% (9.83%, Table 3) distant from the remaining genotype VII viruses, and with the continuing evolution of NDV, will likely fulfill the criteria for a standalone genotype in the near future.

Genotype XIII was found to consist of four sub-genotypes (Supplemental Fig. S5B). Two previously assigned sub-genotypes (Miller et al., 2015), were further split into two sub-genotypes each – XIIIa into XIII.1.1 and XIII.1.2, and XIIIb into XIII.2.1 and XIII.2.2, respectively (Supplemental Fig. S5B) because of the addition of new sequences from recent studies (Gowthaman et al., 2019; Mayahi and Esmaelizad, 2017). Viruses isolated from different countries in Africa between 1995 and 2015 formed sub-genotype XIII.1.1, while viruses from Sweden, Russia, India, and Iran from 1997-2011 were classified in XIII.1.2. Viruses isolated in the last decade from Pakistan and India formed XIII.2.1 and XIII.2.2, respectively. Although very distant from the XIII.2.1 and XIII.2.2 sequences (12.63%), a branch of nine sequences from viruses from India lacked node support and number of independent isolates to be identified as separate sub-genotype and were assigned to the lower order branch (i.e. XIII.2). Similar to the viruses from

genotype VII/lineage 5 (to which they were previously assigned), genotype XIII viruses are widely distributed on at least three continents (Cattoli et al., 2010; Munir et al., 2012; Nath et al., 2016; Shabbir et al., 2013). High genetic distances were observed between clades of genotype XIII, and the continuous NDV evolution and addition of new genetic data will likely change the classification of this genotype.

Genotype XX is one of the three newly identified genotypes. This genotype contains some of the oldest NDV isolates, previously identified as members of genotype VI (former sub-genotype VIc). Notably, genotype XX outgroups genotype VI, and all genotype XX viruses have been isolated from chickens. This new genotype XX includes viruses from Asia and Europe isolated between 1985 and 2011 (Umali et al., 2014).

Genotype XXI contains viruses isolated from chickens and pigeons in different Asian, European, and African countries between 2005 and 2016 (Sabra et al., 2017; Snoeck et al., 2013a; Van Borm et al., 2012; Wajid et al., 2016). Similarly to genotype XX, genotype XXI viruses were previously assigned as members of genotype VI. At the root of genotype XXI is a clade of chicken viruses, isolated in Ethiopia between 2011 and 2012, that have previously been assumed to form a separate sub-genotype (Mulisa et al., 2014; Servan de Almeida et al., 2013). However, as the group lacked a sufficient number of independent isolates, these viruses were assigned to the lower order, namely XXI. Three sub-genotypes were identified within genotype XXI – XXI.2, XXI.1.1, and XXI.1.2 corresponding to former sub-genotypes VIi, VIg, and VIm, respectively (see Table 5, Supplemental Fig. S5B).

Construction of the class II phylogenetic trees with any of the used methods and utilizing all available complete fusion gene sequences occasionally resulted in lack of branch support, presence of polytomies, and disruption of monophyletic branches (i.e. previously identified genotypes not grouping into a single branch) (Supplemental Fig. S5 A-C). For example, viruses of genotype IV did not fall into a monophyletic branch, there was lack of branch support between groups in genotype VII, and polytomies were present in different branches. These issues will likely be resolved when additional sequences from these groups become available (Purvis and Garland, 1993). Indeed, the analysis using the concatenated complete genome coding sequences overcame the flaws observed when the complete fusion gene sequences were used for the analyses (Supplemental Fig. S6). Despite the fact that complete genomes provide more reliable

phylogenetic inferences (Heath et al., 2008), the lack of complete genome sequences in all NDV sub/genotypes and the complexity of the analysis, the use of complete genome phylogenetic reconstruction to resolve NDV classification issues or for definitive classification is not warranted at this time. Certainly, with the development of sequencing technologies and the increasing availability of computational resources, it is logical to suggest that the availability of complete genomes will increase in the near future. This will probably allow this classification to be revisited with more complete genomic data. In addition, genome size is no longer needed as a criterion for separation of NDV isolates into classes as there are sequences in genotype XIX of class II that have the same genome size as class I NDV (15,198 nucleotides). As the complete fusion gene mean nucleotide distance between the two classes is 59.25% and the individual distances between all class II genotypes and class I is above 40%, a cut-off of 40% nucleotide distance of the F gene between NDV classes is suggested here.

3.2.3 Pilot tree and dataset

Building a phylogenetic tree with a lower number of sequences, that still provides consistent topology with the larger dataset, significantly decreases the time for the tree construction. To ensure that the topology of the class II genotypes would be maintained if fewer isolates were used, we performed a ML phylogenetic reconstruction with a smaller "pilot" dataset (n = 125, Supplemental Table S3). The generated tree (named "pilot" tree) is depicted in Fig. 2 and the congruence analysis showed complete consistency with the ML tree inferred using the larger class II fusion gene dataset (Supplementary Fig. S5B). Therefore, this pilot dataset can be utilized for rapid preliminary genotypes identification of new isolates. A similar approach has been previously suggested by Aldous et al. (Aldous et al., 2003). However, for naming new genotypes and sub-genotypes, building a tree using the complete curated F gene dataset is required.

3.2.4. Rooted sub-trees for each class II genotype

To further facilitate fast characterization of newly isolated NDVs, sub-trees utilizing all sequences within each genotype of class II that contains sub-genotypes, were constructed (Supplemental Fig. S7 A-I). To maintain consistent topology with the larger class II tree and to

provide inference of branch support at the first defining node, each sub-tree was rooted with two sequences. A list of sequences to be used for rooting of each genotypes' sub-tree is provided in Supplemental Table S5. Proper sub-tree rooting appeared to be crucial for consistent topology between the larger tree and the sub-trees. Attempts to root the sub-trees with random sequences from different genotypes resulted in topologies largely incongruent to the full tree (data not shown). In addition, lower branch support was observed in some trees and for definitive classification, building a tree with the complete F gene dataset is recommended.

3.3. New nomenclature criteria

Assuming that each node has two immediate descendants (partitions into two branches), a dichotomous naming system using the Arabic numerals 1 and 2 was used at every node at which sub-genotypes were separated. Arguably, the strict following the classification and nomenclature criteria proposed here, will prevent duplicate names of future sub-genotypes, as has happened before with the previous systems. In addition, when using this approach, the names of the sub-genotypes of higher order (closer to the tips), bear ancestral information for the sub/genotypes they split from. Of note, the use of the new naming criteria resulted in complex names for two of the genotype VI sub-genotypes – VI.2.1.1.2.1 and VI.2.1.1.2.2. However, the viruses from these two genotypes are not widely distributed, and their names would likely not have negative impact on the global use of the system. Similar decimal systems are used for classification of swine influenza and highly pathogenic H5N1 avian influenza viruses (Anderson et al., 2016; WHO/OIE/FAO, 2014). A detailed comparison between the nomenclature used in the lineage system (Aldous et al., 2003; Cattoli et al., 2010), the genotype system (Courtney et al., 2013; Diel et al., 2012; Snoeck et al., 2013b) and the nomenclature suggested here, is provided in Table 5.

The worldwide circulation and constant evolution of NDV will, expectedly, lead to emergence of new NDV genetic variants that will form clades fulfilling all criteria for separate genotypes. To ensure consistent naming, specific nomenclature criteria need to be utilized for newly identified genetic diversity. Updated guidelines for naming new genotypes are also outlined in Table 2. Newly identified virus diversity (a group of viruses undescribed before) that meets all classification criteria will be classified as new genotype and will receive a subsequent Roman numeral (e.g. currently XXII is the next available) (example in Supplemental Fig. S2, red color).

However, if a new sub-genotype of viruses is identified, but still falls into a higher order (not at the defining node) within an existing genotype, this new sub-genotype receives the next consecutive sub-genotype numerical address for the respective level of order in the phylogeny. This is necessary to avoid re-numbering of all existing sub-genotypes that are of higher order. For example, if a new sub-genotype that outgroups VII.1.1 and VII.1.2 is identified but it is still within sub-genotype VII.1, this new sub-genotype will be named VII.1.3 (see Supplemental Fig. S3 for an example). Existing sub-genotypes that fulfil the genotype criteria will not be designated with a new name in order to maintain the ancestral information in their names (examples in Supplemental Fig. S2, green color).

3.4. Software for phylogenetic inference

The increased number of available NDV sequences has led to a higher demand of computational resources. To this end, in addition to the widely used MEGA (Tamura et al., 2013), and PhyML software (Guindon et al., 2010), for example, tools like FastTree (Price et al., 2010), Garli (Bazinet et al., 2014), and RaxML (Stamatakis, 2014), have been extensively used for faster phylogenetic inferences. However, some of these utilize the Shimodaira-Hasegawa test to estimate nodal support (FastTree, PhyML), which requires multiple additional steps to calculate the traditional bootstrap value (Felsenstein, 1985), commonly used in NDV phylogenetic analyses. Based on its increased productivity and reliable results, the RaxML tool (v.8.2.11) was utilized for ML inference in this study. Interestingly, when the invariable sites option is used with RaxML, the tool automatically sets the model optimization precision (in likelihood units) to 0.001 to avoid unfavorable effects caused by simultaneous optimization of gamma distribution and invariable sites. Although the combination GTR+ Γ+I has been widely used, it is suggested that distinct approaches to incorporate rate heterogeneity (e.g. Γ+I) should not be used at the same time and concerns have been raised that this might cause problems during the model parameter optimization process (Stamatakis, 2016). Indeed, GTR+ Γ+I is often estimated as the best-fit model for the NDV dataset based on the corrected Akaike information criterion. However, in most cases, trees constructed with this model using the MEGA software lack branch support at established defining nodes or contain multiple polytomies. Disabling the option for invariable sites in MEGA results in better branch support and resolving most polytomies (data not shown). Goodness-of-fit of models

has to be established periodically in the future, as adding new isolates to the datasets may result in change of the best-fit model.

The advances in molecular sequencing technologies, the increasing surveillance efforts, and the significantly larger amount of genetic data collected worldwide have transformed the field of phylogenetic inference into a computational science (Stamatakis et al., 2012). Therefore, faster tools, specifically ones that can be used in high-performance computer (HPC) environments, are needed. In this study, to test the utilization of HPC for NDV phylogenetic inference, the class II ML tree using the bigger complete F gene dataset was built again through the free CIPRES Science Gateway (Miller et al., 2010a) using RaxML-HPC (v.8.2.10) that allows multi-threading by message-passing interface. The use of the supercomputer shortened the construction of a fully congruent tree to less than two hours (compared to two days when using 30 cores, and two weeks when using a single computer). Step-by-step guidelines with all settings needed for ML tree construction through CIPRES (the same settings can be used for any of the freely available HPC) are provided in Supplemental Fig. S8 (provided as screenshots from http://www.phylo.org). Additional guidelines and video tutorials regarding the use of the CIPRES Science Gateway are available online (http://www.phylo.org/index.php/help/).

3.5. Discrepancies (exceptions) to the established criteria

The nucleotide distance between genotypes III and IX was estimated to be below 10% (8.62%) (Table 3) with topology not fully resolved. Some sequences, previously identified as members of genotype IV, did not form a monophyletic branch (Supplemental Fig. S5B). However, genotypes III and IV contain historical viruses that are believed to no longer naturally circulate (Dimitrov et al., 2016a). For consistency with the existent literature, the nomenclature and classification of these viruses were maintained. In addition, the genotype IV viruses from Nigeria could have evolved to a separate genotype as they formed a separate branch, but have probably become extinct as similar viruses have not been isolated since 1980.

3.6. Dataset availability

To facilitate future analyses, all complete fusion gene datasets, generated in this study, are provided as Supplemental materials – see Supplemental Tables S1-S3. The resulting alignments are also provided as Supplemental materials (Supplemental Datasets S1-S3). Updated datasets will be deposited at the GitHub repository (https://github.com/NDVconsortium/NDV_Sequence_Datasets). The utilization of these alignments is highly recommended for NDV classification needs.

4. Conclusions

The classification and nomenclature system proposed here is a result of the collaboration of 39 experts from 29 institutions on six continents, including all OIE NDV reference laboratories. The revised system includes objective criteria for identification and naming of existing and new NDV genotypes. Curated, up-to-date, complete F gene class I and class II NDV sequence datasets are provided for public use. In addition, a pilot dataset and rooting guidelines that allow rapid preliminary genotype identification of new isolates are included. To increase the speed of phylogenetic inference and to enable the use of consistent methods between laboratories, detailed guidelines for HPC use are also provided. In order to avoid super-delineation, more stringent criteria were proposed, and these resulted in the merging of multiple former sub-genotypes. However, the increased viral diversity due to constant NDV evolution and the significant increase of available sequences led to the naming of three new genotypes. The global adoption of the proposed consensus system will facilitate future studies on NDV evolution and epidemiology, and will make comparisons of results obtained across the world easier. Newcastle disease viruses, as any other RNA viruses, are rapidly evolving, and periodic (e.g. five years) revisiting of the consensus classification and nomenclature system proposed here, led by a working group from this consortium, is warranted.

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Tables and figures captions:

Table 1. Criteria for classification of NDV isolates.

Table 2. Nomenclature criteria for existing and new NDV genotypes and sub-genotypes.

Table 3. Estimates of evolutionary distances between class I and class II NDV sub-genotypes.

Table 4. Estimates of evolutionary distances between genotypes of class II NDV.

Table 5. Side-by-side comparison between the "lineage" system (Aldous et al., 2003), the "genotype" system (Diel et al., 2012), and the consensus classification system for NDV isolates proposed in this study.

Fig. 1. Maximum likelihood phylogenetic trees of class I (A) and class II (B).

Phylogenetic analyses are based on the full-length nucleotide sequence of the fusion gene of isolates representing Newcastle disease virus class I (A, *n* = 284) and class II (B, *n* = 1672). The evolutionary history was inferred by using RaxML (Stamatakis, 2014) and utilizing the Maximum Likelihood method based on the General Time Reversible model with 1000 bootstrap replicates. The trees with the highest log likelihood (class I = -18683.27, class II = -106684.34) are shown. A discrete gamma distribution was used to model evolutionary rate differences among sites and the rate variation model allowed for some sites to be evolutionarily invariable. For imaging purposes, the taxa tips are not displayed and colors are randomly assigned to indicate the different sub/genotypes. Three new genotypes assigned in the current study are highlighted in red font. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

Fig. 2. Class II "pilot" tree.

Phylogenetic analysis is based on the full-length nucleotide sequence of the fusion gene of isolates representing all class II Newcastle disease virus sub/genotypes (*n* = 125). The evolutionary history was inferred by using RaxML (Stamatakis, 2014) and utilizing the Maximum Likelihood method based on the General Time Reversible model with 1000 bootstrap replicates. The tree with the highest log likelihood (-28785.59) is shown. A discrete gamma distribution was used to model evolutionary rate differences among sites and the rate variation model allowed for some sites to be evolutionarily invariable. The Roman numerals presented in the taxa names in the phylogenetic tree represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The taxa names also include the GenBank identification number, host name, country of isolation, strain designation, and year of isolation. Three new genotypes assigned in the current study are highlighted in red font. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

Supplemental Table S1. Complete fusion gene curated dataset of class I NDV used in this study. The green shading represents congruence between trees. Red font represents lack of branch support at the defining node. The naming in bold font (ML naming) is according to the nomenclature

suggested in this study. The dataset contains 284 sequences and was used to build the trees depicted in Supplemental Fig. S4 A-C. “UNCL” = unclassified.

Supplemental Table S2. Complete fusion gene curated dataset of class II NDV used in this study. The green shading represents congruence between trees. Red font represents lack of branch support at the defining node. The naming in bold font (ML naming) is according to the nomenclature suggested in this study. The dataset contains 1672 sequences and was used to build the trees depicted in Supplemental Fig. S5 A-C. “UNCL” = unclassified.

Supplemental Table S3. Complete fusion gene “pilot” dataset of class II NDV used in this study. The dataset contains 125 sequences and was used to build the tree depicted in Figure 2.

Supplemental Table S4. Former sub-genotypes within class I and class II that did not pass the updated classification criteria (either one of 5% nucleotide distance, branch support equal or above 70%, at least 4 independent isolates) and were merged. The sub/genotype designation follows the newly proposed nomenclature and the former names are provided in parenthesis.

Supplemental Table S5. Recommended sequences to be used for rooting purposes when building sub-trees for separate analysis of each genotype within class II. The sequence to use for rooting is marked with an asterisk. These sequences were used to root the trees presented in Supplemental Fig. S7 A-I.

Supplemental Fig. S1. Examples of dichotomous naming at nodes at which sub-genotypes are separated. The names of genotypes and sub-genotypes used in this figure do not correspond to the names in the phylogenetic trees presented in the current study. The names in this figure were used for illustration and demonstration purposes.

Supplemental Fig. S2. Examples for naming new genotypes when they outgroup existing genotypes. The names of genotypes and sub-genotypes used in this figure do not correspond to the names in the phylogenetic trees presented in the current study. The names in this figure were used for illustration and demonstration purposes.

Supplemental Fig. S3. Examples for naming new sub-genotypes when they fall into a higher order of an existing genotype. The names of genotypes and sub-genotypes used in this figure do not correspond to the names in the phylogenetic trees presented in the current study. The names in this figure were used for illustration and demonstration purposes.

Supplemental Fig. S4. Full phylogenetic trees based on the complete fusion sequences of isolates representing Newcastle disease virus class I (n = 284). A. Neighbor-joining tree; B. Maximum Likelihood tree; C. Bayesian tree. The Roman numerals presented in the taxa names in the phylogenetic trees represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The numbers after the genotype names represent database ID. The names based on the new system differ for some genotypes in the trees based on differences in topology. The taxa names also include the GenBank identification number, and when available – host name, country of isolation, strain designation,

and year of isolation. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

Supplemental Fig. S5. Full phylogenetic trees based on the complete fusion sequences of isolates representing Newcastle disease virus class II (*n* = 1672). A. Neighbor-joining tree; B. Maximum Likelihood tree; C. Bayesian tree. The Roman numerals presented in the taxa names in the phylogenetic trees represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The numbers after the genotype names represent database ID. The names based on the new system differ for some genotypes in the trees based on differences in topology. The taxa names also include the GenBank identification number, and when available – host name, country of isolation, strain designation, and year of isolation. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

Supplemental Fig. S6. Full phylogenetic tree based on the complete genome concatenated coding sequences of isolates representing Newcastle disease virus class II (*n* = 491). The evolutionary history was inferred by using the Maximum Likelihood method based on the General Time Reversible model with 1000 bootstrap replicates. The tree with the highest log likelihood (-344411.91) is shown. A discrete gamma distribution was used to model evolutionary rate differences among sites and the rate variation model allowed for some sites to be evolutionarily invariable. The Roman numerals presented in the taxa names in the phylogenetic tree represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The names of sub/genotypes are based on the system proposed and as identified by the ML complete fusion gene analysis. The taxa names also include the GenBank identification number, host name, country of isolation, strain designation, and year of isolation. The tree is drawn to scale, with branch lengths measured in the number of substitutions per site.

Supplemental Fig. S7. Phylogenetic sub-tree based on the complete fusion sequence of isolates representing Newcastle disease virus genotypes. A. Genotype I (*n* = 122); B. Genotype V (*n* = 49); C. Genotype VI (*n* = 267); D. Genotype VII (*n* = 774); E. XII. Genotype I (*n* = 25); F. Genotype XIII (*n* = 74); G. Genotype XIV (*n* = 79); H. Genotype XVIII (*n* = 19); I. Genotype XXI (*n* = 53). The trees were built using all sequences within each NDV genotypes and 2 to 4 additional sequences used for rooting. The sequences recommended for use for rooting are also provided in Supplemental Table S5. The evolutionary history was inferred by using the Maximum Likelihood method based on the General Time Reversible model with 1000 bootstrap replicates. The trees with the highest log likelihood are shown. A discrete gamma distribution was used to model evolutionary rate differences among sites and the rate variation model allowed for some sites to be evolutionarily invariable. The Roman numerals presented in the taxa names in the phylogenetic tree represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The taxa names also include the GenBank identification number, and when available - host name, country of isolation, strain designation, and year of isolation. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

Supplemental Fig. S8. Step-by-step guidelines of settings for building Maximum likelihood trees using the CIPRES Science Gateway (provided as screenshots from http://www.phylo.org).

Supplemental Dataset S1. Newcastle disease virus Class I curated complete fusion gene dataset

Supplemental Dataset S2. Newcastle disease virus Class II curated complete fusion gene dataset

Supplemental Dataset S3. Newcastle disease virus Class II pilot complete fusion gene dataset for rapid genotype identification of isolates.

Table 1. Criteria for classification of NDV isolates.

Criterion	Description
1	Assignment of viruses into new genotypes and sub-genotypes is done based on complete fusion gene phylogenetic analysis (sequences of at least 1645 nucleotides or longer).
2	Assignment of viruses into new genotypes and sub-genotypes is done only utilizing a complete dataset of sequences from all existing genotypes. All classification criteria listed below need to be fulfilled for naming new genotypes and sub-genotypes.
3	Sub-trees and pilot tree can be used for assigning new isolates to existing sub/genotypes.
4[a]	New genotypes or sub-genotypes are created only when four or more independent isolates, without a direct epidemiologic link (i.e. distinct outbreaks), are available.
5	New genotypes and sub-genotypes are created based on the phylogenetic tree topology (need to cluster into monophyletic branches) using the Maximum Likelihood method and the general time-reversible (GTR) model with gamma distribution (Γ) utilizing RaxML or a comparable tool.
6[a]	The mean nucleotide distance (evolutionary distances) between groups is inferred as the number of base substitutions per site from averaging over all sequence pairs between groups using MEGA v. 5/6/7 software (or a comparable tool) and utilizing the Maximum Composite Likelihood model with rate variation among sites that was modeled with a gamma distribution.
7[a]	Different genotypes have an average distance per site above 10% (0.1).
8	Different sub-genotypes have an average distance per site above 5% (0.05).
9	The bootstrap value at the genotype and sub-genotype defining node is 70% or above (≥70%).
10	Viruses that do not fulfill all classification criteria are assigned to the lower order (closer to the root) sub/genotype (see Table 2 for nomenclature criteria).

[a] Criteria that were adopted from the Diel et al. (2012) classification system.

Table 2. Nomenclature criteria for existing and new NDV genotypes and sub-genotypes.

Criterion	Description
1	All existing genotypes (as per Diel et al., 2012) in the current classes I and II maintain their Arabic and Roman numerals, respectively.
2	The lowercase Latin letter system to name sub-genotypes is replaced by the numerical-decimal system using Arabic numerals.
3	Class I sub/genotypes receive a numerical-decimal address (Arabic numerals separated by periods) that starts with the Arabic numeral of the genotype. Further numeration is made using the dichotomous system at every defining node using numerals 1 and 2. (e.g. 1.1 and 1.2).
4	Class II sub/genotypes receive a numerical-decimal address (Roman-Arabic numerals separated by periods) that starts with the Roman numeral of the genotype. Further numeration is made using the dichotomous system at every defining node (separating sub-genotypes) using numerals 1 and 2. (e.g. VII.1 and VII.2) (example in Supplemental Fig. S1).
5	At the higher order (next defining node closer to the tips) within sub-genotype VII.1, for example, the sub-genotypes that are one order higher will become VII.1.1 and VII.1.2. At the next node within sub-genotype VII.2, the two further sub-genotypes will be named VII.2.1 and VII.2.2, respectively (example in Supplemental Fig. S1).
6	If a branch has unresolved topology, low branch support (i.e. there are polytomies or low bootstrap values), or insufficient number of isolates, the viruses within this branch are not assigned to a higher order, and are assigned the name of the lower order until the topology/support/number of the isolates is resolved.
7	Newly identified virus diversity (a group of viruses undescribed before) that meets all classification criteria will be classified as new genotype and will receive a subsequent Roman numeral (e.g. currently XXII is the next available) (example in Supplemental Fig. S2, red color).
8	Existing sub-genotypes that fulfil the genotype criteria will not be designated with a new name in order to maintain the ancestral information in their names (examples in Supplemental Fig. S2, green color).
9	If a new sub-genotype of viruses is identified later, but still falls into a higher order within an existing genotype, this new sub-genotype receives the next consecutive numerical address for the respective level of order in the phylogeny to avoid re-numbering all existing sub-genotypes that are of higher order. For example if a new sub-genotype that outgroups VII.1.1 and VII.1.2 is identified but it is still within VII.1, this new sub-genotype will be named VII.1.3 (example in Supplemental Fig. S3).

The names of genotypes and sub-genotypes used in this table do not correspond to the names in the phylogenetic trees presented in the current study. The names in this table were used for demonstration purposes.

Table 3. Estimates of evolutionary distances between class I and class II NDV sub-genotypes.[1,2,3]

A. Sub-genotypes within genotype 1 of class I		B. Sub-genotypes within genotype I of class II		C. Sub-genotypes within genotype V of class II		D. Sub-genotypes within genotype VII of class II	
	1.1 (1a+1b)		**I.1 (a+c+d)**		**V.1 (b)**		**VII.1 (b+d+e+j+f+l)**
1.2 (1c+1d)[4]	7.27	**I.2 (b)**	8.58	**V.2 (c)**	5.86	**VII.2 (h+i+k)**	9.91
	1.1.1 (1a)		**I.1.1 (a)**				**VII.1.1 (b+d+e+j+l)**
1.1.2 (1b)	7.99	**I.1.2 (c+d)**	8.52			**VII.1.2 (VIIf)**	5.58
			I.1.2.1 (c)				
		I.1.2.2 (d)	10.96				

E. Sub-genotypes within genotype VI of class II

	VI.1 (b)		**VI.2.1 (a+h+j+k+n)**		**VI.2.2.1 (e)**		**VI.2.1.1 (a+j+k+n)**
VI.2 (a+e+f+h+j+k+n)	8.05	**VI.2.2 (f+e)**	8.55	**VI.2.2.2 (f)**	6.14	**VI.2.1.2 (h)**	8.12
	VI.2.1.1.1 (a+n)		**VI.2.1.1.2.1 (j)**				
VI.2.1.1.2 (j+k)	6.59	**VI.2.1.1.2.2 (k)**	5.15				

F. Sub-genotypes within genotype XII of class II		G. Sub-genotypes within genotype XIII of class II		H. Sub-genotypes within genotype XIV of class II		I. Sub-genotypes within genotype XVIII of class II	
	XII.1 (a)		**XIII.1 (a)**		**XIV.1 (a)**		**XVIII.1 (a)**
XII.2 (b)	8.86	**XIII.2 (b)**	9.32	**XIV.2 (b)**	7.55	**XVIII.2 (b)**	6.46
			XIII.1.1 (a)				
		XIII.1.2 (a)	5.41				
			XIII.2.1 (b)				
		XIII.2.2 (???)	6.64				

J. Sub-genotypes within genotype XXI of class II

	XXI.2.1 (VIg+VIm)		**XXI.2.1.1 (VIg)**		**XXI (VI*l*)**
XXI.2.2 (VIi)	11.03	**XXI.2.1.2 (VIm)**	9.19	**XXI.2.1+2.2 (VIg+m+i)**	13.24

[1]Inferred from the complete nucleotide F gene sequence.
[2]The nucleotide distances were calculated at every defining node

[3]The number of base substitutions per site from averaging all sequence pairs between class I and class II sub-genotypes is shown. Analysis was conducted using the Maximum Composite Likelihood model (Tamura et al., 2004). The rate variation among sites was modeled with a gamma distribution (shape parameter=1). The number of nucleotide sequences in each sub-genotypes is shown in parenthesis. Codon positions included were 1st, 2nd, 3rd and noncoding. All positions containing gaps and missing data were eliminated. Evolutionary analyses were conducted in MEGA6 (Tamura et al., 2013).
[4]For easier comparison, the former sub-genotype names are provided in parentheses.

Table 4. Estimates of evolutionary distances between genotypes of class II NDV.[1,2]

Genotype (number of analyzed sequences)	No. of base substitutions per site[3]																		
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**XIII**	**XIV**	**XVI**	**XVII**	**XVIII**	**XIX**	**XX**
I (*n* = 120)																			
II (*n* = 17)	13.06																		
III (*n* = 6)	11.23	13.76																	
IV (*n* = 8)	12.79	14.86	10.11																
V (*n* = 47)	18.06	19.69	16.25	15.03															
VI (*n* = 265)	19.69	20.64	18.06	16.07	16.06														
VII (*n* = 772)	18.92	21.63	17.34	15.85	16.12	14.62													
VIII (*n* = 6)	15.53	16.92	13.78	12.41	12.89	13.35	14.15												
IX (*n* = 6)	11.44	12.85	***8.62***	10.14	16.05	17.86	17.38	13.50											
X (*n* = 22)	12.16	11.83	13.52	14.59	19.85	20.85	20.58	17.16	12.88										
XI (*n* = 14)	20.12	22.60	18.52	15.08	21.76	23.72	24.27	20.56	17.33	22.43									
XII (*n* = 23)	19.48	22.38	18.14	16.51	15.72	13.81	12.70	14.05	18.23	20.96	24.58								
XIII (*n* = 70)	18.79	21.28	17.81	16.15	15.87	15.21	12.91	13.98	17.35	20.49	23.45	11.92							
XIV (*n* = 77)	22.32	25.71	22.18	19.46	18.48	18.29	15.90	16.90	22.44	23.70	28.31	14.47	14.83						
XVI (*n* = 4)	17.71	20.31	16.63	14.68	15.92	17.22	17.67	13.90	16.56	19.16	23.68	17.38	17.22	20.47					
XVII (*n* = 85)	17.71	21.30	17.61	16.19	15.90	15.66	13.76	14.67	17.35	21.01	22.75	12.20	12.15	13.59	18.19				
XVIII (*n* = 17)	18.75	21.55	17.95	16.34	15.92	14.53	13.26	14.46	17.37	20.66	23.27	12.03	11.99	13.95	17.74	10.48			
XIX (*n* = 38)	20.60	21.49	18.80	17.49	10.12	17.71	17.26	15.00	18.41	21.93	24.47	18.12	17.69	20.57	18.56	17.94	18.03		
XX (*n* = 17)	16.77	18.83	15.55	13.71	13.69	10.12	12.84	11.41	15.24	19.20	21.85	12.91	13.28	16.78	15.10	13.33	13.10	16.14	
XXI (*n* = 51)	19.83	21.76	18.52	16.81	16.72	11.88	15.06	14.44	18.08	21.81	24.41	15.46	16.02	18.61	18.23	16.68	15.72	18.51	10.78

[1]Inferred from the complete nucleotide F gene sequence.
[2]The sequences from genotype XV are identified as recombinant forms and are not included in this analysis.
[3]The number of base substitutions per site from averaging all sequence pairs between class II genotypes is shown. Analysis was conducted using the Maximum Composite Likelihood model (Tamura et al., 2004). The rate variation among sites was modeled with a gamma distribution (shape parameter=1). The analysis involved 1664 nucleotide sequences (8 unclassified sequences not assigned as members of any genotype were excluded from the analysis, UNCL 1-8, see Supplemental Table. S2). Codon positions included were 1st, 2nd, 3rd and noncoding. All positions containing gaps and missing data were eliminated. Evolutionary analyses were conducted in MEGA6 (Tamura et al., 2013). Shaded cell represents inter-genotype nucleotide distance that is lower than 10%.

Table 5. Side-by-side comparison between the "lineage" system (Aldous et al., 2003), the "genotype" system (Diel et al., 2012), and the updated classification system for NDV isolates proposed in this study.

Sub/lineage Aldous et al., 2003	Sub/genotype Diel et al., 2012	Current study
	Class II	
1	I a	I.1.1
	I b	I.2.
	I c	I.1.2.1
	I d	I.1.2.2
2	II	II
3a, 3f	III	III
3b	IV	IV
3c	V b	V; V.1
	V c	V.2
	V d	V
4bii e	VI a	VI.2.1.1.1
	VI n	VI.2.1.1.1
4b, *4bi*,	VI b	VI.1.1
4bii d	VI e	VI.1.2.2.2
	VI f	VI.1.2.2.1
	VI h	VI.1.2.1.2
4bii f	VI j	VI.2.1.1.2.1
	VI k	VI.2.1.1.2.2
4c	-	-
5a	VII a – one sequence VIIi	VII.2
5d	VII b	VII.1.1
	VII b	VII.1.1
	VII j	VII.1.1
	VII l	VII.1.1
5c	VII e	VII.1.1
	VII f	VII.1.2
-	VII g (RF)	-
5a	VII h	VII.2
-	VII k	VII.2
5e	VII	VII, VII.2

Sub/lineage Aldous et al., 2003	Sub/genotype Diel et al., 2012	Current study
	Class II	
3d	VIII	VIII
3e	IX	IX
1	X a	X
	X b	X
3g	XI	XI
5b	XII a	XII.1
	XII b	XII.2
5b	XIII a	XIII.1.1
	XIII a	XIII.1.2
	XIII b	XIII.2.1
	XIII b	XIII.2.2
5h, 7d	XIV	XIV
5f, 7c	XIV a	XIV.1
	XIV b	XIV.2
-	XV (RF)	XV (RF)
3d	XVI	XVI
5g, 7a	XVII a	XVII
	XVII b	XVII
7b	XVIII a	XVIII.1
	XVIII b	XVIII.2
3c	V a	XIX
4a, 4d	VI c	XX
-	VI l	XXI
-	VI i	XXI.2
-	VI g	XXI.1.1
-	VI m	XXI.1.2
	Class I	
6	1a	1.1.1
	1b	1.1.2
	1c	1.2
	1d	1.2

Fig. 1. Maximum likelihood phylogenetic trees of class I (A) and class II (B).

Phylogenetic analyses are based on the full-length nucleotide sequence of the fusion gene of isolates representing Newcastle disease virus class I (A, n = 284) and class II (B, n = 1672). The evolutionary history was inferred by using RaxML (Stamatakis, 2014) and utilizing the Maximum Likelihood method based on the General Time Reversible model with 1000 bootstrap replicates. The trees with the highest log likelihood (class I = -18683.27, class II = -106684.34) are shown. A discrete gamma distribution was used to model evolutionary rate differences among sites and the rate variation model allowed for some sites to be evolutionarily invariable. For imaging purposes, the taxa tips are not displayed and colors are randomly assigned to indicate the different sub/genotypes. Three new genotypes assigned in the current study are highlighted in red font. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

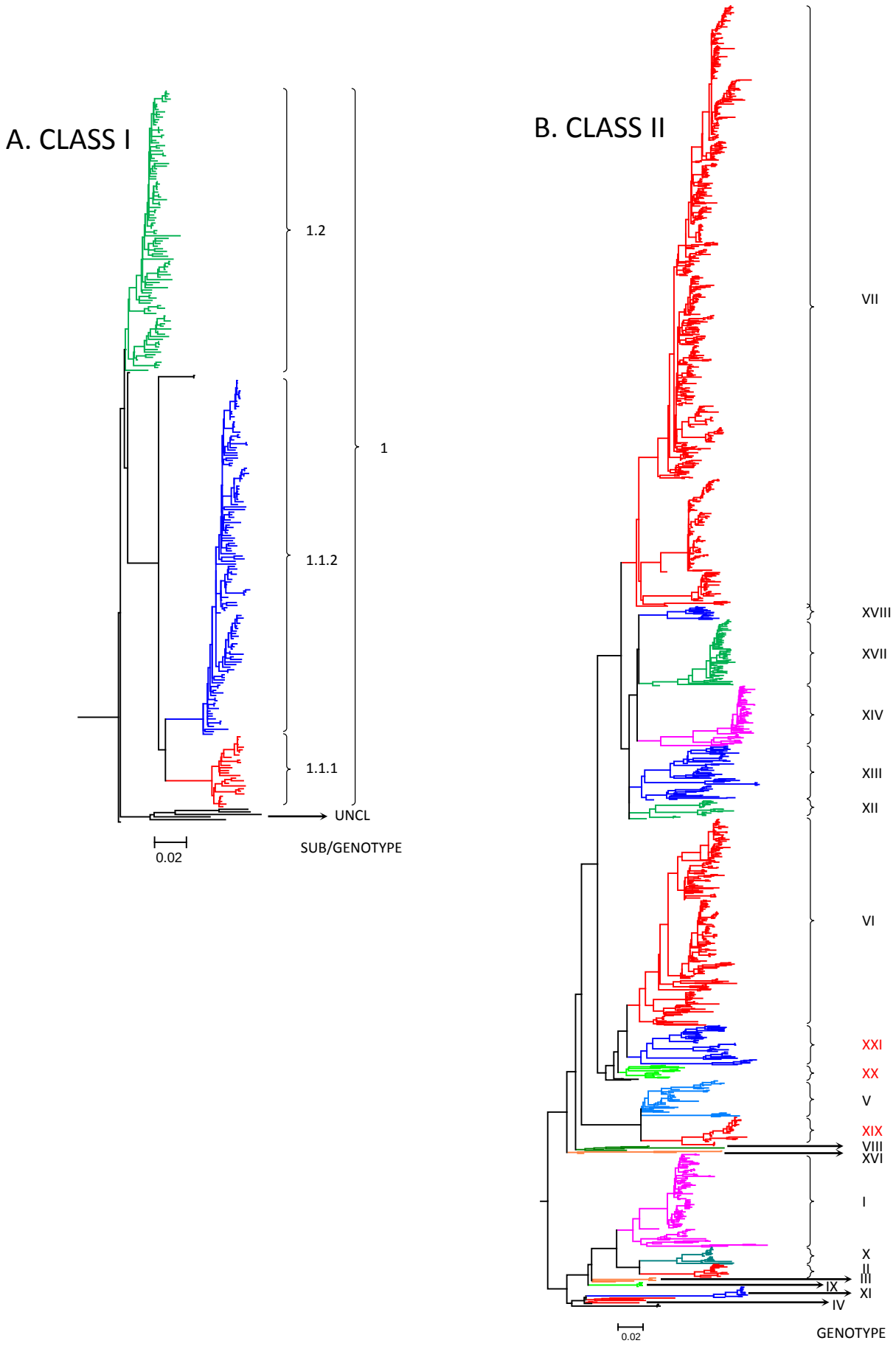

A. CLASS I
1.2
1
1.1.2
1.1.1
UNCL
0.02
SUB/GENOTYPE
B. CLASS II
VII
XVIII
XVII
XIV
XIII
XII
VI
XXI
XX
V
XIX
VIII
XVI
I
X
II
III
IX
XI
IV
0.02
GENOTYPE

Fig. 2. Class II “pilot” tree.

