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Instructions for use

THE DEVELOPMENT OF HOKKAIDO'S URBAN SYSTEM*

Masataka HATANO and Makoto YAMADA**

I. INTRODUCTION

Hokkaido is the second largest of the Japanese islands with an area of 78,513 km² and a population estimated at 5,576,110 persons according to the 1980 census. Therefore the population density of this island is about 71 persons per square kilometer. When one considers that the population density of the rest of Japan (south of the Tsugaru Strait) is approximately 380 persons per square kilometer, Hokkaido is obviously a relatively sparsely settled region. The reason for Hokkaido's settlement being less dense than the rest of Japan can be attributed to severe physical conditions, the short history of colonization and an economic structure which is characterized by a low ratio of manufacturing industry. The purpose of this paper is to outline the development of the urban system in this unique region during the last century.

II. CHANGE IN THE URBAN RANK-SIZE RELATIONSHIP, 1879-1960

At first we will examine the urban rank-size relationship from 1879 to 1960 (Fig.1). In 1879, Hakodate, Fukuyama and Esashi, which had been unban areas since the Tokugawa era, dominated the other small towns and villages. The city size gap between Esashi and the fourth largest town, Otaru, was remarkable. In 1891 Otaru and Sapporo grew to become the second and third cities respectively, but the gap between Hakodate and Otaru was

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sizeable. Thus the year 1891 should be regarded as the transition point from a "feudal" urban system to a modern one.
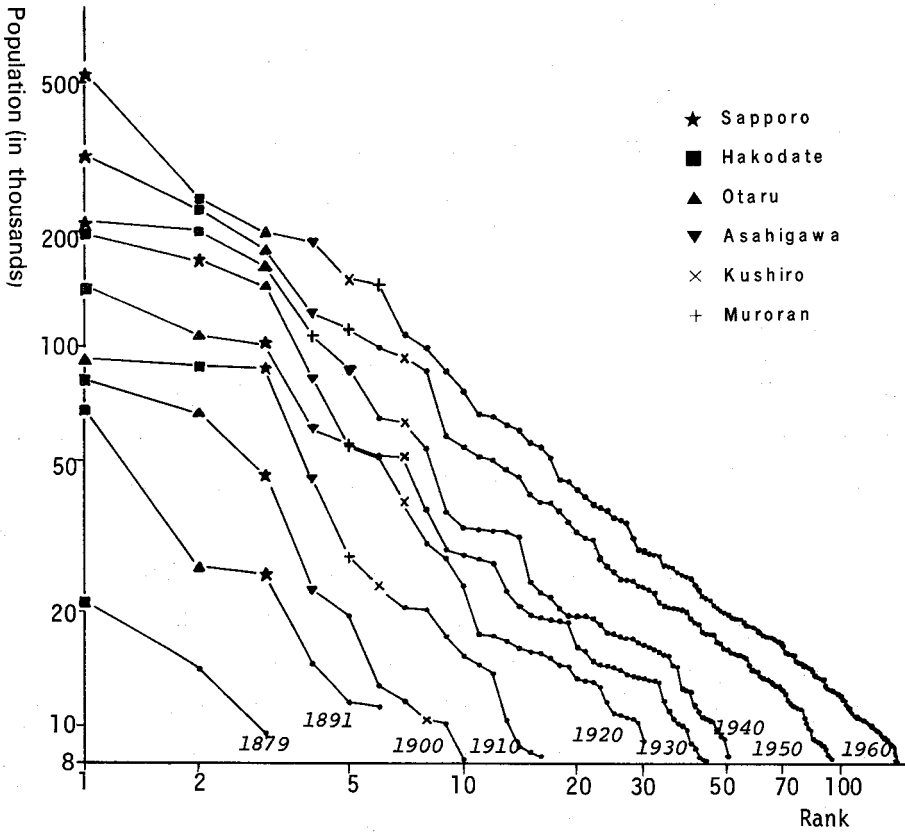
Parameters α, β and Coefficient of Determination r^2 in the Regression Line Formula : $\log P = \alpha \log R + \log \beta$

year	α	β	r^2
1900	−1.11811	112159	0.94895
1910	−1.01425	153850	0.92805
1920	−0.89862	198052	0.96990
1930	−0.89788	255736	0.97895
1940	−0.88708	309858	0.97545
1950	−0.82967	399751	0.99361
1960	−0.82101	511977	0.99709

These formulae are calculated for all the administrative units within Hokkaido.

Fig. 1 Urban Rank-Size Relationships, 1879-1960

From 1900 to 1940 the situation was fairly stable: the population of Hakodate, Otaru and Sapporo was nearly equal. Therefore, when we illustrate the urban rank-size relationship graphically, the top-ranking city is always located below the regression line derived from the rank-size rule. The second and third cities are, on the contrary, located above the line.

