

Distributions of Native and Introduced Dandelions in the Tokyo Metropolitan Area of Japan

by

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Introduction

We have over 600 introduced species of plants in Japan (NAGATA, 1972), and many of these species can be easily found in Tokyo. Among them introduced dandelions have been expanding their occupying areas and now are very common especially in urban districts of Japan.

Taraxacum officinale, one of the introduced dandelions, was found first in Japan in 1904 (MAKINO, 1904) and now is ranked as a characteristic species of roadside communities in Hokkaido, northern island of Japan (MIYAWAKI, 1968; MIYAWAKI et al., 1978). On the other hand, there are over 20 native dandelion species in Japan (KITAMURA, 1958). Among them most diploid species grow on habitats occupied by man and situated mostly below 200 m above sea level in the warm-temperate region (MORITA, 1976).

The distributions of native and introduced dandelions have been investigated in Sendai, Tokyo, Osaka, Okayama, Hiroshima etc. (NAITO, 1975; HARASAWA

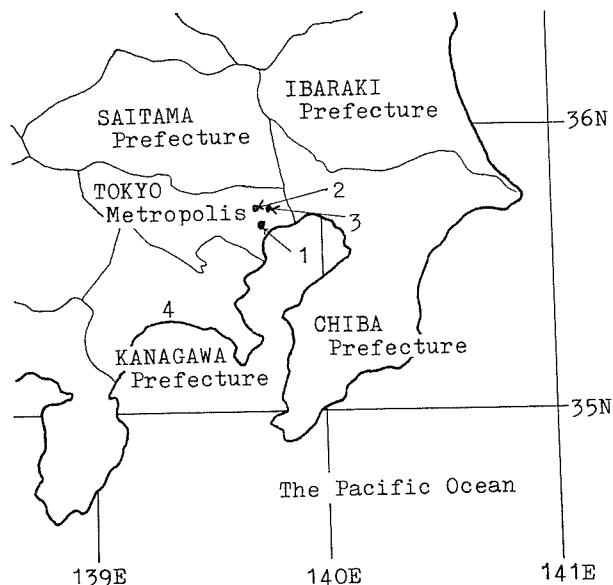


Fig. 1. Southern part of the Tokyo metropolitan area of Japan.
1. The Tokyo Metropolitan Government Office; 2. Bunkyo-ku;
3. Taito-ku; 4. Hiratsuka city.

& YAMADA, 1975; HOTTA, 1975a, b, 1977; NEHIRA et al., 1977; IKEDA et al., 1977; NAKAMURA & ISHIURA, 1978). Though most of such investigations were small-scale short-term surveys, the one in Osaka by HOTTA et al. covered a large area from which many samples were collected, and the distribution of dandelions was clearly mapped. Through these investigations, we can see that the introduced dandelions grow mainly in urban areas and the native ones mainly in the outskirts of cities.

In the Tokyo metropolitan area, no large-scale investigation had been undertaken. The present report will discuss dandelions' habitats and distributions in the Tokyo metropolitan area based on the investigation covering a larger area.

I. Distributions of the native and the introduced dandelions in the Tokyo metropolitan area of Japan

The investigations for the distributions of native and introduced dandelions were made in the Tokyo metropolitan area of Japan in spring of 1978 by a team named "Tampopo-Chyosa 1978-Jikkoiinkai" (an association for investigating dandelions' distribution in 1978).

This team employed an enquête method; collecting answers to the predetermined inquiry about dandelions from many nature conservation groups, teachers, students and other citizens.

In the metropolitan area there are four native dandelions, *Taraxacum platycarpum*, *T. hondoense*, *T. longependiculatum* and *T. albidum*, and two introduced ones, *T. officinale* and *T. laevigatum*. Owing to the difficulty in identifying each of the three yellow-flower species in native dandelions and the two introduced dandelions, they were classified into two groups, native and introduced, except the native *T. albidum* with white flowers. The main questions in the enquête were: Which of the two dandelion groups was found and how was the ratio if both groups were found in the same stand? Over 3,500 answers were collected in April-May of 1978 from the people in the southern part of the metropolitan area, Tokyo Metropolis and the neighboring prefectures, Saitama, Chiba and Kanagawa (Fig. 1).

One of the results is shown in Fig. 2, which indicates the ratio of the two dandelion groups in the metropolitan area in spring of 1978. The average ratio of the two groups is shown every 3 km × 3 km mesh. Where there was no or only one answer, the mesh was left blank.