Phylogenetic analysis is based on the full-length nucleotide sequence of the fusion gene of isolates representing all class II Newcastle disease virus sub/genotypes (n = 125). The evolutionary history was inferred by using RaxML (Stamatakis, 2014) and utilizing the Maximum Likelihood method based on the General Time Reversible model with 1000 bootstrap replicates. The tree with the highest log likelihood (-28785.59) is shown. A discrete gamma distribution was used to model evolutionary rate differences among sites and the rate variation model allowed for some sites to be evolutionarily invariable. The Roman numerals presented in the taxa names in the phylogenetic tree represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The taxa names also include the GenBank identification number, host name, country of isolation, strain designation, and year of isolation. Three new genotypes assigned in the current study are highlighted in red font. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

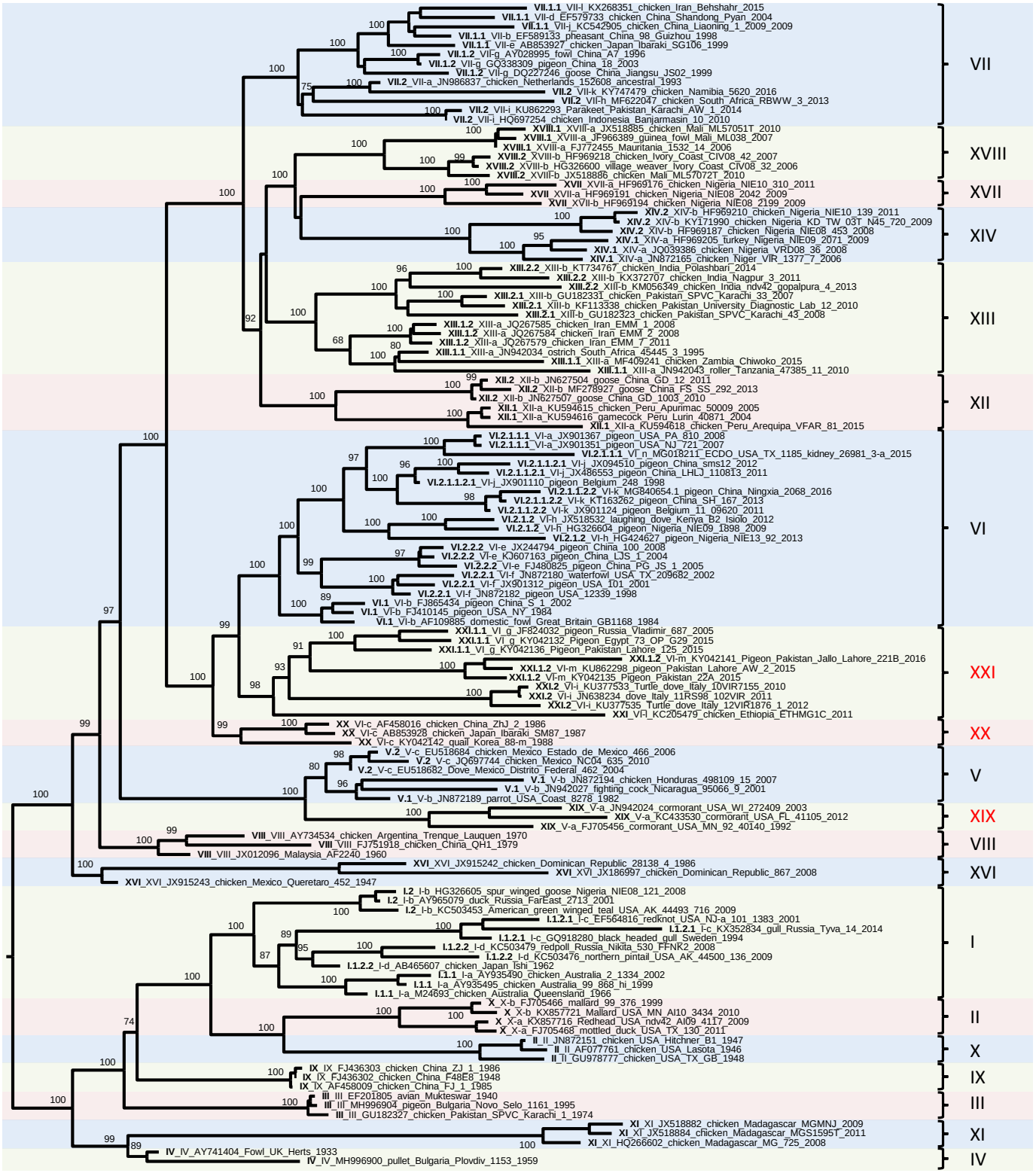

VII.1.1_VII-l_KX268351_chicken_Iran_Behshahr_2015
VII.1.1_VII-d_EF579733_chicken_China_Shandong_Pyan_2004
VII.1.1_VII-j_KC542905_chicken_China_Liaoning_1_2009_2009
VII.1.1_VII-b_EF589133_pheasant_China_98_Guizhou_1998
VII.1.1_VII-e_AB853927_chicken_Japan_Ibaraki_SG106_1999
VII.1.2_VII-g_AY028995_fowl_China_A7_1996
VII.1.2_VII-g_GQ338309_pigeon_China_18_2003
VII.1.2_VII-g_DQ227246_goose_China_Jiangsu_JS02_1999
VII.2_VII-a_JN986837_chicken_Netherlands_152608_ancestral_1993
VII.2_VII-k_KY747479_chicken_Namibia_5620_2016
VII.2_VII-h_MF622047_chicken_South_Africa_RBWW_3_2013
VII.2_VII-i_KU862293_Parakeet_Pakistan_Karachi_AW_1_2014
VII.2_VII-i_HQ697254_chicken_Indonesia_Banjarmasin_10_2010
XVIII.1_XVIII-a_JX518885_chicken_Mali_ML57051T_2010
XVIII.1_XVIII-a_JF966389_guinea_fowl_Mali_ML038_2007
XVIII.1_XVIII-a_FJ772455_Mauritania_1532_14_2006
XVIII.2_XVIII-b_HF969218_chicken_Ivory_Coast_CIV08_42_2007
XVIII.2_XVIII-b_HG326600_village_weaver_Ivory_Coast_CIV08_32_2006
XVIII.2_XVIII-b_JX518886_chicken_Mali_ML57072T_2010
XVII_XVII-a_HF969176_chicken_Nigeria_NIE10_310_2011
XVII_XVII-a_HF969191_chicken_Nigeria_NIE08_2042_2009
XVII_XVII-b_HF969194_chicken_Nigeria_NIE08_2199_2009
XIV.2_XIV-b_HF969210_chicken_Nigeria_NIE10_139_2011
XIV.2_XIV-b_KY171990_chicken_Nigeria_KD_TW_03T_N45_720_2009
XIV.2_XIV-b_HF969187_chicken_Nigeria_NIE08_453_2008
XIV.1_XIV-a_HF969205_Turkey_Nigeria_NIE09_2071_2009
XIV.1_XIV-a_JQ039386_chicken_Nigeria_VRD08_36_2008
XIV.1_XIV-a_JN872165_chicken_Niger_VIR_1377_7_2006
XIII.2.2_XIII-b_KT734767_chicken_India_Polashbari_2014
XIII.2.2_XIII-b_KX372707_chicken_India_Nagpur_3_2011
XIII.2.2_XIII-b_KM056349_chicken_India_ndv42_gopalpura_4_2013
XIII.2.1_XIII-b_GU182331_chicken_Pakistan_SPVC_Karachi_33_2007
XIII.2.1_XIII-b_KF113338_chicken_Pakistan_University_Diagnostic_Lab_12_2010
XIII.2.1_XIII-b_GU182323_chicken_Pakistan_SPVC_Karachi_43_2008
XIII.1.2_XIII-a_JQ267585_chicken_Iran_EMM_1_2008
XIII.1.2_XIII-a_JQ267584_chicken_Iran_EMM_2_2008
XIII.1.2_XIII-a_JQ267579_chicken_Iran_EMM_7_2011
XIII.1.1_XIII-a_JN942034_ostrich_South_Africa_45445_3_1995
XIII.1.1_XIII-a_MF409241_chicken_Zambia_Chiwoko_2015
XIII.1.1_XIII-a_JN942043_roller_Tanzania_47385_11_2010
XII.2_XII-b_JN627504_goose_China_GD_12_2011
XII.2_XII-b_MF278927_goose_China_FS_SS_292_2013
XII.2_XII-b_JN627507_goose_China_GD_1003_2010
XII.1_XII-a_KU594615_chicken_Peru_Apurimac_50009_2005
XII.1_XII-a_KU594616_gamecock_Peru_Lurin_40871_2004
XII.1_XII-a_KU594618_chicken_Peru_Arequipa_VFAR_81_2015
VI.2.1.1.1_VI-a_JX901367_pigeon_USA_PA_810_2008
VI.2.1.1.1_VI-a_JX901351_pigeon_USA_NJ_721_2007
VI.2.1.1.1_VI_n_MG018211_ECDO_USA_TX_1185_kidney_26981_3-a_2015
VI.2.1.1.2.1_VI-j_JX094510_pigeon_China_sms12_2012
VI.2.1.1.2.1_VI-j_JX486553_pigeon_China_LHLJ_110813_2011
VI.2.1.1.2.1_VI-j_JX901110_pigeon_Belgium_248_1998
VI.2.1.1.2.2_VI-k_MG840654.1_pigeon_China_Ningxia_2068_2016
VI.2.1.1.2.2_VI-k_KT163262_pigeon_China_SH_167_2013
VI.2.1.1.2.2_VI-k_JX901124_pigeon_Belgium_11_09620_2011
VI.2.1.2_VI-h_JX518532_laughing_dove_Kenya_B2_Isiolo_2012
VI.2.1.2_VI-h_HG326604_pigeon_Nigeria_NIE09_1898_2009
VI.2.1.2_VI-h_HG424627_pigeon_Nigeria_NIE13_92_2013
VI.2.2.2_VI-e_JX244794_pigeon_China_100_2008
VI.2.2.2_VI-e_KJ607163_pigeon_China_LJS_1_2004
VI.2.2.2_VI-e_FJ480825_pigeon_China_PG_JS_1_2005
VI.2.2.1_VI-f_JN872180_waterfowl_USA_TX_209682_2002
VI.2.2.1_VI-f_JX901312_pigeon_USA_I01_2001
VI.2.2.1_VI-f_JN872182_pigeon_USA_12339_1998
VI.1_VI-b_FJ865434_pigeon_China_S_1_2002
VI.1_VI-b_FJ410145_pigeon_USA_NY_1984
VI.1_VI-b_AF109885_domestic_fowl_Great_Britain_GB1168_1984
XXI.1.1_VI_g_JF824032_pigeon_Russia_Vladimir_687_2005
XXI.1.1_VI_g_KY042132_Pigeon_Egypt_73_OP_G29_2015
XXI.1.1_VI_g_KY042136_Pigeon_Pakistan_Lahore_125_2015
XXI.1.2_VI-m_KY042141_Pigeon_Pakistan_Jallo_Lahore_221B_2016
XXI.1.2_VI-m_KU862298_pigeon_Pakistan_Lahore_AW_2_2015
XXI.1.2_VI-m_KY042135_Pigeon_Pakistan_22A_2015
XXI.2_VI-i_KU377533_Turtle_dove_Italy_10VIR7155_2010
XXI.2_VI-i_JN638234_dove_Italy_11RS98_102VIR_2011
XXI.2_VI-i_KU377535_Turtle_dove_Italy_12VIR1876_1_2012
XXI_VI_KC205479_chicken_Ethiopia_ETHMG1C_2011
XX_VI-c_AF458016_chicken_China_ZhJ_2_1986
XX_VI-c_AB853928_chicken_Japan_Ibaraki_SM87_1987
XX_VI-c_KY042142_quail_Korea_88-m_1988
V.2_V-c_EU518684_chicken_Mexico_Estado_de_Mexico_466_2006
V.2_V-c_JQ697744_chicken_Mexico_NC04_635_2010
V.2_V-c_EU518682_Dove_Mexico_Distrito_Federal_462_2004
V.1_V-b_JN872194_chicken_Honduras_498109_15_2007
V.1_V-b_JN942027_fighting_cock_Nicaragua_95066_9_2001
V.1_V-b_JN872189_parrot_USA_Coast_8278_1982
XIX_V-a_JN942024_cormorant_USA_WI_272409_2003
XIX_V-a_KC433530_cormorant_USA_FL_41105_2012
XIX_V-a_FJ705456_cormorant_USA_MN_92_40140_1992
VIII_VIII_AY734534_chicken_Argentina_Trenque_Lauquen_1970
VIII_VIII_FJ751918_chicken_China_QH1_1979
VIII_VIII_JX012096_Malaysia_AF2240_1960
XVI_XVI_JX915242_chicken_Dominican_Republic_28138_4_1986
XVI_XVI_JX186997_chicken_Dominican_Republic_867_2008
XVI_XVI_JX915243_chicken_Mexico_Queretaro_452_1947
I.2_I-b_HG326605_spur_winged_goose_Nigeria_NIE08_121_2008
I.2_I-b_AY965079_duck_Russia_FarEast_2713_2001
I.2_I-b_KC503453_American_green_winged_teal_USA_AK_44493_716_2009
I.1.2.1_I-c_EF564816_redknot_USA_NJ-a_101_1383_2001
I.1.2.1_I-c_KX352834_gull_Russia_Tyva_14_2014
I.1.2.1_I-c_GQ918280_black_headed_gull_Sweden_1994
I.1.2.2_I-d_KC503479_redpoll_Russia_Nikita_530_FFNR2_2008
I.1.2.2_I-d_KC503476_northern_pintail_USA_AK_44500_136_2009
I.1.2.2_I-d_AB465607_chicken_Japan_Ishi_1962
I.1.1_I-a_AY935490_chicken_Australia_2_1334_2002
I.1.1_I-a_AY935495_chicken_Australia_99_868_hi_1999
I.1.1_I-a_M24693_chicken_Australia_Queensland_1966
X_X-b_FJ705466_mallard_99_376_1999
X_X-b_KX857721_Mallard_USA_MN_AI10_3434_2010
X_X-a_KX857716_Redhead_USA_ndv42_AI09_4117_2009
X_X-a_FJ705468_mottled_duck_USA_TX_130_2011
II_II_JN872151_chicken_USA_Hitchner_B1_1947
II_II_AF077761_chicken_USA_Lasota_1946
II_II_GU978777_chicken_USA_TX_GB_1948
IX_IX_FJ436303_chicken_China_ZJ_1_1986
IX_IX_FJ436302_chicken_China_F48E8_1948
IX_IX_AF458009_chicken_China_FJ_1_1985
III_III_EF201805_avian_Mukteswar_1940
III_III_MH996904_pigeon_Bulgaria_Novo_Selo_1161_1995
III_III_GU182327_chicken_Pakistan_SPVC_Karachi_1_1974
XI_XI_JX518882_chicken_Madagascar_MGMNJ_2009
XI_XI_JX518884_chicken_Madagascar_MGS1595T_2011
XI_XI_HQ266602_chicken_Madagascar_MG_725_2008
IV_IV_AY741404_Fowl_UK_Herts_1933
IV_IV_MH996900_pullet_Bulgaria_Plovdiv_1153_1959
VII
XVIII
XVII
XIV
XIII
XII
VI
XXI
XX
V
XIX
VIII
XVI
I
II
X
IX
III
XI
IV
0.03
GENOTYPE

Table 1. Criteria for classification of NDV isolates.

Criterion	Description
1	Assignment of viruses into new genotypes and sub-genotypes is done based on complete fusion gene phylogenetic analysis (sequences of at least 1645 nucleotides or longer).
2	Assignment of viruses into new genotypes and sub-genotypes is done only utilizing a complete dataset of sequences from all existing genotypes. All classification criteria listed below need to be fulfilled for naming new genotypes and sub-genotypes.
3	Sub-trees and pilot tree can be used for assigning new isolates to existing sub/genotypes.
4[a]	New genotypes or sub-genotypes are created only when four or more independent isolates, without a direct epidemiologic link (i.e. distinct outbreaks), are available.
5	New genotypes and sub-genotypes are created based on the phylogenetic tree topology (need to cluster into monophyletic branches) using the Maximum Likelihood method and the general time-reversible (GTR) model with gamma distribution (Γ) utilizing RaxML or a comparable tool.
6[a]	The mean nucleotide distance (evolutionary distances) between groups is inferred as the number of base substitutions per site from averaging over all sequence pairs between groups using MEGA v. 5/6/7 software (or a comparable tool) and utilizing the Maximum Composite Likelihood model with rate variation among sites that was modeled with a gamma distribution.
7[a]	Different genotypes have an average distance per site above 10% (0.1).
8	Different sub-genotypes have an average distance per site above 5% (0.05).
9	The bootstrap value at the genotype and sub-genotype defining node is 70% or above (≥70%).
10	Viruses that do not fulfill all classification criteria are assigned to the lower order (closer to the root) sub/genotype (see Table 2 for nomenclature criteria).

[a] Criteria that were adopted from the Diel et al. (2012) classification system.

Table 2. Nomenclature criteria for existing and new NDV genotypes and sub-genotypes.

Criterion	Description
1	All existing genotypes (as per Diel et al., 2012) in the current classes I and II maintain their Arabic and Roman numerals, respectively.
2	The lowercase Latin letter system to name sub-genotypes is replaced by the numerical-decimal system using Arabic numerals.
3	Class I sub/genotypes receive a numerical-decimal address (Arabic numerals separated by periods) that starts with the Arabic numeral of the genotype. Further numeration is made using the dichotomous system at every defining node using numerals 1 and 2. (e.g. 1.1 and 1.2).
4	Class II sub/genotypes receive a numerical-decimal address (Roman-Arabic numerals separated by periods) that starts with the Roman numeral of the genotype. Further numeration is made using the dichotomous system at every defining node (separating sub-genotypes) using numerals 1 and 2. (e.g. VII.1 and VII.2) (example in Supplemental Fig. S1).
5	At the higher order (next defining node closer to the tips) within sub-genotype VII.1, for example, the sub-genotypes that are one order higher will become VII.1.1 and VII.1.2. At the next node within sub-genotype VII.2, the two further sub-genotypes will be named VII.2.1 and VII.2.2, respectively (example in Supplemental Fig. S1).
6	If a branch has unresolved topology, low branch support (i.e. there are polytomies or low bootstrap values), or insufficient number of isolates, the viruses within this branch are not assigned to a higher order, and are assigned the name of the lower order until the topology/support/number of the isolates is resolved.
7	Newly identified virus diversity (a group of viruses undescribed before) that meets all classification criteria will be classified as new genotype and will receive a subsequent Roman numeral (e.g. currently XXII is the next available) (example in Supplemental Fig. S2, red color).
8	Existing sub-genotypes that fulfil the genotype criteria will not be designated with a new name in order to maintain the ancestral information in their names (examples in Supplemental Fig. S2, green color).
9	If a new sub-genotype of viruses is identified later, but still falls into a higher order within an existing genotype, this new sub-genotype receives the next consecutive numerical address for the respective level of order in the phylogeny to avoid re-numbering all existing sub-genotypes that are of higher order. For example if a new sub-genotype that outgroups VII.1.1 and VII.1.2 is identified but it is still within VII.1, this new sub-genotype will be named VII.1.3 (example in Supplemental Fig. S3).

The names of genotypes and sub-genotypes used in this table do not correspond to the names in the phylogenetic trees presented in the current study. The names in this table were used for demonstration purposes.

Table 3. Estimates of evolutionary distances between class I and class II NDV sub-genotypes.[1,2,3]

A. Sub-genotypes within genotype 1 of class I		B. Sub-genotypes within genotype I of class II		C. Sub-genotypes within genotype V of class II		D. Sub-genotypes within genotype VII of class II	
	1.1 (1a+1b)		**I.1 (a+c+d)**		**V.1 (b)**		**VII.1 (b+d+e+j+f+l)**
1.2 (1c+1d)[4]	7.27	**I.2 (b)**	8.58	**V.2 (c)**	5.86	**VII.2 (h+i+k)**	9.91
	1.1.1 (1a)		**I.1.1 (a)**				**VII.1.1 (b+d+e+j+l)**
1.1.2 (1b)	7.99	**I.1.2 (c+d)**	8.52			**VII.1.2 (VIIf)**	5.58
			I.1.2.1 (c)				
		I.1.2.2 (d)	10.96				

E. Sub-genotypes within genotype VI of class II

	VI.1 (b)		**VI.2.1 (a+h+j+k+n)**		**VI.2.2.1 (e)**		**VI.2.1.1 (a+j+k+n)**
VI.2 (a+e+f+h+j+k+n)	8.05	**VI.2.2 (f+e)**	8.55	**VI.2.2.2 (f)**	6.14	**VI.2.1.2 (h)**	8.12
	VI.2.1.1.1 (a+n)		**VI.2.1.1.2.1 (j)**				
VI.2.1.1.2 (j+k)	6.59	**VI.2.1.1.2.2 (k)**	5.15				

F. Sub-genotypes within genotype XII of class II		G. Sub-genotypes within genotype XIII of class II		H. Sub-genotypes within genotype XIV of class II		I. Sub-genotypes within genotype XVIII of class II	
	XII.1 (a)		**XIII.1 (a)**		**XIV.1 (a)**		**XVIII.1 (a)**
XII.2 (b)	8.86	**XIII.2 (b)**	9.32	**XIV.2 (b)**	7.55	**XVIII.2 (b)**	6.46
			XIII.1.1 (a)				
		XIII.1.2 (a)	5.41				
			XIII.2.1 (b)				
		XIII.2.2 (???)	6.64				

J. Sub-genotypes within genotype XXI of class II

	XXI.2.1 (VIg+VIm)		**XXI.2.1.1 (VIg)**		**XXI (VI*l*)**
XXI.2.2 (VIi)	11.03	**XXI.2.1.2 (VIm)**	9.19	**XXI.2.1+2.2 (VIg+m+i)**	13.24

[1]Inferred from the complete nucleotide F gene sequence.
[2]The nucleotide distances were calculated at every defining node

[3]The number of base substitutions per site from averaging all sequence pairs between class I and class II sub-genotypes is shown. Analysis was conducted using the Maximum Composite Likelihood model (Tamura et al., 2004). The rate variation among sites was modeled with a gamma distribution (shape parameter=1). The number of nucleotide sequences in each sub-genotypes is shown in parenthesis. Codon positions included were 1st, 2nd, 3rd and noncoding. All positions containing gaps and missing data were eliminated. Evolutionary analyses were conducted in MEGA6 (Tamura et al., 2013).
[4]For easier comparison, the former sub-genotype names are provided in parentheses.

Table 4. Estimates of evolutionary distances between genotypes of class II NDV.[1,2]

Genotype (number of analyzed sequences)	No. of base substitutions per site[3]																		
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**XIII**	**XIV**	**XVI**	**XVII**	**XVIII**	**XIX**	**XX**
I (*n* = 120)																			
II (*n* = 17)	13.06																		
III (*n* = 6)	11.23	13.76																	
IV (*n* = 8)	12.79	14.86	10.11																
V (*n* = 47)	18.06	19.69	16.25	15.03															
VI (*n* = 265)	19.69	20.64	18.06	16.07	16.06														
VII (*n* = 772)	18.92	21.63	17.34	15.85	16.12	14.62													
VIII (*n* = 6)	15.53	16.92	13.78	12.41	12.89	13.35	14.15												
IX (*n* = 6)	11.44	12.85	***8.62***	10.14	16.05	17.86	17.38	13.50											
X (*n* = 22)	12.16	11.83	13.52	14.59	19.85	20.85	20.58	17.16	12.88										
XI (*n* = 14)	20.12	22.60	18.52	15.08	21.76	23.72	24.27	20.56	17.33	22.43									
XII (*n* = 23)	19.48	22.38	18.14	16.51	15.72	13.81	12.70	14.05	18.23	20.96	24.58								
XIII (*n* = 70)	18.79	21.28	17.81	16.15	15.87	15.21	12.91	13.98	17.35	20.49	23.45	11.92							
XIV (*n* = 77)	22.32	25.71	22.18	19.46	18.48	18.29	15.90	16.90	22.44	23.70	28.31	14.47	14.83						
XVI (*n* = 4)	17.71	20.31	16.63	14.68	15.92	17.22	17.67	13.90	16.56	19.16	23.68	17.38	17.22	20.47					
XVII (*n* = 85)	17.71	21.30	17.61	16.19	15.90	15.66	13.76	14.67	17.35	21.01	22.75	12.20	12.15	13.59	18.19				
XVIII (*n* = 17)	18.75	21.55	17.95	16.34	15.92	14.53	13.26	14.46	17.37	20.66	23.27	12.03	11.99	13.95	17.74	10.48			
XIX (*n* = 38)	20.60	21.49	18.80	17.49	10.12	17.71	17.26	15.00	18.41	21.93	24.47	18.12	17.69	20.57	18.56	17.94	18.03		
XX (*n* = 17)	16.77	18.83	15.55	13.71	13.69	10.12	12.84	11.41	15.24	19.20	21.85	12.91	13.28	16.78	15.10	13.33	13.10	16.14	
XXI (*n* = 51)	19.83	21.76	18.52	16.81	16.72	11.88	15.06	14.44	18.08	21.81	24.41	15.46	16.02	18.61	18.23	16.68	15.72	18.51	10.78

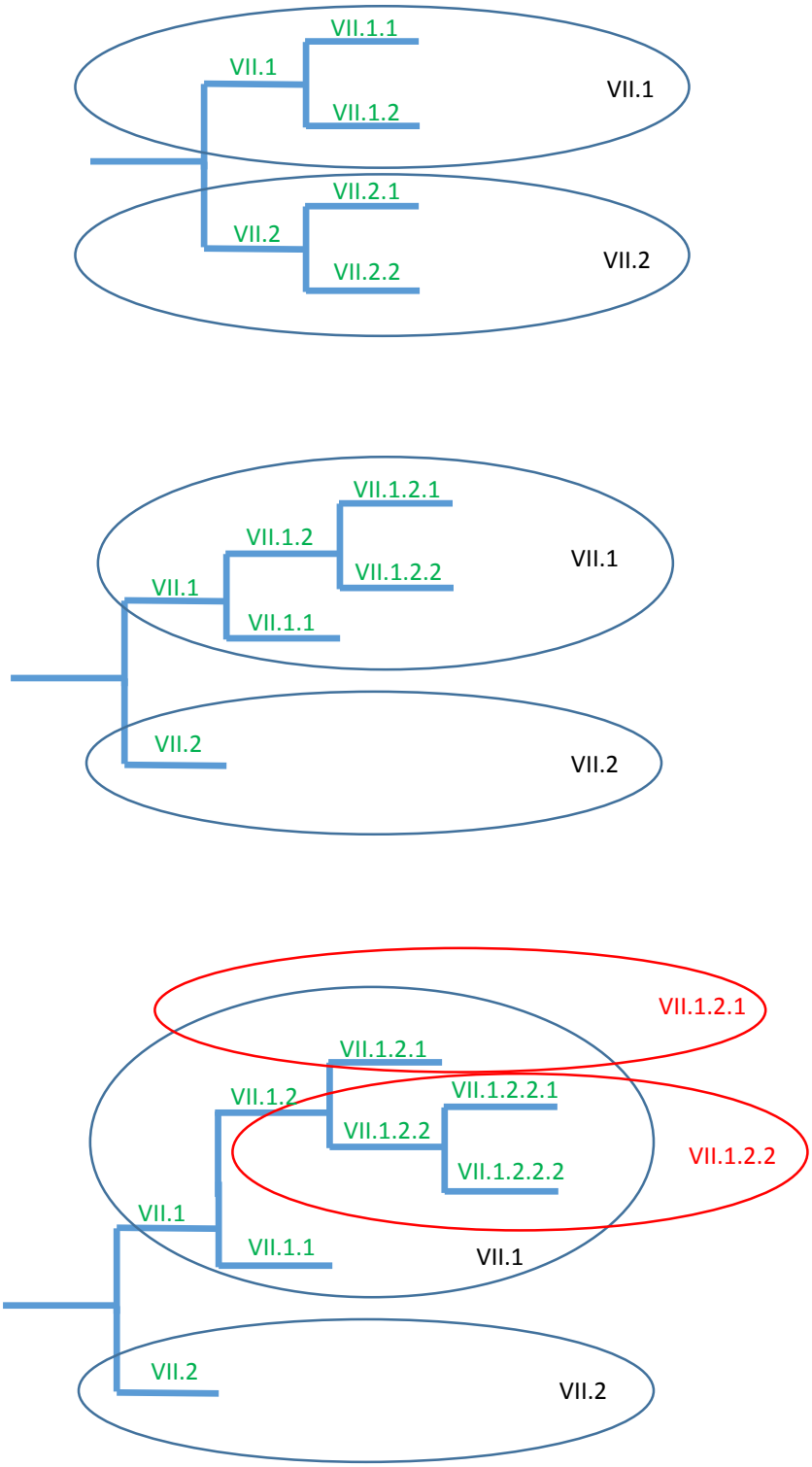
[1]Inferred from the complete nucleotide F gene sequence.
[2]The sequences from genotype XV are identified as recombinant forms and are not included in this analysis.
[3]The number of base substitutions per site from averaging all sequence pairs between class II genotypes is shown. Analysis was conducted using the Maximum Composite Likelihood model (Tamura et al., 2004). The rate variation among sites was modeled with a gamma distribution (shape parameter=1). The analysis involved 1664 nucleotide sequences (8 unclassified sequences not assigned as members of any genotype were excluded from the analysis, UNCL 1-8, see Supplemental Table. S2). Codon positions included were 1st, 2nd, 3rd and noncoding. All positions containing gaps and missing data were eliminated. Evolutionary analyses were conducted in MEGA6 (Tamura et al., 2013). Shaded cell represents inter-genotype nucleotide distance that is lower than 10%.

Table 5. Side-by-side comparison between the "lineage" system (Aldous et al., 2003), the "genotype" system (Diel et al., 2012), and the updated classification system for NDV isolates proposed in this study.

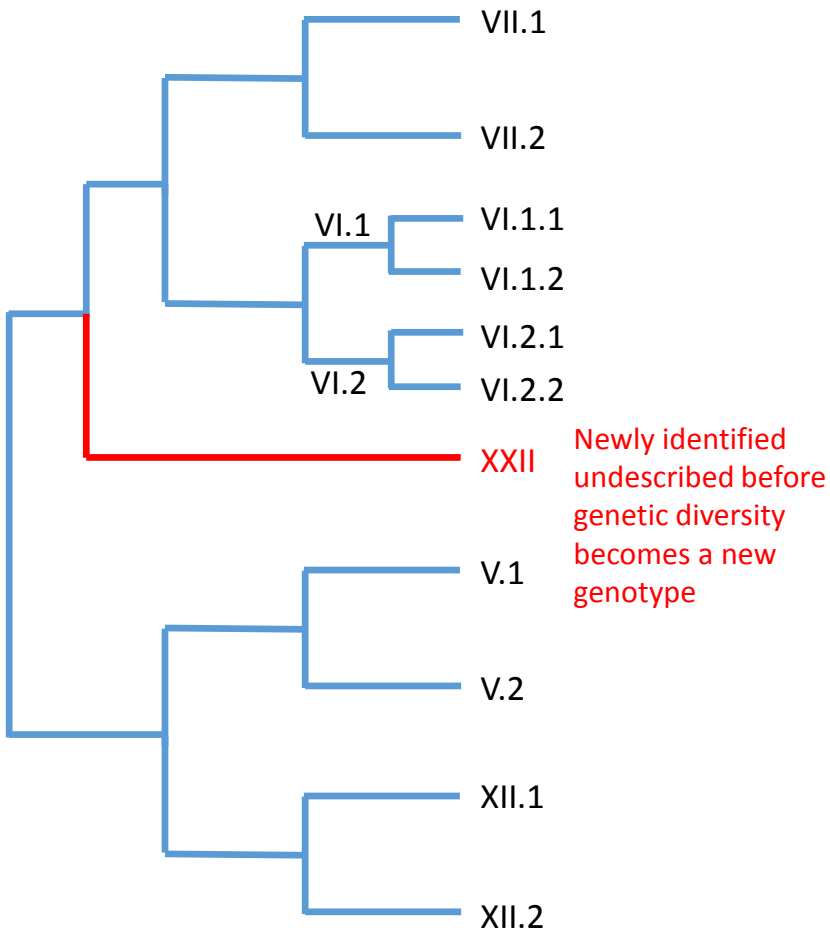
Sub/lineage Aldous et al., 2003	**Sub/genotype Diel et al., 2012**	**Current study**
	Class II	
1	I a	I.1.1
	I b	I.2.
	I c	I.1.2.1
	I d	I.1.2.2
2	II	II
3a, 3f	III	III
3b	IV	IV
3c	V b	V; V.1
	V c	V.2
	V d	V
4bii e	VI a	VI.2.1.1.1
	VI n	VI.2.1.1.1
4b, *4bi*,	VI b	VI.1.1
4bii d	VI e	VI.1.2.2.2
	VI f	VI.1.2.2.1
	VI h	VI.1.2.1.2
4bii f	VI j	VI.2.1.1.2.1
	VI k	VI.2.1.1.2.2
4c	-	-
5a	VII a – one sequence VIIi	VII.2
5d	VII b	VII.1.1
	VII b	VII.1.1
	VII j	VII.1.1
	VII l	VII.1.1
5c	VII e	VII.1.1
	VII f	VII.1.2
-	VII g (RF)	-
5a	VII h	VII.2
-	VII k	VII.2
5e	VII	VII, VII.2

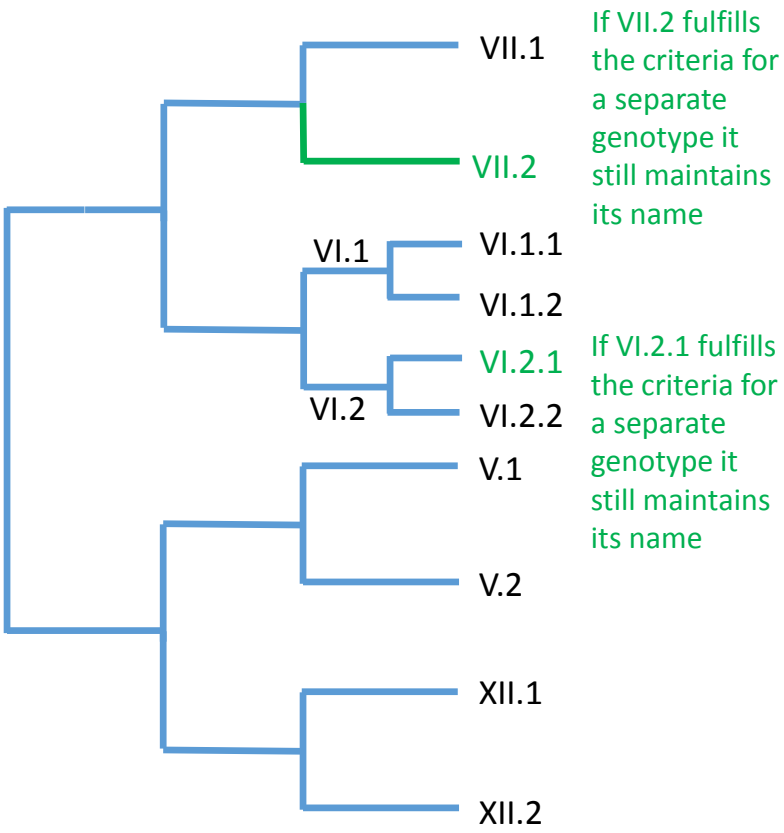
Sub/lineage Aldous et al., 2003	**Sub/genotype Diel et al., 2012**	**Current study**
	Class II	
3d	VIII	VIII
3e	IX	IX
1	X a	X
	X b	X
3g	XI	XI
5b	XII a	XII.1
	XII b	XII.2
5b	XIII a	XIII.1.1
	XIII a	XIII.1.2
	XIII b	XIII.2.1
	XIII b	XIII.2.2
5h, 7d	XIV	XIV
5f, 7c	XIV a	XIV.1
	XIV b	XIV.2
-	XV (RF)	XV (RF)
3d	XVI	XVI
5g, 7a	XVII a	XVII
	XVII b	XVII
7b	XVIII a	XVIII.1
	XVIII b	XVIII.2
3c	V a	XIX
4a, 4d	VI c	XX
-	VI l	XXI
-	VI i	XXI.2
-	VI g	XXI.1.1
-	VI m	XXI.1.2
	Class I	
6	1a	1.1.1
	1b	1.1.2
	1c	1.2
	1d	1.2

Supplemental Fig. S1. Examples of dichotomous naming at nodes at which sub-genotypes are separated. The names of genotypes and sub-genotypes used in this figure do not correspond to the names in the phylogenetic trees presented in the current study. The names in this figure were used for illustration and demonstration purposes.

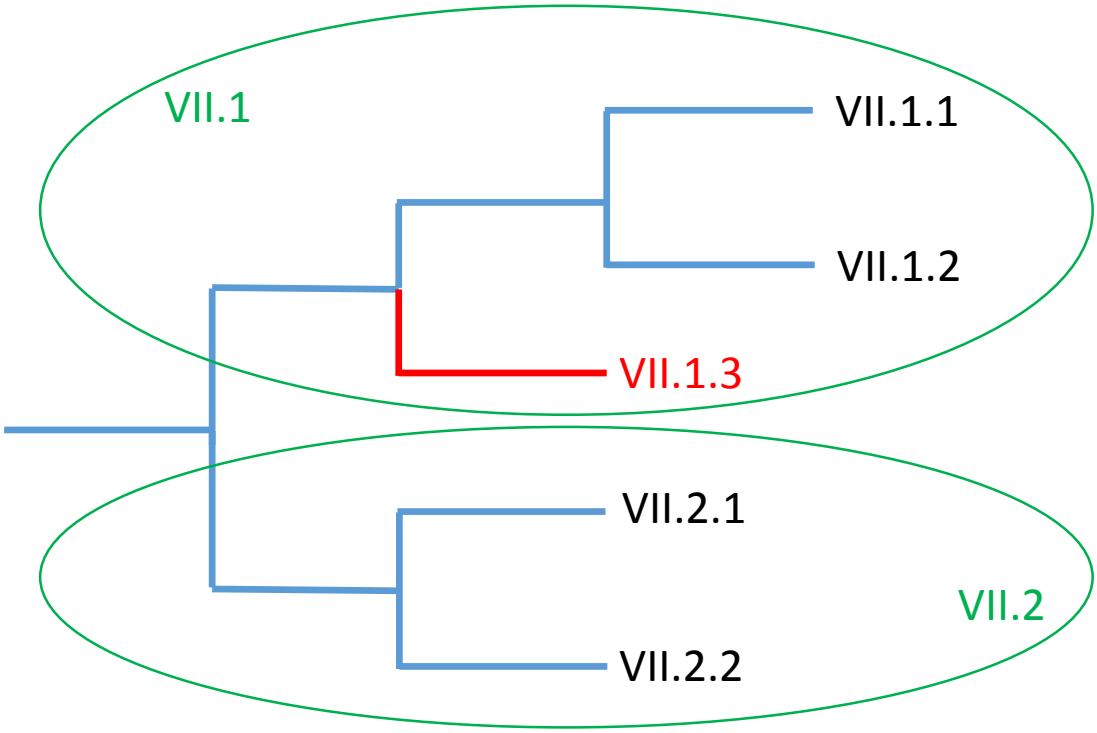


Supplemental Fig. S2. Examples for naming new genotypes when they outgroup existing genotypes. The names of genotypes and sub-genotypes used in this figure do not correspond to the names in the phylogenetic trees presented in the current study. The names in this figure were used for illustration and demonstration purposes.



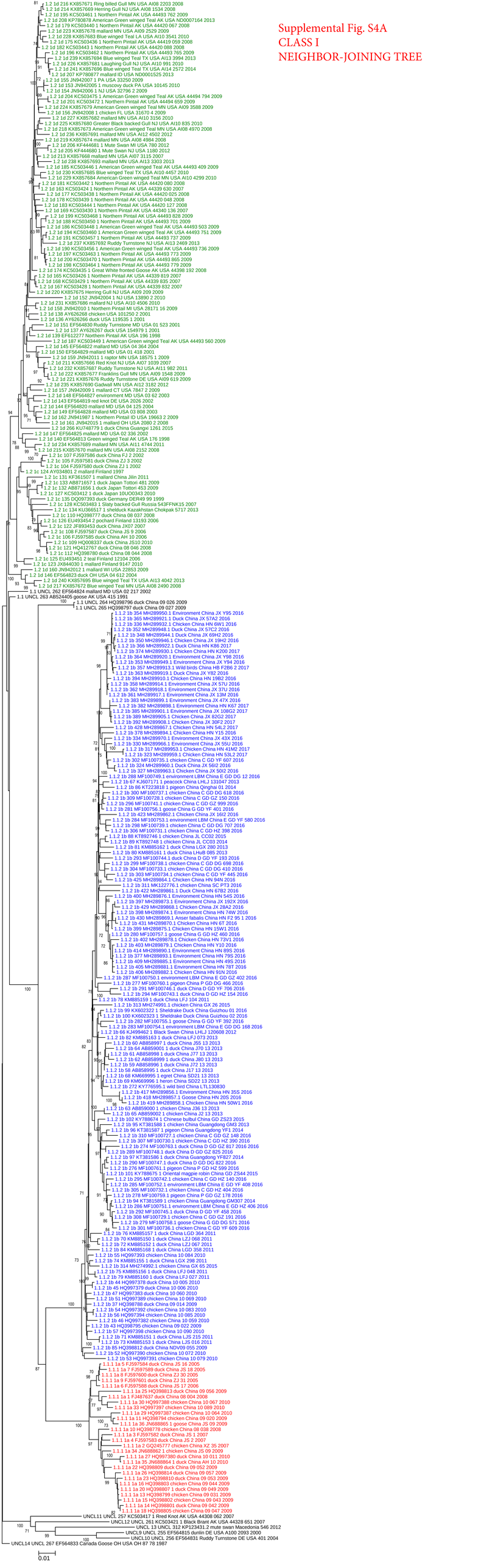


Supplemental Fig. S3. Examples for naming new sub-genotypes when they fall into a higher order of an existing genotype. The names of genotypes and sub-genotypes used in this figure do not correspond to the names in the phylogenetic trees presented in the current study. The names in this figure were used for illustration and demonstration purposes.