Hakodate, Otaru and Sapporo were nearly the same size throughout the above period. The reason for their equivalent population are as follows; Hakodate was initially favored by its gateway site to Hokkaido as well as its urban tradition dating from the Tokugawa era. The wholesale trading area of Hakodate extended a great distance; from the Oshima Peninsula via the Pacific Coast to the southern part of the Okhotsk Sea Coast (Fig.2). Although Otaru's urban development began after Hakodate's, its growth was remarkable. Being the outport of Sapporo, Otaru's wholesale trading area included the northern and central portions of the Okhotsk Sea coast and inland portions connected to it by rail. Otaru supplied necessities of life for all these areas and their products were shipped out from Otaru. In addition, after Japan came into possession of South Sakhalin in 1905, most of South Sakhalin's commercial rights fell into the hands of Otaru's merchants. Sapporo, originally being third to Hakodate and Otaru in economic activity, dominated administrative functions after 1869, when it became the administrative center of Hokkaido. It should be noted that Sapporo was eminent in higher education and research activity, which centered around the Sapporo Agricultural College founded in 1876 (the forerunner of Hokkaido University). Besides these three major cities, some small cities developed gradually, but their functions were restricted to local distribution of goods.

As we have pointed out above, Hokkaido at that time had no primate city dominating both administrative and economic functions. That is why Hokkaido showed the opposite city size distribution to a primate-type which is frequently observed in newly developing colonial countries or regions.

If we look at the rank-size graphs of 1950 and 1960 in Figure 1, a considerable change can be discerned between these and previous years. That is to say, Sapporo had established its status as the top-ranking city in Hokkaido, while the gaps between it, Hakodate, Otaru and other smaller cities expanded. Consequently the 1950 and 1960 graphs were close to a rank-size fit. We can attribute this to Hakodate's stagnation due to a slump in the fishing industry, Otaru's decline caused by loss of the South Sakhalin trade and a gradual shift of
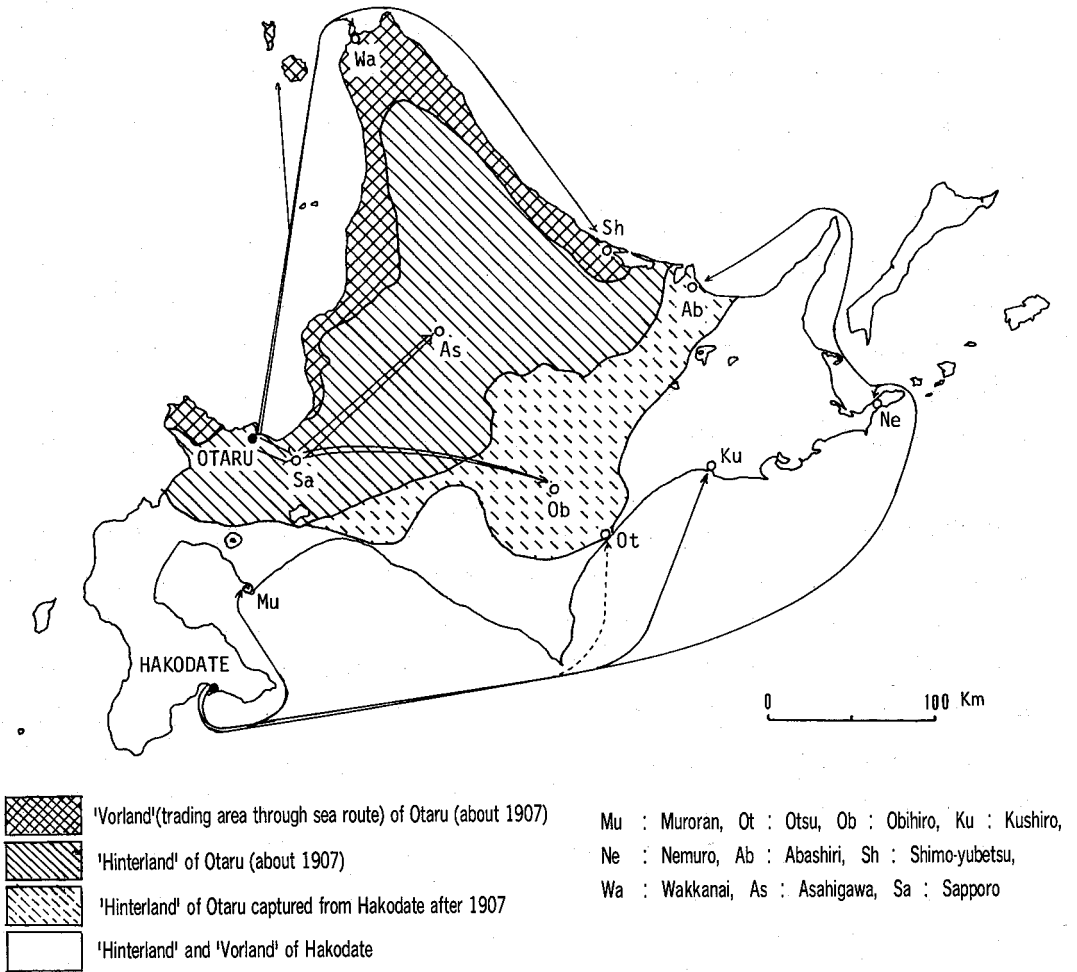
'Vorland'(trading area through sea route) of Otaru (about 1907)

'Hinterland' of Otaru (about 1907)

'Hinterland' of Otaru captured from Hakodate after 1907

'Hinterland' and 'Vorland' of Hakodate

Mu : Muroran, Ot : Otsu, Ob : Obihiro, Ku : Kushiro,
Ne : Nemuro, Ab : Abashiri, Sh : Shimo-yubetsu,
Wa : Wakkanai, As : Asahigawa, Sa : Sapporo

Fig. 2   Wholesale Trading Area of Hokkaido around 1910   (by J. Kawaguchi)[1]

economic activity to Sapporo, prosperity of coal mining towns, in the late 1940s and 1950s, and the steady growth of several local cities.

