Living Environment of Nomads Residing on the Outskirts of Ulaanbaatar, Mongolia Part 2
-Lifestyle and Living Environment from the Perspective of Perceptions and Activities-

Umekazu Kawagishi*1, Hirofumi Sugimoto2, Koki Kitano3, Ishjamts Gonchigbat4 and Naoyuki Hirota5

1 Professor, Department of Conceptual Design and Architecture & Architectural Engineering, College of Industrial Technology, Nihon University, Japan
2 Postdoctoral Researcher, College of Industrial Technology, Nihon University, Japan
3 Assistant Professor, Department of Architecture and Architectural Engineering, College of Industrial Technology, Nihon University, Japan
4 Professor, Department of Architecture, School of Civil Engineering, Mongolian University of Science and Technology, Mongolia
5 Associate Professor, Department of Architecture and Architectural Engineering, College of Industrial Technology, Nihon University, Japan

Abstract
This paper is the second report following the "Living Environment of Nomads Residing on the Outskirts of Ulaanbaatar, Mongolia." The series of this study aims to reveal characteristic tendencies in the perception of livelihood and activities and behaviors of the nomads and to study the relationship between the life system with fewer environmental burdens fostered in the traditional nomad society and their perception of livelihood and communities.

Opinion surveys and interviews were conducted for nomads residing on the outskirts of Ulaanbaatar regarding their summer (August) campsites. A spatial configuration survey (measurement survey) of the groups (khot-ail) formed by nomads was also conducted. The purpose was to consider the relationship between the living space and the unique lifestyle of nomads and their perceptions and activities, with the aim of obtaining basic knowledge regarding the creation of the unique nomad living environment. The results indicated that the sustainable lifestyle of nomads that is rooted in the characteristics of the natural environment is the result of the "cooperative and cooperative labor" quality of nomadic life, as seen in the daily life and leisure activities of nomads, and the "flexibility" of nomadic life, as seen in the mobility of nomads, the spatial configuration and household makeup of the Khot-ail and so on.

Keywords: nomad; lifestyle; living environment; living activity; living space

1. Introduction
The transformation of Mongolian society in recent years due to the shift from a socialist to a democratic system has resulted in rapid urbanization and a shift to fixed residence. Nevertheless, even now some 27% of households continue to live a nomadic life. Moreover, animal husbandry centered on the traditional nomadic lifestyle makes up approximately 30% of Mongolia's GDP. In this way, Mongolia is a country unlike any other in the world, with a nomadic society that coexists with an urban society.

There has been particularly significant population inflow from rural areas to the capital, Ulaanbaatar, and even now the city's population is increasing rapidly. (Fig.1) Large numbers of domestic animals have been lost to heavy snow (Zud) and droughts (Gan) and so on, and the inflow of large numbers of nomads who have left the nomadic life and come to the city in search of work is becoming a serious social problem. It is the

Fig.1. Population of Change (Ulaanbaatar)

*Contact Author: Umekazu Kawagishi, Professor, Department of Conceptual Design and Architecture & Architectural Engineering, College of Industrial Technology, Nihon University, 1-2-1 Izumi-cho, Narashino, Chiba, 275-8575 Japan
Tel: +81-47-474-2489 Fax: +81-47-474-2499
E-mail: kawagishi.umekazu@nihon-u.ac.jp
(Received April 8, 2009; accepted January 15, 2010)
nomad society and their perception of livelihood and communities.

In the first paper,\(^{(4)}\) by comparing the findings from the questionnaire survey conducted among the nomads and the ger urban settlers concerning the characteristics of their awareness of the living environment, the actual situations and characteristics of the living environment of the nomads were identified overall. As a result, the following basic knowledge was obtained:

Most of the nomads primarily earn their livelihood from livestock and live on it at the same time. They use livestock's waste as fuel in cooking and heating and materials no longer needed by the humans are fed to the livestock, thus controlling the amount of waste generated.

The nomads have problems, such as lack of electricity, of health and medical care which is the result of a lifestyle marked by constant roaming and living on grassland. Thus, problems connected with living environments have become apparent. Among the problems of health and the medical environment, a large disparity is observed regarding the "distance between campsite to hospital" and "transportation difficulties" between the nomads and the ger settlers in the built-up areas of Ulaanbaatar.

The nomads have a traditional lifestyle. They are keenly aware of the natural environment and effectively use resources obtained from nature and livestock.