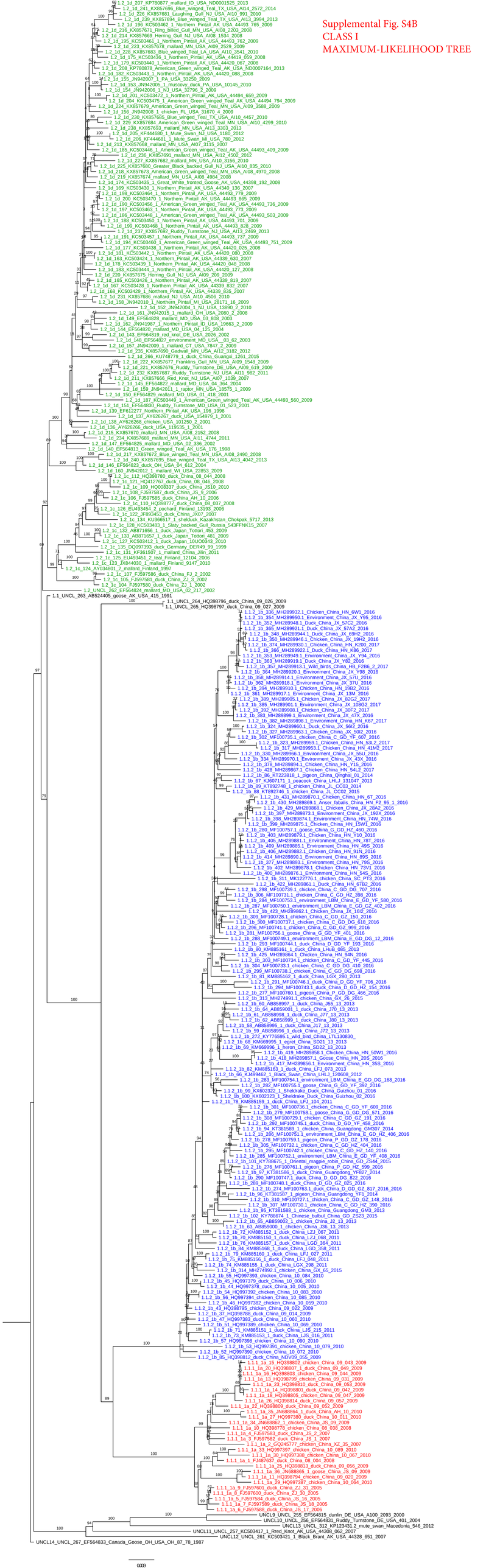


Supplemental Fig. S4. Full phylogenetic trees based on the complete fusion sequences of isolates representing Newcastle disease virus class I (n = 284). A. Neighbor-joining tree; B. Maximum Likelihood tree; C. Bayesian tree. The Roman numerals presented in the taxa names in the phylogenetic trees represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The numbers after the genotype names represent database ID. The names based on the new system differ for some genotypes in the trees based on differences in topology. The taxa names also include the GenBank identification number, and when available – host name, country of isolation, strain designation, and year of isolation. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

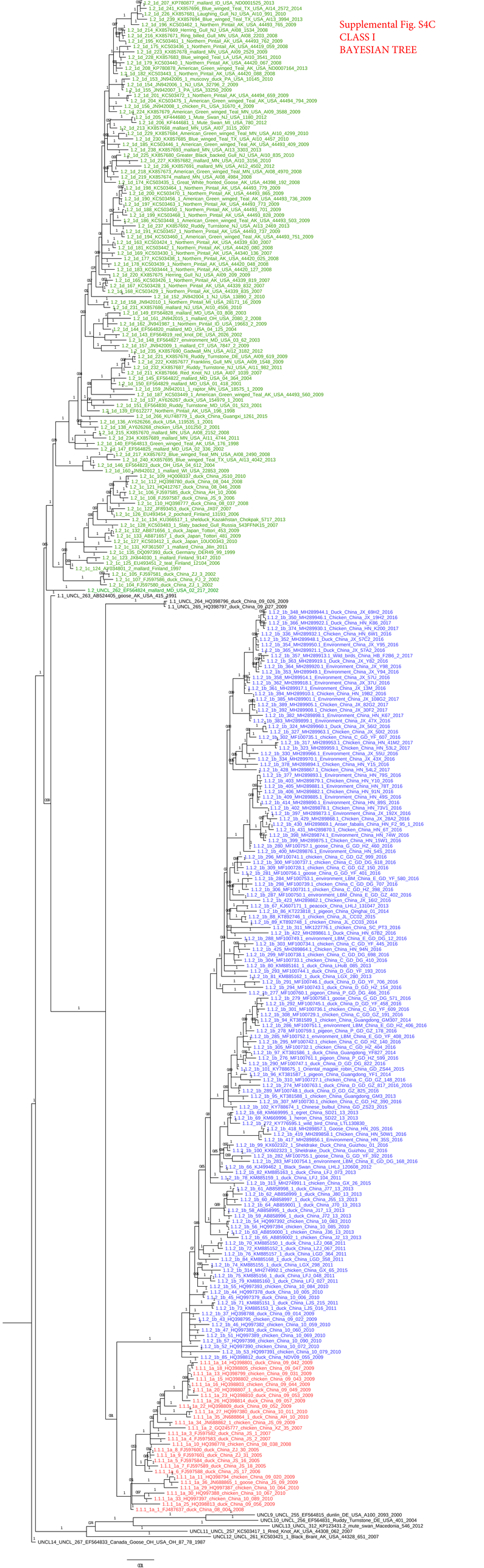
Supplemental Fig. S4A
CLASS I
NEIGHBOR-JOINING TREE



Supplemental Fig. S4B
CLASS I
MAXIMUM-LIKELIHOOD TREE



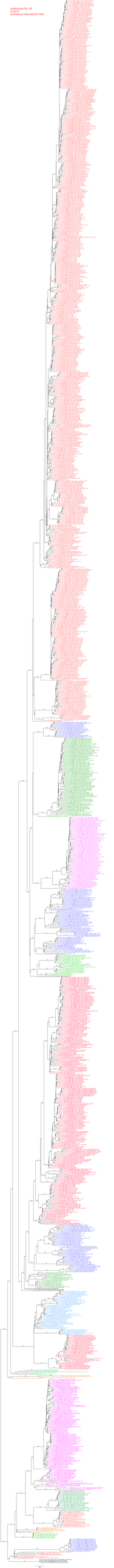
Supplemental Fig. S4C
CLASS I
BAYESIAN TREE



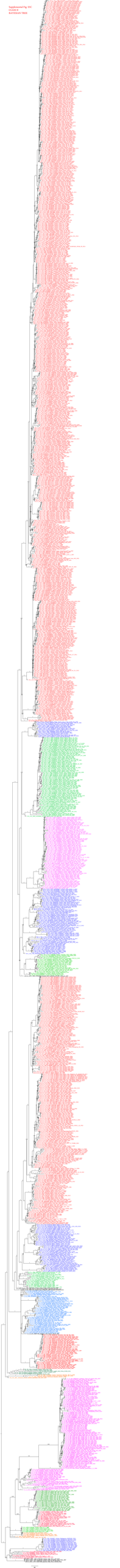
Supplemental Fig. S5. Full phylogenetic trees based on the complete fusion sequences of isolates representing Newcastle disease virus class II (n = 1672). A. Neighbor-joining tree; B. Maximum Likelihood tree; C. Bayesian tree. The Roman numerals presented in the taxa names in the phylogenetic trees represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The numbers after the genotype names represent database ID. The names based on the new system differ for some genotypes in the trees based on differences in topology. The taxa names also include the GenBank identification number, and when available – host name, country of isolation, strain designation, and year of isolation. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

Supplemental Fig. 91A
CLADE B
NEIGHBOR JOINING TREE

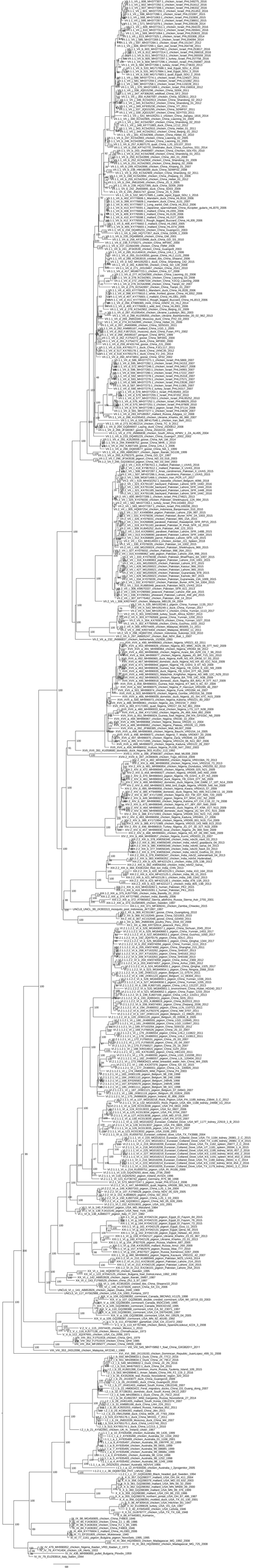
Supplemental Fig. 11B
CLADE II
MAXIMUM LIKELIHOOD TREE



Supplemental Fig. S5C
CLADE G
BAYESIAN TREE



Supplemental Fig. S6. Full phylogenetic tree based on the complete genome concatenated coding sequences of isolates representing Newcastle disease virus class II (n = 491). The evolutionary history was inferred by using the Maximum Likelihood method based on the General Time Reversible model with 1000 bootstrap replicates. The tree with the highest log likelihood (-344411.91) is shown. A discrete gamma distribution was used to model evolutionary rate differences among sites and the rate variation model allowed for some sites to be evolutionarily invariable. The Roman numerals presented in the taxa names in the phylogenetic tree represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The names of sub/genotypes are based on the system proposed and as identified by the ML complete fusion gene analysis. The taxa names also include the GenBank identification number, host name, country of isolation, strain designation, and year of isolation. The tree is drawn to scale, with branch lengths measured in the number of substitutions per site.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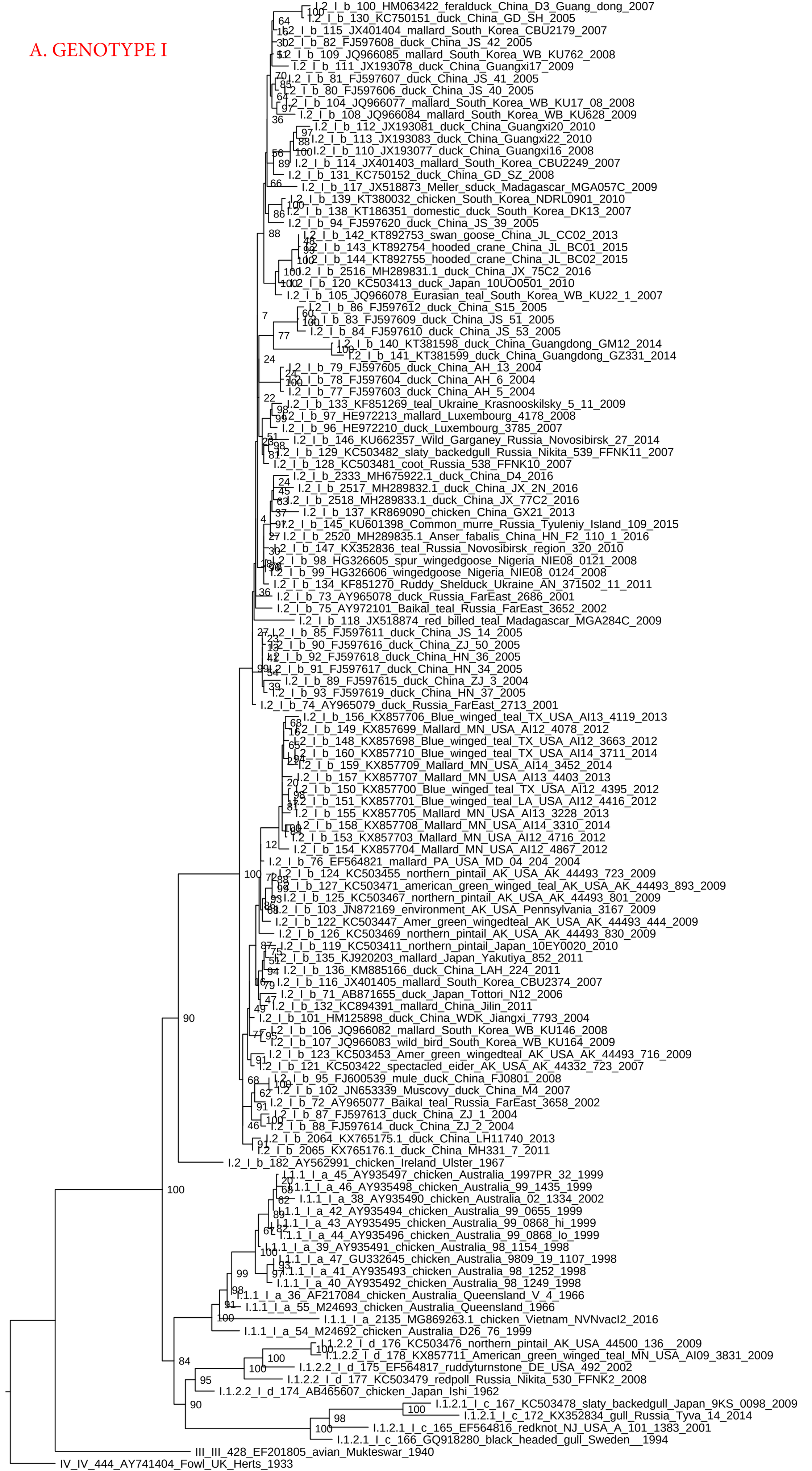
VR-1.1, VR-1, 595, MH377299

Supplemental Fig. S7. Phylogenetic sub-tree based on the complete fusion sequence of isolates representing Newcastle disease virus genotypes. A. Genotype I (n = 122); B. Genotype V (n = 49); C. Genotype VI (n = 267); D. Genotype VII (n = 774); E. XII. Genotype I (n = 25); F. Genotype XIII (n = 74); G. Genotype XIV (n = 79); H. Genotype XVIII (n = 19); I. Genotype XXI (n = 53). The trees were built using all sequences within each NDV genotypes and 2 to 4 additional sequences used for rooting. The sequences recommended for use for rooting are also provided in Supplemental Table S5. The evolutionary history was inferred by using the Maximum Likelihood method based on the General Time Reversible model with 1000 bootstrap replicates. The trees with the highest log likelihood are shown. A discrete gamma distribution was used to model evolutionary rate differences among sites and the rate variation model allowed for some sites to be evolutionarily invariable. The Roman numerals presented in the taxa names in the phylogenetic tree represent the respective genotype for each isolate. The new (decimal naming) and the old names (alpha-numerical) are provided for easier comparison. The taxa names also include the GenBank identification number, and when available - host name, country of isolation, strain designation, and year of isolation. The trees are drawn to scale, with branch lengths measured in the number of substitutions per site.

A. GENOTYPE I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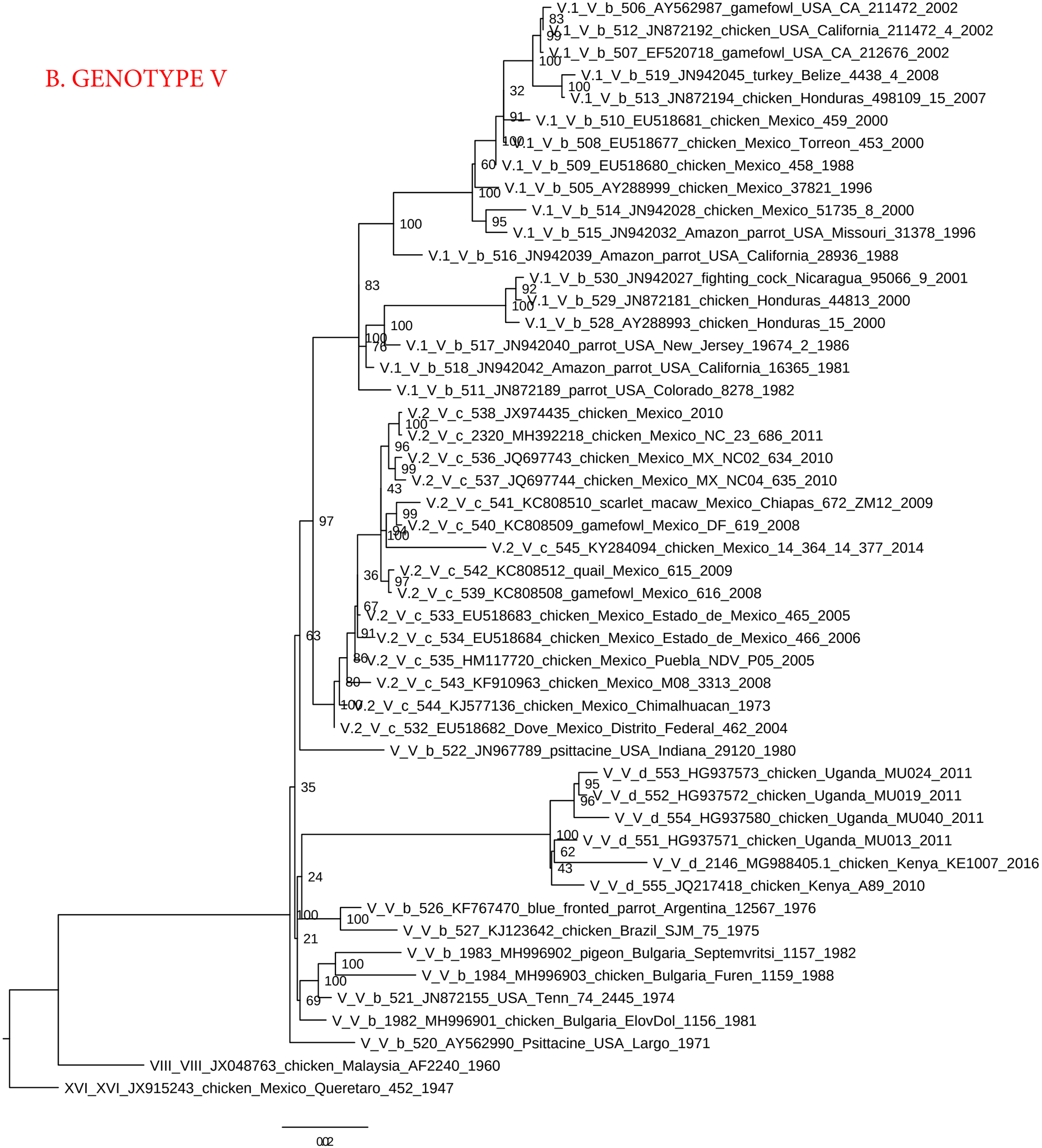
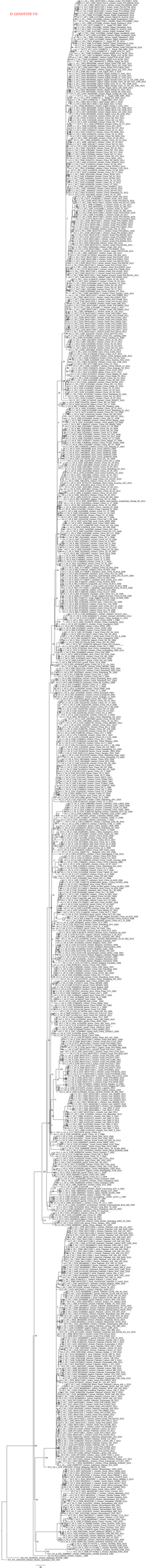
I.1.1_I_a_45_AY935497_chicken_Australia_1997PR_32_1999
I.1.1_I_a_46_AY935498_chicken_Australia_99_1435_1999
I.1.1_I_a_38_AY935490_chicken_Australia_02_1334_2002
I.1.1_I_a_42_AY935494_chicken_Australia_99_0655_1999
I.1.1_I_a_43_AY935495_chicken_Australia_99_0868_hi_1999
I.1.1_I_a_44_AY935496_chicken_Australia_99_0868_lo_1999
I.1.1_I_a_39_AY935491_chicken_Australia_98_1154_1998
I.1.1_I_a_47_GU332645_chicken_Australia_9809_19_1107_1998
I.1.1_I_a_41_AY935493_chicken_Australia_98_1252_1998
I.1.1_I_a_40_AY935492_chicken_Australia_98_1249_1998
I.1.1_I_a_36_AF217084_chicken_Australia_Queensland_V_4_1966
I.1.1_I_a_55_M24693_chicken_Australia_Queensland_1966
I.1.1_I_a_2135_MG869263.1_chicken_Vietnam_NVNvacI2_2016
I.1.1_I_a_54_M24692_chicken_Australia_D26_76_1999
I.1.2.2_I_d_176_KC503476_northern_pintail_AK_USA_44500_136__2009
I.1.2.2_I_d_178_KX857711_American_green_winged_teal_MN_USA_AI09_3831_2009
I.1.2.2_I_d_175_EF564817_ruddyturnstone_DE_USA_492_2002
I.1.2.2_I_d_177_KC503479_redpoll_Russia_Nikita_530_FFNK2_2008
I.1.2.2_I_d_174_AB465607_chicken_Japan_Ishi_1962
I.1.2.1_I_c_167_KC503478_slaty_backedgull_Japan_9KS_0098_2009
I.1.2.1_I_c_172_KX352834_gull_Russia_Tyva_14_2014
I.1.2.1_I_c_165_EF564816_redknot_NJ_USA_A_101_1383_2001
I.1.2.1_I_c_166_GQ918280_black_headed_gull_Sweden__1994
III_III_428_EF201805_avian_Mukteswar_1940
IV_IV_444_AY741404_Fowl_UK_Herts_1933
0.02

B. GENOTYPE V

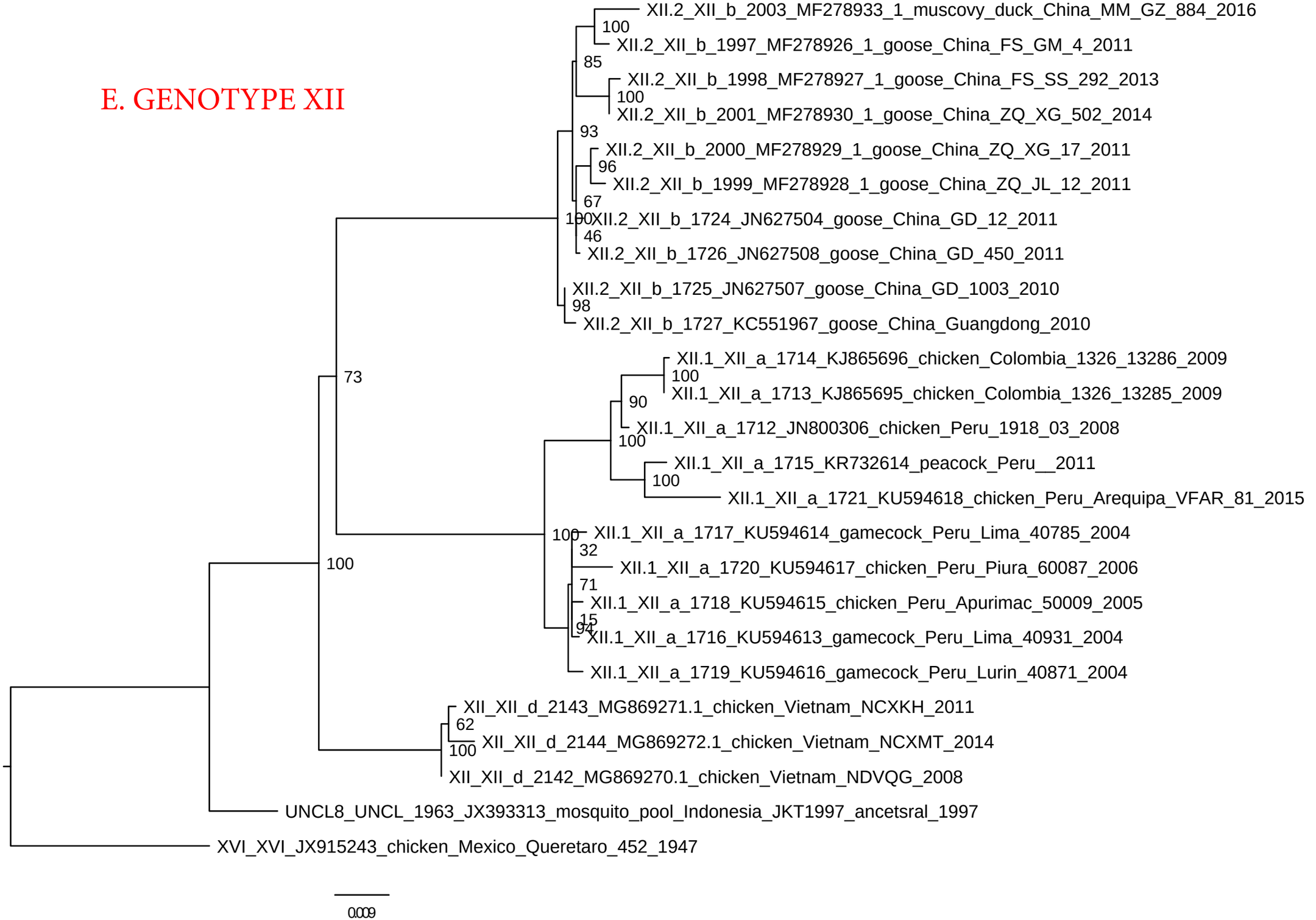

V.1_V_b_506_AY562987_gamefowl_USA_CA_211472_2002
V.1_V_b_512_JN872192_chicken_USA_California_211472_4_2002
V.1_V_b_507_EF520718_gamefowl_USA_CA_212676_2002
V.1_V_b_519_JN942045_turkey_Belize_4438_4_2008
V.1_V_b_513_JN872194_chicken_Honduras_498109_15_2007
V.1_V_b_510_EU518681_chicken_Mexico_459_2000
V.1_V_b_508_EU518677_chicken_Mexico_Torreon_453_2000
V.1_V_b_509_EU518680_chicken_Mexico_458_1988
V.1_V_b_505_AY288999_chicken_Mexico_37821_1996
V.1_V_b_514_JN942028_chicken_Mexico_51735_8_2000
V.1_V_b_515_JN942032_Amazon_parrot_USA_Missouri_31378_1996
V.1_V_b_516_JN942039_Amazon_parrot_USA_California_28936_1988
V.1_V_b_530_JN942027_fighting_cock_Nicaragua_95066_9_2001
V.1_V_b_529_JN872181_chicken_Honduras_44813_2000
V.1_V_b_528_AY288993_chicken_Honduras_15_2000
V.1_V_b_517_JN942040_parrot_USA_New_Jersey_19674_2_1986
V.1_V_b_518_JN942042_Amazon_parrot_USA_California_16365_1981
V.1_V_b_511_JN872189_parrot_USA_Colorado_8278_1982
V.2_V_c_538_JX974435_chicken_Mexico_2010
V.2_V_c_2320_MH392218_chicken_Mexico_NC_23_686_2011
V.2_V_c_536_JQ697743_chicken_Mexico_MX_NC02_634_2010
V.2_V_c_537_JQ697744_chicken_Mexico_MX_NC04_635_2010
V.2_V_c_541_KC808510_scarlet_macaw_Mexico_Chiapas_672_ZM12_2009
V.2_V_c_540_KC808509_gamefowl_Mexico_DF_619_2008
V.2_V_c_545_KY284094_chicken_Mexico_14_364_14_377_2014
V.2_V_c_542_KC808512_quail_Mexico_615_2009
V.2_V_c_539_KC808508_gamefowl_Mexico_616_2008
V.2_V_c_533_EU518683_chicken_Mexico_Estado_de_Mexico_465_2005
V.2_V_c_534_EU518684_chicken_Mexico_Estado_de_Mexico_466_2006
V.2_V_c_535_HM117720_chicken_Mexico_Puebla_NDV_P05_2005
V.2_V_c_543_KF910963_chicken_Mexico_M08_3313_2008
V.2_V_c_544_KJ577136_chicken_Mexico_Chimalhuacan_1973
V.2_V_c_532_EU518682_Dove_Mexico_Distrito_Federal_462_2004
V_V_b_522_JN967789_psittacine_USA_Indiana_29120_1980
V_V_d_553_HG937573_chicken_Uganda_MU024_2011
V_V_d_552_HG937572_chicken_Uganda_MU019_2011
V_V_d_554_HG937580_chicken_Uganda_MU040_2011
V_V_d_551_HG937571_chicken_Uganda_MU013_2011
V_V_d_2146_MG988405.1_chicken_Kenya_KE1007_2016
V_V_d_555_JQ217418_chicken_Kenya_A89_2010
V_V_b_526_KF767470_blue_fronted_parrot_Argentina_12567_1976
V_V_b_527_KJ123642_chicken_Brazil_SJM_75_1975
V_V_b_1983_MH996902_pigeon_Bulgaria_Septemvritsi_1157_1982
V_V_b_1984_MH996903_chicken_Bulgaria_Furen_1159_1988
V_V_b_521_JN872155_USA_Tenn_74_2445_1974
V_V_b_1982_MH996901_chicken_Bulgaria_ElovDol_1156_1981
V_V_b_520_AY562990_Psittacine_USA_Largo_1971
VIII_VIII_JX048763_chicken_Malaysia_AF2240_1960
XVI_XVI_JX915243_chicken_Mexico_Queretaro_452_1947
0.02

C. GENOTYPE VI

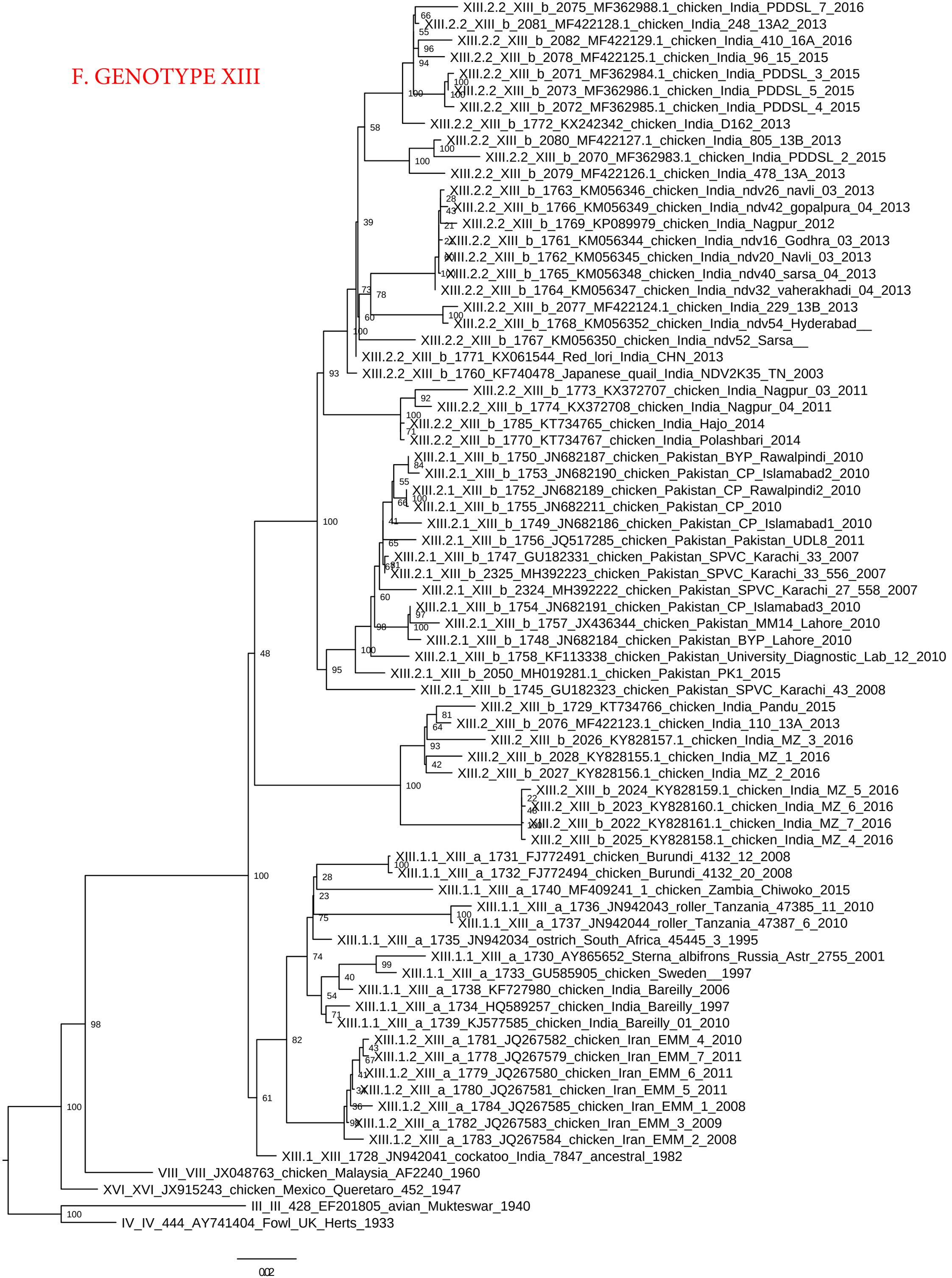
D. GENOTYPE VII



E. GENOTYPE XII

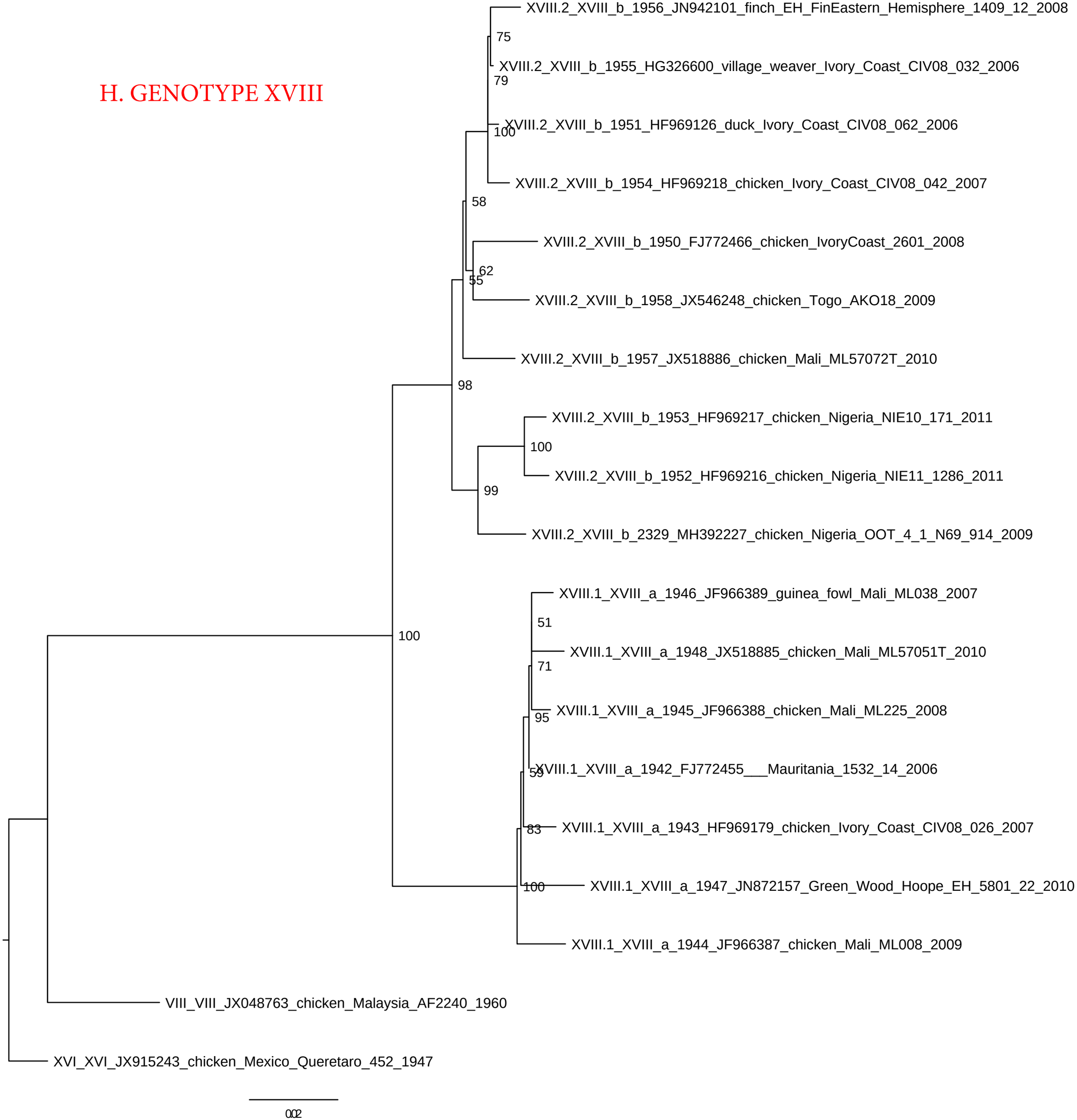


F. GENOTYPE XIII

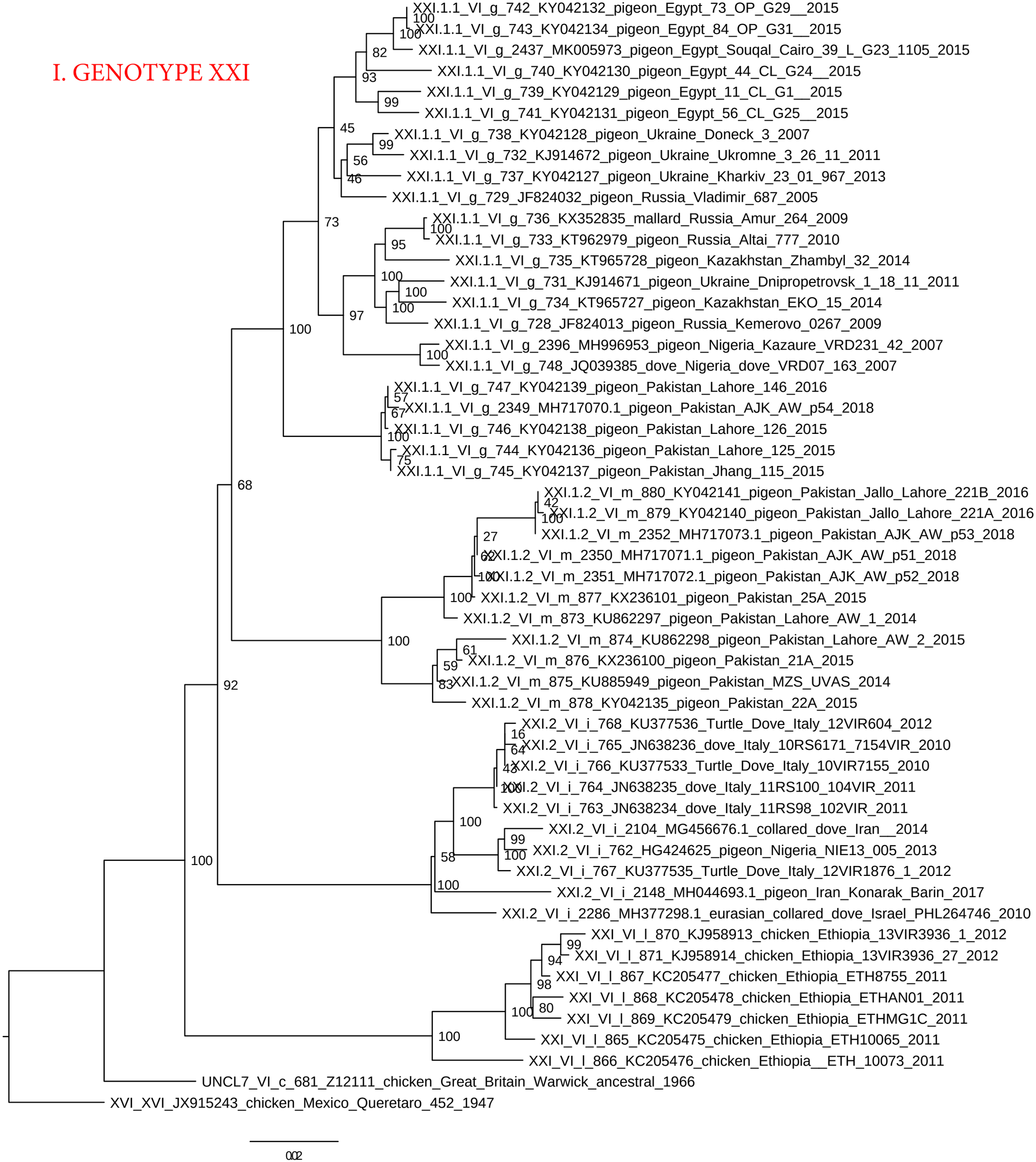


G. GENOTYPE XIV

H. GENOTYPE XVIII



I. GENOTYPE XXI



Supplemental Fig. S8. Step-by-step guidelines of settings for building Maximum likelihood trees using the CIPRES Science Gateway (provided as screenshots from http://www.phylo.org).