III. THE CONTEMPORARY URBAN RANK-SIZE RELATIONSHIP

The analysis in the previous chapter was based on administrative unit data such as *shi* (city) or *machi* (town), with the one exception of 1897. However in 1960 the Bureau of

Statistics set up "Densely Inhabited Districts" (abbreviated as DID)[2] and has published DID statistics for every subsequent census. Since a DID is a good approximation of the actual urbanized area, we are going to use these DID areas to analyze the characteristics and changes in Hokkaido's urban rank-size system in the past 20 years (Fig.3). From these five graphs we can discern the following:
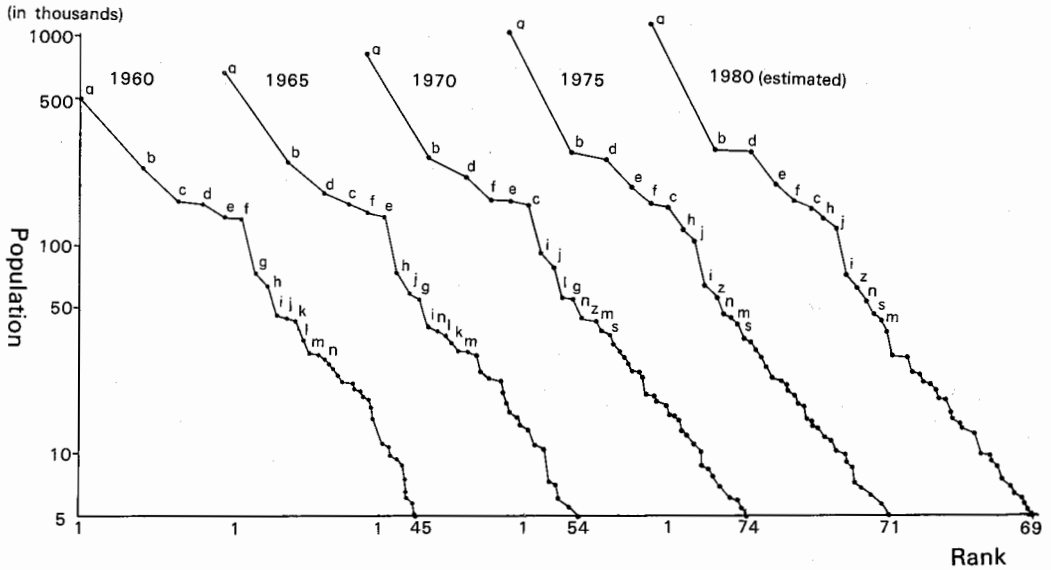
Parameters α, β and Coefficient of Determination r² in
the Regression Line Formula : $\log P = \alpha \log R + \log \beta$

year	α	β	r²
1960	−1.24502	776,367	0.97015
1965	−1.26735	870,227	0.98274
1970	−1.20822	903,528	0.99330
1975	−1.25473	1,028,583	0.99350
1980	−1.27908	1,130,677	0.99245

These formulae are calculated for the DIDs within Hokkaido.

City Names

a :	Sapporo	i :	Akabira *
b :	Hakodate	j :	Tomakomai
c :	Otaru	k :	Mikasa *
d :	Asahigawa	l :	Kitami
e :	Kushiro	m :	Wakkanai
f :	Muroran	n :	Iwamizawa
g :	Yubari*	s :	Chitose
h :	Obihiro	z :	Ebetsu

* Mining Town

Fig. 3   Urban Rank-Size Relationships, 1960-1980

1. The size of the gap between Sapporo and Hakodate, the second most populous city, has greatly extended. In 1960 Sapporo had 2.1 times as much population as Hakodate, in 1970 3.1 times, and in 1980 4.0 times.

2. There is a cluster of five to seven cities within the 100,000 to 300,000 population range with a subsequent gap between this cluster and less populous cities.

