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Prologue: Commensal Rodent Problems Across the Globe

Tatsuo Yabe

1. Introduction

Black rats *Rattus rattus* have become a rare species in northern and central Europe [1–5]. Most of the USA and Canada are also free of the rats [6]. In Australia, house mice *Mus musculus* pose particular problems in high-rise buildings and skyscrapers [7]. In Japan, house mice and Norway rats *R. norvegicus* are rare in buildings in the centers of big cities. Whereas black rat infestations have been experienced even in modern buildings in almost all big cities since the 1970s except those in the northern area [8–11].

However, black rat problems in big buildings tend to be reduced in these years by structural improvement (T. Tanikawa, pers. comm.).

Instead, black rat problems in residential areas in the centers of big cities have become problems since the mid-1990s [12]. Norway rats living outside buildings in busy streets also have become notable problems [13]. Commensal rat problems in islands in Japan have been focused on from the viewpoint of conservation of ecosystems since early in the 2000s [14, 15].

2. Changes in species composition

From the end of World War II to the 1960s, Norway rats appeared to overtake black rats with urbanization, though total number of both species decreased [16, 17] (**Figure 1**). At that time, sanitation was relatively poor, and 1–2 story buildings occupied even the centers of big cities. Catering establishments such as restaurants and drinking houses were generally in such small buildings and were commonly invaded by Norway rats.

However, the situation changed from about the 1970s. In buildings in the central area of Tokyo black rats became dominant, though Norway rats remained in sewers and in parks and gardens in the area. They rarely entered buildings. In an area in which a pest control company (PCO) operated, black rats infested 66% of all types of buildings, with Norway rats or mixed species of commensal rodents infesting the rest [18]. A similar situation was reported widely in Japan, including Sapporo, a city in the northern area [8–11]. Later, however, the black rat problem disappeared in Sapporo. Causes of the disappearance is not known yet, but I suppose one of the causes is the lower temperature of Sapporo [8, 9]. Accordingly, black rats are dominant in buildings in all major cities except Sapporo.

From around the 1970s, the Japanese economy grew and big buildings with three floors or more rapidly increased in commercial districts [9–11] (**Figure 2**); many were connected with the catering industry. At the same time, though PCOs rapidly multiplied, black rats became successful in these areas. From the mid-1990s, these rats scattered to residential areas. Questionnaires showed that 23% of 322 residences in a ward in Tokyo experienced black rat invasions within the past two years [12].