CIPRES SCIENCE GATEWAY

XSEDE
Extreme Science and Engineering Discovery Environment

CIPRES Home Toolkit My Profile Help How to Cite Us XSEDE Status Logout

Folders

Total Storage: 62 MB

CLASS II
- **Data (3)**
- **Tasks (5)**

Create new task

Task Summary | Select Data | Select Tool | Set Parameters

RAxML-HPC v.8 on XSEDE: NEW Interface! Phylogenetic tree inference using maximum likelihood/rapid bootstrapping run on XSEDE (Alexandros Stamatakis)

Simple Parameters

Maximum Hours to Run (click here for help setting this correctly) * 5

Set a name for output files (-n) tree

Enable ML searches under CAT (-F) ☐

Outgroup (-o) ()one or more comma-separated outgroups, see comment for syntax)

Specify the number of distinct rate categories (-c) *

Disable Rate Heterogeneity (-V) * ☐

Supply a tree (Not available when doing rapid bootstrapping, -x) (-t)

Specify a random seed value for parsimony inferences (-p) * ☑

Enter a random seed value for parsimony inferences (-p "value" gives reproducible results from random starting tree) * 456

Specify an initial rearrangement setting (-i) * ☐

Specify the distance from original pruning point (-i) *

Constraint (-g)

Binary Backbone (-r)

Use a mixed/partitioned model? (-q)

Estimate individual per-partition branch lengths (-M) * ☐

Estimate proportion of invariable sites (GTRGAMMA + I) ○ **no** ◉ **yes**

Choose an input file that excludes the range of positions specifed in this file (-E)

Weight characters as specifed in this file (-a)

Disable checking for sequences with no values (-O) ☐

Print output files that can be parsed by Mesquite. (-mesquite) ☐

Advanced Parameters

Please select the Data Type * Nucleotide

Nucleic Acid Options

Choose model for bootstrapping phase [Not Mandatory] GTRCAT GTRGAMMA

Evaluate DNA partitions only under this model [Not Mandatory] HKY85 K80 JC69

Protein Analysis Options

Choose GAMMA or CAT model: + Protein GAMMA Protein CAT

Protein Substitution Matrix + DAYHOFF

Upload a Custom Protein Substitution Matrix (-P)

Use a Partition file that specifies AA Matrices

Select the First Protein Substitution Matrix Called in Your Partition File

Select the Second Protein Substitution Matrix Called in Your Partition File

Select the Third Protein Substitution Matrix Called in Your Partition File

Select the Fourth Protein Substitution Matrix Called in Your Partition File

Select the Fifth Protein Substitution Matrix Called in Your Partition File

Use empirical frequencies? [F] No Yes

Make an ML estimate of frequencies [X] No Yes

RNA Secondary Structure Options

Upload a Secondary Structure File (-S)

Use an RNA Secondary Structure Substitution Model (-A) + Six State Model A

Binary Matrix Options

Binary data model (-m) + Binary CAT Binary GAMMA

Multiple State Morphological Matrix Options

Multiple State Data Model (-m) + Multi-state CAT Multi-state GAMMA

Select a Multiple state data model (-K) + Ordered MK GTR

Configure the Analysis

Select the Analysis Type * Rapid bootstrap analysis / search for best-scoring ML tree (-f a)

Specify the number alternative runs on distinct starting trees? (-N) +

Enter number of number alternative runs (-N) +

File with topologies for bipartitions (-z)

Don't use BFGS searching algorithm (--no-bfgs)

Write intermediate tree files to a file (-j)

Use ML search convergence criterion. (-D)

Specify majority rule consensus tree (-J) technique + Majority rule

Ascertainment Bias Confguration

Correct for Ascertainment bias (ASC_) no yes

Ascertainment bias correction type (--asc-corr) [Not Mandatory] Lewis Felsenstein Stamatakis

Choose Ascertainment bias correction file 1 (will be named p1.txt) +

Choose Ascertainment bias correction file 2 (will be named p2.txt) +

Choose Ascertainment bias correction file 3 (will be named p3.txt) +

Choose Ascertainment bias correction file 4 (will be named p4.txt) +

Choose Ascertainment bias correction file 5 (will be named p5.txt) +

Choose Ascertainment bias correction file 6 (will be named p6.txt) +

Configure more memory

I have a data set that may require more than 20 GB of memory +

Enter the number of patterns in your dataset

Enter the number of taxa in your dataset

Configure Bootstrapping

Choose a Bootstrapping Type **No Bootstrapping** **Non-parametric Boostrapping (-b)** **Rapid Bootstrapping (-x)**

Enter a random seed value for bootstrapping + 12345

Print branch lengths (-k)

Specify bootstrap protocol + **Specify an explicit number of bootstraps** **Let RaxML halt bootstrapping automatically**

Bootstrap iterations (-N) + 1000

Select Bootstopping Criterion: (autoMRE is recommended)

Select the criterion for a posteriori bootstopping analysis (-I) + autoFC

File with topologies for a posteriori bootstopping (-z)

Save Parameters Reset Cancel

Advanced Help

Supplemental Table S1. Complete fusion gene curated dataset of class I NDV used in this study. The green shading represents congruence between trees. Red font represents lack of branch support at the defining node. The naming in bold font (ML naming) is according to the nomenclature suggested in this study. The dataset contains 284 sequences and was used to build the trees depicted in Supplemental Fig. S4 A-C.

red font = lack of branch support									
bold font = naming based on the criteria accepted in this study									
green shading = congruence between trees									
Based on Diel et al. 2012	**Sub/genotypes based on the new classification and nomenclature system**								
Genotype	**NJ**	**ML**	**BAYES**	**ID**	**Acc. Number**	**Host**	**Country**	**Isolate**	**Year**
1a	1.1.1	**1.1.1**	1.1.1	1	FJ487637	duck	China	08_004	2008
1a	1.1.1	**1.1.1**	1.1.1	2	GQ245777	chicken	China	XZ_35	2007
1a	1.1.1	**1.1.1**	1.1.1	3	FJ597582	duck	China	JS_1	2007
1a	1.1.1	**1.1.1**	1.1.1	4	FJ597583	duck	China	JS_2	2007
1a	1.1.1	**1.1.1**	1.1.1	5	FJ597584	duck	China	JS_16	2005
1a	1.1.1	**1.1.1**	1.1.1	6	FJ597588	duck	China	JS_17	2006
1a	1.1.1	**1.1.1**	1.1.1	7	FJ597589	duck	China	JS_18	2005
1a	1.1.1	**1.1.1**	1.1.1	8	FJ597600	duck	China	ZJ_30	2005
1a	1.1.1	**1.1.1**	1.1.1	9	FJ597601	duck	China	ZJ_31	2005
1a	1.1.1	**1.1.1**	1.1.1	10	HQ398778	chicken	China	08_038	2008
1a	1.1.1	**1.1.1**	1.1.1	11	HQ398794	chicken	China	09_020	2009
1a	1.1.1	**1.1.1**	1.1.1	13	HQ398799	chicken	China	09_031	2009
1a	1.1.1	**1.1.1**	1.1.1	14	HQ398801	duck	China	09_042	2009
1a	1.1.1	**1.1.1**	1.1.1	15	HQ398802	chicken	China	09_043	2009
1a	1.1.1	**1.1.1**	1.1.1	16	HQ398803	chicken	China	09_044	2009
1a	1.1.1	**1.1.1**	1.1.1	18	HQ398805	chicken	China	09_047	2009
1a	1.1.1	**1.1.1**	1.1.1	20	HQ398807.1	duck	China	09_049	2009
1a	1.1.1	**1.1.1**	1.1.1	22	HQ398809	duck	China	09_052	2009
1a	1.1.1	**1.1.1**	1.1.1	23	HQ398810	duck	China	09_053	2009
1a	1.1.1	**1.1.1**	1.1.1	25	HQ398813	duck	China	09_056	2009
1a	1.1.1	**1.1.1**	1.1.1	26	HQ398814	duck	China	09_057	2009
1a	1.1.1	**1.1.1**	1.1.1	27	HQ997380	duck	China	10_011	2010
1a	1.1.1	**1.1.1**	1.1.1	29	HQ997387	chicken	China	10_064	2010
1a	1.1.1	**1.1.1**	1.1.1	30	HQ997388	chicken	China	10_067	2010

1a	1.1.1	**1.1.1**	1.1.1	33	HQ997397	chicken	China	10_089	2010
1a	1.1.1	**1.1.1**	1.1.1	34	JN688862.1	chicken	China	JS_09	2009
1a	1.1.1	**1.1.1**	1.1.1	35	JN688864.1	duck	China	AH_10	2010
1a	1.1.1	**1.1.1**	1.1.1	36	JN688865.1	goose	China	JS_09	2009
1b	1.1.2	**1.1.2**	1.1.2	37	HQ398788	duck	China	09_014	2009
1b	1.1.2	**1.1.2**	1.1.2	43	HQ398795	chicken	China	09_022	2009
1b	1.1.2	**1.1.2**	1.1.2	44	HQ997378	duck	China	10_005	2010
1b	1.1.2	**1.1.2**	1.1.2	45	HQ997379	duck	China	10_006	2010
1b	1.1.2	**1.1.2**	1.1.2	46	HQ997382	chicken	China	10_059	2010
1b	1.1.2	**1.1.2**	1.1.2	47	HQ997383	duck	China	10_060	2010
1b	1.1.2	**1.1.2**	1.1.2	51	HQ997389	chicken	China	10_069	2010
1b	1.1.2	**1.1.2**	1.1.2	52	HQ997390	chicken	China	10_072	2010
1b	1.1.2	**1.1.2**	1.1.2	53	HQ997391	chicken	China	10_079	2010
1b	1.1.2	**1.1.2**	1.1.2	54	HQ997392	chicken	China	10_083	2010
1b	1.1.2	**1.1.2**	1.1.2	55	HQ997393	chicken	China	10_084	2010
1b	1.1.2	**1.1.2**	1.1.2	56	HQ997394	chicken	China	10_085	2010
1b	1.1.2	**1.1.2**	1.1.2	57	HQ997398	chicken	China	10_090	2010
1b	1.1.2	**1.1.2**	1.1.2	58	AB858995.1	duck	China	J17_13	2013
1b	1.1.2	**1.1.2**	1.1.2	59	AB858996.1	duck	China	J72_13	2013
1b	1.1.2	**1.1.2**	1.1.2	60	AB858997.1	duck	China	J55_13	2013
1b	1.1.2	**1.1.2**	1.1.2	61	AB858998.1	duck	China	J77_13	2013
1b	1.1.2	**1.1.2**	1.1.2	62	AB858999.1	duck	China	J80_13	2013
1b	1.1.2	**1.1.2**	1.1.2	63	AB859000.1	chicken	China	J36_13	2013
1b	1.1.2	**1.1.2**	1.1.2	64	AB859001.1	duck	China	J70_13	2013
1b	1.1.2	**1.1.2**	1.1.2	65	AB859002.1	chicken	China	J2_13	2013
1b	1.1.2	**1.1.2**	1.1.2	66	KJ499462.1	Black_Swan	China	LHLJ_120608	2012
1b	1.1.2	**1.1.2**	1.1.2	67	KJ607171.1	peacock	China	LHLJ_131047	2013
1b	1.1.2	**1.1.2**	1.1.2	68	KM669995.1	egret	China	SD21_13	2013
1b	1.1.2	**1.1.2**	1.1.2	69	KM669996.1	heron	China	SD22_13	2013
1b	1.1.2	**1.1.2**	1.1.2	70	KM885150.1	duck	China	LZJ_068	2011
1b	1.1.2	**1.1.2**	1.1.2	71	KM885151.1	duck	China	LJS_215	2011
1b	1.1.2	**1.1.2**	1.1.2	72	KM885152.1	duck	China	LZJ_067	2011
1b	1.1.2	**1.1.2**	1.1.2	73	KM885153.1	duck	China	LJS_016	2011
1b	1.1.2	**1.1.2**	1.1.2	74	KM885155.1	duck	China	LGX_298	2011
1b	1.1.2	**1.1.2**	1.1.2	75	KM885156.1	duck	China	LFJ_048	2011
1b	1.1.2	**1.1.2**	1.1.2	76	KM885157.1	duck	China	LGD_364	2011
1b	1.1.2	**1.1.2**	1.1.2	78	KM885159.1	duck	China	LFJ_104	2011
1b	1.1.2	**1.1.2**	1.1.2	79	KM885160.1	duck	China	LFJ_027	2011
1b	1.1.2	**1.1.2**	1.1.2	80	KM885161.1	duck	China	LHuB_085	2013
1b	1.1.2	**1.1.2**	1.1.2	81	KM885162.1	duck	China	LGX_280	2013
1b	1.1.2	**1.1.2**	1.1.2	82	KM885163.1	duck	China	LFJ_073	2013

1b	1.1.2	**1.1.2**	1.1.2	84	KM885168.1	duck	China	LGD_358	2011
1b	1.1.2	**1.1.2**	1.1.2	85	HQ398812	duck	China	NDV09_055	2009
1b	1.1.2	**1.1.2**	1.1.2	86	KT223818.1	pigeon	China	Qinghai_01	2014
1b	1.1.2	**1.1.2**	1.1.2	88	KT892746.1	chicken	China	JL_CC02	2015
1b	1.1.2	**1.1.2**	1.1.2	89	KT892748.1	chicken	China	JL_CC03	2014
1b	1.1.2	**1.1.2**	1.1.2	94	KT381589.1	chicken	China	Guangdong_GM307	2014
1b	1.1.2	**1.1.2**	1.1.2	95	KT381588.1	chicken	China	Guangdong_GM3	2013
1b	1.1.2	**1.1.2**	1.1.2	96	KT381587.1	pigeon	China	Guangdong_YF1	2014
1b	1.1.2	**1.1.2**	1.1.2	97	KT381586.1	duck	China	Guangdong_YF827	2014
1b	1.1.2	**1.1.2**	1.1.2	99	KX602322.1	Sheldrake_Duck	China	Guizhou_01	2016
1b	1.1.2	**1.1.2**	1.1.2	100	KX602323.1	Sheldrake_Duck	China	Guizhou_02	2016
1b	1.1.2	**1.1.2**	1.1.2	101	KY788675.1.	Oriental_magpie_robin	China	GD_ZS44	2015
1b	1.1.2	**1.1.2**	1.1.2	102	KY788674.1.	Chinese_bulbul	China	GD_ZS23	2015
1b	1.1.2	**1.1.2**	1.1.2	272	KY776595.1	wild_bird	China	LTL130830	
1b	1.1.2	**1.1.2**	1.1.2	274	MF100763.1	duck	China	D_GD_GZ_817_2016	2016
1b	1.1.2	**1.1.2**	1.1.2	276	MF100761.1	pigeon	China	P_GD_HZ_599	2016
1b	1.1.2	**1.1.2**	1.1.2	277	MF100760.1	pigeon	China	P_GD_DG_466	2016
1b	1.1.2	**1.1.2**	1.1.2	278	MF100759.1	pigeon	China	P_GD_GZ_178	2016
1b	1.1.2	**1.1.2**	1.1.2	279	MF100758.1	goose	China	G_GD_DG_571	2016
1b	1.1.2	**1.1.2**	1.1.2	280	MF100757.1	goose	China	G_GD_HZ_460	2016
1b	1.1.2	**1.1.2**	1.1.2	281	MF100756.1	goose	China	G_GD_YF_401	2016
1b	1.1.2	**1.1.2**	1.1.2	282	MF100755.1	goose	China	G_GD_YF_392	2016
1b	1.1.2	**1.1.2**	1.1.2	283	MF100754.1	environment_LBM	China	E_GD_DG_168	2016
1b	1.1.2	**1.1.2**	1.1.2	284	MF100753.1	environment_LBM	China	E_GD_YF_580	2016
1b	1.1.2	**1.1.2**	1.1.2	285	MF100752.1	environment_LBM	China	E_GD_YF_408	2016
1b	1.1.2	**1.1.2**	1.1.2	286	MF100751.1	environment_LBM	China	E_GD_HZ_406	2016
1b	1.1.2	**1.1.2**	1.1.2	287	MF100750.1	environment_LBM	China	E_GD_GZ_402	2016
1b	1.1.2	**1.1.2**	1.1.2	288	MF100749.1	environment_LBM	China	E_GD_DG_12	2016
1b	1.1.2	**1.1.2**	1.1.2	289	MF100748.1	duck	China	D_GD_GZ_825	2016
1b	1.1.2	**1.1.2**	1.1.2	290	MF100747.1	duck	China	D_GD_DG_822	2016
1b	1.1.2	**1.1.2**	1.1.2	291	MF100746.1	duck	China	D_GD_YF_706	2016
1b	1.1.2	**1.1.2**	1.1.2	292	MF100745.1	duck	China	D_GD_YF_458	2016
1b	1.1.2	**1.1.2**	1.1.2	293	MF100744.1	duck	China	D_GD_YF_193	2016
1b	1.1.2	**1.1.2**	1.1.2	294	MF100743.1	duck	China	D_GD_HZ_154	2016
1b	1.1.2	**1.1.2**	1.1.2	295	MF100742.1	chicken	China	C_GD_HZ_140	2016
1b	1.1.2	**1.1.2**	1.1.2	296	MF100741.1	chicken	China	C_GD_GZ_999	2016
1b	1.1.2	**1.1.2**	1.1.2	298	MF100739.1	chicken	China	C_GD_DG_707	2016
1b	1.1.2	**1.1.2**	1.1.2	299	MF100738.1	chicken	China	C_GD_DG_698	2016
1b	1.1.2	**1.1.2**	1.1.2	300	MF100737.1	chicken	China	C_GD_DG_618	2016
1b	1.1.2	**1.1.2**	1.1.2	301	MF100736.1	chicken	China	C_GD_YF_609	2016
1b	1.1.2	**1.1.2**	1.1.2	302	MF100735.1	chicken	China	C_GD_YF_607	2016

1b	1.1.2	**1.1.2**	1.1.2	303	MF100734.1	chicken	China	C_GD_YF_445	2016
1b	1.1.2	**1.1.2**	1.1.2	304	MF100733.1	chicken	China	C_GD_DG_410	2016
1b	1.1.2	**1.1.2**	1.1.2	305	MF100732.1	chicken	China	C_GD_HZ_404	2016
1b	1.1.2	**1.1.2**	1.1.2	306	MF100731.1	chicken	China	C_GD_HZ_398	2016
1b	1.1.2	**1.1.2**	1.1.2	307	MF100730.1	chicken	China	C_GD_HZ_390	2016
1b	1.1.2	**1.1.2**	1.1.2	308	MF100729.1	chicken	China	C_GD_GZ_191	2016
1b	1.1.2	**1.1.2**	1.1.2	309	MF100728.1	chicken	China	C_GD_GZ_150	2016
1b	1.1.2	**1.1.2**	1.1.2	310	MF100727.1	chicken	China	C_GD_GZ_148	2016
1b	1.1.2	**1.1.2**	1.1.2	311	MK122776.1	chicken	China	SC_PT3	2016
1b	1.1.2	**1.1.2**	1.1.2	313	MH274991.1	chicken	China	GX_26	2015
1b	1.1.2	**1.1.2**	1.1.2	314	MH274992.1	chicken	China	GX_65	2015
1b	1.1.2	**1.1.2**	1.1.2	317	MH289953.1	Chicken	China	HN_41M2	2017
1b	1.1.2	**1.1.2**	1.1.2	323	MH289959.1	Chicken	China	HN_53L2	2017
1b	1.1.2	**1.1.2**	1.1.2	324	MH289960.1	Duck	China	JX_56I2	2016
1b	1.1.2	**1.1.2**	1.1.2	327	MH289963.1	Chicken	China	JX_50I2	2016
1b	1.1.2	**1.1.2**	1.1.2	330	MH289966.1	Environment	China	JX_55U	2016
1b	1.1.2	**1.1.2**	1.1.2	334	MH289970.1	Environment	China	JX_43X	2016
1b	1.1.2	**1.1.2**	1.1.2	336	MH289932.1	Chicken	China	HN_6W1	2016
1b	1.1.2	**1.1.2**	1.1.2	348	MH289944.1	Duck	China	JX_69H2	2016
1b	1.1.2	**1.1.2**	1.1.2	350	MH289946.1	Chicken	China	JX_19H2	2016
1b	1.1.2	**1.1.2**	1.1.2	352	MH289948.1	Duck	China	JX_57C2	2016
1b	1.1.2	**1.1.2**	1.1.2	353	MH289949.1	Environment	China	JX_Y94	2016
1b	1.1.2	**1.1.2**	1.1.2	354	MH289950.1	Environment	China	JX_Y95	2016
1b	1.1.2	**1.1.2**	1.1.2	357	MH289913.1	Wild_birds	China	HB_F2B6_2	2017
1b	1.1.2	**1.1.2**	1.1.2	358	MH289914.1	Environment	China	JX_57U	2016
1b	1.1.2	**1.1.2**	1.1.2	361	MH289917.1	Environment	China	JX_13M	2016
1b	1.1.2	**1.1.2**	1.1.2	362	MH289918.1	Environment	China	JX_37U	2016
1b	1.1.2	**1.1.2**	1.1.2	363	MH289919.1	Duck	China	JX_Y82	2016
1b	1.1.2	**1.1.2**	1.1.2	364	MH289920.1	Environment	China	JX_Y98	2016
1b	1.1.2	**1.1.2**	1.1.2	365	MH289921.1	Duck	China	JX_57A2	2016
1b	1.1.2	**1.1.2**	1.1.2	366	MH289922.1	Duck	China	HN_K86	2017
1b	1.1.2	**1.1.2**	1.1.2	374	MH289930.1	Chicken	China	HN_K200	2017
1b	1.1.2	**1.1.2**	1.1.2	377	MH289893.1	Environment	China	HN_79S	2016
1b	1.1.2	**1.1.2**	1.1.2	378	MH289894.1	Chicken	China	HN_Y15	2016
1b	1.1.2	**1.1.2**	1.1.2	382	MH289898.1	Environment	China	HN_K67	2017
1b	1.1.2	**1.1.2**	1.1.2	383	MH289899.1	Environment	China	JX_47X	2016
1b	1.1.2	**1.1.2**	1.1.2	385	MH289901.1	Environment	China	JX_108G2	2017
1b	1.1.2	**1.1.2**	1.1.2	389	MH289905.1	Chicken	China	JX_82G2	2017
1b	1.1.2	**1.1.2**	1.1.2	392	MH289908.1	Chicken	China	JX_30F2	2017
1b	1.1.2	**1.1.2**	1.1.2	394	MH289910.1	Chicken	China	HN_19B2	2016
1b	1.1.2	**1.1.2**	1.1.2	397	MH289873.1	Environment	China	JX_192X	2016

1b	1.1.2	**1.1.2**	1.1.2	398	MH289874.1	Environment	China	HN_74W	2016
1b	1.1.2	**1.1.2**	1.1.2	399	MH289875.1	Chicken	China	HN_15W1	2016
1b	1.1.2	**1.1.2**	1.1.2	400	MH289876.1	Environment	China	HN_54S	2016
1b	1.1.2	**1.1.2**	1.1.2	402	MH289878.1	Chicken	China	HN_73V1	2016
1b	1.1.2	**1.1.2**	1.1.2	403	MH289879.1	Chicken	China	HN_Y10	2016
1b	1.1.2	**1.1.2**	1.1.2	405	MH289881.1	Environment	China	HN_78T	2016
1b	1.1.2	**1.1.2**	1.1.2	406	MH289882.1	Chicken	China	HN_91N	2016
1b	1.1.2	**1.1.2**	1.1.2	409	MH289885.1	Environment	China	HN_49S	2016
1b	1.1.2	**1.1.2**	1.1.2	414	MH289890.1	Environment	China	HN_89S	2016
1b	1.1.2	**1.1.2**	1.1.2	417	MH289856.1	Environment	China	HN_35S	2016
1b	1.1.2	**1.1.2**	1.1.2	418	MH289857.1	Goose	China	HN_20S	2016
1b	1.1.2	**1.1.2**	1.1.2	419	MH289858.1	Chicken	China	HN_50W1	2016
1b	1.1.2	**1.1.2**	1.1.2	422	MH289861.1	Duck	China	HN_67B2	2016
1b	1.1.2	**1.1.2**	1.1.2	423	MH289862.1	Chicken	China	JX_16I2	2016
1b	1.1.2	**1.1.2**	1.1.2	425	MH289864.1	Chicken	China	HN_94N	2016
1b	1.1.2	**1.1.2**	1.1.2	428	MH289867.1	Chicken	China	HN_54L2	2017
1b	1.1.2	**1.1.2**	1.1.2	429	MH289868.1	Chicken	China	JX_28A2	2016
1b	1.1.2	**1.1.2**	1.1.2	430	MH289869.1	Anser_fabalis	China	HN_F2_95_1	2016
1b	1.1.2	**1.1.2**	1.1.2	431	MH289870.1	Chicken	China	HN_6T	2016
1c	1.2	**1.2**	1.2	104	FJ597580	duck	China	ZJ_1	2002
1c	1.2	**1.2**	1.2	105	FJ597581	duck	China	ZJ_3	2002
1c	1.2	**1.2**	1.2	106	FJ597585	duck	China	AH_10	2006
1c	1.2	**1.2**	1.2	107	FJ597586	duck	China	FJ_2	2002
1c	1.2	**1.2**	1.2	108	FJ597587	duck	China	JS_9	2006
1c	1.2	**1.2**	1.2	109	HQ008337	duck	China	JS10	2010
1c	1.2	**1.2**	1.2	110	HQ398777	duck	China	08_037	2008
1c	1.2	**1.2**	1.2	112	HQ398780	duck	China	08_044	2008
1c	1.2	**1.2**	1.2	121	HQ412767	duck	China	08_046	2008
1c	1.2	**1.2**	1.2	122	JF893453	duck	China	JX07	2007
1c	1.2	**1.2**	1.2	123	JX844030.1	mallard	Finland	9147	2010
1c	1.2	**1.2**	1.2	124	AY034801.2	mallard	Finland		1997
1c	1.2	**1.2**	1.2	125	EU493451.2	teal	Finland	12104	2006
1c	1.2	**1.2**	1.2	126	EU493454.2	pochard	Finland	13193	2006
1c	1.2	**1.2**	1.2	127	KC503412.1	duck	Japan	10UO0343	2010
1c	1.2	**1.2**	1.2	128	KC503483.1	Slaty_backed_Gull	Russia	543FFNK15	2007
1c	1.2	**1.2**	1.2	131	KF361507.1	mallard	China	Jilin	2011
1c	1.2	**1.2**	1.2	132	AB871656.1	duck	Japan	Tottori_453	2009
1c	1.2	**1.2**	1.2	133	AB871657.1	duck	Japan	Tottori_481	2009
1c	1.2	**1.2**	1.2	134	KU366517.1	shelduck	Kazakhstan	Chokpak_5717	2013
1c	1.2	**1.2**	1.2	135	DQ097393	duck	Germany	DER49_99	1999
1d	1.2	**1.2**	1.2	136	AY626266	duck	USA	119535_1	2001

1d	1.2	**1.2**	1.2	137	AY626267	duck	USA	154979_1	2001
1d	1.2	**1.2**	1.2	138	AY626268	chicken	USA	101250_2	2001
1d	1.2	**1.2**	1.2	139	EF612277	Northern_Pintail	AK_USA	196	1998
1d	1.2	**1.2**	1.2	140	EF564813	Green_winged_Teal	AK_USA	176	1998
1d	1.2	**1.2**	1.2	143	EF564819	red_knot	DE_USA	2026	2002
1d	1.2	**1.2**	1.2	144	EF564820	mallard	MD_USA	04_125	2004
1d	1.2	**1.2**	1.2	145	EF564822	mallard	MD_USA	04_364	2004
1d	1.2	**1.2**	1.2	146	EF564823	duck	OH_USA	04_612	2004
1d	1.2	**1.2**	1.2	147	EF564825	mallard	MD_USA	02_336	2002
1d	1.2	**1.2**	1.2	148	EF564827	environment	MD_USA	_03_62	2003
1d	1.2	**1.2**	1.2	149	EF564828	mallard	MD_USA	03_808	2003
1d	1.2	**1.2**	1.2	150	EF564829	mallard	MD_USA	01_418	2001
1d	1.2	**1.2**	1.2	151	EF564830	Ruddy_Turnstone	MD_USA	01_523	2001
1d	1.2	**1.2**	1.2	152	JN942004.1		NJ_USA	13890_2	2010
1d	1.2	**1.2**	1.2	153	JN942005.1	muscovy_duck	PA_USA	10145	2010
1d	1.2	**1.2**	1.2	154	JN942006.1		NJ_USA	32796_2	2009
1d	1.2	**1.2**	1.2	155	JN942007.1		PA_USA	33250	2009
1d	1.2	**1.2**	1.2	156	JN942008.1	chicken	FL_USA	31670_4	2009
1d	1.2	**1.2**	1.2	157	JN942009.1	mallard	CT_USA	7847_2	2009
1d	1.2	**1.2**	1.2	158	JN942010.1	Northern_Pintail	MI_USA	28171_16	2009
1d	1.2	**1.2**	1.2	159	JN942011.1	raptor	MN_USA	18575_1	2009
1d	1.2	**1.2**	1.2	160	JN942012.1	mallard	WI_USA	22853	2009
1d	1.2	**1.2**	1.2	161	JN942015.1	mallard	OH_USA	2080_2	2008
1d	1.2	**1.2**	1.2	162	JN941987.1	Northern_Pintail	ID_USA	19663_2	2009
1d	1.2	**1.2**	1.2	163	KC503424.1	Northern_Pintail	AK_USA	44339_630	2007
1d	1.2	**1.2**	1.2	165	KC503426.1	Northern_Pintail	AK_USA	44339_819	2007
1d	1.2	**1.2**	1.2	167	KC503428.1	Northern_Pintail	AK_USA	44339_832	2007
1d	1.2	**1.2**	1.2	168	KC503429.1	Northern_Pintail	AK_USA	44339_835	2007
1d	1.2	**1.2**	1.2	169	KC503430.1	Northern_Pintail	AK_USA	44340_136	2007
1d	1.2	**1.2**	1.2	174	KC503435.1	Great_White_fronted_Goose	AK_USA	44398_192	2008
1d	1.2	**1.2**	1.2	175	KC503436.1	Northern_Pintail	AK_USA	44419_059	2008
1d	1.2	**1.2**	1.2	177	KC503438.1	Northern_Pintail	AK_USA	44420_025	2008
1d	1.2	**1.2**	1.2	178	KC503439.1	Northern_Pintail	AK_USA	44420_048	2008
1d	1.2	**1.2**	1.2	179	KC503440.1	Northern_Pintail	AK_USA	44420_067	2008
1d	1.2	**1.2**	1.2	181	KC503442.1	Northern_Pintail	AK_USA	44420_080	2008
1d	1.2	**1.2**	1.2	182	KC503443.1	Northern_Pintail	AK_USA	44420_088	2008
1d	1.2	**1.2**	1.2	183	KC503444.1	Northern_Pintail	AK_USA	44420_127	2008
1d	1.2	**1.2**	1.2	185	KC503446.1	American_Green_winged_Teal	AK_USA	44493_409	2009
1d	1.2	**1.2**	1.2	186	KC503448.1	American_Green_winged_Teal	AK_USA	44493_503	2009
1d	1.2	**1.2**	1.2	187	KC503449.1	American_Green_winged_Teal	AK_USA	44493_560	2009
1d	1.2	**1.2**	1.2	188	KC503450.1	Northern_Pintail	AK_USA	44493_701	2009

1d	1.2	**1.2**	1.2	190	KC503456.1	American_Green_winged_Teal	AK_USA	44493_736	2009
1d	1.2	**1.2**	1.2	191	KC503457.1	Northern_Pintail	AK_USA	44493_737	2009
1d	1.2	**1.2**	1.2	194	KC503460.1	American_Green_winged_Teal	AK_USA	44493_751	2009
1d	1.2	**1.2**	1.2	195	KC503461.1	Northern_Pintail	AK_USA	44493_762	2009
1d	1.2	**1.2**	1.2	196	KC503462.1	Northern_Pintail	AK_USA	44493_765	2009
1d	1.2	**1.2**	1.2	197	KC503463.1	Northern_Pintail	AK_USA	44493_773	2009
1d	1.2	**1.2**	1.2	198	KC503464.1	Northern_Pintail	AK_USA	44493_779	2009
1d	1.2	**1.2**	1.2	199	KC503468.1	Northern_Pintail	AK_USA	44493_828	2009
1d	1.2	**1.2**	1.2	200	KC503470.1	Northern_Pintail	AK_USA	44493_865	2009
1d	1.2	**1.2**	1.2	201	KC503472.1	Northern_Pintail	AK_USA	44494_659	2009
1d	1.2	**1.2**	1.2	204	KC503475.1	American_Green_winged_Teal	AK_USA	44494_794	2009
1d	1.2	**1.2**	1.2	205	KF444680.1	Mute_Swan	NJ_USA	1180	2012
1d	1.2	**1.2**	1.2	206	KF444681.1	Mute_Swan	MI_USA	780	2012
1d	1.2	**1.2**	1.2	207	KP780877	mallard	ID_USA	ND0001525	2013
1d	1.2	**1.2**	1.2	208	KP780878	American_Green_winged_Teal	AK_USA	ND0007164	2013
1d	1.2	**1.2**	1.2	211	KX857666	Red_Knot	NJ_USA	AI07_1039	2007
1d	1.2	**1.2**	1.2	213	KX857668	mallard	MN_USA	AI07_3115	2007
1d	1.2	**1.2**	1.2	214	KX857669	Herring_Gull	NJ_USA	AI08_1534	2008
1d	1.2	**1.2**	1.2	215	KX857670	mallard	MN_USA	AI08_2152	2008
1d	1.2	**1.2**	1.2	216	KX857671	Ring_billed_Gull	MN_USA	AI08_2203	2008
1d	1.2	**1.2**	1.2	217	KX857672	Blue_winged_Teal	MN_USA	AI08_2490	2008
1d	1.2	**1.2**	1.2	218	KX857673	American_Green_winged_Teal	MN_USA	AI08_4970	2008
1d	1.2	**1.2**	1.2	219	KX857674	mallard	MN_USA	AI08_4984	2008
1d	1.2	**1.2**	1.2	220	KX857675	Herring_Gull	NJ_USA	AI09_209	2009
1d	1.2	**1.2**	1.2	221	KX857676	Ruddy_Turnstone	DE_USA	AI09_619	2009
1d	1.2	**1.2**	1.2	222	KX857677	Franklins_Gull	MN_USA	AI09_1548	2009
1d	1.2	**1.2**	1.2	223	KX857678	mallard	MN_USA	AI09_2529	2009
1d	1.2	**1.2**	1.2	224	KX857679	American_Green_winged_Teal	MN_USA	AI09_3588	2009
1d	1.2	**1.2**	1.2	225	KX857680	Greater_Black_backed_Gull	NJ_USA	AI10_835	2010
1d	1.2	**1.2**	1.2	226	KX857681	Laughing_Gull	NJ_USA	AI10_991	2010
1d	1.2	**1.2**	1.2	227	KX857682	mallard	MN_USA	AI10_3156	2010
1d	1.2	**1.2**	1.2	228	KX857683	Blue_winged_Teal	LA_USA	AI10_3541	2010
1d	1.2	**1.2**	1.2	229	KX857684	American_Green_winged_Teal	MN_USA	AI10_4299	2010
1d	1.2	**1.2**	1.2	230	KX857685	Blue_winged_Teal	TX_USA	AI10_4457	2010
1d	1.2	**1.2**	1.2	231	KX857686	mallard	NJ_USA	AI10_4506	2010
1d	1.2	**1.2**	1.2	232	KX857687	Ruddy_Turnstone	NJ_USA	AI11_982	2011
1d	1.2	**1.2**	1.2	234	KX857689	mallard	MN_USA	AI11_4744	2011
1d	1.2	**1.2**	1.2	235	KX857690	Gadwall	MN_USA	AI12_3182	2012
1d	1.2	**1.2**	1.2	236	KX857691	mallard	MN_USA	AI12_4502	2012
1d	1.2	**1.2**	1.2	237	KX857692	Ruddy_Turnstone	NJ_USA	AI13_2469	2013
1d	1.2	**1.2**	1.2	238	KX857693	mallard	MN_USA	AI13_3303	2013

1d	1.2	**1.2**	1.2	239	KX857694	Blue_winged_Teal	TX_USA	AI13_3994	2013
1d	1.2	**1.2**	1.2	240	KX857695	Blue_winged_Teal	TX_USA	AI13_4042	2013
1d	1.2	**1.2**	1.2	241	KX857696	Blue_winged_Teal	TX_USA	AI14_2572	2014
1d	1.2	**1.2**	1.2	266	KU748779.1	duck	China	Guangxi_1261	2015
UNCL	UNCL9	**UNCL9**	UNCL9	255	EF564815	dunlin	DE_USA	A100_2093	2000
UNCL	UNCL10	**UNCL10**	UNCL10	256	EF564831	Ruddy_Turnstone	DE_USA	401	2004
UNCL	UNCL11	**UNCL11**	UNCL11	257	KC503417.1	Rred_Knot	AK_USA	44308_062	2007
UNCL	UNCL12	**UNCL12**	UNCL12	261	KC503421.1	Black_Brant	AK_USA	44328_651	2007
UNCL	1.1	**1.2**	1.2	262	EF564824	mallard	MD_USA	02_217	2002
UNCL	1.1	**1.1**	1.1	263	AB524405	goose	AK_USA	415	1991
UNCL	1.1	**1.1**	1.1	264	HQ398796	duck	China	09_026	2009
UNCL	1.1	**1.1**	1.1	265	HQ398797	duck	China	09_027	2009
UNCL	UNCL14	**UNCL14**	UNCL14	267	EF564833	Canada_Goose	OH_USA	OH_87_78	1987
UNCL	UNCL_13	**UNCL_13**	UNCL_13	312	KP123431.2	mute_swan	Macedonia	546	2012

