鳥兒史詩般的遷徙，讓人類對牠們的生命多了一份敬意 / 劉一達攝
The epic migration of birds is truly respectable in human's eyes. / by Paul Liu

談鳥類繫放的相知與相惜

從繫放中體驗飛行的故事

Stories on a Ring

Experience Birds' Life through Bird Banding

採訪撰文 Interview & Text / 藍嘉俊 Jia-jun Lan
特別感謝 Special thanks to/ 關渡自然公園何一先處長 Yi-shen Ho, Head of Guandu Nature Park、莊永泓先生 Mr.Yong-hong Zhuang、國家公園組林玲科長 Ling Lin, Section Chief of National Parks Division
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自然界大部分的鳥類都會遷徙。人類總是好奇，展翅騰空後，牠們飛了多遠？去了哪些地方？繫放研究可以回答這個問題。現任關渡自然公園的何一先處長，在這方面的實務經驗已超過20年。藉由他的說明，我們得以了解鳥類繫放的相關知識，同時，也對一筆筆得來不易的資料，以及背後代表的飛行故事，更加珍惜。

從一條紅絲線開始

每年天氣開始轉熱之際，台灣不少地方的騎樓屋簷下，就會飛來一批批的燕子，築巢繁殖，秋天時舉家離去，隔年再來。對於這樣的週而復始，兩千年前就有人感到好奇了。相傳[1]，春秋戰國時代的吳王宮女，就曾以紅絲線綁在燕子腳上做記號，看同一隻鳥是否會再出現。可見鳥類繫放的概念，很早就有了。

所謂鳥類繫放，是以各種安全的方法捕捉鳥類，除進行身體各部位的測量外，並在身上配掛標記，然後將其釋放。下次再發現時，即可藉由標記之比對，逐步累積資料，進而獲取鳥類遷徙路線、領域與族群分布、生理變化等各方面的知識。

歷史上，最早以腳環套在鳥類身上作系統性調查的，是1890年的丹麥科學家。台灣方面，繫放工作始於1964年，當時由美軍主導，是一項針對遷移性鳥類與傳染性疾病的研究。1986年到1991年，農

1. 參考台大袁孝維教授所撰的《台灣鳥類繫放工作手冊》

Most birds are migratory in nature. And as humans, we can't help but wonder how far birds can actually fly and where they eventually end up. In fact, a technique known as bird banding can rightly provide answers to these questions. Yi-shen Ho, Head of Guandu Nature Park (GDNP), is a veteran in the area of bird banding. From him we got to know more about the technique and appreciate the various data of birds' life acquired through bird banding.

It All Started with a Red Thread

Each year when it gets warmer, groups of swallows would nest and breed under the eaves of many buildings across Taiwan, and then leave with the entire family around autumn and come back next year. This cycle intrigued our ancestors long time ago as legend[1] has it that in the Warring States Period the maids of the King of Wu would tie a red silk thread on the leg of a swallow as a mark and see if it would one day return. This suggests that the idea of bird banding could date back to ancient times.

Bird banding refers to the technique whereby a bird is first captured in a harmless way, then basic measurement of its body parts is taken and tags attached before the bird is released. Later when the very same bird is found again, data on its migration route, territoriality and population distribution can be acquired.

The earliest recorded attempt of bird banding for systematic investigation was initiated in 1890 by a Danish scientist. In Taiwan, the technique was first adopted in 1964 in a U.S.-led research project on migratory birds and infectious

1.Please refer to *Taiwan Bird Banding Workbook* by Professor Hsiao-wei Yuan of NTU

委會展開國內首次長期而大規模的繫放調查，由台北野鳥學會和中華鳥會先後承接，各地野鳥學會共同執行。接著，中華鳥會成立繫放中心，成為日後統籌全省繫放相關業務、匯集原始資的平台，同時，也是連結國外資訊的重要窗口。

