






A Short Record for the Distribution of *Bulbophyllum inconspicuum* in Hongdo

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ABSTRACT

The purpose of this study was to identify the natural habitat of *Bulbophyllum inconspicuum* Maxim. in Hongdo, Jeonnam Province, South Korea. A field investigation was conducted between May 2019 and May 2021. The growth of *B. inconspicuum* species was confirmed in three known regions based on National Survey on the Distribution of Endangered Species. Additionally, in the area investigated, 37 new regions harboring *B. inconspicuum* were detected. The newly observed *B. inconspicuum* grew naturally on *Quercus mongolica*, *Rhaphiolepis indica* var. *umbellata*, *Carpinus turczaninowii*, and rocks. Most of them were found on southeast and southwest slopes with altitude above 250 m. As few as 10 up to hundreds of *B. inconspicuum* were found in clusters. Close to their habitat, *Calanthe sieboldii* Decne. ex Regel, *C. aristulifera* Rchb. f. and *C. × kibanakirishima* Maek. were also found. As Hongdo is an island, multiple endangered species were found together. Thus, once the habitat of a certain plant is discovered, it is very likely that illegal collection of several other species will also occur. Proactive internal and external measures are needed to preserve these species.

Keywords: *Bulbophyllum*, *Bulbophyllum inconspicuum*, Dadohae National Marine Park, Endangered species, Hongdo, Natural reserve

Introduction

Bulbophyllum Thouars is a genus of perennial plants belonging to the family Orchidaceae. This genus has approximately 700 species distributed globally. Two such species have been found in South Korea: *B. inconspicuum* Maxim. (commonly known as barley orchid or cyst orchid, reflecting the cyst-like shape of the fake bulb on a single leaf) and *B. drymoglossum* Maxim. ex M. Okubo (Lee, 2006). The Ministry of Environment has designated these species as vulnerable (VU) species for protection. *B. drymoglossum* and *B. inconspicuum* were designated as new Class II Endangered Species for more rigorous protection in 2012 and 2017, respectively.

B. drymoglossum and *B. inconspicuum* are distributed mainly in islands along the southwest coast of South Korea, including Jeju, where their indiscriminate collection

and destruction of natural habitat seriously threaten their survival (National Institute of Biological Resources (NIBR), 2018). The recent National Survey on the Distribution of Endangered Species reported the presence of a large-scale natural habitat of *B. inconspicuum* in Hongdo, Shinan-gun, Jeonnam Province. The entire island of Hongdo was designated as a natural reserve (Natural Heritage No.170) in 1965. It is an important location in terms of biodiversity preservation and academic research of the flora and community structure of evergreen broadleaf forest in warm and temperate climate (Lee *et al.*, 2011)

Hongdo is part of the Dadohae National Marine Park. While the total area of the park is only 6.47 km², the island is rich in flora and fauna. It harbors several rare plant resources as well as unusual pediments and scenic areas (Lee, 2014). Hongdo is a valuable academic resource with a unique environment based on geographic and topographic characteristics (Kim *et al.*, 2016). The present field investigation in Hongdo was performed to obtain population data, distribution data, and characteristics of *B. inconspicuum*.

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Materials and Methods

Survey area

The administrative district of Hongdo is present in Heuksan-myeon, Shinan-gun, Jeonnam Province, Korea. It is located at 125°10'35" E–125°13'14" E and 34°39'43" N–34°43'23" N, 115 km west of Mokpo and 22 km west of Daeheuksan-do (Shin & Kim, 1996) (Fig. 1). The total area of the island is 6.47 km². The topography of the entire island features a major axis from northeast to southwest, with Gitdaebong (367m) as the highest peak on the northeast and Yangsanbong (236 m) as that on the southwest, which surrounds the village of Hongdo-1-gu. Based on floristics, the area belongs to the south coast plant zone (Lee & Yang, 1978). Its annual mean temperature from 2011 to 2020 was 14.17°C. Its annual mean precipitation during that period was 1,029.5 mm, with the highest precipitation levels observed between June and September (Korea Meteorological Administration (KMA), 2020).