2. Purpose of Study

In this study, an opinion survey and interviews were conducted on nomads residing on the outskirts of Ulaanbaatar, and a spatial configuration survey (measurement survey) of the groups (Khot-ail)\(^{(Note5)}\) formed by nomads was also conducted. The purpose of the study was to determine trends in the perceptions of daily life and activities of nomads, based on the results of these surveys, and to consider the relationship between the low environmental load lifestyle that has been nurtured in traditional nomadic society and the perceptions, activities and living space of nomads, in order to obtain basic knowledge regarding the creation of the unique nomad living and residence environments.

3. Positioning of This Study in Relation to Previous Studies

Previous Japanese studies of nomads\(^{(Note6)}\) have focused primarily on the fields of cultural anthropology (ethnic studies) and geography. In "An Ecological View of Civilization," Tadao Umesao presented a biogeographical historical view, based on a study of nomads and domestic animals in Mongolia, and he also touched on the relationship between the nomadic lifestyle and livestock, geography, climate and other factors.\(^{(1),(2),(3),(4)}\) Yuki Konagaya has conducted studies that include "Characteristics and Transformation of Pastoral System in Mongolia" and "Transformation of Resources in Nomadic Society in Mongolia" and has discussed the living patterns and ranching technologies of Mongolian nomads, the relationship between livestock and grasslands, the adaptability of nomads to the natural environment, mechanisms for maintaining the grassland ecosystem and so on.\(^{(5),(6)}\) All of these studies have focused on the unique regional, historical and cultural environments of Mongolia. Up to now, no study has considered living space planning and the creation of living environments in Mongolia in terms of the relationship of the perception structure and activities of residents (nomads), or discussed the methodology for or effectiveness of this approach. Herein lies the unique aspect of this study.

4. Overview of Study

4.1 Overview of Nomads in Mongolia

There is a great disparity in annual rainfall from year to year in arid regions such as the Mongolian plateau. As a result, animal husbandry that is always conducted within the same area may place a lethal burden on the vegetation of that area. Therefore, the burden on the vegetation caused by the herds of domestic animals must be adjusted to match the amount of rainfall. The highly mobile nomadic system of animal husbandry is said to have developed as a result of these geographical and climatic factors. In the "nomadic herding" practiced in Mongolia, the following noteworthy types of mobility have been confirmed. Firstly, the campsite\(^{(Note7)}\) is changed according to the season. Secondly, there are several seasonal campsite candidates, and the campsite is selected on a case-by-case basis. Thirdly, the composition of groups in the campsite may also change with the move to the campsite. Fourthly, in the event of a disaster, movement beyond the domain that is normally used may occur.\(^{(Note8)}\)

As of 2006, the number of nomads engaged in lifestyles based on this nomadic herding on the grasslands of Mongolia came to 170,755 households (364,350 persons). This represents approximately 27% of the total number of households in Mongolia (632,500).

In recent years, due to the change to a market-based economy, nomads have become obliged to distribute a variety of livestock products to the market themselves. Accordingly, there is now a tendency for many nomads to live in areas on the outskirts of cities near the market, or near fixed residence districts, or near major roads and so on. In addition, in the course of herding, some households also visit cities and stay in or on the outskirts of the city for periods ranging from several weeks to several months where they continue their nomadic lifestyle.

There have been three patterns for the relationship between nomads and people living in fixed residences in the cities. In one pattern, nomads live near the city. In another pattern, people living in fixed residences in the city leave the city and return to a nomadic lifestyle. In yet another pattern, people go back and forth between the city and the grasslands. In this way, it has been reported that new patterns have begun to emerge in recent years in the relationship between nomadic and urban fixed residence lifestyles in Mongolia as a result of the shift to a market-based economy.\(^{(Note9)}\)

4.2 Research Method

In this study, opinion surveys and interviews were conducted in August 2006 for nomads residing on the outskirts of Ulaanbaatar regarding their perception of their lifestyles, their daily living and community activities and so on. A survey (measurement survey) of
the spatial composition of nomad groups (Khot-ail) was also conducted.

As the methodology of the survey, the authors went directly to nomad households to hand out the questionnaire forms in conjunction with the explanation of the survey intent, then went back to recover them. The forms were distributed on a basis of one copy per household and the household heads were asked to enter responses on the sheets. The survey process is as summarized in Table 1.