3. Cities with less than 100,000 population appear something like a straight line when graphed and fit the urban rank-size rule fairly well. These facts lead us to the following conclusions:
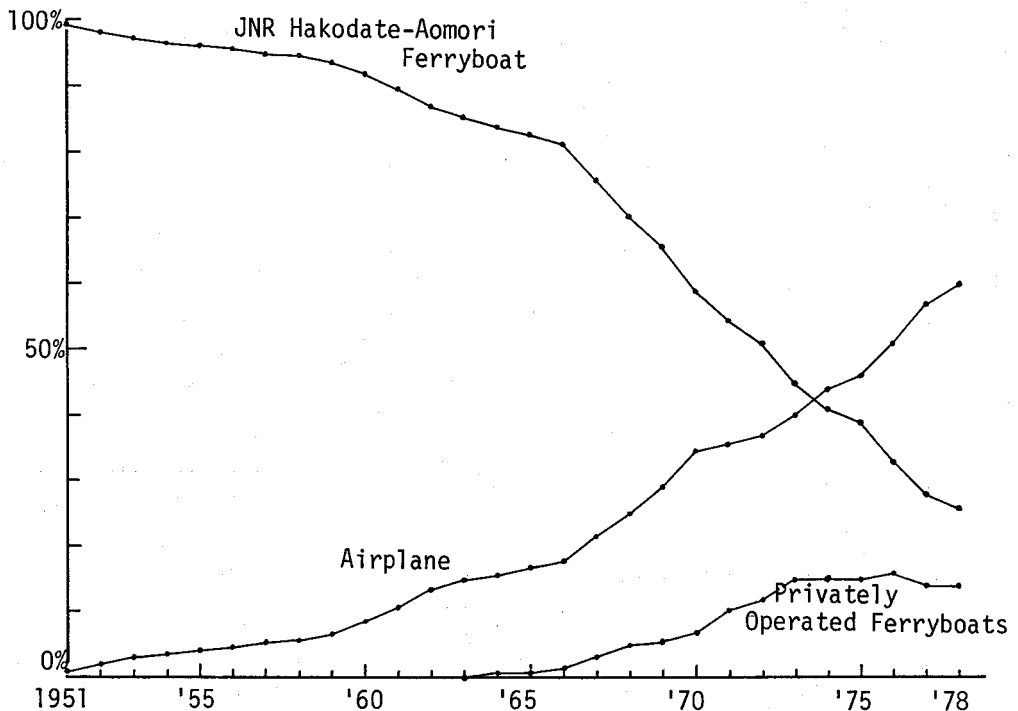

Fig. 4 Share of Passenger Traffic between Hokkaido and the Rest of Japan, 1951-1978

The rapid growth of Sapporo can be primarily attributed to the establishment of branches of major Japanese corporations including banks, accompanied with systematization of Japan's economy and society. That is to say, Sapporo has established its status as a regional central city (*Kōiki-chūshin-toshi*) together with Nagoya, Fukuoka, Sendai and Hiroshima. Moreover, in preparation for the XIth Winter Olympic Games held in Sapporo in 1972 an enormous sum was invested directly or indirectly in the city. The public facilities constructed for the Olympiad included a subway, an expressway to Otaru, and a

new municipal office building. In the same year Sapporo received the status of a special municipality (*Seireishitei-toshi*), and acquired a wider administranive autonomy that it previously had. During this period the main passenger traffic route between Hokkaido and the rest of Japan changed. Formerly almost all passengers traveling to and from Hokkaido utilized the Hakodate-Aomori Ferry operated by the Japanese National Railways, but now most travelers use airplanes (Fig.4). This means there is a new direct connection between Sapporo and Japan's national core, which is very important in explainig the expansion of the gap between Sapporo and Hakodate.

The five to seven major cities after Sapporo consist of those which are peripheral regional centers and of those which have specific functions. The growth of the former cities i.e. Hakodate, Asahigawa, Kushiro and Obihiro relies on changes in the circulation and distribution costs of goods, and development of transportation or communication which can be symbolized by a speed up of railway traffic, operation of long distance buses, and diffusion, of motor cars and telephones. In other words, these cities can be evaluated as the nodal points of administrative and economic networks within Hokkaido, similar to Sapporo's regional nodality within Japan. The influential areas of these cities are almost fixed, although they to some extent vary by the selection of indicators. One such area, for example that established by intercity telephone calls, is shown in Figure 5. Because administrative and economic functions are the bases of these cities, we will construst a rank-size graph based on the value of retail trade and pivotal administrative, economic and cultural function data instead of population (Fig.6, Fig.7). In this way we can pinpoint the existence of these "nodal cities" more clearly. We can also point out that the population gaps between the first ranking city and the second largest city have spread in each sphere of influence and that these phenomena are parallel to Sapporo's growing primacy.

The latter city group includes Muroran which has heavy industrial function, the former commercial port, Otaru, whose population is now gradually decreasing and Tomakomai which has been growing rapidly with the recent construction of a dredged port. Although their spheres of influence are not very wide spread, the above mentioned three cities, as a whole continue to carry out important roles for the economic core of Hokkaido.

