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Landscape Ecological Study on the Habitats of *Aconitum pseudo-leave* var. *erectum* (Ranunculaceae) and Its Distribution

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ABSTRACT

This study was conducted to clarify the floristic composition and to investigate the landscape structure of habitats of *Aconitum pseudo-leave* var. *erectum*. *A. pseudo-leave* is designated an endemic plant in Korea. Floristic compositions of habitats were mainly composed of Quercus mongolica community. Other elements in this composition were *Weigela subsessilis*, *Corylus sieboldiana* and *Cornus contioversa*. Landscape ecological structure of habitats were defined by soils of mesic, loamy skeletal, slope of more than 60°, sixty percent of woody coverage at 460-520m above the sea level and 25m away from drainage. Distribution patterns of *A. pseudo-leave* var. *erectum* plants in Taejon were presented on the 1km X 1km grid map.

Key Words : *Aconitum pseudo-leave* var. *erectum*, Floristic composition, Habitats, Landscape ecology

INTRODUCTION

The monkshood plant *Aconitum pseudo-leave* var. *erectum* is a rare, herbaceous perennial belong to family Ranunculaceae (Lee, 1980). It is designated an endemic plant species in Korea (Lee, 1984; Paik, 1998). Three hundred or more species have been reported in *Aconitum*, which are widely distributed throughout temperate and sub-frigid zones in the Northern Hemisphere (Kadota, 1987; Kita *et al.*, 1995). Ranunculaceae plants especially genus *Aconitum* needs to study specially for conservation and preservation purposes because of *Aconitum* plants are used as ornamental, medical and edible resources (Kang *et al*, 1999; Dhar *et al*, 2000; Rai *et al.*, 2000) themselves. In most country they are designated an endangered or extinct species in their Red-data books (Environment Agency of Japan, 2000).

The need for regional-scale conservation planning has increased given the recent emphasis on regional habitat conservation planning and the development of regional and multispecies recovery plant (Martin, 1995). Regional-scale habitat assessment can improve spatial allocation of conservation efforts and resources, and facilitate strategic development planning to minimize impacts on rare plant resources and potential land use conflicts (Nantel *et al.*, 1998).

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This paper presents the distribution patterns of *A. pseudo-leave* var. *erectum* and its landscape ecological structure of habitats in Taejon and provides basic information for conservation.

MATERIALS AND METHODS

Description of Study area

This study was conducted at Taejon, Korea during March to November 2000. Taejon is located between 127°16'4"-127°18'36" east of longitude and 36°16'44"-36°26'14" of north of latitude at the center of the Korean Peninsula. Taejon is an important transportation network center in Korea because national railroads, expressways, and highways converge here. Taejon is situated in a valley that is located in the northwest part of the Noryeong Mountain Range. Shikjang (508m), Bomoon (457m), Kyejok (429m), and Koobong (264m) mountains surround Taejon. These mountains give the appearance of a folding screen surrounding Taejon City. The Kapchon (35.2km), Yudungchon (15.7km), and the Taejon streams (7.7km) flow from south to north and join the Kum Kang (River). Taejon is a comfortable and cozy place with low hills, open fields, and numerous rivers.

Taejon has four distinct seasons. The average annual temperature is 12.1°C; the temperature variance between summer and winter is 27.8°C with the hottest summer average monthly temperature of 25.5°C in August and the coldest winter average monthly temperature of -2.3°C in January. The average annual precipitation is 1,360mm. Fifty-five percent of the total precipitation falls in the summer season due to the influence of high-pressure systems from the northern Pacific Ocean.

Methods

This study was conducted on landscape ecological structure of *A. pseudo-leave* var. *erectum* plant by using phytosociological method during March to November 2000. Surveyed areas included all of Taejon territories. Surveyed items were character of habitats, and their community species. Based on these result detailed soil map (1:25,000; Office of Rural Development, 1974), geography (1:25,000; National Geography Institute, 1996) and satellite photo were over-laid. Then distribution sites were showed on the 1km x 1km grid map. Korean name and scientific name of plants were according to Lee (1980). The grid size of 1km x 1km was already tested and its efficacy and limit were reported in Korea (Kim and Lee, 1997) and Japan (Nakagoshi *et al.*, 1998).

