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## Processing and Consumption of Wild Animal Meat or “Gibier” in Japan: Safety Concerns and Recommendations

	
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### ABSTRACT

Gibier refers to wild birds and other animals that are hunted for their meat. In recent years, the consumption of gibier has become popular in Japan. This is considered to be good in terms of food sustainability; however, in Japan, there are currently health and safety risks arising from the fact that the meat processing methods for wild animals are not well defined. The main risk is the infection from pathogens such as hepatitis E (derived from viruses), *Escherichia coli* O157 (arising from intestinal bleeding), and *Trichinella spiralis* (trichinosis). Therefore, to reduce the risk of infection, the national and local governments must establish proper processing mechanisms including meat processing plants. In the meantime, hunters, restaurant chefs, meat processors, and consumers must be informed of the meat's origin and processing methods. In this paper, we discuss the differences in processing methods for wild animal meat and livestock meat. We also explain why gibier is popular among consumers and we outline problems associated with gibier.

## INTRODUCTION

Gibier originates from the French word “gibier” and refers to wild birds and other animals captured by a hunter or their meat<sup>1)</sup>. In recent years, gibier has become popular in Japan, served by an increasing number of restaurants<sup>2-3)</sup>. There are several possible reasons for this. The first is that wild animal obtained from hunting are not discarded as waste but are being used for food. Second, the government supports the use of gibier. The Ministry of Agriculture, Forestry and Fisheries believe that extermination of harmful birds and other animals leads to a reduction in crop damage, while also providing a resource for hunters. The Ministry of the Environment adjusts the densities of wild animal populations by paying bounties (dependent on the number of animals removed) to hunters<sup>4)</sup>. However, the Ministry is struggling with its budget<sup>4)</sup>. Ministry officials believe financial budgets can be reduced by using hunted animals for food rather than discarding the carcasses. Therefore, the consumption of hunted animal meat is promoted. Third, gibier is considered to be a healthy food option in Japan. It is generally thought to be low in calories and fat, and is attractive to health-conscious Japanese and those involved in the booming gourmet-food sector<sup>3)</sup>. However, gibier may pose a risk of infection to consumers<sup>5)</sup>. In this article, we outline what gibier is and what it is used for the dangers associated with it, and efforts underway to improve product safety. We also provide further suggestions on how to improve the safety of gibier for consumers.

## PROCESSING LIVESTOCK INTO MEAT

Before describing the processing of gibier meat, we will first introduce general livestock meat processing<sup>2)</sup>. In the case of livestock, such as cattle, pigs, and chickens, their feed is managed by livestock farmers (feed management) and the animals are kept in managed environments that optimize health (health management). When processing meat, veterinarians are present to monitor the health status of each animal (primarily the presence or absence of disease), and a strict inspection is performed (sanitary management). These actions are defined by the “Slaughterhouse Act” and “Poultry Meat Inspection Act”. Animals covered by these laws include livestock (cows, horses, pigs, sheep, and goats) and poultry (chicken, ducks, quail, and turkeys). In terms of gibier, edible wild animals are, therefore, categorized in a similar manner i.e. “beasts” or birds (poultry). Typically, mallard ducks, pheasants, hares, deer, wild boar, and bears are hunted in Japan, but as deer and wild boar populations are heavily managed using extermination methods (approximately 70% of each population)<sup>6)</sup>, these meats are readily available to use as gibier. To sell gibier as meat, it is necessary to first

obtain a business license for meat processing by the Food Sanitation Act. Furthermore, the law stipulates that the standards for facilities, equipment, and sanitary management stipulated by the Prefectural Ordinance on Food Sanitation Act must be adhered to (Fig. 1). At present, few processing plants have this food business license<sup>6)</sup> and only a small fraction of the meat distributed for food has been hunted. Most of the hunted carcasses are buried. Strict sanitary management is essential for the meat industry. However, in addition to the need for hygiene and safety management on the supply and distribution side, it is also considered essential for consumers to have appropriate knowledge of cooking and eating methods. Sanitary management also tends to be insufficient during self-consumption (when the hunter debones, cooks and consumes their meat) or when the hunter sells their kill. Also, feed management and health management practices are absent as the animal was wild. Additional safety and hygiene practices are necessary to ensure the safety of gibier as numerous diseases, including infectious diseases, can be transferred to people from this meat and, also, bullets or pellets can remain within the meat due to the method in which the animal was killed.