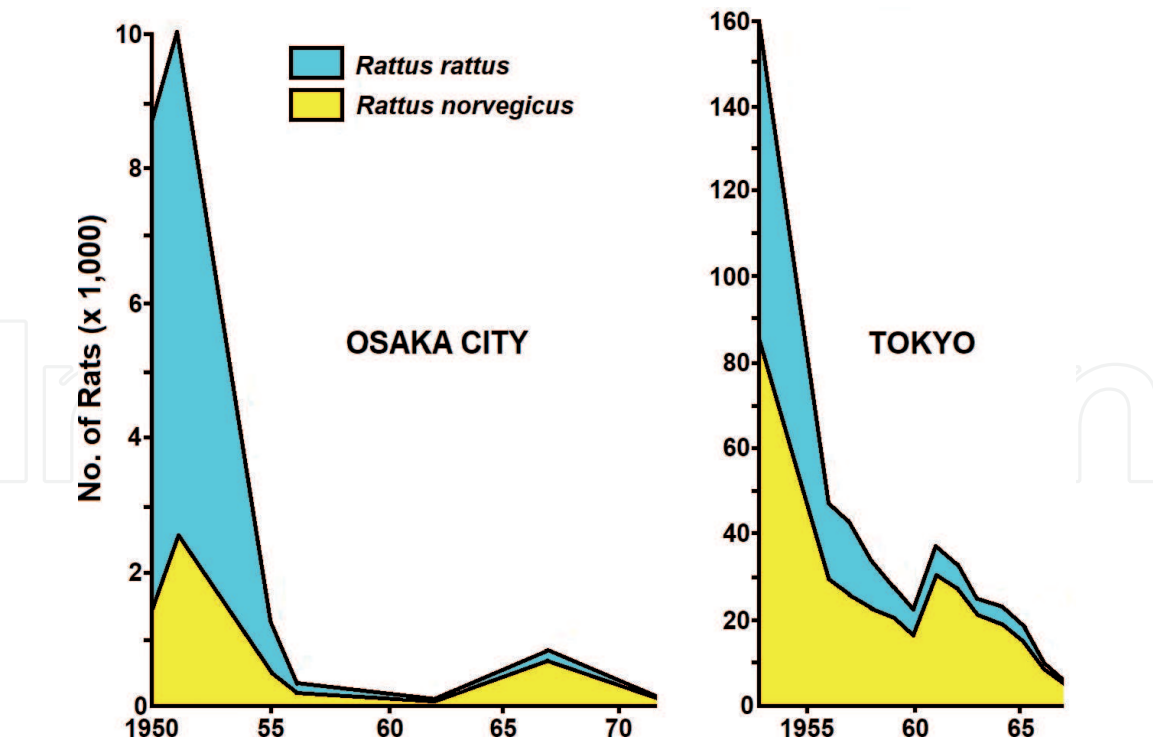


Figure 1. Changes in species composition of commensal rats collected with snap traps in Osaka city and the Tokyo Metropolis during control campaigns [16, 17].

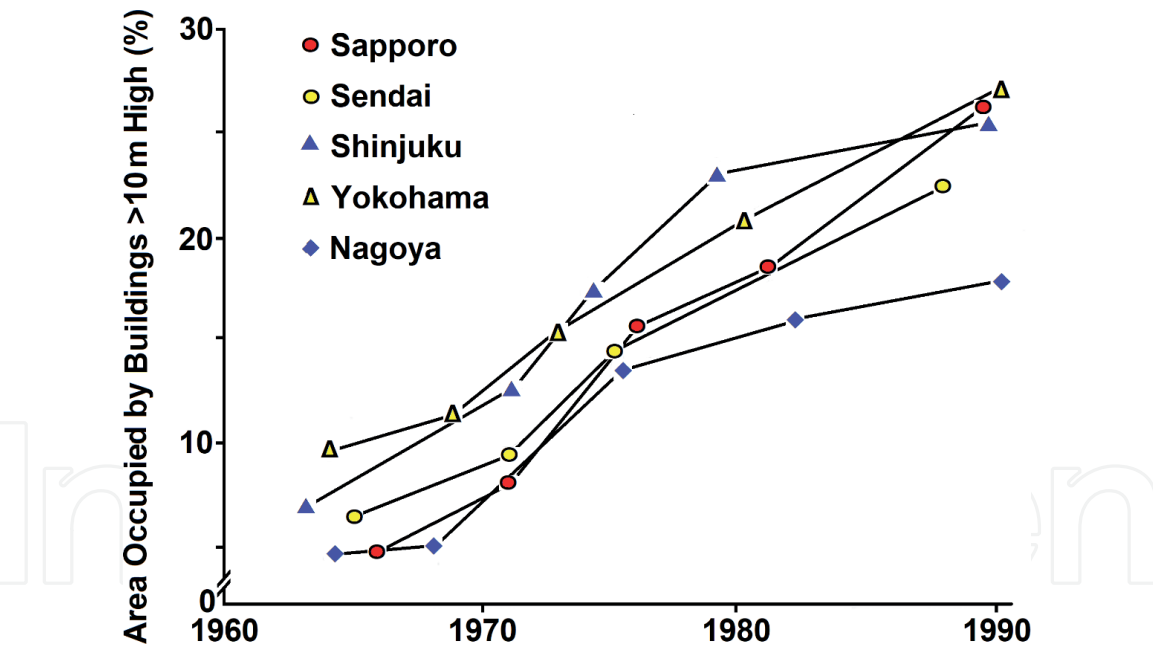


Figure 2. Yearly changes in percentage of basal area of buildings >10 m high in commercial districts in Sapporo, Sendai, Shinjuku, Yokohama, and Nagoya [9–11].

