Title: A rapid risk assessment of African swine fever introduction and spread in Japan based on expert opinions

Running Head: AFRICAN SWINE FEVER RISK ASSESSMENT

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A rapid risk assessment was conducted using a questionnaire composed of 10 questions asking experts in African swine fever (ASF) to identify and rank the potential risk factors associated with the introduction and spread of ASF in Japan. The experts participating in this risk assessment considered illegal food import, followed by transport routes and foreign workers, to be the most relevant pathway of ASF introduction into Japan. Kanto and Kyushu were identified as the most likely regions for ASF introduction. All experts agreed that China is the most likely source of ASF introduction into Japan. Most Japanese experts were of the view that the risk of ASF spread if introduced into Japan would be low, while foreign experts considered the risk to be moderate or high. Most experts answered that wild boars would play an important role in the persistence of ASF if the disease were to spread in Japan.

KEY WORDS:

African swine fever, expert opinion, risk assessment, risk factor
African swine fever (ASF) is a highly contagious disease that affects pigs. It is caused by the African swine fever virus (ASFV) that belongs to the genus *Asfivirus* of the *Asfarviridae* family [1]. ASF can spread through direct or indirect contact and causes high mortality. The ASFV persists for a long time in the environment and in a variety of pig products. Wild boar can harbor the virus, and ASF may become endemic with or without an added transmission cycle through *Ornithodoros* ticks [16].

ASF was first recognized in Kenya in 1921 [8]. Since then, ASF has been found to be endemic in sub-Saharan African countries, where it persists in a sylvatic cycle between warthogs and *Ornithodoros* ticks [8]. It arrived in Portugal from Africa in 1957 and again in 1960. From there it spread to Spain, Caribbean countries (Cuba, Dominican Republic and Haiti), and then to Brazil [19, 20]. In the Iberian Peninsula, ASF was eradicated after 30 years; however, it remains endemic in the Italian island of Sardinia and most sub-Saharan African countries [2, 17]. In 2007, the disease was introduced into Georgia, a Caucasus country, and quickly spread to neighboring countries, including Armenia the Russian Federation in 2007, and Azerbaijan in 2008. From the Caucasus, the disease continued to spread northward and westward to Ukraine and Belarus in 2013, in Poland, Latvia, Estonia and Lithuania in 2014, and in Czech Republic and Romania in 2017. During this period, there were additional outbreaks to the east of the Russian Federation in domestic pig and wild boar populations [3, 17, 18]. In March 2017, ASF was reported in Irkutsk, approximately 1,000 km from the Chinese border [5].

ASF appeared in China, the largest pig producer and pig meat consumer in the world, with the first outbreak reported on a farm near Shenyang City in Liaoning Province on 3 August 2018 [10, 21]. The pigs on this farm had been fed with table scraps and suffered from acute clinical and pathological signs since mid-June 2018 [21]. The second outbreak was reported on 17 August 2018 in a slaughterhouse in Zhengzhou, a city of Henan Province. The infected pigs had been legally transported from a live swine market in Heilongjiang Province [11]. The disease continued to spread in mainland China. By
7 September 2018 six additional widely separated outbreaks had been reported in Jiangsu, Zhejiang, Anhui, and Heilongjiang Provinces [12-15]. There is no sign that the epidemic will cease in the near future despite the disease control measures being in place, which includes culling of affected and susceptible animals. ASFV was suggested to be circulating in the area since at least March 2018 [9]. There is some evidence to support the view that the source of the Chinese epidemic is Russia. Genetic testing has shown that the sequencing of the Chinese virus is consistent with the corresponding sequence of the Russian Irkutsk 2017 strain [21].

In response to the rapid geographic expansion of the disease, the Japanese government has tightened quarantine operations at airports and seaports, especially for travelers from China, and has called for domestic pig farmers to adopt a higher level of biosecurity measures [7]. However, no systematic risk assessment has been made to identify the risk factors associated with the introduction of ASF to Japan and factors that would assist the spread of the disease in Japan.

