淺談台灣的樹冠層附生植物及森林保育

Canopy epiphytes and forest conservation in Taiwan

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在台灣的森林裡，不難看到繁茂的附生植物，懸垂在樹冠層有如花園一般的景象，這些多采多姿的物種，其實具有作為森林副產物的極大潛力，進而促進台灣的森林保育。

台灣綿延不絕的山區深處，仍然得天獨厚的蘊藏著大面積的原始森林，除了地形崎嶇使人類不易到達，也歸功於中央山脈的幾個大型國家公園的保護。然而頻繁的颱風侵襲以及日益發達的山地交通，仍對這些珍貴的森林造成威脅，密集的產業道路系統雖然對山村的經濟發展有直接幫助，隨之而來的卻是山地區域的濫墾濫伐問題。

而許多現行的保育措施，例如消費者抵制、教育、國際協議(如：瀕臨絕種野生動植物國際貿易公約，CITES)，或是設立保育區等等，由於對山村經貢獻微薄、無法為在地居民提供收入，常常成效有限。

也因此，1992年在里約熱內盧的生物多樣性公約揭示，在考量生態保育之時，必須一併考慮縮減貧窮的問題，而提出一個新的保育觀念，所謂的「生態系統途徑」；這個新的保育措施致力於人類在使用自然資源時，也能符合生物多樣性公約的3個目標: 1. 生態保育；2. 永續利用；3. 自然資源收益的公平分享。

山地農業與伐木顯然與森林保育的目標背道而馳，在1992年後，許多保育方案在為山地社群在尋求經濟收益時，自然而然的將重心放在替代性的方案，例如生態旅遊或是非林木的森林副產物(NTFP's)。

In the forests in Taiwan, numerous epiphytes shape hanging gardens in the canopy of the forest and many of the species in these gardens have great potential for use as a non-timber forest resource to promote the conservation of the forest.

Taiwan is still blessed with large tracts of majestic old growth coniferous forests in its interior mountain systems. In part this is due to the inaccessibility of the mountainous interior parts of the island, but also because Taiwan hosts several large national parks. Nevertheless, frequent typhoons and increased accessibility pose a threat to these unique forests. Increased access to remote forests leads to agricultural encroachment and logging. Both activities have a direct economic benefit for rural communities.

In contrast, conservation efforts such as consumer boycotts, educational programs, international agreements (e.g. the Convention on International Trade in Endangered Species, CITES) or the establishment of protected areas provide little or no income for local stakeholders and have therefore often failed.

Accordingly, the 1992 Convention on Biological Diversity (CBD) in Rio de Janeiro came to the realization that conservation and poverty reduction should be tackled together. This concept was applied in a new conservation strategy, the so-called "Ecosystem Approach".

鳥巢蕨南洋山蘇花的嫩葉(Jan Wolf 攝)
Young fronds of the bird's-nest fern *Asplenium australasicum*

還有哪些地方的森林副產物豐富程度、能及得上熱帶及亞熱帶的森林樹冠層的呢?在世界各地的熱帶森林樹冠層，諸如水果、堅果、花卉、秣草、蔬菜、蜂蜜、藥材、藥草、香料以及室內裝飾植物等等，甚至是花色醒目的蝴蝶及鳥類，早已是森林住民傳統上採集利用的對象。而「生態系統途徑」的挑戰，就是要發展一套森林樹冠層副產物保育方案，此方案不只能為山村帶來經濟收益，且能符合社會及生態的永續原則。

那些附著在森林樹冠層上的附生植物，尤其擁有作為森林副產物的極大潛力，由於它們在熱帶森林裡十分繁茂且具有極高的多樣性，因而有作為園藝植物的商業價值。筆者在2008年，有幸受邀來訪台灣，參與林業試驗所的山區調查，於此次的調查旅行中，我們看到了2種有趣的附生植物利用情形，可作為森林保育的範例。

我們首先參訪了台大山地實驗農場(編按：梅峰農場)，這裡栽培了美麗的台灣一葉蘭球莖作為出口之用。台灣一葉蘭是生長在台灣中海拔森林的附生植物，有時候也長在

The "Ecosystem Approach" aims at reaching a balance between the three CBD objectives: 1) conservation, 2) sustainable use, and 3) the fair and equitable sharing of the benefits arising from the use of natural resources.

As agriculture and logging clearly are not compatible with forest conservation, it is not surprising that since 1992 many conservation programs have focused on alternative sources of income for the benefit of local communities such as ecotourism and non-timber forest products (NTFP's).

And where else can we find more NTFP's than in the canopy of the tropical and subtropical forest? Products such as fruits, nuts, flowers, fodder, vegetables, honey, medicines, herbs and spices, house plants, and even eye-catching animals such as butterflies and birds have traditionally been gathered from the tropical forest canopy worldwide. The challenge of the "Ecosystem Approach" is to develop conservation projects for canopy products that are not only economically, but also ecologically and socially sustainable.

