



特別企畫
Special Report

從世界看陽明山 生態環教的行動家

Yangmingshan —
the Activist in Environmental Education



陽明山國家公園因擁有大屯火山群，加上受東北季風影響的北降現象等條件，致使呈現豐富的生物多樣性和壓縮型植被帶，猶如一座生物島。近年來，陽管處在生態保育上的經營，除了長期持續進行生物多樣性的調查研究、棲地環境監測等工作，還著手針對園區內的蟬科鳴聲、監測大屯火山群與建置生態廊道等保育計畫之執行。

監測大屯火山群活動

位於陽明山國家公園內的大屯火山群，是台灣規模最龐大的火山地形，在園區20幾座火山中，海拔超過1千公尺的七星山為最高的火山體。雖然根據定年記錄調查顯示，大屯火山群最後一次噴發的時間點約在一、二十萬年前，但因其地表地熱和微震活動現象還是很明顯，且從噴氣所含氦同位素成分的最新分析研究，顯示部分噴氣來自岩漿源，這強烈的暗示台灣北部地底下依舊存在有岩漿庫的可能性。

Affected by the Datun volcano group and the north-descending effect of northeast monsoon, Yangmingshan National Park is like an organic island of rich biodiversity and compressive vegetation zone. In recent years, the park authority has actively promoted eco-conservation management, including biodiversity surveys, habitat monitoring, the cicada songs research, Datun volcano groups monitoring and the eco-corridor establishment.

Monitoring Datun Volcanic Activities

Datun volcano group is the largest volcanic landform in Taiwan. Among the 20 volcanoes in YMSNP, Cising Mountain is the highest with an elevation over 1,000m. Though geological research indicates that the last eruption of Datun volcanoes happened around 100 to 200 thousand years ago, geothermal activities on the surface and tremors are evident. The latest analysis of helium isotope contained in the fumarolic gas also shows that a part of the gas comes from magma source, which implies strongly the probable existence of underground magma chambers in northern Taiwan.

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1 磺嘴山（陽管處提供·齊柏林攝）
Mt. Huangzuei (by Po-lin Chi, provided by YMSNP)

2 火山地熱奇景（陽管處提供·徐簡麟攝）
The Geothermal Energy of Volcanic Region (by Chien-lin Shiu, provided by YMSNP)





而大屯火山群是否有再度噴發的可能性，這不僅是值得研究的科學問題，更關係大台北附近民眾的生命財產安全。為此，陽管處自2003年起執行「大屯火山群潛在岩漿庫及微震觀測網長期監測」計畫，在園區內設置地震站微震觀測網，以監測火山地震活動。

根據過去4年來，在大屯山地區所設置的微震網所觀測到的地震記錄顯示，除了七星山及大油坑附近最上部地殼中，有明顯的微震與群震活動外，也發現有火山活動所特有的地震訊號。目前，雖然無法清楚研判這些群震現象與訊號之正確發生機制，但初步推斷可能與岩層裂縫中液態或氣態物質，因突增或突減的壓力所造成之震動來解釋。這些現象與國外其他火山地區所觀測到的岩漿相關活動類似，值得長期持續研究做更進一步探討。

It is an issue not only worth scientific studying but also concerning the safety of residents in Taipei. Hence a Long-Term Monitoring Project on Potential Magma Chambers and Tremors of Datun Volcano Groups was initiated in 2003 to monitor the volcanic and seismic activities in the park.

The records made by Datun Mountain Monitor Station show that, in addition to apparent tremors and swarms, abnormal signals of volcanic earthquakes were detected in past 4 years. Though for the moment it is unable to clearly determine the exact mechanism of these swarms and abnormal signals, a preliminary speculation can be made that they might be caused by the sudden pressure increase or drop of liquid or gas in stratum cre vices. These phenomena resemble magma-related activities observed by other countries and deserve further long-term study.

研究蟬鳴為環境教育加分

陽明山國家公園陳振祥執行的「蟬科鳴聲之研究」計畫，在2006年進行為期1年的觀察研究。根據研究發現，台灣現有記錄蟬科的種類有56種，其中陽明山國家公園因地居海拔200至1,120公尺處，遍布許多闊葉林與人造林，致使棲地環境受到良好保護，成為蟬分布最多的地區。陽明山每年從4至10月為蟬科成蟲鳴叫的活動季節，目前已記錄到19種蟬，占全台蟬科種類的三分之一，比例相當高。