3. Cause of infestation of black rats

It is the structure of the building that is the cause of heavy infestations by black rats. Big buildings in the centers of big cities usually have several catering establishments and these provide the food for black rats. Such buildings, with their network of hidden pipes and false ceilings, also provide ideal habitats and nesting places for the rats. Warmth from cooking in the catering establishments and from electrical equipment being used in such buildings also probably supply sufficient heat for all-season breeding.

Another cause of heavy infestation is the difficulty experienced in controlling black rats. Most PCOs had long used first generation anticoagulants, and as a result, black rats acquired resistance to the rodenticide [19]; black rats are also extremely cautious of baits. Moreover, catering establishments disapprove of rodenticide operations because of difficult-to-manage rat carcasses that result. PCOs have therefore to use glue boards and of these black rats are also cautious. Today rat proofing techniques are common in PCOs, but long-term rat-proofing of such buildings is sometimes difficult because of the frequent remodeling of the interiors of these establishments. The cause of the increase of black rats in residential areas from the mid-1990s is unknown, but I suppose that an increase of aged population living alone is one of the factors. Single families composed of people 65 years old or more tended to increase rapidly in the 1990s in Japan [20]. It is sometimes difficult for such people to rearrange rubbish and garbage around them to control rats [21, 22].

4. Norway rats in busy street

The removal system of garbage is different between big buildings and small buildings. Big buildings of 3,000 m² or more in total floors occupied by tenants such as stores, offices and hotels are regulated by the Building Standard Act. In these buildings, garbage is treated by building management companies. On the other hand, small buildings are out of regulation, and garbage in these buildings is usually kept in plastic bags and put along roadside (**Figure 3**). Accordingly, small buildings supply Norway rats with food sources, and the rats have become big problems in busy streets.

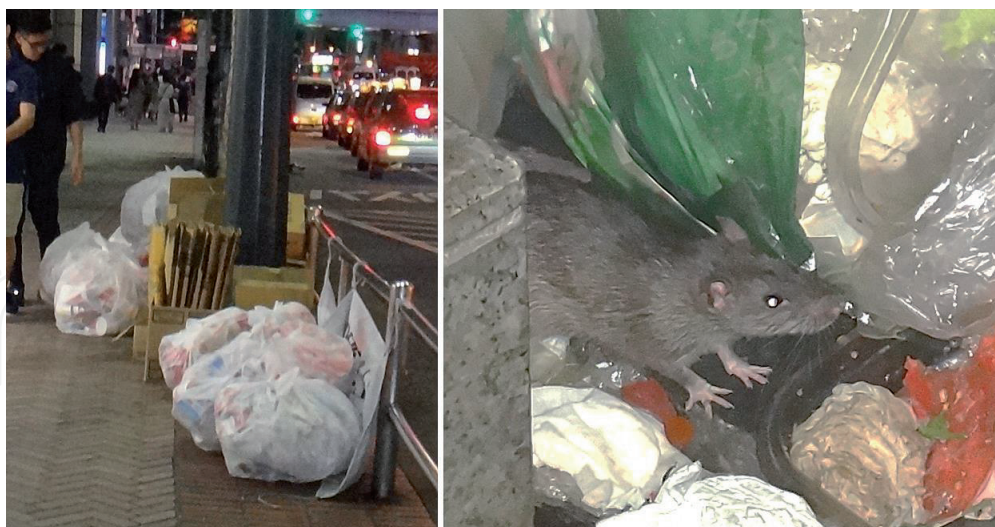


Figure 3.
Garbage in plastic bags along roadside, and a Norway rat attacking such bags.

5. Conservation of island ecosystem

Since the early-2000s eradication campaigns of rodents have been conducted in islands such as Yururi-Moyururi in Hokkaido, northern Japan, and the Ogasawara Islands, southern Japan [14, 15]. These projects were supported by the Ministry of Environment to conserve island ecosystems.

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