As previously mentioned the third cluster of cities which can be distinguished from the above major cities, fits the rank-size regression line relatively well in all periods. The reason why it fits the line is that it is composed of cities with a variety of functions such
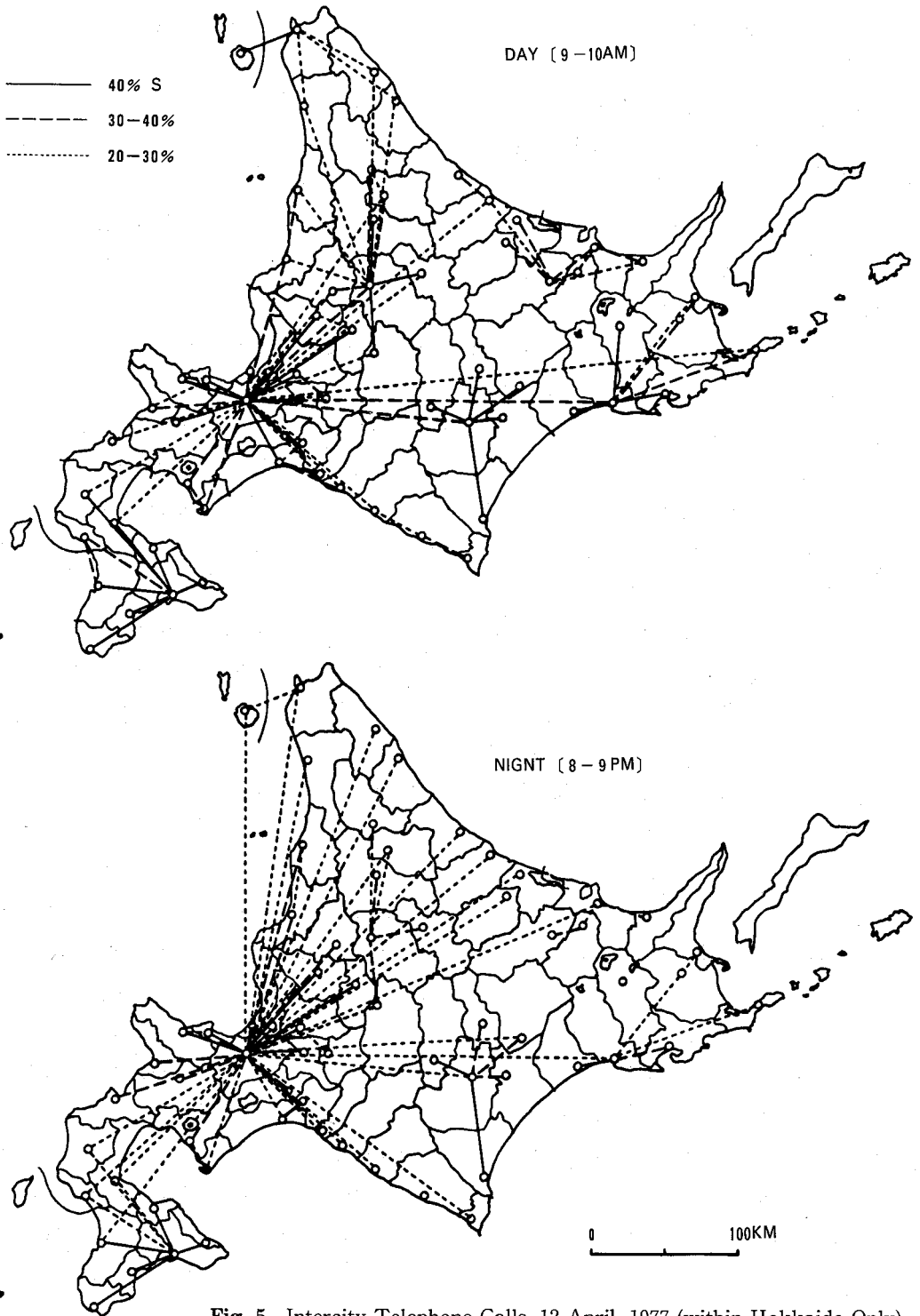
DAY 〔9 －10AM〕

———————	40% S
— — — —	30 － 40 %
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NIGNT 〔8 － 9 PM〕