活抓是鳥類繫放的第一步，這是門學問，需要經驗與技術的累積。何處長表示，每一種鳥類的習性、棲息環境都不同。以警覺性高的小水鴨為例，就要先鎖定每年的先遣部隊，仔細觀察其滑翔方式與習慣的降落地點，因為，每年都可能產生變化。如果無法掌握，結局就是空手而回。一般來說，架設霧網是最常見的方式，但要懂得因地制宜。捕捉的若是水鳥，在灘地架設網子時就要考量漲潮退潮的因素，調整適當高度。又如將網子架設在蘆葦叢前，就能降低反光的影響，提高捕獲機率。

疼惜被捕的鳥兒

單就捕捉的行為來說，其實研究者和獵人並無差別，但目的卻大不相同。鳥類繫放是為了研究所需，更要兼顧保育職責，因此，在過程中要以降低干擾、不傷害鳥為前提。何處長不諱言，既使只是賞鳥，若沒做好隱蔽，就足以嚇跑牠們了，何況是捕抓。鳥是很膽小的動物，上網之後，如果掙扎過度，悲劇就會發生。有的翅膀被撐開、導致失溫，有的被網子纏繞而受傷，更有些特別敏感的鳥，上網沒多久就會因驚嚇而猝死。

diseases. Then from 1986 to 1991, the Council of Agriculture launched a long-time, large-scale bird banding study administered by the Wild Bird Society of Taipei, Chinese Wild Bird Federation (CWBF) and other wild bird societies across Taiwan. Later the CWBF set up a banding center that has since coordinated banding-related activities and collect information home and abroad.

Capturing the bird alive is the important first step in bird banding. It requires both experience and skill. Ho noted that each type of bird has different habits and habitats. The watchful Green-winged Teals (*Anas crecca*), for instance, may land in different places each year. Insufficient preparation, therefore, could render all the wait in vain. The use of a mist net is the most common way to catch a bird, but the circumstances on the spot play a role too. For instance, to capture water birds, the tidal movement needs to be factored in when deciding on the height of the net. Furthermore, if the net is placed in front of the reeds, more birds could be captured as reflection can be effectively reduced.

Be Nice to the Captured Birds

Both researchers and hunters capture birds, but for very different purposes. Researchers do it for both research and conservation purposes, so harm caused to the bird has to be minimized. Ho noted that timid as birds are, sometimes they are even scared off by bird-watchers who don't hide properly, not to mention when they are captured. Some birds, after getting caught, struggle so hard that their body temperatures quickly drop, while some others are even shocked to their sudden death.

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1. 藉由繫放，讓我們對一筆筆得來不易的資料，及其背後代表的飛行故事更加珍惜 / 何一先提供
Through bird banding, we can obtain precious information on birds and learn to appreciate the stories about their migration. / Photo provided by Yi-shen Ho
2. 架設霧網是進行鳥類繫放的最常見方式，但要懂得因地制宜 / 陳昭杰提供
The use of a mist net is the most common way when doing bird banding, but the circumstances on the spot play a role too. /Provided by Chao-chieh Chen

降低傷害的方式，就是提高巡網的頻率，減少鳥類受困的時間。不像獵人架網後隔天才來，研究者必須每小時來察看一次。捕獲了，就迅速、小心地解牠們下來，作業後立刻野放，讓牠們早早回到熟悉的環境裡。再以馬祖無人島上的鳳頭燕鷗為例，研究者要盡量縮短登島時間，降低對其作息的衝擊。簡而言之，就是要非常謹慎、友善的對待這些鳥兒。

除了保護鳥，在野外工作時也要注意自身安全。何處長回憶，有次乘小船到關渡外灘地調查，結果隊員沒把繩子綁好，漲潮時小船就隨著海水飄走了，所幸最後呼叫岸邊的人，才得以脫困。另一次晚上出任務時，有位隊員沒跟上隊伍，走叉了，結果掉入濕地的暗溝裡，吃了水又叫不出來，還好機警的伙伴發現少了一個人，才趕緊回頭尋找、把他救起。

To reduce the harm, the researchers need to patrol the net more frequently-sometimes on an hourly basis so that the birds won't be caught in the net for too long. All in all, from tagging to releasing, every step needs to be completed promptly. For example, researchers catching Crested Tern (*Sterna bergii*) on a desert island in Matsu need to shorten their stay on the island to lessen their impact on the birds' life. In short, the birds should be treated in a humane and careful way.

