Annual Report of Vector-borne Diseases Pathogens and Vector Surveillance 2021

August 2022

MINISTRY OF HEALTH, LABOUR AND WELFARE
Pharmaceutical Safety and Environmental Health Bureau
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Contents

Preface

Two years and 6 months have passed since COVID-19 was declared by the World Health Organization to correspond to a public health emergency of international concern (PHEIC) on January 30, 2020. Although the PHEIC has not been lifted at the present moment, restrictions of various countries of the world against COVID-19 have been eased progressively with the spread of vaccination, and the international flow of people is being gradually restored.

In Japan, also, stepwise relaxation of border control including the elevation of the upper limit of the number of entrants, resumption of acceptance of foreign sightseers, and resumption of acceptance of international flights at New Chitose and Naha Airports in addition to the 5 airports that have been opened to international air transport (Narita International, Tokyo International, Chubu Centrair International, Kansai International, and Fukuoka Airports) has been implemented since June 2022.

During the global pandemic of COVID-19, many countries restricted domestic and international migration of people, and the risk of the pathogen of infection to enter Japan from abroad is considered to have been reduced. However, patients with mosquito-borne infections, such as Zika virus infection, chikungunya fever, dengue fever, and malaria, and rodent-borne infections, such as plague, Lassa fever, and hemorrhagic fever with renal syndrome (HFRS), have continued to appear in epidemic areas.

In foreign countries, simultaneously with the relaxation of restrictions related to COVID-19, monkeypox, which is not a quarantine infectious disease, has become prevalent primarily in European and American countries in which the disease is not usually observed, since May 2022. There have been reports of more than 6,000 cases of monkeypox with no travel history to African countries in which epidemics of monkeypox have been reported. As monkeypox epidemics have reached an unprecedented level in previously non-epidemic countries, the WHO judged that the situation corresponds to a PHEIC on July 23. Thereafter, patients have also been found in Japan.

After termination of the COVID-19 pandemic, marked increases in visitors to Japan are expected due to factors including the reopening of local airports to international flights, which are suspended at present, but, at the same time, the risk of entry of infection from epidemic countries is also expected to increase, causing a gradual return of the risk to the level before the COVID-19 pandemic. At seaports, also, calls of international cruise liners, which are stopped at present, are expected to be resumed with consequent activation of the international movement of people.

Therefore, the implementation of surveys of inhabitation, entry, and pathogen carrier state of mosquitoes and rodents, which are vectors of quarantine infectious diseases and prompt vector control, etc., based on the results by the quarantine stations at points of entry, such as quarantine airports and seaports, is considered to become even more important.

In this report, the results of surveys (vector surveillance) carried out at quarantine stations in Japan in 2021, carried out to fulfill the obligation as a member of the United Nations and in compliance with the International Health Regulation (2005), are presented.

August 2022

1 Vector-borne quarantine infectious diseases reported in Japan (2021)

1.1 Mosquito-borne diseases

The status in 2021 of mosquito-borne disease outbreaks covered by the quarantine program in Japan will be discussed using the data from the infectious disease outbreak trend survey conducted on the basis of the "Law Concerning Prevention of Infectious Diseases and Healthcare for Infected Patients" (hereinafter called "the trend survey"). In 2021, 8 patients with dengue fever, 29 with malaria, and 3 with Japanese encephalitis were reported [1]. The diseases other than Japanese encephalitis are considered to have been imported. There were no reports of Zika virus infection, chikungunya fever, or West Nile fever.

The region from which dengue fever was estimated to be imported was most frequently Asia, accounting for 6 patients, consisting of 2 from Indonesia, 2 from the Philippines, 1 from India, and 1 from Bangladesh. Among the non-Asian regions, dengue fever was estimated to have been imported from Cameroon (1) and Pakistan (1) [2].

Concerning malaria, according to the preliminary report until September (18 imported cases), the estimated region from which the disease was imported was Africa, accounting for 16 patients including 7 from Nigeria, 2 from Chad, and 2 from Uganda. Also, 1 patient was estimated to be infected in Pakistan (Middle East), and 1 was infected while visiting 2 or more countries [3].

As for Japanese encephalitis, patients were reported from Yamaguchi Prefecture (1 patient), Nagasaki Prefecture (1), and Oita Prefecture (1) [1]. In Japan, infection trends of Japanese encephalitis virus are monitored by measuring the serum HI antibody level in swine, which are amplifiers, by the National Epidemiological Surveillance of Vaccine-Preventable Diseases. Of the 22 prefectures in which the survey was conducted in 2021, antibodies to Japanese encephalitis were found in 14 prefectures (Miyagi, Kumamoto, Nagasaki, Saga, Kochi, Ehime, Kagawa, Tokushima, Shimane, Aichi, Shizuoka, Chiba, Ibaragi, and Akita), and in 12 of the 22 prefectures in 2020 [4]. It was reported that Japanese encephalitis patients began to appear about 2 weeks after more than half the swine examined became infected by Japanese encephalitis virus. Presently, however, because of the spread of vaccination against Japanese encephalitis, change in living environment, etc., the state of swine infection and the occurrence of patients are not necessarily parallel, and the annual number of reported Japanese encephalitis patients has recently been about 10 [4].

1.2 Rodent-borne diseases

The trend survey in 2021 identified no reported case of plague (transmitted by rodents and insects such as fleas) or Lassa fever, South American hemorrhagic fever or hemorrhagic fever with renal syndrome (HFRS) or hantavirus pulmonary syndrome (HPS) (transmitted directly by infected rodents) [1]. The absence of any reported case allows us to estimate that none of these diseases developed in Japan during the survey period.

2 Vector-borne quarantine infectious diseases reported in the world (2021)

The overseas outbreak of quarantine infectious diseases in 2021 are described below on the basis of the information from the WHO and other sources.

2.1 Mosquito-borne diseases

Zika virus disease

An outline of the recent state of outbreaks of Zika virus infection in the world is reported in ZIKA EPIDEMIOLOGY UPDATE of the WHO. Local infection by Zika virus transmitted by mosquitoes was confirmed in a total of 89 nations or regions as of December 2021, and by the regional office of the WHO, Zika virus infection is distributed in 5 regions with the exception of the Eastern Mediterranean Region. In and after 2019, local transmission has been confirmed in France and Kenya.

In the Americas, the incidence of Zika virus infection reached a peak in 2016 and declined rapidly thereafter, but cases of infection have continued to be reported in some countries, and the Americas remains the region with the largest annual number of cases. In India, an outbreak was reported in Kerala in July 2021, and it was the first outbreak in South-East Asia after the mass outbreak in Jaipur, India, in 2018. In Europe, cases of returnees from epidemic areas have been reported since 2016, and the first case of local transmission in this region was reported in France in 2019. In Africa, research by monitoring of the Zika virus antibody seropositive rate has been conducted, and a survey in Kenya showed a mass seropositive rate suggestive of local transmission [5].

Countries and territories with current or previous Zika virus transmission, by WHO regional office

WHO Regional Office	Country / territory	Total
AFRO	Angola; Burkina Faso; Burundi; Cabo Verde; Cameroon; Central African Republic; Côte d'Ivoire; Ethiopia; Gabon; Guinea-Bissau; Kenya; Nigeria; Senegal; Uganda	14
AMRO/PAHO	Anguilla; Antigua and Barbuda; Argentina; Aruba; Bahamas; Barbados; Belize; Bolivia (Plurinational State of); Bonaire, Sint Eustatius and Saba; Brazil; British Virgin Islands; Cayman Islands; Colombia; Costa Rica; Cuba; Curaçao; Dominica; Dominican Republic; Ecuador; El Salvador; French Guiana; Grenada; Guadeloupe; Guatemala; Guyana; Haiti; Honduras; Easter Island– Chile; Jamaica; Martinique; Mexico; Montserrat; Nicaragua; Panama; Paraguay; Peru; Puerto Rico; Saint Barthélemy; Saint Kitts and Nevis; Saint Lucia; Saint Martin; Saint Vincent and the Grenadines; Saint Maarten; Suriname; Trinidad and Tobago; Turks and Caicos; United States of America; United States Virgin Islands; Venezuela (Bolivarian Republic of)	49
SEARO	Bangladesh; India; Indonesia; Maldives; Myanmar; Thailand	6
WPRO	American Samoa; Cambodia; Cook Islands; Fiji; French Polynesia; Lao People's Democratic Republic; Marshall Islands; Malaysia; Micronesia (Federated States of); New Caledonia; Palau; Papua New Guinea; Philippines; Samoa; Singapore; Solomon Islands; Tonga; Vanuatu; Viet Nam	19
EURO	France (Var department)	1
Total		89

AFRO : Regional Office for Africa. AMRO/PAHO : Regional Office for the Americas / Pan American Health Organization. EMRO : Regional Office for the Eastern Mediterranean. EURO : Regional Office for Europe. SEARO : Regional Office for South-East Asia. WPRO : Regional Office for Western Pacific

（Source : WHO Countries and territories with current previous Zika virus transmission （Data as of February 2022））

The state of outbreaks in the Americas in 2021 was reported in Epidemiological Update of the Pan American Health Organization (PAHO). During the period from the 1st to the 49th week, a total of 18,804 individuals, including 2 who died (reported in Brazil), were reported to have contracted Zika fever. The number of infected individuals in 2021 decreased compared with the number reported in the comparable period in 2020 (22,038, including 1 who died).

The country with the largest number of patients in this region is Brazil with 15,903 patients (85%), followed by Guatemala with 1,902 patients (10%), and Paraguay with 474 patients (2.5%).

Since Zika fever was first confirmed in Brazil in March 2015, local outbreaks of Zika fever have been confirmed in all American countries/regions except Chile, Uruguay, and Canada [6].

Chikungunya fever

According to the Communicable disease threats report of the European Center for Disease Control (ECDC), 217,074 patients with chikungunya fever were reported in the world in 2021, and Brazilian (119, 019) and Indian (91,477) patients were predominant among them [7].

Geographical distribution of chikungunya virus disease cases reported worldwide, 2021

(Source : ECDC)

The state of regional incidences in 2021 was reported as follows [7].

・**Europe**

There were no cases of local transmission.

・**Asia**

There were reports of 91,477 cases from India, 1,221 cases from Malaysia, 523 cases from Thailand, and 514 cases from Cambodia. No deaths were reported.

・**Africa**

Although 104 cases were reported from the Democratic Republic of the Congo, there were no deaths.

・**Australia and the Pacific**

No cases were reported.

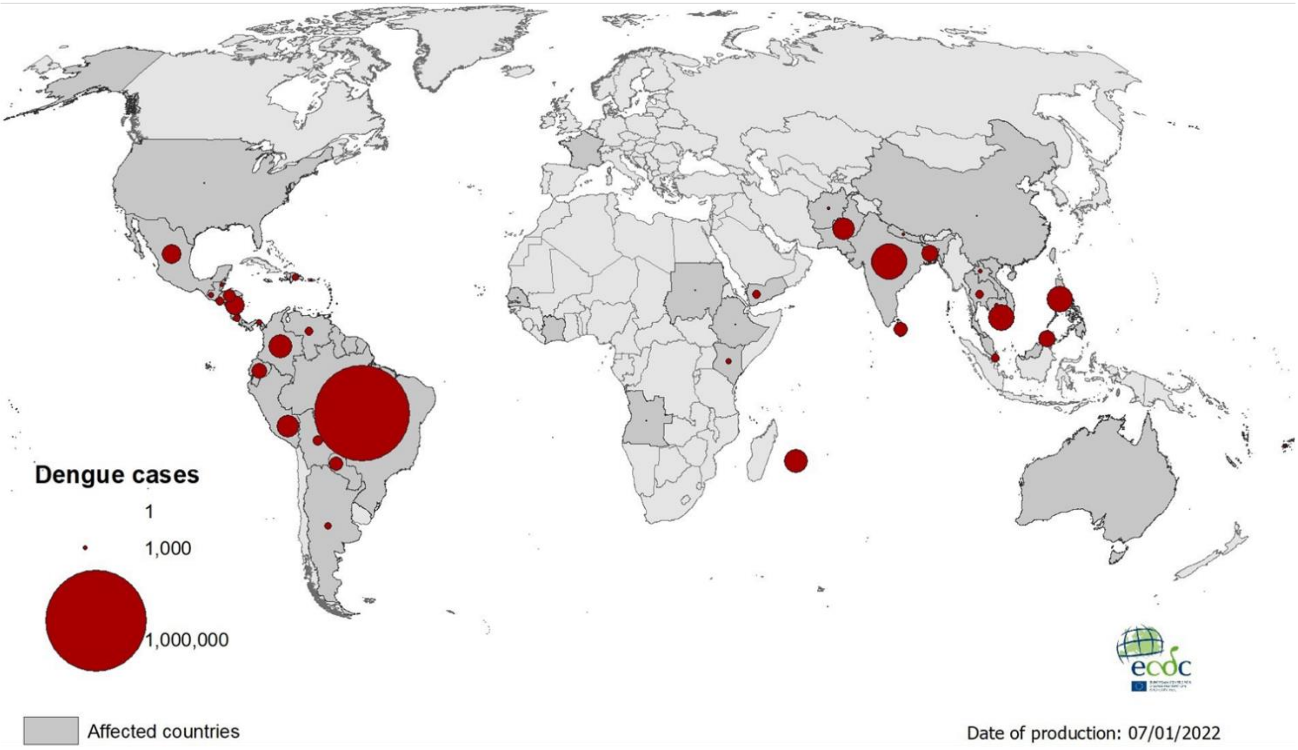
・**North/South America**

According to the Epidemiological Update of the PAHO, during the period from the 1st to the 49th week of 2021, 131,630 patients in 14 countries or regions, including 11 who died, were suspected to have been infected, showing an increase compared with the number in the same period in 2020 (101,518, including 29 who died). Of the suspected cases, 127,487 (97%) in Brazil, 1,951 (1.5%) in Guatemala, and 737 (0.6%) in Belize together accounted for 99%. All 11 deaths occurred in Brazil. In the Americas, 21 patients with imported infection were reported, all in the United States [6].

Dengue fever

According to the Communicable Disease Threats Report by the ECDC, the number of patients with dengue fever in the world in 2021 was reported to have been 1,472,059, most of which were from Brazil (863,650), India (123,106), Vietnam (61,304), the Philippines (61,170), and Peru (41,379) [7].

Geographical distribution of dengue cases reported worldwide, 2021



(Source : ECDC)

The state of regional incidences in 2021 was reported as follows [7].

・**Europe**

In France, one definitively diagnosed case of local transmission was reported.

・**Americas and the Caribbean**

The PAHO reported 1,082,042 cases, including 456,898 definitively diagnosed cases and 319 deaths, in the American continent. Particularly, five countries with a large number of patients were Brazil (863,650), Peru (41,379), Columbia (37,452), Nicaragua (32,020), and Mexico (30,059). Presently, all 4 dengue virus serotypes (type 1, type 2, type 3, and type 4) are circulating on the American continent, and the risk of severe infection is increasing.

The monitoring index for dengue fever in the French West Indies (Guadeloupe, Martinique, Saint-Martin, and Saint Barthélemy) is a low-level or zero incidence, and Martinique and Guadeloupe officially declared the end of the dengue epidemic.

・**Asia**

Countries with a large number of patients were India (123,106, with the death of 90), Vietnam (61,304, with the death of 21), the Philippines (61,170, with the death of 216), Bangladesh (26,453, with the death of 98), Pakistan (25,478, with the death of 118), Malaysia (22,101, with the death of 17), and Sri Lanka (16,598, with no deaths).

Many cases were also reported in Thailand, Yemen, Singapore, Cambodia, Laos, Nepal, Afghanistan, Maldives, and China.

・**Africa**

Cases were reported in Kenya (976, with the death of 2), Sudan (229, with the death of 5), Ethiopia (207, with no deaths), Angola (86, with no deaths), Senegal (47, with no deaths), and Cote d'lvoire (1, with no deaths). In addition, 29,759 definitively diagnosed cases and death of 20 patients were reported in Réunion.

・**Australia and the Pacific**

Cases were reported from Fiji (300), the Cook Islands (217), New Caledonia (116), Wallis et Futuna (68 (definitively diagnosed)), Vanuatu (26), French Polynesia (20), Marshall Islands (12), and Australia (4), with no deaths.

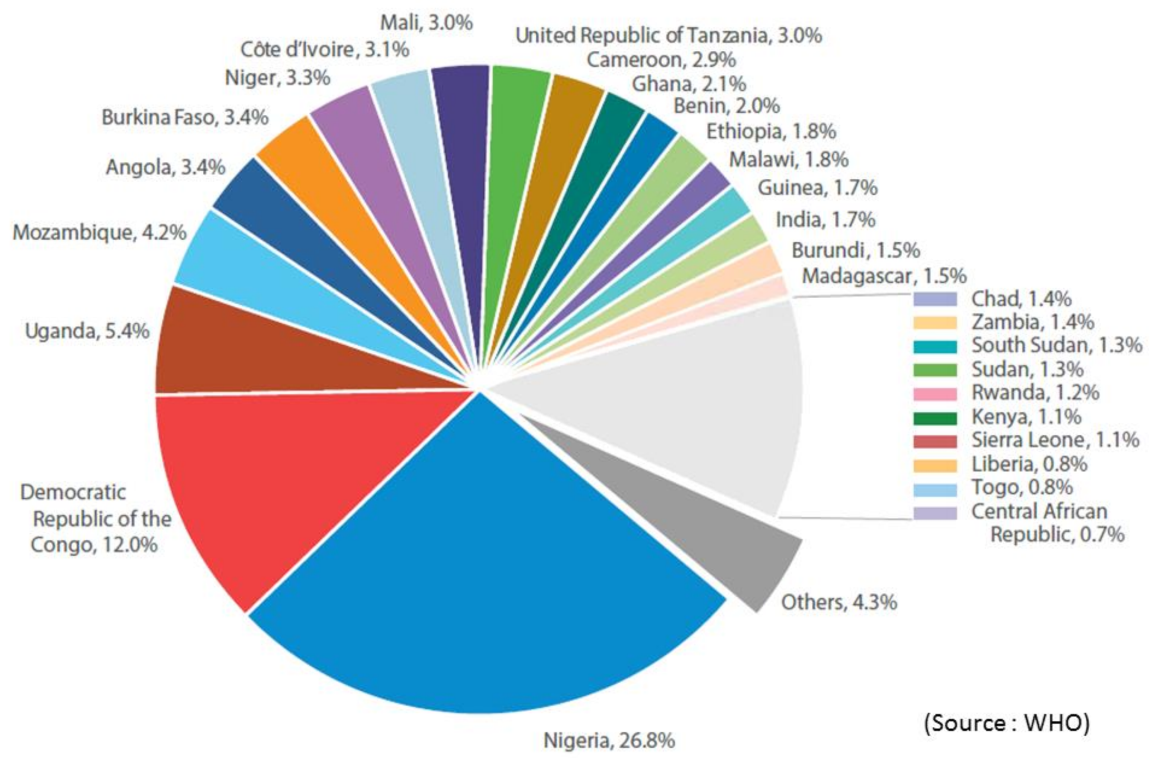
Malaria

Although the data are from 2020, the state of outbreaks of malaria is described by citing the World Malaria Report 2021 of the WHO.

The estimated number of patients with Malaria in 2020 was 241,000,000 in the entire world. It increased by 14,000,000 from 227,000,000 in 2019, and cases in countries in the jurisdiction of the WHO African Regional Office comprised most of the increase. Also, the global number of deaths due to malaria in 2020 was estimated to be 627,000, having increased by 12% from 558,000 in 2019. The increases in the numbers of cases and deaths are considered to be due to disruption of the antimalarial operations during the COVID-19 pandemic.

Nigeria (26.8%), the Democratic Republic of the Congo (12.0%), Uganda (5.4%), Mozambique (4.2%), Angola (3.4%), and Burkina Faso (3.4%) accounted for 55% of the global number of patients in 2020 [8].

Global trends in distribution of malaria cases by country, 2020



The state of outbreaks of malaria in 2020 in the jurisdiction of the WHO Regional Office was reported as follows [8].

・**Africa**

From 2019 to 2020, the estimated number of patients with malaria in the African region increased from 213,000,000 to 228,000,000, and the number of deaths also increased from 534,000 to 602,000. Patients in Africa constitute about 95%, and the number of deaths accounts for about 96%, of those in the world. In this region, 80% of all deaths are children aged less than 5 years.

Six sub-Saharan African countries (Nigeria, the Democratic Republic of the Congo, Uganda, Mozambique, Angola, and Burkina Faso) comprise about 55% of the global total number of patients. Also, 4 countries, i.e., Nigeria (31.9%), the Democratic Republic of the Congo (13.2%), United Republic of Tanzania (4.1%), and Mozambique (3.8%), account for more than 50% of the deaths in the world.

・**South-East Asia**

In the South-East Asian Region, about 5,000,000 cases were estimated to occur, and they comprised 2% of the global number of malaria patients. Cases have not increased since 2019. In this region, about 83% of the total number of cases arose in India. Malaria was caused by *P. vivax* in more than one-third of all cases in this region.

・**Eastern Mediterranean**

The estimated number of cases in the Eastern Mediterranean region was 5,700,000. Sudan accounted for 56% of all cases, followed by Somalia, Yemen, Pakistan, Afghanistan, and Djibouti in descending order. The estimated number of cases increased from 2019 in Sudan (+410,000), Somalia (+71,000), and Djibouti (+23,000). About 18% of all cases of malaria observed in this region in 2020 were caused by *P. vivax*, primarily in Afghanistan and Pakistan.

The estimated number of deaths increased by 800 from 2019 and reached 12,300. Most of the deaths were confirmed in Sudan, and more than 80% of the deaths in Sudan were caused by *P. falciparum*.

・**Western Pacific**

The estimated number of cases of malaria in the Western Pacific region increased by 19% from 1,400,000 in 2019 to 1,700,000. The number of deaths also increased from 2,600 in 2019 to 3,200. The increases in the numbers of patients and deaths in this region were primarily due to their increases in Papua New Guinea, which accounted for 86% of all cases in this region in 2020, followed by the Solomon Islands, Cambodia, and the Philippines in descending order.

The percentage of cases of malaria caused by *P. vivax* relative to all cases in this region was about 17% in 2000 but increased to about one-third of the total number in 2020. This is because of the decrease in the number of cases of malaria caused by *P. falciparum* due to the contribution of effective prevention and treatment measures.

In China, there has been no domestic case since 2017, and China was certified by the WHO in 2021 to be a country that eradicated malaria.

・**Americas**

In the period from 2019 to 2020, the number of cases of malaria in the Americas decreased from 890,000 to 650,000, and the number of deaths also decreased from 509 to 409. Three countries, i.e., Venezuela, Brazil, and Columbia, accounted for 77% of all cases in this region. Malaria was caused by *P. vivax* in 68% of the cases observed in this region.

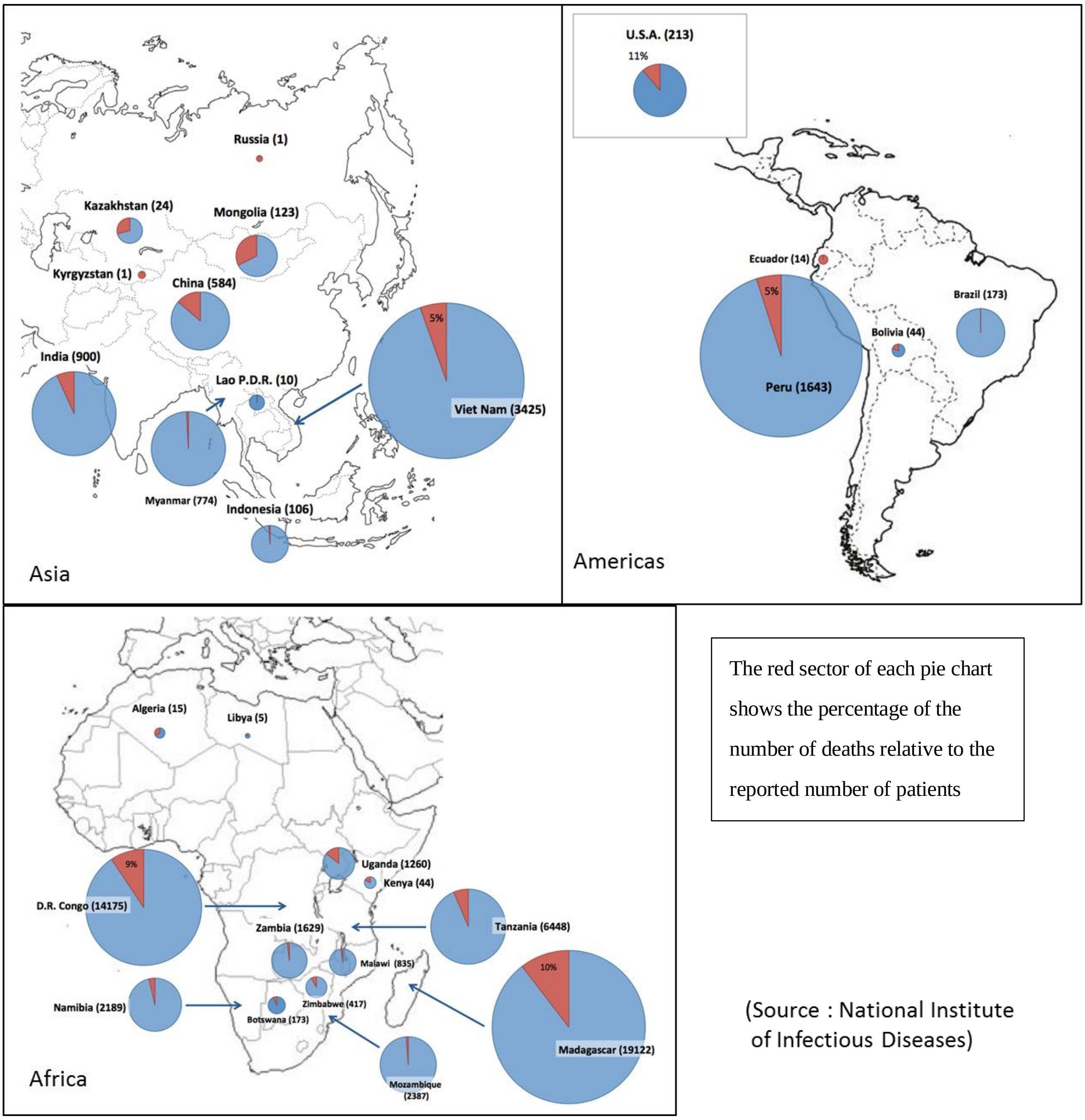
The decreases in the numbers of cases and deaths in the entire region in 2020 were primarily due to the decreases in Venezuela. In contrast, clear increases compared with the figures in 2019 were observed in Haiti, Honduras, Nicaragua, Panama, and Bolivia. Also, in 2021, El Salvador was certified by the WHO to have eradicated malaria.

2.2 Rodent-borne diseases

Plague

Since the beginning of the 21st century, cases have been reported primarily in Africa, North and South Americas, and Asia. According to the WHO, 56,734 cases of plague occurred, and 4,651 died (mortality rate, 8.2%), in the world during the 12 years from 2004 to 2015. Of these cases, 86% (48,699) were reported in African countries, including Madagascar (19,122), the Democratic Republic of the Congo (14,175), and Tanzania (6,448). Of the North and South American countries, epidemics occurred in Peru in 1992-1995, and cases have been reported sporadically even at present in the United States and Bolivia. In Asia, including Russia, cases were reported in countries such as Vietnam (3,425), India (900), Myanmar (774), and China (584). However, during the 5 years from 2011-2015, cases were reported in China (5), Mongolia (5), Kyrgyzstan (1), and Russia (1), and the disease has become a rare infection in Asia according to the reported numbers [9].

Geographical distribution of plague cases reported worldwide, 1987-2015



The state of outbreaks in the world in 2021 is described based on information by the WHO and healthcare authorities of each country.

・**Democratic Republic of the Congo**

In Ituri Province, 124 suspected cases of plague and 13 deaths were reported by November 28. In 2020, 461 suspected cases and 31 deaths were reported in the same province [10].

・**Madagascar**

By September 15, 20 suspected cases of plague and 22 definitively diagnosed cases were reported. Of the definitively diagnosed cases, 19 and 3 exhibited clinical symptoms of pneumonic plague and bubonic plague, respectively, and 8 (2 with bubonic plaque and 6 with pneumonic plague) of them died. Of those that died, 3 and 5 developed the disease by community-acquired and hospital-acquired infection, respectively [11].