Table 1. Overview of Opinion Surveys

<table>
<thead>
<tr>
<th>Opinion Survey of Nomads</th>
<th>Location A</th>
<th>Location B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of survey forms distributed</td>
<td>28</td>
<td>20</td>
<td>57</td>
</tr>
<tr>
<td>No. of survey forms collected</td>
<td>28</td>
<td>20</td>
<td>57</td>
</tr>
<tr>
<td>Collection rate</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Nomads join together in groups, primarily consisting of several households, and build campsites in which to pursue a nomadic lifestyle. Based on this fact, an opinion survey of individual households and groups that pursue a nomadic lifestyle together was conducted. The results have been organized and presented in this paper in order to determine the status of daily life activities and actions and the trends in the perceptions of nomads regarding their lives. The results of a survey of campsites conducted in summer (August) are also presented. Summer is unlike other seasons in that many gers are gathered in the campsites, and this is the season in which the most activities, in which households and groups (Khot-ail) cooperate with one another, are conducted, such as livestock raising, cooperative and cooperative work activities, and banquets (festivals and ceremonies).

The survey was conducted at two locations, Location A and Location B, which have similar characteristics (note8). These sites are within a radius of 50 km and 80 km, respectively, from Ulaanbaatar (Fig.2.).

5. Opinion Survey of Nomads

5.1 Attributes of Nomad Households Targeted by Survey

5.1.1 Group Configuration (Table 2.)

The results of the opinion survey and interviews of nomads, as well as a visit to the sites for the purpose of classifying groups, revealed that the 57 nomad households can be classified into 31 groups. Each group consisted of one to four households. There were 14 cases of groups made up of a single household (hereafter 1F1G), 10 cases of groups made up of two households (2F1G), 5 cases of groups made up of three households (3F1G), and 2 cases of groups made up of four households (4F1G).

5.1.2 Family Composition (Table 2.)

In general, most households were made up of 5-6 members, with an average of three to four children in the household. There were no major differences in groups as a result of the average number of family members and the average number of children. In addition, the average age of the head of household was late 40s, and the average age of the spouse was early 40s.

Approximately 80% of the households reported "livestock breeding" as the occupation that was their source of income. In addition, some households reported "receipt of pension" in response to this question.

Table 2. Group Configuration and Family Makeup

<table>
<thead>
<tr>
<th>Number of cases (number of households)</th>
<th>1F1G</th>
<th>2F1G</th>
<th>3F1G</th>
<th>4F1G</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of household members (persons)</td>
<td>5.4</td>
<td>4.8</td>
<td>5.9</td>
<td>5.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Average age of head of household (years old)</td>
<td>52.0</td>
<td>47.8</td>
<td>45.9</td>
<td>47.1</td>
<td>48.2</td>
</tr>
<tr>
<td>Average age of spouse (years old)</td>
<td>47.2</td>
<td>43.2</td>
<td>44.1</td>
<td>44.1</td>
<td>44.7</td>
</tr>
<tr>
<td>Average number of children (person)</td>
<td>2.9</td>
<td>2.6</td>
<td>3.3</td>
<td>2.9</td>
<td>2.9</td>
</tr>
</tbody>
</table>

5.2 Nomad Lifestyles and Daily Life Activities and Actions

5.2.1 Daily Life Activities and Actions Performed by Nomads Throughout the Year (Fig.3.)

1) Nomadic Herding (Movement) of Nomads Throughout the Year (Fig.3.)

Fig.3. shows the nomadic herding (movement) of nomads throughout the year, based on the opinion survey and references (note9). The characteristics can be organized as follows.

- The nomads roam with the seasons and according to the ecology (reproduction, breeding, milking, etc.) of livestock (Mal note10), and establish camps in locations that offer them a suitable natural environment. In the summer, they focus their labor activities on breeding and milking of livestock and the processing of dairy products. Because of this, they establish their campsite in locations close to a river, airy places, or in any other venues where they can live in utmost comfort.

- The number of ger assemblies at campsites vary with natural environments and seasons (generally they tend to gather together in the summer and disband in other seasons). Thus, the pattern of seasons can be classified into a period of three seasons (spring, autumn, and winter) and the other period (summer). In periods other than summer, they live their individual and closed way of life in gers while in the summertime, larger assemblages of gers occur, in which people interact with one another openly through collaborative work and festive events.

- In the event of adverse environments (seasons with
less grass, the occurrence of natural disaster, etc.), the nomads carry out Otor\footnote{note11) and roam to find grass to feed livestock. At autumn camps, Otor tends to increase to fatten animals in preparation for the harsh winter.

- Spring and winter campsites are often established near each other.

2) Movement Frequency, Distance and Conditions and Reasons for Movement

As Fig. 3 shows, the roaming frequency is approximately four times a year, and many households stay at the same spot for two to four months. This trend does not fluctuate with group configurations.

The roaming distance shows a wide range from 5 to 150 km. Among the survey responses are: "Roaming distance changes according to the grassland conditions," "Roaming distance is altered depending on summer weathers" (the rainy season occurs in the summer in Mongolia), "In the years of heavy rains, the roaming distance is short because grass is abundant while in dry seasons we move following grazing," "How well animals are fleshed determines the roaming distance."

