Annual Report of Vector-borne Diseases Pathogens and Vector Surveillance 2020

July 2021

MINISTRY OF HEALTH, LABOUR AND WELFARE
Pharmaceutical Safety and Environmental Health Bureau
Policy Planning Division for Environmental Health and Food Safety
Office of Quarantine Station Administration

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Contents

Preface

Following the World Health Organization's (WHO) declaration (January 31, 2020) of a "public health emergency of international concern (PHEIC)" arising from coronavirus disease 2019 (COVID-19), countries across the world have been taking countermeasures, and vaccination against this disease has been promoted extensively. To date, however, this emergency has not yet been overcome under the trend of the emergence of virus variants with higher infectivity and so on.

In Japan, the government has taken measures, such as declarations of a state of emergency and the introduction of priority measures to prevent the spread of the disease, accompanied by the temporary suspension of new entry of foreigners into Japan and so on (as of June 17). In addition, the quarantine procedure for individuals entering Japan at seaports and airports remains intensified by the quarantine stations.

Under such circumstances, international flights from/to airports other than Narita International Airport, Tokyo International Airport, Chubu Centrair International Airport, Kansai International Airport, and Fukuoka Airport have been stopped almost completely since April 2020, with the number of foreign visitors to Japan having decreased by 87.1% in 2020 from the previous year (from the Japan National Tourism Organization (JNTO) website).

Domestic and beyond-border movements of individuals have been restricted also in many foreign countries, resulting in a marked decrease in the international travel of individuals. We may therefore estimate that the risk for the invasion of pathogens for infectious diseases into Japan from foreign countries is now lower than before.

However, mosquito-borne infectious diseases (Zika virus disease, Chikungunya fever, dengue fever, and malaria) remain prevalent in many areas of the world, and cases of these imported infectious diseases detected in Japan were reported also in 2020 although their number tended to be smaller than before.

Overseas, patients with rodent-borne infectious diseases, such as plague, Lassa fever, and hemorrhagic fever with renal syndrome (HFRS), have been found continuously.

Although international flights to/from local airports have stopped in Japan, there has not been a marked decrease in the number of ocean-going cargo ships arriving at Japanese seaports compared to the pre-COVID-19 pandemic period, and these ships are entering Japanese seaports everyday even after the suspension of international cruises.

Therefore, even under the current global spread of COVID-19, there is a growing importance for quarantine stations to conduct investigations about colonization, invasion, and possession of pathogens by mosquitoes and rodents at points of entry into Japan (airports, seaports, etc. covered by the quarantine system) and to implement vector control, etc. without delay on the basis of the results of such investigations.

The Tokyo Olympic and Paralympic Games, postponed from 2020, are scheduled to take place in July of this year. In awareness of such an event plan, each quarantine station in Japan is continuing the surveillance of mosquitoes (including *Aedes albopictus* known as a vector for dengue fever and *Culex tritaeniorhynchus* serving as a vector for Japanese encephalitis) and the corresponding seaport sanitation controls, etc. which were started last year.

This report, issued to fulfill the obligations of Japan as a member of the United Nations in accordance with the World Health Organization (WHO) Regulations (2005), will present the results of the vector surveillance conducted in 2020 at nationwide quarantine stations of Japan.

July 2021

1 Vector-borne quarantine infectious diseases reported in Japan (2020)

1.1 Mosquito-borne diseases

The status in 2020 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"). The cases reported in 2020 included one case of Zika virus disease, 3 cases of Chikungunya fever, 45 cases of dengue fever, 20 cases of malaria, and 5 cases of Japanese encephalitis [1]. All these cases, except for the cases of Japanese encephalitis, are considered to be imported cases.

The territory considered responsible for the infection was Indonesia for one case of Zika virus disease [2].

The territories reported to be probably responsible for infection with Chikungunya fever were confined to Asia, including Indonesia (1 case), Thailand (1 case), and Maldives (1 case) [2].

As far as dengue fever is concerned, Asia was the predominant territory considered to be responsible for infection with this disease among the imported cases reported in 2020, that is, responsible for 36 cases or about 80% of all cases (similar to the trend in the past 3 years). Within Asia, Indonesia was most frequently considered the responsible territory (13 cases), followed by the Philippines (9 cases), Thailand (3 cases), and Vietnam (3 cases). Other than the cases imported from Asia, there was 1 case imported from Oceania (Palau) and 2 cases from Central & South America/Caribbean District (1 case each from Brazil and Peru) [3].

As for malaria, Africa was considered the responsible territory for infection with this disease in 12 cases, an overwhelming majority of the total imported cases of malaria described in the fast-track reports until September (17 cases in total). Within Africa, Nigeria was responsible for 3 cases, Cameroon for 3 cases, and Uganda for 2 cases. Within Asia, India was reported as the responsible territory for 1 case, and the other cases developed the disease after visiting two or more countries [2].

Cases of Japanese encephalitis reported since July 2020 included 2 cases from Wakayama Prefecture, 2 cases from Okayama Prefecture, and 1 case from Ishikawa Prefecture [2]. In Japan, the trend in Japanese encephalitis (JE) virus has been monitored by means of serum hemagglutination inhibiting (HI) antibody titration in pigs (animals in which JEV is amplified) within the framework of the Infectious Disease Epidemic Predictive Survey Program. The antibody to JE virus was detected in 12 of the 22 prefectures where the survey was conducted during 2020 [4] (in 22 of the 31 prefectures during 2019). Although infection with this virus can be prevented by vaccination, it is essential to take precautions so as not to be bitten by mosquitoes.

The trend survey mentioned above revealed no cases of West Nile fever [1].

1.2 Rodent-borne diseases

The trend survey in 2020 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 (2020)

The overseas outbreak of quarantine infectious diseases in 2020 and cases of such diseases unique to that year are described below on the basis of the information from the WHO and other sources.

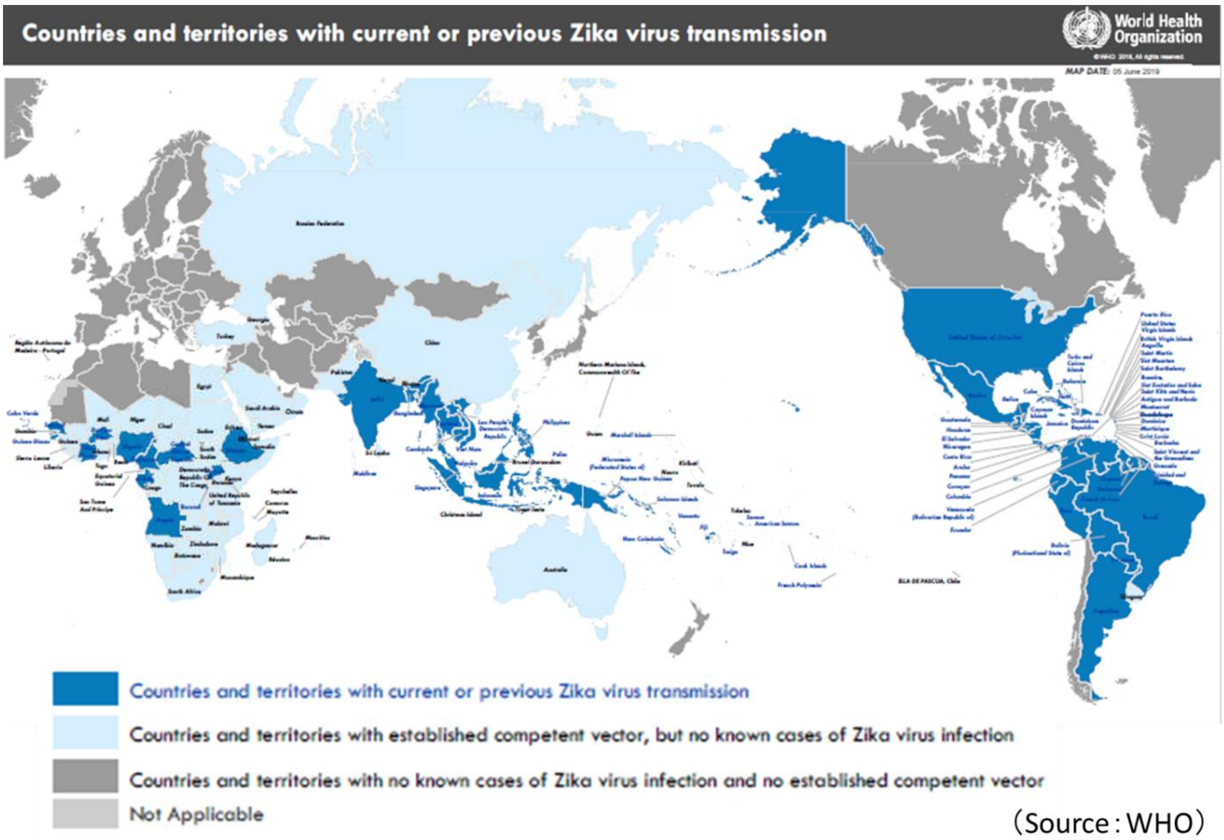
2.1 Mosquito-borne diseases

Zika virus disease

Zika virus disease was recorded in Africa, the Americas, Asia, and Oceania. In the 1960s through the 1980s, its outbreak was confirmed in Africa and Asia. After its outbreak in Yap Island (Micronesia) was reported in 2007, this infection spread to South America [5]. The outbreak of Zika virus disease reached a peak early in the spring of 2016. Thereafter, cases of this disease reported from major countries of North/South America and the Caribbean decreased over time. During the period from 2017 to the first half of 2018, transmission of Zika virus became interrupted in several islands [6].

The WHO reported the countries/territories with Zika virus transmission (as of June 2019) as illustrated in the figure below.

Countries and territories with current or previous Zika virus transmission - 5 June 2019



(Source：WHO)

Regarding Zika virus disease, few global-scale surveys have been reported after the report on its outbreak status was made in April 2019 by the ECDC (European Centre for Disease Prevention and Control) [6]. The status of this disease outbreak in each area of the world is presented below on the basis of the reports by the ECDC, CDC (Centers for Disease Control, USA), and WHO.

Europe

In April 2021, the ECDC issued a report on the number of cases with Zika virus disease in countries belonging to the EU/EEA (European Union/European Economic Area). During that year, 71 cases of this disease were reported, and 32 cases were confirmed. There were 63 imported cases related to tourism, with South-East Asia being the most frequent region considered the site of infection (27 cases, including 20 cases estimated to have become infected in Thailand). Other than South-East Asia, Central-South America (11 cases), Africa (8 cases), the Caribbean (8 cases), etc., were the sites of infection. As domestic cases, 3 cases of mosquito-borne infection in France, 1 case of sexually transmitted infection, and 1 case of laboratory infection in Germany were confirmed.

The number of cases with Zika virus disease in EU/EEA member countries decreased sharply from the peak recorded in 2016 (2,119 cases) to 274 cases in 2017, 51 cases in 2018, and 71 cases in 2019, probably reflecting alleviation of the epidemic in tourism destination countries [7].

USA

According to the fast-track reports in 2020 from the CDC, USA (the data as of May 25, 2021), 4 cases were reported in the USA, and all of them were imported cases. In addition, 57 cases were reported in the Commonwealth of Puerto Rico, totally consisting of domestic cases caused by mosquito biting [8].

North/South America

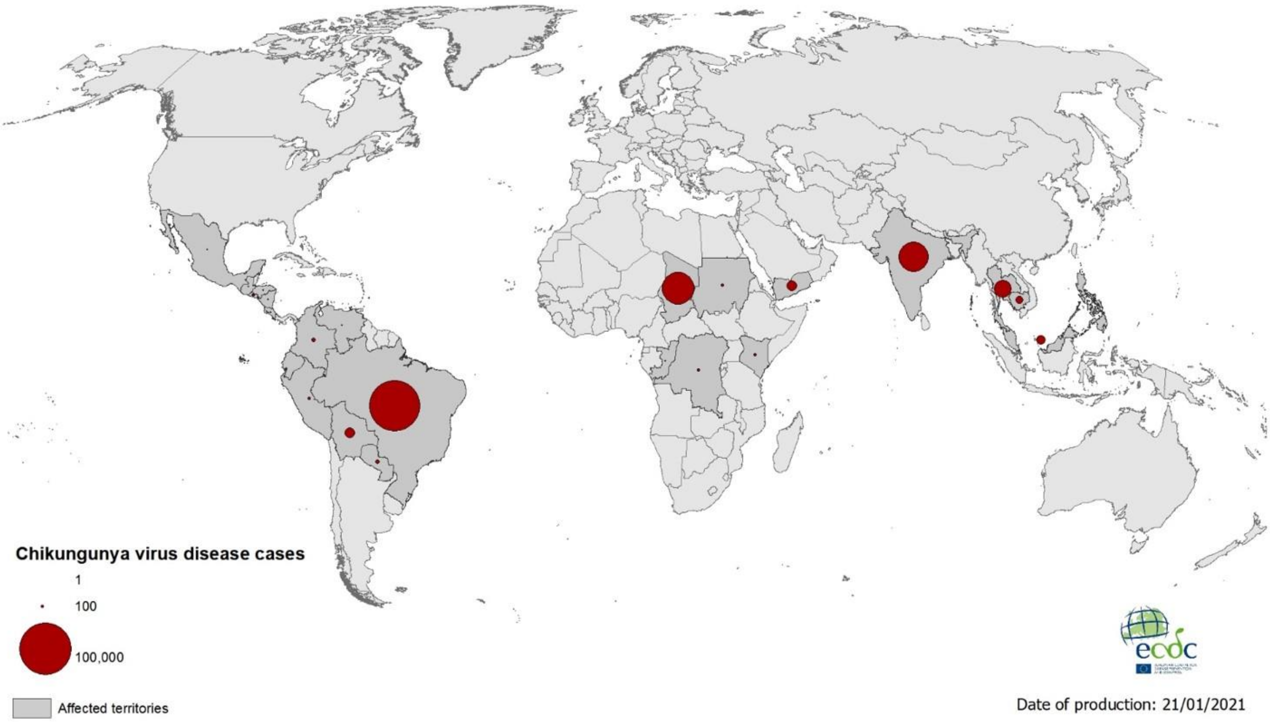
According to the report by PAHO (Pan American Health Organization), there were 2,737 confirmed cases of Zika virus disease in 2020 in North/South America. To review the number of cases reported in the past three years, the number of cases increased markedly from 3,598 cases in 2018 to 6,954 cases in 2019, but it decreased sharply in 2020. When analyzed by country, Brazil accounted for 97% of all cases, recording 2,644 cases. Other than these cases, 47 and 20 cases were confirmed in Puerto Rico and Mexico, respectively [9].

Chikungunya fever

Chikungunya fever resembles dengue fever and Zika virus disease in terms of clinical symptoms and is often misdiagnosed as these diseases. It primarily develops in Africa, Asia, and the Indian Subcontinent.

The distribution of Chinkungunya fever cases in the world in 2020 reported by the ECDC is graphically represented below. The number of cases remained largest in Brazil, and a large increase in the number was recorded in India and Chad (Africa) during 2020. The number of cases was large also in Bolivia, Yemen, Cambodia, and Malaysia.

Geographical distribution of chikungunya virus disease cases reported worldwide, 2020



（Source：ECDC）

The status of Chikungunya disease outbreak in each area of the world in 2020 is described below, with reference to the ECDC Report for the 51st Week of 2020 and the reports from the CDC and PAHO.

Europe

In 2020, no domestic outbreak of the disease was reported from any EU/EEA member country. Since 2017, no domestic case has been reported from EU/EEA countries [10].

USA

According to the fast-track report by the CDC for the year 2020 (as of May 25, 2021), 28 imported cases and 1 case of laboratory transmission were reported in the USA. No outbreak was reported from any overseas USA territory [11].

North/South America

According to the PAHO report, the number of cases was largest in Brazil (98,177 cases, including 39,461 confirmed cases). Other than these cases, reports are available on 1,560 cases from Bolivia (54 confirmed cases), 819 cases from Guatemala (316 confirmed cases), 138 cases from Peru (80 confirmed cases), and so on [12].

Asia

There were 32,287 cases (5,159 confirmed cases) in India and 10,849 cases in a total of 72 Thai provinces [10].

Africa

There were 248 cases (including one death) reported from Sudan [10]. According to the WHO report, 27,540 cases (including one death) were reported between July and September from Chad [13]. There were 38,386 cases according to the report from the WHO Regional Office for Africa for the 51st week of 2020 [14].

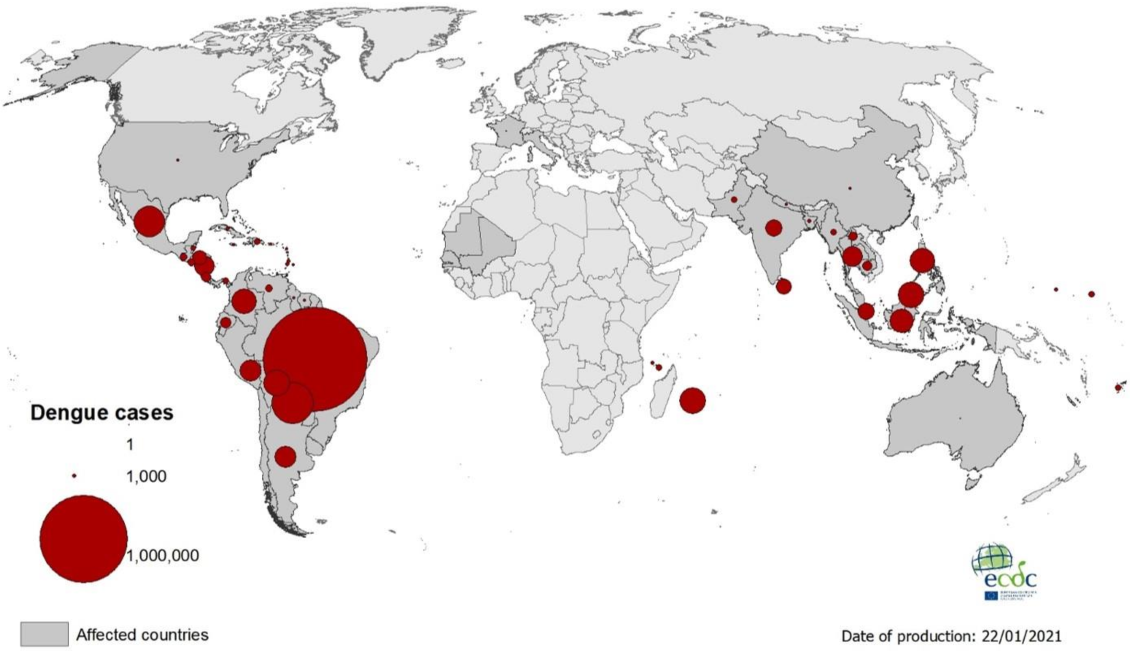
Oceania

No outbreak was reported from Oceania in 2020, identical to the data in 2019 [10].

Dengue fever

The distribution of dengue fever cases in 2020 in the world has been reported by the ECDC as illustrated below.

Geographical distribution of dengue cases reported worldwide, 2020



(Source：ECDC)

Dengue fever outbreaks were reported from Africa, Asia, and Oceania. The number of cases was particularly large in Brazil, Paraguay, Mexico, Vietnam, and Malaysia [10].

The status of the dengue fever outbreak in each area of the world in 2020 is described below, with reference to the ECDC Report for the 51st Week of 2020 and the reports from the CDC and PAHO.

Europe

Among EU/EEA member countries, 12 and 10 domestic cases of dengue fever were reported from France and Italy, respectively [10].

USA

According to the fast-track report by the CDC for the year 2020 (as of February 3, 2021), there were 252 imported cases and 80 domestic cases reported in the USA. Cases reported from overseas USA territories included 2 imported cases and 756 domestic cases in Puerto Rico and 2 domestic cases in Guam [15].

North/South America and the Caribbean

According to the PAHO report, there were 2,300,564 cases (including suspected cases) reported from North/South America. The number of cases in 2020 was 27% smaller than that in 2019. Countries reporting many cases included Brazil (1,467,142 cases), Paraguay (223,782 cases), Mexico (120,639 cases), Bolivia (85,326 cases), Columbia (78,979 cases), and so on [16].

The epidemic of this disease was reported from Guadeloupe, Saint-Martin, Saint-Barthélemy, and Martinique of the French Antilles facing the Caribbean Sea [10].

Asia

Reports are available on 98,372 cases from Vietnam (as of October 25), 84,688 cases from Malaysia (as of November 15) and 74,699 cases from the Philippines (as of October 31). In each of these countries, the number of cases decreased from that reported in 2019. Other than these countries, Thailand, Singapore, India, Sri Lanka, etc. had a relatively large number of cases [10].

Africa

The WHO Regional Office for Africa reported 8 sporadic cases of this disease (7 cases from Mauritania and 1 case from Senegal).

From the French territory Réunion Island, 16,050 cases (all confirmed) were reported as of December 15. The epidemic of this disease has not subsided on this island where 18,206 cases (confirmed) were reported by around the same date of the previous year (2019). From Mayotte Island, 4,305 cases were reported as of December 10, with the number of cases decreasing sharpy from June onward [10].