・USA

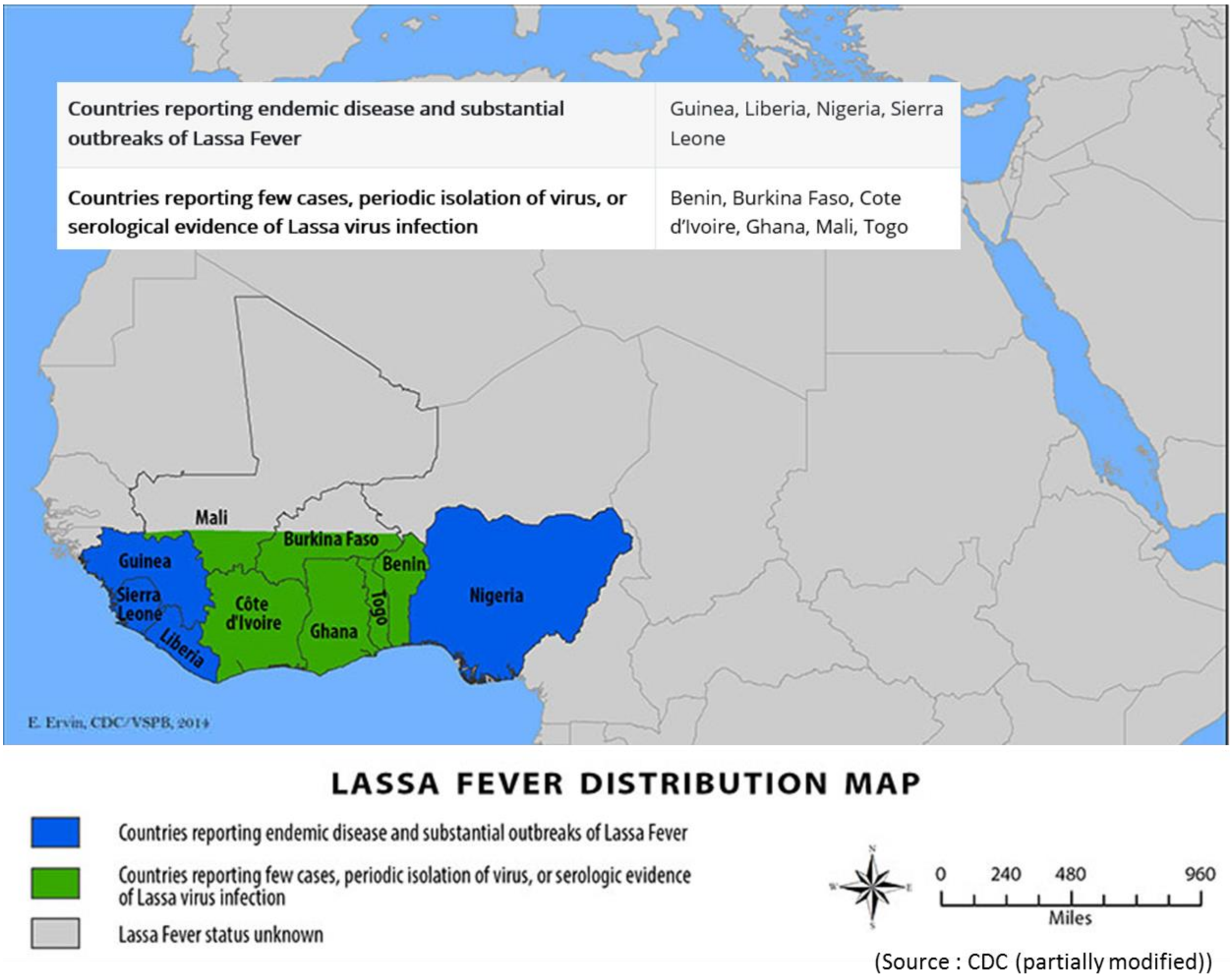
One death was reported in July in Colorado [12], and 1 patient with bubonic plague was confirmed in August in New Mexico [13].

・China

A livestock farm worker in the Inner Mongolia Autonomous Region was diagnosed with bubonic plaque in August and fell critically ill [14].

Lassa fever

Lassa fever is in a state of localized epidemic in the area of Africa from Nigeria to Sierra Leone and Guinea and countries including Central African Republic, which *Mastomys natalensis* carrying the virus inhabits, and individuals of *Mastomys natalensis* having Lassa virus, patients, and infected (antibody-positive) individuals are observed in such areas. It is estimated that 200-300 thousand people are infected annually [15].



(Source : CDC (partially modified))

The state of outbreaks of Lassa fever in 2021 is described by citing WEEKLY BULLETIN ON OUTBREAKS AND OTHER EMERGENCIES of the WHO African Regional Office [10].

・Nigeria

Lassa fever occurred in 16 provinces during the period from the 1st to the 49th week. The cumulative number of definitively diagnosed cases was 444, of which 83 died, with a mortality rate of 18.7%. In 2021, there were 4,083 suspected cases, showing a decrease compared with the same period in

2020.

・**Liberia**

By November 21, 136 suspected cases were reported. Twenty-four (17.6%) were definitively diagnosed, and 15 of them died (mortality rate: 62.5%).

・**Sierra Leone**

As of November 30, 16 cases were reported, and 9 died (mortality rate: 56.3%).

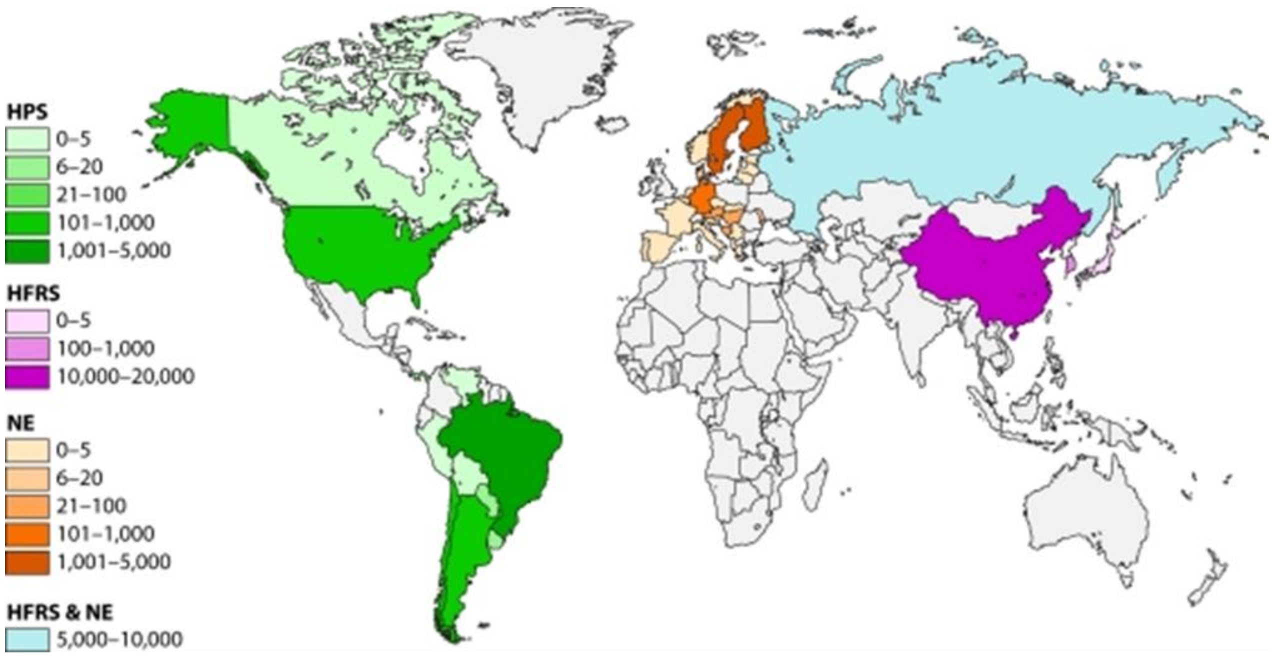
・**Guinea**

Eight definitively diagnosed cases were reported, and 7 died (mortality rate: 87.5%).

HFRS (Haemorrhagic Fever with Renal Syndrome) and HPS (Hantavirus Pulmonary Syndrome)

Epidemics of HFRS have been observed on the entire Eurasia continent. Epidemics of severe HFRS caused by Hantaan virus with *Apodemus agrarius* as a natural reservoir have been reported with tens of thousands of patients annually primarily in Far East Asia, and those of mild HFRS (nephropathia epidemica (NE)) caused by Puumala virus with *Eothenomys andersoni* as an infection source have been reported in North Europe to East Europe and the northern part of the Eurasia continent (with several thousands of patients annually). Seoul virus with *Rattus norvegicus* as an infection source has been detected in various parts of the world, but epidemics have been reported primarily in the Far East and Southeast Asia. In addition, epidemics of severe HFRS caused by Dobrava virus with *Apodemus flavicollis* as an infection source have been reported primarily in East Europe.

Also, HPS suddenly appeared in 1993 in the southeastern part of the United States, and the epidemic was confirmed to have thereafter spread to the entire Americas [16].



Geographical representation of approximate hantaviral disease incidence by country per year.
（Source：Colleen B. Jonsson et al. Clin Microbiol Rev. 2010 Apr; 23(2): 412-441.）

There have been few recent global-scale studies on the state of outbreaks of HFRS and HPS, but the recent greatest epidemic of HFRS occurred in China, where more than 10,000 cases have been reported annually. In addition, several hundreds of patients were reported in Korea, and several thousands of patients were reported in Russia and various areas in Europe [17].

Cases of HPS have been reported in the United States, Canada, and South America (Argentina, Chile, Paraguay, Brazil, Uruguay, Bolivia, and Panama) [18]. The CDC reported that cases were reported in 2020 from 11 states including Arizona, California, Kanzus, and Oregon, and 17 cases were reported in the entire United States [19].

3 Outline of vector surveillance conducted (2021)

3.1 A list of quarantine seaports and quarantine airports investigated

Of the seaports and airports specified in Article 1-2 of the Quarantine Act Enforcement Regulations (Cabinet Order No. 377, December 14, 1951; amended by Cabinet Order No. 41, February 5, 1953; enacted pursuant to Article 3 of the Quarantine Act), the quarantine seaports and quarantine airports reported to the Yokohama Quarantine Station Officer for Analysis on Sanitation Control in accordance with the "Guide to Port Area Sanitation Control" (final amendment: June 20, 2019; hereinafter called "the Sanitation Control Guide") were covered by the surveillance (the survey data on the radio quarantine ports were excluded from the surveillance).

Quarantine Seaports: 92

Otaru Port, Ishikariwan Port, Wakkanai Port, Rumoi Port, Monbetsu Port, Abashiri Port, Hanasaki Port, Kushiro Port, Tomakomai Port, Muroran Port, Hakodate Port, Aomori Port, Hachinohe Port, Miyako Port, Kamaishi Port, Ohfunato Port, Kesennuma Port, Ishinomaki Port, Sendai Shiogama Port, Akita Funakawa Port, Sakata Port, Onahama Port, Hitachi Port, Kashima Port, Kisarazu Port, Chiba Port, Futami Port, Keihin Port (Tokyo Port), Keihin Port (Kawasaki Port), Keihin Port (Yokohama Port), Yokosuka Port, Misaki port, Naoetsu Port, Niigata Port, Fushiki Tomaya Port, Kanazawa Port, Nanao Port, Uchiura Port, Tsuruga Port, Shimizu Port, Yaizu Port, Fukue Port, Mikawa Port (Gamagohri Port), Mikawa Port (Toyohashi Port), Kinuura Port, Nagoya Port, Yokkaichi Port, Owase Port, Maizuru Port, Katsuura Port, Wakayama Shimotsu Port, Hanshin Port (Osaka Port), Hannan Port, Hanshin Port (Kobe Port), Mizushima Port, Sakai Port, Hamada Port, Fukuyama Port, Kure Port, Hiroshima Port, Iwakuni Port, Tokuyama Kudamatsu Port, Tokushima Komatsushima Port, Sakaide Port, Matsuyama Port, Niihama Port, Mishimakawanoe Port, Kochi Port, Kanmon Port, Hakata Port, Miike Port, Karatsu Port, Imari Port, Sasebo Port, Nagasaki Port, Hitakatsu Port, Izuhara Port, Oita Port, Saganoseki Port, Saeki Port, Minamata Port, Yatsushiro Port, Misumi Port, Hososhima Port, Shibushi Port, Kagoshima Port, Kiire Port, Kushikino Port, Kinnakagusuku Port, Naha Port, Hirara Port, Ishigaki Port

Quarantine Airports: 29

New Chitose Airport, Asahikawa Airport, Hakodate Airport, Aomori Airport, Sendai Airport, Akita Airport, Fukushima Airport, Narita International Airport, Tokyo International Airport, Hyakuri

Airport (Ibaraki Airport), Niigata Airport, Komatsu Airport, Chubu Centrair International Airport, Shizuoka Airport, Kansai International Airport, Okayama Airport, Hiroshima Airport, Matsuyama Airport, Takamatsu Airport, Miho Airport (Yonago Airport), Fukuoka Airport, Kitakyushu Airport, Oita Airport, Nagasaki Airport, Kumamoto Airport, Miyazaki Airport, Kagoshima Airport, Saga Airport, Naha Airport

Total: 121 quarantine port/airports (Table 1, Fig. 1-1 & -2)

3.2 Infectious diseases examined and the methods used for the investigation

The infectious diseases covered by the surveillance included Zika virus disease, Chikungunya fever, dengue fever, malaria, West Nile fever, Japanese encephalitis, rodent- or flea-borne South American hemorrhagic fever, plague, Lassa fever, HFRS, and HPS.

The surveillance was conducted in accordance with the "Rodent Surveillance Manual" (Appendix 2) and "Mosquito Surveillance Manual" (Appendix 3) of the "Guide to Sanitation Control."

3.3 Period of surveillance

January 1 through December 31, 2021

3.4 Summarization of the results

The Yokohama Quarantine Station Officer for Analysis on Sanitation Control summarized the data in electronic forms 1 through 11 (Microsoft® Excel) listed in Attachment 1 submitted from the quarantine seaports and airports in accordance with "Handling of Surveillance Results in Connection with 'Guide to Port Area Sanitation Control'."

4 Results of investigations targeting invasive vectors (2021)

4.1 Investigation of invasive mosquitoes

To assess the extent of the spread of mosquito-borne infections and to estimate their prevalence in Japan, investigation of the mosquito invasion/colonization status and a check of pathogens carried by mosquitoes were conducted in aircraft arriving from overseas and in the areas specified by the Cabinet Order.

4.1.1 Mosquito collections in international aircraft on arrival

The investigation was carried out according to the Mosquito Surveillance Manual for mosquitoes on aircrafts arriving from overseas by visual examination and using an insect net at 5 airports concerning 154 aircrafts (82 aircrafts in 2020) of 16 airlines from 12 countries/regions (8 airports, 15 countries/regions, 23 airlines in 2020).

At Narita International Airport, Chubu Centrair International Airport, and Kansai International Airport, the investigation was conducted nearly throughout the year, and the annual numbers of aircrafts examined at the 3 airports were 123, 14, and 14, respectively (Table 3).

The airports from which a relatively large number of examined aircrafts departed were Suvarnabhumi International Airport, Thailand (38); Kuala Lumpur International Airport, Malaysia (37); Changi International Airport, Singapore (37); and Jakarta International Soekarno-Hatta Airport, Indonesia (12) (Table 4-1).

According to the region, the investigation was made primarily about aircrafts that departed from airports in Southeast Asia (Thailand, Singapore, Malaysia, Indonesia, the Philippines, Vietnam, Taiwan, Hong Kong), and the number of aircrafts examined was 144. Regarding other regions, 6 aircrafts from North America (United States), 3 from East Asia (Korea, China), and 1 from the Middle East (Qatar) were examined (Table 4-2).

At Narita International Airport, 2 mosquitoes of the *Culex pipiens* complex, the vector of West Nile fever (primary species), were collected from 1 aircraft that departed from Suvarnabhumi International Airport, Thailand. The pathogen tests (Flavivirus) of the collected mosquitoes were negative (Table 3, 4-1, 4-2, Fig. 2).

4.1.2 Surveillance of adult and larval mosquitoes at airports and seaports

In the survey areas set with the use of the standard regional mesh of the Statistics Bureau of the Ministry of Internal Affairs and Communications in accordance with the "Port Sanitation Control Guidelines" (hereinafter called "the tertiary mesh"), mosquito traps (light traps) containing dry ice were placed to examine the status of exogenous mosquito invasion and emergence (hereinafter called "adult mosquito survey"). In addition, premature/larval mosquito traps (belt traps) were placed in the survey areas to examine the status of exogenous mosquito invasion and colonization of vector mosquitoes, accompanied by investigation of the distribution of larval mosquitos in ditches and catch basins (hereinafter called "larval mosquito survey").

Adult mosquito survey

The survey was conducted in a total of 1,334 survey areas (945 survey areas in 2020) of 118 ports consisting of 89 seaports and 29 airports (113 ports consisting of 85 seaports and 28 airports in 2020). As a result, mosquitoes were collected at 106 ports consisting of 82 seaports and 24 airports (98 ports consisting of 74 seaports and 24 airports in 2020).

26,017 mosquitoes of 9 genera and 30 species (9,605 individuals of 6 genera and 21 species in 2020) were collected, including 25,985 individuals of 19 species of 5 genera (9,573 individuals of 4 genera and 14 species in 2020) that are vectors of mosquito-borne infections (primary species, secondary species, and possible species).

The species that was collected in the largest number was *Culex tritaeniorhynchus* with 11,855 individuals, accounting for 46% of all mosquitoes collected, followed by the *Culex pipiens* complex with 8,672 individuals (33%) and *Aedes albopictus* with 4,070 individuals (16%).

No exogenous species, such as *Aedes aegypti*, were collected (Table 5-1 through -3).

Larval mosquito survey

The survey was carried out in a total 1,353 survey areas (849 areas in 2020) at 116 ports consisting of 87 seaports and 29 airports (102 ports consisting of 77 seaports and 25 airports in 2020). As a result, inhabitation was confirmed at 92 ports consisting of 70 seaports and 22 airports (71 ports consisting of 54 seaports and 17 airports in 2020).

The larvae confirmed to inhabit the ports belonged to 7 genera and 22 species-groups and unknown species (7 genera and 18 species-groups and unknown species in 2020) including 4 genera and 13 species (3 genera and 12 species in 2020) that are vectors of mosquito-borne infections (primary species, secondary species, and possible species) (Table 6-1 through -3).

As a result of the adult and larval mosquito surveys, inhabitation of mosquitoes was confirmed at a total of 112 seaports/airports.

State of inhabitation of vector species by mosquito-borne infections (Table 5-1 through -3, Table 6-1 through -3)

・**Zika virus disease and Chikungunya fever**

Adults or larvae of *Aedes albopictus*, which is the primary species colonizing Japan, were confirmed at a total of 83 seaports/airports (74 seaports/airports in 2020) from Aomori Port (Aomori Prefecture) to Ishigaki Port (Okinawa Prefecture) (Fig. 3).

・**Dengue fever**

Adults or larvae of *Aedes albopictus*, which is the primary species, were confirmed in a wide area with Aomori Prefecture as the northern limit. In addition, adults and larvae of *Culex tritaeniorhynchus*, *Aedes flavopictus*, *Aedes dorsalis*, *Aedes riversi*, and *Mansonia uniformis*, which are possible species, were collected. Vector mosquitoes of dengue fever were confirmed at 89 seaports/airports (84 seaports/airports in 2020) (Fig. 4).

・**Malaria**

Adults or larvae of *Anopheles sinensis*, which is the primary species of vivax malaria, were confirmed at 10 seaports/airports (12 seaports/airports in 2020). In addition, adults of *Anopheles sineroides*, which is a secondary species, were collected at Sendai Airport (Fig. 5).

・**West Nile fever**

Concerning primary species, adults or larvae of the *Culex* family (subspecies not identified) were confirmed at seaports and airports except those in Okinawa Prefecture, and adults or larvae of *Culex pipiens quinquefasciatus* were confirmed at seaports and airports of Okinawa Prefecture. Also, adults of *Culex pipiens molestus* were collected at Narita International Airport. Among secondary species, 11 species including *Culex tritaeniorhynchus*, *Aedes albopictus*, *Aedes vexans nipponii*, and *Culex inatomii,* were confirmed. As for possible species, *Cuex sitiens* was collected. Inhabitation of vectors of West Nile fever was confirmed at 111 seaports/airports (100 seaports/airports in 2020) (Fig. 6).

・**Japanese encephalitis**

Concerning the primary species, adults or larvae of *Culex tritaeniorhynchus* were confirmed at seaport and airports of a wide area from Miyako Port (Iwate Prefecture) as the northern limit to Ishigaki Port (Okinawa Prefecture) as the southern limit. Also, adults of *Culex pseudovishnui* were collected at seaports and airports of the Kyushu District. As for possible species, adults or larvae of 9 species including *Aedes albopictus*, *Aedes japonicus*, *Aedes togoi*, *Culex quinquefasciatus*, *Culex bitaeniorhynchus*, and *Culex sitiens* were confirmed. Inhabitation of vectors of Japanese encephalitis was confirmed at 97 seaports/airports (89 seaports/airports in 2020) (Fig. 7).

Results of pathogen tests of quarantine infectious diseases, etc.

Pathogen tests of quarantine infectious diseases, etc., were performed in 25,390 of the 26,017 adult mosquitoes collected by the surveys (1,577 samples for Flavivirus test (pooled), 287 samples for chikungunya virus test (pooled), and 26 samples for malaria parasite test (pooled)). As a result, common genes of Flavivirus were confirmed in 2 pooled samples of *Culex tritaeniorhynchus* collected at Narita International Airport. Subsequently, gene testing confirmed the Japanese encephalitis virus type I gene, but Japanese encephalitis virus was not isolated. The tests for chikungunya virus or malaria parasites were all negative (Table 5-1 through -3).

4.2 Investigation of rodents (Table 7-1 through -3)

To assess the extent of rodent invasion in connection with rodent-borne infectious diseases and to predict their epidemic, investigation was conducted about the status of rodent and parasitic flea invasion and colonization in the areas specified by the Cabinet Order, accompanied by the check for pathogens carried by these vectors.

Survey areas were set within the Cabinet Order-specified areas, in a way similar to the above-mentioned mosquito surveillance. With baskets and Sherman traps (designed for capture of rodents) placed within the survey areas, the survey was conducted in 677 survey areas (2020: 507 survey areas) of 110 ports consisting of 84 seaports and 26 airports (2020: 108 ports consisting of 82 seaports and 26 airports).

As a result of the investigation, a total of 395 rodents (257 in 2020) were captured at 49 seaports and 15 airports with a total of 64 seaports/airports (69 ports consisting 52 seaports and 17 airports in 2020). The mean number of rodents captured per survey area was 0.58 (0.51 in 2020).

Status of capture of rodents

Rodents of 6 genera and 8 species and unknown species (5 genera and 7 species and unknown species in 2020) were captured. Of the captured rodents, *Mus musculus* accounted for the largest number (153), followed by *Rattus norvegicus* (111), *Rattus rattus* (56), and *Apodemus speciosus* (42). In addition, *Clethrionomys rufocanus bedfordiae* and *Microtus montebelli* were captured.

Status of collection of parasitic fleas and mites

Concerning parasitic fleas, 9 individuals of *Nosopsyllus fasciatus*, which is a secondary species of plague, were collected from captured *Rattus norvegicus*. In addition, *Ctenophthalmus Kolenati* was collected although it is not a vector of quarantine infectious disease, etc. As for parasite mites, species, including the *Laelaps nuttalli* and *Laelaps echidninus*, were collected.

Rodents captured by investigations carried out by detection reports from the authorities concerned

Investigation by the quarantine station based on detection reports from the authorities concerned reported the following as major examples estimated to be cases of invasion from overseas.

At Narita International Airport, exogenous *Peromyscus maniculatus* was captured on an aircraft, and, at Hakata Port, an animal of the genus *Peromyscus* was captured in an ocean-going container.

Rodents Estimated to Have Invaded Japan from Overseas: 2021

Seaport or Airport	Place of detection	Species captured	Number	Estimated place of origin (seaport, district or airport of origin)	Commodity type
Nagoya Port	Ocean-going ship container	*Rattus rattus* (dead)	1	India (Nhavasheva Port)	Raw cotton
Kobe Port	Ocean-going ship container	*Mus musculus* (dead)	1	China (Shandong Port)	Peanut
Kobe Port	Ocean-going ship container	Unidentified (dead)	1	Australia (Fremantle Port)	Malt
Tokyo Port	Ocean-going ship container	Unidentified (dead)	1	Vietnam (Haiphong Port)	Unknown
Shibushi Port	Ocean-going ship container	*Mus musculus* (dead)	2	Canada (Vancouver Port)	Dry hay
Hakata Port	Ocean-going ship container	*Peromyscus sp.* (dead)	1	USA（Seattle Port)	Dry hay
Hakata Port	Ocean-going ship container	*Mus musculus* (dead)	1	USA（Seattle Port)	Seed
Narita International Airport	Aircraft cargo hold	*Peromyscus maniculatus*	1	USA（Chicago Airport)	—
Nagoya Port	Ocean-going ship container	Unidentified (Unknown)	1	China(Dalian Port)	Cereals

State of capture of vector species of rodent-borne infections and the results of pathogen tests

・Plague

Since all rodents including those of secondary species are designated as vectors, vector species are considered to have inhabited widely in the regions of the 64 seaports and airports where rodents were captured. Also, *Nosopsyllus fasciatus*, which is a secondary species of parasite mite, was collected from *Rattus norvegicus* captured at Muroran Port and Kashima Port.

The pathogen test for plague (*Y. pestis*-specific antibody test) was performed in 366 of the captured rodents, and the results were all negative (Fig. 8).

・HFRS

Rattus norvegicus and *Rattus rattus*, which are secondary species, were captured at 36 ports and airports.

Pathogen tests (HFRS virus-specific antibody tests) were also performed in *Mus musculus*, *Apodemus speciosus*, and *Clethrionomys rufocanus bedfordiae*, which have been reported to be hosts in the literature, as well as in *Rattus norvegicus* and *Rattus rattus*. HFRS pathogen tests (HFRS virus-specific antibody tests) were performed in all 340 rodents captured, and the results were all negative (Fig. 9).

・HPS

At Narita International Airport, a mouse of the primary species *Peromyscus maniculatus* was captured, and while the HPS virus antigen test was negative, the HPS virus antibody test was positive. At Fukuoka Port, a mouse of the primary species of the genus *Peromyscus* was captured but could not be tested because it was dead (Fig. 10).

・South American hemorrhagic fever and Lassa fever

No species known to transmit South American hemorrhagic fever or Lassa fever was captured.

5 Risk assessment of vector- borne diseases at airports and seaports (2021)

5.1 Mosquito-borne diseases

Aircraft surveys were performed primarily in aircrafts that departed from airports in Southeast Asia, and mosquitoes of the *Culex pipiens* complex, which is a vector (primary species) of West Nile fever, were captured in 1 aircraft that departed from Suvarnabhumi International Airport, Thailand. The result of the pathogen test (Flavivirus) of the captured mosquito was negative. The results of aircraft surveys were not used for risk assessment because they were performed before invasion into the Cabinet Order-specified area.

As a result of investigation of the Cabinet Order-specified area in each quarantine seaport and airport, no exogenous species, such as *Aedes aegypti,* were confirmed, but inhabitation of vectors of mosquito-borne infections was confirmed. The primary species of various mosquito-borne infections captured were *Aedes albopictus* (Zika virus infection, chikungunya fever, and dengue fever), *Anopheles sinensis* (malaria), *Culex pipiens* complex, *Culex pipiens quinquefascitus*, *Culex pipiens molestus* (West Nile fever), *Culex tritaeniorhynchus*, and *Culex pseudovishnui* (Japanese encephalitis). In addition, inhabitation of secondary species of various mosquito-borne infections and possible species was confirmed.

As a result of pathogen tests of the captured adult mosquitoes, the Japanese encephalitis virus type I gene was detected in the *Culex tritaeniorhynchus* captured at Narita International Airport, but Japanese encephalitis virus was not isolated. The tests for chikungunya virus or malaria parasite were all negative.

Based on the Sanitation Control Guide, the risk of outbreak of quarantine infectious diseases, etc., (A-D) was evaluated from the investigation results according to the following criteria. The outbreak risk was assessed in each month in which the investigation was performed, and the highest outbreak risk was regarded as the risk level of the year (Table 8).

A (very low): No vector mosquito (primary, secondary, or possible species) transmitting mosquito-borne infectious diseases, etc. or no mosquito is captured during permanent surveillance, etc. in the Cabinet Order-specified area.

B (low): Vector mosquitos (primary, secondary, or possible species) transmitting mosquito-borne infectious diseases, etc. are captured during permanent surveillance, etc. in the Cabinet Order-specified area. The mosquitoes captured do not possess any pathogen or gene of pathogen for quarantine infectious disease or the like.

