

제주도 꽃자왈 숲, 국제적으로 중요한 습지

장 용 창*⁺ / 이 찬 원**

Gotjawal Forest In Jeju Island as an Internationally Important Wetland

Yong-Chang Jang*⁺ / Chan-Won Lee**

요약 : 꽃자왈 숲이란 대한민국 제주도에 있는 "아아 용암"이라는 바위 지대 위에 형성된 숲을 가리킨다. 이 논문에서 꽃자왈 숲이 람사협약상 국제적으로 중요한 습지임이 밝혀진다. 꽃자왈 숲은 람사협약에서 습지의 한 종류로 규정하고 있는 지하수시스템이므로 람사협약상 습지로 간주되어야 한다. 또한 꽃자왈 숲은 수문학적 중요성을 가지고 있는 제주도의 대표적인 습지유형이며 희귀식물들의 자생지이므로 국제적으로 중요한 습지이다.

핵심용어 : 꽃자왈, 람사, 습지, 제주, 지하수시스템

Abstract : Gotjawal forest refers to the forest covering the rocky area of "AA Lava" on Jeju Island of South Korea. In this article it is shown that Gotjawal forest is an internationally important wetland under the Ramsar Convention. Gotjawal forest should be regarded as a wetland because it is a subterranean hydrological system, which is classified as wetland under the Ramsar Convention. And Gotjawal forest is an internationally important wetland because it is the representative wetland type of Jeju region with hydrological importance, and because it supports rare species of plants.

Keywords : Gotjawal, Ramsar, Wetland, Jeju, subterranean hydrological system

1. Introduction

1.1 Meaning of Gotjawal

Gotjawal forest refers to the forest covering the rocky area of "AA Lava" on Jeju Island off South Korea's southwestern coast.

Traditionally, Jeju's local residents called any forest "Gotjawal" when such a forest was found in rocky areas, and therefore difficult to cultivate, and so remained undisturbed by people. According to the Jeju Dialect Dictionary (<http://www.jejulib.or.kr/>) published in 1995, "Gotjawal" is an unmanaged and unapproachable forest of mixed trees and bushes. But Song (Song, 2000) suggested giving a new meaning to the term "Gotjawal" in his Ph.D. dissertation. He suggested that as the

Korean term "Gotjawal" shows specifically the feature of AA Lava, using the term "Gotjawal Lava" instead of "AA Lava" can be useful in land management and in groundwater management. In another study (Song, 2003.), he also asserted that protecting the Gotjawal area on Jeju is essential to protecting the island's groundwater, as rain water penetrates directly into the groundwater aquifer in this Gotjawal area through cracks in this region's rocky earth.

Nevertheless, some people insist that the meaning of Gotjawal should not be restricted to geological features. They say the ecological, historical, and cultural context should also be considered (Jeong, 2004). But, it is still not clear how they define the meaning of Gotjawal.

+ Corresponding author : yongchangjang@hotmail.com
* 일반회원 · 경남대학교 연안역통합관리과정 대학원 · 석사과정
** 정회원 · 경남대학교 환경공학과 교수 · 공학박사

1.2 Objective of this article

The objective of this article is to show that (Song, 2000) Gotjawal forest is a type of Wetlands defined by the Ramsar Convention on Wetland and that (Song, 2003) Gotjawal forest qualifies as an "Internationally important Wetland" defined by the Convention.

2. Methods

For the objectives of this article, the nature of the Gotjawal forest as wetland is shown with the already issued articles. And the publications of Ramsar Convention is examined to show that Gotjawal forest is internationally important.

3. Results

3.1 Features of Gotjawal Forest

Three important features of Gotjawal forest are (Song, 2000) its formation in rocky areas (Song, 2003), plants specific to this ecosystem, and (Jeong, 2004) rain water penetrating to the groundwater aquifer.

3.1.1 Rocky areas

Gotjawal forest is formed on rocky areas. As it was difficult to develop these areas for agriculture, the forest remained untouched even in the twentieth century.

Song (Song, 2000) insisted that Gotjawal's terrain is mainly AA Lava. Based on his field research, the Distribution Map of Gotjawal Terrain on Jeju Island (http://gotjawal.com/local/local_2.asp) was drawn. But further research revealed that the terrain is not pure AA Lava, but rather a mixture of AA Lava and Pahohoe Lava (http://en.wikipedia.org/wiki/Aa_lava#Volcanic_morphologies), which Dr. Song also suggested naming Bille Lava, following the dialect term of local people (Song, 2003).

While Gotjawal forest includes Pahohoe Lava in some areas, it is true that Gotjawal Forest is overwhelmingly a rocky area which is difficult to cultivate. So the most practical definition of Gotjawal Forest is: "a forest on Jeju Island, on land difficult to cultivate because it is a rocky area."