Oceania

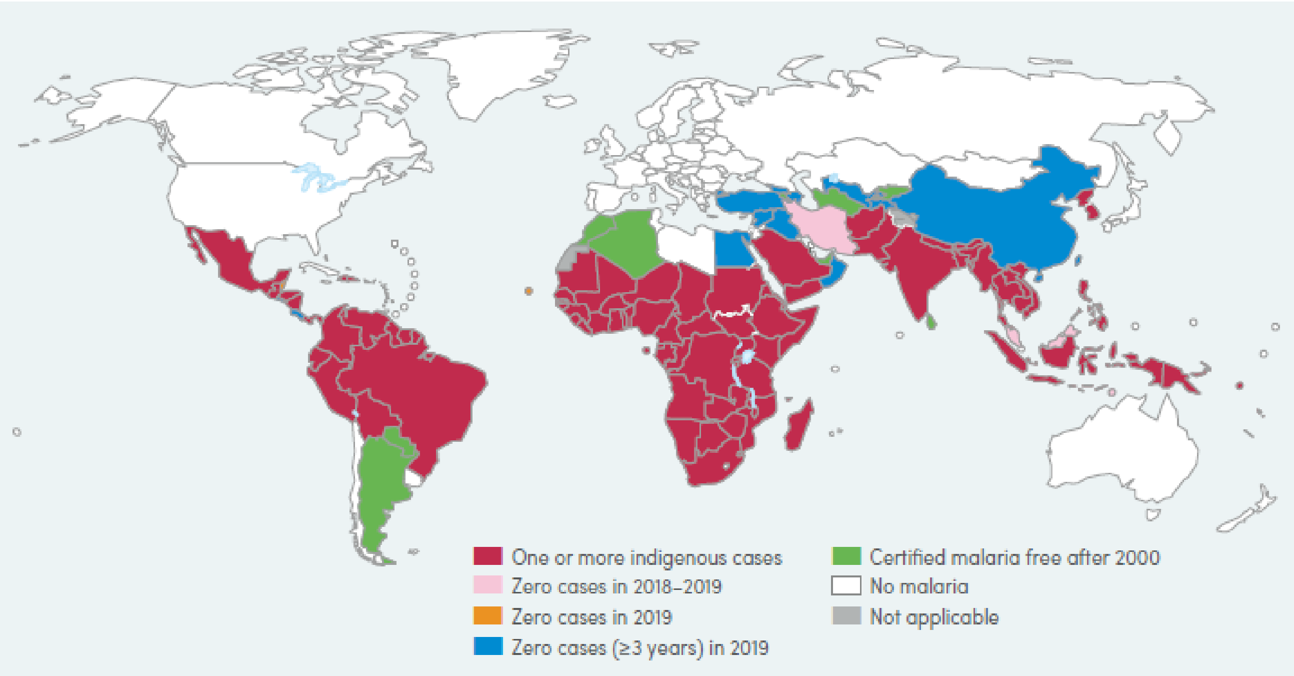
From Australia, 220 cases were reported (as of December 17), recording a marked decrease compared to the number recorded by around the same date of the previous year. The number of cases was small (58 cases) in New Caledonia. From Marshall Islands, 3,865 cases were reported between May 2019 (start of the epidemic) and December 9, 2020 [10].

Malaria

Few global-scale survey reports are available concerning the status of malaria outbreaks in 2020. So, the status of malaria outbreaks in each area of the world will be described below on the basis of survey results covering the period until 2019, contained in the WORLD MALARIA REPORT 2020 which summarized the data from each regional office of the WHO [17].

Countries having recorded no indigenous case of malaria for at least 3 consecutive years were rated as malaria-eradicated countries by the WHO. In 2018, China and El Salvador reported the absence of indigenous malaria cases for 3 consecutive years and were thus judged as malaria-eradicated countries by the WHO. In addition, Iran, Malaysia, and East Timor reported the absence of indigenous malaria cases in 2018 and 2019 (see the figure below).

Countries with indigenous cases in 2000 and their status by 2019



(Source：WHO WORLD MALARIA REPORT 2020)

The total number of cases with malaria in 87 countries of the world in 2019 is estimated at 229 million, with 51% of all cases being accounted for by 5 countries, i.e., Nigeria (27%), the Democratic Republic of the Congo (12%), Uganda (5%), Mozambique (4%), and Niger (3%). The number of cases in Africa is estimated at 215 million, accounting for 94% of all cases in the world.

Africa

The number of malaria cases in West Africa is estimated at 112.1 million, consisting mostly of *Plasmodium falciparum* (*P. falciparum*) malaria cases. Of all the cases reported in this area, 54% were from Nigeria, 7% from Niger, 7% from Burkina Faso, and 7% from the Coté d'lvoire.

In Central Africa, the number of cases has been estimated at 53.2 million. All of these cases were cases of *P. fal*ciparum malaria. The largest number of cases was recorded by the Democratic Republic of the Congo (54.1%), followed by Angola (14.3%) and Cameroon (12.0%).

The estimated number of cases in the 11 countries of South-East Africa with a high malaria transmission rate (Uganda, Mozambique, Tanzania, Rwanda, Malawi, South Sudan, Kenya, Zambia, Ethiopia. Madagascar, and Zimbabwe) has been reported to be 50 million. Most of these cases were cases of *P. falciparum* malaria, less than 1% were cases of *Plasmodium vivax* (*P. vivax*) malaria. The number of cases was largest in Uganda (23.2%), followed by Mozambique (18.7%) and Tanzania (12.9%).

The estimated number of cases in the 6 countries of South-East Africa with a low malaria transmission rate (Eritrea, the Union of Comoros, Namibia, South Africa, Botswana, and Eswatini) has been reported to be 224,900. Of the cases, 96% were cases of *P. falciparum* malaria, 4% were cases of *P. vivax* malaria, and less than 1% were cases of other types of malaria. The number of cases was largest in Eritrea (89.1%), followed by the Union of Comoros (6.8%), Namibia (2.5%), and South Africa (1.4%).

Americas

The number of cases has been estimated at 889,000. Of these cases, 76% were cases of *P. vivax* malaria, 25% were cases of *P. falciparum* and mixed malaria, and less than 1% were cases of other types of malaria. Most of these cases were reported from Venezuela (53%), Brazil (20%), and Columbia (13%).

Eastern Mediterranean

The number of cases has been estimated at 5.2 million. Of these cases, 73% were cases of *P. falciparum* malaria, 27% were cases of *P. vivax* malaria, and less than 1% were cases of other types. The number of cases was largest in Sudan (46%), followed by Yemen (17%), Somalia (14%), and Pakistan (14%).

South-East Asia

The number of cases has been estimated at 6.3 million. Of all cases, 53% were cases of *P. falciparum* and mixed malaria, 46% were cases of *P. vivax* malaria, and less than 1% were other types of malaria. The number of cases was largest in India (87.9%), followed by Indonesia (10.4%).

Western Pacific

The number of cases has been estimated at 1.7 million. Of these cases, 68% were cases of *P. falciparum* and mixed malaria, 32% were cases of *P. vivax* malaria, and less than 1% were cases of other types of malaria. The number of cases was largest in Papua New Guinea (78.9%), followed by Cambodia (8.1%).

Europe

No indigenous case of malaria has been reported since 2015.

As cases of malaria found in Europe in 2020, the ECDC reported 2 patients who died from malaria in October 2020 in the communities near the airport in Belgium (Brussels International Airport in one case and Melsbroek Airport in the other case). Both patients had no history of foreign travel and it was considered very likely that both cases became infected via the vector mosquitoes carried by airplanes from malaria endemic countries [18].

Others

In October, the WHO reported the detection of 13 cases (confirmed cases) of Mayaro fever (a mosquito-borne disease although not classified as an infectious disease covered by the quarantine system in Japan) in French Guiana along the north-eastern coast of South America [19]. Mayaro fever is transmitted by mosquitoes of the genus *Haemagogus* in the moisture-rich tropical rain forest of South America [20].

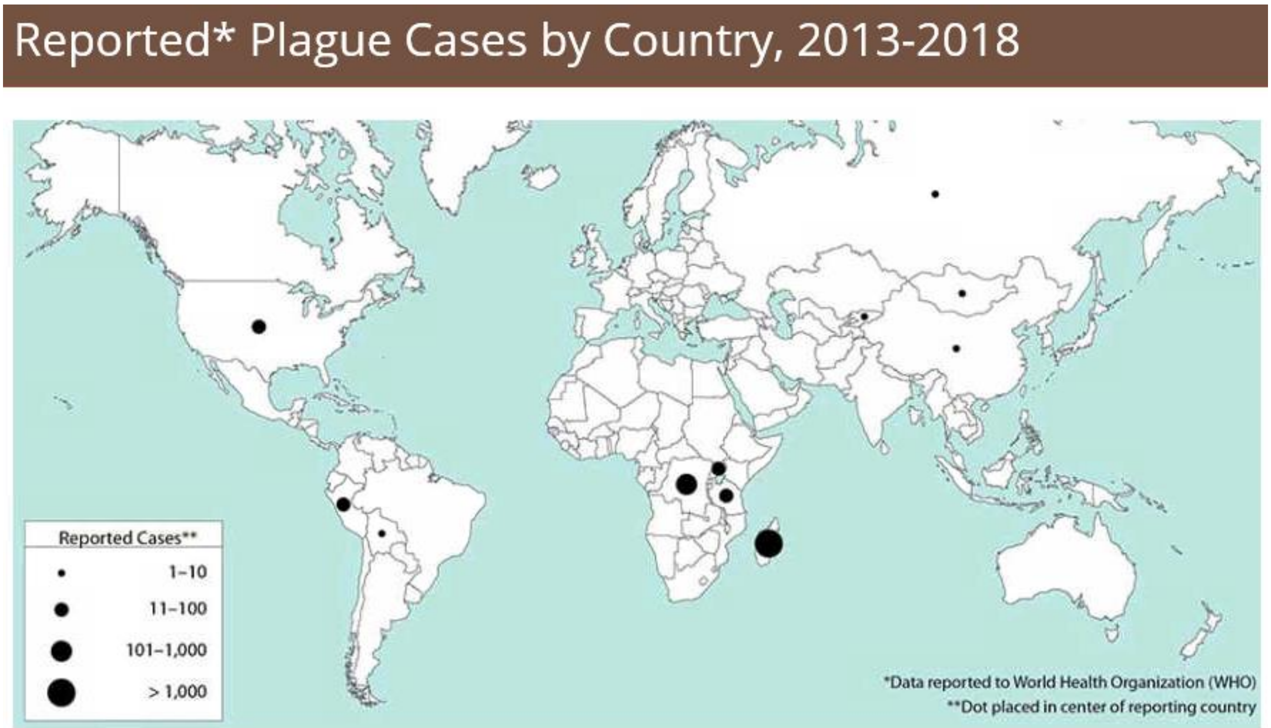
2.2 Rodent-borne diseases

Plague

Plague epidemics have occurred in Africa, Asia, and South America. Most cases of this disease after 1990 broke out in Africa. At present, plague is most prevalent in three countries (Madagascar, the Democratic Republic of the Congo, and Peru) [21]. The global distribution of plague cases between 2013 and 2018 has been reported by the CDC as graphically represented below.

Regarding the plague outbreak in 2020, the WHO reported that the health zone of Rethy in the Ituri Province of the Democratic Republic of the Congo saw an upsurge of plague cases since June 2020 [22].

According to the Week 51 Bulletin of the WHO Regional Office for Africa, 124 cases of plague (including 17 deaths) were reported in 2020 from this area [14].



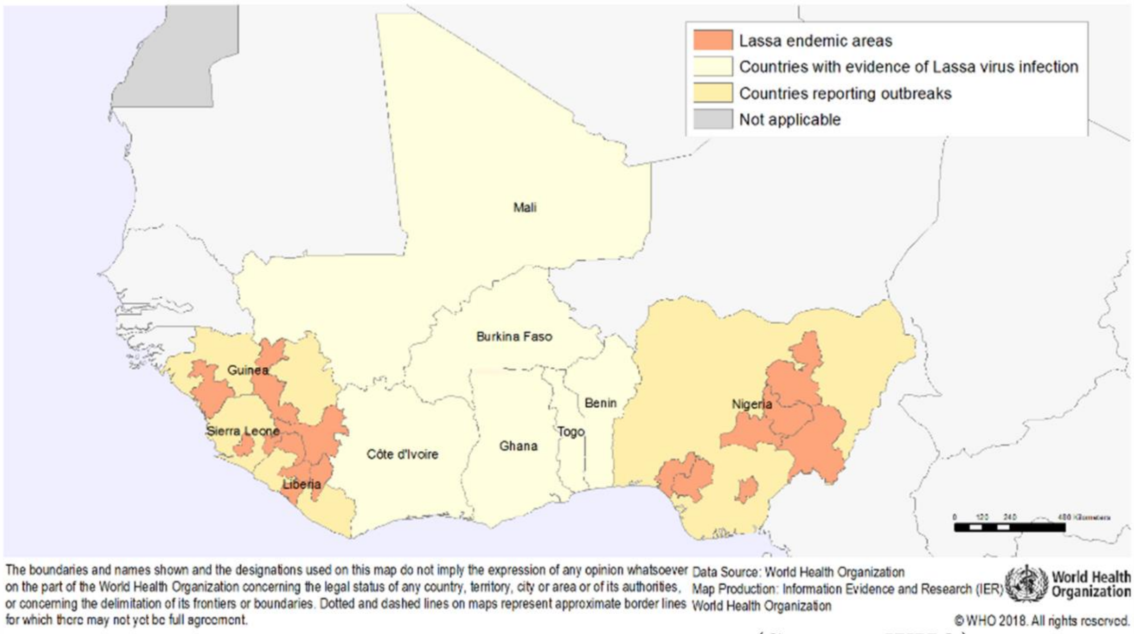
（Source：CDC（prepared on the basis of the WHO report data））

Lassa fever

Lassa fever is known to be endemic in Benin, Ghana, Guinea, Liberia, Mali, Sierra Leone, and Nigeria, but probably exists in other West African countries as well [23].

The WHO reported the below-shown geographic distribution of Lassa fever in West Africa.

Geographic distribution of Lassa fever in West African affected countries, 1969－2018



（Source：WHO）

Regarding the outbreak of this disease in 2020, the WHO reported that there were 472 cases of the disease (confirmed cases) in Nigeria between January 1 and February 9, resulting in 70 deaths. The epidemic of Lassa fever in Nigeria usually reaches a peak during the dry season (December to April) each year [24].

According to the 53rd week report of the NCDC (Nigeria Centre for Disease Control), there were 1,189 cases (confirmed cases) of Lassa fever in Nigeria during 2020, including 244 deaths (20.5%). The disease affected 27 states of the country, with 75% of all cases reported from the states Ondo (36%), Edo (32%), and Ebonyi (7%) [25].

Regarding the outbreak of this disease in other African countries, the Week 51 Bulletin of the WHO Regional Office for Africa reported 51 cases (22 deaths) from Liberia and 1 case (1 death) from Guinea [14].

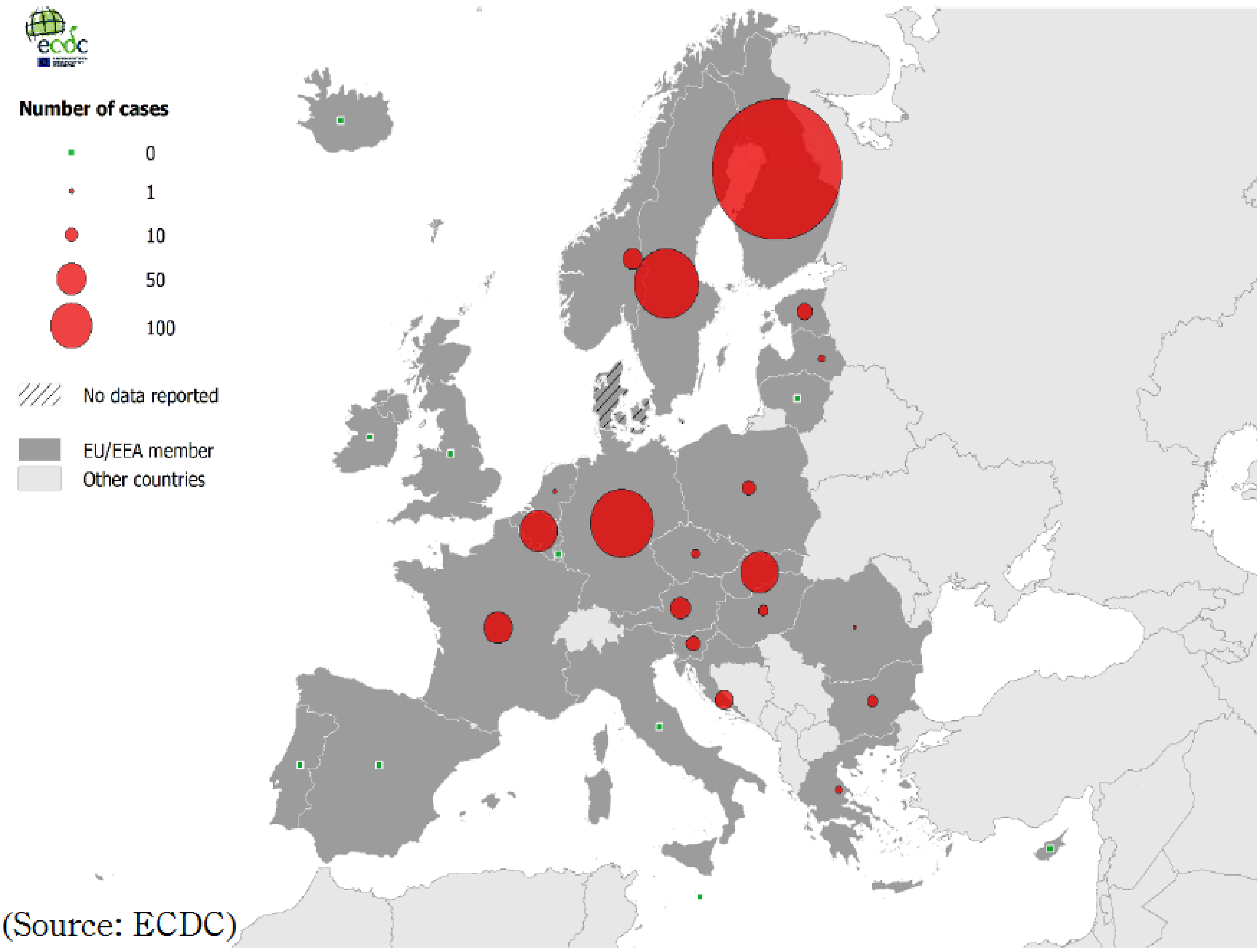
HFRS (Haemorrhagic Fever with Renal Syndrome)

HFRS is prevalent across the Eurasia Continent, primarily affecting the Far East Region (China, tens of thousands of cases/year) and Central/East Europe (thousands of cases/year) [26].

Regarding the outbreak of this disease in Europe, our report for the last year cited the ECDC survey results covering the period from 2014 to 2018. The present report describes the status of its outbreak in 2019 on the basis of ECDC reports.

The figure below represents the distribution of HRFS cases by country.

Distribution of Hantavirus Infection cases by country, EU/EEA, 2019



(Source: ECDC)

In 2019, there were 4,046 cases reported from 29 countries, including 4,203 confirmed cases (99.4%). The incidence of this disease was 0.8 per 100,000 population, comparable to the incidence recorded in 2017 (highest incidence during the past 5 years).

Of all cases, 69% were reported from two countries, i.e., Germany (1,534 cases) and Finland (1,256 cases). The incidence per 100,000 cases was highest in Finland (22.8/100,000 population).