At the time that the survey was conducted (August), the distance that each household moved tended to change even within the same group. This reveals that the group configuration (the number of households gathered in the \( \text{Khot-ail}\) changes in a flexible manner according to the season.

When nomads were asked to give opinions freely regarding the conditions and reasons for movement, they provided responses such as the following: "Fattening status of livestock," "We change the distance that we move in accordance with the state of our livestock," "Quantity of grass and vegetation in the steppe," "According to the natural environment (changes in the season, climate etc.)" "We move more often in the event of a natural disaster such as a Zud [snow damage] or Gan [drought damage]."

This finding is evidence that the mobility of nomads is flexible in response to the natural environment and the livestock ecology.

3) Nomad Perception of Mobility

When nomads were asked to give opinions freely regarding their lifestyle of repeatedly moving to different areas of habitation, many households gave a positive evaluation of the present nomadic lifestyle, expressing opinions as the following: "Moving repeatedly to different places is good for feeding livestock, and it's advantageous for us as well. We can live in the midst of a beautiful natural area, which is also good for health."

"Always moving to different places to live enables us to meet a variety of people, and it's fun to be able to have new neighbors."

On the other hand, some households responded that "Moving is difficult" and "I think fixed residence is better." The reasons offered included comments such as "The government doesn't provide as much assistance to nomads (as it did during the Socialist period)" and "Nowadays rich people own the grazing land, so the area in which we can raise livestock and move is getting smaller."

5.2.2 Nature of Activities in Campsites in Summer

In the opinion survey, free responses were obtained regarding the nature of activities conducted in the summer campsite. In the spring campsite, nomads conducted preparations for livestock birth, feeding of newborn calves and other activities relating to livestock birth. Along with these activities, they took measures to protect newborn calves from the cold, such as "moving to a spring campsite suitable for calves" and "building warm animal sheds for calves." In connection with the summer campsite, nomads mentioned such activities as "production and sale of milk products," "milking," "shearing and felt-making," "festivals, banquets and ceremonies," and "fattening livestock." As the production of milk and various other cooperative and cooperative labor activities are actively conducted, some respondents
mentioned "building a kitchen ger." With regard to the autumn campsite, almost all of the responses mentioned preparations for winter such as "grass-cutting (preparing dried grass)," "preparing fuel (livestock dung, firewood etc.)," "maintaining the ger and livestock sheds," "setting aside milk products in preparation for winter," and "fattening livestock." Responses regarding the winter campsite included "preparing meat for winter and spring," "housing livestock in animal sheds and feeding livestock," and "letting livestock out to graze as appropriate with respect to the winter cold (to make sure they do not die)."

5.3 Daily Life Activities and Actions of Nomads in Summer

5.3.1 Survey and Analysis Method

Along with the survey form, a second survey form was distributed to the surveyed households. On this form, the households wrote the nature of the activities they conducted in the course of the day and the amount of time they engaged in those activities. Based on the nature of the activities conducted during the day as determined in the survey, each activity was categorized as either a daily living activity or a leisure time activity, and these activity items were further subdivided into 18 categories such as "grazing," "milking," "cleaning," and so on. Then the amount of time spent in each activity category was calculated. The average amount of time (out of the total activity time) that was consumed for each activity by each person per day was calculated and the results were organized. With regard to the attributes of nomad activities, the location of activities can be categorized as "within the ger or around the ger" and "on the steppe." Moreover, as the nomads sometimes conduct other activities while allowing their animals to graze on the steppes ("grazing"), the amount of time spent on activity items with the location categorized as "on the steppe" is calculated as activities conducted within the "grazing" activity time.

Valid responses were obtained from 36 households (persons).

5.3.2 Trends and Characteristics as Seen from Activities and Activity Time (Table 3.)

There were no major differences among any of the groups and households with regard to the activity items conducted during the day by nomads. According to the interview survey, each household determines the pattern of daily life activities conducted during the day. As time leisurely goes by, similar activities are repeated each day. The data for the average daily activities of households as determined from the survey responses have been organized in Table 3.