#### Recent trends in gibier consumption

In many prefectures in Japan, wild boar and deer are causing damage to crops and trees. The damage is extensive, at almost 20 billion yen<sup>1)</sup>. Therefore, to control the population density of wild animals, the local government organized a damage countermeasure implementation team which carried out exterminations of birds and other animals in cooperation with the local hunting association. However, wild animal carcasses were rarely consumed. Though some were self-consumed by hunters, most were buried in the mountains. In February 2008, the "Law on Special Measures for Preventing Damage from Agriculture, Forestry, and Fisheries by Birds and Other Animals" was enacted. Since then, there has been a movement to promote the regional development of gibier and expand consumption not only in the form of "hot pot dishes" (that contain deer and/or wild boar) but also other specialty products<sup>1),5), 6)</sup>.

It is thought by some, that gibier can improve self-sufficiency in food resources. Japan's self-sufficiency rate in food is low, with more than 60% of its calories being based on imports from overseas<sup>1)</sup>. Meat is no exception. In terms of domestic livestock breeding, most of the feed is from the United States, so Japanese meat is not self-sufficient. Wild deer do not depend on a feed from people as they forage for wild food in the forests. If gibier meat resources can be made secure, then this will lead to an increase in the country's food self-sufficiency rate. This is preferable as it reduces the burden on the global environment. If

gibier can be utilized as a local resource and marketed appropriately, it may not only reduce agricultural damage but also contribute to local employment (labor required for meat processing and inspection) and economic revitalization<sup>1)</sup>. The government has set a goal to increase gibier consumption from 1900 tons (consumption in 2018, a 16% increase from 2017) to 2600 tons in 2019<sup>3)</sup>. In terms of deer, any meat from small individuals or that is otherwise not suitable for human consumption will be processed into pet food.

Also, the consumption of gibier is expanding in the form of a gourmet boom in Japan. Gourmet chefs maintain that gibier has a unique flavor that is different from livestock or poultry meat<sup>2)</sup>. General consumers show preferences for expensive meat as they believe it tastes better. Nutritionally, gibier meat may have higher protein and lower fat levels as well as higher concentrations of minerals and vitamins compared to livestock animal meat. Some Japanese people prefer to eat gibier. For example, boar meat contains three macronutrients that are almost identical to those in pigs, but the meat also contains high levels of iron (causing the raw meat to look dark red, sometimes called "peony meat" in Japan). Similarly, deer meat is sometimes called "maple meat" because the raw meat is dark red as a result of high iron levels<sup>6)</sup>. Deer meat is also low in fat and rich in protein. Hunters can now benefit financially from the sale of meat in addition to payments received for extermination.

Problems associated with gibier

Here, we describe the negative aspects of gibier use.

#### 1. Processing and distribution<sup>7)</sup>

In terms of livestock, the Ministry of Agriculture, Forestry, and Fisheries are responsible for maintaining the safety of meat during production, while the Ministry of Health, Labor and Welfare (using various legal regulations) is responsible for animal slaughter, meat processing, and distribution. Following the BSE outbreak in July 2003, the Food Safety Basic Act was enacted, and in response to this, a risk assessment was conducted by the Food Safety Commission of the Cabinet Office (which was established in the same month). As a result, the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Health, Labor and Welfare established a system for sharing information and collaborating on food safety. About the use of wild animals in Japan, there are laws and regulations about protection, hunting methods, extermination measures, infectious disease monitoring, and distribution as food.