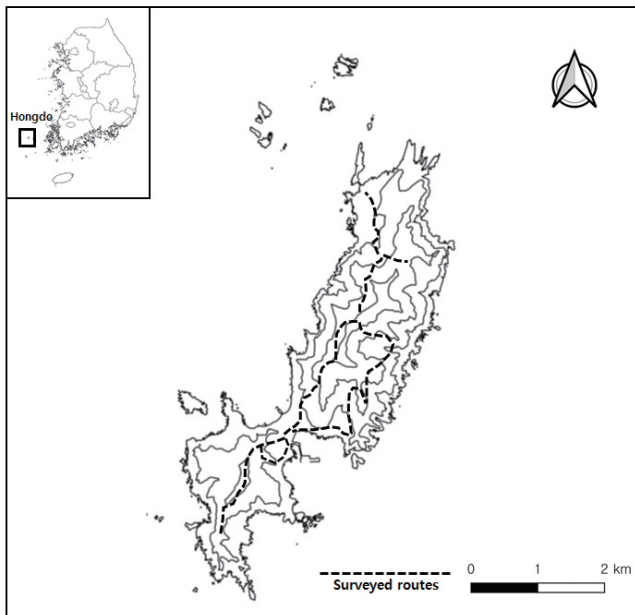


Fig. 1. Location of the study area and surveyed route.

Methods

All natural habitats of *B. inconspicuum* distributed in Hongdo as found in the National Survey on the Distribution of Endangered Species were reconfirmed. The natural habitat and attachment substrate of *B. inconspicuum* were investigated from May 2019 to May 2021. Plant species were identified using Coloured Flora of Korea (Lee, 2003) and New Flora of Korea (Lee, 2006).

Results and Discussion

Regional distribution of *B. inconspicuum* in previous studies

A literature review revealed that *B. inconspicuum* was distributed over approximately 13 locations in Hongdo. The Korea National Arboretum (KNA) reported that the species inhabited rocks in fewer than 10 sunny areas (KNA, 2008). The National Survey on the Distribution of Endangered Species reported that three areas were inhabited. However, as a characteristic of endangered species, precise locations of these areas could not be determined except for the three areas in the National Survey on the Distribution of Endangered Species.

Field investigation

Hongdo was broadly divided into three regions for investigation. Region 1 comprised Hongdo-1-gu to Yangsanbong. The tree layer included *Castanopsis sieboldii*, *Machilus thunbergii*, and *Pinus densiflora*. The subtree layer and shrubs included *Camellia japonica*, *Euonymus oxyphyllus*, and *Dendropanax morbiferus*. The herb layer included *Trachelospermum asiaticum*, *Arisaema amurense*, *Farfugium japonicum*, *Ophiopogon jaburan*, and *Arachniodes aristata*. Region 2 comprised Hongdo-1-gu to Gitdaebong. The tree layer included *C. sieboldii*, *M. thunbergii*, and *Quercus acuta*. The subtree layer and shrubs included *Ligustrum japonicum*, *E. japonicus*, and *Camellia japonica*. The herb layer included *T. asiaticum*, *Calanthe striata*, *Damnacanthus indicus*, *Goodyera schlechtendaliana*, and *Eurya japonica*. Region 3 comprised Gitdaebong to Hongdo-2-gu. The tree layer included *M. thunbergii*, *C. sieboldii*, and *C. japonica*. The subtree layer and shrubs included *C. japonica*, *L. japonicum*, and *E. japonicus*. The herb layer included *F. japonicum*, *Lemmaphyllum microphyllum*, *T. asiaticum*, and *E. japonicus*. In addition, cliffs along the coast and bare rocks had a community of *P. densiflora*, while a community of *Carpinus turczaninowii* was found on ridge protrusions and boulder slopes.