We conducted a rapid risk assessment to identify and rank potential risk factors for the introduction and spread of ASF in Japan using a questionnaire comprising 10 questions asking ASF experts to rank potential risk factors associated with the introduction, spread, and persistence of the disease in Japan. This questionnaire was similar to the one used by the FAO to identify and rank risk factors associated with the introduction, spread, and persistence of ASF in China [4], but modified to accommodate the Japanese situation. The questionnaire was sent to 14 experts by e-mail on 31 August 2018 (See supplementary material 1 for the questionnaire used).

As a proxy for the data required for their assessment, the experts were provided with background information on: Japanese pig production; the number of international flights, boats, and vehicles arriving in Japan; import data of live pigs, pig meat, and heat-processed pig meat products to Japan; import data of feed and feed ingredients to Japan; data on the illegal import of animal product to Japan; the number of international travelers and workers in Japan; the habitats of wild boars and soft ticks in
Japan; and biosecurity measures of pig farms in Japan (See supplementary material 2 for the details of the background information).

Responses were received by 14 September 2018 from 11 experts: Samuel Connell, Pirbright Institute, UK; Klaus Depner, Friedrich-Loeffler-Institute, Germany; Linda Dixon, Pirbright Institute, UK; Chris Netherton, Pirbright Institute, UK; Hua-ji Qiu, Harbin Veterinary Research Institute, China; Helen Roberts, Defra, UK; Mitsugu Shimizu, Japan; Masuo Sueyoshi, Miyazaki University, Japan; Motoyuki Tsuda, KM Biologics, Co., Ltd., Japan; and two experts who did not want their names disclosed. Three of the experts did not respond to all the questions, having reported a lack of information for some of the questions. Responses from all experts are summarized as follows:

**Most likely pathway of ASF introduction into Japan**—Experts widely agreed that the most likely way of ASF introduction into Japan was the illegal import of food, followed by transport routes and foreign workers in Japan (Fig. 1A). They considered the risk of introduction through these pathways to be moderate, while they ranked all other pathways negligible or low risk. One expert was of the view that the risk of ASF introduction through legally imported pig meat products is high given the large amount being imported into Japan, even if the heat treatment condition still applies. Most experts were of the view that the risk of ASF introduction through wild boars and the legal or illegal import of pigs is negligible or very low because of Japan’s geographical advantage; i.e., that it is surrounded by the sea and does not share borders with any country. Among various transport-associated routes, most experts believed that waste from international ships and planes can contribute to the introduction of the disease, and that this was more of a concern than contamination from international vehicles. One expert was of the view that if ASF is introduced to Korea, the risk of introduction to Japan through contaminated vehicles would increase dramatically.

**Japanese regions where ASF is most likely to be introduced**—Most experts considered Kanto and Kyushu, followed by Kinki region, as the two regions where ASF would most likely to be introduced.
They considered the presence of large international airports, the number of foreign tourists, wild boar habitats, and pig population density as key risk factors in ranking the regions.

**Source of ASF introduction into Japan**—All experts agreed that East Asia (China) would be the most likely source of ASF introduction into Japan (Fig. 1B). Most experts considered Africa to be a less likely source of introduction into Japan compared to a similar risk assessment previously conducted for China [4]. This is likely because Japan’s economic relationship with Africa is not as strong as China’s economic relationship with Africa in terms of movement of people, ships, and aircrafts.

**Risk of ASF spread in Japan once introduced**—Most Japanese experts considered that the spread of ASF in Japan is very unlikely (1-10%), while most foreign experts answered that it is as likely as not (30-60%). Some foreign experts believed that in the presence of a wild boar habitat, particularly with poorer biosecurity levels, there is a chance that ASF could spread without being detected at an early stage.

**Relevance of ticks to the spread of ASF in Japan**—Most experts answered that the relevance of ticks to the spread of ASF in Japan is extremely unlikely (<1%). One Japanese expert was of the view that the soft ticks (*Ornithodoros* spp.) that exist in Japan are unlikely to become a vector of ASF.

**Japanese regions where ASF is most likely to spread**—Most experts believed that Kyushu and Kanto are the regions where ASF would be most likely to spread, while Shikoku is the region where the disease would be least likely to spread (Fig. 2B). Some experts were of the view that an epidemic would be prevented if the infection remained contained in domestic pigs.

**Production systems to be affected after the spread of ASF in Japan**—Most experts answered that family-run or semi-intensive pig farms, rather than commercial farms, would be most affected if the disease were to spread in Japan (Fig. 1C).