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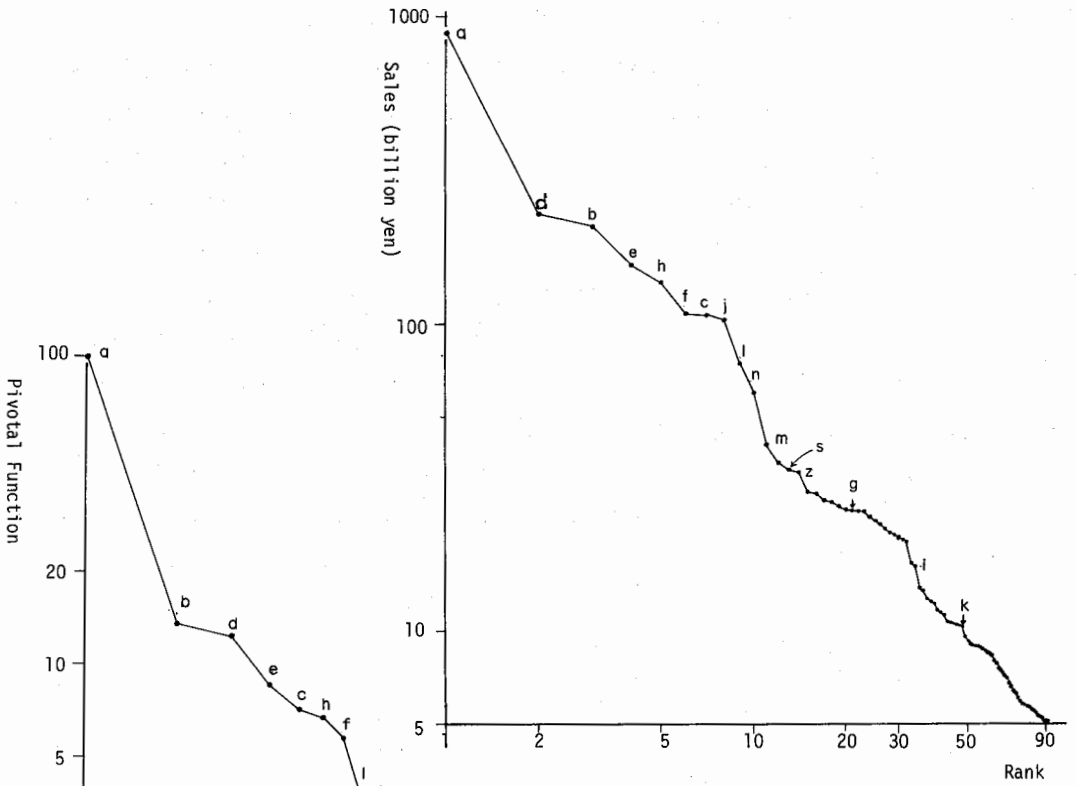**Fig. 5**　Intercity Telephone Calls, 12 April, 1977 (within Hokkaido Only)

Fig. 6   Urban Rank-Size Graph in Terms of Retail Sales
(May 1975–April 1976)
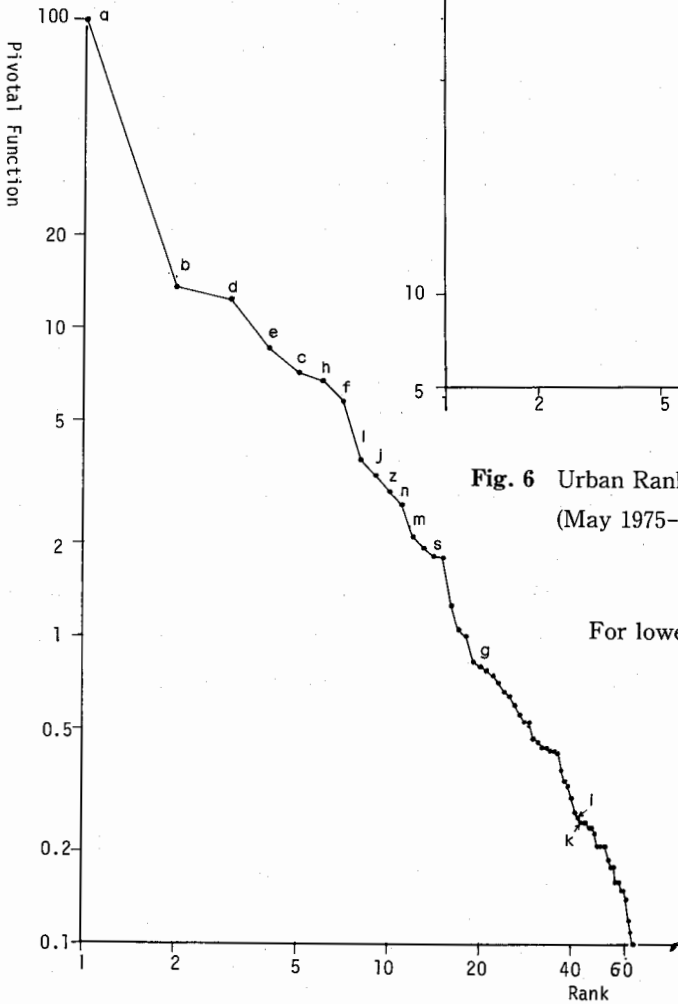
For lower case letters, refer to Figure 3.

Fig. 7   Urban Rank-Size Graph in Terms of Pivotal Function[3] when Sapporo's value is
assumed to be 100.

as agricultural centers, fishing ports, mining towns, satellite towns, and small industrial cities. Among these cities and towns there are many whose population has stagnated or decreased. Especially the steep decrease of population in mining towns since the 1960s, caused by the so called energy revolution has been most noticeable. The exodus of population from these towns as well as from rural regions in general has flocked to Sapporo and other major cities. The 50 largest cities and towns in terms of DID population employed in the above analysis are shown in Figure 8.

Lastly following the rank-size curve downwards, we find towns with basic minimal functions such as post offices and middle schools. These towns with their postal and secondary school functions sometimes originated from small service centers for a rural region and number 393 with the mean distance between each being 10.3 km. (Fig.9)[4] Beyond the periphery of these towns are dispersed rural settlements originating from the land division system established after 1890, which are similar to U.S. townships.