The introduced dandelions were surpassing the native ones in most parts of the urban areas, especially in the coastal regions of Tokyo Bay, where the land is utilized for factories or residential sections with high population density. Only introduced dandelions were found in some areas, for example the western part of Chiba prefecture and in some of the outskirts of Tokyo Metropolis and Kanagawa prefecture. The vegetation and original topography in these areas have been destroyed as a result of the extension of residential area. On the other hand, native dandelions were superior in the rural areas especially in Kanagawa prefecture. Only one exception was found in the center of the urban area in Tokyo, where the two groups of dandelions were equally seen. This mesh invo-

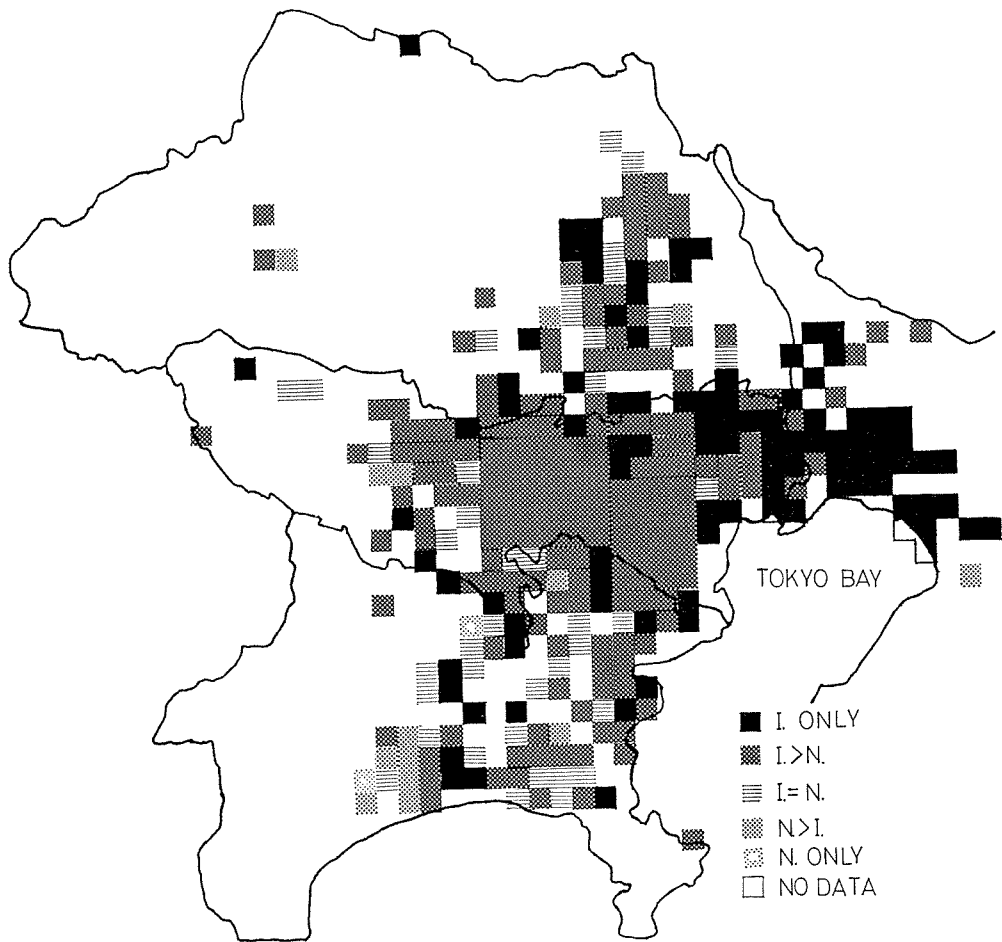


Fig. 2. The distribution of the ratio of the native dandelions and the introduced ones in the metropolitan area of Japan. I., introduced dandelions; N., native ones.

lives the gardens of the Imperial Palace and its neighboring areas.

In the middle part of Tokyo Metropolis, though the introduced dandelions occupied most areas, we could see some plants of a native species, *T. platycarpum* in each mesh. The places where this species was found were, with a few exceptions, old banks, relatively old public gardens, precincts of old temples and campuses of old universities.