**Risk of ASF persistence**—Most experts were of the view that the persistence of ASF is extremely or very unlikely (<10%).
Risk factors involved in ASF persistence—Most experts answered that the presence of wild boars would play the largest role in the persistence of the disease once spread in Japan (Fig. 1D). Until a more refined risk assessment is conducted, these results can provide policy makers, veterinarians and pig farmers with useful information in developing quarantine and biosecurity programs to protect Japanese pig herds from the introduction and spread of ASF. In conducting our risk assessment, we identified information gaps in the following areas:

Amount of pig meat products illegally imported from China and other countries—Illegally imported pig meat products might not be properly heat-treated, and thus have a greater chance of becoming a source of infection compared to legally imported products. Assuming that the amount of animal products actually seized by the Animal Quarantine Service (83 tons in 2017) is the tip of the iceberg, there is a possibility that a much larger amount is being imported illegally from China and other countries for personal consumption or commercial purposes.

Frequency of swill feeding in pig farms—Though swill feeding is not a common practice on Japanese pig farms, it is not prohibited. Data on the frequency of swill feeding, as well as the treatment procedures applied, are needed for a more accurate risk assessment.

Level of biosecurity measures on pig farms—Many experts stressed the importance of biosecurity on pig farms in preventing the introduction and spread of ASF. In accordance with the Domestic Animal Infectious Diseases Control Law, all pig farmers are supposed to observe biosecurity measures to protect their pig herds from the introduction of infectious diseases including ASF. As of 13 August 2018, there are only 107 pig farms certified for the Farm HACCP which includes control points for biosecurity measures [6]. For other pig farms, the compliance level of biosecurity measure is not really known.

Given the fact that there are many foreigners who visit Japan after visiting ASF-affected countries or after working on pig farms, the pig farms should assure that their biosecurity measures are sufficiently
high to protect their farms from the introduction of ASF.

According to many experts, while the spread and persistence of ASF by ticks is unlikely, there is a significant risk by the wild boar habitat in Japan, particularly if early detection is delayed. Japanese pig farmers should be on alert, not just to protect their farms from the introduction of ASF, but to ensure early notification of the disease should it be introduced.

This rapid risk assessment has identified key knowledge gaps and thus a need for the collection of further data to perform a more refined qualitative or quantitative risk assessment.

ACKNOWLEDGMENTS

We would like to thank the ASF experts who participated in this rapid risk assessment for completing the questionnaire and providing us with valuable comments. We would also like to thank the FAO for allowing us to use the questionnaire that they developed for an ASF rapid risk assessment of China.

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REFERENCES


Fig. 1

Most likely way of ASF introduction into Japan (A); most likely source of ASF introduction into Japan (B); production system mostly affected (C); and risk factors associated with the persistence of ASF in Japan (D). The scale on the vertical axis indicates the risk: 0 (negligible risk); 1 (very low risk); 2 (low risk); 3 (moderate risk); 4 (high risk) and 5 (very high risk). Open circles indicate the average and error bars indicate the range of expert opinions.
Fig. 2

Regions where ASF is most likely to be introduced (A); and regions where ASF is most likely to spread (B). The scale on the vertical axis indicates the rank of regions in terms of the likelihood of introduction, from 1 (least likely to be introduced/spread) to 9 (most likely to be introduced/spread). Open circles indicate the average and error bars indicate the range of expert opinions.
A rapid risk assessment of African swine fever introduction and spread in Japan based on expert opinions

Katsuaki Suigiura and Takeshi Haga

Supplementary material
### Section 1: Introduction of ASF in Japan

**Question 1: What is the most likely way that the disease will be introduced?**

Please rank from the very high (5) to the negligible (0) risk factors for the introduction of ASF into Japan.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>0 (Negligible)</th>
<th>1 (Very low)</th>
<th>2 (Low)</th>
<th>3 (Moderate)</th>
<th>4 (High)</th>
<th>5 (Very high)</th>
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</thead>
<tbody>
<tr>
<td>Transport associated routes (international contaminated waste by vehicles, planes, ships)</td>
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<td>Legal importation of live infected pigs</td>
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<td>Illegal importation of live infected pigs</td>
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<td>Introduction of live infected wild boar</td>
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<td>Legal importation of feed that contains contaminated foodstuffs</td>
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<td>Illegal importation of food that contains contaminated foodstuffs</td>
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<tr>
<td>Farm workers in ASF infected countries (through fomites or contaminated equipment)</td>
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</tbody>
</table>