Region 1 (Hongdo-1-gu to Yangsanbong)

C. sieboldii and *M. thunbergii* were dominant species while *B. inconspicuum* was not found. However, villagers rarely entered this region. Edges of the coastal cliffs could not be investigated due to safety reasons. With the aid of a cliff expert using a drone and safety devices, species belonging to the Orchidaceae family, such as *Neofinetia falcata* and *Dendrobium moniliforme* including *B. inconspicuum*, might be found in the future.

Region 2 (Hongdo-1-gu to Gitdaebong)

C. sieboldii, *M. thunbergii*, and *Q. acuta* were dominant species. Their presence in three previously reported habitats was reconfirmed. Thirty-seven new habitats of *B. inconspicuum* were identified (Table 1). Newly observed *B. inconspicuum* were naturally growing on rocks and plants. They included *Q. mongolica*, *Rhaphiolepis indica* var. *umbellata*, and *C. turczaninowii* as substrates (Fig. 2).

Table 1. List and coordinates of *Bulbophyllum inconspicuum* Maxim

No.	GPS		Elevation (m)	Type of substrate	Population
1	34°41' 00" ***	125°11' 59" ***	331	QM	≥ 100
2	34°41' 00" ***	125°11' 59" ***	330	QM	≥ 100
3	34°41' 00" ***	125°11' 59" ***	331	QM	≤ 30
4	34°41' 00" ***	125°11' 59" ***	331	Rock	≤ 10
5	34°41' 00" ***	125°11' 59" ***	332	RU+Rock	≤ 50
6	34°41' 00" ***	125°11' 59" ***	331	CT	≤ 20
7	34°41' 00" ***	125°11' 59" ***	330	QM	≤ 20
8	34°41' 00" ***	125°11' 59" ***	329	CT	≤ 50
9	34°41' 00" ***	125°11' 59" ***	331	QM	≥ 100
10	34°41' 00" ***	125°11' 59" ***	334	RU	≤ 20
11	34°41' 00" ***	125°11' 59" ***	335	CT	≤ 5
12	34°41' 00" ***	125°11' 59" ***	337	CT	≤ 30
13	34°41' 00" ***	125°11' 59" ***	336	RU	≤ 20
14	34°41' 00" ***	125°11' 59" ***	336	CT+RU	≤ 25
15	34°41' 00" ***	125°11' 59" ***	337	CT	≤ 20
16	34°41' 00" ***	125°11' 59" ***	333	RU	≤ 30
17	34°41' 00" ***	125°12' 00" ***	335	RU	≤ 10
18	34°41' 00" ***	125°12' 00" ***	330	CT	≤ 20
19	34°41' 00" ***	125°12' 00" ***	330	CT	≥ 100
20	34°41' 00" ***	125°12' 00" ***	328	QM	≥ 100
21	34°41' 00" ***	125°12' 00" ***	330	RU	≤ 50
22	34°41' 00" ***	125°12' 00" ***	330	CT	≤ 20
23	34°41' 00" ***	125°12' 00" ***	332	QM	≤ 50
24	34°41' 00" ***	125°12' 00" ***	330	RU	≤ 30
25	34°41' 00" ***	125°12' 02" ***	328	CT	≤ 25
26	34°41' 00" ***	125°12' 02" ***	326	QM	≤ 20
27	34°41' 00" ***	125°12' 02" ***	326	CT	≤ 20
28	34°41' 00" ***	125°12' 02" ***	321	RU	≤ 30
29	34°41' 00" ***	125°12' 13" ***	257	Rock	≤ 20
30	34°41' 00" ***	125°12' 10" ***	292	Rock	≤ 30
31	34°41' 00" ***	125°12' 07" ***	203	Rock	≤ 15
32	34°41' 00" ***	125°12' 07" ***	242	RU	≤ 10
33	34°41' 00" ***	125°12' 08" ***	245	Rock	≤ 10
34	34°41' 00" ***	125°12' 11" ***	218	Rock	≤ 30
35	34°41' 00" ***	125°12' 07" ***	205	Rock	≤ 50
36	34°41' 00" ***	125°12' 14" ***	216	Rock	≤ 20
37	34°41' 00" ***	125°12' 19" ***	157	Rock	≤ 30
Previous known	34°41' 28" ***	125°12' 13" ***	262	Rock	≤ 30
	34°41' 29" ***	125°12' 02" ***	325	Rock	≥ 100
	34°41' 29" ***	125°12' 02" ***	265	CT	≥ 100