Supplemental Table S2. Complete fusion gene curated dataset of class II NDV used in this study. The green shading represents congruence between trees. Red font represents lack of branch support at the defining node. The naming in bold font (ML naming) is according to the nomenclature suggested in this study. The dataset contains 1672 sequences and was used to build the trees depicted in Supplemental Fig. S5 A-C.

red font = lack of branch support

bold font = naming based on the criteria accepted in this study

green shading = congruence between trees

Based on Diel et al. 2012	**Genotypes based on the new classification and nomenclature system**								
Genotype	**NJ**	**ML**	**BAYES**	**ID**	**Acc. Number**	**Host**	**Country**	**Isolate**	**Year**
I_a	I.1.1	**I.1.1**	I.1.1	36	AF217084	chicken	Australia	Queensland_V_4	1966
I_a	I.1.1	**I.1.1**	I.1.1	38	AY935490	chicken	Australia	02_1334	2002
I_a	I.1.1	**I.1.1**	I.1.1	39	AY935491	chicken	Australia	98_1154	1998
I_a	I.1.1	**I.1.1**	I.1.1	40	AY935492	chicken	Australia	98_1249	1998
I_a	I.1.1	**I.1.1**	I.1.1	41	AY935493	chicken	Australia	98_1252	1998
I_a	I.1.1	**I.1.1**	I.1.1	42	AY935494	chicken	Australia	99_0655	1999
I_a	I.1.1	**I.1.1**	I.1.1	43	AY935495	chicken	Australia	99_0868_hi	1999
I_a	I.1.1	**I.1.1**	I.1.1	44	AY935496	chicken	Australia	99_0868_lo	1999
I_a	I.1.1	**I.1.1**	I.1.1	45	AY935497	chicken	Australia	1997PR_32	1999
I_a	I.1.1	**I.1.1**	I.1.1	46	AY935498	chicken	Australia	99_1435	1999
I_a	I.1.1	**I.1.1**	I.1.1	47	GU332645	chicken	Australia	9809_19_1107	1998
I_a	I.1.1	**I.1.1**	I.1.1	54	M24692	chicken	Australia	D26_76	1999
I_a	I.1.1	**I.1.1**	I	55	M24693	chicken	Australia	Queensland	1966
I_a	I.1.1	**I.1.1**	I.1.1	2135	MG869263.1	chicken	Vietnam	NVNvacI2	2016
I_c	I.2	**I.1.2.1**	I.1.2.1	165	EF564816	redknot	NJ_USA	A_101_1383	2001
I_c	I.2	**I.1.2.1**	I.1.2.1	166	GQ918280	black_headed_gull	Sweden		1994
I_c	I.2	**I.1.2.1**	I.1.2.1	167	KC503478	slaty_backedgull	Japan	9KS_0098	2009
I_c	I.2	**I.1.2.1**	I.1.2.1	172	KX352834	gull	Russia	Tyva_14	2014
I_d	I.1.2.2	**I.1.2.2**	I.1.2.2	174	AB465607	chicken	Japan	Ishi	1962
I_d	I.1.2.2	**I.1.2.2**	I.1.2.2	175	EF564817	ruddyturnstone	DE_USA	492	2002
I_d	I.1.2.2	**I.1.2.2**	I.1.2.2	176	KC503476	northern_pintail	AK_USA	44500_136_	2009

I_d	I.1.2.2	**I.1.2.2**	I.1.2.2	177	KC503479	redpoll	Russia	Nikita_530_FFNK2	2008
I_d	I.1.2.2	**I.1.2.2**	I.1.2.2	178	KX857711	American_green_winged_teal	MN_USA	AI09_3831	2009
I_b	I.1.2.1	**I.2**	I.2	71	AB871655	duck	Japan	Tottori_N12	2006
I_b	I.1.2.1	**I.2**	I.2	72	AY965077	Baikal_teal	Russia	FarEast_3658	2002
I_b	I.1.2.1	**I.2**	I.2	73	AY965078	duck	Russia	FarEast_2686	2001
I_b	I.1.2.1	**I.2**	I.2	74	AY965079	duck	Russia	FarEast_2713	2001
I_b	I.1.2.1	**I.2**	I.2	75	AY972101	Baikal_teal	Russia	FarEast_3652	2002
I_b	I.1.2.1	**I.2**	I.2	76	EF564821	mallard	PA_USA	MD_04_204	2004
I_b	I.1.2.1	**I.2**	I.2	77	FJ597603	duck	China	AH_5	2004
I_b	I.1.2.1	**I.2**	I.2	78	FJ597604	duck	China	AH_6	2004
I_b	I.1.2.1	**I.2**	I.2	79	FJ597605	duck	China	AH_13	2004
I_b	I.1.2.1	**I.2**	I.2	80	FJ597606	duck	China	JS_40	2005
I_b	I.1.2.1	**I.2**	I.2	81	FJ597607	duck	China	JS_41	2005
I_b	I.1.2.1	**I.2**	I.2	82	FJ597608	duck	China	JS_42	2005
I_b	I.1.2.1	**I.2**	I.2	83	FJ597609	duck	China	JS_51	2005
I_b	I.1.2.1	**I.2**	I.2	84	FJ597610	duck	China	JS_53	2005
I_b	I.1.2.1	**I.2**	I.2	85	FJ597611	duck	China	JS_14	2005
I_b	I.1.2.1	**I.2**	I.2	86	FJ597612	duck	China	S15	2005
I_b	I.1.2.1	**I.2**	I.2	87	FJ597613	duck	China	ZJ_1	2004
I_b	I.1.2.1	**I.2**	I.2	88	FJ597614	duck	China	ZJ_2	2004
I_b	I.1.2.1	**I.2**	I.2	89	FJ597615	duck	China	ZJ_3	2004
I_b	I.1.2.1	**I.2**	I.2	90	FJ597616	duck	China	ZJ_50	2005
I_b	I.1.2.1	**I.2**	I.2	91	FJ597617	duck	China	HN_34	2005
I_b	I.1.2.1	**I.2**	I.2	92	FJ597618	duck	China	HN_36	2005
I_b	I.1.2.1	**I.2**	I.2	93	FJ597619	duck	China	HN_37	2005
I_b	I.1.2.1	**I.2**	I.2	94	FJ597620	duck	China	JS_39	2005
I_b	I.1.2.1	**I.2**	I.2	95	FJ600539	mule_duck	China	FJ0801	2008
I_b	I.1.2.1	**I.2**	I.2	96	HE972210	duck	Luxembourg	3785	2007
I_b	I.1.2.1	**I.2**	I.2	97	HE972213	mallard	Luxembourg	4178	2008
I_b	I.1.2.1	**I.2**	I.2	98	HG326605	spur_wingedgoose	Nigeria	NIE08_0121	2008
I_b	I.1.2.1	**I.2**	I.2	99	HG326606	wingedgoose	Nigeria	NIE08_0124	2008
I_b	I.1.2.1	**I.2**	I.2	100	HM063422	feralduck	China	D3_Guang_dong	2007
I_b	I.1.2.1	**I.2**	I.2	101	HM125898	duck	China	WDK_Jiangxi_7793	2004
I_b	I.1.2.1	**I.2**	I.2	102	JN653339	Muscovy_duck	China	M4	2007

I_b	I.1.2.1	**I.2**	I.2	103	JN872169	environment	AK_USA	Pennsylvania_3167	2009
I_b	I.1.2.1	**I.2**	I.2	104	JQ966077	mallard	South_Korea	WB_KU17_08	2008
I_b	I.1.2.1	**I.2**	I.2	105	JQ966078	Eurasian_teal	South_Korea	WB_KU22_1	2007
I_b	I.1.2.1	**I.2**	I.2	106	JQ966082	mallard	South_Korea	WB_KU146	2008
I_b	I.1.2.1	**I.2**	I.2	107	JQ966083	wild_bird	South_Korea	WB_KU164	2009
I_b	I.1.2.1	**I.2**	I.2	108	JQ966084	mallard	South_Korea	WB_KU628	2009
I_b	I.1.2.1	**I.2**	I.2	109	JQ966085	mallard	South_Korea	WB_KU762	2008
I_b	I.1.2.1	**I.2**	I.2	110	JX193077	duck	China	Guangxi16	2008
I_b	I.1.2.1	**I.2**	I.2	111	JX193078	duck	China	Guangxi17	2009
I_b	I.1.2.1	**I.2**	I.2	112	JX193081	duck	China	Guangxi20	2010
I_b	I.1.2.1	**I.2**	I.2	113	JX193083	duck	China	Guangxi22	2010
I_b	I.1.2.1	**I.2**	I.2	114	JX401403	mallard	South_Korea	CBU2249	2007
I_b	I.1.2.1	**I.2**	I.2	115	JX401404	mallard	South_Korea	CBU2179	2007
I_b	I.1.2.1	**I.2**	I.2	116	JX401405	mallard	South_Korea	CBU2374	2007
I_b	I.1.2.1	**I.2**	I.2	117	JX518873	Meller_sduck	Madagascar	MGA057C	2009
I_b	I.1.2.1	**I.2**	I.2	118	JX518874	red_billed_teal	Madagascar	MGA284C	2009
I_b	I.1.2.1	**I.2**	I.2	119	KC503411	northern_pintail	Japan	10EY0020	2010
I_b	I.1.2.1	**I.2**	I.2	120	KC503413	duck	Japan	10UO0501	2010
I_b	I.1.2.1	**I.2**	I.2	121	KC503422	spectacled_eider	AK_USA	AK_44332_723	2007
I_b	I.1.2.1	**I.2**	I.2	122	KC503447	Amer_green_wingedteal	AK_USA	AK_44493_444	2009
I_b	I.1.2.1	**I.2**	I.2	123	KC503453	Amer_green_wingedteal	AK_USA	AK_44493_716	2009
I_b	I.1.2.1	**I.2**	I.2	124	KC503455	northern_pintail	AK_USA	AK_44493_723	2009
I_b	I.1.2.1	**I.2**	I.2	125	KC503467	northern_pintail	AK_USA	AK_44493_801	2009
I_b	I.1.2.1	**I.2**	I.2	126	KC503469	northern_pintail	AK_USA	AK_44493_830	2009
I_b	I.1.2.1	**I.2**	I.2	127	KC503471	american_green_winged_teal	AK_USA	AK_44493_893	2009
I_b	I.1.2.1	**I.2**	I.2	128	KC503481	coot	Russia	538_FFNK10	2007
I_b	I.1.2.1	**I.2**	I.2	129	KC503482	slaty_backedgull	Russia	Nikita_539_FFNK11	2007
I_b	I.1.2.1	**I.2**	I.2	130	KC750151	duck	China	GD_SH	2005
I_b	I.1.2.1	**I.2**	I.2	131	KC750152	duck	China	GD_SZ	2008
I_b	I.1.2.1	**I.2**	I.2	132	KC894391	mallard	China	Jilin	2011
I_b	I.1.2.1	**I.2**	I.2	133	KF851269	teal	Ukraine	Krasnooskilsky_5_11	2009
I_b	I.1.2.1	**I.2**	I.2	134	KF851270	Ruddy_Shelduck	Ukraine	AN_371502_11	2011
I_b	I.1.2.1	**I.2**	I.2	135	KJ920203	mallard	Japan	Yakutiya_852	2011
I_b	I.1.2.1	**I.2**	I.2	136	KM885166	duck	China	LAH_224	2011

I_b	I.1.2.1	**I.2**	I.2	137	KR869090	chicken	China	GX21	2013
I_b	I.1.2.1	**I.2**	I.2	138	KT186351	domestic_duck	South_Korea	DK13	2007
I_b	I.1.2.1	**I.2**	I.2	139	KT380032	chicken	South_Korea	NDRL0901	2010
I_b	I.1.2.1	**I.2**	I.2	140	KT381598	duck	China	Guangdong_GM12	2014
I_b	I.1.2.1	**I.2**	I.2	141	KT381599	duck	China	Guangdong_GZ331	2014
I_b	I.1.2.1	**I.2**	I.2	142	KT892753	swan_goose	China	JL_CC02	2013
I_b	I.1.2.1	**I.2**	I.2	143	KT892754	hooded_crane	China	JL_BC01	2015
I_b	I.1.2.1	**I.2**	I.2	144	KT892755	hooded_crane	China	JL_BC02	2015
I_b	I.1.2.1	**I.2**	I.2	145	KU601398	Common_murre	Russia	Tyuleniy_Island_109	2015
I_b	I.1.2.1	**I.2**	I.2	146	KU662357	Wild_Garganey	Russia	Novosibirsk_27	2014
I_b	I.1.2.1	**I.2**	I.2	147	KX352836	teal	Russia	Novosibirsk_region_320	2010
I_b	I.1.2.1	**I.2**	I.2	148	KX857698	Blue_winged_teal	TX_USA	AI12_3663	2012
I_b	I.1.2.1	**I.2**	I.2	149	KX857699	Mallard	MN_USA	AI12_4078	2012
I_b	I.1.2.1	**I.2**	I.2	150	KX857700	Blue_winged_teal	TX_USA	AI12_4395	2012
I_b	I.1.2.1	**I.2**	I.2	151	KX857701	Blue_winged_teal	LA_USA	AI12_4416	2012
I_b	I.1.2.1	**I.2**	I.2	153	KX857703	Mallard	MN_USA	AI12_4716	2012
I_b	I.1.2.1	**I.2**	I.2	154	KX857704	Mallard	MN_USA	AI12_4867	2012
I_b	I.1.2.1	**I.2**	I.2	155	KX857705	Mallard	MN_USA	AI13_3228	2013
I_b	I.1.2.1	**I.2**	I.2	156	KX857706	Blue_winged_teal	TX_USA	AI13_4119	2013
I_b	I.1.2.1	**I.2**	I.2	157	KX857707	Mallard	MN_USA	AI13_4403	2013
I_b	I.1.2.1	**I.2**	I.2	158	KX857708	Mallard	MN_USA	AI14_3310	2014
I_b	I.1.2.1	**I.2**	I.2	159	KX857709	Mallard	MN_USA	AI14_3452	2014
I_b	I.1.2.1	**I.2**	I.2	160	KX857710	Blue_winged_teal	TX_USA	AI14_3711	2014
I_b	I.1.2.1	**I.2**	I.2	182	AY562991	chicken	Ireland	Ulster	1967
I_b	I.1.2.1	**I.2**	I.2	2064	KX765175.1	duck	China	LH11740	2013
I_b	I.1.2.1	**I.2**	I.2	2065	KX765176.1	duck	China	MH331_7	2011
I_b	I.1.2.1	**I.2**	I.2	2333	MH675922.1	duck	China	D4	2016
I_b	I.1.2.1	**I.2**	I.2	2516	MH289831.1	duck	China	JX_75C2	2016
I_b	I.1.2.1	**I.2**	I.2	2517	MH289832.1	duck	China	JX_2N	2016
I_b	I.1.2.1	**I.2**	I.2	2518	MH289833.1	duck	China	JX_77C2	2016
I_b	I.1.2.1	**I.2**	I.2	2520	MH289835.1	Anser_fabalis	China	HN_F2_110_1	2016
II	II	**II**	II	355	EU289028	turkey	USA	VG_GA	1989
II	II	**II**	II	372	AF077761	chicken	USA	Lasota	1946
II	II	**II**	II	375	GU978777	chicken	USA	TX_GB	1948

II	II	**II**	II	376	JN863121	chicken	USA	New_Jersey_Roakin	1948
II	II	**II**	II	377	JN872151	chicken	USA	Hitchner_B1	1947
II	II	**II**	II	387	KP939087		Mexico	Texcoco_H1_	1950
II	II	**II**	II	388	KP939088	chicken	USA	California_CG_179_H4_	1946
II	II	**II**	II	389	KP939089	chicken	USA	California_11914_FD_H6_	1944
II	II	**II**	II	390	KP939090	chicken	USA	California_119144_NAP_H7_	1944
II	II	**II**	II	391	KP939091	_	USA	Ky_50	1947
II	II	**II**	II	392	KP939092		USA	Ohio_Miller	1948
II	II	**II**	II	393	KP939093		USA	Montana	1946
II	II	**II**	II	394	KP939094		USA	Nebraska_WW1	1955
II	II	**II**	II	395	KP939095	_	USA	Ontario_Berwick	1948
II	II	**II**	II	396	KP939096	_	USA	NJ_KD	1945
II	II	**II**	II	399	KT445901	chicken	Palestine	Komarov	1945
II	II	**II**	II	426	X04719	chicken	USA	Beaudette_C	1945
III	III	**III**	III	428	EF201805	avian		Mukteswar	1940
III	III	**III**	III	432	DQ485259	chicken	china	Guangxi5	2000
III	III	**III**	III	438	GU182327	chicken	Pakistan	SPVC_Karachi_1	1974
III	IX	**III**	III	1668	M24700	_	Australia		1932
III	IX	**III**	III	1669	M24701	chicken	Japan	MIY_51	1951
III	III	**III**	III	1985	MH996904	pigeon	Bulgaria	Novo_Selo_1161	1995
IV	IV	**IV**	IV	444	AY741404	Fowl	UK	Herts	1933
IV	IV	**IV**	IV	445	EU293914	_	Italy	Italien	1944
IV	IV	**IV**	IV	448	MH996898	chicken	Nigeria	Plateau_1973_N53_	1973
IV	IV	**IV**	IV	1969	MH092820	duck	Nigeria	Vom_1980_N55_	1980
IV	IV	**IV**	IV	1977	MH996897	chicken	Nigeria	Kano_N52_899	1973
IV	IV	**IV**	IV	1978	MH996899	chicken	Nigeria	FLD_N54_901	1973
IV	IV	**IV**	IV	1979	MH996900	pullet	Bulgaria	Plovdiv_1153	1959
IV	IV	**IV**	IV	2395	MH996952	chicken	Nigeria	Ibadan_VRD_Ibadan_2	1973
IX	IX	**IX**	IX	1630	AF458009	chicken	China	FJ_1	1985
IX	IX	**IX**	IX	1638	FJ436303	chicken	China	ZJ_1	1986
IX	IX	**IX**	IX	1640	FJ436305	chicken	China	JS_1	1997
IX	IX	**IX**	IX	1661	AY508514	chicken	China	F48E9	1948
IX	IX	**IX**	IX	1663	FJ436302	chicken	China	F48E8	1946_1948
IX	IX	**IX**	IX	1995	MF278924.1	chicken	China	FS_SS_N	1997

UNCL	UNCL1	**UNCL1**	UNCL1	1968	KT987209	chicken	India	TPT_2_AP	2012
UNCL	UNCL2	**UNCL2**	UNCL2	1971	GU187941	chicken	India	Namakkal_Tamil_Nadu	1987
UNCL	UNCL3	**UNCL3**	UNCL3	1972	HQ011508	peacock	India	2K36_Chennai	2008
UNCL	UNCL4	**UNCL4**	UNCL4	1973	KM056353	chicken	India	55_TN_Namakkal	_
VI	UNCL5	**UNCL5**	UNCL5	561	JN872153	chicken	USA	California_1083_Fontana_ancetsral	1971
VI_c	XX	**UNCL6**	UNCL6	680	AB853926	chicken	Japan	Osaka_2440_ancetsral	1969
VI_c	XX	**UNCL7**	UNCL7	681	Z12111	chicken	Great_Britain	Warwick_ancestral	1966
UNCL	UNCL8	**UNCL8**	UNCL8	1963	JX393313	mosquito_pool	Indonesia	JKT1997_ancetsral	1997
V_b	V.2	**V**	V	520	AY562990	Psittacine	USA	Largo	1971
V_b	V.2	**V**	V	521	JN872155	_	USA	Tenn_74_2445_	1974
V_b	V.2	**V**	V	522	JN967789	psittacine	USA	Indiana_29120	1980
V_b	V.2	**V**	V	1982	MH996901	chicken	Bulgaria	ElovDol_1156	1981
V_b	V.2	**V**	V	1983	MH996902	pigeon	Bulgaria	Septemvritsi_1157	1982
V_b	V.2	**V**	V	1984	MH996903	chicken	Bulgaria	Furen_1159	1988
V_b	V.2	**V**	V	526	KF767470	blue_fronted_parrot	Argentina	12567	1976
V_b	V.2	**V**	V	527	KJ123642	chicken	Brazil	SJM_75	1975
V_d	V	**V**	V	551	HG937571	chicken	Uganda	MU013	2011
V_d	V	**V**	V	552	HG937572	chicken	Uganda	MU019	2011
V_d	V	**V**	V	553	HG937573	chicken	Uganda	MU024	2011
V_d	V	**V**	V	554	HG937580	chicken	Uganda	MU040	2011
V_d	V	**V**	V	555	JQ217418	chicken	Kenya	A89	2010
V_d	V	**V**	V	2146	MG988405.1	chicken	Kenya	KE1007	2016
V_b	V.1	**V.1**	V.1	505	AY288999	chicken	Mexico	37821	1996
V_b	V.1	**V.1**	V.1	506	AY562987	gamefowl	USA	CA_211472	2002
V_b	V.1	**V.1**	V.1	507	EF520718	gamefowl	USA_	CA_212676	2002
V_b	V.1	**V.1**	V.1	508	EU518677	chicken	Mexico	Torreon_453	2000
V_b	V.1	**V.1**	V.1	509	EU518680	chicken	Mexico	458	1988
V_b	V.1	**V.1**	V.1	510	EU518681	chicken	Mexico	459	2000
V_b	V.1	**V.1**	V.1	511	JN872189	parrot	USA	Colorado_8278	1982
V_b	V.1	**V.1**	V.1	512	JN872192	chicken	USA	California_211472_4_	2002
V_b	V.1	**V.1**	V.1	513	JN872194	chicken	Honduras	498109_15_	2007
V_b	V.1	**V.1**	V.1	514	JN942028	chicken	Mexico	51735_8_	2000
V_b	V.1	**V.1**	V.1	515	JN942032	Amazon_parrot	USA	Missouri_31378	1996
V_b	V.1	**V.1**	V.1	516	JN942039	Amazon_parrot	USA	California_28936	1988

V_b	V.1	**V.1**	V.1	517	JN942040	parrot	USA	New_Jersey_19674_2	1986
V_b	V.1	**V.1**	V.1	518	JN942042	Amazon_parrot	USA	California_16365	1981
V_b	V.1	**V.1**	V.1	519	JN942045	turkey	Belize	4438_4	2008
V_b	V.1	**V.1**	V.1	528	AY288993	chicken	Honduras	15	2000
V_b	V.1	**V.1**	V.1	529	JN872181	chicken	Honduras	44813	2000
V_b	V.1	**V.1**	V.1	530	JN942027	fighting_cock	Nicaragua	95066_9_	2001
V_c	V.2	**V.2**	V.2	532	EU518682	Dove	Mexico	Distrito_Federal_462	2004
V_c	V.2	**V.2**	V.2	533	EU518683	chicken	Mexico	Estado_de_Mexico_465	2005
V_c	V.2	**V.2**	V.2	534	EU518684	chicken	Mexico	Estado_de_Mexico_466	2006
V_c	V.2	**V.2**	V.2	535	HM117720	chicken	Mexico_Puebla_	NDV_P05	2005
V_c	V.2	**V.2**	V.2	536	JQ697743	chicken	Mexico	MX_NC02_634	2010
V_c	V.2	**V.2**	V.2	537	JQ697744	chicken	Mexico	MX_NC04_635	2010
V_c	V.2	**V.2**	V.2	538	JX974435	chicken	Mexico		2010
V_c	V.2	**V.2**	V.2	539	KC808508	gamefowl	Mexico	616	2008
V_c	V.2	**V.2**	V.2	540	KC808509	gamefowl	Mexico	DF_619	2008
V_c	V.2	**V.2**	V.2	541	KC808510	scarlet_macaw	Mexico	Chiapas_672_ZM12	2009
V_c	V.2	**V.2**	V.2	542	KC808512	quail	Mexico	615	2009
V_c	V.2	**V.2**	V.2	543	KF910963	chicken	Mexico	M08_3313	2008
V_c	V.2	**V.2**	V.2	544	KJ577136	chicken	Mexico	Chimalhuacan	1973
V_c	V.2	**V.2**	V.2	545	KY284094	chicken	Mexico	14_364_14_377	2014
V_c	V.2	**V.2**	V.2	2320	MH392218	chicken	Mexico	NC_23_686	2011
VI_b	VI.1.1	**VI.1**	VI.1	657	AF109885	domestic_fowl	Great_Britain	GB1168	1984
VI_b	VI.1.1	**VI.1**	VI.1	658	AJ880277	pigeon	Italy	IT_227	1982
VI_b	VI.1.1	**VI.1**	VI.1	659	AY734535	pigeon	Argentina	Tigre_6	1999
VI_b	VI.1.1	**VI.1**	VI.1	660	EF520716	pigeon	USA	NY_US	1984
VI_b	VI.1.1	**VI.1**	VI.1	661	FJ410145	pigeon	USA	New_York	1984
VI_b	VI.1.1	**VI.1**	VI.1	662	FJ410147	pigeon	USA	Maryland	1984
VI_b	VI.1.1	**VI.1**	VI.1	663	FJ865434	pigeon	China	S_1	2002
VI_b	VI.1.1	**VI.1**	VI.1	664	JN872173	pigeon	USA	New_York_44407	2007
VI_b	VI.1.1	**VI.1**	VI.1	665	JN967787	pigeon	USA	Illinois_37397	1987
VI_b	VI.1.1	**VI.1**	VI.1	666	JN967788	pigeon	USA	Maryland_11936	1985
VI_b	VI.1.1	**VI.1**	VI.1	667	KU377528	Turtle_Dove	Italy	00VIR4400	2000
VI_b	VI.1.1	**VI.1**	VI.1	668	KU377531	pigeon	Italy	06VIR463_2	2006
VI	VI.2.2	**VI.2.1**	VI.2.1	2188	MH371057.1	pigeon	Israel	PHL137866	2011

VI	VI.2.2	**VI.2.1**	VI.2.1	2222	MH371091.1	pigeon	Israel	PHL133813	2011
VI	VI.2.2	**VI.2.1**	VI.2.1	2235	MH377247.1	pigeon	Israel	PHL37114.2	2008
VI	VI.2.2	**VI.2.1**	VI.2.1	2290	MH377302.1	loughing_dove	Israel	PHL264752	2012
VI	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	556	AY288995	dove	Italy	2736	2000
VI	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	558	GQ429292	pigeon	Ireland	AV324	1996
VI	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	559	GQ429293	Dove	Italy	2736	2000
VI	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	562	JN872183	pigeon	USA	Maryland_2075	1998
VI	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	564	KJ736742	pigeon	Germany	R75_98	1998
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	577	EU477189	pigeon	USA_RI_	RI166	2000
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	578	JN872160	pigeon	USA	Minnesota_511296	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	579	JN872167	dove	USA	FL_455682_2_	2006
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	580	JN872172	raptor	USA	Minnesota_18575_4_	2009
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	581	JN872174	environment	USA	New_Jersey_9564_	2010
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	582	JN872175	pigeon	USA	Minnesota_723_	2009
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	583	JN872176	pheasant	USA	Massachusetts_359425_	2005
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	584	JN872177	chicken	USA	Massachusetts_344783_3_	2004
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	585	JN872190	pigeon	USA	South_Dakota_486839	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	586	JN941996	pigeon	USA	Pennsylvania_2062_	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	587	JN941998	pigeon	USA	Pennsylvania_2282	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	588	JN941999	pigeon	USA	Minnesota_77_	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	589	JN942000	dove	USA	Florida_1287_	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	590	JN942100	chukar	USA	New_Jersey_32429_5	2000
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	591	JX901304	_	USA	301	2003
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	592	JX901305	_	USA	302	2003
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	593	JX901313	pigeon	USA	102	2001
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	594	JX901314	dove	USA	103	2001
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	595	JX901317	pigeon	USA	201	2002
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	596	JX901319	pigeon	USA	PA_0501	2005
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	597	JX901320	pigeon	USA	PA_0502	2005
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	598	JX901321	chicken	USA	PA_0503	2005
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	599	JX901323	pigeon	USA	PA_0601	2006
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	600	JX901324	pigeon	USA	PA_0602	2006
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	601	JX901325	pigeon	USA	NY_0603	2006
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	602	JX901326	pigeon	USA	NJ_0604	2006

VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	603	JX901327	pigeon	USA	PA_0605	2006
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	604	JX901328	pigeon	USA	NJ_0607	2006
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	605	JX901329	pigeon	USA	PA_0701	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	606	JX901330	pigeon	USA	PA_0702	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	607	JX901332	pigeon	USA	MO_0703	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	608	JX901333	pigeon	USA	PA_0704	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	609	JX901334	pigeon	USA	PA_0705	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	610	JX901335	pigeon	USA	PA_0706	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	611	JX901336	pigeon	USA	NC_0707	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	612	JX901337	pigeon	USA	CT_0708	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	613	JX901338	pigeon	USA	OH_0709	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	614	JX901339	pigeon	USA	NJ_0710	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	615	JX901340	pigeon	USA	PA_0711	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	616	JX901344	pigeon	USA	ME_0714	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	617	JX901346	pigeon	USA	PA_0716	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	618	JX901347	pigeon	USA	NY_0717	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	619	JX901348	pigeon	USA	PA_0718	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	620	JX901349	pigeon	USA	MD_0719	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	621	JX901350	pigeon	USA	PA_0720	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	622	JX901351	pigeon	USA	NJ_0721	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	623	JX901352	pigeon	USA	PA_0723	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	624	JX901353	pigeon	USA	PA_0724	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	625	JX901354	pigeon	USA	PA_0725	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	626	JX901355	pigeon	USA	PA_0726	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	627	JX901356	pigeon	USA	PA_0727	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	628	JX901357	pigeon	USA	PA_0728	2007
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	629	JX901358	pigeon	USA	PA_0801	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	630	JX901359	pigeon	USA	PA_0802	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	631	JX901360	pigeon	USA	PA_0803	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	632	JX901361	pigeon	USA	PA_0804	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	633	JX901362	pigeon	USA	PA_0805	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	634	JX901363	pigeon	USA	PA_0806	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	635	JX901364	pigeon	USA	PA_0807	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	636	JX901365	pigeon	USA	PA_0808	2008

VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	637	JX901366	pigeon	USA	PA_0809	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	638	JX901367	pigeon	USA	PA_0810	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	639	JX901368	pigeon	USA	PA_0811	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	640	JX901369	pigeon	USA	NJ_0812	2008
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	641	JX901373	pigeon	USA	PA_0902	2009
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	642	JX901374	pigeon	USA	OH_0903	2009
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	643	JX901375	pigeon	USA	PA_0904	2009
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	644	JX901376	pigeon	USA	PA_0905	2009
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	645	JX901377	pigeon	USA	PA_0906	2009
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	646	KP780870	Rock_pigeon	USA	MD_ND0002270	2013
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	647	KP780871	Rock_pigeon	USA	Allegheny_PA_ND0007190	2013
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	648	KP780872	Rock_pigeon	USA	Allegheny_PA_ND0007186	2013
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	649	KP780873	Rock_pigeon	USA	Allegheny_PA_ND0007187	2013
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	650	KP780874	Rock_pigeon	USA	Allegheny_PA_ND0007199	2013
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	651	KP780875	Rock_pigeon	USA	Ingham_MI_ND0003553	2013
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	652	KP780876	Rock_pigeon	USA	Ingham_MI_ND0003558	2013
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	653	KU059752	Eurasian_collared_dove	USA_TX_	TX3988	2004
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	654	MG018201	RODO	USA_MA	1188_kidney_24998_1G	2014
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	655	MG018202	ECDO	USA_MT	1177_kidney_22919_1_B	2010
VI_a	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	656	MG018218	RODO	USA_PA	1189_kidney_23844_3_C	2012
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	892	EU477188	Dove	USA_Texas_	TX_B_2580	2004
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	893	EU477190	pigeon	USA_Texas_	TX3503	2004
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	894	EU477191	Eurasian_collared_dove	USA_Texas_	TX3988	2005
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	895	EU477192	Eurasian_collared_dove	USA_Texas_	TX4156	2005
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	896	EU477195	Eurasian_collared_dove	USA	TX6295	2006
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	897	JN872170	pigeon	USA	Texas_5254_12	2010
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	898	JN872178	turkey	USA	Louisiana_331309_	2004
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	899	JN872179	pigeon	USA	Nevada_241851_	2003
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	900	JX901342	pigeon	USA	MN_0713	2007
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	901	MG018205	ECDO	USA_TX	1179_kidney_26041_3_C	2014
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	902	MG018206	ECDO	USA_TX	1180_kidney_26041_4_C	2014
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	903	MG018208	ECDO	USA_UT	1181_spleen_26594_1_A	2015
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	904	MG018209	ECDO	USA_TX	1182_spleen_26877_2_C	2016
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	905	MG018210	ECDO	USA_TX	1184_kidney_26981_2_C	2015

VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	906	MG018211	ECDO	USA_TX	1185_kidney_26981_3_A	2015
VI_n	VI.2.2.1	**VI.2.1.1.1**	VI.2.1.1.1	907	MG018213	ECDO	USA_KS	1191_spleen_W16_453_3	2016
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	563	KJ600777	pigeon	China	SD_132	2012
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	786	AY288996	pigeon	Italy	1166	2000
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	787	FJ766527	pigeon	China	JS_16	2007
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	788	GQ281085	pigeon	China	JS_35	2007
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	789	GQ281086	pigeon	China	WX_10	2007
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	790	GQ281087	pigeon	China	YZ_21	2007
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	791	GQ281088	pigeon	China	YZ_23	2007
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	792	GU551934	carrier_pigeon	China	carrier_Guandong	2008
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	793	HE972209	pigeon	Luxemburg	119	2006
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	794	HE972212	pigeon	Luxemburg	3821_1	2007
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	795	HM063423	whitebreasted_water_hen_	China_Guangdong_	W4	2005
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	796	HM063425	wild_pigeon	China_Guangdong_	P4	2003
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	797	HM625835	duck	China	SS	2008
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	798	HM748948	chicken	China	SD5	2008
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	799	JF713701	pigeon	China	SD10	2010
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	800	JN941995	pigeon	USA	New_York_1989_19_	2008
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	802	JN986839	pigeon	Ireland	806	2004
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	803	JQ268609	pigeon	China	Miangyang12505	2011
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	804	JX094510	pigeon	China	sms12	2012
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	805	JX244789	pigeon	China	JM_11	2000
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	806	JX244798	pigeon	China	104	2008
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	807	JX244799	pigeon	China	105	2008
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	808	JX244800	pigeon	China	106	2008
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	809	JX486550	pigeon	China	LGD_110208	2011
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	810	JX486551	pigeon	China	LJL_100605	2010
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	811	JX486553	pigeon	China	LHLJ_110813	2011
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	812	JX486554	pigeon	China	LHLJ_110822	2011
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	813	JX486555	pigeon	China	LGD_110945	2011
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	814	JX486557	pigeon	China	LJL_120404	2012
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	815	JX901109	pigeon	Belgium	238	1998
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	816	JX901110	pigeon	Belgium	248	1998
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	817	JX901111	pigeon	Belgium	321	1998

VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	818	JX901119	pigeon	Belgium	1824	2005
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	819	JX901121	pigeon	Belgium	4943	2007
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	820	KJ525672	pigeon	China	SD_JN	2010
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	821	KM374059	pigeon	China	Guangxi_1015	2013
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	822	KT381595	pigeon	China	Guangdong_GM1	2014
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	823	KT381606	pigeon	China	Guangdong_GZ289	2014
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	824	KU377529	Turtle_Dove	Italy	02VIR1875	2002
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	825	KU377530	Turtle_Dove	Italy	04VIR434	2004
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	826	KU377532	Turtle_Dove	Italy	08VIR24	2008
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	827	KU377534	pigeon	Italy	11VIR5795	2011
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	828	KU377537	pigeon	Italy	14VIR8258_2	2014
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	829	KX247376	pigeon	China	SX_01	2015
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	830	KX761865	pigeon	China	HB1103	2011
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	2056	MF681716.1	dove	Namibia	8636	2016
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	2057	MF681715.1	dove	Namibia	8199	2016
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	2059	MF681713.1	dove	Namibia	7808	2016
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	2060	MF681712.1	dove	Namibia	5072	2016
VI_j	VI.2.2.2.1	**VI.2.1.1.2.1**	VI.2.1.1.2.1	2061	MF681711.1	dove	Namibia	4533	2017
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	834	JN872162	rosella	Belgium	4940	2008
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	835	JQ979176	pigeon	China	SDLC	2011
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	836	JQ993431	pigeon	China	SDS	2011
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	837	JX486552	pigeon	China	LLN_110713	2011
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	838	JX901120	pigeon	Belgium	03936_8_	2005
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	839	JX901122	pigeon	Belgium	11_07574	2011
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	840	JX901123	pigeon	Belgium	11_08304	2011
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	841	JX901124	pigeon	Belgium	11_09620	2011
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	842	KF828884.1	pigeon	China	_BJP13	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	843	KJ607165	pigeon	China	LHLJ_131237	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	844	KJ607166	pigeon	China	LHLJ_131011	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	845	KJ782376	pigeon	China	NM_0707	2011
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	846	KJ808819	pigeon	China	BJ2013	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	847	KM374056	pigeon	China	Yunnan_1111	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	848	KM374057	pigeon	China	Anhui_2365	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	849	KM374058	pigeon	China	Anhui_2369	2012

VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	850	KM374060	pigeon	China	Shanghai_215	2011
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	851	KM374061	pigeon	China	Zhejiang_2036	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	852	KP861633	pigeon	China	SD069	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	853	KT163262	pigeon	China	SH_0167	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	854	KT381592	pigeon	China	Guangdong_GZ293	2014
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	855	KT381601	pigeon	China	Guangdong_GZ287	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	856	KT381602	pigeon	China	Guangdong_GZ288	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	857	KT381603	pigeon	China	Guangdong_GZ290	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	858	KT381604	pigeon	China	Guangdong_GZ292	2014
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	859	KU522142	pigeon	Egypt	VRLCU	2014
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	860	KU527559	pigeon	China	Jilin_DH09	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	861	KU527560	pigeon	China	Jilin_NG05	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	862	KX710210.1	pigeon	India	D168	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	863	KY788663.1.	Grey_heron	China	GD_GZ333	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	864	KY788667.1.	European_turtle_dove	China	GD_GZ23	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2085	MF580815.1	pigeon	China	GX0094	2011
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2086	MF580816.1	pigeon	China	GX0001	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2087	MF580817.1	pigeon	China	GX0012	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2088	MF580818.1	pigeon	China	GX0019	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2089	MF580819.1	pigeon	China	GX0022	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2090	MF580820.1	pigeon	China	GX0029	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2092	MF580822.1	pigeon	China	GX0034	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2093	MF580823.1	pigeon	China	GX0505	2012
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2094	MF580824.1	pigeon	China	GX0004	2013
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2095	MF580825.1	pigeon	China	GX0119	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2096	MF580826.1	pigeon	China	GX0126	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2097	MF580827.1	pigeon	China	GX1103	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2472	MG840651.1	environment	China	Hubei_HD240	2017
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2473	MG840652.1	pigeon	China	Fujian_1233	2014
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2474	MG840653.1	pigeon	China	Guizhou_1050	2017
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2475	MG840654.1	pigeon	China	Ningxia_2068	2016
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2476	MG840655.1	pigeon	China	Qinghai_1325	2017
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2477	MG840656.1	pigeon	China	Qinghai_1344	2017
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2478	MG840657.1	pigeon	China	Sichuan_2045	2014

VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2479	MG840658.1	pigeon	China	Yunnan_1205	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2480	MG840659.1	pigeon	China	Yunnan_1336	2015
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2481	MG840660.1	pigeon	China	Yunnan_1453	2017
VI_k	VI.2.2.2.2	**VI.2.1.1.2.2**	VI.2.1.1.2.2	2488	MG878084.1	pigeon	China	LN	2017
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	750	HG326601	pigeon	Nigeria	NIE07_061	2007
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	751	HG326602	pigeon	Nigeria	NIE07_062	2007
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	752	HG326603	pigeon	Nigeria	NIE07_063	2007
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	753	HG326604	pigeon	Nigeria	NIE09_1898	2009
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	755	JX518532	laughing_dove	Kenya	B2_Isiolo	2012
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	757	HG424627	pigeon	Nigeria	NIE13_092	2013
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	758	JQ039387	pigeon	Nigeria	VRD08_37BRpe_7_9_	2008
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	759	JQ039391	pigeon	Nigeria	VRD07_231	2007
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	760	AY734536	pigeon	Argentina	Capital_3	1997
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	2021	KX097024.1	pigeon	Brazil	N1065_14	2014
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	2363	MH996920	quail	Nigeria	VRD08_385_N23	2008
VI_h	VI.2.1	**VI.2.1.2**	VI.2.1.2	2435	MH996992	pigeon	Nigeria	Alaba_rago_VRD32_15_32	2015
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	706	JN872180	waterfowl	USA	Texas_209682_	2002
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	707	JN872182	pigeon	USA	New_York_12339	1998
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	708	JN942095	pigeon	USA	Oklahoma_7668_1997_	1997
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	709	JN942098	pigeon	USA	North_Carolina_56404_	2000
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	710	JN942099	gannet	USA	Pennsylvania_25017_	2000
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	711	JN967786	pigeon	USA	New_Jersey_58300_4_	2000
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	712	JX901312	pigeon	USA	101	2001
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	713	JX901318	duck	USA	PA_0203	2002
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	714	JX901341	pigeon	USA	PA_0712	2007
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	715	JN872187	pigeon	USA	Illinois_11748	1993
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	716	JN872185	pigeon	USA	New_York_32851_2	1984
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	717	JN872186	pigeon	USA	Indiana_18002	1991
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	718	JN872188	pigeon	USA	Minnesota_2446	1989
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	719	FJ410148	pigeon	USA	Texas	1998
VI_f	VI.1.2.1	**VI.2.2.1**	VI.2.2.1	721	JN942022	chicken	USA	Texas_309968	2004
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	689	AY325798	pigeon	China	YN_P1	_
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	690	DQ417113	pigeon	China	Beijing_PB01_STP	1996
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	691	FJ480825	pigeon	China	PG_JS_1	2005

VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	692	FJ480826	pigeon	China	PG_JS_1	2006
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	693	FJ766528	pigeon	China	05_029	2005
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	694	GQ338311	_	China	28	2005
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	695	JQ290284	pigeon	China	Anhui_1	2009
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	696	JX244794	pigeon	China	100	2008
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	697	JX244801	pigeon	China	107	2008
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	698	JX244803	pigeon	China	110	2008
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	699	JX244805	pigeon	China	112	2008
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	700	KJ607163	pigeon	China	LJS_1	2004
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	701	KJ607164	pigeon	China	LJS_1	2003
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	702	KJ808820	pigeon	China	SD	2012
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	703	KT381596	pigeon	China	Guangdong_GM8	2013
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	704	KX710209.1	pigeon	India	D167	2015
VI_e	VI.1.2.2	**VI.2.2.2**	VI.2.2.2	705	AF358785	pigeon	China	98_1	1998
VII	VII	**VII**	VII	913	U62620	chicken	Taiwan		1995
VII_b	VII.1.1	**VII.1.1**	VII.1.1	933	AF456443	goose	China	JS_9_01_Go	2001
VII_b	VII.1.1	**VII.1.1**	VII.1.1	935	DQ227247	chicken	China	Shandong_SDD	2001
VII_b	VII.1.1	**VII.1.1**	VII.1.1	936	DQ227249	chicken	China	Shandong_SQD	2004
VII_b	VII.1.1	**VII.1.1**	VII.1.1	937	DQ228922	chicken	China	Shandong_SL	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	938	DQ363530	chicken	China	Shandong_WHZ	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	939	DQ363533	chicken	China	Shandong_SCL	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	941	DQ485231	chicken	China	Guangxi_11	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	942	DQ485261	chicken	China	Guangxi10	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	943	DQ485271	chicken	China	Guangxi14	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	944	DQ485274	dove	China	Guangxi15	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	945	DQ486859	chicken	China	GM	2001
VII_b	VII.1.1	**VII.1.1**	VII.1.1	946	EF211814	goose	China	JS_8	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	947	EF589132	fightcock	China	DQ_Guizhou_	_
VII_b	VII.1.1	**VII.1.1**	VII.1.1	948	EF589133	pheasant	China	98_Guizhou	1998
VII_b	VII.1.1	**VII.1.1**	VII.1.1	949	EF592500	mandarin_duck	China	HLJ_07	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	950	EF592501	mandarin_duck	China	HLJ_34	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	951	EF592503	mandarin_duck	China	HLJ_42	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	952	EF592505	mallard	China	HLJ_50	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	953	EF592506	mandarin_duck	China	HLJ_54	2006

VII_b	VII.1.1	**VII.1.1**	VII.1.1	954	EF592507	whitefronted_goose	China	HLJ_75	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	955	EF592509	common_teal_	China	HLJ_82	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	956	EF592510	mallard	China	HLJ_154	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	957	EU258658	chicken	China	20252	2002
VII_b	VII.1.1	**VII.1.1**	VII.1.1	958	EU258661	chicken	China	22433	2002
VII_b	VII.1.1	**VII.1.1**	VII.1.1	959	EU258662	chicken	China	22435	2002
VII_b	VII.1.1	**VII.1.1**	VII.1.1	960	FJ480774	rough_legged_buzzard	China	HLJ009	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	961	FJ480775	longearde_owl	China	HLJ012	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	962	FJ480776	rough_legged_buzzard	China	HLJ013	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	963	FJ480779	Japanese_sparrowhawk	China	AG_HLJ070	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	964	FJ480780	mallard	China	HLJ127	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	965	FJ480781	mallard	China	HLJ128	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	966	FJ480782	mallard	China	HLJ355	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	967	FJ480784	mallard	China	HLJ363	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	968	FJ480785	mallard	China	HLJ374	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	969	FJ480787	mallard	China	HLJ016	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	970	FJ480789	chicken	China	GD_1	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	971	FJ480796	chicken	China	HN_1	2001
VII_b	VII.1.1	**VII.1.1**	VII.1.1	972	FJ480797	chicken	China	HN_1	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	973	FJ480800	chicken	China	JL_1	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	974	FJ480801	chicken	China	JL_1	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	975	FJ480802	chicken	China	JL_1	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	976	FJ480803	chicken	China	JL_2	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	977	FJ480804	chicken	China	JL_2	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	978	FJ480805	chicken	China	JL_3	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	979	FJ480807	chicken	China	JL_5	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	980	FJ480820	chicken	China	SHX_1	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	981	FJ608335	chicken	China	CJG_Xinjiang_07	2007
VII_b	VII.1.1	**VII.1.1**	VII.1.1	982	FJ608338	chicken	China	SH_Zhejiang	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	984	FJ608348	chicken	China	TCQQ_Tianjin	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	985	FJ608350	chicken	China	DFGS_Beijing	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	986	FJ754271	chicken	China	WF00C	2000
VII_b	VII.1.1	**VII.1.1**	VII.1.1	987	FJ882015	chicken	China	HG_Beijing	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	988	GQ245796	chicken	China	AH_2	2008

VII_b	VII.1.1	**VII.1.1**	VII.1.1	989	GQ245797	chicken	China	AN_11	2007
VII_b	VII.1.1	**VII.1.1**	VII.1.1	990	GQ245798	chicken	China	CZ_10	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	991	GQ245799	chicken	China	HN_7_06	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	992	GQ245800	goose	China	JS_18	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	993	GQ245801	pigeon	China	SD_15	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	994	GQ245802	chicken	China	SN_6	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	995	GQ245803	chicken	China	SN_19	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	996	GQ245804	chicken	China	SN_20	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	997	GQ245805	chicken	China	SY_1	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	998	GQ245806	chicken	China	XY_11	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	999	GQ245807	chicken	China	XY_14	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1000	GQ245808	chicken	China	XY_31	2007
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1001	GQ245809	chicken	China	XZ_5	2007
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1002	GQ245810	chicken	China	XZ_7	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1003	GQ245811	chicken	China	XZ_8	2007
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1004	GQ245812	chicken	China	XZ_9	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1005	GQ245813	chicken	China	XZ_12	2007
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1006	GQ245814	chicken	China	XZ_12	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1007	GQ245815	chicken	China	XZ_13	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1008	GQ245816	chicken	China	XZ_16	2007
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1009	GQ245817	chicken	China	XZ_20	2007
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1010	GQ245818	ostrich	China	YZ_22	2007
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1011	GQ245819	chicken	China	ZJ_17	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1013	GU564399	chicken	China	FMW	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1014	HM188398	duck	China	SDFCH	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1015	HM188399	duck	China	SDWF02	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1016	HM188400	duck	China	SDWF03	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1017	HM188401	duck	China	SDWF04	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1018	HM188402	duck	China	SDWF05	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1019	HM748947	chicken	China	SD4	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1020	HQ317395	duck	China	SD09	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1021	HQ717357	duck	China	GD09_1	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1022	JF343539	chicken	China	Guangxi9	2003
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1023	JN400895	duck	China	SD03	2009

VII_b	VII.1.1	**VII.1.1**	VII.1.1	1024	JN400897	chicken	China	SDLY01	2010
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1026	JN631747	goose	China	JS_5	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1027	JQ013855	chicken	China	JS_01	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1028	JQ013857	chicken	China	JS_03	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1029	JQ013858	chicken	China	JS_04	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1030	JQ013859	chicken	China	JS_05	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1031	JQ013863	chicken	China	JS_09	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1032	JQ013866	chicken	China	JS_12	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1033	JQ013867	chicken	China	JS_13	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1034	JQ013869	chicken	China	JS_15	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1035	JQ013874	chicken	China	JS_20	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1036	JQ013876	chicken	China	JS_22	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1037	JQ013879	duck	China	JS_01	2010
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1038	JX193076	chicken	China	Guangxi15	2010
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1039	JX244790	pigeon	China	ZQ_17	2000
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1040	JX244791	pigeon	China	SD_54	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1041	JX244792	pigeon	China	SD_55	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1043	JX482550	seafowl	China	H12	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1044	KC542892	chicken	China	Liaoning_01	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1045	KC542893	chicken	China	Liaoning_02	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1046	KC542899	chicken	China	Jilin_01	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1047	KC542903	chicken	China	Beijing_02	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1048	KC542908	chicken	China	Shandong_01	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1049	KC542909	chicken	China	Shandong_02	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1050	KC750149	duck	China	GD_SD	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1051	KC750156	duck	China	GD_SD	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1052	KC750157	duck	China	GD_SS	2010
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1053	KF219498.1	duck	China	GD_SS	2010
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1054	KJ184574	chicken	China	JS_04	2012
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1055	KJ184591	chicken	China	JS_22	2012
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1056	KJ184600	chicken	China	JS_03	2012
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1057	KJ450977	chicken	China	Jiangxi_07	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1058	KJ525677	goose	China	GD_GD	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1059	KJ525678	duck	China	SD_GM	2008

VII_b	VII.1.1	**VII.1.1**	VII.1.1	1060	KJ525681	duck	China	GD_GDX	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1061	KJ525682	duck	China	GD_GDY	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1062	KJ525683	chicken	China	SX_SX1	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1063	KJ525684	chicken	China	SX_SX2	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1064	KJ525687	chicken	China	SD_XT	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1065	KJ525697	chicken	China	SD_LY2	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1066	KJ525698	chicken	China	SD_LY1	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1067	KJ525709	chicken	China	SD_BD	2010
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1068	KJ525710	chicken	China	GD_ND	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1069	KJ525716	chicken	China	SD_MH	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1070	KJ525718	chicken	China	SD_CQ	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1071	KJ600786	duck	China	SD_134	2009
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1072	KJ607170	quail	China	LJS_101107	2010
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1073	KJ825877	chicken	China	Guangxi_L1	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1074	KP742770	Sheldrake_duck	China	Guizhou_SS1	2014
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1075	KT381593	chicken	China	Guangdong_GM5	2013
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1076	KT381594	duck	China	Guangdong_YF21	2014
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1077	KU200252	goose	China	Jilin_TH01	2015
VII_b	VII.1.1	**VII.1.1**	VII.1.1	1078	KU933951	duck	China	Guizhou_JH	2015
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2005	MF278935.1	white_duck	China	FS_NH_A	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1102	AF358787	fowl	China		1999
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1103	AF358788	fowl	China		2000
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1104	AF364835	fowl	China	98_3	1998
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1105	AF431744	goose	China	ZJ1	2000
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1106	AF456436	goose	China	JS_3	1998
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1107	AF456438	goose	China	ZJ_1	2000
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1109	AF456442	goose	China	JS_5	2001
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1110	AF456444	goose	China	JS_7	2001
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1111	AF473851	goose	China	SF02	2002
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1112	AY253912	parrot	China	YN_PA01	2001
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1113	AY325797	goose	China	GPV_SF02	_
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1115	AY337464	goose	China	_	_
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1116	DQ080015	penguin	China	Beijing	1999
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1117	DQ114478	goose	China	HZ	_

VII_d	VII.1.1	**VII.1.1**	VII.1.1	1118	DQ227248	chicken	China	Shandong_SGM	2001
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1119	DQ227251	chicken	China	Shandong_SKY	2003
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1120	DQ227253	chicken	China	Shandong_SPY	2003
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1121	DQ363531	goose	China	Jiangsu_JS06	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1122	DQ363534	goose	China	Jiangsu_JS03	2003
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1123	DQ363535	chicken	China	Shandong_SF	2002
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1124	DQ363536	chicken	China	Tianjin_TJ	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1125	DQ417110	goose	China	Jiangsu_JS01	2001
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1126	DQ485229	chicken	China	Guangxi_7	2002
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1128	DQ485269	chicken	China	Guangxi13	2004
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1129	DQ839397	chicken	Korea	KBNP_4152	_
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1130	EF128053	wild_duck	China	JS_3	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1131	EF128054	wild_duck	China	JS_1	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1132	EF128055	wild_duck	China	JS_2	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1133	EF175145	muscovy_duck	China	PX2	2003
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1134	EF211807	goose	China	JS_1	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1135	EF211809	goose	China	JS_3	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1136	EF211810	goose	China	JS_4	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1137	EF211811	goose	China	JS_5	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1138	EF211812	goose	China	JS_6	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1139	EF211813	goose	China	JS_7	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1140	EF521889	mallard	China	HLJ_13	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1141	EF540729	goose	China	JG97	_
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1142	EF579731	chicken	China	Shandong_YS	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1143	EF579732	chicken	China	Shandong_DG	2002
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1144	EF579733	chicken	China	Shandong_Pyan	2004
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1145	EF579734	goose	China	Guangdong_GZ	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1146	EF592502	mandarin_duck	China	HLJ_36	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1147	EF592504	bean_goose	China	HLJ_48	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1148	EF592508	mallard	China	HLJ_78	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1149	EU140947		South_Korea	SNU_0202	2000
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1150	EU140948		South_Korea	KBNP_4152	2004
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1151	EU140949		South_Korea	SNU_5070	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1152	EU140950		South_Korea	SNU_5074	2005

VII_d	VII.1.1	**VII.1.1**	VII.1.1	1153	EU258642	chicken	China	7011	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1155	EU583503	chicken	China	Hebei	2004
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1156	EU597811	chicken	China	SHY	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1157	FJ011441	chicken	China	SDCX	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1158	FJ011442	chicken	China	HNDY	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1159	FJ011443	chicken	China	SDMH	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1160	FJ011448	chicken	China	TZ0601	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1161	FJ217665	chicken	China	SC03	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1162	FJ217666	chicken	China	SC05	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1163	FJ240168	goose	China	HLJ_LL01	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1164	FJ426563	chicken	China	SDWF01	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1165	FJ480777	mandarin_duck	China	HLJ028	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1166	FJ480778	whitefronted_goose_	China	HLJ052	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1167	FJ480783	mallard_	China	HLJ361	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1168	FJ480788	wild_bird	China	HLJ001	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1169	FJ480790	chicken	China	HLJ_1	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1170	FJ480791	chicken	China	HLJ_1	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1171	FJ480792	chicken	China	HLJ_2	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1172	FJ480798	chicken	China	HN_1	2004
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1173	FJ480799	chicken	China	HN_1	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1174	FJ480806	chicken	China	JL_4	2003
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1175	FJ480809	chicken	China	LN_1	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1176	FJ480810	chicken	China	LN_2	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1177	FJ480812	chicken	China	LN_4	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1178	FJ480813	chicken	China	NX_1	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1179	FJ480818	chicken	China	NX_5	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1180	FJ480819	chicken	China	SD_1	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1181	FJ480824	mallard_duck	China	GD_1	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1182	FJ608334	chicken	China	WN_Tianin	2003
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1183	FJ608336	chicken	China	ZSM_Hebei	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1184	FJ608343	chicken	China	GM_Shandong	2001
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1185	FJ608345	chicken	China	DFZD_Jilin	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1186	FJ608349	chicken	China	LGQQ_Liaoning	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1187	FJ608351	chicken	China	YZCQ_Liaoning	2008

VII_d	VII.1.1	**VII.1.1**	VII.1.1	1188	FJ754272	duck	China	WF00D	2000
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1189	FJ754273	goose	China	WF00G	2000
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1190	FJ872531	muscovy_duck	China	Fuian_FP1	2002
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1191	GQ245780	chicken	China	AN_9	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1192	GQ245781	chicken	China	CZ_8	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1193	GQ245782	chicken	China	DT_3	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1194	GQ245783	chicken	China	HA_2	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1195	GQ245784	chicken	China	HA_4_08	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1196	GQ245785	chicken	China	HA_9	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1197	GQ245786	chicken	China	HA_13	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1198	GQ245787	chicken	China	HA_14	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1199	GQ245788	chicken	China	HA_15	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1200	GQ245790	chicken	China	HN_6	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1201	GQ245791	chicken	China	SN_5	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1202	GQ245792	chicken	China	SY_17	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1203	GQ245793	goose	China	XZ_18	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1204	GQ245794	goose	China	YZ_19	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1206	GQ255639	goose	China	GPMV_SH	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1207	GQ849007	laying_duck	China	JSD0812	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1208	GU166154	chicken	China	ND_XX	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1209	GU227738	dove	Serbia	Serbia_749	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1210	GU227739	sparrowhawk	Serbia	Serbia_1038	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1211	HM188393	duck	China	SDBZH	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1212	HM188396	duck	China	SDTA	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1213	HM748945	chicken	China	SD2	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1214	HM748946	chicken	China	SD3	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1215	JF340367	goose	China	JSG0210	2002
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1216	JN599167	penguin	China	BP01	1999
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1217	JN872164	chicken	Colombia	440620	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1218	JN986838	chicken	South_Africa	ZA_AL495	2004
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1219	JQ013861	chicken	China	JS_07	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1220	JQ013862	goose	China	JS_08	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1221	JQ013864	chicken	China	JS_10	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1222	JQ319052	chicken	Venezuela	7	2009

VII_d	VII.1.1	**VII.1.1**	VII.1.1	1223	JQ697739	_	Malaysia	1041_632	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1224	JQ894778	chicken	China	HBHD01	2012
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1225	JX519467	chicken	China	JSX1	2010
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1226	KC292514	chicken	China	F72	2010
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1227	KC292517	chicken	China	FH2	2010
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1228	KC461214	chicken	China	TC_9	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1229	KC542895	chicken	China	Hebei_01	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1230	KC542897	chicken	China	Tianjin_01	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1231	KC542898	chicken	China	Tianjin_02	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1232	KC542902	chicken	China	Beijing_01	2012
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1233	KC750150	duck	China	GD_SD	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1234	KC750154	duck	China	GD_JY	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1235	KC853019	crested_ibis	China	Shaanxi	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1236	KF208469	chicken	China	SD883	2013
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1237	KF442615	chicken	South_Africa	8100426	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1238	KF792023	turkey	Israel	832_497	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1240	KJ450979	chicken	China	ShanDong_024	2010
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1241	KJ525676	goose	China	GD_GZ	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1242	KJ525679	duck	China	SD_DZ	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1243	KJ525680	duck	China	SD_LY	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1244	KJ525690	chicken	China	SD_YT	2013
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1245	KJ525702	chicken	China	SD_KD1	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1246	KJ525706	chicken	China	SD_DZ	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1247	KJ525717	chicken	China	SD_MH	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1248	KJ600785	chicken	China	SD_128	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1249	KJ865694	chicken	Colombia	1326_13207	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1250	KJ865699	chicken	Colombia	1326_13563	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1251	KJ865700	chicken	Colombia	1326_13919	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1252	KJ865701	chicken	Colombia	1326_14301	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1253	KJ865706	fighting_rooster	Colombia	2077_26	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1254	KJ865707	chicken	Colombia	2420_06	2010
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1255	KJ865713	chicken	Colombia	5728_17	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1256	KJ865715	chicken	Colombia	12129_14	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1257	KJ865717	chicken	Colombia	14402_17	2008

VII_d	VII.1.1	**VII.1.1**	VII.1.1	1258	KJ914673	chicken	Ukraine	Ivano_Frankivsk_58	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1259	KM885167	mallard	China	LGD_1	2005
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1260	KP189357	mallard	Russia	Adygea_12	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1261	KU140419	chicken	China	ck_LHLJ_1_06	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1262	KU200249	goose	China	Jilin_SP01	2014
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1263	KU200250	goose	China	Jilin_DA05	2015
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1264	KU200251	chicken	China	Heilongjiang_FY06	2015
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1265	KU295450	chicken	Bulgaria	Juper	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1266	KU295451	chicken	Bulgaria	Moravitsa	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1267	KU295452	chicken	Bulgaria	Vidno	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1268	KU295453	chicken	Ukraine	Kharkiv_66_960	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1269	KU295454	chicken	Ukraine	Lyubotyn_961	2003
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1270	KU295455	chicken	Ukraine	Bashtanivske_20_02_962	2013
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1271	KU710269	chicken	Bulgaria	Vodniantsi	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1272	KU710271	chicken	Bulgaria	Kravoder	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1273	KU710272	chicken	Bulgaria	Liliashka_Mogila	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1274	KU710273	chicken	Bulgaria	Kardam	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1275	KU710274	chicken	Bulgaria	Kazatsite	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1276	KU710275	chicken	Bulgaria	Vozhdovo	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1277	KU710276	chicken	Bulgaria	Mamarchevo	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1278	KU710277	pigeon	Ukraine	Simferopol_2_26	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1279	KU710278	chicken	Ukraine	Lypova_Dolyna	2002
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1280	KU710279	chicken	Ukraine	Lugansk	2003
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1281	KU726619	mallard	Russia	Adygea_927	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	1284	KY404087	chicken	South_Korea	KR_005_00	2013
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1285	AF162714	goose	China_Guangdong_	GPMY_QY97_1	1997
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1286	AF358786	chicken	Taiwan	TW	2000
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1287	AF456437	goose	China	GD_1	1998
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1288	AY325799	_	_	YN_C1	_
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1289	DQ067447	chicken	China	GX1	2000
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1290	DQ363537	chicken	China	Shandong_Jlan_04	2004
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1291	DQ485256	chicken	China	Guangxi2	2000
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1292	DQ485258	chicken	China	Guangxi4	2000
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1293	EF589131	chicken	China	P1_Guizhou	_

VII_e	VII.1.1	**VII.1.1**	VII.1.1	1295	GU332646	duck	Vietnam	Long_Bien_78	2002
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1296	GU332647	environment	Vietnam	environmental_fecal_480	2002
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1297	JX193075	chicken	China	Guangxi14	2002
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1298	KJ782375	goose	China	GD_QY	1997
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1307	AB853329	chicken	Japan	Fukushima_NYF_3	2002
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1308	AB853927	chicken	Japan	Ibaraki_SG106	1999
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1309	AB853929	chicken	Japan	Miyagi_AGT	2002
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1610	DQ659677	goose	China	NA1	1999
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1611	FJ480822	goose	China	HLJ_1	2006
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1612	KJ528559	goose	China	NA_1M	2014
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1613	KJ607169	goose	China	LHLJ_1	2006
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1614	KU200243	chicken	China	Jilin_LY02	2014
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1615	KU200244	chicken	China	Jilin_CY01	2014
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1616	KU200245	quail	China	Jilin_JY02	2015
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1617	KU200246	chicken	China	Jilin_YJ05	2015
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1618	KU200247	pigeon	China	Heilongjiang_TL03	2015
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1619	KU200248	pigeon	China	Heilongjiang_LS03	2014
VII_e	VII.1.1	**VII.1.1**	VII.1.1	1996	MF278925.1	chicken	China	YF_LD_L	1997
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1478	FJ882014	chicken	China	SG_Liaoning	2009
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1479	JQ013856	chicken	China	JS_02	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1480	JQ013860	chicken	China	JS_06	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1481	JQ013865	chicken	China	JS_11	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1482	JQ013868	chicken	China	JS_14	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1483	JQ013870	chicken	China	JS_16	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1484	JQ013871	chicken	China	JS_17	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1485	JQ013873	chicken	China	JS_19	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1486	JQ013877	chicken	China	SD_01	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1487	JQ013878	chicken	China	SD_02	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1488	JQ015295	chicken	China	SDWF07	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1489	JQ015296	chicken	China	SD04	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1490	JQ015297	chicken	China	SDYT03	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1491	JX840452	chicken	China	SD754	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1492	JX840453	chicken	China	SD755	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1493	JX840454	chicken	China	SD704	2012

VII_j	VII.1.1	**VII.1.1**	VII.1.1	1494	JX840455	chicken	China	SD758	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1495	KC020114	chicken	China	SDS672	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1496	KC292519	chicken	China	SDS672	2010
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1497	KC484655	chicken	Israel	Israel_998	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1498	KC489471	chicken	China	SD834_12	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1499	KC542905	chicken	China	Liaoning_01	2009
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1500	KC542906	chicken	China	Hebei_01	2010
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1501	KC542907	chicken	China	Shandong_02	2010
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1502	KC542910	chicken	China	Hebei_01	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1503	KC542911	chicken	China	Beijing_01	2009
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1504	KC542912	chicken	China	Shandong_01	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1505	KF055273	chicken	China	SD01	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1506	KF306265	wildfowl	China	SF2	2010
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1507	KF771883	duck	China	LC	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1508	KF792022	pheasant	Israel	746_828	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1509	KF935230	chicken	China	YT	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1510	KJ136258	chicken	China	JLJT	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1511	KJ136259	duck	China	JLQG	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1512	KJ136260	goose	China	JLCC	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1513	KJ136261	pigeon	China	JLDH	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1514	KJ184575	chicken	China	JS_05	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1515	KJ184576	chicken	China	JS_06	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1516	KJ184577	chicken	China	JS_07	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1517	KJ184578	chicken	China	JS_08	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1518	KJ184581	chicken	China	JS_11	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1520	KJ184586	chicken	China	JS_17	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1521	KJ184587	chicken	China	JS_18	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1522	KJ184588	chicken	China	JS_19	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1523	KJ184589	chicken	China	JS_20	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1524	KJ184592	chicken	China	JS_23	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1525	KJ184593	chicken	China	JS_24	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1526	KJ184594	chicken	China	SD_01	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1527	KJ184595	chicken	China	SD_02	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1528	KJ184596	chicken	China	SD_03	2012

VII_j	VII.1.1	**VII.1.1**	VII.1.1	1529	KJ184597	chicken	China	AH_02	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1530	KJ450978	chicken	China	Ningxia_S006	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1531	KJ450980	chicken	Chian	Sichuan_1125	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1532	KJ525670	chicken	China	SD_SH1	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1533	KJ525686	chicken	China	SD_YS	2010
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1534	KJ525688	chicken	China	SD_YT	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1535	KJ525689	chicken	China	SD_ZJ	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1536	KJ525691	chicken	China	SD_YS1	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1537	KJ525693	chicken	China	SD_YG	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1538	KJ525694	chicken	China	SD_XT1	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1539	KJ525695	chicken	China	SD_XT	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1540	KJ525696	chicken	China	SD_WF	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1541	KJ525699	chicken	China	SD_LQ	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1542	KJ525704	chicken	China	SD_HZ	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1543	KJ525705	chicken	China	SD_HZ	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1544	KJ525707	chicken	China	SD_XT2	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1545	KJ525708	chicken	China	SD_CP	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1546	KJ525712	chicken	China	SD_MH10	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1547	KJ525714	chicken	China	SD_MH5	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1548	KJ525715	chicken	China	SD_MH4	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1549	KJ567597	chicken	China	SDZB11	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1550	KJ825878	chicken	China	Guangxi_D2	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1551	KM016457	chicken	Israel	159	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1552	KM016458	chicken	Israel	160	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1553	KM016459	chicken	Israel	180	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1554	KP064014	chicken	China	JS_21	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1555	KP064015	chicken	China	JS_22	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1556	KP064016	chicken	China	JS_23	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1557	KP064017	chicken	China	JS_24	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1558	KP064018	chicken	China	JS_27	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1559	KP064019	chicken	China	SD_25	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1560	KP064020	chicken	China	JS_30	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1562	KT804693	chicken	Israel	318_IS	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1563	KU200253	chicken	China	Jilin_YJ06	2015

VII_j	VII.1.1	**VII.1.1**	VII.1.1	1564	KU365650	chicken	Egypt	FU4_NLQP	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1565	KU365651	chicken	Egypt	FU8_NLQP	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1566	KU365652	chicken	Egypt	FU13_NLQP	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1567	KU365653	chicken	Egypt	FU5_NLQP	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1568	KU933948	duck	China	Guizhou_ZY	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1569	KU933949	duck	China	Guizhou_SS2	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1570	KU933950	duck	China	Guizhou_TZ	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1571	KX580300.1	chicken	Israel	1421	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1572	KX686722.1		Egypt	ISM_460F	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1573	KX686723.1		Egypt	KFR_B7	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1574	KX686725.1		Egypt	GZ_339F	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1575	KX686724.1		Egypt	EG_35	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1576	KX686726.1		Egypt	BEH_261F	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1577	KX686727.1		Egypt	GZ_986F	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1578	KX686728.1		Egypt	GHB_328F	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1579	KY073880.1	chicken	Israel	IS_266	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1580	KY075880	chicken	Egypt	Sharkia7	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1581	KY075881	chicken	Egypt	Ismailia8	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1582	KY075882	chicken	Egypt	Damietta9	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1583	KY075883	chicken	Egypt	Sharkia10	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1584	KY075884	chicken	Egypt	Qualyobia11	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1585	KY075885	chicken	Egypt	Qualyobia12	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1586	KY075886	chicken	Egypt	Sharkia14	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1587	KY075887	chicken	Egypt	El_Arish15	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1588	KY075888	chicken	Egypt	El_Arish16	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1589	KY075889	chicken	Egypt	Qualyobia26	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1590	KY075890	chicken	Egypt	Dakahlia27	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1591	KY075891	chicken	Egypt	Dakahlia28	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1592	KY075892	chicken	Egypt	Ismailia29	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1593	KY075895	chicken	Egypt	Ismailia32	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1595	KY510685.1	chicken	Israel	428	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1596	KY510687.1	chicken	Israel	2	2017
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1597	KY510688.1	chicken	Israel	27	2017
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1598	KY510689.1	chicken	Israel	28	2017

VII_j	VII.1.1	**VII.1.1**	VII.1.1	1599	KY968651.1	chicken	Israel	IS_222	2017
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1600	MF049232.1	chicken	Israel	IS_195	2017
VII_j	VII.1.1	**VII.1.1**	VII.1.1	1601	MF686923.1	chicken	Israel	IS_235	2011
VII_l	VII.1.1	**VII.1.1**	VII.1.1	1282	KX268351	chicken	Iran	Behshahr	2015
VII_l	VII.1.1	**VII.1.1**	VII.1.1	1986	KU201408	chicken	Iran	SMV_1	2011
VII_l	VII.1.1	**VII.1.1**	VII.1.1	1987	KU201409	chicken	Iran	SMV_2	2011
VII_l	VII.1.1	**VII.1.1**	VII.1.1	1988	KU201410	chicken	Iran	SMV_3	2011
VII_l	VII.1.1	**VII.1.1**	VII.1.1	1989	KU201411	chicken	Iran	SMV_4	2012
VII_l	VII.1.1	**VII.1.1**	VII.1.1	1990	KU201412	chicken	Iran	SMV_5	2012
VII_l	VII.1.1	**VII.1.1**	VII.1.1	1991	KU201413	chicken	Iran	SMV_6	2012
VII_l	VII.1.1	**VII.1.1**	VII.1.1	1992	KU201414	chicken	Iran	SMV_7	2013
VII_l	VII.1.1	**VII.1.1**	VII.1.1	1993	KU201415	chicken	Iran	SMV_8	2013
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2032	KY776610.1	white_fronted_goose	China	HLJ052	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2033	KY776609.1	mandarin_duck	China	JL01	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2034	KY776608.1	wild_bird	China	HLJ001	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2035	KY776607.1	Long_eared_owl	China	HLJ012	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2036	KY776606.1	Mandarin_duck	China	HLJ016	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2037	KY776605.1	Mandarin_dcuk	China	HLJ028	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2041	KY776601.1	mallard	China	HLJ361	2005
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2042	KY776600.1	mallard	China	HLJ355	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2045	KY776593.1	Rough_legged_Buzzard	China	HLJ013	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2046	KY776592.1	Rough_legged_Buzzard	China	HLJ09	2006
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2047	KY776591.1	Japanese_sparrowhawk	China	HLJ070	2006
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2051	MG867723.1	chicken	China	G7	2008
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2055	MG976930.1	Blyths_reed_warbler	Kazakhstan	Almaty_59	2014
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2066	KX765177.1	duck	China	DU_FJCL117	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2067	KX765178.1	duck	China	DU_JXNC35	2012
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2138	MG869266.1	chicken	Vietnam	NCXCP	2011
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2139	MG869267.1	chicken	Vietnam	NDVHN14	2014
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2153	MH371022.1	chicken	Israel	PHL1818	2007
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2154	MH371023.1	chicken	Israel	PHL120809	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2156	MH371025.1	chicken	Israel	PHL141353	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2159	MH371028.1	chicken	Israel	PHL120423	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2163	MH371032.1	chicken	Israel	PHL11278	2011

VII_j	VII.1.1	**VII.1.1**	VII.1.1	2164	MH371033.1	chicken	Israel	PHL137495	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2169	MH371038.1	chicken	Israel	PHL122509	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2170	MH371039.1	chicken	Israel	PHL137569	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2171	MH371040.1	chicken	Israel	PHL99188	2010
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2175	MH371044.1	chicken	Israel	PHL125877	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2176	MH371045.1	chicken	Israel	PHL118279	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2178	MH371047.1	chicken	Israel	PHL114112	2010
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2179	MH371048.1	chicken	Israel	PHL173849	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2192	MH371061.1	chicken	Israel	PHL116035	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2194	MH371063.1	chicken	Israel	PHL232809	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2195	MH371064.1	chicken	Israel	PHL253633	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2196	MH371065.1	turkey	Israel	PHL245632	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2199	MH371068.1	chicken	Israel	PHL153812	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2200	MH371069.1	chicken	Israel	PHL156916	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2202	MH371071.1	chicken	Israel	PHL169730	2013
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2204	MH371073.1	chicken	Israel	PHL201029	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2206	MH371075.1	chicken	Israel	PHL203762	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2209	MH371078.1	chicken	Israel	PHL207436	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2210	MH371079.1	chicken	Israel	PHL209108	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2212	MH371081.1	chicken	Israel	PHL218637	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2215	MH371084.1	chicken	Israel	PHL223759	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2231	MH371100.1	chicken	Israel	PHL208243	2014
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2234	MH377246.1	chicken	Israel	PHL34617	2008
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2238	MH377250.1	pigeon	Israel	PHL76558	2009
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2239	MH377251.1	chicken	Israel	PHL87809	2010
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2240	MH377252.1	chicken	Israel	PHL88629	2010
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2241	MH377253.1	chicken	Israel	PHL95252	2010
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2242	MH377254.1		Israel	PHL95493	2010
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2243	MH377255.1		Israel	PHL97202	2010
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2245	MH377257.1	chicken	Israel	PHL117244	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2246	MH377258.1	chicken	Israel	PHL119228	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2247	MH377259.1	chicken	Israel	PHL121082	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2248	MH377260.1	chicken	Israel	PHL121551	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2249	MH377261.1	chicken	Israel	PHL125051	2011

VII_j	VII.1.1	**VII.1.1**	VII.1.1	2250	MH377262.1	chicken	Israel	PHL141932	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2252	MH377264.1	chicken	Israel	PHL145002	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2253	MH377265.1	turkey	Israel	PHL149777	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2256	MH377268.1	turkey	Israel	PHL173633	2013
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2258	MH377270.1	chicken	Israel	PHL2041	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2259	MH377271.1	chicken	Israel	PHL5869	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2260	MH377272.1	chicken	Israel	PHL9273	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2261	MH377273.1	chicken	Israel	PHL11365	2007
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2262	MH377274.1	chicken	Israel	PHL124027	2011
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2263	MH377275.1	chicken	Israel	PHL23536	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2264	MH377276.1	turkey	Israel	PHL24317	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2265	MH377277.1	chicken	Israel	PHL24639	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2267	MH377279.1	chicken	Israel	PHL27571	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2268	MH377280.1	chicken	Israel	PHL17222	2007
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2271	MH377283.1	chicken	Israel	PHL24993	2007
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2272	MH377284.1	chicken	Israel	PHL151347	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2274	MH377286.1	chicken	Israel	PHL223397	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2275	MH377287.1	chicken	Israel	PHL238651	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2276	MH377288.1		Israel	PHL204642	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2279	MH377291.1	chicken	Israel	PHL251453	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2281	MH377293.1	chicken	Israel	PHL251747	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2282	MH377294.1	chicken	Israel	PHL253817	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2284	MH377296.1	chicken	Israel	PHL256987	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2285	MH377297.1	turkey	Israel	PHL257758	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2289	MH377301.1	long_legged_buzzard	Israel	PHL264751	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2293	MH377305.1	common_kestrel	Israel	PHL264758	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2294	MH377306.1	chicken	Israel	PHL246332	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2295	MH377307.1	chicken	Israel	PHL249275	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2296	MH377308.1	chicken	Israel	PHL251542	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2297	MH377309.1	turkey	Israel	PHL255913	2016
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2298	MH377310.1		Israel	PHL104477	2010
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2300	MH377312.1	chicken	Israel	PHL265941	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2301	MH377313.1	chicken	Israel	PHL265559	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2302	MH377314.1	chicken	Israel	PHL266018	2016