The top three items in terms of the time devoted to the activity per person per day for each group are as follows:

1F1G: (1) Grazing (466.4 minutes/person) (2) Making dairy products (132.3 minutes/person) (3) Milking (126.8 minutes/person)

2F1G: (1) Grazing (460.9 minutes/person) (2) Milking (150.0 minutes/person) (3) Preparing food (73.6 minutes/person)

3F1G: (1) Grazing (480.0 minutes/person) (2) Milking (190.7 minutes/person) (3) Making dairy products (75.0 minutes/person)

4F1G: (1) Grazing (565.7 minutes/person) (2) Milking (100.7 minutes/person) (3) Making dairy products (62.1 minutes/person)

For all households, the values are as follows:

(1) Grazing (486.7 minutes/person) (2) Milking (141.3 minutes/person) (3) Making dairy products (87.9 minutes/person)

The survey results show that the main activities conducted by nomad households are "grazing," "milking," and "producing milk products." While conducting these activities, nomads also engage in

Table 3. Daily Lifestyle of Nomads (Activity Item and Activity Time)

<table>
<thead>
<tr>
<th>Activity Item</th>
<th>Group</th>
<th>Average Activity Time (minutes/person)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grazing</td>
<td>1F1G</td>
<td>466.4</td>
</tr>
<tr>
<td></td>
<td>2F1G</td>
<td>460.9</td>
</tr>
<tr>
<td></td>
<td>3F1G</td>
<td>480.0</td>
</tr>
<tr>
<td></td>
<td>4F1G</td>
<td>565.7</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>486.7</td>
</tr>
<tr>
<td>Making dairy products</td>
<td>1F1G</td>
<td>132.3</td>
</tr>
<tr>
<td></td>
<td>2F1G</td>
<td>73.6</td>
</tr>
<tr>
<td></td>
<td>3F1G</td>
<td>75.0</td>
</tr>
<tr>
<td></td>
<td>4F1G</td>
<td>62.1</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>87.9</td>
</tr>
<tr>
<td>Milking</td>
<td>1F1G</td>
<td>126.8</td>
</tr>
<tr>
<td></td>
<td>2F1G</td>
<td>150.0</td>
</tr>
<tr>
<td></td>
<td>3F1G</td>
<td>190.7</td>
</tr>
<tr>
<td></td>
<td>4F1G</td>
<td>100.7</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>141.3</td>
</tr>
<tr>
<td>Shearing livestock</td>
<td>1F1G</td>
<td>150.0</td>
</tr>
<tr>
<td></td>
<td>2F1G</td>
<td>150.0</td>
</tr>
<tr>
<td></td>
<td>3F1G</td>
<td>190.7</td>
</tr>
<tr>
<td></td>
<td>4F1G</td>
<td>120.0</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>128.9</td>
</tr>
<tr>
<td>Milking</td>
<td>1F1G</td>
<td>132.9</td>
</tr>
<tr>
<td></td>
<td>2F1G</td>
<td>141.3</td>
</tr>
<tr>
<td></td>
<td>3F1G</td>
<td>150.0</td>
</tr>
<tr>
<td></td>
<td>4F1G</td>
<td>100.7</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>141.3</td>
</tr>
<tr>
<td>Grazing (including guiding animals)</td>
<td>1F1G</td>
<td>486.7</td>
</tr>
<tr>
<td></td>
<td>2F1G</td>
<td>87.9</td>
</tr>
<tr>
<td></td>
<td>3F1G</td>
<td>87.9</td>
</tr>
<tr>
<td></td>
<td>4F1G</td>
<td>86.1</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>87.9</td>
</tr>
</tbody>
</table>
leisure activities that include "enjoying conversation," "playing with children," "spending time with children," "exercising," "listening to the radio," and "playing with pets (dogs)."

It was judged that there is a very close relationship between daily living activities and leisure time activities in the nomadic lifestyle, and furthermore that daily living activities and leisure time activities overlap one another and a variety of activities are conducted.

6. State of Nomad Living Spaces

To determine the actual state of nomad living spaces, interviews and an observational and measurement survey were conducted at each site.\textsuperscript{12) With regard to the spatial configuration of the groups (Khot-ail) formed by nomads, the number of gers making up the group, the size and purpose of the gers, the placement of gers, the distance between gers and the number of head of livestock possessed by the group was determined for each group (1F1G, 2F1G, 3F1G and 4F1G) and the results were analyzed.

6.1 Spatial Composition of Groups (Khot-ail)

(Fig.4., Table 4.)