However, regulations on vital hygiene steps from capture and slaughter of wild animals to their processing as food have not been established at the national level, and so have been left to the discretion of local governments (Table 1). The Ministry of Agriculture, Forestry and Fisheries focus mainly on the prevention of crop damage by the extermination of problematic animals. Promoting the use of exterminated animals as food has been postponed. The slaughter, processing, and distribution of wild animal meat are not governed by law (unlike laws for livestock enforced by the Ministry of Health, Labor and Welfare). Therefore, there is no supervisory authority within the country responsible for gibier meat processing and distribution. Local governments, and not the central government, have full powers to regulate the safety of wild animal meat (Fig. 1). However, the safety of wild animal meat, by setting standards based on scientific findings, verifying obligations, and setting verification methods for compliance with these standards, is not being ensured because none of the above procedures have been properly established. Also, there are no individuals or businesses held responsible or penalties given in the event of accidents or the spread of infections from gibier meat. If food poisoning does occur as a result of the self-consumption of gibier that was personally obtained, it is deemed to be at one's own risk. Consuming gibier purchased directly from a hunter at an individual level or consuming raw or raw-baked (cooked at low temperatures) gibier is associated with great risk<sup>2)</sup>.

## 2. Risk of infection

Compared with livestock meat, veterinarians have not tested for pathogenic microorganisms and parasites before gibier carcasses are cut, and it, thus, has been noted that the meat is associated with high risk. In particular, since the meat is highly likely to be contaminated with pathogens that cause food poisoning (such as parasitic diseases, hepatitis E virus, and pathogenic *Escherichia coli*), there is a risk of developing infectious diseases when eaten raw. The Ministry of Health, Labor and Welfare have urged consumers to "heat well then eat". In December 2016, there was a case of trichina food poisoning caused by the consumption of grilled bear meat cutlets<sup>2)</sup>.

In French cuisine, low-temperature cooking methods are sometimes used in which raw deer meat is placed in a bag and heated at a low temperature of approximately 60°C for several hours<sup>2)</sup>. However, the Japanese Ministry of Health, Labor and Welfare recommend that meat be "heated at a central temperature of 75°C for 1 minute or longer", which is the optimal condition for killing pathogenic *E. coli* O157. Some recipes that are designed to enhance

flavor/texture may also have an associated risk of infection. Also, during the recent gibier boom, certain practices have emerged such as aging meat over several days to a month before cooking. There are no standards relating to the length of time meat can be aged safely or the appropriate method to use. Therefore, there is an increased risk of disease due to food poisoning and harmful mold growth.

Furthermore, blood-sucking arthropods such as mites are often attached to wild animals. In addition to workers involved directly in the capture, transport, and processing, their families and neighboring residents may become infected with Japanese spotted fever and severe fever with thrombocytopenia syndrome (SFTS)<sup>2)</sup> as a result of direct or indirect contact with infected meat. It has been reported that even if a person who ate gibier had no observable symptoms, their blood may contain a pathogenic microorganism derived from gibier. The Japanese Red Cross Society has currently stopped blood donations from those who have eaten raw or raw-baked pigs, wild boar, deer meat, and internal organs within the last six months<sup>8)</sup>. In Europe, where there is a long tradition of consuming meat obtained by hunting, many governments are highlighting the dangers associated with gibier (particularly about the ebola hemorrhagic fever epidemic) and are discouraging the consumption of wild animals meat<sup>9)</sup>. Some veterinarians have also recommended a halt to give raw meat to pets.

### 3. The impact of bullets within the meat

During the hunting of gibier, the edible portion may become damaged depending on the location where the bullet hit, or internal organs may be perforated with negative consequences for flavor. Also, perforations by bullets may allow for the movement of pathogens through the blood into a wide range of edible sections of the carcasses.

The bullets used for hunting are usually made of lead, and if full penetration of the body does not occur, bullets will remain in internal organs and muscles. Sometimes when wild animals are shot with bullets from shotguns, they can survive if the injury was not lethal and so recover with bullets embedded within the body. For this reason, wild birds captured using a cage and showing no apparent physical abnormality may still contain bullets and fragments within their bodies<sup>2)</sup>. If bullets are found in meat during a meal, it is considered to foretell good fortune. However, bullets carry the risk of lead poisoning.