蟬的鳴聲是蟬的最大特色，要找尋蟬的蹤影，必須要先學習聽聲找蟬、辨蟬。因為蟬的鳴聲具有相當的專一性，每一種鳴聲代表不同的意義，可做為分類上的重要依據，在山區常聽見的鳴聲種類有召喚聲、驚嚇與警戒聲、攻擊聲、求偶與交尾聲等。通常人們聽到的都是召喚聲，雌蟬對同種類的雄蟬具趨聲性，雄蟬也藉由召喚聲吸引雌蟬來交尾；而當蟬遭受驚嚇而飛走時，則會發出急促的驚嚇聲。陽管處的這項「蟬科鳴聲之研究」計畫，就蒐集了園區裡各種蟬科的基本鳴聲資料，除了有助於對蟬的進一步研究，將來也可藉由培訓解說志工帶隊入園解說生態，讓民眾對蟬科鳴聲有更多的認識，以提升生態旅遊品質與環境教育深度。

Research on Cicadae

According to the 1-year-long research project on cicada songs by Jhen-siang Chen of YMSNP started in 2006, there are 56 species of cicadas recorded in Taiwan, and most of them are found in the well-protected habitat in the 200- to 1,120-m-high broad-leaved forests and artificial plantations within YMSNP. The time between every April to October is the peak of cicada songs, and up to now 19 species has been recorded in the park.

The most distinguishing feature of cicadas is their songs. To look for a cicada, one must learn to trace its song, which is unique to each species and therefore a key for taxonomy. They sing for beckoning, frightening, warning, attacking, mating and copulating, and what people mostly hear is their beckoning call. Female cicadas exhibit a phonotaxis behavior in responding to males of the same species, and the male sing to attract the female. When frightened, they make hasty songs and fly away. This project provides basic information about cicada songs useful for further researches as well as training material for park volunteers who will help the visitors to learn more about cicadas and thus advance the quality of ecotourism and environmental education.

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1 日本東京測震公司所生產之短周期地震記錄器（陽管處提供）

The short-term seismic recorders was manufactured from Monitoring Earthquake Company in Japan (provided by YMSNP)

2 地熱谷（陽管處提供，林源茂攝）

Thermal Valley (by Yuen-mao Lin, provided by YMSNP)

3 硫磺噴氣孔屬於後火山活動的遺跡（陽管處提供，李雨軒攝）

Sulfur fumaroles are signs of post-volcanic activity (by Yu-hsuan Lee, provided by YMSNP)

4 陽明山國家公園內的鹿角坑溪古道相當適合蟬所棲息（陽管處提供）

The Lujiackeng River Historic Trail is adaptable habitat for cicadae (provided by YMSNP)





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1 陽明山生態廊道外觀
(陽管處提供)
The facade of Corridors
in Yangmingshan
(provided by YMSNP)

2 陽管處的環教活動之一
「陽明山國家公園火山、
溫泉探索營」(陽管處提
供)
The program of
environmental
education "Exploring
the volcano and hot
spring" (provided by
YMSNP)

3 陽管處致力於宣導環境
教育的重要性，此圖為
「草山訪蝶踪」活動(陽
管處提供)
YMSNP promote the
import of environmental
education, this photo
shows the activity of
"Visit the Butterfly
in Yangmingshan"
(provided by YMSNP)

建構生態廊道 永續環境發展

有別於台灣其他座國家公園，陽明山國家公園因位處台北盆地，是全世界最鄰近大都會之國家公園。然而，就因人類在區內的交通活動頻繁，加上區內總共有200公里長的各種道路，造成原有的野生動物棲地零碎化，這些動物往往為了過馬路，而遭車輛輾斃或撞擊，造成過高動物意外死亡的頻率。為此，陽管處於去年在園區內發生動物交通意外事故最多的地點，建置生態廊道，利用涵洞、誘導網及喇叭狀入口、設置告示牌等方式，讓動物可自由地利用安全路徑往返道路兩邊。陽管處並設立牌示致力宣導提醒駕駛者經過這些路段時，必須減速慢行，以降低動物死於交通的意外機率，期望人類與野生動物能永續和諧共存。

此外，陽管處還在去年舉辦「2006生態工程博覽會——陽明山園區生態廊道」活動，邀請專家介紹生態廊道的國內外案例、陽明山生態廊道發展概述，帶領與會者實地走訪陽明山國家公園的生態廊道。

Establishing the Ecological Corridor

Located in Taipei basin, YMSNP is the national park most close to a metropolitan in the world. Wildlife habitats are fragmented by the busy traffic on the 200-km-long roads in the park, and many animals are often hit by cars. Therefore the park headquarters started from last year to establish corridors at sites with frequent accidental deaths of animals. Tunnels, guiding nets, horn-shaped entrance and signs are used to help animals to cross the road through safer passages. Signs are established to advise drivers to slow down when passing these sites to reduce the accident rates so that people can live in harmony with wildlife.