Fig. 3 shows the semi-micro distributions of the ratio of the two dandelion groups in 1978 in Hiratsuka city and its neighboring areas in Kanagawa prefecture. The methods of the investigation were the same as mentioned above, but the ratios in all stands are shown without any averaging procedure. It is remarkable that the urban areas are occupied by the introduced dandelions and in the outskirts of the city the native *T. platycarpum* is superior, especially on the hills. Those hills are characterized by agricultural land use and deciduous forests. The agricultural areas in the low lands, however, are being transferred to the residential areas. In such areas we find stands with various ratios and even many no-dandelion stands!

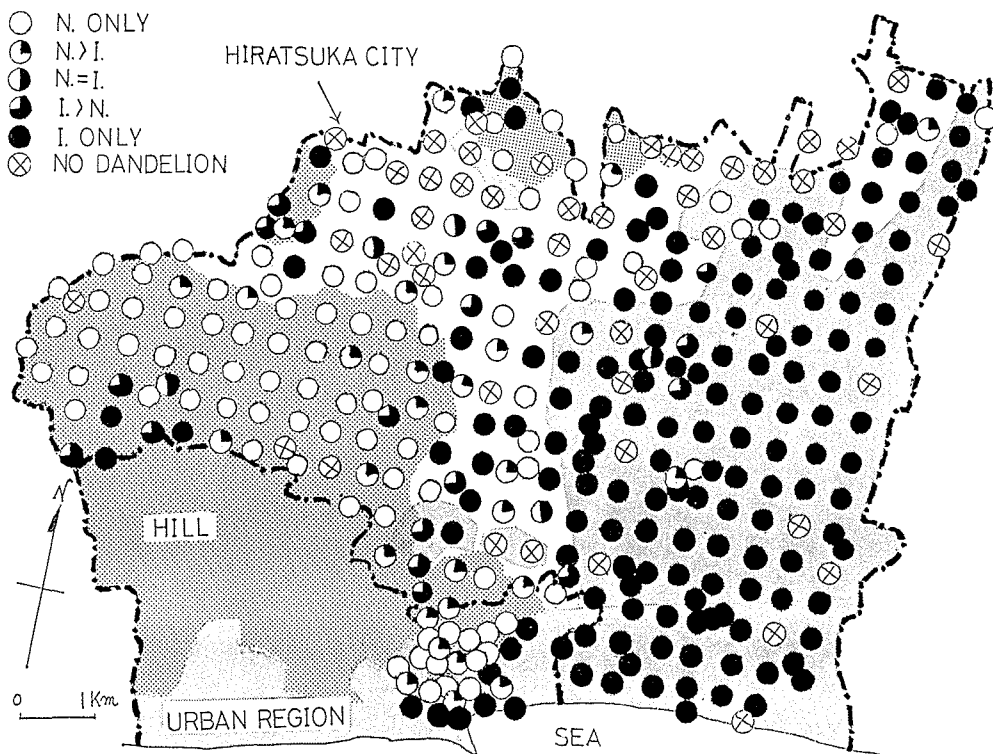


Fig. 3. The distribution of the ratio of the native dandelion, *T. platycarpum* and the introduced ones in Hiratsuka city. I., the introduced dandelion species; N., the native one, *T. platycarpum*.

Against the general rule that the introduced dandelions are superior in urban areas and the native ones in rural areas, there were three exceptions in the case of Hiratsuka city. The first was a large population of *T. platycarpum* in the urban area in the center of the city. This population is in the old experimental station for fruits, the Ministry of Agriculture and Forestry. The second and the third were found on the hills in the outskirts of the city, where only the introduced dandelions were found instead of native ones. The former is the place where new college was recently built and the latter is a golf-links.

II. Habitats of the native dandelion species in urban areas

Table 1 shows the distribution of dandelion species in relation to their habitat, given in a survey of some open spaces in Bunkyo-ku, the central area of the urban Tokyo, made in spring of 1976.

Table 1. Habitats of the dandelions at some open spaces in Bunkyo-ku.

	<i>T. platycarpum</i>	the introduced dandelions	no dandelions
Public gardens (4)	3	4	0
Gardens of temples (2)	2	0	0
Grave-parks (2)	0	0	2
Play-parks for children (22)	0	5	17

Three public gardens out of four possessed both the native *T. platycarpum* and the introduced dandelions, and the remaining one the introduced species only. The five playparks for children had only introduced dandelions, and 17 parks and 2 graveparks had no dandelion. Koishikawa Botanical Garden, one of the four public gardens, had a large population of *T. platycarpum* and very small populations of the introduced dandelions. Also in the other two public gardens and the two of temples, each population of the native species was not small. These gardens have long been under careful management with a regular cycle, such as cutting herbs in spring and autumn, together with protections against any large disturbances or human impacts.

