CHAPTER 1.3.

**DISEASES LISTED B Y** **THE OIE**

The [*diseases*](#_bookmark45) in this chapter have been assessed in accordance with Chapter [1.2.](#_bookmark149) and constitute the OIE list of [*aquatic*](#_bookmark17)[*animal*](#_bookmark17)[*diseases*](#_bookmark45).

In case of modifications of this list of [*aquatic animal*](#_bookmark17)[*diseases*](#_bookmark45) adopted by the World Assembly of Delegates, the new list comes into force on 1 January of the following year.

Article 1.3.1.

The following [*diseases*](#_bookmark45) of fish are listed by the OIE:

* Infection with *Aphanomyces invadans* (epizootic ulcerative syndrome)
* Infection with epizootic haematopoietic necrosis virus
* Infection with *Gyrodactylus salaris*
* Infection with HPR-deleted or HPR0 infectious salmon anaemia virus
* Infection with infectious haematopoietic necrosis virus
* Infection with koi herpesvirus
* Infection with red sea bream iridovirus
* Infection with salmonid alphavirus
* Infection with spring viraemia of carp virus
* Infection with tilapia lake virus
* Infection with viral haemorrhagic septicaemia virus.

[…]

**Assessment for listing infection with Tilapia lake virus (TiLV)
in the *Aquatic Code***

**Overall assessment**

The OIE Aquatic Animal Health Standards Commission assessed infection with tilapia lake virus (TiLV) against the criteria for listing aquatic animal diseases in Article 1.2.2. of the *Aquatic Code* (see Table 1 below).

**Table 1.** Summary of assessment of infection with TiLV

|  |  |  |
| --- | --- | --- |
|  | Listing criteria  | Conclusion |
| 1 | 2 | 3 | 4a | 4b | 4c |  |
| Infection with TiLV | + | + | + | NA | + | + | The disease meets the criteria for listing |

NA = not applicable.

The criteria for the inclusion of a [disease](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_maladie) in the OIE list are as follows:

1. International spread of the [pathogenic agent](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_agent_pathogene) (via [aquatic animals](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_animaux_aquatiques), [aquatic animal products](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_produits_d_animaux_aquatiques), [vectors](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_vecteur) or fomites) is likely.

AND

2. At least one country may demonstrate country or [zone](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_zone) freedom from the [disease](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_maladie) in susceptible [aquatic animals](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_animaux_aquatiques), based on provisions of Chapter [1.4.](https://www.oie.int/index.php?id=171&L=0&htmfile=chapitre_aqua_ani_surveillance.htm#chapitre_aqua_ani_surveillance)

AND

3. A precise [case definition](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_definition_d_un_cas) is available and a reliable means of detection and [diagnosis](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_diagnostic) exists.

AND

4a. Natural transmission to humans has been proven, and human infection is associated with severe consequences.

OR

4b. The [disease](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_maladie) has been shown to affect the health of cultured [aquatic animals](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_animaux_aquatiques) at the level of a country or a [zone](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_zone) resulting in significant consequences e.g. production losses, morbidity or mortality at a [zone](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_zone) or country level.

OR

4c. The [disease](https://www.oie.int/index.php?id=171&L=0&htmfile=glossaire.htm#terme_maladie) has been shown to, or scientific evidence indicates that it would affect the health of wild resulting in significant consequences e.g. morbidity or mortality at a population level, reduced productivity or ecological impacts.

**Background**

A novel orthomyxo-like virus, named as tilapia lake virus (TiLV), has been identified as the cause of mass die-offs of tilapia (Eyngor *et al.,* 2014) in both farms and the wild environment. The host range is not well known but a number of tilapines are known to be susceptible (Eyngor *et al.,* 2014). Tilapia is the second most imported group of farmed fish after carps. Global production of tilapia, predominantly *Oreochromis niloticus*, is estimated at 4.5 million metric tonnes (FAO data). Farming occurs primarily in tropical and subtropical countries though some production in recirculation systems has started in other regions. *O. niloticus* was first introduced to developing countries to support subsistence farming. However, larger scale commercial production is now important and frozen fillet and other tilapia products are traded globally.