VII_j	VII.1.1	**VII.1.1**	VII.1.1	2303	MH377315.1	lesser_kestrel	Israel	PHL264759	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2305	MH377317.1	chicken	Israel	PHL142551	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2313	MH377325.1	chicken	Israel	PHL203308	2014
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2439	MK005975	chicken	Egypt	Sohag_1_1012	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2440	MK005976	chicken	Egypt	Sohag_13_1015	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2443	MK005979	chicken	Egypt	Sohag_21_1023	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2444	MK005980	chicken	Egypt	Sohag_61_1027	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2445	MK005981	chicken	Egypt	Sohag_66_1030	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2446	MK005982	chicken	Egypt	Sohag_67_1031	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2447	MK005983	chicken	Egypt	Sohag_68_1032	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2449	MK005985	chicken	Egypt	Luxor_83_1035	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2450	MK005986	chicken	Egypt	Qena_101_1036	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2451	MK005987	chicken	Egypt	Qena_103_1037	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2452	MK005988	chicken	Egypt	Qena_105_1039	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2453	MK005989	chicken	Egypt	Qena_108_1041	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2455	MK005991	chicken	Egypt	Qena_140_1048	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2456	MK005992	chicken	Egypt	Qena_141_1049	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2457	MK005993	chicken	Egypt	Qena_144_1052	2012
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2458	MK005995	pigeon	Egypt	Souqal_Cairo_19_CL_G3_1090	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2459	MK005996	pigeon	Egypt	Souqal_Cairo_27_OP_G9_1091	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2460	MK005997	pigeon	Egypt	Souqal_Cairo_28_OP_G27_1109	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2461	MK005998	pigeon	Egypt	Giza_15_CL_PG_1095	2015
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2483	MG717683.1	quail	Egypt	SDU_2	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2484	MG717684.1	teal	Egypt	SDU_3	2016
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2486	MG717686.1	teal	Egypt	SDU_4	2016
VII_b	VII.1.1	**VII.1.1**	VII.1.1	2487	MH445410.1	chicken	Egypt	18	2015
VII_l	VII.1.1	**VII.1.1**	VII.1.1	2490	MG519856.1		Iran	MSH_2	2015
VII_l	VII.1.1	**VII.1.1**	VII.1.1	2491	MG519857.1		Iran	MSH_3	2015
VII_l	VII.1.1	**VII.1.1**	VII.1.1	2497	MF417546.1	chicken	Iran	Beh	2011
VII_j	VII.1.1	**VII.1.1**	VII.1.1	2499	MH105251.1	chicken	China	Jiangsu_1816	2014
VII_d	VII.1.1	**VII.1.1**	VII.1.1	2500	MH105250.1	duck	China	Shandong_142	2015
VII_l	VII.1.1	**VII.1.1**	VII.1.1	2506	MH247187.1	chicken	Iran	MAM55	2017
VII_l	VII.1.1	**VII.1.1**	VII.1.1	2507	MH247186.1	chicken	Iran	MAM52	2017
VII_l	VII.1.1	**VII.1.1**	VII.1.1	2508	MH247185.1	chicken	Iran	MAM31	2017

VII_l	VII.1.1	**VII.1.1**	VII.1.1	2509	MH247184.1	chicken	Iran	MAM19	2017
VII_l	VII.1.1	**VII.1.1**	VII.1.1	2510	MH481363.1	chicken	Iran	MAM81	2018
VII_l	VII.1.1	**VII.1.1**	VII.1.1	2511	MH481362.1	chicken	Iran	MAM72	2018
VII_l	VII.1.1	**VII.1.1**	VII.1.1	2512	MH481361.1	chicken	Iran	MAM68	2017
VII_f	VII.1.2	**VII.1.2**	VII.1.2	1311	AF458010	chicken	China	JS_3	2000
VII_f	VII.1.2	**VII.1.2**	VII.1.2	1313	AY028995	fowl	China	A7	1996
VII_f	VII.1.2	**VII.1.2**	VII.1.2	1314	GQ338309	pigeon	China	18	2003
VII_f	VII.1.2	**VII.1.2**	VII.1.2	1315	GQ338310	pigeon	China	44	2003
VII_f	VII.1.2	**VII.1.2**	VII.1.2	1316	DQ227246	goose	China	Jiangsu_JS02	1999
VII_f	VII.1.2	**VII.1.2**	VII.1.2	1317	DQ227254	chicken	China	Broiler_Shandong_SWS_03	2003
VII_f	VII.1.2	**VII.1.2**	VII.1.2	1318	DQ858357	goose	China	Jiangsu_YG	2003
VII_a	VII.2	**VII.2**	VII.2	916	JN986837	chicken	Netherlands	152608_ancestral	1993
VII_h	VII.2	**VII.2**	VII.2	1329	HQ697255	chicken	Indonesia	Sukorejo_019	2010
VII_h	VII.2	**VII.2**	VII.2	1330	HQ697256	chicken	Indonesia	Makassar_003	2009
VII_h	VII.2	**VII.2**	VII.2	1331	HQ697261	chicken	Bali	bali_020_10	2010
VII_h	VII.2	**VII.2**	VII.2	1332	JX193074	egret	China	egret_Guangxi	2011
VII_h	VII.2	**VII.2**	VII.2	1333	KF026013	chicken	Malaysia	UPM_IBS_002	2011
VII_h	VII.2	**VII.2**	VII.2	1334	KR074404	chicken	Malaysia	IBS002_11	2011
VII_h	VII.2	**VII.2**	VII.2	1335	KR074405	chicken	Malaysia	IBS005_11	2011
VII_h	VII.2	**VII.2**	VII.2	1336	KR815908	turkey	South_Africa	N2057	2013
VII_h	VII.2	**VII.2**	VII.2	1337	KT760568	chicken	China	Guizhou_1032	2012
VII_h	VII.2	**VII.2**	VII.2	1338	KT760569	goose	China	Yunnan_1200	2013
VII_h	VII.2	**VII.2**	VII.2	1339	KU175230	chicken	China	Guizhou_1031	2012
VII_h	VII.2	**VII.2**	VII.2	1340	KU175232	chicken	China	Guizhou_1176	2012
VII_h	VII.2	**VII.2**	VII.2	1341	KU523524	chicken	Mozambique	466	2012
VII_h	VII.2	**VII.2**	VII.2	1342	KU523526	chicken	Mozambique	491	2012
VII_h	VII.2	**VII.2**	VII.2	1343	KU523528	chicken	Mozambique	658	2012
VII_h	VII.2	**VII.2**	VII.2	1344	KU523529	chicken	Mozambique	584	2013
VII_h	VII.2	**VII.2**	VII.2	1345	KU523531	chicken	Mozambique	494	2014
VII_h	VII.2	**VII.2**	VII.2	1346	KU523533	chicken	Mozambique	622	2014
VII_h	VII.2	**VII.2**	VII.2	1347	KX231366	chicken	Mozambique	1205	2011
VII_h	VII.2	**VII.2**	VII.2	1348	KX231368	chicken	Mozambique	192A	2016
VII_h	VII.2	**VII.2**	VII.2	2007	MF622034.1	chicken	South_Africa	32995	2015
VII_h	VII.2	**VII.2**	VII.2	2008	MF622035.1	chicken	South_Africa	230665	2013

VII_h	VII.2	**VII.2**	VII.2	2009	MF622036.1	chicken	Zimbabwe	235280	2013
VII_h	VII.2	**VII.2**	VII.2	2010	MF622037.1	chicken	South_Africa	239391	2013
VII_h	VII.2	**VII.2**	VII.2	2011	MF622038.1	chicken	Zambia	Chadiza	2015
VII_h	VII.2	**VII.2**	VII.2	2012	MF622039.1	chicken	South_Africa	H14973	2014
VII_h	VII.2	**VII.2**	VII.2	2013	MF622040.1	chicken	South_Africa	Inchanga	2013
VII_h	VII.2	**VII.2**	VII.2	2014	MF622041.1	chicken	Zambia	Katete	2015
VII_h	VII.2	**VII.2**	VII.2	2015	MF622042.1	chicken	Zambia	Mbeweka	2015
VII_h	VII.2	**VII.2**	VII.2	2016	MF622043.1	chicken	South_Africa	N2117	2015
VII_h	VII.2	**VII.2**	VII.2	2017	MF622044.1	chicken	South_Africa	N2683	2015
VII_h	VII.2	**VII.2**	VII.2	2018	MF622045.1	chicken	South_Africa	RBNW_1	2013
VII_h	VII.2	**VII.2**	VII.2	2020	MF622047.1	chicken	South_Africa	RBWW_3	2013
VII_i	VII.2	**VII.2**	VII.2	1403	HQ697254	chicken	Indonesia	Banjarmasin_010	2010
VII_i	VII.2	**VII.2**	VII.2	1404	HQ697257	chicken	Indonesia	Gianyar_013	2010
VII_i	VII.2	**VII.2**	VII.2	1407	KF113339	chicken	Pakistan	Lahore_30	2011
VII_i	VII.2	**VII.2**	VII.2	1408	KF113341	chicken	Pakistan	Lahore_43	2011
VII_i	VII.2	**VII.2**	VII.2	1409	KF113342	chicken	Pakistan	Lahore_50	2011
VII_i	VII.2	**VII.2**	VII.2	1410	KF113343	chicken	Pakistan	Gujranwala_56	2011
VII_i	VII.2	**VII.2**	VII.2	1411	KF113345	chicken	Pakistan	Khyber_Pukhtun_Khawa_117	2011
VII_i	VII.2	**VII.2**	VII.2	1412	KF113349	chicken	Pakistan	Kasure_191	2012
VII_i	VII.2	**VII.2**	VII.2	1413	KF113350	chicken	Pakistan	Lahore_200	2012
VII_i	VII.2	**VII.2**	VII.2	1414	KF113351	chicken	Pakistan	University_Vet_Animal_Sci_211	2012
VII_i	VII.2	**VII.2**	VII.2	1415	KF792019	chicken	Israel	KY50_826	2013
VII_i	VII.2	**VII.2**	VII.2	1416	KF792021	chicken	Israel	BT_120_827	2013
VII_i	VII.2	**VII.2**	VII.2	1417	KM670337	chicken	Pakistan	SFR_611_13	2013
VII_i	VII.2	**VII.2**	VII.2	1418	KP719224	chicken	Libya	13VIR_7225_1	2013
VII_i	VII.2	**VII.2**	VII.2	1419	KP776462	chicken	Pakistan	AW_14	2014
VII_i	VII.2	**VII.2**	VII.2	1420	KP780878	chicken	Pakistan	Gujranwala_649	2013
VII_i	VII.2	**VII.2**	VII.2	1423	KR676389	chicken	Pakistan	Kohat_122	2011
VII_i	VII.2	**VII.2**	VII.2	1424	KR676391	chicken	Pakistan	Narowal_329	2013
VII_i	VII.2	**VII.2**	VII.2	1425	KR676392	chicken	Pakistan	Waziabbad_431	2013
VII_i	VII.2	**VII.2**	VII.2	1426	KR676396	chicken	Pakistan	Lahore_736	2014
VII_i	VII.2	**VII.2**	VII.2	1427	KR676397	chicken	Pakistan	Attock_7_411	2014
VII_i	VII.2	**VII.2**	VII.2	1428	KR676398	chicken	Pakistan	Multan_5_125	2014
VII_i	VII.2	**VII.2**	VII.2	1429	KR676402	chicken	Pakistan	Lahore_12	2015

VII_i	VII.2	**VII.2**	VII.2	1430	KR676403	chicken	Pakistan	Lahore_24	2015
VII_i	VII.2	**VII.2**	VII.2	1431	KR676404	chicken	Pakistan	Gujranwala_2	2015
VII_i	VII.2	**VII.2**	VII.2	1434	KU862287	Peacock	Pakistan	Lahore_AW_7	2013
VII_i	VII.2	**VII.2**	VII.2	1435	KU862288	Peacock	Pakistan	Lahore_AW_3	2014
VII_i	VII.2	**VII.2**	VII.2	1436	KU862291	Peacock	Pakistan	Pathoki_AW_1	2015
VII_i	VII.2	**VII.2**	VII.2	1437	KU862292	Peacock	Pakistan	Kamoki_AW_2	2015
VII_i	VII.2	**VII.2**	VII.2	1438	KU862293	Parakeet	Pakistan	Karachi_AW_1	2014
VII_i	VII.2	**VII.2**	VII.2	1439	KU862294	Parakeet	Pakistan	Lahore_AW_2	2014
VII_i	VII.2	**VII.2**	VII.2	1440	KU862295	Parakeet	Pakistan	Karachi_AW_3	2015
VII_i	VII.2	**VII.2**	VII.2	1441	KU862296	Black_Swan	Pakistan	Lahore_AW_1	2015
VII_i	VII.2	**VII.2**	VII.2	1442	KX268689	parrot	Pakistan	Lahore_SFR_129	2015
VII_i	VII.2	**VII.2**	VII.2	1443	KX496962	wild_pigeon	Pakistan	Lahore_20A_996	2015
VII_i	VII.2	**VII.2**	VII.2	1444	KX496963	pigeon	Pakistan	Lahore_22A_1001	2015
VII_i	VII.2	**VII.2**	VII.2	1445	KX496964	pigeon	Pakistan	Lahore_23A_997	2015
VII_i	VII.2	**VII.2**	VII.2	1446	KX496967	pigeon	Pakistan	Lahore_1085	2015
VII_i	VII.2	**VII.2**	VII.2	1447	KX791183	parakeet	Pakistan	R_Pindi_SFR_16	2016
VII_i	VII.2	**VII.2**	VII.2	1448	KX791184	backyard	Pakistan	Lahore_SFR_144A	2016
VII_i	VII.2	**VII.2**	VII.2	1449	KX791185	backyard	Pakistan	Lahore_SFR_144B	2016
VII_i	VII.2	**VII.2**	VII.2	1450	KX791186	backyard	Pakistan	Lahore_SFR_144C	2016
VII_i	VII.2	**VII.2**	VII.2	1451	KX791187	backyard	Pakistan	Lahore_SFR_144D	2016
VII_i	VII.2	**VII.2**	VII.2	1452	KY076031	chicken	Pakistan	Wazirabad_15A_995	2015
VII_i	VII.2	**VII.2**	VII.2	1453	KY076032	chicken	Pakistan	Kasur_26A_998	2011
VII_i	VII.2	**VII.2**	VII.2	1454	KY076035	chicken	Pakistan	Pattoki_1A_1002	2015
VII_i	VII.2	**VII.2**	VII.2	1455	KY076039	chicken	Pakistan	Gujranwala_13A_1009	2015
VII_k	VII.2	**VII.2**	VII.2	1604	KY747479.1	chicken	Namibia	5620	2016
VII_k	VII.2	**VII.2**	VII.2	1605	KY747480.1	chicken	Namibia	6195	2016
VII_k	VII.2	**VII.2**	VII.2	1606	KY747481.1	chicken	Namibia	6196	2016
VII_k	VII.2	**VII.2**	VII.2	1607	KY747482.1	chicken	Namibia	6403	2016
VII_k	VII.2	**VII.2**	VII.2	1608	KY747483.1	chicken	Namibia	6762	2016
VII_i	VII.2	**VII.2**	VII.2	2053	KY967611.1	mallard	Pakistan	I_UVAS	2016
VII_i	VII.2	**VII.2**	VII.2	2084	MF437287.1	Anas_carolinenses	Pakistan	II_UVAS	2015
VII_i	VII.2	**VII.2**	VII.2	2098	MG200021	chicken	Pakistan	Lahore_965	2015
VII_i	VII.2	**VII.2**	VII.2	2099	MG200022	chicken	Pakistan	Kassur_966	2015
VII_i	VII.2	**VII.2**	VII.2	2101	MG200024	chicken	Pakistan	Sheikhupura_969	2015

VII_i	VII.2	**VII.2**	VII.2	2102	MG200025	chicken	Pakistan	Lahore_972	2015
VII_i	VII.2	**VII.2**	VII.2	2103	MG200026	chicken	Pakistan	Gujranwala_978	2015
VII_i	VII.2	**VII.2**	VII.2	2113	MG686589.1	goose	Pakistan	SKHP_AW_101	2015
VII_i	VII.2	**VII.2**	VII.2	2114	MG686590.1	duck	Pakistan	GUJR_AW_51	2015
VII_i	VII.2	**VII.2**	VII.2	2115	MG686591.1	duck	Pakistan	GUJR_AW_52	2015
VII_i	VII.2	**VII.2**	VII.2	2116	MG686592.1	duck	Pakistan	ISLM_AW_1	2015
VII_i	VII.2	**VII.2**	VII.2	2117	MG686593.1	goose	Pakistan	SLK_AW_16	2015
VII_i	VII.2	**VII.2**	VII.2	2118	MG686594.1	goose	Pakistan	SKHP_AW_102	2015
VII_i	VII.2	**VII.2**	VII.2	2119	MG686595.1	goose	Pakistan	SKHP_AW_103	2015
VII_i	VII.2	**VII.2**	VII.2	2120	MG686596.1	goose	Pakistan	SKHP_AW_104	2015
VII_i	VII.2	**VII.2**	VII.2	2121	MG686597.1	duck	Pakistan	GUJR_AW_53	2015
VII_i	VII.2	**VII.2**	VII.2	2122	MG686598.1	goose	Pakistan	GUJR_AW_55	2015
VII_i	VII.2	**VII.2**	VII.2	2123	MG686599.1	goose	Pakistan	GUJR_AW_54	2015
VII_i	VII.2	**VII.2**	VII.2	2124	MG686600.1	duck	Pakistan	GUJR_AW_56	2015
VII_i	VII.2	**VII.2**	VII.2	2125	MG686601.1	duck	Pakistan	Lahore_AW_4	2017
VII_i	VII.2	**VII.2**	VII.2	2127	MG686603.1	duck	Pakistan	KAR_AW_2	2014
VII_i	VII.2	**VII.2**	VII.2	2128	MG686604.1	duck	Pakistan	Lahore_AW_6	2016
VII_i	VII.2	**VII.2**	VII.2	2129	MG686605.1	duck	Pakistan	SLK_AW_15	2016
VII_i	VII.2	**VII.2**	VII.2	2130	MG686606.1	duck	Pakistan	SLK_AW_14	2016
VII_i	VII.2	**VII.2**	VII.2	2132	MG686608.1	black_swan	Pakistan	Lahore_AW_8	2016
VII_i	VII.2	**VII.2**	VII.2	2133	MG686609.1	goose	Pakistan	Lahore_AW_3	2017
VII_h	VII.2	**VII.2**	VII.2	2140	MG869268.1	chicken	Vietnam	15A1	2015
VII_h	VII.2	**VII.2**	VII.2	2141	MG869269.1	chicken	Vietnam	LC15	2015
VII_i	VII.2	**VII.2**	VII.2	2145	MG871466.1	chicken	Iran	PCR_UT	2017
VII_i	VII.2	**VII.2**	VII.2	2152	MH120424.1	chicken	Pakistan	NIAB	2017
VII_i	VII.2	**VII.2**	VII.2	2167	MH371036.1	turkey	Israel	PHL138692	2011
VII_i	VII.2	**VII.2**	VII.2	2168	MH371037.1	chicken	Israel	PHL137592	2011
VII_i	VII.2	**VII.2**	VII.2	2181	MH371050.1	chicken	Israel	PHL168757	2013
VII_i	VII.2	**VII.2**	VII.2	2197	MH371066.1	chicken	Israel	PHL149165	2012
VII_i	VII.2	**VII.2**	VII.2	2201	MH371070.1	chicken	Israel	PHL159057	2012
VII_i	VII.2	**VII.2**	VII.2	2203	MH371072.1	chicken	Israel	PHL175571	2013
VII_i	VII.2	**VII.2**	VII.2	2228	MH371097.1	chicken	Israel	PHL140339	2011
VII_i	VII.2	**VII.2**	VII.2	2251	MH377263.1	turkey	Israel	PHL143483	2012
VII_i	VII.2	**VII.2**	VII.2	2254	MH377266.1	chicken	Israel	PHL167788	2012

VII_i	VII.2	**VII.2**	VII.2	2255	MH377267.1	chicken	Israel	PHL169208	2013
VII_i	VII.2	**VII.2**	VII.2	2277	MH377289.1	chicken	Israel	PHL174621	2013
VII_i	VII.2	**VII.2**	VII.2	2278	MH377290.1	turkey	Israel	PHL176533	2013
VII_i	VII.2	**VII.2**	VII.2	2291	MH377303.1	common_kestrel	Israel	PHL264753	2012
VII_i	VII.2	**VII.2**	VII.2	2304	MH377316.1	chicken	Israel	PHL141759	2011
VII_i	VII.2	**VII.2**	VII.2	2306	MH377318.1	chicken	Israel	PHL142626	2012
VII_i	VII.2	**VII.2**	VII.2	2307	MH377319.1	turkey	Israel	PHL142784	2012
VII_i	VII.2	**VII.2**	VII.2	2308	MH377320.1	chicken	Israel	PHL143114	2012
VII_i	VII.2	**VII.2**	VII.2	2309	MH377321.1	chicken	Israel	PHL143696	2012
VII_i	VII.2	**VII.2**	VII.2	2311	MH377323.1	chicken	Israel	PHL147004	2012
VII_i	VII.2	**VII.2**	VII.2	2331	MH432252.1	bassette_chicken	Belgium	4096	2018
VII_i	VII.2	**VII.2**	VII.2	2332	MH614933.1	chicken	Jordan	J11_Spleen	2018
VII_i	VII.2	**VII.2**	VII.2	2334	MH717055.1	chicken	Pakistan	AJK_AW_c21	2017
VII_i	VII.2	**VII.2**	VII.2	2335	MH717056.1	chicken	Pakistan	AJK_AW_c22	2017
VII_i	VII.2	**VII.2**	VII.2	2336	MH717057.1	chicken	Pakistan	AJK_AW_c23	2017
VII_i	VII.2	**VII.2**	VII.2	2337	MH717058.1	chicken	Pakistan	AJK_AW_c24	2017
VII_i	VII.2	**VII.2**	VII.2	2338	MH717059.1	chicken	Pakistan	AJK_AW_c25	2018
VII_i	VII.2	**VII.2**	VII.2	2339	MH717060.1	chicken	Pakistan	AJK_AW_c26	2018
VII_i	VII.2	**VII.2**	VII.2	2340	MH717061.1	chicken	Pakistan	AJK_AW_by31	2017
VII_i	VII.2	**VII.2**	VII.2	2341	MH717062.1	chicken	Pakistan	AJK_AW_by32	2017
VII_i	VII.2	**VII.2**	VII.2	2342	MH717063.1	chicken	Pakistan	AJK_AW_by33	2017
VII_i	VII.2	**VII.2**	VII.2	2343	MH717064.1	chicken	Pakistan	AJK_AW_by34	2018
VII_i	VII.2	**VII.2**	VII.2	2344	MH717065.1	chicken	Pakistan	AJK_AW_by35	2018
VII_i	VII.2	**VII.2**	VII.2	2345	MH717066.1	duck	Pakistan	AJK_AW_d41	2018
VII_i	VII.2	**VII.2**	VII.2	2346	MH717067.1	duck	Pakistan	AJK_AW_d42	2018
VII_i	VII.2	**VII.2**	VII.2	2347	MH717068.1	duck	Pakistan	AJK_AW_d43	2018
VII_i	VII.2	**VII.2**	VII.2	2348	MH717069.1	peacock	Pakistan	AJK_AW_pc45	2018
VII_i	VII.2	**VII.2**	VII.2	2463	MK006009	chicken	Pakistan	Sargohda_9CCS	2015
VII_i	VII.2	**VII.2**	VII.2	2464	MK006010	chicken	Pakistan	Sargohda_10CCS	2015
VII_i	VII.2	**VII.2**	VII.2	2465	MK006011	chicken	Pakistan	MirpurKhas_3EOS	2015
VII_i	VII.2	**VII.2**	VII.2	2468	MK006014	chicken	Pakistan	BankaCheema_PF_1H	2015
VII_i	VII.2	**VII.2**	VII.2	2470	MK006016	chicken	Pakistan	BankaCheema_2HOS	2015
VII_i	VII.2	**VII.2**	VII.2	2471	MK006017	chicken	Pakistan	WadanaKasur_1FOS	2015
VII_h	VII.2	**VII.2**	VII.2	2501	MH105249.1	duck	China	Yunnan	2017

VII_h	VII.2	**VII.2**	VII.2	2502	MH105247.1	chicken	China	Yunnan_1113	2017
VII_i	VII.2	**VII.2**	VII.2	2503	MK069429.1	chicken	China	Kulonprogo_4171317	2017
VII_i	VII.2	**VII.2**	VII.2	2504	MK069428.1	chicken	China	Belitung_3150041	2015
VII_i	VII.2	**VII.2**	VII.2	1422	KR074407	chicken	Malaysia	MB128_04	2004
VIII	VIII	**VIII**	VIII	1623	AF048763	chicken	Malaysia	AF2240	1960
VIII	VIII	**VIII**	VIII	1624	AY734534	chicken	Argentina	Trenque_Lauquen	1970
VIII	VIII	**VIII**	VIII	1625	FJ751918	chicken	China	QH1	1979
VIII	VIII	**VIII**	VIII	1626	FJ751919	chicken	China	QH4	1985
VIII	VIII	**VIII**	VIII	1627	JX012096	_	Malaysia	AF2240_I	1960s
VIII	VIII	**VIII**	VIII	2505	MH715892.1	game_fowl	China	GXGB	2011
X	X	**X**	X	1672	AY727881	duck	Argentina	32C_T_98	1998
X	X	**X**	X	1673	AY727882	swan	Argentina	126C_00	2000
X_a	X	**X**	X	1677	EF564826	northern_pintail	USA	US_OH_87_486	1987
X_a	X	**X**	X	1678	FJ705468	mottled_duck	USA	US_TX_TX01_130	2001
X_a	X	**X**	X	1679	JN872171	turkey	USA	Minnesota_17531_3_	2010
X_a	X	**X**	X	1680	KX857713	Mallard	MN_USA	AI09_1832	2009
X_a	X	**X**	X	1681	KX857714	Blue_winged_teal	ND_USA	AI09_2902	2009
X_a	X	**X**	X	1682	KX857715	Blue_winged_teal	ND_USA	AI09_3678	2009
X_a	X	**X**	X	1683	KX857716	Redhead	ND_USA	AI09_4117	2009
X_a	X	**X**	X	1684	KX857717	Mallard	MN_USA	AI13_4156	2013
X_b	X	**X**	X	1685	EF564832	mallard	USA	US_OH_86_233	1986
X_b	X	**X**	X	1686	FJ705464	mallard	USA	US_OH_04_411	2004
X_b	X	**X**	X	1687	FJ705465	mallard	USA	US_MN_03_632	2003
X_b	X	**X**	X	1688	FJ705466	mallard	USA	US_MN_99_376	1999
X_b	X	**X**	X	1689	FJ705467	mallard	USA	US_MN_MN00_32	2000
X_b	X	**X**	X	1690	FJ705469	mallard	USA	US_MN_MN00_39	2000
X_b	X	**X**	X	1691	KX857718	American_black_duck	MN_USA	AI09_3836	2009
X_b	X	**X**	X	1692	KX857719	Mallard	MN_USA	AI10_2806	2010
X_b	X	**X**	X	1693	KX857720	Mallard	MN_USA	AI10_2962	2010
X_b	X	**X**	X	1694	KX857721	Mallard	MN_USA	AI10_3434	2010
X_b	X	**X**	X	1696	KX857723	Blue_winged_teal	MN_USA	AI08_4957	2008
X_b	X	**X**	X	2323	MH392221	mallard	USA_MN_	99_376_163	1999
XI	XI	**XI**	XI	1697	HQ266602	chicken	Madagascar	MG_725	2008
XI	XI	**XI**	XI	1698	HQ266603	chicken	Madagascar	MG_1992	2008

XI	XI	**XI**	XI	1699	HQ266604	chicken	Madagascar	MG_Meola	2008
XI	XI	**XI**	XI	1700	HQ266605	chicken	Madagascar	MG_39_4	2008
XI	XI	**XI**	XI	1701	JX518875	chicken	Madagascar	MGBBS_	2009
XI	XI	**XI**	XI	1702	JX518876	chicken	Madagascar	MGF003C_	2010
XI	XI	**XI**	XI	1703	JX518877	chicken	Madagascar	MGF015C_	2011
XI	XI	**XI**	XI	1704	JX518878	chicken	Madagascar	MGF082T_	2010
XI	XI	**XI**	XI	1705	JX518879	chicken	Madagascar	MGF120T_	2010
XI	XI	**XI**	XI	1706	JX518880	duck	Madagascar	MGF166_	2010
XI	XI	**XI**	XI	1707	JX518881	chicken	Madagascar	MGF192C_	2010
XI	XI	**XI**	XI	1708	JX518882	chicken	Madagascar	MGMNJ_	2009
XI	XI	**XI**	XI	1709	JX518883	chicken	Madagascar	MGS1130T_	2011
XI	XI	**XI**	XI	1710	JX518884	chicken	Madagascar	MGS1595T_	2011
XII_d	XII	**XII**	XII	2142	MG869270.1	chicken	Vietnam	NDVQG	2008
XII_d	XII	**XII**	XII	2143	MG869271.1	chicken	Vietnam	NCXKH	2011
XII_d	XII	**XII**	XII	2144	MG869272.1	chicken	Vietnam	NCXMT	2014
XII_a	XII.1	**XII.1**	XII.1	1712	JN800306	chicken	Peru	1918_03	2008
XII_a	XII.1	**XII.1**	XII.1	1713	KJ865695	chicken	Colombia	1326_13285	2009
XII_a	XII.1	**XII.1**	XII.1	1714	KJ865696	chicken	Colombia	1326_13286	2009
XII_a	XII.1	**XII.1**	XII.1	1715	KR732614	peacock	Peru		2011
XII_a	XII.1	**XII.1**	XII.1	1716	KU594613	gamecock	Peru	Lima_40931	2004
XII_a	XII.1	**XII.1**	XII.1	1717	KU594614	gamecock	Peru	Lima_40785	2004
XII_a	XII.1	**XII.1**	XII.1	1718	KU594615	chicken	Peru	Apurimac_50009	2005
XII_a	XII.1	**XII.1**	XII.1	1719	KU594616	gamecock	Peru	Lurin_40871	2004
XII_a	XII.1	**XII.1**	XII.1	1720	KU594617	chicken	Peru	Piura_60087	2006
XII_a	XII.1	**XII.1**	XII.1	1721	KU594618	chicken	Peru	Arequipa_VFAR_81	2015
XII_b	XII.2	**XII.2**	XII.2	1724	JN627504	goose	China	GD_12	2011
XII_b	XII.2	**XII.2**	XII.2	1725	JN627507	goose	China	GD_1003	2010
XII_b	XII.2	**XII.2**	XII.2	1726	JN627508	goose	China	GD_450	2011
XII_b	XII.2	**XII.2**	XII.2	1727	KC551967	goose	China	Guangdong	2010
XII_b	XII.2	**XII.2**	XII.2	1997	MF278926.1	goose	China	FS_GM_4	2011
XII_b	XII.2	**XII.2**	XII.2	1998	MF278927.1	goose	China	FS_SS_292	2013
XII_b	XII.2	**XII.2**	XII.2	1999	MF278928.1	goose	China	ZQ_JL_12	2011
XII_b	XII.2	**XII.2**	XII.2	2000	MF278929.1	goose	China	ZQ_XG_17	2011
XII_b	XII.2	**XII.2**	XII.2	2001	MF278930.1	goose	China	ZQ_XG_502	2014

XII_b	XII.2	**XII.2**	XII.2	2003	MF278933.1	muscovy_duck	China	MM_GZ_884	2016
XIII	XIII.1	**XIII.1**	XIII.1	1728	JN942041	cockatoo	India	7847_ancestral	1982
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1730	AY865652	Sterna_albifrons	Russia	Astr_2755	2001
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1733	GU585905	chicken	Sweden		1997
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1734	HQ589257	chicken	India	Bareilly	1997
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1738	KF727980	chicken	India	Bareilly	2006
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1739	KJ577585	chicken	India	Bareilly_01	2010
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1731	FJ772491	chicken	Burundi	4132_12	2008
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1732	FJ772494	chicken	Burundi	4132_20	2008
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1735	JN942034	ostrich	South_Africa	45445_3	1995
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1736	JN942043	roller	Tanzania	47385_11	2010
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1737	JN942044	roller	Tanzania	47387_6	2010
XIII_a	XIII.1.1	**XIII.1.1**	XIII.1.1	1740	MF409241.1	chicken	Zambia	Chiwoko	2015
XIII_a	XIII.1.2.1	**XIII.1.2**	XIII.1.2	1778	JQ267579	chicken	Iran	EMM_7	2011
XIII_a	XIII.1.2.1	**XIII.1.2**	XIII.1.2	1779	JQ267580	chicken	Iran	EMM_6	2011
XIII_a	XIII.1.2.1	**XIII.1.2**	XIII.1.2	1780	JQ267581	chicken	Iran	EMM_5	2011
XIII_a	XIII.1.2.1	**XIII.1.2**	XIII.1.2	1781	JQ267582	chicken	Iran	EMM_4	2010
XIII_a	XIII.1.2.1	**XIII.1.2**	XIII.1.2	1782	JQ267583	chicken	Iran	EMM_3	2009
XIII_a	XIII.1.2.1	**XIII.1.2**	XIII.1.2	1783	JQ267584	chicken	Iran	EMM_2	2008
XIII_a	XIII.1.2.1	**XIII.1.2**	XIII.1.2	1784	JQ267585	chicken	Iran	EMM_1	2008
XIII_b	XIII.1	**XIII.2**	XIII.2	1729	KT734766	chicken	India	Pandu	2015
XIII_b	XIII.1	**XIII.2**	XIII.2	2022	KY828161.1	chicken	India	MZ_7	2016
XIII_b	XIII.1	**XIII.2**	XIII.2	2023	KY828160.1	chicken	India	MZ_6	2016
XIII_b	XIII.1	**XIII.2**	XIII.2	2024	KY828159.1	chicken	India	MZ_5	2016
XIII_b	XIII.1	**XIII.2**	XIII.2	2025	KY828158.1	chicken	India	MZ_4	2016
XIII_b	XIII.1	**XIII.2**	XIII.2	2026	KY828157.1	chicken	India	MZ_3	2016
XIII_b	XIII.1	**XIII.2**	XIII.2	2027	KY828156.1	chicken	India	MZ_2	2016
XIII_b	XIII.1	**XIII.2**	XIII.2	2028	KY828155.1	chicken	India	MZ_1	2016
XIII_b	XIII.1	**XIII.2**	XIII.2	2076	MF422123.1	chicken	India	110_13A	2013
XIII_b	XIII.1.2.2.2	**XIII.2.1**	XIII.2.1	1745	GU182323	chicken	Pakistan	SPVC_Karachi_43	2008
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1747	GU182331	chicken	Pakistan	SPVC_Karachi_33	2007
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1748	JN682184	chicken	Pakistan	BYP_Lahore	2010
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1749	JN682186	chicken	Pakistan	CP_Islamabad1	2010
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1750	JN682187	chicken	Pakistan	BYP_Rawalpindi	2010
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1752	JN682189	chicken	Pakistan	CP_Rawalpindi2	2010
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1753	JN682190	chicken	Pakistan	CP_Islamabad2	2010
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1754	JN682191	chicken	Pakistan	CP_Islamabad3	2010

XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1755	JN682211	chicken	Pakistan	CP	2010
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1756	JQ517285	chicken	Pakistan	Pakistan_UDL8	2011
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1757	JX436344	chicken	Pakistan	MM14_Lahore	2010
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	1758	KF113338	chicken	Pakistan	University_Diagnostic_Lab_12	2010
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	2050	MH019281.1	chicken	Pakistan	PK1	2015
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	2324	MH392222	chicken	Pakistan	SPVC_Karachi_27_558	2007
XIII_b	XIII.1.2.2.1	**XIII.2.1**	XIII.2.1	2325	MH392223	chicken	Pakistan	SPVC_Karachi_33_556	2007
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1760	KF740478	Japanese_quail	India	NDV2K35_TN	2003
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1761	KM056344	chicken	India	ndv16_Godhra_03	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1762	KM056345	chicken	India	ndv20_Navli_03	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1763	KM056346	chicken	India	ndv26_navli_03	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1764	KM056347	chicken	India	ndv32_vaherakhadi_04	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1765	KM056348	chicken	India	ndv40_sarsa_04	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1766	KM056349	chicken	India	ndv42_gopalpura_04	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1767	KM056350	chicken	India	ndv52_Sarsa	_
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1768	KM056352	chicken	India	ndv54_Hyderabad	_
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1769	KP089979	chicken	India	Nagpur	2012
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1770	KT734767	chicken	India	Polashbari	2014
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1771	KX061544	Red_lori	India	CHN	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1772	KX242342	chicken	India	D162	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1773	KX372707	chicken	India	Nagpur_03	2011
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1774	KX372708	chicken	India	Nagpur_04	2011
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	1785	KT734765	chicken	India	Hajo	2014
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2070	MF362983.1	chicken	India	PDDSL_2	2015
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2071	MF362984.1	chicken	India	PDDSL_3	2015
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2072	MF362985.1	chicken	India	PDDSL_4	2015
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2073	MF362986.1	chicken	India	PDDSL_5	2015
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2075	MF362988.1	chicken	India	PDDSL_7	2016
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2077	MF422124.1	chicken	India	229_13B	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2078	MF422125.1	chicken	India	96_15	2015
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2079	MF422126.1	chicken	India	478_13A	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2080	MF422127.1	chicken	India	805_13B	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2081	MF422128.1	chicken	India	248_13A2	2013
XIII_b	XIII.1.2.2.2	**XIII.2.2**	XIII.2.2	2082	MF422129.1	chicken	India	410_16A	2016
XIV	XIV	**XIV**	XIV	1786	JF966386	chicken	Mali	ML029	2007
XIV_a	XIV.1	**XIV.1**	XIV.1	1790	FJ772452	chicken	Nigeria	1377_8	2006
XIV_a	XIV.1	**XIV.1**	XIV.1	1791	HF969131	chicken	Nigeria	NIE08_2117	2009
XIV_a	XIV.1	**XIV.1**	XIV.1	1792	HF969136	chicken	Nigeria	NIE08_2194	2009
XIV_a	XIV.1	**XIV.1**	XIV.1	1793	HF969139	chicken	Nigeria	NIE08_2280	2009
XIV_a	XIV.1	**XIV.1**	XIV.1	1794	HF969144	chicken	Nigeria	NIE09_2009	2009
XIV_a	XIV.1	**XIV.1**	XIV.1	1795	HF969150	chicken	Nigeria	NIE09_2044	2009

XIV_a	XIV.1	**XIV.1**	XIV.1	1796	HF969155	chicken	Nigeria	NIE09_2087	2009
XIV_a	XIV.1	**XIV.1**	XIV.1	1797	HF969167	turkey	Nigeria	NIE10_082	2011
XIV_a	XIV.1	**XIV.1**	XIV.1	1798	HF969186	chicken	Nigeria	NIE07_125	2007
XIV_a	XIV.1	**XIV.1**	XIV.1	1799	HF969193	chicken	Nigeria	NIE08_2150	2009
XIV_a	XIV.1	**XIV.1**	XIV.1	1800	HF969200	chicken	Nigeria	NIE08_2362	2009
XIV_a	XIV.1	**XIV.1**	XIV.1	1801	HF969205	turkey	Nigeria	NIE09_2071	2009
XIV_a	XIV.1	**XIV.1**	XIV.1	1802	JN872165	chicken	Niger	VIR_1377_7_	2006
XIV_a	XIV.1	**XIV.1**	XIV.1	1803	JQ039386	chicken	Nigeria	VRD08_36	2008
XIV_b	XIV.2	**XIV.2**	XIV.2	1807	HF969133	chicken	Nigeria	NIE08_2159	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1808	HF969141	chicken	Nigeria	NIE08_2359	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1809	HF969142	chicken	Nigeria	NIE09_1596	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1810	HF969143	chicken	Nigeria	NIE09_1597	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1811	HF969145	chicken	Nigeria	NIE09_2014	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1812	HF969146	chicken	Nigeria	NIE09_2017	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1813	HF969149	chicken	Nigeria	NIE09_2041	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1814	HF969151	chicken	Nigeria	NIE09_2053	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1815	HF969157	chicken	Nigeria	NIE09_2166	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1816	HF969161	chicken	Nigeria	NIE10_024	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1817	HF969162	chicken	Nigeria	NIE10_032	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1818	HF969163	chicken	Nigeria	NIE10_034	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1819	HF969164	chicken	Nigeria	NIE10_041	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1820	HF969165	chicken	Nigeria	NIE10_043	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1821	HF969166	chicken	Nigeria	NIE10_076	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1822	HF969169	chicken	Nigeria	NIE10_150	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1823	HF969170	chicken	Nigeria	NIE10_160	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1824	HF969172	chicken	Nigeria	NIE10_258	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1825	HF969173	chicken	Nigeria	NIE10_302	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1826	HF969177	chicken	Nigeria	NIE10_409	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1827	HF969178	chicken	Nigeria	NIE08_2270	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1828	HF969187	chicken	Nigeria	NIE08_0453	2008
XIV_b	XIV.2	**XIV.2**	XIV.2	1829	HF969190	chicken	Nigeria	NIE08_2032	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1830	HF969198	chicken	Nigeria	NIE08_2279	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1831	HF969202	chicken	Nigeria	NIE09_2013	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1832	HF969203	turkey	Nigeria	NIE09_2021	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1833	HF969210	chicken	Nigeria	NIE10_139	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1834	HF969211	chicken	Nigeria	NIE10_263	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1835	HF969212	chicken	Nigeria	NIE10_318	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1836	HF969213	chicken	Nigeria	NIE10_325	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1837	HF969214	chicken	Nigeria	NIE10_333	2011
XIV_b	XIV.2	**XIV.2**	XIV.2	1838	JQ039390	chicken	Nigeria	VRD07_233	2007
XIV_b	XIV.2	**XIV.2**	XIV.2	1839	JX546245	chicken	Benin	463MT	2009