**Please Explain:**
**Question 2: What is the region in Japan where the disease is most likely to be introduced?**

Please rank the regions from the least (1) to the most likely (9)

<table>
<thead>
<tr>
<th>Region (prefectures)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hokkaido</td>
<td></td>
</tr>
<tr>
<td>2 Tohoku (Aomori, Iwate, Miyagi, Akita, Yamagata, Fukushima)</td>
<td></td>
</tr>
<tr>
<td>3 Kanto (Ibaraki, Tochigi, Gunma, Saitama, Chiba, Tokyo, Kanagawa)</td>
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</tr>
<tr>
<td>4 Chubu (Niigata, Toyama, Ishikawa, Fukushima, Yamanashi, Nagano, Gifu, Shizuoka, Aichi)</td>
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</tr>
<tr>
<td>5 Kinki (Mie, Shiga, Kyoto, Osaka, Hyogo, Nara, Wakayama)</td>
<td></td>
</tr>
<tr>
<td>6 Chugoku (Tottori, Shimane, Okayama, Hiroshima, Yamaguchi)</td>
<td></td>
</tr>
<tr>
<td>7 Shikoku (Tokushima, Kagawa, Ehime, Kochi)</td>
<td></td>
</tr>
<tr>
<td>8 Kyushu (Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki)</td>
<td></td>
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<tr>
<td>9 Okinawa</td>
<td></td>
</tr>
</tbody>
</table>

**Please Explain:**
**Question 3: What is the risk of introduction through Transport associated Routes (TAR)?**

Please rank from the most to the least relevant risk factors for the introduction of ASF into Japan:

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>0 (Negligible)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 (Very high)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pork meat waste from international vehicles</td>
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<tr>
<td>Pork meat waste from international ships</td>
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<tr>
<td>Pork meat waste from international planes</td>
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</tbody>
</table>

**Please Explain:**

**Question 4. Which ASF infected regions will be the source of introduction of ASF into Japan?**

Please rank from the least (1) to the most likely (6).

<table>
<thead>
<tr>
<th>Region (infected countries)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa (Brundi, Cape Verde, Kenya, Mali, South Africa, Uganda, Zimbabwe)</td>
<td>1</td>
</tr>
<tr>
<td>Caucasus (Moldova)</td>
<td>2</td>
</tr>
<tr>
<td>East Europe (Estonia, Latvia, Lithuania, Poland, Ukraine)</td>
<td>3</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>4</td>
</tr>
<tr>
<td>West Europe (Italy-Sardinia)</td>
<td>5</td>
</tr>
<tr>
<td>East Asia (China)</td>
<td>6</td>
</tr>
</tbody>
</table>

**Please Explain:**
Section 2: Spread of ASF in Japan

Question 5: What is the risk of spread of ASF if introduced into Japan?

Please provide your best estimate

0. Extremely unlikely (0%-1%)
1. Very unlikely (1%-10%)
2. Unlikely (10%-30%)
3. As likely as not (30%-60%)
4. Likely (60%-90%)
5. Very likely (90%-99%)
6. Extremely likely (99%-100%)

Question 6: What would be the relevance of the ticks in the spread of ASF if introduced into Japan?

Please provide your best estimate

0. Extremely unlikely (0%-1%)
1. Very unlikely (1%-10%)
2. Unlikely (10%-30%)
3. As likely as not (30%-60%)
4. Likely (60%-90%)
5. Very likely (90%-99%)
6. Extremely likely (99%-100%)

Question 7: What is the region in Japan where the disease is most likely to spread?

