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Distribution of Rare Plants and Endemic Plants in Jirisan National Park

Hyun Tak Shin[1]*, Myung Hoon YI[2], Jung Won Yoon[2], Ji Hyun Yoo[2], Byoung-Chun Lee[3] and Eun-Hee Park[4]

[1]*Gyeongsangnam-do Forest Environment Research Institute, Jinju 660-871, Korea*
[2]*Department of Landscape Architecture, Graduate School, Yeungnam University, Gyeongsan 712-749, Korea*
[3]*Korea National Arboretum, Jikdong-ri, Scheul-eub, Pocheon-si, Gyeonggi-do 487-821, Korea*
[4]*Korea National Park service, Sicheon-myeon, Sancheong-gun, Gyeongsangnam-do 666-930, Korea*

Abstract: The results of the study of the rare and regional species of the Jirisan (Mt.) Korea National Park has reported 3 CR species, including the *Allium victorialis var. platyphyllum*, 4 EN species, including *Rhododendron tschonoskii*, 7 VU species, including *Cacalia pseudo-taimingasa*, 11 LC species, including *Lilium distichum*, and 3 DD species, including *Aconitum chiisanense*, which makes a total of 28 species. In terms of species exclusive to the region, a total of 7 species, including *Fraxinus chiisanensis*, *Pseudostellaria heterophylla*, *Filipendula formosa* and *Cirsium chanroenicum*, were confirmed, and since they were distributed widely in the Jeonji region of Jirisan (Mt.), there was minimal damage. Since rare species are localized in the region of Agosan (Mt.), there has been continuous damage due to visitors and hikers to the area, and there seems to be the need to handle the decreasing habitat for *Allium victorialis var. platyphyllum*, *Juniperus chinensis* var. *sargentii* and *Trientalis europaea*.

Keywords: Jirisan National Park, Rare Plants, Endemic Plants, IUCN red list

Introduction

The global temperature has increased by 0.74ºC within the past 100 years following the Industrial Revolution, and in the case of Korea, the peninsula experienced an increase of approximately 1.5ºC (Hawkins *et al*, 2008). Recent climate changes have experienced a speed 100 times faster than that of natural climate changes, and as a result, it is expected that this will lead to the extinction of a number of plant species, including *Taxus cuspidata*, *Abies nephrolepis* and *Betula ermani* and the expansion of warm temperate vegetation zone (Hawkins *et al*, 2008). In terms of the conditions of rare species of Korea, Pak (1975) has reported 106 species, Lee (1983) has reported 118 species, and Lee (1987) has reported 79 species. In the case of institutions, the Ministry of Environment (1993) reported 132 species, and the Ministry of Environment (1998) has selected 58 species for government protection, followed by selecting 78 species in 2001. Furthermore, the Korea Forest Service (1997) announced a total of 258 rare species, including 217 confirmed and 41 yet to be confirmed, and Hyun (2001) selected 174 rare species.

In the case of foreign nations, Japan has confirmed rare species in 7 categories, 17 EX species, 12 EW species, 471 CR species, 410 EN species, 517 VU species, NT and DD species, in accordance with the IUCN and has confirmed a total of 1,427 species with the exception of NT and DD species. In China and Mongolia, species were categorized within class I to III in accordance with the New Zealand method of assessment, and China confirmed 385 rare species, while Mongolia confirmed 84 rare species (Korea Forest Service, 2008).

The Jirisan Korea National Park is located at the end of the Baekdu Mountain Range and is surrounded by five regions, including Sancheong-gun, Hamyang-gun and Hadong-gun of Gyeongsangnam-do, Namwon-si of Jeollabuk-do and Gurye-gun of Jeollanam-do. There is a slight temperature difference between the South and the North side of the Jirisan (Mt.), and with the South at 12-13ºC and the North at 11-12ºC, the South experiences a slightly warmer winter.

Jirisan consists of a number of peaks 1,500m above sea level, including Cheonhwangbong (1,875 m), Yeonhwabong (1,730 m), Chotdaebong (1,704 m), Yeongshinbong (1,652 m), Chilseongbong (1,576 m), Tokkibong (1,534 m), Banyabong (1,732 m) and Nogodan (1,507 m), and a number of valleys, including the Chilseon Valley, Hanshin Valley and the Georim Valley.

In terms of the plant flora of the Jirisan, the region between 200 and 300 m above sea level is a warm

*To whom correspondence should be addressed.
Tel: +82-55-771-6545
E-mail: twinshin@hanmail.net

temperate zone, under 1,400 m above sea level is a cool temperate zone, and greater than 1,400 m above sea level is considered to be a subpolar zone. Furthermore, various high altitude plants and rare plant species can be found here.