QM: *Quercus mongolica*, CT: *Carpinus turczaninowii*, RU: *Rhaphiolepis indica* var. *umbellata*

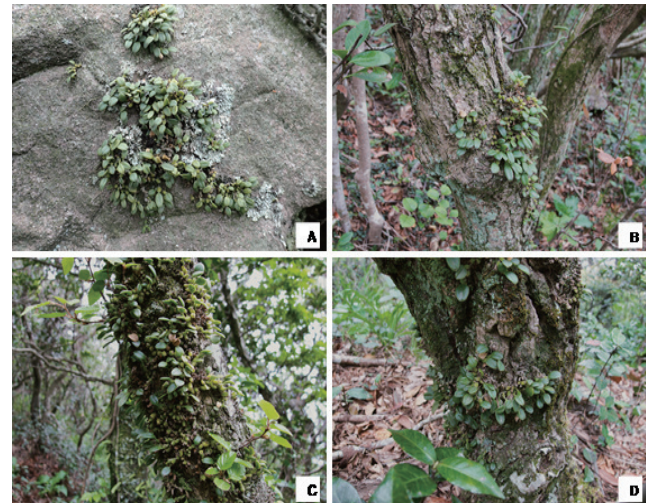


Fig. 2. Substrate type of *Bulbophyllum inconspicuum* Maxim. In Hongdo. A. On rock; B. On *Quercus mongolica*; C. On *Carpinus turczaninowii*; D. *Rhaphiolepis indica* var. *umbellata*.

B. inconspicuum was mainly distributed at altitudes greater than 250 m. The plant mostly grew attached to the bottom of rocks or branches and roots at the base of trees with a height of 1 m or less. Notably, a dense distribution of the species was found on the southeast and southwest slopes of specific ridges that surrounded Gitdaebong.

As few as 10 up to hundreds of plants were found growing in clusters in certain areas with *D. moniliforme*, a Class II Endangered Species. Close to their habitat, *C. striata*, *C. aristulifera*, and *C. × kibanakirishima* were found, implying a high probability of illegal collection of multiple endangered species, including *B. inconspicuum*. Edges of the coastal cliffs could not be investigated due to safety reasons. Many more plants and various endangered species might be detected in future studies with the aid of a cliff expert.

Region 3 (Gitdaebong to Hongdo-2-gu)

C. sieboldii and *M. thunbergii* were dominant species in this region that mainly comprised northwest slopes with Gitdaebong at the center. *B. inconspicuum* was not found in Region 3. Ridges along trail paths were densely forested, which prevented human access. The region was relatively dry compared with natural habitats of *B. inconspicuum*. As in other regions, a thorough investigation of coastal cliffs was not possible due to safety reason. Future investigations that can access this terrain may identify more endangered species, including *B. inconspicuum*.

Suggestions for the preservation of endangered species in Hongdo

Hongdo is a natural reserve that is valuable for the preservation of biological resources and their habitats based on the composition and community structure of evergreen broadleaf forest in a warm or temperate climate. The island requires strict preservation. However, this is not currently ensured. Residents of the island and visitors to the popular tourist regions in the west and south sea island area continue to disturb and destroy the natural habitats of plants and animals. Recent emphasis has been placed on the Convention of Biological Diversity that aims to protect biodiversity in the face of human development. There is an urgent need to develop internal and external measures of protection through systematic surveys to accurately determine the area of distribution and population of the endangered species in the Hongdo Natural Reserve

Conflict of Interest

The authors declare that they have no competing interests.

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