**Assessment of TiLV using the new criteria for listing aquatic animal diseases in Chapter 1.2. of the *Aquatic* *Code***

**Criterion No. 1 International spread of the pathogenic agent (via aquatic animals, aquatic animal products, vectors or fomites) is likely.**

*Assessment*

TiLV has been reported in Bangladesh, Chinese Taipei, Colombia, Ecuador, Egypt, India, Indonesia, Israel, Malaysia, Mexico, Peru, Philippines, Tanzania, Thailand, Uganda and the United States of America (Ahasan *et al*., 2020, Amal *et* *al*., 2018, Bacharach *et al.*, 2016; Behera *et al*., 2018; Chaput *et al*., 2020; Dong *et al.*, 2017; Fathi *et al.*, 2017, Ferguson *et al.*, 2014; Koesharyani *et al*., 2018, Mugimba., 2018, OIE, 2018a, OIE, 2018b; OIE, 2018c; Tsofack *et al.*, 2016). The Network of Aquaculture Centres in Asia–Pacific (NACA) also have notification requirements for infection with TiLV and this data shows a similar distribution of the disease for that region, as reported to the OIE. Despite geographic separation; strains were highly homologous, suggesting an epidemiological link and international spread. Historically, tilapia has been traded internationally to establish populations for production in new regions, and there is still extensive trade in tilapia. The current driver for international trade is the dissemination of improved genetic strains (though current pattern and volume of trade has not been determined for this assessment). Tilapia products are traded internationally and while a risk of transmission with some product types should be expected, specific risks have not been considered in this assessment.

Given the evidence of spread and the broad distribution of tilapia (Asia, Africa and South America), international spread is likely.

*Conclusion*

The criterion is met.

**Criterion No. 2 At least one country may demonstrate country or zone freedom from the disease in susceptible aquatic animals, based on provisions of Chapter 1.4.**

TiLV has been reported in Bangladesh, Chinese Taipei, Colombia, Ecuador, Egypt, India, Indonesia, Israel, Malaysia, Mexico, Peru, Philippines, Tanzania, Thailand, Uganda and the United States of America (Ahasan *et al*., 2020; Amal *et al*., 2018; Bacharach *et al*., 2016; Behera *et al*., 2018; Chaput *et al*., 2020; Dong *et al*., 2017; Fathi *et al*., 2017; Ferguson *et al*., 2014; Koesharyani *et al*., 2018; Mugimba *et al*., 2018; OIE, 2018a; OIE, 2018b; OIE, 2018c; Tsofack *et al*., 2016). The Network of Aquaculture Centres in Asia – Pacific (NACA) also have notification requirements for infection with TiLV and this data shows a similar distribution of the disease for that region, as reported to the OIE. Additional countries in Africa have expressed a wish to declare freedom from infection with TiLV, but report that there is a lack of diagnostic capacity to support such self-declarations.

The distribution of the virus may be wider (mortality may not have been investigated in other regions); however, due to the broad distribution of tilapia (Asia, Africa and South America), virulence of the virus and the extensive trade in tilapia, it is likely that many countries are currently free. The information provided to the OIE and NACA on the disease status of Members for infection with TiLV through immediate notifications, six-monthly reports and annual reports provides support that it is likely countries are currently free of the disease.

**Table 2.** Outbreaks of infection with TiLV by country and commencement year notified to the OIE through the OIE-WAHIS.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Region or Country** | **2017** | **2018** | **2019** | **2020** | **2021\*** |
| **Americas** |  |  |  |  |  |
| Colombia |  |  |  | 1 |  |
| Mexico |  | 20 | 1 |  |  |
| Peru |  | 5 | 2 | 1 |  |
| USA |  |  | 3 |  |  |
| **Asia** |  |  |  |  |  |
| Chinese Taipei | 9 |  |  |  |  |
| India |  |  | 3 |  |  |
| Malaysia | 2 | 2 |  |  |  |
| Philippines | 1 |  | 1 |  |  |
| Thailand | 1 |  |  |  |  |
| **Europe** |  |  |  |  |  |
| Israel  | 16 (Tilapia syncytial hepatitis) |  |  |  |  |
| **Total** | 29 | 27 | 10 | 2 |  |

\*No notifications have been notified to the OIE in 2021 to date.

*Conclusion*

The criterion is met.

**Criterion No. 3 A precise case definition is available and a reliable means of detection and diagnosis exists.**

An *ad hoc* Group was convened in 2017 on request from the Commission with the objective to assess TiLV diagnostics and validation, and specifically:

- evaluate published and unpublished methods for detection of TiLV;

- describe the level of validation of each method and determine additional validation requirements;

- recommend any additional assays that may need to be developed;

- and facilitate the sourcing and distribution of well-characterised positive control material for method evaluation, implementation and two inter-laboratory comparability studies.

The *ad hoc* Group undertook TiLV inter-laboratory panel testing in two stages. Round 1 involved two laboratories and four molecular assays and Round 2 involved seven laboratories and four molecular assays. The *ad hoc* Group provided recommendations based on results of testing for both rounds.