Please rank the regions from the least (1) to the most likely (9)

<table>
<thead>
<tr>
<th>Region (prefectures)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hokkaido</td>
<td>1</td>
</tr>
<tr>
<td>Tohoku (Aomori, Iwate, Miyagi, Akita, Yamagata, Fukushima)</td>
<td>2</td>
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<tr>
<td>Kanto (Ibaraki, Tochigi, Gunma, Saitama, Chiba, Tokyo, Kanagawa)</td>
<td>3</td>
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<tr>
<td>Chubu (Niigata, Toyama, Ishikawa, Fukushima, Yamanashi, Nagano, Gifu, Shizuoka, Aichi)</td>
<td>4</td>
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<tr>
<td>Kinki (Mie, Shiga, Kyoto, Osaka, Hyogo, Nara, Wakayama)</td>
<td>5</td>
</tr>
<tr>
<td>Chugoku (Tottori, Shimane, Okayama, Hiroshima, Yamaguchi)</td>
<td>6</td>
</tr>
<tr>
<td>Shikoku (Tokushima, Kagawa, Ehime, Kochi)</td>
<td>7</td>
</tr>
<tr>
<td>Kyushu (Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki)</td>
<td>8</td>
</tr>
<tr>
<td>Okinawa</td>
<td>9</td>
</tr>
</tbody>
</table>

Please Explain:
Question 8: What production system will be mostly affected in Japan?

Please rank from the negligible (0) to the very high (5) risk factors for the spread of ASF into Japan:

<table>
<thead>
<tr>
<th>Family-run</th>
<th>0 (Negligible)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 (Very high)</th>
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<tbody>
<tr>
<td>Semi-intensive</td>
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<td>Commercial</td>
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<td>Farrow to finish</td>
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<td>Farrow to wean</td>
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<tr>
<td>Wean to finish</td>
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</table>

PLEASE EXPLAIN:
**Section 3: Persistence of ASF in Japan**

**Question 9: What is the chance of ASF getting persistent in Japan if introduced and spread in Japan?**

<table>
<thead>
<tr>
<th></th>
<th>Extremely unlikely (0%-1%)</th>
<th>Very unlikely (1%-10%)</th>
<th>Unlikely (10%-30%)</th>
<th>As likely as not (30%-60%)</th>
<th>Likely (60%-90%)</th>
<th>Very likely (90%-99%)</th>
<th>Extremely likely (99%-100%)</th>
</tr>
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<tbody>
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<td>0</td>
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</table>

**Question 10: What is the most likely factor contributing to the persistence of the ASF in Japan?**

Please rank from the negligible (0) to the very high (5) risk factors for the persistence of ASF in Japan.

<table>
<thead>
<tr>
<th>Factor</th>
<th>0 (negligible)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 (very high)</th>
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<tbody>
<tr>
<td>Presence of infected wild boars</td>
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<tr>
<td>Production system</td>
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<tr>
<td>(family-run/commercial)</td>
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<tr>
<td>Movements related to hunting</td>
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<tr>
<td>Presence of the vector</td>
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<tr>
<td>Slaughterhouses</td>
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**PLEASE EXPLAIN:**
BACKGROUND INFORMATION

Japanese pig production

There are 4,470 pig farms in Japan keeping 9,189,000 pigs as of February 2018. Kyushu and Kanto Regions are the two major pig producing regions representing 58% of the pig production in Japan, followed by Tohoku Region. Of these 1,800 farms have more than 1,000 fattening pigs and represent 89% of the pig meat production. The average number of pigs kept per farm is 2,056 (MAFF, 2018a). In fiscal year 2017 (1 April 2017-31 March 2018) 1,816,000 tons of pig meat was consumed, of which 890,000 tons was domestically produced and 926,000 tons imported (MAFF, 2018b).

Number of international flights, boats and vehicles

A total of 3,782 regular international passenger flights arrived weekly in airports in Japan as of December 2014. Of these, 2,826 (63%) flights are from Asian countries (782 (21%) flights are from China), 448 (11.8%) from North America, 237 (6.3%) from Europe. In addition, 4,516 charter passenger flights arrived in airports in Japan in the same year (MLIT, 2015). There were 103,642 international boats arriving in ports in Japan in 2016 (MLIT, 2017a). Most of them were freight container boats. Food scraps from the international flights and boats must be incinerated. The AQS regularly inspects that the scraps are properly treated (MAFF, 2018c). There is a daily ferryboat service between Shimonoseki (Yamaguchi Prefecture) and Pusan (Korea) that transports not only passengers but also motor vehicles. With this ferryboat service, 6035 trucks and 335 passenger cars arrived in Shimonoseki Port in 2016 (MLIT, 2017b).