XIV_b	XIV.2	**XIV.2**	XIV.2	1840	KC568206	guinea_fowl	Nigeria	NG_706_JG_KZ_14T	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1841	KT948996	duck	Nigeria	NG_695_KG_LOM_11_16	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1842	KY171989	chicken	Nigeria	VRD10_143_N68_913	2010
XIV_b	XIV.2	**XIV.2**	XIV.2	1843	KY171990	chicken	Nigeria	KD_TW_03T_N45_720	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1844	KY171993	chicken	Nigeria	VRD09_031_N23_715	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	1845	KY171994	chicken	Nigeria	VRD09_001_N19_714	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2362	MH996919	Turkey	Nigeria	JG_DT_30_31T_N18	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2365	MH996922	pigeon	Nigeria	KT_MSH_15C_N2	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2366	MH996923	Wild_bird_eagle	Nigeria	VRD09_546_N4	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2370	MH996927	chicken	Nigeria	VRD09_340_N50	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2373	MH996930	chicken	Nigeria	JN_469_N44	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2381	MH996938	domestic_duck	Nigeria	JG_SH_47C_N15	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2384	MH996941	chicken	Nigeria	NS_KF_6_09C_N46	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2385	MH996942	domestic_duck	Nigeria	GM_GMM_17_18T_N14	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2386	MH996943	pigeon	Nigeria	YB_GSH1_4_6T_N3	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2388	MH996945	chicken	Nigeria	VRD09_25_N21	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2389	MH996946	chicken	Nigeria	KT_JBY_09T_N40	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2397	MH996954	chicken	Nigeria	Dundubus_VRD255_62	2010
XIV_b	XIV.2	**XIV.2**	XIV.2	2398	MH996955	chicken	Nigeria	VRD158A_70	2013
XIV_b	XIV.2	**XIV.2**	XIV.2	2399	MH996956	chicken	Nigeria	Kaduna_VRD401_17	2006
XIV_b	XIV.2	**XIV.2**	XIV.2	2400	MH996957	chicken	Nigeria	Kurmi_VRD033_23	2007
XIV_b	XIV.2	**XIV.2**	XIV.2	2401	MH996958	chicken	Nigeria	Kwara_VRD415_57	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2402	MH996959	chicken	Nigeria	Vom_VRD216_73	2013
XIV_b	XIV.2	**XIV.2**	XIV.2	2403	MH996960	chicken	Nigeria	Katsina_KT_CH_C18_22_74	2008
XIV_b	XIV.2	**XIV.2**	XIV.2	2423	MH996980	chicken	Nigeria	Vwang_VRD97_67	2013
XIV_b	XIV.2	**XIV.2**	XIV.2	2424	MH996981	chicken	Nigeria	VRD798_XIV_15_798	2015
XIV_b	XIV.2	**XIV.2**	XIV.2	2429	MH996986	chicken	Nigeria	VRD599_59	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2430	MH996987	chicken	Nigeria	Kogi_VRD578_60	2009
XIV_b	XIV.2	**XIV.2**	XIV.2	2432	MH996989	chicken	Nigeria	Dutse_JG_DT_C32_36_102	2010
V_a	XIX	**XIX**	XIX	463	FJ705456	cormorant	USA_MN_	MN_92_40140	1992
V_a	XIX	**XIX**	XIX	464	FJ705457	cormorant	USA	CA_97_23071	1997
V_a	XIX	**XIX**	XIX	465	FJ705458	cormorant	USA_CA_	CA_D9704285	1997
V_a	XIX	**XIX**	XIX	466	FJ705459	cormorant	Canada	98CNN3_V1125	1998
V_a	XIX	**XIX**	XIX	467	FJ705460	cormorant	Canada	95DC02150	1995
V_a	XIX	**XIX**	XIX	468	FJ705461	cormorant	Canada	95DC2345	1995
V_a	XIX	**XIX**	XIX	469	FJ705463	cormorant	USA_	NV_19529_04	2005
V_a	XIX	**XIX**	XIX	470	GU332655	cormorant	USA_	496	2008
V_a	XIX	**XIX**	XIX	471	GU332662	cormorant	USA_	503	2008
V_a	XIX	**XIX**	XIX	472	GU332663	cormorant	USA_	506	2008
V_a	XIX	**XIX**	XIX	473	JN255775	cormorant	USA	MA_651	2010
V_a	XIX	**XIX**	XIX	474	JN255777	Great_Cormorant	USA	HN_654	2010

V_a	XIX	**XIX**	XIX	475	JN255778	great_black_backed_gull	USA	655	2010
V_a	XIX	**XIX**	XIX	476	JN255779	herring_gull	USA	656	2010
V_a	XIX	**XIX**	XIX	477	JN255781	cormorant	USA	ME_658_	2010
V_a	XIX	**XIX**	XIX	478	JN255782	cormorant	USA	ME_659	2010
V_a	XIX	**XIX**	XIX	479	JN255784	cormorant	USA	MN_648	2010
V_a	XIX	**XIX**	XIX	480	JN255785	cormorant	USA	HN_652	2010
V_a	XIX	**XIX**	XIX	481	JN872159	cormorant	USA	Wisconsin_451287_11_06_	2006
V_a	XIX	**XIX**	XIX	482	JN872161	cormorant	USA	Wisconsin_498260_2_07_	1997
V_a	XIX	**XIX**	XIX	483	JN941988	cormorant	USA	Florida_66638_	2010
V_a	XIX	**XIX**	XIX	484	JN941991	cormorant	USA	Wisconsin_1718_	2008
V_a	XIX	**XIX**	XIX	485	JN941993	pelican	USA	Wisconsin_2415_02_	2008
V_a	XIX	**XIX**	XIX	486	JN942020	cormorant	USA	Oregon_399448_	2005
V_a	XIX	**XIX**	XIX	487	JN942023	cormorant	USA	Oregon_276236_7_	2003
V_a	XIX	**XIX**	XIX	488	JN942024	cormorant	USA	Wisconsin_272409_	2003
V_a	XIX	**XIX**	XIX	489	JN942026	Cormorant	USA	New_York_268898_7	2003
V_a	XIX	**XIX**	XIX	490	JN942029	cormorant	USA	Wisconsin_248	1998
V_a	XIX	**XIX**	XIX	491	JN942030	cormorant	USA	Wisconsin_28547	1997
V_a	XIX	**XIX**	XIX	492	JN942035	cormorant	USA	North_Dakota_43888_6	1992
V_a	XIX	**XIX**	XIX	493	JN942036	turkey	USA	North_Dakota_43084_25	1992
V_a	XIX	**XIX**	XIX	494	JN942038	cormorant	USA	Michigan_38819_5	1992
V_a	XIX	**XIX**	XIX	495	JN942097	cormorant	USA	Wisconsin_1926_	2008
V_a	XIX	**XIX**	XIX	496	KC130083	cormorant	USA	Delaware_39840_2	2010
V_a	XIX	**XIX**	XIX	497	KC433530	cormorant	USA	Florida_41105	2012
V_a	XIX	**XIX**	XIX	498	KC433532	cormorant	USA	Florida_42884	2012
V_a	XIX	**XIX**	XIX	2318	MH392216	cormorant	USA_MN_	92_40140_250	1992
XVI	XVI	**XVI**	XVI	1854	JX119193	chicken	Dominican_Republic	499_31	2008
XVI	XVI	**XVI**	XVI	1855	JX186997	chicken	Dominican_Republic	867	2008
XVI	XVI	**XVI**	XVI	1856	JX915242	chicken	Dominican_Republic	28138_4	1986
XVI	XVI	**XVI**	XVI	1857	JX915243	chicken	Mexico	Queretaro_452_1947	1947
XVII	XVII	**XVII**	XVII	1860	HF969125	chicken	CAR	CAF09_014	2008
XVII	XVII	**XVII**	XVII	1861	HF969180	_	Cameroon	CAE08_318	2009
XVII	XVII	**XVII**	XVII	1862	HF969182	chicken	CAR	CAF09_016	2009
XVII	XVII	**XVII**	XVII	1865	KU058680	chicken	Nigeria	Kudu_113_N56_	1992
XVII_a	XVII	**XVII**	XVII	1869	FJ772449	_	Nigeria	913_33	2006
XVII_a	XVII	**XVII**	XVII	1870	FJ772458	chicken	Burkina_Faso	2415_361	2008
XVII_a	XVII	**XVII**	XVII	1871	FJ772463	chicken	Burkina_Faso	2415_580	2008
XVII_a	XVII	**XVII**	XVII	1872	FJ772469	chicken	Niger	2602_348	2008
XVII_a	XVII	**XVII**	XVII	1873	FJ772472	chicken	Niger	2602_468	2008
XVII_a	XVII	**XVII**	XVII	1874	FJ772475	chicken	Nigeri	2602_605	2008
XVII_a	XVII	**XVII**	XVII	1875	FJ772478	chicken	Cameroon	3490_149	2008
XVII_a	XVII	**XVII**	XVII	1876	FJ772481	chicken	Niger	2602_625	2008

XVII_a	XVII	**XVII**	XVII	1877	FJ772484	chicken	Cameroon	_3490_147	2008
XVII_a	XVII	**XVII**	XVII	1878	FJ772486	_	Nigeria	3724_6	2008
XVII_a	XVII	**XVII**	XVII	1879	HF969129	chicken	Nigeria	NIE08_1363	2008
XVII_a	XVII	**XVII**	XVII	1880	HF969130	guinea_fowl	Nigeria	NIE08_2004	2009
XVII_a	XVII	**XVII**	XVII	1881	HF969132	chicken	Nigeria	NIE08_2149	2009
XVII_a	XVII	**XVII**	XVII	1882	HF969134	chicken	Nigeria	NIE08_2168	2009
XVII_a	XVII	**XVII**	XVII	1883	HF969135	chicken	Nigeria	NIE08_2187	2009
XVII_a	XVII	**XVII**	XVII	1884	HF969138	chicken	Nigeria	NIE08_2224	2009
XVII_a	XVII	**XVII**	XVII	1885	HF969140	chicken	Nigeria	NIE08_2340	2009
XVII_a	XVII	**XVII**	XVII	1886	HF969148	chicken	Nigeria	NIE09_2034	2009
XVII_a	XVII	**XVII**	XVII	1887	HF969152	chicken	Nigeria	NIE09_2072	2009
XVII_a	XVII	**XVII**	XVII	1888	HF969168	chicken	Nigeria	NIE10_124	2011
XVII_a	XVII	**XVII**	XVII	1889	HF969174	chicken	Nigeria	NIE10_304	2011
XVII_a	XVII	**XVII**	XVII	1890	HF969175	chicken	Nigeria	NIE10_306	2011
XVII_a	XVII	**XVII**	XVII	1891	HF969176	chicken	Nigeria	NIE10_310	2011
XVII_a	XVII	**XVII**	XVII	1892	HF969184	chicken	Ivory_Coast	CIV08_103	2007
XVII_a	XVII	**XVII**	XVII	1893	HF969185	chicken	Ivory_Coast	CIV08_104	2007
XVII_a	XVII	**XVII**	XVII	1894	HF969188	chicken	Nigeria	NIE08_1365	2008
XVII_a	XVII	**XVII**	XVII	1895	HF969191	chicken	Nigeria	NIE08_2042	2009
XVII_a	XVII	**XVII**	XVII	1896	HF969192	chicken	Nigeria	NIE08_2119	2009
XVII_a	XVII	**XVII**	XVII	1897	HF969195	chicken	Nigeria	NIE08_2247	2009
XVII_a	XVII	**XVII**	XVII	1898	HF969197	chicken	Nigeria	NIE08_2267	2009
XVII_a	XVII	**XVII**	XVII	1899	HF969199	chicken	Nigeria	NIE08_2349	2009
XVII_a	XVII	**XVII**	XVII	1900	HF969204	chicken	Nigeria	NIE09_2028	2009
XVII_a	XVII	**XVII**	XVII	1901	HF969207	_	Nigeria	NIE09_2167	2009
XVII_a	XVII	**XVII**	XVII	1902	HF969209	chicken	Nigeria	NIE10_123	2011
XVII_a	XVII	**XVII**	XVII	1903	HF969215	chicken	Nigeria	NIE10_335	2011
XVII_a	XVII	**XVII**	XVII	1904	JF966385	chicken	Mali	ML007	2008
XVII_a	XVII	**XVII**	XVII	1905	JQ039393	chicken	Nigeria	VRD07_141	2007
XVII_a	XVII	**XVII**	XVII	1906	JQ039394	chicken	Nigeria	VRD07_410	2007
XVII_a	XVII	**XVII**	XVII	1909	JX546247	chicken	Benin	488MT	2009
XVII_a	XVII	**XVII**	XVII	1910	KC568204	pigeon	Nigeria	ZM_KN_PG01_N1_688	2009
XVII_a	XVII	**XVII**	XVII	1911	KC568208	chicken	Nigeria	NG_710_GM_PLBM_10_12T	2009
XVII_a	XVII	**XVII**	XVII	1912	KY171991	quail	Nigeria	VRD17_04_N2_861	2004
XVII_a	XVII	**XVII**	XVII	1913	KY171992	chicken	Nigeria	JN_469_N44_892	2009
XVII_a	XVII	**XVII**	XVII	1914	KY171995	chicken	Nigeria	VRD124_06_N11_867	2006
XVII_a	XVII	**XVII**	XVII	1915	KY292310	quail	Nigeria	VRD08_385_N23	2009
XVII_b	XVII	**XVII**	XVII	1935	FJ772446	_	Nigeria	913_1	2006
XVII_b	XVII	**XVII**	XVII	1936	HF969128	_	Nigeria	NIE07_216	2007
XVII_b	XVII	**XVII**	XVII	1937	HF969171	chicken	Nigeria	NIE10_182	2011
XVII_b	XVII	**XVII**	XVII	1938	HF969194	chicken	Nigeria	NIE08_2199	2009

XVII_b	XVII	**XVII**	XVII	1939	HF969196	chicken	Nigeria	NIE08_2261	2009
XVII_b	XVII	**XVII**	XVII	1940	KF442614	chicken	Nigeria	228_7	2006
XVII_a	XVII	**XVII**	XVII	2151	MH092810	duck	Kanam	Nigeria_KN_399_N26	2009
XVII_a	XVII	**XVII**	XVII	2361	MH996918	domestic_duck	Nigeria	BA_BAU_R_07T_N17	2009
XVII_a	XVII	**XVII**	XVII	2368	MH996925	chicken	Nigeria	BA_TFB_14C_N38	2009
XVII_a	XVII	**XVII**	XVII	2369	MH996926	chicken	Nigeria	BO_MMC_AGN_6_07T_N42	2009
XVII_a	XVII	**XVII**	XVII	2374	MH996931	Guinea_fowl	Nigeria	KT_MA_5_6C_N7	2009
XVII_a	XVII	**XVII**	XVII	2375	MH996932	Vulture	Nigeria	PL038_N47	2002_2003
XVII_a	XVII	**XVII**	XVII	2376	MH996933	chicken	Nigeria	LTS_11T_N38	2009
XVII_a	XVII	**XVII**	XVII	2378	MH996935	duck	Nigeria	YB_GSHI_07T_N5	2009
XVII_a	XVII	**XVII**	XVII	2382	MH996939	domestic_duck	Nigeria	JG_SH_47C_N15	2009
XVII_a	XVII	**XVII**	XVII	2404	MH996961	chicken	Nigeria	Jos_VRD234_7	2002
XVII_a	XVII	**XVII**	XVII	2406	MH996963	chicken	Nigeria	VRD21_63	2011
XVII_a	XVII	**XVII**	XVII	2407	MH996964	chicken	Nigeria	VRD64_66	2012
XVII_a	XVII	**XVII**	XVII	2408	MH996965	duck	Nigeria	Keffi_NS_KR_DK56_57_93	2010
XVII_a	XVII	**XVII**	XVII	2409	MH996966	chicken	Nigeria	Azare_BA_AZR_C6_7_96	2010
XVII_a	XVII	**XVII**	XVII	2412	MH996969	chicken	Nigeria	Bauchi_VRD154_14	2005
XVII_a	XVII	**XVII**	XVII	2413	MH996970	chicken	Nigeria	Zaria_VRD646_19	2006
XVII_a	XVII	**XVII**	XVII	2414	MH996971	chicken	Nigeria	T_Wada_VRD647_20	2006
XVII_a	XVII	**XVII**	XVII	2416	MH996973	chicken	Nigeria	Katsina_VRD221_40	2007
XVII_a	XVII	**XVII**	XVII	2417	MH996974	chicken	Nigeria	Fune_VRD284_44	2007
XVII_a	XVII	**XVII**	XVII	2418	MH996975	chicken	Nigeria	P_Harcourt_VRD289_46	2007
XVII_a	XVII	**XVII**	XVII	2419	MH996976	chicken	Nigeria	Gombe_VRD316_56	2008
XVII_a	XVII	**XVII**	XVII	2420	MH996977	chicken	Nigeria	Jigawa_JG_BR_T15_101	2010
XVII_a	XVII	**XVII**	XVII	2421	MH996978	chicken	Nigeria	Jos_VRD152_9	2003
XVII_a	XVII	**XVII**	XVII	2425	MH996982	chicken	Nigeria	Owerri_west_VRD798_XVII_15_798	2015
XVII_a	XVII	**XVII**	XVII	2426	MH996983	chicken	Nigeria	Nassarawa_VRD235_15_235	2015
XVII_a	XVII	**XVII**	XVII	2427	MH996984	chicken	Nigeria	Katsina_KT_MG_C2_3_75	2011
XVII_a	XVII	**XVII**	XVII	2428	MH996985	chicken	Nigeria	VRD25_12	2005
XVII_a	XVII	**XVII**	XVII	2431	MH996988	chicken	Nigeria	Keffu_NS_KF_C13_17_90	2010
XVII_a	XVII	**XVII**	XVII	2433	MH996990	chicken	Nigeria	Dutse_JG_DT_C32_36_102	2010
XVII_a	XVII	**XVII**	XVII	2434	MH996991	chicken	Nigeria	Katsina_KT_MDWT3_4_104	2011
XVIII_a	XVIII.1	**XVIII.1**	XVIII.1	1942	FJ772455	_	Mauritania	1532_14	2006
XVIII_a	XVIII.1	**XVIII.1**	XVIII.1	1943	HF969179	chicken	Ivory_Coast	CIV08_026	2007
XVIII_a	XVIII.1	**XVIII.1**	XVIII.1	1944	JF966387	chicken	Mali	ML008	2009
XVIII_a	XVIII.1	**XVIII.1**	XVIII.1	1945	JF966388	chicken	Mali	ML225	2008
XVIII_a	XVIII.1	**XVIII.1**	XVIII.1	1946	JF966389	guinea_fowl	Mali	ML038	2007
XVIII_a	XVIII.1	**XVIII.1**	XVIII.1	1947	JN872157	Green_Wood_Hoope	EH	5801_22	2010
XVIII_a	XVIII.1	**XVIII.1**	XVIII.1	1948	JX518885	chicken	Mali	ML57051T	2010
XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	1950	FJ772466	chicken	IvoryCoast	2601	2008
XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	1951	HF969126	duck	Ivory_Coast	CIV08_062	2006

XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	1952	HF969216	chicken	Nigeria	NIE11_1286	2011
XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	1953	HF969217	chicken	Nigeria	NIE10_171	2011
XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	1954	HF969218	chicken	Ivory_Coast	CIV08_042	2007
XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	1955	HG326600	village_weaver	Ivory_Coast	CIV08_032	2006
XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	1956	JN942101	finch	EH	FinEastern_Hemisphere_1409_12	2008
XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	1957	JX518886	chicken	Mali	ML57072T	2010
XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	1958	JX546248	chicken	Togo	AKO18	2009
XVIII_b	XVIII.2	**XVIII.2**	XVIII.2	2329	MH392227	chicken	Nigeria	OOT_4_1_N69_914	2009
VI_c	XX	**XX**	XX	669	AB465606	chicken	Japan	Ibaraki	1985
VI_c	XX	**XX**	XX	670	AB853928	chicken	Japan	Ibaraki_SM87	1987
VI_c	XX	**XX**	XX	671	AF458015	chicken	China	ZhJ_3	1997
VI_c	XX	**XX**	XX	672	AF458016	chicken	China	ZhJ_2	1986
VI_c	XX	**XX**	XX	673	AF458017	chicken	China	Sh_2	1998
VI_c	XX	**XX**	XX	674	AF458018	chicken	China	Sh_1	1997
VI_c	XX	**XX**	XX	675	EF589137	pigeon	China	GZ_Guizhou	_
VI_c	XX	**XX**	XX	676	HQ839733	chicken	Sweden		1995
VI_c	XX	**XX**	XX	677	KC853020	crested_ibis	China	Shaanxi10	2010
VI_c	XX	**XX**	XX	678	KU373026	ostrich	China	SX_O1	2006
VI_c	XX	**XX**	XX	679	KY042125	chicken	Bulgaria	DolnoLinevo	1992
VI_c	XX	**XX**	XX	683	AF458020	chicken	China	ZJ_1	1991
VI_c	XX	**XX**	XX	684	AF458021	chicken	China	JX_1	1994
VI_c	XX	**XX**	XX	685	GQ507801	chicken	South_Korea	Kr_102	1989
VI_c	XX	**XX**	XX	686	KY042142	quail_	Korea	88_M	1988
VI_c	XX	**XX**	XX	687	KY042143	chicken	Korea	93_58GG	1993
VI_c	XX	**XX**	XX	2004	MF278934.1	pigeon	China	GZ_HD_PN	2011
VI_l	XXI	**XXI**	XXI	865	KC205475	chicken	Ethiopia	ETH10065	2011
VI_l	XXI	**XXI**	XXI	866	KC205476	chicken	Ethiopia	_ETH_10073	2011
VI_l	XXI	**XXI**	XXI	867	KC205477	chicken	Ethiopia	ETH8755	2011
VI_l	XXI	**XXI**	XXI	868	KC205478	chicken	Ethiopia	ETHAN01	2011
VI_l	XXI	**XXI**	XXI	869	KC205479	chicken	Ethiopia	ETHMG1C	2011
VI_l	XXI	**XXI**	XXI	870	KJ958913	chicken	Ethiopia	13VIR3936_1	2012
VI_l	XXI	**XXI**	XXI	871	KJ958914	chicken	Ethiopia	13VIR3936_27	2012
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	728	JF824013	pigeon	Russia	Kemerovo_0267	2009
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	729	JF824032	pigeon	Russia	Vladimir_687	2005
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	731	KJ914671	pigeon	Ukraine	Dnipropetrovsk_1_18_11	2011
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	732	KJ914672	pigeon	Ukraine	Ukromne_3_26_11	2011
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	733	KT962979	pigeon	Russia	Altai_777	2010
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	734	KT965727	pigeon	Kazakhstan	EKO_15	2014
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	735	KT965728	pigeon	Kazakhstan	Zhambyl_32	2014
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	736	KX352835	mallard	Russia	Amur_264	2009
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	737	KY042127	pigeon	Ukraine	Kharkiv_23_01_967	2013

VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	738	KY042128	pigeon	Ukraine	Doneck_3	2007
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	739	KY042129	pigeon	Egypt	11_CL_G1_	2015
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	740	KY042130	pigeon	Egypt	44_CL_G24_	2015
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	741	KY042131	pigeon	Egypt	56_CL_G25_	2015
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	742	KY042132	pigeon	Egypt	73_OP_G29_	2015
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	743	KY042134	pigeon	Egypt	84_OP_G31_	2015
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	744	KY042136	pigeon	Pakistan	Lahore_125	2015
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	745	KY042137	pigeon	Pakistan	Jhang_115	2015
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	746	KY042138	pigeon	Pakistan	Lahore_126	2015
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	747	KY042139	pigeon	Pakistan	Lahore_146	2016
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	748	JQ039385	dove	Nigeria	dove_VRD07_163	2007
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	2349	MH717070.1	pigeon	Pakistan	AJK_AW_p54	2018
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	2396	MH996953	pigeon	Nigeria	Kazaure_VRD231_42	2007
VI_g	XXI.1.1	**XXI.1.1**	XXI.1.1	2437	MK005973	pigeon	Egypt	Souqal_Cairo_39_L_G23_1105	2015
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	873	KU862297	pigeon	Pakistan	Lahore_AW_1	2014
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	874	KU862298	pigeon	Pakistan	Lahore_AW_2	2015
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	875	KU885949	pigeon	Pakistan	MZS_UVAS	2014
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	876	KX236100	pigeon	Pakistan	21A	2015
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	877	KX236101	pigeon	Pakistan	25A	2015
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	878	KY042135	pigeon	Pakistan	22A	2015
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	879	KY042140	pigeon	Pakistan	Jallo_Lahore_221A	2016
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	880	KY042141	pigeon	Pakistan	Jallo_Lahore_221B	2016
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	2350	MH717071.1	pigeon	Pakistan	AJK_AW_p51	2018
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	2351	MH717072.1	pigeon	Pakistan	AJK_AW_p52	2018
VI_m	XXI.1.2	**XXI.1.2**	XXI.1.2	2352	MH717073.1	pigeon	Pakistan	AJK_AW_p53	2018
VI_i	XXI.2	**XXI.2**	XXI.2	762	HG424625	pigeon	Nigeria	NIE13_005	2013
VI_i	XXI.2	**XXI.2**	XXI.2	763	JN638234	dove	Italy	11RS98_102VIR	2011
VI_i	XXI.2	**XXI.2**	XXI.2	764	JN638235	dove	Italy	11RS100_104VIR	2011
VI_i	XXI.2	**XXI.2**	XXI.2	765	JN638236	dove	Italy	10RS6171_7154VIR	2010
VI_i	XXI.2	**XXI.2**	XXI.2	766	KU377533	Turtle_Dove	Italy	10VIR7155	2010
VI_i	XXI.2	**XXI.2**	XXI.2	767	KU377535	Turtle_Dove	Italy	12VIR1876_1	2012
VI_i	XXI.2	**XXI.2**	XXI.2	768	KU377536	Turtle_Dove	Italy	12VIR604	2012
VI_i	XXI.2	**XXI.2**	XXI.2	2104	MG456676.1	collared_dove	Iran		2014
VI_i	XXI.2	**XXI.2**	XXI.2	2148	MH044693.1	pigeon	Iran	Konarak_Barin	2017
VI_i	XXI.2	**XXI.2**	XXI.2	2286	MH377298.1	eurasian_collared_dove	Israel	PHL264746	2010

Supplemental Table S3. Complete fusion gene "pilot" dataset of class II NDV used in this study. The dataset contains 125 sequences and was used to build the trees depicted in Figure 2.

Genotypes based on the new classification and nomenclature system	Based on Diel et al. 2012	Acc. Number	Host	Country	Isolate	Year
I.1.1	I-a	AY935490	chicken	Australia	2_1334	2002
I.1.1	I-a	AY935495	chicken	Australia	99_868_hi	1999
I.1.1	I-a	M24693	chicken	Australia	Queensland	1966
I.1.2.1	I-c	EF564816	redknot	USA	NJ_A_101_1383	2001
I.1.2.1	I-c	GQ918280	black_headed_gull	Sweden		1994
I.1.2.1	I-c	KX352834	gull	Russia	Tyva_14	2014
I.1.2.2	I-d	AB465607	chicken	Japan	Ishi	1962
I.1.2.2	I-d	KC503476	northern_pintail	USA	AK_44500_136	2009
I.1.2.2	I-d	KC503479	redpoll	Russia	Nikita_530_FFNK2	2008
I.2	I-b	AY965079	duck	Russia	FarEast_2713	2001
I.2	I-b	HG326605	spur_winged_goose	Nigeria	NIE08_121	2008
I.2	I-b	KC503453	American_green_winged_teal	USA	AK_44493_716	2009
II	II	AF077761	chicken	USA	Lasota	1946
II	II	GU978777	chicken	USA	TX_GB	1948
II	II	JN872151	chicken	USA	Hitchner_B1	1947
III	III	EF201805	avian		Mukteswar	1940
III	III	GU182327	chicken	Pakistan	SPVC_Karachi_1	1974
III	III	MH996904	pigeon	Bulgaria	Novo_Selo_1161	1995
IV	IV	AY741404	Fowl	UK	Herts	1933
IV	IV	MH996900	pullet	Bulgaria	Plovdiv_1153	1959
V.1	V-b	JN872189	parrot	USA	Coast_8278	1982
V.1	V-b	JN872194	chicken	Honduras	498109_15	2007
V.1	V-b	JN942027	fighting_cock	Nicaragua	95066_9	2001
V.2	V-c	EU518682	Dove	Mexico	Distrito_Federal_462	2004
V.2	V-c	EU518684	chicken	Mexico	Estado_de_Mexico_466	2006
V.2	V-c	JQ697744	chicken	Mexico	NC04_635	2010
VI.2.1.1.1	VI-a	JX901367	pigeon	USA	PA_810	2008
VI.2.1.1.1	VI-a	JX901351	pigeon	USA	NJ_721	2007

VI.2.1.1.1	VI-n	MG018211	ECDO	USA	TX_1185_kidney_26981_3_A	2015
VI.2.1.1.2.1	VI-j	JX094510	pigeon	China	sms12	2012
VI.2.1.1.2.1	VI-j	JX901110	pigeon	Belgium	248_	1998
VI.2.1.1.2.1	VI-j	JX486553	pigeon	China	LHLJ_110813	2011
VI.2.1.1.2.2	VI-k	KT163262	pigeon	China	SH_167	2013
VI.2.1.1.2.2	VI-k	JX901124	pigeon	Belgium	11_09620	2011
VI.2.1.1.2.2	VI-k	MG840654.1	pigeon	China	Ningxia_2068	2016
VI.1	VI-b	AF109885	domestic_fowl	Great_Britain	GB1168	1984
VI.1	VI-b	FJ410145	pigeon	USA	NY	1984
VI.1	VI-b	FJ865434	pigeon	China	S_1	2002
VI.2.2.2	VI-e	FJ480825	pigeon	China	PG_JS_1	2005
VI.2.2.2	VI-e	JX244794	pigeon	China	100	2008
VI.2.2.2	VI-e	KJ607163	pigeon	China	LJS_1	2004
VI.2.2.1	VI-f	JN872180	waterfowl	USA	TX_209682	2002
VI.2.2.1	VI-f	JN872182	pigeon	USA	12339	1998
VI.2.2.1	VI-f	JX901312	pigeon	USA	101	2001
VI.2.1.2	VI-h	HG326604	pigeon	Nigeria	NIE09_1898	2009
VI.2.1.2	VI-h	JX518532	laughing_dove	Kenya	B2_Isiolo	2012
VI.2.1.2	VI-h	HG424627	pigeon	Nigeria	NIE13_92	2013
VII.1.1	VII-b	EF589133	pheasant	China	98_Guizhou	1998
VII.1.1	VII-d	EF579733	chicken	China	Shandong_Pyan	2004
VII.1.1	VII-e	AB853927	chicken	Japan	Ibaraki_SG106	1999
VII.1.1	VII-j	KC542905	chicken	China	Liaoning_1_2009	2009
VII.1.1	VII-l	KX268351	chicken	Iran	Behshahr	2015
VII.1.2	VII-f	AY028995	fowl	China	A7	1996
VII.1.2	VII-f	GQ338309	pigeon	China	18	2003
VII.1.2	VII-f	DQ227246	goose	China	Jiangsu_JS02	1999
VII.2	VII-h	MF622047	chicken	South_Africa	RBWW_3	2013
VII.2	VII-i	KU862293	Parakeet	Pakistan	Karachi_AW_1	2014
VII.2	VII-i	HQ697254	chicken	Indonesia	Banjarmasin_10	2010
VII.2	VII-k	KY747479	chicken	Namibia	5620	2016
VII.2	VII-a	JN986837	chicken	Netherlands	152608_ancestral	1993
VIII	VIII	AY734534	chicken	Argentina	Trenque_Lauquen	1970
VIII	VIII	FJ751918	chicken	China	QH1	1979

VIII	VIII	JX012096		Malaysia	AF2240	1960
IX	IX	AF458009	chicken	China	FJ_1	1985
IX	IX	FJ436303	chicken	China	ZJ_1	1986
IX	IX	FJ436302	chicken	China	F48E8	1948
X	X-a	FJ705468	mottled_duck	USA	TX_130	2011
X	X-a	KX857716	Redhead	USA	ndv42_AI09_4117	2009
X	X-b	FJ705466	mallard		99_376	1999
X	X-b	KX857721	Mallard	USA	MN_AI10_3434	2010
XI	XI	HQ266602	chicken	Madagascar	MG_725	2008
XI	XI	JX518882	chicken	Madagascar	MGMNJ	2009
XI	XI	JX518884	chicken	Madagascar	MGS1595T	2011
XII.1	XII-a	KU594615	chicken	Peru	Apurimac_50009	2005
XII.1	XII-a	KU594616	gamecock	Peru	Lurin_40871	2004
XII.1	XII-a	KU594618	chicken	Peru	Arequipa_VFAR_81	2015
XII.2	XII-b	JN627504	goose	China	GD_12	2011
XII.2	XII-b	JN627507	goose	China	GD_1003	2010
XII.2	XII-b	MF278927	goose	China	FS_SS_292	2013
XIII.1.1	XIII-a	JN942034	ostrich	South_Africa	45445_3	1995
XIII.1.1	XIII-a	JN942043	roller	Tanzania	47385_11	2010
XIII.1.1	XIII-a	MF409241	chicken	Zambia	Chiwoko	2015
XIII.2.1	XIII-b	GU182323	chicken	Pakistan	SPVC_Karachi_43	2008
XIII.2.1	XIII-b	GU182331	chicken	Pakistan	SPVC_Karachi_33_	2007
XIII.2.1	XIII-b	KF113338	chicken	Pakistan	University_Diagnostic_Lab_12	2010
XIII.2.2	XIII-b	KM056349	chicken	India	ndv42_gopalpura_4	2013
XIII.2.2	XIII-b	KT734767	chicken	India	Polashbari	2014
XIII.2.2	XIII-b	KX372707	chicken	India	Nagpur_3	2011
XIII.1.2	XIII-a	JQ267579	chicken	Iran	EMM_7	2011
XIII.1.2	XIII-a	JQ267584	chicken	Iran	EMM_2	2008
XIII.1.2	XIII-a	JQ267585	chicken	Iran	EMM_1	2008
XIV.1	XIV-a	HF969205	turkey	Nigeria	NIE09_2071	2009
XIV.1	XIV-a	JN872165	chicken	Niger	VIR_1377_7	2006
XIV.1	XIV-a	JQ039386	chicken	Nigeria	VRD08_36	2008
XIV.2	XIV-b	HF969187	chicken	Nigeria	NIE08_453	2008
XIV.2	XIV-b	HF969210	chicken	Nigeria	NIE10_139	2011

XIV.2	XIV-b	KY171990	chicken	Nigeria	KD_TW_03T_N45_720	2009
XVI	XVI	JX915242	chicken	Dominican_Republic	28138_4	1986
XVI	XVI	JX915243	chicken	Mexico	Queretaro_452_1947	1947
XVI	XVI	JX186997	chicken	Dominican_Republic	867	2008
XVII	XVII-a	HF969176	chicken	Nigeria	NIE10_310	2011
XVII	XVII-a	HF969191	chicken	Nigeria	NIE08_2042	2009
XVII	XVII-b	HF969194	chicken	Nigeria	NIE08_2199	2009
XVIII.1	XVIII-a	FJ772455		Mauritania	1532_14	2006
XVIII.1	XVIII-a	JF966389	guinea_fowl	Mali	ML038	2007
XVIII.1	XVIII-a	JX518885	chicken	Mali	ML57051T	2010
XVIII.2	XVIII-b	HF969218	chicken	Ivory_Coast	CIV08_42	2007
XVIII.2	XVIII-b	HG326600	village_weaver	Ivory_Coast	CIV08_32	2006
XVIII.2	XVIII-b	JX518886	chicken	Mali	ML57072T	2010
XIX	V-a	FJ705456	cormorant	USA	MN_92_40140	1992
XIX	V-a	JN942024	cormorant	USA	WI_272409	2003
XIX	V-a	KC433530	cormorant	USA	FL_41105	2012
XX	VI-c	AB853928	chicken	Japan	Ibaraki_SM87	1987
XX	VI-c	AF458016	chicken	China	ZhJ_2	1986
XX	VI-c	KY042142	quail	Korea	88_M	1988
XXI	VI-l	KC205479	chicken	Ethiopia	ETHMG1C	2011
XXI.2	VI-i	JN638234	dove	Italy	11RS98_102VIR	2011
XXI.2	VI-i	KU377533	Turtle_dove	Italy	10VIR7155	2010
XXI.2	VI-i	KU377535	Turtle_dove	Italy	12VIR1876_1	2012
XXI.1.2	VI-m	KU862298	pigeon	Pakistan	Lahore_AW_2	2015
XXI.1.2	VI-m	KY042135	Pigeon	Pakistan	22A	2015
XXI.1.2	VI-m	KY042141	Pigeon	Pakistan	Jallo_Lahore_221B	2016
XXI.1.1	VI-g	JF824032	pigeon	Russia	Vladimir_687	2005
XXI.1.1	VI-g	KY042136	Pigeon	Pakistan	Lahore_125	2015
XXI.1.1	VI-g	KY042132	Pigeon	Egypt	73_OP_G29	2015

Supplemental Table S4. Former sub-genotypes within class I and class II that did not pass the updated classification criteria (either one of 5% nucleotide distance, branch support equal or above 70%, at least 4 independent isolates) and were merged. The sub/genotype designation follows the newly proposed nomenclature and the former names are provided in parenthesis.

Class I		Class II genotype VI		Class II genotype X		Class II genotype XVII	
	1.2 (1c)		**VI.1.2.1.1.1 (VIn)**		**X (Xa)**		**XVII (XVIIb)**
1.2 (1d)	3.68	**VI.1.2.1.1.1 (VIa)**	3.46	**X (Xb)**	4.83	**XVII (XVIIa)**	4.59

Class II genotype VII		Class II genotype VII		Class II genotype VII		Class II genotype VII	
	VII.1.1 (VIIe)		**VII.1.1 (VIId+VIIℓ)**		**VII.1.1 (VIIj)**		**VII.2 (VIIi)**
VII.1.1 (b+j+d+ℓ)	4.21	**VII.1.1 (VIIb+VIIj)**	4.68	**VII.1.1 (VIIb)**	3.31	**VII.2 (VIIh+VIIk)**	9.61

Class II genotype VII		Class II genotype V	
	VII.2 (VIIk)		**V (Vd)**
VII.2 (VIIh)	11.10	**V.1 + V.2 (Vb+Vc)**	9.96

Supplemental Table S5. Recommended sequences to be used for rooting purposes when building sub-trees for separate analysis of each genotype within class II. The sequence to use for rooting is marked with an asterisk. These sequences were used to root the trees presented in Supplemental Fig. S7 A-I.

Genotype	Root with (GenBank number)
I, II, VIII, IX, X, XI, XVI	AY741404* and EF201805
III	AY741404* and EU293914*
IV	EF201805* and M24700*
V, VI, VII, XIV, XVII, XVIII, XIX, XX	JX915243* and AF048763
XII	JX915243* and JX393313
XIII	AY741404*, EF201805, JX915243 and AF048763
XXI	JX915243* and Z12111