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Self-declaration for country freedom from infection with yellow head virus genotype 1 (YHV1) by the Republic of Korea

Declaration sent to the World Organisation for Animal Health (WOAH) on 23 May 2024 by Dr Jung-Rok Choi, the WOAHP Delegate of the Republic of Korea, on behalf of the National Fisheries Products Quality Management Service (NFQS), Ministry of Oceans and Fisheries.

1. Introduction

The National Fishery Products Quality Management Service (NFQS) is the responsible authority for the disease control and quarantine service for aquatic organisms in the Republic of Korea. As a national aquatic disease control organisation, NFQS is in charge of several systems, such as aquatic organism disease surveillance, diagnosis, and notification of diseases that may occur in the national territory in accordance with Chapter 3.1 of the *Aquatic Animal Health Code (Aquatic Code)*. Also, the NFQS has responsibility for issuing international aquatic animal health certificates.

The Republic of Korea has implemented targeted surveillance of infection with yellow head virus genotype 1 (YHV1) for at least the last three years with no detection of the disease as well as continuously met the basic biosecurity conditions at least for one year prior to the commencement of targeted surveillance, meeting the requirements for self-declaration of freedom from YHV1 provided in Article 9.10.4 of the *Aquatic Code* of the World Organisation for Animal Health (WOAH). This indicates that the Republic of Korea has fulfilled the conditions defined in Pathway 3 – Targeted surveillance in Article 1.4.3 of the *Aquatic Code*.

The country has conducted targeted surveillance of YHV1 in susceptible species as specified in Article 9.10.2 of the *Aquatic Code* for the last three years, since 2021, in accordance with Chapter 1.4 of the *Aquatic Code* and Chapter 2.2.9 of the *Manual of Diagnostic Tests for Aquatic Animals (Aquatic Manual)* of WOAHP, demonstrating no detection of the disease. Shrimp aquaculture farms operated in the Republic of Korea neither share nor are bordered by waters of any other country.

Therefore, on 23 May 2024, the WOAHP Delegate of the Republic of Korea declared that the country is free from infection with YHV1 and formally requested that WOAHP publish this self-declaration. The statement of the Delegate responsible for this self-declaration can be found in Annex 1.

2. Basic biosecurity conditions in the Republic of Korea

2.1. Aquatic biosecurity system in the Republic of Korea

Under its [Aquatic Organism Disease Control Act](#) enacted in 2008, the Republic of Korea has established a systematic national aquatic organism disease control and aquatic organism quarantine infrastructure along with financial resources to support the system and implemented the system as follows:

2.1.1. Control of aquatic organism diseases

The National Aquatic Organism Disease Control has established, under the Act, the early detection system that fulfils the requirements specified in Article 1.4.7 of the *Aquatic Code* and implemented the system as follows:

Under Article 38 of the Act, the government provides education on the control of aquatic organism diseases for aquaculture farmers and business entities every two years (Article 1.4.7. point 1).

- The occurrence of a contagious aquatic organism disease leads to clinical and technical follow-up measures at the affected farms by aquatic animal health professionals trained and licensed by the government or veterinarians under Article 37-2 of the Act. Also, aquatic organism disease control officers shall be technically trained on the control of aquatic organism diseases under Article 7 of the Act. Training programs are provided every year. Mainly covered subjects include revision details of the Act; trends of disease outbreak in and out of the country (including emerging diseases); guidelines of disease control and epidemiological investigation; and characterisation of aquatic diseases and diagnosis (Article 1.4.7. point 2).
- With a confirmed case, the NFQS implements a systematic epidemiological investigation to understand the scale of the disease outbreak, trace the source of infection, and identify the transmission mechanism under Article 11 of the Act, as well as develops reasonable control measures to prevent the recurrence of the disease (Article 1.4.7. point 3).
- Clinically infected animals reported by aquafarms or aquatic organisms sampled during surveillance activities are sent to disease identification institutions for aquatic organisms or NFQS for laboratory diagnosis under Article 10 of the Act (Article 1.4.7. point 4).
- Aquaculture farmers, aquatic animal health professionals or veterinarians, or others with an occupational role with aquatic organisms have a legal obligation to report the death of aquatic organisms from unidentified disease or suspicion of the occurrence of aquatic infectious diseases (Article 1.4.7. point 5).
- If an occurrence of a contagious aquatic organism disease is confirmed, the equipment, tools, etc., of the affected facility shall be disinfected, incinerated, or buried and affected aquatic organisms shall be subject to measures like stamping out and isolation/movement control, etc. under Articles 13-19 of the Act.

