

永續特刊

生態環境相關計畫



1. 陸域生態

臺灣蛙類重要棲地樣區推動系統性調查

自然資源與環境學系的楊懿如老師，也是校園環境中心主任，長年研究並關心蛙類生態及從事兩棲類保育工作。臺灣兩棲類保育志工成立至今已 10 餘年，累積的普查資料反應出目前臺灣野外蛙類分布現況，並在 2017 年開始劃定臺灣蛙類重要棲地 (Important Frog Areas, 簡稱 IFA) 樣區推動系統性調查。

本年度也持續辦理臺灣青蛙週活動，共有 42 個團隊、934 人次參與，舉行 14 場次蛙類教育推廣研習活動、25 場次蛙類調查及 18 場外來種蛙類移除活動，總計有 57 場次的蛙類保育行動，是引起民眾對臺灣蛙類物種認識與學習的重要成果。11 月 27 日於臺中市東勢林場遊樂區辦理兩棲類保育志工大會，共計有 40 個團隊、182 位志工參加，大會以海報呈現 37 種蛙類在臺灣各地區分布情形，發表年度調查成果，並頒發 12 個團隊獎項與 1 項個人獎項，以激勵志工投入參與。

2021 年調查成果豐碩，系統性 IFAs 樣區調查結果能反映臺灣蛙類野外族群變遷趨勢，建議加強推動。同時也建議未來持續辦理臺灣青蛙週、蛙類大調查、兩棲類保育志工大會等活動，除了鼓勵志工參與調查，也有助提升民眾對臺灣類保育的覺知。

2. 生態及永續科學跨領域研究中心

植物物候學工作坊

氣候變遷將改變未來的氣象模式，包括降雨及溫度的時序及變異程度，進而影響生物的生理變化及生物的生長、生存及族群更新。根據氣象學家的預測，各地降雨及溫度的變化趨勢並不一致，因此各地生物目前的生存策略是否可以適應未來的變化，是亟需探索的課題。從古至今，植物物候對氣象因子的反應最為直接，包括發葉、開花、結果等生理變化的節奏，因此常被用以指示氣候變化程度。這些生理變化攸關植物個體的存活及族群的更新成功與否，因此植物的物候亦可作為評估一物種或生態系對氣候變遷的適應程度之指標。本工作坊希望集合國內主要的物候觀察者，整合各地的植物物候資料，比對物候的海拔、緯度梯度，以瞭解臺灣各地植物物候受氣候變化之程度，作為未來建立原生植物對氣候變遷適應度模型之參考。

臺灣通量工作坊

臺灣通量的相關研究已經正式邁入第 15 年，在眾多研究者的持續耕耘努力下，對於森林生態系的碳、水循環以及各項生態系服務，提供了許多重要的資訊與科學理解 (scientific understanding)。目前全臺 5 個森林生態系的通量研究站，包含位於中海拔雲霧帶中的半天然林棲蘭山、天然林的蓮華池、柳杉林的溪頭、以及平地造林的屏東林後四林與花蓮大農大富等通量測站，建構出森林生態系統的碳、水、能量通量變化格局。為能集結不同通量站台觀測的研究成果，並且更進一步的整合與分析資料，生態及永續科學領域研究中心辦理一系列工作坊與討論會，邀請各通量站的研究人員參與座談。首場「臺灣通量研究討論會」工作坊於 2021 年 12 月 16 日～17 日在東華大學環境學院召開，會議邀請臺灣大學莊振義博士（棲蘭山）、臺灣大學賴彥任博士（溪頭、林後四林）、中央研究院陳奕穎博士（蓮華池）及東華大學張世杰博士（大農大富）與會，針對跨站的通量資料分析方式、通量的日夜變化、季節循環、長期格局與生態系統對短期氣象事件的反應等主題進行討論。



◀ 「臺灣通量研究討論工作坊」邀請專家學者一同參與座談，針對生態系統進行深入討論

Ecology Projects



1. Land Ecology

Systematic Investigation of IFA Quadrat

Yi-Ju Yang, the teacher of NDHU's Department of Natural Resources and Environmental Studies and the Director of the NDHU Campus Center for the Environment, has been studying and observing frog ecology, and is devoted to amphibian conservation for years. More than 10 years ago, volunteers from the Society for Taiwan Amphibian Conservation began gathering information about frogs, and their data thoroughly explained the distribution of wild frogs in Taiwan. The work now includes "Important Frog Areas," the boundaries of which were first defined in 2017, as well as the start of a systematic investigation.

