

**NATIONAL STANDARDS FOR PHYTOSANITARY MEASURES**

**DETERMINATION OF PEST STATUS IN AN AREA**

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**Adoption:** This standard was adopted .....

## **1. INTRODUCTION:**

### **Scope**

This standard describes the components of subject matters and the relevant information required in a pest record in determination of pest status in an area including, pest status categories and the recommendations for the pest reporting. This standard adopted the principles, recommendations and format of ISPM to harmonize phytosanitary measures and facilitates trade by developing internationally recognized pest reporting practices. NSPM is based on guidelines and recommendations developed within the framework of the IPPC

### **References**

- IPPC.** 1997. *International Plant Protection Convention*. Rome, IPPC, FAO.
- ISPM 1.** 1993. *Principles of plant quarantine as related to international trade*. Rome, IPPC, FAO. [published 1995] [revised; ISPM 1: 2006]
- ISPM 2.** 1995. *Guidelines for pest risk analysis*. Rome, IPPC, FAO. [published 1996] [revised; ISPM 2: 2007]
- ISPM 4.** 1995. *Requirements for the establishment of pest free areas*. Rome, IPPC, FAO. [published 1996]
- ISPM 5.** *Glossary of phytosanitary terms*. Rome, IPPC, FAO.
- ISPM 6.** 1997. *Guidelines for surveillance*. Rome, IPPC, FAO.
- ISPM 9.** 1998. *Guidelines for pest eradication programmes*. Rome, IPPC, FAO.
- NSPM.2012.** *Guidelines for Pest Risk analysis, NPQP Nepal*
- NPQP.** 2006 *A report on strawberry nematode Pest Database Generation*, Kathmandu.

### **Definitions**

The definitions of phytosanitary terms used in the text are from Glossary of Phytosanitary terms (ISPM 5). The new definition as adopted in ISPM-8 is retained as such in this NSPM too.

**Outbreak:**

An isolated pest population recently detected and expected to survive for the immediate future

**Outline of requirements**

Primarily, the pest records provide information about the presence or absence of a pest, in an area during a particular time in particular host(s) including, the damage at the time of observation along with other relevant information. The information on the status of the pest are required by all exporting and importing countries for conducting risk analysis, compliance with import regulations, and the establishment and maintenance of pest free areas. The reliability of pest records and relevant data should be understood considering the collector/identifier, and the adopted means of technical identification, the location and date of the record, and the recording/publication of the record etc.

However, the determination of pest status requires expert judgment concerning the information available on the occurrence of a pest in an area. Pest status is generally determined using information from individual pest records, pest records from surveys, data on pest absence or presence, findings of general surveillance, and scientific publications and databases. The reliability of the status depends upon largely on the accuracy of the data and the information provided with minimum impediment to the international movement of people, commodities and vehicles.

## **2. GENERAL REQUIREMENTS FOR DETERMINATION OF PEST STATUS**

### **Purposes of Pest Status Determination**

A pest record is documented evidence including e-documentation, organism bank, indicating the presence or absence of a specific pest at a particular location and certain time, within an area, usually a country, under described circumstances and the pest status is determined taking into account the pest record and the available relevant information on the given pest in particular area . All countries may use pest status information for:

- PRA purposes
- planning national, regional or international pest management program
- establishing national pest lists
- establishing and maintaining pest free areas

Whereas, while importing the agricultural commodities information on pest status is needed mostly for the following purpose:

- conduct a pest risk analysis (PRA)
- establish phytosanitary regulations to prevent the entry, establishment or spread of a pest
- conduct a PRA on a non-quarantine pest with a view to regulating it.

Similarly, exporting countries need pest status information to:

- comply with import regulations of the the importing country and taking necessary Phyto sanitary Measures.
- meet requests for information from the importing countries for the purpose of PRA on pests .

The purpose, time and requirement of pest status report may vary but it is essential that all WTO member countries need to prepare pest record as a part of commitment to IPPC being a signatory.

### **Pest Records**

#### **Pest record**

A document providing information concerning the presence or absence of a specific pest at a particular location at a certain time, within an area (usually a country) under described circumstances [CEPM, 1997]

The NPPO should keep appropriate records quoting the source of Information.