IV. CONCLUSION

As stated above, in regard to her urban system, Hokkaido hes developed as a unique region within Japan because its settlement history began relatively recently. Two particular characteristics of Hokkaido's urban system are the drastic contrast between rapid growing cities and declining ones, and the clear break between urban and rural districts. On the other hand, Hokkaido today should be considered as a subsystem of Japan's total system. This is well reflected by the hierarchical structure of the urban network radiating from Tokyo via Sapporo and several other Hokkaido cities to smaller local towns.

1)J. Kawaguchi(1935) : Hokkaido Chihotoshi Keizaiken no Kenkyu (A Study on the Economic Regions in Hokkaido), CHIRIGAKU (GEOGRAPHY) vol.3 pp. 1311-1317, 1515-1525, 1685-1699, (in Japanese)
2) A DID must have population density of more than 4,000 persons/km². and have a population of more than 5,000 inhabitants.
3) Pivotal function is a mean value of administrative, economic and socio-cultural function of each city.
4) M. Hatano (1978) : Hokkaido no Saikai Chushinchi (On the Minimal Settlements in Hokkaido), TOHOKU CHIRI vol.30 No.1, pp. 64-65. (in Japanese)
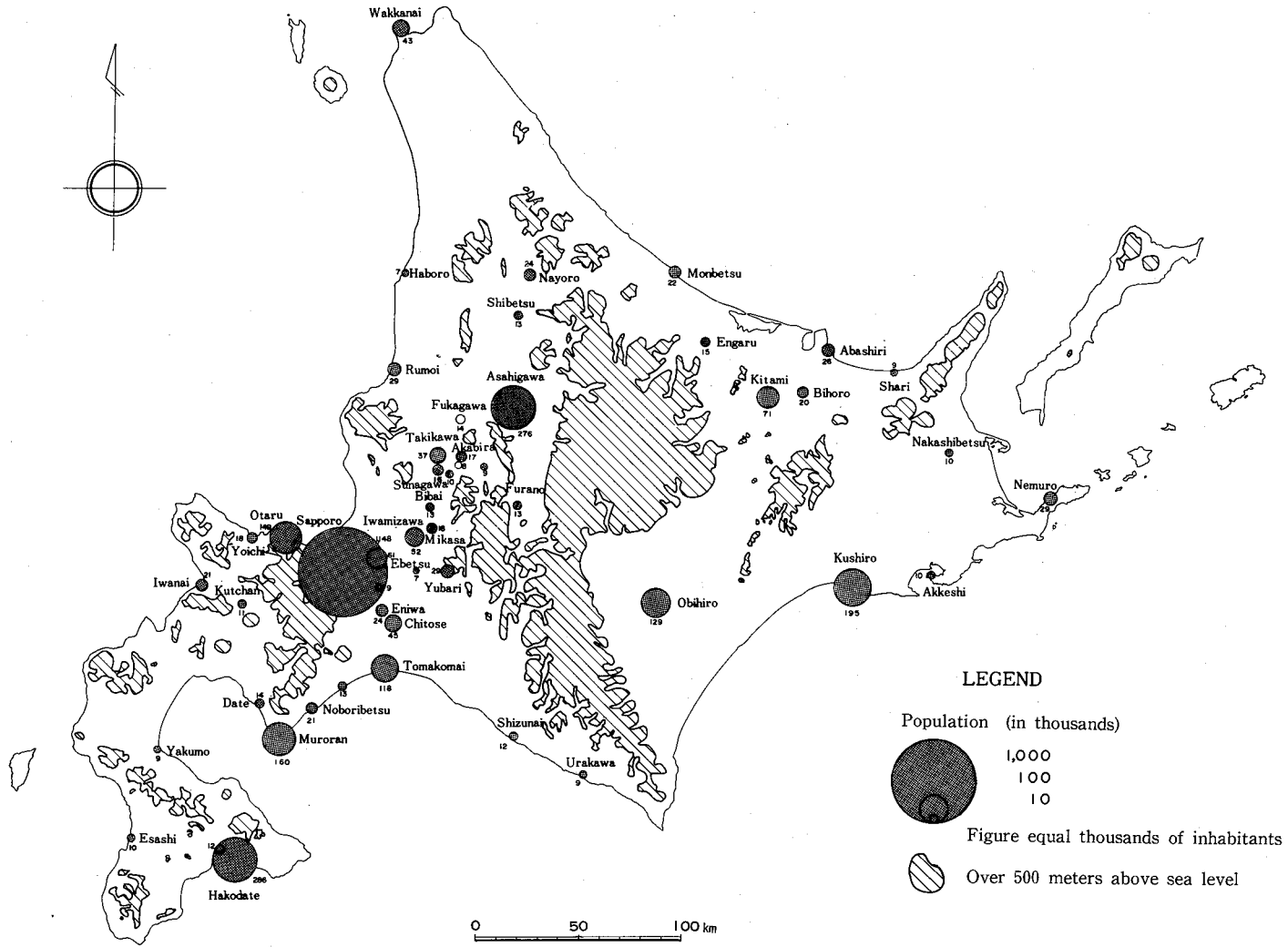
Wakkanai
43