RESULTS

Distribution patterns of each taxon are shown in Fig. 1. *A. pseudo-leave* var. *erectum* was observed at sixteen out of the 541 grids.

A. pseudo-leave var. *erectum* is one of the perennials plants of Ranunculaceae, which grows in forests under shade (Lee, 1980). It had been reported as a component of *Dryopterio-Quercetum lilietosum distichum* by Kim (1992). We could define other main components of this community, those are, *Dryopteris austriaca, Cornus contioversa, Acer barbinerve, A. pseudo-sieboldianum, Pedicuaris resupinata* var. *oppositifolia, Galium kamtschaticum* for. *intermedia, Athyrium vidalii, Corylus sieboldiana* var. *mandshurica, Lilium distichum, Pleuropermum camtschaticum, Abies nephrolepis, Quercus mongolica, Carex siderosticta, C. okamotoi, Ainsliaea acerfolia, Tilia amurensis, Tripterygium regelii, Magnolia sieboldii, Euonyumus oxyphyllus, Solidago virga-aurea var. asiatica, Prunus padus, Betula ermani, Smilacina japonica, Viola diamantica, Ligularia fischeri, Adenophora remotiflora, Angelica gigas, Bupleurum longiradiatum, Isodon excisus, Lychnis cognata, Weigela subsessilis, Viburnum wrightii, V. sargentii, Veratrum maackii* var.

Table 1. Landscape-scale model of habitat for Aconitum pseudo-leave var. erectum

Classification	Structure
Soil rating	
3. High likelihood	Loamy skeletal, mesic
2. Medium likelihood	Coarse loamy, mesic
1. Low likelihood	Fine silty, mixed, nonacid, mesic
Landform rating	
2. High likelihood	460-520m, steep upland areas (slope >60°More than 25m away from drainage)
1. Low likelihood	<300m, flat slope (slope < 60° Near drainage within 25m or floodplains)
Vegetation rating	
3. High likelihood	High woody canopy cover (>60%)
2. Medium likelihood	Medium to high woody cover (15-60%)
1. Low likelihood	Spare woody cover (<15%)

japonicum, Actinidia polygama, Aristolochia manschuriensis, Hosta lancifolia, Scrophularia koraiensis, Vaccinium koreanum, Paris verticillata, Symplocos chinensis for. *pilosa,* and *Asarum sieboldii.* This community was found at east or northeast 60-70° slope, above the sea level 460-520m. Structure of this community was T1 layer, 15m (85%); T2 layer, 7m (30%); Shrub layer, 2.5m (60%); Herb. layer, 1m (95%), respectively. Distribution pattern of *A. pseudo-leave var. erectum is showed* in Fig 1.

High likelihood landscape ecological structure (Table 1) of *A. pseudo-leave* var. *erectum* was soils of loamy skeletal, mesic, under 460-520m above the sea level steep upland area with more than 60° slope and 25m away from drainage. Vegetation rating was high woody cover (more than 60 %).