Information in the records should include to the extent possible:

- scientific name of pest ,family/order
- scientific name of host and if available, and plant part affected or means of collection (e.g. attractant trap, soil sample, sweep net)
- locality, e.g. location, addresses , any specific notes if any
- date of collection and name of collector
- date of identification and name of identifier
- date of verification and name of verifier
- references, if any
- additional information, (e.g. nature of host relationship, infestation status, growth stage of plant affected, or found only in greenhouses).
- type of commodity, the collector and the date, and if appropriate the means of collection.
- Reports of new occurrences of pests should also include information on any measures taken, and such reports made available on request
- identification method
- year, and month if known, recorded; normally the day will only be required for specific circumstances (e.g. the first detection of a particular pest, pest monitoring) . A list of references is noted in the appendix to this standard for consultation in the preparation of a pest record. (Refer ISPM 6; A Report on Nepal strawberry Nematode Pest Database NPQP 2063/64)

### **Reliability**

Pest record information is available from many sources and has varying levels of reliability. Some key components (as in ISPM.8) are given in the following table. It may be adjusted according to time and location or host of the pest or intended purpose .The table ranks the categories in descending order of relative reliability, however it should be noted that these are not rigid and are proposed to provide guidance in evaluating the record.

NPPOs have responsibility to provide accurate information on pest records upon request from contracting parties.

***Guidance for evaluating the reliability of a pest record***

(Sources listed from most reliable to least reliable)

<b>1. Collector/ Identifiers</b>	<b>2. Technical identification</b>	<b>3. Location and date</b>	<b>4. Recording/ Publication</b>
a. Taxonomic specialist	a. Discriminating biochemical, morphological or molecular diagnosis (if available)	a. Delimiting or detection surveys b). NPPOs view	a. NPPO record/RPPO publication NPPO approval and notification record
b. Professional specialist, diagnostician	b. Specimen or culture maintained in official collection, taxonomic description by specialist	b. Other field or production surveys	b. Scientific or technical journal refereed
c. Scientist	c. Specimen in general collection	c. Casual or incidental field observation, possibly with no defined location/date	c. Official historical record
d. Technician	d. Description and photo	d. Observation with/in products or by-products; interception	d. Scientific or technical journal non-refereed
e. Expert/amateur	e. Visual description only	e. Precise location and date not known	e. Specialist amateur publication
f. Non-specialist	f. Method of identification not known	f. Unpublished scientific or technical document	
g. Collector/identifier not known		g. Non-technical publication; periodical/newspaper	
h. Personal communication; unpublished			

## **Pest Status in an Area**

The pest status is defined in following categories based on the the level of their presence i.e. the process for determining whether a pest has or has not the characteristics to be a quarantine pest or those of a **regulated non-quarantine pest**:

- **Presence of the pest** – leading to determinations such as “present in all parts of the country”, “present in some areas only”, etc.
- **Absence of the pest** – leading to determinations such as “no pest records”, “pest eradicated”, “pest no longer present”, etc.
- **Transience of the pest** – leading to determinations such as “non-actionable”, “actionable, under surveillance”, and “actionable, under eradication”.

Thus to facilitate international cooperation among contracting parties in meeting their obligations in reporting the pest occurrence, outbreak or spread, the national plant protection organizations (NPPOs), or other organizations as designated by the NPPO or persons involved in recording the presence, absence, or transience of pests, should follow good reporting practices and timely, share the information . The pest reporting practices should include accurate, reliable data, respecting the legitimate interests of all parties concerned in a prescribed format as recommended by the NPPO

### **Describing pest status in an area**

Determination of pest status requires expert judgment on the current distribution of a pest in an area. This judgment is based on a synthesis of pest records and information from relevant sources. Both current and historical records are used in assessing the present-day situation. Pest status can be described under the following categories:

#### **Presence**

A pest is present if records indicate that it is indigenous or introduced. If a pest is present and sufficient reliable records are available, then it may be possible to characterize its distribution using phrases, or combinations of phrases, such as the following examples:

- **Present:** in all parts of the area the country, or region or districts
- **Present:** only in some areas specify the area where possible
- **Present:** except in specified pest free areas if there are PFAs
- **Present:** in all parts of the area where host crop(s) are grown
- **Present:** only in some areas where host crop(s) are grown e.g, cotton area , tea/coffee area etc



- **Present:** only in protected cultivation like plastic house, green house,
- **Present:** seasonally (winter, summer, or... )
- **Present:** but managed as proper phytosanitary measures' are timely taken
- **Present:** subject to official control i.e the active enforcement of mandatory phytosanitary regulations and the application of mandatory phytosanitary procedures with an objective of eradication or containment of quarantine pests or for the management of regulated non-quarantine pests.
- **Present:** under eradication i.e. application of phytosanitary measures to eliminate a pest from an area
- **Present:** At low prevalence i.e. an area, whether all of a country, part of a country, or all or parts of several countries, as identified by the competent authorities, in which a specific pest occurs at low levels and which is subject to effective surveillance, control or eradication measures [IPPC, 1997].