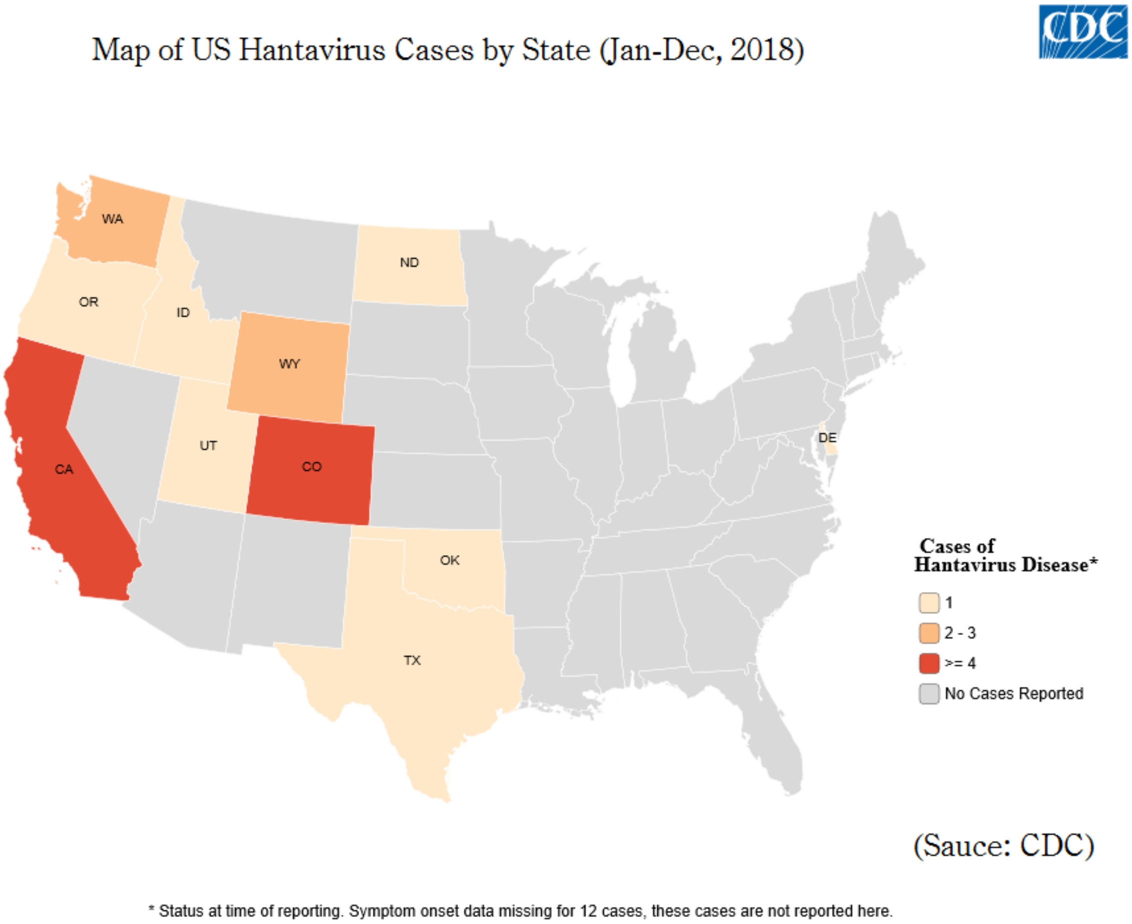
The pathogen most frequently identified was Puumala virus (PUUV), which was shown to be responsible for 1,935 (97.5%) of the 1,984 cases confirmed at the laboratory level. After this virus, the following viruses were identified frequently: Dobrava virus (DOBV) in 27 cases, Hantaan virus (HTNV) in 21 cases (all reported from Slovakia), and Andes orthohantavirus (ANDV) in 1 case (Austria). Saaremaa virus (SAAV) was not identified as a pathogen in any case.

Reports of HFRS cases from individual countries were made throughout the year, reaching a peak in May through August. The summer peak of HFRS outbreak is consistent with the increased exposure of urban inhabitants to the virus during the summer vacation. In North European countries, the peak is reached in November and December. This finding typical to this region is attributable to the increased frequency of contact with infected rodents in rural areas [27].

HPS (Hantavirus Pulmonary Syndrome)

To date, disease outbreaks have been reported from the USA, Canada, and South America (Argentine, Chile, Paraguay, Bolivia, and Panama) [26].

Because few global surveys have recently been reported, this report will describe the status in the USA in 2018 reported by the CDC. Since 1993, CDC has been continuing the survey, reporting cases of this disease every year. The number of cases was largest in 1993 (48 cases) and smallest in 2001 (11 cases). In 2018, 23 cases were reported, including 5 cases each in Colorado and California [28] (see the figure below).



(Sauce: CDC)

3 Outline of vector surveillance conducted (2020)

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 wireless quarantine ports were excluded from the surveillance).

Quarantine Seaports: 88

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), 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, Kochi Port, Kanmon Port, Hakata Port, Miike Port, Karatsu Port, Imari Port, Sasebo Port, Nagasaki Port, Hitakatu Port, Izuhara Port, Oita Port, Saganoseki Port, Saeki Port, Minamata Port, Yatsushiro Port, Misumi Port, Hososhima Port, Shibushi Port, Kagoshima Port, Kiire 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 Airport, Tokyo International Airport, Hyakuri Airport (Ibaraki Airport), Niigata Airport, Toyama Airport, Komatsu Airport, Chubu Centrair International Airport, Shizuoka Airport, Kansai International Airport, Okayama Airport, Hiroshima 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: 117 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, 2020

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 (2020)

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 surveillance was conducted in accordance with the manual, checking mosquitoes (invading via aircraft arriving from overseas) visually and with the use of insect trap nets at 8 airports covering the 82 aircraft (1,099 aircraft in 2019) involved in the 23 routes of air transportation to/from 18 countries (2019: at 27 airports of 100 routes to/from 33 countries).

The aircraft investigated arrived most frequently from Singapore and Thailand (13 aircraft each), followed by Taiwan (11), China (10), the Philippines (9), Hong Kong (5), Vietnam (5), the USA (4), Australia (3), Guam (2), the United Arab Emirates (2), Korea (2), Indonesia (1), Mexico (1), and Nepal (1). Thus, the aircraft investigated often arrived from Asian countries. When analyzed by the region, South-East Asia (57 aircraft) and East Asia (12 aircraft) were predominant, accounting for 69 aircraft (84.1%) in total, followed by North America (5 aircraft), Oceania (3), the Middle East (2), Southern Pacific (2), and South Asia (1). Three mosquitoes were captured in total from 3 aircraft (3.7%) of 3 routes from 3 countries (2019: 19 mosquitoes from 13 aircraft (1.2%) of 10 routes from 9 countries) among all the aircraft investigated (Table 3, 4-1, 4-2).

The route of air flight (the last airport before arrival at Japan) recording the highest capture rate was Gimpo International Airport of Korea (1 of 1 aircraft), followed by Mexico City International Airport of Mexico (1 of 1 aircraft), and Tan Son Nhat International Airport of

Vietnam (1 of 3 aircraft) (Table 1, 4-2, Fig. 2).

The species of mosquitos captured included *Culex pipiens quinquefasciatus* (a dominant species transmitting West Nile fever) (1 mosquito captured from 1 aircraft; 3 mosquitoes captured from 3 aircraft in 2019) with the last airport before arrival at Japan being Tan Son Nhat International Airport, and *Culex pipiens* complex (another dominant species transmitting West Nile fever) (3 mosquitos captured from 5 aircraft) with the last airport before arrival at Japan being Gimpo International Airport (Korea). In addition, one mosquito of genus *Culex* was captured from 1 aircraft arriving from Mexico City International Airport (Mexico).

When the captured mosquitoes were checked for pathogens (flavivirus), all were negative (Table 3, 4-2).

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”).

The adult mosquito survey was conducted at 945 survey areas (2019: 1,925 survey areas) of 113 ports (85 seaports and 28 airports) (2019: 112 ports, consisting of 92 seaports and 30 airports). Mosquitoes were captured at 86.8% of 98 ports, i.e., at 74 seaports (87.1%) (2019: 83 seaports (90.2%)) and 24 airports (85.7%) (2019: 29 airports (96.7%)).

As a result, 9,605 mosquitoes of 21 species (6 genuses) and unidentified species were captured (2019: 23,469 mosquitoes of 27 species (7 genuses)). Of these captured mosquitoes, 9,573 mosquitoes (99.7%) of 14 species (4 genuses) were species transmitting mosquito-borne infectious disease (dominant species, secondary species and unignorable species) (2019: 23,339 mosquitoes (98.4%) of 15 species (4 genuses)).

Similar to the finding from the previous year, there was no invasion by *Aedes aegypti* in 2020 (Table 5-1 through -3).

The larval mosquito survey was conducted at 849 survey areas of 102 ports (77 seaports and 25 airports) (2019: 1,897 survey areas of 122 ports, consisting of 92 seaports and 30 airports). As a result, live larvae were detected at 71 ports (69.6%) consisting of 54 seaports (70.1%) and 17 airports (68.0%) (2019: 108 ports (88.5%) consisting of 78 seaports (84.8%) and 30 airports (100%)).

The live larvae detected were of 18 species (7 genuses) and unidentified genuses (2019: 24 species of 8 genuses and unidentified species), including 12 species (2 genuses) known as transmitting mosquito-borne infectious disease (2019: 10 species of 4 genuses) (Table 6-1 through -3).

The adult mosquito survey or the larval mosquito survey revealed live mosquitoes at 100

(87.7%) of the 114 ports examined (2019: 117 (95.9%) of the 122 ports examined).

When the distribution of vector species was analyzed by mosquito-borne infectious disease, the adults or larvae of *Aedes albopictus*, a dominant species transmitting Zika virus disease and Chikungunya fever and having colonized in Japan, were detected at 74 ports (seaports and airports) (64.9%) excluding those in Hokkaido (2019: 91 ports (74.6%)). Adults (3,180 mosquitoes) accounted for 33.1% of all mosquitoes captured (2019: 4,029 adults (17.2%) (Table 5-1 through -3, Fig. 3).

As far as dengue fever is concerned, larvae or adults of *Aedes albopictus* (a dominant species transmitting this disease) were detected extensively, excluding the seaports and airports in Hokkaido. In addition, the adults or larvae of *Aedes dorsalis*, *Aedes flavopictus*, and *Culex tritaeniorhynchus*, which are unignorable species serving as vectors for this disease, were detected in 84 ports (73.7%) (2019: 72 ports: 59.0%) (Table 5-1 through -3, Fig. 4).

Regarding malaria, adults or larvae of *Anopheles sinensis* (a dominant species serving as the vector for *P. vivax* malaria) were detected at 12 ports (10.5%) (2019: 11 ports (12.3%)), with the number of adults captured being as small as 20 (0.2%) on the whole. In addition, one mosquito of the secondary species *Anopheles sineroides* was detected at New Chitose Airport (Table 5-1 through -3, Fig. 5).

As for West Nile fever, the adults or larvae of its dominant vector *Culex pipiens* were detected at 87 ports (76.3%) (2019: 107 ports (87.7%). At these ports, 464 adults of *Culex pipiens fatigans* and 4,553 adults of *Culex pipiens pallens* (subspecies not identified) were captured (5,017 adults of *Culex pipiens* in total, accounting for 52.8% of all mosquitoes captured: 52.6% in 2019). Species of mosquito serving as vectors for West Nile fever (dominant and secondary species) were captured at 100 ports, and their presence was detected in 87.7% of all ports (2019: 117 ports (95.9%)). Many of these mosquitoes belonged to *Culex* sp. and were widely distributed from Hokkaido to Okinawa Prefecture (Table 5-1 through -3, Fig. 6).

Regarding Japanese encephalitis, adults or larvae of *Culex tritaeniorhynchus* and *Culex pseudovishnui*, which are dominant vectors for this disease, were detected at 52 ports (45.6%) in and south of Miyako City (Iwate Prefecture) (2019: 73 ports (59.8%)). The adults captured were 1,100 adults of *Culex tritaeniorhynchus* and 7 adults of *Culex pseudovishnui*, accounting for 11.5% of all mosquitoes captured. In addition, adults or larvae of *Aedes albopictus*, *Aedes japonicuse*, *Aedes togoi*, *Culex pipiens fatigans*, *Culex bitaeniorhynchus*, and *Culex pipiens pallens* were detected at 84 ports (73.7%) (2019: 72 ports (59.0%)) (Table 5-1 through -3, Fig. 7).

When 9,288 of the 9,605 adult mosquitoes captured during the survey were checked for pathogens for quarantine infectious diseases or the like (924 pooled samples for flavivirus, 232 pooled samples for Chikungunya virus and 12 pooled samples for *P. falciparum*), a common gene for flavivirus was detected from the one pooled sample captured at the Sakaide Satellite Office. The subsequent genetic analysis confirmed a gene of Japanese encephalitis virus, but the virus itself was not isolated. The other samples tested negative (Table 5-1 through -3).

4.2 Investigation of rodents

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 507 survey areas (2019: 1,021 survey areas) of 108 ports consisting of 82 seaports and 26 airports (2019: 122 ports consisting of 92 seaports and 30 airports).

Rodents were captured at 69 ports (63.9%) consisting of 52 seaports and 17 airports (2019: 83 ports (68.0%) consisting of 58 seaports and 25 airports). In total, 257 rodents of 7 species (5 genuses) and unidentified genus were captured (2019: 690 rodents of 10 species (8 genuses) and unidentified genus), with the captured number largest for *Rattus norvegicus* (83), followed by *Mus musculus* (67), *Rattus rattus* (43), *Apodemus speciosus* (26), and *Microtus montebelli* (18).

The number of rodents captured per survey area was 0.51 (2019: 0.68), with the largest number recorded at Wakkanai Port and Rumoi Port (7 rodents each), followed by Muroran Port (6 rodents). The total number of rodents captured per port was largest at Ishinomaki Port (19 rodents) (Table 7-1 through -3).

As far as parasitic fleas are concerned, 15 *Nosopsyllus fasciatus* (secondary species serving as the plague vector) were captured. Other than these fleas, fleas of 3 species not involved in the transmission of quarantine infectious diseases or the like were captured, including *Leptosylla segnis* (6), *Ctenophthalmus Kolenati* (4), and *C.congener truscus* (1) (Table 7-1 through -3, Fig. 8).

Of all rodent-borne infectious diseases, plague is known to be transmitted by all species of rodent, including secondary species. In total, 257 rodents of 7 species (5 genuses) were captured at 69 ports (63.9%), indicating their wide distribution in port areas in Japan. In addition, *Nosopsyllus fasciatus* (a secondary species possibly serving as a plague vector although not a dominant species) was captured at Tomakomai Port (3 fleas), Muroran Port (4), Ohfunato Port (5), Ishinomaki Port (1), and Aomori Airport (2). Furthermore, three other species of flea not involved in the transmission of quarantine infectious diseases or the like were captured, including *Leptosylla segnis* (1 at Miike Port), *Ctenophthalmus Kolenati* (1 at Sakata Port and 3 at Aomori Airport) and *C.congener truscus* (1 at Sendai Shiogama Port).

Of all captured rodents, 232 were checked for plague pathogens (the *Yersinia pestis* specific antibody test), and all of them tested negative.

As far as HFRS is concerned, two species of rodent serving as secondary species transmitting this disease, i.e., Rattus norvegicus and Rattus rattus, were captured at 39 ports (56.5%). When 222 rodents of these species were checked for HRBS pathogens (HFRS virus specific antibody test), all tested negative (Table 7-1 through -3, Fig. 9).

No species known to transmit South American hemorrhagic fever, Lassa fever or HPS was captured (Table 7-1 through -3).

5 Risk assessment of vector- borne diseases at airports and seaports (2020)

5.1 Mosquito-borne diseases

In the surveillance of aircraft in 3 routes from 3 countries, 3 mosquitoes were captured from 3 aircraft (3.8%) (2019: 19 mosquitoes from 13 aircraft (1.2%) in 10 routes from 9 countries) (Table 3,4-1, 4-2).

The mosquitoes captured consist of *Culex pipiens quinquefasciatus* and *Culex pipiens* complex (dominant species transmitting West Nile fever) captured in aircraft arriving from Vietnam and Korea and mosquitoes of genus *Culex* sp. (species not identified) captured in aircraft arriving from Mexico.

Thus, the entire capture rate during this surveillance was low (3.7%), but the results confirmed the presence of the risk for the aircraft-mediated invasion of vector mosquitoes.

In the surveillance of the Cabinet Order-specified areas, adult mosquitoes were captured in 98 (86.7%) of the 113 survey areas, with the percentage of species transmitting the mosquito-borne infectious diseases being 99.7%. In the larval mosquito surveillance, larvae were captured in 71 (69.6%) of the 102 survey areas, and many of these larvae were of the species known to transmit mosquito-borne infectious diseases.

From the results of the surveillance conducted at each quarantine seaport/airport in accordance with the "Guide to Sanitation Control," the risk of outbreaks of quarantine infectious diseases or the like (Grade A through D) was rated using the criteria given below. The risk of disease outbreaks was rated for each month surveyed, and the highest risk during a given year was adopted as the rating for that year.

A (very low): No vector mosquito (dominant, secondary, or unignorable 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 (dominant, secondary, or unignorable 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 (dominant 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 (dominant, secondary, or unignorable 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.

Regarding the risk of outbreaks of dengue fever, 31 ports (27.2%) were rated Grade A (very low) and 83 ports (72.8%) were rated Grade B (low). No quarantine seaport or airport was rated Grade C (moderate) or D (high), because there was no quarantine seaport or airport where any exogenous vector mosquito (dominant species) was captured or any pathogen was detected from the captured mosquitoes.

Regarding the risk of outbreaks of Zika virus disease or Chikungunya fever, 40 ports (35.1%) were rated Grade A (very low) and 74 ports (64.9%) were rated Grade B (low), while no port was rated Grade C (moderate) or D (high).

Regarding the risk of outbreaks of malaria, 102 ports (89.5%) were rated Grade A (very low) and 12 ports (10.5%) B (low), while no port was rated Grade C (moderate) or D (high).

Regarding the risk of outbreaks of West Nile fever, 14 ports (12.3%) were rated Grade A (very low) and 100 ports (87.7%) B, while no port was rated Grade C (moderate) or D (high).

Regarding the risk of outbreak for Japanese encephalitis, 22 ports (19.3%) were rated Grade A (very low) and 91 ports (79.8%) B. No port was rated Grade C (moderate). The risk was rated D (high) for 1 port (0.9%) where the surveillance by the Sakaide Branch Office captured *Culex pipiens* complex possessing the gene for Japanese encephalitis virus (Table 8).。

5.2 Rodent-borne diseases

The rodent surveillance revealed the presence of live rodents at 69 ports (63.9%) (2019: 83 ports (68.0%)), with the number of rodents captured being 257 (2019: 690). Many of the rodents captured were house rats. The number of rodents captured per survey area was 0.51, slightly smaller than the number recorded in the previous year (0.68).

The number of fleas captured was 26, smaller than the number in the previous year (28), but the percentage of the number of fleas relative to the number of rodents was 10.1%, higher than the percentage recorded in the previous year (4.1%).

Like in the previous year, no *Xenopsylla cheopis* (dominant species serving as a plague vector) was captured.

In the permanent surveillance, no species of flea known as a vector of South American hemorrhagic fever, Lassa fever, or HPS was captured.

When 232 and 222 of the captured rodents were checked for plague pathogens and HFRS pathogens, respectively, all tested negative.

As in the mosquito surveillance, the risk of outbreaks of quarantine infectious diseases or the like was rated (Grade A through D) on the basis of the surveillance results, using the criteria given below.

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

B (low): Indigenous rodents (dominant or secondary species) or fleas/mites (dominant 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 (dominant species) or fleas/mites (dominant 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 (dominant or secondary species) or fleas/mites known to transmit quarantine infectious diseases or the like (dominant or secondary species) captured during the permanent surveillance, etc. in the Cabinet Order-specified areas.

Regarding the risk of outbreaks of plague, 39 ports (36.1%) were rated Grade A (very low) and 69 ports (63.9%) Grade B (low), while no port was rated Grade C (moderate) or D (high). Regarding the risk of outbreaks of HFRS, 69 ports (63.9%) were rated Grade A (very low) and 39 ports (36.1%) Grade B (low), while no port was rated Grade C (moderate) or D (high). The risk of outbreaks of South American hemorrhagic fever, Lassa fever, and HPS was rated Grade A for all ports (Table 8).

5.3 Discussion

In 2020, restriction of the entry of foreigners into Japan and some other measures were taken within the framework of border control measures against COVID-19 infection. As a result, the number of international passenger flights arriving at Japan decreased from the level in 2019, and the decrease was particularly large at local airports. Furthermore, since February, because of the need to reinforce the airport quarantine measures, the quarantine offices were obliged to reduce the scale of port sanitation surveillance. It was thus difficult to conduct vector surveillance at the level of previous years in all aspects of the surveillance (aircraft, mosquito, and rodent surveys). The number of surveys conducted in 2020 was markedly smaller than before. When a surveillance plan is devised for a given year, the frequency of survey is set on the basis of the risk factors such as the number of aircraft having arrived during the preceding year. It is plausible to imagine that the actual risk at airports in 2020 was lower than the level anticipated at the time of planning because of the decrease in the number of arriving aircraft. If any event markedly modifying the risk factors has arisen, like the COVID-19 pandemic experienced this time, it is advisable to review the planned survey frequency and to modify the survey method into a more efficient one, as needed.

The number of cases with quarantine infectious diseases or the like detected in Japan during 2020 was smaller than that during 2019 under the influence of reinforced border control measures related to COVID-19 infection, the self-restraint of overseas travel by people, and so on.

In the majority of dengue fever endemic countries, movements of people inside and beyond the border were restricted under the influence of the COVID-19 pandemic, resulting in a decrease in the number of dengue fever patients in South-East Asian countries except for Singapore [29] and a definitely lower risk for invasion of the pathogen into these countries via the people infected overseas with dengue virus [2]. In 2021, however, the Tokyo Olympic/Paralympic Games are scheduled. With anticipation of the flow of a certain number of people and commodities inside and across the border of Japan, it is therefore necessary to conduct efficient surveillance, taking into account the overseas status of epidemics, laying emphasis on suppressing the density of *Aedes albopictus* (a species serving as a vector) colonization at a low level and other measures aimed at preventing domestic outbreak of the disease after completion of the games.

In the mosquito surveillance, no *Aedes aegypti* (an exogenous species serving as a vector) was detected, but this species of mosquito had been detected every year at airports during the period from 2012 to 2017. So, this species requires continued surveillance and close attention from now on.

The gene for the Japanese encephalitis virus was detected from the *Culex tritaeniorhynchus* captured at the Sakaide Port, Kagawa Prefecture. A precaution about the risk for human transmission with this virus had been urged in Kagawa Prefecture on the basis of the Japanese encephalitis epidemic forecast issued in July on the basis of the swine antibody titer data collected by the prefectural government. The gene for the Japanese encephalitis virus was detected also from the same species of mosquito captured at Takamatsu Airport (Kagawa Prefecture) during the surveillance one year ago.