A number of studies have been conducted in Jirisan, starting with the study by Nakai (1915) and followed by studies by Chung (1976), Kim *et al.* (1989), Shin *et al.* (1995), Lim (2000) and recently Chang *et al.* (2007) in order to conduct various analysis and to provide specimen.

However, while many researchers are conducting studies on Jirisan, the majority of the studies are focused on the overall plant flora of the region, and almost no studies are being conducted on rare plant species.

Therefore, the purpose of the study was to examine rare and regionally exclusive plant species in accordance with the IUCN standards in the Jirisan Korea National Park, where a high number of plant species are facing dangers from climate changes and usage by people, and to provide information related to the preservation and monitoring of rare and regionally exclusive species.

Materials and Methods

Study contents

Rare species were categorized into EW (Extinct in the Wild), CR (Critically Endangered), EN (Endangered), VU (Vulnerable), LC(Least Concern) and DD(Data Deficient). Documents have shown that endangered species are found in South Korea, but they are found to be extinct in the wild but still raised and farmed.

CR species refer to species which are at high risk of becoming extinct, and EN species refer to species which also face high risk of extinction with its decrease in individual count. VU species refer to species which are experiencing pressure from current situation and are expected to become endangered species as well. LC species are species which are currently experiencing factors which may make them endangered in the future, and DD species refer to species which do not have sufficient relevant information to assess their level of endangerment. Rare plant species were assessed in accordance with the Korea Forest Service (2008).

Study methods

The study on the rare and local species of the Jirisan Korea National Park was conducted over 20 sessions between April and November of 2010. Rare plant species were assessed in accordance with the IUCN and the Korea Forest Service (2008), and local species were studied in accordance with the Korea National Arboretum (2005). Detailed information regarding the habitat and monitoring have been presented into a diagram (Fig. 1). Furthermore,

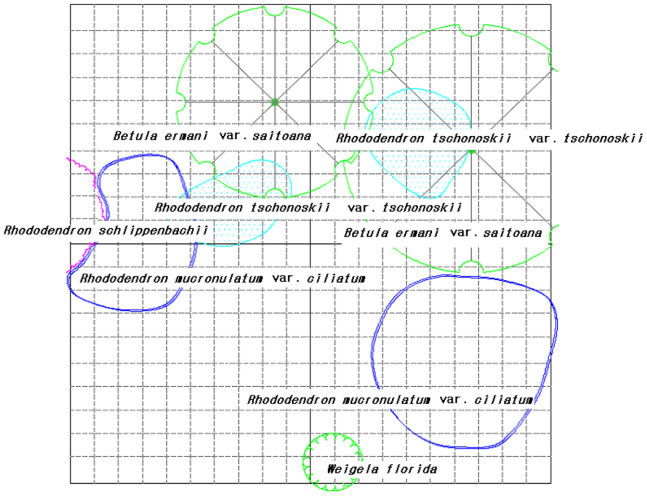

Fig. 1. Schematic examples of *Rhododendron tschonoskii* var. *tschonoskii*.

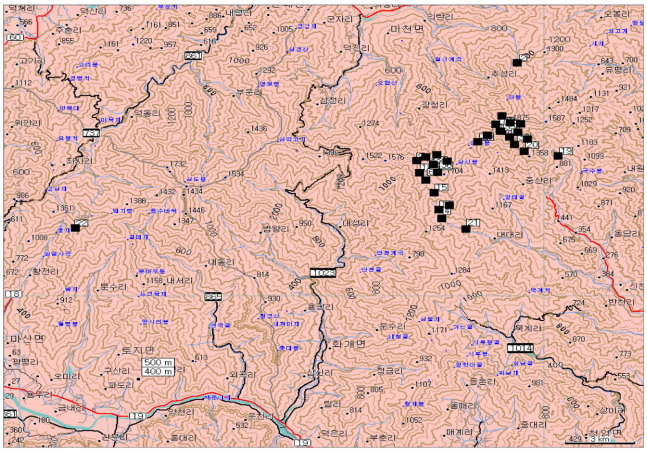

Fig. 2. Map of investigated area in Mt. Jiri.

GPS was used to locate these rare species in the future, and in order to confirm the plants, seeds were gathered from the Gyeongsangnamdo Arboretum.