C (moderate): Adults or larvae of exogenous vector mosquitos (primary, secondary, or possible species) transmitting mosquito-borne infectious diseases, etc. are captured during permanent surveillance, etc. in the Cabinet Order-specified area. The mosquitoes captured do not possess any pathogen or gene of pathogen for quarantine infectious disease or the like.

D (high): Adults of vector mosquitos (primary, secondary, or possible species) transmitting mosquito-borne infectious diseases, etc. are captured during permanent surveillance, etc. in the Cabinet Order-specified area. The mosquitoes captured possess the pathogen or gene of pathogen for quarantine infectious disease or the like.

・**Dengue fever**

The risk was evaluated as low (B) at 89 seaports and airports (75%) and as very low (A) at the other 29 seaports and airports.

・**Japanese encephalitis**

The risk was evaluated as high (D), because *Culex tritaeniorhynchus*, a vector of the disease, was captured at 1 airport (Narita International Airport) and was confirmed to carry the gene of Japanese encephalitis virus. The risk was evaluated as low (B) at the other 96 seaports and airports (81%) and as very low (A) at 21 seaports and airports.

・**West Nile fever**

The risk was evaluated as low (B) at 111 seaports and airports (94%) and as very low (A) at the other 7 seaports and airports.

・**Malaria**

The risk was evaluated as very low (A) at 108 seaports and airports (91%) and to be low (B) at the other 10 ports and airports.

・**Chikungunya fever or Zika virus disease**

The risk was evaluated as low (B) at 83 seaports and airports (70%) and as very low (A) at the other 35 seaports and airports.

5.2 Rodent-borne diseases

As a result of investigation of the Cabinet Order-specified areas of various quarantine seaports/airports, rodents of 6 genera and 8 species and unknown species were captured. All rodents including those of secondary species were vectors of plague. Regarding plague, *Nosopsyllus fasciatus*, which is a subordinate species of parasite flees, was collected from *Rattus norvegicus* at Muroran Port and Kashima Port. *Xenopsylla cheopis*, the primary species that had been captured before, was not captured.

Concerning HFRS, *Rattus norvegicus* and *Rattus rattus*, which are secondary species, were captured at 36 seaports and airports.

By investigation based on reports from related authorities, rodents of exogenous primary species of HPS were captured. At Narita International Airport, *Peromyscus maniculatus* was captured on an aircraft, and it was positive for HPS virus antibody on the pathogen test. Also, at Hakata Port, an individual of the genus *Peromyscus* was captured in an ocean-going container. However, the results of surveys of aircrafts and containers were not used for risk assessment, because they were performed before entry into the Cabinet Order-specified area.

No vectors of South American haemorrhagic fever or Lassa fever were captured.

Similar to the investigation of mosquitoes, the outbreak risk of quarantine infectious diseases, etc. (A-D) was evaluated from the results of surveillance according to the following criteria (Table 8).

A (very low): No rodent is captured during permanent surveillance, etc. in the Cabinet Order-specified areas.

B (low): Indigenous rodents (primary or secondary species) or fleas/mites (primary or secondary species) known to transmit quarantine infectious diseases or the like are captured during permanent surveillance, etc. in the Cabinet Order-specific areas. None of them possesses any antibody, pathogen, or gene suggestive of pathogen for quarantine infectious diseases or the like.

C (moderate): Exogenous rodents (primary or secondary species) or fleas/mites (primary or secondary species) known to transmit quarantine infectious diseases or the like are captured during permanent surveillance, etc. in the Cabinet Order-specific areas. None of them possesses any antibody, pathogen, or gene suggestive of pathogen for quarantine infectious diseases or the like.

D (high): An antibody, pathogen, or gene suggestive of pathogen for quarantine infectious disease or the like is detected in the rodents (primary or secondary species) or fleas/mites known to transmit quarantine infectious diseases or the like (primary or secondary species) captured during the permanent surveillance, etc. in the Cabinet Order-specified areas.

・**Plague**

The outbreak risk was evaluated as low (B) at 64 seaports and airports (58%) and as very low (A) at the other 46 seaports and airports, where no rodents were captured.

・**HFRS**

The risk was evaluated as low (B) at 35 seaports and airports (32%) and as very low (A) at the other 75 seaports and airports.

・**HPS, Lassa fever or South American hemorrhagic fever**

The risk was evaluated as very low (A) at all the 110 seaports and airports investigated.

5.3 Discussion

State of implementation of vector surveillance

In 2021, also, since restriction of entry of foreign nationals was continued as border control against COVID-19, arrivals of international passenger airliners remained markedly reduced compared with 2019 before the global spread of COVID-19. In addition, arrivals of international airlines were concentrated at only 5 airports (Narita International Airport, Tokyo International Airport, Chubu Centrair International Airport, Kansai International Airport, and Fukuoka Airport). Under the influence of such actions, the number of aircrafts examined was 14% (154 aircrafts at 16 airports) of the number in 2019 before the spread of COVID-19 (1,099 aircrafts at 100 airports). Also, although the Cabinet Order-specified survey areas of mosquitoes and rodents increased markedly compared with the previous year, the numbers of both areas were about 70% of those in 2019.

To cope with reinforcement of the quarantine system for COVID-19, there were cases in which partial downscaling of port hygiene surveillance was necessary, but each quarantine station endeavored to implement efficient surveillance depending on the situation of the target seaport or airport and in compliance with International Health Regulations (IHR).

The investigation plan sets the frequency of surveys by regarding the records of port entries of ships and aircrafts of the previous year as a risk factor. However, in 2021, with the end of the COVID-19 pandemic approaching and local airports beginning to reopen to international airlines, each quarantine station formulated a plan based on the port entry records in 2019 in preparation for an increase in the number of arriving aircrafts to the level of an average year. However, as a marked increase in the number of arriving aircrafts or reopening of local airports to international airlines did not occur, the actual risk is considered to have been lower than was estimated at the time of formulation of the plan.

Investigation of mosquitoes

Aircraft surveys for mosquitoes were carried out primarily on aircrafts that departed from airports in Southeast Asia, and the *Culex pipiens* complex, which is a vector of West Nile fever, was confirmed on 1 aircraft from Thailand. According to the aircraft surveys by quarantine stations from 2008 to 2018, 97% of the mosquitoes captured were of the genus *Culex*, and *Culex pipiens quinquefasciatus* and the *Culex pipiens* complex, which are vectors of West Nile fever, and Culex tritaeniorhynchus, which is a vector of Japanese encephalitis virus, were confirmed. In addition, *Aedes aegypti*, which is an exogenous vector (primary species) of dengue fever, chikungunya fever, and Zika virus infection, was confirmed on an aircraft from the Philippines [20].

In the adult and larval surveys in Cabinet Order-specified areas, also, exogenous species, such as the *Aedes* aegypti, were not captured. However, *Aedes aegypti* was confirmed in recent surveys at Narita Airport (2012, 2013, 2014, 2015, 2017), Tokyo International Airport (2013), and Chubu Centrair International Airport (2016). Also, *Culex gelidus*, which is also an exogenous species, was confirmed at Kansai Airport (2013 and 2016) (Fig. 11).

From the results of past surveys, mosquitoes were confirmed to have entered aircrafts, been transported, transferred outside the aircrafts at the airports where they arrived, and temporarily inhabited the airport or the cargo area. Therefore, it is important to continue to take preventive measures against the invasion of exogenous species by aircraft surveys targeting aircrafts departing from epidemic areas of mosquito-borne infections and periodic inspection of Cabinet Order-specified areas.

The Japanese encephalitis virus type I gene was identified in *Culex tritaeniorhynchus* captured in August at Narita International Airport by a survey for adult mosquitoes in Cabinet Order-specified areas, and a warning was issued to the airport staff and people engaged in the pork industry. In the same period, in Chiba Prefecture, positive animals were detected by a porcine Japanese encephalitis antibody positive state survey, and a warning was issued [4]. Infiltration of Japanese encephalitis virus had been confirmed in Chiba Prefecture, and patients appeared in 2015 [21]. Recently, there has been an annual maximum of about 10 cases of Japanese encephalitis, all of which were domestic, but if the Japanese encephalitis virus gene is demonstrated in mosquitoes by surveys of quarantine stations in the future, smooth sharing of information with related organizations and industry personnel and issuance of warnings for infection prevention are necessary.

Investigation of rodents

In basic surveys based on the investigation plan, vectors of infectious diseases including *Mus musculus*, *Rattus norvegicus*, *Rattus rattus*, and *Apodemus speciosus* were captured, but no exogenous species were confirmed. However, *Peromyscus maniculatus*, an exogenous species, was captured in an aircraft at Narita International Airport by a survey based on a report of detection from a related business, and an individual of the genus *Peromyscus* was captured in an ocean-going container at Hakata port. All these species were vectors of HPS, and the *Peromyscus maniculatus* captured at Narita International Airport was confirmed to be HPS-antibody-positive. Recent surveys also confirmed *Peromyscus maniculatus* in containers at Nagoya Port (2014) and Hakata Port (2017) (Fig. 12).

Since cases of detection of rodents estimated to have entered containers overseas have continued to occur, it is necessary to continuously cooperate with the companies involved, obtain information, and conduct investigations. Also, if rodents are detected, it is important to give guidance about infection prevention measures to the persons who handle cargo and to monitor the health of those who may be exposed to infection. In addition, if the pathogen test is positive, operations including disinfection of cargo may be necessary, because cargo may be contaminated.

To prevent the invasion and spread of rodent-borne infections in Japan, it is necessary to try to assess inhabitant species and detect exogenous vectors by regularly conducting surveys at an appropriate frequency and by an appropriate method in areas considered to be at a high risk of invasion such as areas around the piers at which oceangoing vessels dock, sheds and warehouses in which international cargo is stored, and container depositories at ports and areas around the terminal building at which oceangoing airliners arrive, areas in which cargo planes unload, and sheds in which international cargo is stored at airports.

Future vector surveillance

Since June 2022, stepwise relaxations of border control, such as elevation of the upper limit of the number of foreign entrants, resumption of reception of overseas sightseers, and reopening of New Chitose Airport and Naha Airport to international flights, have been made.

For the future, if the COVID-19 pandemic shows signs of termination, the reception of international flights at local airports, which is presently suspended, will be resumed, and the situation is expected to be gradually normalized. However, at the same time, the risk of invasion of infections is also expected to increase due to increases in foreign visitors to Japan and aircrafts arriving from epidemic countries. At seaports, also, port calls of international cruise ships, which are currently suspended, are expected to be resumed.

In implementing future port hygiene surveillances, it is necessary to continue to conduct efficient and effective surveillances by flexibly modifying the surveillance plan according to the situation of each seaport or airport with changes in the risk of invasion of infections associated with relaxation of border control against COVID-19.

6 Informing activities

The data from the surveillance conducted by quarantine stations across Japan have been summarized for each quarter of the year, and the sanitation activities taken at each quarantine station have been listed in the "Vector Surveillance Information Correspondence" delivered to all quarantine stations once a quarter (No. 72 through 75). Examples of sanitation activities including special surveys implemented in the investigation in 2021 are shown below.

[Detection of Japanese encephalitis virus gene from *Culex tritaeniorhynchus* captured during periodical surveillance: Narita International Airport]

The Japanese encephalitis virus type I gene was detected from *Culex tritaeniorhynchus* captured in late August at Narita International Airport. Based on this result, an emergency survey was carried out at the end of October, and the Japanese encephalitis virus type I gene was also detected in *Culex tritaeniorhynchus* captured in early September. In both cases, virus isolation tests were performed at the Yokohama quarantine station, but Japanese encephalitis virus was not isolated.

Since these cases occurred during the Tokyo Olympic/Paralympic Games, organophosphate pesticides were promptly put into drainage channels, rain drainage basins, and pools around the sites of capture at the end of August, and insect growth regulators were applied after 6 days.

Concerning these cases, an official notice was issued to members of the Narita International Airport Health and Hygiene Council and Airline Operators' Committee (AOC) to share information, pay attention, and call for cooperation for the prevention of invasion of mosquitoes onto aircrafts, and posters in Japanese and English were displayed in the airport to warn tourists to avoid being bitten by mosquitoes.

Also, an official notice was issued to the Livestock Industry Division, Agriculture, Forestry and Fisheries Department, Chiba Prefecture, to call the attention of those involved in the pork industry to the prevention of Japanese encephalitis.

[Cases of detection of exogenous *Peromyscus maniculatus* on aircrafts: Narita International Airport]

An airline company reported in November that a rodent was captured on a cargo flight that arrived from Chicago, USA, at Narita International Airport, and an investigation was made.

By examination by the Narita Airport Quarantine Station, it was judged from its appearance that the animal likely belonged to an exogenous species of the genus *Peromyscus*. The cranial specimen, flat-skin specimen, and the liver were sent to Nihon University, requesting detailed species identification. As a result, the rodent was identified as exogenous *Peromyscus maniculatus*.

The HPS virus antigen test and plague antibody test performed by Yokohama Quarantine Station were negative, but the HPS virus antibody test performed at the National Institute of Infectious Diseases was positive.

Concerning this case, since the rodent was captured on the aircraft, exposed individuals were identified, and health monitoring confirmed that none of them developed a poor physical condition during 1 month corresponding to the incubation period of hantavirus pulmonary syndrome (HPS). In addition, since the incubation period had ended by the time the result of the antibody test became known (January 2022), it was judged that no one was infected, and a virus isolation test was not performed.

Regarding this case, a warning for the prevention of entry of rodents was issued to airway companies, and guidance for the prevention of infection at the time of detection was given. Also, details of the case were documented in the report of the Narita International Airport Health and Hygiene Council, and information was provided to members of related organizations.

7 Appendix

Notification No. 0324-3 (MHLW Department of Food Safety, March 24, 2014) "Guide to Port Sanitation Control" (Finally Amended June 20, 2019) (Issued from Manager of the Office of Quarantine Station Administration to Chief of Each Quarantine Station)

(Excerpts from main text)

Appendix 1 "Port Sanitation Control Guidelines"

Appendix 2 "Rodent Surveillance Manual"

Appendix 3 "Mosquito Surveillance Manual"

Appendix 4 "Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted by Vector Animals, etc."

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9 Tables and Figures

Table 1. List of code numbers, names, and locations of quarantine seaports and airports investigated in 2021

	code number and Name	Prefecture		code number and Name	Prefecture
1	001 Otaru	Hokkaido	69	073 Kanmon	Yamaguchi/Fukuoka
2	002 Ishikariwan	Hokkaido	70	074 Hakata	Fukuoka
3	003 Wakkanai	Hokkaido	71	075 Miike	Fukuoka
4	004 Rumoi	Hokkaido	72	076 Karatsu	Saga
5	005 Monbetsu	Hokkaido	73	077 Imari	Saga/Nagasaki
6	006 Abashiri	Hokkaido	74	078 Sasebo	Nagasaki
7	007 Hanasaki	Hokkaido	75	079 Nagasaki	Nagasaki
8	008 Kushiro	Hokkaido	76	080 Hitakatsu	Nagasaki
9	009 Tomakomai	Hokkaido	77	081 Izuhara	Nagasaki
10	010 Muroran	Hokkaido	78	082 Oita	Oita
11	011 Hakodate	Hokkaido	79	083 Saganoseki	Oita
12	012 Aomori	Aomori	80	084 Saiki	Oita
13	013 Hachinohe	Aomori	81	085 Minamata	Kumamoto
14	014 Miyako	Iwate	82	086 Yatsushiro	Kumamoto
15	015 Kamaishi	Iwate	83	087 Misumi	Kumamoto
16	016 Ofunato	Iwate	84	088 Hososhima	Miyazaki
17	017 Kesennuma	Miyagi	85	089 Shibushi	Kagoshima
18	018 Ishinomaki	Miyagi	86	090 Kagoshima	Kagoshima
19	019 Sendaishiogama	Miyagi	87	091 Kiire	Kagoshima
20	020 Akitafunakawa	Akita	88	092 Kushikino	Kagoshima
21	021 Sakata	Yamagata	89	093 Kinnakagusuku	Okinawa
22	022 Onahama	Fukushima	90	094 Naha	Okinawa
23	023 Hitachi	Ibaraki	91	095 Hirara	Okinawa
24	024 Kashima	Ibaraki	92	096 Ishigaki	Okinawa
25	025 Kisarazu	Chiba	93	193 New Chitose AP	Hokkaido
26	026 Chiba	Chiba	94	194 Asahikawa AP	Hokkaido
27	027 Futami	Tokyo	95	195 Hakodate AP	Hokkaido
28	028 Tokyo（Keihin）	Tokyo	96	196 Aomori AP	Aomori
29	029 Kawasaki（Keihin）	Kanagawa	97	197 Sendai AP	Miyagi
30	030 Yokohama（Keihin）	Kanagawa	98	198 Akita AP	Akita
31	031 Yokosuka	Kanagawa	99	199 Fukushima AP	Fukushima
32	032 Misaki	Kanagawa	100	200 Narita International AP	Chiba
33	033 Naoetsu	Niigata	101	201 Tokyo International AP	Tokyo
34	034 Niigata	Niigata	102	202 Niigata AP	Niigata
35	035 Fushikitoyama	Toyama	103	204 Komatsu AP	Ishikawa
36	036 Kanazawa	Ishikawa	104	205 Chubu Centrair International AP	Aichi
37	037 Nanao	Ishikawa	105	206 Kansai International AP	Osaka
38	038 Uchiura	Fukui	106	207 Okayama AP	Okayama
39	039 Tsuruga	Fukui	107	208 Miho AP	Tottori
40	041 Shimizu	Shizuoka	108	209 Hiroshima AP	Hiroshima
41	042 Yaizu	Shizuoka	109	211 Matsuyama AP	Ehime
42	044 Fukue	Aichi	110	212 Fukuoka AP	Fukuoka
43	045 Gamagori（Mikawa）	Aichi	111	213 Kitakyushu AP	Fukuoka
44	046 Toyohashi（Mikawa）	Aichi	112	214 Oita AP	Oita
45	047 Kinuura	Aichi	113	215 Nagasaki AP	Nagasaki
46	048 Nagoya	Aichi	114	216 Kumamoto AP	Kumamoto
47	049 Yokkaichi	Mie	115	217 Miyazaki AP	Miyazaki
48	050 Owase	Mie	116	218 Kagoshima AP	Kagoshima
49	051 Maizuru	Kyoto	117	219 Naha AP	Okinawa
50	053 Katsuura	Wakayama	118	222 Shizuoka AP	Shizuoka
51	054 Wakayamashimotsu	Wakayama	119	223 Hyakuri AP	Ibaraki
52	055 Osaka	Osaka	120	225 Saga AP	Saga
53	056 Hannan	Osaka	121	226 Takamatsu AP	Kagawa
54	057 Kobe	Hyogo			
55	058 Mizushima	Okayama			
56	059 Sakai	Tottori/Shimane			
57	060 Hamada	Shimane			
58	061 Fukuyama	Hiroshima			
59	062 Kure	Hiroshima			
60	063 Hiroshima	Hiroshima			
61	064 Iwakuni	Yamaguchi			
62	065 Tokuyamakudamatsu	Yamaguchi			
63	067 Tokushimakomatsushima	Tokushima			
64	068 Sakaide	Kagawa			
65	069 Matsuyama	Ehime			
66	070 Niihama	Ehime			
67	071 Mishimakawanoe	Ehime			
68	072 Kochi	Kochi			

Table 2. Monthly investigation for vector surveillance at Japanese quarantine seaports and airports in 2021

Seaport（1）

Month/ Quaran-tine port	Otaru Quarantine Station																							
	001 Otaru				002 Ishikari Bay				003 Wakkanai				004 Rumoi				005 Monbetsu				006 Abashiri			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.																								
May																								
Jun.		2	2			2	2																	
Jul.		2	2			2	2	2		2	2											1	1	1
Aug.		2	2	2		2				4	4													
Sep.		2	2			2						1				1				1				
Oct.																								
Nov.																								
Dec.																								
Total	0	8	8	2	0	8	4	2	0	6	6	1	0	0	0	1	0	0	0	1	0	1	1	1

Month/ Quaran-tine port	Otaru Quarantine Station																				Sendai Quarantine Station			
	007 Hanasaki				008 Kushiro				009 Tomakomai				010 Muroran				011 Hakodate				012 Aomori			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.																								
May																								
Jun.																		1	1	2		2	1	1
Jul.																		1	1			1	1	1
Aug.		1	1	1		2	2	2		2	2	2						1	1			1	1	1
Sep.														1	1	1		1	1			1	1	
Oct.																		1	1	2		1	1	2
Nov.																								
Dec.																								
Total	0	1	1	1	0	2	2	2	0	2	2	2	0	1	1	1	0	5	5	4	0	6	5	5

Month/ Quaran-tine port	Sendai Quarantine Station																							
	013 Hachinohe				014 Miyako				015 Kamaishi				016 Ofunato				017 Kesennuma				018 Ishinomaki			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.																								
May																						2		2
Jun.		1	1	1										2	1	2		1		1			2	
Jul.		1	1	1		1	1	1		1	1	1		1	1	1			1			4	2	4
Aug.		1	1	1										1	1	1		1		1			2	
Sep.		1	1	1		1		1		1		1		1	1	1			1					
Oct.		1	1	1			1				1				1									
Nov.																								
Dec.																								
Total	0	5	5	5	0	2	2	2	0	2	2	2	0	5	5	5	0	2	2	2	0	6	6	6

Month/ Quaran-tine port	Sendai Quarantine Station																Tokyo Quarantine Station							
	019 Sendaishiogama				020 Akitafunakawa				021 Sakata				022 Onahama				023 Hitachi				024 Kashima			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.																								
May		2		2																		3	6	3
Jun.		2	2	2		1	1	1						2	2	2		3	6	3				
Jul.			2			1	1	1		3	3	3										3	6	
Aug.		2	2	2		1	1	1						2	2	2						3	6	
Sep.		2	2	2		1	1	1		2	2	2		2	2	2		3	6	3				
Oct.		2		2		1	1	1														3	6	3
Nov.			2																					3
Dec.																								3
Total	0	10	10	10	0	5	5	5	0	5	5	5	0	6	6	6	0	6	12	6	0	12	24	12

(1): Number of investigated aircraft, (2): No. of investigated areas for adult mosquitoes, (3): No. of investigated areas for mosquito larvae, (4): No. of investigated areas for rodents

Seaport（2）

Month/ Quarantine port	Tokyo Quarantine Station																				Yokohama Quarantine Station			
	025 Kisarazu				026 Chiba				027 Futami				028 Tokyo(Keihin)				029 Kawasaki(Keihin)				030 Yokohama(Keihin)			
Investigation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.				3												2								
Feb.								3								2				1				3
Mar.																2								2
Apr.				3										5	5	2						3		3
May		3	3					3						5	4					2		2		2
Jun.		3	3			3	3							3				3	3			3	8	3
Jul.				3		3	3							4	7			3	3			5	25	
Aug.								3						4	4			3	3	1		5	20	
Sep.		3	3			3	3							4	4			3	3	2		3	25	3
Oct.		3	3	3		3	3							4	4					4		5	20	2
Nov.								3		2	2	2		4	4	2				2		5	20	3
Dec.																1				1				
Total	0	12	12	12	0	12	12	12	0	2	2	2	0	33	32	11	0	12	12	13	0	31	118	21

Month/ Quarantine port	Yokohama Quarantine Station								Niigata Quarantine Station															
	031 Yokosuka				032 Misaki				033 Naoetsu				034 Niigata				035 Fushikitoyama				036 Kanazawa			
Investigation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.																								
May		1		1		1		1																
Jun.			1				1																	
Jul.		1	4			1	4																	
Aug.		1	5			1	5											4	4	4		2	2	
Sep.		1	4	1		1	4	1		3	3	3		4	4	5								
Oct.		1	4	1		1	4	1																2
Nov.		1		1				1																
Dec.																								
Total	0	6	18	4	0	5	18	4	0	3	3	3	0	4	4	5	0	4	4	4	0	2	2	2

Month/ Quarantine port	Niigata Quarantine Station				Nagoya Quarantine Station																			
	037 Nanao				041 Shimizu				042 Yaizu				044 Fukue				045 Gamagori(Mikawa)				046 Toyohashi(Mikawa)			
Investigation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.								4																
Apr.																								
May						2												1	1	1		4	3	4
Jun.						2	2	5																
Jul.						2	2			1	3	3		2	1	2						4	3	4
Aug.						2	2	4																
Sep.		2	2	2														1	1	1				
Oct.																						4	2	4
Nov.																								
Dec.																								
Total	0	2	2	2	0	8	6	13	0	1	3	3	0	2	1	2	0	2	2	2	0	12	8	12

Month/ Quarantine port	Nagoya Quarantine Station																				Osaka Quarantine Station			
	047 Kinuura				048 Nagoya				049 Yokkaichi				050 Owase				053 Katsuura				038 Uchiura			
Investigation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.								3																
Feb.								2																
Mar.								1																
Apr.						3	3	3																
May		4	4	4		3	3	3		3	3	3												
Jun.						3	3	3														1	1	1
Jul.						2	2	2		3	3	3												
Aug.						2	2	2						1	1	1		1		1		1	1	1
Sep.		4	4	4		2	2			3	3	3										1	1	1
Oct.						3	3	3																
Nov.		4	4	4		3	3	2		3	3	3												
Dec.								1																
Total	0	12	12	12	0	21	21	25	0	12	12	12	0	1	1	1	0	1	0	1	0	3	3	3

(1): Number of investigated aircraft, (2): No. of investigated areas for adult mosquitoes, (3): No. of investigated areas for mosquito larvae, (4): No. of investigated areas for rodents

Seaport（3）

Month/ Quaran-tine port	Osaka Quarantine Station																				Kobe Quarantine Station			
	039 Tsuruga				051 Maizuru				054 Wakayamashimotsu				055 Osaka				056 Hannan				057 Kobe			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.												2								1				
Feb.																2								1
Mar.																								1
Apr.																3								
May												2				1				1				
Jun.		2	2	2		2	2	2		2	2			2	2			1	1			2		1
Jul.										2	2	2		5	5	5		1	1	1		2		3
Aug.		2	2	2		2	2	2		2	2			5	5			1	1					
Sep.		2	2	2		2	2	2		2	2							1	1					
Oct.																						2		1
Nov.																								2
Dec.																								2
Total	0	6	6	6	0	6	6	6	0	8	8	6	0	12	12	11	0	4	4	3	0	6	0	11

Month/ Quaran-tine port	Hiroshima Quarantine Station																							
	058 Mizushima				059 Sakai				060 Hamada				061 Fukuyama				062 Kure				063 Hiroshima			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.								1								2								
May			1			1	1	1		2	2			2	2	2								
Jun.		2	2			1	1																	
Jul.						1	1															5	5	
Aug.														2	2									
Sep.							1							2	2	2								
Oct.						1	1	1						2	2	2		5	5					
Nov.								1																
Dec.								1																
Total	0	2	3	0	0	4	5	5	0	2	2	0	0	8	8	8	0	5	5	0	0	5	5	0

Month/ Quaran-tine port	Hiroshima Quarantine Station																							
	064 Iwakuni				065 Tokuyamakudamatsu				067 Tokushimakomatsushima				068 Sakaide				069 Matsuyama				070 Niihama			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								2
Mar.																								
Apr.																								
May														2	2	2								
Jun.										1	1	1		2				2	2					
Jul.														2	2									
Aug.						1	1			1	1							2	2					
Sep.														2	2									
Oct.														2	2			2						
Nov.				1															2			2	2	
Dec.																								
Total	0	0	0	1	0	1	1	0	0	2	2	1	0	10	8	2	0	6	6	0	0	2	2	2

Month/ Quaran-tine port	Hiroshima Quarantine Station								Fukuoka Quarantine Station															
	071 Mishimakawanoe				072 Kochi				073 Kanmon				074 Hakata				075 Miike				076 Karatsu			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.						2	2	2																
May																				1				1
Jun.														5	5	5								
Jul.						2	2			2				10	10			1	1			2	2	
Aug.										2	4			10	12	2		2	3			1	1	
Sep.														8	8			1	1			1	1	
Oct.												2				5				1				
Nov.		2	2									2				2								1
Dec.												3				3								
Total	0	2	2	0	0	4	4	2	0	4	4	7	0	33	35	17	0	4	5	2	0	4	4	2

(1): Number of investigated aircraft, (2): No. of investigated areas for adult mosquitoes, (3): No. of investigated areas for mosquito larvae, (4): No. of investigated areas for rodents