The distance between gers in each group varied considerably, ranging from a low of 1.2 m, with the gers right next to one another, to a high of 120 m, a considerable distance for gers in the same group. There were also differences between groups in terms of the number of gers and the use configuration of gers: residence (bedroom + living/dining room/kitchen [LDK], bedroom + living/dining room [LD]), kitchen, or storeroom. (Table 4.) In terms of the spatial configuration of the groups formed by nomads, there were no differences in the purpose of gers or the distance between gers and so on that resulted from group configuration. However, there was a tendency for the average number of gers to increase in direct proportion to the number of households making up the group. Moreover, except for the residence (bedroom + LD) gers, the interval between gers tended to be shorter when there were gers for kitchen or storeroom use as compared to cases in which the group was made up of only residence gers (bedroom + LDK). The average number of head of livestock also tended to be larger in such cases. (Table 4.) This is thought to be affected in no small measure by the fact that in many cases the households share the use of the kitchen and storeroom. The spatial configuration is also thought to be affected considerably by the fact that summer, in which the

Table 4. Spatial Composition of Groups (Khot-ail)

<table>
<thead>
<tr>
<th>Number of gers (Household)</th>
<th>1F1G</th>
<th>2F1G</th>
<th>3F1G</th>
<th>4F1G</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum distance between households (m) (average)</td>
<td>120.0</td>
<td>60.9</td>
<td>50.0</td>
<td>120.0</td>
<td>93.9</td>
</tr>
<tr>
<td>Minimum distance between households (m) (average)</td>
<td>12.3</td>
<td>12.9</td>
<td>11.6</td>
<td>31.8</td>
<td>21.7</td>
</tr>
<tr>
<td>Average distance between households (m) (average)</td>
<td>21.4</td>
<td>19.3</td>
<td>21.2</td>
<td>33.9</td>
<td>26.9</td>
</tr>
<tr>
<td>Average number of livestock (Group)</td>
<td>320.4</td>
<td>289.2</td>
<td>382.2</td>
<td>221.4</td>
<td>332.0</td>
</tr>
<tr>
<td>Average number of livestock (Group)</td>
<td>386.4</td>
<td>44.1</td>
<td>461.0</td>
<td>289.0</td>
<td>539.0</td>
</tr>
<tr>
<td>Average number of gers</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>3.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table 5. Livestock Ownership and Spatial Configuration

<table>
<thead>
<tr>
<th>Number of livestock</th>
<th>Less than 5</th>
<th>10-100</th>
<th>101-200</th>
<th>201-300</th>
<th>More than 300</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum distance between households (m) (average)</td>
<td>50.0</td>
<td>120.0</td>
<td>200.0</td>
<td>300.0</td>
<td>125.0</td>
<td>241.0</td>
</tr>
<tr>
<td>Minimum distance between households (m) (average)</td>
<td>12.0</td>
<td>26.0</td>
<td>19.0</td>
<td>8.0</td>
<td>2.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Average distance between households (m) (average)</td>
<td>25.0</td>
<td>21.1</td>
<td>16.0</td>
<td>7.2</td>
<td>23.1</td>
<td>20.0</td>
</tr>
<tr>
<td>Average number of gers</td>
<td>2.2</td>
<td>2.2</td>
<td>1.2</td>
<td>3.3</td>
<td>3.8</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table 5. Livestock Ownership and Spatial Configuration

<table>
<thead>
<tr>
<th>Number of livestock</th>
<th>Less than 5</th>
<th>10-100</th>
<th>101-200</th>
<th>201-300</th>
<th>More than 300</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum distance between households (m) (average)</td>
<td>50.0</td>
<td>120.0</td>
<td>200.0</td>
<td>300.0</td>
<td>125.0</td>
<td>241.0</td>
</tr>
<tr>
<td>Minimum distance between households (m) (average)</td>
<td>12.0</td>
<td>26.0</td>
<td>19.0</td>
<td>8.0</td>
<td>2.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Average distance between households (m) (average)</td>
<td>25.0</td>
<td>21.1</td>
<td>16.0</td>
<td>7.2</td>
<td>23.1</td>
<td>20.0</td>
</tr>
<tr>
<td>Average number of gers</td>
<td>2.2</td>
<td>2.2</td>
<td>1.2</td>
<td>3.3</td>
<td>3.8</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Fig.4. An Example of Spatial Composition of Groups (Khot-ail)
survey was conducted, is a time at which activities such as the production of milk products that involve the group's households working together in the communal kitchen are at their height.

Nomads determine the size (area) of the ger by means of the number of walls.\footnote{In many cases, the number of walls was determined in accordance with ger use. For example, if the ger was to be used for residence (bedroom + LDK), a five-wall ger would be constructed (resulting in an area of approximately 28 m$^2$). If the ger was to be used as a kitchen or storeroom, a four-wall ger would be constructed (resulting in an area of approximately 10-14 m$^2$). In addition, as shown in Fig.4., three patterns were observed for the combination of uses for the gers making up the group.}

6.2 Livestock Ownership and Spatial Configuration (Table 5.)

With regard to livestock possession in each group, the average number of livestock possessed by 1F1G groups was 320.4 per household (320.4/G). The average number of livestock possessed by 2F1G groups was 146.1 per household (289.9/G). The average number of livestock possessed by 3F1G groups was 300.0 per household (289.9/G). The average number of livestock possessed by 4F1G groups was 553.5 per household (2214.0/G).