2.1.2. Control of imported aquatic organisms

The Republic of Korea carries out quarantine of imported aquatic organisms to prevent the introduction of exotic diseases into the country and protect its ecosystem. Under Articles 22 (Quarantine of exported and imported organisms), 23 (Commodities designated for quarantine purposes), 27 (Quarantine inspection on imports), and 31 (Quarantine inspection on exports) of the Act, the Republic of Korea has been carrying out quarantine inspections of 26 kinds of notifiable disease in imported fish, shellfish, and crustacean species for transplant, human consumption, ornament, testing, research and survey. To import aquatic organisms, an application for import of aquatic creatures and quarantine shall be submitted to NFQS and undergo the quarantine inspection conducted by technically trained aquatic organism quarantine officer. Under Article 32 (Quarantine area), land-based aquaculture tanks, aquarium facilities, and warehouses equipped with temperature controllers can be designated quarantine facilities, and the quarantine inspections of imported aquatic organisms are all completed within the designated quarantine facilities.

The Republic of Korea improved quarantine efficiency by adopting a standard form of health certificate. The country enhanced import quarantine by mandating a health certificate for all imported fishery products using a standard form as well as adding emerging overseas diseases of concern identified through import risk analysis to its list of notifiable diseases subject to quarantine.

The standard form of health certificate should include the following requirements:

- Health inspection was conducted in facilities designated by Competent Authorities in exporting countries.
- Any clinical sign of diseases listed in the Aquatic Organism Disease Control Act of the Republic of Korea was not observed.
- Any pathogenic agent of diseases¹ was not detected by laboratory tests based on the *Aquatic Manual* or the diagnostic methods approved by the Republic of Korea.

2.2. Basic biosecurity conditions for infection with YHV1 in the Republic of Korea

Infection with YHV1 is listed as a nationally notifiable disease in the Republic of Korea under Article 2 of the Aquatic Organism Disease Control Act. All measures related to surveillance and disease control are implemented as specified in the Aquatic Organism Disease Control Act to ensure that basic biosecurity conditions for this disease should be properly achieved.

In terms of surveillance of YHV1, both targeted (twice a year) and general surveillance are carried out, and the surveillance data are all uploaded and maintained in the national integrated network for aquatic organism disease control as stipulated in Article 5-2 of the Act. The detection or any suspicious case (e.g., bleached overall appearance, a yellowish discolouration of the cephalothorax, and mass mortality) of YHV1 must be reported to the Competent Authority through the early detection system. A laboratory test, as well as a confirmatory diagnosis of YHV1, is performed following the procedure specified in Chapter 2.2.9.4 of the *Aquatic Manual* using conventional reverse transcriptase (RT)-PCR and sequencing of amplicons of YHV1. If a YHV1 case is finally confirmed by a confirmatory diagnosis, epidemiological investigations and control measures shall be implemented to prevent the transmission and spread of the disease.

3. Control and management of infection with YHV1 in the Republic of Korea

3.1. Susceptible species to YHV1 in the country

Article 9.10.2 of the *Aquatic Code* refers to Jingga shrimp (*Metapenaeus affinis*), giant tiger prawn (*Penaeus monodon*), dagger blade grass shrimp (*Palaemonetes pugio*), blue shrimp (*Penaeus stylirostris*), and whiteleg shrimp (*Penaeus vannamei*) as susceptible to YHV1.

The Republic of Korea currently farms whiteleg shrimp and giant tiger prawn. Whiteleg shrimp is farmed and produced using semi-closed (ponds) or closed systems, including the bio floc technology (BFT) in 1-2 cycles per year. Giant tiger prawn is farmed using the closed system (production systems with a safe water supply free from pathogenic agents or aquatic animals) at two aquaculture farms. Surveillance of these two species has been performed according to the WOA *Aquatic Code*. Moreover, there are no wild species referred to in Article 9.4.2. present in the natural seawater around the country.

As of 2023, there are 335 whiteleg shrimp farms in Korea, most (>94%) of which are located along the country's western and southern coast (Table 1 & Figure 1). The national annual production of whiteleg shrimp is approximately 6996 tons as of 2023 (Table 2). In addition, the giant tiger prawn has been farmed since 2021. Two giant tiger prawn aquaculture farms are located in Chungcheongnam-do and Gyeongsangnam-do in the Republic of Korea. The annual production of giant tiger prawns was approximately 3,0-4,5 tons in 2021 and 2022. However, the two aquaculture farms of giant tiger prawns were not in activity in 2023 due to a noticeable decrease in aquaculture production.