Seaport（4）

Month/ Quaran-tine port	Fukuoka Quarantine Station																							
	077 Imari				078 Sasebo				079 Nagasaki				080 Hitakatsu				081 Izuhara				082 Oita			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.																								
May				1		1	1	1		2	2	2												
Jun.				1		1	1	1		2	2	2		2	2			2	2	2		3	1	3
Jul.		2	2			1	1			2	2			2	2			2	2	2				
Aug.		4	4			1	1			2	2			1	1			2	2	2				
Sep.		2	4			1	1	1		2	2	2		2	1			2	2	2				
Oct.				2				1				2		3	4			2	2	2				
Nov.								1				2												
Dec.																								
Total	0	8	10	4	0	5	5	5	0	10	10	10	0	10	10	0	0	10	10	10	0	3	1	3

Month/ Quaran-tine port	Fukuoka Quarantine Station																							
	083 Saganoseki				084 Saiki				085 Minamata				086 Yatsushiro				087 Misumi				088 Hososhima			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																1								
Feb.												1												
Mar.																1								
Apr.												1												
May		1	1	1		1	1	1		1	1			1	1	1								
Jun.										1	1	1		1	1									
Jul.										1	1			2	1	1								
Aug.										1	1													
Sep.														2	2			1	1	1				
Oct.										2	1	1										1	1	1
Nov.																1						1	1	1
Dec.												1										1	1	1
Total	0	1	1	1	0	1	1	1	0	6	5	5	0	6	5	5	0	1	1	1	0	3	3	3

Month/ Quaran-tine port	Fukuoka Quarantine Station																Naha Quarantine Station							
	089 Shibushi				090 Kagoshima				091 Kiire				092 Kushikino				093 Kinnakagusuku				094 Naha			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.																		1	1	1				
May										1	1	1										3	3	3
Jun.						2	2	2		1	1	1										3	3	3
Jul.				1						1	1	1						2	2	2				
Aug.						2	2	2		1	1	1						2	2	2				
Sep.		3	3	3										1	1	1						3	3	3
Oct.		3	3	3		1	1	1		1	1	1						2	2	2		3	4	3
Nov.																		2	2	2				
Dec.																								
Total	0	6	6	7	0	5	5	5	0	5	5	5	0	1	1	1	0	9	9	9	0	12	13	12

Month/ Quaran-tine port	Naha Quarantine Station							
	095 Hirara				096 Ishigaki			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.						2	2	
Feb.						2	2	
Mar.						2	2	
Apr.						2	2	
May		2	2	2		2	2	1
Jun.		2	2	2		2	2	1
Jul.						2	2	1
Aug.						2	2	
Sep.						2	2	1
Oct.		2	2	2		2	2	1
Nov.						2	2	1
Dec.						2	2	
Total	0	6	6	6	0	24	24	6

(1): Number of investigated aircraft, (2): No. of investigated areas for adult mosquitoes, (3): No. of investigated areas for mosquito larvae, (4): No. of investigated areas for rodents

Airport（1）

Month/ Quarantine airport	Otaru Quarantine Station												Sendai Quarantine Station											
	193 New Chitose AP				194 Asahikawa AP				195 Hakodate AP				196 Aomori AP				197 Sendai AP				198 Akita AP			
Investigation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.																								
May				2														3	6	2				
Jun.		4	4	3						2	2	2		2	2	4		3	6	2		1	1	1
Jul.		4	4	1		2	1			2	2			2	2	2		4	6	2		1	1	1
Aug.		4	4			4	2			2	2			2	2	2		4	6	2		1	1	1
Sep.	2	4	4			4	2	1		2	2			2	3			4	6	3		1	1	1
Oct.										2	2	2		2	2	2		3	6	3		1	1	1
Nov.																		1		2				
Dec.																								
Total	2	16	16	6	0	10	5	1	0	10	10	4	0	10	11	10	0	22	36	16	0	5	5	5

Month/ Quarantine airport	Sendai Quarantine Station				Narita Airport Quarantine Station				Tokyo Quarantine Station								Niigata Quarantine Station							
	199 Fukushima AP				200 Narita International AP				201 Tokyo Internatinal AP				223 Hyakuri AP				202 Niigata AP				204 Komatsu AP			
Investigation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.						6		1		1	2	1												
Feb.					3	3				1	2	1												
Mar.					18	4		5		1	2	1												
Apr.					10	12	2			5	6	2												
May					17	35	45	2		8	8	2												
Jun.		1	1	2	14	45	44	5		8	8			1	2									
Jul.					12	68	45	1		8	12			1	2							2	2	
Aug.					10	85	53			8	8	1		1	2									
Sep.					6	72	45	5		8	8			1	1	1		2	2	2				
Oct.					7	61	47	2		9	8	5		1	1	2								2
Nov.					14	35	29	1		11	10	3				1								
Dec.					12		8	6			2	8				1								
Total	0	1	1	2	123	426	318	28	0	68	76	24	0	5	8	5	0	2	2	2	0	2	2	2

Month/ Quarantine airport	Nagoya Quarantine Station								Kansai Airport Quarantine Station				Hiroshina Quaratine Station											
	205 Chubu Centrair International AP				222 Shizuoka AP				206 Kansai International AP				207 Okayama AP				208 Miho AP				209 Hiroshima AP			
Investigation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.	2																							
Feb.		1		3					1			5												
Mar.	3	3							1			4												
Apr.		4		2					1	9										1				
May	2	4	4						1	4	4	4			2			1	1	1				
Jun.	1	4	4	2					1	4	4			2	2			1	1					
Jul.	1	4	4						1	5	4	4						1	1					
Aug.	1	5	5			1	1	1	1	5	4							1	1					
Sep.	1	5	4	3					2	4	4								1			2		
Oct.	1	4	4	2					2	4	4	4								1		2	2	
Nov.	2	4		3					1	5	4									1				
Dec.									2											1				
Total	14	38	25	15	0	1	1	1	14	40	28	21	0	2	4	0	0	4	5	5	0	4	2	0

Month/ Quarantine airport	Hiroshina Quaratine Station								Fukuoka Quarantine Station															
	211 Matsuyama AP				226 Takamatsu AP				212 Fukuoka AP				213 Kitakyushu AP				214 Oita AP				215 Nagasaki AP			
Investigation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																								
Feb.																								
Mar.																								
Apr.												2						1	1	1				
May						1	1	1		3	6	3										1	1	1
Jun.		1	1			1	1	1		3	6	2										1	1	1
Jul.		1	1			1	1			4	6			2	2							1	1	
Aug.		1	1			1	1			3	6			2	2							1	1	
Sep.		1	1			1	1			3	6			2	2			1	1	1		1	1	1
Oct.		1				1	1			3	6	3				2								1
Nov.			1					1		1		3				2								1
Dec.												3				2								
Total	0	5	5	0	0	6	6	3	0	20	36	16	0	6	6	6	0	2	2	2	0	5	5	5

(1): Number of investigated aircraft, (2): No. of investigated areas for adult mosquitoes, (3): No. of investigated areas for mosquito larvae, (4): No. of investigated areas for rodents

Airport（2）

Month/ Quaran-tine airport	Fukuoka Quarantine Station																Naha Quarantine Station			
	216 Kumamoto AP				217 Miyazaki AP				218 Kagoshima AP				225 Saga AP				219 Naha AP			
Investi-gation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.																		1	1	1
Feb.																		1	1	1
Mar.				1								1					1			
Apr.																				
May		1	1	1												2		1	1	1
Jun.		1	1							2	2	2						1	1	1
Jul.		1	1	1						2	2	2		6	4					
Aug.		2	1								2			2	4			2	2	1
Sep.		1	1	1						2	2	2		2	2			1	1	1
Oct.										2	2	2						1	1	2
Nov.		1		1		2	2	4		2	2	2				2		1	1	1
Dec.						4	4	2										1	1	2
Total	0	7	5	5	0	6	6	6	0	10	12	11	0	10	10	4	1	10	10	11

(1): Number of investigated aircraft, (2): No. of investigated areas for adult mosquitoes, (3): No. of investigated areas for mosquito larvae, (4): No. of investigated areas for rodents

Table 3. Results of mosquito inspection on international aircraft at Japanese quarantine airports in 2021

Quarantine airport	3-letter code(IATA), UN-CODE	Quarantine code	Number of aircraft inspected, (No. of aircraft with mosquitoes)												Total	Examination of pathogen (Flavivirus, Chikungunya virus and Malaria parasite by RT-PCR or PCR)			Last departure of airport
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.		Positive	Pools	Samples	
New Chitose AP	SPK	193	( )	( )	( )	( )	( )	( )	( )	( )	2 ( )	( )	( )	( )	2 (0)				
Narita International AP	NRT	200	( )	3 ( )	18 (1)	10 ( )	17 ( )	14 ( )	12 ( )	10 ( )	6 ( )	7 ( )	14 ( )	12 ( )	123 (1)	0	1	2	BKK：1
Chubu Centrair International AP	NGA	205	2 ( )	( )	3 ( )	( )	2 ( )	1 ( )	1 ( )	1 ( )	1 ( )	1 ( )	2 ( )	( )	14 (0)				
Kansai International AP	KIX	206	( )	1 ( )	1 ( )	1 ( )	1 ( )	1 ( )	1 ( )	1 ( )	2 ( )	2 ( )	1 ( )	2 ( )	14 (0)				
Naha AP	NAP	219	( )	( )	1 ( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	1 (0)				
Total			2 (0)	4 (0)	23 (1)	11 (0)	20 (0)	16 (0)	14 (0)	12 (0)	11 (0)	10 (0)	17 (0)	14 (0)	154 (1)	0	1	2	

BKK：Suvarnabhumi Airport

Table 4-1. Results of mosquito inspection on international aircraft by the origin of the flights in 2021

Depature Country	Last depature of airport	3-letter code(IATA), UN-CODE	No. of aircraft inspection													Results of collection			
																Number of Mosquitoes /Number of aircraft with mosquitoes			Total
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	*Culex quinquefasciatus*	*Culex pipiens* complex	*Culex*	Number of mosquitoes / aircraft with mosquitoes
Thailand	Suvarnabhumi Airport	BKK		1	9	3	5	5	4	2		1	4	4	38		2 / 1		2 / 1
Malaysia	Kuala Lumpur International Airport	KUL				2	5	2	4	5	4	6	5	4	37				
Singapore	Singapore Changi International Airport	SIN	1	2	10	5	7	4	4	3	1				37				
Indonesia	Jakarta International Soekarno-Hatta Airport	CGK					1	3	1		1	1	3	2	12				
Philippines	Ninoy Aquino International Airport	MNL	1		1		1	1					3	1	8				
Viet Nam	Noi Bai International Airport	HAN					1	1		1	1	1	1	1	7				
Taiwan	Taiwan Taoyuan International Airport	TPE			2						1		1		4				
U.S.A	Ted Stevens Anchorage International Airport	ANC			1						1	1			3				
U.S.A	Fort Worth Alliance Airport	AFW												1	1				
China	Guangzhou Baiyun International Airport	CAN												1	1				
Qatar	Doha International Airport	DOH				1									1				
U.S.A	Detroit Metropolitan Wayne County Airport	DTW								1					1				
Hong Kong	Hong Kong International Airport	HKG									1				1				
Korea	Incheon International Airport	ICN									1				1				
U.S.A	Memphis International Airport	MEM		1											1				
China	Shanghai Pudong International Airport	PVG							1						1				
	Total		2	4	23	11	20	16	14	12	11	10	17	14	154	0 / 0	2 / 1	0 / 0	2 / 1

Table 4-2. Results of mosquito inspection on international aircraft by the origin of the flights in 2021

Area	Depature Country	Last departure of airport	3-letter code(IATA), UN-CODEI	Number of aircraft inspected	Number of aircraft with adult mosquitoes	Number of collected adult mosquitoes/ Number of aircraft captured adult mosquitoes			Total	Examination of pathogen (Flavivirus, Chikungunya virus and Malaria parasite by RT-PCR or PCR)		
						Culex						
						C*ulex quinquefasciatus*	*Culex pipiens* complex	*Culex*				
Primary vector Secondary vector						W	W			Positive	Pools	Samples
Southeast Asia	Thailand	Suvarnabhumi Airport	BKK	38			2 / 1		2 / 1	0	1	2
Southeast Asia	Singapore	Singapore Changi International Airport	SIN	37								
Southeast Asia	Malaysia	Kuala Lumpur International Airport	KUL	37								
Southeast Asia	Indonesia	Jakarta International Soekarno-Hatta Airport	CGK	12								
Southeast Asia	Philippines	Ninoy Aquino International Airport	MNL	8								
Southeast Asia	Viet Nam	Noi Bai International Airport	HAN	7								
Southeast Asia	Taiwan	Taiwan Taoyuan International Airport	TPE	4								
North America	U.S.A	Ted Stevens Anchorage International Airport	ANC	3								
North America	U.S.A	Fort Worth Alliance Airport	AFW	1								
North America	U.S.A	Detroit Metropolitan Wayne County Airport	DTW	1								
North America	U.S.A	Memphis International Airport	MEM	1								
Middle East	Qatar	Doha International Airport	DOH	1								
East Asia	Korea	Incheon International Airport	ICN	1								
Southeast Asia	Hong Kong	Hong Kong International Airport	HKG	1								
East Asia	China	Guangzhou Baiyun International Airport	CAN	1								
East Asia	China	Shanghai Pudong International Airport	PVG	1								
		Total		154	0	0 / 0	2 / 1	0 / 0	2 / 1	0	1	2

Vector - borne disease： W：West Nile fever, J：Japanese encephalitis, D：Dengue fever, M：Malaria , C：Chikungunya fever, Z：Zika virus disease

Table 5-1. Results of adult mosquito inspection by CO2 light-traps at Japanese quarantine seaports and examination of mosquito-borne disease in 2021

Quarantine port	CODE		No. of meshes (1km mesh)	Mosquito taxa																																							Total	No. of samples	Examinatin of pathogen（Flavivirus , Chikungunya virus and Malaria parasite by RT-PCR or PCR） No.of positive samples pool / No. of samples pool		
				Anopheles					*Aedes*														*Armigeres*	*Culex*													*Tripteroides*	*Lutzia*	*Coquillettidia*	*Mansonia*	*Uranotaenia*	*Verrallina*					
	UN	Quarantine		*Anopheles sinensis*	*Anopheles koreicus*	*Anopheles lesteri*	*Anopheles sineroides*	*Anopheles*	*Aedes aegypti*	*Aedes albopictus*	*Aedes vexans nipponii*	*Aedes japonicus*	*Aedes dorsalis*	*Aedes esoensis*	*Aedes flavopictus*	*Aedes togoi*	*Aedes sasai*	*Aedes bekkui*	*Aedes excrucians*	*Aedes nipponicus*	*Aedes riversi*	*Aedes hatorii*	*Armigeres subalbatus*	*Culex inatomii*	*Culex pipiens pallens*	*Culex pipiens molestus*	*Culex pipiens quinquefasciatus*	*Culex pipiens complex*	*Culex pseudovishnui*	*Culex tritaeniorhynchus*	*Culex bitaeniorhynchus*	*Culex orientalis*	*Culex sitiens*	*Culex rubithoracis*	*Culex whitmorei*	*Culex Culiciomyia*	*Tripteroides bambusa*	*Lutzia vorax*	*Coquillettidia crassipes*	*Mansonia uniformis*	*Uranotaenia novobscura*	*Verrallina nobukonis*			Flavivirus	Chikungunya fever	Malaria
Exogenous species									●																																						
Primary vector				M					D, C, Z	D, C, Z															W	W	W	W	J	J																	
Secondary vector				W		M	M	M	W	W	W	W	W		W	W			W				W	W						W										W							
Possible vector					M					(J)		(J)	(D)		(D)	(J)					(D)				(J)		(J)			(D)	(J)		(J)(W)		(J)					(D)(J)(C)							
Otaru	OTR	1	8									4																137															141	140	0 / 11		
Ishikariwan	ISW	2	8								1	3																14															18	18	0 / 7		
Wakkanai	WKJ	3	6																									8															8	8	0 / 2		
Abashiri	ABA	6	1																									1															1	1	0 / 1		
Hanasaki	HNK	7	1																																								0	0			
Kushiro	KUH	8	2																																								0	0			
Tomakomai	TMK	9	2																																								0	0			
Muroran	MUR	10	1																									4															4	0	0 / 1		
Hakodate	HKP	11	5																									6															6	0	0 / 1		
Aomori	AOM	12	6	1						5																		6															12	0	0 / 3	0 / 1	0 / 1
Hachinohe	HHE	13	5							1		2																15															18	1	0 / 5	0 / 1	
Miyako	MYK	14	2							1																		8		3													12	0	0 / 4	0 / 1	
Kamaishi	KIS	15	2																																								0	0			
Ofunato	OFT	16	5																									3															3	1	0 / 1		
Kesennuma	KSN	17	2																									7															7	7	0 / 1		
Ishinomaki	ISM	18	6							1																		15															16	16	0 / 4	0 / 1	
Sendaishiogama	SGM	19	10																									65															65	65	0 / 7		
Akitafunakawa	AXT	20	5							15																		68															83	83	0 / 5	0 / 2	
Sakata	SKT	21	5							12																		31		5													48	48	0 / 4	0 / 1	
Onahama	ONA	22	6							10																		17															27	27	0 / 7	0 / 2	
Hitachi	HTC	23	6																									2															2	2	0 / 2		
Kashima	KSM	24	12	2																								20		17													39	39	0 / 14		0 / 1
Kisarazu	KZU	25	12							39																		198															237	237	0 / 13	0 / 4	
Chiba	CHB	26	12							8																		360		40													408	408	0 / 18	0 / 2	
Futami	HTM	27	2																																								0	0			
Tokyo（Keihin）	TYO	28	33							368																		236		8													612	578	0 / 45	0 / 16	
Kawasaki（Keihin）	KWS	29	12							24																		177		10													211	207	0 / 18	0 / 3	
Yokohama（Keihin）	YOK	30	31							274																		1,036		36	2												1,348	1,339	0 / 73	0 / 20	
Yokosuka	YOS	31	6							1																		15															16	16	0 / 4	0 / 1	
Misaki	MIK	32	5																									37															37	36	0 / 3		
Naoetsu	NAO	33	3							2																		3															5	5	0 / 3	0 / 1	
Niigata	NIH	34	4							19																		14															33	33	0 / 6	0 / 2	
Fushikitoyama	FSK	35	4																									2															2	2	0 / 1		
Kanazawa	KNZ	36	2																																								0	0			
Nanao	NNO	37	2																									7		12													19	19	0 / 4		
Uchiura	UCU	38	3							1		3								3								15															22	17	0 / 4	0 / 1	
Tsuruga	TRG	39	6							32																		72															104	100	0 / 12	0 / 6	
Shimizu	SMZ	41	8							99																		129		1													229	225	0 / 15	0 / 7	
Yaizu	YZU	42	1							3																		17															20	18	0 / 2	0 / 1	
Fukue	FKE	44	2							15	11							4										4		18	1												53	47	0 / 8	0 / 2	
Gamagori（Mikawa）	GAM	45	2							24																		73		3													100	100	0 / 6	0 / 2	
Toyohashi（Mikawa）	THS	46	12							102	148							1										401		87	1												740	734	0 / 37	0 / 8	

Kinuura	KNU	47	12	1						28																			438		24													491	487	0 / 23	0 / 4	0 / 1
Nagoya	NGO	48	21							244													2					722		83													1,051	964	0 / 51	0 / 12	
Yokkaichi	YKK	49	12							14																			239		38	1												292	292	0 / 22	0 / 2	
Owase	OWA	50	1							1																			3															4	4	0 / 2	0 / 1	
Maizuru	MAI	51	6							18																			30															48	48	0 / 10	0 / 5	
Katsuura	KAT	53	1																			1																					1	0			
Wakayamashimotsu	SMT	54	8							415																			739															1,154	1,131	0 / 34	0 / 12	
Osaka	OSA	55	12							409																			153															562	476	0 / 21	0 / 13	
Hannan	HAN	56	4							82																			30															112	109	0 / 8	0 / 4	
Kobe	UKB	57	6							58																			160		2													220	204	0 / 16	0 / 5	
Mizushima	MIZ	58	2																									173		3													176	176	0 / 7		
Sakai	SMN	59	4																									12		1													13	13	0 / 3		
Hamada	HMD	60	2																									73		9													82	80	0 / 4		
Fukuyama	FKY	61	8																				1					40															41	41	0 / 3		
Kure	KRE	62	5																									4															4	4	0 / 2		
Hiroshima	HIJ	63	5							35																			51		3					2								91	91	0 / 10	0 / 2	
Tokuyamakudamatsu	TXD	65	1							39																			22		1													62	62	0 / 3	0 / 1	
Tokushimakomatsushima	TKX	67	2																									78															78	78	0 / 3		
Sakaide	SKD	68	10							1																			65		20													86	86	0 / 10	0 / 1	
Matsuyama	MYJ	69	6																									40															40	38	0 / 4		
Niihama	IHA	70	2																									85															85	84	0 / 2		
Mishimakawanoe	MKX	71	2																									2															2	2	0 / 1		
Kochi	KCZ	72	4																									2															2	2	0 / 1		
Kanmon	MOJ	73	4																											93													93	93	0 / 2		
Hakata	HKT	74	33							1,154																			543		49	1												1,747	1,618	0 / 91	0 / 42	
Miike	MII	75	4	1						4																			1		17													23	23	0 / 4	0 / 2	0 / 1
Karatsu	KAR	76	4							24					3						1							11	1	42							1						83	80	0 / 12	0 / 3	
Imari	IMI	77	8							34																			37	3	87	7												168	167	0 / 15	0 / 4	
Sasebo	SSB	78	5							7																			7		2													16	16	0 / 8	0 / 3	
Nagasaki	NMX	79	10							4																			6															10	10	0 / 8	0 / 4	
Hitakatsu	HTK	80	10																									4															4	4	0 / 1		
Izuhara	IZH	81	10							38											1		12					6		1													58	57	0 / 11	0 / 4	
Oita	OIP	82	3																									17															17	17	0 / 3		
Saganoseki	SAG	83	1																									10															10	10	0 / 1		
Saiki	SAE	84	1							14	1																	83															98	98	0 / 4	0 / 1	
Minamata	MIN	85	6							9																			49	5	17									1				81	80	0 / 12	0 / 3	
Yatsushiro	YAT	86	6							19			1										1	60				287	1	123													492	492	0 / 19	0 / 2	
Misumi	MIS	87	1							4													3					2		1							1						11	10	0 / 4	0 / 1	
Hososhima	HSM	88	3																																								0	0			
Shibushi	SBS	89	6							1																			32		3													36	36	0 / 6	0 / 1	
Kagoshima	KOJ	90	5							1																																	1	1	0 / 1	0 / 1	
Kiire	KII	91	5	2						1																					25													28	28	0 / 4	0 / 1	0 / 2
Kushikino	KSO	92	1							2																			2		2													6	5	0 / 3	0 / 1	
Kinnakagusuku	KNX	93	9							19																	65			30			34			1			1	1			151	148	0 / 18	0 / 7	
Naha	NAH	94	12							42																	180			20			4										246	243	0 / 19	0 / 5	
Hirara	HRR	95	6							82													2				22			8													114	104	0 / 11	0 / 4	
Ishigaki	ISG	96	24							83													1				541			3	1												629	568	0 / 42	0 / 17	
Total				581	7	0	0	0	0	0	3,942	161	12	1	0	3	0	0	5	0	3	2	1	22	60	0	0	808	7,481	10	947	14	0	38	0	2	1	2	0	2	1	0	0	13,525	12,957	0 / 891	0 / 253	0 / 6

Vector - borne disease W : West Nile fever, J : Japanese encephalitis, D : Dengue fever, M : Malaria , C : Chikungunya fever, Z : Zika virus disease

Table 5-2. Results of adult mosquito inspection by CO2 light-traps at Japanese quarantine airports and examination of mosquito-borne disease in 2021

Quarantine airport	CODE		No. of meshes (1km mesh)	Mosquito taxa: Anopheles					Aedes														Armigeres	Culex													Tripteroides	Lutzia	Coquillettidia	Mansonia	Uranotaenia	Verrallina	Total	No. of samples	Examinatin of pathogen (Flavivirus , Chikungunya virus and Malaria parasite by RT-PCR or PCR) No.of positive samples pool / No. of samples pool		
	UN	Quarantine		*Anopheles sinensis*	*Anopheles koreicus*	*Anopheles lesteri*	*Anopheles sineroides*	*Anopheles*	*Aedes aegypti*	*Aedes albopictus*	*Aedes vexans nipponii*	*Aedes japonicus*	*Aedes dorsalis*	*Aedes esoensis*	*Aedes flavopictus*	*Aedes togoi*	*Aedes sasai*	*Aedes bekkui*	*Aedes excrucians*	*Aedes nipponicus*	*Aedes riversi*	*Aedes hatorii*	*Armigeres subalbatus*	*Culex inatomii*	*Culex pipiens pallens*	*Culex pipiens molestus*	*Culex pipiens quinquefasciatus*	*Culex pipiens complex*	*Culex pseudovishnui*	*Culex tritaeniorhynchus*	*Culex bitaeniorhynchus*	*Culex orientalis*	*Culex sitiens*	*Culex rubithoracis*	*Culex whitmorei*	*Culex Culiciomyia*	*Tripteroides bambusa*	*Lutzia vorax*	*Coquillettidia crassipes*	*Mansonia uniformis*	*Uranotaenia novobscura*	*Verrallina nobukonis*			Flavivirus	Chikungunya fever	Malaria
Exogenous species									●																																						
Primary vector				M					D, C, Z	D, C, Z															W	W	W	W	J	J																	
Secondary vector				W		M	M	M	W	W	W	W	W		W	W			W				W	W						W										W							
Possible vector					M					(J)		(J)	(D)		(D)	(J)					(D)				(J)		(J)			(D)	(J)		(J)(W)		(J)					(D)(J)(C)							
New Chitose AP	SPK	193	16								5	2		2																													9	9	0 / 8		
Asahikawa AP	AKJ	194	10								5																					4											9	5	0 / 1		
Hakodate AP	HKD	195	10									1																25															26	26	0 / 7		
Aomori AP	AOJ	196	10									3																1		11													15	15	0 / 5		
Sendai AP	SDJ	197	22	4			1			2														129				80		3	6	3											228	224	0 / 34	0 / 2	0 / 3
Akita AP	AKP	198	5																																								0	0			
Fukushima AP	FKS	199	1																																								0	0			
Narita International AP	NRT	200	426	13						85	2	4		1				1					1			1		190		7,822	3	2		1		1	1				1		8,129	8108	2 / 387	0 / 19	0 / 10
Tokyo International AP	HND	201	68																									219		10													229	229	0 / 24		
Niigata AP	NII	202	2							1																		5															6	6	0 / 3	0 / 1	
Komatsu AP	KMQ	204	2																																								0	0			
Chubu Centrair International AP	NGA	205	38							1		1																168		20	1												191	185	0 / 41	0 / 1	
Kansai International AP	KIX	206	40							10														1				102		6								1					120	105	0 / 31	0 / 4	
Okayama AP	OKJ	207	2	1																								1		37	3												42	42	0 / 4		0 / 1
Miho AP	YGJ	208	4							24																		11		3													38	38	0 / 6	0 / 2	
Hiroshima AP	HIT	209	4																									1		5													6	6	0 / 2		
Matsuyama AP	MAY	211	5																									14															14	14	0 / 2		
Fukuoka AP	FUK	212	20							2																		127		2													131	130	0 / 19	0 / 2	
Kitakyushu AP	KKJ	213	6																											1													1	1	0 / 1		
Oita AP	OIT	214	2																									5															5	5	0 / 1		
Nagasaki AP	NGS	215	5							1																				1													2	2	0 / 2	0 / 1	
Kumamoto AP	KMJ	216	7							1																		1	1	1													4	4	0 / 4	0 / 1	
Miyazaki AP	MZA	217	6																																								0	0			
Kagoshima AP	KOP	218	10																									51															51	51	0 / 5		
Naha AP	NAP	219	10																								10			5													15	15	0 / 6		
Shizuoka AP	FSZ	222	1																																								0	0			
Hyakuri AP	IBK	223	5	1																								63		9													73	73	0 / 5		0 / 1
Saga AP	QSG	225	10	10						1														4				103	2	2,935	31												3,086	3079	0 / 82	0 / 1	0 / 5
Takamatsu AP	TAK	226	6																				1					24		37													62	61	0 / 6		
Total			753	29	0	0	1	0	0	128	12	11	0	3	0	0	0	1	0	0	0	0	2	134	0	1	10	1,191	3	10,908	44	9	0	1	0	1	1	1	0	0	1	0	12,492	12,433	2 / 686	0 / 34	0 / 20

Vector - borne disease W : West Nile fever, J : Japanese encephalitis, D : Dengue fever, M : Malaria , C : Chikungunya fever, Z : Zika virus disease