The number of head of livestock generally increased in direct proportion to the number of people in the group. In 1F1G, however, there were variations in the number of head of livestock depending on the group. Overall, however, there seemed to be a significant relationship between the number of people in the group and the number of head of livestock.

With regard to the spatial configuration characteristics for the number of head of livestock, apart from the 400-999 head of livestock category\footnote{In details}, the average maximum distance between gers tended to increase as the number of head of livestock increased. In cases in which there were 701 or more head of livestock, the distance between the gers and the animal sheds (livestock enclosures) tended to be greater than cases in which there were 700 or fewer head of livestock. In particular, although the distance was shorter for cases with 700-999 head of livestock than in other cases, there was a noteworthy trend in which the distance from the gers to the animal sheds was greater. Moreover, when there were 700 or fewer head of livestock, the average number of gers exceeded 3.0, and the spatial configuration tended to have a larger number of gers than in other cases. The case of 1001 or more head of livestock was applicable to 3F1G and 4F1G only.

7. Conclusion

The knowledge obtained as a result of this study with regard to the perceptions and activities of nomads and the living environment can be summarized as follows.

1) This study was conducted in summer (at the summer campsite). This is a season in which many gers and people tend to gather together and individual households and groups have cooperative relationships with one another. This is also the time of year with the greatest activity in terms of cooperative and cooperative labor activities and traditional banquets (festivals and ceremonies). The study found that the principal daily life activities performed during the summer are grazing, milking and the production of milk products. Active performance of these various cooperative and cooperative labor activities was found to affect the spatial configuration of the group (Khot-ail) to a considerable degree, by increasing the average number of gers gathered at the campsite and the average number of head of livestock in each group, and by changing the configuration of ger use through the construction of gers for kitchen use and so on.

2) In a nomad’s life, there is a multilayered relationship between daily life activities and leisure activities. There is no separation in daily life between daily life activities and leisure activities, and the same space is used for both activities. In this way, nomads create a unique lifestyle in which there is an interconnection between daily life activities and leisure activities within their unique daily living and residential environment. The relationship between daily life activities and leisure activities is thought to result from the emphasis on cooperative and cooperative labor activities in nomad life, which strengthens ties among nomad households and groups and helps to foster a community among neighbors.

3) In nomadic lifestyle, nomads move from place to place in accordance with the natural environment and the needs of their livestock, the basis of this lifestyle is the “cooperative and cooperative labor” nature of nomad life as well as its "flexibility." The "cooperative and cooperative labor" nature of nomad life can be seen in the daily life activities centering on herding that are conducted in each household and in the groups (Khot-ail) formed by nomads, as well as in the leisure activities such as banquets (festivals and ceremonies). The "flexibility" of nomadic lifestyle can be seen in the fact that the distance that nomads move in each season differs for each household even within the same group, and in the change in the configuration of the group (Khot-ail) in different seasons in which different types of activities are conducted. "Flexibility" can also be seen in the change in the spatial configuration of the Khot-ail (in terms of the distance between gers) depending on ger use and the number of head of livestock, and in the fact that the number and use of gers is changed depending on the nature of the activity and the number of households gathered at the campsite. The study determined that the "cooperative and cooperative labor" and "flexible" properties of nomad life create a sustainable lifestyle rooted in the characteristics of the natural environment.

4) In the living environment of present-day nomads, a desire to adopt fixed residence in cities is beginning to appear as a result of increased natural disasters, the reduction in the number of places where nomad children can be educated, the lack of medical
facilities, the emergence of land ownership, and other factors. On the other hand, many nomads also have a positive evaluation of the nomadic lifestyle in which people move from place to place. The study provided evidence that people continue to enjoy the low environmental load nomadic lifestyle in which they cooperate with one another and work together and live in the midst of nature with their livestock, and that they are continuing this traditional lifestyle.

Acknowledgments
This study was conducted as one part of a research project entitled "Research Regarding the Application of Life Science Technology to a Resources Recycling-Oriented Society" currently being conducted by the Advanced Research Center for Life Science and Human Environment of Nihon University's Graduate School of Industrial Technology, as one of the programs selected by the Ministry of Education, Culture, Sports, Science and Technology to promote "Academic Frontier Project" at universities in Japan. The authors would like to express their appreciation.