Table 1. Number of whiteleg shrimp (*P. vannamei*) farms, per province, in the Republic of Korea in 2023. (Source: NFQS)

Province	Incheon	Gyeonggi -do	Gangwon -do	Chungcheongnam -do	Jeollabuk -do	Jeollanam -do	Gyeongsangbuk -do	Gyeongsangnam -do	Jeju -do	Total
No. of farms	22	12	2	67	33	180	1	16	2	335

¹ For crustacean: Acute hepatopancreatic necrosis disease, Cryfish plague, Necrotising hepatopancreatitis, Infection with infectious hypodermal and haematopoietic necrosis virus, Infection with infectious myonecrosis virus, White tail disease, Infection with taura syndrome virus, Infection with white spot syndrome virus, Infection with yellow head virus genotype 1, Infection with decapod iridescent virus 1.

Table 2. Total production of whiteleg shrimp (*P. vannamei*), per province, in the Republic of Korea. Unit: MT. (Source: Statistics Korea)

Province	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Incheon	173	153	186	252	192	198	288	304	342	300
Gyeonggi-do	86	120	93	144	213	190	256	411	229	247
Gangwon-do	1	3	1	1	-	0	3	6	8	6
Chungcheongnam-do	798	646	952	897	1,092	1,656	1,364	1,790	1,962	1,458
Jeollabuk-do	94	82	193	219	227	338	344	666	348	532
Jeollanam-do	3,293	4,418	4,235	3,487	3,609	4,871	5,682	6,105	6,282	4,212
Gyeongsangbuk-do	-	-	4	3	3	-	-	1	1	0
Gyeongsangnam-do	40	91	122	136	145	278	180	215	263	177
Jeju-do	3	2	3	5	12	11	6	48	68	64
Total	4,488	5,515	5,789	5,144	5,493	7,542	8,123	9,546	9,503	6,996

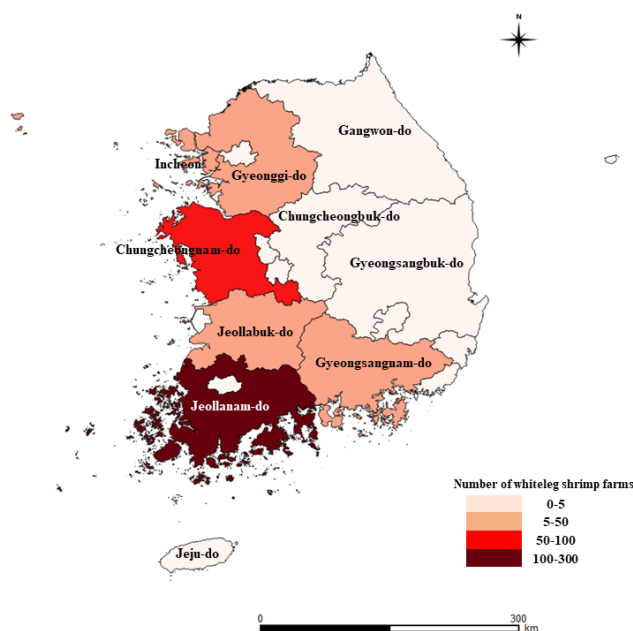


Figure 1. Distribution of whiteleg shrimp (*P. vannamei*) farms in the Republic of Korea in 2023.

3.2. General surveillance of YHV1

Infection with YHV1 is listed as a notifiable disease in the country, and a year-round routine surveillance system has been put in place. General surveillance of YHV1 is routinely implemented for persons who own, manage, and operate aquaculture premises subject to surveillance. In general surveillance activities, inspectors carry out interviews and questionnaire surveys to obtain information on the history and the current status of disease occurrence, mortalities, etc. The obtained information helps operate the early detection system of disease introduction. Since 2014, inspectors have made, on average, at least two visits per farm every year to perform inspections on YHV1 occurrences (Table 3).

Table 3. Number of general surveillance activity for both giant tiger prawn (*P. monodon*) and whiteleg shrimp (*P. vannamei*) from 2014 to 2023. (Source: NFQS)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
No.	308	343	589	642	540	504	849	1,280	1,393	1,561	8,009