Haboro 7
24 Nayoro
Monbetsu 22

Shibetsu
15

Engaru 15
Abashiri 26
Shari 9

Rumoi 29
Asahigawa 276
Kitami 71
Bihoro 20
Nakashibetsu 10

Fukagawa
Takikawa 14
Akabira 17
Sunagawa
Bibai 13
Furano 13
Nemuro 49

Otaru 149
Yoichi 18
Sapporo
Iwamizawa 48
Mikasa 52
Ebetsu 61
Yubari 29
Kushiro 195

Iwanai 21
Kutchan 11
Eniwa 24
Chitose 43
Obihiro 129

Tomakomai 118
Akkeshi 10

Date 18
Noboribetsu 21
Shizunai 12
Yakumo 9
Muroran 160
Urakawa 9

Esashi 10

Hakodate 286

LEGEND

Population (in thousands)

1,000
100
10

Figure equal thousands of inhabitants

Over 500 meters above sea level

0   50   100 km

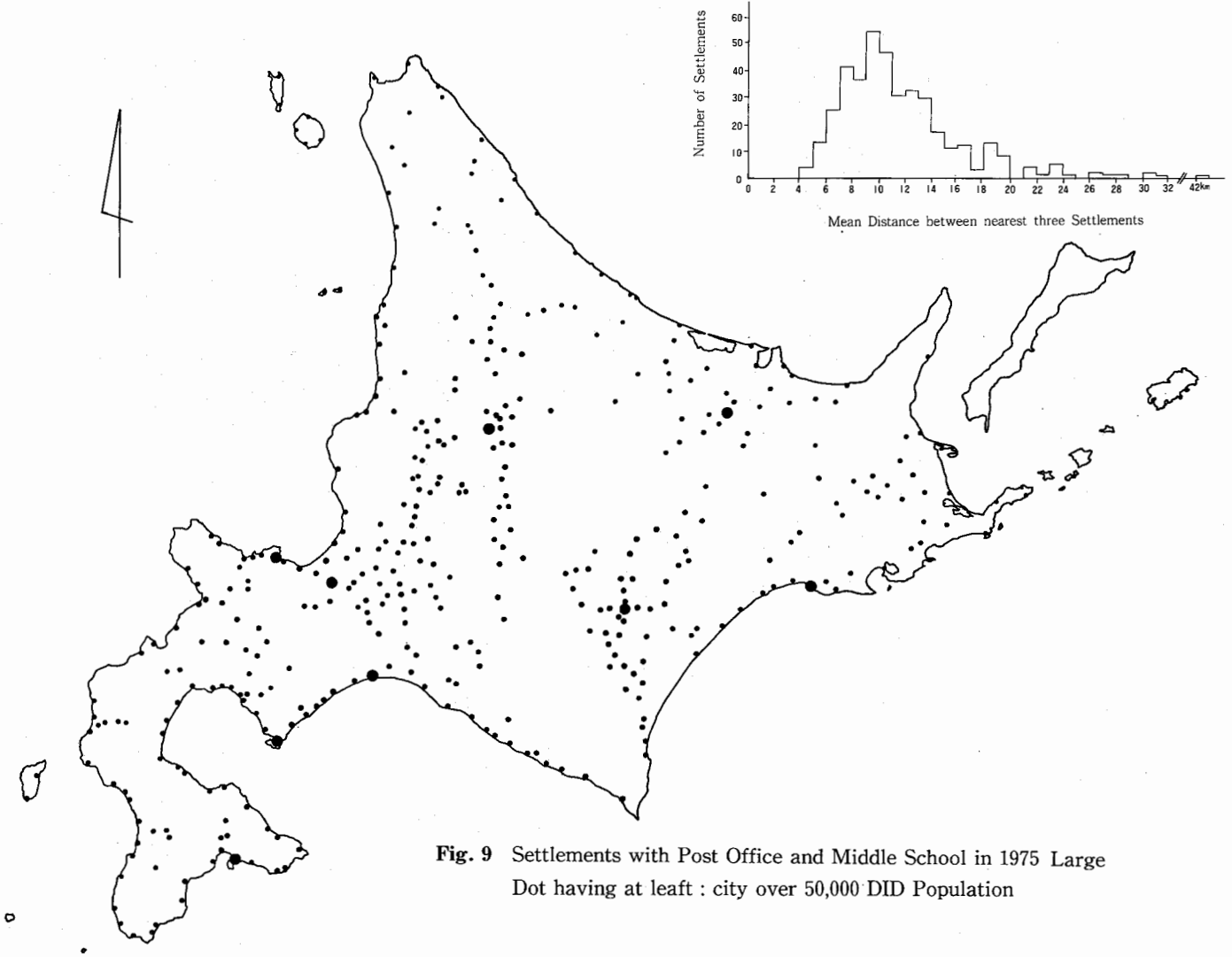**Fig. 8**   Hokkaido's Largest Densely lnhabited Districts as of 1980 (Estimated)

Fig. 9 Settlements with Post Office and Middle School in 1975 Large
Dot having at leaft : city over 50,000 DID Population