Other similar descriptive phrases may be used, as appropriate. If few reliable records are available, it will be difficult to characterize the distribution.

As appropriate, it is useful to characterize the prevalence of the pest (e.g. common, occasional, rare), and the level of damage and/or losses caused by the pest on relevant hosts.

### **Absence**

If there are no records of the presence of the pest in the general surveillance data of an area, it may be reasonable to conclude that a pest is or has always been absent. This may be supported by specific records of absence.

It is also possible to conclude that a pest is absent even if there are pest records in the past. However, absence need to be confirmed by specific surveys (see ISPM 6:1997) and, in that case, the phrase “confirmed by survey” should then be added. Similarly, when a pest free area is established according to the appropriate ISPM 10 (see ISPM 4:1995) the phrase “Pest free area declared” should be added.

**Absent:** no pest records

General surveillance indicates that the pest is absent now and has never been recorded.

**Absent:** pest eradicated i.e. Pest records indicate that the pest was present in the past. A documented pest eradication programme was conducted and was successful (see ISPM 9:1998). Surveillance confirms continued absence. The eradication process involves three main activities: surveillance, containment, and treatment:

- surveillance: to fully investigate the distribution of the pest
- containment: to prevent the spread of the pest
- treatment: to eradicate the pest when it is found.

When an eradication programme is completed, the absence of the pest must be verified. The verification stage is integral to the programme, and should involve independent analysis if trading partners require reassurance. The minimum period of time of pest freedom to verify eradication will vary according to the biology of the pest, but should take into consideration factors such as:

- sensitivity of detection technology
- ease of detection
- life cycle of the pest
- climatic effects
- efficacy of treatment.

NPPOs should ensure that records are kept of information supporting all stages of the eradication process. It is essential that NPPOs maintain such documentation in case trading partners request information to support claims of pest freedom. NPPO should communicate with interested parties, as well as appropriate authorities concerning the fulfillment of programme objectives.

***Absent: pest no longer present***

Pest records indicate that the pest was transient or established in the past, but general surveillance indicates the pest is no longer present. The reason could be all or any of the following but need to be mentioned.

- climate or other natural limitation to pest perpetuation
- changes in hosts cultivated
- changes in cultivars
- changes in agricultural practices.

***Absent: pest records invalid***

Pest records indicate the presence of a pest, but the conclusion is reached that the records are invalid or no longer valid, as in the following officially declared cases:

- changes in taxonomy
- misidentification
- erroneous record

- changes in national borders where reinterpretation of the record may be needed.

***Absent: pest records unreliable***

Pest records indicate the presence of a pest, but the determination leads to the conclusion that the records are unreliable, as in the following officially declared cases:

- ambiguous nomenclature
- outdated identification or diagnostic methods
- records cannot be considered reliable (see table).

***Absent: intercepted only***

The pest has only been reported on consignments at a point of entry or initial destination or while under detention before release, treatment or destruction. Surveillance confirms that the pest has not established.

**Transience**

Pest status is considered transient when a pest is present but establishment is not expected to occur based on technical evaluation. There are three types of transience.

- **Non-actionable** :The pest has only been detected as an individual occurrence or isolated population not expected to survive and no phytosanitary measures have been applied.
- **Actionable, under surveillance** :The pest has been detected as an individual occurrence or an isolated population that may survive into the immediate future, but is not expected to establish. Appropriate phytosanitary measures, including surveillance are being applied.
- **Actionable, under eradication** :The pest has been detected as an isolated population which may survive into the immediate future and, without phytosanitary measures for eradication, may establish. Appropriate phytosanitary measures have been applied for its eradication.