In recent years, about 10 cases of Japanese encephalitis have been reported annually in Japan. In districts where the spread of high activity of the Japanese encephalitis virus is estimated from the status of antibody possession by pigs, it is required to reinforce the linkage among related organizations, promote smooth sharing of information, and urge precautions.

Regarding *Aedes albopictus*, a species whose distribution was expanding toward the northern districts, there was no report of detection in any place north of Aomori Port (the current northern limit of its colonization).

The number of survey areas covered by the rodent surveillance in 2020 was smaller than that in 2019 under the influence of reinforced COVID-19-related quarantine measures, but rodents continued to be detected in areas around many seaports and airports, with the number of rodents captured per survey area differing little from that in 2019. Although there was no report of detection of any significant exogenous species or any rodent possessing a pathogen, it is required to conduct efficient surveillance of rodent distribution and colonization as well as surveillance of invasion by vector animals (parasitic fleas, etc.) and pathogens. To this end, it will be also important to collect information from warehouse companies, container handling offices, administrators of ports accepting foreign ships and so on located in seaport areas.

From one *Apodemus speciosus* captured at Hiroshima Airport, 65 *Haemaphysalis hystricis*, known as a major vector for *Rickettsia japonica* responsible for Japanese spotted fever, were detected. Although ticks (*Ixodides*) had been detected in a small number in previous surveys, no case of parasitism by such a large number of mites had been reported before. When port sanitation surveillance is conducted in districts having patients with Japanese spotted fever during the tick active period (August to October), adequate care is needed to avoid biting by mites.

The table below indicates the locations of detection, estimated places of origin (ports, districts or airports serving as the origin of rodents), and types of commodities carried by the ships/aircraft for 13 cases of rodent invasion from overseas (cases on which detailed reports were available). The data were yielded from the quarantine station's investigation conducted in response to receipt of information about rodents from relevant organizations/enterprises.

In recent years, reports of rodent detection in foreign containers have been filed without interruption, and invasion by pathogens for quarantine infectious diseases or the like via the vector animals through these routes is an issue of concern. It is therefore required to collect relevant information under close linkage to port-related enterprises and parties.

Rodents Estimated to Have Invaded Japan from Overseas: 2020

Month	Place of detection	Species captured	Number	Estimated place of origin (seaport, district or airport of origin)	Commodity type
1	Ocean-going ship container	*Rattus rattus* (dead)	1	Vietnam (Haiphong Port)	Musical instruments
1	Within ship (cargo hold)	*Rattus rattus* (dead)	1	Brazil (Paranagua Port)	Corn
1	Aircraft container	*Mus musculus*	1	Unknown: Arrival from Philippines (Mactan-Cebu International Airport)	(Unknown)
1	Ocean-going ship container	Unidentified (dead)	1	India (Chennai Port)	(Unknown)
3	Ocean-going ship container	Unidentified (dead)	1	USA (Tacoma Port)	Dry hay
5	Ocean-going ship container	*Mus musculus* (dead)	1	Mexico (Manzanillo Port)	Refrigerated pumpkin
8	Ocean-going ship container	Unidentified (dead)	1	USA (Portland Port)	Dry hay
9	Ocean-going ship container	*Mus musculus* (dead)	1	China (Tianjin Port)	Vase
9	Ocean-going ship container	Unidentified (dead)	3	Malaysia (Pasir Gudang Port)	Lumbar
10	Ocean-going ship container	Unidentified (dead)	1	USA (Tacoma Port)	Dry hay
11	Ocean-going ship container	*Mus musculus* (dead)	1	Canada (Toront Port)	Soybean
12	Ocean-going ship container	*Rattus rattus* (dead)	1	Portugal (Lisbon Port)	Drum (containing tomato paste)
12	Ocean-going ship container	*Mus musculus* (dead)	1	China (Xingang Port)	Sesame

Vector surveillance conducted by quarantine stations has been described also as the information related to the featured article about dengue fever and dengue hemorrhagic fever titled "Distribution, Invasion and Colonization of *Aedes aegypti* in Japan" and "Expansion of the *Aedes aegypti* Distributed Area" of the Infectious Agents Surveillance Report (IASR) [30]. It states that *Aedes aegypti* was detected for 6 consecutive years from 2012 during the surveillance at airports, and a countermeasure using insecticides was taken immediately. It additionally states that successful detection of this mosquito species at the border and suppression of its spread from airports to other places within Japan achieved by the vector surveillance program of quarantine stations are remarkable.

Furthermore, the report states that invasion into Aomori Prefecture by *Aedes albopictus* was found for the first time by the quarantine station's vector surveillance.

As described in the IASR article "Risk for Dengue Fever Epidemic and Planned Countermeasures against Vector Mosquitoes in Japan" and the emergency featured article of Medical Entomology and Zoology "Outline of an emergency drill for controlling the mosquito vector of dengue fever held at Shinjuku Gyoen National Garden"[31], the quarantine stations have been participating in the drills and have routinely been taking measures such as drug pooling (because smooth supply of insecticides will be difficult if dengue fever spreads rapidly to an extent requiring extensive control of vector mosquitoes) and conclusion of an agreement with the pest control associations over the pest control activities upon emergency.

We see the necessity of continuing the surveillance of vectors at places serving as the entry point from foreign countries and ensuring the capability of appropriately dealing with emergencies.

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. 68 through 71 (including Extra Issue)). Of these activities, the one involving implementation of sanitation measures (e.g., focused survey) is described below as an example.

[Detection of Japanese encephalitis virus gene from *Culex tritaeniorhynchus* captured during periodical surveillance: Sakaide Port]

Japanese encephalitis virus Type 1 gene was isolated from the captured *Culex tritaeniorhynchus* at Sakaide Port (Kagawa Prefecture) in late July 2020. The virus itself was not isolated although the virus isolation test was conducted.

The Hiroshima Quarantine Station Sakaide Branch Office immediately supplied this information to the related organizations and conducted an urgent survey. The urgent survey lasted until end-October, but no Japanese encephalitis virus gene was isolated from the captured *Culex tritaeniorhynchus*.

In Kagawa Prefecture, Japanese encephalitis virus Type 1 gene had been detected also from the *Culex tritaeniorhynchus* captured at Takamatsu Airport during the previous year's surveillance. Following its detection, the Sakaide Port Sanitation Liaison Council and the Takamatsu Airport Sanitation Liaison Council were organized to reinforce the linkage to relevant organizations. These councils promoted smooth information sharing and urging of preparations with/to the Kagawa Prefectural Government and related organizations.

In Kagawa Prefecture, the prefectural government conducted a survey for the prediction of Japanese encephalitis epidemics based on pig antibody titer data and issued a precaution on the risk for human transmission in July.

The samples from which Japanese encephalitis virus Type 1 gene were isolated were dispatched to the National Institute of Infectious Diseases for base sequence analysis. In 2019, the gene sequence and E protein encoding region were shown to be highly homologous to those of the Japanese encephalitis virus isolated from a patient with Japanese encephalitis in Hiroshima in 2019 (Hu/Hiroshima/NID78/2019), suggesting that these viruses were prevailing in the western districts of Japan in recent years.

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."

8 References

1. MHLW/National Institute of Infectious Diseases. Infectious Diseases Weekly Report (Week 52/53, 2020)
   https://www.niid.go.jp/niid/images/idsc/idwr/IDWR2020/idwr2020-52-53.pdf
   (Accessed on May 25, 2021)
2. Infectious Disease Surveillance Center, National Institute of Infectious Diseases. Trends in Notifications of Imported Cases among Select Notifiable Infectious Diseases in Japan (updated January 2019, 2021)
   https://www.niid.go.jp/niid/images/epi/imported/PDF/202101_WebupImportedIDs_final.pdf
   (Accessed on May 25, 2021)
3. Notification Trends among Imported Dengue Cases in Japan (updated January 15, 2021)
   https://www.niid.go.jp/niid/images/epi/dengue/PDF/dengue_imported202101.pdf
   (Accessed on June 15, 2021)
4. Status of Japanese Encephalitis Virus Antibody Possessed by Pigs (Fast-track report No. 13, 2020)
   https://www.niid.go.jp/niid/ja/je-m/2025-idsc/yosoku/sokuhou/10106-je-yosoku-rapid2020-13.html
   (Accessed on May 25, 2021)
5. WHO. Zika virus. 20 July 2018
   https://www.who.int/news-room/fact-sheets/detail/zika-virus
   (Accessed on May 26, 2021)
6. ECDC. RAPID RISK ASSESSMENT. Zika virus transmission worldwide. 9 April 2019
   https://www.ecdc.europa.eu/sites/default/files/documents/zika-risk-assessment-9-april-2019.pdf
   (Accessed on May 26, 2021)
7. ECDC. Zika virus disease - Annual Epidemiological Report for 2019
   https://www.ecdc.europa.eu/en/publications-data/zika-virus-disease-annual-epidemiological-report-2019
   (Accessed on May 26, 2021)
8. CDC. Zika Virus 2020 Case Counts in the US
   https://www.cdc.gov/zika/reporting/2020-case-counts.html
   (Accessed on May 26, 2021)

9. PAHO. Cases of Zika Virus Disease by Country or Territory Cumulative Cases
https://www3.paho.org/data/index.php/en/mnu-topics/zika/524-zika-weekly-en.html
(Accessed on May 26, 2021)
10. ECDC. COMMUNICABLE DISEASE THREATS REPORT Week 51, 13-19 December 2020
https://www.ecdc.europa.eu/sites/default/files/documents/Communicable-disease-threats-report-19-dec-2020.pdf
(Accessed on May 27, 2021)
11. CDC. Chikungunya Virus 2020 Case Counts in the US
https://www.cdc.gov/chikungunya/geo/united-states-2020.html
(Accessed on May 27, 2021)
12. PAHO. Cases of Chikungunya Virus Disease by Country or Territory Cumulative Cases
https://www3.paho.org/data/index.php/en/mnu-topics/chikv-en/550-chikv-weekly-en.html
(Accessed on May 27, 2021)
13. WHO. Emergencies preparedness response. Chikungunya-Chad Disease outbreak news. 24 September 2020
https://www.who.int/csr/don/24-september-2020-chikungunya-chad/en//
(Accessed on May 27, 2021)
14. WHO Africa. WEEKLY BULLETIN ON OUTBREAKS AND OTHER EMERGENCIES Week 51: 14 - 20 December 2020
https://apps.who.int/iris/bitstream/handle/10665/338051/OEW51-1420122020.pdf
(Accessed on May 27, 2021)
15. CDC. Dengue Statistics and Maps - 2020
https://www.cdc.gov/dengue/statistics-maps/2020.html
(Accessed on May 27, 2021)
16. PAHO. Reported Cases of Dengue Fever in the Americas by Country or Territory Cumulative Cases
https://www3.paho.org/data/index.php/en/mnu-topics/indicadores-dengue-en/dengue-nacional-en/252-dengue-pais-ano-en.html
(Accessed on May 27, 2021)
17. WHO. World malaria report 2020
https://www.who.int/publications/i/item/9789240015791
(Accessed on May 28, 2021)
18. ECDC. COMMUNICABLE DISEASE THREATS REPORT Week 42, 11-17 October 2020
https://www.ecdc.europa.eu/sites/default/files/documents/communicable-disease-treats-reports-16-october-2020.pdf
(Accessed on May 28, 2021)
19. WHO. Emergencies preparedness response. Mayaro virus disease - French Guiana, France Disease Outbreak News 24 October 2020
https://www.who.int/csr/don/25-october-2020-mayaro-fever-french-guiana-france/en/
(Accessed on May 28, 2021)
20. FORTH. Mayaro Fever Epidemic in South America. PAHO Epidemiological Alert June 7, 2010

https://www.forth.go.jp/moreinfo/topics/2010/06161931.html
(Accessed on May 28, 2021)
21. WHO. Fact sheets. Plague 31 October 2017
https://www.who.int/en/news-room/fact-sheets/detail/plague
(Accessed on May 28, 2021)
22. WHO. Emergencies preparedness response. Plague - Democratic Republic of the Congo Disease outbreak news 23 July 2020
https://www.who.int/csr/don/23-july-2020-plague-drc/en/
(Accessed on May 28, 2021)
23. WHO. Fact sheets. Lassa fever 31 July 2017
https://www.who.int/news-room/fact-sheets/detail/lassa-fever
(Accessed on June 2, 2021)
24. WHO. Emergencies preparedness response. Lassa Fever – Nigeria Disease outbreak news 20 February 2020
https://www.who.int/csr/don/20-february-2020-lassa-fever-nigeria/en/
(Accessed on June 2, 2021)
25. NCDC. Lassa fever Situation Report Epi Week 53: 28 December 2020 . 03 January 2021
https://ncdc.gov.ng/themes/common/files/sitreps/ba1e917c531710377786f683ef4aaec4.pdf
(Accessed on June 2, 2021)
26. FORTH. Useful Information. Information on Infectious Diseases – Hantavirus Infection
https://www.forth.go.jp/useful/infectious/name/name35.html
(Accessed on June 2, 2021)
27. ECDC. SURVEILLANCE REPORT Hantavirus infection Annual Epidemiological Report for 2019
https://www.ecdc.europa.eu/sites/default/files/documents/AER-hantavirus-2019.pdf
(Accessed on June 2, 2021)
28. Reported Cases of Hantavirus Disease
https://www.cdc.gov/hantavirus/surveillance/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fhantavirus%2Fsurveillance%2Fannual-cases.html
(Accessed on June 2, 2021)
29. WHO（WPRO） Dengue Situation Update Number 611
http://apps.who.int/iris/bitstream/handle/10665/341149/Dengue-20210114.pdf?sequence=1&isAllowed=y
(Accessed on June 15, 2021)
30. Infectious Agents Surveillance Report (IASR) Vol.41 NO.6 (No.484)
https://www.niid.go.jp/niid/images/idsc/iasr/41/484.pdf
(Accessed on June 15, 2021)
31. Japan Society of Medical Entomology and Zoology. Outline of an emergency drill for controlling the mosquito vector of dengue fever held at Shinjuku Gyoen National Garden in 2019
https://www.jstage.jst.go.jp/article/mez/71/2/71_710203/_pdf/-char/ja
(Accessed on June 15, 2021)

9 Tables and Figures

Table 1. List of code numbers, names, and locations of quarantine seaports and airports investigated in 2020

	Code number and name	Prefecture		Code number and name	Prefecture
1	001 Otaru	Hokkaido	66	073 Kanmon	Yamaguchi/Fukuoka
2	002 Ishikariwan	Hokkaido	67	074 Hakata	Fukuoka
3	003 Wakkanai	Hokkaido	68	075 Miike	Fukuoka
4	004 Rumoi	Hokkaido	69	076 Karatsu	Saga
5	005 Monbetsu	Hokkaido	70	077 Imari	Saga/Nagasaki
6	006 Abashiri	Hokkaido	71	078 Sasebo	Nagasaki
7	007 Hanasaki	Hokkaido	72	079 Nagasaki	Nagasaki
8	008 Kushiro	Hokkaido	73	080 Hitakatsu	Nagasaki
9	009 Tomakomai	Hokkaido	74	081 Izuhara	Nagasaki
10	010 Muroran	Hokkaido	75	082 Oita	Oita
11	011 Hakodate	Hokkaido	76	083 Saganoseki	Oita
12	012 Aomori	Aomori	77	084 Saiki	Oita
13	013 Hachinohe	Aomori	78	085 Minamata	Kumamoto
14	014 Miyako	Iwate	79	086 Yatsushiro	Kumamoto
15	015 Kamaishi	Iwate	80	087 Misumi	Kumamoto
16	016 Ofunato	Iwate	81	088 Hososhima	Miyazaki
17	017 Kesennuma	Miyagi	82	089 Shibushi	Kagoshima
18	018 Ishinomaki	Miyagi	83	090 Kagoshima	Kagoshima
19	019 Sendaishiogama	Miyagi	84	091 Kiire	Kagoshima
20	020 Akitafunakawa	Akita	85	093 Kinnakagusuku	Okinawa
21	021 Sakata	Yamagata	86	094 Naha	Okinawa
22	022 Onahama	Fukushima	87	095 Hirara	Okinawa
23	023 Hitachi	Ibaraki	88	096 Ishigaki	Okinawa
24	024 Kashima	Ibaraki	89	193 New Chitose AP	Hokkaido
25	025 Kisarazu	Chiba	90	194 Asahikawa AP	Hokkaido
26	026 Chiba	Chiba	91	195 Hakodate AP	Hokkaido
27	027 Futami	Tokyo	92	196 Aomori AP	Aomori
28	028 Tokyo（Keihin）	Tokyo	93	197 Sendai AP	Miyagi
29	029 Kawasaki（Keihin）	Kanagawa	94	198 Akita AP	Akita
30	030 Yokohama（Keihin）	Kanagawa	95	199 Fukushima AP	Fukushima
31	031 Yokosuka	Kanagawa	96	200 Narita International AP	Chiba
32	032 Misaki	Kanagawa	97	201 Tokyo International AP	Tokyo
33	033 Naoetsu	Niigata	98	202 Niigata AP	Niigata
34	034 Niigata	Niigata	99	203 Toyama AP	Toyama
35	035 Fushikitoyama	Toyama	100	204 Komatsu AP	Ishikawa
36	036 Kanazawa	Ishikawa	101	205 Chubu International AP	Aichi
37	037 Nanao	Ishikawa	102	206 Kansai International AP	Osaka
38	038 Uchiura	Fukui	103	207 Okayama AP	Okayama
39	039 Tsuruga	Fukui	104	208 Miho AP	Tottori
40	041 Shimizu	Shizuoka	105	209 Hiroshima AP	Hiroshima
41	042 Yaizu	Shizuoka	106	212 Fukuoka AP	Fukuoka
42	044 Fukue	Aichi	107	213 Kitakyushu AP	Fukuoka
43	045 Gamagori（Mikawa）	Aichi	108	214 Oita AP	Oita
44	046 Toyohashi（Mikawa）	Aichi	109	215 Nagasaki AP	Nagasaki
45	047 Kinuura	Aichi	110	216 Kumamoto AP	Kumamoto
46	048 Nagoya	Aichi	111	217 Miyazaki AP	Miyazaki
47	049 Yokkaichi	Mie	112	218 Kagoshima AP	Kagoshima
48	050 Owase	Mie	113	219 Naha AP	Okinawa
49	051 Maizuru	Kyoto	114	222 Shizuoka AP	Shizuoka
50	053 Katsuura	Wakayama	115	223 Hyakuri AP	Ibaraki
51	054 Wakayamashimotsu	Wakayama	116	225 Saga AP	Saga
52	055 Osaka	Osaka	117	226 Takamatsu AP	Kagawa
53	056 Hannan	Osaka			
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	072 Kochi	Kochi			

Table 2. Monthly investigation for vector surveillance at Japanese quarantine seaports and airports in 2020

Seaport（1）

Month/ Quarantine port	Otaru Quarantine Station																							
	001 Otaru				002 Ishikari Bay				003 Wakkanai				004 Rumoi				005 Monbetsu				006 Abashiri			
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																								
Jun.		2	2																					
Jul.		2	2			2	1			2	2											1	1	
Aug.		2	2			2	2			4	4													
Sep.		2	2	2				2						1	1									
Oct.												1				1				1				1
Nov.																								
Dec.																								
Total	0	8	8	2	0	4	3	2	0	6	6	1	0	1	1	1	0	0	0	1	0	1	1	1

Month/ Quarantine port	Otaru Quarantine Station																				Sendai Quarantine Station			
	007 Hanasaki				008 Kushiro				009 Tomakomai				010 Muroran				011 Hakodate				012 Aomori			
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																								
Jun.																		1	1			1	1	1
Jul.		1	1															1	1			1	1	1
Aug.						2	2			2	2							1	1			1	1	1
Sep.		1	1	1		2	2	2				2		1	1	1		1	1			2	1	1
Oct.																		1	1	2		1	1	1
Nov.																								
Dec.																								
Total	0	2	2	1	0	4	4	2	0	2	2	2	0	1	1	1	0	5	5	2	0	6	5	5

Month/ Quarantine port	Sendai Quarantine Station																							
	013 Hachinohe				014 Miyako				015 Kamaishi				016 Ofunato				017 Kesennuma				018 Ishinomaki			
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
Jun.		1	1	1										1	1	1		1	1	1		2	2	
Jul.		1	1	1		1	1	1		1	1	1										2	2	2
Aug.		1	1	1										1	1	1		1	1	1				
Sep.		1	1	1		1	1	1		1	1	1										2	2	2
Oct.		1	1	1																				1
Nov.																								
Dec.																								
Total	0	5	5	5	0	2	2	2	0	2	2	2	0	2	2	2	0	2	2	2	0	6	6	7

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

(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								
Feb.				3																				1
Mar.								3								2								
Apr.																								
May																								1
Jun.														2	2							3		
Jul.		3	3			3	3							5	5			3	3			2	3	
Aug.		3	3			3	3							5	5			6	6			3	5	
Sep.		3	3			3	3							5	5			3	3			5	20	4
Oct.		3	3	3		3	3	3						8	8	2				2		5	20	2
Nov.				3				3		2	2	2		6	6	1				5		5	11	5
Dec.				3				3								4				4				6
Total	0	12	12	12	0	12	12	12	0	2	2	2	0	31	31	12	0	12	12	11	0	23	59	19