#### 4. Variations in flavor and meat quality

It is not known exactly when and where wild animals are caught, and their meat quality is, thus, unpredictable<sup>1)</sup>. Individual differences in meat quality and taste are large and are dependent on sex, age, and season<sup>6)</sup>. There is a particular odor associated with gibier and it is greatly influenced by the blood removal technique. The odor becomes stronger depending on how much blood remains in the carcass. Wild animals store nutrients in their bodies in preparation for winter, so fall is often the best season (in terms of flavor) to obtain gibier<sup>10)</sup>. In winter, the fruits and nuts that wild animals feed decrease, and thus, the meat quality generally decreases at this time of year. Before the breeding season, body fat increases and flavor improves, but after the breeding season, the flavor decreases immediately. Also, the body temperature of an animal increases when pursued by hunters. It is thought that if the meat is not cooled as soon as possible following death, the flavor will decrease rapidly. Therefore, some hunters process the meat, such as removing the blood and cutting up the carcass, immediately after hunting.

#### 5. Quality assurance and price

In addition to individual differences in wild animal meat, it is difficult to record when and where many animals have been captured and, so, the meat quality is not predictable. Prices fluctuate when production levels are insufficient, costly and labor-intensive and when the supply is unstable. Gibier is generally expensive because of the labor involved in capturing, transporting, and processing. The market price of deer meat is 412 yen per 100 g for loin and 297 yen for thigh (as of March 2017). This is much higher than imported beef (278 and 145 yen, respectively) and domestic pork (208 and 136 yen, respectively), and is similar to domestic beef (452 and 277 yen, respectively)<sup>1)</sup>.

### CONCLUSION

As mentioned previously, gibier may greatly improve Japan's self-sufficiency in food, but there is an urgent need to reduce the risk of infectious diseases. Gibier is not automatically safe to eat just because it is fresh. To consume a large amount of gibier, at present, it is necessary to construct slaughterhouses near hunting locations<sup>6)</sup>. This is very important in terms of ensuring that there is an efficient meat processing method for gibier and that consumers are eating safe meat. However, if Japanese dietary habits change so that more



gibier is consumed in the future, then the management of gibier will need to change. At present, wild animal management is focused on the extermination of those animals that cause damage to crops; however, if the demand for gibier increases, then the policy will need to change to ensure a safe and stable supply. There will always be a need to process meat to certain quality and quantity standards. If demand for gibier increases, wild animals will need to be bred on farms rather avoid over-dependence on hunting. Problems such as purchasing optimum supplies of feed and securing suitable levels of human labor to ensure adequate growth of the industry are likely to arise. In terms of crop damage, it is desirable to reduce wild deer numbers. However, high deer numbers are preferable to ensure a stable supply of gibier. Costs associated with catching and transporting wild deer increase when the numbers of wild deer are reduced<sup>1)</sup>. However, low availability may be preferable as this ensures that market prices for gibier remain high. As such, demand for gibier may also remain high by market prices as the product is then viewed as a luxury.

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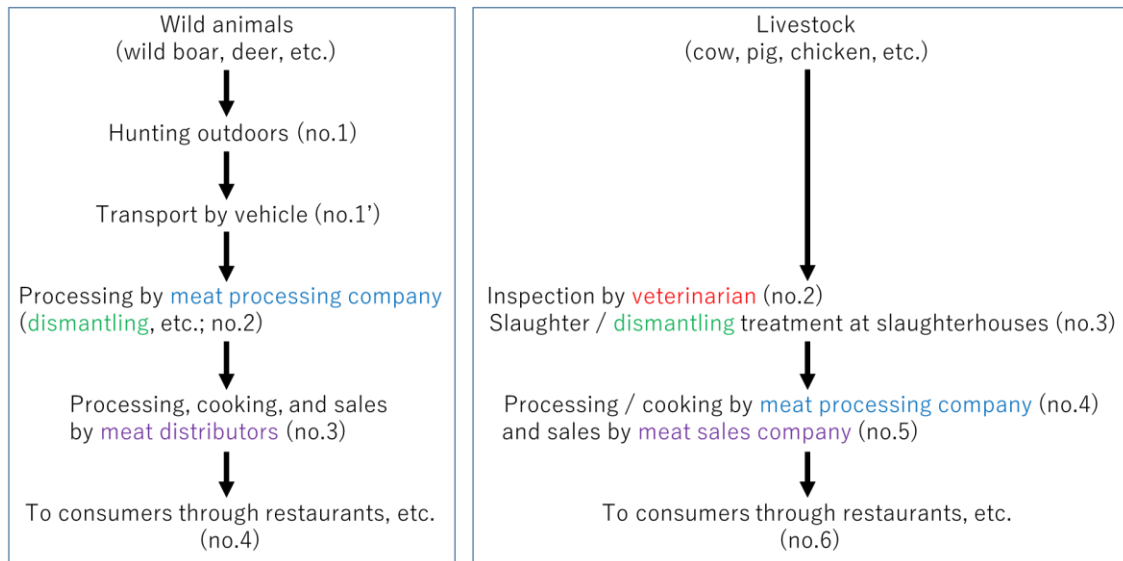
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**Table No. 1: Sanitary management guidelines**