**Determination of pest status in an area**

Determination of the status of a pest is provided by an NPPO. It results in deciding upon the most appropriate description of the pest status in an area based on supporting information. This may include:

- individual pest records
- pest records from surveys

- records or other indication of pest absence
- results of general surveillance
- information from scientific publications and databases
- phytosanitary measures used to prevent introduction or spread
- other information relevant to assessing pest absence or presence.

### **Recommended Reporting Practices**

Contracting parties have obligations under the IPPC (Article VIII.1(a) to report “the occurrence, outbreak or spread of pests”, of which, in the terms of this standard, information pertaining to “pest status in an area” is a part. Accurate reports are an essential part of the international cooperation to facilitate trade. Failure to discover and report pests, or inaccurate, incomplete, untimely or misinterpreted reports, can lead to the establishment of unjustified trade barriers or to the introduction and/or spread of pests.

Persons or organizations involved in collecting pest records should follow the recommendations as given in this standard, and provide the NPPO with accurate and complete details.

To observe good reporting practices, NPPOs should:

- base determinations of pest status in an area on the most reliable and timely information available
- take into account the categories and pest status determinations as set out in this standard when exchanging pest status information between countries
- inform the NPPO of trading partners as soon as possible, and their regional plant protection organization (RPPO) where appropriate, of relevant changes in pest status and especially reports of newly established pests
- report interceptions of regulated pests which suggest a change in pest status in the exporting country to other countries only after consultation with the exporting country
- when becoming aware of an otherwise unreported record of a pest in another country, the NPPO may report it to other countries or RPPOs only after informing and where possible consulting with the NPPO concerned
- exchange pest status information in conformity with Article VII.2(j) which states that Contracting parties shall, to the best of their ability, conduct surveillance for pests and develop and maintain adequate information on pest status in order to support categorization of pests, and for the development of

appropriate phytosanitary measures. This information shall be made available to contracting parties, on request. Article VIII.1(a) and VIII.1(c) states that The contracting parties shall cooperate with one another to the fullest practicable extent in achieving the aims of this Convention, and shall in particular: *(a) cooperate in the exchange of information on plant pests, particularly the reporting of the occurrence, outbreak or spread of pests that may be of immediate or potential danger, in accordance with such procedures as may be established by the Commission; (c) cooperate, to the extent practicable, in providing technical and biological information necessary for pest risk analysis.* of the IPPC to the extent practicable, and in a medium and language acceptable to both parties

- correct erroneous records as soon as possible.

## APPENDIXES

### APPENDIX 1: Useful references

The references here are widely available, easily accessible and generally recognized as authoritative. The list is not comprehensive or static, nor is it endorsed as a standard (*The references were reformatted in 2010 and updated where possible*).

#### Nomenclature, Terminology and General Taxonomy

##### BioNET-INTERNATIONAL.

<http://www.bionet-intl.org/opencms/opencms/index1.jsp> (accessed August 2010).

**Brickell, C.D. (chair) et al., eds.** 2009. *International code of nomenclature for cultivated plants*. 8th edn. (*Scripta Horticulturae*, 10) Leuven, Belgium, International Society for Horticultural Science (ISHS). 204 pp.

**EPPO.** 1996. *Bayer coding system*. Paris, France, European and Mediterranean Plant Protection Organization.

**Fiala, I. & Fèvre, F.** 1992. *Dictionnaire des agents pathogènes des plantes cultivées*. Paris, France, Institut National de la Recherche Agronomique (INRA) (English/French/Latin).

**International Commission on Zoological Nomenclature.** 1999. *International code of zoological nomenclature*. 4th edn. London, International Trust for Zoological Nomenclature. Available at <http://www.nhm.ac.uk/hosted-sites/iczn/code/index.jsp> (accessed August 2010).

**ISO 3166-1:2006.** *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes*. Geneva, International Organization for Standardization. Available at:

[http://www.iso.org/iso/country\\_codes/iso\\_3166\\_code\\_lists.htm](http://www.iso.org/iso/country_codes/iso_3166_code_lists.htm) in English/French (accessed August 2010).

**ISPM 5.** *Glossary of phytosanitary terms*. Rome, IPPC, FAO. (Arabic/Chinese/English/French/Spanish)

**McNeill, J. (chair) et al., eds & compilers.** 2006. *International code of botanical nomenclature* (Vienna Code). Adopted by the Seventeenth International Botanical Congress Vienna, Austria, July 2005. Liechtenstein, Gantner,

Ruggell. 568 pp. Available at <http://ibot.sav.sk/icbn/main.htm> (accessed August 2010).