Results and Discussion

Rare plant species

A total of 28 rare plant species in accordance with the IUCN, including 3 CR species of *Allium victorialis var. platyphyllum*, *Kirengeshoma koreana* and *Cypripedium macranthum*, 4 EN species of *Rhododendron tschonoskii*, *Oplopanax elatus*, *Juniperus chinensis var. sargentii* and *Trientalis europaea*, 7 VU species of *Cacalia pseudo-taimingasa*, *Clintonia udensis*, *Smilacina bicolor*, *Taxus cuspidata*, *Orchis cyclochila*, *Aconitum austrokoreense* and *Gastrodia elata Blume*, 11 LC species of *Lilium distichum*, *Clematis koreana*, *Hylomecon hylomeconoides*, *Gentiana triflora*, *Disporum ovale*, *Rhododendron brachycarpum*, *Viola albida*, *Abies koreana*, *Syringa velutina var.*

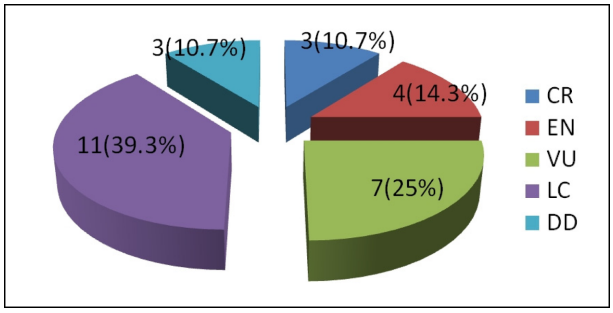

Fig. 3. IUCN according to the criteria list of rare plants.

Table 1. The list of rare plants in Mt. Jiri

Degree	Korean name/Scientific name	Taxa
CR	산마늘*Allium microdictyon*, 나도승마*Kirengeshoma koreana*, 복주머니란*Cypripedium macranthum*	3
EN	흰참꽃*Rhododendron tschonoskii* var. *tschonoskii*, 땃두릅나무*Oplopanax elatus*, 눈향나무*Juniperus chinensis* var. *sargentii*, 기생꽃*Trientalis europaea* var. *arctica*	4
VU	어리병풍*Parasenecio pseudotaimingasa*, 나도옥잠화*Clintonia udensis*, 자주솜대*Smilacina bicolor*, 주목*Taxus cuspidata*, 나도제비란*Orchis cyclochila*, 세뿔투구꽃*Aconitum austrokoreense*, 천마*Gastrodia elata*	7
LC	말나리*Lilium distichum*, 세잎종덩굴*Clematis koreana*, 매미꽃*Coreanomecon hylomeconoides*, 과남풀*Gentiana triflora* var. *japonica*, 금강애기나리*Streptopus ovalis* var. *ovalis*, 만병초*Rhododendron brachycarpum*, 태백제비꽃*Viola albida*, 구상나무*Abies koreana*, 정향나무*Syringa patula* var. *kamibayshii*, 금마타리*Patrinia saniculaefolia*, 나도개감채*Lloydia triflora*	11
DD	지리바꽃*Aconitum chiisanense*, 지리오갈피*Eleutherococcus divaricatus* var. *chiisanensis*, 개대황*Rumex longifolius*	3
Total		28

kamibayashii, *Patrinia saniculaefolia* and *Lloydia triflora* and 3 DD species of *Aconitum chiisanense*, *Acanthopanax chiisanensis* and *Rumex longifolius*, were found (Fig. 3).

Allium victorialis var. *platyphyllum*, which is a CR species, is found in counts of over 100 in the Tokkibong, Yeongshinbong and Chotdaebong in Jirisan, and there is the risk of human damage through collection. *Kirengeshoma koreana* are found in the region of the Ungseongbong Valley of Jirisan, and currently, there is high risk of damage, since it is located near a hiking trail. *Cypripedium macranthum* is protected by the Korea National Forest, and 4 counts have been confirmed in the Nogodan region.