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																								
Jun.																								
Jul.																								
Aug.														4		5		3		3				
Sep.										3		3										1		1
Oct.																								
Nov.																								
Dec.				1				1																
Total	0	0	0	1	0	0	0	1	0	3	0	3	0	4	0	5	0	3	0	3	0	1	0	1

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.																								
Apr.																								
May						2	2															4	3	
Jun.						2	2			1	1													
Jul.						1	2				1													
Aug.		2		2		2	2	6		1	1			2	1	2						4	2	4
Sep.							2			1	1	3						1	1	1				
Oct.						2	2	4		1	1													
Nov.																		1	1	1				
Dec.								5																
Total	0	2	0	2	0	9	12	15	0	4	5	3	0	2	1	2	0	2	2	2	0	8	5	4

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.								2																
Feb.																								
Mar.																								
Apr.																								
May						6	6																	
Jun.						3	3																	
Jul.						2	2	2		3	3													
Aug.														1		1		1		1				
Sep.		3	3	3						3	3	3										1	1	1
Oct.						8	8	7		3	3	3										1	1	1
Nov.		3	3	3						3	3	3												
Dec.								3				3												
Total	0	6	6	6	0	19	19	14	0	12	12	12	0	1	0	1	0	1	0	1	0	2	2	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（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.																								4
Feb.																								
Mar.																								
Apr.																								
May																								
Jun.																								
Jul.										2	2			5	4			1	1					
Aug.										3	2	2		5	4	5		1	1	1				
Sep.		2	2	2		2	2	2		3	2	2		5	4			1	1	1		2		
Oct.		2	2	2		2	2	2		3	2	2				1		1	1	1		4		
Nov.																4								3
Dec.																								2
Total	0	4	4	4	0	4	4	4	0	11	8	6	0	15	12	10	0	4	4	3	0	6	0	9

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.								2																
May		2	2			2	4							2	2									
Jun.		2	2			1	1							2	2									
Jul.		2	2			1	1							1	1	1								
Aug.														2	2	2								
Sep.						1	1			2	2	2		2	2	3								
Oct.		2	2	2				1						2	2	2		5	5	3		5	5	3
Nov.								2								2				2				2
Dec.																2								
Total	0	8	8	2	0	5	7	5	0	2	2	2	0	11	11	12	0	5	5	5	0	5	5	5

Month/ Quaran-tine port	Hiroshima Quarantine Station																				Fukuoka Quarantine Station			
	064 Iwakuni				065 Tokuyamakudamatsu				067 Tokushimakomatsushima				068 Sakaide				072 Kochi				073 Kanmon			
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			2	2					
Jun.										1	1													
Jul.														2	2			2	2				4	
Aug.						1	1							4	2									
Sep.		1	1							1	1			4	2							2	2	
Oct.														4				2	2			2	2	2
Nov.				1												2								2
Dec.								1								2								3
Total	0	1	1	1	0	1	1	1	0	2	2	0	0	16	8	4	0	6	6	0	0	4	8	7

Month/ Quaran-tine port	Fukuoka Quarantine Station																							
	074 Hakata				075 Miike				076 Karatsu				077 Imari				078 Sasebo				079 Nagasaki			
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.				1								1												
Apr.																								
May																								
Jun.																								
Jul.		7	12			3	3			1	1			4	4									
Aug.		13	13	1		1	1			2	2			4	4									
Sep.		5	5			1	1			1	1			2	2									
Oct.				6														1	1	1		2	2	2
Nov.				5								1				2								2
Dec.				1				1																
Total	0	25	30	14	0	5	5	1	0	4	4	2	0	10	10	2	0	1	1	1	0	2	2	4

(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/ Quarantine port	Fukuoka Quarantine Station																							
	080 Hitakatsu				081 Izuhara				082 Oita				083 Saganoseki				084 Saiki				085 Minamata			
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																								
Jun.		2	3			2	2			3	3													
Jul.		1	2			2	2			3	3											1	1	
Aug.		1	2			4	4							1	1			1	1					
Sep.		1	1			2	2			3	3													
Oct.								4						1	1	1		1	1	1				
Nov.								2																
Dec.								2																1
Total	0	5	8	0	0	10	10	8	0	9	9	0	0	2	2	1	0	2	2	1	0	1	1	1

Month/ Quarantine port	Fukuoka Quarantine Station																							
	086 Yatsushiro				087 Misumi				088 Hososhima				089 Shibushi				090 Kagoshima				091 Kiire			
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.				1																				
Apr.				1																				
May																								
Jun.		2	2			1	1																	
Jul.		1	1																					
Aug.		1	1															2		2		1		1
Sep.														3	6	3		2	2	2		1	1	1
Oct.										1	1								4	2			1	1
Nov.										1	1			3	6	3		2	2	2		1	1	1
Dec.																								
Total	0	4	4	2	0	1	1	0	0	2	2	0	0	6	12	6	0	6	8	8	0	3	3	4

Month/ Quarantine port	Naha Quarantine Station															
	093 Kinnakagusuku				094 Naha				095 Hirara				096 Ishigaki			
Investigation	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Jan.														2	2	
Feb.														2	2	
Mar.														2	2	
Apr.														2	2	2
May						3	3							2	2	
Jun.						3	3			2	2			2	2	
Jul.		2	2											2	2	
Aug.		3	3	3						2		2		2	2	1
Sep.						3	3	3						2	2	2
Oct.						3	3	3						2	2	3
Nov.		2	2	2				1		2	2	2		2	2	2
Dec.		2	2	2								2		2	2	
Total	0	9	9	7	0	12	12	7	0	6	4	6	0	24	24	10

(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.		1															5			1				
Feb.		1															3							
Mar.		1																						
Apr.																								
May																		3	6	3				
Jun.		2	2							2	2			2	2	2		3	6	2		1	1	1
Jul.		4	4			4	2			2	2			2	2	2		3	6	3		1	1	1
Aug.		2	4			4	2			2	2			2	2	2		3	6	2		1	1	1
Sep.		4	4	1		2	1			2	2			2	2	2		3	6	3		1	1	1
Oct.	2							1		2	2	2		2	2	2		4	6	2		1	1	1
Nov.																		1		3				
Dec.																		1		1				
Total	2	15	14	1	0	10	5	1	0	10	10	2	0	10	10	10	8	21	36	20	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				203 Toyama 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.	1				23	5	11	2	3	1	3	1						1						
Feb.	2						4			1	2													
Mar.							4			1	2	1												
Apr.							4	1																
May										2														
Jun.		1	1	2		1																		
Jul.		1	1	2	1	2																		
Aug.		1	1			8		1		1								2		2		2		3
Sep.		1	1	2		39				6	6													
Oct.		1	1			44	32			6	6	2		1	1									
Nov.						48	16	5		6	6	2		1	1	1								
Dec.					16	10				1	3													
Total	3	5	5	6	40	157	71	9	3	25	28	6	0	2	2	1	0	3	0	2	0	2	0	3

Month/ Quarantine airport	Niigata Quarantine Station				Nagoya Quarantine Station								Kansai Airport Quarantine Station				Hiroshina Quaratine Station							
	204 Komatsu AP				205 Chubu Internationa AP				222 Shizuoka AP				206 Kansai International AP				207 Okayama 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								16	7		5								
Feb.																								
Mar.								2																
Apr.														1										
May														1										
Jun.										1	2			29				2	2					
Jul.														9	9			2	2			2	2	
Aug.						2																2	2	
Sep.		2		2		1																2	2	3
Oct.										1	1	1						2	2			2	2	3
Nov.						1																2	2	2
Dec.																								2
Total	0	2	0	2	2	4	0	2	0	2	3	1	16	47	9	5	0	6	6	0	0	10	10	10

Month/ Quarantine airport	Hiroshina Quaratine Station								Fukuoka Quarantine Station															
	226 Takamatsu AP				208 Miho 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.									6															
Feb.									2															
Mar.																								
Apr.								2										1	1	1				
May		1	1			1	4																	
Jun.		2	2			1	1			3	3							1	1					
Jul.		2	2			2	2	2		3	3			2	2			1	1					
Aug.		2	2			2	2			3	3							1	1					
Sep.		2	2			2	2			4	3													
Oct.		1	1			2	2	2		3	3			2	1	2							2	
Nov.				1				2																
Dec.								2				3												
Total	0	10	10	1	0	10	13	10	8	16	15	3	0	4	3	2	0	4	4	1	0	0	2	0

(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/ Quarantine 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	2
Feb.																				
Mar.				1														2	2	
Apr.				1																
May																		1		
Jun.		3	2															1	2	
Jul.		4	2											4	4			1	1	
Aug.		1	2							2		2		3	3			1	1	
Sep.		3	2											4	2			1	1	2
Oct.				1		2	2			2	4	2				2		1	1	2
Nov.						2	2											1	1	2
Dec.																		1	1	1
Total	0	11	8	4	0	4	4	0	0	4	4	4	0	11	9	2	0	11	11	9

(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 2020

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)				
Sendai AP	SDJ	197	5 ( )	3 ( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	8 (0)				
Fukushima AP	FKS	199	1 ( )	2 ( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	3 (0)				
Narita International AP	NRT	200	23 (1)	( )	( )	( )	( )	( )	1 (1)	( )	( )	( )	( )	16 ( )	40 (2)	0	2	2	SGN : 1, MEX : 1
Tokyo International AP	HND	201	3 (1)	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	3 (1)	0	1	1	GMP : 1
Chubu International AP	NGA	205	2 ( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	2 (0)				
Kansai International AP	KIX	206	16 ( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	16 (0)				
Fukuoka AP	FUK	212	6 ( )	2 ( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	8 (0)				
Total			56 (2)	7 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	2 (0)	0 (0)	16 (0)	82 (3)	0	3	3	

SGN：Tansonnhat International Airport, MEX：Mexico City International Airport, GMP：Gimpo International Airport

Table 4-1. Results of mosquito inspection on international aircraft by the origin of the flights in 2020

Depature Country	Last depature of airport	3-letter code(IATA), UN-CODE	No. of aircraft inspected													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
Singapore	Singapore Changi International Airport	SIN	7	1										5	13				
Taiwan	Taiwan Taoyuan International Airport	TPE	8	2								1			11				
Philippines	Ninoy Aquino International Airport	MNL	9												9				
Thailand	Suvarnabhumi Airport	BKK	2	2										5	9				
China	Guangzhou Baiyun International Airport	CAN												6	6				
Hong Kong	Hong Kong International Airport	HKG	4									1			5				
Thailand	Don Muang Airport	DMK	2	2											4				
United States of America	Honolulu International Airport	HNL	4												4				
Viet Nam	Tansonnhat International Airport	SGN	3												3	1 / 1			1 / 1
Guam	Guam International Airport	GUM	2												2				
Viet Nam	Noi Bai International Airport	HAN	2												2				
China	Macau International Airport	MFM	2												2				
China	Beijing Capital International Airport	PEK	2												2				
United Arab Emirates	Abu Dhabi International Airport	AUH	1												1				
Indonesia	Jakarta International Soekarno-Hatta Airport	CGK	1												1				
Australia	Cairns Airport	CNS	1												1				
United Arab Emirates	Dubai International Airport	DXB	1												1				
Republic of Korea	Gimpo International Airport	GMP	1												1		1 / 1		1 / 1
Republic of Korea	Incheon International Airport	ICN	1												1				
Nepal	Tribhuvan International Airport	KTM	1												1				
Mexico	Mexico City International Airport	MEX							1						1			1 / 1	1 / 1
Australia	Perth Airport	PER	1												1				
Australia	Sydney Airport	SYD	1												1				
	Total		56	7	0	0	0	0	1	0	0	2	0	16	82	1 / 1	1 / 1	1 / 1	3 / 3

Table 4-2. Results of mosquito inspection on international aircraft by the origin of the flights in 2020

Area	Depature Country	Last departure of airport	3-letter code(IATA), UN-CODE	Number of aircraft inspected	Number of aircraft with adult mosquitoes	Number of collected adult mosquitoes/ Number of aircraft with adult mosquitoes			Total	Examination of pathogen (Flavivirus, Chikungunya virus and Malaria parasite by RT-PCR or PCR)		
						Culex						
						Culex quinquefasciatus	*Culex pipiens* complex	*Culex*				
Dominant vector Secondary vector						W	W			Positive	Pools	Samples
Southeast Asia	Singapore	Singapore Changi International Airport	SIN	13								
Southeast Asia	Taiwan	Taiwan Taoyuan International Airport	TPE	11								
Southeast Asia	Philippines	Ninoy Aquino International Airport	MNL	9								
Southeast Asia	Thailand	Suvarnabhumi Airport	BKK	9								
East Asia	China	Guangzhou Baiyun International Airport	CAN	6								
Southeast Asia	Hong Kong	Hong Kong International Airport	HKG	5								
Southeast Asia	Thailand	Don Muang Airport	DMK	4								
North America	United States of America	Honolulu International Airport	HNL	4								
Southeast Asia	Viet Nam	Tansonnhat International Airport	SGN	3	1	1 / 1			1 / 1	0	1	1
East Asia	China	Macau International Airport	MFM	2								
East Asia	China	Beijing Capital International Airport	PEK	2								
Southeast Asia	Viet Nam	Noi Bai International Airport	HAN	2								
South Pacific	Guam	Guam International Airport	GUM	2								
Oceania	Australia	Cairns Airport	CNS	1								
Oceania	Australia	Perth Airport	PER	1								
Oceania	Australia	Sydney Airport	SYD	1								
North America	Mexico	Mexico City International Airport	MEX	1	1			1 / 1	1 / 1	0	1	1
South Asia	Nepal	Tribhuvan International Airport	KTM	1								
Midlle East	United Arab Emirates	Abu Dhabi International Airport	AUH	1								
Midlle East	United Arab Emirates	Dubai International Airport	DXB	1								
East Asia	Republic of Korea	Gimpo International Airport	GMP	1	1		1 / 1		1 / 1	0	1	1
East Asia	Republic of Korea	Incheon International Airport	ICN	1								
Southeast Asia	Indonesia	Jakarta International Soekarno-Hatta Airport	CGK	1								
Total				82	3	1 / 1	1 / 1	1 / 1	3 / 3	0	3	3

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 2020

Quarantine port	CODE UN	CODE Quarantine	No. of meshes (1km mesh)	Mosquito taxa: *Anopheles*: *Anopheles sinensis*	*Anopheles koreicus*	*Anopheles lesteri*	*Anopheles sineroides*	*Anopheles*	*Aedes*: *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 nobukonis*
Exogenous species									●												
Dominant vector				M					D, C, Z	D, C, Z											
Secondary vector				W		M	M	M	W	W	W	W	W		W	W			W		
Unignorable vector					M					(J)		(J)	(D)		(D)	(J)					
Otaru	OTR	1	8								2		1								
Ishikariwan	ISW	2	4								9	1									
Wakkanai	WKJ	3	6								40			2							
Rumoi	RMI	4	1																		
Abashiri	ABA	6	1																		
Hanasaki	HNK	7	2																		
Kushiro	KUH	8	4								6	1									
Tomakomai	TMK	9	2																		
Muroran	MUR	10	1																		
Hakodate	HKP	11	5																		
Aomori	AOM	12	6							20				1							
Hachinohe	HHE	13	5																		
Miyako	MYK	14	2																		
Kamaishi	KIS	15	2																		
Ofunato	OFT	16	2																		
Kesennuma	KSN	17	2	1																	
Ishinomaki	ISM	18	6																		
Sendaishiogama	SGM	19	10	1						27											
Akitafunakawa	AXT	20	5							3											
Sakata	SKT	21	5							10											
Onahama	ONA	22	6							1											
Hitachi	HTC	23	3							1											
Kashima	KSM	24	6																		
Kisarazu	KZU	25	12							48											
Chiba	CHB	26	12							27											
Futami	HTM	27	2																		
Tokyo（Keihin）	TYO	28	31							975											
Kawasaki（Keihin）	KWS	29	12							4											
Yokohama（Keihin）	YOK	30	23							349											
Naoetsu	NAO	33	3																		
Niigata	NIH	34	4							8											
Fushikitoyama	FSK	35	3							10											
Kanazawa	KNZ	36	1																		
Nanao	NNO	37	2							1											
Uchiura	UCU	38	2							1											
Tsuruga	TRG	39	4							6											
Shimizu	SMZ	41	9							64											
Yaizu	YZU	42	4							23											
Fukue	FKE	44	2							33						1					

Quarantine port	*Armigeres*: *Armigeres subalbatus*	*Culex*: *Culex inatomii*	*Culex pipiens pallens*	*Culex pipiens molestus*	*Culex pipiens quinquefasciatus*	*Culex pipiens complex*	*Culex pseudovishnui*	*Culex tritaeniorhynchus*	*Culex bitaeniorhynchus*	*Culex orientalis*	*Culex rubensis*	*Culex ryukyensis*	*Cuex sitiens*	*Culex rubithoracis*	*Culex pallidothorax*	*Culex sasai*	*Culiciomyia*
Exogenous species																	
Dominant vector			W	W	W	W	J	J									
Secondary vector	W	W						W									
Unignorable vector			(J)		(J)			(D)	(J)				(J)(W)				
Otaru						64				1							
Ishikariwan						13											
Wakkanai						1											
Rumoi																	
Abashiri																	
Hanasaki																	
Kushiro						3											
Tomakomai																	
Muroran																	
Hakodate						1											
Aomori						12											
Hachinohe						36											
Miyako						1		1									
Kamaishi																	
Ofunato						13											
Kesennuma						17											
Ishinomaki						63		2									
Sendaishiogama						199		4		1							
Akitafunakawa						6											
Sakata						28		1									
Onahama						17											
Hitachi																	
Kashima						12											
Kisarazu	2					27		6									
Chiba						174		85									
Futami						9											
Tokyo（Keihin）						212		15									
Kawasaki（Keihin）						42		96									
Yokohama（Keihin）						1,018		1									
Naoetsu																	
Niigata								1									
Fushikitoyama						8		3									
Kanazawa																	
Nanao								5									
Uchiura																	
Tsuruga						16											
Shimizu						50											
Yaizu						15		3									
Fukue								4									

Quarantine port	*Mansonia*: *Culex infantulus*	*Tripteroides*: *Tripteroides bambusa*	*Lutzia*: *Mansonia ochracea*	Unidentfied	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: Flavivirus	Chikungunya fever	Malaria
Exogenous species									
Dominant vector									
Secondary vector									
Unignorable vector									
Otaru					68	66	0 / 9		
Ishikariwan					23	23	0 / 5		
Wakkanai					43	43	0 / 6		
Rumoi					0	0			
Abashiri					0	0			
Hanasaki					0	0			
Kushiro					10	10	0 / 4		
Tomakomai					0	0			
Muroran					0	0			
Hakodate					1	1	0 / 1		
Aomori					33	31	0 / 4	0 / 2	
Hachinohe					36	35	0 / 2		
Miyako					2	2	0 / 2		
Kamaishi					0	0			
Ofunato					13	13	0 / 2		
Kesennuma					18	18	0 / 2		0 / 1
Ishinomaki					65	65	0 / 8		
Sendaishiogama					232	229	0 / 14	0 / 2	0 / 1
Akitafunakawa					9	9	0 / 5	0 / 2	
Sakata					39	39	0 / 5	0 / 2	
Onahama					18	18	0 / 6	0 / 1	
Hitachi					1	1	0 / 1	0 / 1	
Kashima					12	12	0 / 2		
Kisarazu					83	83	0 / 19	0 / 7	
Chiba					286	286	0 / 18	0 / 5	
Futami					9	9	0 / 1		
Tokyo（Keihin）					1,202	1,202	0 / 59	0 / 25	
Kawasaki（Keihin）					142	142	0 / 16	0 / 1	
Yokohama（Keihin）					1,368	1,353	0 / 51	0 / 17	
Naoetsu					0	0			
Niigata					9	9	0 / 2	0 / 1	
Fushikitoyama					21	21	0 / 5	0 / 2	
Kanazawa					0	0			
Nanao					6	6	0 / 3	0 / 1	
Uchiura					1	1	0 / 1	0 / 1	
Tsuruga					22	22	0 / 6	0 / 2	
Shimizu					114	112	0 / 15	0 / 7	
Yaizu					41	40	0 / 10	0 / 4	
Fukue					38	38	0 / 5	0 / 2	