DISCUSSION

The loss of habitats and modification are the most

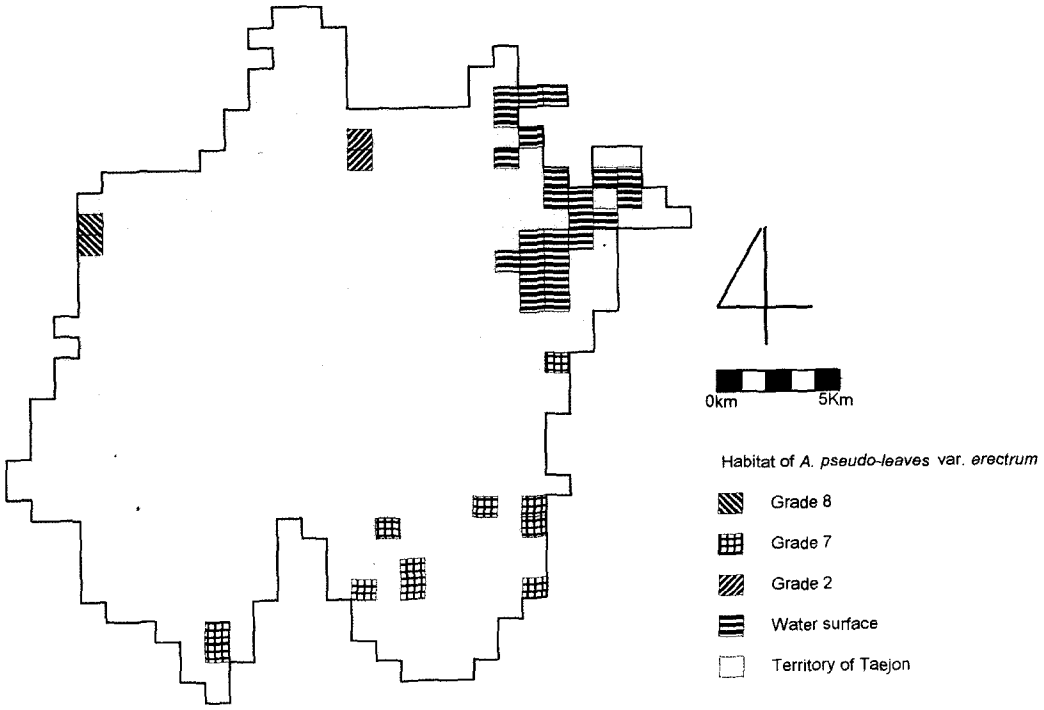

Fig. 1. Distribution map of A.pseudo-leaves var. erectum in Taejon, Korea.

important cause of endangered species (Foin *et al.*, 1998). It is essential for rare plant conservation to incorporate habitat assessment into development planning to minimize destruction of their habitats and maximize the effectiveness of mitigation efforts (Dale *et al.*, 1998; Cuperus *et al.*, 1999). Information on the habitat requirement of the rare plants was synthesized and formalized through the development of the models. These syntheses and models greatly improve the availability of information and habitat assessment tools to involved in conservation and development planning The processes of model development and application help to identify knowledge and data gaps to guide future research and provide a framework for improving habitat assessment with new knowledge grained in the future (Wu and Smeins, 2000).

Kang *et al.* (2000) reported the current situation of environment through the degree of green naturalness (DGN) of Taejon. Secondary forest consisting of *Quercus serrata - Q. acutissima* forest (grade 7) occupied 203 grids (37.5%) out of 541 grids. The area of forest, however, had been decreased by 168ha (0.5%) from 30,949ha to 30,781ha (KLASS, 1998), due to urbanization (Kang *et al.*, 2000).

A. pseudo-leaves var. *erectum* was found at sixteen grids on the map (Fig. 1). The grades of habitat in DGN map are two grids of grade eight (secondary forest), eleven grids of grade seven (replaced forest) and two grids of grade two (cultivated area), respectively. The rate of population, however, increase from 1990 (1,049,578) to 1998 (1,341,413) in Taejon 27.87% (KLASS, 1998). It is expected that population will more rapidly increase within year 2001 (Ko, 1998). Urbanization of the city was lead to change all of area into residential area except forest area in the greenbelts. It was difficult to find green space in the main residential area (Kang *et al.*, 2000).

Species diversity at any one point in a landscape is determined by multiple factors acting at multiple scales (Turner and Gardner, 1991; Turner, 1989; Wiens, 1989). At the landscape sale, the frequency and spatial distribution of critical habitats and resources determines species distribution patterns (Swingland and Greenwood, 1983; Pearson, 1993), while historical accidents, community interactions, and spatio-temporal variability further limit the distribution that is realized at any given time (Debinski *et al.*, 2001).

Planning processes for conservation reserve design and development project sitting most often occur at large landscape-scales and need spatially explicit assessment of suitability and spatial configuration of habitats for evaluation of metapopulation viability and selection of alternative sites (Akcakaya *et al.*, 1995; Lindenmayer and Possingham, 1996). Site level assessment is needed for verification of landscape scale interpretation and field evaluation for fine-scale surveys, construction or maintenance planning, monitoring and mitigation (Pavlik, 1997).

The native forest that has a local character should be conserved and long-term plans, both for environmental conservation and sustainable use, have to be improved for ecological lives of citizens (Kang *et al.*, 2000).

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