3.1.2 Forest composed of specific plants

According to Ms. Yim Eun Young's thesis (Yim, 2007), an area called Dong Baek Dong San (590,083 sq. meters) in Gotjawal forest, located at San 12, Seonheul-ri, Jocheon-eup, Jeju City, Jeju Province, is the only known natural habitat of Mankyua chejuense (<http://www.users.muohio.edu/>), a recently discovered genus. She also found many other species of bryophyte during her investigation. She concluded that the Dong Baek Dong San region in Gotjawal forest is an important area for bryophyte research (Yim, 2007).

The Korean Ministry of Environment also found a variety of endemic plant species and endangered animal species (http://www.me.go.kr/dev/board/board.jsp?id=notice_03&mode=view&idx=142621). Five unrecorded species of planktons were found during their investigation in 2005 in the Dong Baek Dong San area of Gotjawal forest.

According to Yim (Yim, 2007), other parts of Jeju's Gotjawal forest have not yet been thoroughly investigated.

3.1.3 Rain water penetrating to the groundwater aquifer.

The percentage of rainwater permeating into the groundwater is 46% on Jeju, the highest in Korea (KOWACO, 2003.). Lava structures such as Lava Tube, Skylight, Clinker, and Cracks contribute to this high rainwater recharge rate (Ko, 1997.). Such structures are typical in Gotjawal (AA) Lava (Song, 2000). Therefore, we can say Gotjawal forest contributes to the high groundwater permeation rate of rainwater on Jeju Island.

Such a fact can easily be seen from the map. In

the northern and southern parts of Jeju Island, there are lots of small rivers flowing from the mountains. But, in the western and eastern parts, there are a few rivers. This is because almost all the rainwater comes down to the groundwater through Gotjawal forest in the eastern and western parts of Jeju, leaving little water to flow through rivers.



<Picture 1: Typical scene in Gotjawal forest.> The trees grow on cracked rocks consisting of AA Lava. Rainwater penetrates through these cracks, going directly down to the groundwater aquifer. © Jang Yong-chang(http://www.ohmynews.com/NWS_Web/view/at_pg.aspx?CNTN_CD=A0000972326).

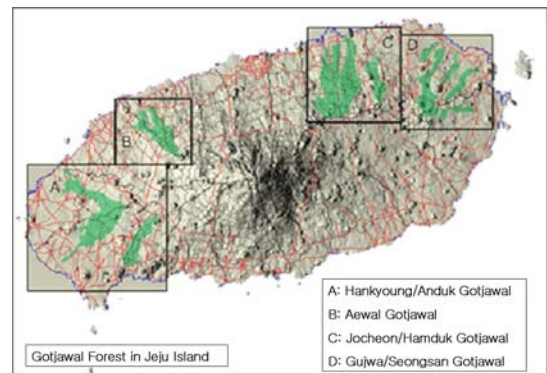


<Picture 2: Pond in Gotjawal forest.> This pond is on Pahoehoe Lava (without cracks). Yet this pond is also a part of Gotjawal forest. Thus, Gotjawal forest is not purely composed of AA Lava, but is sometimes a mixed rocky area composed of AA Lava and Pahoehoe Lava. This pond, along with the forest around it, functions as a site for endemic species. © Jang Yong-chang (http://www.ohmynews.com/NWS_Web/view/at_pg.aspx?CNTN_CD=A0000972326).

3.2 Distribution of Gotjawal forest

According to Song (Song, 2000), there are four main Gotjawal terrains on Jeju Island. They cover 224 square kilometers (Jeong, 2004), comprising about 12% of the whole of Jeju island (1,848 square kilometers).

The Gotjawal terrain is located in the western and eastern parts. Perhaps this is because the lava spewed slowly in this area - where the slope of the earth is less steep compared to the northern and southern parts.



<Picture 3: Distribution of Gotjawal forest on Jeju Island.> © Dr. Song Si Tae. The Gotjawal terrain marked in green comprises fully 12% of Jeju Island. http://gotjawal.com/local/local_2.asp

3.3 Protection and Development Issues

As is seen from the three features of Gotjawal forest, it was difficult to develop this forest before modernization, as it is formed on quite rocky areas. That's why Gotjawal forest could keep its original ecology generally untouched by human activity. But beginning in the 1980s, it is now possible to develop the forest to establish golf courses and other tourist facilities, with the help of technology. And developing new tourist attractions is important for this island, which depends on the tourist industry.

With such threats to the ecology, a citizens' movement to protect Gotjawal forest arose on Jeju Island. "Gotjawal Lovers (www.gotjawal.com)" is

solely dedicated to the protection of Gotjawal forest. Jeju's citizens not only focus on the forest plants, but also on its critically important function of recharging and cleaning Jeju's groundwater supply. People are aware that protecting Gotjawal forest is essential to the protection of Jeju's groundwater, which is under threat from overuse for the agriculture and golf industries.