In addition, in the program "Eco-Engineering Expo' 2006 – Yangmingshan Wildlife Underpass" held by the park authority, experts were invited to speak on international examples of corridors and the development of corridors in YMSNP, and to guide the participants to visit these sites.



Close-up
生物特寫

台灣水韭 *Isoetes taiwanensis*

科別 水韭科
學名 *Isoetes taiwanensis*
英文俗名 Taiwan isoetes

Family Name Isoetaceae
Popular Name Taiwan isoetes

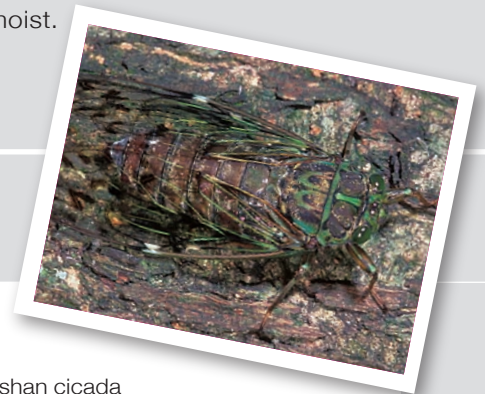


於1971年被發現，全世界僅分布於陽明山國家公園夢幻湖內的台灣水韭，為台灣的特有種，至今在其他地區尚無發現其他野生族群。近年來因湖水無法有效蓄積及腐質土淤積等水文因素，而逐漸陸化，加上白背芒、葶藶、狹葉泥碳蘚及水毛花等強勢植物一同競爭這塊棲地，抑制台灣水韭的萌芽、生長與發育。為此，陽管處與師範大學、荒野保護協會於2006至2007年針對夢幻湖台灣水韭棲地進行強勢種植被移除、樣區設置及長期監測等棲地經營管理工作，以及建構新的濕地來保育台灣水韭。

台灣水韭的基部寬胖膨大處為大小孢子囊著生的地方；葉片纖細翠綠，葉身長4~15公分長，內具4條氣室，中有隔膜，藉以儲存水生環境下較缺乏的氧及二氧化碳，以供光合及呼吸作用之需。植株會隨著夢幻湖水位的高低，而呈現不同的生態特性。在冬季豐水期時，成為沉水植物；夏季枯水期間，由於底部泥層仍保持濕潤，可為挺水植物。

Discovered in 1971, *Isoetes taiwanensis* is an endemic species growing only in Menghuan Pond of YMSNP, and so far no other wild growth of it has been found elsewhere. *Isoetes taiwanensis* was ravaged by feckless stock and stagnant humus of the pond, as well as invasive plant occupied its habitat. In 2006-2007, YMSNP invited National Taiwan Normal University and the Society of Wilderness tries to rid of invasive plant from the habitat of Menghuan Pond, establish areas and manage of long-term monitoring habitat, and develop a new wetland for *Isoetes taiwanensis*.

Its sporangia grow at the swell of its root, and inside its slender green blades 4 to 15cm in length, oxygen and carbon dioxide are deposited in 4 septummed air chambers for photosynthesis and respiration needed in aquatic environment. Different ecological characteristics are displayed by the plant according to the change of water level. It becomes a submerged plant in the rainy winter, and an emerging plant in the dry summer while the bottom mud is still moist.



陽明山暮蟬 *Tanna sozanensis*

科別 蟬科
學名 *Tanna sozanensis*
中文別名 陽明山茅蜋

Family Name Cicadidae
Popular Name Yangmingshan cicada

陽明山暮蟬是陽明山國家公園區內最具特色的蟬種，於每年6至9月的盛夏出沒，以7、8月數量最多；其叫聲音似「ㄅㄟ、ㄅㄟ、ㄅㄟ」，聲音迴盪於山谷裡極為悠揚。陽明山暮蟬外型酷似台灣騷蟬，但體型較小，長約2.6至3.2公分，展翅長約9公分；其頭部、前胸背板側緣、中央及中胸背板具綠色斑紋，腹部呈栗色，軀體下方呈褐色且帶有綠斑，而前、中足的爪呈黑色。

The most characteristic species of cicada in YMSNP, *Tanna sozanensis* prosper from every June to September and the number peaks in July and August when their "k - k" songs echo all over the valleys. They look like *Pomponia fusca* but are smaller with a size 2.6 to 3.2cm in length and 9cm with wings spreaded. The lateral part of their prootum, central and metaotum has green stripes, while their abdomen is chestnut, the lower part of the body brown with green spots, and the fore and middle legs black.