Besides the birds, the researchers also need to mind their own safety. Ho recalled that once his team took a boat to Guandu for some research and a team member didn't properly fasten the boat to the dock, so the boat drifted away as the tide rose. The team had to ask the people ashore for the rescue. There was another time when a team member accidentally fell into the drain and couldn't call for help. Luckily, a vigilant member found him missing and went back to save him.

科技與跨國合作

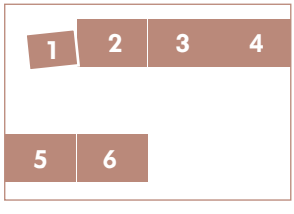
首次捕獲的鳥兒，身上要別上標記，以利辨識及後續資料的追蹤。上金屬腳環是早期最普遍的方式，腳環上面有繫放地的信箱號碼及一組流水編號，前者方便回報，後者作用猶如身份證。近來發展出足旗，其優點是易於觀察。只要根據足旗的顏色及上下位置，便能判斷最初的繫放地，無須重複捕捉。因此，一般鳥友藉由望遠鏡，便能參與資料回報的工作。

當然，若能安裝追蹤發報器，其記錄的移動路徑將是最完整的。不過，早期的發報器需要電池，體積大而笨重，僅適用於哺乳類或大型猛禽。因為鳥身上背負的儀器，不能超過體重的3.5% 至5%。所幸隨著科技的進步，現在的發報器以太陽為能源，重量更可降到10公克以下，故小型鳥類也可使用，只是成本較高。以上三種方式各有優點及限制，需搭配使用。

Technology and Transnational Cooperation

When a bird is captured for the first time, it needs to be tagged for future identification and tracking. In early days, a band was attached to the captured bird's leg, and has on it a contact mailbox for reporting and a unique serial number as an ID. More recently leg flags have also been used as they make observation easier. The original banding place can be identified from the color and the location of the flag on the leg, without the need to recapture the bird. Thus ordinary bird watchers can also take part in the ringing recovery through their own binoculars.

A tracker can record the complete migrating path of a bird. In the early days trackers were generally bulky and required batteries, so they were only suitable for large birds, since the instrument placed on the birds should not exceed 3.5% to 5% of the birds' weight. But thanks to the advances in technology, trackers are now mostly solar-powered and weigh less than 10 g, though they are also relatively more expensive.



1. 活捉是鳥類繫放的第一步，要想觀察警覺性高的小水鴨，就必須先鎖定每年的先遣部隊，仔細觀察其滑翔方式與習慣 / 何一先提供
Capturing the bird alive is the first step in bird banding. If one wants to observe the watchful Green-winged Teals (*Anas crecca*), one has to focus on each year's vanguard of the teals and watch carefully their gliding approach and habits. / Photo provided by Yi-shen Ho

2. 鳥是很膽小的動物，上網之後，如果掙扎過度就容易導致受傷。圖為翅膀被網子割傷的小水鴨 / 何一先提供
Birds are timid animals. Some birds struggle so hard after getting caught that they get injured easily. The picture shows a Green-winged Teal (*Anas crecca*) cut by the net. / Photo provided by Yi-shen Ho

3-4. 研究鳥類時必須謹慎友善。(圖3) 正進行家燕的測量，(圖4) 兩者相比，尾巴較長的是公的家燕 / 何一先提供
The researchers should treat the birds in a humane and careful way. In Picture 3, a researcher is measuring a Barn Swallow (*Hirundo rustica*); In Picture 4, by comparison, the male Barn Swallow has a longer tail. / Photo provided by Yi-shen Ho

5. 架設霧網是繫放研究的最常見方式，但要提高巡網的頻率，以減少鳥類傷害與受困的時間 / 何一先提供
The use of a mist net is the most common way to catch a bird, but the researcher has to check out the nets more often in order to prevent the birds from being trapped for too long and getting seriously injured. / Photo provided by Yi-shen Ho