Table 5-3. Results of adult mosquito inspection by CO2 light-traps at Japanese quarantine seaports and airports and examination of mosquito-borne disease in 2021

	No. of meshes (1km mesh)	*Anopheles sinensis*	*Anopheles koreicus*	*Anopheles lesteri*	*Anopheles sineroides*	*Anopheles*	*Aedes aegypti*	*Aedes albopictus*	*Aedes vexans nipponii*	*Aedes japonicus*	*Aedes dorsalis*	*Aedes esoensis*	*Aedes flavopictus*	*Aedes togoi*	*Aedes sasai*	*Aedes bekkui*	*Aedes excrucians*	*Aedes nipponicus*	*Aedes riversi*	*Aedes hatorii*	*Armigeres subalbatus*	*Culex inatomii*	*Culex pipiens pallens*	*Culex pipiens molestus*	*Culex pipiens quinquefasciatus*	*Culex pipiens complex*	*Culex pseudovishnui*	*Culex tritaeniorhynchus*	*Culex bitaeniorhynchus*	*Culex orientalis*	*Culex sitiens*	*Culex rubithoracis*	*Culex whitmorei*	*Culex Culiciomyia*	*Tripteroides bambusa*	*Lutzia vorax*	*Coquillettidia crassipes*	*Mansonia uniformis*	*Uranotaenia novobscura*	*Verrallina nobukonis*	Total	No. of samples	Flavivirus	Chikungunya fever	Malaria
		Mosquito taxa																																									Examinatin of pathogen（Flavivirus , Chikungunya virus and Malaria parasite by RT-PCR or PCR） No.of positive samples pool / No. of samples pool		
		Anopheles					*Aedes*														*Armigeres*	*Culex*													*Tripteroides*	*Lutzia*	*Coquillettidia*	*Mansonia*	*Uranotaenia*	*Verrallina*					
Exogenous species							●																																						
Primary vector		M					D, C, Z	D, C, Z															W	W	W	W	J	J																	
Secondary vector		W		M	M	M	W	W	W	W	W		W	W			W				W	W						W										W							
Possible vector			M					(J)		(J)	(D)		(D)	(J)					(D)				(J)		(J)			(D)	(J)		(J)(W)		(J)					(D)(J)(C)							
Total	1,334	36	0	0	1	0	0	4,070	173	23	1	3	3	0	0	6	0	3	2	1	24	194	0	1	818	8,672	13	11,855	58	9	38	1	2	2	3	1	2	1	1	0	26,017	25,390	2 / 1577	0 / 287	0 / 26

Vector - borne disease　W : West Nile fever,　J : Japanese encephalitis,　D : Dengue fever,　M : Malaria ,　C : Chikungunya fever,　Z : Zika virus disease

Table 6-1. Results of larval mosquito inspection by ovitraps and basins at Japanese quarantine seaports in 2021

Quarantine port	CODE		No. of meshes (1km mesh)	Mosquito taxa																																			
	UN	Quarantine		*Anopheles*	*Aedes*										*Culex*																			*Tripteroides*	*Lutzia*	*Armigeres*	*Uranotaenia*	*Lutzia*	
				Anopheles sinensis	*Aedes aegypti*	*Aedes albopictus*	*Aedes japonicus*	*Aedes flavopictus*	*Aedes dorsalis*	*Aedes togoi*	*Aedes esoensis*	*Aedes hatorii*	*Aedes koreicoides*	*Aedes vexans nipponii*	*Culex pipiens pallens*	*Culex pipiens molestus*	*Culex pipiens quinquefasciatus*	*Culex pipiens* Complex	*Culex tritaeniorhynchus*	*Culex sasai*	*Culex bitaeniorhynchus*	*Culex hayashii*	*Culex infantulus*	*Culex orientalis*	*Culex pseudovishnui*	*Culex inatomii*	*Culex rubensis*	*Culex sitiens*	*Culex rubithoracis*	*Culex pallidothorax*	*Culex kyotoensis*	*Culex boninensis*	*Culex vagans*	*Tripteroides bambusa*	*Lutzia vorax*	*Armigeres subalbatus*	*Uranotaenia novobscura*	*Lutzia*	Unidentified
Exogenous species					●																																		
Primary vector				M	D, C, Z	D, C, Z									W	W	W	W	J						J														
Secondary vector				W	W	W	W	W	W	W				W					W							W										W			
Possible vector						(J)	(J)	(D)	(D)	(J)					(J)		(J)		(D)		(J)							(J)(W)											
Otaru	OTR	1	8				6																											1					
Ishikariwan	ISW	2	4				3																																
Wakkanai	WKJ	3	6															1																					
Abashiri	ABA	6	1				1																																
Hanasaki	HNK	7	1																																				
Kushiro	KUH	8	2																																				
Tomakomai	TMK	9	2				1																																
Muroran	MUR	10	1																																				
Hakodate	HKP	11	5																																				
Aomori	AOM	12	5			1																																	
Hachinohe	HHE	13	5																																				
Miyako	MYK	14	2			1	1																																
Kamaishi	KIS	15	2			1	1																																
Ofunato	OFT	16	5			1	3																											1					
Kesennuma	KSN	17	2				1																																
Ishinomaki	ISM	18	6			6																																	
Sendaishiogama	SGM	19	10			5																																	
Akitafunakawa	AXT	20	5			2																																	
Sakata	SKT	21	5			3																																	
Onahama	ONA	22	6			3																																	
Hitachi	HTC	23	12																																				
Kashima	KSM	24	24																																				
Kisarazu	KZU	25	12			6																												1					
Chiba	CHB	26	12			6																																	
Futami	HTM	27	2			1												1																					
Tokyo（Keihin）	TYO	28	32			11												2																					
Kawasaki（Keihin）	KWS	29	12			13												2																					

Yokohama（Keihin）	YOK	30	118	53			13					1	
Yokosuka	YOS	31	18	3									
Misaki	MIK	32	18	7		14							
Naoetsu	NAO	33	3	2									
Niigata	NIH	34	4	1									
Fushikitoyama	FSK	35	4										
Kanazawa	KNZ	36	2				1						
Nanao	NNO	37	2	1									
Uchiura	UCU	38	3	1			1					1	
Tsuruga	TRG	39	6	2			5					2	
Shimizu	SMZ	41	6	5									
Yaizu	YZU	42	3	1									
Fukue	FKE	44	1										
Gamagori（Mikawa）	GAM	45	2	1									
Toyohashi（Mikawa）	THS	46	8	3	1		1			1			
Kinuura	KNU	47	12	2									
Nagoya	NGO	48	21	6			4		1			2	
Yokkaichi	YKK	49	12	2				1	1				
Owase	OWA	50	1		1								
Maizuru	MAI	51	6	2	1		3					1	
Wakayamashimotsu	SMT	54	8	2			2						
Osaka	OSA	55	12	16									
Hannan	HAN	56	4	2			3					1	
Mizushima	MIZ	58	3	2			1						
Sakai	SMN	59	5				1						
Hamada	HMD	60	2	2			1		1				
Fukuyama	FKY	61	8										
Kure	KRE	62	5	2									1
Hiroshima	HIJ	63	5	3			1						
Tokuyamakudamatsu	TXD	65	1	1									
Tokushimakomatsushima	TKX	67	2				1						
Sakaide	SKD	68	8	4	1								
Matsuyama	MYJ	69	6				3						
Niihama	IHA	70	2										
Mishimakawanoe	MKX	71	2										
Kochi	KCZ	72	4	1	1	1	3						
Kanmon	MOJ	73	4										
Hakata	HKT	74	35	31			9						
Miike	MII	75	5	4									
Karatsu	KAR	76	4	4									
Imari	IMI	77	10	9	4						2		
Sasebo	SSB	78	5	2									

Nagasaki	NMX	79	10			5																													2					
Hitakatsu	HTK	80	10				1			2																													
Izuhara	IZH	81	10				2			2																													
Oita	OIP	82	1			3																																	
Saganoseki	SAG	83	1																																				
Saiki	SAE	84	1			1																																	
Minamata	MIN	85	5				2																																
Yatsushiro	YAT	86	5			3																																	
Misumi	MIS	87	1																																				
Hososhima	HSM	88	3																																				
Shibushi	SBS	89	6																2																				
Kagoshima	KOJ	90	5			2												2	1																1				
Kiire	KII	91	5																																				
Kushikino	KSO	92	1			1																																	
Kinnakagusuku	KNX	93	9			6											2						1					1		1					1				
Naha	NAH	94	13			18											2																		1				
Hirara	HRR	95	6			6																																	
Ishigaki	ISG	96	24			17											13																						
Total			695	0	0	299	31	0	0	19	0	0	0	0	0	0	17	61	4	3	0	0	1	0	0	1	0	1	0	1	0	0	0	7	11	1	0	0	0

Vector - borne disease　W : West Nile fever,　J : Japanese encephalitis,　D : Dengue fever,　M : Malaria ,　C : Chikungunya fever,　Z : Zika virus disease

Table 6-2. Results of larval mosquito inspection by ovitraps or basins at Japanese quarantine airports in 2021

Quarantine airport	CODE		No. of meshes (1km mesh)	Mosquito taxa																																			
				Anopheles	*Aedes*											*Culex*																			*Tripteroides*	*Lutzia*	*Armigeres*	*Uranotaenia*	*Lutzia*	
	UN	Quarantine		*Anopheles sinensis*	*Aedes aegypti*	*Aedes albopictus*	*Aedes japonicus*	*Aedes flavopictus*	*Aedes dorsalis*	*Aedes togoi*	*Aedes esoensis*	*Aedes hatorii*	*Aedes koreicoides*	*Aedes vexans nipponii*	*Culex pipiens pallens*	*Culex pipiens molestus*	*Culex pipiens quinquefasciatus*	*Culex pipiens* Complex	*Culex tritaeniorhynchus*	*Culex sasai*	*Culex bitaeniorhynchus*	*Culex hayashii*	*Culex infantulus*	*Culex orientalis*	*Culex pseudovishnui*	*Culex inatomii*	*Culex rubensis*	*Culex sitiens*	*Culex rubithoracis*	*Culex pallidothorax*	*Culex kyotoensis*	*Culex boninensis*	*Culex vagans*	*Tripteroides bambusa*	*Lutzia vorax*	*Armigeres subalbatus*	*Uranotaenia novobscura*	*Lutzia*	Unidentified
Exogenous species					●																																		
Primary vector				M	D, C, Z	D, C, Z									W	W	W	W	J						J														
Secondary vector				W	W	W	W	W	W	W				W					W							W										W			
Possible vector						(J)	(J)	(D)	(D)	(J)					(J)		(J)		(D)		(J)							(J)(W)											
New Chitose AP	SPK	193	16				12								2																		2						
Asahikawa AP	AKJ	194	5				3												1																				
Hakodate AP	HKD	195	10				3																																
Aomori AP	AOJ	196	11			1	5																																
Sendai AP	SDJ	197	36			27		4										20		5						1									5				
Akita AP	AKP	198	5			2	3																																
Fukushima AP	FKS	199	1																																				
Narita International AP	NRT	200	318	2		30	11											8	9	1			3	1			4				6			6	14				2
Tokyo International AP	HND	201	76			7									1																								
Niigata AP	NII	202	2			1																																	
Komatsu AP	KMQ	204	2			1												1																					
Chubu Centrair International AP	NGA	205	25															2	1																				
Kansai International AP	KIX	206	28			3	2	1										4		1																			
Okayama AP	OKJ	207	4			2	4	2																															
Miho AP	YGJ	208	5																																				
Hiroshima AP	HIT	209	2			1																												1	1				
Matsuyama AP	MAY	211	5															2																					
Fukuoka AP	FUK	212	36			2												5																					
Kitakyushu AP	KKJ	213	6																																				
Oita AP	OIT	214	2																																				
Nagasaki AP	NGS	215	5			1												1																					
Kumamoto AP	KMJ	216	5			4	4																											2					
Miyazaki AP	MZA	217	6																																				
Kagoshima AP	KOP	218	12			2	4											1	1																				
Naha AP	NAP	219	10			5											1																					1	
Shizuoka AP	FSZ	222	1																																				
Hyakuri AP	IBK	223	8																																				
Saga AP	QSG	225	10			6												1	2																				
Takamatsu AP	TAK	226	6			2	4																																
Total			658	2	0	97	55	7	0	0	0	0	0	0	3	0	1	45	14	7	0	0	3	1	0	1	4	0	0	0	6	0	2	9	20	0	0	1	2

Vector - borne disease W：West Nile fever, J：Japanese encephalitis, D：Dengue fever, M：Malaria , C：Chikungunya fever, Z：Zika virus disease

Table 6-3. Results of larval mosquito inspection by ovitraps and basins at Japanese quarantine seaports and airports in 2021

	No. of meshes（1km mesh）	Mosquito taxa																																			
		Anopheles	*Aedes*										*Culex*																			*Tripteroides*	*Lutzia*	*Armigeres*	*Uranotaenia*	*Lutzia*	
		Anopheles sinensis	*Aedes aegypti*	*Aedes albopictus*	*Aedes japonicus*	*Aedes flavopictus*	*Aedes dorsalis*	*Aedes togoi*	*Aedes esoensis*	*Aedes hatorii*	*Aedes koreicoides*	*Aedes vexans nipponii*	*Culex pipiens pallens*	*Culex pipiens molestus*	*Culex pipiens quinquefasciatus*	*Culex pipiens* Complex	*Culex tritaeniorhynchus*	*Culex sasai*	*Culex bitaeniorhynchus*	*Culex hayashii*	*Culex infantulus*	*Culex orientalis*	*Culex pseudovishnui*	*Culex inatomii*	*Culex rubensis*	*Culex sitiens*	*Culex rubithoracis*	*Culex pallidothorax*	*Culex kyotoensis*	*Culex boninensis*	*Culex vagans*	*Tripteroides bambusa*	*Lutzia vorax*	*Armigeres subalbatus*	*Uranotaenia novobscura*	*Lutzia*	Unidentfied
Exogenous species			●																																		
Primary vector		M	D, C, Z	D, C, Z									W	W	W	W	J						J														
Secondary vector		W	W	W	W	W	W	W				W					W							W										W			
Possible vector				(J)	(J)	(D)	(D)	(J)					(J)		(J)		(D)		(J)							(J)(W)											
合 計　Total	1,353	2	0	396	86	7	0	19	0	0	0	0	3	0	18	106	18	10	0	0	4	1	0	2	4	1	0	1	6	0	2	16	31	1	0	1	2

Vector - borne disease　W：West Nile fever, J：Japanese encephalitis, D：Dengue fever, M：Malaria , C：Chikungunya fever, Z：Zika virus disease

Table 7-1. Results of rodent (including flea and tick) inspection by rat/mouse traps at Japanese quarantine seaports in 2021

Species — Vector and reservoir or host

Quarantine port	3-letter code(IATA), UN-CODE	Quarantine code	No. of meshes (1km mesh)	No. of traps	Fleas: *Xenopsylla cheopis*	Fleas: *Nosopsyllus fasciatus*	Fleas: *Ctenophthalmus Kolenati*	Fleas: *Leptopsylla segnis*	Fleas: *C.congener truscus*	Fleas: Unidentified fleas	Fleas: Total	Ticks: *Laelaps nuttalli*	Ticks: *Laelaps algericus*	Ticks: *Laelaps echidninus*	Ticks: *Laelaps jettmari*	Ticks: *Laelaps microti*	Ticks: *Haemaphysalis hystricis*	Ticks: *Ixodes granulatus*	Ticks: *Eulaelaps onoi*	Ticks: *Ixodes monospinosus*	Ticks: *Laelaps sp.*	Ticks: Unidentified ticks	Ticks: Total
Exogenous species																							
Primary vector					P																		
Secondary vector						P																	
Otaru	OTR	1	2	160							0												0
Ishikariwan	ISW	2	2	160							0												0
Wakkanai	WKJ	3	1	120							0												0
Rumoi	RMI	4	1	40							0												0
Monbetsu	MBE	5	1	20							0												0
Abashiri	ABA	6	1	20							0												0
Hanasaki	HNK	7	1	40							0												0
Kushiro	KUH	8	2	80							0												0
Tomakomai	TMK	9	2	160			1				1												0
Muroran	MUR	10	1	80		1					1												0
Hakodate	HKP	11	4	160							0												0
Aomori	AOM	12	5	400							0	23		6									29
Hachinohe	HHE	13	5	100						1	1			10								10	20
Miyako	MYK	14	2	40							0												0
Kamaishi	KIS	15	2	40							0												0
Ofunato	OFT	16	5	100							0												0
Kesennuma	KSN	17	2	40							0												0
Ishinomaki	ISM	18	6	480							0												0
Sendaishiogama	SGM	19	10	800							0	1			1								2
Akitafunakawa	AXT	20	5	400							0												0
Sakata	SKT	21	5	100							0	1											1
Onahama	ONA	22	6	120							0												0
Hitachi	HTC	23	6	120							0												0
Kashima	KSM	24	12	240		8					8												0
Kisarazu	KZU	25	12	960							0												0
Chiba	CHB	26	12	960							0												0
Futami	HTM	27	2	80							0												0
Tokyo（Keihin）	TYO	28	11	800							0												0
Kawasaki（Keihin）	KWS	29	13	800							0	18											18
Yokohama（Keihin）	YOK	30	21	1,680							0	116		1									117
Yokosuka	YOS	31	4	160							0												0
Misaki	MIK	32	4	160							0												0
Naoetsu	NAO	33	3	60							0												0
Niigata	NIH	34	5	100							0												0
Fushikitoyama	FSK	35	4	80							0												0
Kanazawa	KNZ	36	2	40							0												0
Nanao	NNO	37	2	40							0												0

Quarantine port	Rodents: *Rattus rattus*	Rodents: *Rattus norvegicus*	Rodents: *Mus musculus*	Rodents: *Apodemus speciosus*	Rodents: *Apodemus argenteus*	Rodents: *Apodemus sylvaticus*	Rodents: *Micromys minutus*	Rodents: *Microtus montebelli*	Rodents: *Clethrionomys rufocanus bedfordiae*	Rodents: *Apodemus speciosus ainu*	Rodents: *Peromyscus sp.*	Rodents: *Peromyscus maniculatus*	Rodents: Unidentified rodents	Rodents: Total	Examination of pathogen (Antibody, RT-PCR, PCR) No.of positive samples/No.of samples: Plague	HFRS Hamorrhagic fever with renal syndrome	HPS Hantavirus pulmonary syndrome
Exogenous species											●	●					
Primary vector											HP	HP					
Secondary vector	P,HF	P,HF	P	P	P	P	P	P	P	P	P	P					
Otaru		1												1	0 / 1	0 / 1	
Ishikariwan		4							1					5	0 / 5	0 / 5	
Wakkanai									5					5	0 / 4	0 / 4	
Rumoi									7					7	0 / 7	0 / 7	
Monbetsu														0			
Abashiri														0			
Hanasaki														0			
Kushiro		3												3	0 / 3	0 / 3	
Tomakomai		1												1	0 / 1	0 / 1	
Muroran		3												3	0 / 3	0 / 3	
Hakodate		5												5	0 / 4	0 / 4	
Aomori		9												9	0 / 9	0 / 9	
Hachinohe		6		1				1						8	0 / 8	0 / 8	
Miyako														0			
Kamaishi		1												1	0 / 1	0 / 1	
Ofunato		1												1	0 / 1	0 / 1	
Kesennuma														0			
Ishinomaki				1				3						4	0 / 4	0 / 4	
Sendaishiogama		3		1				1						5	0 / 5	0 / 5	
Akitafunakawa				1										1	0 / 1	0 / 1	
Sakata								4						4	0 / 4	0 / 4	
Onahama														0			
Hitachi														0			
Kashima		1												1	0 / 1	0 / 1	
Kisarazu			8											8	0 / 8	0 / 8	
Chiba														0			
Futami	6													6	0 / 6	0 / 6	
Tokyo（Keihin）	1	4											1	6	0 / 5	0 / 5	
Kawasaki（Keihin）	1	6	3	1										11	0 / 10	0 / 10	
Yokohama（Keihin）	10	20	3											33	0 / 33	0 / 33	
Yokosuka														0			
Misaki		2												2	0 / 2	0 / 2	
Naoetsu														0			
Niigata				1										1	0 / 1	0 / 1	
Fushikitoyama														0			
Kanazawa														0			
Nanao														0			

Uchiura	UCU	38	3	120							0												0				2										2	0 / 1	
Tsuruga	TRG	39	6	156							0												0														0		
Shimizu	SMZ	41	13	480							0												0		3												3	0 / 3	0 / 3
Yaizu	YZU	42	3	40							0												0														0		
Fukue	FKE	44	2	60							0												0														0		
Gamagori（Mikawa）	GAM	45	2	120							0												0			3											3	0 / 3	0 / 3
Toyohashi（Mikawa）	THS	46	12	360							0												0			4	12										16	0 / 16	0 / 16
Kinuura	KNU	47	12	540							0												0			14											14	0 / 14	0 / 14
Nagoya	NGO	48	25	1,660							0												0	1		15										1	17	0 / 16	0 / 16
Yokkaichi	YKK	49	12	840							0												0		3												3	0 / 3	0 / 3
Owase	OWA	50	1	60							0												0		2												2	0 / 2	0 / 2
Maizuru	MAI	51	6	192							0												0														0		
Katsuura	KAT	53	1	60							0												0														0		
Wakayamashimotsu	SMT	54	6	240							0												0														0		
Osaka	OSA	55	11	400							0												0			1											1	0 / 1	
Hannan	HAN	56	3	120							0												0														0		
Kobe	UKB	57	11	200							0												0			6										3	9	0 / 4	
Sakai	SMN	59	5	400							0												0	1													1	0 / 1	0 / 1
Fukuyama	FKY	61	8	640							0				8								8		1		3										4	0 / 4	0 / 3
Iwakuni	IWK	64	1	40							0												0														0		
Tokushimakomatsushima	TKX	67	1	20							0												0														0		
Sakaide	SKD	68	2	160							0												0			2											2	0 / 2	0 / 2
Niihama	IHA	70	2	80							0												0														0		
Kochi	KCZ	72	2	40							0												0														0		
Kanmon	MOJ	73	7	560							0												0			3											3	0 / 3	0 / 3
Hakata	HKT	74	17	1,200							0												0		1	10								1			12	0 / 9	0 / 1
Miike	MII	75	2	160							0	63											63		1	1											2		
Karatsu	KAR	76	2	160							0		2										2			7											7	0 / 4	
Imari	IMI	77	4	300							0												0			2											2	0 / 2	
Sasebo	SSB	78	5	400							0												0														0		
Nagasaki	NMX	79	10	800							0												0														0		
Izuhara	IZH	81	10	800							0												0														0		
Oita	OIP	82	3	120							0												0														0		
Saganoseki	SAG	83	1	24							0												0														0		
Saiki	SAE	84	1	40							0												0														0		
Minamata	MIN	85	5	400							0												0														0		
Yatsushiro	YAT	86	5	400							0		1										1		1	2											3	0 / 3	0 / 1
Misumi	MIS	87	1	80							0												0														0		
Hososhima	HSM	88	3	200							0												0														0		
Shibushi	SBS	89	7	480							0												0			3											3	0 / 3	0 / 3
Kagoshima	KOJ	90	5	180							0												0			1											1	0 / 1	0 / 1
Kiire	KII	91	5	180							0												0														0		
Kushikino	KSO	92	1	40							0												0														0		
Kinnakagusuku	KNX	93	9	720							0												0	2													2	0 / 2	0 / 2
Naha	NAH	94	12	960							0										2		2	2	6												8	0 / 8	0 / 8
Hirara	HRR	95	6	480							0												0	11	5												16	0 / 16	0 / 16
Ishigaki	ISG	96	6	480							0												0	5	1												6	0 / 6	0 / 6
Total			461	26,132	0	9	1	0	0	1	11	222	3	17	9	0	0	0	0	0	2	10	263	40	94	88	23	0	0	0	9	13	0	1	0	5	273	0 / 254	0 / 231

Vector - borne disease　P：Plague,　L：Lassa fever,　HP：Hantavirus Pulmonary Syndrome (HPS),　HF：Hemorrhagic Fever with Renal Syndrom (HFRS),　S：South American hemorrhagic Fever,　C：Crimean-Congo hemorrhagic fever (CCHF)

Table 7-2. Results of rodent (including flea and tick) inspection by rat/mouse traps at Japanese quarantine airports in 2021

Quarantine airport	3-letter code(IATA), UN-CODE	Quarantine code	No. of meshes (1km mesh)	No. of traps	Species: Vector and reservoir or host — Fleas (No. of samples collected)							Ticks (No. of samples collected)												Rodents (No. of samples collected)														Examination of pathogen (Antibody, RT-PCR, PCR) No.of positive samples/No.of samples		
					Xenopsylla cheopis	*Nosopsyllus fasciatus*	*Ctenophthalmus Kolenati*	*Leptopsylla segnis*	*C.congener truscus*	Unidentfied fleas	Total	*Laelaps nuttalli*	*Laelaps algericus*	*Laelaps echidninus*	*Laelaps jettmari*	*Laelaps microti*	*Haemaphysalis hystricis*	*Ixodes granulatus*	*Eulaelaps onoi*	*Ixodes monospinosus*	*Laelaps sp.*	Unidentfied ticks	Total	*Rattus rattus*	*Rattus norvegicus*	*Mus musculus*	*Apodemus speciosus*	*Apodemus argenteus*	*Apodemus sylvaticus*	*Micromys minutus*	*Microtus montebelli*	*Clethrionomys rufocanus bedfordiae*	*Apodemus speciosus ainu*	*Peromyscus sp.*	*Peromyscus maniculatus*	Unidentfied rodents	Total	Plague	HFRS Hamorrhagic fever with renal syndrome	HPS Hantavirus pulmonary syndrome
Exogenous species																																		●	●					
Primary vector					P																													HP	HP					
Secondary vector						P																		P,HF	P,HF	P	P	P	P	P	P	P	P	P	P					
New Chitose AP	SPK	193	6	480							0												0														0			
Asahikawa AP	AKJ	194	1	80							0												0		1												1	0 / 1	0 / 1	
Hakodate AP	HKD	195	4	160							0												0														0			
Aomori AP	AOJ	196	10	700			2				2												0				8				2						10	0 / 10	0 / 10	
Sendai AP	SDJ	197	16	1,280							0	11		6	6								23		5	2	2										9	0 / 9	0 / 9	
Akita AP	AKP	198	5	100							0												0				1										1	0 / 1	0 / 1	
Fukushima AP	FKS	199	2	160						7	7												0				3										3	0 / 3	0 / 3	
Narita International AP	NRT	200	28	1,920							0												0	2	1	3	2								1	2	11	0 / 6	0 / 5	1 / 1
Tokyo International AP	HND	201	24	1,200							0	16	25										41	4	9	32											45	0 / 43	0 / 43	
Niigata AP	NII	202	2	40							0												0														0			
Komatsu AP	KMQ	204	2	40							0												0														0			
Chubu Centrair International AP	NGA	205	15	294							0												0														0			
Kansai International AP	KIX	206	21	1,200							0		3										3			5											5	0 / 4	0 / 4	
Miho AP	YGJ	208	5	400							0												0				3										3	0 / 3	0 / 3	
Fukuoka AP	FUK	212	16	1,200							0												0			2											2	0 / 2		
Kitakyushu AP	KKJ	213	6	480							0												0			7											7	0 / 7	0 / 7	
Oita AP	OIT	214	2	160							0												0														0			
Nagasaki AP	NGS	215	5	400							0												0			1											1	0 / 1	0 / 1	
Kumamoto AP	KMJ	216	5	400							0												0														0			
Miyazaki AP	MZA	217	6	440							0												0			1											1			
Kagoshima AP	KOP	218	11	800							0												0	1		3											4	0 / 4	0 / 4	
Naha AP	NAP	219	11	800							0			2							4		6	9	1	9											19	0 / 18	0 / 18	
Shizuoka AP	FSZ	222	1	40							0												0														0			
Hyakuri AP	IBK	223	5	100							0												0														0			
Saga AP	QSG	225	4	320							0												0														0			
Takamatsu AP	TAK	226	3	240							0												0														0			
合　計 Total			216	13,434	0	0	2	0	0	7	9	27	28	8	6	0	0	0	0	0	4	0	73	16	17	65	19	0	0	0	2	0	0	0	1	2	122	0 / 112	0 / 109	1 / 1

Vector - borne disease　P：Plague,　L：Lassa fever,　HP：Hantavirus Pulmonary Syndrome (HPS),　HF：Hemorrhagic Fever with Renal Syndrom (HFRS),　S：South American hemorrhagic Fever,　C：Crimean-Congo hemorrhagic fever (CCHF)