Gamagori（Mikawa）	GAM	45	2							23												1					4		13														41	41	0 / 4	0 / 1	
Toyohashi（Mikawa）	THS	46	8							25	13																94		62												1		195	192	0 / 20	0 / 5	
Kinuura	KNU	47	6							19																	76		5														100	100	0 / 10	0 / 2	
Nagoya	NGO	48	19							70																	247		64														381	373	0 / 33	0 / 7	
Yokkaichi	YKK	49	12							12																	88		9														109	109	0 / 16	0 / 4	
Owase	OWA	50	1							1																																	1	1	0 / 1	0 / 1	
Maizuru	MAI	51	4							2																	6																8	7	0 / 2	0 / 1	
Katsuura	KAT	53	1																			1					13																14	14	0 / 2		
Wakayamashimotsu	SMT	54	11							316												9					83																408	388	0 / 23	0 / 10	
Osaka	OSA	55	15							261												1					187																449	433	0 / 30	0 / 14	
Hannan	HAN	56	4							7																	32																39	39	0 / 7	0 / 3	
Kobe	UKB	57	6							52																	156																208	198	0 / 17	0 / 6	
Mizushima	MIZ	58	8							2																	152		6														160	160	0 / 11	0 / 2	
Sakai	SMN	59	5																								3																3	3	0 / 2		
Hamada	HMD	60	2							6												1					1																8	7	0 / 4	0 / 2	
Fukuyama	FKY	61	11																								51																51	51	0 / 7		
Kure	KRE	62	5							2																	8																10	10	0 / 4	0 / 1	
Hiroshima	HIJ	63	5							11																	5																16	16	0 / 4	0 / 2	
Iwakuni	IWK	64	1																								9		3														12	12	0 / 12		
Tokuyamakudamatsu	TXD	65	1							6																	7																13	13	0 / 2	0 / 1	
Tokushimakomatsushima	TKX	67	2							1																	36																37	37	0 / 3	0 / 1	
Sakaide	SKD	68	16																								21		22														43	43	1 / 9		
Kochi	KCZ	72	6							4						1											13		2	1													21	17	0 / 6		
Kanmon	MOJ	73	4																								4		1														5	5	0 / 3		
Hakata	HKT	74	25							369																	88																457	429	0 / 31	0 / 17	
Miike	MII	75	5							7																	15		5														27	27	0 / 9	0 / 4	
Karatsu	KAR	76	4							11	2																9	1	8											1			32	30	0 / 12	0 / 2	
Imari	IMI	77	10							14																	14	3	12														43	43	0 / 17	0 / 6	
Sasebo	SSB	78	1																																								0	0			
Nagasaki	NMX	79	2																								3																3	3	0 / 2		
Hitakatsu	HTK	80	5																																								0	0			
Izuhara	IZH	81	10							29												3					13																45	45	0 / 8	0 / 3	
Oita	OIP	82	9							37	1											5					45		5														93	15	0 / 8	0 / 5	
Saganoseki	SAG	83	2																																								0	0			
Saiki	SAE	84	2																								13																13	13	0 / 1		
Minamata	MIN	85	1							1																	2			1													4	4	0 / 3	0 / 1	
Yatsushiro	YAT	86	4							3	5											1					9		3														21	19	0 / 4	0 / 1	
Misumi	MIS	87	1																								13		1														14	14	0 / 2		
Hososhima	HSM	88	2																								3																3	3	0 / 1		
Shibushi	SBS	89	6	1																							27		16														44	44	0 / 4		0 / 1
Kagoshima	KOJ	90	6																								4		31														35	35	0 / 4		
Kiire	KII	91	3																										29														29	29	0 / 1		
Kinnakagusuku	KNX	93	9							7																16			4														27	27	0 / 6	0 / 1	
Naha	NAH	94	12							28																70			58														156	156	0 / 10	0 / 4	
Hirara	HRR	95	6							117												3				11												1	4				136	131	0 / 12	0 / 6	
Ishigaki	ISG	96	24							76												4				357			2														439	361	0 / 38	0 / 14	
Total			524	3	0	0	0	0	0	3,130	78	2	1	3	0	2	0	0	0	0	0	31	0	0	0	454	3,611	4	588	2	2	0	0	0	0	0	0	1	5	0	1	0	7,918	7,636	1 / 694	0 / 212	0 / 3

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 2020

Quarantine airport	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*																*Mansonia*	*Tripteroides*	*Lutzia*						
	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 nobukonis*	*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 rubensis*	*Culex ryukyensis*	*Cuex sitiens*	*Culex rubithoracis*	*Culex pallidothorax*	*Culex sasai*	*Culiciomyia*	*Culex infantulus*	*Tripteroides bambusa*	*Mansonia ochracea*	Unidentied			Flavivirus	Chikungunya fever	Malaria
Exogenous species									●																																						
Dominant 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																		
Unignorable vector					M					(J)		(J)	(D)		(D)	(J)								(J)		(J)			(D)	(J)				(J)(W)													
New Chitose AP	SPK	193	15				1				1	1																				1											4	4	0 / 3		0 / 1
Asahikawa AP	AKJ	194	10	1							4																2																7	7	0 / 5		0 / 1
Hakodate AP	HKD	195	10								4	1															6																11	11	0 / 6		
Aomori AP	AOJ	196	10								22	6															1				1											1	31	29	0 / 3		
Sendai AP	SDJ	197	21	2						2													38				534		7		3												586	583	0 / 36	0 / 2	0 / 2
Akita AP	AKP	198	5							1		2						3													11												17	3	0 / 3	0 / 1	
Fukushima AP	FKS	199	5								1																5																6	6	0 / 3		
Narita International AP	NRT	200	157	1						23																	29		107														160	160	0 / 43	0 / 6	0 / 1
Tokyo International AP	HND	201	25																								8		1														9	9	0 / 5		
Niigata AP	NII	202	3																								7																7	7	0 / 1		
Toyama AP	TOY	203	2							9																	2		2														13	11	0 / 5	0 / 2	
Komatsu AP	KMQ	204	2																								9		8														17	17	0 / 3		
Chubu International AP	NGA	205	4																								2		2														4	3	0 / 3		
Kansai International AP	KIX	206	47							5												1					159		15														180	168	0 / 29	0 / 3	
Okayama AP	OKJ	207	6	5																							2		69	7													83	83	0 / 7		0 / 2
Miho AP	YGJ	208	10							1																	9		5														15	15	0 / 6	0 / 1	
Hiroshima AP	HIT	209	10	4																									41	5													50	50	0 / 5		0 / 1
Fukuoka AP	FUK	212	16							2																	164		8														174	174	0 / 21	0 / 2	
Kitakyushu AP	KKJ	213	4																																								0	0			
Oita AP	OIT	214	4																									1	11														12	12	0 / 3		
Kumamoto AP	KMJ	216	11							1												4					3			1													9	8	0 / 5		
Miyazaki AP	MZA	217	4																																								0	0			
Kagoshima AP	KOP	218	4							1																																	1	1	0 / 1	0 / 1	
Naha AP	NAP	219	11							2	27															10			4	1													44	44	0 / 11	0 / 1	
Shizuoka AP	FSZ	222	2																																								0	0			
Hyakuri AP	IBK	223	2																																								0	0			
Saga AP	QSG	225	11	3						3																		2	165	3													176	176	0 / 14	0 / 1	0 / 1
Takamatsu AP	TAK	226	10	1								3																	67														71	71	0 / 9		0 / 1
Total			421	17	0	0	1	0	0	50	59	13	0	0	0	0	0	3	0	0	0	5	38	0	0	10	942	3	512	17	15	1	0	0	0	0	0	0	0	0	0	1	1,687	1,652	0 / 230	0 / 20	0 / 10

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 2020

	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*																*Mansonia*	*Tripteroides*	*Lutzia*						
		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 nobukonis*	*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 rubensis*	*Culex ryukyensis*	*Cuex sitiens*	*Culex rubithoracis*	*Culex pallidothorax*	*Culex sasai*	*Culiciomyia*	*Culex infantulus*	*Tripteroides bambusa*	*Mansonia ochracea*	Unidentfied			Flavivirus	Chikungunya fever	Malaria
Exogenous species							●																																						
Dominant 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																		
Unignorable vector			M					(J)		(J)	(D)		(D)	(J)								(J)		(J)			(D)	(J)				(J)(W)													
Total	945	20	0	0	1	0	0	3,180	137	15	1	3	0	2	0	3	0	0	0	36	38	0	0	464	4,553	7	1,100	19	17	1	0	0	0	0	0	1	5	0	1	1	9,605	9,288	1 / 924	0 / 232	0 / 13

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 2020

Quarantine port	CODE		No. of meshes (1km mesh)	Mosquito taxa																																		
	UN	Quarantine		Anopheles	Aedes										Culex																		Tripteroides	Lutzia	Armigeres	Uranotaenia	Orthopodomyia	
				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 hayashi*	*Culex infantulus*	*Culex orientalis*	*Culex pseudovishnui*	*Culex inatomii*	*Culex rubensis*	*Cuex sitiens*	*Culex rubithoracis*	*Culex pallidothorax*	*Culex kyotoensis*	*Culex boninensis*	*Tripteroides bambusa*	*Lutzia vorax*	*Armigeres subalbatus*	*Uranotaenia novobscura*	*Orthopodomyia anopheloides*	*Lutzia*
Exogenous species					●																																	
Dominant 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			
Unignorable vector						(J)	(J)	(D)	(D)	(J)					(J)				(D)		(J)							(J)(W)										
Otaru	OTR	1	8				4											1																				
Ishikariwan	ISW	2	3				3											2																				
Wakkanai	WKJ	3	6				1																															
Rumoi	RMI	4	1				1											1																				
Abashiri	ABA	6	1																																			
Hanasaki	HNK	7	2																																			
Kushiro	KUH	8	4																																			
Tomakomai	TMK	9	2																																			
Muroran	MUR	10	1																																			
Hakodate	HKP	11	5																																			
Aomori	AOM	12	5															1																				
Hachinohe	HHE	13	5																																			
Miyako	MYK	14	2																																			
Kamaishi	KIS	15	2				1																															
Ofunato	OFT	16	2			2																																
Kesennuma	KSN	17	2			2	2																															
Ishinomaki	ISM	18	6			3													1	1																		
Sendaishiogama	SGM	19	10			5	1																															
Akitafunakawa	AXT	20	5			3																																
Sakata	SKT	21	5			3																																
Onahama	ONA	22	6			5																																
Hitachi	HTC	23	6			1																												1				
Kashima	KSM	24	12																																			
Kisarazu	KZU	25	12			9																											3					
Chiba	CHB	26	12			7																																
Futami	HTM	27	2			1																																
Tokyo（Keihin）	TYO	28	31			14												4																				
Kawasaki（Keihin）	KWS	29	12			16																																
Yokohama（Keihin）	YOK	30	59			24												7																				
Uchiura	UCU	38	2				1																															
Tsuruga	TRG	39	4			1																																
Shimizu	SMZ	41	12			8																																
Yaizu	YZU	42	5			1																																
Fukue	FKE	44	1																																			

Gamagori（Mikawa）	GAM	45	2																		1																		
Toyohashi（Mikawa）	THS	46	5							1																													
Kinuura	KNU	47	6																																				
Nagoya	NGO	48	19			6												4	1															1					
Yokkaichi	YKK	49	12			6												1																					
Maizuru	MAI	51	4																																				
Wakayamashimotsu	SMT	54	8																																				
Osaka	OSA	55	12			16				1																													
Hannan	HAN	56	4			3												2																					
Mizushima	MIZ	58	8			2												2																					
Sakai	SMN	59	7																																				
Hamada	HMD	60	2			2																																	
Fukuyama	FKY	61	11			2												1																					
Kure	KRE	62	5			4																																	
Hiroshima	HIJ	63	5			3												1																					
Iwakuni	IWK	64	1			1																																	
Tokuyamakudamatsu	TXD	65	1																																				
Tokushimakomatsushima	TKX	67	2															1																					
Sakaide	SKD	68	8			3																																	
Kochi	KCZ	72	6			2				1								1																					
Kanmon	MOJ	73	8																																				
Hakata	HKT	74	30			29												3																					
Miike	MII	75	5	1		5												2															1						
Karatsu	KAR	76	4			4																																	
Imari	IMI	77	10			9																											1						
Sasebo	SSB	78	1																																				
Nagasaki	NMX	79	2																																				
Hitakatsu	HTK	80	8																																				
Izuhara	IZH	81	10			3	3																																
Oita	OIP	82	9			2																																	
Saganoseki	SAG	83	2																																				
Saiki	SAE	84	2																																				
Minamata	MIN	85	1			1	2																																
Yatsushiro	YAT	86	4			2																																	
Misumi	MIS	87	1			2	1	1																									1						
Hososhima	HSM	88	2																																				
Shibushi	SBS	89	12			1				1																													
Kagoshima	KOJ	90	8			1												2																					
Kiire	KII	91	3																																				
Kinnakagusuku	KNX	93	9			7											1																						
Naha	NAH	94	12			13																																	
Hirara	HRR	95	4			2											2																						
Ishigaki	ISG	96	24			8																																	
Total			552	1	0	244	20	1	0	4	0	0	0	0	0	0	3	36	2	1	1	0	0	0	0	0	0	0	0	0	0	0	6	2	0	0	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 2020

Quarantine airport	CODE		No. of meshes (1km mesh)	Mosquito taxa																																		
				Anopheles	*Aedes*										*Culex*																		*Tripteroides*	*Lutzia*	*Armigeres*	*Uranotaenia*	*Orthopodomyia*	
	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 hayashi*	*Culex infantulus*	*Culex orientalis*	*Culex pseudovishnui*	*Culex inatomii*	*Culex rubensis*	*Cuex sitiens*	*Culex rubithoracis*	*Culex pallidothorax*	*Culex kyotoensis*	*Culex boninensis*	*Tripteroides bambusa*	*Lutzia vorax*	*Armigeres subalbatus*	*Uranotaenia novobscura*	*Orthopodomyia anopheloides*	*Lutzia*
Exogenous species					●																																	
Dominant 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			
Unignorable vector						(J)	(J)	(D)	(D)	(J)					(J)				(D)		(J)							(J)(W)										
New Chitose AP	SPK	193	14				7							1	3												1											
Asahikawa AP	AKJ	194	5				5	2										2																				
Hakodate AP	HKD	195	10				5																															
Aomori AP	AOJ	196	10				6											1																				
Sendai AP	SDJ	197	36			29												8		2																		
Akita AP	AKP	198	5				1																															
Fukushima AP	FKS	199	5			2	4																										1			1		
Narita International AP	NRT	200	71			2																																
Tokyo International AP	HND	201	28																																			
Kansai International AP	KIX	206	9			2													1																			
Okayama AP	OKJ	207	6			2	4	2																									2			1		
Miho AP	YGJ	208	13															2																				
Hiroshima AP	HIT	209	10	2		5	8													1	4				1								1					
Fukuoka AP	FUK	212	15															4																				
Kitakyushu AP	KKJ	213	3																																			
Oita AP	OIT	214	4																																			
Nagasaki AP	NGS	215	2																																			
Kumamoto AP	KMJ	216	8			4	1																										1	1				
Miyazaki AP	MZA	217	4																																			
Kagoshima AP	KOP	218	4																																			
Naha AP	NAP	219	11			2								1																								1
Shizuoka AP	FSZ	222	3																																			
Hyakuri AP	IBK	223	2																																			
Saga AP	QSG	225	9			8																																
Takamatsu AP	TAK	226	10			3	1											1																1				
Total			297	2	0	59	42	4	0	0	0	0	0	2	3	0	0	18	1	3	4	0	0	0	1	0	1	0	0	0	0	0	5	2	0	2	0	1

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 2020

	No. of meshes (1km mesh)	Mosquito taxa																																		
		Anopheles	*Aedes*										*Culex*																		*Tripteroides*	*Lutzia*	*Armigeres*	*Uranotaenia*	*Orthopodomyia*		
		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*	*Cuex sitiens*	*Culex rubithoracis*	*Culex pallidothorax*	*Culex kyotoensis*	*Culex boninensis*	*Tripteroides bambusa*	*Lutzia vorax*	*Armigeres subalbatus*	*Uranotaenia novobscura*	*Orthopodomyia anopheloides*	*Lutzia*	Unidentified
Exogenous species			●																																		
Dominant 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				
Unignorable vector				(J)	(J)	(D)	(D)	(J)					(J)				(D)		(J)							(J)(W)											
Total	849	3	0	303	62	5	0	4	0	0	0	2	3	0	3	54	3	4	5	0	0	0	1	0	1	0	0	0	0	0	11	4	0	2	0	1	3

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 2020

Quarantine port	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*	Unidentified fleas	Total	*Laelaps nuttalli*	*Laelaps echidninus*	*Laelaps echidninus*	*Laelaps sp.*	*Laelapidae microti*	*Haemaphysalis hystricis*	*Ixodes granulatus*	*Eulaelaps onoi*	*Ixodes monospinosus*	*Androlaelaps*	Unidentified ticks	Total	*Rattus rattus*	*Rattus norvegicus*	*Mus musculus*	*Apodemus speciosus*	*Apodemus argenteus*	*Apodemus sylvaticus*	*Micromys minutus*	*Microtus montebelli*	*Clethrionomys rufocanus bedfordiae*	*Apodemus speciosus ainu*	*Microtus*	*Arvicolinae*	Unidentified rodents	Total	Plague	Hemorrhagic fever with renal syndrome	Hantavirus pulmonary syndrome
Exogenous species																																								
Dominant vector					P																																			
Secondary vector						P																		P, HF	P, HF	P	P	P	P	P	P	P	P	P	P					
Otaru	OTR	1	2	160							0												0		4											1	5	0 / 4	0 / 4	
Ishikariwan	ISW	2	2	160							0												0		4												4	0 / 4	0 / 4	
Wakkanai	WKJ	3	1	60							0												0		1							6					7	0 / 4	0 / 4	
Rumoi	RMI	4	1	40							0												0		1							6					7	0 / 5	0 / 5	
Monbetsu	MBE	5	1	40							0												0														0			
Abashiri	ABA	6	1	20							0												0		1												1	0 / 1	0 / 1	
Hanasaki	HNK	7	1	40							0												0														0			
Kushiro	KUH	8	2	80							0												0		2												2	0 / 2	0 / 2	
Tomakomai	TMK	9	2	120		3					3												0		1												1	0 / 1	0 / 1	
Muroran	MUR	10	1	60		4					4												0		6												6	0 / 6	0 / 6	
Hakodate	HKP	11	2	80							0												0		9												9	0 / 8	0 / 8	
Aomori	AOM	12	5	400							0			2									2		4						1						5	0 / 5	0 / 5	
Hachinohe	HHE	13	5	100							0												0														0			
Miyako	MYK	14	2	40							0												0								1						1	0 / 1	0 / 1	
Kamaishi	KIS	15	2	40							0												0		1												1	0 / 1	0 / 1	
Ofunato	OFT	16	2	40		5					5												0		1												1	0 / 1	0 / 1	
Kesennuma	KSN	17	2	40							0												0														0			
Ishinomaki	ISM	18	7	592		1					1	1			2								3		15		3				1						19	0 / 19	0 / 19	
Sendaishiogama	SGM	19	10	800					1		1												0								3						3	0 / 3	0 / 3	
Akitafunakawa	AXT	20	5	400							0												0		1						2						3	0 / 3	0 / 3	
Sakata	SKT	21	5	100			1				1	2		3		1							6		1		1				1						3	0 / 3	0 / 3	
Onahama	ONA	22	6	120							0												0														0			
Hitachi	HTC	23	3	60							0												0														0			
Kashima	KSM	24	4	61							0												0	1													1	0 / 1	0 / 1	
Kisarazu	KZU	25	12	960							0												0			8											8	0 / 8	0 / 8	
Chiba	CHB	26	12	960							0												0														0			
Futami	HTM	27	2	80							0												0	4													4	0 / 4	0 / 4	
Tokyo (Keihin)	TYO	28	12	880							0												0	1	3												4	0 / 3	0 / 3	
Kawasaki (Keihin)	KWS	29	11	800							0												0	1		2											3	0 / 2	0 / 2	
Yokohama (Keihin)	YOK	30	19	1,120							0	1											1	3	1	5											9	0 / 6	0 / 6	
Yokosuka	YOS	31	1	20							0												0														0			
Misaki	MIK	32	1	20							0												0														0			
Naoetsu	NAO	33	3	60							0												0														0			
Niigata	NIH	34	5	100							0	2											2				1										1	0 / 1	0 / 1	
Fushikitoyama	FSK	35	3	60							0												0														0			

Kanazawa	KNZ	36	1	20							0												0														0		
Nanao	NNO	37	2	40							0												0														0		
Uchiura	UCU	38	2	80							0												0				2										2	0 / 2	
Tsuruga	TRG	39	4	104							0												0			3											3	0 / 3	
Shimizu	SMZ	41	15	680							0												0		7												7	0 / 7	0 / 7
Yaizu	YZU	42	3	80							0												0														0		
Fukue	FKE	44	2	120							0												0														0		
Gamagori（Mikawa）	GAM	45	2	120							0												0			2											2	0 / 2	0 / 2
Toyohashi（Mikawa）	THS	46	4	240							0												0				5										5	0 / 5	0 / 5
Kinuura	KNU	47	6	240							0												0		1	3											4	0 / 4	0 / 4
Nagoya	NGO	48	14	1,080							0			1									1			9											9	0 / 9	0 / 9
Yokkaichi	YKK	49	12	960							0												0		3												3	0 / 3	0 / 3
Owase	OWA	50	1	60							0												0		1												1	0 / 1	0 / 1
Maizuru	MAI	51	4	128							0												0														0		
Katsuura	KAT	53	1	60							0												0		1												1	0 / 1	0 / 1
Wakayamashimotsu	SMT	54	6	240							0												0			1											1		
Osaka	OSA	55	10	400							0												0														0		
Hannan	HAN	56	3	120							0												0														0		
Kobe	UKB	57	9	440							0												0		1											1	2	0 / 1	0 / 1
Mizushima	MIZ	58	2	120							0												0			1											1	0 / 1	0 / 1
Sakai	SMN	59	5	400							0												0			4											4	0 / 4	0 / 4
Hamada	HMD	60	2	80							0												0			1											1	0 / 1	0 / 1
Fukuyama	FKY	61	12	880							0	6											6		3												3	0 / 3	0 / 3
Kure	KRE	62	5	400							0												0	1													1	0 / 1	0 / 1
Hiroshima	HIJ	63	5	400							0												0														0		
Iwakuni	IWK	64	1	40							0												0														0		
Tokuyamakudamatsu	TXD	65	1	40							0												0														0		
Sakaide	SKD	68	4	280							0												0			2											2	0 / 2	0 / 2
Kanmon	MOJ	73	7	220							0												0														0		
Hakata	HKT	74	14	800							0												0			2											2	0 / 1	
Miike	MII	75	1	80				6			6												0			2											2	0 / 1	
Karatsu	KAR	76	2	120							0		3										3			2											2	0 / 2	
Imari	IMI	77	2	160							0												0			1											1	0 / 1	
Sasebo	SSB	78	1	80							0												0														0		
Nagasaki	NMX	79	4	320							0												0														0		
Izuhara	IZH	81	8	640							0												0														0		
Saganoseki	SAG	83	1	24							0												0														0		
Saiki	SAE	84	1	40							0												0		1												1	0 / 1	0 / 1
Minamata	MIN	85	1	80							0												0														0		
Yatsushiro	YAT	86	2	160							0												0														0		
Shibushi	SBS	89	6	120							0												0			2											2	0 / 2	0 / 2
Kagoshima	KOJ	90	8	140							0												0														0		
Kiire	KII	91	4	80							0												0														0		
Kinnakagusuku	KNX	93	7	560							0												0	3		1											4	0 / 3	0 / 3
Naha	NAH	94	7	481							0									2			2		1	1											2	0 / 1	0 / 1
Hirara	HRR	95	6	160							0												0	7	1												8	0 / 8	0 / 8
Ishigaki	ISG	96	10	680							0												0	8													8	0 / 8	0 / 8
Total			385	21,510	0	13	1	6	1	0	21	12	3	6	2	1	0	0	0	0	2	0	26	29	76	52	12	0	0	0	9	12	0	0	0	2	192	0 / 174	0 / 164