**Shurtleff, M.C. & Averre, C.W.** 1997. *Glossary of plant pathological terms*. St. Paul MN, USA, American Phytopathological Society Press. 361 pp.

**United Nations.** 1997. Country names. *Terminology Bulletin No. 347/Rev. 1*. (UN Member names in Arabic/Chinese/English/French/Russian/Spanish.) New York, Department of General Assembly Affairs and Conference Services of the United Nations Secretariat.

### **General Pest Identification and Distribution**

**CABI.** a. *CABPEST CD-ROM*. Wallingford, UK, CAB International.

**CABI.** b. *Crop protection compendium CD-ROM*. Wallingford, UK, CAB International. Refer <http://www.cabi.org/cpc/> (accessed August 2010).

**CABI.** c. *Descriptions of fungi and bacteria*. Wallingford, UK, CAB International. Refer <http://www.cabi.org/dfb/> (accessed August 2010).

**CABI.** d. *Distribution maps of plant pests*. Wallingford, UK, CAB International. Refer <http://www.cabi.org/dmpp/> (accessed August 2010).

**OIRSA.** 1994–1999. *Hojas de datos sobre plagas y enfermedades agrícolas de importancia cuarentenaria para los países miembros del OIRSA*, volúmenes 1–5. San Salvador, El Salvador, Organismo Internacional Regional de Sanidad Agropecuaria. Available at [http://www.oirsa.org/portal/Biblioteca\\_Virtual.aspx](http://www.oirsa.org/portal/Biblioteca_Virtual.aspx) (accessed August 2010)

**Smith, I.M., McNamara, D.G., Scott, P.R. & Holderness, M., eds.** *Quarantine Pests for Europe*. 2nd edn. (Data sheets on quarantine pests for the European Union and for the European and Mediterranean Plant Protection Organization.) Wallingford, UK, CAB International in association with EPPO.

**Waller, J.M., Lenné, J.M. & Waller, S., eds.** 2001. *Plant pathologists' pocketbook*. 3rd edn. Wallingford, UK, CAB International. 528 pp. (Arabic edn, 1990, CABI/FAO; Spanish edn, 1985, published by FAO Regional Office for Latin America and the Caribbean, Santiago, Chile, in cooperation with CABI.)

**Wilson, D.E. & Reeder, D.M., eds.** 2005. *Mammal Species of the World. A Taxonomic and Geographic Reference*. 3rd edn. Baltimore, USA, Johns Hopkins University Press. 2142 pp. Online database, <http://www.bucknell.edu/msw3/> (accessed August 2010).

## **Bacteria**

**Bradbury, J.F. & Saddler, G.S.** 2008. *Guide to plant pathogenic bacteria*. 2nd rev. subedn. Wallingford, UK, CAB International.

**Young, J.M., Saddler, G., Takikawa, Y., De Boer, S.H., Vauterin, L., Gardan, L., Gvozdyak, R.I. & Stead, D.E.** 1996. Names of plant pathogenic bacteria 1864–1995. *Review of Plant Pathology*, 75: 721–763. Online database, [http://www.isppweb.org/names\\_bacterial.asp](http://www.isppweb.org/names_bacterial.asp) (accessed August 2010).

## **Fungi**

**Kirk, P.M., Cannon, P.F., Minter, D.W. & Stalpers, J.A.** 2008. *Ainsworth & Bisby's Dictionary of the Fungi*. 10th edn. Wallingford, UK, CAB International. 784 pp.

**CABI.** e. *Index of fungi*. (A bi-annual listing providing full bibliographic and nomenclatural details of some 2000 names of fungi per annum.) Surrey, UK, CAB International Mycological Institute. (Online database, *Index Fungorum*, at <http://www.indexfungorum.org/Names/Names.asp>, accessed August 2010.)

## **Insects and Mites**

**CABI.** f. *Arthropod name index on CD-ROM*. Wallingford, UK, CAB International.

**Wood, A.M., compiler.** 1989. *Insects of economic importance: a checklist of preferred names*. Wallingford, UK, CAB International.