Table 7-3. Results of rodent (including flea and tick) inspection by rat/mouse traps at Japanese quarantine seaports and airports in 2021

	No. of meshes（1km mesh）	No. of traps	Species																																	Examination of pathogen（Antibody, RT-PCR, PCR）No.of positive samples/No.of samples		
			Vector and reservoir or host																																			
			Fleas (No. of samples collected)							Ticks (No. of samples collected)												Rodents (No. of samples collected)																
			Xenopsylla cheopis	*Nosopsyllus fasciatus*	*Ctenophthalmus Kolenati*	*Leptopsylla segnis*	*C.congener truscus*	Unidentfied fleas	Total	*Laelaps nuttalli*	*Laelaps algericus*	*Laelaps echidninus*	*Laelaps jettmari*	*Laelaps microti*	*Haemaphysalis hystricis*	*Ixodes granulatus*	*Eulaelaps onoi*	*Ixodes monospinosus*	*Laelaps sp.*	Unidentfied ticks	Total	*Rattus rattus*	*Rattus norvegicus*	*Mus musculus*	*Apodemus speciosus*	*Apodemus argenteus*	*Apodemus sylvaticus*	*Micromys minutus*	*Microtus montebelli*	*Clethrionomys rufocanus bedfordiae*	*Apodemus speciosus ainu*	*Peromyscus sp.*	*Peromyscus maniculatus*	Unidentfied rodents	Total	Plague	HFRS Hamorrhagic fever with renal syndrome	HPS Hantavirus pulmonary syndrome
Exogenous species																																●	●					
Primary vector			P																													HP	HP					
Secondary vector				P																		P,HF	P,HF	P	P	P	P	P	P	P	P	P	P					
Total	677	39,566	0	9	3	0	0	8	20	249	31	25	15	0	0	0	0	0	6	10	336	56	111	153	42	0	0	0	11	13	0	1	1	7	395	0 ／ 366	0／ 340	1／ 1

Vector - borne disease　P：Plague,　L：Lassa fever,　HP：Hantavirus Pulmonary Syndrome (HPS) ,　HF：Hemorrhagic Fever with Renal Syndrom (HFRS) ,　S：South American hemorrhagic Fever,　C：Crimean-Congo hemorrhagic fever (CCHF)

Table 8. Summary of risk assessment of vector-borne diseases at Japanese quarantine seaports and airports in 2021

		Dengue	Japanese encephalitis	West nile fever	Malaria	Chikungunya fever	Zika virus disease	Plague	Hemorrhagic fever with renal syndrome	Hantavirus pulmonary syndrome	Lassa fever	South American hemorrhagic fever
		No. of seaports and airports										
Primary, secondary, and possible vector or reservoir were found		89	97	111	10	83	83	64	35	0	0	0
Risk category	A	29	21	7	108	35	35	46	75	110	110	110
	B	89	96	111	10	83	83	64	35	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	0
	D	0	1	0	0	0	0	0	0	0	0	0
Total		118	118	118	118	118	118	110	110	110	110	110

Risk category	Definition	
	Mosquitoes inspection	Rodents inspection
A：Very low	No vector mosquito (primary, secondary, or possible species) transmitting mosquito-borne infectious diseases, etc. or no mosquito is captured during permanent surveillance, etc. in the Cabinet Order-specified area.	No rodent is captured during permanent surveillance, etc. in the Cabinet Order-specified areas.
B：Low	Vector mosquitos (primary, secondary, or possible species) transmitting mosquito-borne infectious diseases, etc. are captured during permanent surveillance, etc. in the Cabinet Order-specified area. The mosquitoes captured do not possess any pathogen or gene of pathogen for quarantine infectious disease or the like.	Indigenous rodents (primary or secondary species) or fleas/mites (primary or secondary species) known to transmit quarantine infectious diseases or the like are captured during permanent surveillance, etc. in the Cabinet Order-specific areas. None of them possesses any antibody, pathogen, or gene suggestive of pathogen for quarantine infectious diseases or the like.
C：Moderate	Adults or larvae of exogenous vector mosquitos (primary, secondary, or possible species) transmitting mosquito-borne infectious diseases, etc. are captured during permanent surveillance, etc. in the Cabinet Order-specified area. The mosquitoes captured do not possess any pathogen or gene of pathogen for quarantine infectious disease or the like.	Exogenous rodents (primary or secondary species) or fleas/mites (primary or secondary species) known to transmit quarantine infectious diseases or the like are captured during permanent surveillance, etc. in the Cabinet Order-specific areas. None of them possesses any antibody, pathogen or gene suggestive of pathogen for quarantine infectious diseases or the like.
D：High	Adults of vector mosquitos (primary, secondary, or possible species) transmitting mosquito-borne infectious diseases, etc. are captured during permanent surveillance, etc. in the Cabinet Order-specified area. The mosquitoes captured possess the pathogen or gene of pathogen for quarantine infectious disease or the like.	An antibody, pathogen or gene suggestive of pathogen for quarantine infectious disease or the like is detected in the rodents (primary or secondary species) or fleas/mites known to transmit quarantine infectious diseases or the like (primary or secondary species) captured during the permanent surveillance, etc. in the Cabinet Order-specified areas.

※ If any mosquito or rodent has been caught on a ship or aircraft, it is considered as a temporary invasion not covered by the risk evaluation program because the space inside ships or aircrafts is not included in the Cabinet Order-specified areas.

Figure 1-1 Quarantine seaports and airports investigated (Quarantine CODE)

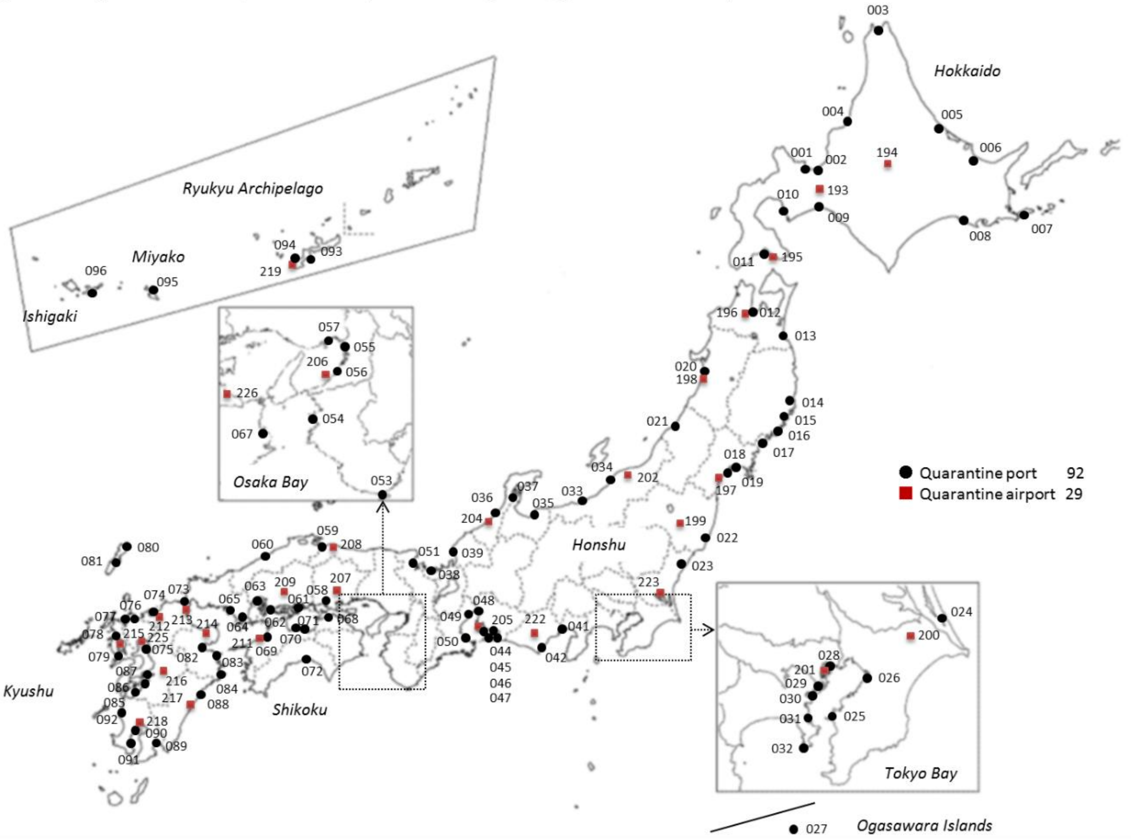


Figure 1-2 Quarantine seaports and airports investigated (UN/ LOCODE)

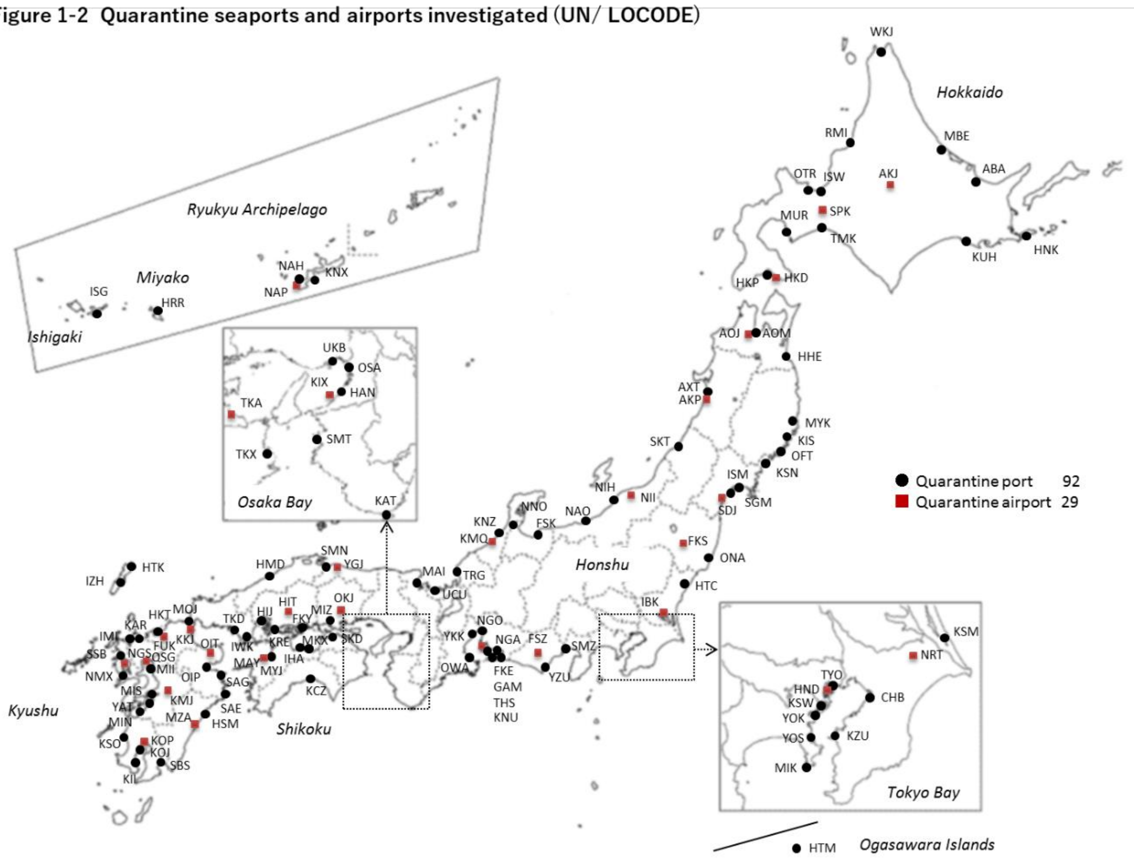


Figure 2　Invasive mosquitoes found in international aircraft and the origin of the flights in 2021

Figure 3　Vector situations of chikungunya fever and zika virus disease at quarantine seaports and airports, Japan, in 2021

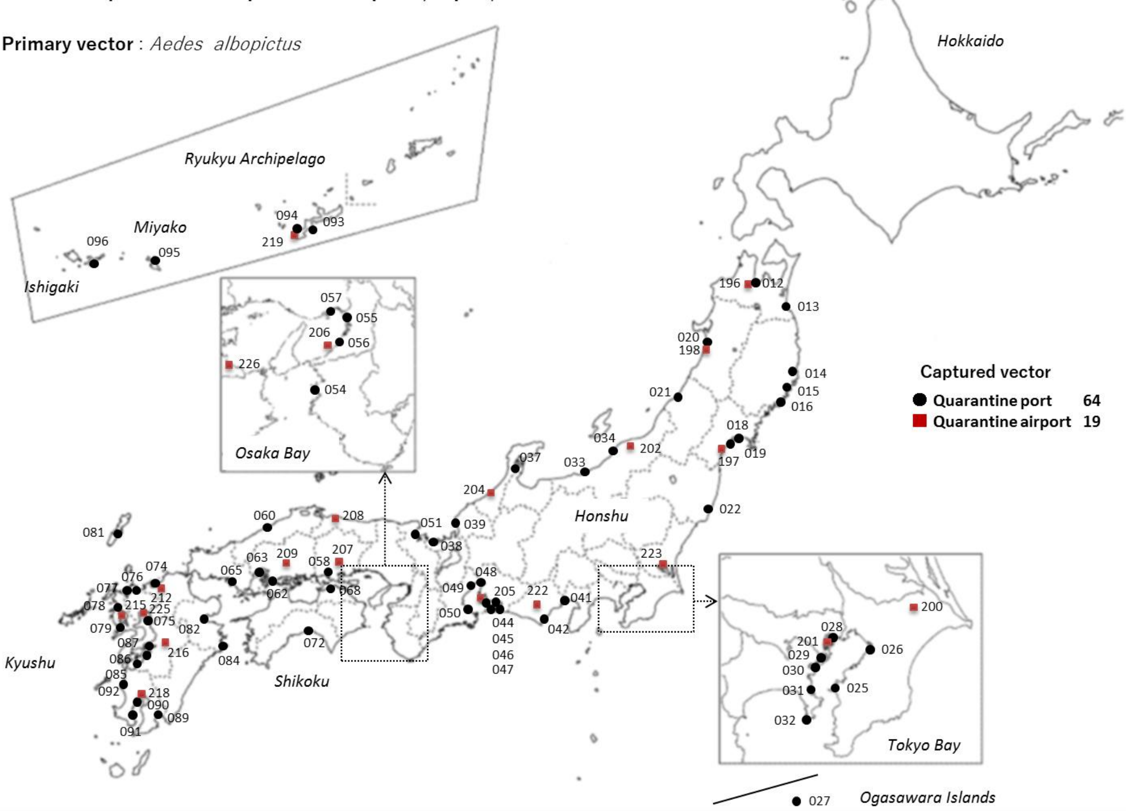


Figure 4 Vector situations of dengue fever at quarantine seaports and airports, Japan, in 2021.

Primary vector : *Aedes albopictus*
Possible vector : *Aedes dorsalis* , *Aedes flavopictus*, *Aedes riversi*, *Culex tritaeniorhynchus*, *Mansonia uniformis*

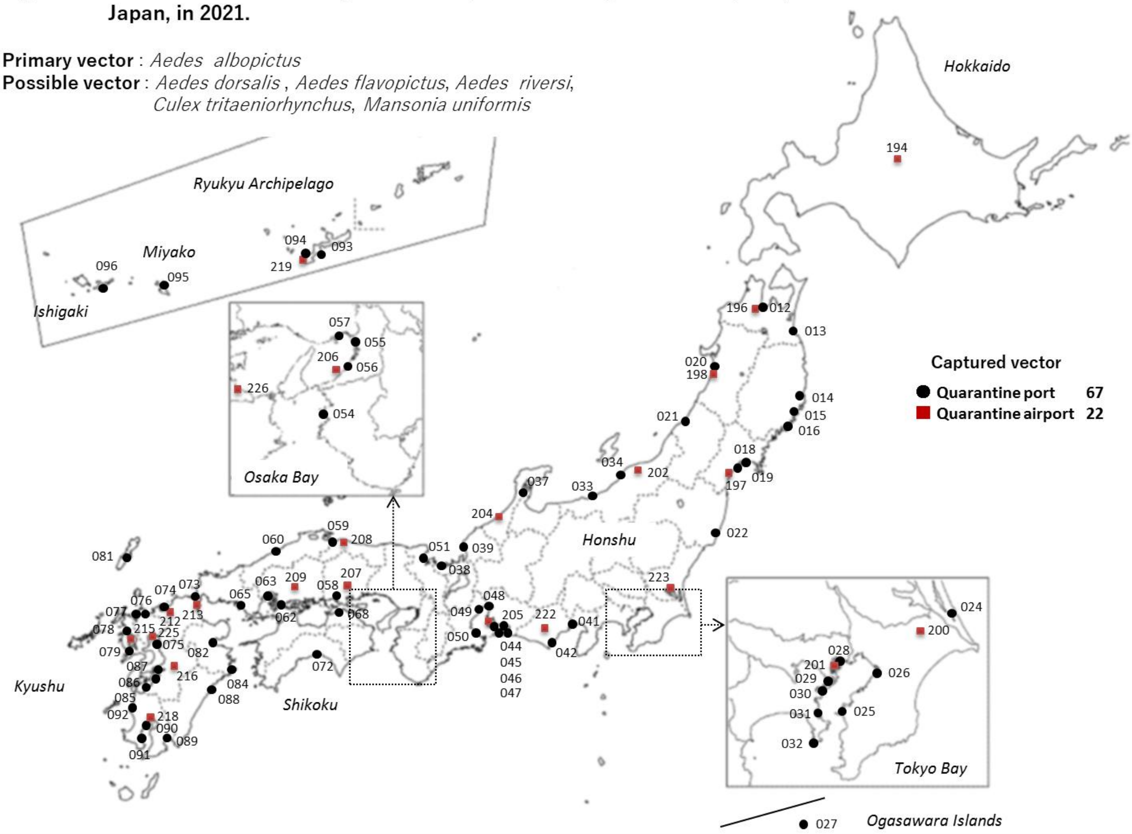


Figure 5 Vector situations of malaria at quarantine seaports and airports, Japan, in 2021

Primary vector : *Anopheles sinensis*
Secondary vector : *Anopheles sineroides*

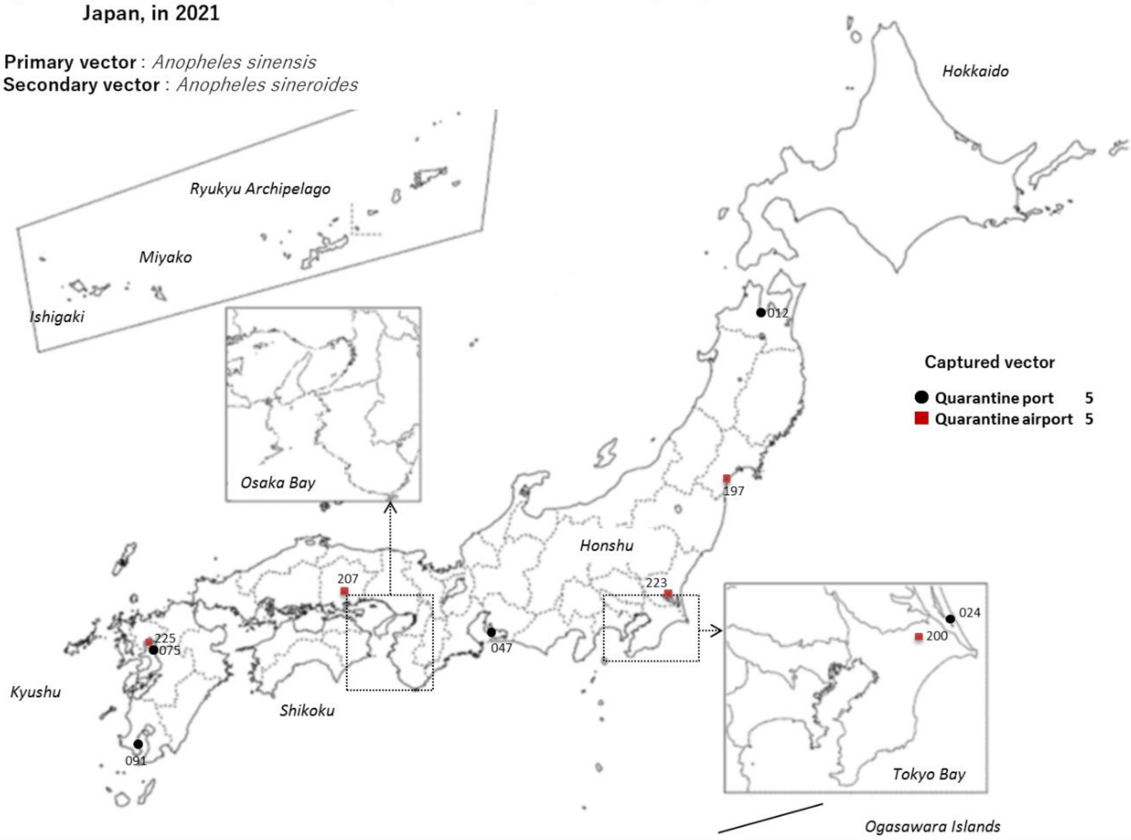


Figure 6　Vector situations of West Nile fever at quarantine seaports and airports, Japan, in 2021

Primary vector : *Culex pipiens pallens, Culex pipiens molestus, Culex pipiens quinquefasciatus*、*Culex pipiens* Complex

Secondary vector : *Anopheles sinensis, Aedes albopictus, Aedes vexans nipponii, Aedes japonicuse, Aedes dorsalis, Aedes togoi, Aedes flavopictus, Armigeres subalbatus, Culex inatomii, Culex tritaeniorhynchus, Mansonia uniformis*

Possible vector： *Culex sitiens*

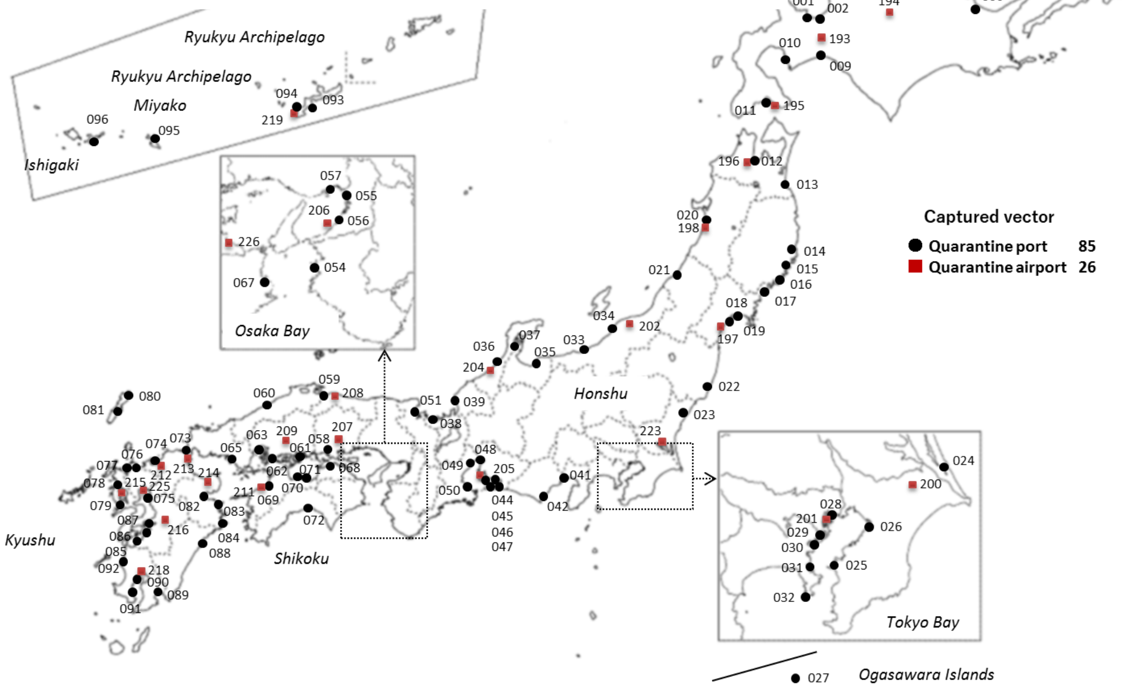


Figure 7　Vector situations of Japanese encephalitis at quarantine seaports and airports, Japan, in 2021

Primary vector : *Culex tritaeniorhynchus, Culex pseudovishnui*

Possible vector : *Aedes albopictus, Aedes japonicuse, Aedes togoi, Culex pipiens pallens, Culex pipiens quinquefasciatus, Culex bitaeniorhynchus, Culex sitiens, Culex whitmorei, Mansonia uniformis*

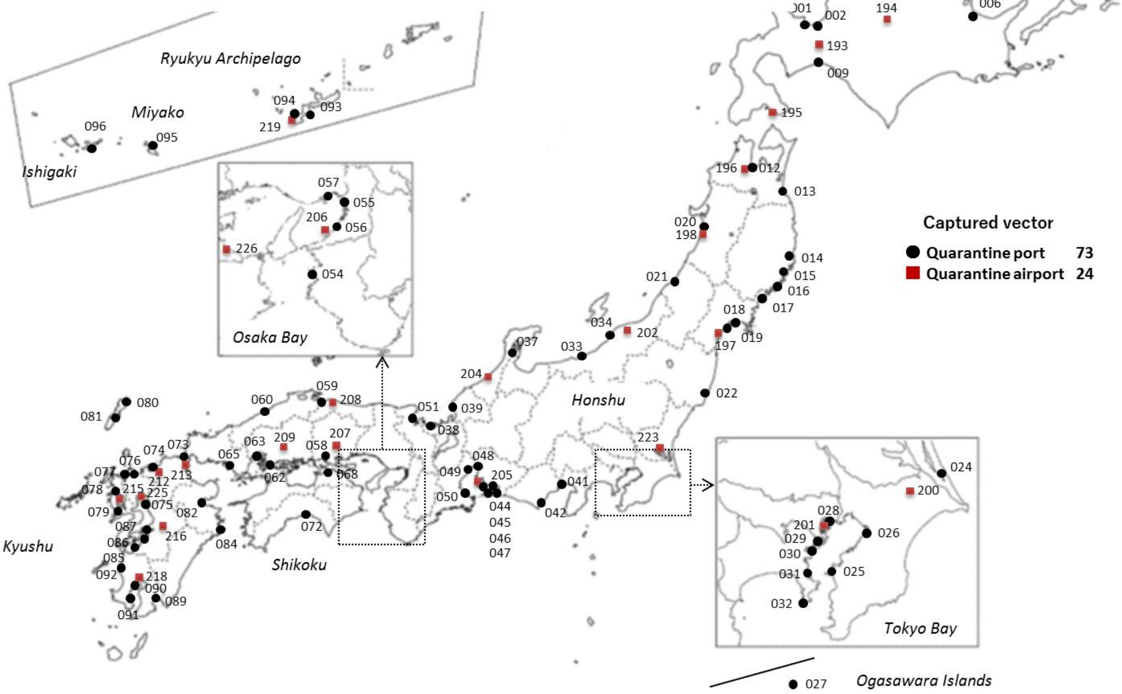


Figure 8　Vector and host situations of Plague at quarantine seaports and airports, Japan, in 2021

Secondary vector : *Nosopsyllus fasciatus*
Host : Rodents

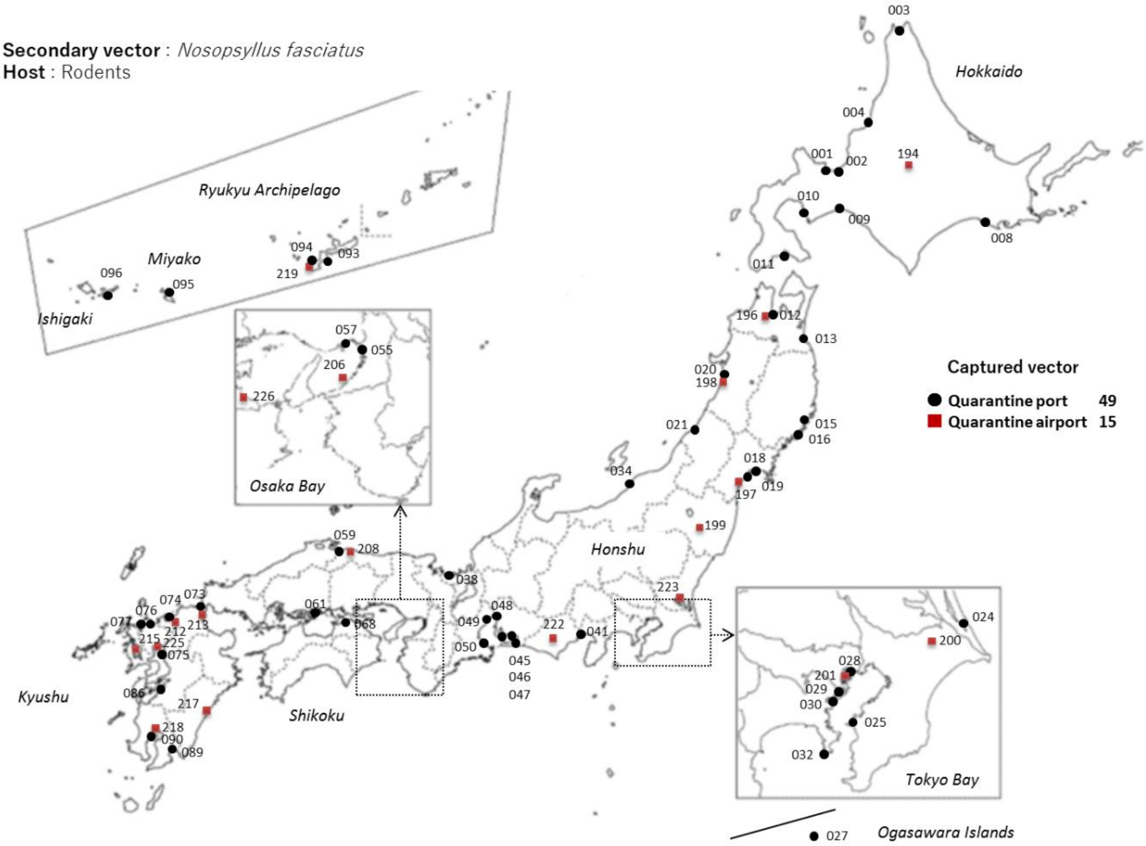


Figure 9　Vector situations of hemorrhagic fever with renal syndrome at quarantine seaports and airports, Japan, in 2021.