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 2020

Quarantine airport	3-letter code(IATA), UN-CODE	Quarantine code	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 echidninus*	*Laelaps echidninus*	*Laelaps sp.*	*Laelapidae microti*	*Haemaphysalis hystricis*	*Ixodes granulatus*	*Eulaelaps onoi*	*Ixodes monospinosus*	*Androlaelaps*	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*	*Microtus*	*Arvicolinae*	Unidentfied rodents	Total	Plague	Hemorrhagic fever with renal syndrome	Hantavirus pulmonary syndrome
Exogenous species																																								
Dominant vector					P																																			
Secondary vector						P																		P, HF	P, HF	P	P	P	P	P	P	P	P	P	P					
New Chitose AP	SPK	193	1	80							0												0									1					1	0 / 1	0 / 1	
Asahikawa AP	AKJ	194	1	40							0												0		1							1					2	0 / 1	0 / 1	
Hakodate AP	HKD	195	2	80							0												0														0			
Aomori AP	AOJ	196	10	800		2	3				5				2					10			12				5	1			9						15	0 / 14	0 / 14	
Sendai AP	SDJ	197	20	1,600							0												0		1												1	0 / 1	0 / 1	
Akita AP	AKP	198	5	100							0												0														0			
Fukushima AP	FKS	199	6	480							0				6								6				3	3									6	0 / 6	0 / 6	
Narita International AP	NRT	200	9	400							0												0	3		1											4	0 / 2	0 / 2	
Tokyo International AP	HND	201	6	122							0												0		1	1											2	0 / 2	0 / 2	
Niigata AP	NII	202	2	40							0												0			1											1			
Toyama AP	TOY	203	3	60							0												0														0			
Komatsu AP	KMQ	204	2	40							0												0			1											1	0 / 1	0 / 1	
Chubu International AP	NGA	205	2	152							0												0		1												1	0 / 1	0 / 1	
Kansai International AP	KIX	206	5	400							0		22										22			6											6	0 / 6	0 / 6	
Miho AP	YGJ	208	10	800							0												0			1	3										4	0 / 4	0 / 4	
Hiroshima AP	HIT	209	10	800							0				1		65		2				68				3										3	0 / 2	0 / 2	
Fukuoka AP	FUK	212	3	60							0												0														0			
Kitakyushu AP	KKJ	213	2	120							0												0			1											1	0 / 1	0 / 1	
Oita AP	OIT	214	1	80							0												0			1											1	0 / 1	0 / 1	
Kumamoto AP	KMJ	216	4	320							0												0														0			
Kagoshima AP	KOP	218	4	80							0												0			1											1	0 / 1	0 / 1	
Naha AP	NAP	219	9	641							0							2			3		5	11	3	1											15	0 / 14	0 / 14	
Shizuoka AP	FSZ	222	1	80							0												0														0			
Hyakuri AP	IBK	223	1	20							0												0														0			
Saga AP	QSG	225	2	160							0												0														0			
Takamatsu AP	TAK	226	1	80							0												0														0			
Total			122	7,635	0	2	3	0	0	0	5	0	22	0	9	0	65	2	2	10	3	0	113	14	7	15	14	4	0	0	9	2	0	0	0	0	65	0 / 58	0 / 58	

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 2020

Quarantine code 3-letter code(IATA), UN-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 echidninus*	*Laelaps echidninus*	*Laelaps sp.*	*Laelapidae microti*	*Haemaphysalis hystricis*	*Ixodes granulatus*	*Eulaelaps onoi*	*Ixodes monospinosus*	*Androlaelaps*	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*	*Microtus*	*Arvicolinae*	Unidentfied rodents	合 計 Total	Plague	Hemorrhagic fever with renal syndrome	Hantavirus pulmonary syndrome
Exogenous species																																						
Dominant vector			P																																			
Secondary vector				P																		P, HF	P, HF	P	P	P	P	P	P	P	P	P	P					
Total	507	29,145	0	15	4	6	1	0	26	12	25	6	11	1	65	2	2	10	5	0	139	43	83	67	26	4	0	0	18	14	0	0	0	2	257	0 / 232	0 / 222	

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 2020

		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										
Dominant, secondary, and unignorable vector or reservoir were found		83	92	100	12	74	74	69	39	0	0	0
Risk category	A	31	22	14	102	40	40	39	69	108	108	108
	B	83	91	100	12	74	74	69	39	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		114	114	114	114	114	114	108	108	108	108	108

Risk category	Definition	
	Mosquito inspection	Rodent inspection
A：Very low	No vector mosquito (dominant, secondary, or unignorable 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 (dominant, secondary, or unignorable 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 (dominant or secondary species) or fleas/mites (dominant 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 (dominant 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 (dominant species) or fleas/mites (dominant 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 (dominant, secondary, or unignorable 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 (dominant or secondary species) or fleas/mites known to transmit quarantine infectious diseases or the like (dominant 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 quarantine airports investigated (Quarantine CODE)

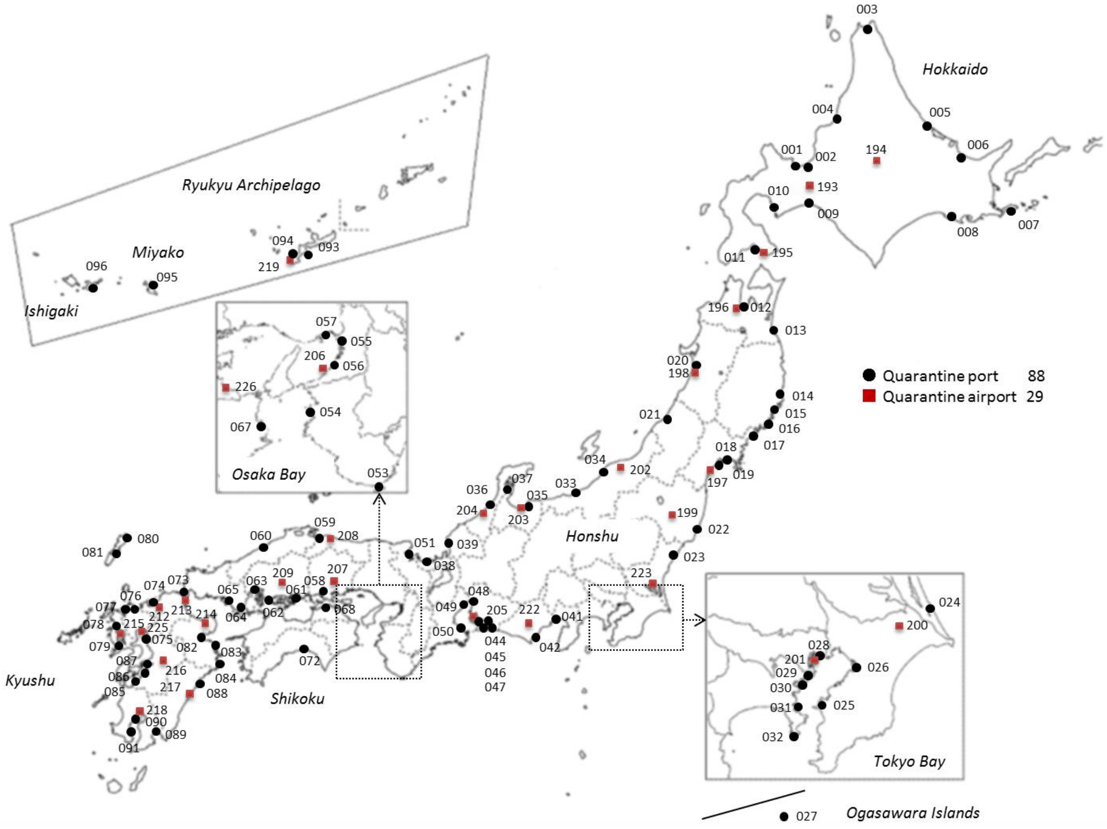


Figure 1-2 Quarantine seaports and quarantine airports investigated (UN/ LOCODE)

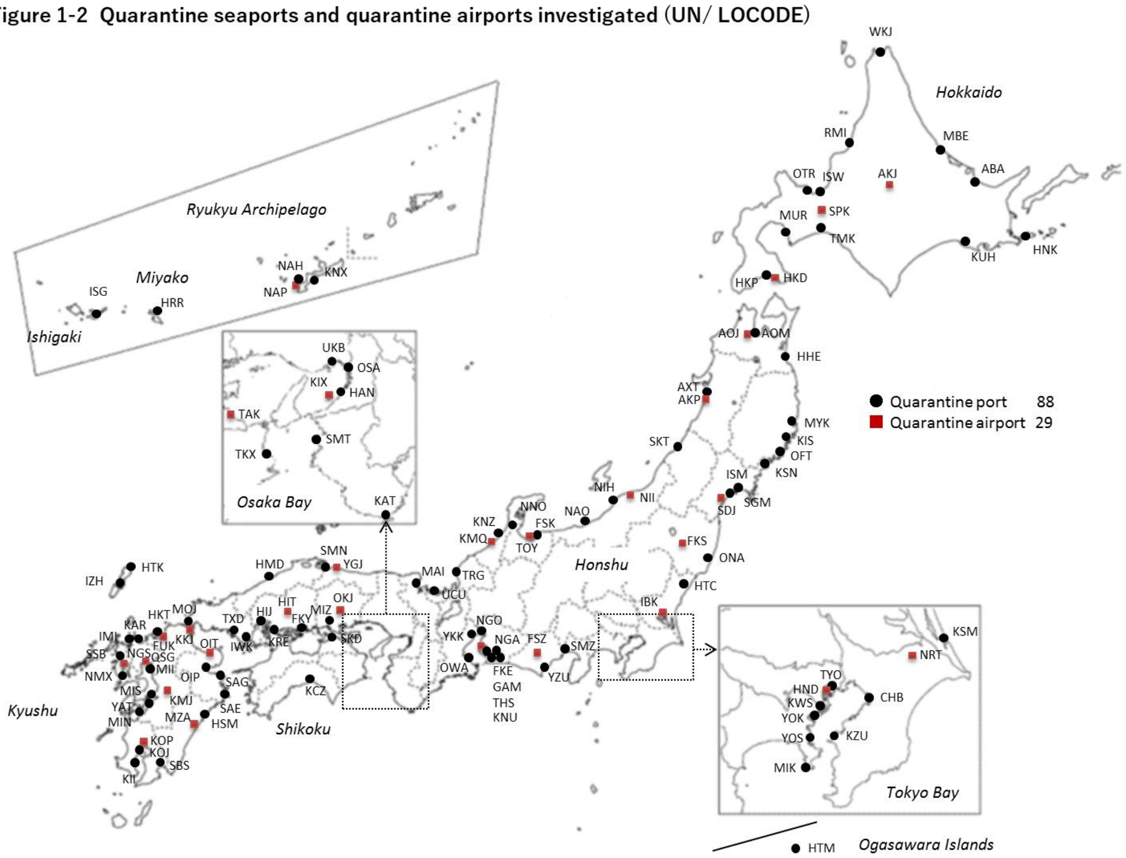


Figure 2 Invasive mosquitoes found in international aircraft and the origin of the flights in 2020.

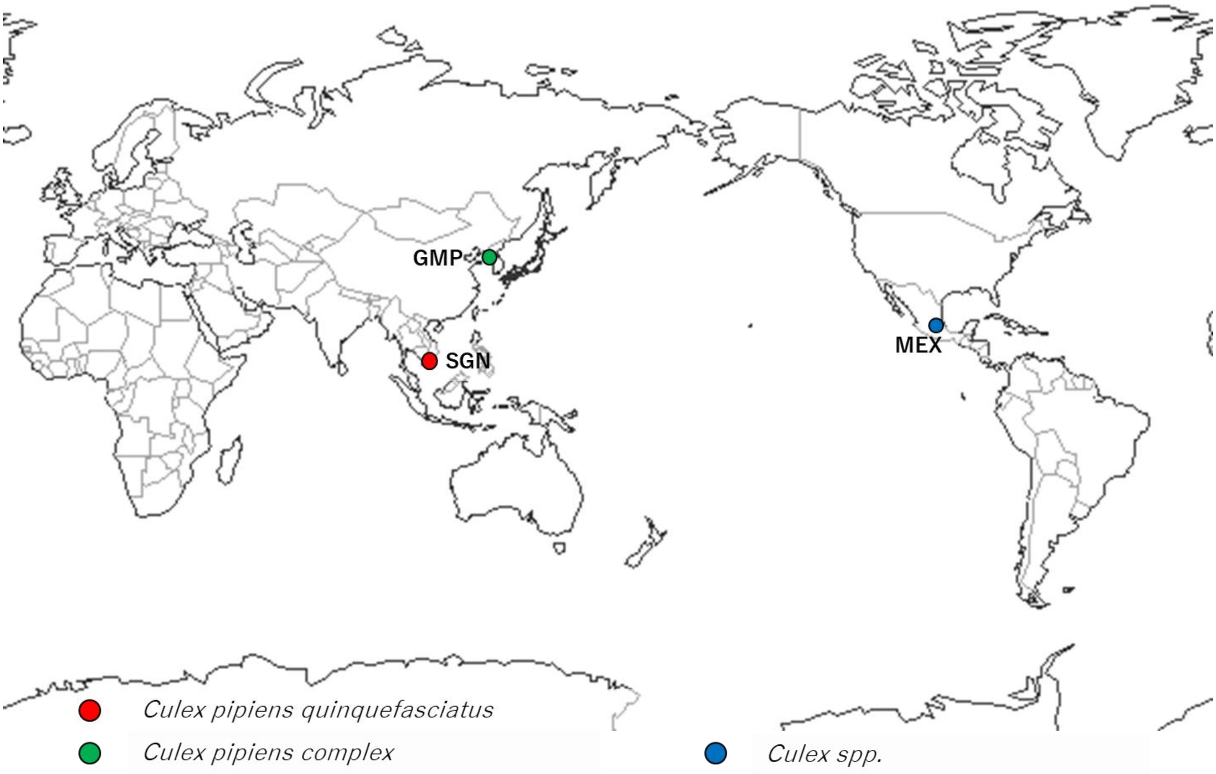


Figure 3 Dominant and secondary vector situations of Chikungunya fever and Zika virus disease at quarantine seaports and quarantine airports, Japan, in 2020.

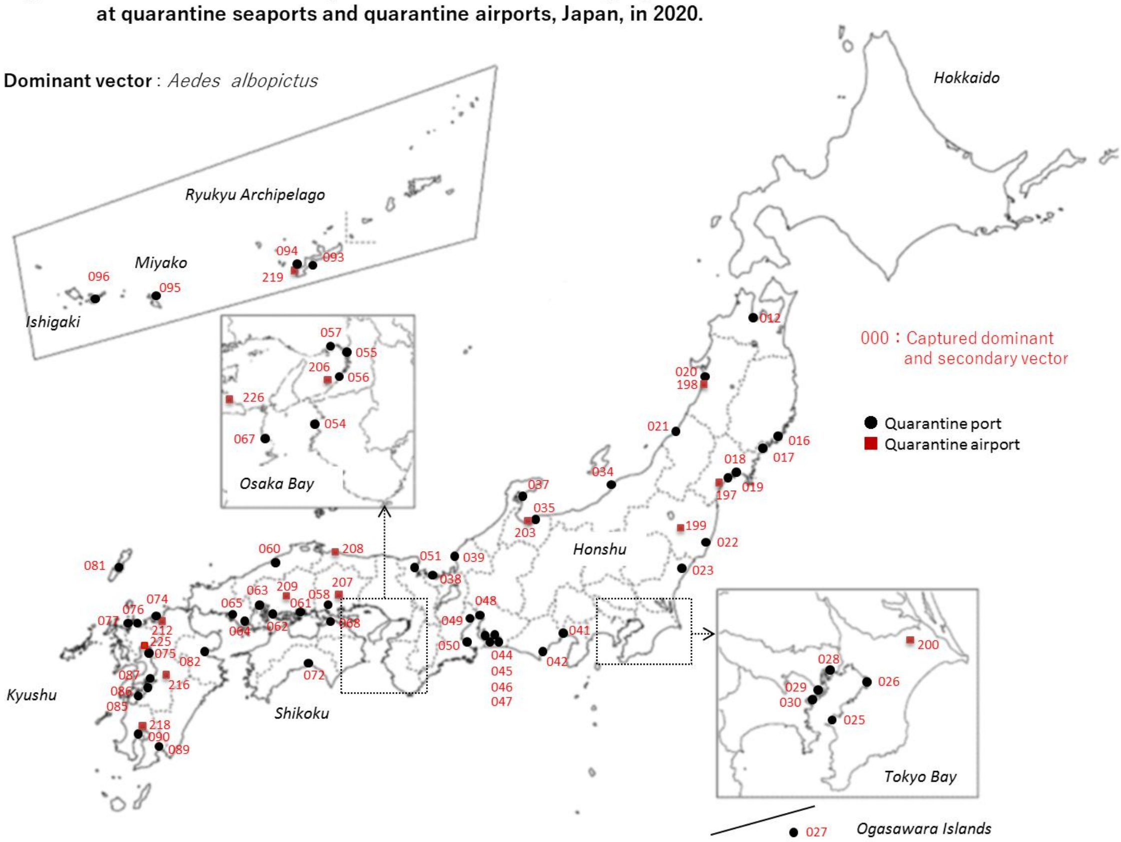


Figure 4 Dominant, secondary, and unignorable vector situations of dengue fever at quarantine seaports and quarantine airports, Japan, in 2020.

Dominant vector : *Aedes albopictus*
Unignorable vector : *Aedes dorsalis, Aedes flavopictus, Culex tritaeniorhynchus*

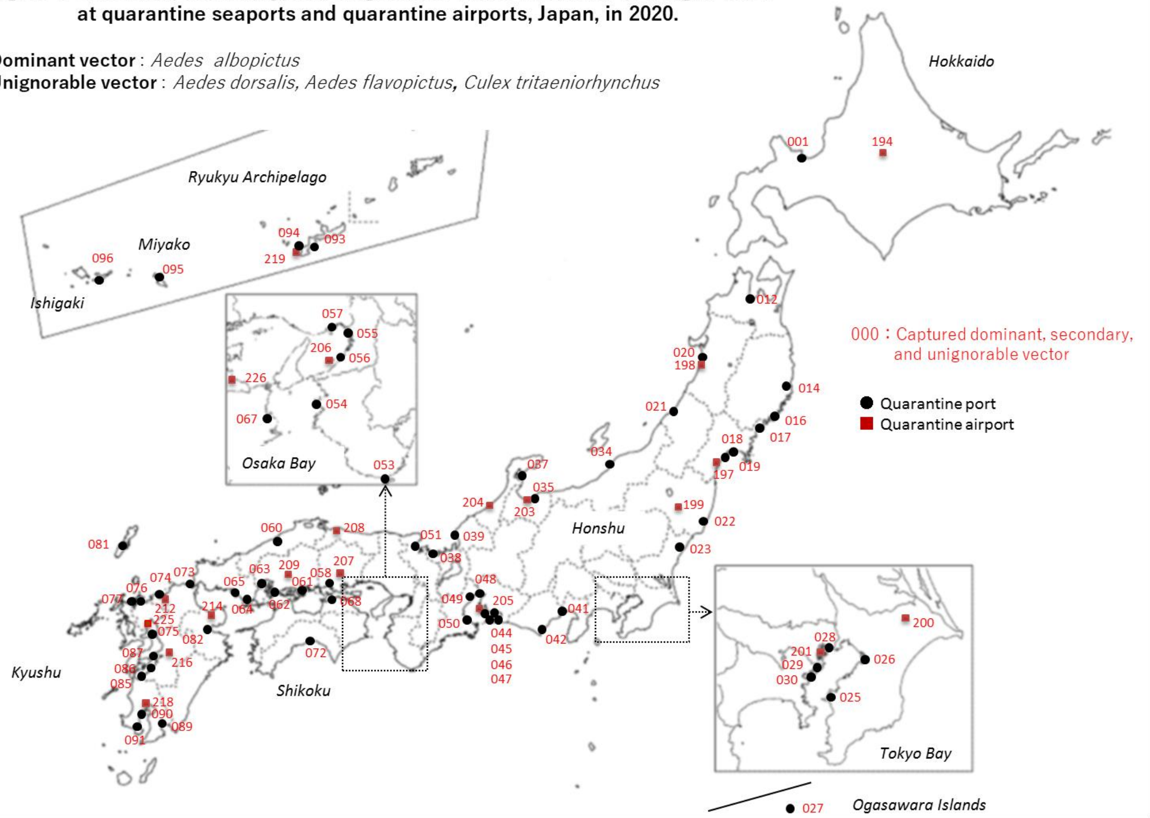


Figure 5 Dominant and secondary vector situations of malaria at quarantine seaports and quarantine airports, Japan, in 2020.