The *ad hoc* Group evaluated three real-time PCR assays and one conventional nested PCR for their ability to reliably detect TiLV in an inter-laboratory comparison using a panel of 30 samples. All assays performed as expected and could reliably detect TiLV. Based on the recommendations of the *ad hoc* Group, the Commission considered all four tests evaluated would allow criterion 3, a precise case definition is available and a reliable means of detection and diagnosis exist, of Chapter 1.2. of the *Aquatic Code*, to be fulfilled.

*Conclusion*

The criterion is met.

**Criterion No. 4a Natural transmission to humans has been proven, and human infection is associated with severe consequences.**

*Assessment*

There is no evidence of transmission to humans.

*Conclusion*

Criterion not applicable.

**Criterion No. 4b The disease has been shown to affect the health of cultured aquatic animals at the level of a country or a zone resulting in significant consequences e.g. production losses, morbidity or mortality at a zone or country level.**

*Assessment*

Very high levels of mortality (>80%) have been observed in affected populations (both farmed and wild) (Bacharach *et al*., 2016; Behera *et al*., 2018; Ferguson *et al*., 2014; Gophen *et al*., 2015). Dong *et al*. (2017) reported approximately 90% mortality in red tilapia fingerlings within one month of stocking into cages. Since 2009 episodic losses of tilapia (*Oreochromis niloticus*) were recorded in fish farms all over Israel (Eyngor *et al*., 2014). Mortality in farmed *O. niloticus* in Ecuador have also been attributed to TiLV (Ferguson *et al*., 2014). Losses are significant regionally and at a national level.

*Conclusion*

The criterion is met.

**Criterion No. 4c The disease has been shown to, or scientific evidence indicates that it would affect the health of wild resulting in significant consequences e.g. morbidity or mortality at a population level, reduced productivity or ecological impacts.**

*Assessment*

Very high levels of mortality (>80%) have been observed in affected populations (both farmed and wild) (Bacharach *et al*., 2016; Ferguson *et al*., 2014; Gophen *et al*., 2015). Decreases of catch of tilapines, specifically *Sarotherodon* (Tilapia) *galilaeus*, from the Sea of Galilee have been observed since 2007. In 2017, a mortality event in wild tilapia in Malaysia was reported with an estimated 50% mortality (OIE, 2018c).

*Conclusion*

The criterion is met.

**Conclusion**

Infection with TiLV clearly meets the criteria for listing (1, 2, 3, 4b and 4c) and is proposed for inclusion in Chapter 1.3. Diseases listed by the OIE.

**References**

Ahasan, M. S., Keleher, W., Giray, C., Perry, B., Surachetpong, W., Nicholson, P., Al-Hussinee, L., Subramaniam, K. And Waltzek, T. B. (2020). Genomic characterization of tilapia lake virus isolates recovered from moribund Nile Tilapia (*Oreochromis niloticus*) on a farm in the United States. *Microbiology Resource Announcements*, ***9*(4)**, e01368-19. https://doi.org/10.1128/mra.01368 -19

Amal, M., Koh, C. B., Nurliyana, M., Suhaiba, M., Nor-Amalina, Z., Santha, S., Diyana-nadhirah, k.p., yusof, m.t., ina-salwany, m.y., Zamri-Saad, M. (2018). A case of natural co-infection of Tilapia Lake Virus and *Aeromonas veronii* in a Malaysian red hybrid tilapia (*Oreochromis niloticus*×*O. mossambicus*) farm experiencing high mortality *Aquaculture*, ***485***, 12–16. https://doi.org/10.1016/j.aquaculture.2017.11.019

Bacharach, E., Mishra, N., Briese, T., Zody, M. C., Kembou Tsofack, J. E., Zamostiano, R., Berkowitz, A., Ng, J., Nitido, A., Corvelo, A., Toussaint, N.C., Nielsen, S.C.A., Hornig, M., Del Pozo, j., bloom, t., ferguson, h., eldar, A. & Lipkin, W. I. (2016). Characterization of a Novel Orthomyxo-like Virus Causing Mass Die-Offs of Tilapia. *mBio*, ***7*(2)**, e00431–16. http://doi.org/10.1128/mBio.00431-16

Behera, B. K., Pradhan, P. K., Swaminathan, T. R., Sood, N., Paria, P., Das, A., Verma, D.K., Kumar, R., Yadav, M.K., Dev, A.K., Parida, P.K., Das, B.K., Lal, K.K., and Jena, J. K. (2018). Emergence of tilapia lake virus associated with mortalities of farmed Nile Tilapia *Oreochromis niloticus* (Linnaeus 1758) in India. *Aquaculture*, ***484***, 168–174. https://doi.org/10.1016/j. aquac ulture.2017.11.025