In fact, protecting Gotjawal forest contributes to protecting groundwater in two ways: (1) Gotjawal forest is an important groundwater recharging area. So, by protecting the forest, the groundwater can be recharged. (2) Golf courses use huge amounts of groundwater (Kim, 2006). As golf courses are usually built in Gotjawal nowadays, we can protect the groundwater by protecting Gotjawal forest.

However, some parts of Gotjawal forest have already been developed. Some parts of the forest are now golf courses. By the end of 2005, there were already more than 16 golf courses on Jeju, and many golf courses are either under construction or in the planning stages. In addition, a film location set was established on a part of the forest. Other tourist sites are also being planned in or near Gotjawal forest.

How much groundwater is used by golf courses and whether the present use of groundwater is sustainable is the subject of many hot debates. In data from 2002, we find documentation that water used for domestic purposes per day in Jeju is 634,864m³/day, (43%), while water used for agricultural purposes per day is 800,565m³/day (54%) (Yun, Lee and Cha, 2006). These researchers referred to the report issued by KOWACO (KOWACO, 2003).

Water used by 16 golf courses during 2004 was 39,303 ton per day (Kim, 2006). Environmental organizations say that golf courses are the main cause of groundwater exhaustion and pollution (<http://www.kfem.or.kr/>), but we do not yet know whether this is true or not.

A:

In 2007, the Jeju Provincial Government established the "Gotjawal Foundation (www.jejutrust.net)",

supposedly dedicated to the protection of Gotjawal forest. Nonetheless the government has been criticized for allowing the construction of golf courses and other tourist facilities that are rapidly destroying Gotjawal.

In addition, a part of Gotjawal (Dong Baek Dong San) was designated as a Local Natural Monument in 1981 by Jeju's Provincial Government (<http://100.naver.com/100.nhn?docid=736551>). But the government has not paid much attention or budgeted necessary funds for research and education projects for Dong Baek Dong San forest.

3.4 Gotjawal Forest as an Internationally Important Wetland

Jang (<http://www.ohmynews.com/>), a researcher at Jeju Wildlife Research Center, Inc. suggested that Gotjawal forest qualifies as an Internationally Important Wetland as designated by the Ramsar Convention on Wetlands, in his article in the September 2, 2008 edition of Ohmynews, an internet-based newspaper. He insisted that Gotjawal forest falls into the wetland category of (Zk) karst and other subterranean hydrological systems (The Ramsar Convention, 2005).

Ramsar Convention guidelines say that, "Regardless of genesis, these terms (karst and other subterranean hydrological systems) should be used to include all subterranean cavities and voids with water. Such sites would be eligible for inclusion in the Ramsar List whenever the site selection Criteria are fulfilled (The Ramsar Convention, 2005)." This guideline further clarifies the definition of Wetland by saying that "The Ramsar definition of "wetland" is very broad, reflecting the global scale of the Convention, and gives Contracting Parties great scope and flexibility for ensuring compatibility between national, supranational/ regional, and international wetland conservation efforts." (The Ramsar Convention, 2005)

When thinking of the essential function of

Gotjawal forest in recharging and protecting groundwater - and the SOLE source of water for 500,000 people on Jeju - Gotjawal forest qualifies as an Internationally Important Wetland according to the Ramsar Convention. In addition, Gotjawal forest qualifies as a Ramsar Site because of its unique forest ecology.

The Ramsar Convention requires that a wetland meet just ONE of the criteria suggested by the Convention in order to be considered an Internationally Important Wetland (29). According to the above mentioned guidelines, Gotjawal forest qualifies on the basis of ALL of the following criteria (The Ramsar Convention, 2005).

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

About Criterion 1, the Convention further explains (The Ramsar Convention, 2005):

Hydrological importance. As indicated by Article 2 of the Convention, wetlands can be selected for their hydrological importance which, inter alia, may include the following attributes. They may:

i) play a major role in the natural control, amelioration or prevention of flooding; ii) be important for seasonal water retention for wetlands or other areas of conservation importance downstream; iii) be important for the recharge of aquifer; iv) form part of karst or underground hydrological or spring systems that supply major surface wetlands;

Gotjawal forest in Jeju qualifies criterion 1, because it is an important area of groundwater recharge, as is explained by paragraph 2(Jeong, 2004) of this essay. And it qualifies the criterion

2, because it provides habitat for endangered species of fern, as is explained in paragraph 2(Song, 2003) of this study. In addition, Gotjawal forest is also a regular breeding site for endangered bird species, including the Fairy Pitta, *Pitta brachyura nympha* (Kim, 2003), and Black Paradise Flycatcher, *Terpsiphone atrocaudata* (Oh, Kim and Kim, 2002.).