Dominant vector : *Anopheles sinensis*
Secondary vector : *Anopheles sineroides*

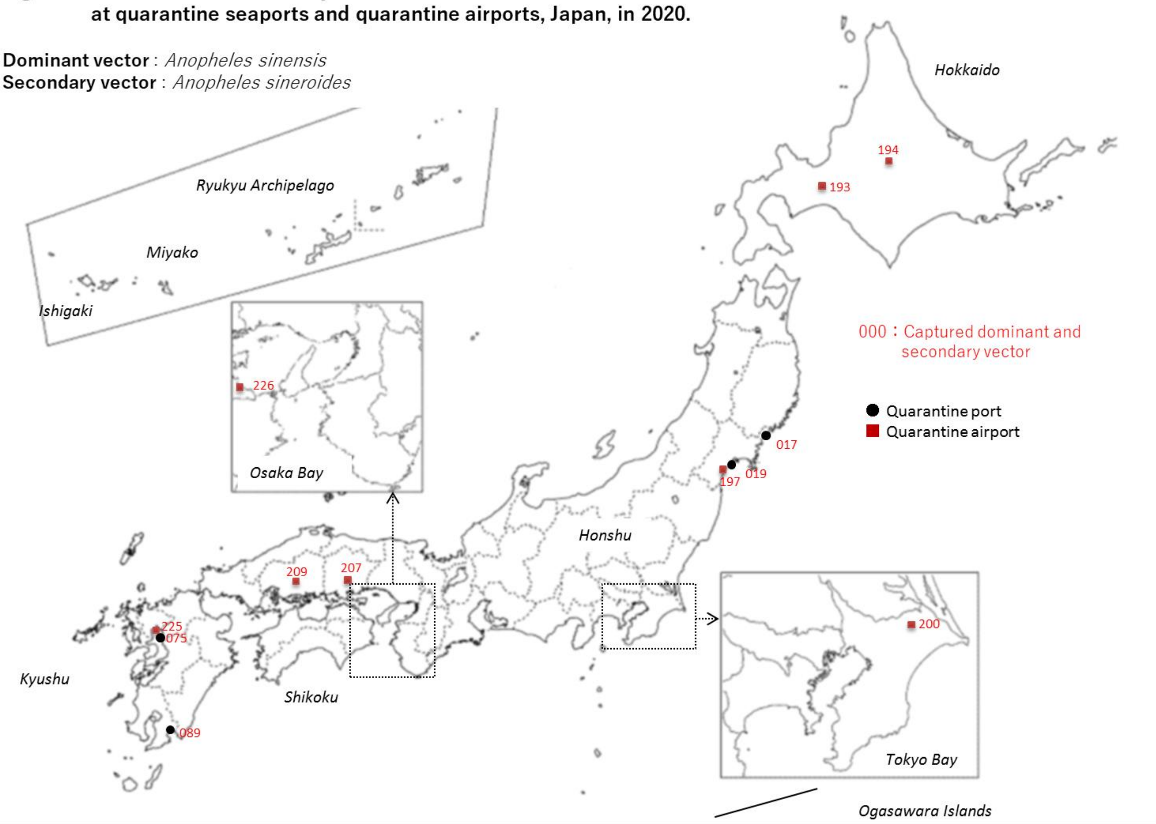


Figure 6 Dominant and secondary vector situations of West Nile fever at quarantine seaports and quarantine airports, Japan, in 2020.

Dominant vector : *Culex pipiens pallens, 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*

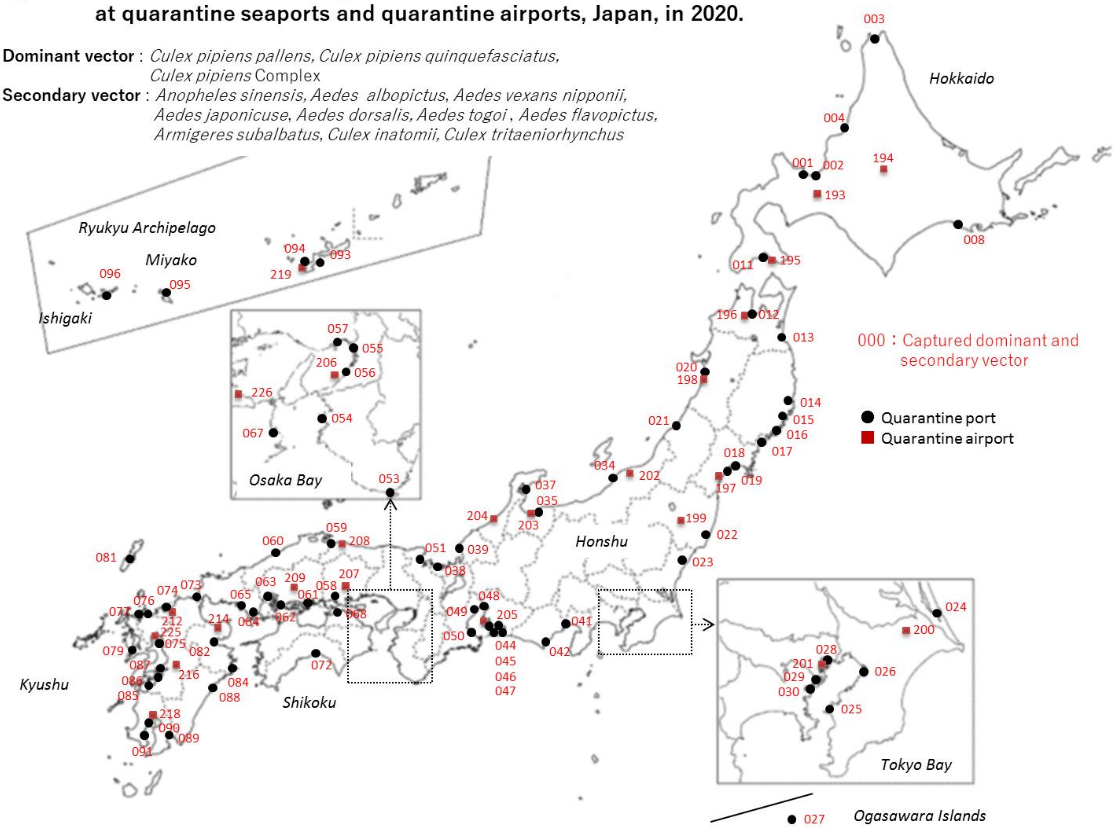


Figure 7 Dominant, secondary, and unignorable vector situations of Japanese encephalitis at quarantine seaports and quarantine airports, Japan, in 2020.

Dominant vector : *Culex tritaeniorhynchus, Culex pseudovishnui*
Unignorable vector : *Aedes albopictus, Aedes japonicuse , Aedes togoi, Culex pipiens quinquefasciatus, Culex bitaeniorhynchus, Culex pipiens pallens*

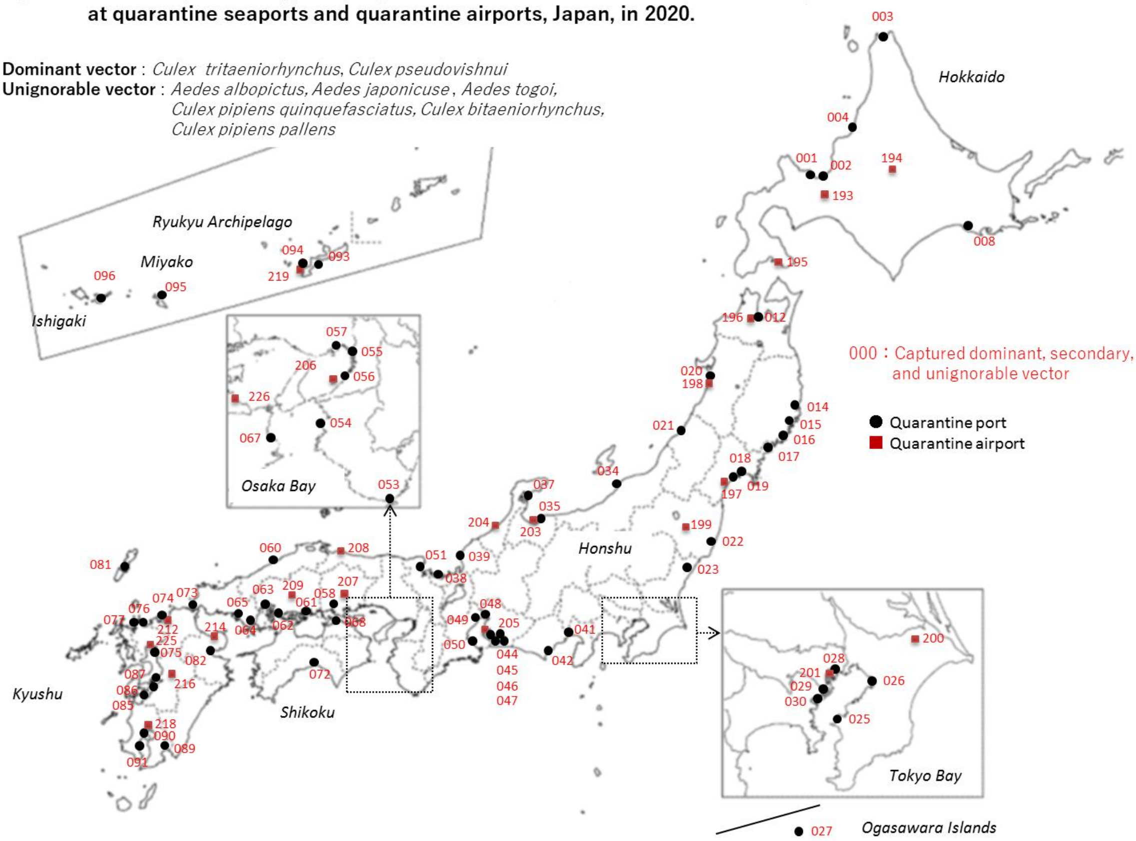


Figure 8 Dominant and secondary vector situations of plague (rodents and fleas) at quarantine seaports and quarantine airports, Japan, in 2020.

Secondary vector : *Nosopsyllus fasciatus*
Host : Rodents

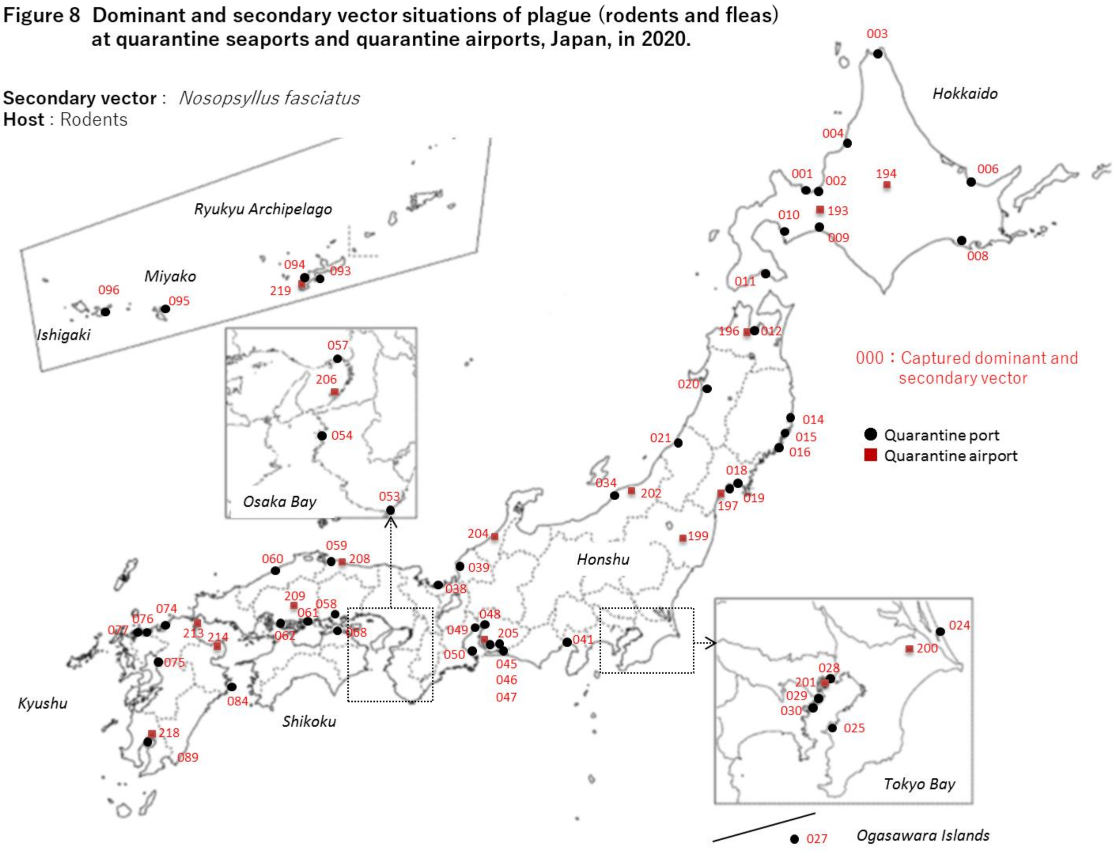


Figure 9 Dominant and secondary vector situations of hemorrhagic fever with renal syndrome at quarantine seaports and quarantine airports, Japan, in 2020.

Secondary vector : *Rattus rattus, Rattus norvegicus*

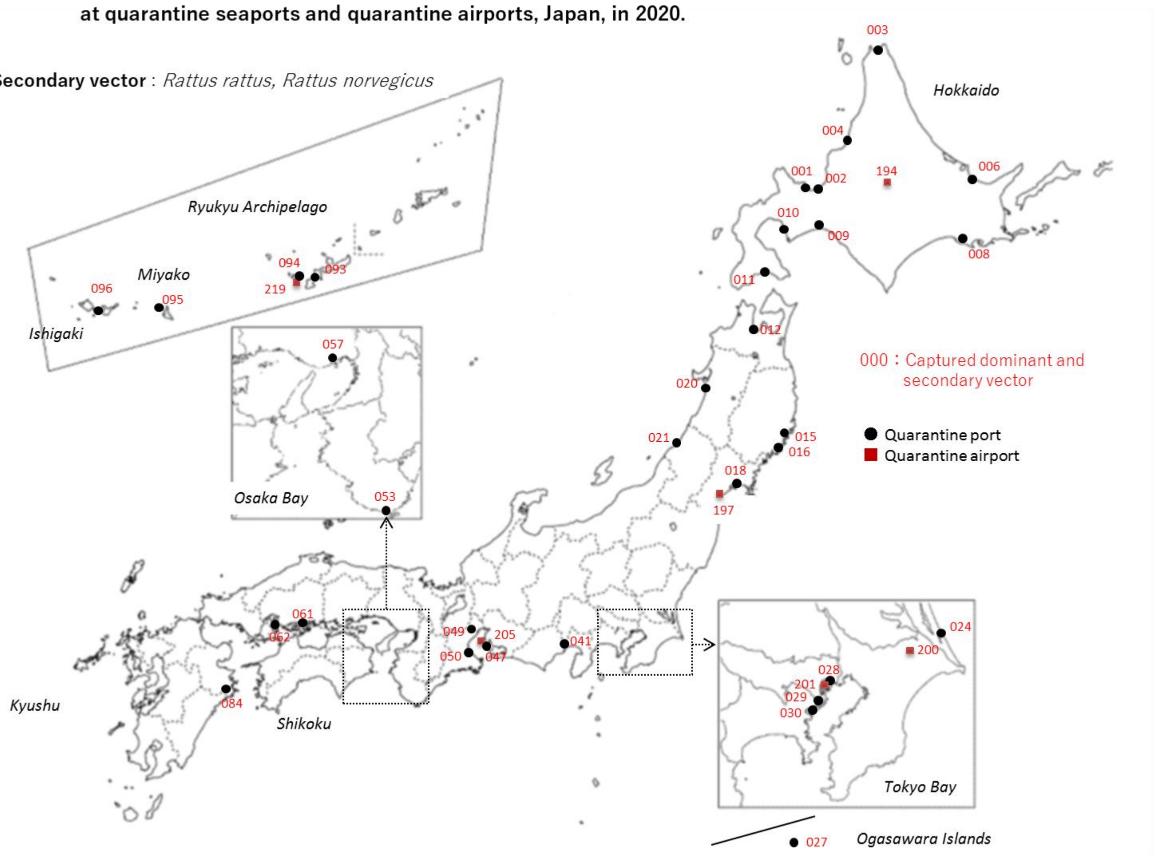
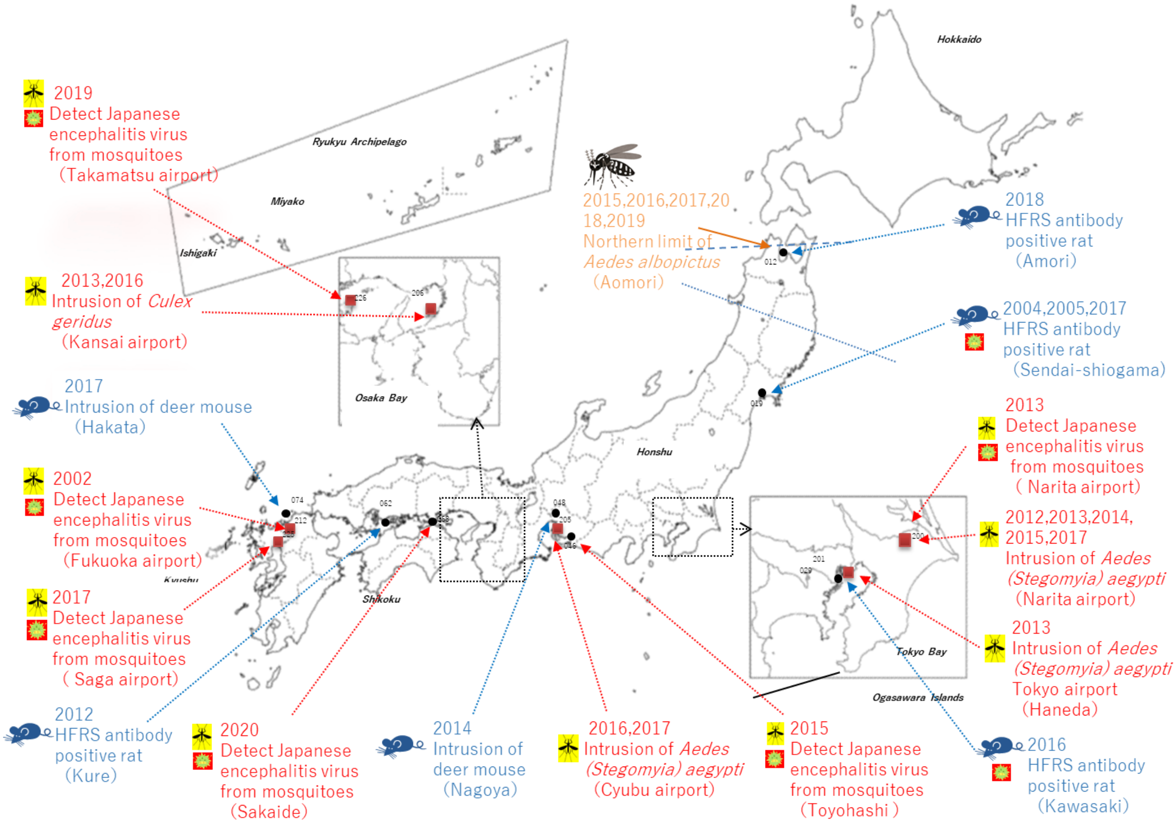


Figure 10 Major exogenous vector species and pathogens detected at points of entry in 2002-2020



○ **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-).

(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 10^{th} 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.

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 (dominant or secondary species)[1] or vector fleas/mites (dominant 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 (dominant species)[1]or fleas/mites (dominant 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 (dominant or secondary species)[1] or fleas/mites (dominant 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] Dominant 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.

Dominant 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 (dominant, secondary, or unignorable 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 (dominant 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 (dominant, secondary, or unignorable 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 (dominant, secondary, or unignorable 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)] Dominant 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.

Dominant 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.

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.