Import of live pigs

A total of 1,040 live pigs were imported into Japan in 2016, from Ireland, UK, Netherlands, Denmark, France, US and Canada in 2016 (AQS, 2017a). Pigs exported to Japan must be born in ASF free countries and shipped without going via ASF infected countries (AQS, 2011). Consequently, no pigs have been imported from ASF infected countries (AQS, 2017a).

Import of pig meat

A total of 1,027,934 metric tons of pig meat was imported into Japan in 2016, from the US, Canada, Denmark, Mexico, Chili and other countries (AQS, 2017b). The pigs from which the pig meat exported to Japan must originate in ASF free countries (AQS, 2000). Consequently, no pig meat was imported from ASF infected countries (AQS, 2017b).
Import of heat-processed pig meat products

A total of 12,656 metric tons of heat processed pig meat and 19,211 tons of heat processed sausage were imported into Japan in 2016. Of these 7,803 tons of heat-processed pig meat and 8,285 tons of heat-processed sausage were from China. (AQS, 2017b) The heat processed pig products are subjected to heat treatment at a temperature of 70 degree Celsius for one minute by boiling or for 30 mins by heating in a water bath, or drying in hot air (AQS, 2013). There are 106 plants designated in China for the production of heat-processed meat products for export to Japan (AQS, 2018a).

Import of feed and feed ingredients

A total of 10,015,625 tons of maize was imported into Japan in 2016 for feed ingredients, of which 18635 tons was imported from China (ALIC, 2017). A total of 185,927 tons of cotton oil cake was imported into Japan in 2016 for feed ingredients, of which 955,582 tons was imported from China (ALIC, 2017).

Illegal import of animal product

There were 94,741 cases (83313 kilograms) of seizure of prohibited animal product from international passengers in 2017, of which 28,994 cases (41,040 kilograms) were from passengers from China. (AQS, 2018b)

Number of international travelers and workers

A total of 24,039,700 foreigners visited Japan in 2016, of which 6,373,564 (27.6%) were from China, 5090,302 (21.2%) were from Korea, 4,167,512 (17.3%) were from Taiwan and 1,839,193 (7.6%) were from Hong Kong. 119,251 were from Italy and 54,839 from Russia (JNTO, 2018a). A total of 17,116,420 Japanese went abroad in 2016, of which 3,576,955 (20.9%) went to the US, 2,587,440 (15.1%) went to China, 2,297,893 (13.4%) went to Korea, 1,895,702 (11.1%) went to Taiwan, and at least 81,810 went to African countries, 403,879 went to Italy, 88,000 went to Poland 23953 went to Estonia, 23,191 went to Rumania, 22,674 went to Lithuania, 6,598 went to Ukraine (JNTO, 2018b).

There were 5353 foreign workers working as trainee on farms in Japan in 2016 (JITCO, 2017). Of these, 1442 (27%) in Kanto Region and 1914 (35%) in Kyushu Region (JITCO, 2017). In terms of the foreign workers working on pig farms, 16.9 % of pig farms in Japan employ foreign workers. They are from Vietnam (36.7%), China (21.9%) and other Asian countries according to a survey conducted by Japan Pig Producers Association (JPPA, 2018).

Wild boar habitat in Japan
There are two subspecies of wild boar in Japan: Japanese wild boar and Ryukyu wild boar. Japanese wild boars live mainly in Honshu (main land), Shikoku and Kyushu. Ryukyu wild boars live in Okinawa and other islands in the south. In addition, cross breed animals between wild boar and domestic pig live widely in Japan (INOHOI, 2017).

**Soft ticks habitat in Japan**

Soft ticks (Genus Ornithodoros) live in Japan. However, it is not known if they are capable of transmitting or propagating ASF virus (NIAH, 2018).

**Biosecurity measures of pig farms**

In accordance with the Domestic Animal Infectious Diseases Control Law, the pig farmers are obliged to observe the biosecurity standards that include establishment of clean and contaminated areas, restriction of visitors into the clean area, disinfection of vehicles entering the clean area, early notification and suspension of shipment and movement of pigs when specified conditions are observed (MAFF, 2017).

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