On the other hand, in many play-parks for children weeds have been removed and/or soil surface has been trampled extremely by overuse. Thus they have only a trivial population of introduced dandelions and some of them even suffer from extinction of dandelion plants of any kind.

A similar case was seen in 1977 at Ueno-Park in Taito-ku, neighboring area of Bunkyo-ku. The introduced dandelions could be found in all parts of the park, especially on the edges of the gardens of newly built museums, while native dandelions were restricted only to specific areas; gardens of the National Museum, aged gardens of some temples and graves, a bank of railway, bank of a pond and a new garden with lawn.

The last exceptional case can be explained by assuming that the native dandelions had been introduced with lawn from their former habitat. Except this, the stands of native dandelions had probably long been protected against large disturbances.

III. Discussion

Through these investigations it is revealed that introduced dandelions are expanding their occupying areas in the metropolitan area of Tokyo and the native ones are keeping their main territories in the outskirts of the urban area. It is also revealed in urban areas that there are many stands where the native dandelions still grow, protected for a long time against large disturbances. It often appears that introduced dandelions have been hindered to invade such places preoccupied by native ones. Although some insist that native dandelions are being ousted by introduced ones, it would be more reasonable to assume that characteristics of each dandelion species in relation to actual environment will decide success or unsuccess of its colonization. In this respect OGAWA (1978) discussed the importance of germination timing in relation to the suppressing influences of other plants and regular disturbances made by man.

Although *T. officinale* and *T. laevigatum* are found on calcareous soil in England (GRIME & LLOYD, 1973), they grow on wider habitats in Japan. Inspecting the distribution of the dandelion species in Hiratsuka city (Fig. 3), we notice a blank belt between two separate areas, each occupied by one of the two groups. Although this belt belongs to the agricultural area, it is now being transferred to a residential area. This fact indicates that a large disturbance exterminates the population of the native dandelion species and accelerates the settlement of the introduced dandelions as new inhabitants. Since the introduced

dandelions disperse their copies through their apomictic seed production without pollination (RICHARD, 1973), they can rapidly invade newly made blank spaces and colonize from place to place.

On the other hand, Japanese diploid dandelions have selfincompatibility and cannot produce any seed without pollen from other individuals (OKABE, 1951; RICHAD, 1973). Since it requires some population size, the recovery of their population after a large disturbance might be impossible, even if one or two individuals have remained luckily. This was confirmed by the fact that though a few native dandelion individuals grew in a large population of the introduced dandelions in 1975 at Shiba park in the center of the urban area of Tokyo, they produced few fertile seeds.

For the reasons above, the introduced dandelions in Japan may be the indicator plants of destruction of nature. On the other hand, the native dandelions may be thought as the indicators of traditional land use. It may also be expected that, where a large population of native dandelions is sustained, a biocommunity or ecosystem of some complexity can be organized, as evidenced by the existence of many native plant species and small carnivorous animals as snakes and bufos in the garden of the National Museum at Ueno-Park and the Koishikawa Botanical Garden.

Summary

The distributions and the habitats of the native dandelions and the introduced ones in the Metropolitan area were investigated through the enquête method and some field surveys.

1. The native dandelions (*T. platycarpum*, *T. hondoense* and *T. longeappendiculatum*) had their main territories in the outskirts of cities and the introduced ones (*T. officinale* and *T. laevigatum*) were superior in the urban areas.
2. Even in the urban areas there are some stands with population of *T. platycarpum*. They have been protected against large disturbances for a long time.
3. In the case of Hiratsuka city, there was a belt devoid of dandelion populations between the two separate regions occupied by *T. platycarpum* and the introduced species respectively. Although this belt belongs to the rural area, many portions of the belt are being transferred to residential areas.
4. Inspection of the distributions and the habitats of the dandelions together with seed production characteristics led to the conclusion that native dandelions with some population size are relatively stable under a regular cycle of small disturbance, while the introduced dandelions rapidly colonize the areas subjected to a great disturbance.

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