Notes
1) The population of Ulaanbaatar has grown approximately 161% in the 15-year period between 1990 and 2004. According to 2007 statistics, the population of Ulaanbaatar was 1,031,000. Although Ulaanbaatar accounts for only 0.3% of the land area of Mongolia, it is home to approximately 39% of the nation's total population.
2) Zud (snow damage) refers to snowfall in winter that covers the grass with snow and makes grazing difficult. Frost damage that occurs simply because the temperature is low even if there is no snow is also referred to as "Zud." Gan refers to a situation in which there is little rainfall in summer and grass does not grow. The Zud that occurred in 1999-2001 in particular caused enormous damage. Many domestic animals were killed, and losses amounting to some 20% of Mongolia's GDP were sustained.
3) Each Mongolian nomad household lives inside a tent (ger) covered in white felt. The household is called an Ai1. Normally nomads live in a group of multiple families. This group is called a khat-al.
4) In this paper, "campsite" is defined as a location that nomads make their home base and at which they conduct activities for a certain period of time.
5) In this paper, "campsite" is defined as a location that nomads make their home base and at which they conduct activities for a certain period of time.
6) According to Reference 16, pp. 162.
8) In both of the survey locations, the summer season is located some 20 km away. In this sum center government offices, cultural centers, museums, hospitals, schools, banks and other facilities, as well as stores selling daily use items and food, are close. Nomads are generally able to obtain the things they need for daily life at these sum centers. Moreover, although there is a difference between the two locations in terms of the distance from Ulaanbaatar in the case of Location B located some 80 km from Ulaanbaatar, there is a main highway leading to Ulaanbaatar a few kilometers from the survey location (on the grassland). For this reason, in terms of vehicular transport, there is no major difference between Location B and Location A in terms of the time it takes to get to Ulaanbaatar.
9) References 8 and 11 were consulted in the preparation of Fig.3.
10) The word "Mäi" in Mongolian means "property." It indicates the five types of domesticated animals (goats, sheep, horses, cows and camels) that constitute the means of livelihood for nomads.
11) Otor refers to an additional breakaway move to a different location that occurs in addition to the seasonal move when encamped at the seasonal location. Some of the nomads (generally only men) take some of the livestock on this move. Many Otoras are conducted to avoid danger, such as in the event of a Zud or Gan. This is a mode of movement whose particular purpose is to adapt flexibly to changes in the environment.
12) Of the 31 groups targeted in the survey, it was not possible to conduct a spatial configuration survey for one case in 2F1G and one case in 3F1G. Accordingly, these cases have been omitted from the data in Table 4. Moreover, no responses regarding the number of livestock were obtained for two households belonging to 2F1G and 3F1G, so one case in 2F1G and one case in 3F1G have been excluded from the calculations of average number of livestock for the group.
13) In the opinion survey, some households responded that they only build kitchen and storeroom gers in summer.
14) The framework of nomad gers consists of latticed-shaped walls (hama), pillars that support the roof (bagan), a core that forms the roof (oni) and a circular skylight (touno). The size of the ger is determined by connecting several walls together to form a circular enclosure. In general, many nomads live in gers formed by connecting 4-5 walls together.
15) For the 400-609 head of livestock category, only in one case was there more than one ger, and this has not been included in the calculation of the average value.
16) In June 2002, a Property Ownership Law was enacted (and went into force in May 2003). This law made it possible for Mongolian citizens aged 18 and over (as a household) and companies to own property.

Previous Publications Related to This Study

References
1) Umesao, Tadao "An Ecological View of Civilization" (Chuukou Bunko; 1967).
2) Umesao, Tadao "World of theNomadism and Hunting" (Koudansha Gakujutsu Bunko; 1976).
3) Umesao, Tadao "Collected Writings of Tadao Umesao, vol.2 -Study of Mongolia" (Chuushou Kouronshi; 1990).
4) Umesao, Tadao "Recollection of the Mongolia" (Chuukou Bunko; 1991).
7) MONGOLIAN STATISTICAL YEARBOOK 2005, National Statistical Office of Mongolia.
8) Konagaya, Yuki "Living in the World of the Mongolian Steppe" (Asahi Shinbun; April 1996).
10) "Nomadic Architecture" (INAX Publishing Co.; April 2000).
11) Konagaya, Yuki, editor "Asia Reader: Mongolia" (Kawade Shobou Shinsha; Publishers; May 2002).
14) Konagaya, Yuki, editor "The Day that Nomadism will Change the Mongolian Economy" (Shuppan BunkaSha Corporation; November 2002).