This year, Taiwan Frog Week was joined by 42 teams of a total of 934 people and included 14 study sessions, 25 investigations on frog varieties, and 18 exotic frog removals, for a total of 57 activities dedicated to frog conservation, denoting key progress for the public taking interest in learning frog knowledge. On 27th November, 182 people formed 40 teams to attend the Amphibian Conservation Volunteer Assembly, where the distribution of 37 frog varieties across Taiwan was illustrated on posters, together with the announcement of that year's frog statistics and acknowledgment to 12 teams and one individual to honor their contributions, as well as inspire more people to join the effort.

We have achieved abundance in 2021. The systematic survey of IFA quadrats revealed insights into the migration of wild frogs in Taiwan. It is recommended to reinforce the survey, as well as Taiwan Frog Week, Frog Investigation, and Amphibian Conservation Volunteer Assembly, encouraging people to come forward for the survey and fostering Taiwan amphibian conservation awareness among the general public.

2. Center for Interdisciplinary Research on Ecology and Sustainability

Plant Phenology Workshop

Climate change is altering the future weather model, including the timing and the degree of variation of rainfall and temperature, and impacting creatures' growth, existence, and population renewal. Based on the meteorological forecast, the change in rainfall and temperature differ from area to area, so looking into whether these creatures with current survival strategies will be able to adapt in the future is urgent. Flora phenology has been reacting directly to meteorological factors since ancient times, from leafing to flowering to fruiting, which is why it is used as an indicator to verify the degree of weather changes. These physiological changes are key to the survival of individuals and the renewal of a group; as a result, plant phenology is applied to specify the adaptation of a certain species or ecosystem to climate change. Our workshop is inviting principal phenology observers to integrate cross-region phonologic data and compare the altitude and latitudinal gradient of phonology to better understand the degree of impact that climate change has made on local plant phonology and then use it as a future reference for native flora's adaptation to climate change

Taiwan Flux Workshop

Taiwan flux research has entered its 15th year. We are able to locate significant information and scientific understanding thanks to various researchers' contributions to the carbon cycle and water cycle of the forest ecosystem, as well as different ecosystem services. We now have the following five flux stations for the forest ecosystem across Taiwan: semi-natural forest Mountain Chi-lan at Cintermediate elevation; natural forest Lienhuachih; cryptomeria forest Xitou; plain afforestation in Linhousilin Pingtung; and Danongdafu in Hualien, interweaving a structure consisting of the flux of carbon, water, and energy of the forest ecosystem. In order to gather the research results from each flux station and further organize and analyze the data, the Center for Interdisciplinary Research on Ecology and Sustainability (CIRES) has hosted a series of workshops and invited station researchers to contribute to the results. From 16th to 17th December 2021, the first Taiwan Flux Research and Discussion workshop was joined by NTU Dr. Jehn-Yih Juang (Mt. Chi-lan), NTU Dr. Yen-Jen Lai (Xitou & Linhousilin), Academia Sinica Dr. Yi-Ying Chen (Lienhuachih), and NDHU Dr. Shih-Chieh Chang (Danongdafu) at the College of Environmental Studies to discuss methods of cross-station flux data analysis, day-night flux changes, seasonal cycles, long-term patterns, and the ecosystem's reaction to short-term meteorological events.



◀ Experts and scholars talked about the ecosystem at the Taiwan Flux Research and Discussion Workshop.