## **Nematodes**

**CABI.** g. *NEMA CD-ROM*. Wallingford, UK, CAB International.

**Ebsary, B.A.** 1991. *Catalog of the order Tylenchida (Nematoda)*. Ottawa, Agriculture Canada. 196 pp.

**Hunt, D.J.** 1993. *Aphelenchida, Longidoridae and Trichodoridae: their systematics and bionomics*. Wallingford, UK, CAB International. 150 pp.

## **Plant Diseases**

**APS.** a. *Common names of plant diseases*. St. Paul, MN, USA, American Phytopathological Society, Committee on Standardization of Common Names for Plant Diseases. (Online database at <http://www.apsnet.org/online/common/>, accessed August 2010.)

**APS.** b. Disease compendium series of the American Phytopathological Society. St. Paul, MN, USA, American Phytopathological Society.



**CABI.** h. *Distribution maps of plant diseases*. Wallingford, UK, CAB International.  
(See [http:// www.cabi.org/dmpd/](http://www.cabi.org/dmpd/), accessed August 2010.)

**Miller, P.R. & Pollard, H.L.** 1976–1977. *Multilingual compendium of plant diseases*. Vol. 1 (Fungi and bacteria); Vol. II (Viruses and nematodes). (Crosslingual: 23 languages.) St. Paul, MN, USA, American Phytopathological Society. 457 pp. (vol. 1); 434 pp. (vol. 2)

**Singh, U.S., Chaube, H.S., Kumar, J. & Mukhopadhyay, A.N., eds.** 1992. *Plant diseases of international importance*. Vol. 1: Diseases of cereals and pulses; Vol. 2: Diseases of vegetables and oil seed crops; Vol. 3: Diseases of fruit crops; Vol. 4: Diseases of sugar, forest, and plantation crops. Englewood Cliffs, NJ, USA, Prentice Hall.

### **Plants and Weeds**

**Brako, L., Rossman, A.Y. & Farr, D.F., eds.** 1995. *Scientific and common names of 7,000 vascular plants in the United States*. St. Paul MN, USA, American Phytopathological Society. 301 pp.

**Brummitt, R.K.** 1992. *Vascular plant families and genera*. Kew, Surrey, UK, Royal Botanic Gardens.

**Haefliger, E., Scholz, H., eds.** *Grass weeds, 1: Weeds of the subfamily Panicoideae; Grass weeds, 2: Weeds of the subfamilies Chloridoideae, Pooideae, Oryzoideae; Monocot weeds, 3: Monocot weeds excluding grasses*. Basle, Switzerland, Ciba-Geigy Ltd. (English/French/German/Spanish)

**Holm, L., Doll, J., Holm, E., Pancho, J. & Herberger, J.** 1997. *World weeds: natural histories and distribution*. New York, USA, John Wiley. 1129 pp.

**Merino-Rodríguez, M., comp.** 1983. *Plants and plant products of economic importance*. FAO terminology bulletin no. 25. Rome, FAO. (English/French/German/Spanish)

**Royal Botanic Gardens.** *Index Kewensis*. Kew, Surrey, UK, Royal Botanic Gardens. (Included in online database, International Plant Names Index (IPNI), <http://www.ipni.org/index.html>, accessed August 2010.)

**Terrell, E.E., Hill, S.R., Wiersema, J.H. & Rice, W.E.** 1986. *A checklist of names for 3,000 vascular plants of economic importance*. Washington DC, USA, United States Department of Agriculture Agricultural Handbook 505. 241 pp.

## Viruses

**AAB.** 1970–1989 (print). *Descriptions of plant viruses*. Wellesbourne, Warwick, UK, Association of Applied Biologists. Online database, <http://www.dpvweb.net>, accessed August 2010.

**Brunt, A.A., Crabtree, K., Dallwitz, M.J., Gibbs, A.J., Watson, L. & Zurcher, E.J., eds.** 1996. *Viruses of plants: descriptions and lists from the VIDE database*. Wallingford, UK, CAB International. (Online database, <http://micronet.im.ac.cn/vid/index.html>, accessed August 2010.)

**Murphy, F.A., Fauquet, C.M., Bishop, D.H.L., Ghabrial, S.A., Jarvis, A.W., Martelli, G.P., Mayo, M.A., & Summers, M.D., eds.** 1995. *Virus taxonomy: classification and nomenclature of viruses*. Sixth Report of the International Committee on Taxonomy of Viruses. Vienna, New York, Springer-Verlag.