6. 在台灣繫放的小水鴨經韓國鳥友在濟州島拍攝後回傳 / 何一先提供
A Korean bird watcher in Jeju Island, South Korea, took a picture of this Green-winged Teal (*Anas crecca*) banded in Taiwan, and then sent the photo back to Taiwan. / Photo provided by Yi-shen Ho

隨著季節長途遷徙的鳥群，是沒有國籍分別的。牠們的飛行範圍是如此廣闊，要獲得完整的紀錄，唯有透過各國的合作。建立足旗分類的共識，就是很好的分工例子。如果鳥腳綁上兩支小黑旗，表示繫放自緬甸；一白一綠則代表來自南半球的紐西蘭南島。若是自台灣起飛，標示方式是白色小旗在上，藍色小旗在下；換做日本，旗子顏色相同、但上下位置顛倒。這些規則統一後，整個東亞澳水鳥遷徙線的聯合觀察，就有了很好的基礎。此外，鳥類繫放研究，背後數量龐大的基本數據，不是一朝一夕就能完成的。除了學者，也需要世界各地有組織的鳥會與愛鳥人士共同協助，把一筆筆資料建立起來。

史詩般的遷徙

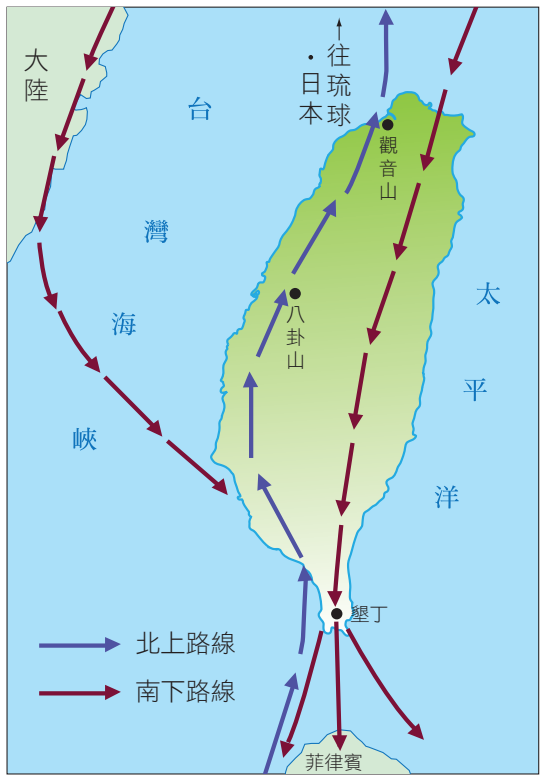
繫上標誌的鳥，除了在本地回收，也會在不同地方被不同的人觀察或捕捉。藉由相關資料的回報，就能知道其生長變化、生存年齡與停棲點，並逐步拼湊出遷移路線。在這過程中，交流的不只是資訊，還有人與土地。例如有一次，研究人員在關渡捕獲一隻來自日本九洲的家燕，測量後，依據腳環的信箱號碼，將最新資料回報給最初的繫放者。那位日本人對他繫放的鳥的停留處感到很好奇，於是跨海來到關渡，一窺這裡的環境。有來就有往，台灣繫放的水鳥，在日本、韓國、菲律賓、越南、澳洲都有回收的紀錄，最遠的距離，可以來到俄羅斯的西伯利亞。

It should be noted that birds migrate along with the change in seasons, not national boundaries. The range of their flight is so broad that to gain a comprehensive record, different nations need to work together. Building consensus on the classification scheme of leg flags is just a good example: two black flags suggests that the bird is released from Burma; one white and one green means it's from South Island of New Zealand; a white flag on top of a blue one indicates it's from Taiwan, while a reversed pattern indicates it's from Japan. The unified system has facilitated the observation of the water birds in East Asia and Australia, and this highlights the importance of cross-border cooperation, which also helps process the large amount of data.