Secondary vector : *Rattus rattus* , *Rattus norvegicus*

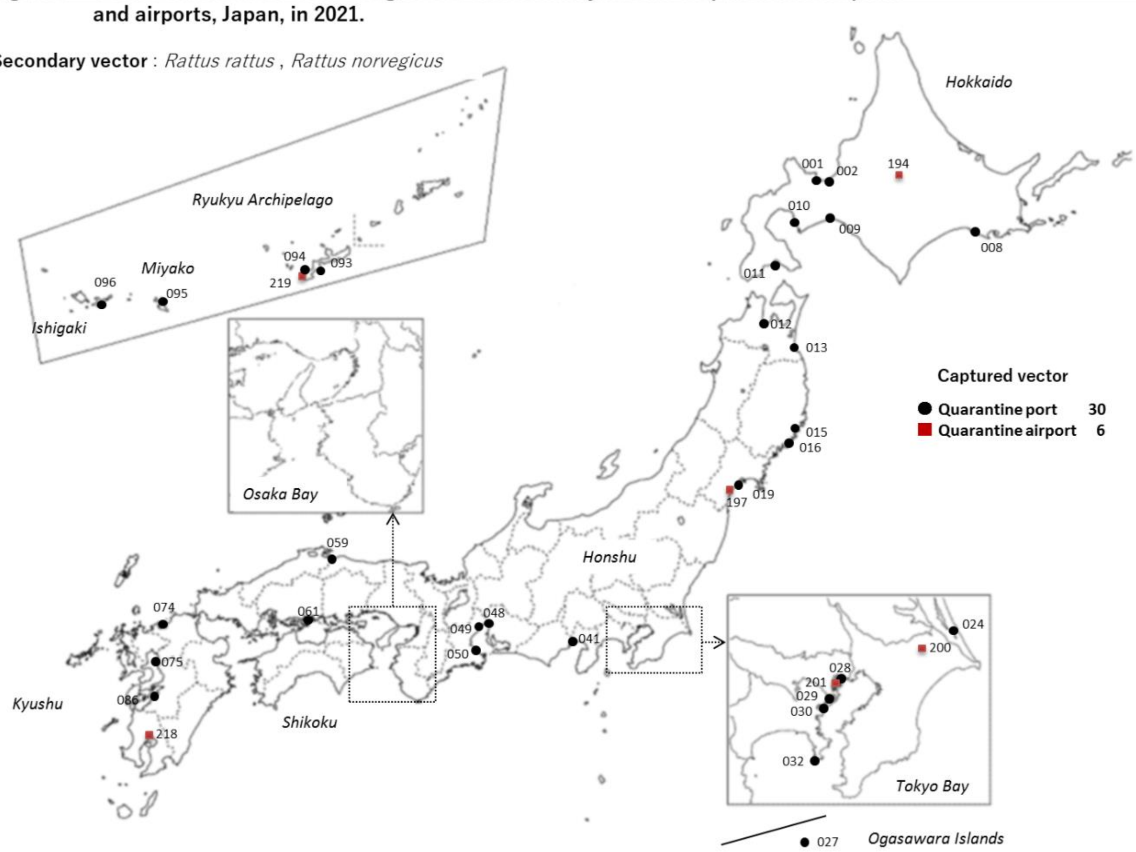


Figure 10 Vector situations of Hantavirus pulmonary quarantine seaports airports, Japan, in 2021

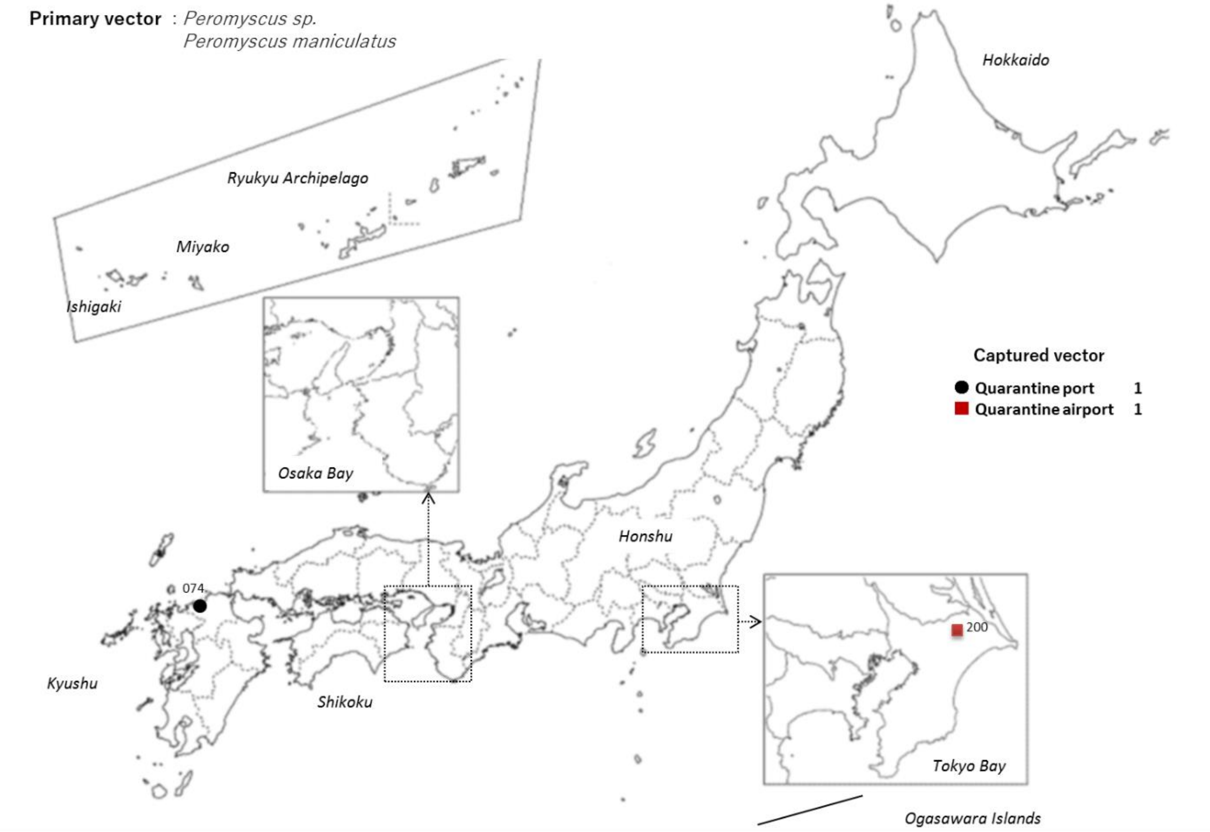


Figure11 Exogenous mosquitoes and pathogens detected at points of entry in 2002-2021

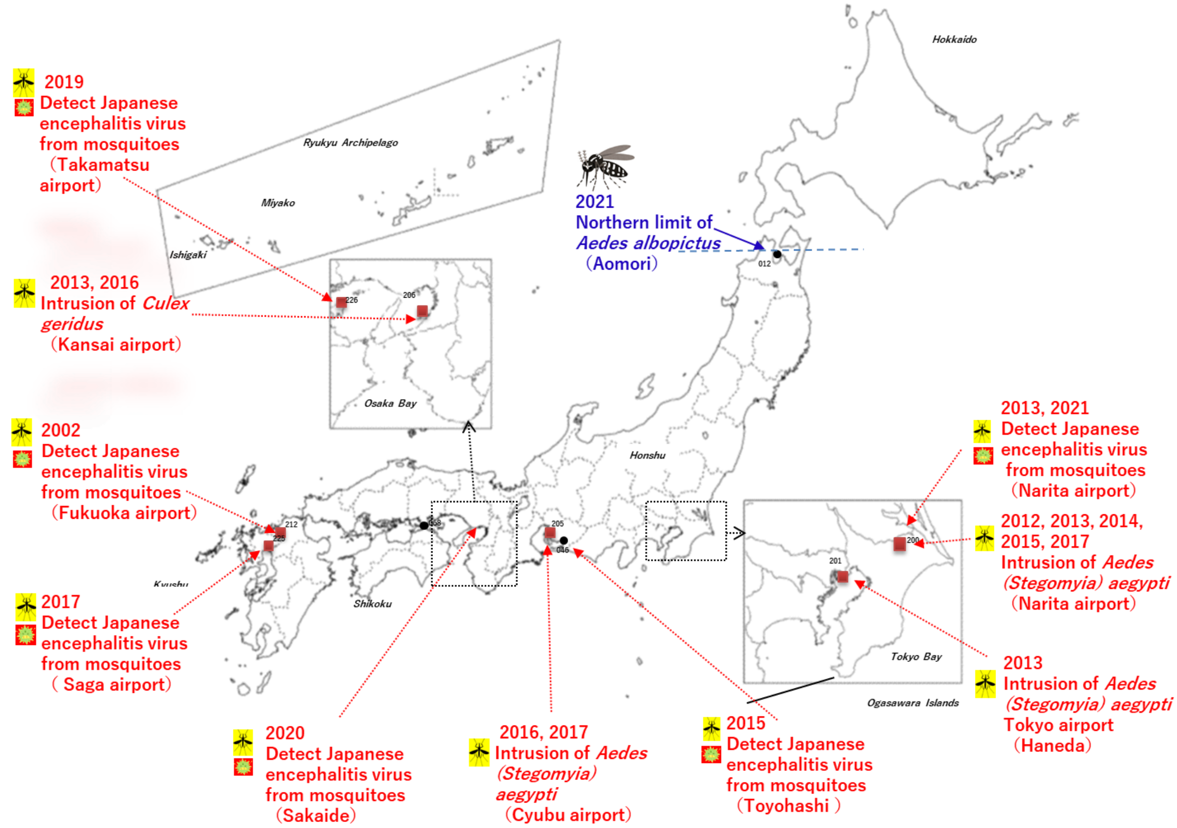
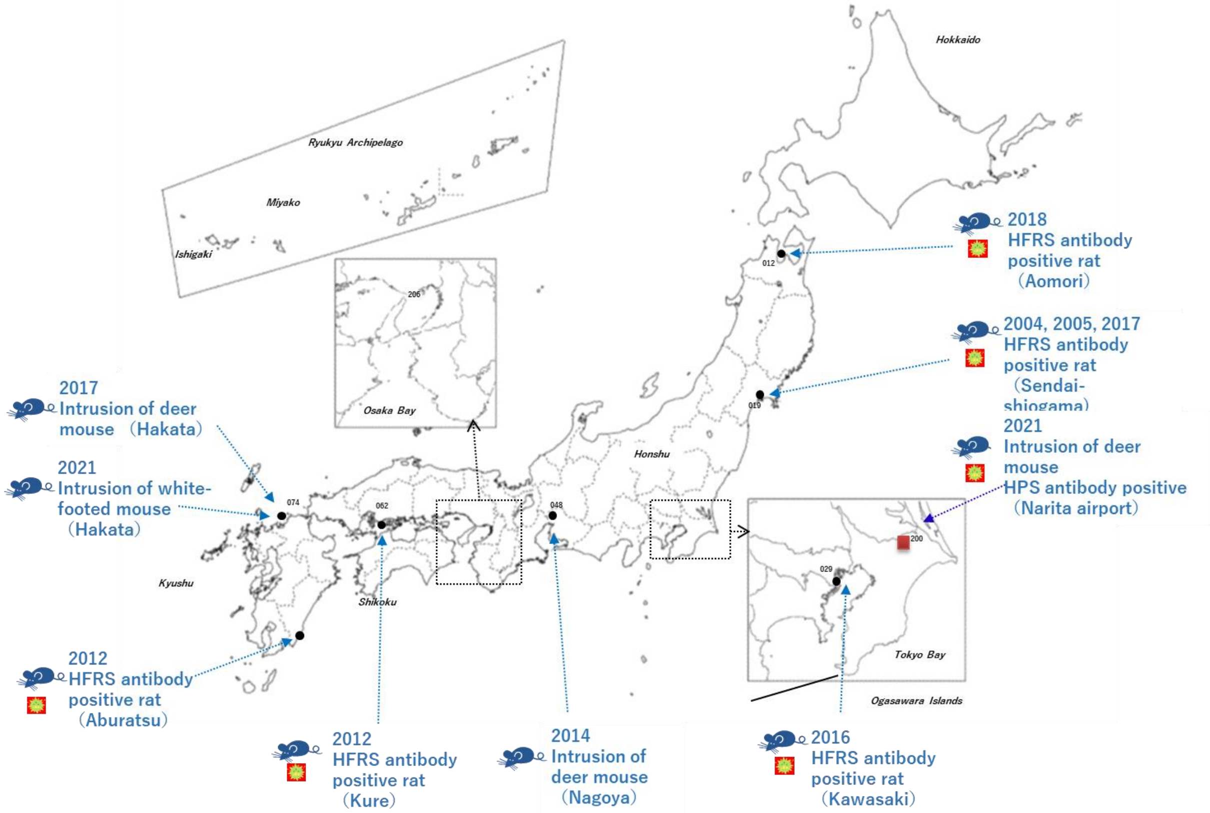


Figure 12 Exogenous rodents and pathogens detected at points of entry in 2002-2021



○ **Quarantine Act** (excerpts) (Finally amended: Act No.5, February 3, 2021)

Chapter I General Provisions

(Purpose)

Article 1 The purpose of this Act is to prevent pathogens of infectious diseases that are not endemic in Japan from entering the country via vessels or aircrafts, as well as to take other necessary measures concerning vessels or aircrafts to prevent infectious diseases.

(Quarantinable Infectious Disease)

Article 2 The term "Quarantinable Infectious Diseases" as used in this Act means the following infectious diseases:

(i) class I infectious diseases specified in the Act on Prevention of Infectious Diseases and Medical Care for Patients with Infectious Diseases (Act No. 114 of 1998);

(ii) infectious diseases such as novel influenza A specified in the Act on Prevention of Infectious Diseases and Medical Care for Patients with Infectious Diseases; or

(iii) beyond the diseases listed in the previous two items, diseases specified by Cabinet Order as those which require inspection in order to prevent pathogens of infectious diseases not endemic to Japan from entering the country.

(Application of this Act to Suspected Carriers and Asymptomatic Carriers)

Article 2-2

(1) In this Act, suspected carriers for infectious diseases listed in item 1 of the preceding Article are deemed patients with infectious diseases listed in the same item; therefore this Act applies to them.

(2) In this Act, suspected carriers for infectious diseases listed in item (ii) of the preceding Article that may be infected with pathogens of the infectious disease are deemed to be patients with infectious diseases listed in the same item; therefore this Act applies to them.

(3) Individuals possessing the pathogen for any of the infectious diseases listed in Item 1 or 2 of the preceding article but presenting with no symptom of the disease concerned shall be deemed as patients with the infectious diseases listed therein; therefore this Act applies to them.

(Quarantine Ports)

Article 3 The term "Quarantine Port" or "Quarantine Airport" as used in this Act means ports or airports specified by Cabinet Order respectively.

Chapter III Other Public Health Operations conducted by Quarantine Station Chiefs

(Investigation and Sanitation Measures to be carried out by the Quarantine Station Chief)

Article 27

(1) A quarantine station chief may investigate food, drinking water, waste material, wastewater, rodents and insects in vessels or aircrafts within areas of Quarantine Ports or Quarantine

Airports provided the area is specified by Cabinet Order, or investigate sea water, waste material, wastewater, rodents and insects in facilities, buildings and other places located in the areas, in order to determine the existence of insects that are a vector of pathogens of a Quarantinable Infectious Disease or similar infectious diseases specified by Cabinet Order, and to clarify sanitation measures with respect to these diseases in a Quarantine Port or Quarantine Airport, or have a quarantine officer do it.

(2) If a quarantine station chief deems an infectious disease provided for in the preceding paragraph to be prevalent or finds there to be a risk of this, the quarantine station chief may, within the areas specified by Cabinet Order pursuant to the provisions of the preceding paragraph, exterminate rodents or insects, or clean or sterilize vessels or aircrafts in the areas, or facilities, buildings and other places located in the areas, or may perform health checks or exterminate insects with regard to persons engaging in work in the areas, or have a quarantine officer or other person deemed as appropriate do it.

(3) If measures are taken as set forth in the preceding paragraph, the quarantine station chief must give notification of this promptly to the chief of the relevant administrative body.

○ **Quarantine Act Enforcement Regulations (excerpts) (Finally amended: Cabinet Order No. 25, February 3, 2021)**

(Quarantine infectious diseases specified by the Cabinet Order)

Article 1 The Cabinet Order-specified infectious diseases mentioned in Article 2 Item 3 of the Quarantine Act (hereinafter simply called “the Act”) include Zika virus disease, Middle East respiratory syndrome (confined to the syndrome caused by MERS coronavirus of the genus *Betacoronavirus*; hereinafter called “MERS” in Separate Table 2), dengue fever, avian influenza (confined to the influenza caused by serotype H5N1 or H7N9 influenza A virus of genus *Influenzavirus A*; hereinafter called “avian influenza H5N1/H7N9” in the same table), and malaria.

(Infectious diseases equivalent to quarantine infectious diseases)

Article 3 The Cabinet Order-specified infectious diseases mentioned in Article 27 Paragraph 1 of the Act include West Nile fever, hemorrhagic fever with renal syndrome, Japanese encephalitis, and hantavirus pulmonary syndrome.

○ **Act on the Prevention of Infectious Diseases and Medical Care for Patients with Infectious Diseases** (excerpts) (Finally amended: Act No.5, February 3, 2021)

Article 6

(1) The term "Infectious Disease" as used in this Act means a Class I Infectious Disease, a Class II Infectious Disease, a Class III Infectious Disease, a Class IV Infectious Disease, a Class V Infectious Disease, a Novel Influenza Infection, etc., a Designated Infectious

Disease, or a New Infectious Disease.

(2) The term "Class I Infectious Disease" as used in this Act means any of the following Infectious Diseases:

(i) Ebola haemorrhagic fever;
(ii) Crimean-Congo haemorrhagic fever;
(iii) smallpox;
(iv) South American haemorrhagic fever;
(v) plague;
(vi) Marburg virus disease;
(vii) Lassa fever.

○ Notification No. 0324-3 (MHLW Department of Food Safety, March 24, 2014) "Guide to Port Sanitation Control" (Finally Amended June 20, 2019) (Issued from Manager of the Office of Quarantine Station Administration to Chief of Each Quarantine Station)

The surveillance and sanitation measures to be conducted by the quarantine station chief pursuant to Article 27 of the Quarantine Act have been implemented in accordance with "Sanitation Measures in Seaport and Airport Areas" (Notification No. Seiei-1415, Director of Environmental Health Bureau) and "Guide to Sanitation Control in Ports, etc." (Notification No. Seishokuken-0212-2, Manager of the Office of Quarantine Station Administration). Recently the amended International Health Regulations (IHR2005) came into full effect, requiring control of infectious disease vector animals, etc. at all cross-border entry points. In view of this situation and the necessity for efficient and valid surveillance and sanitation measures based on risk assessment, we have prepared "Port Sanitation Control Guidelines", "Rodent Surveillance Manual", "Mosquito Surveillance Manual", and "Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted via Vector Animals, etc." as given in the appendices. We hereby request you to follow these guidelines and manuals when implementing sanitation control in port, etc.

Appendix 1 "Port Sanitation Control Guidelines"
Appendix 2 "Rodent Surveillance Manual"
Appendix 3 "Mosquito Surveillance Manual"
Appendix 4 "Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted by Vector Animals, etc."

Appendix 1

Port Sanitation Control Guidelines (excerpts)

1. Objectives

It has been reported that epidemics of emerging/remerging infections have broken out frequently in foreign countries, expanding rapidly to extensive areas under the trend of increasing speed, scale, etc. of the means of transportation. Under such a trend of globalization of infections, there is now a concern over the invasion and establishment of infectious diseases previously not indigenous in Japan.

Under such circumstances, it is critical to prevent the invasion and spread in Japan of quarantine infectious diseases and infectious diseases equivalent to quarantine infectious diseases (hereinafter collectively called “quarantine infectious diseases or the like”) as well as the animals, etc. potentially serving as vectors for quarantine infectious diseases or the like (“vector animals, etc.”).

This set of guidelines is aimed at facilitating rational and efficient surveillance of vector animals, etc. invading our country via the ships/aircraft arriving from countries with epidemics of quarantine infectious diseases or the like and at ensuring appropriate port sanitation measures on the basis of the data from surveys of the status of colonization of vector animals, etc. in the seaport/airport areas defined in Separate Table 3 of the Quarantine Act Enforcement Regulations set forth pursuant to Article 27 Paragraph 1 of the Quarantine Act (Law No. 201, 1951). This objective will contribute to the securing of the sanitation and control of vector animals, etc. at the points of cross-border entry required under the International Health Regulations (IHR2005).

Port sanitation measures include: (1) risk assessment on the basis of the results of surveillance conducted at each quarantine station using the nationwide uniform procedure; (2) implementation of surveillance of vector animals, etc. invading our country via ships/aircraft on the basis of the risk assessment findings; and (3) implementation of surveys on the status of colonization of vector animals, etc. in port areas, etc. When these measures are taken, each quarantine station is required to ensure the efficiency and preciseness of the measures taken in a manner corresponding to the assessment level. The surveillance of drinking water, meals provided within aircraft, seawater, and waste water should be implemented as needed, for example, upon the outbreak of an infection cluster attributable to any of these factors.

2. Infections covered by surveillance

The infections covered by port sanitation control include the quarantine infectious diseases transmitted by rodents and insects (Crimean/Congo hemorrhagic fever, South American hemorrhagic fever, plague, Lassa fever, Zika virus disease, Chikungunya fever, dengue fever, and malaria) and infectious diseases equivalent to quarantine infectious diseases (West Nile fever, hemorrhagic fever with renal syndrome), Japanese encephalitis, and hantavirus pulmonary syndrome.

The vector animals or the like covered by the surveillance of these infectious diseases are listed below. A surveillance manual needs to be prepared for each of these surveillance targets.

(1) Rodents, etc.

- Rodents: South American hemorrhagic fever, plague, Lassa fever, hemorrhagic fever with renal syndrome, and hantavirus pulmonary syndrome
- Fleas: Plague
- Mites: Crimean/Congo hemorrhagic fever

*Surveillance of mites serving as vectors for Crimean/Congo hemorrhagic fever is implemented under instruction of the Office of Quarantine Station Administration on the basis of the overseas epidemic status.

(2) Mosquitoes

Zika virus disease, Chikungunya fever, dengue fever, malaria, West Nile fever, and Japanese encephalitis

3. Implementation of port sanitation control

If invasion or colonization of vector animals, etc. for quarantine infectious diseases or the like occurs, the nation's health may be affected seriously. For this reason, vector surveillance is quite important as a port sanitation measure.

Each quarantine station is therefore required to conduct the surveillance of vector animals, etc. invading Japan from overseas in a well-planned manner throughout each year, corresponding to the risk of invasion, and to implement periodical surveys of the type, distribution, etc. of each species for assessment of the status of domestic colonization of exogenous species.

For this kind of surveillance, the permanent survey points and the survey areas need to be set in accordance with Appendix 1-1 "Setup of Survey Areas for Surveillance" and the surveillance should be implemented on the basis of a preset annual plan. The frequency of survey needs to be set in accordance with "Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted by Vector Animals, etc."(Appendix 4).

The head office of each quarantine station is required to check the permanent survey points and the survey areas set by each branch/satellite office as well as the surveillance plan, method, evaluation, etc., and to provide supervision and advice objectively. At the same time, the information from the permanent survey points of each quarantine station needs to be submitted to the Officer for Analysis on Sanitation Control, to enable summarization and objective evaluation, supervision, and advice.

4. Utilization of surveillance data and provision of information

Summarization and analysis of results are necessary to enable effective utilization of the results of port sanitation surveillance. It is also important to summarize the thus obtained information as port area permanent survey point information.

(1) At each quarantine station, the status of colonization of vector animals, etc. needs to be assessed and analyzed on the basis of the results of port sanitation surveillance conducted. The results need to be registered with the Officer for Analysis on Sanitation Control.

(2) The Officer for Analysis on Sanitation Control is required to analyze the summarized data from nationwide quarantine stations and to submit a report to the Office of Quarantine Station Administration.

The same officer is additionally required to provide the obtained information to each quarantine station periodically with an appropriate method.

(3) At each quarantine station, a surveillance plan for the next year needs to be devised in accordance with the "Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted by Vector Animals, etc."(Appendix 4), reflecting the results from the surveillance in a given year, and to implement the thus planned surveillance in the next year.

(4) The Office of Quarantine Station Administration is required to disseminate the required survey frequency and measures to each quarantine station and to provide the information related to the port sanitation surveillance results to the nation in an appropriate way.

5. Linkage to domestic infection control organizations, etc.

The port sanitation control is aimed at inspecting the invasion of quarantine infectious diseases or the like into Japan via vector animals, etc. and to prevent epidemics of such diseases in Japan.

To this end, linkage to the domestic infection control organizations (local government departments/bureaus in charge of infection control, local health stations, etc.: hereinafter called "related administrative organs") as well as airport administration companies, warehouse/port administration companies, airlines, shipping companies, shipping agents, etc. ("enterprises") is indispensable. Under cooperation with these administrative organs and enterprises, the inspection needs to be reinforced and infection control measures, such as pest control, should be taken.

To ensure such linkage, it is essential for each quarantine station to provide the information about surveillance results to the related administrative organs and enterprises and to reinforce linkage to these parties.

6. Infection-preventive measures during port sanitation control

(1) Preventive measures at the time of port sanitation surveillance

The surveyors are required to use an insect repellent and to wear appropriate clothing, gloves, safety shoes, etc. when conducting surveys so that they may not sustain health hazards.

(2) Preventive measures upon emergency

Upon emergency (e.g., upon detection of any vector animal, etc. possessing the pathogen for the infectious disease being surveyed), measures for prevention of exposure to the pathogen (e.g., wearing a mask, anti-dust goggles, boots, etc.) need to be taken, in addition to the ordinary preventive measures. If contact with the vector animal, etc. has occurred, the surveyor should receive prophylactic oral doses of antibiotics and follow-up of health condition as needed.

7. Utilization of a cooperative support system, etc.

The information about specific cases and the reference data, etc. collected at each quarantine station will be entered into the cooperative support system, etc. to facilitate the accumulation of relevant information.

The categories of information to be entered into the cooperative support system and the frequency of entry are specified below.

(1) Reports on focused surveys and measures taken upon emergency and reports on specific cases arisen within aircraft

(2) Table of the species of vectors for quarantine infectious diseases or the like: To be updated by the Officer for Analysis on Sanitation Control, and each update to be entered into the cooperative support system by the Office of Quarantine Station Administration.

(3) Reference information such as identification/search table, papers and other documents: Gathered from each quarantine station and entered upon acquisition into the system by the Office of Quarantine Station Administration.