[Bwalya](http://www.frontiersin.org/people/PatriciaBwalya/352159)1, P., HANG'OMBE, B.M., MUTOLOKI, S., EVENSEN, O., STORE, S. & STORE, P. (2016). Use of DNA sequencing to map Streptococcus agalactiae and Streptococcus iniae infections in farmed Nile Tilapia (Oreochromis niloticus) on Lake Kariba in Zambia. *Frontiers Veterinary Science Conference Abstract: AquaEpi I - 2016*. doi: 10.3389/conf.FVETS.2016.02.00052

Chaput, D. L., Bass, D., Alam, M. M., Al Hasan, N., Stentiford, G. D., van Aerle, R., Moore, K., Bignell, J.P., Mahfujul Haque, M., Tyler, C. R. (2020). The segment matters: Probable reassortment of tilapia lake virus (TILV) complicates phylogenetic analysis and inference of geographical origin of new isolate from Bangladesh. *Viruses*, **12(3),** 258. https://doi.org/10.3390/v12030258

Dong, H.T., Siriroob, S., Meemetta, W., Santimanawong, W., Gangnonngiw, W., Pirarat, N., Khunrae, P., Rattanarojpong, T.,. Vanichviriyakit, R, & Senapin, S. (2017). Emergence of tilapia lake virus in Thailand and an alternative semi-nested RT-PCR for detection. *Aquaculture*, **476**, 111-118.

Eyngor, M., Zamostiano, R., Tsofack, J. E. K., Berkowitz, A., Bercovier, H., Tinman, S., Lev, M., hurvitz, a., galeotti, m. bacharach, e. & Eldar, A. (2014). Identification of a novel RNA virus lethal to tilapia. *Journal of Clinical Microbiology*, ***52***(12), 4137–4146. http://doi.org/10.1128/JCM.00827-14

Fathi, M., Dickson, C., Dickson, M., Leschen, W., Baily, J., Muir, F., Ulrich, K., & Weidmann, M.(2017). Identification of Tilapia Lake Virus in Egypt in Nile tilapia affected by ‘summer mortality’ syndrome. *Aquaculture*, **472**, 430-432.

Ferguson, H. W., Kabuusu, R., Beltran, S., Reyes, E., Lince, J. A., & del Pozo, J. (2014). Syncytial hepatitis of farmed tilapia, Oreochromis niloticus (L.): A case report. *Journal of Fish Diseases*, **37**, 583–589. http://doi.org/10.1111/jfd.12142

Gophen, M., Sonin, Oren, Lev, Menachem, Snovsky, G. (2015). Regulated Fishery Is Beneficial for the Sustainability of Fish Population in Lake Kinneret (Isreal). *Open Journal of Ecology*, **5**, 513–527. http://file.scirp.org/pdf/OJE\_2015102614545417.pdf

Koesharyani, I., Gardenia, L., Widowati, Z., Khumaira, K., & Rustianti, D. (2018). Studi kasus infeksi tilapia lake virus (TiLV) pada ikan nila (Oreochromis niloticus). *Jurnal Riset Akuakultur*, **13(1),** 85–92. https://doi.org/10.15578/ jra.13.1.2018.85-92

OIE (2018a). *Immediate notification. Tilapia lake virus, USA*. Retrieved from https://wahis.oie.int/#/report-info?reportId=12868

OIE (2018b). *Immediate notification. Tilapia lake virus, Mexico*. Retrieved from https://wahis.oie.int/#/report-info?reportId=11470

OIE (2018c) Follow up report 1. Tilapia lake virus, Malaysia. Retrieved from : https://wahis.oie.int/#/report-info?reportId=27838

Mugimba, K.K., Chengula, A.a., wamala, s., mwega, e.d., kasanga, c.J., byarugaba, d.k., mdegela, r.h., tal, s., bornstein, b., dishon, a., mutoloki, s., david, l., evensen, o., & munang'andu, h.m. (2018). Detection of tilapia lake virus (TiLV) infection by PCR in farmed and wild Nild tilapia (*Oreochromis niloticus*) from Lake Victoria. *Journal of fish diseases*. **41,** 1181-1189.

Tsofack, J. E. K., Zamostiano, R. Watted, S., Berkowitz, E., Mishra, N., Briese, T., Lipkin, W.I., Kabuusu, R.M., Ferguson, H., del Pozo, J., Eldar, A., and Bacharach, E. (2016). Detection of Tilapia Lake Virus (TiLV) in Clinical Samples by Culturing and Nested RT-PCR. *Journal of Clinical Microbiology*, **55**, 759-767. doi:10.1128/JCM.01808-16

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