Epic Migration

A banded bird can be observed or recaptured in places other than the original banding location. Through the recovery of the data researchers get to connect the dots and picture the migratory path of the bird. In such a process, exchanges between people and countries are also made possible. For example, a researcher in Guandu once found a Barn Swallow(*Hirundo rustica*) from Japan. After he took measurement of the bird, he reported the updated data back according to the mail box specified on the band. The original bander was then interested in the place where the bird took a stay so he came all the way to Guandu. As for birds banded in Taiwan, banders have received data sent back as far as from Vietnam, Australia and even Siberia.

▲ 藉由衛星發報器，我們能更加了解某些鳥類驚人的飛行能力。圖為裝上衛星發報器與足旗的鳳頭燕鷗 / 何一先提供，周成志攝
Through satellite transmitters we get to understand the amazing flying capability of some birds. The picture shows some Creasted Terns (*Sterna bergii*) with satellite transmitters and leg flags. / Photo provided by Yi-shen Ho, taken by Cheng-zhi Zhou



▶ 灰面鵟鷹遷徙路線圖
(繪圖資料參考來源：恆春半島戶外教學網站 http://163.32.133.8/yang/index.htm)
The picture shows the migration route of Grey-faced Buzzards (*Butastur indicus*). (Reference: Hengchun Peninsula Outdoor Education Website http://163.32.133.8/yang/index.htm)

藉由衛星發報器，我們更加了解某些鳥類驚人的飛行能力。研究顯示，嬌小的北極燕鷗每年往返南極大陸的距離，可以超過8萬公里。斑尾鷸也不遑多讓，牠能不吃不喝不休息的連續飛行1週，航程達1萬公里。這些史詩般的遷徙，讓人類對牠們的生命多了一份敬意。

關渡自然公園曾經是台灣重要的鳥類繫放地點。何處長從1989年便開始參與調查工作，見證了此處的滄海桑田。他認為，陽明山國家公園與關渡自然公園，一個在山上，一個在水邊，作為水陸交接的鄰居，在研究與保育工作上，應該可以相互合作，把水鳥與陸鳥之美，及動人的飛行故事，共同介紹給大家。

Through satellite transmitters we get to understand the amazing flying capability of some birds: the tiny Artic Tern (*Sterna paradisaea*) can travel over 80,000 km back and forth the Antarctica; the Bar-tailed Godwit (*Limosa lapponica*) can fly up to 10,000 km for a whole week without any food, drink or any rest. This kind of epic migration is so astounding that we as humans cannot but deeply respect the birds.

Guandu Nature Park was once the most important bird banding place in Taiwan, with Ho getting involved as early as in 1989. He believes that Yangmingshan National Park and GDNP should further collaborate in research and conservation, and make known to the public the beauty of the birds as well as their impressive stories of migration.

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1. 近來發展出的足旗，其優點是易於觀察，一般鳥友只要藉由望遠鏡，便能參與資料回報的工作。圖為鳳頭燕鷗 / 何一先提供
Leg flags have been used recently as they make observation easier; ordinary bird watchers can also take part in the ringing recovery through their own binoculars. The picture shows a Crested Tern (*Sterna bergii*). / Photo provided by Yi-shen Ho
2. 鳥類繫放研究，背後數量龐大的基本數據，不是一朝一夕就能完成的 / 何一先提供
The large amount of data behind bird banding research requires a long period of time to collect and compile. / Photo provided by Yi-shen Ho

簡介 *Profile*

何一先
Yi-shen Ho

大學念企管，因興趣與職務之需考入台北大學自然資源與環境管理研究所。從小便喜愛接觸自然，學生時代即參與鳥類繫放研究之工作。台北鳥會成員，曾任職中華鳥會繫放中心。現為關渡自然公園處長、台北縣永和社區大學講師。

Director Ho studied business management in college, but then entered the Institute of Natural Resource Management of National Taipei University due to his interests. As a long-time nature lover since childhood, he had joined bird banding research in his school years, and had served in Chinese Wild Bird Federation. Ho is currently a member of Bird Society of Taipei, a lecturer of Youngho Community University and the director of Guandu Nature Park.