Appendix 2

Rodent Surveillance Manual (excerpts)

1. Introduction

Rodent surveillance is aimed at assessing the colonization of rodents and other species (including parasitic fleas serving as plague vectors) and detecting the presence of rodents and other species not indigenous in our country ("exogenous vectors") in a well-planned manner in the port areas set for each quarantine seaport and airport ("quarantine ports") for the purpose of the prevention of invasion and epidemic of rodent-borne South American hemorrhagic fever, plague, Lassa fever, hemorrhagic fever with renal syndrome, and hantavirus pulmonary syndrome ("rodent-borne infectious diseases") among all quarantine infectious diseases or the like.

The term "rodents" in this manual indicates primarily animals of the family *Muridae*.

2. Rodent surveillance

To check for the invasion of rodent-borne infectious diseases, permanent survey points are preferentially set at the following locations having a high risk for invasion in accordance with "Setup of permanent survey points and trap installment points for rodent surveillance" (Appendix 2-1): (1) around the piers and inside the buildings/warehouses/container yards, etc. accommodating international cargoes at seaports visited by ocean-going ships; and (2) around the terminal buildings and inside the cargo unloading areas, international cargo-accommodating buildings, etc. at airports. Surveillance is conducted at these points/locations with a certain frequency and method.

Under normal circumstances, the permanent surveillance and, as needed, "questionnaire survey" (Appendix 2-4) are conducted. Under unusual circumstances (e.g., cases where invasion by exogenous vectors is likely), a focused survey is conducted. Upon detection of the pathogen for any rodent-borne infectious disease or the antibody to its pathogen, sanitation measures need to be taken with reference to the "Rodent-related Emergency Measures Manual" (Appendix 2-5) and "Collection of Examples Related to Rodent Surveillance Reinforcement, Pest Control, etc." (Clerical Communication issued by the Office of Quarantine Station Administration).

(1) Survey by capture

Rodents are to be captured alive, as a rule, to enable assessment of the invasion of rodent-borne infectious diseases and the colonization/distribution of rodents, parasitic fleas, and mites. To enable the survey efficiency, permanent survey points are set and rodents are captured with a certain frequency and method. In view of the possibility that birds, unintended animals, etc. are captured by the traps, the traps need to be used appropriately in compliance with the "Act on Welfare and Management of Animals" (Law No. 105, October 1, 1973) and "Act on Ensuring Appropriate Protection and Hunting of Birds and Other Animals" (Law No. 88, July 12, 2002).

A. Survey frequency, permanent survey points, etc.

The survey frequency needs to be set in accordance with the "Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted by Vector Animals, etc."(Appendix 4). The permanent survey points need to be set in accordance with "Setup of permanent survey points and trap installment points for rodent surveillance" (Appendix 2-1). The information about the thus set permanent survey points needs to be entered into the "Rodent/Mosquito Surveillance Survey Point Recording Sheet" (Form 1-1) and stored in this form.

B. Survey method

The survey in each survey area is conducted in accordance with the "Method for Rodent Surveillance by Capture" (Appendix 2-2).

C. Recording

The information about the survey is entered into the "Rodent Surveillance Results Recording Table and Test Request Sheet" (Form 1-2) and stored in this form.

(2) Questionnaire survey

The questionnaire survey is conducted of warehouse companies, container handling offices, administrators of piers for ocean-going ships, and so on, to check the presence/absence of damage to the stored cargos, etc. and to collect information about the measures being taken, with the ultimate goal of efficiently assessing the distribution and colonization of rodents.

This survey is conducted in accordance with the "Questionnaire Surveys" (Appendix 2-4).

(3) Measures taken upon the detection of signs of rodents during rodent surveillance in aircraft

If any sign of rodent colonization, etc. (e.g., feces) is found in an aircraft, the airline concerned will be guided to take invasion-preventive measures, etc.

(4) Focused survey

If any exogenous vector species has been found during the permanent surveillance of Cabinet Order-specified areas, a focused survey will be carried out. This survey is accompanied by an extraordinary questionnaire survey of the enterprises concerned, as needed. If the vector detected in aircraft, ship, container, etc. is judged as a case of transient invasion, this does not require a focused survey in the Cabinet Order-specified areas. However, if multiple cases of similar detection have been reported, a focused survey needs to be conducted in the Cabinet Order-specified areas. The samples collected during such a survey need to be immediately subjected to the pathogen test.

(5) Measures taken upon emergency

If any vector species possessing the pathogen or antibody of rodent-borne infectious diseases or any patient with rodent-borne infectious disease having no history of overseas trip has been found in the port area during permanent surveillance or a focused survey, posing a threat of disease transmission by the rodents having colonized in a given area, sanitation measures need to be taken in accordance with the "Rodent-related Emergency Measures Manual" (Appendix 2-5) after discussion with the Office of Quarantine Station Administration. When sanitation measures are taken, reference should be made to the "Collection of Examples Related to Rodent Surveillance Reinforcement, Pest Control, etc." (Clerical Communication issued by the Office of Quarantine Station Administration). As needed, an emergency survey, health survey, pest control, environmental arrangement, or the like is carried out in linkage to the related organizations.

3. Species identification and rodent-borne infectious disease pathogen test

Identification of the species of captured rodents and plague-transmitting parasitic fleas and their pathogen test are carried out with reference to the "Methods for Species Identification, Pathogen Possession Check and Sample Dispatch during Rodent Surveillance" (Appendix 2-3). The pathogen check is carried out in accordance with the "Categories of Tests, etc. Based on the Quarantine Act" (Notification from Manager of the Office of Quarantine Station Administration), thereby issuing a test request using the filled-in "Rodent Surveillance Results Recording and Test Request Sheet" (Form 1-2) after the collection of testing materials and parasitic fleas by each Test Section and Laboratory. If species identification is difficult at the Test Section or the Laboratory, a request of species identification is issued in the same way.

4. Reporting

Regarding the survey results, the necessary information for each month is entered into the database file and then reported to the head office of each quarantine station. The head office of each quarantine station combines the data from the head office and all branch/satellite offices into a single reporting form and stores it. The data in this form need to be registered with the Officer for Analysis on Sanitation Control by the 10th day of the month following each quarter of the year (by the end of the month following the fourth quarter). If a focused survey or any emergency measure has been conducted, the relevant information needs to be shared with the Office of the Quarantine Station Administration and the Officer for Analysis on Sanitation Control.

5. Evaluation and countermeasures

The survey results need to be re-evaluated each year at each quarantine station in accordance with the "Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted by Vector Animals, etc."(Appendix 4), and sanitation measures are taken as needed.

6. Others

(1) Dealing with reports of rodent detection (information supply) and rodent capture by related organizations or enterprises

If a report (information supply) has been received about rodent detection (including the detection of a dead rodent) or the like from any of the related organizations or enterprises within the port area, the quarantine station is required to conduct a hearing and check of the site status, followed by capture of the animals if possible. If capture is judged to be difficult, advice about subsequent actions needs to be given to the related organizations and enterprises. If a dead rodent is found, the rodent is collected, followed by implementation (or instruction) of disinfection or other measures. After returning of the quarantine staff member to the quarantine station, the captured or collected rodent needs to be subjected to species identification and a check for parasitic fleas. If the rodent is identified as a vector, the pathogen test needs to be carried out, as a rule.

Appendix 3

Mosquito Surveillance Manual (excerpts)

1. Introduction

Mosquito surveillance is aimed at assessing the presence of mosquitoes serving as the vectors for mosquito-borne infectious diseases and detecting the presence of mosquito species not indigenous in our country ("exogenous vectors") in a well-planned manner in the port areas set for each quarantine seaport and airport ("quarantine ports") for the purpose of the prevention of invasion and epidemic of mosquito-borne Zika virus disease, Chikungunya fever, dengue fever, malaria, West Nile fever, and Japanese encephalitis ("mosquito-borne infectious diseases") among all quarantine infectious diseases or the like.

The term "mosquitoes" in this manual indicates primarily the insects of family Culicidae.

2. Mosquito surveillance

Mosquito surveillance is carried out for the purpose of inspecting invasion by vector species.

Mosquito surveillance at airports consists of aircraft investigation (investigation of the aircraft, etc. having a high potential of mosquito invasion) and investigation of the species of mosquitoes having colonized in the port area and the status of their emergence.

Mosquito surveillance at seaports assumes the form of mosquito colonization investigation aimed at examining the species of mosquitoes having colonized around the piers for ocean-going ships and the status of emergence of mosquitoes serving as vectors.

Under normal circumstances, the permanent surveillance and, as needed, “questionnaire survey” (Appendix 3-5) are conducted. Under unusual circumstances (e.g., cases where invasion by exogenous vectors is likely), a focused survey is conducted. Upon detection of the pathogen for any mosquito-borne infectious disease from vector species, measures need to be taken in accordance with the “Mosquito-related Emergency Measures Manual” (Appendix 3-6). In addition, sanitation measures need to be taken with reference to the “Collection of Examples Related to Mosquito Surveillance Reinforcement, Pest Control, etc.” (Clerical Communication issued by the Office of Quarantine Station Administration).

(1) Colonization survey (permanent surveillance)

Colonization surveys need to be carried out by setting the survey areas and points preferentially at the areas/points at elevated risk for invasion by mosquitoes, including the aprons, surrounding roads, boarding bridges, passenger flight arriving terminals, cargo flight arriving areas, and air cargo handling areas of airports accepting aircraft from foreign countries as well as the piers and container unloading areas of seaports accepting ocean-going ships. In addition, adult and larval mosquitoes need to be collected with a certain frequency and method to check for the invasion/colonization of exogenous vector species of mosquito.

A. Survey frequency and points

The quarantine ports covered by the survey and the frequency and other details of the survey are decided in accordance with the “Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted by Vector Animals, etc.”(Appendix 4). Survey points are set in accordance with “Setup of survey points for mosquito surveillance” (Appendix 3-1). The necessary information about each survey point is entered into the “Rodent/Mosquito Survey Point Recording Sheet” (Form 2-1) and saved in this form.

B. Survey method

① Adult mosquito survey

The survey in each survey area is conducted in accordance with 2. Carbon Dioxide/Light Trap Method described in “Mosquito Collection Methods” (Appendix 3-2).

② Larval mosquito survey

The survey in each survey area is conducted in accordance with 3. Dipper/Pipette Method and 4. Ovitrap Method described in "Mosquito Collection Methods" (Appendix 3-3).

C. Recording

The necessary information about survey and test results is entered into the "Adult Mosquito Survey Results Sheet" (Form 2-3) and "Larval Mosquito Survey Results Sheet" (Form 2-4) and saved in these forms.

(2) Questionnaire survey

The status of mosquito colonization, etc. in port areas is investigated by the expert agent or the like assigned by each enterprise, followed by the implementation of pest control measures as needed. It is known that the status of mosquito colonization is affected by changes in physical factors and meteorological conditions. With these borne in mind, a questionnaire survey of port area enterprises, etc. is conducted, as needed, using the "Questionnaire for Mosquito Surveillance" (Form 2-6). The information thus collected will be utilized to facilitate the implementation of an efficient and valid survey within the framework of periodical mosquito surveillance, planning measures against sources of mosquito emergence, and conducting a focused survey and so on.

If mosquitoes collected at the time of unloading of cargo or the like from a foreign country have been provided by an enterprise or the like, the species needs to be identified. If they are identified as female mosquitoes of vector species, the pathogen test is conducted, as a rule. In addition, as needed, countermeasures against the origin of mosquito emergence are taken and the enterprise or the like is advised about pest control, etc.

(3) Aircraft survey

In view of the possibility that rodents invade our country via aircraft arriving from mosquito-borne infection epidemic territories, the survey of mosquito colonization in aircrafts and the check of pathogens are conducted in accordance with "Aircraft Surveys" (Appendix 3-2) to examine the status of mosquito invasion into aircraft, presence/absence of vector species, and the status of pathogen possession. This survey is conducted in a well-planned manner by devising a survey plan taking into consideration the status of mosquito-borne infection outbreak and meteorological conditions (temperature, rainfall, etc.) in the aircraft departing place, the flight schedule (starting time zone, etc.) and past survey results.

Survey items and results are entered into the "Aircraft Mosquito Survey Sheet & Test Results Sheet" (Form 2-2) and saved in this form.

(4) Focused survey

If any exogenous vector species has been found during the colonization survey (permanent surveillance) of Cabinet Order-specified areas, a focused survey will be carried out. This survey is accompanied by an extraordinary questionnaire survey of the enterprises concerned, as needed. If the vector detected in aircraft, ship, container, etc. is judged as a case of transient invasion, this does not require a focused survey in the Cabinet Order-specified areas. However, if multiple cases of similar detection have been reported, a focused survey needs to be conducted in the Cabinet Order-specified areas. The samples collected during such a survey need to be immediately subjected to the pathogen test. The survey items and results are entered into the “Aircraft Mosquito Survey & Survey Results Sheet” (Form 2-2) or “Ship Mosquito Survey & Survey Results Sheet” (Form 2-8) and saved in these forms.

(5) Measures taken upon emergency

If any vector species possessing the pathogen for mosquito-borne infectious diseases or any patient with rodent-borne infectious disease having no history of overseas trip has been found in the port area during a colonization survey (permanent surveillance) or a focused survey, posing a threat of disease transmission by the mosquitoes having colonized in a given area, sanitation measures need to be taken in accordance with the “Mosquito-related Emergency Measures Manual” (Appendix 3-6) after discussion with the Office of Quarantine Station Administration. When sanitation measures are taken, reference should be made to the “Collection of Examples Related to Mosquito Surveillance Reinforcement, Pest Control, etc.” (Clerical Communication issued by the Office of Quarantine Station Administration). As needed, an emergency survey, health survey, pest control, environmental arrangement, or the like is carried out in linkage to the related organizations.

3. Species identification and mosquito-borne infectious disease pathogen test

Identification of the species of captured mosquitoes and their pathogen test are carried out at each test section and laboratory with reference to “Methods for Species Identification, Pathogen Possession Check and Sample Dispatch during Mosquito Surveillance” (Appendix 3-4). If the identification of species (exogenous vector species, etc.) is difficult, identification and pathogen test are requested to the Testing Center using a filled-in “Mosquito Test Request Form” (Form 2-5).

4. Reporting

Regarding the survey results, the necessary information for each month is entered into the database file and then reported to the head office of each quarantine station. The head office of each quarantine station combines the data from the head office and all branch/satellite offices into a single reporting form and manages it. The data in this form need to be registered with the Officer for Analysis on Sanitation Control by the 10th day of the month following each quarter of the year (by the end of the month following the fourth quarter). If a focused survey or any emergency measure has been conducted, the relevant information needs to be shared with Office of Quarantine Station Administration and the Officer for Analysis on Sanitation Control.

5. Evaluation and countermeasures

The survey results need to be re-evaluated each year at each quarantine station in accordance with the "Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted by Vector Animals, etc." (Appendix 4), and sanitation measures are taken as needed. These data are referred to when the survey plan for the next year is devised.

6. Others

- Dealing with mosquitoes captured by related organizations or enterprises

  If information has been received about mosquito detection or the like from any of the related organizations, etc. within the port area or from aircraft, etc., the site needs to be checked and the mosquitoes need to be recollected, followed by species identification. If any vector species has been identified, the pathogen test needs to be conducted, as a rule.

Appendix 4

Manual for Risk Assessment of Quarantine Infectious Diseases or the Like Transmitted by Vector Animals, etc. (excerpts)

1. Introduction

Quarantine stations have been conducting the surveillance of vector animals, etc. in port areas to prevent the invasion and spread of quarantine infectious diseases or the like via vector animals, etc. Following the recent diversification of international traffic flow of humans and commodities, the number of routes for entry from overseas to local seaports/airports in Japan has increased, resulting in elevation of the risk for invasion of quarantine infectious diseases or the like into Japan. Furthermore, following complete enforcement of the International Health Regulations (IHR2005), there is now a greater need than before to ensure the sanitary status at the points of cross-border entry such as international seaports and airports. Under such circumstances, quarantine stations are now required to conduct efficient and valid surveillance. In this connection, it became more desirable to modify the Port Sanitation Control Guidelines issued in 2005, and the research and investigation conducted by quarantine stations in 2018 and 2019 included discussion over the creation of basic data/information for risk assessment about quarantine infectious diseases or the like (invading Japan via the vector animals, etc. carried by ships/aircraft from foreign countries) at quarantine seaports/airports (hereinafter called "quarantine ports") and over the method for calculation of such risk.

Calculation of the risk for invasion of quarantine infectious diseases or the like requires extraction of risk factors with diverse methods for subsequent analysis of individual risks at quarantine ports. Furthermore, from the viewpoint of preventing the invasion of quarantine infectious diseases or the like, it is desirable to establish a method allowing simple calculation of the risk so that the risk calculated may be reflected rapidly into the surveillance plan, etc. for the next year.

If the risk of invasion is calculated through the numerical analysis of two risk factors (one related to the invasion of vector animals, etc. and the other related to the carry-in of pathogens by humans) using the past data of ship/aircraft arrival from foreign countries and if efficient and valid port sanitation surveillance is attempted with the thus-calculated risk, we may expect that the sanitary status of Cabinet Order-specified areas can be assessed satisfactorily. If any event possibly posing a threat to public health is predicted from the information collected during such surveillance (permanent surveillance), it is essential to conduct active surveillance, sanitation measures, etc. such as focused surveys and countermeasures against emergency to prevent the invasion and spread of quarantine infectious diseases or the like in Japan.

2. Permanent surveillance

With reference to the opinions of experts, study reports, etc. in the field of mosquito-borne infections, the pathogens carried by vector animals invading Japan via foreign ships/aircraft were considered as a risk factor to be addressed in the permanent surveillance, thereby dividing the risk factor into risk factor A (past data on ship/aircraft arrival) and risk factor B (invasion of pathogens via humans).

3. Numerical analysis of risk factor

So that the details of the permanent surveillance might be designed in a manner corresponding to the risks involved, the risk factors were expressed numerically. The scores for each risk factor were defined by means of logarithm (a common technique adopted to this procedure).

4. Results of risk analysis for permanent surveillance

The scores for numerically expressed risk factors A and B were totaled, and their sum total was used in deciding the frequency of surveys conducted within the framework of permanent surveillance.

5. Permanent surveillance

The survey to be conducted routinely (permanent surveillance) is conducted, as a rule, at an annual frequency calculated by application of the value (calculated from risk factors A and B) to Table 2. This frequency is presented as a basic frequency of survey during a given year within the framework of permanent surveillance. It is acceptable to conduct the survey at a frequency higher than the presented level or in a number of survey areas larger than the planned one depending on the actual circumstances.

6. Risk assessment and sanitation measures based on permanent surveillance

The measures to be taken on the basis of permanent surveillance, etc. are listed in Table 3-1 and 3-2.

If any exogenous species not indigenous in Japan but involved in the epidemic of any quarantine infectious disease or the like has been found, sanitation measures need to be conducted, taking into consideration the local circumstances, etc. and referring to the "Collection of Examples Related to Rodent/Mosquito Surveillance Reinforcement, Pest Control, etc." and so on.

As needed, additional sanitation measures are taken, such as continuing the surveillance at a higher frequency and including neighboring survey areas into surveillance.

It is quite important to conduct a focused survey or measures against emergency in addition to permanent surveillance for closer assessment of the sanitation status throughout the Cabinet Order-specified areas and to reduce the risk level to below a certain level through the implementation of sanitation measures (environmental arrangement, countermeasures against the origin of emergence, etc.) by the quarantine station chief pursuant to Article 27 of the Quarantine Act for the purpose of reducing the density of vector animal colonization.

The results of the aircraft survey, which pertains to the status before invasion into the Cabinet Order-specified areas, are not covered by risk assessment. Instead, the aircraft administrator or the like is advised about the prevention of invasion by vector animals (mosquitoes and rodents). Similar actions are taken also against the exogenous vector species detected within containers. If quarantine infectious diseases or the like are anticipated to be spread by the vector species, sanitation measures (e.g., pest control with insecticides, rodenticides, etc. and disinfection for prevention of expanded infection) are instructed or implemented.

7. Preparation of assessment maps

Assessment is conducted separately for seaports and airports. Assessment maps prepared with different colors of mesh are advantageous in that the points having the risk in a given port can be readily identified.

Table 3-1 Countermeasures and assessment related to rodent survey results

Results of permanent surveillance, etc.	Risk assessment	Sanitation measures	Color of assessment map
Antibody, pathogen, or gene suggestive of pathogen for quarantine infectious diseases or the like has been detected from rodents (primary or secondary species)[1] or vector fleas/mites (primary or secondary species)[1] captured during permanent surveillance, etc. in Cabinet Order-specified areas.	D High risk for invasion of quarantine infectious diseases or the like	① Take measures against emergency, set separately[2]. Resume ordinary surveillance upon the disappearance of the pathogen-possessed animals. ② Continue surveillance at a higher frequency next year, accompanied as needed by sanitation measures to reduce the vector animal colonization density (environmental arrangement, measures against origin of emergence, etc.; in cooperation with related organizations as needed) ③ Instruct the administrator or the like about the prevention of rodent invasion. Perform disinfection as needed.	Red
Exogenous rodents (primary or secondary species)[1]or fleas /mites (primary or secondary species) [1] known as vectors for quarantine infectious diseases or the like have been captured during permanent surveillance, etc. in Cabinet Order-specified areas. Antibody, pathogen, or gene suggestive of pathogen for quarantine infectious diseases or the like has not been detected.	C Moderate risk for invasion of quarantine infectious diseases or the like	① Implement a focused survey (active survey) set forth separately. Resume ordinary surveillance upon ceasing of the capture of exogenous rodents or fleas. ② Perform permanent surveillance in the next year, as a rule, but continue surveillance of the survey area concerned at a higher frequency and a larger number of survey points than usual, accompanied by sanitation measures to reduce the density of vector animal colonization (environmental arrangement, measures against origin of emergence, etc.; in cooperation with related organizations as needed) as needed. Survey also the area neighboring the area concerned. ③ Instruct the administrator or the like about prevention of rodent invasion. Perform disinfection as needed.	Yellow

Indigenous rodents (primary or secondary species)[1)] or fleas /mites (primary or secondary species)[1)] known as vectors for quarantine infectious diseases or the like have been captured during permanent surveillance, etc. in Cabinet Order-specified areas. Antibody, pathogen, or gene suggestive of pathogen for quarantine infectious diseases or the like has not been detected.	B Low risk for invasion of quarantine infectious diseases or the like	① Continue permanent surveillance in the next year, accompanied by sanitation measures to reduce the density of vector animal colonization (environmental arrangement, measures against origin of emergence, etc.; in cooperation with related organizations as needed) as needed. ② Continue permanent surveillance in the next year, as a rule, but if the number of animals captured or the number of sites captured is larger than usual, increase the frequency of survey or the number of survey points in a given survey area as needed, accompanied by the effort to take sanitation measures for reducing the colonization density. ③ Instruct the administrator or the like about the prevention of rodent invasion.	Green
No rodent has been captured during permanent surveillance, etc. in Cabinet Order-specified areas.	A Very low risk for invasion of quarantine infectious diseases or the like	① Continue permanent surveillance, monitor the species, and density of colonized animals and endeavor to maintain the sanitation level within the survey area in cooperation with related organizations and enterprises. ② Perform permanent surveillance in the next year.	Blue
If captured within aircraft, ships, etc.	Not included in the risk assessment	Continue permanent surveillance, monitor the species and density of colonized animals, and endeavor to maintain the sanitation level within the survey area in cooperation with related organizations and enterprises. Perform permanent surveillance in the next year. Reinforce the survey of the area concerned as needed. If possession of pathogen, etc. has been found, take emergency measures (set forth separately)[2)], as needed.	Not included in the risk assessment. The information about detection should be supplied to the Officer for Analysis on Sanitation Control immediately.

[1)] Primary species, secondary species, etc. are defined in Attachment 2 "Vector species of rodents, etc. covered by data entry on each infectious disease (major rodents, fleas, and ticks known as vectors for quarantine infectious diseases and other equivalent infectious diseases)." If a new species has been detected, the reference document is revised (if needed, the new species is added urgently).

[2)] Implemented with reference to the "Collection of Examples Related to Rodent Surveillance Reinforcement, Pest Control, etc." issued by the Office of Quarantine Station Administration.

Permanent surveillance, etc. encompasses the cases detected within the Cabinet Order-specified areas by means of notification/reporting, etc. However, detection inside aircraft, ships, etc., which does not reflect invasion into the Cabinet Order-specified areas, is not included in the risk assessment, and only the outcome is reported about such detection.

Primary species means the species involved in past epidemic of quarantine infectious diseases or the like.

Secondary species means the species involved in past outbreak of quarantine infectious diseases or the like.

Table 3-2 Countermeasures and assessment related to mosquito survey results

Results of permanent surveillance, etc.	Risk assessment	Sanitation measures	Color of assessment map
Adult mosquitoes of species known as vectors for quarantine infectious diseases or the like (primary, secondary, or possible species)[1] have been detected during permanent surveillance, etc. in Cabinet Order-specified areas. Possession of pathogen or gene of pathogen for quarantine infectious diseases or the like has been detected.	D High risk for invasion of quarantine infectious diseases or the like	① Take measures against emergency, set separately[2]. Resume ordinary surveillance upon disappearance of the pathogen-possessed animals. ② Continue surveillance at a higher frequency next year, accompanied as needed by sanitation measures to reduce vector animal colonization density (environmental arrangement, measures against origin of emergence, etc.; in cooperation with the related organizations as needed) ③ Instruct the administrator or the like about the prevention of rodent invasion. Use insecticides as needed.	Red

Adult or larval mosquitoes of exogeneous species known as vectors for quarantine infectious diseases or the like (primary, secondary, or possible species)[1)] have been detected during permanent surveillance, etc. in Cabinet Order-specified areas. Possession of pathogen or gene of pathogen for quarantine infectious diseases or the like has not been detected.	C Moderate risk for invasion of quarantine infectious diseases or the like	① Implement a focused survey (active survey) set forth separately. Resume ordinary surveillance upon ceasing of the capture of exogenous rodents or fleas. ② Perform permanent surveillance in the next year, as a rule, but continue surveillance of the survey area concerned at a higher frequency and a larger number of survey points than usual, accompanied by sanitation measures to reduce the density of vector animal colonization (environmental arrangement, measures against origin of emergence, etc.; in cooperation with related organizations as needed) as needed. ③ Instruct the administrator or the like about the prevention of rodent invasion. Use insecticides as needed.	Yellow
Mosquitoes (primary, secondary, or possible species)[1)] known as vectors for quarantine infectious diseases or the like have been captured during permanent surveillance, etc. in Cabinet Order-specified areas. Pathogen or gene of pathogen for quarantine infectious diseases or the like has not been detected.	B Low risk for invasion of quarantine infectious diseases or the like	① Continue permanent surveillance in the next year, accompanied by sanitation measures to reduce the density of vector animal colonization (environmental arrangement, measures against origin of emergence, etc.; in cooperation with related organizations as needed) as needed. Continue permanent surveillance in the next year, as a rule, while increasing the frequency of survey or the number of survey points in the survey area concerned, accompanied by the effort to take sanitation measures for reducing the colonization density, as needed.	Green

None of the mosquitoes captured during permanent surveillance, etc. in Cabinet Order-specified areas is known as a vector (primary, secondary, or possible species)[1], or no mosquito is captured.	A Very low risk for invasion of quarantine infectious diseases or the like	① Continue permanent surveillance, monitor the species and density of colonized animals and endeavor to maintain the sanitation level within the survey area in cooperation with related organizations and enterprises. ② Perform permanent surveillance in the next year.	Blue
If captured within aircraft, ships, etc.	Not included in risk assessment	Continue permanent surveillance, monitor the species and density of colonies, and endeavor to maintain the sanitation level within the survey area in cooperation with the related organizations and enterprises. Perform permanent surveillance in the next year. Reinforce the survey of the area concerned as needed. If possession of pathogen, etc. has been found, take emergency measures (set forth separately)[2], as needed.	Not included in risk assessment. The information about detection should be supplied to the Officer for Analysis on Sanitation Control immediately.

[1] Primary species, secondary species, etc. are defined in Attachment 3 “Vector species of mosquitoes covered by data entry on each infectious disease (major mosquitoes known as vectors for quarantine infectious diseases and other equivalent infectious diseases).” If a new species has been detected, the reference document is revised (if needed, the new species is added urgently).

[2] Implemented with reference to the “Collection of Examples Related to Mosquito Surveillance Reinforcement, Pest Control, etc.” issued by the Office of Quarantine Station Administration.

Permanent surveillance, etc. encompasses the cases detected within the Cabinet Order-specified areas by means of notification/reporting, etc. However, detection inside aircraft, ships, etc., which does not reflect invasion into the Cabinet Order-specified areas, is not included in the risk assessment, and only the outcome is reported about such detection.

Primary species means the species involved in a past epidemic of quarantine infectious diseases or the like.

Secondary species means the species involved in a past outbreak of quarantine infectious diseases or the like.