Handler	Activity	Guidelines
Hunter	Hunting	<ul style="list-style-type: none"> <li>- Wear gloves made of synthetic resin such as rubber or vinyl to avoid direct contact with animal flesh</li> <li>- Check and record the appearance and behavior of wild animals before targeting them for hunting</li> <li>- Discard suspicious carcasses or body parts that cannot be judged as edible</li> <li>- Be mindful of one’s physical condition before engaging in hunting behavior</li> </ul>
	During exsanguination, transportation, and delivery to a slaughterhouse	<ul style="list-style-type: none"> <li>- Disinfect the knife used for exsanguination immediately before use</li> <li>- If evisceration is unavoidable outdoors, hunters with appropriate sanitary management knowledge and skills should check and record any internal organ abnormalities</li> <li>- Viscera removed outdoors are not edible</li> <li>- The information recorded between capture and delivery should be transmitted to the meat processing company and stored for a certain period</li> </ul>
	Self-consumption (consuming one's kill)	<ul style="list-style-type: none"> <li>- Follow all hygiene management guidelines</li> <li>- Heat meat to a temperature of 75°C for one minute or more, or use a method that ensures an</li> </ul>

		equivalent or better result. Never eat raw meat.
Restaurant managers	Ordering and purchasing	<ul style="list-style-type: none"> <li>- When ordering wild birds and other animals (or gibier), obtain information on the hunting status and slaughter methods of each individual/carcass from hunters and/or suppliers</li> <li>- For gibier, purchase dismantled products from a facility that has received the necessary permissions from the meat processing industry</li> </ul>
	Sanitary management	<ul style="list-style-type: none"> <li>- Check for abnormal colors and odors during purchasing, processing, and cooking. If any abnormalities are found, stop handling immediately and contact the supplier</li> <li>- Equipment and containers used for the treatment, cooking, and processing of wild birds and other animals should be washed after each treatment and disinfected with either hot water (temperature <math>\geq 83^{\circ}\text{C}</math>) or sodium hypochlorite (concentration <math>\geq 200</math> ppm)</li> <li>- When storing, label the product to distinguish it from other meats and store at a temperature of <math>\leq 10^{\circ}\text{C}</math> (or <math>-15^{\circ}\text{C} \geq</math> when frozen)</li> <li>- If a facility, that has received permission to operate as a restaurant business, kills and/or processes boar or deer then permission to operate as a meat processing facility is also required</li> </ul>
	Foodservice	<ul style="list-style-type: none"> <li>- When serving gibier for human consumption, ensure that it has been heated thoroughly (see above) and never serve it raw</li> </ul>

Information sourced from the Bureau of Social Welfare and Public Health<sup>5)</sup>



**Figure No. 1: Differences in meat processing methods between wild animals and livestock**

Numbers represent vendors (many vendors are involved in livestock processing). The figure on the right starts with number two as there are livestock farmers, young livestock producers, etc. not listed in this figure. Information sourced from the Bureau of Social Welfare and Public Health<sup>5</sup>.