Epiphytes, plants that use other plants, mostly trees, for support, are particularly interesting as a non-timber product from the forest canopy because of their great variety and abundance and their commercial value as ornamental plants. In 2008, I was fortunate to be invited to join a TRFI field team to the mountains. On this trip, we encountered two interesting examples of the use of canopy

快炒山蘇嫩葉是一道美味佳餚(徐嘉君 攝)
Asplenium fronds make a delicious stir-fry

覆滿苔蘚的岩壁上。

在熱帶美洲的研究顯示，某些附生性的鳳梨科植物，可以直接從原始森林的地面或樹上採取，而不至於會影響族群的永續生存，然而台灣一葉蘭的棲地多半是破碎而狹小，且根據世界自然保育聯盟所公布的瀕危物種紅皮書紀載，台灣一葉蘭屬於易受害等級，顯然不適宜從野外直接採取利用，值得慶幸的是一葉蘭的栽培相對容易。根據「生態系統途徑」的策略，栽培且輸出台灣一葉蘭應該能為當地業者帶來經濟收益，進而減少伐木等山地開發壓力，筆者在梅峰農場所見，顯然是一個符合國際保育潮流的正面範例。

另外一個例子是有關一種附生性的大型鳥巢蕨：南洋山蘇花。這種蕨類具有很大的園藝市場，在世界各地的苗圃都能夠普遍地取得。出乎我意料之外，台灣人將這種蕨類當作蔬菜來栽培食用，快炒後嘗起來還真的頗為美味。

山蘇花在台灣比起一葉蘭普遍可見的多，不過數量還是不足以從森林裡直接採取供應市場。雖然許多地區將山蘇花栽培在人工溫室或蔭棚裡，我們也發現常有將山蘇花

epiphytes for forest conservation.

First, we visited Highland experimental farm of NTU where the beautiful orchids *Pleione bulbocodioides* and are cultivated for export. *Pleione bulbocodioides* grow as epiphytes at mid elevations in Taiwan. *Pleione bulbocodioides* is also found growing in moss carpets on rocks.

Research in the Neotropics suggests that some species of epiphytic bromeliads may be harvested sustainably from the wild, either directly from the trees or from the forest floor. *Pleione bulbocodioides*, however, always occur in small populations and the survival of this species is threatened (vulnerable, IUCN Red list). Therefore, harvesting from the wild is not an option for this species but, fortunately, cultivation is relatively easy. Following the “Ecosystem approach”, the generated income should at least partly benefit the local stakeholders in forest management to reduce logging pressure on the forest. At NTU’s farm, this seems to be the case, and the cultivation of these orchids thus represents a good example of the now internationally endorsed new conservation strategy.

Another project we visited involved the epiphytic bird’s-nest fern *Asplenium australasicum*. This species also has great ornamental value and worldwide it is commonly available in the plant nursery trade. To my great surprise, however, in Taiwan the species cultivated as a vegetable. And with good reason. The young sprouts surely make a delicious stir-fry.

台灣大學一葉蘭農場(Jan Wolf 攝)
Pleione bulbocodioides farm at Taiwan University

鳥巢蕨農場(Jan Wolf 攝)
Bird's nest fern (*Asplenium australasicum*) farm

直接栽培在林下的農場。以生態保育的觀點來說這十分有趣，因為這種栽培發一方面保存了森林的完整性，一方面也為當地業者帶來謀生收益，也因此這種“在地”的林下山蘇栽培法，顯然是一個成功的「生態系統途徑」範例。

台灣一葉蘭及山蘇花的栽培只是少數範例，顯示了樹冠層的附生植物如何幫助山村脫貧，同時促進森林保育。台灣的森林冠層花園裡還有其他數百種附生植物，以及各式各樣的森林副產物等待我們去發掘，期許這些生物資源所具有的潛力，能幫助我們保存台灣獨特而美麗的原始林。

In Taiwan, the bird's nest fern is much more common than the aforementioned orchids, but again not sufficient abundant for harvesting from the wild. Whereas in many areas the bird's-nest ferns are cultivated in greenhouses, we also noticed that at mid-elevations the ferns are often grown in the understory of the forest. This is interesting from a conservationist's standpoint because in this way the integrity of the forest remains largely intact, whilst contributing to the livelihood of local stakeholders. Hence, the in situ cultivation of bird's-nest fern may also be seen as a successful application of the Ecosystem Approach.

The cultivation of *Pleione bulbocodioides* and bird's nest ferns are just some examples of how canopy epiphytes may help alleviate poverty and promote forest conservation. In Taiwan, hanging canopy gardens house hundreds of species of epiphytes. Together with many other canopy non-timber forest products, these epiphytes have, yet unexplored, great potential to be used as a tool for conservation to hopefully safeguard the preservation of the unique and beautiful old-growth forests in Taiwan.