Acknowledgement

This study was supported by the Kyungnam University research fund in 2008, Korea.

References

1. Song, Shi-tae, 2000, Distributions and Lithology of the Aa Rubble Flows in Cheju Island, Korea, Pusan University, Ph.D. Dissertation.
2. Song, Shi-tae, 2003, Lavas in Gotjawal Terrain, Jeju Island, Korea No.3, Doneori Gotjawal Lava, Journal of Basic Science, Jeju National University, V16(1), pp. 47-55.
3. Jeong, Gwang-jung, 2004, Gotjawal and the livelihood of Jeju's People, 2004, Jeju Educational College, V. 33, pp. 41~65.
4. Yim, Eun-young, 2007, Bryophyte Flora of Dongbaek-dongsan, Jeju-do, Cheju National University, M.A. thesis.
5. Korea Water Resources Corporation (KOWACO), 2003, Comprehensive Research Report on the Hydrology and Groundwater of Jeju Island.
6. Ko, Kiwon, 1997, Characteristics of Groundwater Existence on Jeju Island and its hydro-geological relationship with Seogwipo layer, Pusan University, Ph.D dissertation.
7. Han, Sang-cheol, 2002, A Study on the grouting method of construction of Jeju island groundwater, Cheju National University.
8. Song, Shi-tae, Ko, Kiwon, and Yoon, Sun, 1996, A survey on Gotjawal and Lava tube affecting groundwater recharge and pollution in

- Jeju, Korea Groundwater and Environment, pp. 68-69
9. Yun Beomseop, Lee Sangeun, Cha Donghoon, Park Heekyung, 2006, Analyzing the Groundwater Use Sustainability of Small Islands Using System Dynamics: Jeju Island Case Study
 10. Kim, Jeong-hee, 2006, The Impact Study of golf course construction planning on the groundwater sustainable yield in Jeju Island, Seoul National University, M.A. thesis.
 11. Kim, Eun-mi, 2003, Habitat Environment of Fairy Pitta (*Pitta nympha Temminck & Schlegel*) on Jeju Island, Korea, Jeju National University, M.A. thesis.
 12. Oh Hong-shik, Kim Byung-soo, Kim Wanbyung, 2002, A Study on the bird communities of Mt. Halla, Korea Journal of Ornithology, Vol 9, No. 2, pp85-104
 13. http://en.wikipedia.org/wiki/Aa_lava#_Volcanic_morphologies
 14. <http://en.wikipedia.org/wiki/Jeju-do>
 15. http://en.wikipedia.org/wiki/South_korea
 16. <http://www.jejulib.or.kr/>
 17. The map is included in his 2000 Ph.D dissertation (p. 20), and is also viewable on this website. http://gotjawal.com/local/local_2.asp
 18. http://en.wikipedia.org/wiki/Aa_lava#Volcanic_morphologies
 19. <http://www.users.muohio.edu/smithhn/mankyua.html>
 20. http://www.me.go.kr/dev/board/board.jsp?id=notice_03&mode=view&idx=142621
 21. http://www.jeuwater.go.kr/sujawon/index3_3.jsp?pageNum=3
 22. www.gotjawal.com
 23. http://www.kfem.or.kr/kbbs/bbs/board.php?bo_table=lo_statement&wr_id=573&page=8
 24. <http://100.naver.com/100.nhn?docid=736551>
 25. http://www.ohmynews.com/NWS_Web/view/at_pg.aspx?CNTN_CD=A0000972326
 26. The Ramsar Convention, 2005, Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance of the Convention on Wetlands, Annex B: Ramsar Classification System for Wetland Type
http://www.ramsar.org/ris/key_ris.htm#type
 27. The Ramsar Convention, 2005, Strategic Framework for the List of Wetlands of International Importance, edition 2006, paragraph 111.
http://www.ramsar.org/key_guide_list2006_e.htm#IV
 28. The Ramsar Convention, 2005, Strategic Framework for the List of Wetlands of International Importance, edition 2006, paragraph 31.
http://www.ramsar.org/key_guide_list2006_e.htm#IV
 29. The Ramsar Convention, 1987, The Convention on Wetlands text, as amended in 1982 and 1987, article 2-2.
http://ramsar.org/key_conv_e.htm
 30. The Ramsar Convention, 2005, Strategic Framework for the List of Wetlands of International Importance, edition 2006, paragraph 55.
http://www.ramsar.org/key_guide_list2006_e.htm#IV
 31. The Ramsar Convention, 2005, Strategic Framework for the List of Wetlands of International Importance, edition 2006, paragraph 60.
http://www.ramsar.org/key_guide_list2006_e.htm#IV