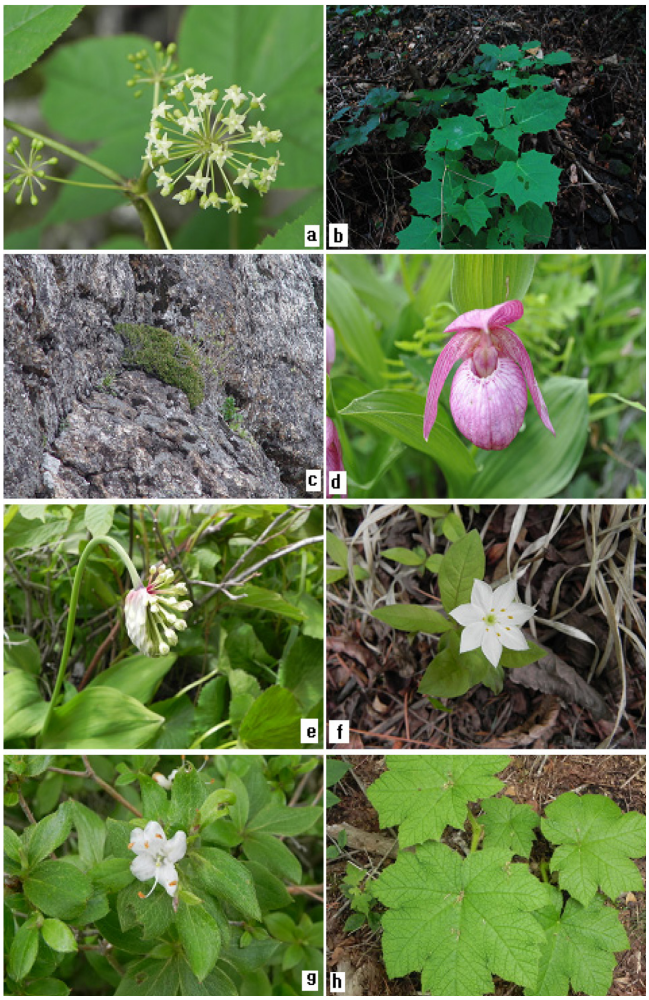

Fig 3. Photo of rar plants (a. *Eleutherococcus divaricatus* var. *chiisanensis*, b. *Kirengeshoma koreana*, c. *Juniperus chinensis* var. *sargentii*, , d. *Cypripedium macranthum*, e. *Allium microdictyon*, f. *Trientalis europaea* var. *arctica*, g. *Rhododendron tschonoskii* var. *tschonoskii*, f. *Oplopanax elatus*.

In the case of EN species, *Rhododendron tschonoskii* was found in high altitude zones which stretch between the Seseokpyeongjeon and Cheonwangbong, and *Oplopanax elatus* was found in high numbers in Seseokpyeongjeon and the Chilseon Valley, with risks of human damage. Approximately 200 counts of *Juniperus chinensis var. sargentii* was found all across the Jirisan, and since the majority of the region consists of rocks and boulders, the area is experiences minimal contact with the general public. Approximately 500 counts of *Trientalis europaea* were found in a localized area, and there is the risk of damage due to recreational activities.

The *Cacalia pseudo-taimingasa*, *Clintonia udensis*, *Smilacina bicolor*, *Taxus cuspidata* and *Orchis cyclochila*, which are all VU species, were found in a number of locations, including the Seseokpyeongjeon, Nogodan, Cheonhwangbong and Chotdaebong of Jirisan, and *Aconitum austrokoreense* and *Gastrodia elata* were found

Table 2. The list of the Korean endemic plants in Mt. Jiri

Korean name/Scientific name	Taxa
물들메나무*Fraxinus chiisanensis*, 지리산개별꽃*Pseudostellaria okamotoi,* 좀고채목*Betula ermani* var. *saitoana*, 지리터리풀*Filipendula formosa*, 병꽃나무*Weigela subsessilis*, 노각나무*Stewartia koreana*, 정영엉겅퀴*Cirsium chanroenicum*	7

in the Chilseon Valley and the Jungsanri Valley. VU species are found widely in the Jirisan region and are currently predicted to experience minimal pressure of extinction.

The *Lilium distichum*, *Clematis koreana*, *Hylomecon hylomeconoides*, *Gentiana triflora*, *Disporum ovale*, *Rhododendron brachycarpum*, *Viola albida*, *Abies koreana*, *Syringa velutina* var. *kamibayashii* and *Patrinia saniculaefolia*, which are LC species, can be found in high numbers of Jirisan, and in the case of *Lloydia triflora*, about 5 counts were found in high altitude since they are sensitive to humidity and light. Therefore, an in-depth study which encompasses the area must be conducted, and since there is high risk of damaged caused by humans, a method of preservation and management must be looked into.

Local plant species

The *Fraxinus chiisanensis*, which is a species specialized in a the specific area studied was observed in Cheonwangbong and Nogodan, and *Pseudostellaria heterophylla* was detected in high altitudes of Jirisan and near hiking path of Cheonwangbong. The *Betula ermanii* var. *saitoana*, *Filipendula formosa* and *Cirsium chanroenicum* were found in high numbers in the area stretching from Seseokpyeongjeon, passing by Chotdaebong, to Cheonhwangbong, and *Stewartia koreana* and *Weigela subsessilis* were found in the overall area of Jirisan. Therefore, since locally specialized species were distributed widely in high altitude areas, there needs to be a method of preservation.

Conclusion

The results of the study on the Jirisan Korea National Park on its rare and locally special species showed a total of 28 species, which includes 3 CR species including *Allium victorialis* var. *platyphyllum*, 4 EN species including *Rhododendron tschonoskii*, 7 VU species including *Cacalia pseudo-taimingasa*, 11 LC species including *Lilium distichum* and 3 DD species including *Aconitum chiisanense*. A total of 7 locally special species, including *Fraxinus chiisanensis*, *Pseudostellaria heterophylla*, *Filipendula formosa* and *Cirsium chanroenicum*, were observed, and since they were found distributed all across the Jirisan region, there is low risk of damage. Since rare species were found primarily in the Agosan region, there has been a level of human-caused damage to the species. The *Allium victorialis* var. *platyphyllum*, *Juniperus chinensis* var. *sargentii* and *Trientalis europaea* especially require preservative methods since they are experiencing decrease in numbers.

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