3.3. Targeted surveillance of YHV1

To demonstrate the country's freedom from YHV1, the targeted surveillance programme that is carried out twice a year, in the first and second half of the year, to capture potential seasonal variations was designed according to Chapter 1.4 of the *Aquatic Code*. The sample size required to demonstrate the country's freedom from the disease in years from 2021 to 2023 was calculated by the FreeCalc two-stage sampling (Table 4 & Figure 2). In 2021 and 2022, the population of 376 whiteleg shrimp farms was applied, while in 2023, the population was 335. The first sampling stage to select aquaculture establishments (farms) employed parameters of 2% farm-level prevalence, 20% individual-level prevalence, 95% test sensitivity, 95% target cluster sensitivity (SeH), and 95% target system sensitivity (SSe, confidence

level). The farm sample size required for targeted surveillance was calculated as 124 farms in 2021 and 2022 and 123 farms in 2023. The number of farms to sample was based on a random sampling with probability proportional to the number of farms per province to plan a targeted surveillance programme. The number of farms to sample was divided by administrative units (cities and provinces) to plan a targeted surveillance programme. In the second stage, the animal sample size per farm was calculated by applying the following parameters: 95% test sensitivity, 100% test specificity, 20% individual-level prevalence, 5% type I error, 5% type II error, and a population of 500,000 animals. From these parameters, the required animal sample size was calculated as 15 per farm. In 2021 and 2022, targeted surveillance was also performed on all the giant tiger prawn farms. The required animal sample size per farm was calculated. The resulting sample size was 15 animals per farm.

Between 15-30 whiteleg shrimps per selected farm were sampled from 2021 to 2023. In 2021, when acute hepatopancreatic necrosis disease (AHPND) first occurred in Korean shrimp farms, we collected 30 shrimp per farm in an effort to strengthen disease surveillance as well as prevention in domestic shrimp farms. A total of 8,640, 4,380, and 4,410 whiteleg shrimps were randomly selected in 2021, 2022, and 2023, respectively to be tested for YHV1, and all showed negative results (Table 4). Moreover, a total of 120 and 60 samples were collected from 2 giant tiger prawn farms in 2021 and 2022, respectively and all tested negative for infection with YHV1 (Table 4).

Particularly, two producers of giant tiger prawn had no stocking of giant tiger prawn in 2023, and no samples could be collected. These results indicate that the country has been free for the last three years from YHV1 at a confidence level of 95%.

Table 4. Targeted surveillance of whiteleg shrimp (*P. vannamei*) and giant tiger prawn (*P. monodon*) from 2021 to 2023 with two-stage sampling. (Source: NFQS)

Year	Targeted surveillance	Incheon	Gyeonggi-do	Gangwon-do	Chungcheongnam-do	Jeollabuk-do	Jeollanam-do	Gyeongsangbuk-do	Gyeongsangnam-do	Jeju-do	Total	
2021	Total No. of farms	25	14	2	75 / 1*	36	201	1	18 / 1*	4	376 / 2*	
	Required sample size	No. of farms	11	6	-	27 / 1*	12	61	-	5 / 1*	2	124 / 2*
		No. of samples (2 times)	330	180	-	810 / 30*	360	1,830	-	150 / 30*	60	3,720 / 60*
	Tested sample size	No. of farms	8	6	-	22 / 1*	14	86	-	5 / 1*	3	144 / 2*
		No. of tested samples (2 times)	480	360	-	1,320 / 60*	840	5,160	-	300 / 60*	180	8,640 / 120*
2022	Total No. of farms	25	14	2	75 / 1*	36	201	1	18 / 1*	4	376 / 2*	
	Required sample size	No. of farms	16	5	1	20 / 1*	12	61	0	7 / 1*	2	124 / 2*
		No. of samples (2 time)	480	150	30	600 / 30*	360	1,830	0	210 / 30*	60	3,720 / 60*
	Tested sample size	No. of farms	19	10	1	15 / 1*	14	76	0	7 / 1*	4	146 / 2*
		No. of tested samples (2 time)	570	300	30	450 / 30*	420	2,280	0	210 / 30*	120	4,380 / 60*
2023	Total No. of farms	22	12	2	67	33	180	1	16	2	335	
	Required sample size	No. of farms	14	6	1	20	12	62	0	7	1	123
		No. of samples (2 time)	420	180	30	600	360	1,860	0	210	30	3,690
	Tested sample size	No. of farms	13	11	2	20	16	75	0	8	2	147
		No. of tested samples (2 time)	390	330	60	600	480	2,250	0	240	60	4,410

* Targeted surveillance of giant tiger prawn (*P. monodon*) in 2021 and 2022.

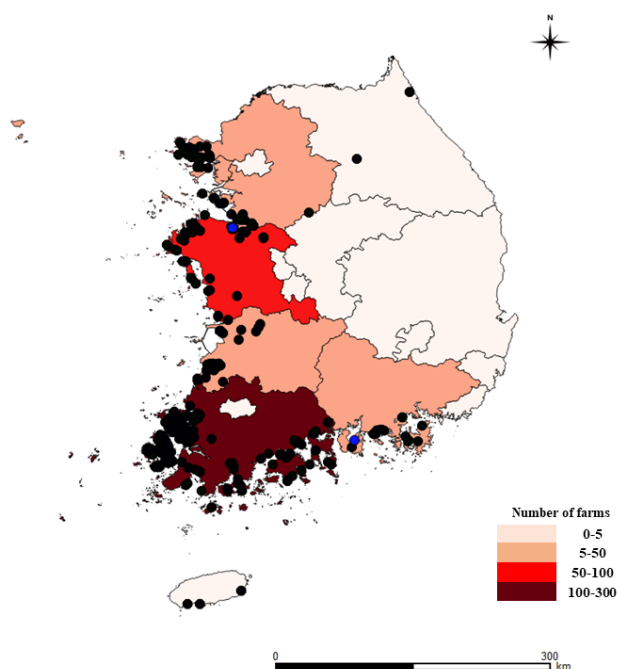


Figure 2. Sampling sites whiteleg shrimp (●) farms (2021 to 2023) and giant tiger shrimp (●) farms (2021 to 2022) for targeted surveillance with two-stage sampling.

4. Quarantine of YHV1 in the country

4.1. Import quarantine

The Republic of Korea requires all imports of species susceptible to YHV1 for transplant to obtain a health certificate (as described in Section 2.1.2. Control of imported aquatic organisms) demonstrating the absence of YHV1 before leaving the exporting country. Once arriving in the country, the imported species should go through a clinical as well as a laboratory test for YHV1 in accordance with methods provided in the *Aquatic Manual*. Only those that have passed the tests are allowed to enter the country while those that fail the tests are returned or incinerated.

Species susceptible to YHV1 that were imported to the country for transplant from 2014 to 2023 are whiteleg shrimp (*P. vannamei*) and giant tiger prawn (*P. monodon*) (Table 5).

The imported whiteleg shrimp or giant tiger prawn were delivered directly to a designated quarantine facility. After entering the country, imported whiteleg shrimp or giant tiger prawn were clinically checked by aquatic organism quarantine officers within 30 days. Imported susceptible animals additionally went through at least two surveillance inspections every year without any detection of infection with YHV1.

Table 5. Import quarantine count of host species susceptible to YHV1 from 2014 to 2023. (Source: NFQS)

Species	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
<i>P. vannamei</i>	7	10	16	10	9	6	11	19	13	36	137
<i>P. monodon</i>	0	0	0	0	0	0	0	2	2	1	5

5. Measures implemented to maintain freedom

To maintain the country's self-declared freedom from YHV1, the Republic of Korea will continue its targeted surveillance activities and basic biosecurity conditions in accordance with the provisions of Article 9.10.8 of the *Aquatic Code* and the quarantine in accordance with the provisions of Articles 9.10.9-14 of the *Aquatic Code*. If infection with YHV1 is confirmed, epidemiological investigations and control measures shall be implemented (as described in Section 2.1.1. Control of aquatic organism diseases) to prevent the transmission and spread of the disease under [Aquatic Organism Disease Control Act](#) in the Republic of Korea.

6. Conclusion

The Republic of Korea has continuously met the basic biosecurity conditions for at least one year prior to the commencement of targeted surveillance of YHV1 and implemented targeted surveillance of the disease for the past three years with no detection of YHV1, meeting the requirements for self-declaration of freedom from YHV1 provided in Chapter 1.4 and Article 9.10.4 of the *Aquatic Code*.

YHV1 is a notifiable disease under the Aquatic Organism Disease Control Act enacted in 2008, and there is an early detection system in place to encourage prompt reporting of YHV1 suspicions.

The Republic of Korea carries out quarantine of imported aquatic organisms to prevent the introduction of exotic diseases and has implemented measures to maintain freedom from YHV1.

Based on the above results, the National Fishery Products Quality Management Service (NFQS), the Ministry of Oceans and Fisheries, the Republic of Korea, finally declares that the country complies with the requirements of a country free from infection with yellow head virus genotype 1 (YHV1) as of 23 May 2024, in accordance with Chapters 1.4 and 9.10 of the *Aquatic Code* and Chapter 2.2.9 of the *Aquatic Manual* and is consistent with the information provided in WAHIS.

Statement to be included in the self-declaration document.

I, the undersigned, Dr. Jung-Rok Choi

Delegate of Republic of Korea

to the World Organisation for Animal Health (WOAH), takes responsibility for the self-declaration of freedom from infection with yellow head virus genotype 1 (YHV1)

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Drawn up on 23 May, 2024

Signature of the Delegate:  _____